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FINAL REMEDIAL INVESTIGATION REPORT FOR SITE 11A BUILDING 3033 FORMER VEHICLE REPAIR FACILITY AND WASTE OIL TANK JEB LITTLE CREEK VA

07/01/2010

CH2M HILL

Final

Remedial Investigation Report for Site 11a - Building 3033 Former Vehicle Repair Facility and Waste Oil Tank

Naval Amphibious Base Little Creek
Joint Expeditionary Base Little Creek—Fort Story
Virginia Beach, Virginia

Naval Facilities Engineering Command
NAVFAC MID-ATLANTIC

Prepared for

Department of the Navy

Naval Facilities Engineering Command
Mid-Atlantic

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Acronyms and Abbreviations

amsl	above mean sea level
ATSDR	Agency for Toxic Substances and Disease Registry
BERA	Baseline Ecological Risk Assesment
bgs	below ground surface
Cal EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
COC	constituent of concern
COI	constituent of interest
COPC	constituent of potential concern
CP	chlorophenol
CSF	carcinogenic slope factor
CSM	Conceptual Site Model
CTE	central tendency exposure
CTO	Contract Task Order
CVOC	chlorinated volatile organic compound
DCE	dichloroethene
DCP	dichlorophenol
DDD	dichlorodiphenyldichloroethane
DDE	dichlorodiphenyldichloroethylene
DDT	dichlorodiphenyltrichloroethane
DHC	dehalococcoides
DL	detection limit
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DoD	Department of Defense
DPT	direct-push technology
DQO	data quality objective
ECD	electron capture detector
ELCR	excess lifetime carcinogenic risk
EPC	exposure point concentration
ERA	Ecological Risk Assesment
FFA	Federal Facilities Agreement
ft	foot, feet
FS	feasibility study
gpm	gallons per minute
gm/ml	grams per cubic centimeter
HEAST	Health Effects Assessment Summary Tables

HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
ID	inside diameter
IDW	investigation-derived waste
IR	Installation Restoration
IRIS	Integrated Risk Information System
ISCO	in situ chemical oxidation
JEB	Joint Expeditionary Base
K	hydraulic conductivity
µg/kg	micrograms per kilograms
µg/L	micrograms per liter
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MIP	membrane interface probe
MS/MSD	matrix spike/matrix spike duplicate
NAB	Naval Amphibious Base
NAVFAC	Naval Facilities Engineering Command
NCEA	National Center for Environmental Assessment
NOD	natural oxidant demand
NPL	National Priorities List
ORP	oxidation reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PCP	pentachlorophenol
PDB	passive diffusion bag
PPRTV	Provisional Peer-Reviewed Toxicity Values
PQO	Project Quality Objective
PVC	polyvinyl chloride
QA/QC	quality assurance/quality control
RAGS	Risk Assessment Guidance for Superfund
RAOs	remedial action objectives
RBC	risk-based concentration
RDA	Recommended Dietary Allowance
RfD	reference doses
RI	Remedial Investigation
RME	reasonable maximum exposure
RSL	Regional Screening Level
SDI	Strategic Diagnostics Inc.

SERA	Screening Ecological Risk Assessment
SMDP	Scientific Management Decision Points
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAL	target analyte list
TCA	trichloroethane
TCBHQ	trichlorohydroxylbenzoquinone
TCE	trichloroethene
TCP	trichlorophenol
TCL	target compound list
TeCBQ	tetrachlorobenzoquinone
TeCHQ	tetrachloroatechol, tetrachlorohydroquinone
TeCP	tetrachlorophenol
TOC	total organic carbon
USEPA	United States Environmental Protection Agency
UCL	upper confidence limit
UF	uncertainty factor
USCS	Unified Soil Classification System
UST	underground storage tank
UTL	upper tolerance limit
VC	vinyl chloride
VDEQ	Virginia Department of Environmental Quality
VFA	volatile fatty acid
VGWS	Virginia Groundwater Standards
VOC	volatile organic compound
WHO	World Health Organization

Executive Summary

This report presents the Remedial Investigation (RI), Human Health Risk Assessment (HHRA), and Ecological Risk Assessment (ERA) for Site 11a, Joint Expeditionary Base (JEB) Little Creek-Fort Story, in Virginia Beach, Virginia. CH2M HILL conducted the RI in September 2007 to further define the nature and extent of contamination at Site 11a. The RI's primary objectives are as follows:

- Assess the nature and extent of volatile organic compounds (VOCs) in groundwater
- Characterize the source area
- Determine if additional constituents of concern (COCs) exist in site media
- Evaluate site-specific hydrogeologic conditions
- Assess human health and ecological risks

This report presents the activities, results, and conclusions of the RI and presents recommendations for future site activities. The use of the term "groundwater" in this report refers to groundwater within the shallow (Columbia) aquifer unless otherwise stated.

Site Description and History

On October 1, 2009, Hampton Roads' first Department of Defense Joint Base was established. This new installation comprises the former NAB Little Creek and Army post of Fort Story; the new name is JEB Little Creek-Fort Story. With the forming of this new command, the Navy assumes responsibility for management of both properties and will now merge meetings regarding the ongoing environmental restoration programs. However, separate records will be maintained to ensure the integrity of ongoing efforts at both properties. When required for public notices and distributions, the former bases will be individually identified as JEB East (former Fort Story) and JEB West (former NAB Little Creek). For ERP documents, the former names NAB Little Creek and Fort Story shall be used to maintain consistency within the program.

Site 11a, Building 3033 Former Vehicle Repair Facility and Waste Oil Tank, is centrally located in the industrial area of NAB Little Creek. The current southern portion of the site boundary adjoins the northern portion of the boundary for Installation Restoration (IR) Site 11. The site consists of an open grass-covered field, Building 3606, and an asphalt parking area that surrounds Building 3606. Building 3606 is a four-story barracks building and is used as single residence lodging for active duty personnel. The open field south of Building 3606 is utilized primarily as a recreational area for barracks personnel.

Two former buildings, Buildings 3033 and 3034, were located at the site. Former Building 3034 was located in the grass-covered field and was used as a garden supply center. There are no documented releases associated with the building. Former Building 3033 was a twelve bay vehicle repair facility located immediately south of the current barracks building. Historical records indicate the presence of an underground waste oil tank associated with the vehicle repair facility operations. The tank was identified as Solid Waste Management Unit (SWMU) 60 in the SWMU/IR Summary report (NAB Little Creek, 2000).

Contents of the tank were not documented and there is no record of solvent disposal in the tank. The tank was reportedly excavated and removed in 1988 under the Underground Storage Tank (UST) Program. Prior to NAB Little Creek's placement on the National Priorities List (NPL) in 1999, SWMU 60 was closed out under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) with no further action following a desktop audit (NAB Little Creek, 2000).

During the 1998 Supplemental RI at IR Site 11 trichloroethene (TCE) was detected in an upgradient monitoring well, LS11-MW16D, (CH2M HILL, 2004), approximately 330 feet north of the Site 11 source area. This indicated a separate source of VOC contamination. Subsequently, the area north of Site 11 became identified as Site 11a and was included in the CERCLA process for site investigation. Further investigation of the Site 11a plume found that the southern (downgradient) edge of the Site 11a plume adjoins the northern portion of the Site 11plume.

Several investigations were conducted at Site 11a between 2001 and 2005 to characterize the nature and extent of contamination at the site. A treatability study, consisting of in situ chemical oxidation (ISCO), was implemented in 2005 to address VOCs in the groundwater; however, it was ineffective in consistently reducing VOC concentrations within the treatment area.

Remedial Investigation Activities

RI activities included the collection of direct-push technology (DPT) groundwater samples, monitoring well installation, groundwater sampling at all site monitoring wells, aquifer slug testing, and surface and subsurface soil sampling.

Site Physical Characteristics

The topography of the site is flat; unpaved areas are landscaped with shrubs/bushes, grass, and several large trees along the northern and southern sides of Building 3606. There are no natural drainage features evident and no surface water bodies on or near the site; therefore, no sediment is associated with the site.

The subsurface geology at Site 11a consists of primarily fine to medium grained sands underlain by high plasticity clay of the Yorktown confining unit. The top of the confining unit is approximately 20 to 30 feet (ft) below ground surface (bgs), and impedes the vertical flow of groundwater to the underlying Yorktown aquifer.

The water table at Site 11a is encountered at depths ranging from 4 to 10 ft bgs and the primary groundwater flow is south/southwest. The hydraulic gradient at the site ranges from 6.1×10^{-4} to 8.1×10^{-4} with an average of 7.3×10^{-4}. Groundwater velocity is approximately 2.4 feet per year (ft/year).

Nature and Extent of Contamination

Groundwater

TCE and tetrachloroethene (PCE) were detected in groundwater above the Maximum Contaminant Levels (MCLs). The total VOC plume trends south-southwest following the

primary direction of groundwater flow from the source area near the footprint of the former Building 3033 and the suspected location of the former underground waste oil tank (**Figure 5-2**). However, grab groundwater data just north and south of the Building 3606 show VOCs extending beneath the building, indicating that groundwater may also be dispersing out from the source area due to the low groundwater gradient. The plumes were delineated using the 2007 analytical data from the monitoring wells and the grab groundwater samples collected north of Building 3606. TCE is the most horizontally extensive VOC, while PCE is concentrated to the source area and the area just south of the source. Based on the results of the grab groundwater samples, Site 11a and Site 11 plumes appear to be co-mingled. Therefore, the true extent of the southern area the Site 11a groundwater plume can not be clearly defined.

The semivolatile organic compound (SVOC) pentachlorophenol (PCP) was detected above the MCL in the upgradient site monitoring well (LS11-MW20D). The PCP source is unknown.

Several pesticides and inorganics were detected across the site; however, none were detected above the MCLs.

Soil

VOCs, SVOCs, pesticides, and inorganics were detected in soil. Only inorganics; aluminum, arsenic, calcium, iron, and magnesium, exceeded established Background upper tolerance limits (UTLs). However, no releases to the soil have been documented at the site.

Fate and Transport of Contamination

Based on the data collected to date, the primary source of the VOCs in groundwater is attributed to the former underground waste oil tank. The source of PCP in groundwater has not been identified.

The primary mechanism for constituent transport at Site 11a is transport of dissolved VOCs in groundwater through advection. A secondary, less prominent, fate and transport mechanism of representative constituents is the potential volatilization to the atmosphere from groundwater.

Human Health Risk Assessment

An HHRA was conducted as part of the RI to assess the potential risks to human health associated with exposure to groundwater and soil. Results of the RI identified potential unacceptable risks associated with the future potable use of shallow aquifer groundwater.

The receptors and exposure pathways quantitatively evaluated are:

- **Current Scenarios:**
  - **Resident (adult)** - incidental ingestion, dermal contact, and inhalation of VOCs and fugitive dust emissions from the surface soil

- **Future Scenarios:**
  - **Industrial Worker (adult) -** incidental ingestion, dermal contact, and inhalation of VOCs and fugitive emissions from surface and subsurface soils
  - **Trespassers/Visitors (adult and adolescent) -** incidental ingestion, dermal contact, and inhalation of VOCs and fugitive emissions from surface and subsurface soils
  - **Construction Worker -** incidental ingestion, dermal contact, and inhalation of VOCs and fugitive emissions from surface and subsurface soils; dermal contact with groundwater and inhalation of VOC emissions from groundwater
  - **Residents (adult and child) -** incidental ingestion, dermal absorption, and inhalation of VOCs and fugitive emissions from surface and subsurface soils; inhalation of VOCs from groundwater while showering (adults) and ingestion and dermal contact with groundwater used as a potable residential water supply source

Current residents of the barracks and future hypothetical residents could be exposed to vapors migrating from the groundwater into onsite buildings. In order to evaluate this pathway, groundwater samples were collected during the RI for use in the Johnson and Ettinger Model. However, following collection of the data, uncertainties with use of the model prevented this pathway from being quantitatively evaluated in this risk assessment. Additional site data will be collected to evaluate this pathway, the HHRA revised, and the results incorporated into the Feasibility Study (FS).

Exposure to soil would not pose unacceptable non-carcinogenic hazards or carcinogenic risks to any of the potential receptors.

Exposure to groundwater may pose unacceptable hazards and risks for future hypothetical construction workers or residents. The potential unacceptable risks and hazards to the construction worker are primarily associated with inhalation of TCE and PCE vapors from the groundwater in an open excavation. The potential unacceptable risks and hazards to the future resident are primarily associated with ingestion of and/or dermal contact with PCE, TCE, PCP, and manganese. Although the risk assessment indicated a hazard associated with manganese, the concentrations detected in the groundwater result in intake of manganese below the RDA and the manganese concentrations at the site are below the background levels of manganese.

Ecological Risk Assessment

A Screening Ecological Risk Assessment (SERA) was conducted to evaluate the potential ecological risks associated with potential releases at Site 11a. The available surface soil data do not indicate that a surface release has occurred at the site based upon the pattern and magnitude of the resulting constituent concentrations detected for the constituent groups potentially related to the former waste oil tank (VOCs and SVOCs). Only very low concentrations of VOCs (less than about 10 µg/kg) have been detected in site surface soils. Only two SVOCs (one PAH and one phthalate) were detected in site surface soils. None of these constituents exceed available ecological soil screening values.

Although inorganics are not likely to be site related, inorganics detected in site surface soil samples were also compared with available ecological soil screening values. The results indicate that only chromium, mercury, and vanadium exceeded ecological screening values and only chromium and vanadium exceeded the 95% Background UTLs. Vanadium exceeded background in only a single sample at a maximum ratio of just 1.03. Only two samples have chromium exceedances slightly above background (maximum ratio of 1.08) in an area not covered by asphalt. Based upon these site-specific lines of evidence, these three constituents do not pose an unacceptable risk greater than background. This comparison supports the lack of a surface release at the site. Therefore, potential ecological risks at Site 11a are negligible based upon the lack of a significant soil exposure pathway.

Recommendations

Because there is a potential for vapor intrusion into the current onsite building, Building 3606, further evaluation of the potential vapor intrusion pathway is necessary. A work plan is being prepared to further evaluate the vapor intrusion pathway and the results of this evaluation will be used to refine the HHRA in the FS. Additionally, confirmation of PCP in the groundwater at monitoring well LS11A-MW20D is recommended.

It is recommended that an FS be conducted to develop remedial action objectives and evaluate remedial alternatives to mitigate the potential unacceptable site-related risks posed by the COCs in groundwater. This recommendation is based on the results of the HHRA presented in Sections 7, as well as the risk management considerations presented in Section 9. No further action is warranted for soil associated with Site 11a as there are no unacceptable human or ecological risks from exposure to this media.

SECTION 1

Introduction

This report presents field activities, results, and conclusions of the Remedial Investigation (RI) conducted at Installation Restoration (IR) Site 11a, Building 3033 Former Vehicle Repair Facility and Waste Oil Tank, Joint Expeditionary Base (JEB) Little Creek-Fort Story, Virginia Beach, Virginia. This report was prepared under the United States (U.S.) Navy, Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic, Comprehensive Long-term Environmental Action Navy (CLEAN) III, Contract N62470-02-D-3052, Contract Task Order (CTO) 0125.

On October 1, 2009, Hampton Roads' first Department of Defense Joint Base was established. This new installation comprises the former NAB Little Creek and Army post of Fort Story; the new name is JEB Little Creek-Fort Story. With the forming of this new command, the Navy assumes responsibility for management of both properties and will now merge meetings regarding the ongoing environmental restoration programs. However, separate records will be maintained to ensure the integrity of ongoing efforts at both properties. When required for public notices and distributions, the former bases will be individually identified as JEB East (former Fort Story) and JEB West (former NAB Little Creek). For ERP documents, the former names NAB Little Creek and Fort Story shall be used to maintain consistency within the program.

Representatives from the Navy, U.S. Environmental Protection Agency (USEPA) Region III, and Virginia Department of Environmental Quality (VDEQ) jointly scoped the technical approach and specific objectives of this event. The field activities were completed during September and October 2007 in accordance with the *Final Remedial Investigation Work Plan Site 11a, Building 3033 Former Waste Oil Tank* (CH2M HILL, 2007).

1.1 Objectives and Approach

The RI project quality objectives (PQOs) consist of the following:

- Assess the nature and extent of volatile organic compounds (VOCs) in groundwater
- Characterize the source area
- Determine if additional constituents of concern (COCs) exist in site media
- Evaluate site-specific hydrogeologic conditions
- Assess human health and ecological risks

Data from previous investigations are included to aid in development of a comprehensive conceptual site model (CSM). Results from the RI will be used to develop remedial action objectives (RAOs) and evaluate remedial alternatives in the Feasibility Study (FS).

1.2 Report Organization

This RI report is comprised of the following sections:

- Section 1—Introduction

- Section 2—Site Background
- Section 3—Field Investigation Activities and Data Evaluation
- Section 4—Physical Characteristics
- Section 5—Nature and Extent of Contamination
- Section 6—Contaminant Fate and Transport
- Section 7—Human Health Risk Assessment
- Section 8—Ecological Risk Assessment
- Section 9—Conclusions and Recommendations
- Section 10—References

Figures and tables are provided at the end of each section. Appendixes are provided at the end of the document.

SECTION 2

Site Background

2.1 NAB Little Creek History and Description

NAB Little Creek is primarily an industrial and training facility located in the northwest corner of Virginia Beach, Virginia. The western boundary of NAB Little Creek borders the City of Norfolk, Virginia (**Figure 2-1**). The 2,215-acre base is low lying and relatively flat with several freshwater lakes (Chubb Lake, Lake Bradford, Little Creek Reservoir/Lake Smith, and Lake Whitehurst) located on or adjacent to the base. NAB Little Creek centers around four saltwater bodies: Little Creek Harbor, Little Creek Cove, Desert Cove, and Little Creek Channel, which connects the coves and harbor with the Chesapeake Bay.

In addition to industrial land use, NAB Little Creek and the surrounding areas are also used for recreational, commercial, and residential purposes. Specifically, the southeast corner of the base has been developed for residential use. Land development surrounding the base is residential, commercial, and industrial. Little Creek Reservoir/Lake Smith, located upgradient of the base, serves as a secondary drinking water supply for parts of the City of Norfolk.

NAB Little Creek grew out of four bases constructed during World War II: the Amphibious Training Base, the Naval Frontier Base, and Camps Bradford and Shelton. It consisted of three annexes named for the former owners of the property: Shelton on the east, Bradford in the center, and Whitehurst to the west. A Secretary of the Navy letter in July 1945 disestablished the separate bases and established NAB Little Creekon August 10, 1945. In 1946,NAB Little Creek was designated a permanent base. The base's mission was the training of landing craft personnel for operational assignments.

NAB Little Creek has expanded in both area and the complexity of its mission over the past 50 years. Base personnel provide logistic facilities and support services to 27 home-ported ships and more than 80 tenant commands. The combination of operational support and training facilities is geared predominantly to meet the amphibious warfare–training requirements of the United States Armed Forces. Operations that have occurred at NAB Little Creek include: vehicle and boat maintenance, boat painting and sandblasting, construction and repair of buildings and piers, mixing and application of pesticides, electroplating of musical instruments, laundry and dry cleaning, medical and dental treatment, and the generation of steam for heat.

2.2 Site 11a Description and History

Site 11a, Building 3033 Former Vehicle Repair Facility and Waste Oil Tank, is centrally located in the industrial area of NAB Little Creek (**Figure 2-1**). The current southern portion of the site boundary adjoins the northern portion of the boundary for Installation Restoration (IR) Site 11 (**Figure 2-2**). Surface features at Site 11a consist of Building 3606, its surrounding asphalt parking area, and an open mown grass field (**Figure 2-2**). Building 3606 is a five-story barracks building used as single residence lodging for active duty personnel.

The open field south of Building 3606 is utilized primarily as a recreational area for building occupants.

Flora at the site consists of landscaping shrubs/bushes, grass, and several large trees located along the northern and southern sides of Building 3606. The topography is flat with no natural drainage features evident. A sanitary storm sewer runs through the central portion of the site. There are no surface water bodies on or near the site and, therefore, no sediment associated with the site.

Two former buildings, Buildings 3033 and 3034, were located at the site (**Figure 2-2**). Building 3034, used as a garden supply center, was located in the grass-covered field. No releases associated with the building have been documented. Building 3033, used as a twelve bay vehicle repair facility, was located immediately south of the current barracks building. Historical records indicate the presence of an underground waste oil tank associated with the vehicle repair activities. The tank was identified as Solid Waste Management Unit (SWMU) 60 in the SWMU/IR Summary report (NAB Little Creek, 2000). Contents of the tank were not documented and there is no record of solvent disposal in the tank. The tank was reportedly excavated and removed in 1988 under the Underground Storage Tank (UST) Program; however documentation of tank closure is not available. Prior to NAB Little Creek's placement on the National Priorities List (NPL) in 1999, SWMU 60 was closed out under CERCLA with no further action following a desktop audit (NAB Little Creek, 2000). SWMU 60 was documented in the Federal Facilities Agreement (FFA) as closed out with no further CERCLA action (DON, 2003).

2.3 Previous Investigations

During the 1998 Supplemental RI at IR Site 11 (CH2M HILL, 2004), Trichloroethene (TCE) was detected at a concentration of 1,600 micrograms per liter (µg/L) in Site 11 upgradient monitoring well LS11-MW16D, indicating the presence of an upgradient source of VOCs. Subsequently, the area north of Site 11 was identified as Site 11a and included in the CERCLA process for site investigation. Several investigations were conducted at the site between 2001 and 2005, to determine the VOC source and define the nature and extent of contamination. Each investigation and the associated samples are listed on **Table 2-1**. Previous investigation sample locations are shown on **Figure 2-3** and analytical data are provided in **Appendix A.**

2.3.1 August 2001 Groundwater Investigation

In August 2001, CH2M HILL conducted a groundwater investigation using membrane interface probe (MIP) and direct-push technology (DPT), to investigate VOCs upgradient of Site 11 and define a potential source area. Eight sample locations were screened for the presence of VOCs in groundwater using MIP. Based on elevated electron capture detector (ECD) response at several of the MIP locations, four grab groundwater samples were collected from various depths and analyzed for target compound list (TCL) VOCs. TCE was the only VOC detected above the Maximum Contaminant Level (MCL), at location GP402. Investigation results confirmed that VOCs were present in groundwater upgradient of Site 11; however, a source was not identified. Consequently, the NAB Little CreekTier I partnering team reached consensus in December 2001 to separate the northern area of Site 11 into an Appendix B site, Site 11a (CH2M HILL, 2003c). Appendix B sites are Preliminary

Screening Areas that undergo thorough reviews of all existing or easily obtainable documentation and information on the identified site. Additional investigation was recommended to further characterize the nature and extent of contamination in site media.

2.3.2 May through June 2002 Supplemental Investigation

A supplemental investigation was conducted in May and June 2002 to delineate the nature and extent of contamination in groundwater and identify a potential TCE source area within the soil at Site 11a (CH2M HILL, 2003b).

To delineate TCE in the groundwater and soil, samples were collected and initially screened using the Strategic Diagnostics Inc. (SDI) Quick Check field screening test kits to provide rapid results (**Appendix A**). Two soil samples were collected from each of 10 locations; one from the surface and one from a depth immediately above the water table; and one subsurface soil sample was collected at an additional location (10 total surface soil samples and 11 total subsurface soil samples). Two groundwater samples were also collected from seven of the soil locations as well as from five additional locations (19 total groundwater samples). The groundwater samples were collected from the Columbia aquifer using DPT. At one location (GP519) the sample was collected at the top of the aquifer. To confirm the field screening results, 10 of the surface and 11 of the subsurface soil samples were sent to an off-site laboratory and analyzed for VOCs, inorganics, and percent solids; and 10 of the groundwater samples collected were sent to an off-site laboratory and analyzed for low concentration VOCs. TCE was only detected in the surface soil sample collected at SO319 and the highest concentrations of TCE were detected in grab groundwater samples GP506, GP512, and GP505, all located in the parking lot south of Building 3606. The SDI field screening results correlated well with the laboratory data for the groundwater samples. However, it did not appear that there was any significant correlation between the soil TCE results from the SDI kits and soil TCE results from the laboratory. Therefore, the SDI soil test kit results have not been used in the conceptual site model or risk evaluation, and are not discussed in subsequent sections of this report.

Based on analytical results from the grab groundwater sampling, three monitoring wells (MW20D, MW21D, and MW22D) were installed within the lower portion of the Columbia aquifer (approximately 26-29 feet bgs) and sampled for low concentration VOCs and TAL inorgancis (total and dissolved). Additionally, one existing monitoring well (MW16D) was sampled for the same parameters. Although several VOCs were detected across the site, TCE was the only significant exceedance of groundwater criteria. Monitoring well groundwater sample results confirmed that TCE is prevalent near MW21D. TCE was not detected in the upgradient well (MW20D), and the lowest detected TCE concentration was found in the downgradient well (MW22D).

No inorganics in soil exceeded residential risk based concentrations (RBCs) and background upper tolerance limits (UTLs). Nearly all inorganics analyzed for were detected in groundwater at most of the sample locations; however there were no exceedances of screening criteria. Based on the results of the supplemental investigation, VOCs are not present in the soil at concentrations likely contributing to the VOC concentrations detected in groundwater.

The supplemental investigation resulted in a recommendation for further delineation of VOCs in groundwater at Site 11a, and that Site 11a be considered for a pilot study to evaluate the effectiveness of an in-situ technology for reducing the concentrations of TCE below the MCL.

2.3.3 October 2003 MIP and DPT Investigation

Soil and groundwater were investigated using MIP and DPT in October 2003 to further delineate the VOC plume. A depiction of VOC spatial distribution in groundwater based on the MIP results is presented in **Figure 2-4** and the data is presented in **Appendix B**. The MIP indicated a potential source area in the vicinity of the barracks parking lot south of Building 3606. Two soil samples (LS11A-SB109 and LS11A-SB129) were collected from this location based on the MIP results and analyzed for TCL VOCs. PCE and TCE were detected in only one (LS11-SB109) of the two sample locations; however, concentrations were less than their respective residential RBCs.

Eight groundwater samples were collected using DPT to confirm the MIP data results. Concentrations of PCE, TCE, cis-1,2-dichloroethene (DCE), and vinyl chloride (VC) exceeded the MCL in confirmatory groundwater samples, with the highest concentrations detected at GP108 and GP126. VOC concentrations in the northern portion of the plume extended from the upper to the lower portion of the Columbia aquifer (**Figure 2-4**). The VOC plume extended deeper into the Columbia aquifer toward the southwest, which is consistent with expected contaminant fate and transport in the southern portion of the site, based on historic groundwater flow direction. Based on the results of this investigation, it was recommended additional monitoring wells be installed and groundwater sampling be conducted to assess the horizontal and vertical delineation of VOCs in groundwater.

2.3.4 February 2004 Monitoring Well Installation and Groundwater Sampling

Based upon the results of the 2003 MIP/DPT investigation, four monitoring wells (LS11-MW31D, MW32D, MW33D, and MW34D) were installed in February 2004 to assess horizontal and vertical stratification of the VOC plume. Each monitoring well was screened across the entire depth of the Columbia aquifer and groundwater samples were collected at various depths from the new and existing monitoring wells using passive diffusion bags (PDBs). Samples were analyzed for TCL VOCs. PCE, TCE, and VC were detected at concentrations exceeding their corresponding MCLs; however, there were no notable differences in VOC concentrations with respect to depth. The highest concentration of PCE was detected at LS11-MW32D and the highest concentration of TCE was detected at LS11-MW22D.

Based on the results of this investigation, a treatability study was recommended at Site 11a to evaluate potential treatment technologies for the remediation of the VOCs in groundwater. Chemical oxidation was selected and agreed upon by the Navy, USEPA, and VDEQ as the groundwater treatment technology for the treatability study.

2.3.5 January through November 2005 Treatability Study

A groundwater treatability study was implemented at Site 11a using in situ chemical oxidation (ISCO). Prior to the ISCO injection, bench-scale testing using saturated soil and groundwater samples was conducted, an additional monitoring well (LS11-MW35D) was installed to verify the western extent of the VOC plume, and all site monitoring wells were sampled to establish a baseline dataset for post-injection comparison. Thirty-five permanent

application wells were installed at twenty-six locations (**Figure 2-5**) and used to inject the aquifer with a conditioning solution consisting of ferrous sulfate, hydrochloric acid, and sodium persulfate, followed by hydrogen peroxide (the oxidizing agent). Injections were completed in March 2005 and three rounds (April 2005, June 2005, and November 2005) of post-injection groundwater monitoring for VOCs and inorganics were conducted to evaluate treatment effectiveness.

The results of the treatability study indicated that ISCO was ineffective in consistently reducing VOC concentrations across the treatment area. Insufficient distribution of reagent in the aquifer likely contributed to the lack of significant VOC reduction across the site (CH2M HILL, 2006a).

2.4 Basis for Remedial Investigation

Based on previous investigation and treatability study results, the Tier I Partnering Team agreed a RI was warranted for Site 11a to better characterize the nature and extent of contamination and quantify human health and ecological risks. Review of available site data identified the following data gaps.

- The MIP data indicated the highest VOC concentrations were located in the parking lot south of the barracks. This is consistent with the location of the former underground waste oil storage tank located near former Building 3033 (Former SWMU 60). Although there is no historical record of solvent disposal associated with the tank, soil and groundwater data suggest the tank may have contained solvents. Previous investigations have not fully characterized the suspected VOC source area associated with the former underground waste oil storage tank.
- A comparison of the DPT data adjacent to monitoring well LS11-MW21D indicates the well may not be screened to a depth which captures the easternmost extent of VOC contamination at the site. Additionally, the downgradient monitoring well LS11-MW15D is screened at a shallow depth interval which may not capture the extent of VOCs in the lower portion of the Columbia aquifer. Therefore the vertical and horizontal distribution of the VOC plume south and east of the source area may not be sufficiently defined.
- The current geochemical conditions in the Columbia aquifer may have changed as a result of the ISCO injection. These conditions need to be determined for future remedial alternative evaluation.
- Previous investigations have not evaluated the potential presence of VOC contamination in the unsaturated soil to the extent necessary to determine if it has been impacted by a release at the site.

Table 2-1
Previous Investigations Sample Summary
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Previous Investigation	TCL VOCs (OLM04)	TCL Select VOCs (8021B)[1]	TAL Total Inorganics (ILM04.1)	TAL Dissolved Inorganics (ILM04/ILM05)	TAL Select Dissolved Inorganics (6010B)[2]	Geochemical Parameters[3]
Site 11 DPT Sampling (January 1999)						
Grab Groundwater						
LS11-GP309-10C		X				
LS11-GP310-10C		X				
LS11-GP311-10C		X				
Site 11 Remedial Investigation, Round 2 (July 1999)						
Monitoring Well Groundwater						
LS11-MW15D-99C		X			X	X
LS11-MW16D-99C		X			X	X
Groundwater Investigation (August 2001)						
Grab Groundwater						
LS11-GP401-12	X					
LS11-GP401-07	X					
LS11-GP402-12	X					
LS11-GP403-12	X					
Supplemental Investigation (May - June 2002)						
Grab Groundwater						
LS11-GP503-12	X					
LS11-GP505-12	X					
LS11-GP506-12	X					
LS11-GP507-12	X					
LS11-GP508-12	X					
LS11-GP509-12	X					
LS11-GP510-12	X					
LS11-GP512-12	X					
LS11-GP516-12	X					
LS11-GP517-12	X					
Monitoring Well Groundwater						
LS11-MW16D-02B	X		X	X		
LS11-MW20D-02B	X		X	X		
LS11-MW21D-02B	X		X	X		
LS11-MW22D-02B	X		X	X		
Co-located Surface & Subsurface Soil						
LS11-SS306-00	X		X			
LS11-SB306-06	X		X			
LS11-SS307-00	X		X			
LS11-SB307-03	X		X			
LS11-SS308-00	X		X			
LS11-SB308-03	X		X			
LS11-SS309-00	X		X			
LS11-SB309-03	X		X			
LS11-SS310-00	X		X			
LS11-SB310-03	X		X			
LS11-SS311-00	X		X			
LS11-SB311-03	X		X			
LS11-SS312-00	X		X			
LS11-SB312-03	X		X			
LS11-SS313-00	X		X			
LS11-SB313-03	X		X			
LS11-SS314-00	X		X			
LS11-SB314-03	X		X			
LS11-SS319-00	X		X			
LS11-SB319-03	X		X			
Site 11 Supplemental Remedial Investigation (January 2003)						
Monitoring Well Groundwater						
LS11-MW15D-03A	X					
MIP and DPT Investigation (October 2003)						
Grab Groundwater						
LS11A-GP101-18-03D	X					
LS11A-GP104-22-03D	X					
LS11A-GP108-10-03D	X					
LS11A-GP117-24-03D	X					
LS11A-GP125-26-03D	X					
LS11A-GP126-08-03D	X					
LS11A-GP128-10-03D	X					
LS11A-GP129-8-03D	X					
Subsurface Soil						
LS11A-SB109-04-03D	X					
LS11A-SB129-04-03D	X					
Monitoring Well Installation and Groundwater Sampling (February 2004)						
Monitoring Well Groundwater						
LS11-MW15D-17-04A	X					
LS11-MW16D-22-04A	X					
LS11-MW20D-18-04A	X					
LS11-MW20D-23-04A	X					
LS11-MW21D-26-04A	X					
LS11-MW21D-21-04A	X					

Table 2-1
Previous Investigations Sample Summary
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Previous Investigation	TCL VOCs (OLM04)	TCL Select VOCs (8021B)[1]	TAL Total Inorganics (ILM04.1)	TAL Dissolved Inorganics (ILM04/ILM05)	TAL Select Dissolved Inorganics (6010B)[2]	Geochemical Parameters[3]
LS11-MW22D-20-04A	X					
LS11-MW22D-25-04A	X					
LS11-MW31D-7-04A	X					
LS11-MW31D-12-04A	X					
LS11-MW31D-17-04A	X					
LS11-MW31D-22-04A	X					
LS11-MW31D-27-04A	X					
LS11-MW32D-6-04A	X					
LS11-MW32D-11-04A	X					
LS11-MW32D-16-04A	X					
LS11-MW32D-21-04A	X					
LS11-MW32D-26-04A	X					
LS11-MW33D-7-04A	X					
LS11-MW33D-12-04A	X					
LS11-MW33D-17-04A	X					
LS11-MW33D-22-04A	X					
LS11-MW34D-6-04A	X					
LS11-MW34D-11-04A	X					
LS11-MW34D-16-04A	X					
LS11-MW34D-21-04A	X					
LS11-MW34D-26-04A	X					
Treatability Study (January - November 2005)						
Baseline Monitoring Well Groundwater (January 2005)						
LS11-MW15D-05A	X		X	X		
LS11-MW16D-05A	X		X	X		
LS11-MW20D-05A	X		X	X		
LS11-MW21D-05A	X		X	X		
LS11-MW22D-05A	X		X	X		
LS11-MW31D-05A	X		X	X		
LS11-MW32D-05A	X		X	X		
LS11-MW33D-05A	X		X	X		
LS11-MW34D-05A	X		X	X		
LS11-MW35D-05A	X		X	X		
Post-Injection Round 1 Monitoring Well Groundwater (April 2005)						
LS11-MW15D-R01-05B	X		X	X		
LS11-MW16D-R01-05B	X		X	X		
LS11-MW20D-R01-05B	X		X	X		
LS11-MW21D-R01-05B	X		X	X		
LS11-MW22D-R01-05B	X		X	X		
LS11-MW31D-R01-05B	X		X	X		
LS11-MW32D-R01-05B	X		X	X		
LS11-MW33D-R01-05B	X		X	X		
LS11-MW34D-R01-05B	X		X	X		
LS11-MW35D-R01-05B	X		X	X		
Post-Injection Round 2 Monitoring Well Groundwater (June 2005)						
LS11-MW15D-R02-05B	X		X	X		
LS11-MW16D-R02-05B	X		X	X		
LS11-MW20D-R02-05B	X		X	X		
LS11-MW21D-R02-05B	X		X	X		
LS11-MW22D-R02-05B	X		X	X		
LS11-MW31D-R02-05B	X		X	X		
LS11-MW32D-R02-05B	X		X	X		
LS11-MW33D-R02-05B	X		X	X		
LS11-MW34D-R02-05B	X		X	X		
LS11-MW35D-R02-05B	X		X	X		
Post-Injection Round 3 Monitoring Well Groundwater (November 2005)						
LS11-MW15D-R03-05D	X		X	X		
LS11-MW16D-R03-05D	X		X	X		
LS11-MW20D-R03-05D	X		X	X		
LS11-MW21D-R03-05D	X		X	X		
LS11-MW22D-R03-05D	X		X	X		
LS11-MW31D-R03-05D	X		X	X		
LS11-MW32D-R03-05D	X		X	X		
LS11-MW33D-R03-05D	X		X	X		
LS11-MW34D-R03-05D	X		X	X		
LS11-MW35D-R03-05D	X		X	X		

Notes:
DPT - direct push technology
MIP - membrane interface probe
TAL - target analyte list
TCL - target compound list
VOC - volatile organic compound

[1]Consists of 1,1,1-trichloroethane (TCA); 1,1-dichloroethane (DCA); 1,1-trichloroethane (TCA); tetrachloroethene (PCE); trichloroethene (TCE); cis-1,2-DCE; and trans-1,2-DCE
[2]Consists of calcium, iron, magnesium, manganese, potassium, and sodium
[3]Consists of alkalinity, chloride, nitrate as n, nitrite, sulfate, sulfide, and total organic carbon

V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Figure 2-1 - Site Location Map.mxd

Legend

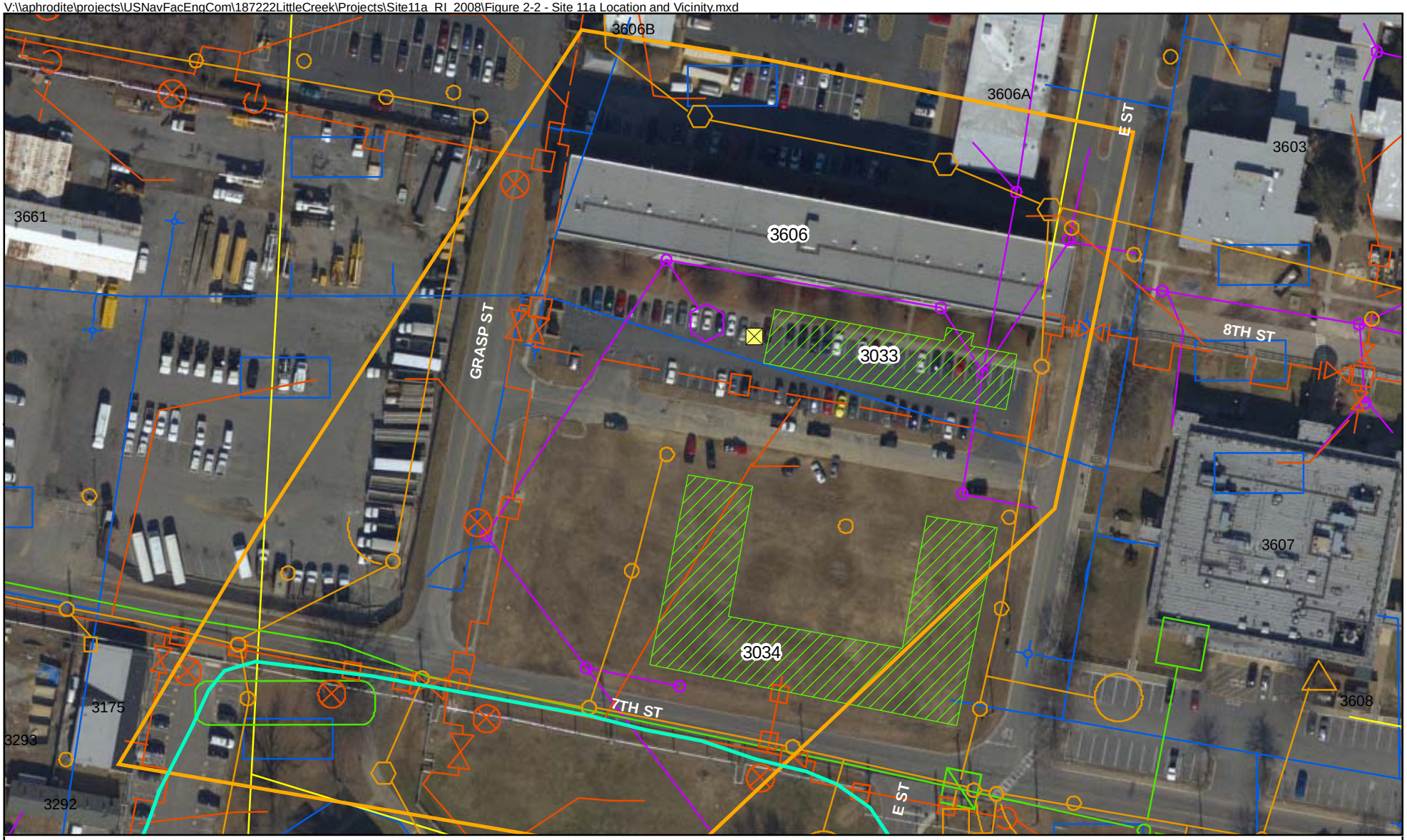
- Site 11a Area of Investigation
- Installation Boundary

N
W E
S

0 1,000 2,000 4,000 Feet

Figure 2-1
NAB Little Creek and Site 11a Location Map
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Figure 2-2 - Site 11a Location and Vicinity.mxd



Legend

- Site 11a Area of Investigation
- Site 11 Area of Investigation
- Demolished Building
- Approximate Location of Former Underground Waste Oil Tank
- Electrical Cable Line
- Heat Cool Line
- Natural Gas Line
- Storm Sewer Line
- Wastewater Line
- Water Line

N
W E
S

0 55 110 Feet

Figure 2-2
Site 11a Location and Vicinity
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

CH2MHILL

\\aphrodite\Proj\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Figure 2-3 - Previous Sample Locations_revised.mxd

Legend

- Area of Investigation
- Demolished Building
- Approximate Location of Former Underground Waste Oil Tank
- Surface Soil Sample Location
- MIP and Grab Groundwater Sample Location
- Grab Groundwater Sample Location
- Monitoring Well Location
- MIP Location
- Subsurface Soil Sample Location

All sample IDs begin with base and site indentification "LS11" or "LS11A"

N
W E
S

0 50 100
Feet

Figure 2-3
Previous Investigation Sample Locations
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

CH2MHILL

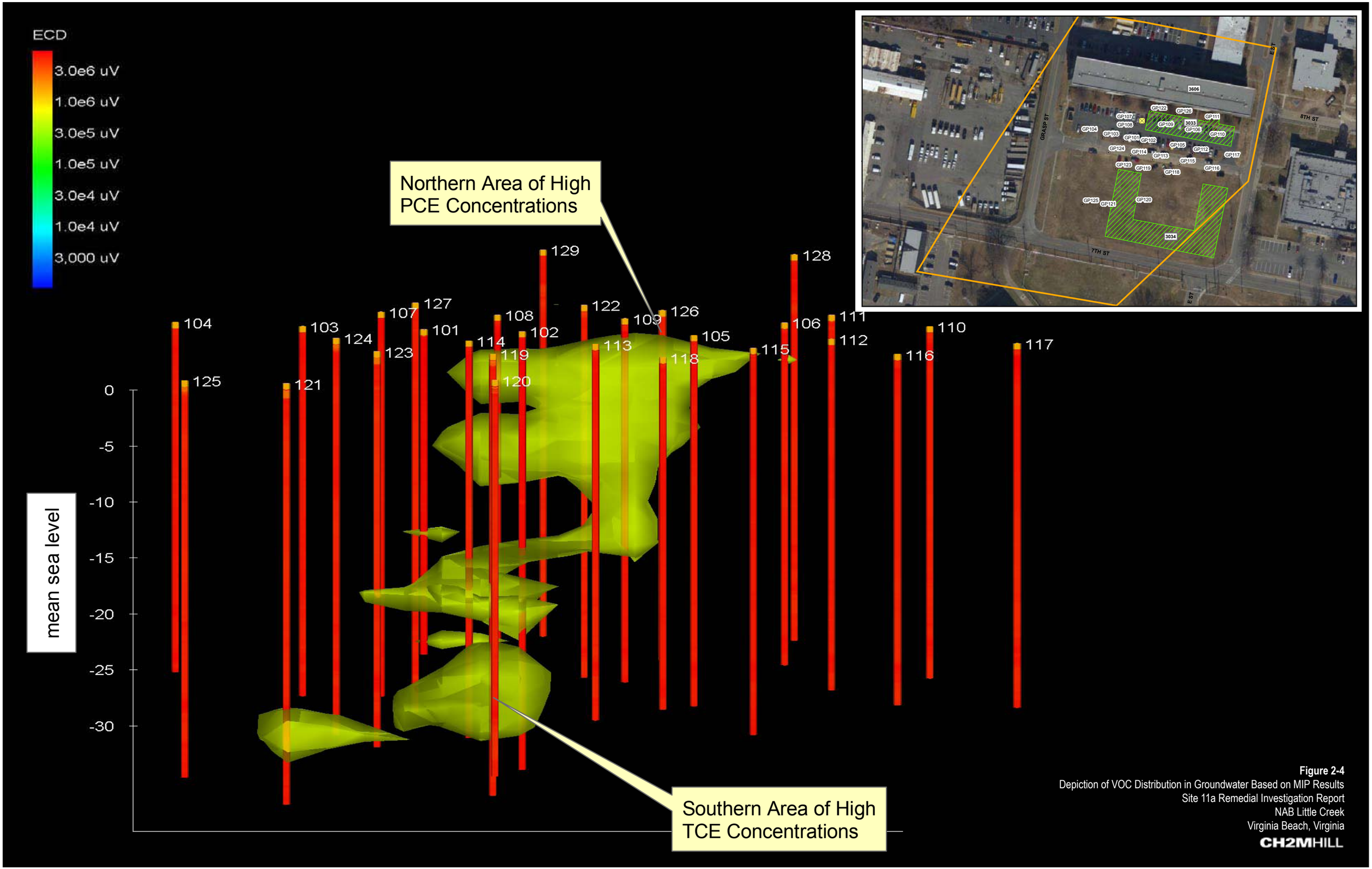


Figure 2-4
Depiction of VOC Distribution in Groundwater Based on MIP Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia
CH2MHILL

\\aphrodite\Proj\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Figure 2-5 - Application Wells.mxd

Legend

- Area of Investigation
- Demolished Building
- Application Well Location
- Approximate Location of Former Underground Waste Oil Tank

N
W E
S

0 50 100
Feet

Figure 2-5
Application Well Locations
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

CH2MHILL

SECTION 3

Field Investigation Activities and Data Evaluation

The RI field investigation activities, conducted September through October 2007, consisted of the following activities:

- Monitoring well installation
- Groundwater, surface soil, and subsurface soil sampling and analysis
- Columbia aquifer slug testing

The field activities were conducted in accordance with the RI work plan (CH2M HILL, 2007). Details of the field activities are provided in the subsections below. Results of the investigation activities are presented in Section 5.

3.1 Investigation Protocol

Prior to initiating intrusive activities, all sampling locations were cleared for utilities by a third-party subcontractor and Miss Utility of Virginia. Samples were collected in laboratory supplied bottleware and submitted to pre-approved subcontracted laboratories. Appropriate quality assurance/quality control (QA/QC) sampling was performed in accordance with Navy and CH2M HILL protocols, including field blanks, equipment blanks, duplicates, and matrix spike/matrix spike duplicates (MS/MSDs). Analytical data is provided in **Appendix A**.

Investigation-derived waste (IDW) generated during the RI included drill cuttings from the soil borings and monitoring well installations, well development and purge water, and solutions used to decontaminate non-disposable sampling equipment. IDW was containerized in approved 55-gallon drums, stored on secondary containment at the approved IDW staging location, located at IR Site 13, and properly labeled. The drums were sampled by CH2M HILL for disposal characterization. Based on the analytical results, the waste was characterized as non-hazardous and disposed of at an approved disposal facility.

3.2 Investigation Activities

The following sections summarize the investigation activities. **Table 3-1** provides a summary of the RI samples and the sample locations are shown on **Figure 3-1**.

3.2.1 DPT Grab Groundwater Sampling

Plume Delineation

Eighty-eight DPT grab groundwater samples were collected from twenty-two locations to delineate the horizontal and vertical extent of the groundwater contamination, confirm the presence or absence of a suspected source area in the northeastern portion of the site, and support selection of permanent monitoring well locations. The samples were collected by advancing a 4-ft retractable stainless steel screen to predetermined depth intervals

extending to the top of the Yorktown confining unit. Grab groundwater samples were collected from 8 to 12 ft bgs, 14 to 18 ft bgs, 20 to 24 ft bgs, and 24 to 28 ft bgs at each location with the exception of sample locations DW615 and DW626. Groundwater samples from the 24 to 28 ft bgs interval could not be collected at these locations, where the confining unit was assumed present at a shallower depth due to the inability to withdraw groundwater from the location. The groundwater was sampled directly through the screen using a peristaltic pump and low flow purging techniques (USEPA, 1996) to minimize turbidity. Samples were analyzed for TCL VOCs by an onsite laboratory, with the exception of those samples collected from DW624, DW626, and DW631 which were analyzed at an off-site laboratory due to schedule constraints.

Vapor Intrusion Assessment

Four DPT grab groundwater samples were collected to assess the potential vapor intrusion at Building 3606. Sample locations were selected to assess the maximum concentrations with respect to potential contamination beneath the building. A fifth sample was attempted along the west site of Building 3606 but could not be collected due to the presence of underground utilities. A hand auger was utilized for boring from the ground surface down to 5 ft in order to avoid unmarked utilities near Building 3606, therefore lithologic description of soil was initiated at 5 ft bgs and extended to the base of the boring at 9 ft bgs. Because samples were to be collected at the top of the aquifer, DPT soil cores were collected at each location prior to sample collection to identify the depth of the water table. A 4-ft retractable stainless steel screen was advanced to the uppermost portion (approximately 5 to 9 ft bgs) of the aquifer and the groundwater sampled directly through this screen using a peristaltic pump and low flow purging techniques (USEPA, 1996) to minimize turbidity. Water quality parameters (specific conductance, pH, turbidity, temperature, salinity, dissolved oxygen [DO], and oxidation reduction potential [ORP]) were measured and recorded during sampling (**Table 3-2**). Groundwater samples were collected in preserved laboratory-prepared bottleware and analyzed for VOCs by an offsite laboratory.

3.2.2 Soil Sampling

Surface and subsurface soil samples were collected to characterize the nature and extent of contamination and identify a potential residual source of VOCs to groundwater. Six surface (0 to 6 inches bgs) and six subsurface (1 to 3 ft bgs) samples were collected from co-located locations using a stainless steel hand auger. The sample locations were selected in high, medium, and low VOC concentration areas in groundwater. The soil samples were sent to an offsite laboratory and analyzed for TCL VOCs, TCL semivolatile organic compounds (SVOCs), TCL Pesticide/ polychlorinated biphenyls (PCBs), and TAL inorganics.

To assist in evaluating remedial alternatives for the site, saturated soil samples were collected at four of the six locations. The samples were collected from areas of high, medium, and low VOC concentrations in groundwater, as determined by previous results. Shallow (6 to 12 ft bgs) and deep (20 to 28 ft bgs) Columbia aquifer soil samples were collected and sent to offsite laboratories and analyzed for TCL VOCs, natural oxidant demand (NOD), microbiological parameters (*Dehalococcoides* [DHC], a functional gene associated with DHC strain BAV1 [BAV1 R-Dase], and phospholipid fatty acids), total organic carbon (TOC), grain size, and bulk density. Additionally, samples were collected

from the top 4 ft of the Yorktown confining unit and analyzed for NOD by an offsite laboratory.

Samples at all boring locations were collected from clean, 4-ft, disposable acetate sleeves. The soil borings were logged in a field logbook according to the Unified Soil Classification System (USCS). In order to preserve organic materials in soils, VOC and NOD samples were not homogenized prior to placement into sample containers. The interval of soil collected for SVOCs, pesticides/PCBs, inorganics, TOC, and microbial samples were homogenized in a stainless steel bowl prior to placement in sample containers. Soil collected for grain size analysis was contained in 4-ft acetate sleeves with plastic seals on the ends; and soil collected for bulk density analysis was contained in one gallon zip-lock freezer bags. Soil samples were initially planned to be analyzed for bulk density; however, due to miscommunication, the containers used to store and ship the samples for this analysis were not in accordance with the required method and would not yield representative results, therefore the tests were not run. Because the bulk density data was to be collected to aid in remedial alternative evaluation in the feasibility study, lack of the data does not affect the results of the RI.

3.2.3 Permanent Monitoring Well Installation and Sampling

Five permanent Columbia aquifer groundwater monitoring wells (LS11A-MW36D through MW40D) were installed to further define the nature and extent of contamination, determine groundwater flow direction, aid in remedial alternative evaluation, and support Columbia aquifer groundwater monitoring in association with future remedial activities. The wells were installed using hollow stem augers. Soil cores were collected in 4-ft acetate sleeves at each boring and logged according to the USCS. Boring logs are included in **Appendix C**.

Each new monitoring well was constructed with 2–inch inside diameter (ID) Schedule 40 polyvinyl chloride (PVC) screen and riser. Monitoring wells LS11A-MW36D, MW37D, MW39D, and MW40D were screened from the top of the water table to the top of the Yorktown confining unit and monitoring well LS11A-MW38D was screened within the bottom 10 ft of the aquifer to capture the elevated TCE concentrations detected at this location and depth during DPT grab groundwater sampling (DW605). Annular space surrounding the 0.01-inch machine slotted well screens was filled with #1 filter sand. The groundwater monitoring wells were completed flush to ground surface with a watertight steel cover. A watertight cap was placed on the PVC pipe and the wells were clearly marked. Well construction diagrams are provided in **Appendix C**.

Following installation, each monitoring well was developed using a submersible Whale® pump. Conductivity, pH, turbidity, and flow rate were monitored during development.

Groundwater samples were collected from the 11 existing and 5 new monitoring wells. Prior to sample collection, depth to groundwater was measured and recorded at each well. Each groundwater sample was analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, TAL total and dissolved inorganics, volatile fatty acids (VFAs), methane, ethane, ethene, alkalinity, chloride, nitrate, nitrite, sulfate, sulfide, and TOC.

Groundwater samples were collected using a peristaltic pump following a low-flow sampling protocol (USEPA, 1996). All samples were collected by placing the sample tubing at the midpoint of the well's screened interval. Water quality parameters (DO, ORP, pH,

temperature, conductivity, turbidity, and salinity) were field measured with a Horiba U-22 and flow through cell to ensure aquifer stability prior to sample collection and recorded in the field notebook (**Table 3-2**). The aquifer was considered stable after at least one well volume was purged and water quality readings collected 3 to 5 minutes apart were stabilized to within 10 percent of one another, with the exception of turbidity, which was reduced to the extent practical.

3.2.4 Aquifer Hydraulic Conductivity Testing

In situ hydraulic conductivity ("slug") testing was conducted on monitoring wells LS11-MW15D, MW20D, MW21D, MW22D, and MW35D to determine horizontal hydraulic conductivity. Monitoring wells were selected for spatial distribution and varying aquifer depths to provide an overall estimate of the hydraulic conductivity throughout the aquifer. Due to the limited area of influence, the slug test data provide a rough estimate of the hydrogeologic parameters of the unit proximal to the individual monitoring wells. The tests were conducted by rapidly introducing a solid displacement device (slug) into the well for the falling head test and rapid removal of the slug from the well for the rising head test. The slug consisted of a 10 ft length of solid PVC, and the water level data was recorded using a Mini TROLL® pressure transducer. Both falling head and rising head tests were recorded for each monitoring well. However, at those wells where the static water level is below the top of the screen, the falling head test can result in the water draining from the well into the gravel pack and vadose zone providing an overestimate of the hydraulic conductivity. Therefore, under these circumstances, only the rising head test data was analyzed. Data was recorded for each test until the water level had recovered to 90 % of the pre-test level. The test data were evaluated using AQTESOLV software by HydroSOLVE, Inc. Test data were analyzed using the Bouwer-Rice (1976, 1989) method for unconfined aquifers. The slug test results are discussed in Section 4.

3.3 Data Management and Evaluation

Data management and tracking, from the time of field collection to receipt of validated electronic analytical results, is of primary importance and reflects the overall quality of analytical results. Field samples and their corresponding analytical tests were recorded on chain-of-custody forms, which were submitted with the samples to the laboratory. Chain-of-custody entries were checked against the site-specific project instructions and work plans to verify that all designated field samples were collected and submitted for the appropriate analysis. Upon receipt of the samples by the laboratories, a comparison to the field information was conducted to verify that each sample was analyzed for the correct parameters and appropriate QA/QC samples were collected.

3.3.1 Data Qualifiers

Analytical data reports, in hardcopy and electronic format were submitted to Navy-approved third-party data validators for select analyses. Data not validated by a third-party validator underwent an internal validation by the project chemist. Procedures used for validation were Region III Modifications to the *National Functional Guidelines for Organic Data Review, Multi-media, Multi-concentration* (USEPA, 1994), and *Region III Modifications to Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analysis* (USEPA, 1993b). The data validation summaries are provided in **Appendix D**.

The data validation qualifiers, or flags, used for the RI data are the following:

- A "B" flag by the data validator indicates the analytes have also been detected in a field, equipment, or trip blank, or in a laboratory QA/QC sample. The concentration of a "B"-qualified result is less than 10 times the concentration of the constituent for an associated QA/QC result. If the sample concentration is less than ten times the associated blank concentration, the conclusion is the parameter was not detected. The following section provides further discussion of potential sources of blank contamination.
- A "J" flag indicates the analyte is present but the value is estimated.
- A "L" flag indicates the analyte is present, but the reported value may be biased low and the actual value is expected to be higher.
- A "K" flag indicates the analyte is present, but the reported value may be biased high and the actual value is expected to be lower
- A "U" flag indicates the analyte was not detected and the associated value indicates the approximate sample concentration necessary to be detected.
- A "R" flag indicates an unusable result. The analyte may or may not have been present and the result was rejected.

3.3.2 Potential Non-Site-Related Analytical Results

Some of the organic (for example, polycyclic aromatic hydrocarbons [PAHs]) and inorganic constituents detected in soil and/or groundwater may be attributed to non-site-related conditions or sources such as laboratory contaminants, anthropogenic non-site release sources, and naturally occurring (background) concentrations of constituents.

Laboratory and Sample Blank Contamination

In some instances, constituents detected in samples may have been introduced during field sampling, transportation to the analytical laboratory, or during laboratory procedures. A variety of blank samples were analyzed and used in the QA/QC process to determine which of the constituents may or may not be attributed to the field sample.

Typically, a field blank is collected to account for ambient conditions during sample collection. An equipment/rinsate blank is collected to determine if the equipment used to collect the samples (for example, augers, bailers, and sample containers) was adequately clean. Additionally, the laboratory analyzes a method blank in each batch of 20 samples to verify instrument cleanliness and function. Common phthalate compounds can be introduced during the analytical process and are often considered laboratory contaminants.

When blank samples are found to contain common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to ten times the concentrations in the blanks are qualified during data validation with a "B" for that compound. A "B" qualifier means that the compound may not be attributed to the site at that sample location. When a sampling or laboratory blank contains contaminants other than the common laboratory contaminants, each of the aqueous field samples associated with that blank that contain up to 5 times the concentrations is qualified during data validation with a "B" for that compound.

To determine if a "B" qualifier should be assigned to a soil sample, a unit conversion is performed whereby soil sample concentrations relative to aqueous samples or laboratory blank concentrations are determined by dividing the soil concentration by the fraction of moisture, then dividing the result by five. A "B" qualifier designation, as described above for aqueous samples, can then be applied directly to the converted soil concentrations.

Background Data

To identify constituents present in soil and groundwater reflective of a potential site-related release, naturally occurring and anthropogenic compounds (inorganics, pesticides, and PAHs) detected in soil and groundwater were compared to the background 95 percent UTLs established for NAB Little Creek. The findings of the facility-wide background investigation are presented in the *Final Background Investigation for Naval Amphibious Base Little Creek* (CH2M HILL, 2000) and *Final Background Investigation Addendum for Summer Groundwater Sampling Event* (CH2M HILL, 2003a).

Table 3-1
Remedial Investigation Sample Summary
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Previous Investigation	VOCs (8260B)	TCL VOCs (OLM04)	TCL SVOCs (OLM04)	TCL Pest/PCBs (OLM04)	TAL Total Inorganics (ILM04.1)	TAL Dissolved Inorganics (ILM04/ILM05)	Geochemical Parameters[5]	Volatile Fatty Acids (SM 5560C)	Methane, Ethane, Ethene (RSK SOP-175)	Grain Size (ASTM D422)	PLFA (PLFA)	DHC/BAV1 (qPCR)[6]
Grab Groundwater Samples (Plume Delineation)[1]	86	--	--	--	--	--	--	--	--	--	--	--
Grab Groundwater Samples (Vapor Intrusion Assessment)[2]	--	4	--	--	--	--	--	--	--	--	--	--
Monitoring Well Groundwater[3]	--	16	16	16	16	16	16	16	16	--	--	--
Surface Soil Samples (0-6 inches bgs)	--	6	6	6	6	--	--	--	--	--	--	--
Subsurface Soil Samples[4]	--	10	6	6	6	--	--	--	--	8	8	8

Notes:
[1]Samples were generally collected from four depths (8-12' bgs, 14-18' bgs, 20-24' bgs, and 24-28' bgs)
[2]Samples collected from top of Columbia aquifer
[3]Samples collected from middle of screened interval
[4]Six samples collected from 1-3' bgs, four from 6-12' bgs, and four from 20-28' bgs
[5]Consists of alkalinity, chloride, nitrate as n, nitrite, sulfate, sulfide, and total organic carbon
[6] *Dehalococcoides* (DHC), a functional gene associated with DHC strain BAV1 (BAV1 R-Dase)
PCBs - polychlorinated biphenyls
PLFA - Phospholipid Fatty Acid
SVOCs - semivolatile organic compounds
TAL - target analyte list
TCL - target compound list
TOC - total organic carbon
VOC - volatile organic compound

Table 3-2
Water Quality Field Parameters
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

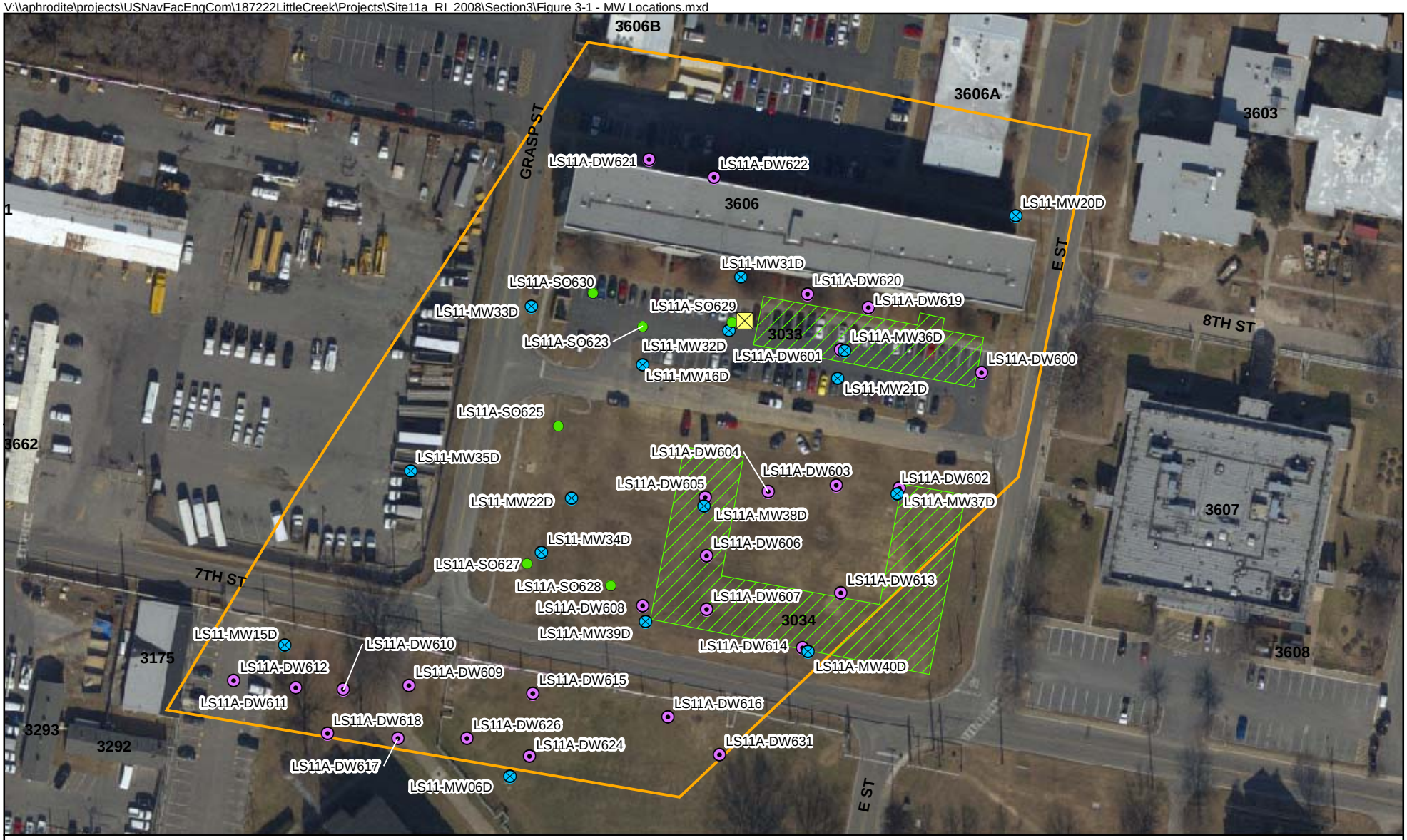
Station ID	LS11-MW06D	LS11-MW15D	LS11-MW16D	LS11-MW20D	LS11-MW21D	LS11-MW22D	LS11-MW31D
Sample Date	10/12/2007	10/9/2007	10/10/2007	10/12/2007	10/12/2007	10/11/2007	10/10/2007
Dissolved Oxygen (mg/L)	4.41	0.2*	10*	0.6*	1*	7.67	4*
Oxidation Reduction Potential (mV)	-124	-219	167	74	70	154	187
Salinity (%)	0.02	0.02	0.01	0.01	0	0.03	0.02
pH	7.38	6.98	5.55	5.68	5.52	5.64	4.69
Specific Conductance (ms/cm)	0.379	0.537	0.341	0.297	0.124	0.676	0.387
Temperature (C)	20.56	23.44	25.06	21.3	29	23.79	24.49
Turbidity (NTU)	2.7	2.2	14.1	6.09	40.9	8.13	2.13

Station ID	LS11-MW32D	LS11-MW33D	LS11-MW34D	LS11-MW35D	LS11A-MW36D	LS11A-MW37D	LS11A-MW38D
Sample Date	10/10/2007	10/10/2007	10/11/2007	10/12/2007	10/9/2007	10/9/2007	10/8/2007
Dissolved Oxygen (mg/L)	4*	6.13	8.85	0.4*	2.79	1*	1*
Oxidation Reduction Potential (mV)	164	152	161	85	80	-14	94
Salinity (%)	0.02	0.01	0.01	0.01	0.01	0.01	0.01
pH	5.29	5.41	5.58	5.57	5.43	6.21	5.67
Specific Conductance (ms/cm)	0.42	0.299	0.355	0.18	0.205	0.287	0.24
Temperature (C)	26.85	32.25	24.46	24.25	27.69	21.95	20.88
Turbidity (NTU)	32.6	3.31	6.5	10.2	1.1	2.95	7.9

Station ID	LS11A-MW39D	LS11A-MW40D	LS11A-DW619	LS11A-DW620	LS11A-DW621	LS11A-DW622
Sample Date	10/8/2007	10/9/2007	10/1/2007	10/1/2007	10/1/2007	10/1/2007
Dissolved Oxygen (mg/L)	1*	1*	0.6*	1*	0.8*	1*
Oxidation Reduction Potential (mV)	78	52	70	-26	4	-38
Salinity (%)	0.01	0.01	0.01	0.02	0.02	0.02
pH	5.83	5.92	5.9	6.53	6.37	7.02
Specific Conductance (ms/cm)	0.139	0.202	0.37	0.399	0.523	0.506
Temperature (C)	22.5	22.21	26.17	25.66	24.41	23.95
Turbidity (NTU)	10.7	0.4	70.7	541	201	91.3

Note:
*Dissolved oxygen measured using Chemets Test Kits

V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section3\Figure 3-1 - MW Locations.mxd



Legend

- Area of Investigation
- Demolished Building
- Soil Sample Location
- Monitoring Well Location
- Grab Groundwater Location
- Approximate Location of Former Underground Waste Oil Tank

N
W E
S

0 100 200 Feet

Figure 3-1
Remedial Investigation Sample Locations
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

CH2MHILL

SECTION 4

Physical Characteristics

This section summarizes the physical characteristics of the region, NAB Little Creek, and Site 11a. Subsection 4.1 discusses the regional characteristics (physiography, climate, surface water hydrology, topography, surface features, drainage, geology, and hydrogeology) and Subsection 4.2 describes the site-specific characteristics.

4.1 Regional Characteristics

4.1.1 Regional Physiography, Surface Water Hydrology, and Climate

NAB Little Creek is located in Virginia's Tidewater Region, adjacent to the Chesapeake Bay. The facility lies within the eastern portion of the Atlantic Coastal Plain Physiographic Province in northwestern Virginia Beach, Virginia (**Figure 4-1**). Low elevations (typically less than 25 ft above mean sea level [amsl]) and relatively flat relief, characterize this part of the Coastal Plain.

The average annual temperature is 60.7 ° Fahrenheit (°F) with average monthly temperatures ranging from 43.1 °F in January to 78.7 °F in July. On the average, two hurricanes a year come close enough to affect Virginia, but less than one per year comes ashore. Northeasters are also a cause of wind-set tides; these storms occur from late fall to spring. Precipitation averages 43 inches annually and is slightly higher from June to August because of the prevalence of conductive thunderstorms.

Between 50 percent and 70 percent (22 to 30 inches) of the precipitation is removed from the area via runoff and evapotranspiration. The remaining precipitation recharges the surficial aquifer system by percolation through the upper soils (Siudyla, 1981). Approximately 90 percent of recharged groundwater returns to surface water streams as base-flow.

4.1.2 Regional Geologic and Hydrogeologic Framework

The Southeastern Virginia Coastal Plain physiographic province is underlain by an eastward thickening wedge of early Cretaceous to Holocene marine and nonmarine deposits (**Figure 4-2**). Along the coastline, several thousand ft of interlayered, unconsolidated sediment consists of gravel, sand, silt, and clay deposits that overlay pre-Cretaceous crystalline basement rock.

Differential subsidence produced a series of gently dipping regional structural highs and lows, known as arches and embayments (or basins). The Tidewater Area of Virginia is located along the axis of a regional structural feature known as the Norfolk Arch (Meng and Harsh, 1988) (**Figure 4-3**), an east-west structural ridge of crystalline basement rock that separates the Salisbury Embayment to the north from Albemarle Embayment to the south. Thicker sediment accumulations are found in the basins relative to over the arches. The arches were partially responsible for characteristic depositional sequences (marine, alluvial, and lagoonal) within the different basins.

The generalized regional stratigraphic column (Meng and Harsh, 1988) is shown on **Figure 4-4**. Of these regional hydrostratigraphic units, only the youngest three are likely to be affected by NAB Little Creekoperations conducted at the ground surface and in the shallow subsurface.

The Columbia aquifer underlying Site 11a is representative of the Holocene and Pleistocene age deposits, including any fill material in these deposits, composing the Columbia Formation (Meng and Harsh, 1988). Beds and lenses of shell-containing light-colored clay, sand, gravel, and silt characterize the Columbia Formation. The water bearing zones in the Columbia aquifer consist of sand and shell beds and lenses. The saturated thickness of the Columbia aquifer ranges from about 15 ft near its western extent to about 80 ft in southeastern Virginia (Harsh and Laczniak, 1990). The Columbia aquifer, overlying the Yorktown confining unit, is unconfined at Site 11a.

The lower impermeable silt, clay, and sandy clay deposits of the Yorktown confining unit underly the Columbia aquifer beneath Site 11a. Locally the Yorktown confining unit consists of a blue/gray, plastic clay. Regionally, the unit ranges from almost nonexistent in western southeastern Virginia to approximately 56 ft thick in the Virginia Beach area. The low hydraulic conductivity of the silt and clay layers impedes vertical groundwater flow from the Columbia aquifer through the confining unit to the underlying Yorktown aquifer. The Yorktown aquifer is semi-confined beneath the clay and silt layers of the Yorktown confining unit. The aquifer is heterogeneous. Water bearing zones in the Yorktown aquifer consist of fine to coarse sand, gravel, and shells.

4.1.3 Regional Water Usage

Groundwater is not currently used as a potable water source at or in the vicinity of NAB Little Creek; potable water is supplied by the City of Virginia Beach. Groundwater is not anticipated to be used as a potable water supply in the future due to its general poor quality (iron and manganese above secondary MCLs) and low yield (generally less than 3 to 5 gallons per minute [gpm]). Base-operated groundwater wells withdraw groundwater from the Yorktown aquifer to provide non-potable irrigation water to the golf course located approximately 0.5 mile northwest of Site 11a. The Yorktown aquifer is extensively used for domestic and public water supply, as well as for industrial purposes throughout the eastern portion of the Coastal Plain. It is reported that the Yorktown aquifer is not used as a potable source of supply in the area surrounding the Base.

Although groundwater is not currently used as a potable water supply, the Commonwealth of Virginia considers all aquifer groundwater to be of potential beneficial use (potable). For this reason, beneficial groundwater use as a potable water supply is considered.

4.2 Site-Specific Characteristics

4.2.1 Topography, Drainage, and Surface Features

The topography of NAB Little Creekand the surrounding area is low lying and nearly level, with several freshwater lakes (Chubb Lake, Lake Bradford, Little Creek Reservoir/Lake Smith, and Lake Whitehurst) surrounding the Base, and several saltwater coves and channels within the boundaries of the Base. Surface elevations at the Base range from sea level to 10 ft amsl.

The majority of surface water on the Base flows to the Chesapeake Bay, either directly or by way of the coves and channels. Surface water runoff from the far eastern side of the Base flows to Lake Bradford. Surface water runoff from small areas along the southern edge of the Base may flow to Little Creek Reservoir. Lake Bradford and Lake Chubb drain to Little Creek Cove.

The topography at Site 11a is flat, ranging from 8.3 to 9.5 ft amsl, with no natural drainage features evident. A storm sewer system passes through Site 11a. The majority of precipitation runs off into the storm sewer system that eventually drains into Little Creek Cove. Precipitation that does not run off to the storm sewer system would be expected to infiltrate to the groundwater, evaporate, or transpire. There are no surface water bodies on or near the site and, therefore, no sediment associated with the site.

4.2.2 Geology and Hydrogeology

The subsurface geology at Site 11a consists of primarily medium and fine grained sands of the Columbia aquifer underlain by the high plasticity clay of the Yorktown confining unit. The Columbia aquifer extends to a depth of between 20 to 30 ft bgs across the site. All monitoring wells at the site are screened within the Columbia Aquifer (**Table 4-1**). Grain size data collected within the Columbia aquifer at the site indicate the soils are predominantly fine to medium sands with a general coarsening downward. Hydrostratigraphic cross sections depicting the subsurface environment at Site 11a and a cross section are presented as **Figure 4-5** and **Figure 4-6**.

Groundwater levels were collected from Site 11a permanent monitoring wells during the field activities (**Table 4-2**). Based on these data, the Columbia aquifer water table is generally encountered from 5 to 10 ft bgs and groundwater flows west in the northern portion of the site and southwest in the southern portion of the site. **Figure 4-7** depicts the potentiometric surface of groundwater observed in October 2007. The horizontal hydraulic gradient in the Columbia aquifer at the site ranges from 6.1×10^{-4} to 8.1×10^{-4}, with an average of 7.3×10^{-4}.

The slug test data, provided in **Appendix E,** were used to determine horizontal hydraulic conductivity (K) for the site. For the Columbia aquifer, the geometric mean K was interpreted to be about 3.15 ft/day with a standard deviation of 1.61 ft/day (**Table 4-3**). These values are consistent with expected K values for a medium to fine sand. Groundwater flow velocity can be estimated using the following equation, based on Darcy's law:

$$v = Ki/n_e$$

Where:

v = estimated groundwater flow velocity
K = hydraulic conductivity
i = horizontal groundwater gradient
n_e = estimated effective porosity

For Columbia aquifer groundwater at NAB Little Creek Site 11a, assuming K = 3.15 ft/day, $i = 7.3 \times 10^{-4}$, and assumed $n_e = 0.35$, the velocity is calculated as $v = 6.57 \times 10^{-3}$ ft/day (2.4 ft/year).

Table 4-1
Monitoring Well Construction Summary
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Monitoring Well	Installation Date	Ground Elevation (ft msl)	Top of PVC Elevation (ft msl)	Total Well Depth (ft bgs)	Length of Screen (ft)	Depth of Top of Screen (ft bgs)	Depth of Bottom of Screen (ft bgs)	Depth to Base of Columbia Aquifer (ft bgs)	Description of Screened Lithology (All wells screened in the Columbia Aquifer)	Elevation of Top of Screen (ft msl)	Elevation of Bottom of Screen (ft msl)	Elevation of Base of Borehole (ft msl)	Elevation of Base of Columbia Aquifer (ft msl)
LS11-MW15D	06/08/99	NA	7.19	20	5	15	20	NA	Columbia - fine to medium sand with some silt and clay at 18-18.5', silty clay 18.5-20'	NA	NA	NA	NA
LS11-MW16D	06/07/99	NA	8.44	25	5	20	25	NA	Columbia - fine to medium sand with some silt 20-24'; silty clay at 25'	NA	NA	NA	NA
LS11-MW20D	06/04/02	9.5	9.17	26	10	16	26	25.5	Columbia - coarse sand 16-17'; coarse to fine sand 20-22', medium sand 22-23.5', silty fine sand 23.5-24', medium sand 24-25', gray silty fine sand 25-25.5', gray clay 25.5'	-6.5	-16.5	-16.5	-16
LS11-MW21D	06/04/02	8.3	8.03	29	10	19	29	29	Columbia - silty medium to fine sand 20-22', medium sand 22-23', silty fine sand with some clay nodules 23-24', fine to medium sand 24-29' with some clay stringers 24-25', gray clay at 29'	-10.7	-20.7	-20.7	-20.7
LS11-MW22D	06/03/02	8.6	8.41	28	10	18	28	NA	Columbia - coarse sand with some fines 20-25.5', silty fine sand 25.5-28'	-9.4	-19.4	-19.4	NA
LS11-MW31D	02/04/04	NA	9.24	30	25	5	30	32	Columbia - silt with some clay 5-6', silty fine sand with trace clay 6-7', silt with sand and trace clay 10-11', silty fine to medium sand 11-12', sand with some silt 15-17', coarsening sand with some silt and fine gravel 20-28.5', clayey fine to medium sand 28.5-32', sandy clay at 32'	NA	NA	NA	NA
LS11-MW32D	02/04/04	NA	8.05	29	25	4	29	29	Columbia - clayey silt with some fine sand 5-6', silty fine to medium sand 6-28.8' clay lenses 10-12', gray clay with fine to medium sand at 28.8-29'	NA	NA	NA	NA
LS11-MW33D	02/05/04	NA	8.79	25	20	5	25	26	Columbia - clayey silt 5-6', silty fine to coarse sand with some fine gravel 6-7', sand becoming fine with depth with some silt and trace clay 10-26' clay lense at 16.3', clay 26-28', sandy clay 28-29'	NA	NA	NA	NA
LS11-MW34D	02/05/04	NA	8.47	28	25	3	28	28	Columbia - clayey silt 5-5.5', sand with some silt 5.5-6', silty fine to medium sand 10-17', some coarse sand and fine quartz gravel 16-17', very coarse sand 20-22', silty fine to medium sand 25-28', sandy clay 28-29'	NA	NA	NA	NA
LS11-MW35D	02/19/04	8.58	8.23	25	20	3	23	25.5	Columbia - silty clay 5-6', silty sand 6-7', medium to coarse sand 10-25.5', clay 25.5-27'	5.58	-14.42	-16.42	-16.92
LS11-MW36D	10/05/07	8.30	7.97	29	20	9	29	29	Columbia - sand 9-24', silty sand 27-28', silty clay 28-29'	-0.7	-20.7	-20.7	-20.7
LS11-MW37D	10/03/07	9.00	8.60	28	20	8	28	29	Columbia - fine to coarse sand 8-20', silty sand 20-26', sandy clay 26-28'	1	-19	-19	-20
LS11-MW38D	10/04/07	9.40	8.96	30	10	20	30	NA	Columbia - fine to coarse sand 9-28', clayey sand 28-29'	-10.6	-20.6	-20.6	NA
LS11-MW39D	10/04/07	9.10	8.90	28	20	8	28	28	Columbia - fine to coarse sand 9-20', silty sand 20-24', sand 24-27.5', 27.5-28 sandy clay, 28-30 clay Yorktown confining unit	1.1	-18.9	-18.9	-18.9
LS11-MW40D	10/05/07	9.60	9.37	29	20	9	29	29	Columbia - fine to coarse sand 9-24' some clay lense at 23.5', silty sand 24-28', 28-29' clayey sand, 29-32' silty clay of the Yorktown confining unit	0.6	-19.4	-19.4	-19.4

Notes:
BGS - Below Ground Surface
MSL - Mean Sea Level
NA - Not Available or Not Applicable
OVM - Organic Vapor Meter
YCU - Yorktown Confining Unit
YF - Yorktown Formation

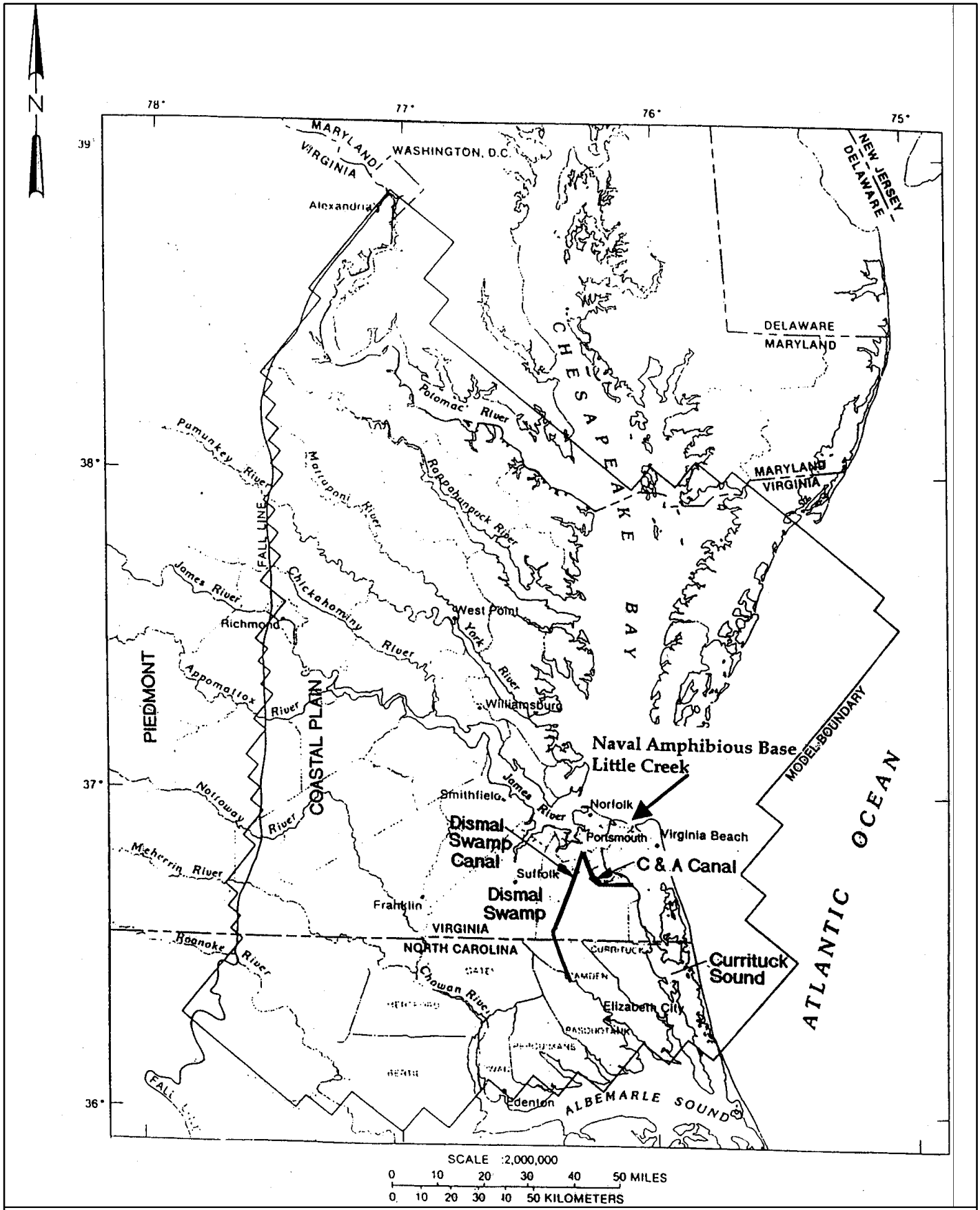
Table 4-2
Groundwater Elevations
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

		January 2005		April 2005		June 2005		November 2005		October 2007	
Monitoring Well ID	TOC Elevation (ft amsl)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft amsl)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft amsl)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft amsl)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft amsl)	Depth to Groundwater (ft below TOC)	Groundwater Elevation (ft amsl)
LS11-MW15D	7.19	4.14	3.05	4.09	3.10	4.38	2.81	4.52	2.67	5.50	1.69
LS11-MW16D	8.44	5.22	3.22	4.94	3.50	5.24	3.20	5.46	2.98	6.62	1.82
LS11-MW20D	9.17	6.02	3.15	5.09	4.08	6.01	3.16	6.20	2.97	7.19	1.98
LS11-MW21D	8.03	4.79	3.24	4.50	3.53	4.79	3.24	NA	NA	NA	NA
LS11-MW22D	8.41	5.26	3.15	5.20	3.21	5.36	3.05	5.51	2.90	6.65	1.76
LS11-MW31D	9.24	6.07	3.17	5.81	3.43	5.99	3.25	6.31	2.93	7.36	1.88
LS11-MW32D	8.05	4.89	3.16	4.61	3.44	4.89	3.16	5.12	2.93	6.24	1.81
LS11-MW33D	8.79	5.62	3.17	5.34	3.45	5.69	3.10	5.85	2.94	7.05	1.74
LS11-MW34D	8.47	5.34	3.13	5.05	3.42	5.46	3.01	5.61	2.86	6.81	1.66
LS11-MW35D	8.23	5.17	3.06	4.93	3.30	5.33	2.90	5.37	2.86	6.52	1.71
LS11A-MW36D	7.97	NA	NA	NA	NA	NA	NA	NA	NA	6.07	1.90
LS11A-MW37D	8.60	NA	NA	NA	NA	NA	NA	NA	NA	6.71	1.89
LS11A-MW38D	8.97	NA	NA	NA	NA	NA	NA	NA	NA	7.18	1.79
LS11A-MW39D	8.90	NA	NA	NA	NA	NA	NA	NA	NA	9.44	-0.54
LS11A-MW40D	9.37	NA	NA	NA	NA	NA	NA	NA	NA	7.59	1.78

Notes:
amsl - above mean sea level
ft - feet
NA - not available
TOC - top of casing

Table 4-3
Slug Test Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Monitoring Well	Slug Test Type/ID	Hydraulic Conductivity (feet/day)
Columbia Aquifer - Unconfined Aquifer		
LS11-MW15D	Rising Head #1	3.18
LS11-MW15D	Rising Head #2	3.29
LS11-MW15D	Rising Head #3	3.27
LS11-MW15D	Falling Head #1	3.23
LS11-MW15D	Falling Head #2	4.19
LS11-MW15D	Falling Head #3	2.87
LS11-MW20D	Rising Head #1	4.55
LS11-MW20D	Rising Head #2	4.91
LS11-MW20D	Rising Head #3	5.82
LS11-MW20D	Falling Head #1	3.36
LS11-MW20D	Falling Head #2	3.85
LS11-MW20D	Falling Head #3	3.71
LS11-MW21D	Rising Head #1	3.37
LS11-MW21D	Rising Head #2	3.20
LS11-MW21D	Rising Head #3	3.25
LS11-MW21D	Falling Head #1	2.99
LS11-MW21D	Falling Head #2	4.37
LS11-MW21D	Falling Head #3	2.37
LS11-MW22D	Rising Head #1	1.65
LS11-MW22D	Rising Head #2	1.71
LS11-MW22D	Rising Head #3	1.72
LS11-MW22D	Falling Head #1	1.65
LS11-MW22D	Falling Head #2	1.40
LS11-MW22D	Falling Head #3	1.60
LS11-MW35D	Rising Head #1	7.18
LS11-MW35D	Rising Head #3	7.68
Hydraulic Conductivity Geometric Mean:		**3.15**
Hydraulic Conductivity Standard Deviation:		**1.61**



SOURCES:
BASE FROM U.S. GEOLOGICAL SURVEY
STATE BASE MAPS 1:1,000,000 AND
USGS SURVEY PROFESSIONAL
PAPER 1404-F

FIGURE 4-1
PHYSIOGRAPHIC PROVINCES OF SOUTHERN VIRGINIA
SITE 11A REMEDIAL INVESTIGATION REPORT
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

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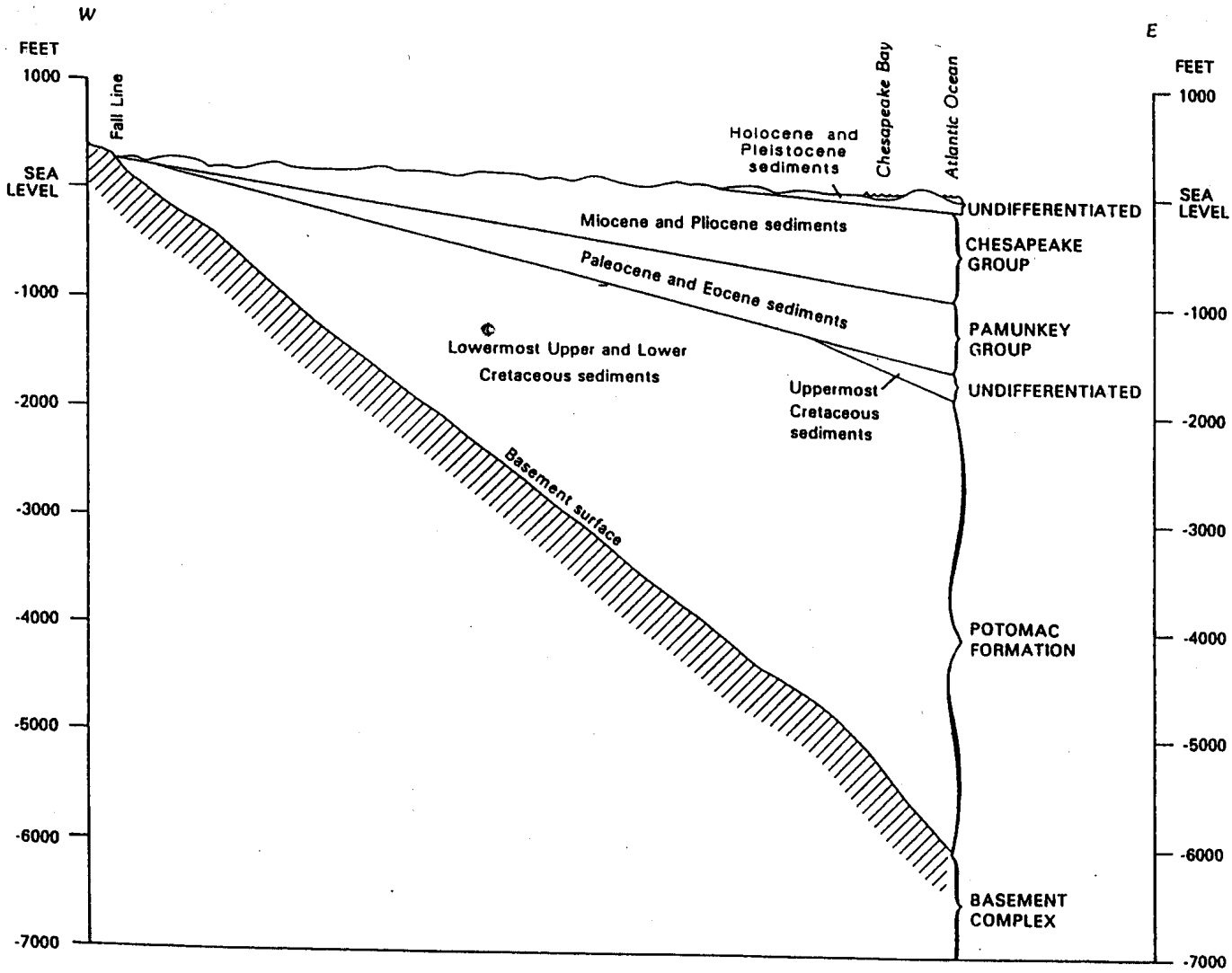

FIGURE 4-2
GENERALIZED GEOLOGIC SECTION SHOWING
EASTWARD-THICKENING SEDIMENTARY WEDGE
OF VIRGINIA COASTAL PLAIN
SITE 11 A REMEDIAL INVESTIGATION REPORT
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

SOURCE:
FIGURE 5 OF REGIONAL AQUIFER-SYSTEM ANALYSIS
USGS SURVEY PROFESSIONAL PAPER 1404-C

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10-APR-2003 7234f025.dlv

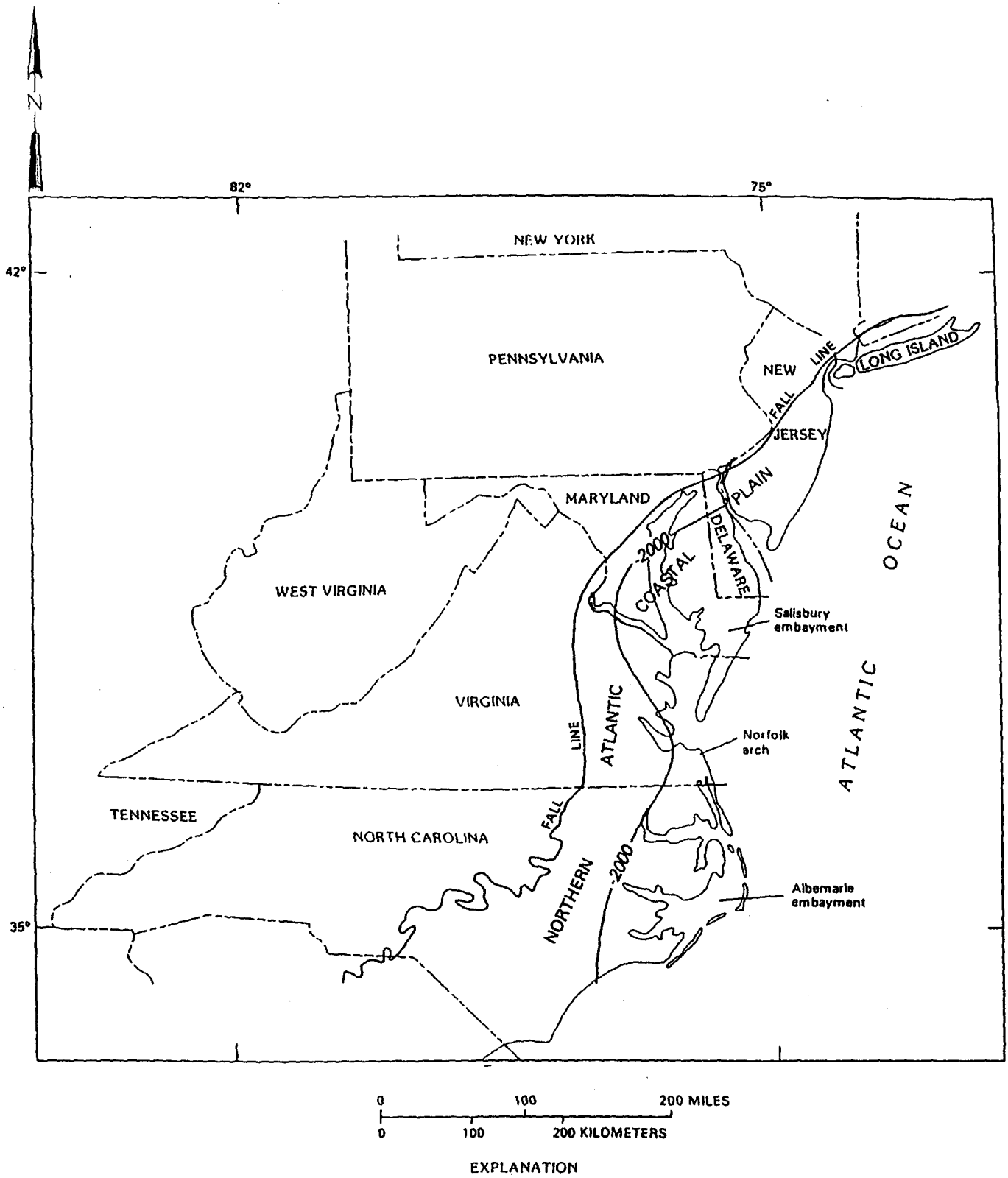

FIGURE 4-3
MAJOR STRUCTURAL BASEMENT-DEFORMATION FEATURES
OF THE VIRGINIA COASTAL PLAIN AND ADJOINING AREAS
SITE 11A REMEDIAL INVESTIGATION REPORT
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

SOURCE:
FIGURE 6 OF REGIONAL AQUIFER-SYSTEM ANALYSIS
USGS SURVEY PROFESSIONAL PAPER 1404-C

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PERIOD	EPOCH	AGE	STRATIGRAPHIC FORMATION		VIRGINIA RASA HYDROGEOLOGIC UNIT
QUATERNARY	HOLOCENE	POST-GLACIAL	HOLOCENE DEPOSITS		COLUMBIA AQUIFER
	PLEISTOCENE	WISCONSIN TO NEBRASKAN	PLEISTOCENE UNDIFFERENTIATED DEPOSITS		
TERTIARY	PLIOCENE	PIACENZIAN	BACONS CASTLE FORMATION (OAKS AND COCH, 1973)		YORKTOWN CONFINING UNIT
		ZANCLEAN	CHESAPEAKE GROUP	YORKTOWN FORMATION	YORKTOWN - EASTOVER AQUIFER
	MIOCENE	MESSINIAN		EASTOVER FORMATION	
		TORTONIAN			ST. MARYS CONFINING UNIT
		SERRAVALLIAN		ST. MARYS FORMATION	ST. MARYS-CHOPTANK AQUIFER
				CHOPTANK FORMATION	
		LANGHIAN		CALVERT FORMATION	CALVERT CONFINING UNIT
		BURDIGALIAN			
		AQUITANIAN		OLD CHURCH FORMATION	CHICKAHOMINY-PINEY POINT AQUIFER
	OLIGOCENE	CHICKASAWHAYAN[1]	NOT PRESENT IN STUDY AREA		
		VICKSBURGIAN[1]			
	EOCENE	JACKSONIAN[1]	PAMUNKEY GROUP	CHICKAHOMINY FORMATION	CHICKAHOMINY-PINEY POINT AQUIFER
		CLAIBORNIAN[1]		PINEY POINT FORMATION	
		SABINIAN[1]		NANJEMOY FORMATION	NANJEMOY-MARLBORO CLAY CONFINING UNIT
	PALEOCENE			MARLBORO CLAY	
		MIDWAYAN[1]		AQUIA FORMATION	AQUIA AQUIFER
				BRIGHTSEAT FORMATION	BRIGHTSEAT FORMATION
					BRIGHTSEAT AQUIFER
CRETACEOUS	LATE CRETACEOUS	MAASTRICHTIAN	UNDIFFERENTIATED SEDIMENTS		UPPER POTOMAC CONFINING UNIT
		CAMPANIAN			
		SANTONIAN			
		CONIACIAN			
		TURONIAN			
		CENOMANIAN	POTOMAC FORMATION		UPPER POTOMAC AQUIFER
	EARLY CRETACEOUS	ALBIAN			MIDDLE POTOMAC CONFINING UNIT
					MIDDLE POTOMAC AQUIFER
		APTIAN			LOWER POTOMAC CONFINING UNIT
		BARREMIAN			
		HAUTERIVIAN			
		VALANGINIAN			LOWER POTOMAC AQUIFER
		BERRIASIAN			

[1] COMMONLY USED AGES IN ATLANTIC COASTAL PLAIN PROVINCE

FIGURE 4-4
STRATIGRAPHIC AND HYDROGEOLOGIC FRAMEWORK
SITE 11A REMEDIAL INVESTIGATION REPORT
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

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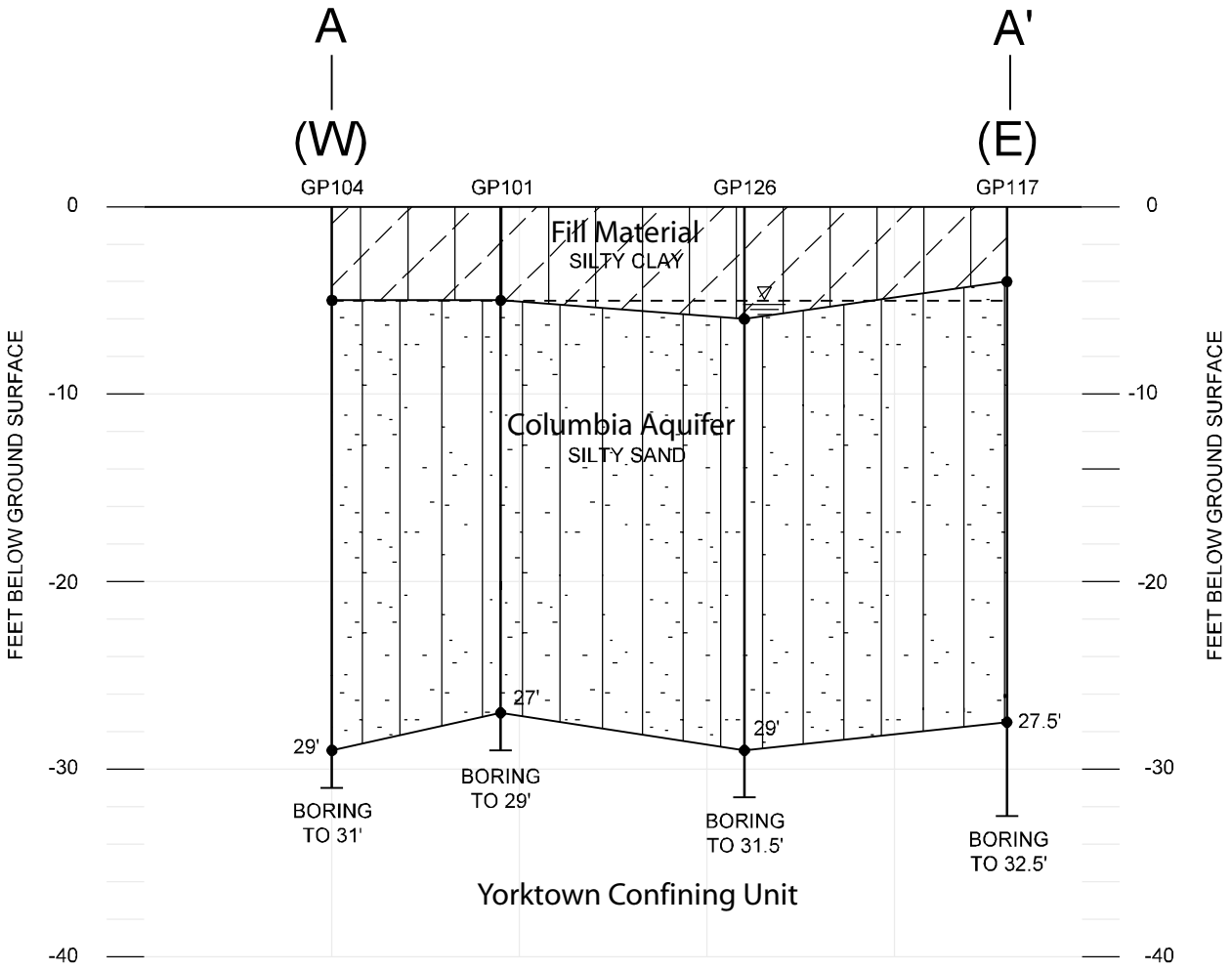

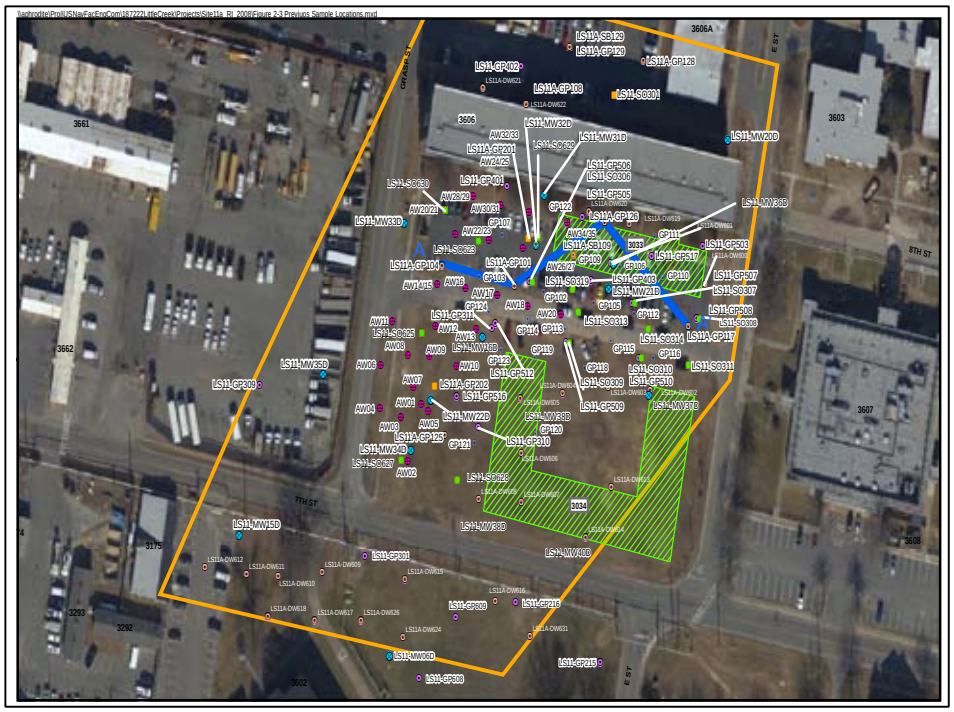

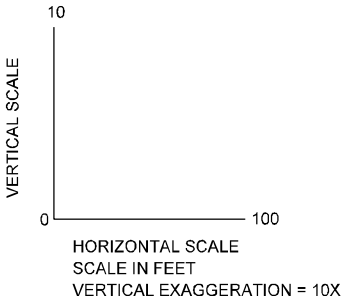

NOTE:
ALL DEPTHS ARE IN FEET BELOW GROUND SURFACE; THEREFORE, THE ELEVATION OF POINTS ON THE X-SECTION RELATIVE TO EACH OTHER MAY NOT BE ACCURATELY DEPICTED.

LEGEND

SILTY CLAY

SILTY SAND

INFERRED WATER TABLE SURFACE

FIGURE 4-5
Generalized Hydrostratigraphic Cross-Section A-A'
Site 11a Remedial Investigation Report
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA

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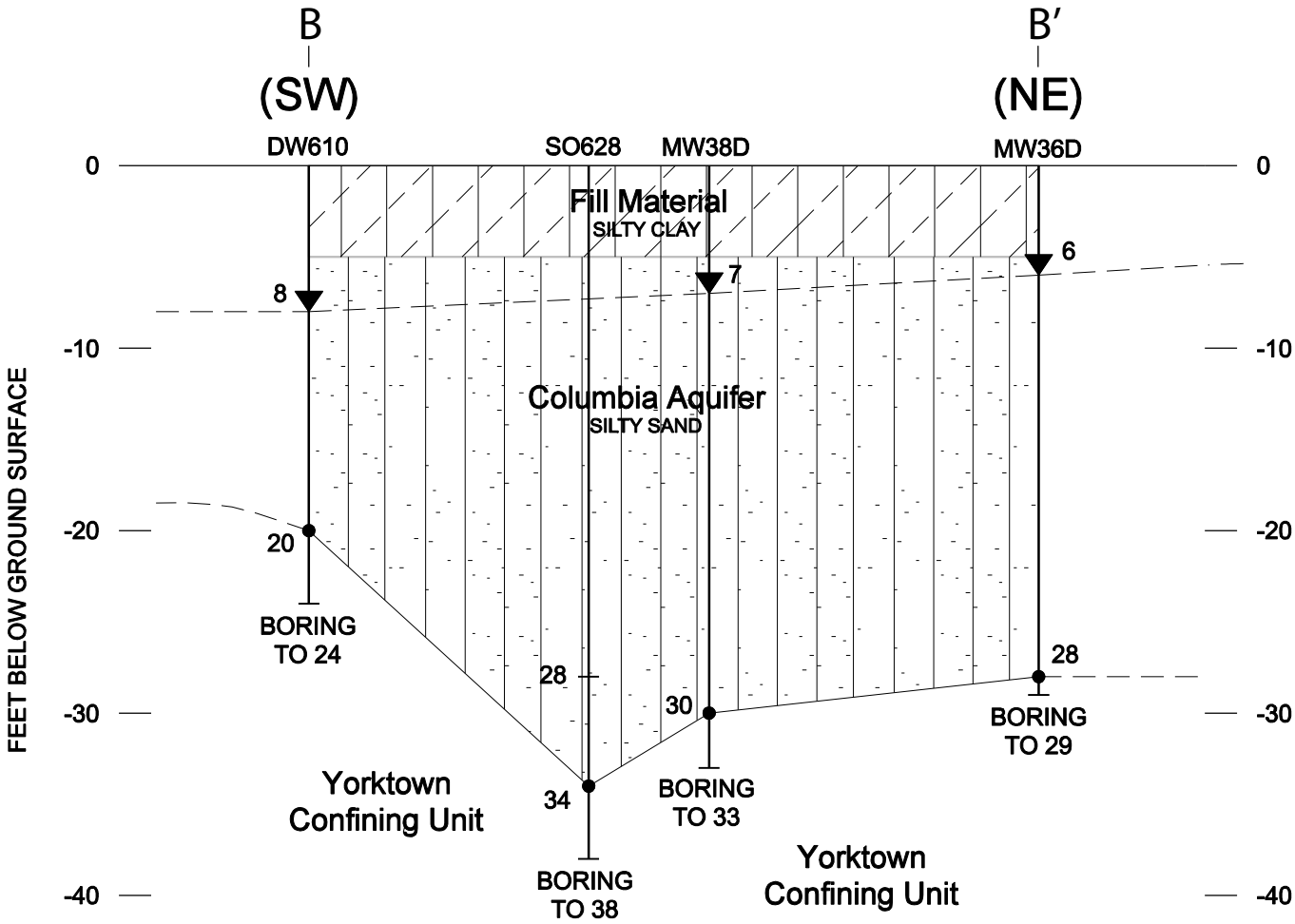
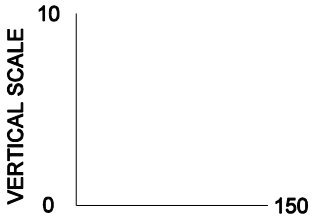
13-OCT-2004 1794f005.dgn





APPROXIMATE
HORIZONTAL SCALE
(SCALE IN FEET)
VERTICAL EXAGGERATION = 15

NOTE:
ALL DEPTHS ARE IN FEET BELOW GROUND SURFACE; THEREFORE, THE ELEVATION OF POINTS ON THE X-SECTION RELATIVE TO EACH OTHER MAY NOT BE ACCURATELY DEPICTED.

LEGEND

FILL MATERIAL (SILTY CLAY)

COLUMBIA AQUIFER (SILTY SAND)

INFERRED WATER TABLE SURFACE

Figure 4-6
Generalized Hydrostratigraphic Cross-Section B-B′
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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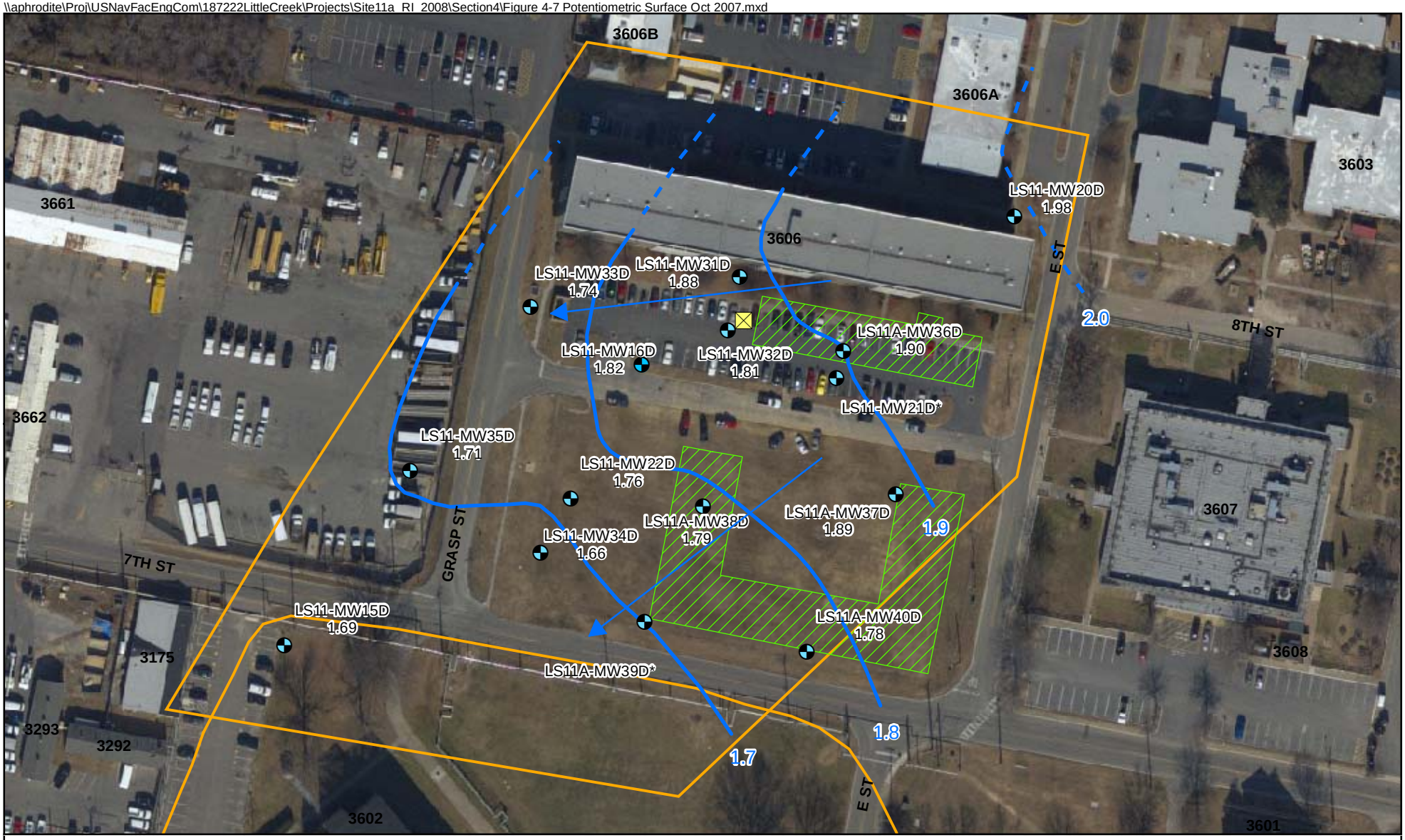
\\aphrodite\Proj\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section4\Figure 4-7 Potentiometric Surface Oct 2007.mxd



Legend

- Monitoring Well Locations
- Groundwater Elevation Contour
- Inferred Groundwater Elevation Contour
- Demolished Building
- Area of Investigation
- Approximate Location of Former Underground Waste Oil Tank

1.88 Groundwater Elevation (ft amsl)
Groundwater Flow Direction

* No access to MW21D during the survey. Elevation at MW39D was anomylous.

N
W E
S

0 100 200 Feet

Figure 4-7
Potentiometric Surface Map of the Columbia Aquifer (October 2007)
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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SECTION 5

Nature and Extent of Contamination

5.1 Investigation Results

This subsection presents the results of the RI field investigation activities. The complete analytical results are provided in **Appendix A** and the sample locations are shown on **Figure 3-1.** Water quality measurements collected in the field to ensure aquifer stabilization prior to sampling are provided on **Table 3-2.**

Data were compared to screening criteria, where available. Monitoring well groundwater data were compared to MCLs and Virginia Groundwater Standards (VGWS), DPT grab groundwater results were compared only to MCLs for plume delineation. Monitoring well groundwater and soil data were compared to background UTLs to identify site-related releases. In cases where no background UTLs are available (e.g., VOCs and certain pesticides/PCBs, SVOCs, and inorganics) detections were treated as exceedances.

The inorganic constituents calcium, magnesium, potassium, and sodium are not typical in waste stream characteristic for the activities conducted at Site 11a and, therefore, do not warrant detailed attention or discussion. Because these constituents are considered essential nutrients there is no associated human health or ecological screening criteria.

5.1.1 Groundwater

This section presents the results for laboratory analysis of VOCs, SVOCs, pesticides/PCBs, and inorganics in groundwater.

Volatile Organic Compounds

Twenty-three VOCs were detected in the groundwater at Site 11a (**Tables 5-1 and 5-2**). Of the 23 detected VOCs, only two chlorinated VOCs, PCE and TCE were detected at concentrations above their respective MCLs (**Figure 5-1**). No VOCs detected in the groundwater samples collected for vapor intrusion assessment exceeded the MCLs.

TCE was detected in varying concentrations across the site ranging from 0.11 J to 1,100 J µg/L. The highest concentration of TCE was detected in the central portion of the site in a grab groundwater sample as opposed to a monitoring well (LS11A-DW605 from 24 to 28 ft bgs). The highest concentration of TCE in a monitoring well was 730 µg/L detected at LS11A-MW38D which is centrally located within the site. PCE was detected in varying concentrations across the site ranging from 0.12 J to 430 µg/L. The highest concentration of PCE was detected at LS11A-MW32D, which is located adjacent to the suspected location of the former underground waste oil tank. Detections of PCE in the shallow groundwater depth intervals (8 to 12 ft bgs and 14 to 18 ft bgs) show the highest concentrations near the suspected location of the former underground waste oil tank.

The total VOC plume trends south-southwest following the primary direction of groundwater flow from the source area near the footprint of the former Building 3033 and the suspected location of the former underground waste oil tank (**Figure 5-2**). However,

grab groundwater data just north and south of the Building 3606 show VOCs extending beneath the building to the north at concentrations in the range of 0 to 2 µg/L, indicating that groundwater may also be dispersing out from the source area in various directions. The plume shown in **Figure 5-2** was delineated using the 2007 analytical data from the monitoring wells and the grab groundwater samples collected north of Building 3606. TCE is the most horizontally extensive VOC, PCE is concentrated to the source area and the area just south of the source. Based on the results of the grab groundwater samples, the Site 11a and Site 11 plumes appear to be co-mingled. Therefore, the true extent of the southern area the Site 11a groundwater plume can not be clearly defined.

Semivolatile Organic Compounds

Three SVOCs (2,4-dinitrotoluene, pentachlorophenol [PCP], and pyrene) were detected in groundwater at one monitoring well (LS11-MW20D) located upgradient of the suspected source area (**Table 5-2** and **Figure 5-3**). PCP was detected (6 J µg/L) above its respective MCL (1 µg/L) and VGWS (1 µg/L). There are no established screening values for comparison to pyrene and 2,4-dinitrotoluene, which were both detected at estimated concentrations (3 J and 4 J µg/L, respectively) below the detection limits.

Pesticides/PCBs

Eight pesticides (4,4'-dichlorodiphenyldichloroethane (DDD), dieldrin, endrin, heptachlor epoxide, alpha-BHC, alpha-Chlordane, gamma-BHC, and gamma-Chlordane) were detected in groundwater (**Table 5-2**). None of the detected pesticides exceeded the established MCLs. Three pesticides (dieldrin, endrin and heptachlor epoxide) were detected above the VGWS. Dieldrin exceeded the VGWS (0.003 µg/L) at LS11A-MW37D (0.057 µg/L), LS11A-MW39D (0.14 µg/L), and LS11A MW40D (0.26 µg/L) (**Figure 5-3**). Endrin was only detected at an estimated concentration (0.0048 J µg/L) just above the VGWS (0.004 µg/L) at LS11A-MW37D. Heptachlor epoxide exceeded the VGWS (0.001 µg/L) at LS11-MW20D (0.02 J µg/L) and LS11-MW32D (0.0057 J µg/L).

The majority of the constituents detected were in monitoring wells located in the grass-covered field (**Figure 5-3**). Therefore, the presence of pesticides may be associated with routine pesticide application and may not be associated with a CERCLA release.

Inorganics

Twenty total inorganics were detected in groundwater (**Table 5-2**). No constituents were detected at concentrations exceeding their corresponding MCL. Seven inorganics (beryllium, cobalt, copper, lead, mercury, thallium, and zinc) were detected at concentrations above corresponding background UTLs; and four inorganics (iron, manganese, mercury, and zinc) were detected at concentrations exceeding the VGWS. Of the inorganics that exceeded screening criteria, only mercury and zinc exceeded both background UTLs and VGWS. Mercury exceeded the background UTL (0.3 µg/L) and VGWS (0.05 µg/L) at LS11-MW16D (0.74 µg/L) and LS11-MW31D (0.8 µg/L) (**Figure 5-3)**. Zinc was detected (1,150 µg/L) above the background UTL (59 µg/L) and VGWS (50 µg/L) at LS11A-MW39D.

Seventeen dissolved inorganics were detected in groundwater (**Table 5-2**). No constituents were detected at concentrations exceeding their corresponding MCL. Five dissolved inorganics (aluminum, chromium, cobalt, lead, and mercury) were detected at

concentrations above corresponding background UTLs; and three 3 (iron, manganese, and mercury) were detected at concentrations exceeding VGWS (**Figure 5-3**). No constituents that exceeded the VGWS also exceeded the background UTLs.

5.1.2 Soil

This section presents the results for laboratory analysis of VOCs, SVOCs, pesticide/PCBs, and inorganics in surface and subsurface soil. A discussion of the TOC, NOD, DHC/BAV1[2], and phospholipid fatty acids (PLFA) results and their relationship to the fate and transport of site contamination is included in Section 6.

Volatile Organic Compounds

Three VOCs (PCE, TCE, and cis-1,2-DCE) were detected at estimated concentrations below the reporting limit in surface soil at LS11A-SS629, near the suspected location of the former underground waste oil storage tank (**Table 5-3** and **Figure 5-4**).

Two VOCs, TCE and PCE, were detected in subsurface soil (**Table 5-4**). TCE was detected in saturated soil at the bottom of the aquifer (20 to 28 ft bgs) at LS11A-SB627 (12 µg/kg) and LS11A-SB628 (23 µg/kg) and at a lower concentration in the shallower portion of the aquifer (6 to 12 ft bgs) at LS11A-SB629 (3J µg/kg). PCE was detected in saturated soil in the shallower portion of the aquifer (64 µg/kg) and at a lower concentration (8 J µg/kg) in the unsaturated soil (1 to 3 ft bgs) at LS11A-SB629, adjacent to the suspected location of the former underground waste oil storage tank (**Figure 5-5**).

These results are not indicative of a continuing source of VOC contamination in soil contributing to concentrations in the groundwater.

Semivolatile Organic Compounds

Two SVOCs, pyrene and bis(2-ethylhexyl)phthalate, were detected in surface soil (**Table 5-3**). No background UTLs have been established for the detected SVOCs. The highest concentration was detected in LS11A-SS629 (bis[2-ethylhexyl]phthalate at 13,000 micrograms per kilograms [ug/kg]), collected from underneath the asphalt-covered parking lot (**Figure 5-4**).

One SVOC, bis(2-ethylhexyl)phthalate, was detected in subsurface soil collected from one to three ft bgs (**Table 5-4**). No background UTL has been established for bis(2-ethylhexyl)phthalate. Three of the four samples in which this constituent was detected, including the sample with the highest concentration (LS11A-SB629), were collected from underneath the asphalt-covered parking lot (**Figure 5-5**).

Pesticide/Polychlorinated Biphenyls

Fourteen pesticides were detected in surface soil (**Table 5-3**). However, the majority of the constituents were detected in the three samples (LS11A-SS625, SS627, and SS628) collected from the grass-covered field (**Figure 5-4**). Therefore, the presence of pesticides may be associated with routine pesticide application and may not be associated with a CERCLA release.

Four pesticides (4,4′-DDD, 4,4′-dichlorodiphenyldichloroethylene (DDE), 4,4′-dichlorodiphenyltrichloroethane (DDT), and dieldrin) were detected in subsurface soil (**Table 5-4**). However, these constituents were only detected in samples (LS11A-SB625 and

SB628) collected from the grass-covered field (**Figure 5-5**). Therefore, the presence of pesticides may be associated with routine pesticide application and may not be associated with a CERCLA release.

No PCBs were detected in surface or subsurface soil.

Inorganics

Eighteen inorganics were detected in surface soil (**Table 5-3** and **Figure 5-4**). Background UTLs have been established for 15 of the 18 detected inorganics, only four were exceeded (aluminum, arsenic, calcium, and magnesium). Aluminum was only detected (11,100 mg/kg) above the UTL (8,500 mg/kg) at LS11A-SS623. Arsenic was detected (6.2 J mg/kg) above the UTL (5.6 mg/kg) at LS11A-SS625. Additionally, three inorganics (copper, mercury, and thallium) without background UTLs were detected.

Seventeen inorganics were detected in subsurface soil (**Table 5-4**). Background UTLs have been established for 15 of the 17 detected inorganics, only two were exceeded (aluminum and iron). Aluminum was detected above the background UTL (8,500 mg/kg) at several locations with concentrations ranging from 11,300 mg/kg (LS11A-SB629) to 15,000 mg/kg (LS11A-SB628) (**Figure 5-5**). Iron was detected at one location (LS11A-SB630 at 16,200 mg/kg) above the background UTL (15,000 mg/kg). Additionally, two inorganics without background UTLs, copper and thallium, were detected in the subsurface soil.

Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW600				LS11A-DW601				LS11A-DW602			
Sample ID		LS11A-DW600-0812-07C	LS11A-DW600-1418-07C	LS11A-DW600-2024-07C	LS11A-DW600-2428-07C	LS11A-DW601-0812-07C	LS11A-DW601-1418-07C[1]	LS11A-DW601-2024-07C	LS11A-DW601-2428-07C	LS11A-DW602-0812-07C	LS11A-DW602-1418-07C	LS11A-DW602-2024-07C	LS11A-DW602-2428-07C
Sample Depth		8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs
Sample Date		09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07
Chemical Name													
Volatile Organic Compounds (UG_L)													
1,1-Dichloroethene	7	6 U	6 U	6 U	6 U	6 U	6 U	12 U	12 U	6 U	6 U	6 U	6 U
1,2-Dichloroethene (total)	70	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Acetone	--	10 U	10 U	10 U	13	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Carbon disulfide	--	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Chloroform	80	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	--	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	--	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Methylene chloride	5	4 U	4 U	4 U	4 U	4 U	4 U	8 U	8 U	4 U	4 U	4 U	4 U
Tetrachloroethene	5	4 U	4 U	4 U	4 U	**79.7**	**130**	8 U	8 U	4 U	4 U	4 U	4 U
Toluene	1,000	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Trichloroethene	5	4 U	4 U	4 U	**10.1**	**28.1**	**55.6**	**100**	**18**	4 U	4 U	4 U	4 U
Trichlorofluoromethane(Freon-11)	--	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
Vinyl chloride	2	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U	1 U	1 U	1 U	1 U
Xylene, total	10,000	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U
m-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	100	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate sample collected at this location; the most conservative result is shown
-- No criteria established
Bold blue font represents MCL exceedances
NA - not analyzed
B - possible blank contamination
J - reported value is estimated
U - not detected

Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW603				LS11A-DW604				LS11A-DW605			
Sample ID		LS11A-DW603-0812-07C	LS11A-DW603-1418-07C	LS11A-DW603-2024-07C	LS11A-DW603-2428-07C	LS11A-DW604-0812-07C	LS11A-DW604-1418-07C	LS11A-DW604-2024-07C	LS11A-DW604-2428-07C[1]	LS11A-DW605-0812-07C	LS11A-DW605-1418-07C	LS11A-DW605-2024-07C	LS11A-DW605-2428-07C
Sample Depth		8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs
Sample Date		09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07
Chemical Name													
Volatile Organic Compounds (UG_L)													
1,1-Dichloroethene	7	6 UJ	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloroethene (total)	70	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	--	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	--	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	80	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	--	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	--	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	76 J	10 U	10 U	10 U
Methylene chloride	5	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Tetrachloroethene	5	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	**20.6**	**36.7**	**9.5**
Toluene	1,000	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	5	4 UJ	4 U	**160**	**98.1**	4 U	4 U	**170**	**99.2**	**6.5**	**26.1**	**110 J**	**1,100 J**
Trichlorofluoromethane(Freon-11)	--	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	2	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10,000	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	100	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate sample collected at this location; the most conservati
-- No criteria established
Bold blue font represents MCL exceedances
NA - not analyzed
B - possible blank contamination
J - reported value is estimated
U - not detected

Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW606				LS11A-DW607				LS11A-DW608			
Sample ID		LS11A-DW606-0812-07C	LS11A-DW606-1418-07C	LS11A-DW606-2024-07C	LS11A-DW606-2428-07C	LS11A-DW607-0812-07C[1]	LS11A-DW607-1418-07C	LS11A-DW607-2024-07C	LS11A-DW607-2428-07C	LS11A-DW608-0812-07C	LS11A-DW608-1418-07C	LS11A-DW608-2024-07C	LS11A-DW608-2428-07C
Sample Depth		8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs
Sample Date		09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/27/07	09/27/07	09/27/07	09/27/07
Chemical Name													
Volatile Organic Compounds (UG_L)													
1,1-Dichloroethene	7	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloroethene (total)	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	80	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Tetrachloroethene	5	4 U	4 U	**6**	4 U	4 U	4 U	4 U	4 U	4 U	**15.3**	4 U	4 U
Toluene	1,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	5	4.5	4 U	**190**	**200**	4 U	4 U	**370**	**110**	4 U	**99**	**180**	**12.8**
Trichlorofluoromethane(Freon-11)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate sample collected at this location; the most conservati
-- No criteria established
Bold blue font represents MCL exceedances
NA - not analyzed
B - possible blank contamination
J - reported value is estimated
U - not detected

Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW609				LS11A-DW610				LS11A-DW611			
Sample ID		LS11A-DW609-0812-07C	LS11A-DW609-1418-07C	LS11A-DW609-2024-07C	LS11A-DW609-2428-07C[1]	LS11A-DW610-0812-07C	LS11A-DW610-1418-07C	LS11A-DW610-2024-07C	LS11A-DW610-2428-07C	LS11A-DW611-0812-07C	LS11A-DW611-1418-07C	LS11A-DW611-2024-07C	LS11A-DW611-2428-07C
Sample Depth		8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs
Sample Date		09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07
Chemical Name													
Volatile Organic Compounds (UG_L)													
1,1-Dichloroethene	7	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloroethene (total)	70	10 U	10 U	10 U	10 U	10 U	10 U	10.7	10 U	10 U	10 U	10 U	10 U
Acetone	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	80	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Tetrachloroethene	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Toluene	1,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	5	4 U	**100**	**56.7**	4 U	**75.3**	**37.3**	**10.8**	4 U	**21.8**	**27.2**	4 U	4 U
Trichlorofluoromethane(Freon-11)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	10.7	10 U	10 U	10 U	10 U	10 U
m-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate sample collected at this location; the most conservati
-- No criteria established
Bold blue font represents MCL exceedances
NA - not analyzed
B - possible blank contamination
J - reported value is estimated
U - not detected

Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW612				LS11A-DW613				LS11A-DW614			
Sample ID		LS11A-DW612-0812-07C[1]	LS11A-DW612-1418-07C	LS11A-DW612-2024-07C	LS11A-DW612-2428-07C	LS11A-DW613-0812-07C	LS11A-DW613-1418-07C	LS11A-DW613-2024-07C	LS11A-DW613-2428-07C	LS11A-DW614-0812-07C	LS11A-DW614-1418-07C	LS11A-DW614-2024-07C[1]	LS11A-DW614-2428-07C
Sample Depth		8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs
Sample Date		09/27/07	09/27/07	09/27/07	09/27/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/08	09/28/07	09/28/07
Chemical Name													
Volatile Organic Compounds (UG_L)													
1,1-Dichloroethene	7	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloroethene (total)	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	80	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Tetrachloroethene	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Toluene	1,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Trichlorofluoromethane(Freon-11)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
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-- No criteria established
Bold blue font represents MCL exceedances
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U - not detected

Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW615			LS11A-DW616				LS11A-DW617				
Sample ID		LS11A-DW615-0812-07C	LS11A-DW615-1418-07C	LS11A-DW615-2024-07C	LS11A-DW616-0812-07C	LS11A-DW616-1418-07C	LS11A-DW616-2024-07C	LS11A-DW616-2428-07C	LS11A-DW617-0812-07C	LS11A-DW617-1418-07C[1]	LS11A-DW617-2024-07C	LS11A-DW617-2428-07C	LS11A-DW618-0812-07C
Sample Depth		8-12' bgs	14-18' bgs	20-24'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs
Sample Date		09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07
Chemical Name													
Volatile Organic Compounds (UG_L)													
1,1-Dichloroethene	7	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2-Dichloroethene (total)	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	15.3	10 U	10 U
Acetone	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	80	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	700	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Tetrachloroethene	5	4 U	4 U	4 U	4 U	**7**	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Toluene	1,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	5	**8.9**	**23.7**	4 U	4 U	**380**	**160 J**	4 U	4 U	**20.5**	**23.6**	4 U	4.9
Trichlorofluoromethane(Freon-11)	--	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	2	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	15.3	10 U	10 U
m-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
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Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW618			LS11A-DW619	LS11A-DW620	LS11A-DW621	LS11A-DW622	LS11A-DW624				
Sample ID		LS11A-DW618-1418-07C	LS11A-DW618-2024-07C	LS11A-DW618-2428-07C	LS11A-DW619-0509-07C	LS11A-DW620-0509-07C	LS11A-DW621-0509-07C	LS11A-DW622-0509-07C[1]	LS11A-DW624-0812-07C	LS11A-DW624-1418-07C	LS11A-DW624-2024-07C	LS11A-DW624-2428-07C	LS11A-DW626-0812-07C
Sample Depth		14-18' bgs	20-24'bgs	24-28'bgs	5-9' bgs	5-9' bgs	5-9' bgs	5-9' bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs	8-12' bgs
Sample Date		09/28/07	09/28/07	09/28/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07
Chemical Name													
Volatile Organic Compounds (UG_L)													
1,1-Dichloroethene	7	6 U	6 U	6 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.76 J	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	10 U	10 U	10 U	NA	NA	NA	NA	0.5 U	0.28 J	34	0.12 J	0.5 U
Acetone	--	10 U	10 U	10 U	2.7 B	5.1 B	5.9 B	5 U	3.8 B	3.3 B	46	5.8 B	2.5 B
Carbon disulfide	--	10 U	10 U	10 U	0.5 U	0.5 U	0.23 J	0.5 U	0.18 J	0.11 J	3.1 U	0.17 J	0.5 U
Chloroform	80	10 U	10 U	10 U	0.5 U	0.5 U	0.85	0.5 U	0.5 U	0.5 U	3.1 U	0.18 J	0.5 U
Dichlorodifluoromethane (Freon-12)	--	10 U	10 U	10 U	0.5 U	0.5 U	0.7	0.64	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U
Ethylbenzene	700	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	--	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.19 J	3.1 U	0.5 U	0.5 U
Methylene chloride	5	4 U	4 U	4 U	0.11 B	0.2 B	0.18 B	0.12 B	0.5 U	0.12 J	0.64 J	0.5 U	0.5 U
Tetrachloroethene	5	4 U	4 U	4 U	0.62	0.12 J	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U
Toluene	1,000	10 U	10 U	10 U	0.16 J	4.1	1.4	1.4	0.16 J	0.35 J	3.1 U	0.17 J	0.5 U
Trichloroethene	5	4 U	4 U	4 U	2.1	1.5	0.66	0.6	0.5 U	**25**	**97**	0.52	0.23 J
Trichlorofluoromethane(Freon-11)	--	10 U	10 U	10 U	4.7	3.1	18	9.4	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U
Vinyl chloride	2	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U
Xylene, total	10,000	10 U	10 U	10 U	1.5 U	1.5 U	1.5 U	1.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.28 J	32	0.12 J	0.5 U
m-Xylene	--	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	6.3 U	1 U	1 U
o-Xylene	--	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.3 J	0.5 U	0.5 U

Notes:
[1] Duplicate sample collected at this location; the most conservati
-- No criteria established
Bold blue font represents MCL exceedances
NA - not analyzed
B - possible blank contamination
J - reported value is estimated
U - not detected

Table 5-1
Grab Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**MCL-Groundwater**	LS11A-DW626		LS11A-DW631			
Sample ID		LS11A-DW626-1418-07C	LS11A-DW626-2024-07C[1]	LS11A-DW631-0812-07C	LS11A-DW631-1418-07C	LS11A-DW631-2024-07C	LS11A-DW631-2428-07C
Sample Depth		14-18' bgs	20-24'bgs	8-12' bgs	14-18' bgs	20-24'bgs	24-28'bgs
Sample Date		10/01/07	10/01/07	10/03/07	10/03/07	10/03/07	10/03/07
Chemical Name							
Volatile Organic Compounds (UG_L)							
1,1-Dichloroethene	7	0.11 J	0.66 J	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	0.72	50	0.5 U	0.5 U	0.5 U	0.5 U
Acetone	--	5.2 B	7.6 B	5.4 B	5.3 B	2.4 J	4.9 B
Carbon disulfide	--	0.11 J	1.3 U	0.5 U	0.16 J	0.5 U	0.5 U
Chloroform	80	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	--	0.5 U	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	700	0.5 U	0.17 J	0.5 U	0.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	--	0.11 J	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	5	0.12 J	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	5	0.5 U	1.3 U	0.5 U	0.78	0.67	0.43 J
Toluene	1,000	0.14 J	1.3 U	0.12 J	0.29 J	0.5 U	0.16 J
Trichloroethene	5	**24**	**27**	0.5 U	0.11 J	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	--	0.5 U	1.3 U	0.5 U	0.1 J	0.12 J	0.5 U
Vinyl chloride	2	0.5 U	0.26 J	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	10,000	0.5 U	1.5	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	70	0.62	44	0.5 U	0.5 U	0.5 U	0.5 U
m-Xylene	--	1 U	0.84 J	1 U	1 U	1 U	1 U
o-Xylene	--	0.5 U	0.54	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	0.11 J	6.7	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
[1] Duplicate sample collected at this location; the most conservati
-- No criteria established
Bold blue font represents MCL exceedances
NA - not analyzed
B - possible blank contamination
J - reported value is estimated
U - not detected

Table 5-2
Monitoring Well Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	VA Groundwater Standards	MCL-Groundwater	NABLC Background UTL-Groundwater	LS11-MW06D	LS11-MW15D	LS11-MW16D	LS11-MW20D	LS11-MW21D	LS11-MW22D	LS11-MW31D	LS11-MW32D	LS11-MW33D	LS11-MW34D	LS11-MW35D	LS11A-MW36D	LS11A-MW37D	LS11A-MW38D	LS11A-MW39D	LS11A-MW40D
Sample ID				LS11-MW06D-07C	LS11-MW15D-07C	LS11-MW16D-07C	LS11-MW20D-07C	LS11-MW21D-07C	LS11-MW22D-07C	LS11-MW31D-07C	LS11-MW32D-07C	LS11-MW33D-07C	LS11-MW34D-07C[1]	LS11-MW35D-07C[1]	LS11A-MW36D-07C	LS11A-MW37D-07C	LS11A-MW38D-07C	LS11A-MW39D-07C	LS11A-MW40D-07C
Sample Date				10/12/07	10/09/07	10/10/07	10/12/07	10/12/07	10/11/07	10/10/07	10/10/07	10/10/07	10/11/07	10/12/07	10/09/07	10/09/07	10/08/07	10/08/07	10/09/07
Chemical Name																			
Volatile Organic Compounds (UG_L)																			
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	--	--	--	0.5 U	0.5 U	0.52	0.5 U	0.5 U	0.5 U	0.87	50 U	0.52	0.5 U	0.5 U	0.5 U	0.5 U	50 U	0.5 U	0.5 U
1,1-Dichloroethane	--	--	--	1.2	0.5 U	0.17 J	0.5 U	0.5 U	0.5 U	0.5 U	50 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	0.5 U	0.5 U
1,1-Dichloroethene	--	7	--	3	0.5 U	0.61	0.5 U	0.5 U	0.54	0.27 J	50 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	0.5 U	0.5 U
Bromodichloromethane	--	80	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.48 J	0.5 U	50 U	0.5 U	0.17 J	0.5 U	0.5 U	0.5 U	50 U	0.17 J	0.2 J
Chlorobenzene	--	100	--	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.12 J	50 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	0.5 U	0.5 U
Chloroform	--	80	--	0.5 U	0.5 U	0.92	0.5 U	0.5 U	22	1.6	50 U	0.5 U	11	0.5 U	0.5 U	0.5 U	50 U	0.62	1.4
Methyl-tert-butyl ether (MTBE)	--	--	--	2.3	1.6	0.12 J	0.15 J	0.5 U	0.5 U	0.1 J	50 U	0.5 U	0.17 J	3.9	0.32 J	0.41 J	50 U	0.5 U	11
Tetrachloroethene	--	5	--	0.5 U	0.12 J	0.39 B	0.5 U	0.5 U	0.45 J	**6.8**	**430 J**	0.2 B	**5.1**	0.21 J	**160**	0.13 J	50 U	0.46 J	2.8
Trichloroethene	--	5	--	**24**	0.5 U	**140**	0.5 U	1.9	**260**	**110**	**150**	**10**	**210**	2.3	**61**	0.5 U	**730**	16 B	0.21 B
Trichlorofluoromethane(Freon-11)	--	--	--	0.5 U	0.5 U	0.19 J	0.5 U	0.5 U	0.5 U	0.5 U	50 U	0.56	0.5 U	0.5 U	0.47 J	0.5 U	50 U	0.5 U	0.54
cis-1,2-Dichloroethene	--	70	--	24	0.19 J	1.8	0.5 U	0.5 U	1.5	1.3	13 J	0.54	0.86	0.5 U	5.4	0.5 U	50 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	--	100	--	1	0.5 U	0.13 J	0.5 U	0.5 U	0.2 J	0.22 J	50 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (UG_L)																			
2,4-Dinitrotoluene	--	--	--	11 U	10 U	10 U	3 J	10 U	11 U	11 U	10 U	11 U	10 U	10 U	10 U	10 U	11 U	10 U	10 U
Pentachlorophenol	1	1	--	27 U	26 U	26 U	**6 J**	26 U	27 U	28 U	26 U	26 U	25 U	25 U	25 U	25 U	28 U	26 U	25 U
Pyrene	--	--	--	11 U	10 U	10 U	4 J	10 U	11 U	11 U	10 U	11 U	10 U	10 U	10 U	10 U	11 U	10 U	10 U
Pesticide/Polychlorinated Biphenyls (UG_L)																			
4,4'-DDD	--	--	--	0.02 U	0.02 U	0.021 U	0.02 U	0.02 U	0.021 U	0.021 U	0.02 U	0.021 U	0.02 U	0.02 U	0.0059 J	0.0075 J	0.02 U	0.02 U	0.0044 J
Dieldrin	0.003	--	--	0.02 U	0.02 U	0.021 U	0.017 B	0.02 U	0.021 U	0.021 U	0.018 B	0.021 U	0.0084 B	0.02 U	0.0075 B	0.057	0.0084 B	0.14	0.26
Endrin	0.004	2	--	0.02 U	0.02 U	0.021 U	0.02 U	0.02 U	0.021 U	0.021 U	0.02 U	0.021 U	0.02 U	0.02 U	0.022 U	0.0048 J	0.02 U	0.02 U	0.02 U
Heptachlor epoxide	0.001	0.2	--	0.01 U	0.01 U	0.011 U	0.02 J	0.01 U	0.01 U	0.011 U	0.0057 J	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U
alpha-BHC	--	--	--	0.01 U	0.0031 J	0.011 U	0.01 U	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U
alpha-Chlordane	--	--	--	0.01 U	0.01 U	0.011 U	0.0061 J	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.0059 J	0.01 U	0.01 U	0.01 U	0.01 U
gamma-BHC (Lindane)	0.01	0.2	--	0.01 U	0.01 U	0.0029 J	0.01 U	0.01 U	0.01 U	0.003 J	0.01 U	0.0028 J	0.01 U	0.01 U	0.011 U	0.01 U	0.0039 J	0.01 U	0.0029 J
gamma-Chlordane	--	--	--	0.01 U	0.01 U	0.011 U	0.0066 J	0.01 U	0.01 U	0.011 U	0.01 U	0.011 U	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U	0.01 U	0.01 U
Total Metals (UG_L)																			
Aluminum	--	--	713	200 U	200 U	200 U	89.4 J	193 J	65.7 J	15.2 J	32.2 J	18.7 J	200 U	48.1 J	14.6 J	17.4 J	200 U	12.8 J	12.2 J
Arsenic	50	10	4	1.6 B	3.8 K	1 U	0.39 B	1.6 B	0.46 B	1 U	0.49 B	0.37 B	0.41 B	1 U	1 U	0.64 B	1 U	1 U	0.32 B
Barium	1,000	2,000	55,000	7.6 J	19.6	37.4	31.1	11.7	56.5	28.8	41.5	26.1	29.7	16.4	30	26.4	24	13.7	21.9
Beryllium	--	4	0.5	1 U	1 U	1 U	1 U	1 U	1 U	0.52 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	0.4	5	2.1	1 U	0.11 J	0.096 J	0.23 J	0.1 B	0.28 J	0.24 J	0.12 B	0.099 B	0.31 J	0.071 B	0.066 J	1 U	0.065 J	0.064 J	0.066 J
Calcium	--	--	129,000	43,600 J	64,500 J	11,100 J	13,200 J	2,320 J	28,500 J	1,270 J	17,100 J	12,300 J	24,700 J	9,780 J	10,700 J	31,800 J	9,100 J	6,850 J	14,500 J
Chromium	50	100	4.1	2 U	2 U	2 U	2 U	0.95 J	0.45 B	2.7	1 J	0.056 B	1.4 J	2 U	2 U	2 U	2 U	2 U	2 U
Cobalt	--	--	2.6	0.64 J	0.26 J	0.28 J	3	2.2	3.3	3.4	0.18 J	0.27 J	0.16 J	1.7	2	1.9	2.1	5.8	3.9
Copper	1,000	1,300	--	1.2 B	1.9 B	1.2 B	0.95 B	3.2 B	0.96 B	2.4 B	2.5 B	0.79 B	1.3 B	19.4	0.81 B	1.4 B	1 B	1.2 B	2.7 B
Iron	300	--	17,100	192	1,830	100 U	109 B	324	100 U	100 U	100 U	100 U	100 U	18.8 B	115 B	171	100 U	48.6 B	100 U
Lead	50	15	--	0.062 B	0.24 B	0.07 B	0.11 B	0.63 J	0.15 B	0.45 B	0.1 B	0.066 B	0.64 J	0.11 B	0.13 B	0.084 B	0.089 B	0.2 B	0.1 B
Magnesium	--	--	45,600	2,260 J	7,010	7,050	6,810	1,350 J	11,800	971 J	11,000	7,890	8,380	5,730	4,570 J	5,070	5,640	2,090 J	5,370
Manganese	50	--	1,500	248 J	481 J	140 J	367 J	69.6 J	231 J	161 J	161 J	25 J	47.1 J	670 J	415 J	327 J	146 J	116 J	281 J
Mercury	0.05	2	0.3	0.2 U	0.2 U	0.74	0.2 U	0.2 U	0.095 J	0.8	0.074 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	--	--	14	0.6 B	0.65 B	1.2 B	1.8 B	1.3 B	2.6 B	4.2	1.6 B	0.92 B	1.5 B	1 B	3.1	2 B	2.1 B	2.1 B	2.5 B
Potassium	--	--	16,600	754 J	1,830 J	1,710 J	1,690 J	890 J	2,380 J	226 J	2,030 J	2,500 J	1,340 J	1,540 J	1,410 J	1,410 J	1,410 J	1,020 J	1,680 J
Selenium	10	50	8	5 U	0.55 J	2 J	0.32 J	5 U	1.3 J	2.5 J	2.3 J	0.75 J	0.64 J	0.32 J	0.74 J	1.6 J	1.7 J	0.53 J	0.39 J
Sodium	100,000	--	65,000	15,500 J	37,200 J	36,000 J	25,600 J	14,800 J	44,200 J	5,790 J	36,300 J	21,400 J	28,300 J	10,600 J	14,900 J	21,200 J	24,800 J	16,200 J	16,400 J
Thallium	--	2	--	1 U	1 U	0.073 B	0.034 B	0.078 B	0.12 J	0.12 B	0.083 B	0.11 B	0.047 B	0.039 B	0.057 B	0.057 B	0.065 B	0.046 B	0.083 B
Zinc	50	--	59	3.5 B	5 B	4.5 B	8.7 B	9 B	10 B	17.8	6.9 B	4.7 B	5.2 B	35 J	4.7 B	4.8 B	10.2 B	1,150	4.3 B
Dissolved Metals (UG_L)																			
Aluminum	--	--	58	200 U	200 U	200 U	200 U	200 U	200 U	210	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Arsenic	50	10	4	1.8 B	4	0.41 B	0.49 B	1.1 B	0.5 B	0.41 B	0.52 B	0.5 B	0.54 B	0.49 B	0.38 B	0.69 B	0.4 B	0.41 B	0.62 B
Barium	1,000	2,000	28,000	7.7 J	18.5	35.6	30.7	8.9 J	52.7	29.4	38.2	24.5	29.5	15.5	29.4	24.2	20.3	14.4	20.8
Beryllium	--	4	--	1 U	1 U	1 U	1 U	1 U	1 U	0.51 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Calcium	--	--	136,000	50,200	55,900	10,600	12,600	2,690 J	35,200	8,970	17,800	12,200	36,300	23,500	13,000	30,200	8,020	6,850	14,500
Chromium	50	100	2.1	2 U	2 U	2 U	2 U	2 U	0.29 B	2.8	0.81 J	2 U	1.4 J	2 U	2 U	2 U	2 U	2 U	2 U
Cobalt	--	--	1.9	0.59 J	0.25 J	0.22 J	2.7	1.8	2.9	3.4	0.097 J	0.14 J	0.15 J	1.7	1.9	1.7	1.9	5.4	4
Iron	300	--	11,200	220	1,750	100 U	36.3 J	132	100 U	100 U	100 U	100 U	100 U	14.5 J	138	158	100 U	11.3 J	15.9 J
Lead	50	15	--	0.14 B	0.18 B	0.22 B	0.15 B	0.16 B	0.42 B	0.47 B	0.15 B	3.4	0.62 B	1.6	0.51 J	0.055 B	0.12 B	0.1 B	0.12 B
Magnesium	--	--	49,000	2,710 J	6,420	6,870	6,650	1,510 J	15,400	7,090	11,600	7,990	15,800	8,220	5,560	5,000	5,130	2,230 J	5,580
Manganese	50	--	1,510	230	467	134	346	65.4	219	163	144	21.3	48	653	411	305	128	118	284
Mercury	0.05	2	--	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.12 L	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel	--	--	6	0.54 B	0.67 B	1.3 B	1.7 B	0.85 B	2.4 B	4.2	1.3 B	0.77 B	1.5 B	0.61 B	2.6 B	1.6	1.5 B	2 B	2.6 B
Potassium	--	--	16,600	854 J	1,750 J	1,650 J	1,730 J	980 J	3,420 J	1,890 J	2,150 J	2,800 J	3,240 J	1,630 J	1,730 J	1,580 J	1,420 J	1,180 J	1,740 J
Selenium	10	50	9	5 U	0.7 B	1.8 J	5 U	5 U	1.3 B	2.6 J	2 J	0.48 B	0.63 B	0.45 B	0.59 B	1.3 B	1.5 B	0.52 B	0.62 B
Sodium	100,000	--	65,000	16,600	33,200	33,500	24,100	15,100	57,300	40,600	36,200	21,900	56,100	27,300	16,600	21,200	22,800	16,400	16,100
Zinc	50	--	42	3.2 B	4.7 B	5.3 B	8.3 B	6.3 B	10 B	21.3	6.4 B	15.7	13.4 B	8.4 B	6.3 B	3.2 B	4.9 B	7.9 B	3.5 B

Table 5-2
Monitoring Well Groundwater Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**VA Groundwater Standards**	**MCL-Groundwater**	**NABLC Background UTL-Groundwater**	LS11-MW06D	LS11-MW15D	LS11-MW16D	LS11-MW20D	LS11-MW21D	LS11-MW22D	LS11-MW31D	LS11-MW32D	LS11-MW33D	LS11-MW34D	LS11-MW35D	LS11A-MW36D	LS11A-MW37D	LS11A-MW38D	LS11A-MW39D	LS11A-MW40D
Sample ID				LS11-MW06D-07C	LS11-MW15D-07C	LS11-MW16D-07C	LS11-MW20D-07C	LS11-MW21D-07C	LS11-MW22D-07C	LS11-MW31D-07C	LS11-MW32D-07C	LS11-MW33D-07C	LS11-MW34D-07C[1]	LS11-MW35D-07C[1]	LS11A-MW36D-07C	LS11A-MW37D-07C	LS11A-MW38D-07C	LS11A-MW39D-07C	LS11A-MW40D-07C
Sample Date				10/12/07	10/09/07	10/10/07	10/12/07	10/12/07	10/11/07	10/10/07	10/10/07	10/10/07	10/11/07	10/12/07	10/09/07	10/09/07	10/08/07	10/08/07	10/09/07
Chemical Name																			
Wet Chemistry (MG_L)																			
Alkalinity	--	--	--	120	165	19	20.5	9.18 B	20.7	6.56 B	18.1	18.6	19.3	23.5	13	60.2	17.4	19.2	31.6
Chloride	--	--	25	21.9	50.7	46.6	28.6	23.9	62.3	40	42.4	19.4	34	13.8	18.3	22.3	36	18.3	17.6
Methane	--	--	--	0.121	0.0535	0.00167 U	0.00167 U	0.0377	0.00167 U	0.00167 U	0.00167 U	0.00167 U	0.00167 U	0.00419	0.00167 U	0.0125	0.00167 U	0.0174	0.00167 U
Nitrate	--	10	--	0.05 U	0.05 U	0.6	0.055	0.05 U	1.21	0.31	1.51	0.16	2.93	0.1	1.17	0.235	2.16	0.92	0.145
Sulfate	--	--	54	13.7	24.2	55.5	58.8	7.03	183	98.2	102	57.2	79.5	30.4	51.9	44	30.6	13.9	39.3
Total organic carbon (TOC)	--	--	--	10.7	1.68 B	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1.69 B	5 U	5 U	5 U

Notes:
[1]Duplicate sample collected at this location; the most conservative result is shown
-- Criteria not established
Bold blue text represents exceedances of MCLs
Shaded cells represent exceedances of UTLs (established only for PAHs and inorganics) or detections of VOCs, Pest/PCBs, or inorganics not sampled/detected during the Background Investigation
Bold outlined cells represent exceedances of Virginia Groundwater Standards
B- Possible blank contamination
J- Reported value is estimated
K - Reported value is biased high
L- Reported value is biased low
NA- Not analyzed
R- Unreliable result
U- Not detected

Table 5-3
Surface Soil Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**NABLC-Background UTL - Urban Soil-SS**	LS11A-SO623	LS11A-SO625	LS11A-SO627	LS11A-SO628	LS11A-SO629	LS11A-SO630
Sample ID		LS11A-SS623-07C	LS11A-SS625-07C[1]	LS11A-SS627-07C	LS11A-SS628-07C	LS11A-SS629-07C	LS11A-SS630-07C
Sample Date		10/01/07	10/01/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name							
Volatile Organic Compounds (UG_KG)							
Tetrachloroethene	--	11 U	10 U	10 U	11 U	4 J	11 U
Trichloroethene	--	11 U	10 U	10 U	11 U	5 J	11 U
cis-1,2-Dichloroethene	--	11 U	10 U	10 U	11 U	3 J	11 U
Semi-volatile Organic Compounds (UG_KG)							
Pyrene	--	380 U	78 J	340 U	360 U	360 U	360 U
bis(2-Ethylhexyl)phthalate	--	110 J	79 J	340 U	180 J	13,000	910
Pesticide/Polychlorinated Biphenyls (UG_KG)							
4,4'-DDD	--	3.8 U	8.4	1.2 J	3.6 U	3.6 U	3.6 U
4,4'-DDE	--	3.8 U	45 J	8.8	1.1 J	3.6 U	3.6 U
4,4'-DDT	--	3.8 U	7.9 J	5.3 J	1.3 J	3.6 U	3.6 U
Aldrin	--	1.9 U	1.8 U	1.8 U	3.8	1.8 U	1.8 U
Dieldrin	--	3.8 U	2.1 J	3.8	80	3.6 U	3.6 U
Endosulfan I	--	1.9 U	1.8 U	0.55 J	1.9 U	1.8 U	1.8 U
Endosulfan sulfate	--	1.9 J	3.4 U	3.4 U	3.6 U	3.6 U	3.6 U
Endrin	--	3.8 U	3.4 U	3.4 U	1.6 J	3.6 U	3.6 U
Endrin aldehyde	--	3.8 U	1.1 J	1.4 J	3.6 U	3.6 U	3.6 U
Endrin ketone	--	3.8 U	3.4 U	3.4 U	1.1 J	3.6 U	3.6 U
Heptachlor epoxide	--	1.9 U	1.8 U	0.68 J	1.9 U	1.8 U	1.8 U
Methoxychlor	--	19 U	18 U	4.6 J	19 U	18 U	18 U
alpha-Chlordane	--	1.9 U	1.5 J	2.6 J	1.9 U	0.43 J	1.8 U
gamma-Chlordane	--	1.9 U	1.4 J	1.3 J	0.49 J	0.62 J	1.8 U
Total Metals (MG_KG)							
Aluminum	8,500	11,100	5,440	4,840	6,020	7,190	6,520
Arsenic	5.6	2.9 J	6.2 J	3.9 J	2.9 J	1.1 J	1.6 J
Barium	69	37.1	39.9	35.2	33.4	63.3	63.2
Beryllium	0.6	0.23 J	0.39 J	0.28 J	0.27 J	0.34 J	0.23 J
Calcium	1,817	635	1,630	1,770	650	1,300	2,070
Chromium	20	13.3	12.7	9.1	7.6	14.4	15.3
Cobalt	5.1	3.1 J	1.5 J	1.2 J	0.96 J	3.2 J	3.4 J
Copper	--	4	7.1	10.5	4	10.6	15.3
Iron	15,000	13,800	10,600	7,640	4,790	9,450	10,100
Lead	110	7.1	37.6	33.8	6.6	4.5	21.2
Magnesium	1,347	921	657	892	498 J	2,360	2,370
Manganese	267	79.3 J	140 J	123 J	133 J	188 J	189 J
Mercury	--	0.11 U	0.053 J	0.036 J	0.043 J	0.11 U	0.04 J
Nickel	9.5	6.1	5.1	3.9 J	4 J	7.5	6.8
Potassium	1,435	379 J	296 J	516 J	189 J	793 J	906 J
Thallium	--	0.74 J	0.8 J	0.35 J	0.48 J	0.59 J	0.43 J
Vanadium	34.3	20.4	22.6	15.7	8	18.6	23
Zinc	123	14.1	40.4	53.2	12.8	40.8	65.7

Notes:

All samples collected from 0-0.5' bgs

[1]Duplicate sample collected at this location; most conservative result is shown

-- No criteria established

Shaded cells represent exceedances of UTLs, (established only for PAHs and inorganics) or detections of VOCs, Pest/PCBs, or inorganics not sampled/detected during the Background Investigation

J - Reported value is estimated

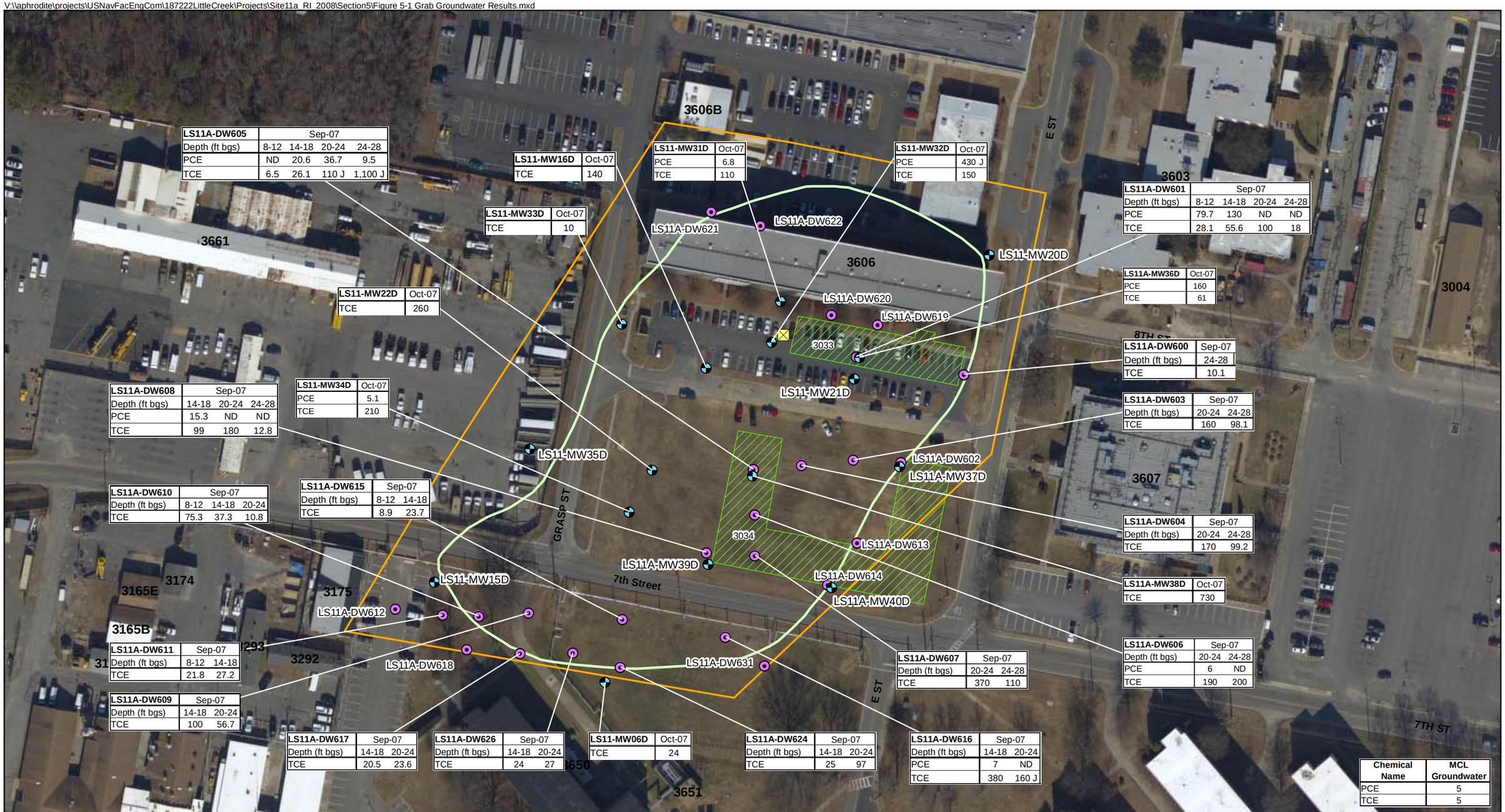
U - Not detected

Table 5-4
Subsurface Soil Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	**NABLC-Background UTL - Urban Soil-SB**	LS11A-SO623	LS11A-SO625	LS11A-SO627			LS11A-SO628			LS11A-SO629			LS11A-SO630		
Sample ID		LS11A-SB623-0103-07C	LS11A-SB625-0103-07C	LS11A-SB627-0103-07C	LS11A-SB627-0612-07C	LS11A-SB627-2028-07C	LS11A-SB628-0103-07C	LS11A-SB628-0612-07C	LS11A-SB628-2028-07C[1]	LS11A-SB629-0103-07C	LS11A-SB629-0612-07C	LS11A-SB629-2028-07C	LS11A-SB630-0103-07C	LS11A-SB630-0612-07C	LS11A-SB630-2028-07C
Sample Depth		1-3' bgs	1-3' bgs	1-3'bgs	6-12' bgs	20-28' bgs	1-3' bgs	6-12' bgs	20-28' bgs	1-3'bgs	6-12' bgs	20-28' bgs	1-3'bgs	6-12' bgs	20-28' bgs
Sample Date		10/01/07	10/01/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name															
Volatile Organic Compounds (UG_KG)															
Tetrachloroethene	--	12 U	11 U	11 U	11 U	12 U	14 U	11 U	12 U	8 J	64	12 U	12 U	12 U	12 U
Trichloroethene	--	12 U	11 U	11 U	11 U	12	14 U	11 U	23	12 U	3 J	12 U	12 U	12 U	12 U
Semi-volatile Organic Compounds (UG_KG)															
bis(2-Ethylhexyl)phthalate	--	140 J	360 U	380 UL	NA	NA	230 J	NA	NA	250 J	NA	NA	1,600	NA	NA
Pesticide/Polychlorinated Biphenyls (UG_KG)															
4,4'-DDD	--	3.9 U	1.4 J	3.8 U	NA	NA	4.5 U	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
4,4'-DDE	--	3.9 U	6.4	3.8 U	NA	NA	4.5 U	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
4,4'-DDT	--	3.9 U	1.7 J	3.8 U	NA	NA	4.5 U	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Dieldrin	--	3.9 U	3.6 U	3.8 U	NA	NA	2.9 J	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Total Metals (MG_KG)															
Aluminum	8,500	13,300	6,430	14,300	NA	NA	15,000	NA	NA	11,300	NA	NA	12,900	NA	NA
Arsenic	5.6	2.6 J	1.7 J	2.9 J	NA	NA	2.6 J	NA	NA	2.4 J	NA	NA	3.3 J	NA	NA
Barium	69	33.4	44	38.9	NA	NA	43.8	NA	NA	56.5	NA	NA	39.8	NA	NA
Beryllium	0.6	0.18 J	0.2 J	0.24 J	NA	NA	0.26 J	NA	NA	0.32 J	NA	NA	0.21 J	NA	NA
Calcium	1,817	512 J	907	797	NA	NA	776	NA	NA	776	NA	NA	875	NA	NA
Chromium	20	13.4	9.8	15.5	NA	NA	16	NA	NA	14.8	NA	NA	18.6	NA	NA
Cobalt	5.1	3.1 J	2.2 J	1.8 J	NA	NA	1.9 J	NA	NA	2.1 J	NA	NA	2.2 J	NA	NA
Copper	--	4.5	3.7	4.1	NA	NA	4	NA	NA	5.4	NA	NA	5.7	NA	NA
Iron	15,000	14,100	6,730	14,500	NA	NA	13,300	NA	NA	11,900	NA	NA	16,200	NA	NA
Lead	16.4	7.6	11.3	8.4	NA	NA	8.9	NA	NA	6.5	NA	NA	8.2	NA	NA
Magnesium	1,347	628	584	730	NA	NA	832	NA	NA	1,100	NA	NA	955	NA	NA
Manganese	267	80 J	148 J	25.4 J	NA	NA	37.6 J	NA	NA	164 J	NA	NA	71.1 J	NA	NA
Nickel	9.5	6	4.6	5.4	NA	NA	6.5	NA	NA	7.4	NA	NA	6.7	NA	NA
Potassium	1,435	314 J	234 J	315 J	NA	NA	332 J	NA	NA	368 J	NA	NA	492 J	NA	NA
Thallium	--	1.2 J	2.7 U	0.86 J	NA	NA	3.4 U	NA	NA	0.63 J	NA	NA	0.96 J	NA	NA
Vanadium	34.3	21.9	12.9	23.1	NA	NA	22.7	NA	NA	19	NA	NA	24.2	NA	NA
Zinc	39	10.9	13.1	11.2	NA	NA	12.3	NA	NA	17.3	NA	NA	15.9	NA	NA
Wet Chemistry (MG_KG)															
Total organic carbon (TOC)	3	NA	NA	NA	3,170	4,990	NA	3,470	4,390	NA	4,520	5,390	NA	6,900	4,280

Notes:
[1]A duplicate sample was collected at this location; the most conservative result is shown.
-- No criteria established
Shaded cells represent exceedances of UTLs, (established only for PAHs and inorganics) or detections of VOCs, Pest/PCBs, or inorganics not sampled/detected during the Background Investigation
J - Reported value is estimated
U - Not detected

V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section5\Figure 5-1 Grab Groundwater Results.mxd



LS11A-DW605	Sep-07			
Depth (ft bgs)	8-12	14-18	20-24	24-28
PCE	ND	20.6	36.7	9.5
TCE	6.5	26.1	110 J	1,100 J

LS11-MW16D	Oct-07
TCE	140

LS11-MW31D	Oct-07
PCE	6.8
TCE	110

LS11-MW32D	Oct-07
PCE	430 J
TCE	150

LS11-MW33D	Oct-07
TCE	10

LS11-MW22D	Oct-07
TCE	260

LS11A-DW601	Sep-07			
Depth (ft bgs)	8-12	14-18	20-24	24-28
PCE	79.7	130	ND	ND
TCE	28.1	55.6	100	18

LS11A-MW36D	Oct-07
PCE	160
TCE	61

LS11A-DW600	Sep-07
Depth (ft bgs)	24-28
TCE	10.1

LS11A-DW608	Sep-07		
Depth (ft bgs)	14-18	20-24	24-28
PCE	15.3	ND	ND
TCE	99	180	12.8

LS11-MW34D	Oct-07
PCE	5.1
TCE	210

LS11A-DW603	Sep-07	
Depth (ft bgs)	20-24	24-28
TCE	160	98.1

LS11A-DW610	Sep-07		
Depth (ft bgs)	8-12	14-18	20-24
TCE	75.3	37.3	10.8

LS11A-DW615	Sep-07	
Depth (ft bgs)	8-12	14-18
TCE	8.9	23.7

LS11A-DW604	Sep-07	
Depth (ft bgs)	20-24	24-28
TCE	170	99.2

LS11A-MW38D	Oct-07
TCE	730

LS11A-DW606	Sep-07	
Depth (ft bgs)	20-24	24-28
PCE	6	ND
TCE	190	200

LS11A-DW611	Sep-07	
Depth (ft bgs)	8-12	14-18
TCE	21.8	27.2

LS11A-DW607	Sep-07	
Depth (ft bgs)	20-24	24-28
TCE	370	110

LS11A-DW609	Sep-07	
Depth (ft bgs)	14-18	20-24
TCE	100	56.7

LS11A-DW617	Sep-07	
Depth (ft bgs)	14-18	20-24
TCE	20.5	23.6

LS11A-DW626	Sep-07	
Depth (ft bgs)	14-18	20-24
TCE	24	27

LS11-MW06D	Oct-07
TCE	24

LS11A-DW624	Sep-07	
Depth (ft bgs)	14-18	20-24
TCE	25	97

LS11A-DW616	Sep-07	
Depth (ft bgs)	14-18	20-24
PCE	7	ND
TCE	380	160 J

Chemical Name	MCL Groundwater
PCE	5
TCE	5

Legend
- Area of Investigation
- Demolished Building
- Approximate Location of Former Underground Waste Oil Tank
- Total VOC Plume Boundary
- Grab Groundwater Location
- Monitoring Well Location

Notes:
Sample locations without text boxes have no exceedances.
Concentrations reported in µg/L
ND - Analyte not detected
PCE - Tetrachloroethene
TCE - Trichloroethene

N
W E
S

0 50 100
Feet

Figure 5-1
Groundwater Exceedances of Screening Criteria - VOCs
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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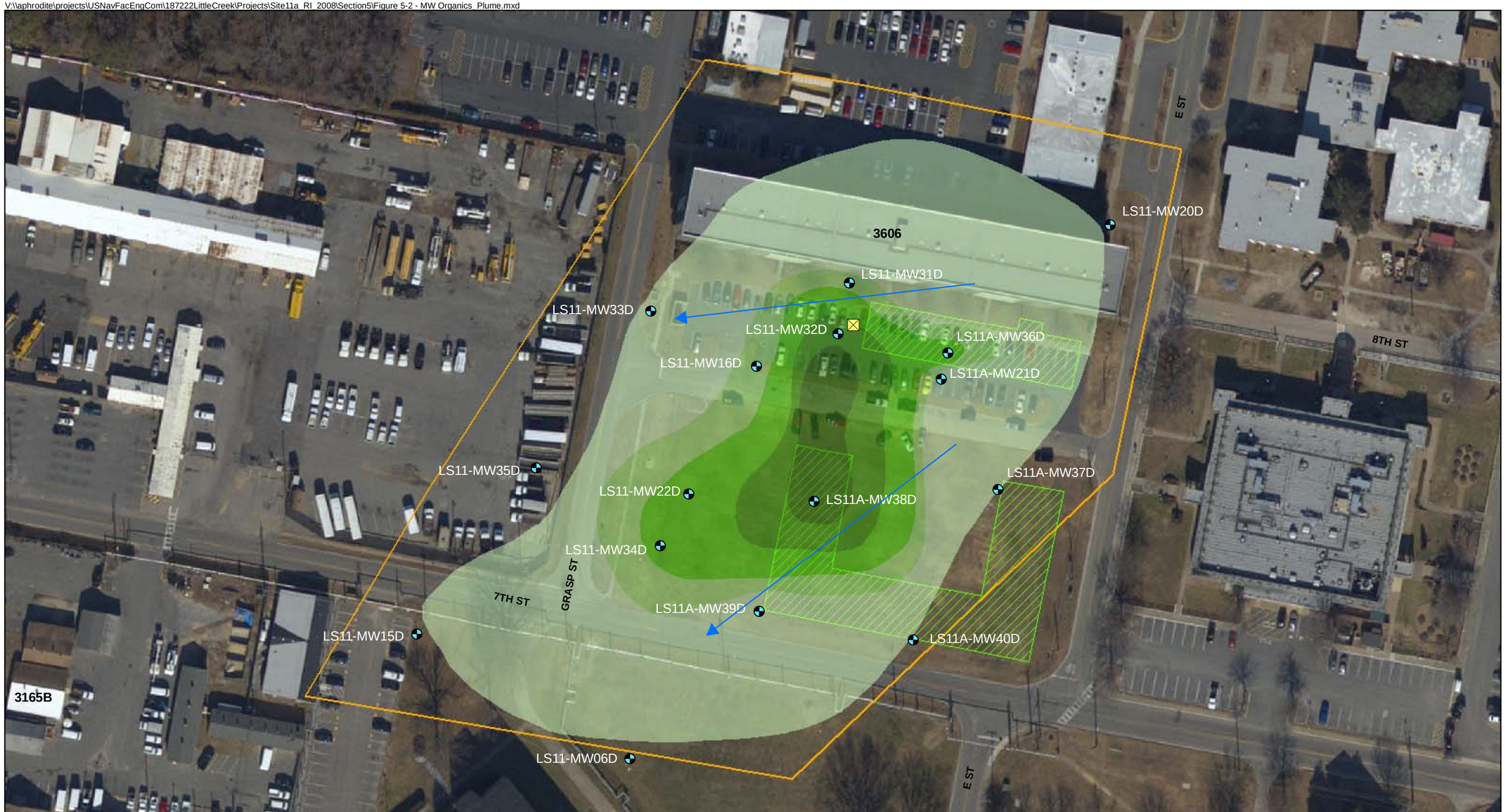
V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section5\Figure 5-2 - MW Organics_Plume.mxd



Legend

- Demolished Building
- Area of Investigation
- Monitoring Well Locations
- Approximate Location of Former Underground Waste Oil Tank

VOC Concentrations (µg/L)

- 0 -100
- 100 - 200
- 200 - 400
- 400 - 600
- 600 +
- Groundwater Flow Direction

N W E S

0 40 80 Feet

Figure 5-2
Total VOC Groundwater Plume
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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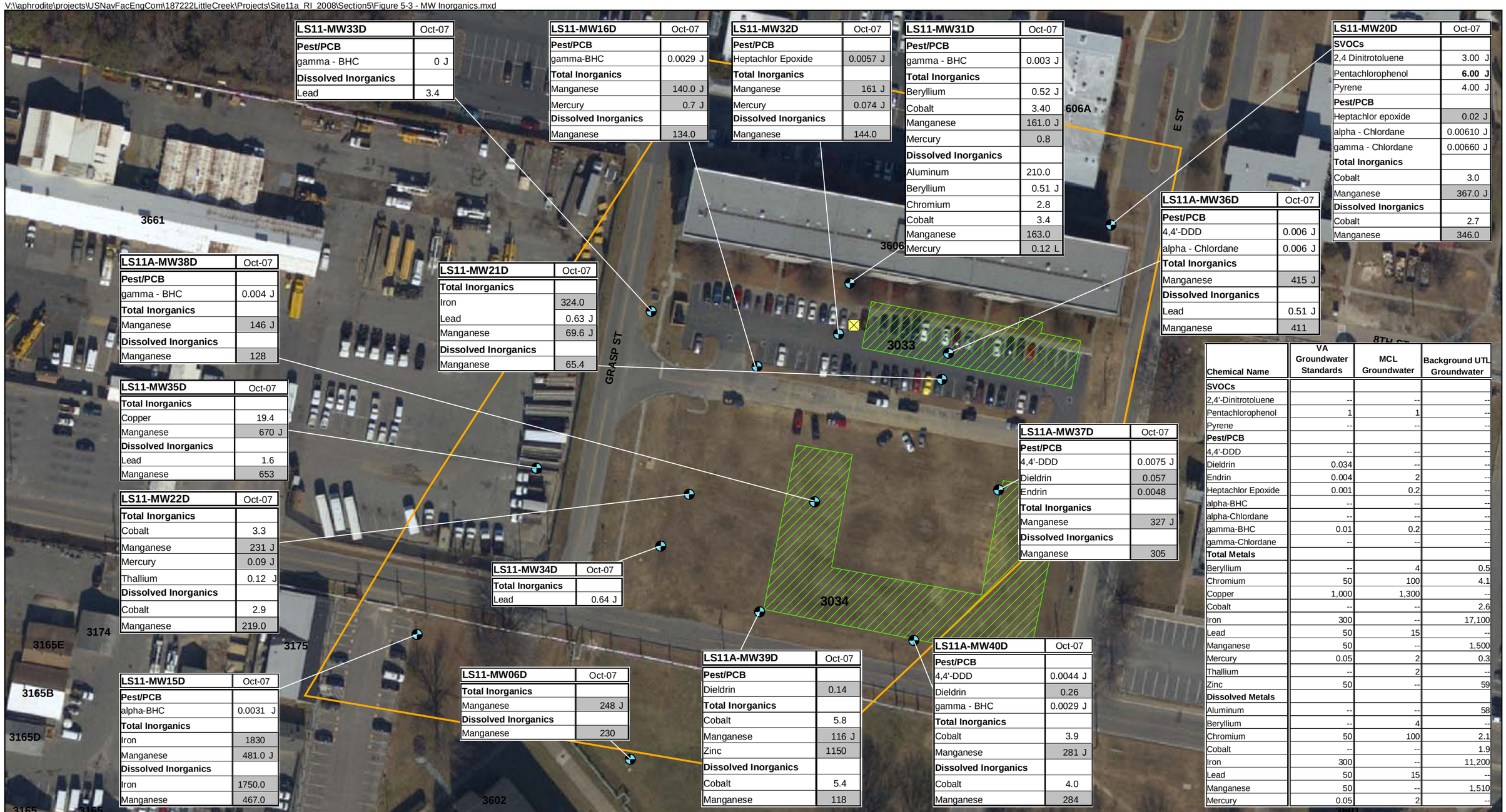
V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section5\Figure 5-3 - MW Inorganics.mxd



LS11-MW33D	Oct-07
Pest/PCB	
gamma - BHC	0 J
Dissolved Inorganics	
Lead	3.4

LS11-MW16D	Oct-07
Pest/PCB	
gamma-BHC	0.0029 J
Total Inorganics	
Manganese	140.0 J
Mercury	0.7 J
Dissolved Inorganics	
Manganese	134.0

LS11-MW32D	Oct-07
Pest/PCB	
Heptachlor Epoxide	0.0057 J
Total Inorganics	
Manganese	161 J
Mercury	0.074 J
Dissolved Inorganics	
Manganese	144.0

LS11-MW31D	Oct-07
Pest/PCB	
gamma - BHC	0.003 J
Total Inorganics	
Beryllium	0.52 J
Cobalt	3.40
Manganese	161.0 J
Mercury	0.8
Dissolved Inorganics	
Aluminum	210.0
Beryllium	0.51 J
Chromium	2.8
Cobalt	3.4
Manganese	163.0
Mercury	0.12 L

LS11-MW20D	Oct-07
SVOCs	
2,4 Dinitrotoluene	3.00 J
Pentachlorophenol	**6.00 J**
Pyrene	4.00 J
Pest/PCB	
Heptachlor epoxide	0.02 J
alpha - Chlordane	0.00610 J
gamma - Chlordane	0.00660 J
Total Inorganics	
Cobalt	3.0
Manganese	367.0 J
Dissolved Inorganics	
Cobalt	2.7
Manganese	346.0

LS11A-MW36D	Oct-07
Pest/PCB	
4,4'-DDD	0.006 J
alpha - Chlordane	0.006 J
Total Inorganics	
Manganese	415 J
Dissolved Inorganics	
Lead	0.51 J
Manganese	411

LS11A-MW38D	Oct-07
Pest/PCB	
gamma - BHC	0.004 J
Total Inorganics	
Manganese	146 J
Dissolved Inorganics	
Manganese	128

LS11-MW21D	Oct-07
Total Inorganics	
Iron	324.0
Lead	0.63 J
Manganese	69.6 J
Dissolved Inorganics	
Manganese	65.4

LS11-MW35D	Oct-07
Total Inorganics	
Copper	19.4
Manganese	670 J
Dissolved Inorganics	
Lead	1.6
Manganese	653

LS11-MW22D	Oct-07
Total Inorganics	
Cobalt	3.3
Manganese	231 J
Mercury	0.09 J
Thallium	0.12 J
Dissolved Inorganics	
Cobalt	2.9
Manganese	219.0

LS11-MW34D	Oct-07
Total Inorganics	
Lead	0.64 J

LS11A-MW37D	Oct-07
Pest/PCB	
4,4'-DDD	0.0075 J
Dieldrin	0.057
Endrin	0.0048
Total Inorganics	
Manganese	327 J
Dissolved Inorganics	
Manganese	305

LS11-MW15D	Oct-07
Pest/PCB	
alpha-BHC	0.0031 J
Total Inorganics	
Iron	1830
Manganese	481.0 J
Dissolved Inorganics	
Iron	1750.0
Manganese	467.0

LS11-MW06D	Oct-07
Total Inorganics	
Manganese	248 J
Dissolved Inorganics	
Manganese	230

LS11A-MW39D	Oct-07
Pest/PCB	
Dieldrin	0.14
Total Inorganics	
Cobalt	5.8
Manganese	116 J
Zinc	1150
Dissolved Inorganics	
Cobalt	5.4
Manganese	118

LS11A-MW40D	Oct-07
Pest/PCB	
4,4'-DDD	0.0044 J
Dieldrin	0.26
gamma - BHC	0.0029 J
Total Inorganics	
Cobalt	3.9
Manganese	281 J
Dissolved Inorganics	
Cobalt	4.0
Manganese	284

Chemical Name	VA Groundwater Standards	MCL Groundwater	Background UTL Groundwater
SVOCs			
2,4'-Dinitrotoluene	--	--	--
Pentachlorophenol	1	1	--
Pyrene	--	--	--
Pest/PCB			
4,4'-DDD	--	--	--
Dieldrin	0.034	--	--
Endrin	0.004	2	--
Heptachlor Epoxide	0.001	0.2	--
alpha-BHC	--	--	--
alpha-Chlordane	--	--	--
gamma-BHC	0.01	0.2	--
gamma-Chlordane	--	--	--
Total Metals			
Beryllium	--	4	0.5
Chromium	50	100	4.1
Copper	1,000	1,300	--
Cobalt	--	--	2.6
Iron	300	--	17,100
Lead	50	15	--
Manganese	50	--	1,500
Mercury	0.05	2	0.3
Thallium	--	2	--
Zinc	50	--	59
Dissolved Metals			
Aluminum	--	--	58
Beryllium	--	4	--
Chromium	50	100	2.1
Cobalt	--	--	1.9
Iron	300	--	11,200
Lead	50	15	--
Manganese	50	--	1,510
Mercury	0.05	2	--

Legend

- Area of Investigation
- Demolished Building
- Approximate Location of Former Underground Waste Oil Tank
- Monitoring Well Locations

Notes:
All results shown are exceedances of Background UTLs (established for PAHs and select organics) or detection of non PAH SVOCs, pesticides/PCBs, and inorganics not detected in Background Investigation
Shaded results represent exceedance of VA Groundwater Standards
Bolded results represent exceedance of MCLs
Concentrations reported in µg/L
J - Reported value is estimated
L - Reported value is biased low

N W E S

0 40 80 Feet

Figure 5-3
Groundwater Exceedances of
Screening Criteria - SVOCs, Pesticides/PCBs, Inorganics
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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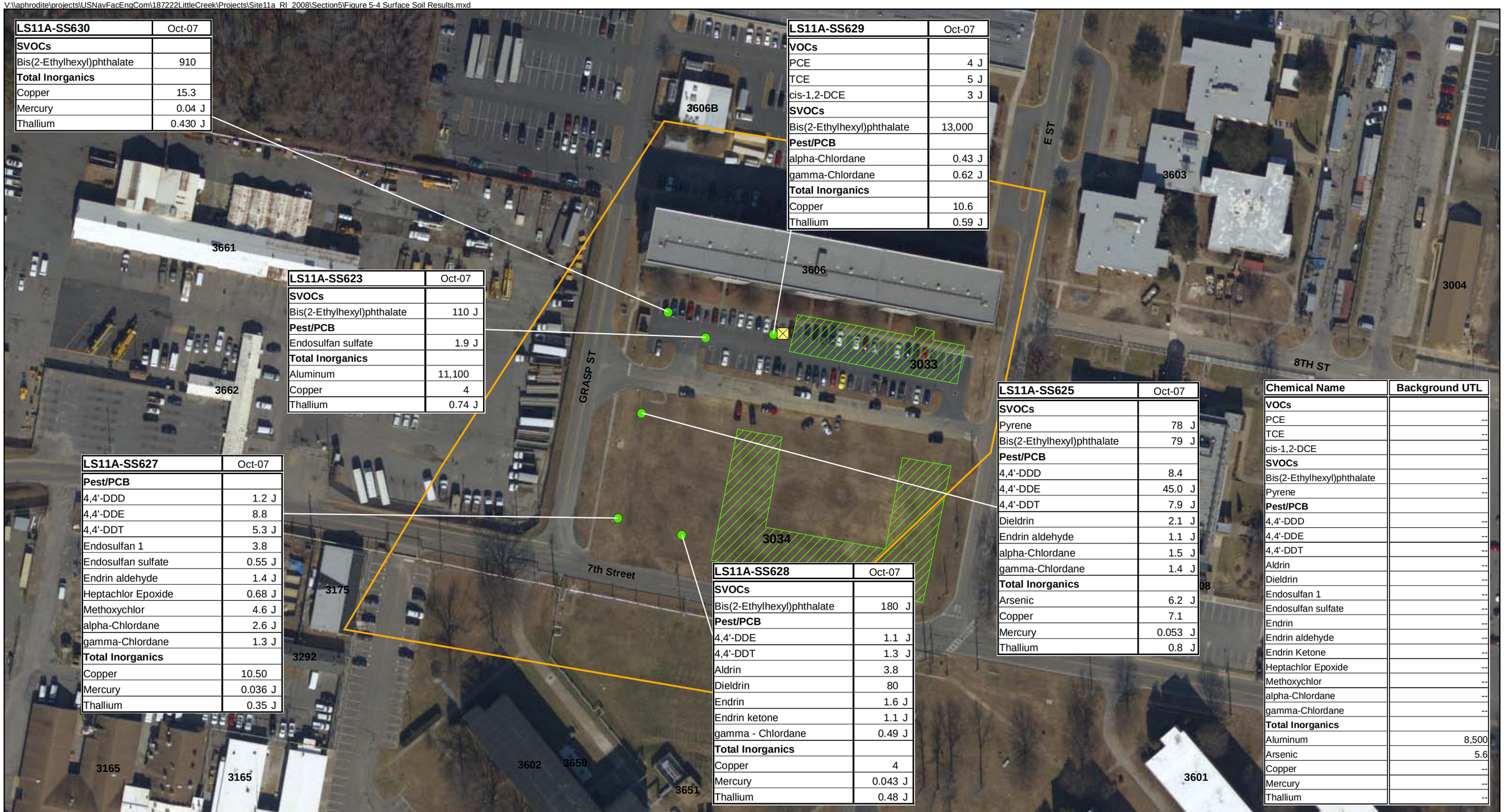
V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section5\Figure 5-4 Surface Soil Results.mxd



LS11A-SS630	Oct-07
SVOCs	
Bis(2-Ethylhexyl)phthalate	910
Total Inorganics	
Copper	15.3
Mercury	0.04 J
Thallium	0.430 J

LS11A-SS629	Oct-07
VOCs	
PCE	4 J
TCE	5 J
cis-1,2-DCE	3 J
SVOCs	
Bis(2-Ethylhexyl)phthalate	13,000
Pest/PCB	
alpha-Chlordane	0.43 J
gamma-Chlordane	0.62 J
Total Inorganics	
Copper	10.6
Thallium	0.59 J

LS11A-SS623	Oct-07
SVOCs	
Bis(2-Ethylhexyl)phthalate	110 J
Pest/PCB	
Endosulfan sulfate	1.9 J
Total Inorganics	
Aluminum	11,100
Copper	4
Thallium	0.74 J

LS11A-SS625	Oct-07
SVOCs	
Pyrene	78 J
Bis(2-Ethylhexyl)phthalate	79 J
Pest/PCB	
4,4'-DDD	8.4
4,4'-DDE	45.0 J
4,4'-DDT	7.9 J
Dieldrin	2.1 J
Endrin aldehyde	1.1 J
alpha-Chlordane	1.5 J
gamma-Chlordane	1.4 J
Total Inorganics	
Arsenic	6.2 J
Copper	7.1
Mercury	0.053 J
Thallium	0.8 J

LS11A-SS627	Oct-07
Pest/PCB	
4,4'-DDD	1.2 J
4,4'-DDE	8.8
4,4'-DDT	5.3 J
Endosulfan 1	3.8
Endosulfan sulfate	0.55 J
Endrin aldehyde	1.4 J
Heptachlor Epoxide	0.68 J
Methoxychlor	4.6 J
alpha-Chlordane	2.6 J
gamma-Chlordane	1.3 J
Total Inorganics	
Copper	10.50
Mercury	0.036 J
Thallium	0.35 J

LS11A-SS628	Oct-07
SVOCs	
Bis(2-Ethylhexyl)phthalate	180 J
Pest/PCB	
4,4'-DDE	1.1 J
4,4'-DDT	1.3 J
Aldrin	3.8
Dieldrin	80
Endrin	1.6 J
Endrin ketone	1.1 J
gamma - Chlordane	0.49 J
Total Inorganics	
Copper	4
Mercury	0.043 J
Thallium	0.48 J

Chemical Name	Background UTL
VOCs	
PCE	--
TCE	--
cis-1,2-DCE	--
SVOCs	
Bis(2-Ethylhexyl)phthalate	--
Pyrene	--
Pest/PCB	
4,4'-DDD	--
4,4'-DDE	--
4,4'-DDT	--
Aldrin	--
Dieldrin	--
Endosulfan 1	--
Endosulfan sulfate	--
Endrin	--
Endrin aldehyde	--
Endrin Ketone	--
Heptachlor Epoxide	--
Methoxychlor	--
alpha-Chlordane	--
gamma-Chlordane	--
Total Inorganics	
Aluminum	8,500
Arsenic	5.6
Copper	--
Mercury	--
Thallium	--

Legend
- Area of Investigation
- Demolished Building
- Approximate Location of Former Underground Waste Oil Tank
- Soil Sample Location

Notes:
Organic concentrations reported in µg/kg
Inorganic concentrations reported in mg/kg
J - Reported value is estimated
All results shown are exceedances of Background UTLs (established for PAHs and select inorganics) or detections of VOCs, non PAH SVOCs, pesticides/PCBs, and inorganics not detected in Background Investigation

N W E S

0 50 100 Feet

Figure 5-4
Surface Soil Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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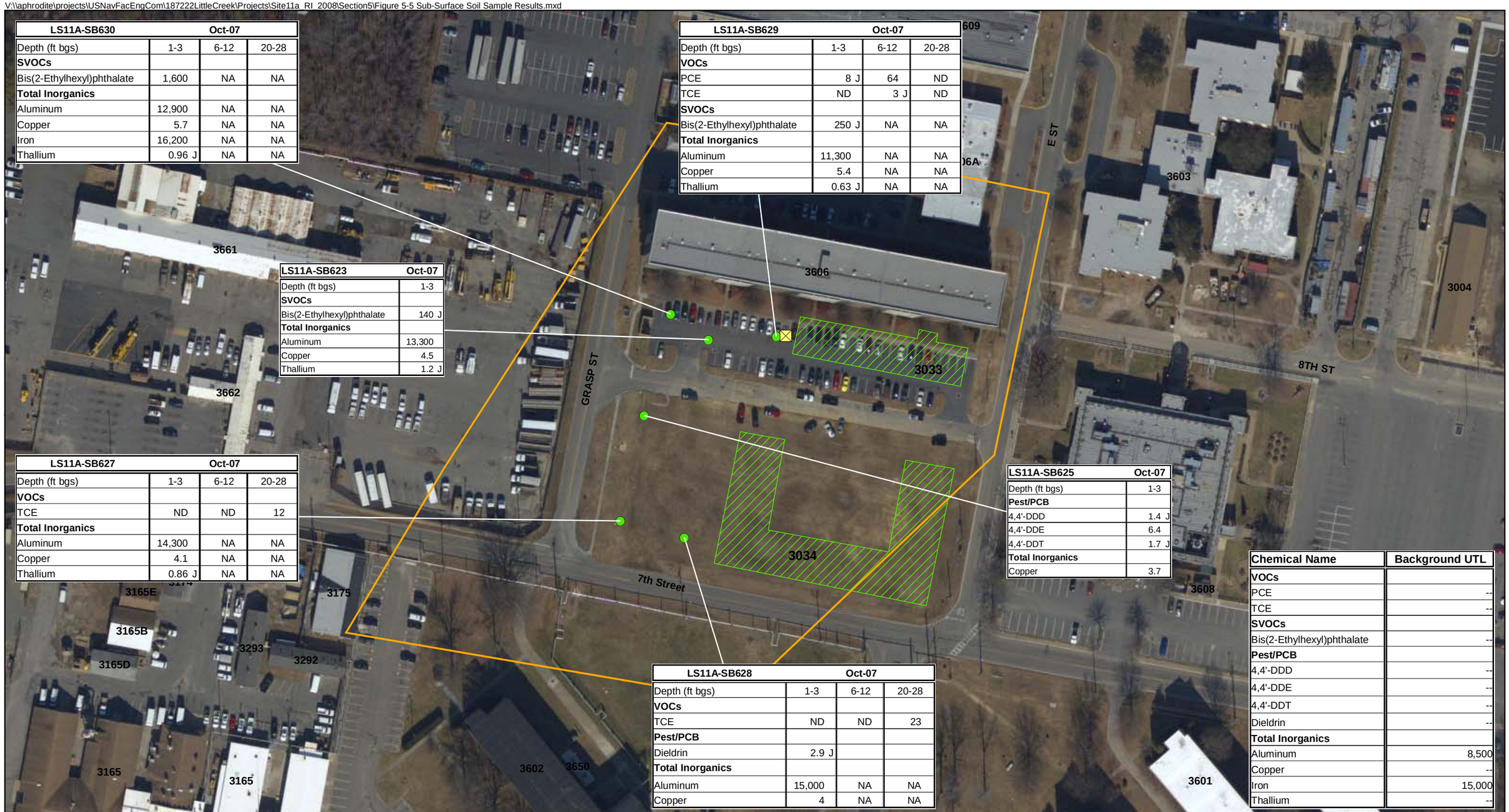
V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section5\Figure 5-5 Sub-Surface Soil Sample Results.mxd



LS11A-SB630	Oct-07		
Depth (ft bgs)	1-3	6-12	20-28
SVOCs			
Bis(2-Ethylhexyl)phthalate	1,600	NA	NA
Total Inorganics			
Aluminum	12,900	NA	NA
Copper	5.7	NA	NA
Iron	16,200	NA	NA
Thallium	0.96 J	NA	NA

LS11A-SB629	Oct-07		
Depth (ft bgs)	1-3	6-12	20-28
VOCs			
PCE	8 J	64	ND
TCE	ND	3 J	ND
SVOCs			
Bis(2-Ethylhexyl)phthalate	250 J	NA	NA
Total Inorganics			
Aluminum	11,300	NA	NA
Copper	5.4	NA	NA
Thallium	0.63 J	NA	NA

LS11A-SB623	Oct-07
Depth (ft bgs)	1-3
SVOCs	
Bis(2-Ethylhexyl)phthalate	140 J
Total Inorganics	
Aluminum	13,300
Copper	4.5
Thallium	1.2 J

LS11A-SB627	Oct-07		
Depth (ft bgs)	1-3	6-12	20-28
VOCs			
TCE	ND	ND	12
Total Inorganics			
Aluminum	14,300	NA	NA
Copper	4.1	NA	NA
Thallium	0.86 J	NA	NA

LS11A-SB625	Oct-07
Depth (ft bgs)	1-3
Pest/PCB	
4,4'-DDD	1.4 J
4,4'-DDE	6.4
4,4'-DDT	1.7 J
Total Inorganics	
Copper	3.7

LS11A-SB628	Oct-07		
Depth (ft bgs)	1-3	6-12	20-28
VOCs			
TCE	ND	ND	23
Pest/PCB			
Dieldrin	2.9 J		
Total Inorganics			
Aluminum	15,000	NA	NA
Copper	4	NA	NA

Chemical Name	Background UTL
VOCs	
PCE	--
TCE	--
SVOCs	
Bis(2-Ethylhexyl)phthalate	--
Pest/PCB	
4,4'-DDD	--
4,4'-DDE	--
4,4'-DDT	--
Dieldrin	--
Total Inorganics	
Aluminum	8,500
Copper	--
Iron	15,000
Thallium	--

Legend
- Area of Investigation
- Demolished Building
- Approximate Location of Former Underground Waste Oil Tank
- Soil Sample Location

Notes:
Organic concentrations reported in µg/kg
Inorganic concentrations reported in mg/kg
PCE - Tetrachloroethene
TCE - Trichloroethene
NA - Analyte not analyzed
ND - Analyte not detected
J - Reported value is estimated

All Results shown are exceedances of Background UTLs (established for PAHs and select inorganics) or detections of VOCs, non PAH SVOCs, pesticides/PCBs, and inorganics not detected in Background Investigation

N
W E
S

0 50 100
Feet

Figure 5-5
Subsurface Soil Exceedances of Screening Criteria
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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SECTION 6

Contaminant Fate and Transport

This section discusses the fate and transport of representative constituents of interest (COIs) identified at Site 11a and their interactions with the groundwater and the aquifer matrix (saturated soil). The site data indicate that the unsaturated (or vadose zone) soil, has not been impacted by the CERCLA release, and therefore fate and transport of COIs in this media are not discussed in this section. The site does not have any surface water or sediment features on or adjacent to it. Fate and transport consists of identification of theoretical contaminant phases and migration and degradation pathways. COIs were selected based on exceedance of screening criteria (Federal MCLs, VGWS, and groundwater background UTLs) and in the absence of exceedance criteria, detections. COIs represent potentially site-related compounds. The constituents detected in the shallow groundwater at Site 11a, and considered as COIs in this section are presented in **Table 6-1**.

A few of the more prevalent COIs were selected as representative contaminants for detailed discussion in this section on the basis of concentrations exceeding screening criteria, frequency of occurrence, variable migration potential, and potential to be a risk driver to human health and the environment. Although manganese was identified as a human health risk driver, it was not selected as a representative contaminant because it was not detected above the recognized background concentration. The representative contaminants discussed in this section are listed in **Table 6-2** and their specific fate and transport properties are described in the following section. These fate and transport properties provide a range of the characteristic properties of each constituent group. Quantification of a COI's contribution to human health and ecological risk is evaluated in Sections 7 and 8, respectively.

The fate and transport, in addition to data presented in the previous sections, were used to develop a CSM (**Figure 6-1**). As shown on the CSM, soil is not a media of concern based on investigation results and therefore, is not included in the fate and transport discussion. The CSM is used to support potential risk management decisions and aid in defining the effectiveness of potential remedial alternatives in the FS.

6.1 Contaminant Fate Processes

The primary mechanisms responsible for the fate of contaminants include sorption of contamination to soil surfaces, volatilization from groundwater into the gas phase, and natural degradation. **Table 6-2** summarizes several physical and chemical properties for the representative contaminants. **Figure 6-1** presents a conceptual depiction of the primary fate and transport processes at Site 11a.

6.1.1 Sorption

Sorption occurs when a compound adheres to and becomes associated with solid particles in the formation (sorbed phase). The subsurface materials likely to sorb chemicals are clays and organic matter. The presence of clays and organic matter in the Columbia Formation at

Site 11a is limited. Well-sorted clean sand, which the majority of the Columbia Formation is composed of, would be less likely for chemicals to sorb to. The Yorktown confining unit, however, is composed of very fine-grained materials including clay, silt, and very fine sand and organic matter, and would be likely to have a strong affinity for many of the representative contaminants.

The conventional measure of sorption is the distribution coefficient (K_d). The K_d for organic constituents is the product of the soil organic carbon partition coefficient (K_{oc}) of the constituent and the fraction of organic carbon (f_{oc}) in the soil (**Table 6-2**). In general, constituents with a K_{oc} greater than 10,000 milliters per gram (ml/g) have high degrees of adsorption and consequentially low mobility, whereas constituents with a K_{oc} lower than 1,000 ml/g have lower degrees of adsorption and consequentially higher mobility. The representative VOCs (the chlorinated VOCs PCE and TCE) have relatively low K_{oc} values (less than 1,000 ml/g) while the representative SVOC (PCP) has relatively high K_{oc} values (greater than 10,000 ml/g).

The adsorption of PCP in soils is also highly dependent on pH. PCP has a dissociation constant (pKa) of 4.74, meaning that it exists primarily in a highly adsorbed pronated form at pH values below 4.74 and as a relatively highly soluble ionic form at pH values above 4.74. The pH of the groundwater at Site 11a varies from 4.7 to 7.0 suggesting that most (90 to 99 percent) of the PCP is present in the more soluble form. However, PCP does not reach maximum solubility until a pH above 6.8. (Choi and Aomine, 1974).

The migration rates of different dissolved contaminants vary depending on the K_d and the rate of groundwater flow. The average groundwater flow velocity, as discussed in Section 4.2.2, is estimated at 2.4 ft/yr in the Columbia aquifer. Adsorption of constituents in groundwater to soil can retard the movement of groundwater constituents. For each contaminant detected at the site, it is possible to calculate a theoretical retardation coefficient, which is an estimate of the degree to which the contaminant is slowed by adsorption in relation to the groundwater flow velocity. 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 (grams per cubic centimeter [gm/ml])
K_d = Distribution coefficient (ml/g)
n_e = effective porosity (dimensionless)

The retardation coefficients were calculated assuming a bulk density of 1.6 gm/ml (typical for sand) and an effective porosity of 0.35 (typical of silty sand). The resulting retardation coefficients are listed in **Table 6-2**. The retardation coefficients for the representative VOCs range from 11.8 for PCE to 4.3 for TCE, resulting in contaminant flow velocities ranging from 0.2 ft/yr for PCE to 0.6 ft/yr for TCE. The retardation coefficient for the representative SVOC, PCP, ranges from 36.7 for the ionized form to 2525 for the pronated form.

6.1.2 Volatilization

Volatilization occurs when a compound transfers from the aqueous phase to the gas phase. Measures of a constituent's tendency to volatilize from water and soil include its vapor pressure and Henry's Law Constant (K_h). Compounds with K_h values higher than 10^{-3} atmosphere-cubic meter per mole (atm-m^3/M) (for example, all site-related chlorinated VOCs) 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., PCP) are relatively non-volatile. Compounds with K_h values in between these values are expected to be moderately volatile. At a given temperature, the higher the vapor pressure of a compound, the higher the volatility of that compound.

Values of vapor pressure and K_h for the representative contaminants are provided in **Table 6-2**. The relatively high vapor pressure and K_h values for TCE and PCE suggest that volatilization could be an important fate mechanism for these compounds in groundwater. However, volatilization only occurs at the air/water interface between the saturated and unsaturated zones, and movement of aqueous-phase contaminants from the bulk groundwater to the interface is largely diffusion-limited. Furthermore, the lower the water solubility and soil distribution coefficient, the lower the amount of chemical available for volatilization across that interface will be.

6.1.3 Degradation

Degradation is the deterioration or destruction of a constituent via processes such as hydrolysis, photolysis, and biodegradation. The rate of degradation can be expressed as a half life and is dependent on the existing chemical, biological, and physical conditions of the media in which the contaminant is located. Hydrolysis is the reaction of a chemical with water and photolysis is the result of exposing the chemical to light. Biodegradation of chemicals by microbial organisms occurs through metabolic or enzymatic processes. The biodegradation of TCE and PCE and PCP is discussed in detail in the following section.

VOCs

Based on the nature and extent of contamination presented in Section 5, chlorinated VOCs appear to be the most pervasive and extensive contaminants in groundwater at Site 11a. Dissolved phase chlorinated VOCs can undergo biodegradation through use as an electron acceptor (reductive dechlorination), use as an electron donor (oxidation), or co-metabolism. PCE and TCE typically biodegrade via reductive dechlorination. This is an anaerobic process, in which the contaminant is used as an electron acceptor and a chlorine atom is replaced by a hydrogen atom. Reductive dechlorination occurs in a series of reactions in which the parent compound is reduced to daughter compounds; each reaction forms a daughter compound with sequentially fewer chlorine atoms. The reductive degradation pathway for PCE and TCE is as follows:

$$\text{PCE} \rightarrow \text{TCE} \rightarrow \text{cis-1,2-DCE} \rightarrow \text{VC} \rightarrow \text{ethene}$$

This reaction is often limited by the amount of an available carbon source (electron donor) in the groundwater system. Additionally, the rate of reductive dechlorination appears to decrease as the degree of chlorination decreases. The reduced daughter products of TCE (especially VC) can also be biodegraded via aerobic degradation pathways.

Reductive dechlorination can proceed simultaneously with other oxidation-reduction (redox) reactions (such as aerobic oxidation, denitrification, manganese, iron, and sulfate reduction, and methanogenesis). As each electron acceptor is used and depleted, the ORP of the groundwater system is driven downward. Reductive dechlorination is more thermodynamically favorable under highly reduced conditions. The optimal energy range for reductive dechlorination of chlorinated VOCs is within the same range favorable for sulfate reducing and methanogenic conditions (USEPA, 1998). The redox conditions of the subsurface, and the dominant redox mechanisms, can be inferred by the ORP and electron acceptor concentration, reduction product concentration, and hydrogen concentration.

Chlorinated VOCs may also be degraded under abiotic mechanisms. These are chemical reactions (such as hydrolysis or dehydrohalogenation) without the aid of microorganisms. Some abiotic reactions are triggered by the byproducts of biological reactions.

Direct field measurements of contaminant transformation or degradation are still being established. Documentation of reactions or mechanisms at multiple levels is therefore used to evaluate the activity and effectiveness of chlorinated VOC biodegradation. This can be qualitatively assessed through observation of "reaction footprints," which include:

- Reduction of higher chlorinated compounds
- Consumption of the electron donors (TOC)
- Footprints of other normal redox reactions
  - Consumption of DO (aerobic oxidation)
  - Consumption of nitrate (denitrification)
  - Consumption of sulfate and/or production of sulfide (sulfate reduction)
  - Production of methane (methanogenesis)
- Generation of ethene and chloride ion
- Increase in alkalinity or hydrogen consumption

Degradation Products. The primary line of evidence that chlorinated VOC biodegradation is occurring at a site is the reduction in parent compound concentrations and the increase in degradation products. TCE concentrations have been impacted by the ISCO treatability study. Therefore, these trends cannot be used to assess natural reductive dechlorination. However, the presence of degradation products in site groundwater is evidence that the process is occurring. During the October 2007 sampling event, cis-1,2-DCE (first generation daughter product) was detected at low concentrations. However, VC (second generation daughter product) and ethene were not detected in the Columbia aquifer. Therefore, chlorinated VOC degradation is occurring; however degradation appears to be limited possibly due to the groundwater geochemistry, microbial population, or available electron donor or carbon source, as discussed below.

Spatial Distribution of Geochemical Parameters. **Table A-2** summarizes the geochemical data for groundwater during the October 2007 sampling event. **Figure 6-2** shows the distribution of selected geochemical parameters in the groundwater.

Reaction footprints for the redox processes aerobic oxidation, denitrification, sulfate reduction, and methanogenesis were evaluated. DO concentrations and ORP values suggest groundwater is predominantly slightly aerobic to aerobic, with some isolated pockets of more reduced conditions. More oxidizing conditions are the result of the ISCO treatability study. Nitrate was detected at low concentrations in several of the groundwater samples,

although nitrite was not. Nitrite, the reductive product of nitrate, is not frequently detected in groundwater because it is highly reactive. Sulfate was present at high concentrations which may be competitive with chlorinated VOCs as an electron acceptor; however, reductive dechlorination can still proceed under these conditions. Depressed sulfate concentrations in the southern portion of the site may suggest sulfate reduction has occurred. Sulfide was not detected in groundwater from any monitoring wells; however, sulfide frequently is not detected in groundwater because it quickly reacts with dissolved inorganics to form insoluble minerals. Methane was detected at low levels in the central/southern portion of the site, which is evidence of methanogenesis.

Alkalinity was highest in groundwater from the two downgradient wells sampled LS11-MW06D and –MW15D, indicating that the most biological activity is occurring in these areas. Chloride concentrations were elevated in several downgradient wells (particularly, LS11-MW-15D and -22D), which may be evidence of reductive dechlorination.

Reductive dechlorination requires a supply of biologically oxidizable organic matter to maintain reducing conditions in the aquifer and to serve as an electron donor. TOC was only detected at LS11-MW06D, which was at a concentration below the recommended level of 20 mg/L for reductive dechlorination (USEPA, 1998). VFAs, possible carbon sources, were also not detected in groundwater.

Natural Oxidant Demand. NOD testing was conducted using potassium permanganate to determine the amount of oxidant that could be consumed by the soil itself if an additional ISCO treatment were completed at the site. Samples were collected from three different locations (LS11A-SO628, LS11A-SO629, and LS11A-SO630) at three different depth intervals (6-12 ft bgs, 20-28 ft bgs, and 34-38 ft bgs). Locations are shown on **Figure 3-1**. The top two depth intervals were sands from the Columbia aquifer and the lower depth interval was collected from the top portion of the Yorktown confining unit.

Based on the results, the oxidant demand of the Columbia aquifer ranges from approximately 225 mg/kg to 1,560 mg/kg. This is a low to moderate demand. The oxidant demand of the Yorktown confining unit ranges from approximately 1180 mg/kg to >9375 mg/kg. Most of the results in this interval indicate high demand which makes the feasibility of treatment with chemical oxidation at this site questionable, especially if contaminants are present in the confining clay. Additional data evaluation will be necessary as part of the FS to determine if a cost-effective ISCO design could be generated for this site.

Microbial Parameters. Results of the DHC/BAV1 microbial testing indicate the absence of DHC. However, testing to determine the presence of these organisms is usually done through collection of groundwater into biofilters. Soil analysis is considered a less reliable analysis method. Therefore, the negative results do not necessarily conclude that DHCs are not present and active.

PCP

PCP has been observed to degrade both aerobically and anaerobically. The anaerobic degradation of PCP occurs via reductive dechlorination where each chlorine molecule acts as an electron receptor and is replaced by hydrogen, producing first tetrachlorophenol (TeCP), then trichlorophenol (TCP), dichlorophenol (DCP), chlorophenol (CP). The isomers of CP may dechlorinate to phenol or mineralize to carbon dioxide and water. Possible intermediate breakdown products include three isomers of TeCP, five isomers of TCP, six

isomers of DCP, and three isomers of CP. The pathway that is followed at a specific site appears to depend on the type of microorganism present in the system (Mahaffey, 1997). In order for anaerobic degradation of PCP to occur, highly anaerobic conditions must exist in the aquifer; dissolved oxygen levels below 0.5 mg/L are typically necessary in the groundwater.

In the aerobic degradation of PCP, the phenol ring is broken during an early stage of the process and complete mineralization to carbon dioxide, water and chloride occurs much more quickly than through the anaerobic pathway. Initial intermediate products that form prior to breaking the phenol ring may include tetrachloroatechol, tetrachlorohydroquinone (TeCHQ), tetrachlorobenzoquinone (TeCBQ), trichlorohydroxylbenzoquinone (TCBHQ), TCHQ, DCHQ, and CHQ (Mahaffey, 1997). For aerobic oxidation to occur, a dissolved oxygen concentration in the groundwater of at least 2 mg/L is typically required.

Groundwater in the vicinity of LS11-MW20D, where PCP was detected above its MCL, is slightly aerobic with DO concentrations above 2.5 mg/L. There is currently not enough data to determine if PCP concentration trends are decreasing at this well. The intermediate aerobic daughter products are extremely short lived in the environment (Mahaffey, 1997); therefore, it is unlikely these compounds are present at the site. Chloride concentrations do not appear to be significantly elevated in this groundwater area.

6.2 Contaminant Transport

Although the exact flow pathways of contaminants transported in the subsurface can not be determined definitively, the following sections present a generalized description of theoretical contaminant flow pathways at Site 11a that may have resulted in the distribution of contaminants.

Contaminants are transported in the subsurface through a variety of ways depending on the phase of the contaminant. There are four main phases that can exist in the subsurface: aqueous, sorbed, NAPL, and gas (vadose zone only).

6.2.1 Aqueous Phase

Contaminants existing in the aqueous phase will have dissolved into the groundwater and are moved through advection and dispersion. Advection is the transport of dissolved contaminants by the bulk motion of flowing groundwater. It is the primary transport mechanism for dissolved contamination along the hydraulic gradient. Advective contaminant transport is a function of the groundwater flow as it has been modified by the retardation factor of the specific contaminant. Dispersion is the spreading of dissolved contaminants from the path they would be expected to follow during advection. It results from the spatial variation in aquifer permeability, fluid mixing, and molecular diffusion. Dispersion primarily controls the concentration of the contaminant at any point in the flow system.

6.2.2 Sorbed Phase

For contaminants to be present in the sorbed phase they must first have the affinity to bind to a solid surface. This ability differs between contaminants as discussed above. Sorbed contaminants tend to be stationary, staying with the soil and not being transported. As

mentioned above, a contaminant's preference for sorption will influence its retardation and advective transport.

6.2.3 Non-Aqueous Phase Liquids

Because of their relatively low solubility, chlorinated VOCs can occur in aquifers as dense NAPL (DNAPL) or free product. They are referred to as dense because they are denser than water when present in free-phase and will therefore migrate downward through the aquifer. DNAPL will slowly partition (dissolve) into the surrounding groundwater at a rate dependent on the solubility of the constituent compounds, composition of the DNAPL, temperature, chemical characteristics of the groundwater, and other factors, thereby continuing to act as a source of contamination. Therefore, determination of the presence and approximate quantity of a DNAPL can be very important for evaluating process requirements and effectiveness of remedial alternatives.

DNAPL is often difficult to detect, especially if it occurs as dispersed droplets (residual DNAPL) as opposed to a continuous pool (mobile DNAPL). As a general rule-of-thumb, dissolved concentrations of chlorinated VOCs in groundwater in excess of approximately 1 percent of a compound's solubility suggest that DNAPL may be present. For TCE, with a water solubility of 1,100 mg/L, a concentration of 11,000 µg/L is typically used as an indicator for potential DNAPL. Historically, the maximum concentration of TCE detected at Site 11a was 1,500 µg/L at a discrete grab sample (LS11-GP402). Since this concentration is well below 11,000 µg/L, DNAPL is not likely present.

6.2.4 Gas Phase

A contaminant can only exist in the gas phase in the vadose zone, which is the unsaturated layer of soil between the surface and the saturated zone. Contaminants can enter the gas phase through volatilization of aqueous phase contaminants. They tend to remain trapped in the pore space between grains of soil but can migrate out of the soil to the atmosphere.

6.2.5 Unsaturated Zone Flow

The primary source of the groundwater contamination is attributed to a release from the former underground waste oil tank. Because the release most likely occurred at or near the water table, contaminants migrated directly to groundwater through gravitational force or leaching from infiltration. Transport in the unsaturated zone is not a primary migration pathway.

6.2.6 Saturated Zone Flow

Representative chemicals that reached the top of the saturated zone at the water table most likely followed a flow path determined by the phase and density of the contaminant stream. If in free phase, chlorinated VOCs are likely to vertically migrate downward, near the bottom of the aquifer due to their density; while free phase constituents with a density of 1 are likely to travel with groundwater, and those with densities less than 1 will stay near the top of the water table.

Dissolved chlorinated VOCs most likely travel via advection in the direction of groundwater flow. At Site 11a, Columbia aquifer groundwater primarily flows west in the northern portion of the site and southwest in the southern portion of the site (**Figure 4-7**).

Transport mechanisms for flow though porous media that also may have influenced chlorinated VOC migration include hydrodynamic dispersion and retardation. PCP has a higher affinity for sorption and is more strongly retarded.

Migration of the representative chemicals from the Columbia aquifer through the Yorktown confining unit and into the Yorktown aquifer is not likely to occur at Site 11a. Evidence of this includes the presence of a laterally extensive hydraulic aquitard (Yorktown confining unit), in which there is very low vertical permeability.

6.3 Summary of Current Migration Pathways

As depicted in the CSM (**Figure 6-1**), the current primary migration pathway of representative contaminants in the groundwater at Site 11a is dissolved plume migration downgradient with groundwater flow (advection). Secondary, less prominent, fate and transport mechanisms of representative constituents include the horizontal dispersion of groundwater contaminants and the volatilization of groundwater contaminants into the vadose zone and subsequently into the atmosphere. The potential migration pathway of vapor intrusion into indoor air (volatilization) will be further evaluated in a subsequent study.

Table 6-1
Constituents of Interest by Media
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Constituents of Interest (COIs)	Shallow Groundwater
Volatile Organic Compounds	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	X
1,1-Dichloroethane	X
1,1-Dichloroethene	X
Bromodichloromethane	X
Chlorobenzene	X
Choroform	X
Methyl-tert-butyl ether (MTBE)	X
Tetrachloroethene	X
Trichloroethene	X
Trichlorofluoromethane(Freon-11)	X
Cis-1,2-Dichloroethene	X
Trans-1,2-Dichloroethene	X
Semivolatile Organic Compounds	
2,4-Dinitrotoluene	X
Pentachlorophenol	X
Pyrene	X
Pesticides/Polychlorinated Biphenyls	
4,4'-DDD	X
Alpha-BHC	X
Alpha chlordane	X
Dieldrin	X
Endrin	X
Gamma-BHC	X
Gamma-chlordane	X
Heptachlor Epoxide	X
Inorganics	
Aluminum	X
Beryllium	X
Chromium	X
Cobalt	X
Copper	X
Iron	X
Lead	X
Manganese	X
Mercury	X
Thallium	X
Zinc	X

Table 6-2
Physical, Chemical, and Half-life Data of Representative Constituents
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

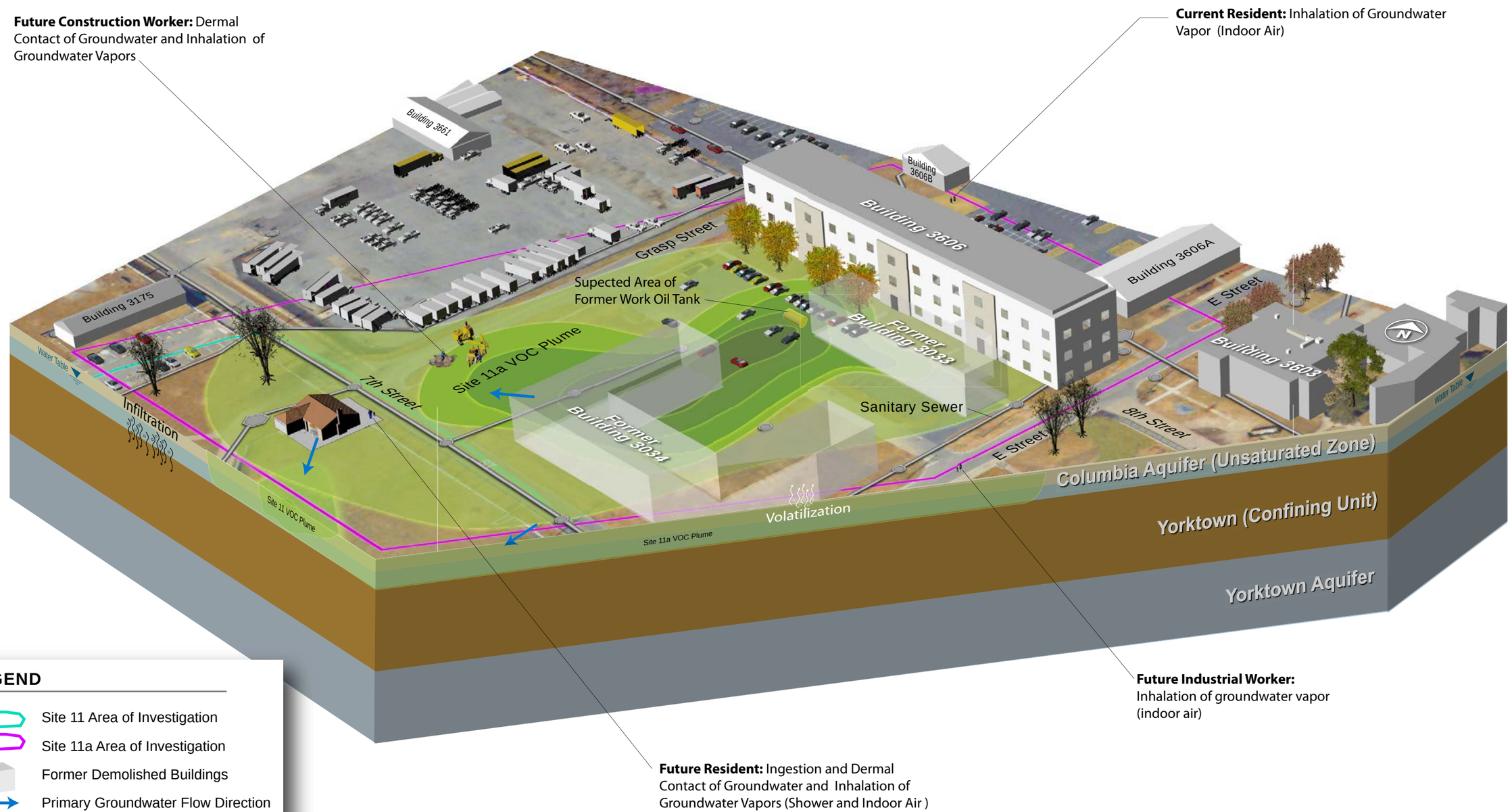
Chemical	Molecular Weight (g/mole)	Density (g/cm^3)	Water Solubility (mg/L)	Vapor Pressure (mm Hg)	K_h (atm-m3/mole)	kP_a	Log K_{oc} (---)	K_d (mL/g)	R (---)	Log K_{ow} (---)
Volatile Organic Compounds										
Tetrachloroethene	165.8	1.62	150	2.00E+01	1.53E-02	NA	2.43	1.35	11.8	2.53
Trichloroethene	131.4	1.46	1,100	7.40E+01	9.10E-03	NA	1.92	0.42	4.3	2.53
Semivolatile Organic Compounds										
Pentachlorophenol (pronated)	266.34 (1)	1.98	14 (1)	0.00011(1)	2.8E-6 (5)	4.74(1)	4.80 (5)	315	2525	4.72 (1)
Pentachlorophenol (ionized)	266.34 (1)	1.98	1,950 (6)	<<0.0001 (1)	not available	4.74(1)	2.95 (1)	4.46	36.65	3.56 (1)

K_h= Henry's Law Constant
K_{oc} = Organic carbon partition coefficient
K_{ow} = Octanol-water partition coefficient
NA = no information available

Data source:
Montgomery. 2000. *Groundwater Chemicals Desk Reference. Third Edition.*
(5) United States Environmental Protection Agency. October 1990.*Subsurface Contamination Reference Guide.*

Assumptions:

foc =	0.005
porosity =	0.2
bulk density =	1.6



LEGEND

- Site 11 Area of Investigation
- Site 11a Area of Investigation
- Former Demolished Buildings
- Primary Groundwater Flow Direction
- Water Table

VOC Groundwater Plumes

- 0 -100
- 100 - 200
- 200 - 400
- 400 - 600
- 600 +

FIGURE 6-1
Site 11a Conceptual Site Model
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

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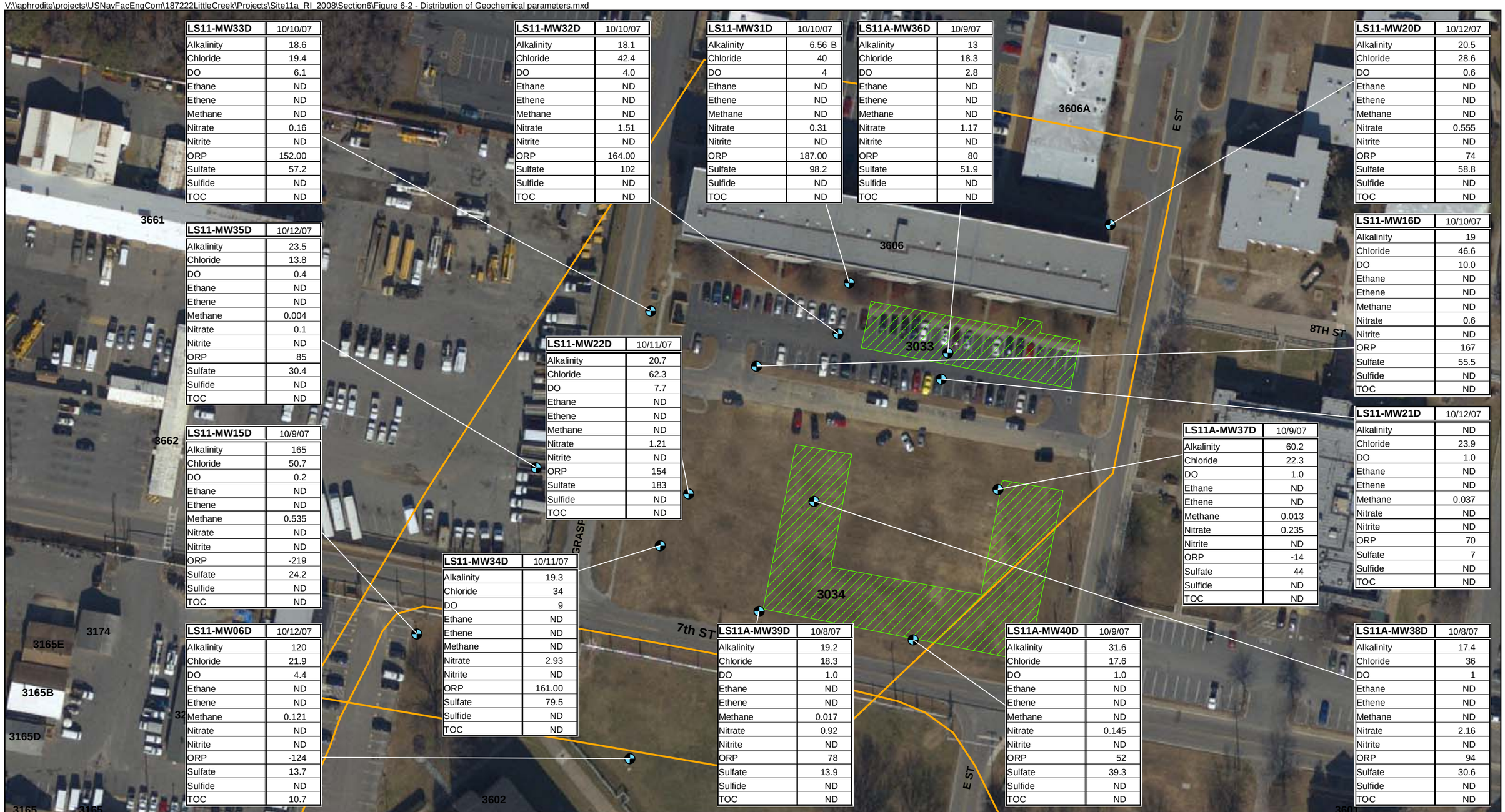
V:\\aphrodite\projects\USNavFacEngCom\187222LittleCreek\Projects\Site11a_RI_2008\Section6\Figure 6-2 - Distribution of Geochemical parameters.mxd



LS11-MW33D	10/10/07
Alkalinity	18.6
Chloride	19.4
DO	6.1
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	0.16
Nitrite	ND
ORP	152.00
Sulfate	57.2
Sulfide	ND
TOC	ND

LS11-MW32D	10/10/07
Alkalinity	18.1
Chloride	42.4
DO	4.0
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	1.51
Nitrite	ND
ORP	164.00
Sulfate	102
Sulfide	ND
TOC	ND

LS11-MW31D	10/10/07
Alkalinity	6.56 B
Chloride	40
DO	4
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	0.31
Nitrite	ND
ORP	187.00
Sulfate	98.2
Sulfide	ND
TOC	ND

LS11A-MW36D	10/9/07
Alkalinity	13
Chloride	18.3
DO	2.8
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	1.17
Nitrite	ND
ORP	80
Sulfate	51.9
Sulfide	ND
TOC	ND

LS11-MW20D	10/12/07
Alkalinity	20.5
Chloride	28.6
DO	0.6
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	0.555
Nitrite	ND
ORP	74
Sulfate	58.8
Sulfide	ND
TOC	ND

LS11-MW35D	10/12/07
Alkalinity	23.5
Chloride	13.8
DO	0.4
Ethane	ND
Ethene	ND
Methane	0.004
Nitrate	0.1
Nitrite	ND
ORP	85
Sulfate	30.4
Sulfide	ND
TOC	ND

LS11-MW16D	10/10/07
Alkalinity	19
Chloride	46.6
DO	10.0
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	0.6
Nitrite	ND
ORP	167
Sulfate	55.5
Sulfide	ND
TOC	ND

LS11-MW22D	10/11/07
Alkalinity	20.7
Chloride	62.3
DO	7.7
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	1.21
Nitrite	ND
ORP	154
Sulfate	183
Sulfide	ND
TOC	ND

LS11-MW21D	10/12/07
Alkalinity	ND
Chloride	23.9
DO	1.0
Ethane	ND
Ethene	ND
Methane	0.037
Nitrate	ND
Nitrite	ND
ORP	70
Sulfate	7
Sulfide	ND
TOC	ND

LS11-MW15D	10/9/07
Alkalinity	165
Chloride	50.7
DO	0.2
Ethane	ND
Ethene	ND
Methane	0.535
Nitrate	ND
Nitrite	ND
ORP	-219
Sulfate	24.2
Sulfide	ND
TOC	ND

LS11A-MW37D	10/9/07
Alkalinity	60.2
Chloride	22.3
DO	1.0
Ethane	ND
Ethene	ND
Methane	0.013
Nitrate	0.235
Nitrite	ND
ORP	-14
Sulfate	44
Sulfide	ND
TOC	ND

LS11-MW34D	10/11/07
Alkalinity	19.3
Chloride	34
DO	9
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	2.93
Nitrite	ND
ORP	161.00
Sulfate	79.5
Sulfide	ND
TOC	ND

LS11-MW06D	10/12/07
Alkalinity	120
Chloride	21.9
DO	4.4
Ethane	ND
Ethene	ND
Methane	0.121
Nitrate	ND
Nitrite	ND
ORP	-124
Sulfate	13.7
Sulfide	ND
TOC	10.7

LS11A-MW39D	10/8/07
Alkalinity	19.2
Chloride	18.3
DO	1.0
Ethane	ND
Ethene	ND
Methane	0.017
Nitrate	0.92
Nitrite	ND
ORP	78
Sulfate	13.9
Sulfide	ND
TOC	ND

LS11A-MW40D	10/9/07
Alkalinity	31.6
Chloride	17.6
DO	1.0
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	0.145
Nitrite	ND
ORP	52
Sulfate	39.3
Sulfide	ND
TOC	ND

LS11A-MW38D	10/8/07
Alkalinity	17.4
Chloride	36
DO	1
Ethane	ND
Ethene	ND
Methane	ND
Nitrate	2.16
Nitrite	ND
ORP	94
Sulfate	30.6
Sulfide	ND
TOC	ND

Legend
- Area of Investigation
- Demolished Building
- Monitoring Well Locations

Notes:
Concentrations reported in mg/L (ORP reported in mV)
TOC - Total organic carbon
ND - Analyte not detected
DO - Dissolved oxygen
ORP - oxidation reduction potential

N
W E
S

0 40 80
Feet

Figure 6-2
Distribution of Geochemical Parameters
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

CH2MHILL

SECTION 7

Human Health Risk Assessment

7.1 Introduction

This section presents the results of a baseline human health risk assessment (HHRA) for soil and groundwater at Site 11a. This baseline risk assessment was conducted to assess the potential human health impacts associated with soil and groundwater 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. The results of this risk assessment will be useful in determining if there is a potential current or future risk to human health that warrants remedial action at the site.

A detailed description and history of the facility are presented in Section 2. The data used for this risk assessment are discussed in Sections 5 and a discussion of the fate and transport of representative constituents is discussed in Section 6.

This risk assessment has been prepared using conservative assumptions. Exposure pathways based on current site conditions and current and potential future site use were evaluated. Guidance documents used for preparing the risk assessment include *Risk Assessment Guidance for Superfund (RAGS) Part A* (USEPA, 1989), *RAGS Part D* (USEPA, 2001), and *RAGS Part E* (USEPA, 2004a).

The HHRA for Site 11a soil and groundwater is comprised of the following components:

- **Identification of Constituents of Potential Concern (COPCs)**—identifies the COPCs found on-site. Constituents 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 (for example, residents and construction workers), 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 (for example, carcinogenic slope factors and reference dose values), and summarizes the relationship between magnitude of exposure and occurrence of adverse health effects.
- **Risk Characterization**—integrates the results of the exposure assessment and toxicity assessment to estimate the potential risks to human health. Both carcinogenic and noncarcinogenic human health effects are evaluated. Pathways that pose an unacceptable risk are identified.
- **Uncertainty Assessment**—identifies sources of uncertainty associated with the data, methodology, and the values used in the risk assessment.

These components are described briefly in the following sections. Spreadsheets were prepared in accordance with USEPA's *RAGS, Volume 1, Human Health Evaluation Manual, Part D* (USEPA, 2001) to screen for COPCs, and to calculate risk estimates associated with the COPCs. These spreadsheets are presented in **Appendix F** (Tables 1 through 10).

7.2 Identification of Constituents of Potential Concern

The identification of COPCs is performed through data evaluation and screening. The data used for the quantitative risk analysis were validated prior to use in the HHRA and met project-specific data quality objectives (DQOs).

7.2.1 Data Evaluation and Summary

Surface soil, subsurface soil, and groundwater data collected at Site 11a were evaluated in the HHRA.

Soil. All soil data collected to date (collected in May 2002, October 2003, and October 2007) were evaluated in the risk assessment. Surface soil samples were collected from depths of 0 to 6 inches bgs and subsurface soil samples were collected at various depth intervals ranging from 1 to 28 ft bgs. Although it is unlikely any permanent building would be placed within the saturated zone (potentially resulting in contact with the soil by construction workers, industrial workers, and/or residents), it is possible that underground utilities could be placed at this depth. Therefore, subsurface soil samples collected down to 12 ft bgs were evaluated in this risk assessment.

Groundwater. Groundwater data collected from permanent monitoring wells during the RI were evaluated in the risk assessment; groundwater data from grab samples were not used because turbidity present in those samples is not representative of drinking water concentrations that would result in a developed potable water supply well. Data collected prior to the RI were not evaluated due to the change in aquifer conditions following the ISCO treatability study conducted in 2005.

All of the data selected for inclusion in the risk assessment were evaluated to determine the reliability of the data for use in the quantitative risk assessment. A review of the data identified the following criteria for data usability:

- Estimated values flagged with a J, K, or L qualifier 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 the constituents were not detected, with the blank-related concentrations of each constituent used as the sample detection limit. One-half of the blank-related concentrations were used to calculate exposure point concentrations in the risk assessment.
- One-half of the sample detection limit (DL) was used in the risk assessment for cases where no detectable constituent quantities were found in that sample, but the constituent was detected in other samples from the same medium.

- For duplicate samples, the maximum concentration between the two samples was used as the sample concentration.

Table 7-1 summarizes the samples that were used to estimate potential exposures and risks from Site 11a soil and groundwater. Data used in the risk assessment are presented in **Appendix A**. Unfiltered groundwater samples were analyzed in the risk assessment to evaluate residential exposure to groundwater as there was no significant difference in concentrations in the unfiltered and filtered samples, following USEPA Region III *Draft Guidance on the Selection of Analytical Metal Results from Monitoring Well Samples for Use in the Quantitative Assessment of Risk* (USEPA, 1992). Unfiltered groundwater results were also used to determine inorganic constituent exposure concentrations for the construction worker since the construction worker would be directly exposed to groundwater in an excavation, which would not be filtered prior to exposure.

7.2.2 Selection of Constituents of Potential Concern

The selection of COPCs was based on the criteria presented in a USEPA Region III technical guidance manual (USEPA, 1993a) and USEPA's *RAGS Part D* (USEPA, 2001). The maximum detected concentration of each constituent was compared to the criteria discussed below to select the COPCs. If the maximum concentration exceeded the criteria, the constituent was selected as a COPC. Constituents that were not detected in any of the samples were not retained as COPCs. The COPC screening is presented in **Appendix F**, Tables 2.1 through 2.6.

- **Comparison with Health-based Criteria for Groundwater:** Groundwater data were compared to the USEPA Regional Screening Levels (RSLs) for tap water (USEPA, 2009). RSLs that are based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RSLs based on carcinogenic effects were used as presented in the RSL table. Groundwater data were also compared to the National Primary Drinking Water Regulations MCLs, however, this comparison was not used to select the groundwater COPCs. Appropriate constituents were chosen as surrogates for constituents not included in the USEPA RSL table (USEPA, 2009) and their RSLs were used as the screening value. These constituents and their surrogates are identified on Tables 2.3 and 2.4, in **Appendix F**. Lead concentrations in groundwater were compared to the National Primary Drinking Water Regulations action level of 15 µg/L (USEPA, 2004b).

- **Comparison with Health-Based Criteria for Soil:** Soil data were compared to the USEPA RSLs for residential soil (USEPA, 2009). RSLs that are based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RSLs based on carcinogenic effects were used as presented in the RSL table. Appropriate constituents were chosen as surrogates for constituents not included in the USEPA RSL table (USEPA, 2009) and their RSLs were used as the screening value. These constituents and their surrogates are identified on Tables 2.1 and 2.5, in **Appendix F**. Lead concentrations in soil were compared to the USEPA residential child soil screening value of 400 mg/kg (USEPA, 1994; OSWER Directive 9355.4-12).

- **Comparison with Health-Based Criteria for Air:** The maximum detected constituent concentrations in soil were used to model the maximum potential air concentrations. Fugitive and volatile emissions from soil were estimated using the particulate emission

factor (PEF) and volatile emission factor (VEF) approach presented in USEPA's *Soil Screening Guidance* (USEPA, 1996). The modeled air concentrations were then compared to USEPA RSLs for residential air. RSLs based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RSLs based on carcinogenic effects were used as presented in the RBC table.

- **Comparison to Background Concentrations:** A comparison to background concentrations was not used to select the COPCs. However, background concentrations are included in **Appendix F**, Table 2s. The background concentrations shown on the tables are the groundwater UTLs developed for NAB Little Creek as part of the Basewide *Final background Investigation Addendum for Summer Groundwater Sampling Event* (CH2M HILL, 2003a), and 95% UTLs for Urban Soils, *Background Investigation for NAB Little Creek* (CH2M HILL, 2000) .

- **Essential Human Nutrients:** Constituents that are considered essential nutrients, present at low concentrations (that is, only slightly elevated above naturally occurring levels), and toxic only at very high doses were eliminated from the quantitative risk analysis. These constituents include calcium, magnesium, potassium, and sodium. Although iron and manganese are also considered essential nutrients and are only toxic at very high doses, iron and manganese were included in the HHRA since toxicity values are available.

7.2.3 Summary of COPCs

Table 7-2 lists the constituents that were selected as COPCs. The screening process is shown in Tables 2.1 through 2.6 in **Appendix F**.

7.3 Exposure Assessment

Exposure assessment is the estimation of the likelihood, magnitude, frequency, duration, and routes of exposure to a constituent. Exposure refers to the potential contact of an individual (or receptor) with a constituent. Exposure can occur when contaminants migrate from a source to an exposure point, or when a receptor comes into direct contact with contaminated media.

The three components of exposure assessment include:

- Characterization of exposure setting
- Identification of exposure pathways
- Quantification of exposure

A conceptual exposure model showing potential exposure scenarios identified for potential current and future site-use conditions is presented in **Figure 7-1**. **Table 7-3** summarizes the potentially exposed populations evaluated in this risk assessment. The following sections discuss the components of exposure assessment.

7.3.1 Characterization of Exposure Setting

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

Basic site characteristics such as physical setting, climate, and groundwater hydrology are summarized in Section 2 and Section 4 of this report.

The building on Site 11a, Building 3606, is used as single residence lodging for active duty personnel. There is an open field to the south of Building 3606 that is currently used as a recreational area for barracks personnel.

Groundwater is not currently used as a potable water supply at Site 11a. The shallow groundwater (Columbia aquifer) is not used as a water supply at the Base and is not a likely future potable water source for NAB Little Creek. Since the water table at Site 11a is within 10 ft of the ground surface, a construction worker could be exposed to shallow groundwater beneath the site during construction or excavation activities. Groundwater samples collected from the top 10 ft of the shallow aquifer were used to evaluate potential construction worker exposure to groundwater during construction/excavation activities. Although unlikely, it was assumed that wells could be placed within or downgradient of Site 11a. Therefore, potential future exposure to Columbia aquifer groundwater at Site 11a by residents was evaluated as hypothetical worst case exposure scenarios.

The deep confined aquifer (Yorktown aquifer) is not currently used at the Base, except for four irrigation wells at the Little Creek golf course which are used infrequently to fill storage ponds on the golf course. The Yorktown aquifer flows northward under NAB Little Creek and discharges directly from the Base to the Chesapeake Bay. Exposure to groundwater from the Yorktown aquifer is not quantitatively assessed in the risk assessment because this aquifer is adequately isolated by a clay confining unit.

7.3.2 Identification of Exposure Pathways

An exposure pathway can be described as the physical course that a COPC takes from the point of release (or source) to a receptor. To be complete, an exposure pathway must have all of the following components:

- A source (for example, constituent residues in soil)
- A mechanism for constituent release and migration (for example, leaching)
- An environmental transport medium (for example, groundwater)
- A point or site of potential human contact (exposure point, for example, drinking water)
- A route of intake (for example, ingestion of groundwater used as a drinking water source)

In the absence of any one of these components, an exposure pathway is considered incomplete and, by definition, there is no risk or hazard. In some cases, a receptor may contact a source directly, eliminating the release and transport pathways.

The following subsections discuss the elements of the exposure pathways for Site 11a.

Contaminant Sources

Contaminant sources at Site 11a are associated with past uses of former Building 3033, which was located within the current barracks parking lot. The suspected primary source of contamination is the former underground waste oil tank associated with the former vehicle repair shop. Soil is not considered to be a continuing source of contamination at the site based on analytical data.

Release and Transport Mechanisms

The fate and transport of constituents in soil and groundwater 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 for the site is included in Section 6.

The transport mechanisms at Site 11a include release of particulates or vapors into air from soil. Fate and transport modeling was conducted to determine constituent concentrations in fugitive dust and volatile emissions from soil (**Appendix F**, Tables 2.2 and 2.2A and Tables 2.6 and 2.6A). Transport modeling for volatilization from soil was performed for volatile constituents detected in the soil (**Appendix F**, Table 2.6.A). Fate and transport modeling for chemical volatilization from groundwater during showering or during excavation activities was conducted as part of the HHRA to determine contaminant concentrations in air because there were volatile constituents selected as COPCs for the groundwater evaluation.

Although the potential exists for volatilization from constituents in groundwater and vapor intrusion into indoor air, this pathway was not evaluated as part of the HHRA, but will be evaluated in the future Feasibility Study that will be performed for the site.

Exposure Points and Exposure Routes

Exposure points are locations where receptors could contact site-related contamination. Potential on-site exposure points for Site 11a include surface soil, combined surface and subsurface soil, Columbia aquifer groundwater, and indoor air. Off-site exposure points (those located outside of the facility boundary) were not evaluated in the risk assessment because data show that the plume has not migrated offsite and that it is extremely unlikely that it will in the future.

Potential exposure pathways are illustrated in **Figure 7-1**. **Table 7-3** lists the exposure pathways that were evaluated in the risk assessment. Table F-1, **Appendix F**, includes the exposure pathways that were considered, and presents the rational for evaluation of the exposure pathways. Note, although inhalation of fugitive dust and volatile emissions from surface soil is identified as being qualitatively evaluated in **Appendix F**, Table H-1 and Table 7-3, this pathway was not evaluated for the surface soil because there were no COPCs identified.

Current residents of the onsite barracks may be exposed to surface soil through incidental ingestion and dermal contact. Additionally, current residents of the barracks may be exposed to vapors migrating from the groundwater, through the barrack foundation, into the living space of the barracks. In order to evaluate this pathway, groundwater samples were collected during the RI for use in the Johnson and Ettinger Model. However, following collection of the data, uncertainties with use of the model prevented this pathway from being quantitatively evaluated in this risk assessment. Additional site data will be collected to evaluate this pathway, the HHRA revised, and the results incorporated into the FS.

The HHRA considers the possibility that the site may be developed for residential use (not only use as military barracks), which would result in adult and child residents as potential receptors to soil (combined surface and subsurface), or the site may be developed for industrial use, which would result in adult industrial workers as potential receptors to soil. During any future construction activities, construction workers could also be exposed to the

soil. The potential exposure pathways to soil include incidental ingestion, dermal contact, and inhalation of VOCs and fugitive dust emissions from soil.

As discussed above, groundwater is not currently used as a potable water supply at Site 11a and the shallow groundwater (Columbia aquifer) is not used as a water supply anywhere on the Base, nor is it a likely future potable water source for NAB Little Creek. However, for the risk assessment it was assumed that wells could be placed within or downgradient of Site 11a. Therefore, potential future exposure to Columbia aquifer groundwater used as a potable water supply by residents was evaluated in the risk assessment as hypothetical worst case scenarios. It is assumed that adult residents would be exposed to groundwater through ingestion, dermal contact and inhalation while showering, and child residents could be exposed through ingestion, and dermal contact while bathing. Additionally, since the water table at Site 11a is within 10 ft of the ground surface, a construction worker could be exposed to shallow groundwater beneath the site during construction or excavation activities. The construction worker would be exposed to the upper aquifer groundwater through dermal contact and inhalation of volatiles.

In summary, the current land use exposure routes are:

- Resident (adult) of military barracks: incidental ingestion, dermal absorption, and inhalation of VOCs and fugitive dust emissions from surface soil and inhalation of indoor air (vapor intrusion from groundwater into current site building).

The future land use exposure routes are:

- Industrial Worker: incidental ingestion, dermal absorption, and inhalation of VOCs and fugitive emissions from surface and subsurface soils.
- Trespassers/Visitors (adult and adolescent): incidental ingestion, dermal absorption, and inhalation of VOCs and fugitive emissions from surface and subsurface soils.
- Resident (adult): incidental ingestion, dermal absorption, and inhalation of VOCs and fugitive emissions from surface and subsurface soils; ingestion of groundwater, dermal contact with, and inhalation of volatiles from groundwater while showering, and inhalation of indoor air (vapor intrusion from groundwater into future residence).
- Resident (child): incidental ingestion, dermal absorption, and inhalation of VOCs and fugitive emissions from surface and subsurface soils; ingestion of groundwater, dermal contact with groundwater while bathing, and inhalation of indoor air (vapor intrusion from groundwater into future residence).
- Construction Worker: incidental ingestion, dermal absorption, and inhalation of VOCs and fugitive emissions from surface and subsurface soils; dermal contact with groundwater, and inhalation of VOCs from groundwater in an open excavation.

7.3.3 Quantification of Exposure

Exposure is quantified by estimating the exposure point concentrations (EPCs) of COPCs in environmental media and COPC intake by the receptor. Both reasonable maximum exposure (RME) and central tendency exposure (CTE) intakes were evaluated; however,

CTE intakes were only calculated for exposure scenarios with RME cumulative carcinogenic risks greater than $1x10^{-4}$ or cumulative non carcinogenic hazards greater than 1.

Exposure Concentrations

EPCs are estimated constituent concentrations that a receptor may contact and are specific to each exposure medium. EPCs may be directly measured or estimated using environmental fate and transport models. Constituent concentrations in soil and groundwater were measured for this assessment. Fate and transport modeling conducted for the Site 11a risk assessment included estimating volatile emissions from groundwater while showering using the Foster and Chrostowski (1987) shower model for residential receptors (Table 7.1.RME Supplement B in **Appendix F**), and estimating volatile emissions from groundwater in an open excavation for a construction scenario following the methods presented in the VDEQ *Voluntary Remediation Program Risk Assessment Guidance (VDEQ, 2006)*. (Table 7.4.RME Supplement B in **Appendix F**). Volatile and fugitive emissions from soil were also estimated in the risk assessment, following the same method discussed in the COPC selection (Section 7.2.2).

The RME EPC for each COPC was calculated as a 95 percent upper confidence limit (UCL) of the arithmetic mean of the data set, using ProUCL Version 4.0 (Singh, et al., 2007). The distribution of each data set was first determined (normal, lognormal, and/or gamma; or non-parametric if data fit none of these distributions) by ProUCL using the Shapiro-Wilks test to test for a normal or lognormal distribution, and the Anderson-Darling and Kolmogorov-Smirnov Tests to test for a gamma distribution. Based on the distribution and the skewness of the data, ProUCL recommended a 95 percent UCL that was used as the RME EPC for the data set. In cases where the recommended 95 percent UCL exceeded the maximum detected concentration, the maximum concentration was used as the EPC. For data sets with more than one detected concentration, the non-detected values (detection limits) were entered into ProUCL and ProUCL calculated the EPCs using those data. For data sets with only one detected concentration, one-half the detection limits were entered into ProUCL and the program used the one-half the detection limit methods to calculate the data set statistics and EPCs.

The arithmetic mean of the dataset, based on the distribution of the data fit and the distribution used to calculate the EPC, as determined by ProUCL, was used as the CTE EPC.

Appendix F, Tables 3.1.RME through 3.5.CTE present the EPCs for the COPCs, and the rationale for the selected EPC. The input files and output files for ProUCL are included at the end of **Appendix F**.

Estimation of Chemical Intakes

Chemical intake is the amount of the chemical constituent entering the receptor's body. The quantification of exposure is based on an estimate of the average daily intake, the average amount of the chemical contaminant entering the receptor's body per day. Chemical intakes are generally expressed as follows:

$$ADI = \frac{C \times CR \times EF \times ED}{BW \times AT}$$

Where:

ADI = average daily intake (milligram per kilogram [mg/kg]-day)
C = chemical concentration (mg/L, mg/kg)
CR = contact rate (L/day, mg/day)
EF = exposure frequency (days/year)
ED = exposure duration (years)
BW = body weight (kg)
AT = averaging time (days)

The intake equation requires exposure parameters that are specific to 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 and duration, are provided in USEPA guidance. Both RME and CTE exposure parameters were compiled. Tables 4.1.RME through 4.5.RME and 4.1.CTE through 4.5.CTE in **Appendix F** identify the exposure parameters and intake equations used for different receptor scenarios at the site.

To estimate exposure via dermal contact with soil, two additional parameters are necessary. The first parameter, the dermal absorption fraction, estimates the amount of a constituent in soil that would be absorbed by the skin. Dermal absorption factors were obtained from USEPA's RAGS, Part E (USEPA, July 2004). The second additional parameter necessary to estimate dermal expose to constituents in soil is the adherence factor (AF). The AF estimates the amount of soil that adheres to the skin per unit of surface area. The AFs were also obtained from USEPA RAGS Part E (USEPA, July 2004) and are included in the Tables 4.1.RME, 4.4.RME, 4.1.CTE and 4.4.CTE in **Appendix F**.

For the dermal contact with water scenario, skin permeability rates were obtained from *RAGS E* (USEPA, 2004a). Permeability constants used in the risk assessment are presented in the supplemental tables to Tables 7s in **Appendix F**.

7.4 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: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to the constituent 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 constituent 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.

EPA recommends that a tiered approach be used to obtain the toxicity values, the reference doses (RfDs) and carcinogenic slope factors (CSFs), that are used to calculate non-

carcinogenic and carcinogenic risks, respectively (USEPA, 2003). The sources of toxicity values were:

- IRIS
- Provisional Peer-Reviewed Toxicity Values (PPRTV)
- Other EPA and non-EPA sources including the National Center for Environmental Assessment (NCEA), Agency for Toxic Substances and Disease Registry (ATSDR), Health Effects Assessment Summary Tables (HEAST), California EPA (Cal EPA), and EPA's Office of Water, and the World Health Organization (WHO)

The use of provisional toxicity values, such as those from the PPRTV database, in an HHRA increases the uncertainty of the quantitative risk estimate. If no toxicity values were available for a detected constituent, surrogate constituents were selected and their RSLs were used for the COPC selection process.

Health effects are divided into two broad groups: noncarcinogenic and carcinogenic effects. This division is based on the different mechanisms of action currently associated with each category. This section discusses noncarcinogenic and carcinogenic effects separately, and how these effects were assessed in this HHRA.

7.4.1 Toxicity Information for Noncarcinogenic Effects

Noncarcinogenic health effects include a variety of toxic effects on body systems, ranging from renal (that is, kidney) toxicity to central nervous system disorders. The toxicity of a constituent is assessed through a review of toxic effects noted in short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

USEPA (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 (for example, 7 years to a lifetime), and consider uncertainty in the toxicological database and sensitive receptors. Chronic and subchronic RfDs are developed for both inhalation and oral exposures. Subchronic RfDs were used for the construction worker scenario because the exposure duration is less than seven years. Chronic RfDs were used for all other scenario.

In the development of RfDs, all available studies examining the toxicity of a constituent following exposure are considered based on their scientific merit. Several uncertainty factors (UFs) that may be applied account for uncertainty. UFs account for uncertainties such as poor data quality, extrapolation of data from animal studies to human exposures, or the use of subchronic studies to develop chronic criteria. These UFs range between 10 to 10,000 and are based on the professional judgment.

USEPA-derived oral and inhalation chronic RfDs and associated UFs for the COPCs at Site 11a are listed in Tables 5.1 and 5.2 in **Appendix F**.

Per USEPA guidance, oral toxicity values (RfDs) were adjusted from administered doses (oral) to absorbed doses (dermal) for evaluating dermal toxicity when deemed appropriate. The RfDs were adjusted using oral absorption factors from USEPA (USEPA, 2004a). The adjusted dermal RfDs are summarized in Table 5.1 in **Appendix F**.

7.4.2 Toxicity Information for Carcinogenic Effects

Potential carcinogenic effects are quantified using oral and inhalation CSFs, or unit risk factors that convert estimated exposures directly to incremental lifetime carcinogenic risks. 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. 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 and inhalation CSFs are listed in Tables 6.1 and 6.2 in **Appendix F**.

In accordance with USEPA guidance, oral CSFs were adjusted from administered doses to absorbed doses to evaluate dermal toxicity. When appropriate, the CSFs were adjusted using oral absorption factors from USEPA (USEPA, 2004a). The adjusted dermal CSFs are summarized in Table 6.1 in **Appendix F**.

7.5 Risk Characterization

Risk characterization combines the results of the previous elements of the risk assessment to evaluate the potential health risks associated with exposure to the COPCs. The risk characterization is then used as an integral component in remedial decision-making and selection of potential remedies or actions, as necessary.

7.5.1 Noncarcinogenic and Carcinogenic Risk Estimation Methods

Potential human health risks are discussed independently for carcinogenic and noncarcinogenic constituents because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. Some constituents may produce both noncarcinogenic and carcinogenic effects, and were evaluated in both groups. The methodology used to estimate noncarcinogenic hazards and carcinogenic risks are described below. Following the description of the methodology, the noncarcinogenic hazards and carcinogenic risks for Site 11a are discussed.

Noncarcinogenic Hazard Estimation

Noncarcinogenic health risks are estimated by comparing the calculated intake to an RfD. The calculated intake divided by the RfD is equal to the hazard quotient (HQ):

$$HQ = Intake / RfD$$

The intake and RfD represent the same exposure period (that is, chronic or subchronic) and the same exposure route (that is, oral intakes are divided by oral RfDs). A HQ that exceeds 1.0 (that is, the intake exceeds the RfD) indicates that there is a potential for adverse health effects associated with exposure to that constituent.

To assess the potential for noncarcinogenic health effects posed by exposure to multiple constituents, a hazard index (HI) approach is used (USEPA, 1986). This approach assumes that noncarcinogenic hazards associated with exposure to more than one constituent are additive. Synergistic or antagonistic interactions between constituents are not considered. The HI may exceed 1.0 even if all of the individual HQs are less than one. HIs are also

added across exposure routes and media to estimate the total noncarcinogenic health effects to a receptor posed by exposure through multiple routes and media. A HI greater than one indicates that there is some potential for adverse noncarcinogenic health effects associated with exposure to the contaminants of concern. However, if the HI is greater than one, separate HIs are calculated for each target organ/effect, to determine if the HI for a specific target organ/effect is greater than one. If the HI for each target organ/effect is not above one, it can be assumed that there is no unacceptable noncarcinogenic hazard to the receptor.

Carcinogenic Risk Estimation

The potential for carcinogenic effects due to exposure to site-related constituents is evaluated by estimating the excess lifetime carcinogenic risk (ELCR). ELCR 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, an individual exposed to a carcinogen with a calculated carcinogenic risk of $2x10^{-6}$ indicates that the probability of the individual getting cancer increases by 2 in a million above background levels.

Carcinogenic risk is calculated by multiplying the intake by the CSF.

$$ELCR = Intake \times CSF$$

The combined risk from exposure to multiple constituents was evaluated by adding the risks from individual constituents. Risks were also added across the exposure routes and media if an individual would be exposed through multiple routes and to multiple media.

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 carcinogenic risk), CERCLA generally requires remedial action to reduce risks at the site (USEPA, 1991). If the cumulative risk is less than 10^{-4}, action generally is not required, but may be warranted if a risk-based constituent-specific standard (for example, MCL) is exceeded.

7.5.2 Risk Assessment Results

The results of the risk characterization are presented below by receptor. The risks are calculated in **Appendix F**, Tables 7.1.RME through 7.8.RME, and 7.1.CTE through 7.4.CTE and summarized in **Appendix F**, Tables 9.1.RME through 9.8.RME and 9.1.CTE through 9.4.CTE. A summary of the RME results is shown in **Table 7-4** and a summary of the CTE results is shown in **Table 7-5**. CTE risks were calculated only when the RME hazard exceeded 1 and/or the RME carcinogenic risk exceeded $1x10^{-4}$.

Current Adult Resident

Table 9.1.RME, **Appendix F**, summarizes the hazards and risks to the current adult resident for exposure to surface soil (ingestion and dermal contact). As discussed previously, the exposure to surface soil through inhalation of fugitive and volatile emissions was not quantified since no COPCs were identified for this pathway. The RME noncarcinogenic hazard is below USEPA's target HI of 1 and the carcinogenic risk is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Future Adult Resident

Table 9.2.RME, **Appendix F**, summarizes the hazards and risks to the future adult resident for exposure to combined surface and subsurface soil (ingestion, dermal contact, and inhalation of particulate and volatile emissions) and shallow groundwater (ingestion, dermal contact, and inhalation while showering). The total RME non-carcinogenic hazard to future adult residents (HI = 4.1) is above USEPA's target HI of 1.0. The non-carcinogenic hazard from exposure to combined soil alone was below the USEPA's target HI of 1.0. The RME non-carcinogenic hazard from exposure to groundwater (HI =4.0) is above USEPA's target HI of 1.0. The RME non-carcinogenic hazard from exposure to groundwater is primarily associated with ingestion (HI = 2.9) and dermal contact (HI = 1.0), although no individual constituents contribute a HI above 1.0. However, the target-organ-specific HI for liver effects (3.0) and the HI for whole body effects (1.4) are above 1.0.

The CTE non-carcinogenic hazard from exposure to combined soil and groundwater was below USEPA's target HI of 1.0 (Table 9.1 CTE, Appendix F).

The carcinogenic risk associated with inhalation while showering for an adult resident is within USEPA's target risk range of $1x10^{-6}$ to $1x10^{-4}$.

Future Child Resident

Table 9.2.RME, **Appendix F**, summarizes the hazards and risks to the future child resident for exposure to combined surface and subsurface soil (ingestion, dermal contact, and inhalation of particulate and volatile emissions) and groundwater (ingestion and dermal contact). The total RME non-carcinogenic hazard from exposure to combined soil and groundwater (HI = 10) exceeds USEPA's target HI of 1.0. The RME hazard from exposure to combined soil alone (HI = 1.1) exceeds USEPA's target HI; however, there are no individual constituents with HIs above 1.0. The RME non-carcinogenic hazard from exposure to groundwater (HI =9.1) also is above USEPA's target HI of 1.0. The RME non-carcinogenic hazard from exposure to groundwater is primarily associated with ingestion (HI = 6.8) of PCE, TCE, and manganese and dermal contact (HI = 2.3) with PCE.

The CTE non-carcinogenic hazard from exposure to soil and groundwater (HI = 2.5) exceeds USEPA's target HI. The CTE non-carcinogenic hazard associated with soil alone was below USEPA's target HI. The CTE hazard from exposure to groundwater alone (HI = 2.3) exceeds USEPA's target HI of 1.0, although there are no individual constituents with HIs above 1.0. However, the target-organ-specific HI for liver effects (1.3) is above 1.0.

Future Lifetime Resident

Table 9.4.RME, **Appendix F**, summarizes the carcinogenic risks to a future lifetime resident for exposure to combined surface and subsurface soil (ingestion, dermal contact, and inhalation of particulate and volatile emissions) and groundwater (ingestion, dermal contact, and inhalation while showering). The RME carcinogenic risk from exposure to combined soil and groundwater (CR=$4.5x10^{-3}$) exceeds USEPA's target risk range of 10^{-6} to 10^{-4}. The RME carcinogenic risk associated with exposure to soil is within USEPA's acceptable cancer risk range. The RME carcinogenic risk from exposure to groundwater ($4.5x10^{-3}$) exceeds USEPA's acceptable carcinogenic risk range. The RME carcinogenic risk from exposure to groundwater is primarily associated with ingestion ($2.8x10^{-3}$) of PCEand dermal contact ($1.7x10^{-3}$) with PCP.

The CTE carcinogenic risk from exposure to groundwater ($2.2x10^{-4}$) exceeds USEPA's acceptable risk range of 10^{-6} to 10^{-4}. The CTE carcinogenic risk from exposure to groundwater is primarily associated with ingestion ($1.4x10^{-4}$) of PCE.

Future Construction Worker

Table 9.5.RME, **Appendix F**, summarizes the hazards and risks to the future construction worker for exposure to combined surface and subsurface soil (ingestion, dermal contact, and inhalation of particulate and volatile emissions) and shallow groundwater (dermal contact and inhalation). The total RME non-carcinogenic hazard (HI = 8.5) is above USEPA's target HI of 1.0. The non-carcinogenic hazard from exposure to combined soil alone was below the USEPA's target HI of 1.0. The RME non-carcinogenic hazard from exposure to groundwater (HI = 8.1) exceeds USEPA's target HI of 1.0. The RME non-carcinogenic hazard from exposure to groundwater is primarily associated with inhalation (HI = 7.0) of PCE and TCE.

The RME carcinogenic risk from exposure to combined soil and groundwater ($2.0x10^{-4}$) exceeds USEPA's acceptable carcinogenic risk range of 10^{-6} to 10^{-4}. The RME carcinogenic risk from exposure to soil alone ($4.0x10^{-7}$) is below USEPA's acceptable risk range. The RME carcinogenic risk from exposure to groundwater ($2.0x10^{-4}$) is primarily associated with inhalation ($1.5x10^{-4}$) of PCE.

The CTE non-carcinogenic hazard from exposure to groundwater (HI = 3.7) exceeds USEPA's target HI of 1.0. The CTE non-carcinogenic hazard from exposure to groundwater is primarily associated with inhalation (HI = 3.5) of PCE. The CTE carcinogenic risk from exposure to groundwater ($2.0x10^{-5}$) is within USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}.

Future Industrial Worker

Table 9.6.RME, **Appendix F**, summarizes the hazards and risks to the future industrial worker from exposure to combined surface and subsurface soil (incidental ingestion, dermal contact, and inhalation of particulate and volatile emissions). The RME non-carcinogenic hazard from exposure to combined soil is below USEPA's target HI of 1.0. The RME carcinogenic risk is within USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}.

Future Adult Trespasser/Visitor

Table 9.7.RME, **Appendix F**, summarizes the hazards and risks to the future adult trespasser/visitor for exposure to combined surface and subsurface soil (incidental ingestion, dermal contact, and inhalation of particulate and volatile emissions). The RME non-carcinogenic hazard from exposure to combined soil was below USEPA's target HI of 1.0. The RME carcinogenic risk based was below USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}.

Future Adolescent Trespasser/Visitor

Table 9.8.RME, **Appendix F**, summarizes the hazards and risks to the future adolescent trespasser/visitor for exposure to combined surface and subsurface soil (incidental ingestion, dermal contact, and inhalation of particulate and volatile emissions). The RME non-carcinogenic hazard from exposure to combined soil was below USEPA's target HI of 1.0. The RME carcinogenic risk was within USEPA's acceptable cancer risk range of 10^{-6} to 10^{-4}.

7.6 Uncertainty Associated with Human Health Assessment

The risk measures used in human health risk assessments are not fully probabilistic estimates of risk, but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective (USEPA, 1989).

7.6.1 General Uncertainty in COPC Selection

The sampling conducted at Site 11a generally focused on areas of known or suspected impact from past site use and based on previous sampling. Therefore, the uncertainty in sampling and possibility of missing a location impacted by site constituents is expected to be minimal. The uncertainty associated with the data analysis is minimal, as the data were fully validated prior to use in the risk assessment.

A comparison of site concentrations to background concentrations was not used to select the COPCs. This may result in including risks that may be associated with background conditions and are not necessarily site-related. Risk management considerations for these constituents are provided in Section 9.

7.6.2 Uncertainty Associated with Exposure Assessment

Uncertainty in the exposure assessment was generally treated with conservative decision rules and assumptions, and therefore, the uncertainty likely overestimates actual exposure to COPCs. For instance, it is not likely that the surficial aquifer groundwater would ever be used as a potable or industrial supply.

The exposure factors used for the quantitation of exposure were conservative and reflect worst-case or upper-bound assumptions on the exposure. The reliability of the values chosen for the exposure factors also contributes substantially to the uncertainty of the resulting risk estimates. Because most of the exposure factors are worst-case or upper-bound assumptions, the resulting risks are worst-case and likely overestimate the actual risk.

The future soil exposure scenario evaluates combined surface and subsurface soil, which assumes there would be complete mixing of the media during future construction activities. While some mixing is expected to occur, there is some uncertainty associated regarding the overall extent of mixing. The assumption that the media are mixed may result in an under-estimation of risk due to the higher concentrations of pesticides detected in surface soils. However, the surface soil risks would likely not require action and are likely not to be associated with a CERCLA related release. Additionally, during many construction projects, clean fill material such as topsoil may be placed over the soil that is disturbed during excavation projects. The topsoil material is generally needed to support growth of grass and other landscape plants. This would decrease the possibility of future exposure to both the current surface and subsurface soil after any construction activities.

Site-related contamination is expected to decrease with time due to naturally occurring attenuation processes (for example, degradation due to weathering, volatilization, advection, dispersion, leaching due to infiltrating precipitation, etc.), and because there does

not appear to be an ongoing source of VOC contamination to the groundwater. The risk assessment assumed concentrations would remain constant throughout the exposure period and that these concentrations occur everywhere throughout the site. This assumption likely results in an over-estimation of risk.

7.6.3 Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the noncarcinogenic toxicity factors is included in **Appendix F**, Tables 5.1 and 5.2. Several UFs were applied to extrapolate dose points from animal studies to humans. These UFs range between 1 and 3,000. Additional modification factors are also used based on the professional judgment of the USEPA. Therefore, there is a high degree of uncertainty in the noncarcinogenic toxicity criteria, based on the available scientific data for each constituent. The noncarcinogenic toxicity factors are most likely an overestimate of actual toxicity.

CSFs developed by USEPA represent upper-bound estimates. 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 (USEPA, 1989).

Additional uncertainty is in the prediction of relative sensitivities of different species of animals and the applicability of animal data to humans.

Use of provisional or withdrawn toxicity factors increases the uncertainty of the quantitative hazard and risk estimates. Provisional toxicity values for chloroform, PCE, and TCE were used in this assessment. These provisional values were used to provide a quantitative estimate rather than a merely qualitative risk discussion; however, these values should be interpreted cautiously since USEPA has not approved these toxicity values.

The toxicity values used for TCE in this assessment were obtained from the California EPA. These values are the values the Department of Defense (DoD) recommends be used in human health risk assessments performed for the DoD. However, these toxicity values are considered provisional as they are have not been endorsed by EPA and published in the IRIS database.

Although the oral RfD for manganese is not provisional (that is, the RfD has been approved by a USEPA workgroup), the derivation of toxicity factors for essential nutrients is complicated, and therefore, warrants further discussion. Manganese is an essential human nutrient responsible for activating several enzymes (USEPA, 2007). Disease states have been documented in humans associated with both deficiencies and excess intakes of manganese (USEPA, 2007). The IRIS profile for manganese states, "The reference dose is estimated to be an intake for the general population that is not associated with adverse health effects; this is not meant to imply that intakes above the reference dose are necessarily associated with toxicity. Some individuals may, in fact, consume a diet that contributes more than 10 mg Mn/day without any cause for concern," (USEPA, 2007). Ingestion of manganese in Site 11a groundwater may result in an HI of 1.0 to a future child resident, based on a daily intake rate of 0.02 mg/kg-day, which corresponds to an intake of 0.3 mg/day (**Appendix F**, Table 7.2.RME). This intake is much lower than the recommended dietary allowance (RDA) for manganese for a child 1 to 3 years of age of 1.2 mg/day (Institute of Medicine, 2005).

Therefore, ingestion of manganese in the Site 11a groundwater is not expected to be a health concern for the child resident.

There is a large degree of uncertainty associated with the oral to dermal adjustment factors (based on constituent-specific gastrointestinal absorption factors) used to transform the oral RfDs based on administered doses to dermal RfDs based on absorbed doses. It is not known if the adjustment factor results in an underestimate or overestimate of the actual toxicity associated with dermal exposure.

When using the CalEPA slope factor of TCE, EPA advocates truncating risks at 1E-05 rather than 1E-04 due to uncertainties associated with the CalEPA slope factor, including more recent studies indicating TCE is a more potent carcinogen than previously thought, and evidence that non-cancer threats may predominate when cancer risks are in the 10-5 range.

7.6.4 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 constituents contributes to uncertainty based on the interaction of constituents such as additivity, synergism, potentiation, and susceptibility of exposed receptors. The simple assumption of additivity used for this site may or may not be accurate and may over- or under-estimate risk; however, a better alternative is not available at this time.

7.7 Human Health Risk Summary

The risk assessment was conducted to evaluate the potential human health risks associated with current and hypothetical future receptors and exposure scenarios if no remedial action is implemented for soil and groundwater.

Table 7-4 and Tables 9.1.RME through 9.8.RME in **Appendix F** summarize the RME carcinogenic risks and hazard indices. Table 7-5 and Tables 9.1.CTE through 9.4.CTE in **Appendix F** summarize the CTE carcinogenic risks and hazard indices. Tables 10.1.RME through 10.4.RME and 10.1.CTE through 10.3.CTE show only the constituents that contributed HIs above 0.1 to total cumulative receptor HIs greater than 1.0 or carcinogenic risks greater than 10^{-6} to total cumulative receptor carcinogenic risks greater than 10^{-4}. The following subsections provide the summary of potential human health risks above USEPA target levels for future residents or construction workers. Risks and hazards to all other potential receptors were within USEPA acceptable risk levels.

7.7.1 Groundwater

There is no current exposure to groundwater, therefore, there are no non-carcinogenic hazards or carcinogenic risks that exceed USEPA target levels for current receptors. Future potable use of groundwater may pose non-carcinogenic hazards and carcinogenic risks above USEPA target levels (HI above 1 and total carcinogenic risk above 10^{-4}) for future residents and inhalation of vapors during construction activities by future construction workers may pose non-carcinogenic hazards and carcinogenic risks above USEPA target levels.

The RME non-carcinogenic hazard to the future adult resident is associated with ingestion and dermal contact; no individual constituents contribute a HI above 1.0, however, the

target-specific HI for liver effects (3.0), and the HI for whole-body effects (1.4) are above 1.0. The CTE non-carcinogenic hazards from exposure to groundwater are within USEPA target levels.

The RME non-carcinogenic hazards to the future child resident are associated with ingestion of PCE, TCE, and manganese and dermal contact with PCE in groundwater. The CTE non-carcinogenic hazard to the child resident also exceeds USEPA's target HI, although there are no individual constituents with HIs above 1.0. However, the target organ-specific HI for liver effects (1.3) is above 1.0.

The RME carcinogenic risk to the hypothetical future lifetime resident is primarily associated with ingestion of PCE and dermal contact with PCP in groundwater. Additionally, TCE contributes a carcinogenic risk above the 10^{-5} risk level used as the level of concern for TCE (see Section 7.6.3 on discussion of use of 10^{-5} as point of reference for TCE). The CTE carcinogenic risk to the future lifetime resident is primarily associated with ingestion of PCE.

Exposure to groundwater by a construction worker during excavation activities may pose non-carcinogenic hazards that exceed USEPA target levels. The RME non-carcinogenic hazards to the future construction worker are primarily associated with inhalation of PCE and TCE. The RME carcinogenic risk from exposure to groundwater exceeds USEPA's acceptable risk range and is primarily associated with inhalation of PCE. The CTE non-carcinogenic hazard from exposure to groundwater exceeds USEPA's target HI of 1.0. The CTE non-carcinogenic hazard from exposure to groundwater is primarily associated with inhalation of PCE.

The risk drivers for exposure to or potable use of groundwater at Site 11a are:

- PCE
- TCE
- PCP
- Manganese

Although the risk assessment indicated a hazard associated with manganese, as discussed in the uncertainty evaluation (Section 7.6.3), the concentrations detected in the groundwater result in intake of manganese below the RDA. Additionally, manganese was not detected in groundwater above background levels. Therefore, risk from exposure to manganese in groundwater is considered acceptable.

Due to the data limitations associated with the groundwater samples collected for assessing risk from potential vapor intrusion, a work plan has been prepared to further evaluate the vapor intrusion pathway at Site 11a. The results of this evaluation will be used to refine the HHRA.

7.7.2 Surface Soil

There are no non-carcinogenic hazards or carcinogenic risks that exceed USEPA target levels for the current adult resident exposed to surface soil.

7.7.3 Combined Surface and Subsurface Soil

There are no non-carcinogenic hazards or carcinogenic risks that exceed USEPA target levels for the future adult resident, future lifetime resident, future industrial worker, future construction worker, or future adult or adolescent trespasser/visitor exposed to combined surface and subsurface soil. Exposure to combined surface and subsurface soil may pose non-carcinogenic hazards above USEPA target levels for future child residents.

Although the RME non-carcinogenic hazard from exposure to combined soil to the future child resident exceeds USEPA's target HI of 1.0, there are no individual constituents or target organ/effects with His above 1.0, and therefore the non-carcinogenic hazard is considered acceptable. Additionally, there are no unacceptable CTE non-carcinogenic hazards from exposure to combined soil.

Table 7-1
Summary of Data Quantitatively Used in Risk Assessment
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Medium	Date of Sampling	Sample	Parameters
Surface Soil			
	05/28/02	LS11-SS306-00	VOCs, Metals
	05/28/02	LS11-SS307-00	VOCs, Metals
	05/28/02	LS11-SS308-00	VOCs, Metals
	05/29/02	LS11-SS309-00	VOCs, Metals
	05/29/02	LS11-SS310-00	VOCs, Metals
	05/29/02	LS11-SS311-00	VOCs, Metals
	05/29/02	LS11-SS312-00	VOCs, Metals
	05/29/02	LS11-SS313-00	VOCs, Metals
	05/29/02	LS11-SS313P-00	VOCs, Metals
	05/29/02	LS11-SS314-00	VOCs, Metals
	05/30/02	LS11-SS319-00	VOCs, Metals
	05/30/02	LS11-SS319P-00	VOCs, Metals
	10/01/07	LS11A-SS623-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/01/07	LS11A-SS625-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/01/07	LS11A-SS625P-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS627-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS628-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS629-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS630-07C	VOCs, SVOCs, Pest/PCBs, Metals
Soil*			
	05/28/02	LS11-SS306-00	VOCs, Metals
	05/28/02	LS11-SS307-00	VOCs, Metals
	05/28/02	LS11-SS308-00	VOCs, Metals
	05/29/02	LS11-SS309-00	VOCs, Metals
	05/29/02	LS11-SS310-00	VOCs, Metals
	05/29/02	LS11-SS311-00	VOCs, Metals
	05/29/02	LS11-SS312-00	VOCs, Metals
	05/29/02	LS11-SS313-00	VOCs, Metals
	05/29/02	LS11-SS313P-00	VOCs, Metals
	05/29/02	LS11-SS314-00	VOCs, Metals
	05/30/02	LS11-SS319-00	VOCs, Metals
	05/30/02	LS11-SS319P-00	VOCs, Metals
	10/01/07	LS11A-SS623-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/01/07	LS11A-SS625-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/01/07	LS11A-SS625P-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS627-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS628-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS629-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SS630-07C	VOCs, SVOCs, Pest/PCBs, Metals
	05/28/02	LS11-SB306-03	VOCs, Metals
	05/28/02	LS11-SB307-03	VOCs, Metals
	05/28/02	LS11-SB308-03	VOCs, Metals
	05/29/02	LS11-SB309-03	VOCs, Metals
	05/29/02	LS11-SB310-03	VOCs, Metals
	05/29/02	LS11-SB311-03	VOCs, Metals
	05/29/02	LS11-SB312-03	VOCs, Metals
	05/29/02	LS11-SB313-03	VOCs, Metals
	05/29/02	LS11-SB313P-03	VOCs, Metals
	05/29/02	LS11-SB314-03	VOCs, Metals
	05/30/02	LS11-SB319-03	VOCs, Metals
	10/15/03	LS11A-SB109-04-03D	VOCs
	10/15/03	LS11A-SB129-04-03D	VOCs
	10/15/03	LS11A-SB129P-04-03D	VOCs
	10/01/07	LS11A-SB623-0103-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/01/07	LS11A-SB625-0103-07C	VOCs, SVOCs, Pest/PCBs, Metals

*Soil = combined surface soil and subsurface soil

Table 7-1
Summary of Data Quantitatively Used in Risk Assessment
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Medium	Date of Sampling	Sample	Parameters
Soil*	10/02/07	LS11A-SB627-0103-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SB627-0612-07C	VOCs
	10/02/07	LS11A-SB628-0103-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SB628-0612-07C	VOCs
	10/02/07	LS11A-SB629-0103-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SB629-0612-07C	VOCs
	10/02/07	LS11A-SB630-0103-07C	VOCs, SVOCs, Pest/PCBs, Metals
	10/02/07	LS11A-SB630-0612-07C	VOCs
Groundwater			
	10/12/07	LS11-MW06D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/09/07	LS11-MW15D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/10/07	LS11-MW16D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/12/07	LS11-MW20D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/12/07	LS11-MW21D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/11/07	LS11-MW22D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/10/07	LS11-MW31D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/10/07	LS11-MW32D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/10/07	LS11-MW33D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/11/07	LS11-MW34D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/11/07	LS11-MW34DP-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/12/07	LS11-MW35D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/12/07	LS11-MW35DP-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/09/07	LS11A-MW36D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/09/07	LS11A-MW37D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/08/07	LS11A-MW38D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/08/07	LS11A-MW39D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals
	10/09/07	LS11A-MW40D-07C	VOCs, SVOCs, Pest/PCBs, Filtered and Total Metals

*Soil = combined surface soil and subsurface soil

Table 7-2
Summary of COPCs for the HHRA
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach Virginia

Surface Soil	***Surface Soil - Inhalation***
Dieldrin Aluminum Arsenic Cobalt Iron Manganese Thallium	None
Soil*	***Soil* - Inhalation***
Dieldrin Aluminum Arsenic Cobalt Iron Manganese Thallium	Tetrachloroethene
Groundwater - Tap Water and Excavation	***Groundwater - Shower and Excavation Air***
Bromodichloromethane Chloroform Tetrachloroethene Trichloroethene 2,4-Dinitrotoluene Pentachlorophenol Dieldrin Heptachlor epoxide Arsenic Cobalt Manganese Zinc	Bromodichloromethane Chloroform Tetrachloroethene Trichloroethene

Table 7-3
Potentially Complete Human Health Exposure Pathways
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Land Use	Exposure Media	Potentially Exposed Populations	Exposure Route (Human Health)	Pathway Selected for Evaluation	Rationale
Current					
Residential	Surface soil	Resident - Adult	Ingestion, Dermal Contact, and Inhalation	Yes	Residents in barracks could ingest, inhale, and/or have dermal contact with surface soil at the site.
Future					
Residential	Surface and Subsurface soil, Groundwater	Resident - Adult and Child	Ingestion, Dermal Contact and Inhalation	Yes	Although unlikely, if site used for future residential development, residents could ingest, inhale, or have dermal contact with surface and subsurface soil, and groundwater
Residential/Industrial	Surface and Subsurface soil, Groundwater	Construction Worker	Ingestion, Dermal Contact and Inhalation	Yes	Workers could ingest surface and subsurface soil and may have dermal contact with shallow groundwater and surface and subsurface soil or may inhale volatiles from shallow groundwater or surface and subsurface soils during excavation activites.
Residential/Industrial	Surface and Subsurface soil	Industrial Worker	Ingestion, Dermal Contact and Inhalation	Yes	Workers could ingest and have dermal contact with surface and subsurface soil or may inhale volatiles from surface and subsurface soils while working at the site.
Residential/Industrial	Surface and Subsurface soil	Trespasser/Visitor - Adult and Adolescent	Ingestion, Dermal Contact and Inhalation	Yes	Trespasser or visitor could ingest, inhale, or have dermal contact with surface and subsurface soils onsite.

Table 7-4
Summary of RME Cancer Risks and Hazard Indices
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Current Resident Adult	Surface Soil	Ingestion	8.7E-07				9.9E-02	
		Dermal Contact	1.5E-07				1.4E-02	
		Inhalation	NC				NC	
		Total	1.0E-06				1.1E-01	
	All Media	Total	1.0E-06				1.1E-01	
Future Resident Adult	Soil*	Ingestion	NA				1.1E-01	
		Dermal Contact	NA				1.2E-02	
		Inhalation	NA				2.0E-04	
		Total	NA				1.2E-01	
	Groundwater	Ingestion	NA				2.9E+00	
		Dermal Contact	NA				1.0E+00	
		Inhalation	NA				1.1E-01	
		Total	NA				4.0E+00	Tetrachloroethene (1.5)
	All Media	Total	NA				4.1E+00	
Future Resident Child	Soil*	Ingestion	NA				1.0E+00	
		Dermal Contact	NA				8.1E-02	
		Inhalation	NA				7.0E-04	
		Total	NA				1.1E+00	
	Groundwater	Ingestion	NA				6.8E+00	Tetrachloroethene (2.1), Trichloroethene (2.0)
		Dermal Contact	NA				2.3E+00	Tetrachlorethene (1.2)
		Inhalation	NA				NA	
		Total	NA				9.1E+00	Tetrachloroethene (3.3), Trichloroethene (2.4), Manganese (1.2)
	All Media	Total	NA				1.0E+01	
Future Resident Child/Adult	Soil*	Ingestion	8.4E-06			Dieldrin (1.3E-06), Arsenic (7.1E-06)	NA	
		Dermal Contact	1.1E-06				NA	
		Inhalation	1.4E-07				NA	
		Total	9.7E-06			Dieldrin (1.8E-06), Arsenic (7.8E-06)	NA	
	Groundwater	Ingestion	2.8E-03	Tetrachloroethene (2.6E-03)	Trichloroethene (3.7E-05), 2,4-Dinitrotoluene (1.4E-05, Pentachlorophenol (1.1E-05), Dieldrin (6.2E-05), Arsenic (3.5E-05)	Chloroform (2.8E-06), Heptachlor epoxide (2.7E-06)	NA	
		Dermal Contact	1.7E-03	Tetrachloroethene (1.5E-03), Pentachlorophenol (1.3E-04)	Dieldrin (4.2E-05)	Trichloroethene (6.1E-06), Heptachlor epoxide (6.2E-06)	NA	
		Inhalation[1]	5.6E-05		Tetrachloroethene (4.2E-05)	Chloroform (3.6E-06), Trichloroethene (9.8E-06)	NA	
		Total	4.5E-03	Tetrachloroethene (4.2E-03), Pentachlorophenol (1.4E-04)	Trichloroethene (5.3E-05), 2,4-Dinitrotoluene (1.5E-05), Dieldrin (1.0E-04), Arsenic (3.5E-05)	Heptachlor epoxide (8.9E-06), Choroform (3.6E-06)	NA	
	All Media	Total	4.5E-03				NA	

Table 7-4
Summary of RME Cancer Risks and Hazard Indices
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future Construction Worker Adult	Soil*	Ingestion	3.6E-07				3.3E-01	
		Dermal Contact	3.1E-08				2.1E-02	
		Inhalation	3.2E-09				1.4E-04	
		Total	4.0E-07				3.5E-01	
	Groundwater	Ingestion	NA				NA	
		Dermal Contact	4.6E-05		Tetrachloroethene (4.2E-05)	Pentachlorophenol (2.9E-06)	1.1E+00	
		Inhalation	1.5E-04	Tetrachloroethene (1.2E-04)	Trichloroethene (2.7E-05)	Chloroform (1.0E-05)	7.0E+00	Tetrachloroethene (5.1), Trichloroethene (1.6)
		Total	2.0E-04	Tetrachloroethene (1.6E-04)	Chloroform (1.0E-05), Trichloroethene (2.7E-05)	Pentachlorophenol (2.9E-06)	8.1E+00	Tetrachloroethene (5.6), Trichloroethene (1.8)
	All Media	Total	2.0E-04				8.5E+00	
Future Industrial Worker Adult	Soil*	Ingestion	1.9E-06			Arsenic (1.6E-06)	6.9E-02	
		Dermal Contact	5.1E-07				1.5E-02	
		Inhalation	8.1E-08				1.4E-04	
		Total	2.5E-06			Arsenic (1.9E-06)	8.3E-02	
	All Media	Total	2.5E-06				8.3E-02	
Future Trespasser/Visitor Adult	Soil*	Ingestion	3.8E-07				1.6E-02	
		Dermal Contact	6.2E-08				1.8E-03	
		Inhalation	1.0E-09				1.8E-06	
		Total	4.4E-07				1.8E-02	
	All Media	Total	4.4E-07				1.8E-02	
Future Trespasser/Visitor Adolescent	Soil*	Ingestion	1.9E-07				2.2E-02	
		Dermal Contact	1.3E-07				1.0E-02	
		Inhalation	5.2E-10				2.5E-06	
		Total	3.2E-07				3.2E-02	
	All Media	Total	3.2E-07				3.2E-02	

Soil* = combined surface and subsurface soil.
[1]Inhalation calculated for adult only.
NA = Exposure assessment not applicable.
NC = No COPCs identified for the exposure route. Risks and hazards not calculated for the exposure route.

Table 7-5
Summary of CTE Cancer Risks and Hazard Indices
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

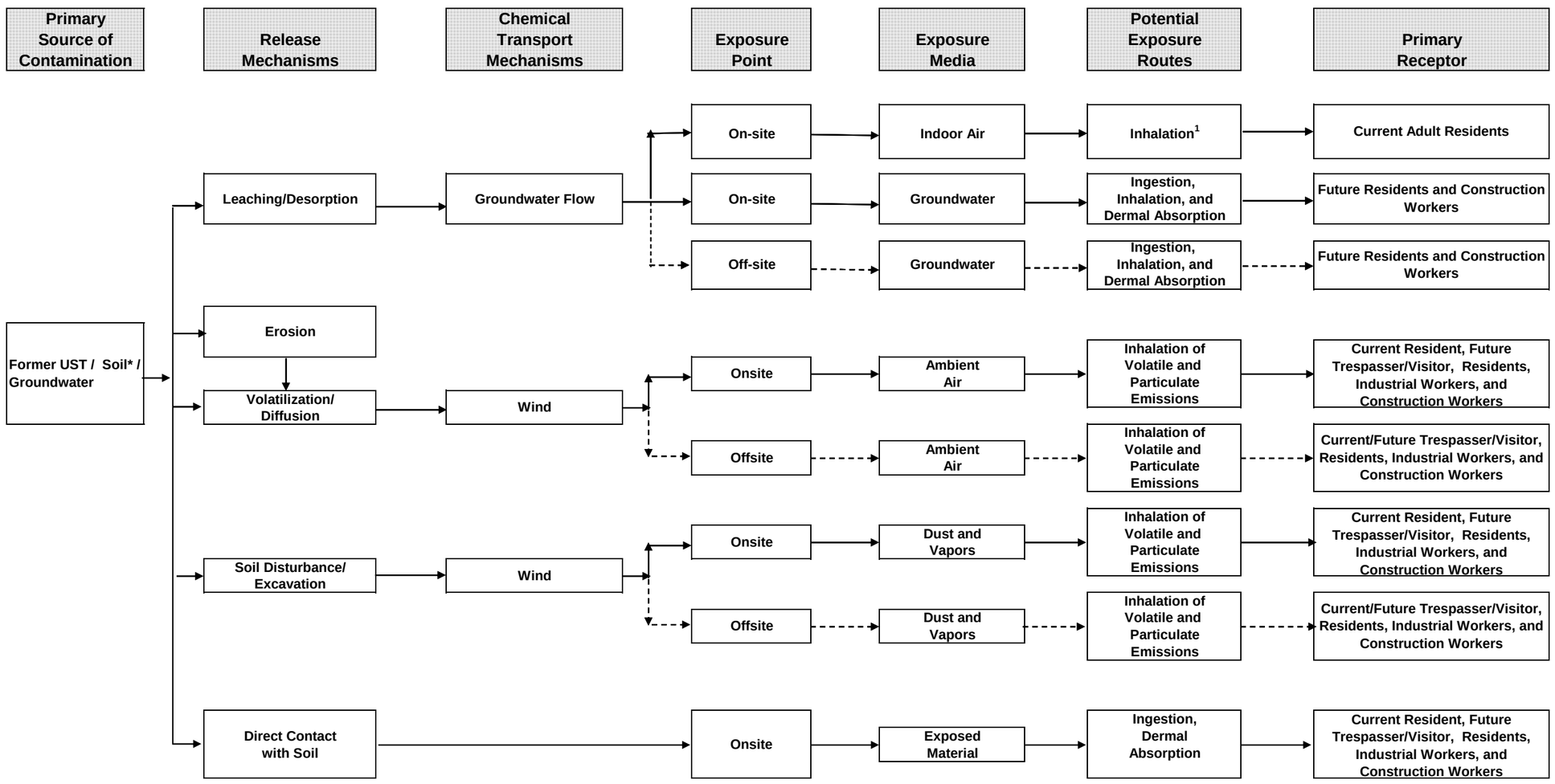
Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
Future Resident Adult	Soil*	Ingestion	NA				2.1E-02	
		Dermal Contact	NA				7.8E-04	
		Inhalation	NA				7.4E-05	
		Total	NA				2.1E-02	
	Groundwater	Ingestion	NA				6.0E-01	
		Dermal Contact	NA				1.3E-01	
		Inhalation	NA				7.2E-03	
		Total	NA				7.4E-01	
	All Media	Total	NA				7.6E-01	
Future Resident Child	Soil*	Ingestion	NA				1.9E-01	
		Dermal Contact	NA				7.1E-03	
		Inhalation	NA				2.6E-04	
		Total	NA				2.0E-01	
	Groundwater	Ingestion	NA				2.0E+00	
		Dermal Contact	NA				2.7E-01	
		Inhalation	NA				NA	
		Total	NA				2.3E+00	
	All Media	Total	NA				2.5E+00	
Future Resident Child/Adult	Soil*	Ingestion	1.7E-06			Arsenic (1.6E-06)	NA	
		Dermal Contact	6.2E-08				NA	
		Inhalation	5.3E-08				NA	
		Total	1.8E-06			Arsenic (1.7E-06)	NA	
	Groundwater	Ingestion	1.4E-04	Tetrachloroethene (1.1E-04)		Trichloroethene (7.4E-06), Pentachlorophenol (3.8E-06), Dieldrin (6.4E-06), Arsenic (7.8E-06)	NA	
		Dermal Contact	8.0E-05		Tetrachloroethene (4.4E-05), Pentachlorophenol (3.1E-05)	Dieldrin (3.0E-06)	NA	
		Inhalation[1]	1.3E-06				NA	
		Total	2.2E-04	Tetrachloroethene (1.5E-04)	Pentachlorophenol (3.4E-05)	Trichloroethene (8.8E-06), Dieldrin (9.3E-06)	NA	
	All Media	Total	2.2E-04				NA	
Future Construction Worker Adult	Soil*	Ingestion	7.8E-08				5.3E-02	
		Dermal Contact	1.9E-09				1.5E-03	
		Inhalation	9.1E-10				4.0E-05	
		Total	8.1E-08				5.4E-02	
	Groundwater	Ingestion	NA				NA	
		Dermal Contact	2.7E-06			Tetrachloroethene (1.5E-06)	1.0E-01	

Table 7-5
Summary of CTE Cancer Risks and Hazard Indices
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	Hazard Index	Chemicals with HI>1
		Inhalation	1.7E-05			Chloroform (2.6E-06), Tetrachloroethene (6.9E-06), Trichloroethene (7.6E-06)	3.5E+00	Tetrachloroethene (2.5)
		Total	2.0E-05			Chloroform (2.6E-06), Tetrachloroethene (8.4E-06), Trichloroethene (7.6E-06)	3.6E+00	
	All Media	Total	2.0E-05				3.7E+00	

Soil* = combined surface and subsurface soil.
[1]Inhalation calculated for adult only.

Figure 7-1
Conceptual Exposure Model for Potential Human Exposure
Site 11a
NAB Little Creek, Virginia Beach, Virginia



* Current scenarios are for surface soil and future scenarios are for surface and subsurface soil combined.

[1]Groundwater samples were collected in order to evaluate this pathway; however, data limitations prevented the evaluation. Additional data will be collected and the human health risk assessment revised in the feasibility study.

Complete Pathway
Incomplete Pathway

SECTION 8

Screening Ecological Risk Assessment

This section presents a screening problem formulation, corresponding to Step 1 of the ecological risk assessment (ERA) process, for Site 11a.

8.1 Ecological Risk Assessment Process

ERAs are conducted using a tiered, step-wise approach and are punctuated with Scientific Management Decision Points (SMDPs). SMDPs represent points in the ERA process where agreement on conclusions, actions, or methodologies is needed so that the ERA process can continue (or terminate) in a technically defensible manner. The results of the ERA at a particular SMDP are used to determine how the ERA process should proceed, for example, to the next step in the process or directly to a later step. The process continues until a final decision has been reached (that is, remedial action if unacceptable risks are identified, or no further action if risks are acceptable). The process can also be iterative if data needs are identified at any step; the needed data are collected and the process starts again at the point appropriate to the type of data collected.

This ERA was conducted in accordance with the *Navy Policy for Conducting Ecological Risk Assessments* (CNO, 1999) and the Navy guidance for implementing this policy (NAVFAC, 2003). The Navy ERA policy and guidance, which describe a process consisting of eight steps organized into three tiers, are conceptually similar to the 8-step ERA process outlined in U.S. Environmental Protection Agency (USEPA) ERA guidance for the Superfund program (USEPA, 1997). For both sets of guidance, Steps 1 and 2 involve conducting a Screening ERA (SERA) based upon very conservative assumptions. The Baseline ERA (BERA) represents Steps 3 through 7. The BERA uses more realistic assumptions and site-specific data to refine the risk estimates from the SERA for components that fail the initial screen. Step 8 addresses risk management issues. The major differences between the Navy ERA policy/guidance and the USEPA ERA guidance are: (1) the Navy policy/guidance provides clearly defined criteria for exiting the ERA process at specific points; (2) the Navy policy/guidance divides Step 3 (the first step of the BERA) into two distinct sub-steps (Steps 3A and 3B), with a potential exit point after Step 3A; and (3) the Navy policy/guidance incorporates risk management considerations throughout all tiers of the ERA process.

The screening (preliminary) problem formulation is the first step of an ERA and establishes the goals, scope, and focus of the SERA. Step 1 of the ERA process is intended to answer two main questions: (1) do complete exposure pathways exist; and (2) if so, are sufficient data available to conduct the SERA? If no complete exposure pathways exist, the ERA process terminates at Step 1 with a conclusion of negligible risk. If one or more complete exposure pathways are known, or likely to exist, the ERA process continues to Step 2, but only evaluates those pathways determined to be significant. An evaluation of the available data is then conducted to determine if the data are adequate to support the SERA. If not, additional data are collected before the ERA process continues. The second step of the ERA

process involves conducting a screening exposure assessment, a screening effects assessment, and a screening risk calculation (risk characterization).

The results of the SERA are used to evaluate the potential for unacceptable ecological risks based upon very conservative assumptions. If the results of the SERA suggest that further ecological risk evaluation is warranted, the ERA process proceeds to the BERA (Steps 3 through 7), which is a more detailed phase of the ERA process, for the pathways, constituents, receptors, and areas identified by the SERA.

8.2 Screening Problem Formulation

Problem formulation establishes the goals, scope, and focus of the ERA. As part of problem formulation, the ecological setting of Site 11a is characterized in terms of the habitats and biota known or likely to be present. The types and concentrations of constituents present in relevant media are also described based upon available analytical data. A conceptual exposure model is developed that describes source areas, transport pathways and exposure media, exposure pathways and routes, and receptors. Assessment endpoints, measurement endpoints, and risk hypotheses are developed to evaluate those receptors for which significant exposure pathways exist.

8.2.1 Ecological Setting

A description of the physical setting of Site 11a is presented in Section 2 of this report.

The flora at the site is limited to various shrubs/bushes used as landscaping, several large trees located next to Building 3606, and grasses and other herbaceous plants comprising the open field (which is mowed on a regular basis). Terrestrial fauna utilizing the site are expected to be limited in number and diversity due to the developed nature of the area. The current land use in this area (industrial and residential) is expected to remain the same for the foreseeable future. There are no wetlands or water bodies associated with the site or in the immediate site vicinity.

The topography of the site is very flat, with elevations ranging from 8.3 to 9.5 ft amsl with no natural surface drainage features evident. Sanitary and storm sewers run through the site (**Figure 2-2**). The majority of precipitation falling on the site runs off into the storm sewer system and eventually drains into Little Creek Cove. Precipitation that does not run off to the storm sewer system would infiltrate to groundwater, evaporate, or transpire.

Groundwater flow in the area is generally to the southwest (**Figure 4-7**). The nearest downgradient water body in the direction of groundwater flow (southwest) is Little Creek Cove, which is approximately 3,500 ft southwest of Site 11a (**Figure 2-1**). The groundwater gradient at the site is low, however, so estimated travel times to Little Creek Cove would be on the order of 50 years or more, and significant dilution and attenuation would occur along the way.

8.2.2 Summary of Available Analytical Data

Groundwater and soil (both surface and subsurface) have been sampled at Site 11a as part of various investigations. Previous investigations at the site are summarized in Section 2.3. Investigations activities associated with this RI are summarized in Section 3, and results are summarized in Section 5.

8.2.3 Conceptual Exposure Model

The conceptual exposure model relates potentially exposed receptor populations with potential source areas based upon physical site characteristics and complete exposure pathways. Important components of the conceptual model are the identification of potential source areas, release mechanisms and transport pathways, exposure media, exposure pathways and routes, and receptor groups. Actual or potential exposures of ecological receptors associated with a source are determined by identifying the most likely, and most important, pathways of contaminant releases and transport. A complete exposure pathway has three components:

- A source of constituents that results in a release to the environment
- A pathway of constituent transport through an environmental medium
- An exposure or contact point for an ecological receptor

Figure 8-1 illustrates a diagrammatic conceptual model for Site 11a. Key components of this conceptual model are discussed in the following subsections.

Potential Source Areas

Information on historical land use indicates the presence of a former vehicle repair shop, former Building 3033 (the area is currently an asphalt parking lot). The tank associated with the former building was identified as SWMU 60 in the FFA and SWMU/IR Summary report, and was closed out with no further action following a desktop audit prior to NAB Little Creek's placement on the NPL. The contents of the tank were not documented in these reports and there is no record of solvent disposal in the tank. However, groundwater analytical data and MIP results show elevated VOC concentrations in the shallow portion of the aquifer near the suspected location of the former waste oil tank. Additionally, data indicate VOCs migrate within the aquifer to the southwest of the former tank, in the direction of groundwater flow. Therefore, VOCs in groundwater may be attributed to former Building 3033, primarily the former underground tank. There is no record of a surface release at the site.

Release Mechanisms and Transport Pathways

A transport pathway describes the mechanisms whereby site-related constituents, once released, may be transported from a source to an exposure medium, such as surface soil, where exposures can occur. These transport pathways are shown on **Figure 8-1**.

The primary transport pathway at Site 11a is from leaks to subsurface soil and groundwater from the former underground tank and associated piping. This is a historical pathway since the tank is no longer present. Although a sanitary sewer runs through the center of the site, it is not considered a current preferential pathway for offsite transport of contamination. Groundwater flow at the site does not support the flow pattern that would be expected if groundwater flow was being influenced by a leaky sewer system. Additionally, a review of historical facility records indicates that no leaks in that portion of the line have occurred. Although not a current preferential pathway the sanitary may serve as a pathway in the future. No other current or potential preferential pathways are present at the site.

Exposure Media

Exposure media for ecological receptors are typically limited to surface water, surface sediment, and surface soil. Groundwater is generally considered only as a transport medium since there are no ecological exposures to groundwater until it discharges to a water body or surfaces as a seep. Air is not addressed in the ERA because this medium is not likely to result in significant contributions to total exposure at the site given the nature of the known source areas (subsurface release).

There are no surface water bodies on or near the site, and transport via groundwater to Little Creek Cove is not significant based upon the known configuration of the plume (**Figure 5-2**), groundwater travel times, and the distance from the site to the cove (approximately 3,500 ft). Thus, surface water and sediment are not relevant exposure media.

Surface soils are also not a significant exposure medium due to the subsurface nature of the release at the site. The available surface soil data (**Appendix A**) do not indicate that a surface release has occurred at the site based upon the pattern and magnitude of the resulting constituent concentrations detected for the constituent groups potentially related to the former waste oil tank (VOCs and SVOCs). Only very low concentrations of VOCs (less than about 10 µg/kg) have been detected in site surface soils. Only two SVOCs (one PAH and one phthalate) were detected in site surface soils. None of these constituents exceed available ecological soil screening values (**Table 8-1**).

Although inorganics are not likely to be site related, the inorganics detected in site surface soil samples were also compared with available ecological soil screening values (**Table 8-1**). The results indicated that chromium, mercury, and vanadium exceeded the conservative ecological screening values (**Table 8-1**). However, only chromium and vanadium exceeded the 95% Background UTLs. Vanadium slightly exceeded background in only one sample, located in an area covered by asphalt, at a maximum ratio of 1.03. Only two samples have chromium exceedances slightly above background (maximum ratio of 1.08) in an area not covered by asphalt (**Figure 8-2**). Based upon these site-specific lines of evidence (information), these three constituents do not pose an unacceptable risk greater than background. This comparison supports the lack of a surface release at the site. Therefore, potential ecological risks at Site 11a are negligible based upon the lack of a significant soil exposure pathway.

Exposure Pathways and Routes

An exposure pathway links a source with one or more receptors through exposure via one or more media and exposure routes. Exposure, and thus potential risk, can only occur if complete exposure pathways exist. An exposure route describes the specific mechanism(s) by which a receptor is exposed to a constituent present in an environmental medium. As shown on **Figure 8-1**, there are no complete exposure pathways to ecological receptors at Site 11a. Since surface soils were not contaminated by site-related constituents, no complete exposure pathways via surface soils exist at the site. No surface water bodies occur on or near this site. Even in the absence of any remediation, groundwater transport to the nearest downgradient surface water body (Little Creek Cove) would not be significant due to the slow groundwater velocity, and the large distance from the site, which would allow for significant dilution and attenuation prior to any discharge.

Receptors

Receptors at the site are limited. The flora consists of various trees and shrubs used as landscaping, and maintained lawn. The fauna at the site consists of various urban-adapted terrestrial species that will use these types of maintained habitats.

Endpoints and Risk Hypotheses

The conclusion of the problem formulation includes the selection of ecological endpoints and risk hypotheses, which are based upon the conceptual model. Two types of endpoints, assessment endpoints and measurement endpoints, are defined as part of the ERA process (USEPA, 1997). An assessment endpoint is an explicit expression of the environmental component or value that is to be protected. A measurement endpoint is a measurable ecological characteristic that is related to the component or value chosen as the assessment endpoint. Risk hypotheses are testable hypotheses about the relationship among the assessment endpoints and the predicted responses when exposed to contaminants.

Because no complete exposure pathways were identified at the site, no assessment endpoints, risk hypotheses, or measurement endpoints were selected.

8.3 Ecological Risk Conclusions

In conclusion, potential ecological risks at Site 11a are negligible based on the lack of significant exposure pathways. No further action is recommended at this site for the protection of ecological resources.

Table 8-1
Ecological Screening Statistics - Site 11a Surface Soil - Detected Constituents
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

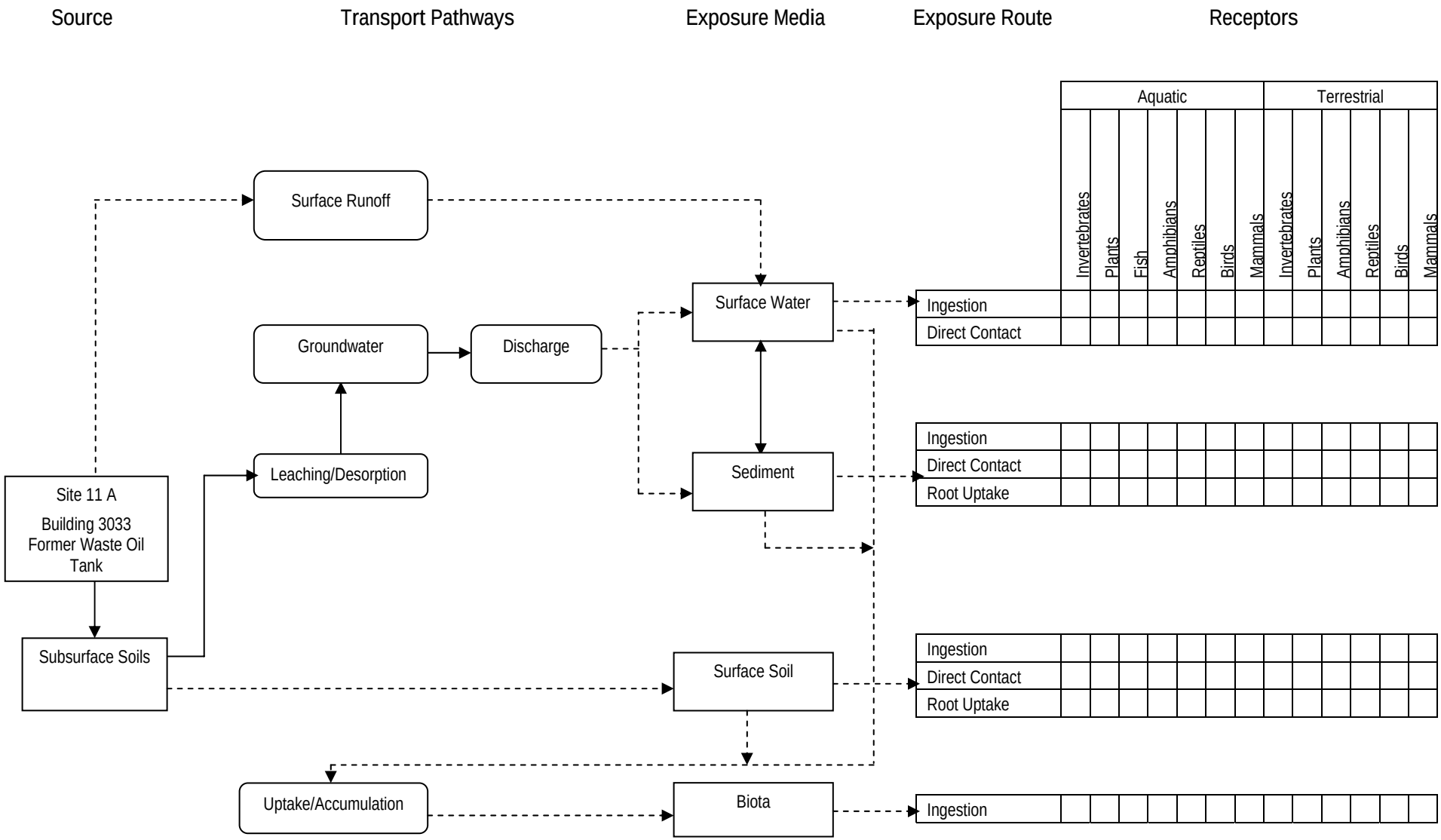
Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value	Source	Frequency of Exceedance	Maximum Hazard Quotient	Mean Hazard Quotient	Background	Type	Frequency of Exceedance	Maximum Ratio	COPC?
Inorganics (MG/KG)															
Aluminum	-- - --	16 / 16	23,800	LS11-SS313-00	14,582	pH < 5.5	USEPA 2003a	-- / --	avg pH = 6.22		--	--	-- / --	--	NO
Arsenic	-- - --	16 / 16	6.20	LS11A-SS625-07C	3.52	18.0	USEPA 2005a	0 / 16	0.34	0.20	--	--	-- / --	--	NO
Barium	-- - --	16 / 16	84.6	LS11-SS319-00	50.6	330	USEPA 2005b	0 / 16	0.26	0.15	--	--	-- / --	--	NO
Beryllium	0.36 - 0.36	15 / 16	0.46	LS11-SS319-00	0.31	40.0	USEPA 2005c	0 / 16	0.01	0.008	--	--	-- / --	--	NO
Calcium [1]	-- - --	16 / 16	3,050	LS11-SS311-00	1,382	NSV	--	-- / --	NSV	NSV	--	--	-- / --	--	NO
Chromium	-- - --	16 / 16	22.2	LS11-SS308-00	16.2	0.40	Efroymson et al. 1997b	16 / 16	55.5	40.6	20.0	Urban UTL	5 / 16	1.11	NO
Cobalt	-- - --	16 / 16	3.50	LS11-SS311-00	2.75	13.0	USEPA 2005d	0 / 16	0.27	0.21	--	--	-- / --	--	NO
Copper	3.30 - 4.10	14 / 16	15.3	LS11A-SS630-07C	6.46	70.0	USEPA 2007a	0 / 16	0.22	0.09	--	--	-- / --	--	NO
Iron	-- - --	16 / 16	20,700	LS11-SS308-00	13,730	5 < pH > 8	USEPA 2003b	-- / --	avg pH = 6.22		--	--	-- / --	--	NO
Lead	-- - --	16 / 16	37.6	LS11A-SS625-07C	12.6	120	USEPA 2005e	0 / 16	0.31	0.11	--	--	-- / --	--	NO
Magnesium [1]	-- - --	16 / 16	2,370	LS11A-SS630-07C	1,252	NSV	--	-- / --	NSV	NSV	--	--	-- / --	--	NO
Manganese	-- - --	16 / 16	189	LS11A-SS630-07C	91.1	220	USEPA 2007b	0 / 16	0.86	0.41	--	--	-- / --	--	NO
Mercury	0.020 - 0.11	13 / 16	0.17	LS11-SS313-00	0.042	0.10	Efroymson et al. 1997b	1 / 16	1.70	0.42	0.63	Max Back	0 / 16	0.27	NO
Nickel	-- - --	16 / 16	10.0	LS11-SS313-00	6.98	38.0	USEPA 2007c	0 / 16	0.26	0.18	--	--	-- / --	--	NO
Potassium [1]	-- - --	16 / 16	1,010	LS11-SS314-00	690	NSV	--	-- / --	NSV	NSV	--	--	-- / --	--	NO
Selenium	0.40 - 3.90	4 / 16	1.00	LS11-SS319-00	0.98	1.80	USEPA 1995	0 / 16	0.56	0.54	--	--	-- / --	--	NO
Thallium	0.56 - 0.70	6 / 16	0.80	LS11A-SS625-07C	0.42	1.00	Efroymson et al. 1997a	0 / 16	0.80	0.42	--	--	-- / --	--	NO
Vanadium	-- - --	16 / 16	35.2	LS11-SS308-00	25.3	2.00	Efroymson et al. 1997a	16 / 16	17.6	12.7	34.3	Urban UTL	1 / 16	1.03	NO
Zinc	-- - --	16 / 16	65.7	LS11A-SS630-07C	26.5	120	USEPA 2007d	0 / 16	0.55	0.22	--	--	-- / --	--	NO
Pesticide/PCBs (UG/KG)															
4,4'-DDD	3.60 - 3.80	2 / 6	8.40	LS11A-SS625-07C	2.82	100	USEPA 1995	0 / 6	0.08	0.03	--	--	-- / --	--	NO
4,4'-DDE	3.60 - 3.80	3 / 6	45.0	LS11A-SS625-07C	10.1	100	USEPA 1995	0 / 6	0.45	0.10	--	--	-- / --	--	NO
4,4'-DDT	3.60 - 3.80	3 / 6	7.90	LS11A-SS625-07C	3.33	100	USEPA 1995	0 / 6	0.08	0.03	--	--	-- / --	--	NO
Aldrin	1.80 - 1.90	1 / 6	3.80	LS11A-SS628-07C	1.39	100	USEPA 1995	0 / 6	0.04	0.01	--	--	-- / --	--	NO
Dieldrin	3.60 - 3.80	3 / 6	80.0	LS11A-SS628-07C	15.2	100	USEPA 1995	0 / 6	0.80	0.15	--	--	-- / --	--	NO
Endosulfan I	1.80 - 1.90	1 / 6	0.55	LS11A-SS627-07C	0.86	100	Other pesticides	0 / 6	0.01	--	--	--	-- / --	--	NO
Endosulfan sulfate	3.40 - 3.60	1 / 6	1.90	LS11A-SS623-07C	1.78	100	Other pesticides	0 / 6	0.02	0.02	--	--	-- / --	--	NO
Endrin	3.40 - 3.80	1 / 6	1.60	LS11A-SS628-07C	1.75	100	USEPA 1995	0 / 6	0.02	--	--	--	-- / --	--	NO
Endrin aldehyde	3.60 - 3.80	2 / 6	1.40	LS11A-SS627-07C	1.63	100	USEPA 1995	0 / 6	0.01	--	--	--	-- / --	--	NO
Endrin ketone	3.40 - 3.80	1 / 6	1.10	LS11A-SS628-07C	1.67	100	USEPA 1995	0 / 6	0.01	--	--	--	-- / --	--	NO
Heptachlor epoxide	1.80 - 1.90	1 / 6	0.68	LS11A-SS627-07C	0.88	100	USEPA 1995	0 / 6	0.01	--	--	--	-- / --	--	NO
Methoxychlor	18.0 - 19.0	1 / 6	4.60	LS11A-SS627-07C	8.43	100	USEPA 1995	0 / 6	0.05	--	--	--	-- / --	--	NO
alpha-Chlordane	1.80 - 1.90	3 / 6	2.60	LS11A-SS627-07C	1.22	100	USEPA 1995	0 / 6	0.03	0.01	--	--	-- / --	--	NO
gamma-Chlordane	1.80 - 1.90	4 / 6	1.40	LS11A-SS625-07C	0.94	100	USEPA 1995	0 / 6	0.01	0.01	--	--	-- / --	--	NO

NSV - No Screening Value
1 - Macronutrient - Not considered to be a COPC
Shaded cells indicate an exceedance

Table 8-1
Ecological Screening Statistics - Site 11a Surface Soil - Detected Constituents
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Screening Value	Source	Frequency of Exceedance	Maximum Hazard Quotient	Mean Hazard Quotient	Background	Type	Frequency of Exceedance	Maximum Ratio	COPC?
Semivolatile Organic Compounds (UG/KG)															
Pyrene	340 - 380	1 / 6	78.0	LS11A-SS625-07C	163	100	USEPA 1995	0 / 6	0.78	--	--	--	-- / --	--	NO
bis(2-Ethylhexyl)phthalate	340 - 340	5 / 6	13,000	LS11A-SS629-07C	2,408	100,000	IPCS 1992	0 / 6	0.13	0.02	--	--	-- / --	--	NO
Volatile Organic Compounds (UG/KG)															
1,2,4-Trichlorobenzene	10.0 - 12.0	1 / 16	3.30	LS11-SS319-00	5.55	100	USEPA 1995	0 / 16	0.03	--	--	--	-- / --	--	NO
1,2-Dichlorobenzene	10.0 - 12.0	1 / 16	1.80	LS11-SS319-00	5.46	100	USEPA 1995	0 / 16	0.02	--	--	--	-- / --	--	NO
1,4-Dichlorobenzene	10.0 - 12.0	1 / 16	1.80	LS11-SS319-00	5.46	100	USEPA 1995	0 / 16	0.02	--	--	--	-- / --	--	NO
2-Butanone	10.0 - 12.0	1 / 16	4.20	LS11-SS319-00	5.61	100	Other VOCs	0 / 16	0.04	--	--	--	-- / --	--	NO
Ethylbenzene	10.0 - 12.0	1 / 16	1.20	LS11-SS306-00	5.45	100	USEPA 1995	0 / 16	0.01	--	--	--	-- / --	--	NO
Methyl-tert-butyl ether (MTBE)	10.0 - 12.0	1 / 16	1.20	LS11-SS306-00	5.45	900	An et al. 2002	0 / 16	0.001	--	--	--	-- / --	--	NO
Methylene chloride	8.80 - 11.0	1 / 16	11.0	LS11-SS313-00	5.55	300	USEPA 1995	0 / 16	0.04	0.018	--	--	-- / --	--	NO
Tetrachloroethene	1.90 - 11.0	7 / 16	8.20	LS11-SS319-00	3.71	300	USEPA 1995	0 / 16	0.03	0.012	--	--	-- / --	--	NO
Trichloroethene	10.0 - 12.0	2 / 16	5.00	LS11A-SS629-07C	5.57	300	USEPA 1995	0 / 16	0.02	--	--	--	-- / --	--	NO
cis-1,2-Dichloroethene	10.0 - 12.0	2 / 16	3.00	LS11A-SS629-07C	5.27	300	USEPA 1995	0 / 16	0.01	--	--	--	-- / --	--	NO

NSV - No Screening Value
1 - Macronutrient - Not considered to be a COPC
Shaded cells indicate an exceedance



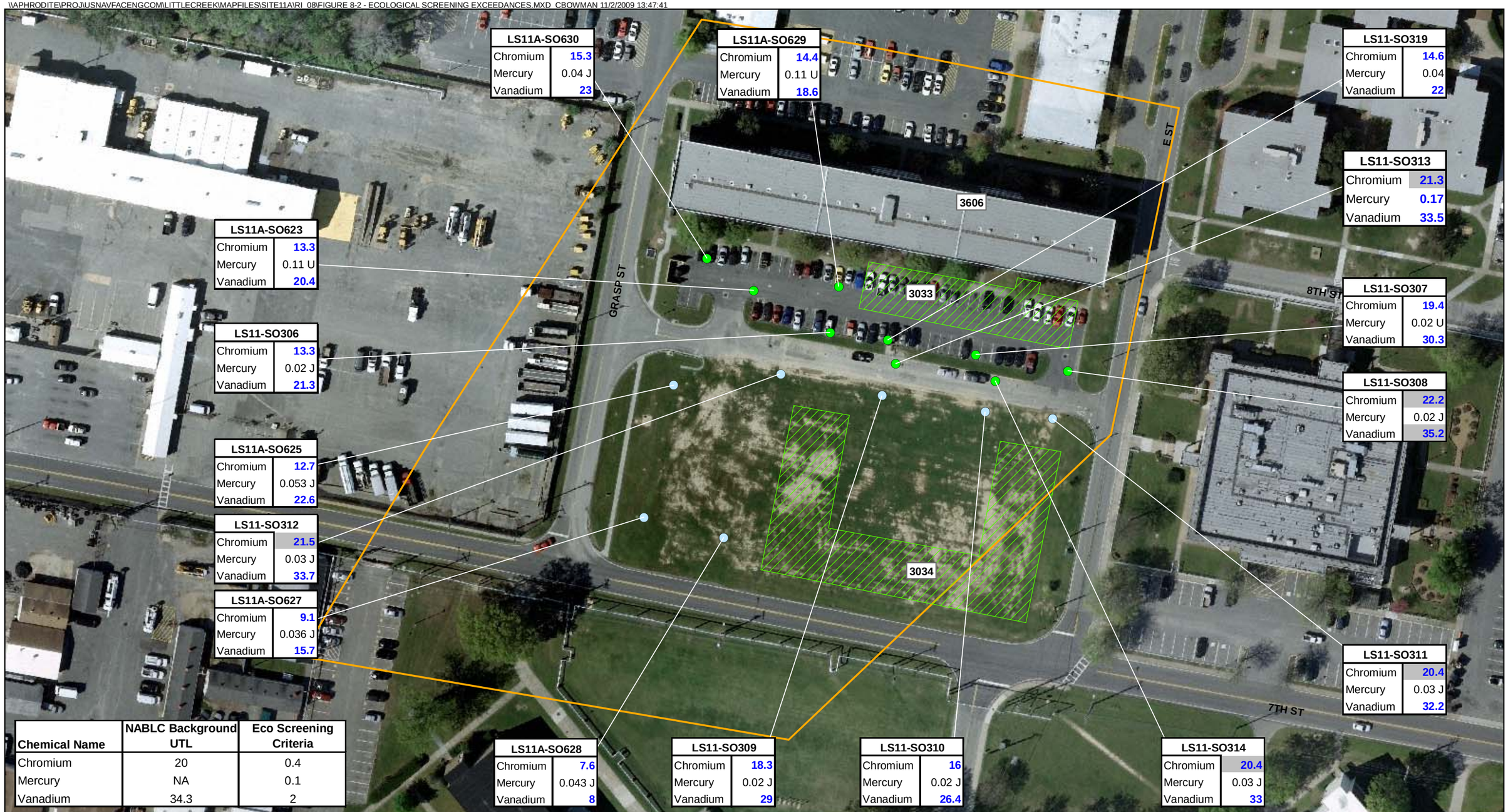
Complete pathway

Incomplete/insignificant pathway

FIGURE 8-1. Conceptual Exposure Model for Potential Ecological Exposure
Site 11a Remedial Investigation Report, NAB Little Creek

● - Receptor evaluated quantitatively
∗ - Receptor not evaluated quantitatively

\\APHRODITE\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\SITE11A\RI_08\FIGURE 8-2 - ECOLOGICAL SCREENING EXCEEDANCES.MXD CBOWMAN 11/2/2009 13:47:41



Chemical Name	NABLC Background UTL	Eco Screening Criteria
Chromium	20	0.4
Mercury	NA	0.1
Vanadium	34.3	2

Legend

- Soil Sample Located in Field Area
- Soil Sample Located in Asphalt Area
- Demolished Building
- Area of Investigation

Notes:
J - Reported value is estimated
U - Not detected
Shaded cells represent NABLC Background UTL exceedances
All values shown are reported in mg/kg
Bold blue values represent Eco Screening criteria exceedances

N
W E
S

0 80 160
Feet

Figure 8-2
Ecological Screening Exceedances
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, VA

CH2MHILL

SECTION 9

Conclusions and Recommendations

The following conclusions regarding the nature and extent of contamination, fate and transport, and risk to human and ecological receptors have been derived from the data collected at Site 11a. Considerations for risk management recommendations are also presented.

9.1 Conclusions

Based on the chemical and physical data collected and evaluated under this RI and previous investigations, the source of groundwater contamination is the former underground waste oil tank. Two VOCs (the chlorinated VOCs TCE and PCE) were detected in groundwater above their respective MCLs. Subsequent to the 2005 ISCO treatability study, the maximum concentration of PCE in the groundwater is 430 J µg/L and the maximum concentration of TCE is 730 µg/L. One SVOC (PCP) was detected (at a concentration of 6 J µg/L) above the MCL in groundwater from the upgradient monitoring well LS11A-MW20D. No source has been identified for the PCP in groundwater upgradient of the site. Although several pesticides and inorganics were detected in groundwater, none were detected above their corresponding MCLs. PCBs were not detected in groundwater at Site 11a. VOCs, SVOCs, pesticides, and inorganics were detected in the soil at Site 11a. However, concentrations are not indicative of a residual source of contamination to groundwater at the site. Additionally, no release to soil at the site has been documented.

As depicted in the CSM (**Figure 6-1**), the current primary migration pathways of representative contaminants in the groundwater at Site 11a is dissolved plume migration downgradient with groundwater flow (advection). Secondary, less prominent, fate and transport mechanisms of representative constituents include the horizontal dispersion of groundwater contaminants and the volatilization of groundwater contaminants into the vadose zone and subsequently into the atmosphere. The potential migration pathway of vapor intrusion into indoor air (volatilization) has not been fully addressed and will be further evaluated in the FS stage.

The VOC plume trends south-southwest following the primary direction of groundwater flow from the former source area. TCE is the most horizontally extensive VOC, while PCE is concentrated to the vicinity of the former UST. Based on the results of the grab groundwater samples, the downgradient (southern) edge of the Site 11a plume appears to be co-mingled with the Site 11 plume. Therefore, the precise extent of the southern edge of the Site 11a groundwater plume cannot be clearly defined. However, this is not a significant issue because both plumes have similar contaminants and are being addressed.

9.1.1 Human Health Risk Assessment

The risk assessment was conducted to evaluate the potential human health risks associated with exposure to soil and groundwater. A summary of the RME and CTE risks are provided in **Tables 7-4** and **7-5**, respectively. Exposure to soil by all potential current and future

residents would result in RME non-carcinogenic hazards and carcinogenic risks within USEPA's acceptable risk levels.

Exposure to groundwater by a construction worker during excavation activities may pose RME and CTE non-carcinogenic hazards exceeding USEPA target levels. This hazard is primarily associated with PCE and TCE detected in the groundwater. The RME carcinogenic risk for the construction worker also exceeds USEPA's target risk level, associated with PCE.

Future potable use of groundwater may pose non-carcinogenic hazards and carcinogenic risks above USEPA target levels for future hypothetical residents if the water is used as a primary potable supply. The non-carcinogenic hazard to the adult resident based on RME is associated with ingestion and dermal contact. No individual constituents contribute a HI above 1.0; however, the cumulative HI based on liver effects is above 1.0. There are no non-carcinogenic hazards to an adult resident from exposure to groundwater based on CTE.

The non-carcinogenic hazards to the child resident based on RME are associated with ingestion of PCE, TCE, and manganese, and dermal contact of PCE in groundwater. Based on CTE, the non-carcinogenic hazard to the child resident is associated with ingestion, although there are no individual constituents with HIs above 1.0. However, the cumulative target organ-specific HI for liver effects is above 1.0.

The carcinogenic risk to the hypothetical future lifetime resident based on RME and CTE exceeds the upper risk range of 1x10-4. The RME carcinogenic risk is associated with ingestion of PCE and dermal contact with PCP in groundwater. Additionally, TCE contributes a risk above the 10^{-5} risk level used as the level of concern for TCE (see Section 7.6.3 on discussion of use of 10^{-5} as point of reference for TCE). The CTE carcinogenic risk is associated with ingestion of PCE.

Although the risk assessment indicated a hazard to the future child resident associated with manganese in groundwater, as discussed in Section 7.6.3, the concentrations detected in the groundwater result in the intake of manganese at a rate below the RDA. Additionally, manganese concentrations in groundwater were not detected above background levels. Therefore, risk associated with exposure to manganese in groundwater is acceptable.

Although vapor intrusion from groundwater into indoor air was identified as a potentially complete pathway for current residents, the pathway was not quantitatively evaluated because of data limitations. Additional data will be collected and the HHRA will be revised to include the vapor intrusion evaluation, the results of which will be incorporated in an RI addendum and the FS.

9.1.2 Screening Ecological Risk Assessment

A SERA was conducted to evaluate the potential ecological risks associated with potential releases at Site 11a. The available surface soil data do not indicate that a surface release has occurred at the site based upon the pattern and magnitude of the resulting constituent concentrations detected for the constituent groups potentially related to the former waste oil tank (VOCs and SVOCs). Only very low concentrations of VOCs (less than about 10 µg/kg) have been detected in site surface soils. Only two SVOCs (one PAH and one phthalate) were detected in site surface soils. None of these constituents exceed available ecological soil

screening values. Three inorganics; chromium, mercury, and vanadium; exceeded ecological screening values, and only chromium and vanadium exceeded the 95% Background UTLs. Vanadium slightly exceeded background in only one sample at a maximum ratio of 1.03. Only two samples have chromium exceedances slightly above background (maximum ratio of 1.08) in an area not covered by asphalt. Based upon these site-specific lines of evidence (information), these three constituents do not pose an unacceptable risk greater than background. This comparison supports the lack of a surface release at the site. Therefore, potential ecological risks at Site 11a are negligible based upon the lack of a significant soil exposure pathway.

9.2 Recommendations

Based on the results of the field investigations, the following recommendations have been identified for each media.

9.2.1 Groundwater

Confirmation of the presence of PCP in the groundwater at monitoring well LS11-MW20D should be conducted and the results incorporated into the FS.

Further evaluation of the potential vapor intrusion pathway at Building 3606 is necessary. Collection of site-specific data is ongoing. A work plan has been prepared to collect additional samples in the vicinity of Building 3606. The results of these activities will be used to refine the HHRA and incorporated into a FS.

A FS is recommended to evaluate potential remedial alternatives to mitigate unacceptable human health risks from PCE and TCE in groundwater at Site 11a. The FS will also include the further evaluation of PCP and the potential vapor intrusion pathway in Building 3606 described above.

9.2.2 Soil

Based on a review of historical activities and data collected at Site 11a, and because no human health or ecological risks were identified in soil, no further action is recommended for Site 11a soil.

SECTION 10

References

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Appendix A
Analytical Results

Grain Size

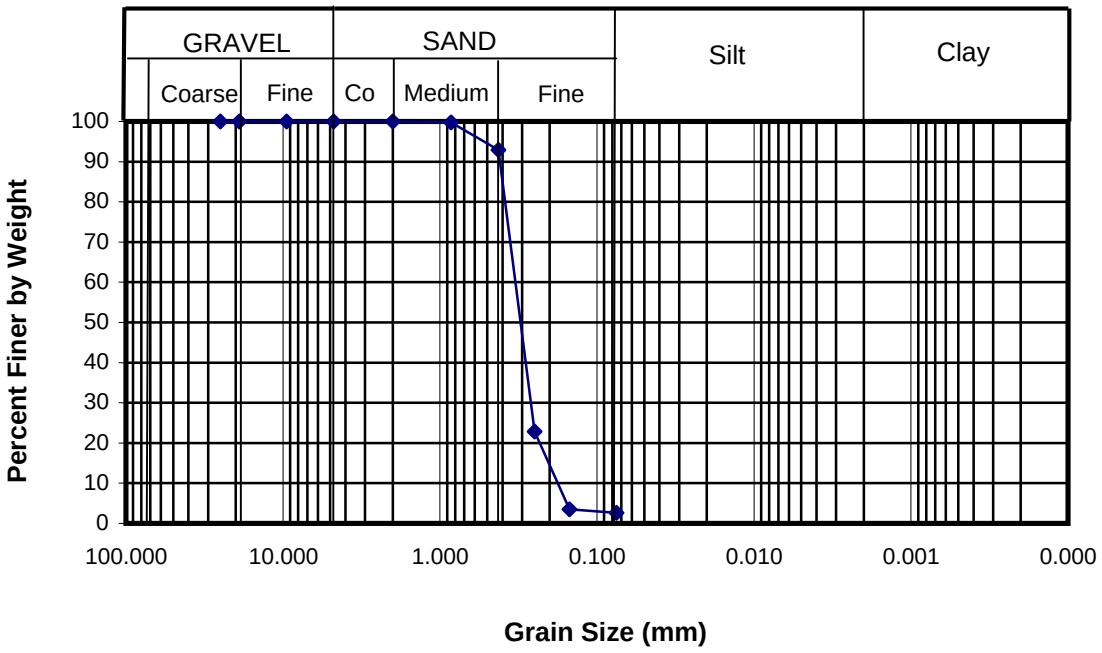
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-DW621-0509-07C
Sample Description:	SAND (SP), Tan-Orange, Fine to Medium, Trace Silt
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	100.0
20	99.8
40	92.9
60	22.9
100	3.5
200	2.6



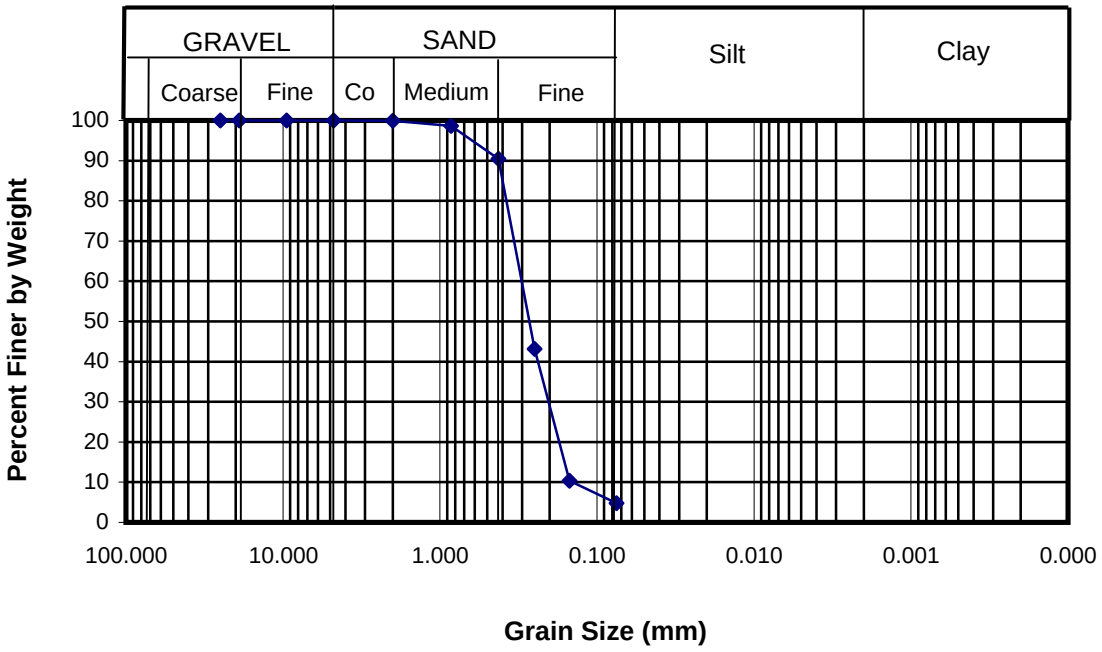
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-SB627-0612-07C
Sample Description:	SAND (SP), Tan-Orange, Fine to Medium, Trace Silt
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.9
20	98.7
40	90.5
60	43.2
100	10.4
200	4.8



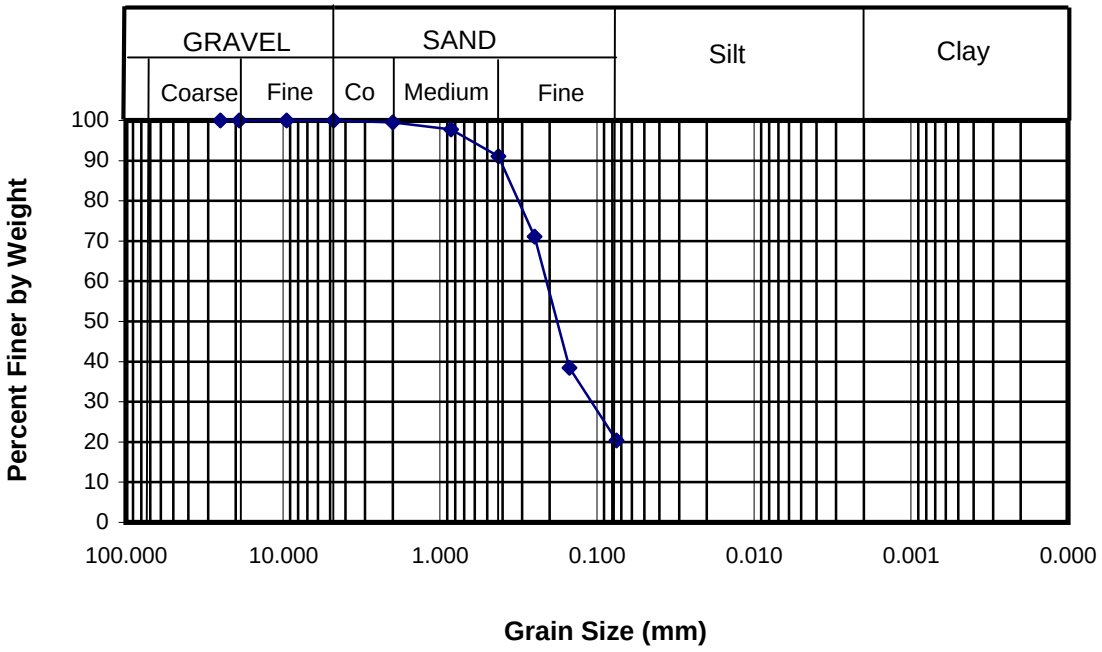
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-SB627-2028-07C
Sample Description:	Silty SAND (SM), Tan, mottled Orange, Fine to Medium
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.5
20	97.8
40	91.1
60	71.1
100	38.5
200	20.4



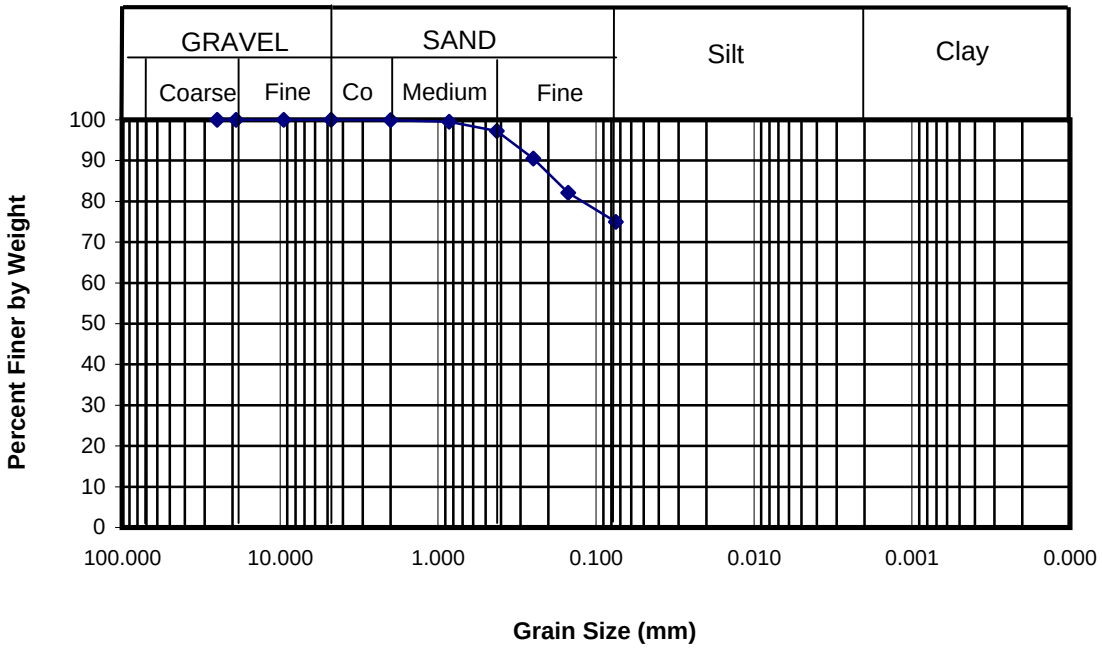
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
Naval Amphibious Base Little Creek
Project Number: 345721.SI.FQ, Contract # N62470-02D-3052
Number: 4076-110-F
Sample Number: LS11A-SB627-3438-07C
Sample Description: Sandy CLAY (CL), Dark Gray, with Silt
Test Methods: ASTM D 422, Particle-Size Analysis of Soils
ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.9
20	99.5
40	97.3
60	90.5
100	82.1
200	74.9



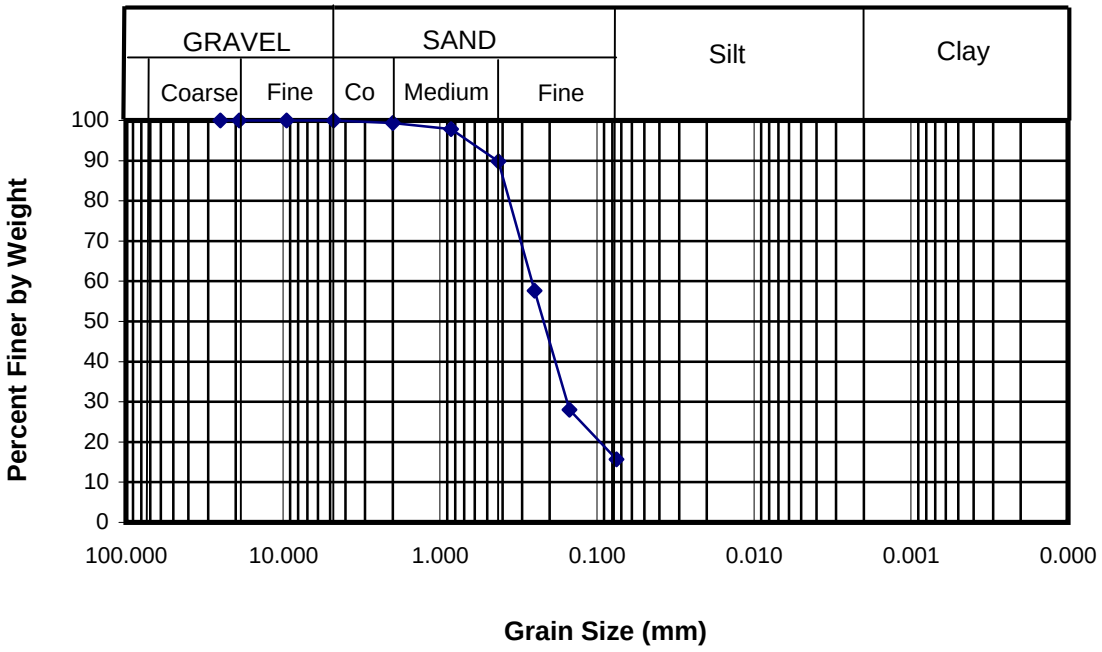
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
Naval Amphibious Base Little Creek
Project Number: 345721.SI.FQ, Contract # N62470-02D-3052
Number: 4076-110-F
Sample Number: LS11A-SB628-0612-07C
Sample Description: Silty SAND (SM), Tan, mottled Orange, Fine to Medium
Test Methods: ASTM D 422, Particle-Size Analysis of Soils
ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.4
20	97.8
40	89.8
60	57.6
100	28.0
200	15.7



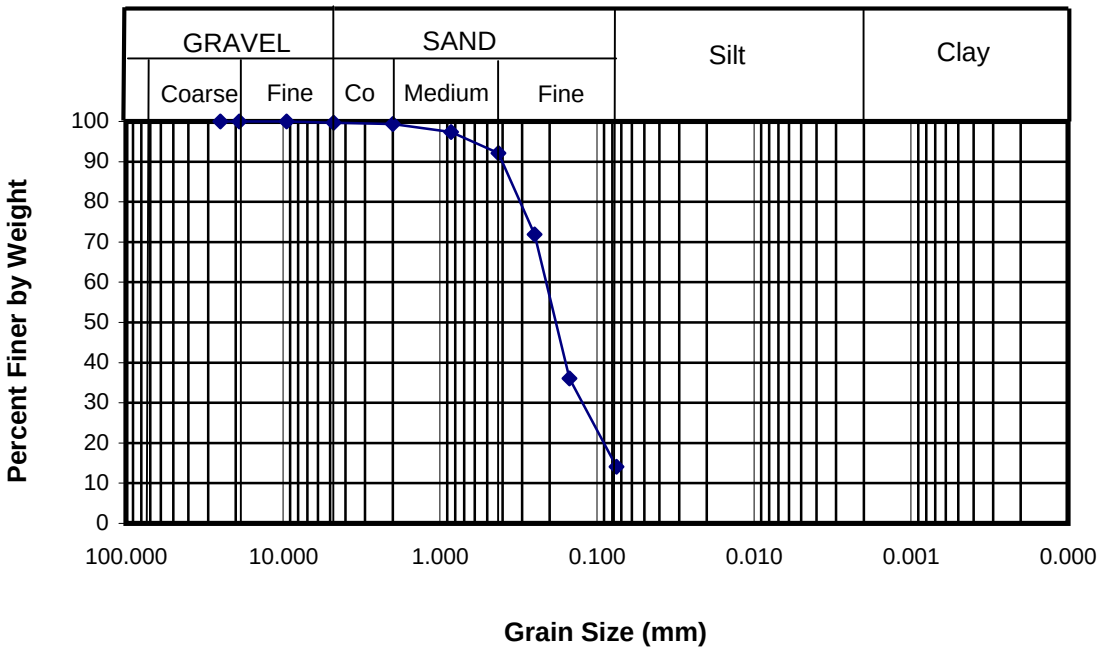
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
Naval Amphibious Base Little Creek
Project Number: 345721.SI.FQ, Contract # N62470-02D-3052
Number: 4076-110-F
Sample Number: LS11A-SB628-2028-07C
Sample Description: Silty SAND (SM), Tan, mottled Orange, Fine to Medium, Trace Fine Gravel
Test Methods: ASTM D 422, Particle-Size Analysis of Soils
ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	99.7
10	99.4
20	97.4
40	92.1
60	71.9
100	36.0
200	14.1



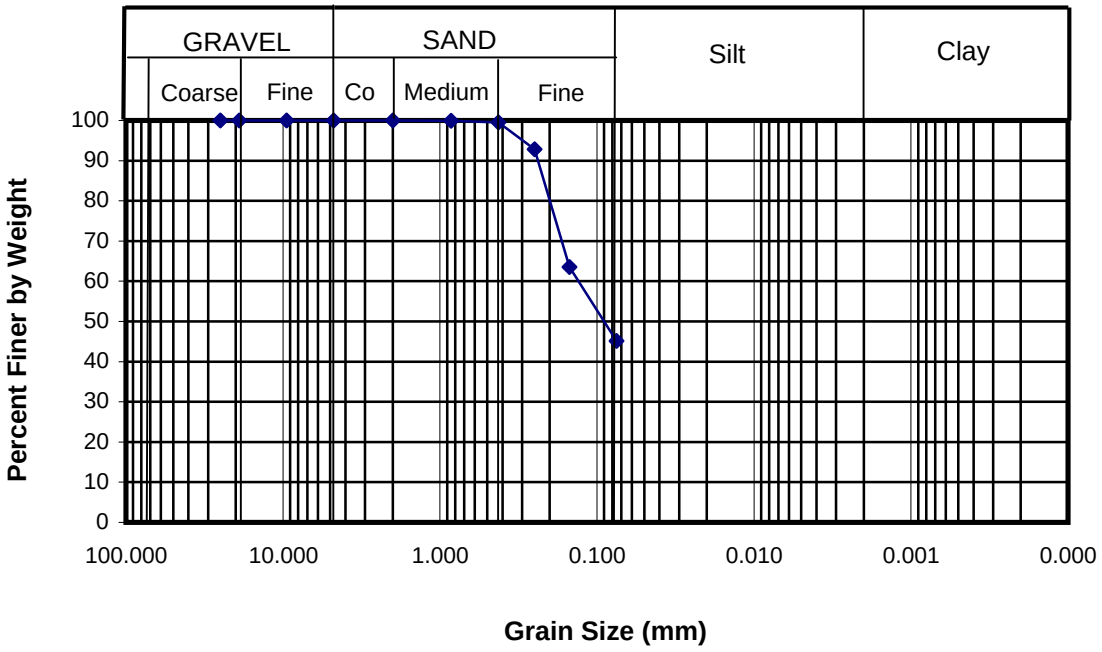
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-SB628-3438-07C
Sample Description:	Clayey SAND (SC), Dark Gray, mottled Tan and Orange, Fine, with Silt
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	100.0
20	99.9
40	99.5
60	92.8
100	63.5
200	45.2



Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-SB629-0612-07C
Sample Description:	SAND (SP), Tan, mottled Orange, Fine, Trace Silt
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.9
20	99.7
40	96.5
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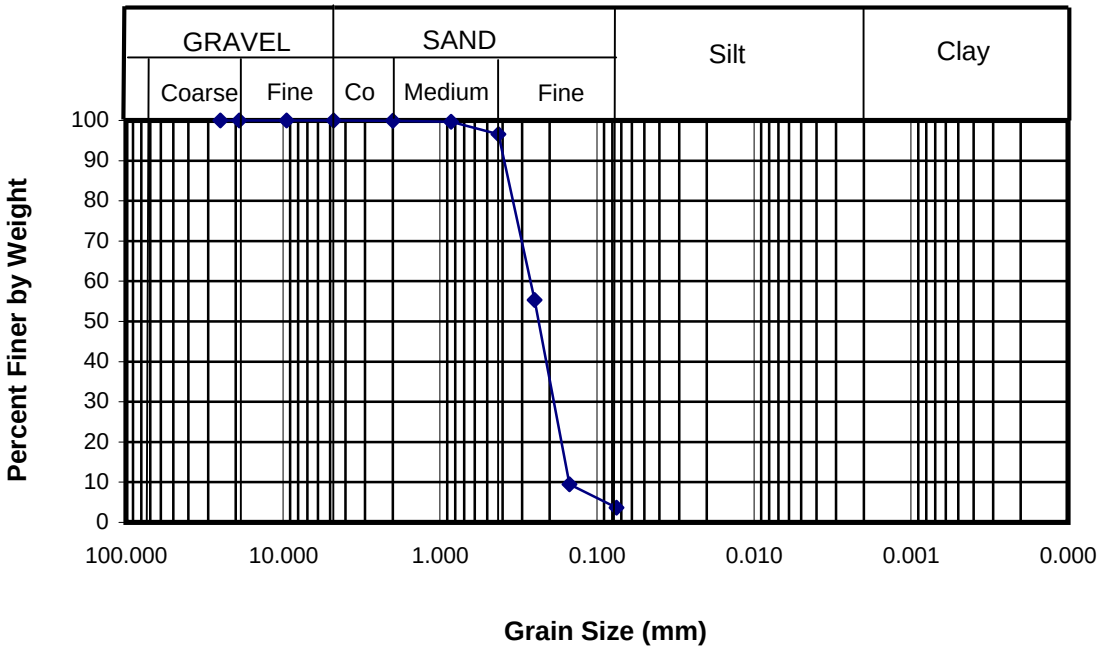
100	9.5
200	3.7



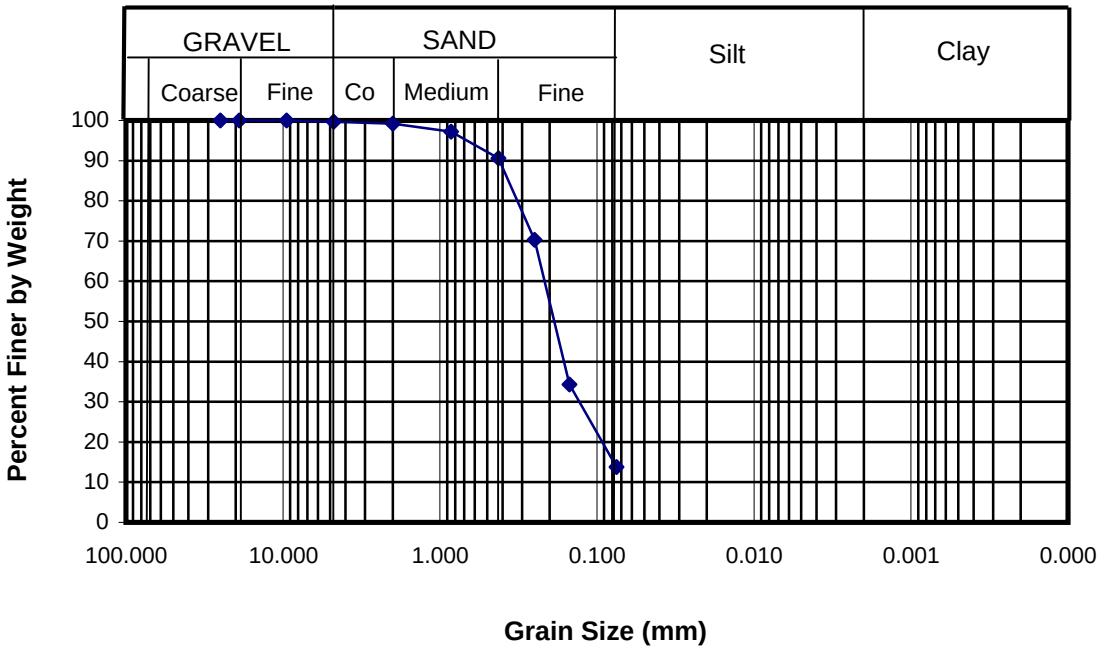
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
Naval Amphibious Base Little Creek
Project Number: 345721.SI.FQ, Contract # N62470-02D-3052
Number: 4076-110-F
Sample Number: LS11A-SB629-2028-07C
Sample Description: Silty SAND (SM), Tan, mottled Orange, Fine to Medium
Test Methods: ASTM D 422, Particle-Size Analysis of Soils
ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	99.7
10	99.2
20	97.2
40	90.6
60	70.3
100	34.4
200	13.7



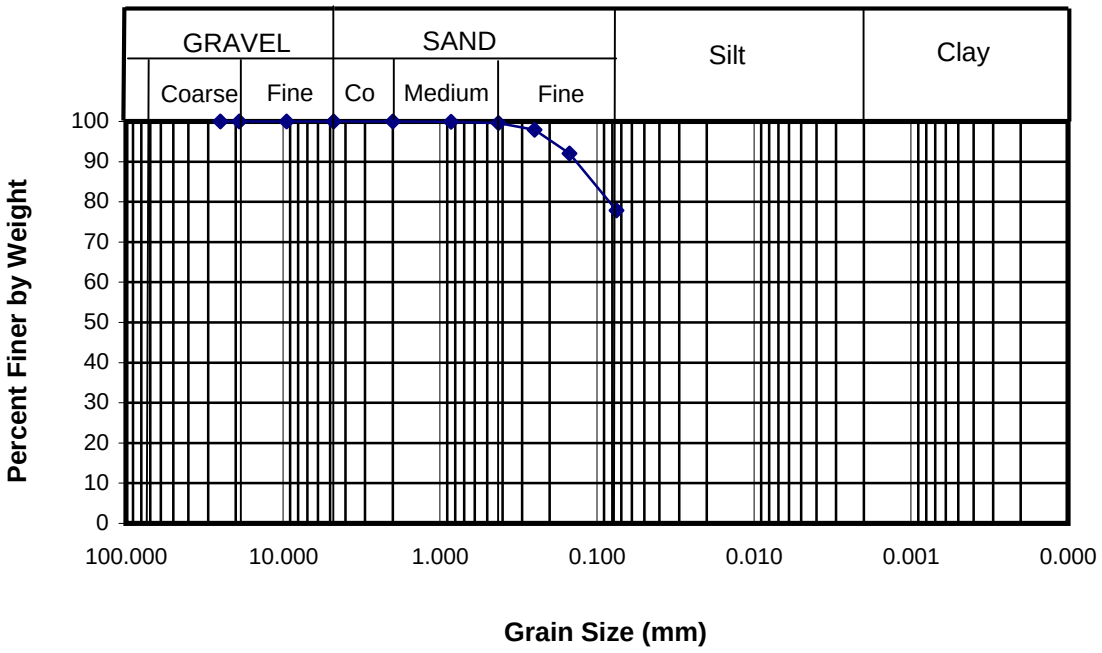
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-SB629-3438-07C
Sample Description:	Sandy CLAY (CL), Dark Gray, with Silt
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	100.0
20	99.9
40	99.6
60	98.0
100	92.1
200	77.9



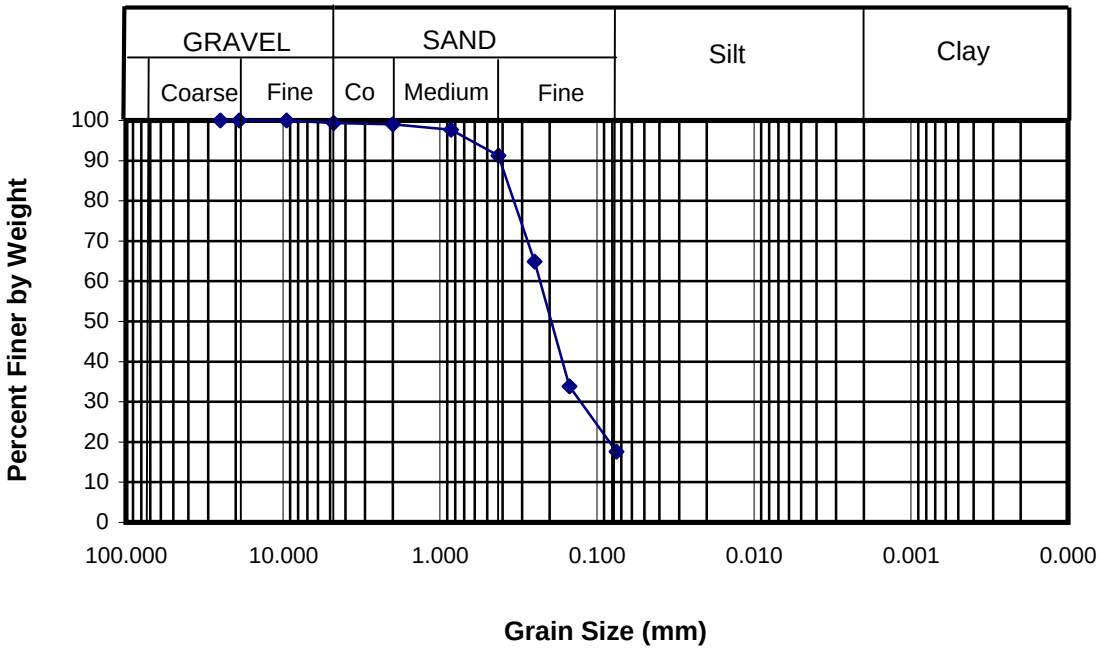
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-SB630-0612-07C
Sample Description:	Silty SAND (SM), Tan, mottled Orange, Fine to Medium, Trace Fine Gravel
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	99.4
10	99.0
20	97.7
40	91.2
60	64.9
100	33.9
200	17.6



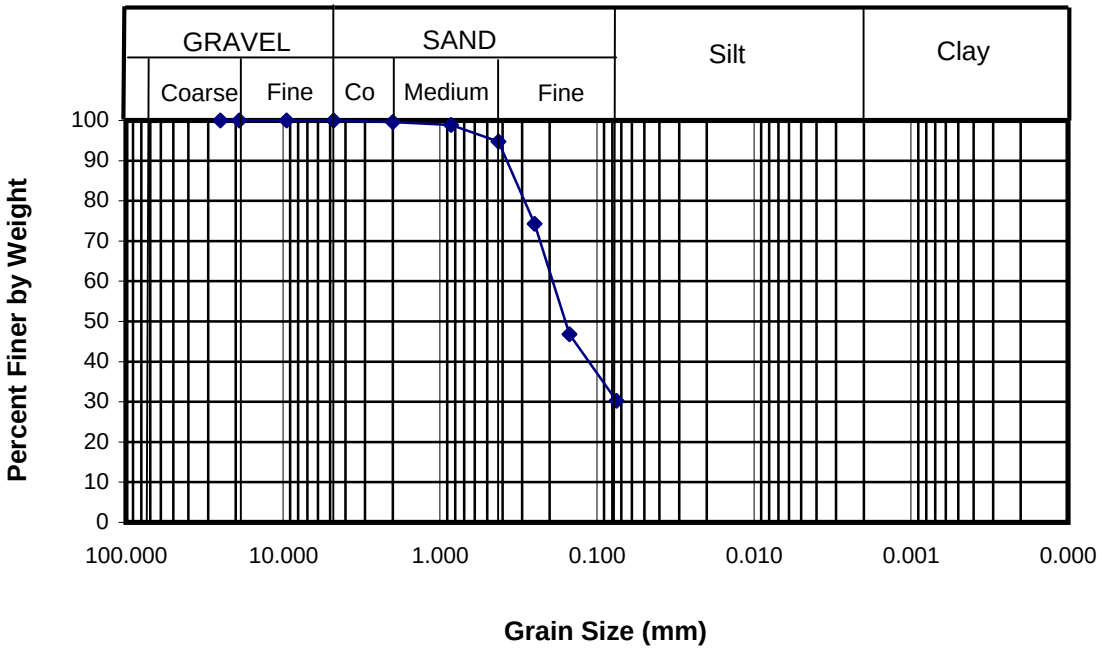
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name:	**CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
	Naval Amphibious Base Little Creek
Project Number:	345721.SI.FQ, Contract # N62470-02D-3052
Number:	4076-110-F
Sample Number:	LS11A-SB630-2028-07C
Sample Description:	Silty SAND (SM), Tan, mottled Orange, Fine to Medium, Trace Clay
Test Methods:	ASTM D 422, Particle-Size Analysis of Soils
	ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.6
20	98.8
40	94.7
60	74.3
100	46.8
200	30.2



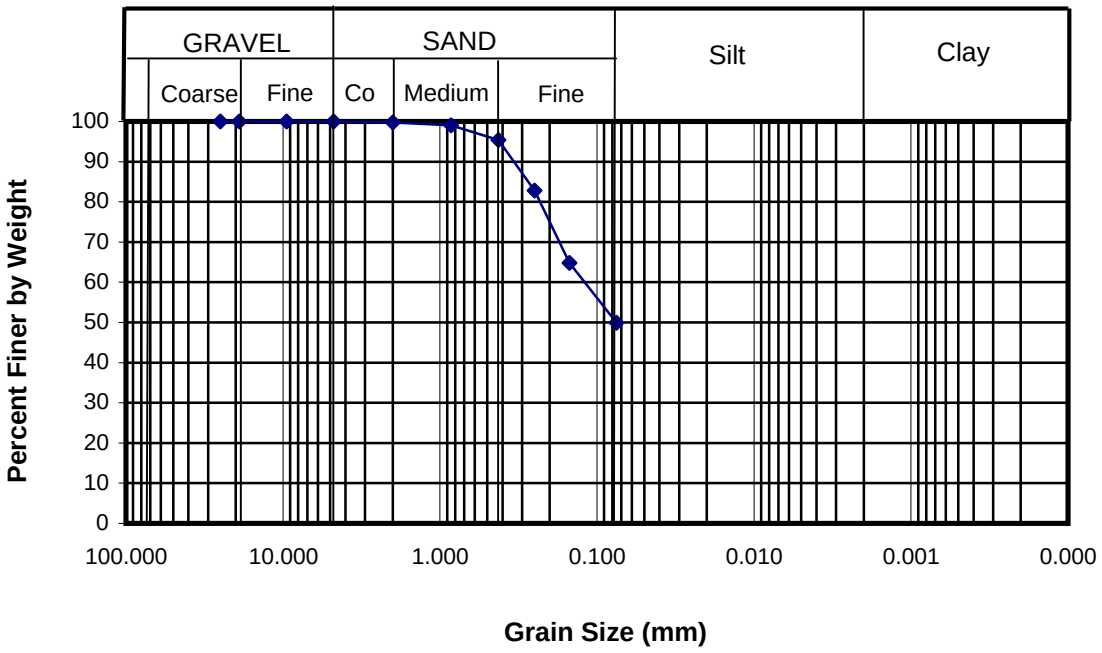
Engineering and Testing Consultants, Inc.

SIEVE ANALYSIS

Project Name: **CH2M HILL Laboratory Testing 2007, CTO-0125, Site 11a**
Naval Amphibious Base Little Creek
Project Number: 345721.SI.FQ, Contract # N62470-02D-3052
Number: 4076-110-F
Sample Number: LS11A-SB630-3438-07C
Sample Description: Clayey SAND (SC), Dark Gray, mottled Tan and Orange, Fine, with Silt
Test Methods: ASTM D 422, Particle-Size Analysis of Soils
ASTM D 2487, Classification of Soils for Engineering Purposes (USCS)

Sieve Analysis Data

SIEVE NO.	PERCENT PASSING
1 Inch	100.0
3/4 Inch	100.0
3/8 Inch	100.0
4	100.0
10	99.8
20	99.0
40	95.4
60	82.8
100	64.8
200	49.9



LABORATORY DATA SUMMARY

Project: CH2M Hill Laboratory Testing 2007
CTO-0125, Site 11
Naval Amphibious Base Little Creek, Virginia Beach, VA

CH2M Hill Project Number: 345721.SI.FQ
Navy CLEAN III Contract Number N62470-02D-3052

Number: 4076-110-F
Date: 10-29-07

SAMPLE NUMBER	DEPTH (FEET)	SAMPLE TYPE	CLASS. (USCS)	MOISTURE CONTENT (%)	PERCENT FINER THAN No. 200 SIEVE	TOTAL BULK DENSITY (pcf)	DRY BULK DENSITY (pcf)	SPECIFIC GRAVITY	TOTAL POROSITY (%)	WATER FILLED POROSITY (%)	AIR FILLED POROSITY (%)
LS11A-DW621-0509-07C	8	SLEEVE	SP	18.0	2.6	125.1	106.0	2.635	23.8	30.6	0.0
LS11A-SB627-0612-07C	N/S	BAG	SP	N/S	4.8	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB627-2028-07C	N/S	BAG	SM	N/S	20.4	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB627-3438-07C	N/S	BAG	CL	N/S	74.9	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB628-0612-07C	N/S	BAG	SM	N/S	15.7	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB628-2028-07C	N/S	BAG	SM	N/S	14.1	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB628-3438-07C	N/S	BAG	SC	N/S	45.2	N/S	N/S	N/S	N/S	N/S	N/S

etc.

References: ASTM D 2216, ASTM D 854, ASTM D 422, ATI RP40, ASTM D 2487

LABORATORY DATA SUMMARY

Project: CH2M Hill Laboratory Testing 2007
CTO-0125, Site 11
Naval Amphibious Base Little Creek, Virginia Beach, VA

CH2M Hill Project Number: 345721.SI.FQ
Navy CLEAN III Contract Number N62470-02D-3052

Number: 4076-110-F
Date: 10-29-07

SAMPLE NUMBER	DEPTH (FEET)	SAMPLE TYPE	CLASS. (USCS)	MOISTURE CONTENT (%)	PERCENT FINER THAN No. 200 SIEVE	TOTAL BULK DENSITY (pcf)	DRY BULK DENSITY (pcf)	SPECIFIC GRAVITY	TOTAL POROSITY (%)	WATER FILLED POROSITY (%)	AIR FILLED POROSITY (%)
LS11A-SB629-0612-07C	N/S	BAG	SP	N/S	3.7	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB629-2028-07C	N/S	BAG	SM	N/S	13.7	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB629-3438-07C	N/S	BAG	CL	N/S	77.9	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB630-0612-07C	N/S	BAG	SM	N/S	17.6	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB630-2028-07C	N/S	BAG	SM	N/S	30.2	N/S	N/S	N/S	N/S	N/S	N/S
LS11A-SB630-3438-07C	N/S	BAG	SC	N/S	49.9	N/S	N/S	N/S	N/S	N/S	N/S

etc.

References: ASTM D 2216, ASTM D 854, ASTM D 422, ATI RP40, ASTM D 2487

Microbial

2340 Stock Creek Blvd.
Rockford TN 37853-3044
Phone: (865) 573-8188
Fax: (865) 573-8133
Email: info@microbe.com

Lipid Analysis Report

Client:
CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, VA 23462

Phone: (757) 671-6208

Fax: (757) 497-6885

MI Identifier: 008EJ **Date Rec:** 10/03/2007 **Report Date:** 12/11/2007

Client Project #: 0125 **Client Project Name:** N6247002D3052

Purchase Order #: 924128

Analysis Requested: PLFA, CENSUS

Comments:

All samples within this data package were analyzed under U.S. EPA Good Laboratory Practice Standards: Toxic Substances Control Act (40 CFR part 790). All samples were processed according to standard operating procedures. Test results submitted in this data package meet the quality assurance requirements established by Microbial Insights, Inc.

Reported By:

Reviewed By:

NOTICE: This report is intended only for the addressee shown above and may contain confidential or privileged information. If the recipient of this material is not the intended recipient or if you have received this in error, please notify Microbial Insights, Inc. immediately. The data and other information in this report represent only the sample(s) analyzed and are rendered upon condition that it is not to be reproduced without approval from Microbial Insights, Inc. Thank you for your cooperation.

MICROBIAL INSIGHTS, INC.

2340 Stock Creek Blvd. Rockford, TN 37853-3044
Tel. (865) 573-8188 Fax. (865) 573-8133

PLFA

Client: **CH2M HILL**
Project: N6247002D3052

MI Project Number: **008EJ**
Date Received: 10/03/2007

Sample Information

Sample Name:	**LS11A-SB627-0612-07C**	**LS11A-SB627-2028-07C**	**LS11A-SB628-0612-07C**	**LS11A-SB628-2028-07C**	**LS11A-SB628P-2028-07C**
Sample Date:	10/02/2007	10/02/2007	10/02/2007	10/02/2007	10/02/2007
Sample Matrix:	Soil	Soil	Soil	Soil	Soil

Biomass

Total Biomass (cells/g)	**3.2E+05**	**3.33E+05**	**1.66E+06**	**7.15E+05**	**4.46E+06**

Community Structure (% total PLFA)

Firmicutes (TerBrSats)	**8.66**	**3.01**	**15.90**	**3.83**	**0.76**
Proteobacteria (Monos)	**30.80**	**30.72**	**32.77**	**15.90**	**43.12**
Anaerobic metal reducers (BrMonos)	**2.36**	**0.00**	**3.07**	**0.42**	**0.28**
SRB/Actinomycetes (MidBrSats)	**11.49**	**2.01**	**9.21**	**3.17**	**0.43**
General (Nsats)	**30.04**	**24.28**	**26.67**	**18.84**	**23.22**
Eukaryotes (polyenoics)	**16.66**	**39.99**	**12.40**	**57.85**	**32.18**

Physiological Status (Proteobacteria only)

Slowed Growth	**1.97**	**1.77**	**2.80**	**0.53**	**0.71**
Decreased Permeability	**0.46**	**0.00**	**0.21**	**0.00**	**0.00**

Legend:
NA = Not Analyzed NS = Not Sampled

MICROBIAL INSIGHTS, INC.

2340 Stock Creek Blvd. Rockford, TN 37853-3044
Tel. (865) 573-8188 Fax. (865) 573-8133

PLFA

Client: **CH2M HILL**
Project: N6247002D3052

MI Project Number: **008EJ**
Date Received: 10/03/2007

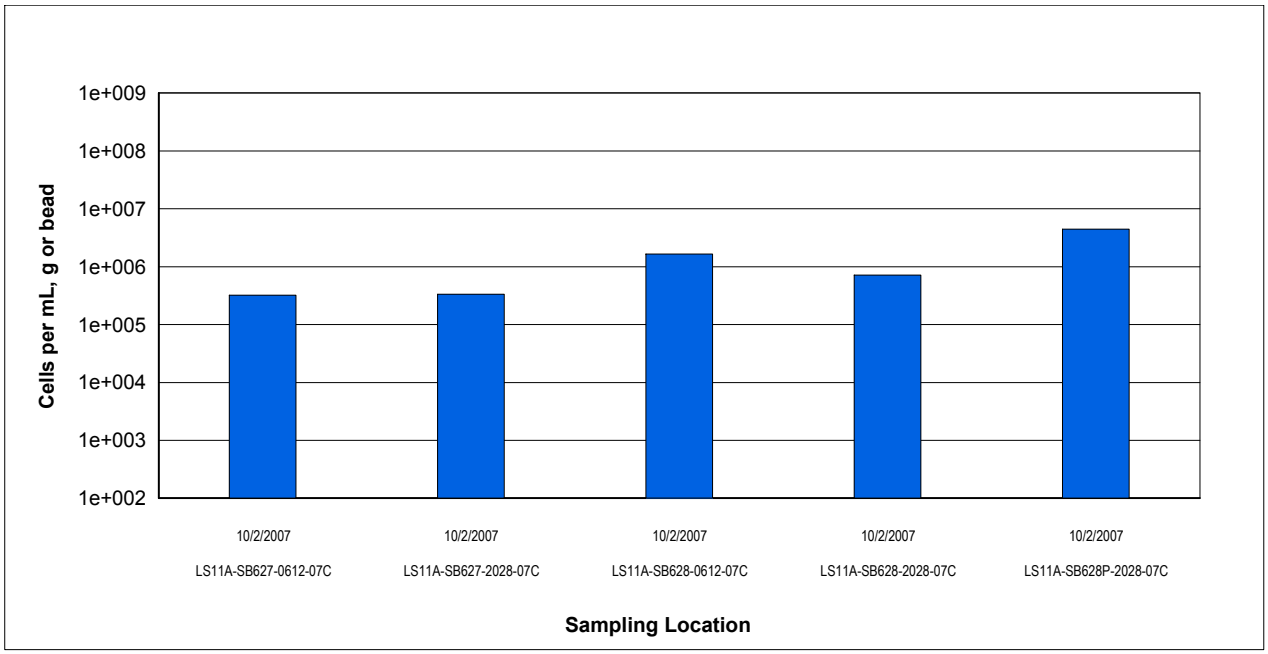


Figure 1. Biomass content is presented as a cell equivalent based on the total amount of phospholipid fatty acids (PLFA) extracted from a given sample. Total biomass is calculated based upon PLFA attributed to bacterial and eukaryotic biomass (associated with higher organisms).

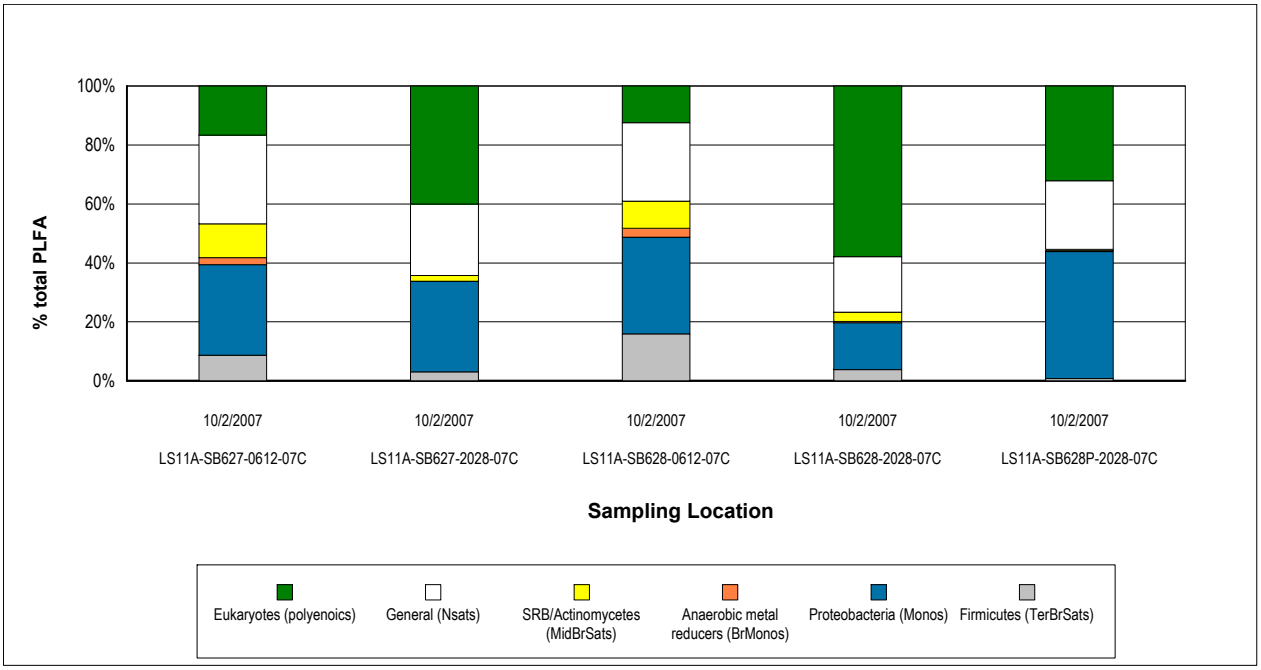


Figure 2. Relative percentages of total PLFA structural groups in the samples analyzed. Structural groups are assigned according to PLFA chemical structure, which is related to fatty acid biosynthesis.

MICROBIAL INSIGHTS, INC.

2340 Stock Creek Blvd. Rockford, TN 37853-3044
Tel. (865) 573-8188 Fax. (865) 573-8133

PLFA

Client: **CH2M HILL**
Project: N6247002D3052

MI Project Number: **008EJ**
Date Received: 10/03/2007

Sample Information

Sample Name:	**LS11A-SB629-0612-07C**	**LS11A-SB629-2028-07C**	**LS11A-SB630-0612-07C**	**LS11A-SB630-2028-07C**
Sample Date:	10/02/2007	10/02/2007	10/02/2007	10/02/2007
Sample Matrix:	Soil	Soil	Soil	Soil

Biomass

Total Biomass (cells/g)	**4.05E+05**	**7.33E+04**	**2.47E+06**	**4.39E+05**

Community Structure (% total PLFA)

Firmicutes (TerBrSats)	**8.03**	**0.00**	**7.23**	**6.04**
Proteobacteria (Monos)	**27.88**	**40.90**	**35.21**	**34.08**
Anaerobic metal reducers (BrMonos)	**1.08**	**0.00**	**0.58**	**0.76**
SRB/Actinomycetes (MidBrSats)	**11.85**	**9.54**	**3.10**	**5.19**
General (Nsats)	**31.54**	**46.53**	**23.70**	**30.65**
Eukaryotes (polyenoics)	**19.61**	**3.04**	**30.18**	**23.30**

Physiological Status (Proteobacteria only)

Slowed Growth	**3.25**	**2.56**	**4.12**	**1.79**
Decreased Permeability	**0.00**	**0.00**	**0.23**	**0.14**

Legend:
NA = Not Analyzed NS = Not Sampled

MICROBIAL INSIGHTS, INC.

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PLFA

Client: **CH2M HILL**
Project: N6247002D3052

MI Project Number: **008EJ**
Date Received: 10/03/2007

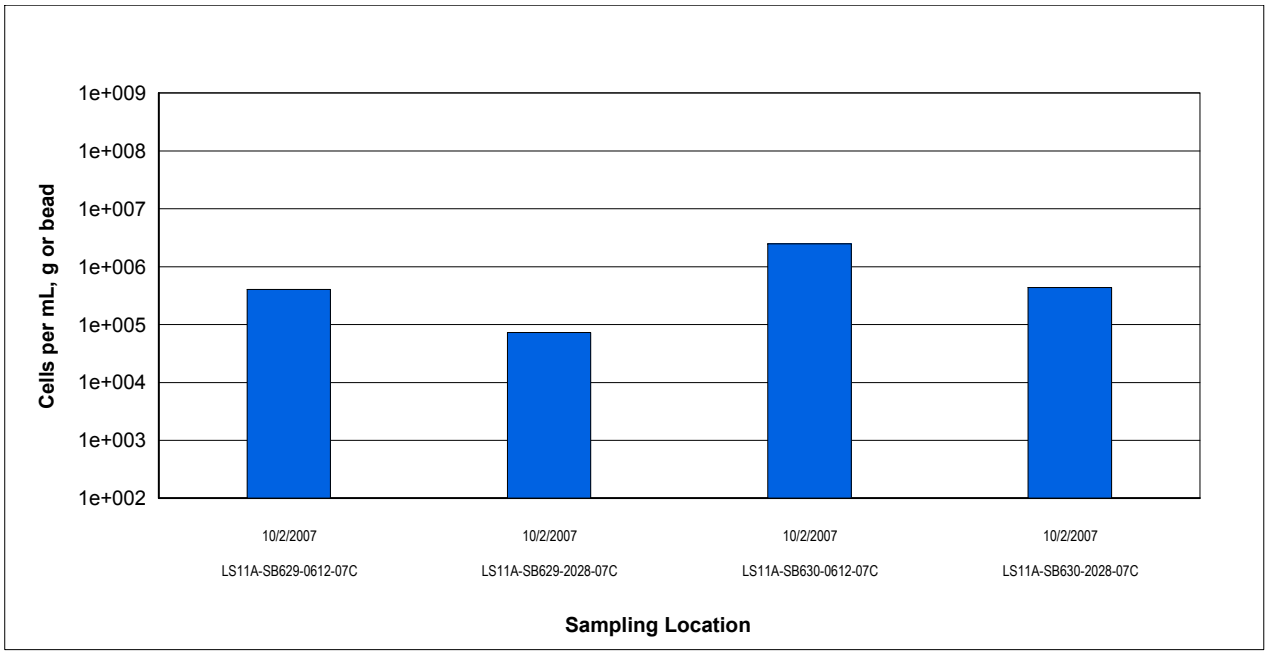

Figure 1. Biomass content is presented as a cell equivalent based on the total amount of phospholipid fatty acids (PLFA) extracted from a given sample. Total biomass is calculated based upon PLFA attributed to bacterial and eukaryotic biomass (associated with higher organisms).

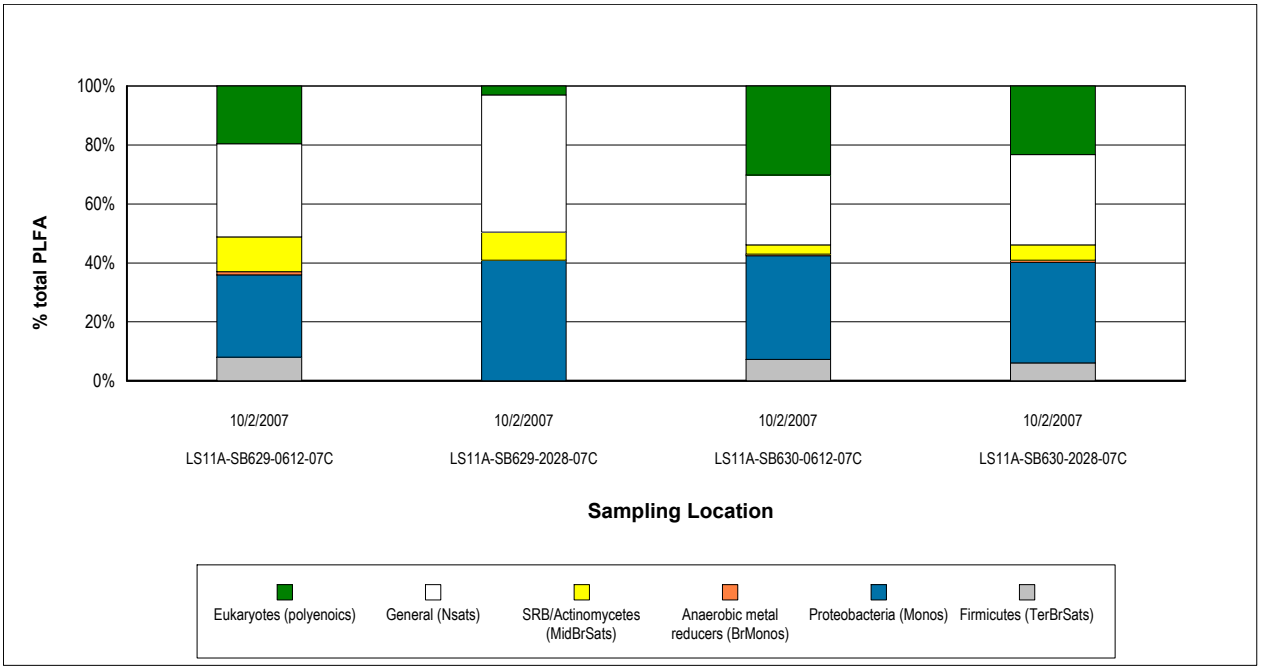

Figure 2. Relative percentages of total PLFA structural groups in the samples analyzed. Structural groups are assigned according to PLFA chemical structure, which is related to fatty acid biosynthesis.

MICROBIAL INSIGHTS, INC.

2340 Stock Creek Blvd. Rockford, TN 37853-3044
Tel. (865) 573-8188 Fax. (865) 573-8133

Q Potential (DNA)

Client: **CH2M HILL**
Project: N6247002D3052

MI Project Number: **008EJ**
Date Received: 10/03/2007

Sample Information

Client Sample ID:		**LS11A-SB627-0 612-07C**	**LS11A-SB627-2 028-07C**	**LS11A-SB628-0 612-07C**	**LS11A-SB628-2 028-07C**	**LS11A-SB628P-2028-07C**
Sample Date:		10/02/2007	10/02/2007	10/02/2007	10/02/2007	10/02/2007
Units:		cells/g	cells/g	cells/g	cells/g	cells/g
Dechlorinating Bacteria						
Dehalococcoides spp (1)	DHC	<5.43E+02	<5.87E+02	<7.15E+02	<6.08E+02	<5.12E+02
Functional Genes						
TCE R-Dase (1)	TCE	<5.43E+02	<5.87E+02	<7.15E+02	<6.08E+02	<5.12E+02
BAV1 VC R-Dase (1)	BVC	<5.43E+02	<5.87E+02	<7.15E+02	<6.08E+02	<5.12E+02
VC R-Dase	VCR	<5.43E+02	<5.87E+02	<7.15E+02	<6.08E+02	<5.12E+02

Legend:
NA = Not Analyzed NS = Not Sampled J = Estimated gene copies below PQL but above LQL I = Inhibited
< = Result not detected

Notes:
1 Bio-Dechlor Census technology was developed by Dr. Loeffler and colleagues at Georgia Institute of Technology and was licensed for use through Regenesis.

MICROBIAL INSIGHTS, INC.

2340 Stock Creek Blvd. Rockford, TN 37853-3044
Tel. (865) 573-8188 Fax. (865) 573-8133

Q Potential (DNA)

Client: **CH2M HILL**
Project: N6247002D3052

MI Project Number: **008EJ**
Date Received: 10/03/2007

Sample Information

Client Sample ID:		**LS11A-SB629-0 612-07C**	**LS11A-SB629-2 028-07C**	**LS11A-SB630-0 612-07C**	**LS11A-SB630-2 028-07C**
Sample Date:		10/02/2007	10/02/2007	10/02/2007	10/02/2007
Units:		cells/g	cells/g	cells/g	cells/g
Dechlorinating Bacteria					
Dehalococcoides spp (1)	DHC	<5.73E+02	**5.41E+02 (J)**	<5.01E+02	<5.69E+02
Functional Genes					
TCE R-Dase (1)	TCE	<5.73E+02	<6.84E+02	<5.01E+02	<5.69E+02
BAV1 VC R-Dase (1)	BVC	<5.73E+02	<6.84E+02	<5.01E+02	<5.69E+02
VC R-Dase	VCR	<5.73E+02	<6.84E+02	<5.01E+02	<5.69E+02

Legend:
NA = Not Analyzed NS = Not Sampled J = Estimated gene copies below PQL but above LQL I = Inhibited
< = Result not detected

Notes:
1 Bio-Dechlor Census technology was developed by Dr. Loeffler and colleagues at Georgia Institute of Technology and was licensed for use through Regenesis.

REPORT TO: CTO-125

Reports will be provided to the contact(s) listed below. Parties other than the contact(s) listed below will require prior approval.

Name: CHELSEA BENNETT
Company: CH2M HILL
Address: 5700 CLEVELAND ST #101
VA BEACH VA 23462
email: chelsea.bennet@ch2m.com
Phone: (757) 671 6208
Fax: (757) 497 6885

Project Manager: ADRIENNE JONES
Project Name: ~~LATE~~ LITTLE CREEK SITE 11A
Project No.: CTO-125

INVOICE TO:

For Invoices **paid by a third party** it is imperative that contact information & corresponding reference No. be provided.

Name: SAME
Company:
Address:
email:
Phone:
Fax:

Purchase Order No.
Subcontract No.

PAGE 1 of 2

microbialinsights
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Rockford, TN 37853-3044
phone (865) 573-8188
fax: (865) 573-8133
email: info@microbe.com
www.microbe.com

Please Check One:
☐ More samples to follow
☑ No Additional Samples

Saturday Delivery
Please see sampling protocol for instructions

Report Type: ☐ Standard (default) per contract ☐ Comprehensive (15% surcharge) ☐ Historical (30% surcharge)

Please contact us prior to submitting samples regarding questions about the analyses you are requesting at (865) 573-8188 (8:00 am to 4:00 pm M-F). After these hours please call (865) 300-8053.

Sample Information											CENSUS: Please select the target organism/gene																									
MI ID (Laboratory Use Only)	Sample Name	Date Sampled	Time Sampled	Matrix	PLFA	VFA	MEE	DGGE+RD	DGGE+RD		qDHC (Dehalococcoides)	DHC Functional genes	qDHB (Dehalobacter)	qDSM (Desulfuromonas)	qDSB (Desulfitobacterium)	qEBAC (Total)	qDSR (Sulfite red)	qDRB RB	qMGN (methanogens)	qMOB (methanotrophs)	qMF (Methylotrophs)	qNOB (ammonia oxidizing)	qNR1 (MTBE aerobic)	qTOD (Initial PAHs aerobic)	qCAT (Intermediate PAHs aerobic)	qBSS (Toluene/Xylene Anaerobic)	qNAH (Naphthalene aerobic)	16S qPCR	16S qPCR	16S qPCR	RNA Expression Options*	Other BAV1	Other	Other	Other
0845 1	LS11A-SB627-0612-07C	10/02	0845	SO	✓						✓																					✓				
2	LS11A-SB627-2028-07C	10/02	0915	SO	✓						✓																					✓				
3	LS11A-SB627-3438-07C	10/02	0952	SO	✓						✓																					✓				
4	LS11A-SB628-0612-07C		1110	SO	✓						✓																					✓				
5	LS11A-SB628-2028-07C		1130	SO	✓						✓								RUN	MS/MSD												✓				
6	LS11A-SB628-3438-07C		1210	SO	✓						✓																					✓				
7	LS11A-SB628-2028P-07C		1130	SO	✓						✓																					✓				
8	LS11A-SB629-0612-07C		1410	SO	✓						✓																					✓				
9	LS11A-SB629-2028-07C		1435	SO	✓						✓																					✓				
10	LS11A-SB629-3438-07C		1500	SO	✓						✓																					✓				

Relinquished by: [signature] Date: 10/02/07 Received by: Date

In order for analysis to be completed correctly, it is vital that chain of custody is filled out correctly & that all relative information is provided. Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable. *** additional cost and sample preservation are associated with RNA samples.**

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Page 2 of 2

CHAIN OF CUSTODY

~~CompuChem~~
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CTO-125

~~501 Madison Ave.~~
Cary, ~~NC 27513~~
Phone: 919-~~379-4100~~ Fax 919-379-4040

Courier
Airbill No.
Sampling Complete? Y or N

Client/Reporting Information	Project Information
Company Name: CH2M HILL	Project Name: NAB LITTLE CREEK
Address	Sampling Location: SITE 11a
City State Zip	Turnaround time
Project Contact	Batch QC or Project Specific? If Specific, which Sample ID?
Phone #	Are aqueous samples field filtered for metals? Y or N
Sampler's Name	Are high concentrations expected? Y or N? If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	PLFA	9DHC (Dehalococcoides)	BAV1	pH / Sample Info (Lab Use)
008EJ11	LS11A-SB630-0612-07C	10/2/07	1620	SO								✓	✓	✓	
12	LS11A-SB630-2028-07C		1640	SO								✓	✓	✓	
13	LS11A-SB630-2438-07C		1700	SO								✓	✓	✓	

Lab Use Only		Comments
Sample Unpacked By:	Cyanide samples checked for sulfide & chlorine? Y or NA	
Sample Order Entry By:	625 & Phenol samples checked for chlorine? Y or NA	
Samples Received in Good Condition? Y or N	608 samples checked for pH between 5.0-9.0? Y or NA	
If no, explain:		

Sample Custody

Relinquished by: [signature]	Date/Time: 10/02/07	Received by:	Date/Time:
Relinquished by:	Date/Time: 1843	Received by:	Date/Time:
Subcontact? Y or N If yes, where?	Custody Seal(s) intact? Y or N	On Ice? Y or N	Cooler Temp: °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

2340 Stock Creek Blvd.
Rockford TN 37853-3044
Phone: (865) 573-8188
Fax: (865) 573-8133
Email: info@microbe.com

Analytical Analysis Report

Client: Adrienne Jones
CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, VA 23462

Phone: (757) 518-9666

Fax: (757) 497-6885

MI Identifier: 022EJ **Date Rec:** 10/09/2007 **Report Date:** 12/11/2007

Client Project #: '0125 **Client Project Name:** N6247002D3052

Purchase Order #: 924128

Analysis Requested: VFA, MEE

Comments:

All samples within this data package were analyzed under U.S. EPA Good Laboratory Practice Standards: Toxic Substances Control Act (40 CFR part 790). All samples were processed according to standard operating procedures. Test results submitted in this data package meet the quality assurance requirements established by Microbial Insights, Inc.

Reported By:

Reviewed By:

NOTICE: This report is intended only for the addressee shown above and may contain confidential or privileged information. If the recipient of this material is not the intended recipient or if you have received this in error, please notify Microbial Insights, Inc. immediately. The data and other information in this report represent only the sample(s) analyzed and are rendered upon condition that it is not to be reproduced without approval from Microbial Insights, Inc. Thank you for your cooperation.

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Fax: (865) 573-8133
Email: info@microbe.com

Analysis Summary Report

Sample Name:	Date Sampled:	Date Received:	Arrival Condition:	Metabolic Acids (mg/L) Pyruvic	Lactic	Formic	Acetic	Propionic	Butyric
LS11A-MW39D-07C	10/08/2007	10/09/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW38D-07C	10/08/2007	10/09/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW37D-07C	10/09/2007	10/10/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW40D-07C	10/09/2007	10/10/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW36D-07C	10/09/2007	10/10/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW15D-07C	10/09/2007	10/10/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW16D-07C	10/10/2007	10/11/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW31D-07C	10/10/2007	10/11/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW32D-07C	10/10/2007	10/11/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW33D-07C	10/10/2007	10/11/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW22D-07C	10/11/2007	10/11/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW34D-07C	10/11/2007	10/11/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW35D-07C	10/12/2007	10/13/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW21D-07C	10/12/2007	10/13/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW20D-07C	10/12/2007	10/13/2007	Intact	<4	<1	<1	<1	<1	<1
LS11A-MW06D-07C	10/12/2007	10/13/2007	Intact	<4	<1	<1	<1	<1	<1

2340 Stock Creek Blvd.
Rockford TN 37853-3044
Phone: (865) 573-8188
Fax: (865) 573-8133
Email: info@microbe.com

Analysis Summary Report

Sample Name:	Date Sampled:	Date Received:	Arrival Condition:	Metabolic Gases (ug/L) Methane	Ethene	Ethane
LS11A-MW39D-07C	10/08/2007	10/09/2007	Intact	17.40	<2.92	<3.13
LS11A-MW38D-07C	10/08/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-TB100807	10/08/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW37D-07C	10/09/2007	10/09/2007	Intact	12.46	<2.92	<3.13
LS11A-MW40D-07C	10/09/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW36D-07C	10/09/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW15D-07C	10/09/2007	10/09/2007	Intact	53.50	<2.92	<3.13
LS11A-TB100907-07	10/09/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-TB 101007	10/10/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW16D-07C	10/10/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW31D-07C	10/10/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW32D-07C	10/10/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW33D-07C	10/10/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW22D-07C	10/11/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW34D-07C	10/11/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-TB101107	10/11/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW35D-07C	10/12/2007	10/09/2007	Intact	4.19	<2.92	<3.13
LS11A-MW21D-07C	10/12/2007	10/09/2007	Intact	37.65	<2.92	<3.13
LS11A-MW20D-07C	10/12/2007	10/09/2007	Intact	<1.67	<2.92	<3.13
LS11A-MW06D-07C	10/12/2007	10/09/2007	Intact	120.81	<2.92	<3.13
LS11A-TB101207	10/12/2007	10/09/2007	Intact	<1.67	<2.92	<3.13

MICROBIAL INSIGHTS, INC.

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Tel. (865) 573-8188 Fax. (865) 573-8133

Quality Control Report

Compound	MS Recovery %	MSD Recovery %	RPD %	LCS Recovery %
Pyruvic	105.7	107.2	1.4	100.0
Lactic	102.6	104.5	1.8	93.6
Formic	122.7	124.7	1.6	116.0
Acetic	100.8	101.3	0.5	98.7
Propionic	111.9	113.1	1.1	110.0
Butyric	97.7	98.8	1.1	98.3

REPORT TO:

Reports will be provided to the contact(s) listed below. Parties other than the contact(s) listed below will require prior approval.

Name: Chelsea Bennet
Company: CH2M HILL
Address: 5700 Cleveland St. Suite 101
Virginia Beach, VA 23462

email: chelsea.bennet@ch2m.com
Phone: (757) 671-6208
Fax: (757) 497-6805

Project Manager: Adrienne Jones
Project Name: Site 11A
Project No.:

INVOICE TO:

For Invoices **paid by a third party** it is imperative that contact information & corresponding reference No. be provided.

Name:
Company:
Address: Same

email:
Phone: ( )
Fax: ( )

Purchase Order No. CTO-125
Subcontract No.

microbialinsights
2340 Stock Creek Blvd.
Rockford, TN 37853-3044
phone (865) 573-8188
fax: (865) 573-8133
email: info@microbe.com
www.microbe.com

Please Check One:

☐ More samples to follow
☐ No Additional Samples

Saturday Delivery
Please see sampling protocol for instructions

Report Type: ☑ Standard (default) ☐ Comprehensive (15% surcharge) ☐ Historical (30% surcharge)

Please contact us prior to submitting samples regarding questions about the analyses you are requesting at (865) 573-8188 (8:00 am to 4:00 pm M-F). After these hours please call (865) 300-8053.

Sample Information / **Q-Targets:** Prior to selecting targets mark either Q-Potential for DNA or Q-Expression for RNA.

MI ID (Laboratory Use Only)	Sample Name	Date Sampled	Time Sampled	Matrix	PLFA	VFA	MBTE	0/0GE+3D	0/0GE+9D	Q-Potential (DNA)	Q-Expression (RNA)*	qBHC (Dehalococcoides)	qTCE R-Dase	qBAV1 VC R-Dase	qDHB (Dehalobacter)	qDSM (Desulfuromonas)	qDSB (Desulfitobacterium)	qEBAC (Total)	qDSR (SRBs only)	qSRB/RB	qMOM (methanogens)	qMOB (methanotrophs)	qDNF (Denitrifying)	qADB (ammonia oxidizing)	qPMI (MTBE aerobic)	qTOD (Initial PAHs aerobic)	qCAT (Intermediate PAHs aerobic)	qBSS (Toluene/Xylene Anaerobic)	qNAH (Naphthalene aerobic)	add qPCR	add qPCR	add qPCR	Other:	Other:	Other:
D22EJ1	LS11A-MW39D-07C	10-8-07	1237	GW		X	X																												
2	LS11A-MW38D-07C	10-8-07	1530	GW		X	X																												
3	LS11A-EB100807	10-8-07	1635	AQ		X	X																												
4	LS11A-TB100807	10-8-07	—	AQ			X																												

Relinquished by: Carol Peterson Date: 10/8/07 Received by: [illegible] Date: 10-9-07

In order for analysis to be completed correctly, it is vital that chain of custody is filled out correctly & that all relative information is provided. Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable. * additional cost and sample preservation are associated with RNA samples.

16620

Microbial Insights

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CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page ____ of ____

Courier
Airbill No.
Sampling Complete? Y or N

Client/Reporting Information	Project Information
Company Name: CH2M HILL	Project Name: NAB LITTLE CREEK
Address: 5700 CLEVELAND ST #101	Sampling Location: Site 11a
City: VA BEACH, VA State: VA Zip: 23462	Turnaround time: Std
Project Contact: CHELSEA BENNET	Batch QC or Project Specific? If Specific, which Sample ID?
Phone #: (757) 671 6208	Are aqueous samples field filtered for metals? Y or N
Sampler's Name: Shaun Whitworth/Carol Peterson	Are high concentrations expected? Y or N? If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	MEE	VFA	pH / Sample Info (Lab Use)
022EJ5	LS11A-MW37D-07C	10/3/07	0925	GW	4							2	2	
6	LS11A-MW40D-07C		1100	GW	4							2	2	
7	LS11A-MW36D-07C		1440	GW	4							2	2	
8	LS11A-MW15D-07C			GW	4							2	2	
9	LS11A-TB100307			TB	2							2		

Lab Use Only

Sample Unpacked By:
Sample Order Entry By:
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: Carol Peterson	Date/Time: 10/3/07	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

Subcontact? Y or N If yes, where?
Custody Seal(s) intact? Y or N
On Ice? Y or N
Cooler Temp: °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

CTO-125

16623

Microbial Insights

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CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Page 1 of 1

Courier FED EX
Airbill No.
Sampling Complete? Y or N

Client/Reporting Information	Project Information
Company Name: CH2M HILL	Project Name: NAB LITTLE CREEK
Address: 5700 CLEVELAND ST #101	Sampling Location: SITE 11a
City: VA BEACH State: VA Zip: 23462	Turnaround time: STD
Project Contact: CHELSEA BENNET	Batch QC or Project Specific? If Specific, which Sample ID?
Phone #: (757)671 6208	Are aqueous samples field filtered for metals? Y or N
Sampler's Name: SHAUN WHITWORTH / CAROL PETERSON	Are high concentrations expected? Y or N? If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	MEE	VFA	pH / Sample Info (Lab Use)
022EJ10	~~LS11~~ LS11A-TB101007	10/10/07		TB	2							2		
11	LS11-MW16D-07C	↓	1055	GW	4							2	2	
12	LS11-MW31D-07C	↓	1310	GW	4							2	2	
13	LS11-MW32D-07C	↓	1520	GW	4							2	2	
14	LS11-MW33D-07C	↓	1725	GW	4							2	2	

Lab Use Only

Sample Unpacked By:
Sample Order Entry By:
Samples Received in Good Condition? Y or N
If no, explain:

Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

Subcontact? Y or N If yes, where? | Custody Seal(s) intact? Y or N | On Ice? Y or N | Cooler Temp: °C

Samples stored 60 days after date report mailed at no extra charge.

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microbial insights

CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
Phone: 919-379-4100 Fax 919-379-4040

Courier: FedEx
Airbill No.
Sampling Complete? Y or N

Client/Reporting Information

Company Name: CH2M HILL
Address: 5700 CLEVELAND ST H 101
City: VA Beach State: VA Zip: 23462
Project Contact: Chelsea Bennet
Phone #: (757) 671-6228
Sampler's Name: Shaun Whitworth

Project Information

Project Name: NAB Little Creek
Sampling Location: Site 11a
Turnaround time: Std
Batch QC or Project Specific? If Specific, which Sample ID?
Are aqueous samples field filtered for metals? Y or N
Are high concentrations expected? Y or N? If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other	MEE	VFA	pH / Sample Info (Lab Use)
0226J 15	LS11-MW22D-07c	10/11/07	1090	GW	~~4~~ 12							6	6	Run QA/QC
16	LS11-MW34D-07c		1555	GW	4							2	2	
17	LS11-MW34DP-07c		1555	GW	4							2	2	
18	LS11A-FB101107		1710	O	4							2	2	
19	LS11A-TB101107		—	TB	2							2		

Lab Use Only

Sample Unpacked By:
Sample Order Entry By:
Samples Received in Good Condition? Y or N
If no, explain:
Cyanide samples checked for sulfide & chlorine? Y or NA
625 & Phenol samples checked for chlorine? Y or NA
608 samples checked for pH between 5.0-9.0? Y or NA

Comments

Sample Custody

Relinquished by: [signature]	Date/Time: 10/11/07	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:

Subcontact? Y or N If yes, where? | Custody Seal(s) intact? Y or N | On Ice? Y or N | Cooler Temp: °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

Microbial Insights

CTO 125

16629

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CHAIN OF CUSTODY

501 Madison Ave.
Cary, NC 27513
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Page 1 of 1

Courier
Airbill No.
Sampling Complete? Y or N

Client/Reporting Information	Project Information
Company Name: CH2M Hill	Project Name: NABIC Site 11a (345721)
Address: 5700 Cleveland St. Ste 101	Sampling Location: NABIC VA Beach, VA.
City: VA Beach State: VA Zip: 23462	Turnaround time: Standard
Project Contact: Chelsea Bennet	Batch QC or Project Specific? If Specific, which Sample ID?
Phone #: 757-671-6208	Are aqueous samples field filtered for metals? Y or N: NA
Sampler's Name: Shaun Whitcomb / Cecilia Cardin	Are high concentrations expected? Y or N? If yes, which ID(s)?

Matrices: GW - Ground water; WW - Waste water; SW - Surface water; SO - Soil/Sediment; TB - Trip Blank; RI - Rinsate; WP - Wipe; O - Other

CompuChem No (Lab Use)	Field ID	Collection Date	Collection Time	Matrix	# of bottles	HCl	NaOH	HNO3	H2SO4	MEOH	Other VOLE	VFAs	MEE	pH / Sample Info (Lab Use)
022EJ19	LSI-MW35D-07C	10/12	0910	GW	4						4	2	2	
20	LSI-MW35DP-07C	10/12	0915	GW	4						4	2	2	
21	LSI-MW21D-07C	10/12	1205	GW	3						3	1	2	
22	LSI-MW20D-07C	10/12	1510	GW	4						4	2	2	
23	LSI-MW016D-07C	10/12	1700	GW	4						4	2	2	
24	LSI-TB101207	10/12	—	O	2	2							2	

Lab Use Only		Comments
Sample Unpacked By:	Cyanide samples checked for sulfide & chlorine? Y or NA	
Sample Order Entry By:	625 & Phenol samples checked for chlorine? Y or NA	
Samples Received in Good Condition? Y or N	608 samples checked for pH between 5.0-9.0? Y or NA	
If no, explain:		

Sample Custody

Relinquished by: [signature]	Date/Time: 10/12/07 1825	Received by: [signature]	Date/Time: 10/13/07
Relinquished by:	Date/Time:	Received by:	Date/Time:
Subcontact? Y or N If yes, where?	Custody Seal(s) intact? Y or N	On Ice? Y or N	Cooler Temp: °C

Samples stored 60 days after date report mailed at no extra charge.

White & Yellow copy to lab • Pink copy for customer

NOD

Reaction Code	mass soil (g)	KMnO4 Conc. (init mg/L)	volume KMnO4 (mL)	Shaking (Constant, static, or manual 1/day)	Soil Code	Full Name
3A	16	5000	30	M	628-1	LS-11A-SB628-0612-07C
3B (replicate)	16	5000	30	M		
					628-2	LS-11A-SB628-2028-07C
6A	16	1000	30	M		
6B	16	1000	30	M	628-3	LS-11A-SB628-3438-07C
12A	32	5000	20	M	629-1	LS-11A-SB629-0612-07C
12B	32	5000	20	M		
					629-2	LS-11A-SB629-2028-07C
15A	32	1000	20	M		
15B	32	1000	20	M	629-3	LS-11A-SB629-3438-07C
					630-1	LS-11A-SB630-0612-07C
					630-2	LS-11A-SB630-2028-07C
					630-3	LS-11A-SB630-3438-07C

6/25/2007	Soil ID (and rxn cond'n)	525abs Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
		0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
	LS11A-SB628-0612-07C	0.952	0.971	0.958	0.961	0.951	0.954	0.949	0.939	0.933	0.933	0.926	0.937	0.935
	LS11A-SB628-0612-07C (Lab Duplicate)	0.963	0.975	0.962	0.958	0.942	0.946	0.952	0.929	0.934	0.93	0.93	0.979	0.948
	LS11A-SB628-2028-07C	0.948	0.956	0.955	0.954	0.944	0.941	0.956	0.935	0.942	0.933	0.939	0.954	0.942
	LS11A-SB628-2028-07C (Lab Duplicate)	0.961	0.982	0.961	0.952	0.953	0.954	0.944	0.942	0.945	0.946	0.942	0.954	0.948
	LS11A-SB628-3438-07C	0.849	0.779	0.725	0.663	0.576	0.374	0.209	0.119	0.024	0.007	0.01		
	LS11A-SB628-3438-07C (Lab Duplicate)	0.843	0.83	0.791	0.764	0.709	0.484	0.269	0.154	0.047	0.007	0.011		
	LS11A-SB629-0612-07C	0.953	0.978	0.972	0.967	0.955	0.942	0.942	0.936	0.932	0.923	0.917	0.923	0.918
	LS11A-SB629-0612-07C (Lab Duplicate)	0.974	0.994	0.978	0.97	0.967	0.951	0.952	0.927	0.939	0.925	0.926	0.931	0.935
	LS11A-SB629-2028-07C	0.978	0.975	0.97	0.974	0.957	0.945	0.948	0.916	0.926	0.927	0.925	0.93	0.932
	LS11A-SB629-2028-07C (Lab Duplicate)	0.972	0.98	0.972	0.976	0.959	0.945	0.94	0.923	0.928	0.926	0.918	0.932	0.926
	LS11A-SB629-3438-07C	0.969	0.985	0.956	0.971	0.941	0.86	0.813	0.792	0.773	0.758	0.734	0.735	0.705
	LS11A-SB629-3438-07C (Lab Duplicate)	0.976	0.988	0.978	0.959	0.946	0.925	0.849	0.828	0.82	0.795	0.786	0.729	0.754
	LS11A-SB630-0612-07C	0.968	0.978	0.977	0.954	0.961	0.949	0.935	0.927	0.941	0.929	0.921	0.929	0.918
	LS11A-SB630-0612-07C (Lab Duplicate)	0.958	0.975	0.958	0.951	0.964	0.942	0.931	0.925	0.932	0.924	0.913	0.933	0.919
	LS11A-SB630-2028-07C	0.977	0.991	0.989	0.984	0.976	0.938	0.925	0.908	0.914	0.891	0.882	0.886	0.871
	LS11A-SB630-2028-07C (Lab Duplicate)	0.98	0.985	0.98	0.974	0.96	0.949	0.931	0.91	0.906	0.903	0.892	0.905	0.891
	LS11A-SB630-3438-07C	0.969	0.932	0.877	0.815	0.741	0.635	0.555	0.507	0.451	0.408	0.372	0.333	0.267
	LS11A-SB630-3438-07C (Lab Duplicate)	0.98	0.935	0.862	0.801	0.72	0.584	0.499	0.445	0.397	0.356	0.32	0.279	0.211

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
LS11A-SB628-0612-07C	0.18	15.93	2.87	32.87	4564	4760
LS11A-SB628-0612-07C (Lab Duplicate)	0.18	16.17	2.91	32.91	4558	4815
LS11A-SB628-2028-07C	0.161	16.09	2.59	32.59	4603	4740
LS11A-SB628-2028-07C (Lab Duplicate)	0.161	15.91	2.56	32.56	4607	4805
LS11A-SB628-3438-07C	0.242	15.91	3.85	33.85	4431	4245
LS11A-SB628-3438-07C (Lab Duplicate)	0.242	16.15	3.91	33.91	4424	4215
LS11A-SB629-0612-07C	0.174	15.99	2.78	32.78	4576	4765
LS11A-SB629-0612-07C (Lab Duplicate)	0.174	16.05	2.79	32.79	4574	4870
LS11A-SB629-2028-07C	0.192	15.96	3.06	33.06	4537	4890
LS11A-SB629-2028-07C (Lab Duplicate)	0.192	16.13	3.10	33.10	4532	4860
LS11A-SB629-3438-07C	0.222	15.9	3.53	33.53	4474	4845
LS11A-SB629-3438-07C (Lab Duplicate)	0.222	16.01	3.55	33.55	4470	4880
LS11A-SB630-0612-07C	0.119	16.08	1.91	31.91	4700	4840
LS11A-SB630-0612-07C (Lab Duplicate)	0.119	16.04	1.91	31.91	4701	4790
LS11A-SB630-2028-07C	0.215	15.88	3.41	33.41	4489	4885
LS11A-SB630-2028-07C (Lab Duplicate)	0.215	16.02	3.44	33.44	4485	4900
LS11A-SB630-3438-07C	0.267	16.03	4.28	34.28	4376	4845
LS11A-SB630-3438-07C (Lab Duplicate)	0.267	16.15	4.31	34.31	4372	4900

Soil ID (and rxn cond'n)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution									
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
LS11A-SB628-0612-07C	4855	4790	4805	4755	4770	4745	4695	4665	4665	4630
LS11A-SB628-0612-07C (Lab Duplicate)	4875	4810	4790	4710	4730	4760	4645	4670	4650	4650
LS11A-SB628-2028-07C	4780	4775	4770	4720	4705	4780	4675	4710	4665	4695
LS11A-SB628-2028-07C (Lab Duplicate)	4910	4805	4760	4765	4770	4720	4710	4725	4730	4710
LS11A-SB628-3438-07C	3895	3625	3315	2880	1870	1045	595	120	35	50
LS11A-SB628-3438-07C (Lab Duplicate)	4150	3955	3820	3545	2420	1345	770	235	35	55
LS11A-SB629-0612-07C	4890	4860	4835	4775	4710	4710	4680	4660	4615	4585
LS11A-SB629-0612-07C (Lab Duplicate)	4970	4890	4850	4835	4755	4760	4635	4695	4625	4630
LS11A-SB629-2028-07C	4875	4850	4870	4785	4725	4740	4580	4630	4635	4625
LS11A-SB629-2028-07C (Lab Duplicate)	4900	4860	4880	4795	4725	4700	4615	4640	4630	4590
LS11A-SB629-3438-07C	4925	4780	4855	4705	4300	4065	3960	3865	3790	3670
LS11A-SB629-3438-07C (Lab Duplicate)	4940	4890	4795	4730	4625	4245	4140	4100	3975	3930
LS11A-SB630-0612-07C	4890	4885	4770	4805	4745	4675	4635	4705	4645	4605
LS11A-SB630-0612-07C (Lab Duplicate)	4875	4790	4755	4820	4710	4655	4625	4660	4620	4565
LS11A-SB630-2028-07C	4955	4945	4920	4880	4690	4625	4540	4570	4455	4410
LS11A-SB630-2028-07C (Lab Duplicate)	4925	4900	4870	4800	4745	4655	4550	4530	4515	4460
LS11A-SB630-3438-07C	4660	4385	4075	3705	3175	2775	2535	2255	2040	1860
LS11A-SB630-3438-07C (Lab Duplicate)	4675	4310	4005	3600	2920	2495	2225	1985	1780	1600

Soil ID (and rxn cond'n)			LN((mg/L)/(mg/L init.))						
	336	504	0	1	2	4	8	24	48
LS11A-SB628-0612-07C	4685	4675	0	0.019761	0.006283	0.009409	-0.001051	0.002099	-0.003156
LS11A-SB628-0612-07C (Lab Duplicate)	4895	4740	0	0.012384	-0.001039	-0.005206	-0.022048	-0.017811	-0.011488
LS11A-SB628-2028-07C	4770	4710	0	0.008403	0.007357	0.006309	-0.004228	-0.007411	0.008403
LS11A-SB628-2028-07C (Lab Duplicate)	4770	4740	0	0.021617	0	-0.009409	-0.00836	-0.007311	-0.017848
LS11A-SB628-3438-07C	0	0	0	-0.086048	-0.157888	-0.247284	-0.387952	-0.819803	-1.401725
LS11A-SB628-3438-07C (Lab Duplicate)	0	0	0	-0.015541	-0.063669	-0.098399	-0.173111	-0.554882	-1.142256
LS11A-SB629-0612-07C	4615	4590	0	0.025895	0.019741	0.014584	0.002096	-0.01161	-0.01161
LS11A-SB629-0612-07C (Lab Duplicate)	4655	4675	0	0.020326	0.004098	-0.004115	-0.007213	-0.023897	-0.022846
LS11A-SB629-2028-07C	4650	4660	0	-0.003072	-0.008214	-0.004098	-0.021706	-0.034325	-0.031155
LS11A-SB629-2028-07C (Lab Duplicate)	4660	4630	0	0.008197	0	0.004107	-0.013465	-0.028171	-0.033476
LS11A-SB629-3438-07C	3675	3525	0	0.016377	-0.013507	0.002062	-0.029321	-0.119332	-0.175534
LS11A-SB629-3438-07C (Lab Duplicate)	3645	3770	0	0.01222	0.002047	-0.017572	-0.03122	-0.053669	-0.139403
LS11A-SB630-0612-07C	4645	4590	0	0.010278	0.009255	-0.014568	-0.007258	-0.019823	-0.034686
LS11A-SB630-0612-07C (Lab Duplicate)	4665	4595	0	0.01759	0	-0.007334	0.006244	-0.016843	-0.028589
LS11A-SB630-2028-07C	4430	4355	0	0.014228	0.012208	0.007139	-0.001024	-0.040737	-0.054693
LS11A-SB630-2028-07C (Lab Duplicate)	4525	4455	0	0.005089	0	-0.006141	-0.020619	-0.032144	-0.051293
LS11A-SB630-3438-07C	1665	1335	0	-0.038932	-0.099758	-0.173076	-0.268264	-0.42264	-0.557296
LS11A-SB630-3438-07C (Lab Duplicate)	1395	1055	0	-0.047006	-0.128297	-0.201692	-0.308301	-0.517652	-0.674946

Soil ID (and rxn cond'n)	72	120	168	240	336	504	From 1 to 48h 1st order k (hr ^ -1)	R^2	avg
LS11A-SB628-0612-07C	-0.01375	-0.02016	-0.02016	-0.027691	-0.015882	-0.018019	-0.000307	0.46	-0.000303
LS11A-SB628-0612-07C (Lab Duplicate)	-0.035945	-0.030577	-0.034869	-0.034869	0.016478	-0.015699	-0.0003	0.20	
LS11A-SB628-2028-07C	-0.013808	-0.006349	-0.015949	-0.009539	0.006309	-0.006349	-1.94E-05	0.00	-0.000246
LS11A-SB628-2028-07C (Lab Duplicate)	-0.019969	-0.016789	-0.015732	-0.019969	-0.007311	-0.01362	-0.000473	0.41	
LS11A-SB628-3438-07C	-1.964936	-3.566005	-4.798149	-4.441474	#NUM!	#NUM!	-0.027292	0.99	-0.025496
LS11A-SB628-3438-07C (Lab Duplicate)	-1.700014	-2.886819	-4.791057	-4.339072	#NUM!	#NUM!	-0.0237	1.00	
LS11A-SB629-0612-07C	-0.017999	-0.022282	-0.031986	-0.038507	-0.031986	-0.037418	-0.000741	0.72	-0.000731
LS11A-SB629-0612-07C (Lab Duplicate)	-0.049458	-0.036596	-0.051618	-0.050537	-0.045152	-0.040865	-0.000721	0.63	
LS11A-SB629-2028-07C	-0.065493	-0.054635	-0.053556	-0.055716	-0.050325	-0.048177	-0.000611	0.66	-0.000733
LS11A-SB629-2028-07C (Lab Duplicate)	-0.051727	-0.046324	-0.048482	-0.057158	-0.042023	-0.048482	-0.000854	0.82	
LS11A-SB629-3438-07C	-0.201703	-0.225986	-0.245581	-0.277756	-0.276394	-0.318067	-0.004049	0.95	-0.003487
LS11A-SB629-3438-07C (Lab Duplicate)	-0.164449	-0.174158	-0.20512	-0.216506	-0.291789	-0.25807	-0.002925	0.96	
LS11A-SB630-0612-07C	-0.043279	-0.028289	-0.041123	-0.049772	-0.041123	-0.053035	-0.000825	0.76	-0.000799
LS11A-SB630-0612-07C (Lab Duplicate)	-0.035054	-0.027515	-0.036136	-0.048112	-0.026443	-0.041562	-0.000774	0.75	
LS11A-SB630-2028-07C	-0.073242	-0.066656	-0.092142	-0.102295	-0.09777	-0.114845	-0.001545	0.93	-0.001328
LS11A-SB630-2028-07C (Lab Duplicate)	-0.074108	-0.078513	-0.08183	-0.094086	-0.079618	-0.095208	-0.001112	0.91	
LS11A-SB630-3438-07C	-0.647754	-0.764797	-0.864997	-0.957371	-1.068122	-1.289016	-0.010185	0.90	-0.011306
LS11A-SB630-3438-07C (Lab Duplicate)	-0.789478	-0.903616	-1.012622	-1.119232	-1.256341	-1.535694	-0.012426	0.91	

Soil ID (and rxn cond'n)	st dev	From 48 to 336h 1st order k (hr ^ -1)	R^2	avg	st dev
LS11A-SB628-0612-07C	5.31E-06	-0.00004	0.75146	0.00003	0.000100617
LS11A-SB628-0612-07C (Lab Duplicate)		0.00010	0.40187		
LS11A-SB628-2028-07C	0.000321	0.00001	0.47055	0.00002	1.11852E-05
LS11A-SB628-2028-07C (Lab Duplicate)		0.00003	0.59265		
LS11A-SB628-3438-07C	0.00254				
LS11A-SB628-3438-07C (Lab Duplicate)					
LS11A-SB629-0612-07C	1.43E-05	-0.00008	0.97035	-0.00006	1.87428E-05
LS11A-SB629-0612-07C (Lab Duplicate)		-0.00005	0.40343		
LS11A-SB629-2028-07C	0.000172	-0.00002	0.14321	-0.00002	2.91304E-07
LS11A-SB629-2028-07C (Lab Duplicate)		-0.00002	0.27869		
LS11A-SB629-3438-07C	0.000795	-0.00035	0.96102	-0.00042	9.2279E-05
LS11A-SB629-3438-07C (Lab Duplicate)		-0.00048	0.94242		
LS11A-SB630-0612-07C	3.56E-05	-0.00003	0.00231	-0.00002	1.40061E-05
LS11A-SB630-0612-07C (Lab Duplicate)		-0.00001	0.16446		
LS11A-SB630-2028-07C	0.000306	-0.00015	0.72694	-0.00012	4.76828E-05
LS11A-SB630-2028-07C (Lab Duplicate)		-0.00008	0.68352		
LS11A-SB630-3438-07C	0.001585	-0.00172	0.98774	-0.00183	0.000148883
LS11A-SB630-3438-07C (Lab Duplicate)		-0.00193	0.97719		

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
LS11A-SB628-0612-07C	156.45	159.57	157.43	157.93	156.28	156.78	155.96	154.31	153.33	153.33	152.18	153.98	153.66
LS11A-SB628-0612-07C (Lab Duplicate)	158.46	160.44	158.30	157.64	155.01	155.67	156.65	152.87	153.69	153.03	153.03	161.10	156.00
LS11A-SB628-2028-07C	154.48	155.78	155.62	155.46	153.83	153.34	155.78	152.36	153.50	152.03	153.01	155.46	153.50
LS11A-SB628-2028-07C (Lab Duplicate)	156.46	159.88	156.46	154.99	155.16	155.32	153.69	153.36	153.85	154.02	153.36	155.32	154.34
LS11A-SB628-3438-07C	143.69	131.85	122.71	112.21	97.49	63.30	35.37	20.14	4.06	1.18	1.69	0.00	0.00
LS11A-SB628-3438-07C (Lab Duplicate)	142.92	140.72	134.11	129.53	120.20	82.06	45.61	26.11	7.97	1.19	1.86	0.00	0.00
LS11A-SB629-0612-07C	156.21	160.31	159.32	158.50	156.54	154.40	154.40	153.42	152.77	151.29	150.31	151.29	150.47
LS11A-SB629-0612-07C (Lab Duplicate)	159.70	162.98	160.36	159.04	158.55	155.93	156.09	151.99	153.96	151.67	151.83	152.65	153.31
LS11A-SB629-2028-07C	161.68	161.19	160.36	161.02	158.21	156.23	156.72	151.43	153.09	153.25	152.92	153.75	154.08
LS11A-SB629-2028-07C (Lab Duplicate)	160.85	162.18	160.85	161.51	158.70	156.38	155.56	152.74	153.57	153.24	151.92	154.23	153.24
LS11A-SB629-3438-07C	162.45	165.13	160.27	162.79	157.76	144.18	136.30	132.78	129.59	127.08	123.05	123.22	118.19
LS11A-SB629-3438-07C (Lab Duplicate)	163.74	165.76	164.08	160.89	158.71	155.19	142.44	138.91	137.57	133.38	131.87	122.31	126.50
LS11A-SB630-0612-07C	154.46	156.06	155.90	152.23	153.34	151.43	149.20	147.92	150.15	148.24	146.96	148.24	146.48
LS11A-SB630-0612-07C (Lab Duplicate)	152.84	155.56	152.84	151.73	153.80	150.29	148.54	147.58	148.69	147.42	145.66	148.85	146.62
LS11A-SB630-2028-07C	163.23	165.57	165.23	164.40	163.06	156.71	154.54	151.70	152.70	148.86	147.36	148.02	145.52
LS11A-SB630-2028-07C (Lab Duplicate)	163.88	164.71	163.88	162.87	160.53	158.69	155.68	152.17	151.50	151.00	149.16	151.34	148.99
LS11A-SB630-3438-07C	166.09	159.74	150.32	139.69	127.01	108.84	95.13	86.90	77.30	69.93	63.76	57.08	45.76
LS11A-SB630-3438-07C (Lab Duplicate)	168.13	160.41	147.88	137.42	123.52	100.19	85.61	76.34	68.11	61.08	54.90	47.87	36.20

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4/kg media (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
LS11A-SB628-0612-07C	11977	12216	12052	12090	11964	12002	11939	11813	11738	11738	11650	11788	11763
LS11A-SB628-0612-07C (Lab Duplicate)	11951	12100	11939	11889	11690	11740	11815	11529	11591	11542	11542	12150	11765
LS11A-SB628-2028-07C	11443	11540	11528	11516	11395	11359	11540	11286	11371	11262	11335	11516	11371
LS11A-SB628-2028-07C (Lab Duplicate)	11721	11977	11721	11611	11623	11636	11514	11489	11526	11538	11489	11636	11562
LS11A-SB628-3438-07C	11915	10933	10175	9305	8084	5249	2933	1670	337	98	140	0	0
LS11A-SB628-3438-07C (Lab Duplicate)	11675	11495	10955	10581	9819	6703	3726	2133	651	97	152	0	0
LS11A-SB629-0612-07C	11827	12137	12063	12001	11852	11690	11690	11616	11566	11455	11380	11455	11393
LS11A-SB629-0612-07C (Lab Duplicate)	12046	12294	12096	11997	11960	11762	11774	11465	11613	11440	11453	11514	11564
LS11A-SB629-2028-07C	12538	12499	12435	12487	12269	12115	12153	11743	11871	11884	11858	11923	11948
LS11A-SB629-2028-07C (Lab Duplicate)	12342	12443	12342	12393	12177	11999	11935	11720	11783	11758	11656	11834	11758
LS11A-SB629-3438-07C	13133	13349	12956	13160	12753	11655	11018	10734	10476	10273	9948	9961	9555
LS11A-SB629-3438-07C (Lab Duplicate)	13146	13308	13173	12917	12742	12459	11435	11153	11045	10708	10587	9819	10156
LS11A-SB630-0612-07C	10903	11016	11005	10746	10824	10689	10532	10441	10599	10464	10374	10464	10340
LS11A-SB630-0612-07C (Lab Duplicate)	10816	11008	10816	10737	10884	10635	10511	10443	10522	10432	10308	10534	10376
LS11A-SB630-2028-07C	13094	13282	13255	13188	13081	12571	12397	12169	12250	11941	11821	11874	11673
LS11A-SB630-2028-07C (Lab Duplicate)	13031	13098	13031	12951	12765	12619	12380	12100	12047	12007	11861	12034	11848
LS11A-SB630-3438-07C	14135	13595	12793	11889	10809	9263	8096	7396	6579	5952	5426	4858	3895
LS11A-SB630-3438-07C (Lab Duplicate)	14203	13550	12492	11608	10435	8464	7232	6449	5753	5159	4638	4043	3058

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
LS11A-SB628-0612-07C	0	-239	-75	-113	13	-25	38	164	239	239	327	189	214
LS11A-SB628-0612-07C (Lab Duplicate)	0	-149	12	62	261	211	137	422	360	410	410	-199	186
LS11A-SB628-2028-07C	0	-97	-84	-72	48	84	-97	157	72	181	109	-72	72
LS11A-SB628-2028-07C (Lab Duplicate)	0	-256	0	110	98	85	207	232	195	183	232	85	159
LS11A-SB628-3438-07C	0	982	1740	2610	3831	6666	8982	10245	11578	11817	11775	11915	11915
LS11A-SB628-3438-07C (Lab Duplicate)	0	180	720	1094	1856	4972	7950	9542	11024	11578	11523	11675	11675
LS11A-SB629-0612-07C	0	-310	-236	-174	-25	137	137	211	261	372	447	372	434
LS11A-SB629-0612-07C (Lab Duplicate)	0	-247	-49	49	87	284	272	581	433	606	594	532	482
LS11A-SB629-2028-07C	0	38	103	51	269	423	385	795	667	654	679	615	590
LS11A-SB629-2028-07C (Lab Duplicate)	0	-102	0	-51	165	343	406	622	559	584	686	508	584
LS11A-SB629-3438-07C	0	-217	176	-27	379	1477	2114	2399	2656	2860	3185	3171	3578
LS11A-SB629-3438-07C (Lab Duplicate)	0	-162	-27	229	404	687	1711	1993	2101	2438	2559	3327	2990
LS11A-SB630-0612-07C	0	-113	-101	158	79	214	372	462	304	439	529	439	563
LS11A-SB630-0612-07C (Lab Duplicate)	0	-192	0	79	-68	181	305	373	294	384	508	282	440
LS11A-SB630-2028-07C	0	-188	-161	-94	13	523	697	925	844	1153	1273	1220	1421
LS11A-SB630-2028-07C (Lab Duplicate)	0	-66	0	80	266	412	652	931	984	1024	1170	997	1183
LS11A-SB630-3438-07C	0	540	1342	2246	3326	4872	6039	6739	7556	8183	8709	9277	10240
LS11A-SB630-3438-07C (Lab Duplicate)	0	652	1710	2594	3768	5739	6971	7753	8449	9043	9565	10159	11145

6/25/2007	Soil ID (and rxn cond'n)	525abs Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
		0	1	2	4	8	24	48	72	120	168	216	336	504
	LS11A-SB628-0612-07C	0.38	0.379	0.379	0.379	0.37	0.375	0.371	0.358	0.354	0.356	0.358	0.361	0.351
	LS11A-SB628-0612-07C (Lab Duplicate)	0.378	0.386	0.391	0.379	0.375	0.362	0.371	0.355	0.349	0.343	0.144	0.348	0.344
	LS11A-SB628-2028-07C	0.375	0.382	0.38	0.375	0.37	0.368	0.373	0.358	0.354	0.35	0.191	0.361	0.353
	LS11A-SB628-2028-07C (Lab Duplicate)	0.38	0.382	0.385	0.376	0.38	0.372	0.38	0.355	0.354	0.349	0.358	0.359	0.36
	LS11A-SB628-3438-07C	0.325	0.296	0.279	0.258	0.216	0.071	0.01						
	LS11A-SB628-3438-07C (Lab Duplicate)	0.304	0.285	0.247	0.232	0.204	0.052	0.013						
	LS11A-SB629-0612-07C	0.39	0.388	0.378	0.374	0.381	0.367	0.363	0.346	0.344	0.22	0.343	0.329	0.318
	LS11A-SB629-0612-07C (Lab Duplicate)	0.386	0.387	0.384	0.388	0.374	0.366	0.367	0.347	0.347	0.341	0.345	0.328	0.324
	LS11A-SB629-2028-07C	0.38	0.382	0.374	0.369	0.371	0.366	0.363	0.356	0.36	0.355	0.339	0.351	0.346
	LS11A-SB629-2028-07C (Lab Duplicate)	0.383	0.384	0.378	0.37	0.378	0.372	0.375	0.356	0.36	0.36	0.359	0.355	0.359
	LS11A-SB629-3438-07C	0.393	0.383	0.375	0.348	0.339	0.276	0.24	0.223	0.184	0.151	0.138	0.1	0.074
	LS11A-SB629-3438-07C (Lab Duplicate)	0.394	0.396	0.384	0.371	0.373	0.325	0.289	0.277	0.233	0.209	0.196	0.16	0.147
	LS11A-SB630-0612-07C	0.381	0.38	0.387	0.378	0.376	0.368	0.375	0.364	0.357	0.354	0.347	0.346	0.348
	LS11A-SB630-0612-07C (Lab Duplicate)	0.382	0.378	0.382	0.374	0.376	0.367	0.373	0.358	0.357	0.357	0.349	0.347	0.349
	LS11A-SB630-2028-07C	0.393	0.396	0.389	0.38	0.383	0.349	0.343	0.334	0.323	0.319	0.303	0.297	0.291
	LS11A-SB630-2028-07C (Lab Duplicate)	0.397	0.397	0.387	0.366	0.372	0.321	0.296	0.283	0.25	0.222	0.202	0.17	0.144
	LS11A-SB630-3438-07C	0.379	0.351	0.311	0.262	0.22	0.125	0.085	0.058					
	LS11A-SB630-3438-07C (Lab Duplicate)	0.387	0.356	0.258	0.197	0.134	0.082	0.049	0.041					

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water (mL)	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
LS11A-SB628-0612-07C	0.18	16	2.88	32.88	912	950
LS11A-SB628-0612-07C (Lab Duplicate)	0.18	16.1	2.90	32.90	912	945
LS11A-SB628-2028-07C	0.161	16	2.58	32.58	921	938
LS11A-SB628-2028-07C (Lab Duplicate)	0.161	16.02	2.58	32.58	921	950
LS11A-SB628-3438-07C	0.242	16.04	3.88	33.88	885	813
LS11A-SB628-3438-07C (Lab Duplicate)	0.242	15.96	3.86	33.86	886	760
LS11A-SB629-0612-07C	0.174	15.94	2.77	32.77	915	975
LS11A-SB629-0612-07C (Lab Duplicate)	0.174	15.89	2.76	32.76	916	965
LS11A-SB629-2028-07C	0.192	16	3.07	33.07	907	950
LS11A-SB629-2028-07C (Lab Duplicate)	0.192	16.05	3.08	33.08	907	958
LS11A-SB629-3438-07C	0.222	15.84	3.52	33.52	895	983
LS11A-SB629-3438-07C (Lab Duplicate)	0.222	15.93	3.54	33.54	895	985
LS11A-SB630-0612-07C	0.119	16.1	1.92	31.92	940	953
LS11A-SB630-0612-07C (Lab Duplicate)	0.119	16.08	1.91	31.91	940	955
LS11A-SB630-2028-07C	0.215	15.86	3.41	33.41	898	983
LS11A-SB630-2028-07C (Lab Duplicate)	0.215	15.95	3.43	33.43	897	993
LS11A-SB630-3438-07C	0.267	16.15	4.31	34.31	874	948
LS11A-SB630-3438-07C (Lab Duplicate)	0.267	16.06	4.29	34.29	875	968

Soil ID (and rxn cond'n)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution									
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**216**
LS11A-SB628-0612-07C	948	948	948	925	938	928	895	885	890	895
LS11A-SB628-0612-07C (Lab Duplicate)	965	978	948	938	905	928	888	873	858	360
LS11A-SB628-2028-07C	955	950	938	925	920	933	895	885	875	478
LS11A-SB628-2028-07C (Lab Duplicate)	955	963	940	950	930	950	888	885	873	895
LS11A-SB628-3438-07C	740	698	645	540	178	25	0	0	0	0
LS11A-SB628-3438-07C (Lab Duplicate)	713	618	580	510	130	33	0	0	0	0
LS11A-SB629-0612-07C	970	945	935	953	918	908	865	860	550	858
LS11A-SB629-0612-07C (Lab Duplicate)	968	960	970	935	915	918	868	868	853	863
LS11A-SB629-2028-07C	955	935	923	928	915	908	890	900	888	848
LS11A-SB629-2028-07C (Lab Duplicate)	960	945	925	945	930	938	890	900	900	898
LS11A-SB629-3438-07C	958	938	870	848	690	600	558	460	378	345
LS11A-SB629-3438-07C (Lab Duplicate)	990	960	928	933	813	723	693	583	523	490
LS11A-SB630-0612-07C	950	968	945	940	920	938	910	893	885	868
LS11A-SB630-0612-07C (Lab Duplicate)	945	955	935	940	918	933	895	893	893	873
LS11A-SB630-2028-07C	990	973	950	958	873	858	835	808	798	758
LS11A-SB630-2028-07C (Lab Duplicate)	993	968	915	930	803	740	708	625	555	505
LS11A-SB630-3438-07C	878	778	655	550	313	213	145	0	0	0
LS11A-SB630-3438-07C (Lab Duplicate)	890	645	493	335	205	123	103	0	0	0

Soil ID (and rxn cond'n)			LN((mg/L)/(mg/L init.))						
	336	**504**	**0**	**1**	**2**	**4**	**8**	**24**	**48**
LS11A-SB628-0612-07C	903	878	0	-0.002635	-0.002635	-0.002635	-0.026668	-0.013245	-0.023969
LS11A-SB628-0612-07C (Lab Duplicate)	870	860	0	0.020943	0.033813	0.002642	-0.007968	-0.04325	-0.018692
LS11A-SB628-2028-07C	903	883	0	0.018495	0.013245	0	-0.013423	-0.018843	-0.005348
LS11A-SB628-2028-07C (Lab Duplicate)	898	900	0	0.005249	0.013072	-0.010582	0	-0.021277	0
LS11A-SB628-3438-07C	0	0	0	-0.093466	-0.152613	-0.230866	-0.408547	-1.521145	-3.48124
LS11A-SB628-3438-07C (Lab Duplicate)	0	0	0	-0.064539	-0.207639	-0.27029	-0.398908	-1.765784	-3.152078
LS11A-SB629-0612-07C	823	795	0	-0.005141	-0.031253	-0.041891	-0.023347	-0.060785	-0.071744
LS11A-SB629-0612-07C (Lab Duplicate)	820	810	0	0.002587	-0.005195	0.005168	-0.031582	-0.053204	-0.050476
LS11A-SB629-2028-07C	878	865	0	0.005249	-0.015915	-0.029375	-0.023969	-0.037538	-0.045768
LS11A-SB629-2028-07C (Lab Duplicate)	888	898	0	0.002608	-0.013141	-0.034532	-0.013141	-0.029141	-0.021109
LS11A-SB629-3438-07C	250	185	0	-0.025775	-0.046884	-0.121607	-0.14781	-0.353409	-0.493171
LS11A-SB629-3438-07C (Lab Duplicate)	400	368	0	0.005063	-0.025708	-0.060149	-0.054772	-0.192526	-0.309924
LS11A-SB630-0612-07C	865	870	0	-0.002628	0.015625	-0.007905	-0.01321	-0.034716	-0.015873
LS11A-SB630-0612-07C (Lab Duplicate)	868	873	0	-0.010526	0	-0.021165	-0.015831	-0.040059	-0.023842
LS11A-SB630-2028-07C	743	728	0	0.007605	-0.01023	-0.033638	-0.025775	-0.118738	-0.136079
LS11A-SB630-2028-07C (Lab Duplicate)	425	360	0	0	-0.025512	-0.081303	-0.065042	-0.212495	-0.293577
LS11A-SB630-3438-07C	0	0	0	-0.07675	-0.197743	-0.369192	-0.543909	-1.109222	-1.494885
LS11A-SB630-3438-07C (Lab Duplicate)	0	0	0	-0.083494	-0.405465	-0.675221	-1.060585	-1.551705	-2.066604

Soil ID (and rxn cond'n)	72	120	168	216	336	504	From 1 to 48h 1st order k (hr ^ -1)	R^2	avg
LS11A-SB628-0612-07C	-0.059638	-0.070874	-0.065241	-0.059638	-0.051293	-0.079385	-0.000387	0.41	-0.000698
LS11A-SB628-0612-07C (Lab Duplicate)	-0.062776	-0.079822	-0.097164	-0.965081	-0.082692	-0.094253	-0.001009	0.45	
LS11A-SB628-2028-07C	-0.046393	-0.057629	-0.068993	-0.674653	-0.038048	-0.060458	-0.000403	0.26	-0.000297
LS11A-SB628-2028-07C (Lab Duplicate)	-0.068053	-0.070874	-0.085099	-0.059638	-0.056849	-0.054067	-0.000191	0.08	
LS11A-SB628-3438-07C	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.072101	0.99	-0.069356
LS11A-SB628-3438-07C (Lab Duplicate)	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.066611	0.99	
LS11A-SB629-0612-07C	-0.119708	-0.125505	-0.572519	-0.128416	-0.170089	-0.204095	-0.001132	0.73	-0.001158
LS11A-SB629-0612-07C (Lab Duplicate)	-0.106513	-0.106513	-0.123955	-0.112293	-0.162824	-0.175094	-0.001183	0.68	
LS11A-SB629-2028-07C	-0.065241	-0.054067	-0.068053	-0.114171	-0.079385	-0.093732	-0.000762	0.62	-0.0005
LS11A-SB629-2028-07C (Lab Duplicate)	-0.073104	-0.061931	-0.061931	-0.064713	-0.075917	-0.064713	-0.000239	0.11	
LS11A-SB629-3438-07C	-0.566638	-0.758874	-0.95653	-1.046556	-1.368639	-1.669745	-0.009807	0.95	-0.008124
LS11A-SB629-3438-07C (Lab Duplicate)	-0.352333	-0.525312	-0.634017	-0.698236	-0.901177	-0.985918	-0.00644	0.97	
LS11A-SB630-0612-07C	-0.045646	-0.065064	-0.073502	-0.093475	-0.096361	-0.090597	-0.0005	0.31	-0.000459
LS11A-SB630-0612-07C (Lab Duplicate)	-0.064888	-0.067685	-0.067685	-0.090349	-0.096096	-0.090349	-0.000418	0.33	
LS11A-SB630-2028-07C	-0.162669	-0.196157	-0.208619	-0.260077	-0.280077	-0.300486	-0.003018	0.87	-0.00452
LS11A-SB630-2028-07C (Lab Duplicate)	-0.338489	-0.462475	-0.581259	-0.675669	-0.848138	-1.014123	-0.006022	0.93	
LS11A-SB630-3438-07C	-1.877093	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.029173	0.94	-0.033311
LS11A-SB630-3438-07C (Lab Duplicate)	-2.244853	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.037448	0.87	

Soil ID (and rxn cond'n)	st dev	From 48 to 336h 1st order k (hr ^ -1)	R^2	avg	st dev
LS11A-SB628-0612-07C	0.00044	-0.00004	0.06	-0.00054	0.00071189
LS11A-SB628-0612-07C (Lab Duplicate)		-0.00104	0.09		
LS11A-SB628-2028-07C	0.00015	-0.00068	0.08	-0.00039	0.000414194
LS11A-SB628-2028-07C (Lab Duplicate)		-0.00009	0.11		
LS11A-SB628-3438-07C	0.003882				
LS11A-SB628-3438-07C (Lab Duplicate)					
LS11A-SB629-0612-07C	3.58E-05	-0.00032	0.03	-0.00031	1.85044E-05
LS11A-SB629-0612-07C (Lab Duplicate)		-0.00030	0.75		
LS11A-SB629-2028-07C	0.00037	-0.00014	0.38	-0.00013	2.11095E-05
LS11A-SB629-2028-07C (Lab Duplicate)		-0.00011	0.35		
LS11A-SB629-3438-07C	0.002381	-0.00306	0.99	-0.00257	0.00070169
LS11A-SB629-3438-07C (Lab Duplicate)		-0.00207	0.97		
LS11A-SB630-0612-07C	5.83E-05	-0.00026	0.79	-0.00023	3.73186E-05
LS11A-SB630-0612-07C (Lab Duplicate)		-0.00020	0.72		
LS11A-SB630-2028-07C	0.002124	-0.00050	0.92	-0.00124	0.00104013
LS11A-SB630-2028-07C (Lab Duplicate)		-0.00197	0.98		
LS11A-SB630-3438-07C	0.005851				
LS11A-SB630-3438-07C (Lab Duplicate)					

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	1	2	4	8	24	48	72	120	168	216	336	504
LS11A-SB628-0612-07C	31.24	31.15	31.15	31.15	30.41	30.83	30.50	29.43	29.10	29.26	29.43	29.67	28.85
LS11A-SB628-0612-07C (Lab Duplicate)	31.09	31.75	32.16	31.17	30.84	29.77	30.51	29.20	28.70	28.21	11.84	28.62	28.29
LS11A-SB628-2028-07C	30.54	31.11	30.95	30.54	30.13	29.97	30.38	29.16	28.83	28.50	15.56	29.40	28.75
LS11A-SB628-2028-07C (Lab Duplicate)	30.95	31.11	31.36	30.62	30.95	30.30	30.95	28.91	28.83	28.43	29.16	29.24	29.32
LS11A-SB628-3438-07C	27.53	25.07	23.63	21.85	18.30	6.01	0.85	0.00	0.00	0.00	0.00	0.00	0.00
LS11A-SB628-3438-07C (Lab Duplicate)	25.74	24.13	20.91	19.64	17.27	4.40	1.10	0.00	0.00	0.00	0.00	0.00	0.00
LS11A-SB629-0612-07C	31.95	31.79	30.97	30.64	31.22	30.07	29.74	28.35	28.19	18.03	28.10	26.96	26.05
LS11A-SB629-0612-07C (Lab Duplicate)	31.62	31.70	31.45	31.78	30.64	29.98	30.06	28.42	28.42	27.93	28.26	26.87	26.54
LS11A-SB629-2028-07C	31.42	31.58	30.92	30.51	30.67	30.26	30.01	29.43	29.76	29.35	28.03	29.02	28.61
LS11A-SB629-2028-07C (Lab Duplicate)	31.68	31.76	31.26	30.60	31.26	30.77	31.01	29.44	29.77	29.77	29.69	29.36	29.69
LS11A-SB629-3438-07C	32.93	32.09	31.42	29.16	28.41	23.13	20.11	18.69	15.42	12.65	11.56	8.38	6.20
LS11A-SB629-3438-07C (Lab Duplicate)	33.03	33.20	32.20	31.11	31.27	27.25	24.23	23.22	19.53	17.52	16.43	13.41	12.32
LS11A-SB630-0612-07C	30.40	30.32	30.88	30.16	30.00	29.36	29.92	29.04	28.48	28.25	27.69	27.61	27.77
LS11A-SB630-0612-07C (Lab Duplicate)	30.48	30.16	30.48	29.84	30.00	29.28	29.76	28.56	28.48	28.48	27.84	27.68	27.84
LS11A-SB630-2028-07C	32.83	33.08	32.49	31.74	31.99	29.15	28.65	27.90	26.98	26.64	25.31	24.81	24.31
LS11A-SB630-2028-07C (Lab Duplicate)	33.18	33.18	32.34	30.59	31.09	26.83	24.74	23.65	20.89	18.55	16.88	14.21	12.03
LS11A-SB630-3438-07C	32.51	30.11	26.68	22.47	18.87	10.72	7.29	4.98	0.00	0.00	0.00	0.00	0.00
LS11A-SB630-3438-07C (Lab Duplicate)	33.17	30.52	22.12	16.89	11.49	7.03	4.20	3.51	0.00	0.00	0.00	0.00	0.00

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4/kg media (corrected for W.C.)											
	0	1	2	4	8	24	48	72	120	168	216	336	504
LS11A-SB628-0612-07C	2381	2375	2375	2375	2318	2349	2324	2243	2218	2230	2243	2262	2199
LS11A-SB628-0612-07C (Lab Duplicate)	2355	2405	2436	2361	2336	2255	2311	2212	2174	2137	897	2168	2143
LS11A-SB628-2028-07C	2275	2317	2305	2275	2245	2233	2263	2172	2148	2123	1159	2190	2142
LS11A-SB628-2028-07C (Lab Duplicate)	2303	2315	2333	2278	2303	2254	2303	2151	2145	2115	2169	2175	2182
LS11A-SB628-3438-07C	2264	2062	1944	1797	1505	495	70	0	0	0	0	0	0
LS11A-SB628-3438-07C (Lab Duplicate)	2127	1994	1728	1623	1428	364	91	0	0	0	0	0	0
LS11A-SB629-0612-07C	2427	2414	2352	2327	2371	2284	2259	2153	2141	1369	2134	2047	1979
LS11A-SB629-0612-07C (Lab Duplicate)	2409	2415	2396	2421	2334	2284	2290	2166	2166	2128	2153	2047	2022
LS11A-SB629-2028-07C	2430	2443	2392	2360	2373	2341	2322	2277	2302	2270	2168	2245	2213
LS11A-SB629-2028-07C (Lab Duplicate)	2443	2449	2411	2360	2411	2372	2392	2270	2296	2296	2289	2264	2289
LS11A-SB629-3438-07C	2672	2604	2550	2366	2305	1877	1632	1516	1251	1027	938	680	503
LS11A-SB629-3438-07C (Lab Duplicate)	2665	2679	2598	2510	2523	2199	1955	1874	1576	1414	1326	1082	994
LS11A-SB630-0612-07C	2143	2138	2177	2126	2115	2070	2109	2048	2008	1991	1952	1946	1958
LS11A-SB630-0612-07C (Lab Duplicate)	2151	2129	2151	2106	2118	2067	2101	2016	2011	2011	1966	1954	1966
LS11A-SB630-2028-07C	2637	2657	2610	2549	2569	2341	2301	2241	2167	2140	2033	1993	1952
LS11A-SB630-2028-07C (Lab Duplicate)	2650	2650	2583	2443	2483	2143	1976	1889	1669	1482	1348	1135	961
LS11A-SB630-3438-07C	2746	2543	2254	1899	1594	906	616	420	0	0	0	0	0
LS11A-SB630-3438-07C (Lab Duplicate)	2818	2592	1879	1434	976	597	357	299	0	0	0	0	0

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**216**	**336**	**504**
LS11A-SB628-0612-07C	0	6	6	6	63	31	56	138	163	150	138	119	182
LS11A-SB628-0612-07C (Lab Duplicate)	0	-50	-81	-6	19	100	44	143	181	218	1458	187	212
LS11A-SB628-2028-07C	0	-42	-30	0	30	42	12	103	127	152	1116	85	133
LS11A-SB628-2028-07C (Lab Duplicate)	0	-12	-30	24	0	48	0	151	158	188	133	127	121
LS11A-SB628-3438-07C	0	202	320	467	759	1770	2195	2264	2264	2264	2264	2264	2264
LS11A-SB628-3438-07C (Lab Duplicate)	0	133	399	504	700	1763	2036	2127	2127	2127	2127	2127	2127
LS11A-SB629-0612-07C	0	12	75	100	56	143	168	274	286	1058	292	380	448
LS11A-SB629-0612-07C (Lab Duplicate)	0	-6	12	-12	75	125	119	243	243	281	256	362	387
LS11A-SB629-2028-07C	0	-13	38	70	58	90	109	153	128	160	262	185	217
LS11A-SB629-2028-07C (Lab Duplicate)	0	-6	32	83	32	70	51	172	147	147	153	179	153
LS11A-SB629-3438-07C	0	68	122	306	367	796	1040	1156	1421	1645	1734	1992	2169
LS11A-SB629-3438-07C (Lab Duplicate)	0	-14	68	156	142	467	710	791	1089	1252	1339	1583	1671
LS11A-SB630-0612-07C	0	6	-34	17	28	73	34	96	135	152	191	197	186
LS11A-SB630-0612-07C (Lab Duplicate)	0	23	0	45	34	84	51	135	141	141	186	197	186
LS11A-SB630-2028-07C	0	-20	27	87	67	295	335	396	470	496	604	644	684
LS11A-SB630-2028-07C (Lab Duplicate)	0	0	67	207	167	507	674	761	981	1168	1302	1515	1689
LS11A-SB630-3438-07C	0	203	493	848	1152	1841	2130	2326	2746	2746	2746	2746	2746
LS11A-SB630-3438-07C (Lab Duplicate)	0	226	939	1384	1842	2221	2461	2519	2818	2818	2818	2818	2818

6/25/2007	Soil ID	525abs	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
	(and rxn cond'n)	Time (hrs)												
		0	1	2	4	8	24	48	72	120	168	240	360	528
	LS11A-SB628-0612-07C	0.814	0.812	0.8	0.814	0.799	0.797	0.789	0.777	0.767	0.763	0.751	0.76	0.746
	LS11A-SB628-0612-07C (Lab Duplicate)	0.812	0.817	0.795	0.808	0.802	0.786	0.775	0.761	0.745	0.735	0.719	0.721	0.703
	LS11A-SB628-2028-07C	0.823	0.834	0.821	0.822	0.825	0.806	0.805	0.789	0.789	0.792	0.788	0.788	0.791
	LS11A-SB628-2028-07C (Lab Duplicate)	0.821	0.83	0.815	0.818	0.814	0.792	0.791	0.783	0.776	0.771	0.764	0.772	0.764
	LS11A-SB628-3438-07C	0.529	0.472	0.399	0.378	0.294	0.006	0.008						
	LS11A-SB628-3438-07C (Lab Duplicate)	0.456	0.369	0.336	0.296	0.217	0.006	0.011						
	LS11A-SB629-0612-07C	0.83	0.834	0.814	0.817	0.794	0.774	0.764	0.742	0.711	0.703	0.687	0.669	0.652
	LS11A-SB629-0612-07C (Lab Duplicate)	0.825	0.838	0.816	0.824	0.812	0.801	0.786	0.763	0.739	0.72	0.715	0.718	0.685
	LS11A-SB629-2028-07C	0.817	0.831	0.804	0.811	0.81	0.779	0.778	0.771	0.761	0.756	0.742	0.752	0.745
	LS11A-SB629-2028-07C (Lab Duplicate)	0.841	0.849	0.829	0.841	0.834	0.803	0.787	0.782	0.758	0.76	0.746	0.754	0.751
	LS11A-SB629-3438-07C	0.779	0.789	0.736	0.751	0.713	0.462	0.321	0.387	0.319	0.278	0.252	0.203	0.132
	LS11A-SB629-3438-07C (Lab Duplicate)	0.821	0.801	0.787	0.784	0.761	0.5	0.456	0.242	0.156	0.104	0.071	0.031	0.003
	LS11A-SB630-0612-07C	0.847	0.846	0.839	0.842	0.833	0.815	0.808	0.785	0.778	0.778	0.761	0.751	0.736
	LS11A-SB630-0612-07C (Lab Duplicate)	0.824	0.823	0.815	0.811	0.811	0.79	0.785	0.783	0.748	0.742	0.732	0.751	0.712
	LS11A-SB630-2028-07C	0.866	0.866	0.835	0.854	0.834	0.785	0.757	0.738	0.724	0.713	0.697	0.689	0.666
	LS11A-SB630-2028-07C (Lab Duplicate)	0.849	0.842	0.823	0.834	0.812	0.773	0.744	0.743	0.706	0.703	0.692	0.678	0.657
	LS11A-SB630-3438-07C	0.793	0.743	0.714	0.688	0.634	0.284	0.124	0.04					
	LS11A-SB630-3438-07C (Lab Duplicate)	0.841	0.791	0.763	0.75	0.685	0.302	0.13	0.038					

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water (mL)	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
LS11A-SB628-0612-07C	0.18	32.22	5.80	25.80	3876	4070
LS11A-SB628-0612-07C (Lab Duplicate)	0.18	32.16	5.79	25.79	3878	4060
LS11A-SB628-2028-07C	0.161	32.02	5.16	25.16	3975	4115
LS11A-SB628-2028-07C (Lab Duplicate)	0.161	32.12	5.17	25.17	3973	4105
LS11A-SB628-3438-07C	0.242	32.09	7.77	27.77	3602	2645
LS11A-SB628-3438-07C (Lab Duplicate)	0.242	32.02	7.75	27.75	3604	2280
LS11A-SB629-0612-07C	0.174	32.05	5.58	25.58	3910	4150
LS11A-SB629-0612-07C (Lab Duplicate)	0.174	31.91	5.55	25.55	3914	4125
LS11A-SB629-2028-07C	0.192	32.05	6.15	26.15	3824	4085
LS11A-SB629-2028-07C (Lab Duplicate)	0.192	32	6.14	26.14	3825	4205
LS11A-SB629-3438-07C	0.222	31.95	7.09	27.09	3691	3895
LS11A-SB629-3438-07C (Lab Duplicate)	0.222	31.98	7.10	27.10	3690	4105
LS11A-SB630-0612-07C	0.119	32.09	3.82	23.82	4198	4235
LS11A-SB630-0612-07C (Lab Duplicate)	0.119	31.85	3.79	23.79	4203	4120
LS11A-SB630-2028-07C	0.215	31.91	6.86	26.86	3723	4330
LS11A-SB630-2028-07C (Lab Duplicate)	0.215	31.89	6.86	26.86	3724	4245
LS11A-SB630-3438-07C	0.267	32.03	8.55	28.55	3502	3965
LS11A-SB630-3438-07C (Lab Duplicate)	0.267	31.85	8.50	28.50	3508	4205

cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution

1	2	4	8	24	48	72	120	168	240	360	528
4060	4000	4070	3995	3985	3945	3885	3835	3815	3755	3800	3730
4085	3975	4040	4010	3930	3875	3805	3725	3675	3595	3605	3515
4170	4105	4110	4125	4030	4025	3945	3945	3960	3940	3940	3955
4150	4075	4090	4070	3960	3955	3915	3880	3855	3820	3860	3820
2360	1995	1890	1470	30	40	0	0	0	0	0	0
1845	1680	1480	1085	30	55	0	0	0	0	0	0
4170	4070	4085	3970	3870	3820	3710	3555	3515	3435	3345	3260
4190	4080	4120	4060	4005	3930	3815	3695	3600	3575	3590	3425
4155	4020	4055	4050	3895	3890	3855	3805	3780	3710	3760	3725
4245	4145	4205	4170	4015	3935	3910	3790	3800	3730	3770	3755
3945	3680	3755	3565	2310	1605	1935	1595	1390	1260	1015	660
4005	3935	3920	3805	2500	2280	1210	780	520	355	155	15
4230	4195	4210	4165	4075	4040	3925	3890	3890	3805	3755	3680
4115	4075	4055	4055	3950	3925	3915	3740	3710	3660	3755	3560
4330	4175	4270	4170	3925	3785	3690	3620	3565	3485	3445	3330
4210	4115	4170	4060	3865	3720	3715	3530	3515	3460	3390	3285
3715	3570	3440	3170	1420	620	200	0	0	0	0	0
3955	3815	3750	3425	1510	650	190	0	0	0	0	0

LN((mg/L)/(mg/L init.))

0	1	2	4	8	24	48	72	120	168	240	360	528
0	-0.00246	-0.017349	0	-0.018599	-0.021106	-0.031194	-0.04652	-0.059474	-0.064702	-0.080555	-0.068642	-0.087235
0	0.006139	-0.021158	-0.004938	-0.012392	-0.032544	-0.046637	-0.064867	-0.086116	-0.09963	-0.121639	-0.118861	-0.144143
0	0.013277	-0.002433	-0.001216	0.002427	-0.020872	-0.022114	-0.04219	-0.04219	-0.038395	-0.043458	-0.043458	-0.039658
0	0.010903	-0.007335	-0.003661	-0.008563	-0.035962	-0.037225	-0.04739	-0.056371	-0.062835	-0.071955	-0.061539	-0.071955
0	-0.114009	-0.282027	-0.336094	-0.587409	-4.479229	-4.191547	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	-0.211696	-0.305382	-0.432133	-0.742595	-4.330733	-3.724598	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	0.004808	-0.019465	-0.015787	-0.044342	-0.069854	-0.082858	-0.112076	-0.154753	-0.166069	-0.189091	-0.215642	-0.241381
0	0.015635	-0.010969	-0.001213	-0.015883	-0.029522	-0.048427	-0.078125	-0.110085	-0.136132	-0.143101	-0.138914	-0.185965
0	0.016991	-0.01604	-0.007371	-0.008605	-0.047628	-0.048913	-0.057951	-0.071006	-0.077598	-0.09629	-0.082903	-0.092255
0	0.009468	-0.014372	0	-0.008358	-0.046237	-0.066363	-0.072737	-0.103908	-0.101273	-0.119866	-0.109199	-0.113186
0	0.012755	-0.056781	-0.036605	-0.08853	-0.522446	-0.88657	-0.699586	-0.89282	-1.03039	-1.128582	-1.344805	-1.775209
0	-0.024662	-0.042295	-0.046114	-0.07589	-0.495915	-0.58803	-1.221585	-1.660667	-2.066132	-2.447843	-3.276536	-5.611911
0	-0.001181	-0.00949	-0.005921	-0.016667	-0.038513	-0.047139	-0.076017	-0.084974	-0.084974	-0.107067	-0.120295	-0.140471
0	-0.001214	-0.010982	-0.015902	-0.015902	-0.042138	-0.048487	-0.051038	-0.096768	-0.104821	-0.11839	-0.092765	-0.146093
0	0	-0.036453	-0.013954	-0.037652	-0.098201	-0.134522	-0.159941	-0.179094	-0.194403	-0.217099	-0.228644	-0.262595
0	-0.008279	-0.031103	-0.017826	-0.044559	-0.09378	-0.132018	-0.133363	-0.184444	-0.188702	-0.204473	-0.224912	-0.256375
0	-0.065127	-0.10494	-0.142034	-0.223774	-1.026849	-1.855542	-2.986944	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	-0.061294	-0.097334	-0.114518	-0.205173	-1.024165	-1.867057	-3.097006	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!

From 1 to 48h				From 48 to 336h			
1st order				**1st order**			
k (hr ^ -1)	R^2	avg	st dev	k (hr ^ -1)	R^2	avg	st dev
-0.000513	0.64	-0.000714	0.000283	-0.00012	0.61	-0.00017	0.000080
-0.000914	0.78			-0.00023	0.81		
-0.00064	0.73	-0.000775	0.000191	-0.00004	0.32	-0.00006	0.000026
-0.00091	0.77			-0.00008	0.54		
-0.100122	0.79	-0.094052	0.008585				
-0.087982	0.75						
-0.001648	0.81	-0.00137	0.000393	-0.00040	0.89	-0.00033	0.000089
-0.001092	0.82			-0.00027	0.67		
-0.001166	0.71	-0.001333	0.000236	-0.00012	0.64	-0.00013	0.000017
-0.001501	0.90			-0.00014	0.61		
-0.019469	0.98	-0.01636	0.004398	-0.00181	0.89	-0.00486	0.004315
-0.01325	0.90			-0.00791	0.95		
-0.000963	0.90	-0.000951	1.63E-05	-0.00020	0.86	-0.00018	0.000029
-0.00094	0.87			-0.00016	0.42		
-0.002696	0.92	-0.002621	0.000106	-0.00029	0.89	-0.00029	0.000010
-0.002545	0.95			-0.00030	0.86		
-0.039201	0.99	-0.03947	0.000381				
-0.039739	0.99						

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	1	2	4	8	24	48	72	120	168	240	360	528
LS11A-SB628-0612-07C	105.00	104.75	103.20	105.00	103.07	102.81	101.78	100.23	98.94	98.43	96.88	98.04	96.23
LS11A-SB628-0612-07C (Lab Duplicate)	104.70	105.35	102.51	104.19	103.41	101.35	99.93	98.13	96.06	94.77	92.71	92.97	90.65
LS11A-SB628-2028-07C	103.51	104.90	103.26	103.39	103.77	101.38	101.25	99.24	99.24	99.61	99.11	99.11	99.49
LS11A-SB628-2028-07C (Lab Duplicate)	103.33	104.46	102.57	102.95	102.45	99.68	99.55	98.55	97.66	97.04	96.15	97.16	96.15
LS11A-SB628-3438-07C	73.44	65.53	55.39	52.48	40.82	0.83	1.11	0.00	0.00	0.00	0.00	0.00	0.00
LS11A-SB628-3438-07C (Lab Duplicate)	63.27	51.20	46.62	41.07	30.11	0.83	1.53	0.00	0.00	0.00	0.00	0.00	0.00
LS11A-SB629-0612-07C	106.14	106.65	104.10	104.48	101.54	98.98	97.70	94.89	90.93	89.90	87.86	85.55	83.38
LS11A-SB629-0612-07C (Lab Duplicate)	105.40	107.06	104.25	105.28	103.74	102.34	100.42	97.48	94.42	91.99	91.35	91.73	87.52
LS11A-SB629-2028-07C	106.84	108.67	105.14	106.05	105.92	101.87	101.74	100.82	99.51	98.86	97.03	98.34	97.42
LS11A-SB629-2028-07C (Lab Duplicate)	109.94	110.98	108.37	109.94	109.02	104.97	102.88	102.22	99.09	99.35	97.52	98.56	98.17
LS11A-SB629-3438-07C	105.53	106.88	99.70	101.73	96.59	62.58	43.48	52.42	43.21	37.66	34.14	27.50	17.88
LS11A-SB629-3438-07C (Lab Duplicate)	111.24	108.53	106.64	106.23	103.11	67.75	61.79	32.79	21.14	14.09	9.62	4.20	0.41
LS11A-SB630-0612-07C	100.87	100.75	99.92	100.28	99.20	97.06	96.23	93.49	92.65	92.65	90.63	89.44	87.65
LS11A-SB630-0612-07C (Lab Duplicate)	98.02	97.90	96.94	96.47	96.47	93.97	93.38	93.14	88.98	88.26	87.07	89.33	84.69
LS11A-SB630-2028-07C	116.31	116.31	112.14	114.69	112.01	105.43	101.67	99.12	97.24	95.76	93.61	92.53	89.45
LS11A-SB630-2028-07C (Lab Duplicate)	114.01	113.07	110.51	111.99	109.04	103.80	99.91	99.77	94.80	94.40	92.92	91.04	88.22
LS11A-SB630-3438-07C	113.21	106.07	101.93	98.22	90.51	40.54	17.70	5.71	0.00	0.00	0.00	0.00	0.00
LS11A-SB630-3438-07C (Lab Duplicate)	119.86	112.73	108.74	106.89	97.63	43.04	18.53	5.42	0.00	0.00	0.00	0.00	0.00

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4/kg media (corrected for W.C.)											
	0	1	2	4	8	24	48	72	120	168	240	360	528
LS11A-SB628-0612-07C	3974	3965	3906	3974	3901	3891	3852	3794	3745	3725	3667	3711	3642
LS11A-SB628-0612-07C (Lab Duplicate)	3970	3995	3887	3951	3921	3843	3789	3721	3643	3594	3516	3525	3437
LS11A-SB628-2028-07C	3853	3905	3844	3848	3863	3774	3769	3694	3694	3708	3689	3689	3703
LS11A-SB628-2028-07C (Lab Duplicate)	3834	3876	3806	3820	3802	3699	3694	3657	3624	3601	3568	3605	3568
LS11A-SB628-3438-07C	3019	2694	2277	2157	1678	34	46	0	0	0	0	0	0
LS11A-SB628-3438-07C (Lab Duplicate)	2607	2109	1921	1692	1240	34	63	0	0	0	0	0	0
LS11A-SB629-0612-07C	4009	4029	3932	3947	3836	3739	3691	3584	3435	3396	3319	3232	3150
LS11A-SB629-0612-07C (Lab Duplicate)	3999	4062	3955	3994	3936	3883	3810	3698	3582	3490	3466	3480	3320
LS11A-SB629-2028-07C	4126	4196	4060	4095	4090	3934	3929	3893	3843	3818	3747	3797	3762
LS11A-SB629-2028-07C (Lab Duplicate)	4252	4292	4191	4252	4216	4060	3979	3954	3832	3842	3772	3812	3797
LS11A-SB629-3438-07C	4245	4300	4011	4093	3886	2518	1749	2109	1738	1515	1373	1106	719
LS11A-SB629-3438-07C (Lab Duplicate)	4471	4362	4286	4270	4144	2723	2483	1318	850	566	387	169	16
LS11A-SB630-0612-07C	3568	3564	3534	3547	3509	3433	3404	3307	3277	3277	3206	3164	3100
LS11A-SB630-0612-07C (Lab Duplicate)	3493	3489	3455	3438	3438	3349	3328	3319	3171	3145	3103	3184	3018
LS11A-SB630-2028-07C	4643	4643	4477	4579	4472	4209	4059	3957	3882	3823	3737	3694	3571
LS11A-SB630-2028-07C (Lab Duplicate)	4554	4517	4415	4474	4356	4146	3991	3985	3787	3771	3712	3637	3524
LS11A-SB630-3438-07C	4822	4518	4342	4183	3855	1727	754	243	0	0	0	0	0
LS11A-SB630-3438-07C (Lab Duplicate)	5134	4829	4658	4578	4182	1844	794	232	0	0	0	0	0

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**360**	**528**
LS11A-SB628-0612-07C	0	10	68	0	73	83	122	181	229	249	308	264	332
LS11A-SB628-0612-07C (Lab Duplicate)	0	-24	83	20	49	127	181	249	328	376	455	445	533
LS11A-SB628-2028-07C	0	-52	9	5	-9	80	84	159	159	145	164	164	150
LS11A-SB628-2028-07C (Lab Duplicate)	0	-42	28	14	33	135	140	177	210	234	266	229	266
LS11A-SB628-3438-07C	0	325	742	862	1341	2985	2974	3019	3019	3019	3019	3019	3019
LS11A-SB628-3438-07C (Lab Duplicate)	0	497	686	915	1366	2572	2544	2607	2607	2607	2607	2607	2607
LS11A-SB629-0612-07C	0	-19	77	63	174	271	319	425	575	613	691	778	860
LS11A-SB629-0612-07C (Lab Duplicate)	0	-63	44	5	63	116	189	301	417	509	533	519	679
LS11A-SB629-2028-07C	0	-71	66	30	35	192	197	232	283	308	379	328	364
LS11A-SB629-2028-07C (Lab Duplicate)	0	-40	61	0	35	192	273	298	420	410	480	440	455
LS11A-SB629-3438-07C	0	-54	234	153	360	1728	2496	2136	2507	2730	2872	3139	3526
LS11A-SB629-3438-07C (Lab Duplicate)	0	109	185	202	327	1748	1988	3153	3622	3905	4084	4302	4455
LS11A-SB630-0612-07C	0	4	34	21	59	135	164	261	291	291	362	404	468
LS11A-SB630-0612-07C (Lab Duplicate)	0	4	38	55	55	144	165	174	322	348	390	309	475
LS11A-SB630-2028-07C	0	0	166	64	172	434	584	686	761	820	906	949	1072
LS11A-SB630-2028-07C (Lab Duplicate)	0	38	139	80	198	408	563	569	767	783	842	917	1030
LS11A-SB630-3438-07C	0	304	480	638	967	3095	4068	4579	4822	4822	4822	4822	4822
LS11A-SB630-3438-07C (Lab Duplicate)	0	305	476	556	952	3290	4340	4902	5134	5134	5134	5134	5134

6/25/2007	Soil ID (and rxn cond'n)	525abs Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
		0	1	2	4	8	24	48	72	120	168	240	336	504
	LS11A-SB628-0612-07C	0.318	0.307	0.304	0.296	0.301	0.283	0.258	0.251	0.234	0.227	0.213	0.213	0.187
	LS11A-SB628-0612-07C (Lab Duplicate)	0.32	0.306	0.307	0.298	0.307	0.3	0.279	0.275	0.271	0.265	0.256	0.263	0.248
	LS11A-SB628-2028-07C	0.336	0.334	0.326	0.328	0.328	0.318	0.297	0.288	0.287	0.287	0.277	0.286	0.278
	LS11A-SB628-2028-07C (Lab Duplicate)	0.326	0.317	0.315	0.315	0.321	0.307	0.287	0.287	0.278	0.284	0.263	0.27	0.261
	LS11A-SB628-3438-07C	0.025	0.033	0.024	0.023	0.014	0.01	0.009						
	LS11A-SB628-3438-07C (Lab Duplicate)	0.11	0.087	0.071	0.056	0.034	0.009	0.027						
	LS11A-SB629-0612-07C	0.32	0.312	0.307	0.308	0.302	0.283	0.263	0.243	0.23	0.215	0.194	0.19	0.161
	LS11A-SB629-0612-07C (Lab Duplicate)	0.326	0.314	0.312	0.312	0.308	0.287	0.261	0.243	0.231	0.215	0.194	0.197	0.159
	LS11A-SB629-2028-07C	0.326	0.314	0.318	0.314	0.315	0.299	0.282	0.274	0.267	0.257	0.251	0.257	0.241
	LS11A-SB629-2028-07C (Lab Duplicate)	0.326	0.314	0.31	0.311	0.317	0.298	0.273	0.267	0.256	0.255	0.246	0.244	0.228
	LS11A-SB629-3438-07C	0.315	0.272	0.272	0.254	0.231	0.179	0.035	0.02					
	LS11A-SB629-3438-07C (Lab Duplicate)	0.301	0.286	0.267	0.246	0.224	0.176	0.014	0.017					
	LS11A-SB630-0612-07C	0.337	0.333	0.326	0.32	0.323	0.318	0.302	0.292	0.296	0.28	0.263	0.265	0.246
	LS11A-SB630-0612-07C (Lab Duplicate)	0.335	0.327	0.323	0.318	0.318	0.309	0.291	0.285	0.275	0.263	0.249	0.251	0.226
	LS11A-SB630-2028-07C	0.321	0.309	0.309	0.305	0.306	0.293	0.245	0.237	0.218	0.201	0.181	0.176	0.152
	LS11A-SB630-2028-07C (Lab Duplicate)	0.334	0.318	0.321	0.317	0.316	0.304	0.252	0.235	0.219	0.197	0.183	0.18	0.159
	LS11A-SB630-3438-07C	0.335	0.292	0.262	0.221	0.178	0.11	0.008						
	LS11A-SB630-3438-07C (Lab Duplicate)	0.329	0.294	0.278	0.256	0.215	0.139	0.01						

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water (mL)	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
LS11A-SB628-0612-07C	0.18	32.03	5.77	25.77	776	795
LS11A-SB628-0612-07C (Lab Duplicate)	0.18	32.18	5.79	25.79	775	800
LS11A-SB628-2028-07C	0.161	31.98	5.15	25.15	795	840
LS11A-SB628-2028-07C (Lab Duplicate)	0.161	32.24	5.19	25.19	794	815
LS11A-SB628-3438-07C	0.242	32.07	7.76	27.76	720	63
LS11A-SB628-3438-07C (Lab Duplicate)	0.242	31.93	7.73	27.73	721	275
LS11A-SB629-0612-07C	0.174	32.03	5.57	25.57	782	800
LS11A-SB629-0612-07C (Lab Duplicate)	0.174	31.97	5.56	25.56	782	815
LS11A-SB629-2028-07C	0.192	32	6.14	26.14	765	815
LS11A-SB629-2028-07C (Lab Duplicate)	0.192	32.04	6.15	26.15	765	815
LS11A-SB629-3438-07C	0.222	31.91	7.08	27.08	738	788
LS11A-SB629-3438-07C (Lab Duplicate)	0.222	31.87	7.08	27.08	739	753
LS11A-SB630-0612-07C	0.119	32.09	3.82	23.82	840	843
LS11A-SB630-0612-07C (Lab Duplicate)	0.119	31.91	3.80	23.80	840	838
LS11A-SB630-2028-07C	0.215	31.93	6.86	26.86	744	803
LS11A-SB630-2028-07C (Lab Duplicate)	0.215	32.02	6.88	26.88	744	835
LS11A-SB630-3438-07C	0.267	32.12	8.58	28.58	700	838
LS11A-SB630-3438-07C (Lab Duplicate)	0.267	31.86	8.51	28.51	702	823

cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution

1	2	4	8	24	48	72	120	168	240	336	504
768	760	740	753	708	645	628	585	568	533	533	468
765	768	745	768	750	698	688	678	663	640	658	620
835	815	820	820	795	743	720	718	718	693	715	695
793	788	788	803	768	718	718	695	710	658	675	653
83	60	58	35	25	23	0	0	0	0	0	0
218	178	140	85	23	68	0	0	0	0	0	0
780	768	770	755	708	658	608	575	538	485	475	403
785	780	780	770	718	653	608	578	538	485	493	398
785	795	785	788	748	705	685	668	643	628	643	603
785	775	778	793	745	683	668	640	638	615	610	570
680	680	635	578	448	88	50	0	0	0	0	0
715	668	615	560	440	35	43	0	0	0	0	0
833	815	800	808	795	755	730	740	700	658	663	615
818	808	795	795	773	728	713	688	658	623	628	565
773	773	763	765	733	613	593	545	503	453	440	380
795	803	793	790	760	630	588	548	493	458	450	398
730	655	553	445	275	20	0	0	0	0	0	0
735	695	640	538	348	25	0	0	0	0	0	0

LN((mg/L)/(mg/L init.))

0	1	2	4	8	24	48	72	120	168	240	336	504
0	-0.035204	-0.045024	-0.071692	-0.054941	-0.116604	-0.209092	-0.236598	-0.30673	-0.337101	-0.400759	-0.400759	-0.530943
0	-0.044736	-0.041473	-0.071228	-0.041473	-0.064539	-0.137109	-0.15155	-0.166202	-0.188591	-0.223144	-0.196167	-0.254892
0	-0.00597	-0.030214	-0.024098	-0.024098	-0.05506	-0.123379	-0.154151	-0.157629	-0.157629	-0.193094	-0.161119	-0.18949
0	-0.027996	-0.034325	-0.034325	-0.015456	-0.06005	-0.127415	-0.127415	-0.159276	-0.137923	-0.214743	-0.188475	-0.222377
0	0.277632	-0.040822	-0.083382	-0.579818	-0.916291	-1.021651	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	-0.234572	-0.4378	-0.675129	-1.17412	-2.503256	-1.404643	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	-0.025318	-0.041473	-0.038221	-0.057894	-0.122874	-0.196167	-0.27526	-0.330242	-0.397683	-0.500463	-0.521297	-0.686917
0	-0.037504	-0.043894	-0.043894	-0.056798	-0.127415	-0.222377	-0.293836	-0.34448	-0.416259	-0.519039	-0.503694	-0.717993
0	-0.037504	-0.024846	-0.037504	-0.034325	-0.086454	-0.14499	-0.173769	-0.199649	-0.237821	-0.261444	-0.237821	-0.3021
0	-0.037504	-0.050325	-0.047104	-0.027996	-0.089804	-0.177426	-0.199649	-0.24172	-0.245634	-0.281566	-0.289729	-0.357552
0	-0.146771	-0.146771	-0.215238	-0.310155	-0.565187	-2.197225	-2.75684	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	-0.051118	-0.119862	-0.201779	-0.295464	-0.536626	-3.068053	-2.873897	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	-0.01194	-0.033186	-0.051762	-0.042431	-0.058032	-0.109656	-0.143329	-0.129723	-0.185293	-0.247929	-0.240353	-0.314751
0	-0.02417	-0.036478	-0.052079	-0.052079	-0.080789	-0.140807	-0.161641	-0.197359	-0.241976	-0.296678	-0.288678	-0.393596
0	-0.0381	-0.0381	-0.051129	-0.047856	-0.091269	-0.270183	-0.303381	-0.386946	-0.468136	-0.572944	-0.600957	-0.747561
0	-0.04909	-0.0397	-0.052239	-0.055399	-0.094113	-0.281712	-0.351555	-0.422069	-0.527937	-0.601655	-0.618184	-0.742237
0	-0.137377	-0.245786	-0.415968	-0.632347	-1.11365	-3.734689	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
0	-0.112478	-0.168437	-0.25088	-0.42542	-0.861584	-3.493473	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!

From 1 to 48h				From 48 to 336h			
1st order				**1st order**			
k (hr ^ -1)	R^2	avg	st dev	k (hr ^ -1)	R^2	avg	st dev
-0.003501	0.97	-0.002651	0.001203	-0.00070	0.88	-0.00047	0.000321429
-0.0018	0.82			-0.00024	0.69		
-0.002224	0.95	-0.00216	9.02E-05	-0.00013	0.40	-0.00020	9.7781E-05
-0.002096	0.91			-0.00027	0.66		
-0.024375	0.74	-0.026123	0.002471				
-0.02787	0.39						
-0.003581	0.99	-0.003779	0.00028	-0.00113	0.92	-0.00107	8.25807E-05
-0.003977	1.00			-0.00101	0.87		
-0.002492	0.98	-0.002709	0.000307	-0.00034	0.70	-0.00036	2.97743E-05
-0.002926	0.93			-0.00038	0.88		
-0.041611	0.92	-0.050641	0.012771				
-0.059671	0.89						
-0.001661	0.87	-0.001951	0.00041	-0.00049	0.85	-0.00053	4.73838E-05
-0.002241	0.97			-0.00056	0.88		
-0.004743	0.93	-0.004797	7.65E-05	-0.00122	0.94	-0.00121	2.3047E-05
-0.004851	0.92			-0.00119	0.89		
-0.071786	0.95	-0.069997	0.00253				
-0.068208	0.93						

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	1	2	4	8	24	48	72	120	168	240	336	504
LS11A-SB628-0612-07C	20.48	19.77	19.58	19.07	19.39	18.23	16.62	16.17	15.07	14.62	13.72	13.72	12.05
LS11A-SB628-0612-07C (Lab Duplicate)	20.63	19.73	19.80	19.22	19.80	19.34	17.99	17.73	17.47	17.09	16.51	16.96	15.99
LS11A-SB628-2028-07C	21.12	21.00	20.50	20.62	20.62	19.99	18.67	18.11	18.04	18.04	17.42	17.98	17.48
LS11A-SB628-2028-07C (Lab Duplicate)	20.53	19.96	19.84	19.84	20.22	19.33	18.07	18.07	17.51	17.89	16.56	17.00	16.44
LS11A-SB628-3438-07C	1.74	2.29	1.67	1.60	0.97	0.69	0.62	0.00	0.00	0.00	0.00	0.00	0.00
LS11A-SB628-3438-07C (Lab Duplicate)	7.62	6.03	4.92	3.88	2.36	0.62	1.87	0.00	0.00	0.00	0.00	0.00	0.00
LS11A-SB629-0612-07C	20.46	19.95	19.63	19.69	19.31	18.09	16.81	15.54	14.70	13.75	12.40	12.15	10.29
LS11A-SB629-0612-07C (Lab Duplicate)	20.83	20.07	19.94	19.94	19.68	18.34	16.68	15.53	14.76	13.74	12.40	12.59	10.16
LS11A-SB629-2028-07C	21.31	20.52	20.78	20.52	20.59	19.54	18.43	17.91	17.45	16.80	16.41	16.80	15.75
LS11A-SB629-2028-07C (Lab Duplicate)	21.31	20.53	20.27	20.33	20.73	19.48	17.85	17.46	16.74	16.67	16.08	15.95	14.91
LS11A-SB629-3438-07C	21.33	18.42	18.42	17.20	15.64	12.12	2.37	1.35	0.00	0.00	0.00	0.00	0.00
LS11A-SB629-3438-07C (Lab Duplicate)	20.37	19.36	18.07	16.65	15.16	11.91	0.95	1.15	0.00	0.00	0.00	0.00	0.00
LS11A-SB630-0612-07C	20.07	19.83	19.41	19.05	19.23	18.94	17.98	17.39	17.63	16.67	15.66	15.78	14.65
LS11A-SB630-0612-07C (Lab Duplicate)	19.93	19.45	19.22	18.92	18.92	18.38	17.31	16.96	16.36	15.65	14.81	14.93	13.45
LS11A-SB630-2028-07C	21.56	20.75	20.75	20.48	20.55	19.68	16.45	15.92	14.64	13.50	12.16	11.82	10.21
LS11A-SB630-2028-07C (Lab Duplicate)	22.45	21.37	21.57	21.31	21.24	20.43	16.94	15.79	14.72	13.24	12.30	12.10	10.69
LS11A-SB630-3438-07C	23.93	20.86	18.72	15.79	12.72	7.86	0.57	0.00	0.00	0.00	0.00	0.00	0.00
LS11A-SB630-3438-07C (Lab Duplicate)	23.45	20.95	19.81	18.24	15.32	9.91	0.71	0.00	0.00	0.00	0.00	0.00	0.00

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4/kg media (corrected for W.C.)											
	0	1	2	4	8	24	48	72	120	168	240	336	504
LS11A-SB628-0612-07C	780	753	746	726	738	694	633	616	574	557	522	522	459
LS11A-SB628-0612-07C (Lab Duplicate)	782	748	750	728	750	733	682	672	662	648	626	643	606
LS11A-SB628-2028-07C	787	783	764	769	769	745	696	675	673	673	649	670	651
LS11A-SB628-2028-07C (Lab Duplicate)	759	738	733	733	747	715	668	668	647	661	612	629	608
LS11A-SB628-3438-07C	71	94	69	66	40	29	26	0	0	0	0	0	0
LS11A-SB628-3438-07C (Lab Duplicate)	315	249	203	160	97	26	77	0	0	0	0	0	0
LS11A-SB629-0612-07C	773	754	742	744	730	684	636	587	556	520	469	459	389
LS11A-SB629-0612-07C (Lab Duplicate)	789	760	755	755	745	695	632	588	559	520	469	477	385
LS11A-SB629-2028-07C	824	794	804	794	796	756	713	693	675	650	634	650	609
LS11A-SB629-2028-07C (Lab Duplicate)	823	793	783	785	801	753	689	674	647	644	621	616	576
LS11A-SB629-3438-07C	859	742	742	693	630	488	95	55	0	0	0	0	0
LS11A-SB629-3438-07C (Lab Duplicate)	822	781	729	672	612	480	38	46	0	0	0	0	0
LS11A-SB630-0612-07C	710	701	687	674	680	670	636	615	623	590	554	558	518
LS11A-SB630-0612-07C (Lab Duplicate)	709	692	684	673	673	654	616	603	582	557	527	531	478
LS11A-SB630-2028-07C	860	828	828	817	820	785	656	635	584	539	485	472	407
LS11A-SB630-2028-07C (Lab Duplicate)	893	850	858	848	845	813	674	628	586	527	489	481	425
LS11A-SB630-3438-07C	1016	886	795	671	540	334	24	0	0	0	0	0	0
LS11A-SB630-3438-07C (Lab Duplicate)	1004	897	848	781	656	424	31	0	0	0	0	0	0

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
LS11A-SB628-0612-07C	0	27	34	54	42	86	147	164	206	223	258	258	321
LS11A-SB628-0612-07C (Lab Duplicate)	0	34	32	54	32	49	100	110	120	134	156	139	176
LS11A-SB628-2028-07C	0	5	23	19	19	42	91	112	115	115	138	117	136
LS11A-SB628-2028-07C (Lab Duplicate)	0	21	26	26	12	44	91	91	112	98	147	130	151
LS11A-SB628-3438-07C	0	-23	3	6	31	43	46	71	71	71	71	71	71
LS11A-SB628-3438-07C (Lab Duplicate)	0	66	112	155	218	289	238	315	315	315	315	315	315
LS11A-SB629-0612-07C	0	19	31	29	43	89	138	186	217	254	304	314	384
LS11A-SB629-0612-07C (Lab Duplicate)	0	29	34	34	44	94	157	201	230	269	319	312	404
LS11A-SB629-2028-07C	0	30	20	30	28	68	111	131	149	174	190	174	215
LS11A-SB629-2028-07C (Lab Duplicate)	0	30	40	38	23	71	134	149	177	179	202	207	247
LS11A-SB629-3438-07C	0	117	117	166	229	371	764	805	859	859	859	859	859
LS11A-SB629-3438-07C (Lab Duplicate)	0	41	93	150	210	341	783	775	822	822	822	822	822
LS11A-SB630-0612-07C	0	8	23	36	29	40	74	95	86	120	156	152	192
LS11A-SB630-0612-07C (Lab Duplicate)	0	17	25	36	36	55	93	106	127	152	182	178	231
LS11A-SB630-2028-07C	0	32	32	43	40	75	204	225	276	322	375	389	453
LS11A-SB630-2028-07C (Lab Duplicate)	0	43	35	45	48	80	219	265	308	366	404	412	468
LS11A-SB630-3438-07C	0	130	222	346	476	683	992	1016	1016	1016	1016	1016	1016
LS11A-SB630-3438-07C (Lab Duplicate)	0	107	156	223	348	580	973	1004	1004	1004	1004	1004	1004

Reaction Code	mass soil (g)	KMnO4 Conc. (init mg/L)	volume KMnO4 (mL)	Shaking (Constant, static, or manual 1/day)	Soil Code	Full Name
3A	16	5000	30	M	9SS25	22GW09-SS025, 9/27, 9:08
3B (replicate)	16	5000	30	M		
					9SS30	22GW09-SS030, 9/27, 9:17
6A	16	1000	30	M		
6B	16	1000	30	M	9SS45	22GW09-SS045, 9/27, 9:59
12A	32	5000	20	M	10SS13	22GW10-SS013, 9/26, 10:57
12B	32	5000	20	M		
					10SS40	22GW10-SS040, 9/26, 12:23
15A	32	1000	20	M		
15B	32	1000	20	M	YS-1	YS22-SB07-1517, 10/17, 8:50
3A**	16	4500	30	M	YS-2	YS22-SB07-3132, 10/17, 9:25
3B**	16	4500	30	M		
					YS-3	YS22-SB07-4142, 10/17, 9:35
6A**	16	1500	30	M		
6B**	16	1500	30	M	12--1	YS12-SB21-B-1007, 10/29, 11:00
12A**	32	4500	20	M	12--2	YS12-SB22-B-1007, 10/30, 8:50
12B**	32	4500	20	M		
					12--5	YS12-SB25-A-1007, 10/30, 15:45
15A**	32	1500	20	M		
15B**	32	1500	20	M		

6/25/2007	Soil ID (and rxn cond'n)	525abs Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
		0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
	9SS25-3A	0.95	0.958	0.936	0.92	0.914	0.907	0.893	0.874	0.864	0.859	0.845	0.828	0.82
	9SS25-3B	0.983	0.944	0.933	0.927	0.906	0.882	0.861	0.837	0.818	0.857	0.799	0.791	0.764
	9SS30-3A	0.928	0.943	0.916	0.927	0.919	0.866	0.858	0.841	0.821	0.808	0.811	0.807	0.787
	9SS30-3B	0.92	0.929	0.929	0.917	0.909	0.863	0.839	0.825	0.811	0.794	0.793	0.79	0.771
	9SS45-3A	0.989	0.984	0.944	0.918	0.888	0.72	0.544	0.466	0.364	0.288	0.218	0.128	0.059
	9SS45-3B	0.992	0.987	0.944	0.91	0.891	0.684	0.429	0.338	0.243	0.18	0.126	0.051	0.017
	10SS13-3A													
	10SS13-3B	0.968	0.977	0.96	0.945	0.957	0.912	0.872	0.843	0.832	0.793	0.8	0.796	0.76
	10SS40-3A	0.753	0.724	0.68	0.646	0.601	0.381	0.192	0.107	0.035	0.013			
	10SS40-3B	0.747	0.721	0.684	0.647	0.599	0.416	0.238	0.136	0.05	0.007			
	YS-1-3A	0.968	0.942	0.917	0.898	0.881	0.811	0.758	0.71	0.679	0.65	0.612	0.607	0.546
	YS-1-3B	0.981	0.965	0.927	0.907	0.891	0.836	0.803	0.768	0.742	0.705	0.68	0.668	0.619
	YS-2-3A	0.952	0.963	0.954	0.938	0.936	0.9	0.892	0.878	0.866	0.857	0.854	0.854	0.842
	YS-2-3B	0.951	0.971	0.95	0.939	0.933	0.893	0.883	0.872	0.858	0.854	0.846	0.846	0.844
	YS-3-3A	0.856	0.8552	0.838	0.813	0.791	0.611	0.511	0.452	0.391	0.372	0.329	0.28	0.217
	YS-3-3B	0.867	0.857	0.845	0.823	0.801	0.612	0.502	0.437	0.374	0.334	0.302	0.241	0.18
		0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**		
	12-1-3A**	0.796	0.778	0.781	0.756	0.736	0.616	0.559	0.525	0.51	0.497	0.471		
	12-1-3B**	0.802	0.776	0.771	0.756	0.744	0.595	0.539	0.515	0.504	0.488	0.467		
	12-2-3A**	0.801	0.786	0.781	0.765	0.759	0.608	0.521	0.489	0.481	0.465	0.443		
	12-2-3B**	0.825	0.816	0.805	0.785	0.775	0.608	0.524	0.486	0.473	0.457	0.432		
	12-5-3A**	0.863	0.839	0.828	0.814	0.81	0.667	0.618	0.597	0.59	0.576	0.557		
	12-5-3B**	0.863	0.839	0.822	0.801	0.805	0.665	0.624	0.606	0.597	0.585	0.57		

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water (mL)	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
9SS25-3A	0.23	16.12	3.71	33.71	4450	4750
9SS25-3B	0.23	16.11	3.71	33.71	4450	4915
9SS30-3A	0.212	16.19	3.43	33.43	4487	4640
9SS30-3B	0.212	16.17	3.43	33.43	4487	4600
9SS45-3A	0.187	16.13	3.02	33.02	4543	4945
9SS45-3B	0.187	15.85	2.96	32.96	4550	4960
10SS13-3A	0.17	16.15	2.75	32.75	4581	0
10SS13-3B	0.17	15.93	2.71	32.71	4586	4840
10SS40-3A	0.2	16.11	3.22	33.22	4515	3765
10SS40-3B	0.2	15.96	3.19	33.19	4519	3735
YS-1-3A	0.201	16.16	3.25	33.25	4512	4840
YS-1-3B	0.201	16.11	3.24	33.24	4513	4905
YS-2-3A	0.206	16.13	3.32	33.32	4501	4760
YS-2-3B	0.206	16.06	3.31	33.31	4503	4755
YS-3-3A	0.2	16.03	3.21	33.21	4517	4280
YS-3-3B	0.2	16.11	3.22	33.22	4515	4335
						0
12-1-3A**	0.236	16.12	3.80	33.80	3994	3980
12-1-3B**	0.236	16.06	3.79	33.79	3995	4010
12-2-3A**	0.229	16.12	3.69	33.69	4007	4005
12-2-3B**	0.229	16.11	3.69	33.69	4007	4125
12-5-3A**	0.195	16.12	3.14	33.14	4073	4315
12-5-3B**	0.195	16.06	3.13	33.13	4075	4315

Soil ID (and rxn cond'n)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution									
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
9SS25-3A	4790	4680	4600	4570	4535	4465	4370	4320	4295	4225
9SS25-3B	4720	4665	4635	4530	4410	4305	4185	4090	4285	3995
9SS30-3A	4715	4580	4635	4595	4330	4290	4205	4105	4040	4055
9SS30-3B	4645	4645	4585	4545	4315	4195	4125	4055	3970	3965
9SS45-3A	4920	4720	4590	4440	3600	2720	2330	1820	1440	1090
9SS45-3B	4935	4720	4550	4455	3420	2145	1690	1215	900	630
10SS13-3A	0	0	0	0	0	0	0	0	0	0
10SS13-3B	4885	4800	4725	4785	4560	4360	4215	4160	3965	4000
10SS40-3A	3620	3400	3230	3005	1905	960	535	175	65	0
10SS40-3B	3605	3420	3235	2995	2080	1190	680	250	35	0
YS-1-3A	4710	4585	4490	4405	4055	3790	3550	3395	3250	3060
YS-1-3B	4825	4635	4535	4455	4180	4015	3840	3710	3525	3400
YS-2-3A	4815	4770	4690	4680	4500	4460	4390	4330	4285	4270
YS-2-3B	4855	4750	4695	4665	4465	4415	4360	4290	4270	4230
YS-3-3A	4276	4190	4065	3955	3055	2555	2260	1955	1860	1645
YS-3-3B	4285	4225	4115	4005	3060	2510	2185	1870	1670	1510
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-3A**	3890	3905	3780	3680	3080	2795	2625	2550	2485	2355
12-1-3B**	3880	3855	3780	3720	2975	2695	2575	2520	2440	2335
12-2-3A**	3930	3905	3825	3795	3040	2605	2445	2405	2325	2215
12-2-3B**	4080	4025	3925	3875	3040	2620	2430	2365	2285	2160
12-5-3A**	4195	4140	4070	4050	3335	3090	2985	2950	2880	2785
12-5-3B**	4195	4110	4005	4025	3325	3120	3030	2985	2925	2850

Soil ID (and rxn cond'n)	336	504	LN((mg/L)/(mg/L init.)) 0	1	2	4	8	24	48
9SS25-3A	4140	4100	0	0.008386	-0.014847	-0.032088	-0.038631	-0.04632	-0.061875
9SS25-3B	3955	3820	0	-0.040483	-0.052204	-0.058656	-0.08157	-0.108417	-0.132515
9SS30-3A	4035	3935	0	0.016035	-0.013015	-0.001078	-0.009746	-0.069147	-0.078428
9SS30-3B	3950	3855	0	0.009735	0.009735	-0.003266	-0.012029	-0.063959	-0.092163
9SS45-3A	640	295	0	-0.005068	-0.046568	-0.074497	-0.107723	-0.317443	-0.597745
9SS45-3B	255	85	0	-0.005053	-0.049597	-0.086279	-0.107379	-0.371765	-0.838266
10SS13-3A	0	0	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
10SS13-3B	3980	3800	0	0.009255	-0.008299	-0.024047	-0.011429	-0.059592	-0.104443
10SS40-3A	0	0	0	-0.039274	-0.101972	-0.153266	-0.22547	-0.681266	-1.36657
10SS40-3B	0	0	0	-0.035426	-0.088107	-0.143719	-0.220804	-0.58538	-1.143795
YS-1-3A	3035	2730	0	-0.027227	-0.054125	-0.075062	-0.094174	-0.176964	-0.244549
YS-1-3B	3340	3095	0	-0.016444	-0.056619	-0.07843	-0.096228	-0.159944	-0.200218
YS-2-3A	4270	4210	0	0.011488	0.002099	-0.014815	-0.01695	-0.05617	-0.065099
YS-2-3B	4230	4220	0	0.020812	-0.001052	-0.012699	-0.019109	-0.062927	-0.074189
YS-3-3A	1400	1085	0	-0.000935	-0.021252	-0.051539	-0.078972	-0.337173	-0.515901
YS-3-3B	1205	900	0	-0.011601	-0.025702	-0.052083	-0.079178	-0.348307	-0.546439
			0	**1**	**2**	**4**	**8**	**24**	**48**
12-1-3A**	0	0	0	-0.022873	-0.019024	-0.051558	-0.078369	-0.256352	-0.35345
12-1-3B**	0	0	0	-0.032956	-0.03942	-0.059067	-0.075068	-0.298547	-0.397393
12-2-3A**	0	0	0	-0.018904	-0.025286	-0.045985	-0.053859	-0.275686	-0.430111
12-2-3B**	0	0	0	-0.010969	-0.024541	-0.0497	-0.06252	-0.305209	-0.453892
12-5-3A**	0	0	0	-0.028204	-0.041402	-0.058454	-0.06338	-0.257625	-0.333926
12-5-3B**	0	0	0	-0.028204	-0.048674	-0.074554	-0.069572	-0.260628	-0.324264

Soil ID (and rxn cond'n)	72	120	168	240	336	504	From 1 to 48h 1st order k (hr ^ -1)	R^2	avg
9SS25-3A	-0.083382	-0.094889	-0.100693	-0.117125	-0.137449	-0.147158	-0.001087	0.66	-0.001461
9SS25-3B	-0.160785	-0.183747	-0.137171	-0.207248	-0.217311	-0.252041	-0.001834	0.90	
9SS30-3A	-0.09844	-0.122509	-0.13847	-0.134764	-0.139708	-0.164803	-0.001916	0.84	-0.002084
9SS30-3B	-0.10899	-0.126106	-0.14729	-0.14855	-0.152341	-0.176685	-0.002252	0.95	
9SS45-3A	-0.752509	-0.99954	-1.233734	-1.512199	-2.044664	-2.819157	-0.012273	1.00	-0.014743
9SS45-3B	-1.076677	-1.406662	-1.706766	-2.063441	-2.967897	-4.06651	-0.017213	0.99	
10SS13-3A	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!			
10SS13-3B	-0.138265	-0.1514	-0.199409	-0.19062	-0.195633	-0.241914	-0.002207	0.95	
10SS40-3A	-1.951236	-3.068717	-4.059116	#NUM!	#NUM!	#NUM!	-0.027809	1.00	-0.025455
10SS40-3B	-1.70341	-2.704042	-4.670155	#NUM!	#NUM!	#NUM!	-0.023102	1.00	
YS-1-3A	-0.309967	-0.354611	-0.39826	-0.4585	-0.466703	-0.572613	-0.004361	0.95	-0.003897
YS-1-3B	-0.244783	-0.279223	-0.330375	-0.36648	-0.384284	-0.460467	-0.003433	0.87	
YS-2-3A	-0.080918	-0.09468	-0.105127	-0.108634	-0.108634	-0.122785	-0.001544	0.85	-0.00168
YS-2-3B	-0.086725	-0.10291	-0.107583	-0.116995	-0.116995	-0.119362	-0.001816	0.84	
YS-3-3A	-0.638588	-0.783563	-0.833377	-0.956213	-1.117481	-1.372373	-0.011243	0.98	-0.011514
YS-3-3B	-0.685106	-0.840783	-0.953898	-1.054612	-1.280242	-1.572082	-0.011785	0.98	
	72	**120**	**168**	**240**					
12-1-3A**	-0.416201	-0.445188	-0.471009	-0.524741	#NUM!	#NUM!	-0.007443	0.96	-0.007861
12-1-3B**	-0.442942	-0.464532	-0.496793	-0.540779	#NUM!	#NUM!	-0.008279	0.95	
12-2-3A**	-0.493498	-0.509994	-0.543824	-0.592291	#NUM!	#NUM!	-0.009171	0.98	-0.009494
12-2-3B**	-0.529175	-0.556288	-0.5907	-0.646958	#NUM!	#NUM!	-0.009816	0.97	
12-5-3A**	-0.368498	-0.380292	-0.404307	-0.437849	#NUM!	#NUM!	-0.006874	0.94	-0.006699
12-5-3B**	-0.353535	-0.368498	-0.388803	-0.414778	#NUM!	#NUM!	-0.006525	0.93	

Soil ID (and rxn cond'n)	st dev	From 48 to 336h **1st order** k (hr ^ -1)	R^2	avg	st dev
9SS25-3A	0.000528	-0.00024	0.95	-0.00025	1.79853E-05
9SS25-3B		-0.00026	0.64		
9SS30-3A	0.000238	-0.00019	0.68	-0.00019	6.37137E-06
9SS30-3B		-0.00020	0.78		
9SS45-3A	0.003493	-0.00488	1.00	-0.00595	0.001515464
9SS45-3B		-0.00702	0.99		
10SS13-3A					
10SS13-3B		-0.00029	0.70		
10SS40-3A	0.003328				
10SS40-3B					
YS-1-3A	0.000656	-0.00075	0.88	-0.00069	8.33831E-05
YS-1-3B		-0.00063	0.90		
YS-2-3A	0.000192	-0.00014	0.73	-0.00014	1.58295E-06
YS-2-3B		-0.00014	0.79		
YS-3-3A	0.000383	-0.00194	0.96	-0.00216	0.000305797
YS-3-3B		-0.00238	0.97		
12-1-3A**	0.000591				
12-1-3B**					
12-2-3A**	0.000456				
12-2-3B**					
12-5-3A**	0.000247				
12-5-3B**					

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
9SS25-3A	160.11	161.46	157.75	155.05	154.04	152.86	150.50	147.30	145.62	144.77	142.41	139.55	138.20
9SS25-3B	165.66	159.09	157.24	156.22	152.69	148.64	145.10	141.06	137.85	144.43	134.65	133.30	128.75
9SS30-3A	155.13	157.63	153.12	154.96	153.62	144.76	143.42	140.58	137.24	135.07	135.57	134.90	131.56
9SS30-3B	153.77	155.27	155.27	153.27	151.93	144.24	140.23	137.89	135.55	132.71	132.54	132.04	128.87
9SS45-3A	163.27	162.44	155.84	151.54	146.59	118.86	89.80	76.93	60.09	47.54	35.99	21.13	9.74
9SS45-3B	163.50	162.68	155.59	149.99	146.85	112.74	70.71	55.71	40.05	29.67	20.77	8.41	2.80
10SS13-3A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10SS13-3B	158.31	159.78	157.00	154.55	156.51	149.15	142.61	137.86	136.07	129.69	130.83	130.18	124.29
10SS40-3A	125.08	120.26	112.95	107.31	99.83	63.29	31.89	17.77	5.81	2.16	0.00	0.00	0.00
10SS40-3B	123.97	119.66	113.52	107.38	99.41	69.04	39.50	22.57	8.30	1.16	0.00	0.00	0.00
YS-1-3A	160.92	156.60	152.44	149.28	146.46	134.82	126.01	118.03	112.88	108.06	101.74	100.91	90.77
YS-1-3B	163.03	160.37	154.06	150.73	148.08	138.94	133.45	127.63	123.31	117.16	113.01	111.02	102.87
YS-2-3A	158.62	160.45	158.95	156.28	155.95	149.95	148.62	146.29	144.29	142.79	142.29	142.29	140.29
YS-2-3B	158.38	161.71	158.21	156.38	155.38	148.72	147.06	145.22	142.89	142.23	140.89	140.89	140.56
YS-3-3A	142.12	141.99	139.13	134.98	131.33	101.44	84.84	75.05	64.92	61.76	54.62	46.49	36.03
YS-3-3B	144.02	142.36	140.36	136.71	133.05	101.66	83.39	72.59	62.13	55.48	50.17	40.03	29.90

	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-3A**	134.54	131.50	132.01	127.78	124.40	104.12	94.48	88.74	86.20	84.00	79.61
12-1-3B**	135.50	131.11	130.26	127.73	125.70	100.53	91.06	87.01	85.15	82.45	78.90
12-2-3A**	134.93	132.41	131.57	128.87	127.86	102.42	87.77	82.38	81.03	78.33	74.63
12-2-3B**	138.97	137.45	135.60	132.23	130.55	102.42	88.27	81.86	79.67	76.98	72.77
12-5-3A**	143.01	139.04	137.21	134.89	134.23	110.53	102.41	98.93	97.77	95.45	92.30
12-5-3B**	142.96	138.99	136.17	132.69	133.36	110.16	103.37	100.39	98.90	96.91	94.43

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4/kg media (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
9SS25-3A	12899	13008	12709	12492	12410	12315	12125	11867	11732	11664	11474	11243	11134
9SS25-3B	13355	12825	12675	12594	12309	11983	11697	11371	11113	11643	10855	10746	10379
9SS30-3A	12159	12356	12002	12146	12041	11347	11242	11019	10757	10587	10626	10574	10312
9SS30-3B	12068	12186	12186	12029	11924	11320	11005	10822	10638	10415	10402	10363	10113
9SS45-3A	12450	12387	11884	11556	11179	9064	6848	5866	4582	3625	2744	1611	743
9SS45-3B	12688	12624	12074	11639	11396	8749	5487	4323	3108	2302	1612	652	217
10SS13-3A	0	0	0	0	0	0	0	0	0	0	0	0	0
10SS13-3B	11973	12084	11874	11689	11837	11280	10786	10427	10291	9809	9895	9846	9400
10SS40-3A	9705	9331	8764	8326	7746	4911	2475	1379	451	168	0	0	0
10SS40-3B	9710	9372	8891	8410	7786	5407	3094	1768	650	91	0	0	0
YS-1-3A	12463	12128	11806	11562	11343	10442	9759	9141	8742	8369	7880	7815	7030
YS-1-3B	12666	12459	11969	11710	11504	10794	10368	9916	9580	9102	8780	8625	7992
YS-2-3A	12385	12528	12411	12203	12177	11708	11604	11422	11266	11149	11110	11110	10954
YS-2-3B	12420	12682	12407	12264	12185	11663	11532	11389	11206	11154	11049	11049	11023
YS-3-3A	11082	11072	10849	10526	10241	7911	6616	5852	5062	4816	4260	3625	2809
YS-3-3B	11175	11046	10891	10607	10324	7888	6470	5632	4820	4305	3892	3106	2320

	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-3A**	10924	10677	10719	10375	10101	8454	7672	7205	6999	6821	6464
12-1-3B**	11043	10685	10616	10410	10245	8193	7422	7091	6940	6720	6430
12-2-3A**	10857	10654	10586	10369	10288	8241	7062	6628	6520	6303	6004
12-2-3B**	11188	11066	10917	10646	10510	8245	7106	6591	6415	6198	5859
12-5-3A**	11021	10714	10574	10395	10344	8518	7892	7624	7535	7356	7113
12-5-3B**	11058	10751	10533	10264	10315	8521	7996	7765	7650	7496	7304

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
9SS25-3A	0	-109	190	407	489	584	774	1032	1168	1236	1426	1657	1765
9SS25-3B	0	530	679	761	1046	1372	1657	1984	2242	1712	2500	2608	2975
9SS30-3A	0	-197	157	13	118	812	917	1140	1402	1572	1533	1585	1847
9SS30-3B	0	-118	-118	39	144	748	1063	1246	1430	1653	1666	1705	1954
9SS45-3A	0	63	566	894	1271	3386	5602	6584	7868	8825	9706	10839	11707
9SS45-3B	0	64	614	1049	1292	3939	7201	8365	9580	10386	11077	12036	12471
10SS13-3A	0	0	0	0	0	0	0	0	0	0	0	0	0
10SS13-3B	0	-111	99	284	136	693	1187	1546	1682	2165	2078	2127	2573
10SS40-3A	0	374	941	1379	1959	4795	7231	8326	9254	9538	9705	9705	9705
10SS40-3B	0	338	819	1300	1924	4302	6616	7942	9060	9619	9710	9710	9710
YS-1-3A	0	335	657	901	1120	2021	2704	3322	3721	4094	4584	4648	5433
YS-1-3B	0	207	697	955	1162	1872	2298	2750	3086	3563	3886	4041	4674
YS-2-3A	0	-143	-26	182	208	676	781	963	1119	1236	1275	1275	1431
YS-2-3B	0	-261	13	157	235	758	888	1032	1215	1267	1371	1371	1397
YS-3-3A	0	10	233	557	842	3172	4467	5231	6020	6266	6823	7457	8273
YS-3-3B	0	129	284	567	851	3287	4704	5542	6354	6870	7282	8068	8855
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**		
12-1-3A**	0	247	206	549	823	2470	3253	3719	3925	4104	4460		
12-1-3B**	0	358	427	633	799	2850	3621	3952	4103	4324	4613		
12-2-3A**	0	203	271	488	569	2616	3795	4229	4337	4554	4852		
12-2-3B**	0	122	271	542	678	2943	4082	4597	4774	4991	5330		
12-5-3A**	0	306	447	626	677	2503	3129	3397	3486	3665	3908		
12-5-3B**	0	308	525	794	743	2537	3062	3293	3408	3562	3754		

6/25/2007	Soil ID (and rxn cond'n)	525abs Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
		0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**216**	**336**	**504**
	9SS25-6A	0.375	0.367	0.356	0.349	0.326	0.287	0.265	0.257	0.22	0.199	0.195	0.165	0.139
	9SS25-6B	0.376	0.365	0.353	0.342	0.315	0.256	0.215	0.194	0.147	0.12	0.107	0.062	0.036
	9SS30-6A	0.366	0.365	0.363	0.355	0.339	0.288	0.264	0.25	0.225	0.068	0.206	0.176	0.151
	9SS30-6B	0.357	0.361	0.361	0.355	0.336	0.286	0.268	0.261	0.231	0.214	0.218	0.187	0.165
	9SS45-6A	0.244	0.214	0.204	0.186	0.152	0.04	0.007						
	9SS45-6B	0.232	0.209	0.197	0.171	0.141	0.028	0.008						
	10SS13-6A	0.388	0.38	0.375	0.365	0.351	0.319	0.306	0.295	0.269	0.257	0.249	0.222	0.197
	10SS13-6B	0.374	0.373	0.37	0.364	0.353	0.318	0.307	0.29	0.271	0.259	0.255	0.219	0.193
	10SS40-6A	0.177	0.161	0.149	0.129	0.102		0.007						
	10SS40-6B	0.369	0.184	0.171	0.143	0.112		0.013						
	YS-1-6A	0.383	0.365	0.344	0.323	0.289	0.231	0.198	0.17	0.14	0.122	0.103	0.066	0.037
	YS-1-6B	0.382	0.371	0.351	0.321	0.293	0.232	0.185	0.163	0.128	0.105	0.093	0.06	0.036
	YS-2-6A	0.373	0.369	0.368	0.36	0.35	0.316	0.298	0.289	0.276	0.255	0.262	0.238	0.223
	YS-2-6B	0.371	0.369	0.367	0.365	0.353	0.303	0.292	0.28	0.259	0.247	0.248	0.23	0.215
	YS-3-6A	0.289	0.268	0.259	0.233	0.204	0.072	0.012						
	YS-3-6B	0.277	0.253	0.243	0.228	0.194	0.081	0.012						
		0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**		
	12-1-6A**	0.485	0.465	0.436	0.419	0.396	0.278	0.179	0.123	0.089	0.065	0.039		
	12-1-6B**	0.474	0.438	0.433	0.416	0.396	0.268	0.178	0.122	0.095	0.075	0.051		
	12-2-6A**	0.495	0.486	0.466	0.451	0.431	0.279	0.172	0.111	0.083	0.06	0.036		
	12-2-6B**	0.482	0.453	0.449	0.435	0.415	0.277	0.171	0.107	0.078	0.056	0.033		
	12-5-6A**	0.511	0.492	0.481	0.482	0.462	0.362	0.26	0.211	0.191	0.163	0.133		
	12-5-6B**	0.521	0.506	0.499	0.479	0.469	0.348	0.254	0.204	0.191	0.159	0.127		

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water (mL)	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
9SS25-6A	0.23	16.16	3.72	33.72	890	938
9SS25-6B	0.23	16.01	3.68	33.68	891	940
9SS30-6A	0.212	16.12	3.42	33.42	898	915
9SS30-6B	0.212	15.94	3.38	33.38	899	893
9SS45-6A	0.187	15.94	2.98	32.98	910	610
9SS45-6B	0.187	16.12	3.01	33.01	909	580
10SS13-6A	0.17	16.09	2.74	32.74	916	970
10SS13-6B	0.17	16.16	2.75	32.75	916	935
10SS40-6A	0.2	16.03	3.21	33.21	903	443
10SS40-6B	0.2	15.99	3.20	33.20	904	923
YS-1-6A	0.201	16.07	3.23	33.23	903	958
YS-1-6B	0.201	16.14	3.24	33.24	902	955
YS-2-6A	0.206	16.03	3.30	33.30	901	933
YS-2-6B	0.206	16.04	3.30	33.30	901	928
YS-3-6A	0.2	15.91	3.18	33.18	904	723
YS-3-6B	0.2	16.04	3.21	33.21	903	693
						0
12-1-6A**	0.236	16.16	3.81	33.81	1331	1213
12-1-6B**	0.236	16.03	3.78	33.78	1332	1185
12-2-6A**	0.229	16.09	3.68	33.68	1336	1238
12-2-6B**	0.229	15.98	3.66	33.66	1337	1205
12-5-6A**	0.195	16.17	3.15	33.15	1357	1278
12-5-6B**	0.195	16.11	3.14	33.14	1358	1303

Soil ID (and rxn cond'n)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution									
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**216**
9SS25-6A	918	890	873	815	718	663	643	550	498	488
9SS25-6B	913	883	855	788	640	538	485	368	300	268
9SS30-6A	913	908	888	848	720	660	625	563	170	515
9SS30-6B	903	903	888	840	715	670	653	578	535	545
9SS45-6A	535	510	465	380	100	18	0	0	0	0
9SS45-6B	523	493	428	353	70	20	0	0	0	0
10SS13-6A	950	938	913	878	798	765	738	673	643	623
10SS13-6B	933	925	910	883	795	768	725	678	648	638
10SS40-6A	403	373	323	255	0	18	0	0	0	0
10SS40-6B	460	428	358	280	0	33	0	0	0	0
YS-1-6A	913	860	808	723	578	495	425	350	305	258
YS-1-6B	928	878	803	733	580	463	408	320	263	233
YS-2-6A	923	920	900	875	790	745	723	690	638	655
YS-2-6B	923	918	913	883	758	730	700	648	618	620
YS-3-6A	670	648	583	510	180	30	0	0	0	0
YS-3-6B	633	608	570	485	203	30	0	0	0	0

	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-6A**	1163	1090	1048	990	695	448	308	223	163	98
12-1-6B**	1095	1083	1040	990	670	445	305	238	188	128
12-2-6A**	1215	1165	1128	1078	698	430	278	208	150	90
12-2-6B**	1133	1123	1088	1038	693	428	268	195	140	83
12-5-6A**	1230	1203	1205	1155	905	650	528	478	408	333
12-5-6B**	1265	1248	1198	1173	870	635	510	478	398	318

Soil ID (and rxn cond'n)	336	504	LN((mg/L)/(mg/L init.)) 0	1	2	4	8	24	48
9SS25-6A	413	348	0	-0.021564	-0.051995	-0.071854	-0.140029	-0.267444	-0.347196
9SS25-6B	155	90	0	-0.029692	-0.063121	-0.094778	-0.177017	-0.384412	-0.558951
9SS30-6A	440	378	0	-0.002736	-0.00823	-0.030516	-0.076633	-0.239673	-0.326684
9SS30-6B	468	413	0	0.011142	0.011142	-0.005618	-0.060625	-0.221744	-0.286749
9SS45-6A	0	0	0	-0.131192	-0.179048	-0.271422	-0.473288	-1.808289	-3.551258
9SS45-6B	0	0	0	-0.104403	-0.163534	-0.305074	-0.497977	-2.114533	-3.367296
10SS13-6A	555	493	0	-0.020834	-0.034079	-0.061108	-0.100219	-0.195814	-0.23742
10SS13-6B	548	483	0	-0.002677	-0.010753	-0.027102	-0.057788	-0.162204	-0.197408
10SS40-6A	0	0	0	-0.094745	-0.172203	-0.316337	-0.551177	#NUM!	-3.23024
10SS40-6B	0	0	0	-0.695861	-0.769133	-0.947952	-1.192298	#NUM!	-3.345847
YS-1-6A	165	93	0	-0.048138	-0.107393	-0.170383	-0.281608	-0.505617	-0.659768
YS-1-6B	150	90	0	-0.029219	-0.084634	-0.173979	-0.265248	-0.498683	-0.725065
YS-2-6A	595	558	0	-0.010782	-0.013495	-0.035474	-0.063645	-0.165836	-0.224485
YS-2-6B	575	538	0	-0.005405	-0.01084	-0.016305	-0.049734	-0.202469	-0.239448
YS-3-6A	0	0	0	-0.07544	-0.109599	-0.215388	-0.348307	-1.389761	-3.18152
YS-3-6B	0	0	0	-0.090628	-0.130956	-0.194672	-0.356159	-1.229568	-3.139111

	0	1	2	4	8	24	48
12-1-6A**	0	-0.042111	-0.106507	-0.146278	-0.202735	-0.556528	-0.996763
12-1-6B**	0	-0.078988	-0.09047	-0.130522	-0.179793	-0.57022	-0.979424
12-2-6A**	0	-0.018349	-0.060372	-0.09309	-0.13845	-0.573346	-1.057063
12-2-6B**	0	-0.062052	-0.070921	-0.102598	-0.149666	-0.553927	-1.036281
12-5-6A**	0	-0.037891	-0.060502	-0.058425	-0.100805	-0.344725	-0.675688
12-5-6B**	0	-0.029213	-0.043144	-0.084049	-0.105147	-0.403548	-0.718416

Soil ID (and rxn cond'n)	72	120	168	216	336	504	From 1 to 48h 1st order k (hr ^ -1)	R^2	avg
9SS25-6A	-0.37785	-0.533298	-0.633621	-0.653926	-0.820981	-0.992452	-0.00679	0.92	-0.008984
9SS25-6B	-0.661731	-0.939157	-1.142097	-1.25676	-1.802455	-2.34607	-0.011178	0.97	
9SS30-6A	-0.381172	-0.486533	-1.683126	-0.574757	-0.732149	-0.885353	-0.007198	0.95	-0.006989
9SS30-6B	-0.313215	-0.435318	-0.51176	-0.493241	-0.646627	-0.77179	-0.00678	0.93	
9SS45-6A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.074089	1.00	-0.073146
9SS45-6B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.072204	0.98	
10SS13-6A	-0.27403	-0.366294	-0.411929	-0.443552	-0.558328	-0.677802	-0.004587	0.90	-0.004443
10SS13-6B	-0.254375	-0.322137	-0.367428	-0.382992	-0.535184	-0.661566	-0.004299	0.91	
10SS40-6A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!			
10SS40-6B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!			
YS-1-6A	-0.812237	-1.006393	-1.144014	-1.313306	-1.75838	-2.337117	-0.0125	0.92	-0.013301
YS-1-6B	-0.85167	-1.09339	-1.29146	-1.412821	-1.851076	-2.361902	-0.014103	0.95	
YS-2-6A	-0.255152	-0.301178	-0.380315	-0.353234	-0.449308	-0.514407	-0.004693	0.95	-0.005059
YS-2-6B	-0.281412	-0.359374	-0.406814	-0.402773	-0.478123	-0.545564	-0.005425	0.90	
YS-3-6A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.066258	0.99	-0.065304
YS-3-6B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.064351	0.99	

	72	120	168	240			
12-1-6A**	-1.371965	-1.695513	-2.009762	-2.520587	-0.019915	1.00	-0.019788
12-1-6B**	-1.357186	-1.60733	-1.843719	-2.229382	-0.01966	0.99	
12-2-6A**	-1.495028	-1.785717	-2.110213	-2.621039	-0.022294	1.00	-0.021773
12-2-6B**	-1.505115	-1.821235	-2.152592	-2.681437	-0.021252	1.00	
12-5-6A**	-0.884511	-0.984096	-1.142619	-1.34602	-0.013721	1.00	-0.014316
12-5-6B**	-0.93763	-1.003477	-1.186846	-1.411563	-0.014911	0.99	

Soil ID (and rxn cond'n)	st dev	From 48 to 336h **1st order** k (hr ^ -1)	R^2	avg	st dev
9SS25-6A	0.003103	-0.00165	0.95	-0.00295	0.001836802
9SS25-6B		-0.00425	0.99		
9SS30-6A	0.000296	-0.00151	0.10	-0.00137	0.000207932
9SS30-6B		-0.00122	0.93		
9SS45-6A	0.001333				
9SS45-6B					
10SS13-6A	0.000203	-0.00109	0.97	-0.00109	1.97495E-06
10SS13-6B		-0.00109	0.97		
10SS40-6A					
10SS40-6B					
YS-1-6A	0.001133	-0.00368	0.99	-0.00376	0.000111035
YS-1-6B		-0.00384	0.99		
YS-2-6A	0.000518	-0.00075	0.91	-0.00077	2.19829E-05
YS-2-6B		-0.00078	0.89		
YS-3-6A	0.001348				
YS-3-6B					
12-1-6A**	0.00018				
12-1-6B**					
12-2-6A**	0.000737				
12-2-6B**					
12-5-6A**	0.000841				
12-5-6B**					

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**216**	**336**	**504**
9SS25-6A	31.61	30.94	30.01	29.42	27.48	24.19	22.34	21.66	18.54	16.77	16.44	13.91	11.72
9SS25-6B	31.66	30.74	29.72	28.80	26.52	21.56	18.10	16.34	12.38	10.10	9.01	5.22	3.03
9SS30-6A	30.58	30.49	30.33	29.66	28.32	24.06	22.06	20.89	18.80	5.68	17.21	14.70	12.62
9SS30-6B	29.79	30.12	30.12	29.62	28.04	23.87	22.36	21.78	19.28	17.86	18.19	15.60	13.77
9SS45-6A	20.12	17.64	16.82	15.34	12.53	3.30	0.58	0.00	0.00	0.00	0.00	0.00	0.00
9SS45-6B	19.15	17.25	16.26	14.11	11.64	2.31	0.66	0.00	0.00	0.00	0.00	0.00	0.00
10SS13-6A	31.75	31.10	30.69	29.87	28.73	26.11	25.04	24.14	22.01	21.03	20.38	18.17	16.12
10SS13-6B	30.62	30.54	30.29	29.80	28.90	26.03	25.13	23.74	22.19	21.20	20.88	17.93	15.80
10SS40-6A	14.69	13.37	12.37	10.71	8.47	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00
10SS40-6B	30.63	15.27	14.19	11.87	9.30	0.00	1.08	0.00	0.00	0.00	0.00	0.00	0.00
YS-1-6A	31.82	30.32	28.58	26.83	24.01	19.19	16.45	14.12	11.63	10.14	8.56	5.48	3.07
YS-1-6B	31.75	30.83	29.17	26.68	24.35	19.28	15.38	13.55	10.64	8.73	7.73	4.99	2.99
YS-2-6A	31.05	30.72	30.64	29.97	29.14	26.31	24.81	24.06	22.98	21.23	21.81	19.81	18.57
YS-2-6B	30.89	30.72	30.56	30.39	29.39	25.23	24.31	23.31	21.56	20.57	20.65	19.15	17.90
YS-3-6A	23.97	22.23	21.49	19.33	16.92	5.97	1.00	0.00	0.00	0.00	0.00	0.00	0.00
YS-3-6B	23.00	21.00	20.17	18.93	16.11	6.72	1.00	0.00	0.00	0.00	0.00	0.00	0.00

	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-6A**	41.00	39.31	36.86	35.42	33.48	23.50	15.13	10.40	7.52	5.49	3.30
12-1-6B**	40.03	36.99	36.57	35.13	33.45	22.63	15.03	10.30	8.02	6.33	4.31
12-2-6A**	41.68	40.93	39.24	37.98	36.30	23.50	14.48	9.35	6.99	5.05	3.03
12-2-6B**	40.56	38.12	37.78	36.60	34.92	23.31	14.39	9.00	6.56	4.71	2.78
12-5-6A**	42.35	40.78	39.87	39.95	38.29	30.00	21.55	17.49	15.83	13.51	11.02
12-5-6B**	43.17	41.92	41.34	39.69	38.86	28.83	21.04	16.90	15.83	13.17	10.52

Soil ID (and rxn cond'n)	Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution mg KMnO4/kg media (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**216**	**336**	**504**
9SS25-6A	2540	2486	2412	2364	2208	1944	1795	1741	1490	1348	1321	1118	942
9SS25-6B	2568	2493	2411	2336	2152	1749	1469	1325	1004	820	731	423	246
9SS30-6A	2407	2401	2387	2335	2230	1894	1736	1644	1480	447	1355	1158	993
9SS30-6B	2372	2398	2398	2358	2232	1900	1780	1734	1535	1422	1448	1242	1096
9SS45-6A	1552	1362	1298	1183	967	254	45	0	0	0	0	0	0
9SS45-6B	1461	1316	1241	1077	888	176	50	0	0	0	0	0	0
10SS13-6A	2378	2329	2298	2237	2151	1955	1875	1808	1648	1575	1526	1360	1207
10SS13-6B	2283	2277	2258	2222	2155	1941	1874	1770	1654	1581	1556	1337	1178
10SS40-6A	1146	1042	965	835	660	0	45	0	0	0	0	0	0
10SS40-6B	2394	1194	1109	928	727	0	84	0	0	0	0	0	0
YS-1-6A	2478	2362	2226	2090	1870	1495	1281	1100	906	789	666	427	239
YS-1-6B	2462	2391	2262	2069	1888	1495	1192	1050	825	677	599	387	232
YS-2-6A	2440	2414	2407	2355	2289	2067	1949	1890	1805	1668	1714	1557	1459
YS-2-6B	2425	2412	2399	2386	2308	1981	1909	1831	1693	1615	1621	1504	1406
YS-3-6A	1884	1747	1688	1519	1330	469	78	0	0	0	0	0	0
YS-3-6B	1792	1637	1572	1475	1255	524	78	0	0	0	0	0	0

	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-6A**	3321	3184	2985	2869	2711	1903	1226	842	609	445	267
12-1-6B**	3269	3021	2986	2869	2731	1848	1228	841	655	517	352
12-2-6A**	3360	3299	3163	3062	2926	1894	1168	754	563	407	244
12-2-6B**	3292	3094	3067	2971	2834	1892	1168	731	533	382	225
12-5-6A**	3254	3133	3063	3069	2942	2305	1656	1344	1216	1038	847
12-5-6B**	3329	3233	3188	3060	2996	2223	1623	1303	1220	1016	811

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**216**	**336**	**504**
9SS25-6A	0	54	129	176	332	596	745	799	1050	1192	1219	1423	1599
9SS25-6B	0	75	157	232	417	820	1100	1243	1564	1749	1837	2145	2322
9SS30-6A	0	7	20	72	178	513	671	763	927	1960	1052	1250	1414
9SS30-6B	0	-27	-27	13	140	472	591	638	837	950	923	1129	1276
9SS45-6A	0	191	254	369	585	1298	1508	1552	1552	1552	1552	1552	1552
9SS45-6B	0	145	220	384	573	1285	1411	1461	1461	1461	1461	1461	1461
10SS13-6A	0	49	80	141	227	423	502	570	729	803	852	1017	1170
10SS13-6B	0	6	24	61	128	342	409	513	629	702	726	946	1105
10SS40-6A	0	104	181	311	486	1146	1100	1146	1146	1146	1146	1146	1146
10SS40-6B	0	1200	1285	1466	1667	2394	2310	2394	2394	2394	2394	2394	2394
YS-1-6A	0	116	252	388	608	983	1197	1378	1572	1689	1812	2051	2239
YS-1-6B	0	71	200	393	574	967	1270	1411	1637	1785	1863	2075	2230
YS-2-6A	0	26	33	85	150	373	491	549	634	772	726	883	981
YS-2-6B	0	13	26	39	118	445	516	595	732	811	804	922	1020
YS-3-6A	0	137	196	365	554	1414	1805	1884	1884	1884	1884	1884	1884
YS-3-6B	0	155	220	317	537	1268	1714	1792	1792	1792	1792	1792	1792
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**		
12-1-6A**	0	137	336	452	609	1417	2095	2479	2711	2876	3054		
12-1-6B**	0	248	283	400	538	1421	2041	2427	2614	2752	2917		
12-2-6A**	0	61	197	299	434	1466	2193	2607	2797	2953	3116		
12-2-6B**	0	198	225	321	458	1400	2124	2561	2759	2910	3067		
12-5-6A**	0	121	191	185	312	949	1598	1910	2038	2216	2407		
12-5-6B**	0	96	141	268	332	1105	1706	2025	2108	2313	2517		

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Soil ID (and rxn cond'n)	525abs Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**360**	**528**
9SS25-12A	0.823	0.8	0.777	0.762	0.745	0.686	0.651	0.621	0.586	0.556	0.529	0.493	0.453
9SS25-12B	0.836	0.812	0.785	0.767	0.752	0.698	0.665	0.645	0.608	0.582	0.604	0.556	0.507
9SS30-12A	0.748	0.748	0.732	0.727	0.707	0.606	0.559	0.531	0.492	0.465	0.447	0.418	0.385
9SS30-12B	0.738	0.749	0.709	0.717	0.703	0.594	0.549	0.511	0.485	0.458	0.436	0.411	0.38
9SS45-12A	0.381	0.319	0.252	0.238	0.176	0.007	0.011						
9SS45-12B	0.398	0.339	0.258	0.25	0.19	0.006	0.009						
10SS13-12A	0.859	0.882	0.831	0.844	0.834	0.674	0.605	0.569	0.52	0.483	0.442	0.429	0.365
10SS13-12B	0.854	0.854	0.822	0.811	0.768	0.599	0.51	0.446	0.349	0.302	0.244	0.205	0.116
10SS40-12A	0.215	0.141	0.113	0.098	0.058	0.007	0.011						
10SS40-12B	0.222	0.164	0.123	0.103	0.066	0.006	0.014						
YS-1-12A	0.799	0.754	0.704	0.664	0.584	0.476	0.388	0.329	0.27	0.224	0.175	0.098	0.04
YS-1-12B	0.817	0.756	0.691	0.657	0.577	0.483	0.392	0.326	0.264	0.223	0.171	0.089	0.029
YS-2-12A	0.774	0.777	0.757	0.766	0.75	0.649	0.616	0.593	0.563	0.549	0.535	0.519	0.483
YS-2-12B	0.771	0.775	0.765	0.755	0.743	0.64	0.604	0.577	0.55	0.536	0.526	0.502	0.473
YS-3-12A	0.551	0.53	0.487	0.469	0.411	0.111	0.016						
YS-3-12B	0.523	0.497	0.465	0.444	0.375	0.087	0.006						

	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-12A**	0.593	0.554	0.532	0.509	0.475	0.233	0.126	0.076	0.048	0.028	0.023
12-1-12B**	0.583	0.551	0.538	0.516	0.485	0.231	0.108	0.059	0.035	0.016	0.015
12-2-12A**	0.464	0.396	0.358	0.325	0.278	0.044	0.006				
12-2-12B**	0.506	0.443	0.413	0.381	0.345	0.099	0.02				
12-5-12A**	0.658	0.633	0.621	0.6	0.576	0.292	0.185	0.141	0.117	0.093	0.06
12-5-12B**	0.652	0.639	0.62	0.6	0.579	0.298	0.204	0.162	0.143	0.117	0.084

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water (mL)	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
9SS25-12A	0.23	32.23	7.41	27.41	3648	4115
9SS25-12B	0.23	31.84	7.32	27.32	3660	4180
9SS30-12A	0.212	32.08	6.80	26.80	3731	3740
9SS30-12B	0.212	32.09	6.80	26.80	3731	3690
9SS45-12A	0.187	31.97	5.98	25.98	3849	1905
9SS45-12B	0.187	31.83	5.95	25.95	3853	1990
10SS13-12A	0.17	31.83	5.41	25.41	3935	4295
10SS13-12B	0.17	31.94	5.43	25.43	3932	4270
10SS40-12A	0.2	32.01	6.40	26.40	3788	1075
10SS40-12B	0.2	32.09	6.42	26.42	3785	1110
YS-1-12A	0.201	32.04	6.44	26.44	3782	3995
YS-1-12B	0.201	31.86	6.40	26.40	3787	4085
YS-2-12A	0.206	31.94	6.58	26.58	3762	3870
YS-2-12B	0.206	31.92	6.58	26.58	3763	3855
YS-3-12A	0.2	32.03	6.41	26.41	3787	2755
YS-3-12B	0.2	31.89	6.38	26.38	3791	2615
						0
12-1-12A**	0.236	32.03	7.56	27.56	3266	2965
12-1-12B**	0.236	31.91	7.53	27.53	3269	2915
12-2-12A**	0.229	31.96	7.32	27.32	3294	2320
12-2-12B**	0.229	32.23	7.38	27.38	3287	2530
12-5-12A**	0.195	32.02	6.24	26.24	3429	3290
12-5-12B**	0.195	31.94	6.23	26.23	3431	3260

Soil ID (and rxn cond'n)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution									
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
9SS25-12A	4000	3885	3810	3725	3430	3255	3105	2930	2780	2645
9SS25-12B	4060	3925	3835	3760	3490	3325	3225	3040	2910	3020
9SS30-12A	3740	3660	3635	3535	3030	2795	2655	2460	2325	2235
9SS30-12B	3745	3545	3585	3515	2970	2745	2555	2425	2290	2180
9SS45-12A	1595	1260	1190	880	35	55	0	0	0	0
9SS45-12B	1695	1290	1250	950	30	45	0	0	0	0
10SS13-12A	4410	4155	4220	4170	3370	3025	2845	2600	2415	2210
10SS13-12B	4270	4110	4055	3840	2995	2550	2230	1745	1510	1220
10SS40-12A	705	565	490	290	35	55	0	0	0	0
10SS40-12B	820	615	515	330	30	70	0	0	0	0
YS-1-12A	3770	3520	3320	2920	2380	1940	1645	1350	1120	875
YS-1-12B	3780	3455	3285	2885	2415	1960	1630	1320	1115	855
YS-2-12A	3885	3785	3830	3750	3245	3080	2965	2815	2745	2675
YS-2-12B	3875	3825	3775	3715	3200	3020	2885	2750	2680	2630
YS-3-12A	2650	2435	2345	2055	555	80	0	0	0	0
YS-3-12B	2485	2325	2220	1875	435	30	0	0	0	0
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-12A**	2770	2660	2545	2375	1165	630	380	240	140	115
12-1-12B**	2755	2690	2580	2425	1155	540	295	175	80	75
12-2-12A**	1980	1790	1625	1390	220	30	0	0	0	0
12-2-12B**	2215	2065	1905	1725	495	100	0	0	0	0
12-5-12A**	3165	3105	3000	2880	1460	925	705	585	465	300
12-5-12B**	3195	3100	3000	2895	1490	1020	810	715	585	420

Soil ID (and rxn cond'n)	360	528	LN((mg/L)/(mg/L init.)) 0	1	2	4	8	24	48
9SS25-12A	2465	2265	0	-0.028344	-0.057516	-0.07701	-0.099572	-0.182079	-0.234447
9SS25-12B	2780	2535	0	-0.029128	-0.062945	-0.086142	-0.105892	-0.18041	-0.228842
9SS30-12A	2090	1925	0	0	-0.021622	-0.028477	-0.056372	-0.210523	-0.291254
9SS30-12B	2055	1900	0	0.014795	-0.040088	-0.028868	-0.048587	-0.217065	-0.295845
9SS45-12A	0	0	0	-0.177608	-0.41337	-0.470529	-0.772315	-3.996889	-3.544904
9SS45-12B	0	0	0	-0.160452	-0.433492	-0.464991	-0.739428	-4.194693	-3.789227
10SS13-12A	2145	1825	0	0.026423	-0.033139	-0.017616	-0.029536	-0.242539	-0.35054
10SS13-12B	1025	580	0	0	-0.038191	-0.051663	-0.106141	-0.35467	-0.51552
10SS40-12A	0	0	0	-0.421878	-0.64325	-0.785671	-1.310195	-3.424728	-2.972743
10SS40-12B	0	0	0	-0.302811	-0.590493	-0.767948	-1.213023	-3.610918	-2.76362
YS-1-12A	490	200	0	-0.057969	-0.126583	-0.185079	-0.31346	-0.517943	-0.722356
YS-1-12B	445	145	0	-0.077598	-0.167499	-0.217955	-0.347797	-0.525622	-0.734377
YS-2-12A	2595	2415	0	0.003868	-0.022209	-0.01039	-0.031499	-0.176139	-0.228325
YS-2-12B	2510	2365	0	0.005175	-0.007813	-0.020971	-0.036992	-0.18622	-0.244114
YS-3-12A	0	0	0	-0.038858	-0.123471	-0.161132	-0.293142	-1.602205	-3.539146
YS-3-12B	0	0	0	-0.050991	-0.117544	-0.163757	-0.332655	-1.793673	-4.467822
			0	**1**	**2**	**4**	**8**	**24**	**48**
12-1-12A**			0	-0.06803	-0.108551	-0.152746	-0.22188	-0.934156	-1.548912
12-1-12B**			0	-0.056452	-0.080329	-0.12208	-0.184038	-0.925769	-1.686056
12-2-12A**			0	-0.15847	-0.259352	-0.356059	-0.512263	-2.355695	-4.348125
12-2-12B**			0	-0.132967	-0.203089	-0.283737	-0.382992	-1.631417	-3.230804
12-5-12A**			0	-0.038735	-0.057874	-0.092275	-0.133097	-0.812451	-1.268849
12-5-12B**			0	-0.02014	-0.050325	-0.083115	-0.118742	-0.782951	-1.161925

Soil ID (and rxn cond'n)	72	120	168	240	360	528	From 1 to 48h 1st order k (hr ^ -1)	R^2	avg
9SS25-12A	-0.281625	-0.339636	-0.392188	-0.441968	-0.512447	-0.597064	-0.004125	0.93	-0.004002
9SS25-12B	-0.259378	-0.318454	-0.362158	-0.325054	-0.40786	-0.500118	-0.003879	0.91	
9SS30-12A	-0.342641	-0.418924	-0.475366	-0.514844	-0.581922	-0.66416	-0.006352	0.96	-0.00642
9SS30-12B	-0.367574	-0.419795	-0.477075	-0.526302	-0.585351	-0.663773	-0.006488	0.94	
9SS45-12A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.081714	0.76	-0.084742
9SS45-12B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.087769	0.77	
10SS13-12A	-0.411888	-0.50194	-0.575752	-0.664459	-0.694312	-0.855872	-0.007991	0.95	-0.009552
10SS13-12B	-0.649612	-0.894859	-1.039504	-1.252763	-1.426921	-1.996341	-0.011112	0.97	
10SS40-12A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.059654	0.73	-0.059022
10SS40-12B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.05839	0.65	
YS-1-12A	-0.887303	-1.084939	-1.271715	-1.518575	-2.098393	-2.994481	-0.013369	0.94	-0.013114
YS-1-12B	-0.918742	-1.12969	-1.298467	-1.563976	-2.217003	-3.338343	-0.012859	0.93	
YS-2-12A	-0.266377	-0.318292	-0.343473	-0.369305	-0.399668	-0.471555	-0.005156	0.93	-0.005354
YS-2-12B	-0.289846	-0.33777	-0.363554	-0.382387	-0.429088	-0.488593	-0.005552	0.94	
YS-3-12A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.075208	0.99	-0.084764
YS-3-12B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.094319	0.99	
	72	**120**	**168**	**240**					
12-1-12A**	-2.054461	-2.513993	-3.05299	-3.2497			-0.032546	0.99	-0.034187
12-1-12B**	-2.29065	-2.812839	-3.595598	-3.660137			-0.035828	0.99	
12-2-12A**	#NUM!	#NUM!	#NUM!	#NUM!			-0.091336	0.99	-0.079108
12-2-12B**	#NUM!	#NUM!	#NUM!	#NUM!			-0.066879	1.00	
12-5-12A**	-1.540445	-1.727031	-1.956605	-2.39486			-0.027675	0.97	-0.026698
12-5-12B**	-1.392448	-1.5172	-1.717871	-2.049228			-0.025722	0.97	

Soil ID (and rxn cond'n)	st dev	From 48 to 360h **1st order** k (hr ^ -1)	R^2	avg	st dev
9SS25-12A	0.000174	-0.00086	0.96	-0.00068	0.00025669
9SS25-12B		-0.00050	0.80		
9SS30-12A	9.6E-05	-0.00090	0.92	-0.00088	1.56377E-05
9SS30-12B		-0.00087	0.92		
9SS45-12A	0.004282				
9SS45-12B					
10SS13-12A	0.002207	-0.00111	0.89	-0.00200	0.001264441
10SS13-12B		-0.00290	0.94		
10SS40-12A	0.000893				
10SS40-12B					
YS-1-12A	0.000361	-0.00424	1.00	-0.00438	0.000202172
YS-1-12B		-0.00453	0.99		
YS-2-12A	0.00028	-0.00052	0.88	-0.00053	1.56881E-05
YS-2-12B		-0.00054	0.90		
YS-3-12A	0.013513				
YS-3-12B					
12-1-12A**	0.002321				
12-1-12B**					
12-2-12A**	0.017294				
12-2-12B**					
12-5-12A**	0.001381				
12-5-12B**					

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**360**	**528**
9SS25-12A	112.80	109.65	106.50	104.44	102.11	94.03	89.23	85.12	80.32	76.21	72.51	67.57	62.09
9SS25-12B	114.21	110.93	107.24	104.78	102.74	95.36	90.85	88.12	83.06	79.51	82.52	75.96	69.26
9SS30-12A	100.24	100.24	98.09	97.42	94.74	81.21	74.91	71.16	65.93	62.31	59.90	56.01	51.59
9SS30-12B	98.90	100.38	95.02	96.09	94.21	79.61	73.57	68.48	65.00	61.38	58.43	55.08	50.93
9SS45-12A	49.49	41.44	32.73	30.91	22.86	0.91	1.43	0.00	0.00	0.00	0.00	0.00	0.00
9SS45-12B	51.64	43.99	33.48	32.44	24.65	0.78	1.17	0.00	0.00	0.00	0.00	0.00	0.00
10SS13-12A	109.14	112.06	105.58	107.23	105.96	85.64	76.87	72.29	66.07	61.37	56.16	54.51	46.38
10SS13-12B	108.59	108.59	104.52	103.12	97.65	76.16	64.85	56.71	44.38	38.40	31.02	26.07	14.75
10SS40-12A	28.38	18.61	14.92	12.94	7.66	0.92	1.45	0.00	0.00	0.00	0.00	0.00	0.00
10SS40-12B	29.32	21.66	16.25	13.61	8.72	0.79	1.85	0.00	0.00	0.00	0.00	0.00	0.00
YS-1-12A	105.63	99.68	93.07	87.78	77.20	62.93	51.29	43.49	35.69	29.61	23.14	12.96	5.29
YS-1-12B	107.86	99.81	91.23	86.74	76.18	63.77	51.75	43.04	34.85	29.44	22.58	11.75	3.83
YS-2-12A	102.86	103.26	100.60	101.80	99.67	86.25	81.87	78.81	74.82	72.96	71.10	68.97	64.19
YS-2-12B	102.45	102.98	101.65	100.32	98.73	85.04	80.26	76.67	73.08	71.22	69.89	66.70	62.85
YS-3-12A	72.75	69.98	64.30	61.92	54.26	14.66	2.11	0.00	0.00	0.00	0.00	0.00	0.00
YS-3-12B	68.98	65.55	61.33	58.56	49.46	11.47	0.79	0.00	0.00	0.00	0.00	0.00	0.00

	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-12A**	81.71	76.34	73.31	70.14	65.45	32.11	17.36	10.47	6.61	3.86	3.17
12-1-12B**	80.25	75.85	74.06	71.03	66.76	31.80	14.87	8.12	4.82	2.20	2.06
12-2-12A**	63.38	54.09	48.90	44.39	37.97	6.01	0.82	0.00	0.00	0.00	0.00
12-2-12B**	69.27	60.65	56.54	52.16	47.23	13.55	2.74	0.00	0.00	0.00	0.00
12-5-12A**	86.34	83.06	81.49	78.73	75.58	38.32	24.28	18.50	15.35	12.20	7.87
12-5-12B**	85.50	83.80	81.31	78.68	75.93	39.08	26.75	21.24	18.75	15.34	11.02

Soil ID (and rxn cond'n)	Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution mg KMnO4/kg media (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**360**	**528**
9SS25-12A	4545	4418	4291	4209	4115	3789	3595	3430	3236	3071	2922	2723	2502
9SS25-12B	4658	4525	4374	4274	4190	3889	3706	3594	3388	3243	3366	3098	2825
9SS30-12A	3965	3965	3880	3854	3748	3212	2963	2815	2608	2465	2370	2216	2041
9SS30-12B	3911	3970	3758	3800	3726	3148	2910	2708	2570	2427	2311	2178	2014
9SS45-12A	1904	1594	1259	1189	880	35	55	0	0	0	0	0	0
9SS45-12B	1996	1700	1294	1254	953	30	45	0	0	0	0	0	0
10SS13-12A	4131	4242	3996	4059	4011	3241	2910	2736	2501	2323	2126	2063	1755
10SS13-12B	4096	4096	3943	3890	3684	2873	2446	2139	1674	1448	1170	983	556
10SS40-12A	1108	727	583	505	299	36	57	0	0	0	0	0	0
10SS40-12B	1142	844	633	530	340	31	72	0	0	0	0	0	0
YS-1-12A	4126	3894	3636	3429	3016	2458	2004	1699	1394	1157	904	506	207
YS-1-12B	4237	3921	3584	3407	2992	2505	2033	1691	1369	1157	887	462	150
YS-2-12A	4056	4072	3967	4014	3930	3401	3228	3108	2950	2877	2804	2720	2531
YS-2-12B	4042	4063	4011	3958	3895	3355	3167	3025	2884	2810	2758	2632	2480
YS-3-12A	2839	2731	2509	2417	2118	572	82	0	0	0	0	0	0
YS-3-12B	2704	2569	2404	2295	1939	450	31	0	0	0	0	0	0

	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
12-1-12A**	3339	3120	2996	2866	2675	1312	710	428	270	158	130
12-1-12B**	3292	3111	3038	2914	2738	1304	610	333	198	90	85
12-2-12A**	2572	2195	1985	1802	1541	244	33	0	0	0	0
12-2-12B**	2788	2441	2275	2099	1901	545	110	0	0	0	0
12-5-12A**	3350	3222	3161	3054	2932	1486	942	718	596	473	305
12-5-12B**	3325	3259	3162	3060	2953	1520	1040	826	729	597	428

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**360**	**528**
9SS25-12A	0	127	254	337	431	757	950	1116	1309	1475	1624	1823	2044
9SS25-12B	0	134	284	384	468	769	953	1064	1270	1415	1293	1560	1833
9SS30-12A	0	0	85	111	217	753	1002	1150	1357	1500	1596	1749	1924
9SS30-12B	0	-58	154	111	185	763	1002	1203	1341	1484	1601	1733	1897
9SS45-12A	0	310	645	715	1024	1869	1849	1904	1904	1904	1904	1904	1904
9SS45-12B	0	296	702	742	1043	1966	1951	1996	1996	1996	1996	1996	1996
10SS13-12A	0	-111	135	72	120	890	1222	1395	1630	1808	2005	2068	2376
10SS13-12B	0	0	153	206	412	1223	1650	1957	2422	2648	2926	3113	3540
10SS40-12A	0	381	526	603	809	1072	1052	1108	1108	1108	1108	1108	1108
10SS40-12B	0	298	509	612	803	1111	1070	1142	1142	1142	1142	1142	1142
YS-1-12A	0	232	491	697	1110	1668	2122	2427	2732	2969	3222	3620	3920
YS-1-12B	0	316	653	830	1245	1732	2204	2546	2868	3081	3350	3776	4087
YS-2-12A	0	-16	89	42	126	655	828	949	1106	1179	1252	1336	1525
YS-2-12B	0	-21	31	84	147	687	876	1017	1159	1232	1285	1410	1562
YS-3-12A	0	108	330	423	721	2267	2757	2839	2839	2839	2839	2839	2839
YS-3-12B	0	134	300	408	765	2254	2673	2704	2704	2704	2704	2704	2704
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**		
12-1-12A**	0	220	343	473	664	2027	2630	2911	3069	3182	3210		
12-1-12B**	0	181	254	378	553	1988	2682	2959	3094	3201	3207		
12-2-12A**	0	377	588	771	1031	2328	2539	2572	2572	2572	2572		
12-2-12B**	0	347	512	689	887	2242	2678	2788	2788	2788	2788		
12-5-12A**	0	127	188	295	417	1863	2408	2632	2754	2876	3044		
12-5-12B**	0	66	163	265	372	1806	2285	2499	2596	2729	2897		

6/25/2007	Soil ID (and rxn cond'n)	525abs Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution											
		0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
	9SS25-15A	0.365	0.332	0.326	0.307	0.305	0.278	0.252	0.245	0.244	0.22	0.212	0.201	0.186
	9SS25-15B	0.352	0.334	0.317	0.305	0.3	0.278	0.249	0.242	0.23	0.219	0.21	0.198	0.174
	9SS30-15A	0.292	0.276	0.27	0.257	0.245	0.202	0.095	0.07	0.039				
	9SS30-15B	0.281	0.265	0.254	0.238	0.222	0.176	0.07	0.038	0.015				
	9SS45-15A	0.029	0.022	0.02	0.016	0.011	0.005	0.008						
	9SS45-15B	0.015	0.011	0.011	0.009	0.007	0.004	0.006						
	10SS13-15A	0.357	0.326	0.315	0.315	0.301	0.266	0.125	0.12					
	10SS13-15B	0.357	0.346	0.335	0.32	0.316	0.282	0.148	0.131					
	10SS40-15A	0.009	0.006	0.006	0.007	0.004	0.005	0.007						
	10SS40-15B	0.007	0.01	0.005	0.011	0.007	0.004	0.009						
		0	**1**	**2**	**4**	**8**	**24**	**48**	**72**					
	12-1-15A**	0.214	0.174	0.154	0.132	0.103	0.01							
	12-1-15B**	0.189	0.158	0.142	0.124	0.099	0.016							
	12-2-15A**	0.176	0.122	0.109	0.089	0.064	0.01							
	12-2-15B**	0.158	0.105	0.083	0.066	0.044	0.011							
	12-5-15A**	0.284	0.254	0.234	0.216	0.179	0.028	0.009						
	12-5-15B**	0.291	0.263	0.24	0.217	0.187	0.038	0.015						

Soil ID (and rxn cond'n)	Water Content	mass samp (wet g)	vol add'l water (mL)	mL (total)	mg/L initial KMnO4	mg/L KMnO4 Time (hrs) 0
9SS25-15A	0.23	32.26	7.42	27.42	729	913
9SS25-15B	0.23	32.28	7.42	27.42	729	880
9SS30-15A	0.212	31.92	6.77	26.77	747	730
9SS30-15B	0.212	32.25	6.84	26.84	745	703
9SS45-15A	0.187	32.17	6.02	26.02	769	73
9SS45-15B	0.187	32.06	6.00	26.00	769	38
10SS13-15A	0.17	31.9	5.42	25.42	787	893
10SS13-15B	0.17	32.13	5.46	25.46	785	893
10SS40-15A	0.2	32.25	6.45	26.45	756	23
10SS40-15B	0.2	32.02	6.40	26.40	757	18
						0
12-1-15A**	0.236	31.84	7.51	27.51	1090	535
12-1-15B**	0.236	32.15	7.59	27.59	1087	473
12-2-15A**	0.229	32.25	7.39	27.39	1095	440
12-2-15B**	0.229	32.15	7.36	27.36	1096	395
12-5-15A**	0.195	31.84	6.21	26.21	1145	710
12-5-15B**	0.195	31.96	6.23	26.23	1144	728

Soil ID (and rxn cond'n)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution									
	1	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**
9SS25-15A	830	815	768	763	695	630	613	610	550	530
9SS25-15B	835	793	763	750	695	623	605	575	548	525
9SS30-15A	690	675	643	613	505	238	175	98	0	0
9SS30-15B	663	635	595	555	440	175	95	38	0	0
9SS45-15A	55	50	40	28	13	20	0	0	0	0
9SS45-15B	28	28	23	18	10	15	0	0	0	0
10SS13-15A	815	788	788	753	665	313	300	0	0	0
10SS13-15B	865	838	800	790	705	370	328	0	0	0
10SS40-15A	15	15	18	10	13	18	0	0	0	0
10SS40-15B	25	13	28	18	10	23	0	0	0	0

	1	**2**	**4**	**8**	**24**	**48**
12-1-15A**	435	385	330	258	25	0
12-1-15B**	395	355	310	248	40	0
12-2-15A**	305	273	223	160	25	0
12-2-15B**	263	208	165	110	28	0
12-5-15A**	635	585	540	448	70	23
12-5-15B**	658	600	543	468	95	38

Soil ID (and rxn cond'n)	336	504	LN((mg/L)/(mg/L init.)) 0	1	2	4	8	24	48
9SS25-15A	503	465	0	-0.094762	-0.113	-0.17305	-0.179586	-0.272276	-0.370468
9SS25-15B	495	435	0	-0.05249	-0.104729	-0.143319	-0.159849	-0.23601	-0.346178
9SS30-15A	0	0	0	-0.056353	-0.078332	-0.127678	-0.175496	-0.368486	-1.122877
9SS30-15B	0	0	0	-0.058625	-0.10102	-0.166084	-0.235677	-0.467871	-1.389859
9SS45-15A	0	0	0	-0.276253	-0.371564	-0.594707	-0.969401	-1.757858	-1.287854
9SS45-15B	0	0	0	-0.310155	-0.310155	-0.510826	-0.76214	-1.321756	-0.916291
10SS13-15A	0	0	0	-0.090838	-0.125163	-0.125163	-0.170626	-0.294239	-1.049422
10SS13-15B	0	0	0	-0.031297	-0.063605	-0.109415	-0.121994	-0.235829	-0.880524
10SS40-15A	0	0	0	-0.405465	-0.405465	-0.251314	-0.81093	-0.587787	-0.251314
10SS40-15B	0	0	0	0.356675	-0.336472	0.451985	0	-0.559616	0.251314
			0	**1**	**2**	**4**	**8**	**24**	**48**
12-1-15A**			0	-0.206921	-0.329023	-0.483174	-0.731247	-3.063391	#NUM!
12-1-15B**			0	-0.179152	-0.28592	-0.421465	-0.646627	-2.469158	#NUM!
12-2-15A**			0	-0.366463	-0.479136	-0.681848	-1.011601	-2.867899	#NUM!
12-2-15B**			0	-0.408635	-0.643754	-0.87294	-1.278405	-2.6647	#NUM!
12-5-15A**			0	-0.11164	-0.193653	-0.273696	-0.461588	-2.31677	-3.45175
12-5-15B**			0	-0.101169	-0.192684	-0.293426	-0.442215	-2.035737	-2.965273

Soil ID (and rxn cond'n)	72	120	168	240	336	504	From 1 to 48h 1st order k (hr ^ -1)	R^2	avg
9SS25-15A	-0.398639	-0.402729	-0.50627	-0.543311	-0.596592	-0.674151	-0.005472	0.94	-0.005459
9SS25-15B	-0.374693	-0.425552	-0.474559	-0.516524	-0.575364	-0.704576	-0.005446	0.93	
9SS30-15A	-1.428259	-2.013192	#NUM!	#NUM!	#NUM!	#NUM!	-0.021659	0.96	-0.024236
9SS30-15B	-2.000769	-2.930304	#NUM!	#NUM!	#NUM!	#NUM!	-0.026812	0.96	
9SS45-15A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.022849	0.54	-0.018724
9SS45-15B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.0146	0.47	
10SS13-15A	-1.090244	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.019217	0.92	-0.017997
10SS13-15B	-1.002538	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.016776	0.93	
10SS40-15A	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	0.002612	0.05	0.000645
10SS40-15B	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	-0.001322	0.00	
12-1-15A**									
12-1-15B**									
12-2-15A**									
12-2-15B**									
12-5-15A**									
12-5-15B**									

Soil ID (and rxn cond'n)	st dev	From 48 to 336h **1st order** k (hr ^ -1)	R^2	avg	st dev
9SS25-15A	1.82E-05	-0.00082	0.94	-0.00080	2.14586E-05
9SS25-15B		-0.00079	0.98		
9SS30-15A	0.003644				
9SS30-15B					
9SS45-15A	0.005833				
9SS45-15B					
10SS13-15A	0.001726				
10SS13-15B					
10SS40-15A	0.002782				
10SS40-15B					
12-1-15A**					
12-1-15B**					
12-2-15A**					
12-2-15B**					
12-5-15A**					
12-5-15B**					

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	mg KMnO4 (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
9SS25-15A	25.02	22.76	22.35	21.04	20.91	19.06	17.27	16.79	16.73	15.08	14.53	13.78	12.75
9SS25-15B	24.13	22.90	21.73	20.91	20.57	19.06	17.07	16.59	15.77	15.01	14.40	13.58	11.93
9SS30-15A	19.54	18.47	18.07	17.20	16.39	13.52	6.36	4.68	2.61	0.00	0.00	0.00	0.00
9SS30-15B	18.85	17.78	17.04	15.97	14.89	11.81	4.70	2.55	1.01	0.00	0.00	0.00	0.00
9SS45-15A	1.89	1.43	1.30	1.04	0.72	0.33	0.52	0.00	0.00	0.00	0.00	0.00	0.00
9SS45-15B	0.97	0.71	0.71	0.58	0.45	0.26	0.39	0.00	0.00	0.00	0.00	0.00	0.00
10SS13-15A	22.69	20.72	20.02	20.02	19.13	16.91	7.94	7.63	0.00	0.00	0.00	0.00	0.00
10SS13-15B	22.72	22.02	21.32	20.37	20.12	17.95	9.42	8.34	0.00	0.00	0.00	0.00	0.00
10SS40-15A	0.60	0.40	0.40	0.46	0.26	0.33	0.46	0.00	0.00	0.00	0.00	0.00	0.00
10SS40-15B	0.46	0.66	0.33	0.73	0.46	0.26	0.59	0.00	0.00	0.00	0.00	0.00	0.00
	0	**1**	**2**	**4**	**8**	**24**	**48**						
12-1-15A**	14.72	11.97	10.59	9.08	7.08	0.69	0.00						
12-1-15B**	13.04	10.90	9.79	8.55	6.83	1.10	0.00						
12-2-15A**	12.05	8.35	7.46	6.09	4.38	0.68	0.00						
12-2-15B**	10.81	7.18	5.68	4.51	3.01	0.75	0.00						
12-5-15A**	18.61	16.64	15.33	14.15	11.73	1.83	0.59						
12-5-15B**	19.08	17.25	15.74	14.23	12.26	2.49	0.98						

Soil ID (and rxn cond'n)	Time (hrs)	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution mg KMnO4/kg media (corrected for W.C.)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
9SS25-15A	1007	916	900	847	842	767	695	676	673	607	585	555	513
9SS25-15B	971	921	874	841	828	767	687	668	634	604	579	546	480
9SS30-15A	777	734	718	684	652	537	253	186	104	0	0	0	0
9SS30-15B	742	700	671	628	586	465	185	100	40	0	0	0	0
9SS45-15A	72	55	50	40	27	12	20	0	0	0	0	0	0
9SS45-15B	37	27	27	22	17	10	15	0	0	0	0	0	0
10SS13-15A	857	783	756	756	723	639	300	288	0	0	0	0	0
10SS13-15B	852	826	800	764	754	673	353	313	0	0	0	0	0
10SS40-15A	23	15	15	18	10	13	18	0	0	0	0	0	0
10SS40-15B	18	26	13	28	18	10	23	0	0	0	0	0	0
	0	**1**	**2**	**4**	**8**	**24**	**48**						
12-1-15A**	605	492	435	373	291	28	0						
12-1-15B**	531	444	399	348	278	45	0						
12-2-15A**	485	336	300	245	176	28	0						
12-2-15B**	436	290	229	182	121	30	0						
12-5-15A**	726	649	598	552	458	72	23						
12-5-15B**	742	670	612	553	477	97	38						

Soil ID	cond'ns 3 and 12 100x dilution, cond'ns 6 and 15 50x dilution												
(and rxn cond'n)	Time (hrs)	OD (mg KMnO4/kg media)											
	0	**1**	**2**	**4**	**8**	**24**	**48**	**72**	**120**	**168**	**240**	**336**	**504**
9SS25-15A	0	91	108	160	166	240	312	331	334	400	422	453	494
9SS25-15B	0	50	97	130	143	204	284	303	337	367	392	425	491
9SS30-15A	0	43	59	93	125	239	524	591	673	777	777	777	777
9SS30-15B	0	42	71	114	156	277	557	642	702	742	742	742	742
9SS45-15A	0	17	22	32	45	60	52	72	72	72	72	72	72
9SS45-15B	0	10	10	15	20	27	22	37	37	37	37	37	37
10SS13-15A	0	74	101	101	134	218	557	569	857	857	857	857	857
10SS13-15B	0	26	53	88	98	179	499	539	852	852	852	852	852
10SS40-15A	0	8	8	5	13	10	5	23	23	23	23	23	23
10SS40-15B	0	-8	5	-10	0	8	-5	18	18	18	18	18	18
	0	**1**	**2**	**4**	**8**	**24**	**48**						
12-1-15A**	0	113	170	232	314	577	605						
12-1-15B**	0	87	132	183	253	486	531						
12-2-15A**	0	149	184	240	308	457	485						
12-2-15B**	0	146	207	254	315	406	436						
12-5-15A**	0	77	128	174	268	654	703						
12-5-15B**	0	71	130	189	265	645	704						

Raw Analytical

Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-GP309	LS11-GP310	LS11-GP311	LS11-GP401		LS11-GP402	LS11-GP403	LS11-GP503	LS11-GP505	LS11-GP506	LS11-GP507	LS11-GP508	LS11-GP509	LS11-GP510	LS11-GP512	LS11-GP516	LS11-GP517	LS11A-GP101	LS11A-GP104	LS11A-GP108
Sample ID	LS11-GP309-10C	LS11-GP310-10C	LS11-GP311-10C	LS11-GP401-12	LS11-GP401-07	LS11-GP402-12	LS11-GP403-12	LS11-GP503-12	LS11-GP505-12	LS11-GP506-12	LS11-GP507-12	LS11-GP508-12	LS11-GP509-12	LS11-GP510-12	LS11-GP512-12	LS11-GP516-12	LS11-GP517-12	LS11A-GP101-18-03D	LS11A-GP104-22-03D	LS11A-GP108-10-03D
Sample Depth	17-20' bgs	17-20' bgs	17-20' bgs	20-24' bgs	10-14' bgs	20-24' bgs	20-24' bgs	22-26' bgs	22-26' bgs	22-26' bgs	22-26' bgs	22-26' bgs	22-26' bgs	22-26' bgs	22-26' bgs	22-26' bgs	22-26' bgs	16-20' bgs	19-23' bgs	9-13' bgs
Sample Date	01/19/99	01/19/99	01/19/99	08/03/01	08/04/01	08/03/01	08/03/01	05/28/02	05/28/02	05/28/02	05/29/02	05/28/02	05/29/02	05/29/02	05/29/02	05/30/02	05/30/02	10/15/03	10/15/03	10/15/03
Chemical Name																				
Volatile Organic Compounds (UG_L)																				
1,1,1-Trichloroethane	1 U	1 U	1 U	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	10 U	10 U	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	1 U	1 U	1 U	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	1 U	1 U	1 U	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	0.53 J	1	1 U	1 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
2-Butanone	NA	NA	NA	10 U	10 U	100 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U
2-Hexanone	NA	NA	NA	10 U	10 U	100 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	NA	NA	NA	10 U	10 U	100 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U
Acetone	NA	NA	NA	10 U	10 U	100 U	10 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.9 B	2.5 U	2.5 U	2.5 U
Benzene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	NA	NA
Bromodichloromethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Bromoform	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Bromomethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Carbon tetrachloride	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Chloroethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Chloroform	NA	NA	NA	10 U	1 J	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.72
Chloromethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Cyclohexane	NA	NA	NA	10 U	10 U	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
Dibromochloromethane	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	NA	10 U	10 U	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
Ethylbenzene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Isopropylbenzene	NA	NA	NA	10 U	10 U	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	NA	NA	10 U	10 U	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	10 U	10 U	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.2	0.5 U	0.5 U
Methylcyclohexane	NA	NA	NA	10 U	10 U	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
Methylene chloride	NA	NA	NA	10 U	0.4 J	100 U	0.4 J	0.6 B	1 U	1 U	0.66 B	0.54 B	1 U	1 U	1 U	0.76 B	1 U	0.5 U	0.87	0.5 U
Styrene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	1 U	1 U	1 U	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1.2	1 U	1 U	4.3	0.91 J	0.98 J	1 U	73	0.5 U	3,500
Toluene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
Trichloroethene	1 U	20	4.1	10	1 J	1,500	10 U	56	130	550	130	1.6	120	170	270	50	87	6.8	4.1	84
Trichlorofluoromethane(Freon-11)	NA	NA	NA	10 U	2 J	100 U	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	1.2	0.5 U
Vinyl chloride	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	3.9
Xylene, total	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	NA	NA
cis-1,2-Dichloroethene	1 U	0.9 J	1 U	10 U	0.9 J	100 U	10 U	1 U	2.9	1.9	0.91 J	1 U	1 U	6.9	3.3	1.9	0.62 J	0.77	0.5 U	81 D
cis-1,3-Dichloropropene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	NA	NA	NA	10 U	10 U	100 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11A-GP117	LS11A-GP125		LS11A-GP126	LS11A-GP128	LS11A-GP129	LS11A-DW600				LS11A-DW601				
Sample ID	LS11A-GP117-24-03D	LS11A-GP125-26-03D	LS11A-GP125P-26-03D[1]	LS11A-GP126-08-03D	LS11A-GP128-10-03D	LS11A-GP129-8-03D	LS11A-DW600-0812-07C	LS11A-DW600-1418-07C	LS11A-DW600-2024-07C	LS11A-DW600-2428-07C	LS11A-DW601-0812-07C	LS11A-DW601-1418-07C	LS11A-DW601P-1418-07C[1]	LS11A-DW601-2024-07C	LS11A-DW601-2428-07C
Sample Depth	22-26' bgs	24-28' bgs	24-28' bgs	6-10' bgs	8-12' bgs	12-16' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	14-18' bgs	20-24' bgs	24-28' bgs
Sample Date	10/15/03	10/15/03	10/15/03	10/15/03	10/15/03	10/15/03	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07	09/25/07
Chemical Name															
Volatile Organic Compounds (UG_L)															
1,1,1-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,1,2-Trichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	8 U	8 U
1,1-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,1-Dichloroethene	0.5 U	2.7	2.7	0.5 U	0.5 U	0.5 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	12 U	12 U
1,2,3-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U
1,2-Dibromoethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U
1,2-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,2-Dichloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	8 U	8 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,2-Dichloropropane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	8 U	8 U
1,3-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
1,4-Dichlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
2-Butanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
2-Hexanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
4-Methyl-2-pentanone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Acetone	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	10 U	10 U	10 U	13	10 U	10 U	10 U	20 U	20 U
Benzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	8 U	8 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Bromoform	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Bromomethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Carbon disulfide	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Carbon tetrachloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	8 U	8 U
Chlorobenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Chloroethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Chloroform	0.5 U	0.5 U	0.5 U	1.6	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Chloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Cyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Ethylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Isopropylbenzene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Methyl acetate	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Methyl-tert-butyl ether (MTBE)	0.5 U	0.5 U	0.5 U	0.57	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Methylcyclohexane	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Methylene chloride	0.63	0.5 U	0.5 U	0.51	0.5 U	0.5 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	8 U	8 U
Styrene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Tetrachloroethene	0.64	0.5 U	0.5 U	1,800	0.79	0.5 U	4 U	4 U	4 U	4 U	79.7	130	130	8 U	8 U
Toluene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Trichloroethene	0.5 U	550	490	76	1.4	1.4	4 U	4 U	4 U	10.1	28.1	55.6	52.4	100	18
Trichlorofluoromethane(Freon-11)	0.5 U	0.5 U	0.5 U	1	2.4	3.9	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
Vinyl chloride	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U
Xylene, total	NA	NA	NA	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
cis-1,2-Dichloroethene	0.5 U	4.2	4.2	22	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
cis-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
m- and p-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U
trans-1,3-Dichloropropene	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	20 U	20 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11A-DW602				LS11A-DW603				LS11A-DW604					
Sample ID	LS11A-DW602-0812-07C	LS11A-DW602-1418-07C	LS11A-DW602-2024-07C	LS11A-DW602-2428-07C	LS11A-DW603-0812-07C	LS11A-DW603-1418-07C	LS11A-DW603-2024-07C	LS11A-DW603-2428-07C	LS11A-DW604-0812-07C	LS11A-DW604-1418-07C	LS11A-DW604-2024-07C	LS11A-DW604-2428-07C	LS11A-DW604P-2428-07C [1]	LS11A-DW605-0812-07C
Sample Depth	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	24-28' bgs	8-12' bgs
Sample Date	09/25/07	09/25/07	09/25/07	09/25/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07
Chemical Name														
Volatile Organic Compounds (UG_L)														
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	4 U	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	6 U	6 U	6 U	6 U	6 UJ	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	4 U	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	4 U	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	4 U	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	4 U	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	76 J
Methylcyclohexane	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	4 U	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Styrene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	4 U	4 U	4 U	4 U	4 UJ	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Toluene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	4 U	4 U	4 U	4 U	4 UJ	4 U	160	98.1	4 U	4 U	170	92	99.2	6.5
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11A-DW605			LS11A-DW606				LS11A-DW607					LS11A-
Sample ID	LS11A-DW605-1418-07C	LS11A-DW605-2024-07C	LS11A-DW605-2428-07C	LS11A-DW606-0812-07C	LS11A-DW606-1418-07C	LS11A-DW606-2024-07C	LS11A-DW606-2428-07C	LS11A-DW607-0812-07C	LS11A-DW607-1418-07C	LS11A-DW607-2024-07C	LS11A-DW607-2428-07C	LS11A-DW607P-0812-07C[1]	LS11A-DW608-0812-07C	LS11A-DW608-1418-07C
Sample Depth	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	8-12' bgs	14-18' bgs
Sample Date	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/26/07	09/27/07	09/27/07
Chemical Name														
Volatile Organic Compounds (UG_L)														
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 UJ
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 UJ
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 UJ	10 UJ
Methylene chloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	20.6	36.7	9.5	4 U	4 U	6	4 U	4 U	4 U	4 U	4 U	4 U	4 U	15.3
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	26.1	110 J	1,100 J	4.5	4 U	190	200	4 U	4 U	370	110	4 U	4 U	99
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	DW608		LS11A-DW609					LS11A-DW610				LS11A-DW611		
Sample ID	LS11A-DW608-2024-07C	LS11A-DW608-2428-07C	LS11A-DW609-0812-07C	LS11A-DW609-1418-07C	LS11A-DW609-2024-07C	LS11A-DW609-2428-07C	LS11A-DW609P-2428-07C[1]	LS11A-DW610-0812-07C	LS11A-DW610-1418-07C	LS11A-DW610-2024-07C	LS11A-DW610-2428-07C	LS11A-DW611-0812-07C	LS11A-DW611-1418-07C	LS11A-DW611-2024-07C
Sample Depth	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs
Sample Date	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07
Chemical Name														
Volatile Organic Compounds (UG_L)														
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10.7	10 U	10 U	10 U	10 U
1,2-Dichloropropane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 UJ	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 UJ	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 UJ	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	180	12.8	4 U	100	56.7	4 U	4 U	75.3	37.3	10.8	4 U	21.8	27.2	4 U
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10.7	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
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Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID		LS11A-DW612					LS11A-DW613				LS11A-DW614			
Sample ID	LS11A-DW611-2428-07C	LS11A-DW612-0812-07C	LS11A-DW612P-0812-07C[1]	LS11A-DW612-1418-07C	LS11A-DW612-2024-07C	LS11A-DW612-2428-07C	LS11A-DW613-0812-07C	LS11A-DW613-1418-07C	LS11A-DW613-2024-07C	LS11A-DW613-2428-07C	LS11A-DW614-0812-07C	LS11A-DW614-1418-07C	LS11A-DW614-2024-07C	LS11A-DW614P-2024-07C[1]
Sample Depth	24-28' bgs	8-12' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	20-24' bgs
Sample Date	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/27/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07
Chemical Name														
Volatile Organic Compounds (UG_L)														
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA			
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID		LS11A-DW615			LS11A-DW616				LS11A-DW617					
Sample ID	LS11A-DW614-2428-07C	LS11A-DW615-0812-07C	LS11A-DW615-1418-07C	LS11A-DW615-2024-07C	LS11A-DW616-0812-07C	LS11A-DW616-1418-07C	LS11A-DW616-2024-07C	LS11A-DW616-2428-07C	LS11A-DW617-0812-07C	LS11A-DW617-1418-07C	LS11A-DW617P-1418-07C [1]	LS11A-DW617-2024-07C	LS11A-DW617-2428-07C	LS11A-DW618-0812-07C
Sample Depth	24-28' bgs	8-12' bgs	14-18' bgs	20-24' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs
Sample Date	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07	09/28/07
Chemical Name														
Volatile Organic Compounds (UG_L)														
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U	6 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dibromoethane	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	15.3	10 U	10 U
1,2-Dichloropropane	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	4 U	4 U	4 U	4 U	4 U	7	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	4 U	8.9	23.7	4 U	4 U	380	160 J	4 U	4 U	19.7	20.5	23.6	4 U	4.9
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	15.3	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene														
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
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Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11A-DW618			LS11A-DW619	LS11A-DW620	LS11A-DW621	LS11A-DW622		LS11A-DW624					LS11A
Sample ID	LS11A-DW618-1418-07C	LS11A-DW618-2024-07C	LS11A-DW618-2428-07C	LS11A-DW619-0509-07C	LS11A-DW620-0509-07C	LS11A-DW621-0509-07C	LS11A-DW622-0509-07C	LS11A-DW622P-0509-07C[1]	LS11A-DW624-0812-07C	LS11A-DW624-1418-07C	LS11A-DW624-2024-07C	LS11A-DW624-2428-07C	LS11A-DW626-0812-07C	LS11A-DW626-1418-07C
Sample Depth	14-18' bgs	20-24' bgs	24-28' bgs	5-9' bgs	5-9' bgs	5-9' bgs	5-9' bgs	5-9' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs	8-12' bgs	14-18' bgs
Sample Date	09/28/07	09/28/07	09/28/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07	10/01/07
Chemical Name														
Volatile Organic Compounds (UG_L)														
1,1,1-Trichloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	4 U	4 U	4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	6 U	6 U	6 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.76 J	0.5 U	0.5 U	0.11 J
1,2,3-Trichlorobenzene	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.21 B	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	4 U	4 U	4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	NA	NA	NA	NA	NA	0.5 U	0.28 J	34	0.12 J	0.5 U	0.72
1,2-Dichloropropane	4 U	4 U	4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
2-Butanone	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U	16 U	2.5 U	2.5 U	2.5 U
2-Hexanone	10 U	10 U	10 U	5 U	5 U	5 U	5 UJ	5 U	2.5 U	2.5 U	16 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	10 U	10 U	10 U	5 U	5 U	5 U	5 UJ	5 U	2.5 U	2.5 U	16 U	2.5 U	2.5 U	2.5 U
Acetone	10 U	10 U	10 U	2.7 B	5.1 B	5.9 B	5 U	2.8 B	3.8 B	3.3 B	46	5.8 B	2.5 B	5.2 B
Benzene	4 U	4 U	4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Bromochloromethane	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Bromoform	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Bromomethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	10 U	10 U	10 U	0.5 U	0.5 U	0.23 J	0.5 U	0.5 U	0.18 J	0.11 J	3.1 U	0.17 J	0.5 U	0.11 J
Carbon tetrachloride	4 U	4 U	4 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Chloroethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Chloroform	10 U	10 U	10 U	0.5 U	0.5 U	0.85	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.18 J	0.5 U	0.5 U
Chloromethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Cyclohexane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	0.5 U	0.5 U	0.7	0.64	0.63	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Isopropylbenzene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Methyl acetate	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.19 J	3.1 U	0.5 U	0.5 U	0.11 J
Methylcyclohexane	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Methylene chloride	4 U	4 U	4 U	0.11 B	0.2 B	0.18 B	0.12 B	0.15 B	0.5 U	0.12 J	0.64 J	0.5 U	0.5 U	0.12 J
Styrene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	4 U	4 U	4 U	0.62	0.12 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Toluene	10 U	10 U	10 U	0.16 J	4.1	1.4	1.4	1.4	0.16 J	0.35 J	3.1 U	0.17 J	0.5 U	0.14 J
Trichloroethene	4 U	4 U	4 U	2.1	1.5	0.66	0.59	0.6	0.5 U	25	97	0.52	0.23 J	24
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	4.7	3.1	18	9.1	9.4	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
Xylene, total	10 U	10 U	10 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.28 J	32	0.12 J	0.5 U	0.62
cis-1,3-Dichloropropene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
m- and p-Xylene														
m-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	6.3 U	1 U	1 U	1 U
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.3 J	0.5 U	0.5 U	0.11 J
trans-1,3-Dichloropropene	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	3.1 U	0.5 U	0.5 U	0.5 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-1
Grab Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	-DW626		LS11A-DW631			
Sample ID	LS11A-DW626-2024-07C	LS11A-DW626P-2024-07C[1]	LS11A-DW631-0812-07C	LS11A-DW631-1418-07C	LS11A-DW631-2024-07C	LS11A-DW631-2428-07C
Sample Depth	20-24' bgs	20-24' bgs	8-12' bgs	14-18' bgs	20-24' bgs	24-28' bgs
Sample Date	10/01/07	10/01/07	10/03/07	10/03/07	10/03/07	10/03/07
Chemical Name						
Volatile Organic Compounds (UG_L)						
1,1,1-Trichloroethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	0.66 J	0.22 J	0.5 U	0.5 U	0.5 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dibromoethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	50	19	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
2-Butanone	6.3 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
2-Hexanone	6.3 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	6.3 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	7.6 B	3 B	5.4 B	5.3 B	2.4 J	4.9 B
Benzene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromochloromethane	NA	NA	NA	NA	NA	NA
Bromodichloromethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromoform	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Bromomethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	1.3 U	0.5 U	0.5 U	0.16 J	0.5 U	0.5 U
Carbon tetrachloride	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloroform	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Cyclohexane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	1.3 U	0.17 J	0.5 U	0.5 U	0.5 U	0.5 U
Isopropylbenzene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylcyclohexane	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Styrene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	1.3 U	0.5 U	0.5 U	0.78	0.67	0.43 J
Toluene	1.3 U	0.5 U	0.12 J	0.29 J	0.5 U	0.16 J
Trichloroethene	27	11	0.5 U	0.11 J	0.5 U	0.5 U
Trichlorofluoromethane(Freon-11)	1.3 U	0.5 U	0.5 U	0.1 J	0.12 J	0.5 U
Vinyl chloride	0.26 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Xylene, total	1.3 U	1.5	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	44	17	0.5 U	0.5 U	0.5 U	0.5 U
cis-1,3-Dichloropropene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
m- and p-Xylene						
m-Xylene	2.5 U	0.84 J	1 U	1 U	1 U	1 U
o-Xylene	1.3 U	0.54	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	6.7	2.5	0.5 U	0.5 U	0.5 U	0.5 U
trans-1,3-Dichloropropene	1.3 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-2
Monitoring Well Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW15D									LS11-MW16D							
Sample ID	LS11-MW15DP-99C[1]	LS11-MW15D-99C	LS11-MW15D-03A	LS11-MW15D-17-04A	LS11-MW15D-05A	LS11-MW15D-R01-05B	LS11-MW15D-R02-05B	LS11-MW15D-R03-05D	LS11-MW15D-07C	LS11-MW16D-99C	LS11-MW16D-02B	LS11-MW16D-22-04A	LS11-MW16D-05A	LS11-MW16D-R01-05B	LS11-MW16D-R02-05B	LS11-MW16D-R03-05D	LS11-MW16D-07C
Sample Date	07/01/99	07/01/99	01/03/03	02/23/04	01/31/05	04/04/05	06/13/05	11/07/05	10/09/07	07/01/99	06/07/02	02/23/04	01/31/05	04/04/05	06/14/05	11/07/05	10/10/07
Chemical Name																	
Volatile Organic Compounds (UG_L)																	
1,1,1-Trichloroethane	1 U	1 U	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	0.5 U	10 U	10 U	10 U	1 B	0.5 U	0.5 U	NA	NA	10 U	10 U	10 U	2 B	0.14 J	0.52
1,1,2-Trichloroethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,1-Dichloroethane	1 U	1 U	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	1 U	10 U	10 U	10 U	10 U	0.15 J	0.17 J
1,1-Dichloroethene	1 U	1 U	0.5 UJ	10 U	10 U	10 U	10 U	0.5 UJ	0.5 U	10 U	1 U	10 U	10 U	10 U	10 U	0.73	0.61
1,2,3-Trichlorobenzene	NA	NA	0.5 U	NA	NA	NA	NA	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U
1,2,4-Trichlorobenzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dibromoethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dichlorobenzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dichloroethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,2-Dichloropropane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,3-Dichlorobenzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
1,4-Dichlorobenzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
2-Butanone	NA	NA	5 U	10 UJ	10 U	10 U	10 U	5 U	5 U	NA	5 U	10 UJ	2 B	10 U	10 U	5 U	5 U
2-Hexanone	NA	NA	5 U	10 U	10 U	10 U	10 U	5 U	5 U	NA	5 U	10 U	10 U	10 U	10 U	5 U	5 U
4-Methyl-2-pentanone	NA	NA	5 U	10 U	10 U	10 U	10 U	5 U	5 U	NA	5 U	10 U	10 U	10 U	10 U	5 U	5 U
Acetone	NA	NA	2.7 B	10 UJ	4 B	10 U	10 U	9.9 B	8.8 B	NA	5 U	10 UJ	10 UJ	10 U	4 J	9 B	2.1 B
Benzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Bromochloromethane	NA	NA	0.5 U	NA	NA	NA	NA	0.5 U	0.5 U	NA	1 U	NA	NA	NA	NA	0.5 U	0.5 U
Bromodichloromethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Bromoform	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Bromomethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Carbon disulfide	NA	NA	0.5 UJ	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Carbon tetrachloride	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Chlorobenzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Chloroethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Chloroform	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	1 J	10 U	0.96	0.92
Chloromethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Cyclohexane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	NA	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Dibromochloromethane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	0.5 UJ	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	NA	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Ethylbenzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Isopropylbenzene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	NA	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Methyl acetate	NA	NA	0.5 UJ	10 U	10 U	10 U	10 U	0.5 U	0.5 R	NA	NA	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	NA	NA	0.14 J	10 U	3 J	5 J	8 J	6.8	1.6	NA	NA	10 U	10 U	10 U	10 U	0.1 J	0.12 J
Methylcyclohexane	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	NA	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Methylene chloride	NA	NA	0.5 U	1.4 B	10 U	8 B	9 B	0.5 U	0.5 U	NA	0.79 B	1.6 B	10 U	10 U	13 B	0.15 B	0.1 B
Styrene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Tetrachloroethene	1 U	1 U	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.12 J	10 U	1 U	2.2 J	10 U	10 U	10 U	0.11 J	0.39 B
Toluene	NA	NA	0.11 B	10 U	10 U	10 U	10 U	0.5 U	0.13 B	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.16 B
Trichloroethene	1 U	1 U	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	100	83	61	100	89	140	190	140
Trichlorofluoromethane(Freon-11)	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	NA	10 U	10 U	10 U	10 U	0.5 U	0.19 J
Vinyl chloride	1 U	1 U	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Xylene, total	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	1.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	1.5 U
cis-1,2-Dichloroethene	1 U	1 U	0.5 U	10 U	10 U	10 U	10 U	0.37 J	0.19 J	10 U	2.5	1.7 J	2 J	2 J	2 J	2.3	1.8
cis-1,3-Dichloropropene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	1 U	1 U	0.5 U	10 U	10 U	10 U	10 U	0.5 UJ	0.5 U	10 U	1 U	10 U	10 U	10 U	10 U	0.11 J	0.13 J
trans-1,3-Dichloropropene	NA	NA	0.5 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	1 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U
Semi-volatile Organic Compounds (UG_L)																	
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U

Table A-2
Monitoring Well Groundwater Analytical Results
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NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW20D									LS11-MW21D							
Sample ID	LS11-MW20D-02B	LS11-MW20DP-02B[1]	LS11-MW20D-18-04A	LS11-MW20D-23-04A	LS11-MW20D-05A	LS11-MW20D-R01-05B	LS11-MW20D-R02-05B	LS11-MW20D-R03-05D	LS11-MW20D-07C	LS11-MW21D-02B	LS11-MW21D-21-04A	LS11-MW21D-26-04A	LS11-MW21D-05A	LS11-MW21D-P-05A[1]	LS11-MW21D-R01-05B	LS11-MW21D-R02-05B	LS11-MW21D-R03-05D
Sample Date	06/07/02	06/07/02	02/23/04	02/23/04	02/01/05	04/04/05	06/14/05	11/07/05	10/12/07	06/07/02	02/23/04	02/23/04	02/01/05	02/01/05	04/04/05	06/14/05	11/07/05
Chemical Name																	
Volatile Organic Compounds (UG_L)																	
1,1,1-Trichloroethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,1,2,2-Tetrachloroethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	10 U	10 U	10 U	10 U	1 B	0.5 U	0.5 U	NA	10 U	10 U	10 U	10 U	10 U	2 B	0.5 U
1,1,2-Trichloroethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,1-Dichloroethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.13 J	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,1-Dichloroethene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	0.5 U
1,2,4-Trichlorobenzene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,2-Dibromo-3-chloropropane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,2-Dibromoethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,2-Dichlorobenzene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.21 B	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,2-Dichloroethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,2-Dichloropropane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,3-Dichlorobenzene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
1,4-Dichlorobenzene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.16 B	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
2-Butanone	5 U	5 U	10 UJ	10 UJ	3 B	10 U	10 U	5 U	5 U	5 U	10 UJ	10 UJ	3 B	10 U	10 U	10 U	5 U
2-Hexanone	5 U	5 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U	5 U
4-Methyl-2-pentanone	5 U	5 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U	5 U
Acetone	5 U	1.5 B	10 UJ	3.1 J	10 UJ	10 U	10 U	5 U	3.4 B	3.8 B	2.4 J	10 UJ	10 UJ	10 UJ	10 U	10 U	5.1 B
Benzene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Bromochloromethane	1 U	1 U	NA	NA	NA	NA	NA	0.5 U	0.5 U	1 U	NA	NA	NA	NA	NA	NA	0.5 U
Bromodichloromethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Bromoform	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Bromomethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Carbon disulfide	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Carbon tetrachloride	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Chlorobenzene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.14 J	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Chloroethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Chloroform	1	1	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1.2	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Chloromethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Cyclohexane	NA	NA	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Dibromochloromethane	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Dichlorodifluoromethane (Freon-12)	NA	NA	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Ethylbenzene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Isopropylbenzene	NA	NA	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Methyl acetate	NA	NA	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Methyl-tert-butyl ether (MTBE)	NA	NA	10 U	10 U	10 U	10 U	10 U	0.5 U	0.15 J	NA	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Methylcyclohexane	NA	NA	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Methylene chloride	0.8 B	0.78 B	1.2 B	1.1 B	10 U	15 B	12 B	0.5 U	0.11 B	0.81 B	1.1 B	1.7 B	10 U	10 U	16	14 B	0.5 U
Styrene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Tetrachloroethene	0.54 B	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	44	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Toluene	1 U	1 U	10 U	10 U	10 U	10 U	0.8 B	0.5 U	0.13 B	1 U	10 U	10 U	10 U	10 U	10 U	0.8 B	0.5 U
Trichloroethene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	110	2 J	2.1 J	1 J	1 J	1 J	1 J	1.5 B
Trichlorofluoromethane(Freon-11)	NA	NA	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	NA	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Vinyl chloride	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Xylene, total	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	1.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
cis-1,2-Dichloroethene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	5.4	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
cis-1,3-Dichloropropene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
trans-1,2-Dichloroethene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
trans-1,3-Dichloropropene	1 U	1 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	1 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U
Semi-volatile Organic Compounds (UG_L)																	
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	3 J	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA

Table A-2
Monitoring Well Groundwater Analytical Results
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NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW21D	LS11-MW22D									LS11-MW31D					
Sample ID	LS11-MW21D-07C	LS11-MW22D-02B	LS11-MW22D-20-04A	LS11-MW22D-25-04A	LS11-MW22DP-25-04A[1]	LS11-MW22D-05A	LS11-MW22D-R01-05B	LS11-MW22D-R02-05B	LS11-MW22D-R03-05D	LS11-MW22D-07C	LS11-MW31D-7-04A	LS11-MW31D-12-04A	LS11-MW31D-17-04A	LS11-MW31D-22-04A	LS11-MW31D-27-04A	LS11-MW31D-05A
Sample Date	10/12/07	06/07/02	02/23/04	02/23/04	02/23/04	02/01/05	04/05/05	06/14/05	11/08/05	10/11/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05
Chemical Name																
Volatile Organic Compounds (UG_L)																
1,1,1-Trichloroethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	2 B	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.54	10 U	10 U	10 U	10 U	10 U	10 U
1,2,3-Trichlorobenzene	0.5 U	NA	NA	NA	NA	NA	NA	NA	13 U	0.5 U	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	5 U	5 U	10 UJ	10 UJ	10 UJ	2 B	33 U	10 U	130 U	5 U	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	3 B
2-Hexanone	5 U	5 U	10 U	10 U	10 U	10 U	33 U	10 U	130 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	5 U	5 U	10 U	10 U	10 U	10 U	33 U	10 U	130 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	4.1 B	2.4 B	10 UJ	10 UJ	10 UJ	10 UJ	33 U	6 J	69 B	2.2 B	2.6 J	3.6 J	10 UJ	10 UJ	10 UJ	10 UJ
Benzene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromochloromethane	0.5 U	1 U	NA	NA	NA	NA	NA	NA	13 U	0.5 U	NA	NA	NA	NA	NA	NA
Bromodichloromethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.48 J	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	0.5 U	1.8	10 U	10 U	10 U	10 U	33 U	10 U	13 U	22	4.8 J	4.9 J	4.9 J	4.9 J	4.6 J	10 U
Chloromethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	0.11 B	1.1 B	1.8 B	1.5 B	1.6 B	10 U	33 U	13 B	13 U	0.28 B	1.1 B	1.2 B	1.3 B	2 B	2.6 B	10 U
Styrene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	0.5 U	0.94 B	10 U	10 U	10 U	10 U	4 J	10 U	13 U	0.45 J	6.4 J	6.5 J	6 J	5.9 J	5.7 J	12
Toluene	0.17 B	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.16 B	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	1.9	53	200	200	200	290	420	370	370	260	94	94	94	96	98	150
Trichlorofluoromethane(Freon-11)	0.5 U	NA	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Xylene, total	1.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	1.5 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	0.5 U	1.3	2.2 J	2.1 J	1.8 J	2 J	33 U	3 J	3.1 J	1.5	5.6 J	5.7 J	5.4 J	5.4 J	5.3 J	4 J
cis-1,3-Dichloropropene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.2 J	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	0.5 U	1 U	10 U	10 U	10 U	10 U	33 U	10 U	13 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-volatile Organic Compounds (UG_L)																
1,1-Biphenyl	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Chlorophenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Methylphenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Nitroaniline	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
2-Nitrophenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
3-Nitroaniline	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Chloroaniline	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Methylphenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA

Table A-2
Monitoring Well Groundwater Analytical Results
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NAB Little Creek
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Station ID	LS11-MW31D				LS11-MW32D										
Sample ID	LS11-MW31D-R01-05B	LS11-MW31D-R02-05B	LS11-MW31D-R03-05D	LS11-MW31D-07C	LS11-MW32D-6-04A	LS11-MW32D-11-04A	LS11-MW32D-16-04A	LS11-MW32D-21-04A	LS11-MW32D-26-04A	LS11-MW32DP-26-04A	LS11-MW32D-05A	LS11-MW32D-R01-05B	LS11-MW32D-R02-05B	LS11-MW32D-R03-05D	LS11-MW32D-07C
Sample Date	04/05/05	06/14/05	11/08/05	10/10/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05	04/05/05	06/14/05	11/08/05	10/10/07
Chemical Name															
Volatile Organic Compounds (UG_L)															
1,1,1-Trichloroethane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,1,2,2-Tetrachloroethane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	2 B	0.44 J	0.87	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	12 B	6.3 U	50 U
1,1,2-Trichloroethane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,1-Dichloroethane	10 U	10 U	0.29 J	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,1-Dichloroethene	10 U	10 U	1 U	0.27 J	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,2,3-Trichlorobenzene	NA	NA	1 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U	NA
1,2,4-Trichlorobenzene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,2-Dibromo-3-chloropropane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,2-Dibromoethane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,2-Dichlorobenzene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,2-Dichloroethane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,2-Dichloropropane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,3-Dichlorobenzene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
1,4-Dichlorobenzene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
2-Butanone	10 U	10 U	10 U	5 U	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	83 U	10 U	100 U	63 U	50 U
2-Hexanone	10 U	10 U	10 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	63 U	50 U
4-Methyl-2-pentanone	10 U	10 U	10 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	63 U	50 U
Acetone	38	25	26 B	2.8 B	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	83 UJ	10 U	100 U	35 B	17 B
Benzene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Bromochloromethane	NA	NA	1 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.3 U	NA
Bromodichloromethane	2 J	2 J	1.2	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Bromoform	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Bromomethane	10 U	10 U	0.25 J	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Carbon disulfide	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Carbon tetrachloride	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Chlorobenzene	10 U	10 U	1 U	0.12 J	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Chloroethane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Chloroform	41	29	21	1.6	3.1 J	3.3 J	2.9 J	3.1 J	2.8 J	3 J	83 U	3 J	100 U	6.3 U	50 U
Chloromethane	10 U	10 U	0.47 J	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Cyclohexane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Dibromochloromethane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Ethylbenzene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Isopropylbenzene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Methyl acetate	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	0.35 J	0.1 J	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Methylcyclohexane	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Methylene chloride	8 J	14 B	0.33 B	0.5 U	2.1 B	2.8 B	1.7 B	2.5 B	1.4 B	1.6 B	83 U	10 U	74 B	1.3 B	50 U
Styrene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Tetrachloroethene	3 J	8 J	2.5	6.8	410	420	400	360	270	250	1,100	1,800	1,100	110	430 J
Toluene	10 U	10 U	1 U	0.11 B	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Trichloroethene	14	25	65	110	86	86	84	85	81	83	84	94	120	190	150
Trichlorofluoromethane(Freon-11)	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Vinyl chloride	10 U	10 U	1 U	0.5 U	9.7 J	8.4 J	8.5 J	8.7 J	9 J	9.8 J	83 U	10 U	100 U	6.3 U	50 U
Xylene, total	10 U	10 U	1 U	1.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
cis-1,2-Dichloroethene	10 U	10 U	2.9	1.3	31	32	28	30	28	30	33 J	40	26 J	6.3	13 J
cis-1,3-Dichloropropene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
trans-1,2-Dichloroethene	10 U	10 U	0.48 J	0.22 J	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
trans-1,3-Dichloropropene	10 U	10 U	1 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U	83 U	10 U	100 U	6.3 U	50 U
Semi-volatile Organic Compounds (UG_L)															
1,1-Biphenyl	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2,4,5-Trichlorophenol	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
2,4,6-Trichlorophenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2,4-Dichlorophenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2,4-Dimethylphenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2,4-Dinitrophenol	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
2,4-Dinitrotoluene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2,6-Dinitrotoluene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2-Chloronaphthalene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2-Chlorophenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2-Methylnaphthalene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2-Methylphenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
2-Nitroaniline	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
2-Nitrophenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
3,3'-Dichlorobenzidine	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
3-Nitroaniline	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
4,6-Dinitro-2-methylphenol	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
4-Bromophenyl-phenylether	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
4-Chloro-3-methylphenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
4-Chloroaniline	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
4-Chlorophenyl-phenylether	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
4-Methylphenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U

Table A-2
Monitoring Well Groundwater Analytical Results
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Station ID	LS11-MW33D										LS11-MW34D					
Sample ID	LS11-MW33D-07-04A	LS11-MW33D-12-04A	LS11-MW33D-17-04A	LS11-MW33D-22-04A	LS11-MW33DP-22-04A[1]	LS11-MW33D-05A	LS11-MW33D-R01-05B	LS11-MW33D-R02-05B	LS11-MW33D-R03-05D	LS11-MW33D-07C	LS11-MW34D-6-04A	LS11-MW34D-11-04A	LS11-MW34D-16-04A	LS11-MW34D-21-04A	LS11-MW34D-26-04A	LS11-MW34D-05A
Sample Date	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	01/31/05	04/05/05	06/14/05	11/07/05	10/10/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05
Chemical Name																
Volatile Organic Compounds (UG_L)																
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 B	0.22 J	0.52	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.16 J	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2,3-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 R	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	2 B	10 U	10 U	5 U	5 U	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	2 B
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	5 U	5 U	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	10 UJ	3.1 J	10 U	10 UJ	10 UJ	10 UJ	10 U	10 U	5 U	4 B	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ	10 UJ
Benzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	1.8 J	1.1 J	1.1 J	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	2.2 J	2.5 J	2.5 J	2.5 J	2.3 J	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.1 J	0.5 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Isopropylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	1.8 B	1.3 B	1.1 B	10 U	1.6 B	10 U	13	13 B	0.17 B	0.16 B	1.8 B	2 B	1.2 B	1.1 B	10 U	10 U
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.2 B	10 U	10 U	10 U	10 U	10 U	10 U
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.21 B	10 U	10 U	10 U	10 U	10 U	10 U
Trichloroethene	11	15	16	17	17	7 J	6 J	6 J	5.9 J	10	28	29	32	34	44	120
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.33 J	0.56	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 UJ	10 U	10 U	10 U	10 U	10 U	10 U
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	1.5 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	1.2 J	1.2 J	1.2 J	1.7 J	1.6 J	10 U	10 U	10 U	0.63	0.54	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	0.5 U	0.5 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-volatile Organic Compounds (UG_L)																
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA

Table A-2
Monitoring Well Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW34D						LS11-MW35D						LS11A-MW36D	LS11A-MW37D	LS11A-MW38D
Sample ID	LS11-MW34D-R01-05B	LS11-MW34D-R02-05B	LS11-MW34D-R03-05D	LS11-MW34DP-R03-05D[1]	LS11-MW34D-07C	LS11-MW34DP-07C[1]	LS11-MW35D-05A	LS11-MW35D-R01-05B	LS11-MW35D-R02-05B	LS11-MW35D-R03-05D	LS11-MW35D-07C	LS11-MW35DP-07C[1]	LS11A-MW36D-07C	LS11A-MW37D-07C	LS11A-MW38D-07C
Sample Date	04/05/05	06/14/05	11/08/05	11/08/05	10/11/07	10/11/07	01/31/05	04/04/05	06/13/05	11/07/05	10/12/07	10/12/07	10/09/07	10/09/07	10/08/07
Chemical Name															
Volatile Organic Compounds (UG_L)															
1,1,1-Trichloroethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,1,2,2-Tetrachloroethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	1 B	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	2 B	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,1,2-Trichloroethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,1-Dichloroethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,1-Dichloroethene	10 U	10 U	0.23 J	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,2,3-Trichlorobenzene	NA	NA	1 U	1.1 U	0.5 U	0.5 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
1,2,4-Trichlorobenzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,2-Dibromo-3-chloropropane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,2-Dibromoethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,2-Dichlorobenzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,2-Dichloroethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,2-Dichloropropane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,3-Dichlorobenzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
1,4-Dichlorobenzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
2-Butanone	10 U	10 U	10 U	11 U	5 U	5 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	50 U
2-Hexanone	10 U	10 U	10 U	11 U	5 U	5 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	50 U
4-Methyl-2-pentanone	10 U	10 U	10 U	11 U	5 U	5 U	10 U	10 U	10 U	5 U	5 U	5 U	5 U	5 U	50 U
Acetone	10 U	10 U	5.6 B	5.2 B	3.4 B	3.7 B	4 B	10 U	10 U	5 U	3.1 B	5.5 B	7.6 B	22 B	33 B
Benzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Bromochloromethane	NA	NA	1 U	1.1 U	0.5 U	0.5 U	NA	NA	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA
Bromodichloromethane	10 U	10 U	1 U	1.1 U	0.13 J	0.17 J	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Bromoform	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Bromomethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Carbon disulfide	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Carbon tetrachloride	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Chlorobenzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Chloroethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Chloroform	5 J	10 U	0.73 J	0.67 J	11	11	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Chloromethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Cyclohexane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Dibromochloromethane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Dichlorodifluoromethane (Freon-12)	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Ethylbenzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Isopropylbenzene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Methyl acetate	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	6.3 R	0.5 R	50 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	1 U	1.1 U	0.17 J	0.12 J	10 U	10 U	10 U	0.5 U	3.7	3.9	0.32 J	0.41 J	50 U
Methylcyclohexane	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Methylene chloride	10 U	12 B	1 U	1.1 U	0.14 B	0.3 B	10 U	9 B	15 B	0.5 U	0.11 B	0.16 B	0.5 U	0.5 U	50 U
Styrene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Tetrachloroethene	5 J	10 U	0.68 J	0.83 J	4.6	5.1	10 U	10 U	10 U	0.5 U	0.19 J	0.21 J	160	0.13 J	50 U
Toluene	10 U	0.9 B	1 U	1.1 U	0.12 B	0.1 B	10 U	10 U	1 B	0.5 U	0.1 B	0.5 U	0.36 B	0.17 B	50 U
Trichloroethene	49	160	30	31	210	210	7 J	5 J	4 J	0.78 B	2.3	2.2	61	0.5 U	730
Trichlorofluoromethane(Freon-11)	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.47 J	0.5 U	50 U
Vinyl chloride	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Xylene, total	10 U	10 U	1 U	1.1 U	1.5 U	1.5 U	10 U	10 U	10 U	0.5 U	1.5 U	1.5 U	1.5 U	1.5 U	50 U
cis-1,2-Dichloroethene	10 U	10 U	0.29 J	0.31 J	0.86	0.86	10 U	10 U	10 U	0.5 UJ	0.5 U	0.5 U	5.4	0.5 U	50 U
cis-1,3-Dichloropropene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
trans-1,2-Dichloroethene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 UJ	0.5 U	0.5 U	0.5 U	0.5 U	50 U
trans-1,3-Dichloropropene	10 U	10 U	1 U	1.1 U	0.5 U	0.5 U	10 U	10 U	10 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	50 U
Semi-volatile Organic Compounds (UG_L)															
1,1-Biphenyl	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2,4,5-Trichlorophenol	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
2,4,6-Trichlorophenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2,4-Dichlorophenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2,4-Dimethylphenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2,4-Dinitrophenol	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
2,4-Dinitrotoluene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2,6-Dinitrotoluene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2-Chloronaphthalene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2-Chlorophenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2-Methylnaphthalene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2-Methylphenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
2-Nitroaniline	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
2-Nitrophenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
3,3'-Dichlorobenzidine	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
3-Nitroaniline	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
4-Chloro-3-methylphenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
4-Chloroaniline	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
4-Chlorophenyl-phenylether	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
4-Methylphenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U

Table A-2
Monitoring Well Groundwater Analytical Results
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Station ID	LS11A-MW39D	LS11A-MW40D
Sample ID	LS11A-MW39D-07C	LS11A-MW40D-07C
Sample Date	10/08/07	10/09/07
Chemical Name		
Volatile Organic Compounds (UG_L)		
1,1,1-Trichloroethane	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	0.5 U	0.5 U
1,1,2-Trichloroethane	0.5 U	0.5 U
1,1-Dichloroethane	0.5 U	0.5 U
1,1-Dichloroethene	0.5 U	0.5 U
1,2,3-Trichlorobenzene	0.5 U	0.5 U
1,2,4-Trichlorobenzene	0.5 U	0.5 U
1,2-Dibromo-3-chloropropane	0.5 U	0.5 U
1,2-Dibromoethane	0.5 U	0.5 U
1,2-Dichlorobenzene	0.5 U	0.5 U
1,2-Dichloroethane	0.5 U	0.5 U
1,2-Dichloropropane	0.5 U	0.5 U
1,3-Dichlorobenzene	0.5 U	0.5 U
1,4-Dichlorobenzene	0.5 U	0.5 U
2-Butanone	5 U	5 U
2-Hexanone	5 U	5 U
4-Methyl-2-pentanone	5 U	5 U
Acetone	5.8 B	5 B
Benzene	0.5 U	0.5 U
Bromochloromethane	0.5 U	0.5 U
Bromodichloromethane	0.17 J	0.2 J
Bromoform	0.5 U	0.5 U
Bromomethane	0.5 U	0.5 U
Carbon disulfide	0.5 U	0.5 U
Carbon tetrachloride	0.5 U	0.5 U
Chlorobenzene	0.5 U	0.5 U
Chloroethane	0.5 U	0.5 U
Chloroform	0.62	1.4
Chloromethane	0.5 U	0.5 U
Cyclohexane	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U
Dichlorodifluoromethane (Freon-12)	0.5 U	0.5 U
Ethylbenzene	0.5 U	0.5 U
Isopropylbenzene	0.5 U	0.5 U
Methyl acetate	0.5 R	0.5 R
Methyl-tert-butyl ether (MTBE)	0.5 U	11
Methylcyclohexane	0.5 U	0.5 U
Methylene chloride	0.5 U	0.18 B
Styrene	0.5 U	0.5 U
Tetrachloroethene	0.46 J	2.8
Toluene	0.5 U	0.15 B
Trichloroethene	16 B	0.21 B
Trichlorofluoromethane(Freon-11)	0.5 U	0.54
Vinyl chloride	0.5 U	0.5 U
Xylene, total	1.5 U	1.5 U
cis-1,2-Dichloroethene	0.5 U	0.5 U
cis-1,3-Dichloropropene	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	0.5 U
trans-1,3-Dichloropropene	0.5 U	0.5 U
Semi-volatile Organic Compounds (UG_L)		
1,1-Biphenyl	10 U	10 U
2,2'-Oxybis(1-chloropropane)	10 U	10 U
2,4,5-Trichlorophenol	26 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	26 U	25 U
2,4-Dinitrotoluene	10 U	10 U
2,6-Dinitrotoluene	10 U	10 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	26 U	25 U
2-Nitrophenol	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U
3-Nitroaniline	26 U	25 U
4,6-Dinitro-2-methylphenol	26 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-Methylphenol	10 U	10 U

Table A-2
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Station ID	LS11-MW15D									LS11-MW16D							
Sample ID	LS11-MW15DP-99C[1]	LS11-MW15D-99C	LS11-MW15D-03A	LS11-MW15D-17-04A	LS11-MW15D-05A	LS11-MW15D-R01-05B	LS11-MW15D-R02-05B	LS11-MW15D-R03-05D	LS11-MW15D-07C	LS11-MW16D-99C	LS11-MW16D-02B	LS11-MW16D-22-04A	LS11-MW16D-05A	LS11-MW16D-R01-05B	LS11-MW16D-R02-05B	LS11-MW16D-R03-05D	LS11-MW16D-07C
Sample Date	07/01/99	07/01/99	01/03/03	02/23/04	01/31/05	04/04/05	06/13/05	11/07/05	10/09/07	07/01/99	06/07/02	02/23/04	01/31/05	04/04/05	06/14/05	11/07/05	10/10/07
Chemical Name																	
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA	NA	26 U
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	10 U
Pesticide/Polychlorinated Biphenyls (UG_L)																	
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.011 U
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	0.21 U
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	0.4 U	NA	NA	NA	NA	NA	NA	NA	0.43 U
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	0.21 U
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	0.21 U
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	0.21 U
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	0.21 U
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	0.21 U
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.011 U
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	0.021 U
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	0.013 B	NA	NA	NA	NA	NA	NA	NA	0.015 B
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.011 U
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	NA	NA	NA	NA	NA	NA	NA	0.11 U
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	1.1 U
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	0.0031 J	NA	NA	NA	NA	NA	NA	NA	0.011 U
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.011 U
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.011 U
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.011 U
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.0029 J
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	0.011 U
Total Metals (UG_L)																	
Aluminum	NA	NA	NA	NA	105 B	135 B	175 B	122 B	200 U	NA	386 B	NA	113 B	355	99.2 B	33.9 B	200 U
Antimony	NA	NA	NA	NA	2.1 U	1.3 U	1.3 U	1.6 U	2 U	NA	2.3 U	NA	2.1 U	1.8 B	1.3 U	1.6 U	2 U
Arsenic	NA	NA	NA	NA	2.1 U	1.6 U	1.6 U	2 U	3.8 K	NA	3.5 U	NA	2.1 U	1.7 B	1.6 U	2 U	1 U

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Station ID	LS11-MW20D									LS11-MW21D							
Sample ID	LS11-MW20D-02B	LS11-MW20DP-02B[1]	LS11-MW20D-18-04A	LS11-MW20D-23-04A	LS11-MW20D-05A	LS11-MW20D-R01-05B	LS11-MW20D-R02-05B	LS11-MW20D-R03-05D	LS11-MW20D-07C	LS11-MW21D-02B	LS11-MW21D-21-04A	LS11-MW21D-26-04A	LS11-MW21D-05A	LS11-MW21D-P-05A[1]	LS11-MW21D-R01-05B	LS11-MW21D-R02-05B	LS11-MW21D-R03-05D
Sample Date	06/07/02	06/07/02	02/23/04	02/23/04	02/01/05	04/04/05	06/14/05	11/07/05	10/12/07	06/07/02	02/23/04	02/23/04	02/01/05	02/01/05	04/04/05	06/14/05	11/07/05
Chemical Name																	
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	25 U	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	6 J	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	4 J	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG_L)																	
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	0.017 B	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	0.015 B	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	0.02 J	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	0.0061 J	NA	NA	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	0.0066 J	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG_L)																	
Aluminum	337 B	308 B	NA	NA	80.7 B	80.5 B	64.3 B	27.2 B	89.4 J	1,180	NA	NA	173 J	123 B	246	97.5 B	79.1 B
Antimony	2.3 U	2.3 U	NA	NA	2.1 U	1.9 B	1.3 U	1.6 U	2 U	2.3 U	NA	NA	2.1 U	2.1 U	1.3 U	1.3 U	1.6 U
Arsenic	3.5 U	3.5 U	NA	NA	2.1 U	1.6 U	1.6 U	2 U	0.39 B	3.5 U	NA	NA	4 J	2.1 U	3.4 B	1.6 U	2 U

Table A-2
Monitoring Well Groundwater Analytical Results
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Station ID	LS11-MW21D	LS11-MW22D									LS11-MW31D					
Sample ID	LS11-MW21D-07C	LS11-MW22D-02B	LS11-MW22D-20-04A	LS11-MW22D-25-04A	LS11-MW22DP-25-04A[1]	LS11-MW22D-05A	LS11-MW22D-R01-05B	LS11-MW22D-R02-05B	LS11-MW22D-R03-05D	LS11-MW22D-07C	LS11-MW31D-7-04A	LS11-MW31D-12-04A	LS11-MW31D-17-04A	LS11-MW31D-22-04A	LS11-MW31D-27-04A	LS11-MW31D-05A
Sample Date	10/12/07	06/07/02	02/23/04	02/23/04	02/23/04	02/01/05	04/05/05	06/14/05	11/08/05	10/11/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05
Chemical Name																
4-Nitroaniline	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
4-Nitrophenol	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
Acenaphthene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Acenaphthylene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Acetophenone	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Anthracene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Atrazine	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzaldehyde	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Caprolactam	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Carbazole	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Chrysene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Dibenzofuran	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Diethylphthalate	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Fluoranthene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Fluorene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachloroethane	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Isophorone	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Naphthalene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Nitrobenzene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Pentachlorophenol	26 U	NA	NA	NA	NA	NA	NA	NA	NA	27 U	NA	NA	NA	NA	NA	NA
Phenanthrene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Phenol	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Pyrene	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	10 U	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG_L)																
4,4'-DDD	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
4,4'-DDE	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
4,4'-DDT	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Aldrin	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
Aroclor-1016	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1221	0.4 U	NA	NA	NA	NA	NA	NA	NA	NA	0.41 U	NA	NA	NA	NA	NA	NA
Aroclor-1232	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1242	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1248	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1254	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1260	0.2 U	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Dieldrin	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endosulfan I	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
Endosulfan II	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endrin	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endrin aldehyde	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endrin ketone	0.02 U	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Heptachlor	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.014 B	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
Methoxychlor	0.1 U	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	NA	NA	NA	NA	NA	NA
Toxaphene	1 U	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
alpha-BHC	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
alpha-Chlordane	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
beta-BHC	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
delta-BHC	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
gamma-Chlordane	0.01 U	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U	NA	NA	NA	NA	NA	NA
Total Metals (UG_L)																
Aluminum	193 J	1,480	NA	NA	NA	76.4 B	765	127 B	316 B	65.7 J	NA	NA	NA	NA	NA	327
Antimony	2 U	2.3 U	NA	NA	NA	2.1 U	1.7 B	1.3 J	1.6 U	2 U	NA	NA	NA	NA	NA	2.1 U
Arsenic	1.6 B	3.5 U	NA	NA	NA	2.1 U	2.4 B	1.6 U	2 U	0.46 B	NA	NA	NA	NA	NA	2.1 U

Table A-2
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Station ID	LS11-MW31D				LS11-MW32D										
Sample ID	LS11-MW31D-R01-05B	LS11-MW31D-R02-05B	LS11-MW31D-R03-05D	LS11-MW31D-07C	LS11-MW32D-6-04A	LS11-MW32D-11-04A	LS11-MW32D-16-04A	LS11-MW32D-21-04A	LS11-MW32D-26-04A	LS11-MW32DP-26-04A	LS11-MW32D-05A	LS11-MW32D-R01-05B	LS11-MW32D-R02-05B	LS11-MW32D-R03-05D	LS11-MW32D-07C
Sample Date	04/05/05	06/14/05	11/08/05	10/10/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05	04/05/05	06/14/05	11/08/05	10/10/07
Chemical Name															
4-Nitroaniline	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
4-Nitrophenol	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
Acenaphthene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Acenaphthylene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Acetophenone	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Anthracene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Atrazine	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Benzaldehyde	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(a)anthracene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(a)pyrene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(b)fluoranthene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(g,h,i)perylene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Benzo(k)fluoranthene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Butylbenzylphthalate	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Caprolactam	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Carbazole	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Chrysene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Di-n-butylphthalate	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Di-n-octylphthalate	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Dibenz(a,h)anthracene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Dibenzofuran	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Diethylphthalate	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Dimethyl phthalate	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Fluoranthene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Fluorene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachlorobenzene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachlorobutadiene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachlorocyclopentadiene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Hexachloroethane	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Indeno(1,2,3-cd)pyrene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Isophorone	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Naphthalene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Nitrobenzene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Pentachlorophenol	NA	NA	NA	28 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U
Phenanthrene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Phenol	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Pyrene	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
bis(2-Chloroethoxy)methane	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
bis(2-Chloroethyl)ether	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
bis(2-Ethylhexyl)phthalate	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
n-Nitroso-di-n-propylamine	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
n-Nitrosodiphenylamine	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U
Pesticide/Polychlorinated Biphenyls (UG_L)															
4,4'-DDD	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
4,4'-DDE	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
4,4'-DDT	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
Aldrin	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U
Aroclor-1016	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U
Aroclor-1221	NA	NA	NA	0.42 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.4 U
Aroclor-1232	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U
Aroclor-1242	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U
Aroclor-1248	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U
Aroclor-1254	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U
Aroclor-1260	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.2 U
Dieldrin	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.018 B
Endosulfan I	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.006 B
Endosulfan II	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
Endosulfan sulfate	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
Endrin	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
Endrin aldehyde	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
Endrin ketone	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.02 U
Heptachlor	NA	NA	NA	0.011 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.014 B
Heptachlor epoxide	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0057 J
Methoxychlor	NA	NA	NA	0.11 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U
Toxaphene	NA	NA	NA	1.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
alpha-BHC	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U
alpha-Chlordane	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U
beta-BHC	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U
delta-BHC	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U
gamma-BHC (Lindane)	NA	NA	NA	0.003 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U
gamma-Chlordane	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.01 U
Total Metals (UG_L)															
Aluminum	19,600	3,770	2,350	15.2 J	NA	NA	NA	NA	NA	NA	790	970	271	414	32.2 J
Antimony	1.3 U	1.3 U	1.6 U	2 U	NA	NA	NA	NA	NA	NA	2.1 U	1.3 U	1.3 U	1.6 U	2 U
Arsenic	13.2 B	3.3 J	2 U	1 U	NA	NA	NA	NA	NA	NA	2.1 U	1.6 U	1.6 U	2 U	0.49 B

Table A-2
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Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW33D										LS11-MW34D					
Sample ID	LS11-MW33D-07-04A	LS11-MW33D-12-04A	LS11-MW33D-17-04A	LS11-MW33D-22-04A	LS11-MW33DP-22-04A[1]	LS11-MW33D-05A	LS11-MW33D-R01-05B	LS11-MW33D-R02-05B	LS11-MW33D-R03-05D	LS11-MW33D-07C	LS11-MW34D-6-04A	LS11-MW34D-11-04A	LS11-MW34D-16-04A	LS11-MW34D-21-04A	LS11-MW34D-26-04A	LS11-MW34D-05A
Sample Date	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	01/31/05	04/05/05	06/14/05	11/07/05	10/10/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05
Chemical Name																
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	26 U	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	NA	NA	NA	NA	NA	NA
Pesticide/Polychlorinated Biphenyls (UG_L)																
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.43 U	NA	NA	NA	NA	NA	NA
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.21 U	NA	NA	NA	NA	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0016 B	NA	NA	NA	NA	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.021 U	NA	NA	NA	NA	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.016 B	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.11 U	NA	NA	NA	NA	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 U	NA	NA	NA	NA	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 J	NA	NA	NA	NA	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.011 U	NA	NA	NA	NA	NA	NA
Total Metals (UG_L)																
Aluminum	NA	NA	NA	NA	NA	236	74.1 B	62.7 B	86.5 B	18.7 J	NA	NA	NA	NA	NA	404
Antimony	NA	NA	NA	NA	NA	2.1 U	1.3 U	1.3 U	1.9 B	2 U	NA	NA	NA	NA	NA	2.1 U
Arsenic	NA	NA	NA	NA	NA	2.1 U	1.6 U	1.6 U	2 U	0.37 B	NA	NA	NA	NA	NA	2.1 U

Table A-2
Monitoring Well Groundwater Analytical Results
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Virginia Beach, Virginia

Station ID	LS11-MW34D						LS11-MW35D						LS11A-MW36D	LS11A-MW37D	LS11A-MW38D
Sample ID	LS11-MW34D-R01-05B	LS11-MW34D-R02-05B	LS11-MW34D-R03-05D	LS11-MW34DP-R03-05D[1]	LS11-MW34D-07C	LS11-MW34DP-07C[1]	LS11-MW35D-05A	LS11-MW35D-R01-05B	LS11-MW35D-R02-05B	LS11-MW35D-R03-05D	LS11-MW35D-07C	LS11-MW35DP-07C[1]	LS11A-MW36D-07C	LS11A-MW37D-07C	LS11A-MW38D-07C
Sample Date	04/05/05	06/14/05	11/08/05	11/08/05	10/11/07	10/11/07	01/31/05	04/04/05	06/13/05	11/07/05	10/12/07	10/12/07	10/09/07	10/09/07	10/08/07
Chemical Name															
4-Nitroaniline	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
4-Nitrophenol	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
Acenaphthene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Acenaphthylene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Acetophenone	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Anthracene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Atrazine	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Benzaldehyde	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Benzo(a)anthracene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Benzo(a)pyrene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Benzo(b)fluoranthene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Benzo(g,h,i)perylene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Benzo(k)fluoranthene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Butylbenzylphthalate	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Caprolactam	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Carbazole	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Chrysene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Di-n-butylphthalate	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Di-n-octylphthalate	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Dibenz(a,h)anthracene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Dibenzofuran	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Diethylphthalate	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Dimethyl phthalate	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Fluoranthene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Fluorene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Hexachlorobenzene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Hexachlorobutadiene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Hexachlorocyclopentadiene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Hexachloroethane	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Isophorone	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Naphthalene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Nitrobenzene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Pentachlorophenol	NA	NA	NA	NA	25 U	25 U	NA	NA	NA	NA	25 U	25 U	25 U	25 U	28 U
Phenanthrene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Phenol	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Pyrene	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
bis(2-Chloroethyl)ether	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
n-Nitrosodiphenylamine	NA	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	10 U	10 U	10 U	10 U	11 U
Pesticide/Polychlorinated Biphenyls (UG_L)															
4,4'-DDD	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.0059 J	0.0075 J	0.02 U
4,4'-DDE	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U
4,4'-DDT	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U
Aldrin	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
Aroclor-1016	NA	NA	NA	NA	0.2 U	0.21 U	NA	NA	NA	NA	0.2 U	0.2 U	0.22 U	0.2 U	0.2 U
Aroclor-1221	NA	NA	NA	NA	0.4 U	0.41 U	NA	NA	NA	NA	0.4 U	0.4 U	0.44 U	0.4 U	0.4 U
Aroclor-1232	NA	NA	NA	NA	0.2 U	0.21 U	NA	NA	NA	NA	0.2 U	0.2 U	0.22 U	0.2 U	0.2 U
Aroclor-1242	NA	NA	NA	NA	0.2 U	0.21 U	NA	NA	NA	NA	0.2 U	0.2 U	0.22 U	0.2 U	0.2 U
Aroclor-1248	NA	NA	NA	NA	0.2 U	0.21 U	NA	NA	NA	NA	0.2 U	0.2 U	0.22 U	0.2 U	0.2 U
Aroclor-1254	NA	NA	NA	NA	0.2 U	0.21 U	NA	NA	NA	NA	0.2 U	0.2 U	0.22 U	0.2 U	0.2 U
Aroclor-1260	NA	NA	NA	NA	0.2 U	0.21 U	NA	NA	NA	NA	0.2 U	0.2 U	0.22 U	0.2 U	0.2 U
Dieldrin	NA	NA	NA	NA	0.0084 B	0.0082 B	NA	NA	NA	NA	0.02 U	0.02 U	0.0075 B	0.057	0.0084 B
Endosulfan I	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.004 B	0.01 U	0.01 U
Endosulfan II	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U
Endosulfan sulfate	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U
Endrin	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.022 U	0.0048 J	0.02 U
Endrin aldehyde	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U
Endrin ketone	NA	NA	NA	NA	0.02 U	0.021 U	NA	NA	NA	NA	0.02 U	0.02 U	0.022 U	0.02 U	0.02 U
Heptachlor	NA	NA	NA	NA	0.0098 B	0.011 B	NA	NA	NA	NA	0.01 U	0.01 U	0.012 B	0.01 U	0.034 B
Heptachlor epoxide	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
Methoxychlor	NA	NA	NA	NA	0.1 U	0.1 U	NA	NA	NA	NA	0.1 U	0.1 U	0.11 U	0.1 U	0.1 U
Toxaphene	NA	NA	NA	NA	1 U	1 U	NA	NA	NA	NA	1 U	1 U	1.1 U	1 U	1 U
alpha-BHC	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
alpha-Chlordane	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.0059 J	0.01 U	0.01 U
beta-BHC	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.0088 B	0.01 U	0.0086 B
delta-BHC	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
gamma-BHC (Lindane)	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.01 U	0.0039 J
gamma-Chlordane	NA	NA	NA	NA	0.01 U	0.01 U	NA	NA	NA	NA	0.01 U	0.01 U	0.011 U	0.01 U	0.01 U
Total Metals (UG_L)															
Aluminum	1,280	119 B	391	367 B	200 U	200 U	140 B	102 B	75.2 B	121 B	48.1 J	44 J	14.6 J	17.4 J	200 U
Antimony	1.9 B	1.3 U	1.6 U	1.6 U	2 U	2 U	2.1 U	1.3 U	1.3 U	1.6 U	2 U	2 U	2 U	2 U	2 U
Arsenic	1.6 U	1.6 U	2 U	2 U	0.41 B	0.4 B	2.1 U	1.6 U	1.6 U	2 U	1 U	1 U	1 U	0.64 B	1 U

Table A-2
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Station ID	LS11A-MW39D	LS11A-MW40D
Sample ID	LS11A-MW39D-07C	LS11A-MW40D-07C
Sample Date	10/08/07	10/09/07
Chemical Name		
4-Nitroaniline	26 U	25 U
4-Nitrophenol	26 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 U	10 U
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
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
Nitrobenzene	10 U	10 U
Pentachlorophenol	26 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
Pesticide/Polychlorinated Biphenyls (UG_L)		
4,4'-DDD	0.02 U	0.0044 J
4,4'-DDE	0.02 U	0.02 U
4,4'-DDT	0.02 U	0.02 U
Aldrin	0.01 U	0.01 U
Aroclor-1016	0.2 U	0.2 U
Aroclor-1221	0.4 U	0.4 U
Aroclor-1232	0.2 U	0.2 U
Aroclor-1242	0.2 U	0.2 U
Aroclor-1248	0.2 U	0.2 U
Aroclor-1254	0.2 U	0.2 U
Aroclor-1260	0.2 U	0.2 U
Dieldrin	0.14	0.26
Endosulfan I	0.01 U	0.01 U
Endosulfan II	0.02 U	0.02 U
Endosulfan sulfate	0.02 U	0.02 U
Endrin	0.02 U	0.02 U
Endrin aldehyde	0.02 U	0.02 U
Endrin ketone	0.02 U	0.02 U
Heptachlor	0.011 B	0.017 B
Heptachlor epoxide	0.01 U	0.01 U
Methoxychlor	0.1 U	0.1 U
Toxaphene	1 U	1 U
alpha-BHC	0.01 U	0.01 U
alpha-Chlordane	0.01 U	0.01 U
beta-BHC	0.01 U	0.0094 B
delta-BHC	0.01 U	0.01 U
gamma-BHC (Lindane)	0.01 U	0.0029 J
gamma-Chlordane	0.01 U	0.01 U
Total Metals (UG_L)		
Aluminum	12.8 J	12.2 J
Antimony	2 U	2 U
Arsenic	1 U	0.32 B

Table A-2
Monitoring Well Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW15D									LS11-MW16D							
Sample ID	LS11-MW15DP-99C[1]	LS11-MW15D-99C	LS11-MW15D-03A	LS11-MW15D-17-04A	LS11-MW15D-05A	LS11-MW15D-R01-05B	LS11-MW15D-R02-05B	LS11-MW15D-R03-05D	LS11-MW15D-07C	LS11-MW16D-99C	LS11-MW16D-02B	LS11-MW16D-22-04A	LS11-MW16D-05A	LS11-MW16D-R01-05B	LS11-MW16D-R02-05B	LS11-MW16D-R03-05D	LS11-MW16D-07C
Sample Date	07/01/99	07/01/99	01/03/03	02/23/04	01/31/05	04/04/05	06/13/05	11/07/05	10/09/07	07/01/99	06/07/02	02/23/04	01/31/05	04/04/05	06/14/05	11/07/05	10/10/07
Chemical Name																	
Barium	NA	NA	NA	NA	12.4 B	18.1 J	17.8 J	19.8 J	19.6	NA	37.2 J	NA	29.3 B	33.3 J	35.9 J	32.2 J	37.4
Beryllium	NA	NA	NA	NA	0.1 U	0.28 B	0.42 B	0.1 U	1 U	NA	0.1 U	NA	0.1 U	0.23 B	0.57 B	0.16 B	1 U
Cadmium	NA	NA	NA	NA	0.3 U	0.2 U	0.2 U	0.81 B	0.11 J	NA	0.3 U	NA	0.3 U	0.2 U	0.2 U	0.2 U	0.096 J
Calcium	NA	NA	NA	NA	70,100	71,500	69,000	76,500	64,500 J	NA	12,200	NA	12,100	11,200	12,300	10,900	11,100 J
Chromium	NA	NA	NA	NA	0.6 U	0.8 U	0.91 J	1.3 B	2 U	NA	2.8 B	NA	0.6 U	0.8 U	0.81 J	0.94 B	2 U
Cobalt	NA	NA	NA	NA	0.6 U	0.4 U	0.4 U	0.54 B	0.26 J	NA	2.6 B	NA	2.5 J	0.4 U	0.74 J	0.5 U	0.28 J
Copper	NA	NA	NA	NA	2.8 B	1.7 J	1.2 J	1.5 J	1.9 B	NA	4 B	NA	0.4 U	0.6 U	0.6 U	0.6 U	1.2 B
Cyanide	NA	NA	NA	NA	0.8 U	1 B	0.8 UL	0.7 U	10 U	NA	10 U	NA	0.8 U	3.6 B	0.8 U	0.7 U	10 U
Iron	NA	NA	NA	NA	1,650	1,010	2,490	1,800	1,830	NA	553 B	NA	137 B	305	69.2 B	19.2 B	100 U
Lead	NA	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.1 B	0.24 B	NA	1.5 U	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.07 B
Magnesium	NA	NA	NA	NA	6,140	6,150	6,820	7,170	7,010	NA	6,470	NA	7,990	8,500	7,610	6,080	7,050
Manganese	NA	NA	NA	NA	420	319	492	470	481 J	NA	271	NA	280	113	64.2	30.1	140 J
Mercury	NA	NA	NA	NA	0.1 B	0.1 U	0.1 U	0.1 U	0.2 U	NA	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.11 J	0.74
Nickel	NA	NA	NA	NA	0.8 U	1.3 J	1 J	1.2 J	0.65 B	NA	13 B	NA	1.1 J	0.8 U	0.85 J	1.1 J	1.2 B
Potassium	NA	NA	NA	NA	3,340 J	2,980 J	2,840 J	3,050 J	1,830 J	NA	2,480 J	NA	2,020 J	1,940 J	2,290 J	2,110 J	1,710 J
Selenium	NA	NA	NA	NA	2.7 U	2.2 U	2.4 J	4.3 U	0.55 J	NA	3 UJ	NA	2.7 U	3.2 J	3.6 J	4.3 U	2 J
Silver	NA	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.7 B	1 UL	NA	1.3 U	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL
Sodium	NA	NA	NA	NA	29,600	31,300	33,500	31,700	37,200 J	NA	36,000	NA	36,300	33,400	36,900	34,200	36,000 J
Thallium	NA	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	1 U	NA	4.2 U	NA	3 U	2.8 U	2.8 U	4.5 U	0.073 B
Vanadium	NA	NA	NA	NA	0.5 U	0.6 J	0.89 B	0.84 B	5 U	NA	1.5 J	NA	0.56 J	0.6 J	0.84 B	0.5 U	5 U
Zinc	NA	NA	NA	NA	49.6 B	86.8	20.9	19.4 J	5 B	NA	44.6 B	NA	4.6 B	7.1 J	5.2 J	3.9 B	4.5 B
Dissolved Metals (UG_L)																	
Aluminum	NA	NA	NA	NA	13.5 U	26.9 B	69 B	8.1 U	200 U	NA	19.9 B	NA	13.5 U	37.3 B	63.4 B	8.1 U	200 U
Antimony	NA	NA	NA	NA	2.3 B	1.3 U	1.3 U	1.6 U	2 U	NA	2.3 U	NA	2.1 U	1.6 B	1.3 U	1.6 U	2 U
Arsenic	NA	NA	NA	NA	2.1 U	1.7 B	2.3 J	2.3 B	4	NA	3.5 U	NA	2.1 U	1.6 U	1.6 U	2.4 B	0.41 B
Barium	NA	NA	NA	NA	11.6 B	17.2 J	16.3 J	18.4 J	18.5	NA	35.1 J	NA	27.3 B	32.6 J	35.7 J	31.7 J	35.6
Beryllium	NA	NA	NA	NA	0.1 U	0.24 B	0.4 B	0.1 U	1 U	NA	0.1 U	NA	0.1 U	0.37 B	0.55 B	0.1 U	1 U
Cadmium	NA	NA	NA	NA	0.3 U	0.2 U	0.2 U	0.2 U	1 U	NA	0.3 U	NA	0.3 U	0.2 U	0.2 U	0.2 U	0.088 B
Calcium	38,700	38,600	NA	NA	72,700	69,600	66,000	76,900	55,900	15,200	12,200	NA	12,500	11,200	12,100	10,800	10,600
Chromium	NA	NA	NA	NA	0.62 B	0.8 U	0.8 U	0.6 U	2 U	NA	0.8 U	NA	0.6 U	0.8 U	0.8 U	0.6 U	2 U
Cobalt	NA	NA	NA	NA	0.6 U	0.4 U	0.47 B	0.5 U	0.25 J	NA	1.5 B	NA	1.2 J	0.86 J	0.4 U	0.5 U	0.22 J
Copper	NA	NA	NA	NA	0.4 U	0.6 U	0.6 U	0.6 U	1.5 B	NA	1.5 B	NA	0.4 U	0.6 U	0.6 U	0.6 U	1 B
Iron	670	670	NA	NA	1,460	943	2,260	1,680	1,750	200	25.2 U	NA	11.2 U	10 U	10 U	12.2 U	100 U
Lead	NA	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.18 B	NA	1.5 U	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.22 B
Magnesium	8,400	8,400	NA	NA	6,130	6,100	6,560	7,190	6,420	6,700	6,540	NA	7,890	8,530	7,360	6,090	6,870
Manganese	910	910	NA	NA	402	316	466	479	467	430	199	NA	200	125	53.3	24.4	134
Mercury	NA	NA	NA	NA	0.1 U	0.28	0.1 U	0.1 U	0.2 UL	NA	0.1 U	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.2 UL
Nickel	NA	NA	NA	NA	1 J	1.1 J	0.8 U	0.9 U	0.67 B	NA	3.1 B	NA	0.83 J	1.3 J	0.8 U	0.9 U	1.3 B
Potassium	5,000 U	5,000 U	NA	NA	3,100 J	2,860 J	2,830 J	3,070 J	1,750 J	5,000 U	2,510 J	NA	1,890 J	1,970 J	2,200 J	2,130 J	1,650 J
Selenium	NA	NA	NA	NA	2.7 U	2.2 U	2.2 U	4.3 U	0.7 B	NA	3 UJ	NA	2.7 U	2.2 U	3.9 J	4.3 U	1.8 J
Silver	NA	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL	NA	1.3 U	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL
Sodium	22,500	22,500	NA	NA	27,300	30,800	32,000	32,400	33,200	34,500	35,300	NA	34,800	34,100	34,900	34,700	33,500
Thallium	NA	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	1 U	NA	4.2 U	NA	3 U	2.8 U	2.8 U	4.5 U	0.063 B
Vanadium	NA	NA	NA	NA	0.53 J	0.3 U	0.72 B	0.5 U	5 U	NA	1.3 U	NA	0.5 U	0.73 B	0.47 B	0.5 U	5 U
Zinc	NA	NA	NA	NA	1.7 B	9.7 B	9.4 J	1 U	4.7 B	NA	9.4 B	NA	3.4 B	5.7 B	2.5 J	4.7 B	5.3 B
Wet Chemistry (MG_L)																	
Acetate	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	1 U
Alkalinity	130	130	NA	NA	NA	NA	NA	NA	165	23	NA	NA	NA	NA	NA	NA	19
Butyrate	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	1 U
Chloride	14.8	13.3	NA	NA	NA	NA	NA	NA	50.7	33.9	NA	NA	NA	NA	NA	NA	46.6
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	0.00313 U	NA	NA	NA	NA	NA	NA	NA	0.00313 U
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	0.00292 U	NA	NA	NA	NA	NA	NA	NA	0.00292 U
Formic acid	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	1 U
Lactic Acid	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	1 U
Methane	NA	NA	NA	NA	NA	NA	NA	NA	0.0535	NA	NA	NA	NA	NA	NA	NA	0.00167 U
Nitrate	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	0.05 U	0.5 U	NA	NA	NA	NA	NA	NA	0.6
Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	0.05 U
Propionic Acid	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	1 U
Pyruvate	NA	NA	NA	NA	NA	NA	NA	NA	4 U	NA	NA	NA	NA	NA	NA	NA	4 U
Sulfate	36.9	37.1	NA	NA	NA	NA	NA	NA	24.2	58.2	NA	NA	NA	NA	NA	NA	55.5
Sulfide	0.5 U	0.5 U	NA	NA	NA	NA	NA	NA	1 U	0.5 U	NA	NA	NA	NA	NA	NA	1 U
Total organic carbon (TOC)	2	2	NA	NA	NA	NA	NA	NA	1.68 B	2	NA	NA	NA	NA	NA	NA	5 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-2
Monitoring Well Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW20D									LS11-MW21D							
Sample ID	LS11-MW20D-02B	LS11-MW20DP-02B[1]	LS11-MW20D-18-04A	LS11-MW20D-23-04A	LS11-MW20D-05A	LS11-MW20D-R01-05B	LS11-MW20D-R02-05B	LS11-MW20D-R03-05D	LS11-MW20D-07C	LS11-MW21D-02B	LS11-MW21D-21-04A	LS11-MW21D-26-04A	LS11-MW21D-05A	LS11-MW21D-P-05A[1]	LS11-MW21D-R01-05B	LS11-MW21D-R02-05B	LS11-MW21D-R03-05D
Sample Date	06/07/02	06/07/02	02/23/04	02/23/04	02/01/05	04/04/05	06/14/05	11/07/05	10/12/07	06/07/02	02/23/04	02/23/04	02/01/05	02/01/05	04/04/05	06/14/05	11/07/05
Chemical Name																	
Barium	36.3 J	34.8 J	NA	NA	35.1 B	41.9 J	43.3 J	40 J	31.1	19.9 J	NA	NA	1.3 B	0.96 B	9.1 J	9.4 J	8.8 J
Beryllium	0.13 B	0.12 B	NA	NA	0.1 U	0.28 B	0.6 B	0.11 B	1 U	0.15 B	NA	NA	0.1 U	0.1 U	0.24 B	0.42 B	0.1 U
Cadmium	0.3 U	0.3 U	NA	NA	0.3 U	0.2 U	0.32 B	0.2 U	0.23 J	0.3 U	NA	NA	0.3 U	0.3 U	0.2 U	0.2 U	0.2 U
Calcium	12,400	12,500	NA	NA	15,000	14,300	14,000	12,600	13,200 J	35,200	NA	NA	2,570 J	2,530 J	2,480 J	2,500 J	2,330 J
Chromium	2.1 B	2.4 B	NA	NA	0.73 B	0.8 U	0.8 U	0.6 U	2 U	10 B	NA	NA	1.2 B	0.77 B	0.8 U	0.8 U	0.6 U
Cobalt	5.7 J	5.9 J	NA	NA	7 J	2.8 J	3.3 J	7.6 J	3	0.6 U	NA	NA	1.4 J	1.1 J	0.59 J	1.1 J	1 B
Copper	1.9 B	1.4 B	NA	NA	0.4 U	0.6 U	0.6 U	0.6 U	0.95 B	2.5 B	NA	NA	0.4 U	0.4 U	0.6 U	0.6 U	0.6 U
Cyanide	10 U	10 U	NA	NA	5.6 J	0.8 U	0.8 U	0.7 U	10 U	10 U	NA	NA	0.8 U	0.8 U	0.8 U	1.2 J	0.7 U
Iron	368 B	329 B	NA	NA	368	138	124	384	109 B	1,010	NA	NA	1,360	763	532	208	582
Lead	1.5 U	1.5 U	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.11 B	1.5 U	NA	NA	1.3 U	1.3 U	1.2 U	1.2 U	1.1 U
Magnesium	7,000	7,010	NA	NA	9,650	10,000	10,100	9,590	6,810	4,700 J	NA	NA	1,370 J	1,330 J	1,430 J	1,440 J	1,340 J
Manganese	445	446	NA	NA	511	310	277	437	367 J	139	NA	NA	59.8	56.5	54.3	52.4	48.8
Mercury	0.1 U	0.1 U	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U	0.1 U	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	5.6 B	5.7 B	NA	NA	1.2 J	1.1 J	1.5 J	2.2 J	1.8 B	2.6 B	NA	NA	0.8 U	0.92 J	0.8 U	1.3 J	0.9 U
Potassium	2,100 J	2,090 J	NA	NA	2,050 J	1,970 J	2,280 J	2,180 J	1,690 J	2,440 J	NA	NA	1,090 J	1,060 J	1,110 J	1,300 J	1,240 J
Selenium	3 UJ	3 UJ	NA	NA	2.7 U	2.2 U	3.4 J	4.3 U	0.32 J	3 UJ	NA	NA	2.7 U	2.7 U	2.2 U	3.5 J	4.3 U
Silver	1.3 U	1.3 U	NA	NA	0.81 J	0.6 U	0.6 U	0.29 B	1 UL	1.3 U	NA	NA	0.8 U	0.8 U	0.6 U	0.6 U	0.2 U
Sodium	25,100	25,100	NA	NA	31,000	31,900	32,200	29,700	25,600 J	21,800	NA	NA	14,600	14,400	15,000	15,200	14,500
Thallium	4.2 U	4.2 U	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.034 B	4.2 U	NA	NA	3 U	3 U	2.8 U	2.8 U	4.5 U
Vanadium	1.3 U	1.3 U	NA	NA	0.5 U	0.3 U	0.45 B	0.5 U	5 U	6.6 J	NA	NA	0.96 J	0.51 J	0.3 U	0.45 B	0.5 U
Zinc	13.1 B	15 B	NA	NA	22.3 B	5.7 J	6.1 J	5.6 B	8.7 B	3.3 B	NA	NA	3 B	3 B	3.3 J	2.9 J	5.1 B
Dissolved Metals (UG_L)																	
Aluminum	29.9 B	21.6 B	NA	NA	13.5 U	52 B	70.4 B	8.1 U	200 U	99.7 B	NA	NA	13.5 U	13.5 U	25.6 B	50.4 B	8.1 U
Antimony	2.3 U	2.3 U	NA	NA	2.1 U	1.3 U	1.6 B	1.6 U	2 U	2.3 U	NA	NA	2.1 U	2.1 U	1.3 U	1.3 U	1.6 U
Arsenic	3.5 U	3.5 U	NA	NA	2.1 U	1.6 U	1.6 U	2.6 B	0.49 B	3.5 U	NA	NA	2.1 U	2.1 U	1.6 U	1.6 U	2.5 B
Barium	33.1 J	33.5 J	NA	NA	33.5 B	41.2 J	40.8 J	40.9 J	30.7	17.7 J	NA	NA	0.54 B	0.61 B	8.6 J	8.9 J	8 B
Beryllium	0.12 B	0.13 B	NA	NA	0.1 U	0.33 B	0.58 B	0.1 U	1 U	0.1 U	NA	NA	0.1 U	0.1 U	0.27 B	0.4 B	0.1 U
Cadmium	0.3 U	0.3 U	NA	NA	0.3 U	0.2 U	0.2 U	0.2 U	0.21 B	0.3 U	NA	NA	0.3 U	0.3 U	0.2 U	0.2 U	0.2 U
Calcium	12,200	12,600	NA	NA	15,000	14,200	13,600	13,000	12,600	34,200	NA	NA	2,610 J	2,670 J	2,460 J	2,510 J	2,200 J
Chromium	1.1 B	0.8 U	NA	NA	0.6 U	0.8 U	0.8 U	0.6 U	2 U	6 B	NA	NA	0.6 U	0.6 U	0.8 U	0.8 U	0.6 U
Cobalt	5.7 J	6 J	NA	NA	2.3 J	2 J	2.3 B	6.4 J	2.7	0.6 U	NA	NA	0.9 J	0.93 J	0.55 J	1.2 B	0.56 J
Copper	1.4 B	2.1 B	NA	NA	0.4 U	0.6 U	0.6 U	0.6 U	0.86 B	2.8 B	NA	NA	0.4 U	0.4 U	0.6 U	0.6 U	0.72 B
Iron	94.5 B	87.1 B	NA	NA	11.2 U	41.7 J	39.4 J	301	36.3 J	44.3 B	NA	NA	145	159	190	137	81.3 J
Lead	1.5 U	1.5 U	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.15 B	1.5 U	NA	NA	1.3 J	1.3 U	1.2 U	1.2 U	1.1 U
Magnesium	6,900	7,130	NA	NA	9,660	10,000	9,710	9,770	6,650	5,160	NA	NA	1,350 J	1,380 J	1,420 J	1,410 J	1,260 J
Manganese	441	444	NA	NA	280	271	229	422	346	146	NA	NA	53.4	55.1	53.9	50.6	44.6
Mercury	0.1 U	0.1 U	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.2 UL	0.1 U	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
Nickel	6.6 B	5 B	NA	NA	1.5 J	0.98 J	1.4 J	1.5 J	1.7 B	1.5 B	NA	NA	0.8 J	0.8 U	0.8 U	0.8 U	1.6 J
Potassium	2,020 J	2,030 J	NA	NA	1,920 J	1,950 J	2,180 J	2,220 J	1,730 J	2,360 J	NA	NA	1,000 J	1,000 J	1,110 J	1,260 J	1,170 J
Selenium	3 UJ	3 UJ	NA	NA	2.7 U	2.2 U	2.2 U	4.3 U	5 U	3 UJ	NA	NA	2.7 U	2.7 U	3.1 J	2.3 J	4.3 U
Silver	1.3 U	1.3 U	NA	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL	1.3 U	NA	NA	0.8 U	0.8 U	0.6 U	0.6 U	0.2 U
Sodium	24,400	25,100	NA	NA	29,600	31,600	30,000	30,900	24,100	23,000	NA	NA	13,700	13,800	14,900	14,400	14,000
Thallium	4.2 U	4.3 B	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.028 B	4.2 U	NA	NA	3 U	3 U	2.8 U	2.8 U	4.5 U
Vanadium	1.3 U	1.3 U	NA	NA	0.5 U	0.3 U	0.47 B	0.5 U	5 U	3.6 J	NA	NA	0.5 U	0.5 U	0.3 U	0.3 U	0.5 U
Zinc	15 B	17.2 B	NA	NA	5.6 B	6.8 B	3.7 J	5.9 B	8.3 B	6 B	NA	NA	2.8 B	2.9 B	2.5 B	4.2 J	5.1 B
Wet Chemistry (MG_L)																	
Acetate	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	20.5	NA	NA	NA	NA	NA	NA	NA	NA
Butyrate	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	28.6	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	0.00313 U	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	0.00292 U	NA	NA	NA	NA	NA	NA	NA	NA
Formic acid	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Lactic Acid	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	0.00167 U	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	NA	NA	NA	NA	NA	NA	NA	NA	0.055	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvate	NA	NA	NA	NA	NA	NA	NA	NA	4 U	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	58.8	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	NA	NA	NA	NA	NA	NA

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-2
Monitoring Well Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW21D	LS11-MW22D									LS11-MW31D					
Sample ID	LS11-MW21D-07C	LS11-MW22D-02B	LS11-MW22D-20-04A	LS11-MW22D-25-04A	LS11-MW22DP-25-04A[1]	LS11-MW22D-05A	LS11-MW22D-R01-05B	LS11-MW22D-R02-05B	LS11-MW22D-R03-05D	LS11-MW22D-07C	LS11-MW31D-7-04A	LS11-MW31D-12-04A	LS11-MW31D-17-04A	LS11-MW31D-22-04A	LS11-MW31D-27-04A	LS11-MW31D-05A
Sample Date	10/12/07	06/07/02	02/23/04	02/23/04	02/23/04	02/01/05	04/05/05	06/14/05	11/08/05	10/11/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05
Chemical Name																
Barium	11.7	20.5 J	NA	NA	NA	12.7 B	24.9 J	23.9 J	21 J	56.5	NA	NA	NA	NA	NA	23.6 B
Beryllium	1 U	0.13 B	NA	NA	NA	0.1 U	0.33 B	0.62 B	0.1 U	1 U	NA	NA	NA	NA	NA	0.1 U
Cadmium	0.1 B	0.3 U	NA	NA	NA	0.3 U	0.47 J	0.28 B	0.2 U	0.28 J	NA	NA	NA	NA	NA	0.3 U
Calcium	2,320 J	10,400	NA	NA	NA	11,000	11,000	11,000	11,300	28,500 J	NA	NA	NA	NA	NA	8,560
Chromium	0.95 J	6.8 B	NA	NA	NA	2.2 B	1.3 J	0.8 U	1.6 B	0.45 B	NA	NA	NA	NA	NA	0.94 B
Cobalt	2.2	4.2 J	NA	NA	NA	2.3 J	2.3 J	1.3 J	2.9 B	3.3	NA	NA	NA	NA	NA	2.3 J
Copper	3.2 B	3.3 B	NA	NA	NA	0.4 U	0.6 U	0.6 U	0.6 U	0.96 B	NA	NA	NA	NA	NA	0.4 U
Cyanide	10 U	10 U	NA	NA	NA	4.1 B	0.8 U	1.4 J	0.7 U	10 U	NA	NA	NA	NA	NA	0.8 U
Iron	324	1,290	NA	NA	NA	118 B	682	87.2 J	340	100 U	NA	NA	NA	NA	NA	648
Lead	0.63 J	1.5 U	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.15 B	NA	NA	NA	NA	NA	1.3 U
Magnesium	1,350 J	5,140	NA	NA	NA	4,400 J	4,990 J	4,510 J	4,880 J	11,800	NA	NA	NA	NA	NA	6,460
Manganese	69.6 J	237	NA	NA	NA	127	143	111	126	231 J	NA	NA	NA	NA	NA	159
Mercury	0.2 U	0.1 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.095 J	NA	NA	NA	NA	NA	0.1 U
Nickel	1.3 B	7 B	NA	NA	NA	1 J	2.1 J	1.1 J	1.2 J	2.6 B	NA	NA	NA	NA	NA	1.3 J
Potassium	890 J	2,250 J	NA	NA	NA	4,130 J	4,060 J	4,200 J	3,050 J	2,380 J	NA	NA	NA	NA	NA	2,160 J
Selenium	5 U	3 UJ	NA	NA	NA	2.7 U	2.2 U	3.5 J	4.3 U	1.3 J	NA	NA	NA	NA	NA	3.7 J
Silver	1 UL	1.3 U	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL	NA	NA	NA	NA	NA	0.8 U
Sodium	14,800 J	23,600	NA	NA	NA	28,400	30,700	29,000	29,200	44,200 J	NA	NA	NA	NA	NA	39,500
Thallium	0.078 B	4.6 B	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.12 J	NA	NA	NA	NA	NA	3 U
Vanadium	5 U	3.5 J	NA	NA	NA	0.63 J	2.3 J	0.77 B	0.98 B	5 U	NA	NA	NA	NA	NA	1.6 J
Zinc	9 B	10.9 B	NA	NA	NA	8 B	8.7 J	4 J	6.4 B	10 B	NA	NA	NA	NA	NA	4.4 B
Dissolved Metals (UG_L)																
Aluminum	200 U	30.4 B	NA	NA	NA	13.5 U	30.6 B	69.9 B	8.1 U	200 U	NA	NA	NA	NA	NA	13.5 U
Antimony	2 U	2.3 U	NA	NA	NA	2.1 U	1.3 U	1.3 U	1.6 U	2 U	NA	NA	NA	NA	NA	2.1 U
Arsenic	1.1 B	3.5 U	NA	NA	NA	2.1 U	1.6 U	1.6 U	2 U	0.5 B	NA	NA	NA	NA	NA	2.1 U
Barium	8.9 J	16.3 J	NA	NA	NA	11.4 B	21.9 J	23.4 J	18.8 J	52.7	NA	NA	NA	NA	NA	21.6 B
Beryllium	1 U	0.1 U	NA	NA	NA	0.1 U	0.32 B	0.62 B	0.1 U	1 U	NA	NA	NA	NA	NA	0.1 U
Cadmium	0.077 B	0.3 U	NA	NA	NA	0.3 U	0.2 U	0.2 U	0.2 U	0.25 B	NA	NA	NA	NA	NA	0.3 U
Calcium	2,690 J	10,500	NA	NA	NA	11,000	10,400	11,300	10,500	35,200	NA	NA	NA	NA	NA	8,640
Chromium	2 U	0.81 B	NA	NA	NA	0.6 U	0.8 U	0.8 U	0.6 U	0.29 B	NA	NA	NA	NA	NA	0.6 U
Cobalt	1.8	3.4 B	NA	NA	NA	1 J	1 J	1.2 B	1.2 J	2.9	NA	NA	NA	NA	NA	2 J
Copper	0.98 B	1.1 B	NA	NA	NA	0.4 U	0.6 U	0.6 U	0.6 U	1.3 B	NA	NA	NA	NA	NA	0.4 U
Iron	132	60.5 B	NA	NA	NA	11.2 U	10 U	10 U	12.2 U	100 U	NA	NA	NA	NA	NA	11.2 U
Lead	0.16 B	1.5 U	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.42 B	NA	NA	NA	NA	NA	1.3 U
Magnesium	1,510 J	4,930 J	NA	NA	NA	4,380 J	4,730 J	4,590 J	4,670 J	15,400	NA	NA	NA	NA	NA	6,470
Manganese	65.4	225	NA	NA	NA	102	130	107	118	219	NA	NA	NA	NA	NA	153
Mercury	0.2 UL	0.1 U	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.2 UL	NA	NA	NA	NA	NA	0.1 U
Nickel	0.85 B	5.8 B	NA	NA	NA	0.8 U	0.96 J	1.1 J	0.9 U	2.4 B	NA	NA	NA	NA	NA	1.7 J
Potassium	980 J	2,030 J	NA	NA	NA	3,850 J	3,740 J	4,180 J	2,800 J	3,420 J	NA	NA	NA	NA	NA	1,980 J
Selenium	5 U	3 UJ	NA	NA	NA	2.7 U	2.2 U	2.2 U	4.3 U	1.3 B	NA	NA	NA	NA	NA	2.7 U
Silver	1 UL	1.3 U	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL	NA	NA	NA	NA	NA	0.8 U
Sodium	15,100	23,800	NA	NA	NA	27,700	28,800	28,200	28,100	57,300	NA	NA	NA	NA	NA	38,100
Thallium	0.061 B	4.2 U	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.088 B	NA	NA	NA	NA	NA	3 U
Vanadium	5 U	1.3 U	NA	NA	NA	0.5 U	0.3 U	0.41 B	0.5 U	5 U	NA	NA	NA	NA	NA	0.5 U
Zinc	6.3 B	8.6 B	NA	NA	NA	3.7 B	8.6 B	4.2 J	5.1 B	10 B	NA	NA	NA	NA	NA	4.1 B
Wet Chemistry (MG_L)																
Acetate	1 U	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Alkalinity	9.18 B	NA	NA	NA	NA	NA	NA	NA	NA	20.7	NA	NA	NA	NA	NA	NA
Butyrate	1 U	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Chloride	23.9	NA	NA	NA	NA	NA	NA	NA	NA	62.3	NA	NA	NA	NA	NA	NA
Ethane	0.00313 U	NA	NA	NA	NA	NA	NA	NA	NA	0.00313 U	NA	NA	NA	NA	NA	NA
Ethene	0.00292 U	NA	NA	NA	NA	NA	NA	NA	NA	0.00292 U	NA	NA	NA	NA	NA	NA
Formic acid	1 U	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Lactic Acid	1 U	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Methane	0.0377	NA	NA	NA	NA	NA	NA	NA	NA	0.00167 U	NA	NA	NA	NA	NA	NA
Nitrate	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	1.21	NA	NA	NA	NA	NA	NA
Nitrite	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	NA	NA	NA	NA	NA	NA
Propionic Acid	1 U	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Pyruvate	4 U	NA	NA	NA	NA	NA	NA	NA	NA	4 U	NA	NA	NA	NA	NA	NA
Sulfate	7.03	NA	NA	NA	NA	NA	NA	NA	NA	183	NA	NA	NA	NA	NA	NA
Sulfide	1 U	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	5 U	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	NA	NA	NA	NA

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
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Table A-2
Monitoring Well Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW31D				LS11-MW32D										
Sample ID	LS11-MW31D-R01-05B	LS11-MW31D-R02-05B	LS11-MW31D-R03-05D	LS11-MW31D-07C	LS11-MW32D-6-04A	LS11-MW32D-11-04A	LS11-MW32D-16-04A	LS11-MW32D-21-04A	LS11-MW32D-26-04A	LS11-MW32DP-26-04A	LS11-MW32D-05A	LS11-MW32D-R01-05B	LS11-MW32D-R02-05B	LS11-MW32D-R03-05D	LS11-MW32D-07C
Sample Date	04/05/05	06/14/05	11/08/05	10/10/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05	04/05/05	06/14/05	11/08/05	10/10/07
Chemical Name															
Barium	33.2 J	30.6 J	24.2 J	28.8	NA	NA	NA	NA	NA	NA	28.1 B	33.4 J	33.3 J	30.6 J	41.5
Beryllium	7.5	3 B	2.7 J	0.52 J	NA	NA	NA	NA	NA	NA	0.1 U	0.31 B	0.65 B	0.11 B	1 U
Cadmium	4.1 J	1.1 J	0.48 B	0.24 J	NA	NA	NA	NA	NA	NA	0.3 U	0.2 U	0.3 B	0.2 U	0.12 B
Calcium	78,900	56,200	45,900	1,270 J	NA	NA	NA	NA	NA	NA	27,800	32,100	20,300	11,200	17,100 J
Chromium	8.5 J	6.9 J	15.1	2.7	NA	NA	NA	NA	NA	NA	1.8 B	0.8 U	0.97 J	1.2 B	1 J
Cobalt	43.3 J	15.6 J	6.4 J	3.4	NA	NA	NA	NA	NA	NA	1.4 J	0.4 U	0.4 U	0.5 U	0.18 J
Copper	28.4	3.4 J	3.1 J	2.4 B	NA	NA	NA	NA	NA	NA	0.81 B	0.6 U	0.6 U	0.6 U	2.5 B
Cyanide	0.8 U	0.8 U	0.7 U	10 U	NA	NA	NA	NA	NA	NA	0.8 U	0.8 U	0.8 U	0.7 U	10 U
Iron	907	450	431	100 U	NA	NA	NA	NA	NA	NA	963	902	258	394	100 U
Lead	9.6	1.3 J	2 B	0.45 B	NA	NA	NA	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.3 B	0.1 B
Magnesium	55,400	38,900	32,700	971 J	NA	NA	NA	NA	NA	NA	10,300	10,900	9,290	7,100	11,000
Manganese	1,910	1,070	435	161 J	NA	NA	NA	NA	NA	NA	454	422	125	92.5	161 J
Mercury	2.6	0.84	1.4	0.8	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.074 J
Nickel	62.1	22.6 J	18.6 J	4.2	NA	NA	NA	NA	NA	NA	1.1 J	0.8 U	0.98 J	1.7 J	1.6 B
Potassium	6,380	7,120	5,130	226 J	NA	NA	NA	NA	NA	NA	2,260 J	2,070 J	2,570 J	2,370 J	2,030 J
Selenium	2.7 J	4.2 J	4.3 U	2.5 J	NA	NA	NA	NA	NA	NA	2.7 U	3.2 J	2.8 J	4.3 U	2.3 J
Silver	0.6 U	0.6 U	0.2 U	1 UL	NA	NA	NA	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL
Sodium	255,000	128,000	120,000	5,790 J	NA	NA	NA	NA	NA	NA	25,700	24,400	30,400	31,400	36,300 J
Thallium	3.9 J	2.8 U	4.5 U	0.12 B	NA	NA	NA	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.083 B
Vanadium	0.85 J	0.59 B	0.5 U	5 U	NA	NA	NA	NA	NA	NA	2.5 J	2.1 J	0.89 B	1 B	5 U
Zinc	376	101	77	17.8	NA	NA	NA	NA	NA	NA	9.9 B	7.5 J	6.5 J	6.4 B	6.9 B
Dissolved Metals (UG_L)															
Aluminum	19,100	3,690	2,080	210	NA	NA	NA	NA	NA	NA	16.3 J	28.7 B	73.8 B	8.1 U	200 U
Antimony	1.3 U	1.3 U	1.6 U	2 U	NA	NA	NA	NA	NA	NA	2.1 U	1.6 B	1.3 U	1.6 U	2 U
Arsenic	13	3.6 J	2.4 B	0.41 B	NA	NA	NA	NA	NA	NA	2.1 U	1.6 U	1.6 U	2.3 B	0.52 B
Barium	32.5 J	27.4 J	22.7 J	29.4	NA	NA	NA	NA	NA	NA	25 B	31.5 J	32.4 J	29 J	38.2
Beryllium	7.4	3 B	2 J	0.51 J	NA	NA	NA	NA	NA	NA	0.1 U	0.29 B	0.66 B	0.1 U	1 U
Cadmium	4.2 J	0.65 J	0.38 B	0.22 B	NA	NA	NA	NA	NA	NA	0.3 U	0.2 U	0.2 U	0.2 U	0.1 B
Calcium	77,900	57,400	50,300	8,970	NA	NA	NA	NA	NA	NA	28,000	32,800	20,300	11,100	17,800
Chromium	7.9 J	6.5 J	13.4	2.8	NA	NA	NA	NA	NA	NA	0.6 U	0.8 U	0.8 U	0.6 U	0.81 J
Cobalt	42.7 J	15.6 J	6.2 J	3.4	NA	NA	NA	NA	NA	NA	1.3 J	0.4 U	0.4 U	0.5 U	0.097 J
Copper	28.5	2.8 J	3.5 B	2.1 B	NA	NA	NA	NA	NA	NA	0.4 U	0.6 U	0.6 U	0.6 U	1.3 B
Iron	541	10 U	12.2 U	100 U	NA	NA	NA	NA	NA	NA	11.2 U	10 U	10 U	12.2 U	100 U
Lead	9.4	1.2 J	2.1 J	0.47 B	NA	NA	NA	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.15 B
Magnesium	55,200	39,200	35,300	7,090	NA	NA	NA	NA	NA	NA	10,300	11,100	9,130	6,930	11,600
Manganese	1,880	1,030	414	163	NA	NA	NA	NA	NA	NA	450	430	105	58.4	144
Mercury	2.4	0.46	0.49	0.12 L	NA	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.2 UL
Nickel	61.2	22.7 J	20.1 J	4.2	NA	NA	NA	NA	NA	NA	1.5 J	0.8 U	0.99 J	1.8 J	1.3 B
Potassium	6,350	6,880	5,130	1,890 J	NA	NA	NA	NA	NA	NA	2,040 J	2,010 J	2,470 J	2,320 J	2,150 J
Selenium	2.2 U	2.2 U	4.3 U	2.6 J	NA	NA	NA	NA	NA	NA	2.7 U	2.2 U	2.2 U	4.3 U	2 J
Silver	0.6 U	0.6 U	0.2 U	1 UL	NA	NA	NA	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL
Sodium	251,000	124,000	126,000	40,600	NA	NA	NA	NA	NA	NA	24,600	25,300	28,700	31,700	36,200
Thallium	3.2 J	2.8 U	4.5 U	0.12 B	NA	NA	NA	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.065 B
Vanadium	0.3 U	0.5 B	0.5 U	5 U	NA	NA	NA	NA	NA	NA	0.57 J	0.3 U	0.47 B	0.5 U	5 U
Zinc	372	99.8	71	21.3	NA	NA	NA	NA	NA	NA	7.8 B	7 B	5.3 J	6.6 B	6.4 B
Wet Chemistry (MG_L)															
Acetate	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Alkalinity	NA	NA	NA	6.56 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	18.1
Butyrate	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Chloride	NA	NA	NA	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	42.4
Ethane	NA	NA	NA	0.00313 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00313 U
Ethene	NA	NA	NA	0.00292 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00292 U
Formic acid	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Lactic Acid	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Methane	NA	NA	NA	0.00167 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00167 U
Nitrate	NA	NA	NA	0.31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.51
Nitrite	NA	NA	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U
Propionic Acid	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Pyruvate	NA	NA	NA	4 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U
Sulfate	NA	NA	NA	98.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	102
Sulfide	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U
Total organic carbon (TOC)	NA	NA	NA	5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-2
Monitoring Well Groundwater Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW33D										LS11-MW34D					
Sample ID	LS11-MW33D-07-04A	LS11-MW33D-12-04A	LS11-MW33D-17-04A	LS11-MW33D-22-04A	LS11-MW33DP-22-04A[1]	LS11-MW33D-05A	LS11-MW33D-R01-05B	LS11-MW33D-R02-05B	LS11-MW33D-R03-05D	LS11-MW33D-07C	LS11-MW34D-6-04A	LS11-MW34D-11-04A	LS11-MW34D-16-04A	LS11-MW34D-21-04A	LS11-MW34D-26-04A	LS11-MW34D-05A
Sample Date	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	01/31/05	04/05/05	06/14/05	11/07/05	10/10/07	02/23/04	02/23/04	02/23/04	02/23/04	02/23/04	02/01/05
Chemical Name																
Barium	NA	NA	NA	NA	NA	12.8 B	19.7 B	18.9 J	22.7 J	26.1	NA	NA	NA	NA	NA	6.1 B
Beryllium	NA	NA	NA	NA	NA	0.1 U	0.29 J	0.5 B	0.12 B	1 U	NA	NA	NA	NA	NA	0.1 U
Cadmium	NA	NA	NA	NA	NA	0.3 U	0.2 U	0.31 B	0.2 U	0.099 B	NA	NA	NA	NA	NA	0.31 B
Calcium	NA	NA	NA	NA	NA	11,200	11,700	10,700	12,200	12,300 J	NA	NA	NA	NA	NA	16,300
Chromium	NA	NA	NA	NA	NA	1.1 B	0.8 U	0.8 U	1.1 B	0.056 B	NA	NA	NA	NA	NA	1.4 B
Cobalt	NA	NA	NA	NA	NA	4.5 J	4 J	3.5 J	3.4 J	0.27 J	NA	NA	NA	NA	NA	2.3 J
Copper	NA	NA	NA	NA	NA	1.6 B	0.6 U	0.6 U	0.6 U	0.79 B	NA	NA	NA	NA	NA	0.4 U
Cyanide	NA	NA	NA	NA	NA	0.8 U	0.8 U	1.2 J	0.7 U	10 U	NA	NA	NA	NA	NA	0.8 U
Iron	NA	NA	NA	NA	NA	566	64.7 J	42.7 B	148	100 U	NA	NA	NA	NA	NA	630
Lead	NA	NA	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	0.066 B	NA	NA	NA	NA	NA	1.3 U
Magnesium	NA	NA	NA	NA	NA	7,510	7,910	7,200	8,320	7,890	NA	NA	NA	NA	NA	4,100 J
Manganese	NA	NA	NA	NA	NA	432	476	334	186	25 J	NA	NA	NA	NA	NA	82
Mercury	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.13 J	0.2 U	NA	NA	NA	NA	NA	0.1 U
Nickel	NA	NA	NA	NA	NA	0.94 J	0.8 U	1 J	1.6 J	0.92 B	NA	NA	NA	NA	NA	1.5 J
Potassium	NA	NA	NA	NA	NA	2,660 J	3,000 J	3,160 J	3,470 J	2,500 J	NA	NA	NA	NA	NA	1,180 J
Selenium	NA	NA	NA	NA	NA	2.7 U	2.2 U	2.7 J	4.3 U	0.75 J	NA	NA	NA	NA	NA	2.7 U
Silver	NA	NA	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.25 B	1 UL	NA	NA	NA	NA	NA	0.8 U
Sodium	NA	NA	NA	NA	NA	17,000	15,600	15,600	16,800	21,400 J	NA	NA	NA	NA	NA	21,700
Thallium	NA	NA	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.11 B	NA	NA	NA	NA	NA	3 U
Vanadium	NA	NA	NA	NA	NA	1.7 J	0.57 J	0.56 B	0.75 B	5 U	NA	NA	NA	NA	NA	2.2 J
Zinc	NA	NA	NA	NA	NA	4.3 B	5.2 J	3.7 J	2.6 B	4.7 B	NA	NA	NA	NA	NA	5.4 B
Dissolved Metals (UG_L)																
Aluminum	NA	NA	NA	NA	NA	13.5 U	31 B	59.4 B	8.1 U	200 U	NA	NA	NA	NA	NA	13.5 U
Antimony	NA	NA	NA	NA	NA	2.1 U	1.8 B	1.3 U	1.6 U	2 U	NA	NA	NA	NA	NA	2.1 U
Arsenic	NA	NA	NA	NA	NA	2.1 U	1.6 U	1.6 U	2.8 B	0.5 B	NA	NA	NA	NA	NA	2.1 U
Barium	NA	NA	NA	NA	NA	11.3 B	19.8 J	18.2 J	23.1 J	24.5	NA	NA	NA	NA	NA	4.2 B
Beryllium	NA	NA	NA	NA	NA	0.1 U	0.3 B	0.49 B	0.1 U	1 U	NA	NA	NA	NA	NA	0.1 U
Cadmium	NA	NA	NA	NA	NA	0.3 U	0.2 U	0.2 U	0.2 U	0.094 B	NA	NA	NA	NA	NA	0.3 U
Calcium	NA	NA	NA	NA	NA	11,600	11,800	10,600	12,600	12,200	NA	NA	NA	NA	NA	15,900
Chromium	NA	NA	NA	NA	NA	0.6 U	0.8 U	0.8 U	0.6 U	2 U	NA	NA	NA	NA	NA	0.6 U
Cobalt	NA	NA	NA	NA	NA	4.3 J	4.3 J	3.3 J	2.6 J	0.14 J	NA	NA	NA	NA	NA	1.7 J
Copper	NA	NA	NA	NA	NA	0.4 U	0.6 U	0.6 U	0.6 U	1.6 B	NA	NA	NA	NA	NA	0.4 U
Iron	NA	NA	NA	NA	NA	11.2 U	10 U	10 U	12.2 U	100 U	NA	NA	NA	NA	NA	11.2 U
Lead	NA	NA	NA	NA	NA	1.3 U	1.2 U	1.2 U	1.1 U	3.4	NA	NA	NA	NA	NA	1.3 U
Magnesium	NA	NA	NA	NA	NA	7,390	7,990	7,020	8,530	7,990	NA	NA	NA	NA	NA	3,940 J
Manganese	NA	NA	NA	NA	NA	384	479	320	194	21.3	NA	NA	NA	NA	NA	75.3
Mercury	NA	NA	NA	NA	NA	0.1 U	0.1 U	0.1 U	0.1 U	0.2 UL	NA	NA	NA	NA	NA	0.1 U
Nickel	NA	NA	NA	NA	NA	0.8 U	1 J	0.8 U	0.9 J	0.77 B	NA	NA	NA	NA	NA	0.9 J
Potassium	NA	NA	NA	NA	NA	2,320 J	3,020 J	3,050 J	3,580 J	2,800 J	NA	NA	NA	NA	NA	1,070 J
Selenium	NA	NA	NA	NA	NA	2.7 U	2.2 U	2.2 U	4.3 UJ	0.48 B	NA	NA	NA	NA	NA	2.7 U
Silver	NA	NA	NA	NA	NA	0.8 U	0.6 U	0.6 U	0.2 U	1 UL	NA	NA	NA	NA	NA	0.84 J
Sodium	NA	NA	NA	NA	NA	16,500	15,900	14,900	17,500	21,900	NA	NA	NA	NA	NA	20,600
Thallium	NA	NA	NA	NA	NA	3 U	2.8 U	2.8 U	4.5 U	0.091 B	NA	NA	NA	NA	NA	3 U
Vanadium	NA	NA	NA	NA	NA	0.5 U	0.64 B	0.63 B	0.5 U	5 U	NA	NA	NA	NA	NA	0.5 J
Zinc	NA	NA	NA	NA	NA	3.7 B	4.8 B	2.8 J	2.9 B	15.7	NA	NA	NA	NA	NA	3 B
Wet Chemistry (MG_L)																
Acetate	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Alkalinity	NA	NA	NA	NA	NA	NA	NA	NA	NA	18.6	NA	NA	NA	NA	NA	NA
Butyrate	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA	19.4	NA	NA	NA	NA	NA	NA
Ethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00313 U	NA	NA	NA	NA	NA	NA
Ethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00292 U	NA	NA	NA	NA	NA	NA
Formic acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Lactic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00167 U	NA	NA	NA	NA	NA	NA
Nitrate	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.16	NA	NA	NA	NA	NA	NA
Nitrite	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05 U	NA	NA	NA	NA	NA	NA
Propionic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Pyruvate	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 U	NA	NA	NA	NA	NA	NA
Sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	57.2	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	NA	NA	NA	NA

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
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Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-MW34D						LS11-MW35D						LS11A-MW36D	LS11A-MW37D	LS11A-MW38D
Sample ID	LS11-MW34D-R01-05B	LS11-MW34D-R02-05B	LS11-MW34D-R03-05D	LS11-MW34DP-R03-05D[1]	LS11-MW34D-07C	LS11-MW34DP-07C[1]	LS11-MW35D-05A	LS11-MW35D-R01-05B	LS11-MW35D-R02-05B	LS11-MW35D-R03-05D	LS11-MW35D-07C	LS11-MW35DP-07C[1]	LS11A-MW36D-07C	LS11A-MW37D-07C	LS11A-MW38D-07C
Sample Date	04/05/05	06/14/05	11/08/05	11/08/05	10/11/07	10/11/07	01/31/05	04/04/05	06/13/05	11/07/05	10/12/07	10/12/07	10/09/07	10/09/07	10/08/07
Chemical Name															
Barium	45.8 J	12.6 J	24.2 J	23.6 J	28.9	29.7	9.6 B	9.6 J	18.1 J	32.3 J	15.4	16.4	30	26.4	24
Beryllium	0.28 B	0.61 B	0.12 B	0.1 U	1 U	1 U	0.1 U	0.18 B	0.29 B	0.13 B	1 U	1 U	1 U	1 U	1 U
Cadmium	0.2 U	0.99 B	0.26 B	0.26 B	0.31 J	0.28 J	0.3 U	0.2 U	0.2 U	0.2 U	0.071 B	0.066 B	0.066 J	1 U	0.065 J
Calcium	80,300	14,200	22,900	22,500	24,700 J	23,900 J	7,720	7,440	11,500	20,000	9,780 J	9,620 J	10,700 J	31,800 J	9,100 J
Chromium	1.7 J	1 J	3 B	2.9 B	1.4 J	1.4 J	0.6 U	0.8 U	0.8 U	0.84 B	2 U	2 U	2 U	2 U	2 U
Cobalt	0.4 U	0.41 J	0.66 B	0.52 B	0.16 J	0.15 J	2.9 J	2 J	1.9 J	2.3 B	1.6	1.7	2	1.9	2.1
Copper	0.96 J	0.6 U	0.68 J	0.8 J	1.3 B	1.5 B	0.59 B	0.6 U	0.6 U	0.6 U	19.4	1.1 B	0.81 B	1.4 B	1 B
Cyanide	0.8 U	1 J	0.7 U	0.7 U	10 U	10 U	0.8 U	0.92 B	0.8 UL	0.7 U	10 U	10 U	10 U	10 U	10 U
Iron	1,380	86 J	434	422	100 U	100 U	171 B	107	79.1 B	195	18.8 B	100 U	115 B	171	100 U
Lead	1.2 U	1.2 U	1.1 U	1.1 U	0.64 J	0.066 B	1.3 U	1.2 U	1.2 U	1.1 U	0.11 B	0.16 B	0.13 B	0.084 B	0.089 B
Magnesium	13,200	3,950 J	9,470	9,270	8,380	8,050	3,210 J	3,900 J	6,110	9,740	5,730	5,660	4,570 J	5,070	5,640
Manganese	17.8	7.7 J	37.1	36.5	44.9 J	47.1 J	274	227	204	184	651 J	670 J	415 J	327 J	146 J
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U	0.2 U	0.1 U	0.1 U	0.1 U	0.1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	0.8 U	1.3 J	0.9 U	0.9 U	1.5 B	1.7 B	0.8 U	0.8 U	0.81 J	1.7 J	1 B	0.58 B	3.1	2 B	2.1 B
Potassium	2,030 J	1,460 J	1,800 J	1,750 J	1,340 J	1,310 J	1,260 J	1,140 J	1,790 J	2,700 J	1,530 J	1,540 J	1,410 J	1,410 J	1,410 J
Selenium	2.2 U	4.4 J	4.3 U	4.3 U	0.64 J	0.62 J	2.7 U	2.2 U	2.3 J	4.3 U	0.32 J	0.3 J	0.74 J	1.6 J	1.7 J
Silver	0.6 U	0.6 U	0.2 U	0.2 U	1 UL	1 UL	0.8 U	0.6 U	0.6 U	0.2 U	1 UL	1 UL	1 UL	1 UL	1 UL
Sodium	24,500	22,000	20,400	20,100	28,300 J	27,700 J	12,300	12,900	16,700	20,100	10,600 J	10,500 J	14,900 J	21,200 J	24,800 J
Thallium	2.8 U	2.8 U	4.5 U	4.5 U	0.047 B	0.048 B	3 U	2.8 U	2.8 U	4.5 U	0.039 B	0.041 B	0.057 B	0.057 B	0.065 B
Vanadium	3.1 J	1.3 B	1.4 B	1.4 B	5 U	5 U	0.5 U	0.3 U	0.59 B	0.86 B	5 U	5 U	5 U	5 U	5 U
Zinc	5.6 J	3.2 J	5.1 B	4.5 B	5.2 B	6.1 B	4.7 B	7.2 J	2.4 J	5.5 B	35 J	4.1 B	4.7 B	4.8 B	10.2 B
Dissolved Metals (UG_L)															
Aluminum	32 B	69.2 B	8.1 U	8.1 U	200 U	200 U	13.5 U	26.1 B	57.6 B	8.1 U	200 U	200 U	200 U	200 U	200 U
Antimony	1.3 U	1.3 B	1.6 U	1.6 U	2 U	2 U	2.1 U	1.3 U	1.9 B	1.6 U	2 U	2 U	2 U	2 U	2 U
Arsenic	1.6 U	1.6 U	2.4 B	2.8 B	0.54 B	0.55 B	2.1 U	1.6 U	1.6 U	2.1 B	0.49 B	0.4 B	0.38 B	0.69 B	0.4 B
Barium	39.9 J	12.1 J	22 J	22.1 J	29.5	29.2	1.6 B	9.3 J	17.1 J	35.5 J	15.5	15.3	29.4	24.2	20.3
Beryllium	0.3 B	0.57 B	0.1 U	0.1 U	1 U	1 U	0.1 U	0.28 B	0.27 B	0.1 U	1 U	1 U	1 U	1 U	1 U
Cadmium	0.2 U	0.33 J	0.2 U	0.2 U	0.31 B	0.28 B	0.3 U	0.2 U	0.2 U	0.2 U	0.059 B	0.073 B	0.055 B	1 U	0.056 B
Calcium	77,300	14,400	22,000	22,000	36,300	22,500	7,890	7,380	11,200	22,300	23,500	9,540	13,000	30,200	8,020
Chromium	0.8 U	0.8 U	1.6 B	1.6 B	1.4 J	1.4 J	0.6 U	0.8 U	0.8 U	0.6 U	2 U	2 U	2 U	2 U	2 U
Cobalt	0.4 U	0.4 U	0.5 U	0.5 U	0.15 J	0.14 J	3.3 J	2.3 J	2.3 B	2.1 J	1.7	1.7	1.9	1.7	1.9
Copper	0.6 U	0.6 U	0.74 B	1 B	1.2 B	3.6 B	0.4 U	0.6 U	0.6 U	0.6 U	1.1 B	0.81 B	0.94 B	1.2 B	1.3 B
Iron	10 U	10 U	12.2 U	12.2 U	100 U	100 U	49.5 B	11.8 J	34 J	12.2 U	100 U	14.5 J	138	158	100 U
Lead	1.2 U	1.2 U	1.1 U	1.1 U	0.62 B	0.084 B	1.3 U	1.2 U	1.2 U	1.1 U	1.6	0.25 B	0.51 J	0.055 B	0.12 B
Magnesium	12,700	3,930 J	9,110	9,070	15,800	7,940	3,160 J	3,860 J	5,870	10,800	8,220	5,740	5,560	5,000	5,130
Manganese	3.2 J	7.1 J	29.3	28.8	48	46.6	272	220	195	208	653	653	411	305	128
Mercury	0.1 U	0.1 U	0.1 U	0.1 U	0.2 UL	0.2 UL	0.1 J	0.1 U	0.1 U	0.1 U	0.2 UL	0.2 UL	0.2 UL	0.2 UL	0.2 UL
Nickel	0.8 U	0.8 U	0.9 U	1.1 J	1.5 B	1.5 B	0.89 J	0.8 U	0.87 J	1.1 J	0.61 B	0.54 B	2.6 B	1.6	1.5 B
Potassium	1,850 J	1,410 J	1,690 J	1,690 J	3,240 J	1,260 J	1,120 J	1,130 J	1,700 J	2,960 J	1,390 J	1,630 J	1,730 J	1,580 J	1,420 J
Selenium	3.3 J	2.2 U	4.3 U	4.3 U	0.63 B	0.64 B	2.7 U	2.2 U	2.2 U	4.3 U	0.45 B	0.33 B	0.59 B	1.3 B	1.5 B
Silver	0.6 U	0.6 U	0.2 U	0.2 U	1 UL	1 UL	0.8 U	0.6 U	0.6 U	0.21 B	1 UL	1 UL	1 UL	1 UL	1 UL
Sodium	24,100	20,800	20,300	20,000	56,100	25,400	11,700	12,900	15,600	22,700	27,300	10,300	16,600	21,200	22,800
Thallium	2.8 U	2.8 U	4.5 U	4.5 U	0.04 B	0.038 B	3 U	2.8 U	4.7 B	4.5 U	0.034 B	0.035 B	0.048 B	0.05 B	0.059 B
Vanadium	0.55 B	0.74 B	0.5 U	0.5 U	5 U	5 U	0.5 U	0.3 U	0.74 B	0.5 U	5 U	5 U	5 U	5 U	5 U
Zinc	2.7 B	1.4 J	4.1 B	6.3 B	13.4 B	5.4 B	5.4 B	4.3 B	1.8 J	5.9 B	8.4 B	4.2 B	6.3 B	3.2 B	4.9 B
Wet Chemistry (MG_L)															
Acetate	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	1 U	NA	1 U	1 U	1 U
Alkalinity	NA	NA	NA	NA	19.3	NA	NA	NA	NA	NA	23.5	NA	13	60.2	17.4
Butyrate	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	1 U	NA	1 U	1 U	1 U
Chloride	NA	NA	NA	NA	34	2 U	NA	NA	NA	NA	13.8	NA	18.3	22.3	36
Ethane	NA	NA	NA	NA	0.00313 U	NA	NA	NA	NA	NA	0.00313 U	NA	0.00313 U	0.00313 U	0.00313 U
Ethene	NA	NA	NA	NA	0.00292 U	NA	NA	NA	NA	NA	0.00292 U	NA	0.00292 U	0.00292 U	0.00292 U
Formic acid	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	1 U	NA	1 U	1 U	1 U
Lactic Acid	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	1 U	NA	1 U	1 U	1 U
Methane	NA	NA	NA	NA	0.00167 U	NA	NA	NA	NA	NA	0.00419	NA	0.00167 U	0.0125	0.00167 U
Nitrate	NA	NA	NA	NA	0.9	2.93	NA	NA	NA	NA	0.1	NA	1.17	0.235	2.16
Nitrite	NA	NA	NA	NA	0.05 U	0.05 U	NA	NA	NA	NA	0.05 U	NA	0.05 U	0.05 U	0.05 U
Propionic Acid	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	1 U	NA	1 U	1 U	1 U
Pyruvate	NA	NA	NA	NA	4 U	NA	NA	NA	NA	NA	4 U	NA	4 U	4 U	4 U
Sulfate	NA	NA	NA	NA	79	79.5	NA	NA	NA	NA	30.4	NA	51.9	44	30.6
Sulfide	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	1 U	NA	1 U	1 U	1 U
Total organic carbon (TOC)	NA	NA	NA	NA	5 U	NA	NA	NA	NA	NA	5 U	NA	5 U	1.69 B	5 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
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Table A-2
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NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11A-MW39D	LS11A-MW40D
Sample ID	LS11A-MW39D-07C	LS11A-MW40D-07C
Sample Date	10/08/07	10/09/07
Chemical Name		
Barium	13.7	21.9
Beryllium	1 U	1 U
Cadmium	0.064 J	0.066 J
Calcium	6,850 J	14,500 J
Chromium	2 U	2 U
Cobalt	5.8	3.9
Copper	1.2 B	2.7 B
Cyanide	10 U	10 U
Iron	48.6 B	100 U
Lead	0.2 B	0.1 B
Magnesium	2,090 J	5,370
Manganese	116 J	281 J
Mercury	0.2 U	0.2 U
Nickel	2.1 B	2.5 B
Potassium	1,020 J	1,680 J
Selenium	0.53 J	0.39 J
Silver	1 UL	1 UL
Sodium	16,200 J	16,400 J
Thallium	0.046 B	0.083 B
Vanadium	5 U	5 U
Zinc	1,150	4.3 B
Dissolved Metals (UG_L)		
Aluminum	200 U	200 U
Antimony	2 U	2 U
Arsenic	0.41 B	0.62 B
Barium	14.4	20.8
Beryllium	1 U	1 U
Cadmium	0.056 B	0.07 B
Calcium	6,850	14,500
Chromium	2 U	2 U
Cobalt	5.4	4
Copper	1.2 B	1.2 B
Iron	11.3 J	15.9 J
Lead	0.1 B	0.12 B
Magnesium	2,230 J	5,580
Manganese	118	284
Mercury	0.2 UL	0.2 UL
Nickel	2 B	2.6 B
Potassium	1,180 J	1,740 J
Selenium	0.52 B	0.62 B
Silver	1 UL	1 UL
Sodium	16,400	16,100
Thallium	0.057 B	0.073 B
Vanadium	5 U	5 U
Zinc	7.9 B	3.5 B
Wet Chemistry (MG_L)		
Acetate	1 U	1 U
Alkalinity	19.2	31.6
Butyrate	1 U	1 U
Chloride	18.3	17.6
Ethane	0.00313 U	0.00313 U
Ethene	0.00292 U	0.00292 U
Formic acid	1 U	1 U
Lactic Acid	1 U	1 U
Methane	0.0174	0.00167 U
Nitrate	0.92	0.145
Nitrite	0.05 U	0.05 U
Propionic Acid	1 U	1 U
Pyruvate	4 U	4 U
Sulfate	13.9	39.3
Sulfide	1 U	1 U
Total organic carbon (TOC)	5 U	5 U

Notes:
[1] Duplicate Sample
Represents detections
NA - Not analyzed
U - Analyte not detected
J - Reported value is estimated
B - Anlayte not detected above the associated blank
R - Unreliable result
K - Reported value may be biased high

Table A-3
Surface Soil Raw Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO314	LS11-SO319		LS11A-SO623	LS11A-SO625		LS11A-SO627	LS11A-SO628	LS11A-SO629	LS11A-SO630
Sample ID	LS11-SS306-00	LS11-SS307-00	LS11-SS308-00	LS11-SS309-00	LS11-SS310-00	LS11-SS311-00	LS11-SS312-00	LS11-SS314-00	LS11-SS319P-00[1]	LS11-SS319-00	LS11A-SS623-07C	LS11A-SS625-07C	LS11A-SS625P-07C[1]	LS11A-SS627-07C	LS11A-SS628-07C	LS11A-SS629-07C	LS11A-SS630-07C
Sample Depth	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs
Sample Date	05/28/02	05/28/02	05/28/02	05/29/02	05/29/02	05/29/02	05/29/02	05/29/02	05/30/02	05/30/02	10/01/07	10/01/07	10/01/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name																	
Volatile Organic Compounds (UG_KG)																	
1,1,1-Trichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,1,2,2-Tetrachloroethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,1,2-Trichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,1-Dichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,1-Dichloroethene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,2,4-Trichlorobenzene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	3.3 J	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,2-Dibromo-3-chloropropane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,2-Dibromoethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,2-Dichlorobenzene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	1.8 J	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,2-Dichloroethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,2-Dichloropropane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,3-Dichlorobenzene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
1,4-Dichlorobenzene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	1.8 J	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
2-Butanone	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	4.2 J	11 U	10 U	10 U	10 U	11 U	11 U	11 U
2-Hexanone	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
4-Methyl-2-pentanone	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Acetone	6.2 B	7.2 B	5.6 B	6.2 B	7.1 B	6.9 B	6.3 B	6.9 B	24 B	18 B	4 B	10 U	10 U	10 U	11 U	25 B	12 B
Benzene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Bromodichloromethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Bromoform	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Bromomethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Carbon disulfide	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Carbon tetrachloride	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Chlorobenzene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Chloroethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Chloroform	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Chloromethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Cyclohexane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Dibromochloromethane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Dichlorodifluoromethane (Freon-12)	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Ethylbenzene	1.2 J	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Isopropylbenzene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Methyl acetate	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Methyl-tert-butyl ether (MTBE)	1.2 J	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Methylcyclohexane	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Methylene chloride	8.8 B	11 B	9.6 B	11 B	11 B	9.1 B	11 B	10 B	10 B	9.8 B	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Styrene	1.2 B	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Tetrachloroethene	3.5 J	3.1 J	2.3 B	2.9 J	3.2 J	1.9 B	2.3 B	2.3 B	8.2 J	8 J	11 U	10 U	10 U	10 U	11 U	4 J	11 U
Toluene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Trichloroethene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	4.1 J	3.2 J	11 U	10 U	10 U	10 U	11 U	5 J	11 U
Trichlorofluoromethane(Freon-11)	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Vinyl chloride	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Xylene, total	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
cis-1,2-Dichloroethene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	1.3 J	11 U	10 U	10 U	10 U	11 U	3 J	11 U
cis-1,3-Dichloropropene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
trans-1,2-Dichloroethene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
trans-1,3-Dichloropropene	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	11 U	12 U	11 U	10 U	10 U	10 U	11 U	11 U	11 U
Semi-volatile Organic Compounds (UG_KG)																	
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 U	900 U	900 U
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 UJ	900 UJ	900 UJ
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U

Table A-3
Surface Soil Raw Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO314	LS11-SO319		LS11A-SO623	LS11A-SO625		LS11A-SO627	LS11A-SO628	LS11A-SO629	LS11A-SO630
Sample ID	LS11-SS306-00	LS11-SS307-00	LS11-SS308-00	LS11-SS309-00	LS11-SS310-00	LS11-SS311-00	LS11-SS312-00	LS11-SS314-00	LS11-SS319P-00[1]	LS11-SS319-00	LS11A-SS623-07C	LS11A-SS625-07C	LS11A-SS625P-07C[1]	LS11A-SS627-07C	LS11A-SS628-07C	LS11A-SS629-07C	LS11A-SS630-07C
Sample Depth	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs
Sample Date	05/28/02	05/28/02	05/28/02	05/29/02	05/29/02	05/29/02	05/29/02	05/29/02	05/30/02	05/30/02	10/01/07	10/01/07	10/01/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name																	
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 U	900 U	900 U
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 U	900 U	900 U
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 U	900 U	900 U
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 U	900 U	900 U
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 U	900 U	900 U
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	270 B	140 B	150 B	220 B	250 B	270 B	260 B
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	940 U	860 U	860 U	860 U	910 U	900 U	900 U
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	78 J	340 U	360 U	360 U	360 U
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	110 J	340 U	79 J	340 U	180 J	13,000	910
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	380 U	340 U	340 U	340 U	360 U	360 U	360 U
Pesticide/Polychlorinated Biphenyls (UG_KG)																	
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	8.4	5.9	1.2 J	3.6 U	3.6 U	3.6 U
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	45 J	17 J	8.8	1.1 J	3.6 U	3.6 U
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	7.9 J	3.9 J	5.3 J	1.3 J	3.6 U	3.6 U
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	1.8 U	3.8	1.8 U	1.8 U
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U	34 U	34 U	34 U	36 U	36 U	36 U
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	76 U	69 U	70 U	70 U	74 U	73 U	73 U
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U	34 U	34 U	34 U	36 U	36 U	36 U
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U	34 U	34 U	34 U	36 U	36 U	36 U
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U	34 U	34 U	34 U	36 U	36 U	36 U

Table A-3
Surface Soil Raw Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO314	LS11-SO319		LS11A-SO623	LS11A-SO625		LS11A-SO627	LS11A-SO628	LS11A-SO629	LS11A-SO630
Sample ID	LS11-SS306-00	LS11-SS307-00	LS11-SS308-00	LS11-SS309-00	LS11-SS310-00	LS11-SS311-00	LS11-SS312-00	LS11-SS314-00	LS11-SS319P-00[1]	LS11-SS319-00	LS11A-SS623-07C	LS11A-SS625-07C	LS11A-SS625P-07C[1]	LS11A-SS627-07C	LS11A-SS628-07C	LS11A-SS629-07C	LS11A-SS630-07C
Sample Depth	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-1' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs	0-0.5' bgs
Sample Date	05/28/02	05/28/02	05/28/02	05/29/02	05/29/02	05/29/02	05/29/02	05/29/02	05/30/02	05/30/02	10/01/07	10/01/07	10/01/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name																	
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U	34 U	34 U	34 U	36 U	36 U	36 U
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38 U	34 U	34 U	34 U	36 U	36 U	36 U
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	1.5 J	2.1 J	3.8	80	3.6 U	3.6 U
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	0.55 J	1.9 U	1.8 U	1.8 U
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	3.4 U	3.4 U	3.4 U	3.6 U	3.6 U	3.6 U
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 J	3.4 U	3.4 U	3.4 U	3.6 U	3.6 U	3.6 U
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	3.4 U	3.4 U	3.4 U	1.6 J	3.6 U	3.6 U
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	3.4 U	1.1 J	1.4 J	3.6 U	3.6 U	3.6 U
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.8 U	3.4 U	3.4 U	3.4 U	1.1 J	3.6 U	3.6 U
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	1.8 U	1.9 U	1.8 U	1.8 U
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	0.68 J	1.9 U	1.8 U	1.8 U
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	19 U	18 U	18 U	4.6 J	19 U	18 U	18 U
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	190 U	180 U	180 U	180 U	190 U	180 U	180 U
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	1.8 U	1.9 U	1.8 U	1.8 U
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.5 J	0.81 J	2.6 J	1.9 U	0.43 J	1.8 U
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	1.8 U	1.9 U	1.8 U	1.8 U
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	1.8 U	1.9 U	1.8 U	1.8 U
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.8 U	1.8 U	1.8 U	1.9 U	1.8 U	1.8 U
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.9 U	1.4 J	0.65 J	1.3 J	0.49 J	0.62 J	1.8 U
Total Metals (MG_KG)																	
Aluminum	13,400	20,000	22,800	17,700	17,300	22,200	21,700	20,200	12,700	13,100	11,100	5,440	5,300	4,840	6,020	7,190	6,520
Antimony	0.31 U	0.37 U	0.37 U	0.33 U	0.34 U	0.33 U	0.34 U	0.38 U	0.29 U	0.37 U	6.5 UL	6.2 UL	0.37 B	6.1 UL	6.6 UL	6.5 UL	6.2 UL
Arsenic	2.6	4	5	3.9	3.2	3.6	4.3	4.3	3	2.8	2.9 J	4.3 J	6.2 J	3.9 J	2.9 J	1.1 J	1.6 J
Barium	52.7	41.3	39.1	52.4	53.1	51.5	46.2	58.8	84.6	69.9	37.1	39.9	34.4	35.2	33.4	63.3	63.2
Beryllium	0.36 J	0.28 J	0.3 J	0.36 B	0.32 J	0.36 J	0.31 J	0.41 J	0.46 J	0.38 J	0.23 J	0.29 J	0.39 J	0.28 J	0.27 J	0.34 J	0.23 J
Cadmium	0.04 U	0.05 U	0.05 U	0.04 U	0.04 U	0.04 U	0.04 U	0.05 U	0.04 U	0.05 U	0.54 U	0.52 U	0.52 U	0.51 U	0.55 U	0.54 U	0.52 U
Calcium	770	1,080	614 J	843	1,770	3,050	1,260	1,970	821	840	635	1,150	1,630	1,770	650	1,300	2,070
Chromium	13.3	19.4	22.2	18.3	16	20.4	21.5	20.4	13	14.6	13.3	10.1	12.7	9.1	7.6	14.4	15.3
Cobalt	2.9 J	3 J	3.3 J	2.8 J	2.9 J	3.5 J	3.2 J	2.9 J	2.7 J	2.3 J	3.1 J	1.5 J	1.4 J	1.2 J	0.96 J	3.2 J	3.4 J
Copper	3.3 B	8.9	7.5	4.1 B	4.2	6.1	5.8	5.5	3.6 B	4.3	4	7.1	7	10.5	4	10.6	15.3
Cyanide	0.18 U	0.17 U	0.2 U	0.19 U	0.18 U	0.18 U	0.19 U	0.18 U	0.17 U	0.16 U	2.8 U	2.6 U	2.6 U	2.6 U	2.7 U	2.6 U	2.7 U
Iron	11,300	16,900	20,700	16,000	14,000	16,500	19,300	18,500	11,500	12,900	13,800	7,600	10,600	7,640	4,790	9,450	10,100
Lead	7	9.2	10.2	8.5	8.6	9.4	11.1	9.4	7.1	7.3	7.1	35.9	37.6	33.8	6.6	4.5	21.2
Magnesium	1,140	1,130	1,310	1,250	1,090	1,490	1,280	1,480	1,050	1,010	921	657	543	892	498 J	2,360	2,370
Manganese	90.1	36.7	51.2	58.3	67.1	49.3	49.8	55.8	105	73.1	79.3 J	140 J	140 J	123 J	133 J	188 J	189 J
Mercury	0.02 J	0.02 U	0.02 J	0.02 J	0.02 J	0.03 J	0.03 J	0.03 J	0.04	0.04	0.11 U	0.044 J	0.053 J	0.036 J	0.043 J	0.11 U	0.04 J
Nickel	6	7.8	8.3	7.1	6.8	9.2	8.4	8	6.6	6.2 J	6.1	5.1	4.9	3.9 J	4 J	7.5	6.8
Potassium	587 J	714 J	744 J	772	718 J	978	842	1,010	585 J	598 J	379 J	296 J	248 J	516 J	189 J	793 J	906 J
Selenium	0.4 UJ	0.48 UJ	0.92 J	0.66 J	0.44 UJ	0.43 UJ	0.49 J	0.5 UJ	0.38 UJ	1 J	3.8 UL	3.6 UL	3.7 UL	3.6 UL	3.9 UL	3.8 UL	3.6 UL
Silver	0.17 U	0.21 U	0.21 U	0.19 U	0.19 U	0.19 U	0.19 U	0.22 U	0.17 U	0.21 U	1.1 U	1 U	1 U	1 U	1.1 U	1.1 U	1 U
Sodium	62 B	95.2 B	114 B	63.2 B	71 B	91.4 B	82.8 B	122 B	65.6 B	68.8 B	120 B	61.7 B	68.4 B	81 B	74.8 B	104 B	93.3 B
Thallium	0.56 U	0.67 U	0.68 U	0.6 U	0.62 U	0.69 B	0.61 U	0.7 U	0.54 U	0.68 U	0.74 J	0.79 J	0.8 J	0.35 J	0.48 J	0.59 J	0.43 J
Vanadium	21.3	30.3	35.2	29	26.4	32.2	33.7	33	20.2	22	20.4	15.9	22.6	15.7	8	18.6	23
Zinc	17.2	18.2	22.8	20.1	17.6	20.9	22.7	22.9	17.3	16.5	14.1	40.4	36.2	53.2	12.8	40.8	65.7

Notes:
[1] Duplicate Sample
Shading indicates detection
NA - Not analyzed
B - Analyte not detected above associated blank
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

Table A-4
Subsurface Soil Raw Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO314	LS11-SO319	LS11A-SB109	LS11A-SB129		LS11A-SO623	LS11A-SO625	LS11A-SO627		
Sample ID	LS11-SB306-03	LS11-SB307-03	LS11-SB308-03	LS11-SB309-03	LS11-SB310-03	LS11-SB311-03	LS11-SB312-03	LS11-SB314-03	LS11-SB319-03	LS11A-SB109-04-03D	LS11A-SB129-04-03D	LS11A-SB129P-04-03D[1]	LS11A-SB623-0103-07C	LS11A-SB625-0103-07C	LS11A-SB627-0103-07C	LS11A-SB627-0612-07C	LS11A-SB627-2028-07C
Sample Depth	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	2-4' bgs	2-4' bgs	2-4' bgs	1-3' bgs	1-3' bgs	1-3' bgs	6-12' bgs	20-28' bgs
Sample Date	05/28/02	05/28/02	05/28/02	05/29/02	05/29/02	05/29/02	05/29/02	05/29/02	05/30/02	10/15/03	10/15/03	10/15/03	10/01/07	10/01/07	10/02/07	10/02/07	10/02/07
Chemical Name																	
Volatile Organic Compounds (UG_KG)																	
1,1,1-Trichloroethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,1,2,2-Tetrachloroethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,1,2-Trichloroethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,1-Dichloroethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,1-Dichloroethene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,2,4-Trichlorobenzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,2-Dibromo-3-chloropropane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,2-Dibromoethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,2-Dichlorobenzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,2-Dichloroethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,2-Dichloropropane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,3-Dichlorobenzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
1,4-Dichlorobenzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
2-Butanone	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	57 U	50 U	53 U	12 U	11 U	11 U	11 U	12 U
2-Hexanone	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	57 U	50 U	53 U	12 U	11 U	11 U	11 U	12 U
4-Methyl-2-pentanone	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	57 U	50 U	53 U	12 U	11 U	11 U	11 U	12 U
Acetone	7.5 B	8.5 B	8 B	6.8 B	7.4 B	7.2 B	8.4 B	7.4 B	9.6 B	57 U	50 U	53 U	4 B	5 B	11 U	11 UJ	12 UJ
Benzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Bromodichloromethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Bromoform	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Bromomethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Carbon disulfide	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Carbon tetrachloride	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Chlorobenzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Chloroethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Chloroform	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Chloromethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Cyclohexane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Dibromochloromethane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Dichlorodifluoromethane (Freon-12)	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Ethylbenzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Isopropylbenzene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Methyl acetate	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Methyl-tert-butyl ether (MTBE)	4.7 J	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Methylcyclohexane	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Methylene chloride	9.7 B	11 B	11 B	11 B	9.9 B	9.7 B	11 B	9.9 B	11 B	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Styrene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Tetrachloroethene	2.7 J	2.7 J	2.4 B	2.6 B	2.4 B	1.9 B	2.3 B	2.2 B	2.1 B	110	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Toluene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Trichloroethene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 J	10 U	11 U	12 U	11 U	11 U	11 U	12
Trichlorofluoromethane(Freon-11)	12 U	11 U	11 U	11 U	12 U	11 U	11 U	2.1 J	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Vinyl chloride	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Xylene, total	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	NA	NA	NA	12 U	11 U	11 U	11 U	12 U
cis-1,2-Dichloroethene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
cis-1,3-Dichloropropene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	10 U	11 U	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	11 U	10 U	11 U	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
trans-1,3-Dichloropropene	12 U	11 U	11 U	11 U	12 U	11 U	11 U	12 U	12 U	11 U	10 U	11 U	12 U	11 U	11 U	11 U	12 U
Semi-volatile Organic Compounds (UG_KG)																	
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
2,2'-Oxybis(1-chloropropane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 U	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 U	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 UL	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA

Table A-4
Subsurface Soil Raw Analytical Results
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NAB Little Creek
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Station ID	LS11A-SO628				LS11A-SO629			LS11A-SO630		
Sample ID	LS11A-SB628-0103-07C	LS11A-SB628-0612-07C	LS11A-SB628-2028-07C	LS11A-SB628P-2028-07C[1]	LS11A-SB629-0103-07C	LS11A-SB629-0612-07C	LS11A-SB629-2028-07C	LS11A-SB630-0103-07C	LS11A-SB630-0612-07C	LS11A-SB630-2028-07C
Sample Depth	1-3' bgs	6-12' bgs	20-28' bgs	20-28' bgs	1-3' bgs	6-12' bgs	20-28' bgs	1-3' bgs	6-12' bgs	20-28' bgs
Sample Date	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name										
Volatile Organic Compounds (UG_KG)										
1,1,1-Trichloroethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,1,2,2-Tetrachloroethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,1,2-Trichloroethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,1-Dichloroethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,1-Dichloroethene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,2,4-Trichlorobenzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,2-Dibromo-3-chloropropane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,2-Dibromoethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,2-Dichlorobenzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,2-Dichloroethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,2-Dichloropropane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,3-Dichlorobenzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
1,4-Dichlorobenzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
2-Butanone	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
2-Hexanone	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
4-Methyl-2-pentanone	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Acetone	14 U	11 UJ	12 UJ	12 UJ	7 B	12 UJ	12 UJ	12 U	12 UJ	12 UJ
Benzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Bromodichloromethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Bromoform	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Bromomethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Carbon disulfide	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Carbon tetrachloride	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Chlorobenzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Chloroethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Chloroform	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Chloromethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Cyclohexane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Dibromochloromethane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Dichlorodifluoromethane (Freon-12)	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Ethylbenzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Isopropylbenzene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Methyl acetate	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Methyl-tert-butyl ether (MTBE)	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Methylcyclohexane	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Methylene chloride	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Styrene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Tetrachloroethene	14 U	11 U	12 U	12 U	8 J	64	12 U	12 U	12 U	12 U
Toluene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Trichloroethene	14 U	11 U	23	15	12 U	3 J	12 U	12 U	12 U	12 U
Trichlorofluoromethane(Freon-11)	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Vinyl chloride	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Xylene, total	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
cis-1,2-Dichloroethene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
cis-1,3-Dichloropropene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
trans-1,3-Dichloropropene	14 U	11 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U	12 U
Semi-volatile Organic Compounds (UG_KG)										
1,1-Biphenyl	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2,2'-Oxybis(1-chloropropane)	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2,4,5-Trichlorophenol	1,100 U	NA	NA	NA	990 U	NA	NA	980 U	NA	NA
2,4,6-Trichlorophenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2,4-Dichlorophenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2,4-Dimethylphenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2,4-Dinitrophenol	1,100 UJ	NA	NA	NA	990 UJ	NA	NA	980 UJ	NA	NA
2,4-Dinitrotoluene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2,6-Dinitrotoluene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2-Chloronaphthalene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2-Chlorophenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2-Methylnaphthalene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2-Methylphenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
2-Nitroaniline	1,100 U	NA	NA	NA	990 U	NA	NA	980 U	NA	NA
2-Nitrophenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA

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Station ID	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO314	LS11-SO319	LS11A-SB109	LS11A-SB129		LS11A-SO623	LS11A-SO625	LS11A-SO627		
Sample ID	LS11-SB306-03	LS11-SB307-03	LS11-SB308-03	LS11-SB309-03	LS11-SB310-03	LS11-SB311-03	LS11-SB312-03	LS11-SB314-03	LS11-SB319-03	LS11A-SB109-04-03D	LS11A-SB129-04-03D	LS11A-SB129P-04-03D[1]	LS11A-SB623-0103-07C	LS11A-SB625-0103-07C	LS11A-SB627-0103-07C	LS11A-SB627-0612-07C	LS11A-SB627-2028-07C
Sample Depth	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	2-4' bgs	2-4' bgs	2-4' bgs	1-3' bgs	1-3' bgs	1-3' bgs	6-12' bgs	20-28' bgs
Sample Date	05/28/02	05/28/02	05/28/02	05/29/02	05/29/02	05/29/02	05/29/02	05/29/02	05/30/02	10/15/03	10/15/03	10/15/03	10/01/07	10/01/07	10/02/07	10/02/07	10/02/07
Chemical Name																	
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 UL	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 U	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 UL	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 U	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	300 B	260 B	150 B	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	980 U	900 U	950 U	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 U	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	140 J	360 U	380 UL	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	390 U	360 U	380 UL	NA	NA
Pesticide/Polychlorinated Biphenyls (UG_KG)																	
4,4'-DDD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	1.4 J	3.8 U	NA	NA
4,4'-DDE	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	6.4	3.8 U	NA	NA
4,4'-DDT	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	1.7 J	3.8 U	NA	NA
Aldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
Aroclor-1016	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U	36 U	38 U	NA	NA
Aroclor-1221	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	79 U	73 U	77 U	NA	NA
Aroclor-1232	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U	36 U	38 U	NA	NA
Aroclor-1242	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U	36 U	38 U	NA	NA
Aroclor-1248	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U	36 U	38 U	NA	NA
Aroclor-1254	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U	36 U	38 U	NA	NA
Aroclor-1260	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	39 U	36 U	38 U	NA	NA
Dieldrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	3.6 U	3.8 U	NA	NA
Endosulfan I	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
Endosulfan II	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	3.6 U	3.8 U	NA	NA
Endosulfan sulfate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	3.6 U	3.8 U	NA	NA
Endrin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	3.6 U	3.8 U	NA	NA
Endrin aldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	3.6 U	3.8 U	NA	NA

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Station ID	LS11A-SO628				LS11A-SO629			LS11A-SO630		
Sample ID	LS11A-SB628-0103-07C	LS11A-SB628-0612-07C	LS11A-SB628-2028-07C	LS11A-SB628P-2028-07C[1]	LS11A-SB629-0103-07C	LS11A-SB629-0612-07C	LS11A-SB629-2028-07C	LS11A-SB630-0103-07C	LS11A-SB630-0612-07C	LS11A-SB630-2028-07C
Sample Depth	1-3' bgs	6-12' bgs	20-28' bgs	20-28' bgs	1-3' bgs	6-12' bgs	20-28' bgs	1-3' bgs	6-12' bgs	20-28' bgs
Sample Date	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name										
3,3'-Dichlorobenzidine	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
3-Nitroaniline	1,100 U	NA	NA	NA	990 U	NA	NA	980 U	NA	NA
4,6-Dinitro-2-methylphenol	1,100 U	NA	NA	NA	990 U	NA	NA	980 U	NA	NA
4-Bromophenyl-phenylether	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
4-Chloro-3-methylphenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
4-Chloroaniline	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
4-Chlorophenyl-phenylether	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
4-Methylphenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
4-Nitroaniline	1,100 U	NA	NA	NA	990 U	NA	NA	980 U	NA	NA
4-Nitrophenol	1,100 U	NA	NA	NA	990 U	NA	NA	980 U	NA	NA
Acenaphthene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Acenaphthylene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Acetophenone	280 B	NA	NA	NA	220 B	NA	NA	270 B	NA	NA
Anthracene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Atrazine	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Benzaldehyde	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Benzo(a)anthracene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Benzo(a)pyrene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Benzo(b)fluoranthene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Benzo(g,h,i)perylene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Benzo(k)fluoranthene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Butylbenzylphthalate	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Caprolactam	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Carbazole	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Chrysene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Di-n-butylphthalate	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Di-n-octylphthalate	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Dibenz(a,h)anthracene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Dibenzofuran	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Diethylphthalate	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Dimethyl phthalate	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Fluoranthene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Fluorene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Hexachlorobenzene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Hexachlorobutadiene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Hexachlorocyclopentadiene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Hexachloroethane	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Indeno(1,2,3-cd)pyrene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Isophorone	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Naphthalene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Nitrobenzene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Pentachlorophenol	1,100 U	NA	NA	NA	990 U	NA	NA	980 U	NA	NA
Phenanthrene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Phenol	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Pyrene	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
bis(2-Chloroethoxy)methane	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
bis(2-Chloroethyl)ether	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
bis(2-Ethylhexyl)phthalate	230 J	NA	NA	NA	250 J	NA	NA	1,600	NA	NA
n-Nitroso-di-n-propylamine	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
n-Nitrosodiphenylamine	450 U	NA	NA	NA	390 U	NA	NA	390 U	NA	NA
Pesticide/Polychlorinated Biphenyls (UG_KG)										
4,4'-DDD	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
4,4'-DDE	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
4,4'-DDT	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Aldrin	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
Aroclor-1016	45 U	NA	NA	NA	39 U	NA	NA	39 U	NA	NA
Aroclor-1221	91 U	NA	NA	NA	80 U	NA	NA	79 U	NA	NA
Aroclor-1232	45 U	NA	NA	NA	39 U	NA	NA	39 U	NA	NA
Aroclor-1242	45 U	NA	NA	NA	39 U	NA	NA	39 U	NA	NA
Aroclor-1248	45 U	NA	NA	NA	39 U	NA	NA	39 U	NA	NA
Aroclor-1254	45 U	NA	NA	NA	39 U	NA	NA	39 U	NA	NA
Aroclor-1260	45 U	NA	NA	NA	39 U	NA	NA	39 U	NA	NA
Dieldrin	2.9 J	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Endosulfan I	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
Endosulfan II	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Endosulfan sulfate	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Endrin	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Endrin aldehyde	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA

Table A-4
Subsurface Soil Raw Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO314	LS11-SO319	LS11A-SB109	LS11A-SB129		LS11A-SO623	LS11A-SO625	LS11A-SO627		
Sample ID	LS11-SB306-03	LS11-SB307-03	LS11-SB308-03	LS11-SB309-03	LS11-SB310-03	LS11-SB311-03	LS11-SB312-03	LS11-SB314-03	LS11-SB319-03	LS11A-SB109-04-03D	LS11A-SB129-04-03D	LS11A-SB129P-04-03D[1]	LS11A-SB623-0103-07C	LS11A-SB625-0103-07C	LS11A-SB627-0103-07C	LS11A-SB627-0612-07C	LS11A-SB627-2028-07C
Sample Depth	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	5-7' bgs	2-4' bgs	2-4' bgs	2-4' bgs	1-3' bgs	1-3' bgs	1-3' bgs	6-12' bgs	20-28' bgs
Sample Date	05/28/02	05/28/02	05/28/02	05/29/02	05/29/02	05/29/02	05/29/02	05/29/02	05/30/02	10/15/03	10/15/03	10/15/03	10/01/07	10/01/07	10/02/07	10/02/07	10/02/07
Chemical Name																	
Endrin ketone	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.9 U	3.6 U	3.8 U	NA	NA
Heptachlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
Heptachlor epoxide	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
Methoxychlor	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20 U	18 U	20 U	NA	NA
Toxaphene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	200 U	180 U	200 U	NA	NA
alpha-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
alpha-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
beta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
delta-BHC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
gamma-BHC (Lindane)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
gamma-Chlordane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2 U	1.8 U	2 U	NA	NA
Total Metals (MG_KG)																	
Aluminum	8,510	2,140	1,520	3,470	1,090	726	2,020	1,370	11,600	NA	NA	NA	13,300	6,430	14,300	NA	NA
Antimony	0.35 U	0.4 J	0.32 U	0.3 U	0.37 U	0.37 U	0.31 U	0.33 U	0.4 U	NA	NA	NA	6.8 UL	6.5 UL	6.9 UL	NA	NA
Arsenic	1.1 J	0.52 U	0.49 U	0.46 U	0.56 U	0.56 U	0.79 J	0.5 U	2.7	NA	NA	NA	2.6 J	1.7 J	2.9 J	NA	NA
Barium	18.7 J	6 J	4.3 B	8.5 J	4 B	2.5 B	6 J	4.2 B	70.8	NA	NA	NA	33.4	44	38.9	NA	NA
Beryllium	0.11 J	0.05 B	0.03 B	0.06 B	0.02 U	0.04 B	0.04 B	0.03 B	0.42 J	NA	NA	NA	0.18 J	0.2 J	0.24 J	NA	NA
Cadmium	0.05 U	0.04 U	0.04 U	0.04 U	0.05 U	0.05 U	0.04 U	0.04 U	0.05 U	NA	NA	NA	0.56 U	0.55 U	0.57 U	NA	NA
Calcium	191 B	44.6 B	76.4 B	113 B	63.7 B	56.1 B	105 B	71.3 B	826 J	NA	NA	NA	512 J	907	797	NA	NA
Chromium	7.6	2.3	2.5	3.2	2.4	1.7	2.2	1.4	12.6	NA	NA	NA	13.4	9.8	15.5	NA	NA
Cobalt	1.7 J	0.87 J	0.53 B	1.3 J	0.3 B	0.22 B	0.55 B	0.44 B	2.5 J	NA	NA	NA	3.1 J	2.2 J	1.8 J	NA	NA
Copper	2.3 B	0.74 B	0.55 B	1.2 B	0.58 B	0.42 B	1.3 B	0.72 B	3.2 B	NA	NA	NA	4.5	3.7	4.1	NA	NA
Cyanide	0.18 U	0.18 U	0.18 U	0.18 U	0.18 U	0.15 U	0.17 U	0.17 U	0.17 U	NA	NA	NA	2.9 U	2.7 U	2.9 U	NA	NA
Iron	5,070	1,190	760	1,670	620	379	1,120	650	10,400	NA	NA	NA	14,100	6,730	14,500	NA	NA
Lead	4.8	0.89 J	0.7 J	1.1 J	0.56 J	0.6 J	0.84 J	0.57 J	7.2	NA	NA	NA	7.6	11.3	8.4	NA	NA
Magnesium	513 J	122 J	102 J	243 J	84.7 J	54.1 B	125 J	82.2 J	991	NA	NA	NA	628	584	730	NA	NA
Manganese	26.2	11.3	11.4	25.6	7.7	2.1 B	7.1	12.3	182	NA	NA	NA	80 J	148 J	25.4 J	NA	NA
Mercury	0.02 U	0.02 U	0.01 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.01 U	NA	NA	NA	0.12 U	0.11 U	0.12 U	NA	NA
Nickel	3.5 J	1.1 B	1 B	2 B	0.77 B	0.5 B	1 B	0.77 B	5.8 J	NA	NA	NA	6	4.6	5.4	NA	NA
Potassium	312 J	109 J	94.1 J	201 J	77.5 B	51.9 B	119 J	77.2 B	538 J	NA	NA	NA	314 J	234 J	315 J	NA	NA
Selenium	0.46 UJ	0.45 UJ	0.42 UJ	0.39 UJ	0.48 UJ	0.48 UJ	0.41 UJ	0.43 UJ	0.52 UJ	NA	NA	NA	3.9 UL	3.8 UL	4 UL	NA	NA
Silver	0.2 U	0.19 U	0.18 U	0.17 U	0.21 U	0.21 U	0.18 U	0.18 U	0.23 U	NA	NA	NA	1.1 U	1.1 U	1.1 U	NA	NA
Sodium	62.9 B	72.9 B	38.6 B	45.9 B	57.6 B	60.7 B	39.5 B	45.2 B	67.2 B	NA	NA	NA	104 B	63.1 B	97.5 B	NA	NA
Thallium	0.64 U	0.63 U	0.58 U	0.55 U	0.67 U	0.68 U	0.57 U	0.6 U	0.73 U	NA	NA	NA	1.2 J	2.7 U	0.86 J	NA	NA
Vanadium	11.3	2.7 J	1.7 J	3.6 J	1.4 J	0.97 J	2.6 J	1.5 J	18.8	NA	NA	NA	21.9	12.9	23.1	NA	NA
Zinc	7.8 B	2.5 B	2.1 B	3.2 B	1.3 B	1.1 B	2.7 B	1.7 B	14.6 B	NA	NA	NA	10.9	13.1	11.2	NA	NA
Wet Chemistry (MG_KG)																	
% Solids	87	86	89	89	82	NA	89	85	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3,170	4,990

Notes:
[1] Duplicate Sample
Shading indicates detection
NA - Not analyzed
B - Analyte not detected above associated blank
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

Table A-4
Subsurface Soil Raw Analytical Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Station ID	LS11A-SO628				LS11A-SO629			LS11A-SO630		
Sample ID	LS11A-SB628-0103-07C	LS11A-SB628-0612-07C	LS11A-SB628-2028-07C	LS11A-SB628P-2028-07C[1]	LS11A-SB629-0103-07C	LS11A-SB629-0612-07C	LS11A-SB629-2028-07C	LS11A-SB630-0103-07C	LS11A-SB630-0612-07C	LS11A-SB630-2028-07C
Sample Depth	1-3' bgs	6-12' bgs	20-28' bgs	20-28' bgs	1-3' bgs	6-12' bgs	20-28' bgs	1-3' bgs	6-12' bgs	20-28' bgs
Sample Date	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07	10/02/07
Chemical Name										
Endrin ketone	4.5 U	NA	NA	NA	3.9 U	NA	NA	3.9 U	NA	NA
Heptachlor	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
Heptachlor epoxide	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
Methoxychlor	23 U	NA	NA	NA	20 U	NA	NA	20 U	NA	NA
Toxaphene	230 U	NA	NA	NA	200 U	NA	NA	200 U	NA	NA
alpha-BHC	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
alpha-Chlordane	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
beta-BHC	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
delta-BHC	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
gamma-BHC (Lindane)	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
gamma-Chlordane	2.3 U	NA	NA	NA	2 U	NA	NA	2 U	NA	NA
Total Metals (MG_KG)										
Aluminum	15,000	NA	NA	NA	11,300	NA	NA	12,900	NA	NA
Antimony	8.1 UL	NA	NA	NA	6.8 UL	NA	NA	0.23 B	NA	NA
Arsenic	2.6 J	NA	NA	NA	2.4 J	NA	NA	3.3 J	NA	NA
Barium	43.8	NA	NA	NA	56.5	NA	NA	39.8	NA	NA
Beryllium	0.26 J	NA	NA	NA	0.32 J	NA	NA	0.21 J	NA	NA
Cadmium	0.67 U	NA	NA	NA	0.57 U	NA	NA	0.54 U	NA	NA
Calcium	776	NA	NA	NA	776	NA	NA	875	NA	NA
Chromium	16	NA	NA	NA	14.8	NA	NA	18.6	NA	NA
Cobalt	1.9 J	NA	NA	NA	2.1 J	NA	NA	2.2 J	NA	NA
Copper	4	NA	NA	NA	5.4	NA	NA	5.7	NA	NA
Cyanide	3.3 U	NA	NA	NA	2.9 U	NA	NA	2.9 U	NA	NA
Iron	13,300	NA	NA	NA	11,900	NA	NA	16,200	NA	NA
Lead	8.9	NA	NA	NA	6.5	NA	NA	8.2	NA	NA
Magnesium	832	NA	NA	NA	1,100	NA	NA	955	NA	NA
Manganese	37.6 J	NA	NA	NA	164 J	NA	NA	71.1 J	NA	NA
Mercury	0.14 U	NA	NA	NA	0.12 U	NA	NA	0.12 U	NA	NA
Nickel	6.5	NA	NA	NA	7.4	NA	NA	6.7	NA	NA
Potassium	332 J	NA	NA	NA	368 J	NA	NA	492 J	NA	NA
Selenium	4.7 UL	NA	NA	NA	4 UL	NA	NA	3.8 UL	NA	NA
Silver	1.3 U	NA	NA	NA	1.1 U	NA	NA	1.1 U	NA	NA
Sodium	100 B	NA	NA	NA	110 B	NA	NA	69 B	NA	NA
Thallium	3.4 U	NA	NA	NA	0.63 J	NA	NA	0.96 J	NA	NA
Vanadium	22.7	NA	NA	NA	19	NA	NA	24.2	NA	NA
Zinc	12.3	NA	NA	NA	17.3	NA	NA	15.9	NA	NA
Wet Chemistry (MG_KG)										
% Solids	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	NA	3,470	3,730	4,390	NA	4,520	5,390	NA	6,900	4,280

Notes:
[1] Duplicate Sample
Shading indicates detection
NA - Not analyzed
B - Analyte not detected above associated blank
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

Table A-5
Groundwater TCE Field Screening Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

Sample	TCE Field Screening Results (ug/L)
GP501	U
GP502	4
GP503	U
GP504	U
GP505	140
GP506	370
GP507	38
GP508	U
GP509	49
GP510	26
GP511	U
GP512	124
GP513	81
GP514	11.5
GP515	38
GP516	33
GP517	67
GP518	50
GP519	37

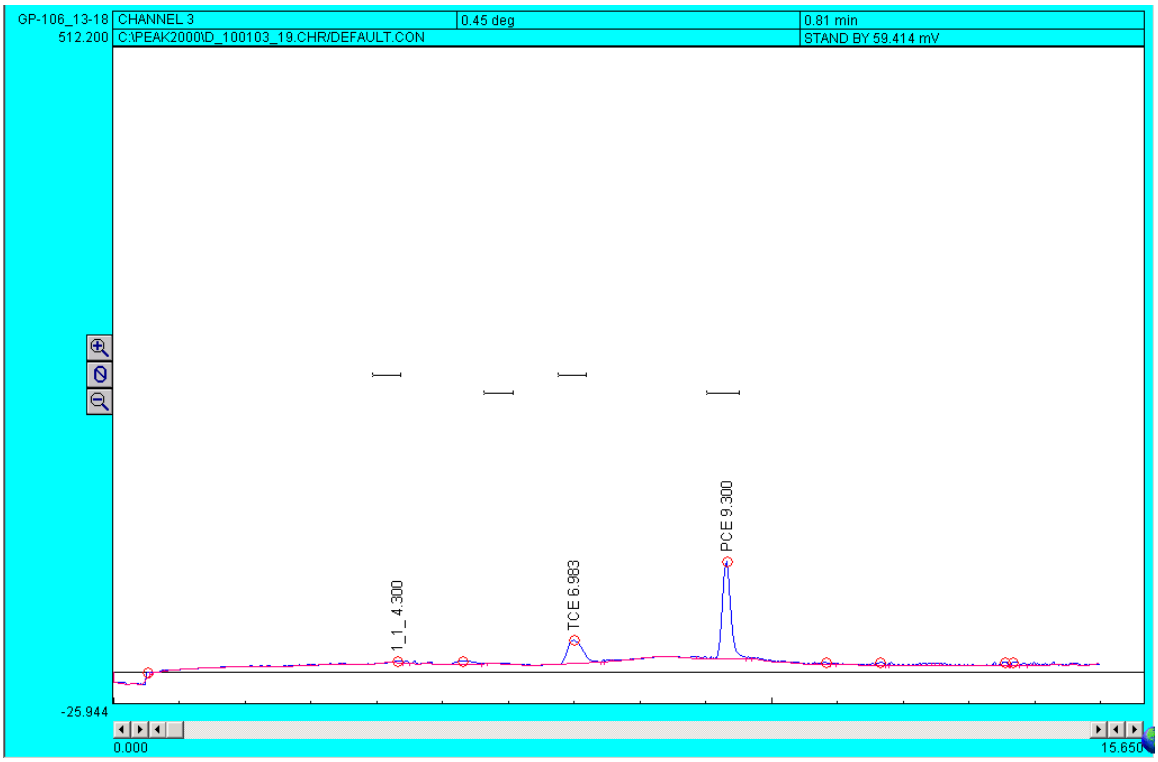
U - analyte not detected
NA - not analyzed

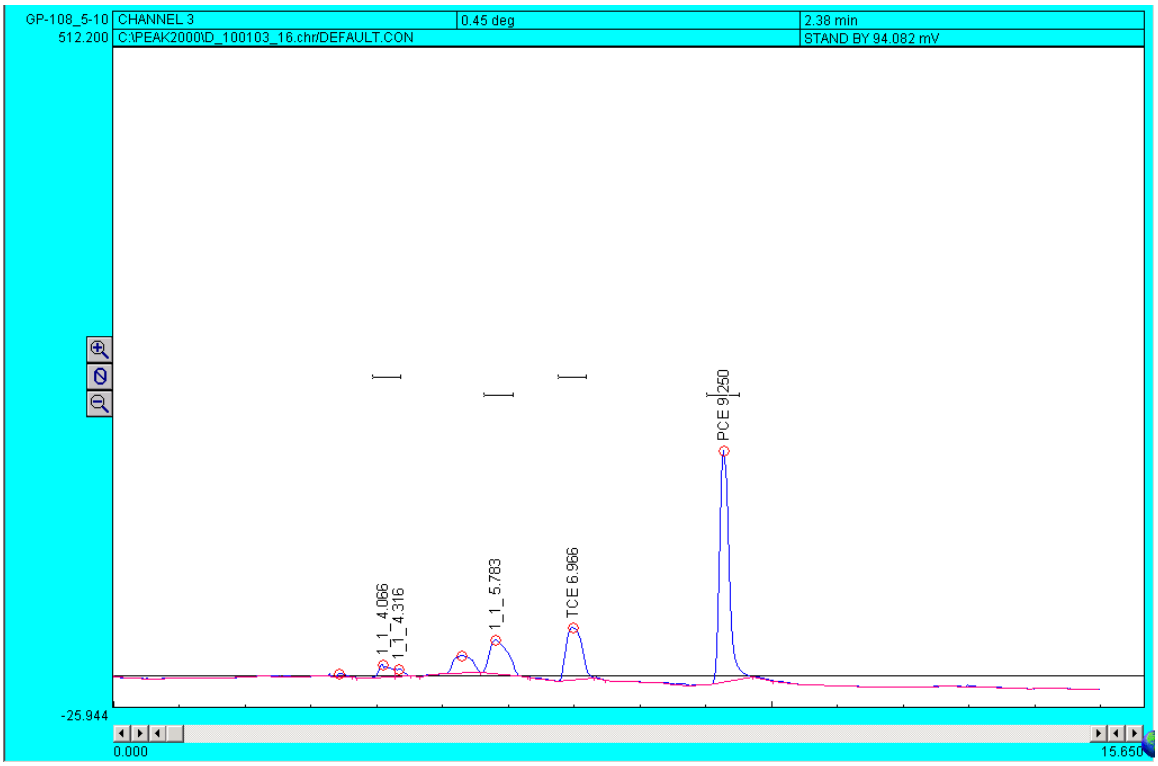
Table A-6
Soil TCE Field Screening Results
Site 11a Remedial Investigation Report
NAB Little Creek
Virginia Beach, Virginia

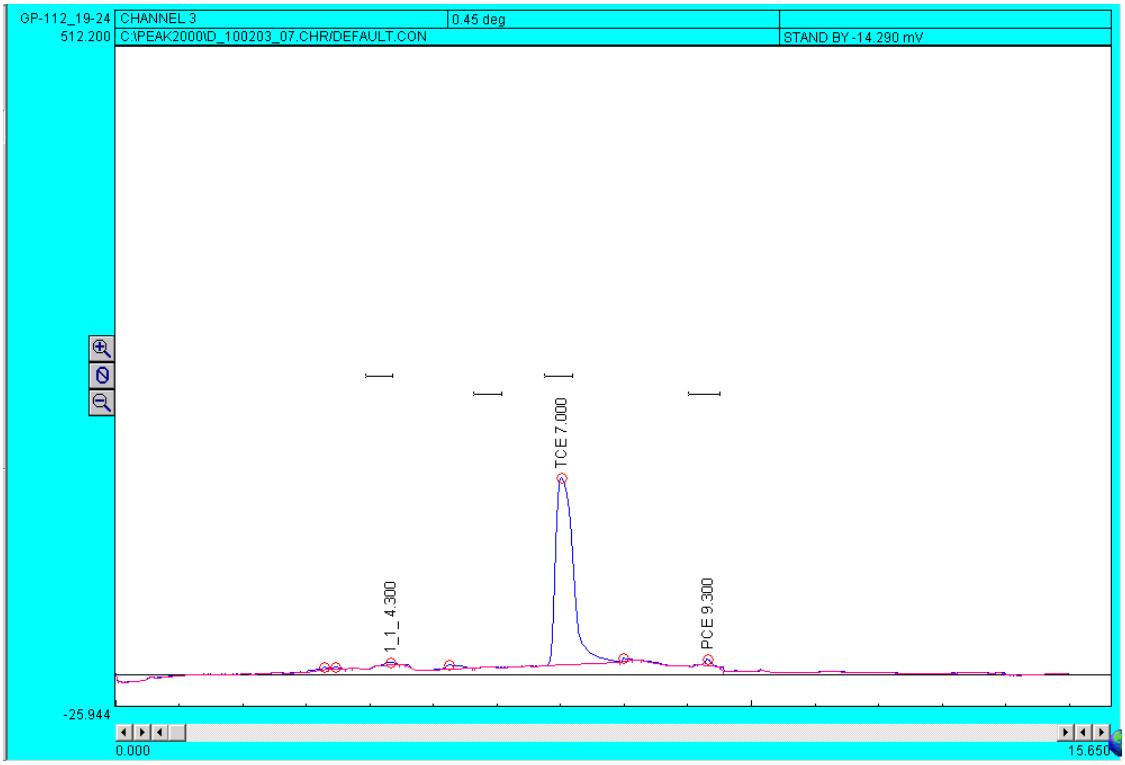
Station	Sample	TCE Field Screening Results (ug/kg)
Surface		
SO306	SS306	6640
SO307	SS307	U
SO308	SS308	4980
SO309	SS309	4150
SO310	SS310	2490
SO311	SS311	4150
SO312	SS312	10790
SO313	SS313	4980
SO314	SS314	10790
SO319	SS319	10790
Subsurface		
SO301	SB301	3320
SO306	SS306	830
SO307	SS307	830
SO308	SS308	U
SO309	SS309	2490
SO310	SS310	9960
SO311	SS311	9960
SO312	SS312	9960
SO313	SS313	2490
SO314	SS314	5810
SO319	SS319	2490

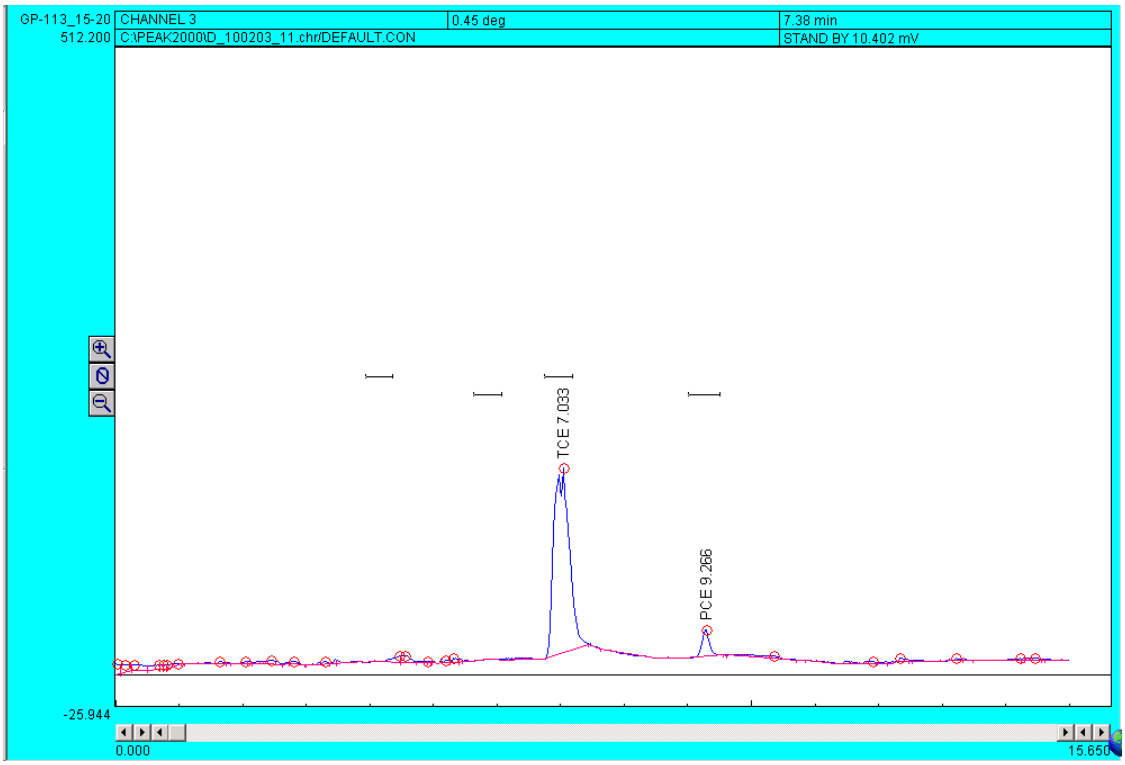
U - analyte not detected
J - reported value is estimated

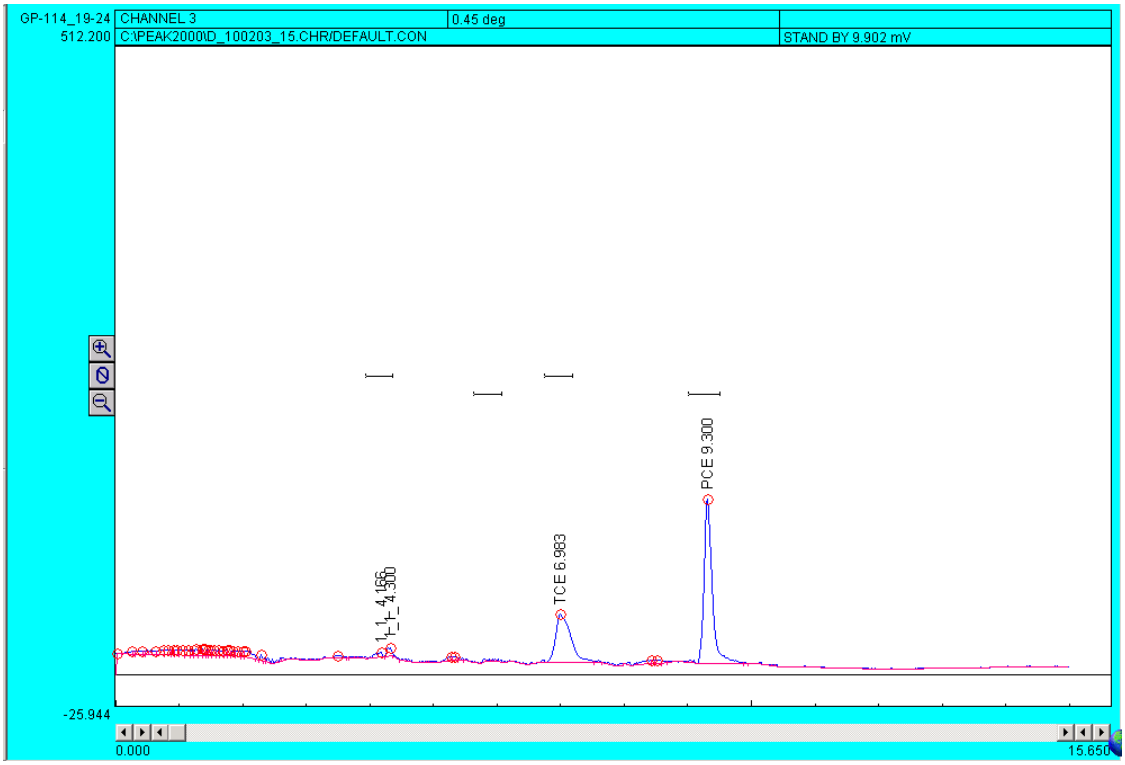
Appendix B
MIP Data and Report

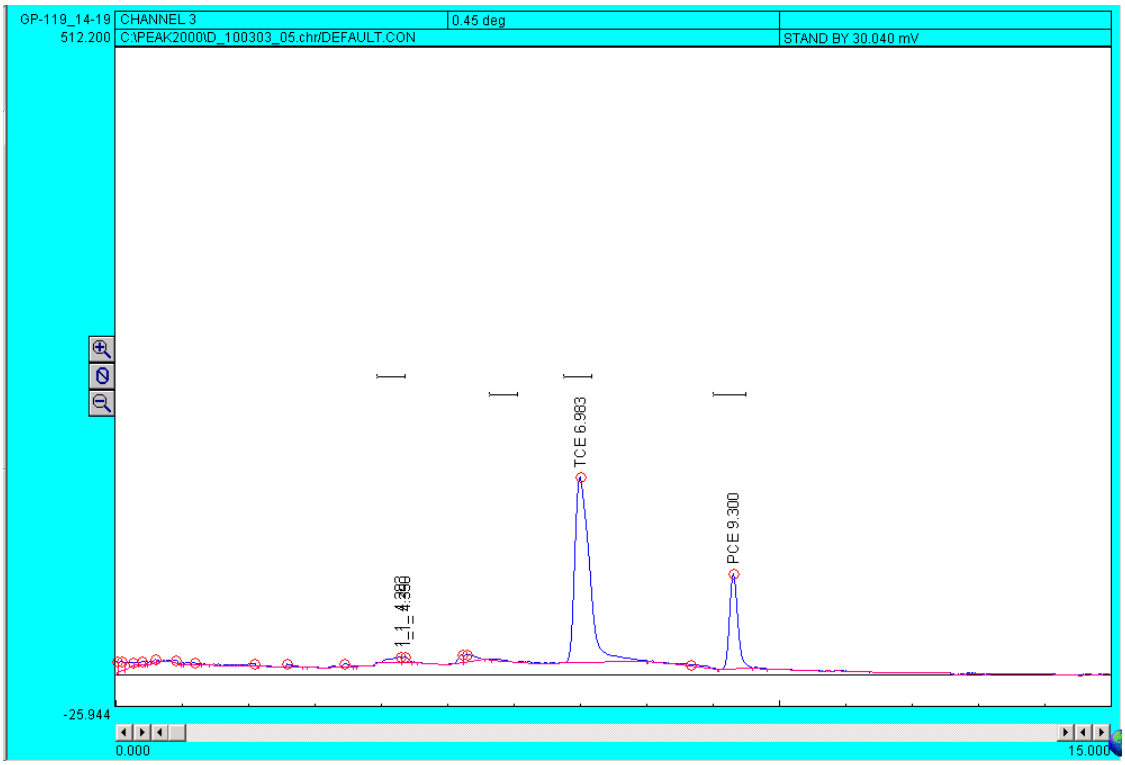

GP-106_13-18
CHANNEL 3
0.45 deg
0.81 min
512.200
C:\PEAK2000\D_100103_19.CHR/DEFAULT.CON
STAND BY 59.414 mV
1_1_ 4.300
TCE 6.983
PCE 9.300
-25.944
0.000
15.650

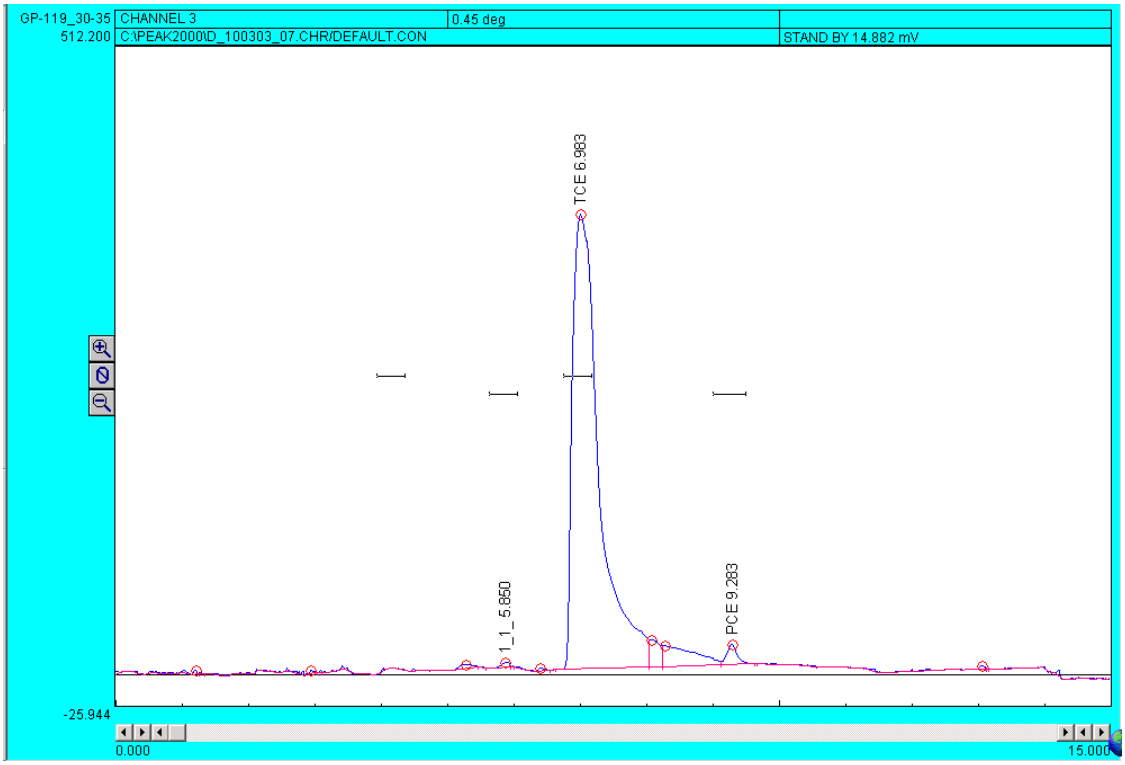

GP-108_5-10
CHANNEL 3
0.45 deg
2.38 min
512.200
C:\PEAK2000\D_100103_16.chr/DEFAULT.CON
STAND BY 94.082 mV
1_1_ 4.066
1_1_ 4.316
1_1_ 5.783
TCE 6.966
PCE 9.250
-25.944
0.000
15.650

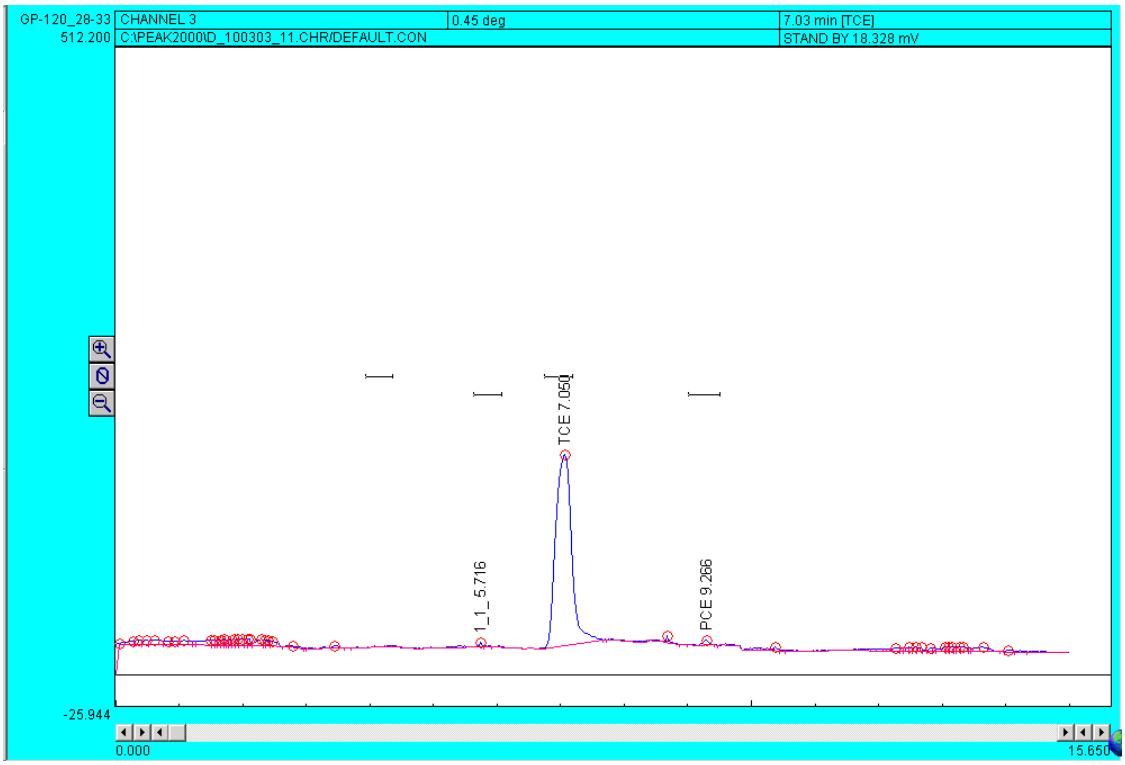

GP-112_19-24
512.200
CHANNEL 3
0.45 deg
C:\PEAK2000\D_100203_07.CHR/DEFAULT.CON
STAND BY -14.290 mV
1_1_4.300
TCE 7.000
PCE 9.300
-25.944
0.000
15.650

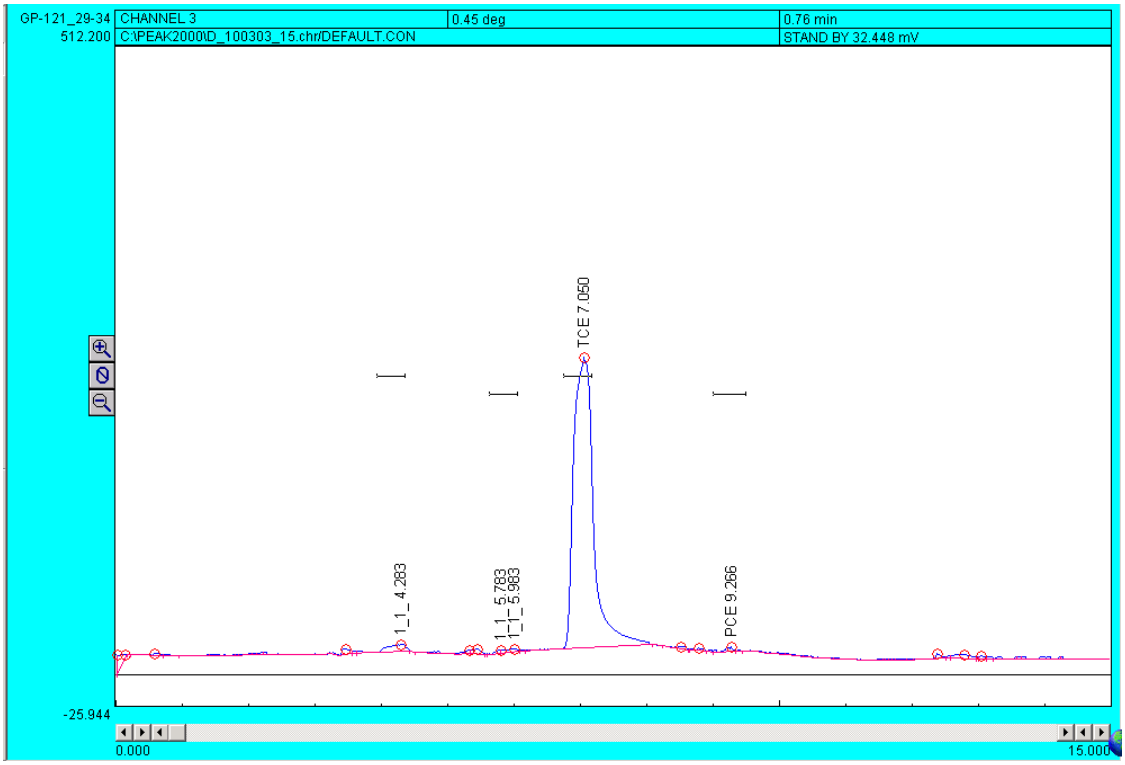

GP-113_15-20
512.200
CHANNEL 3
0.45 deg
7.38 min
C:\PEAK2000\D_100203_11.chr/DEFAULT.CON
STAND BY 10.402 mV
TCE 7.033
PCE 9.266
-25.944
0.000
15.650

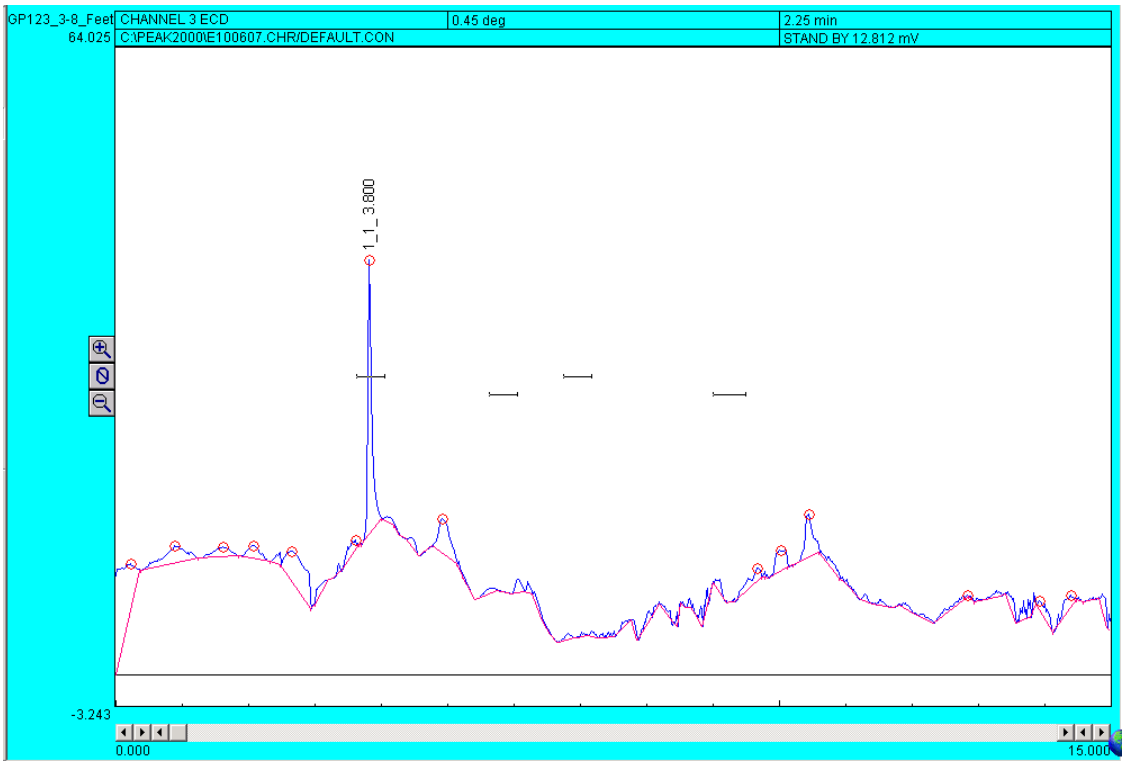

GP-114_19-24
CHANNEL 3
0.45 deg
512.200
C:\PEAK2000\D_100203_15.CHR/DEFAULT.CON
STAND BY 9.902 mV
TCE 6.983
PCE 9.300
-25.944
0.000
15.650

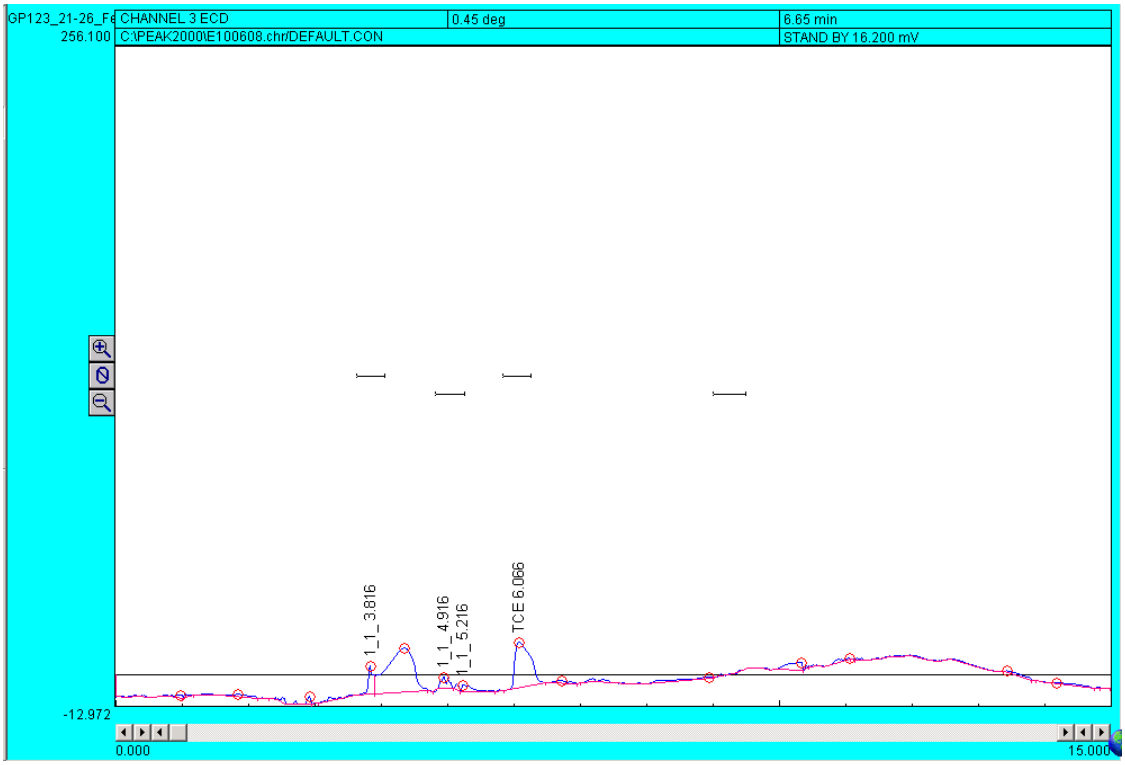

GP-119_14-19
CHANNEL 3
0.45 deg
512.200
C:\PEAK2000\D_100303_05.chr/DEFAULT.CON
STAND BY 30.040 mV
TCE 6.983
PCE 9.300
-25.944
0.000
15.000

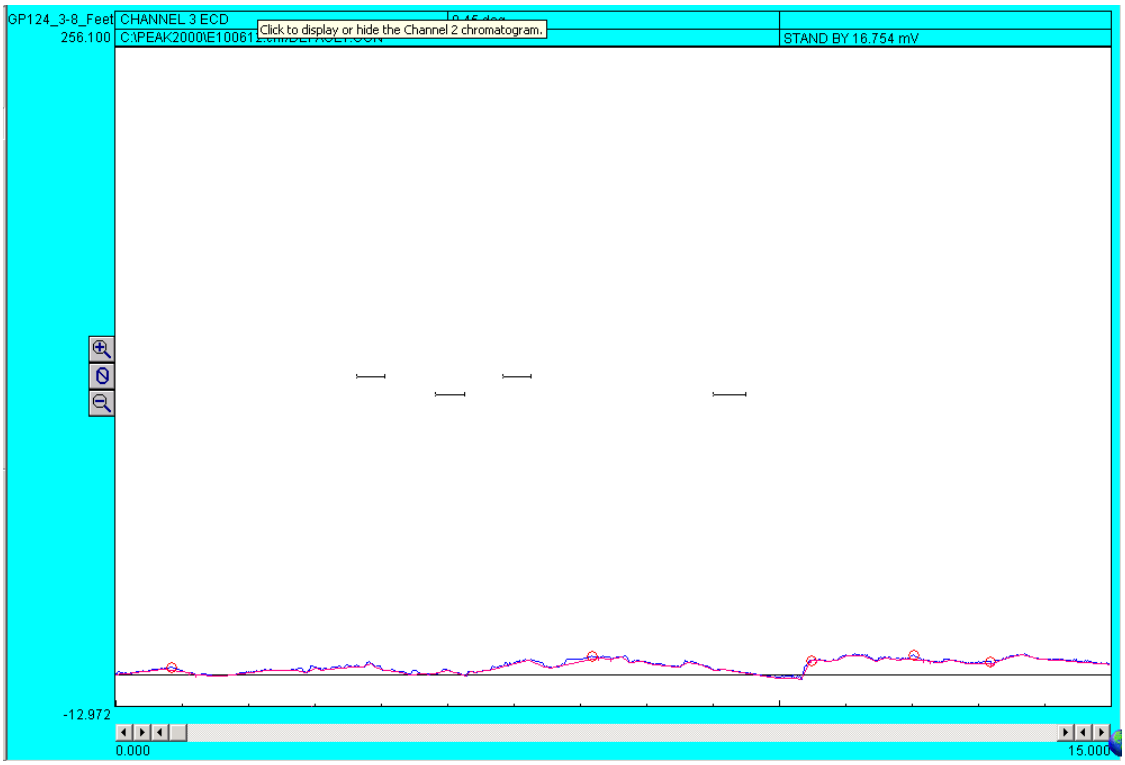

GP-119_30-35
CHANNEL 3
0.45 deg
512.200
C:\PEAK2000\D_100303_07.CHR/DEFAULT.CON
STAND BY 14.882 mV
TCE 6.983
1_1_5.850
PCE 9.283
-25.944
0.000
15.000

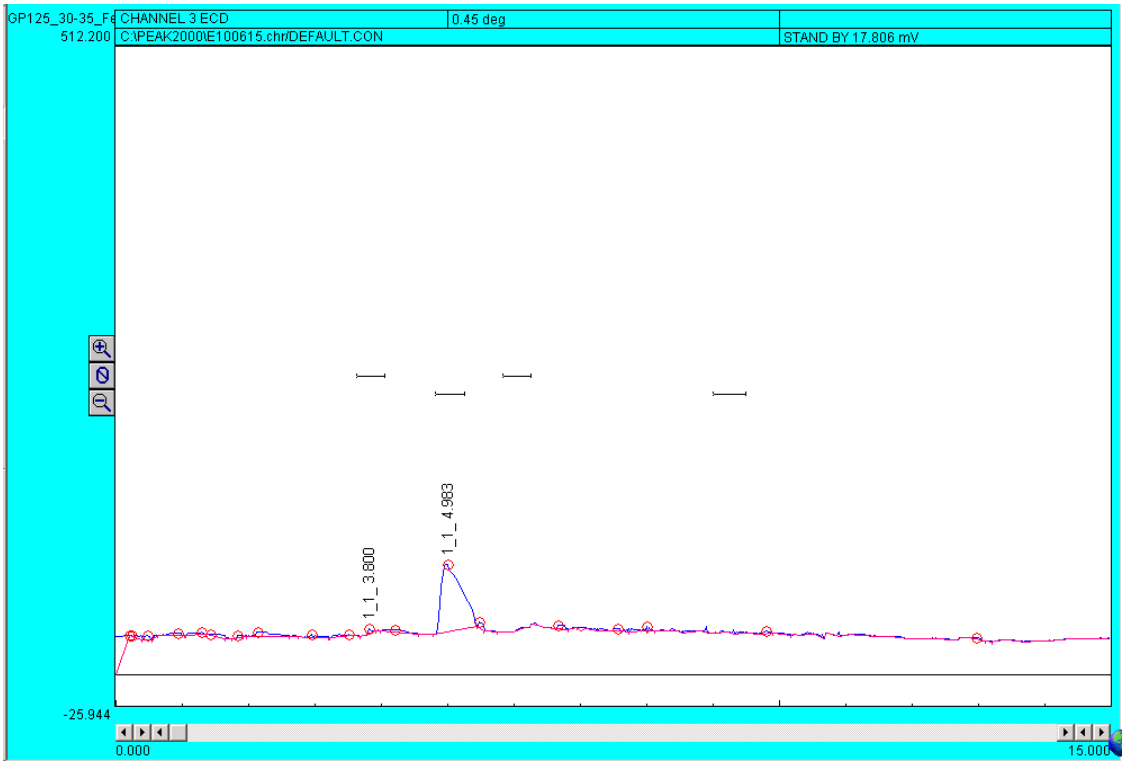

GP-120_28-33
CHANNEL 3
0.45 deg
7.03 min [TCE]
512.200
C:\PEAK2000\D_100303_11.CHR/DEFAULT.CON
STAND BY 18.328 mV
TCE 7.050
1_1_5.716
PCE 9.266
-25.944
0.000
15.650


GP-121_29-34
CHANNEL 3
0.45 deg
0.76 min
512.200
C:\PEAK2000\D_100303_15.chr/DEFAULT.CON
STAND BY 32.448 mV
TCE 7.050
1_1_4.283
1_1_5.783
1_1_5.983
PCE 9.266
-25.944
0.000
15.000


GP123_3-8_Feet
CHANNEL 3 ECD
0.45 deg
2.25 min
64.025
C:\PEAK2000\E100607.CHR/DEFAULT.CON
STAND BY 12.812 mV
1_1_3.800
-3.243
0.000
15.000


GP123_21-26_Fe
CHANNEL 3 ECD
0.45 deg
6.65 min
256.100
C:\PEAK2000\E100608.chr/DEFAULT.CON
STAND BY 16.200 mV
1_1_3.816
1_1_4.916
1_1_5.216
TCE 6.066
-12.972
0.000
15.000


GP124_3-8_Feet
CHANNEL 3 ECD
Click to display or hide the Channel 2 chromatogram.
256.100
C:\PEAK2000\E100611
STAND BY 16.754 mV
-12.972
0.000
15.000


GP125_30-35_Fe
CHANNEL 3 ECD
0.45 deg
512.200
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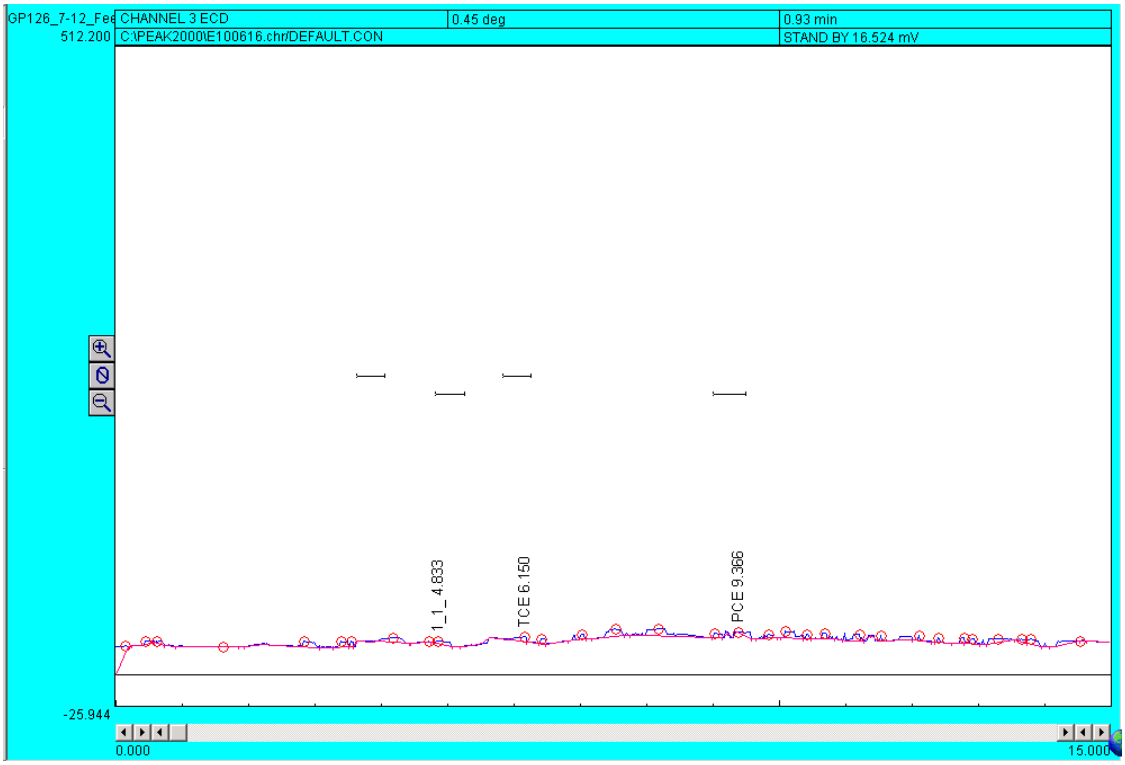
1_1_3.800
1_1_4.983
-25.944
0.000
15.000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0.45 deg
0.93 min
512.200
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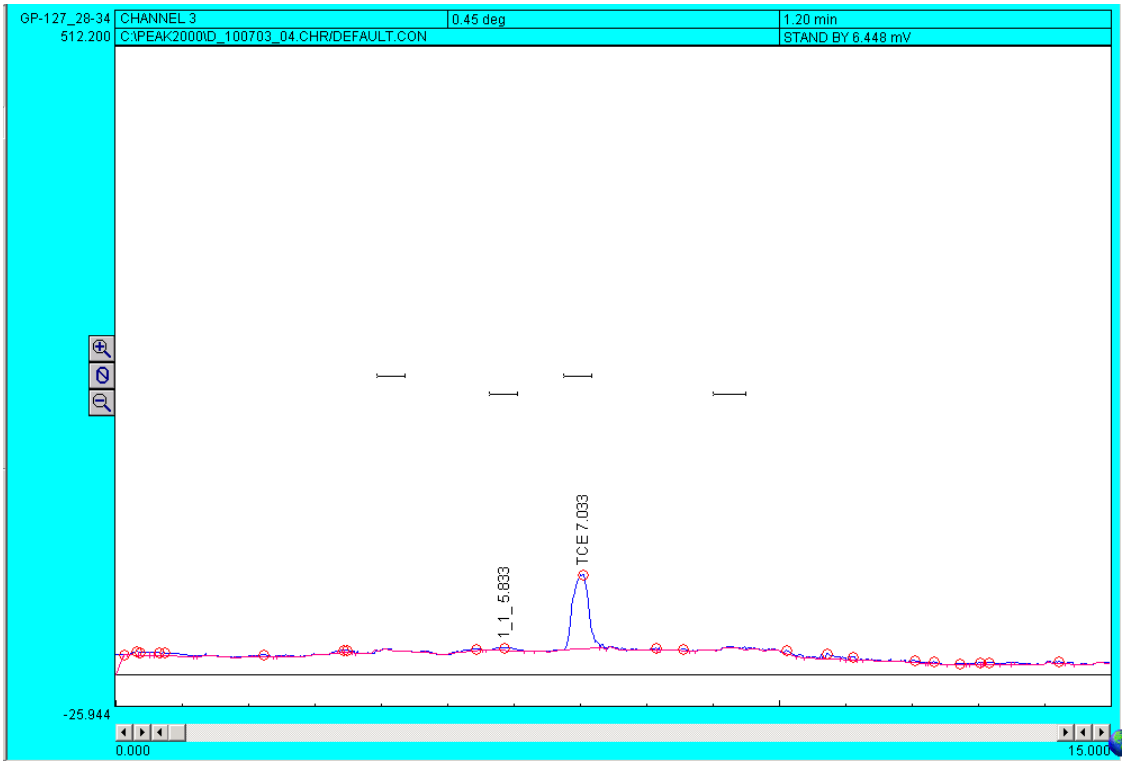
STAND BY 16.524 mV
1_1_4.833
TCE 6.150
PCE 9.366
-25.944
0.000
15.000


GP-127_28-34
512.200
CHANNEL 3
0.45 deg
1.20 min
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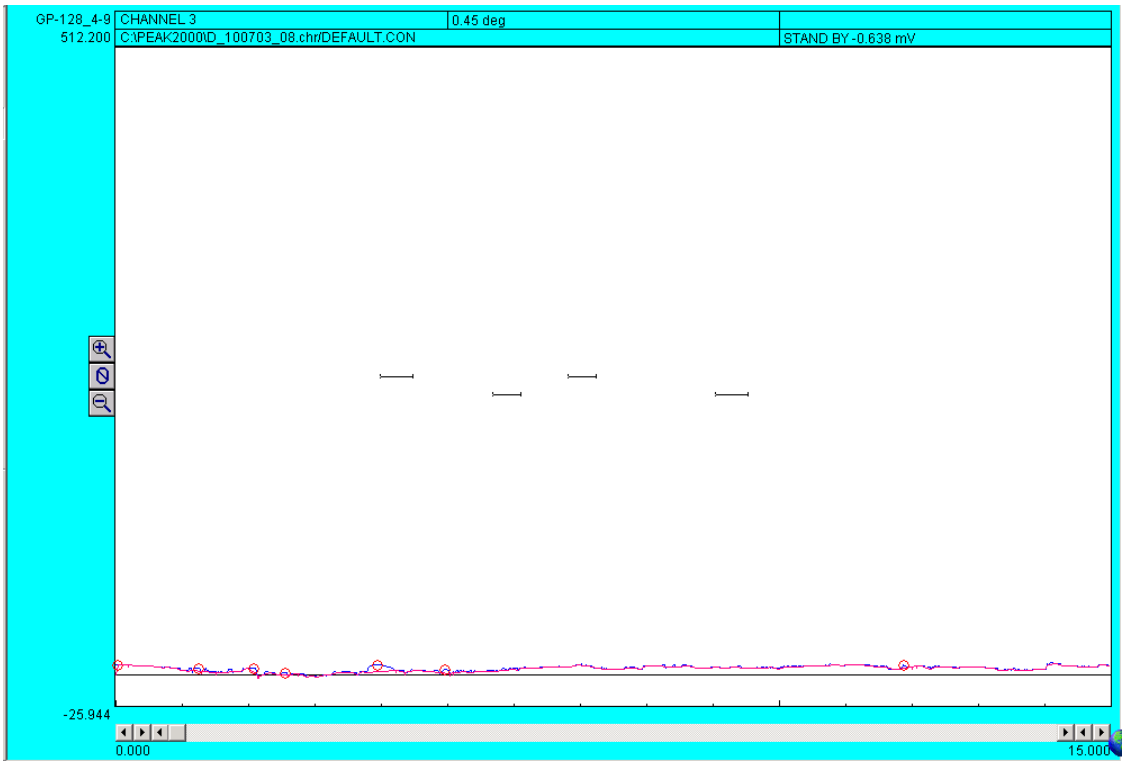
STAND BY 6.448 mV
1_1_5.833
TCE 7.033
-25.944
0.000
15.000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0.45 deg
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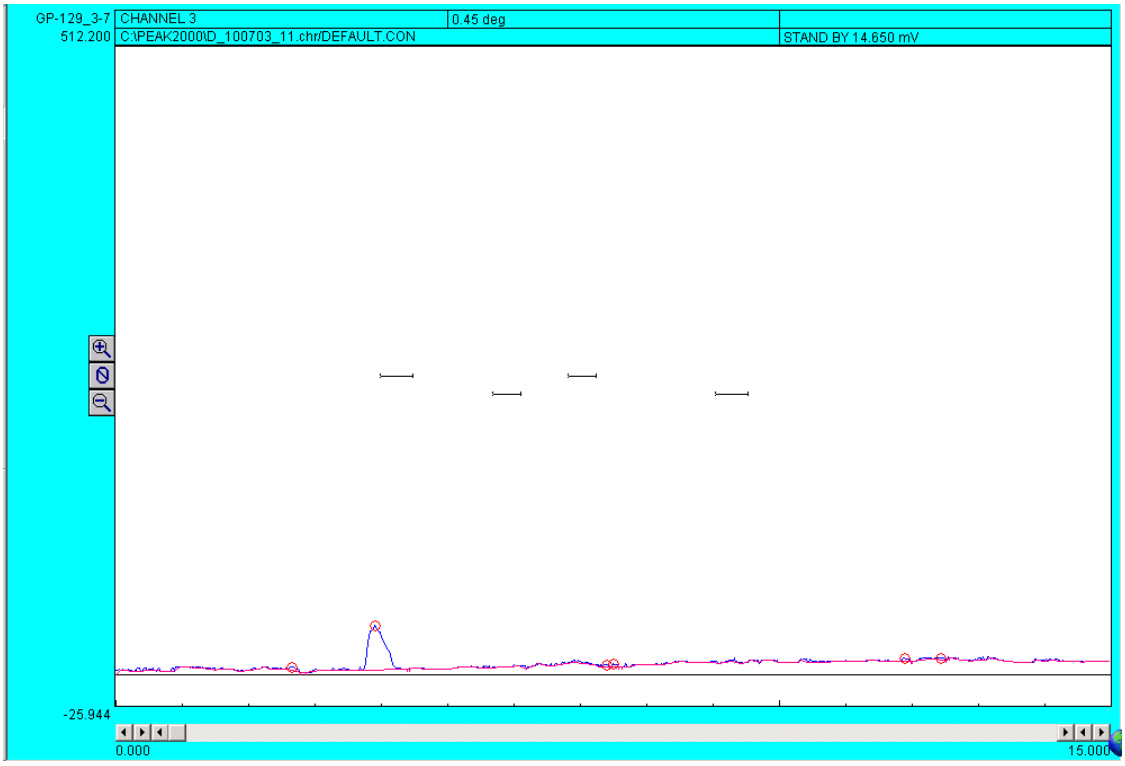
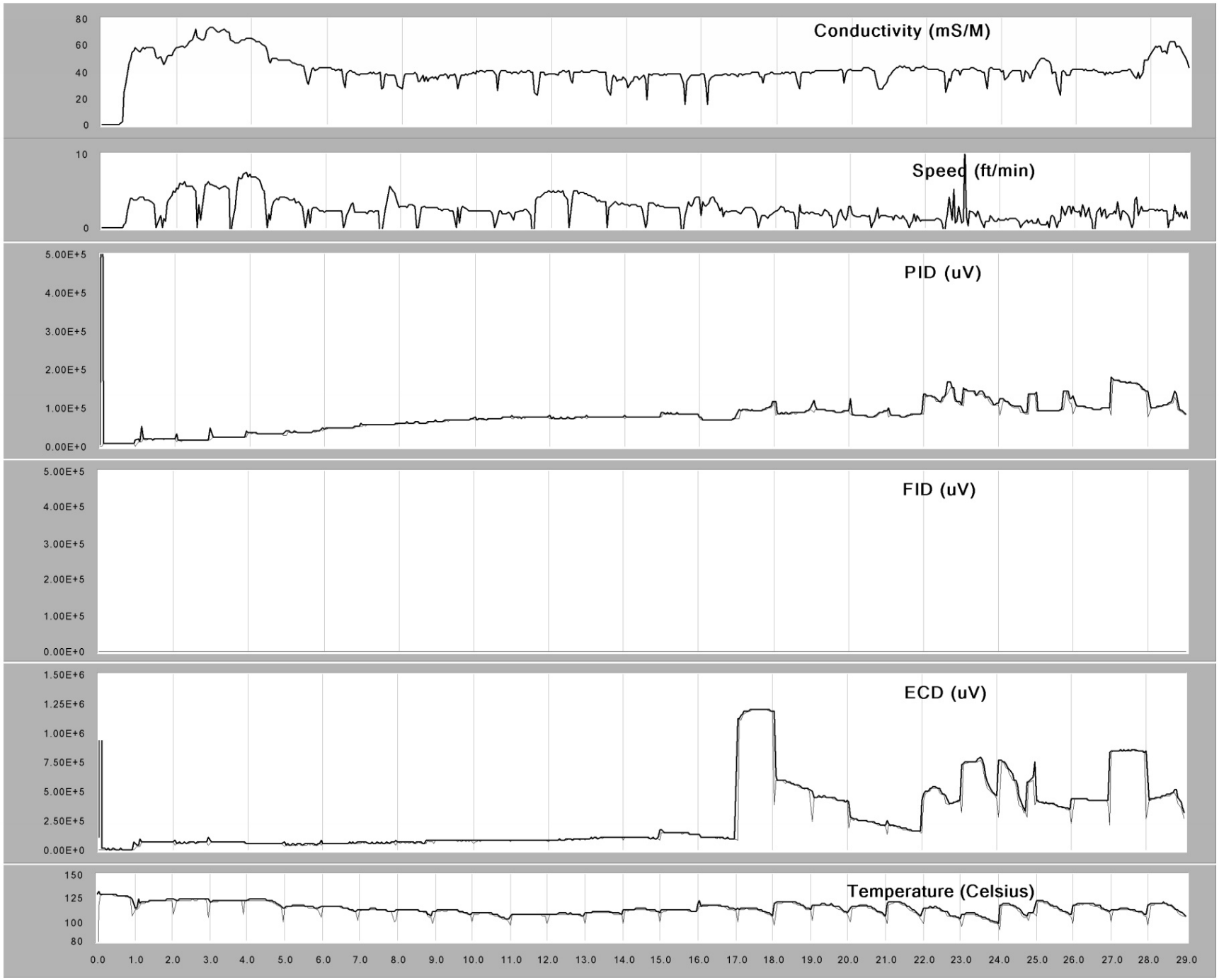
STAND BY -0.638 mV
-25.944
0.000
15.000


GP-129_3-7
CHANNEL 3
0.45 deg
512.200
C:\PEAK2000\D_100703_11.chr/DEFAULT.CON
STAND BY 14.650 mV
-25.944
0.000
15.000

GP-101



CH2M Hill
NAB Little Creek, Site 11A
09/29/03

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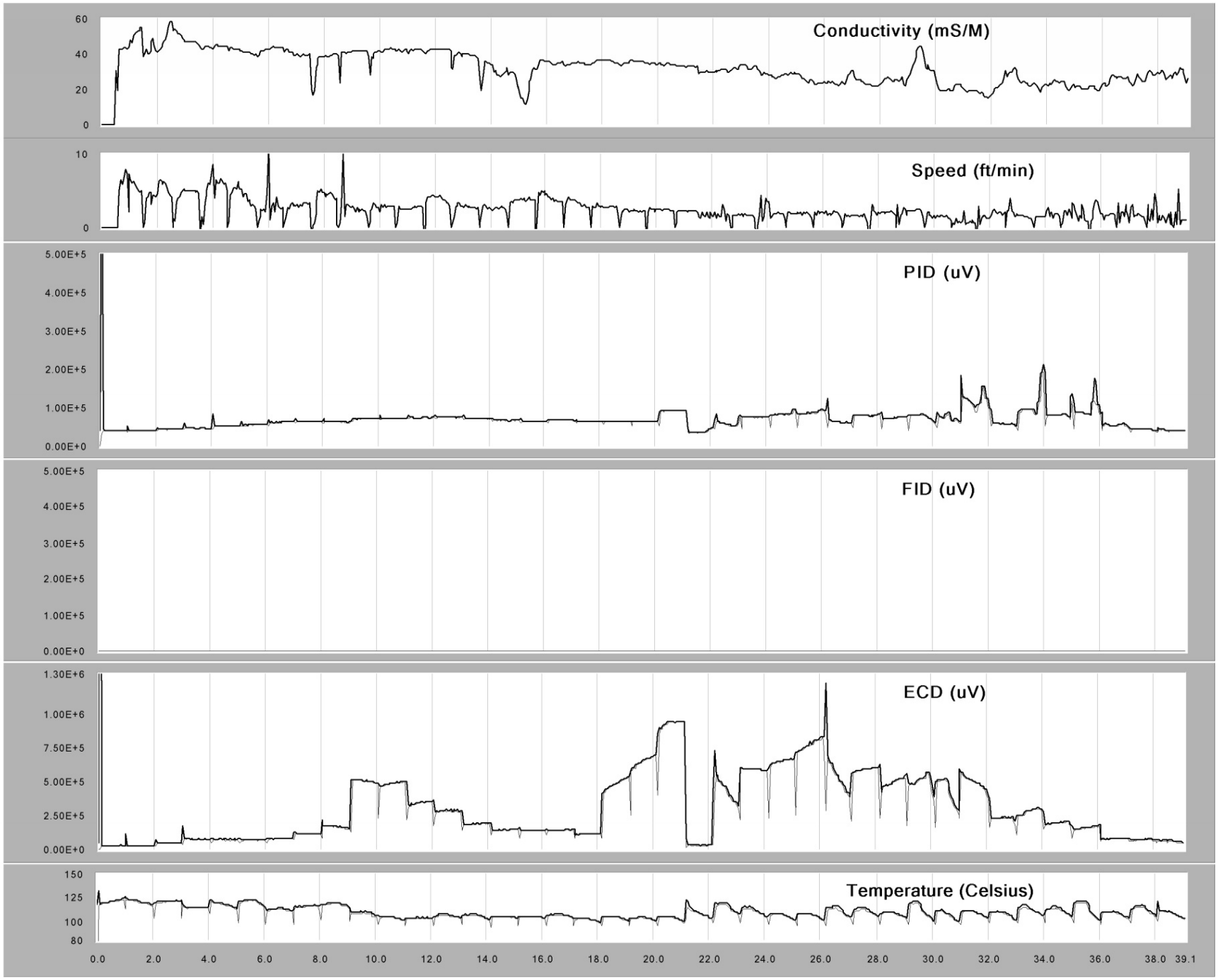
GP-102



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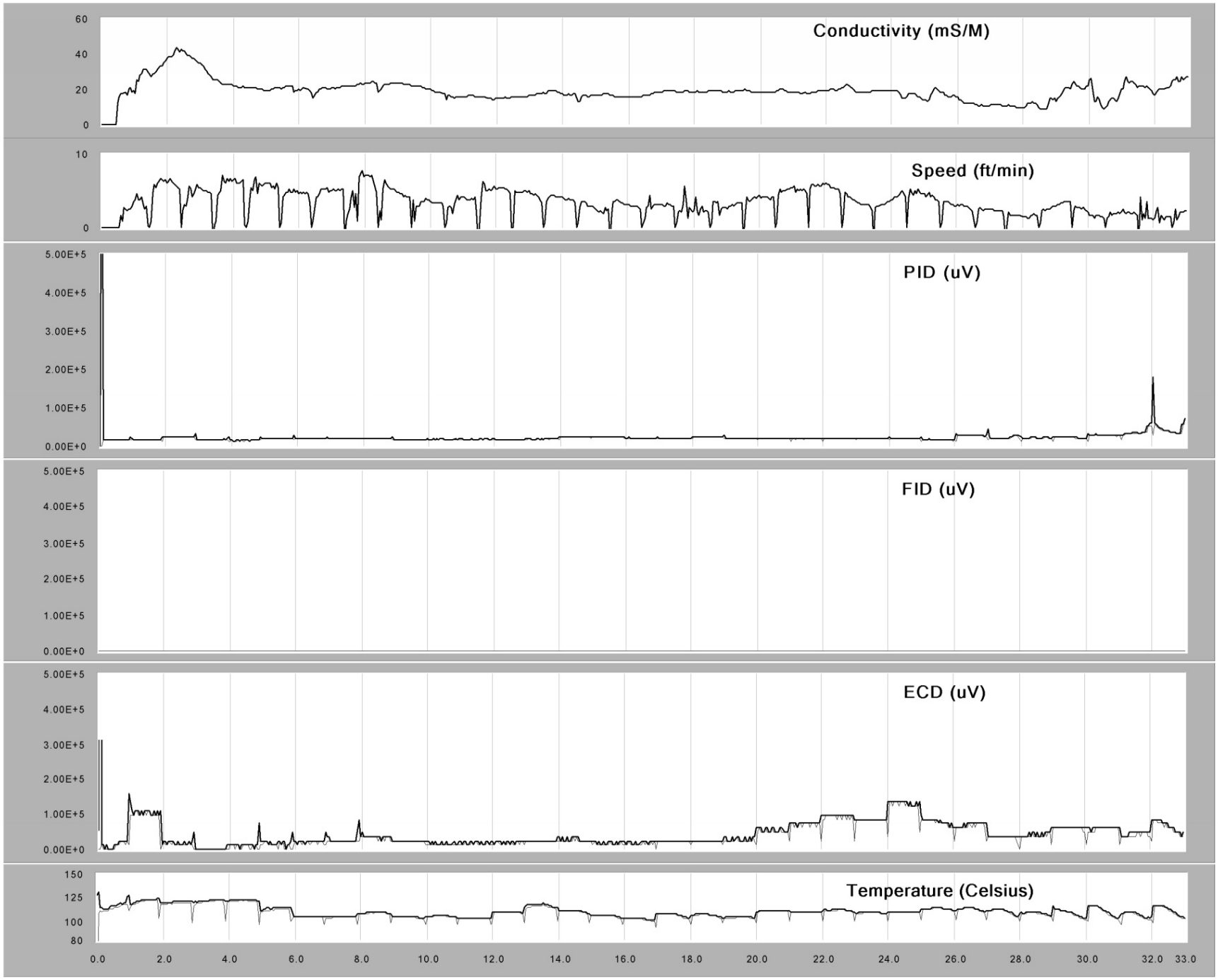
GP-103



CH2M Hill
NAB Little Creek, Site 11A
09/29/03

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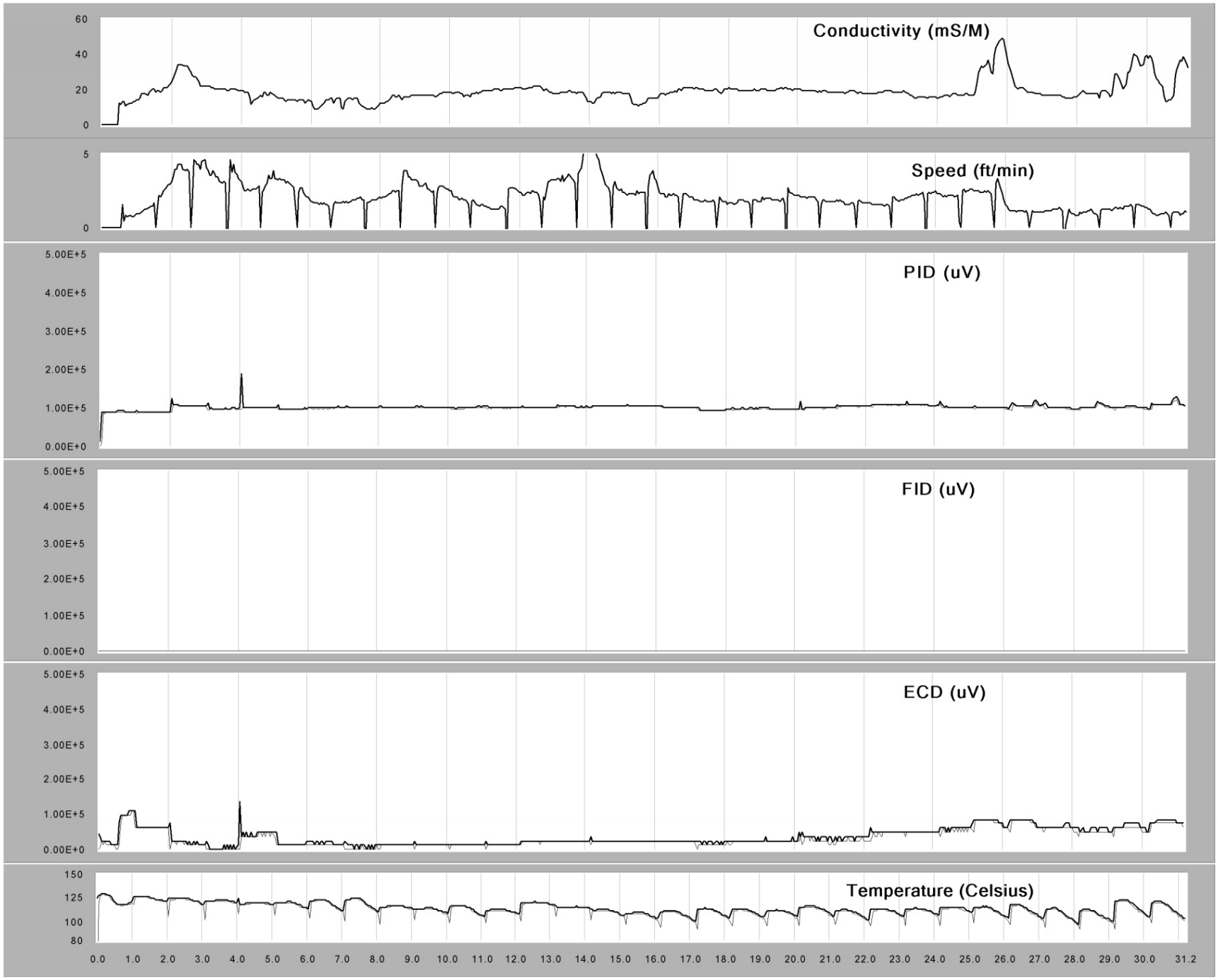
GP-104



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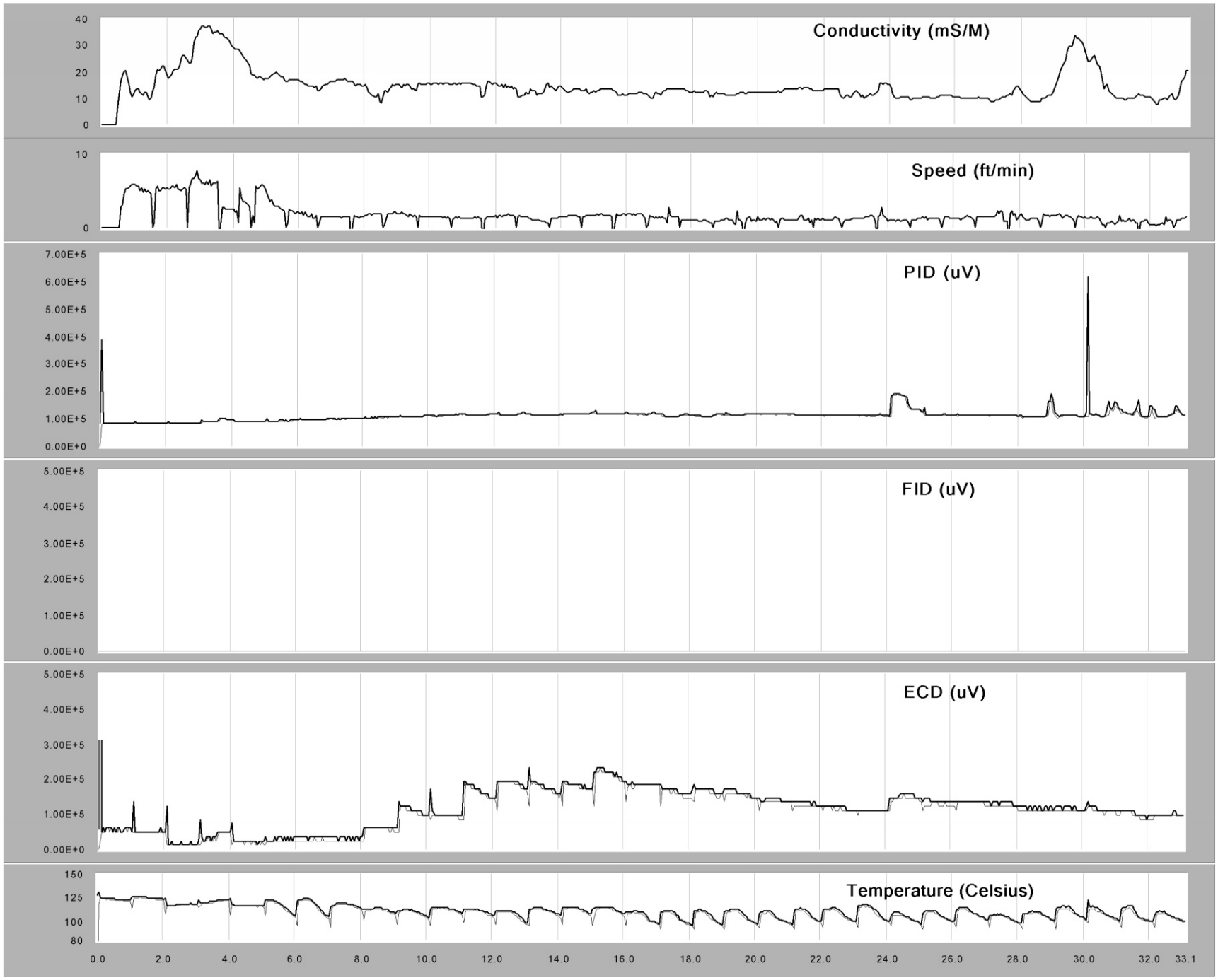
GP-105



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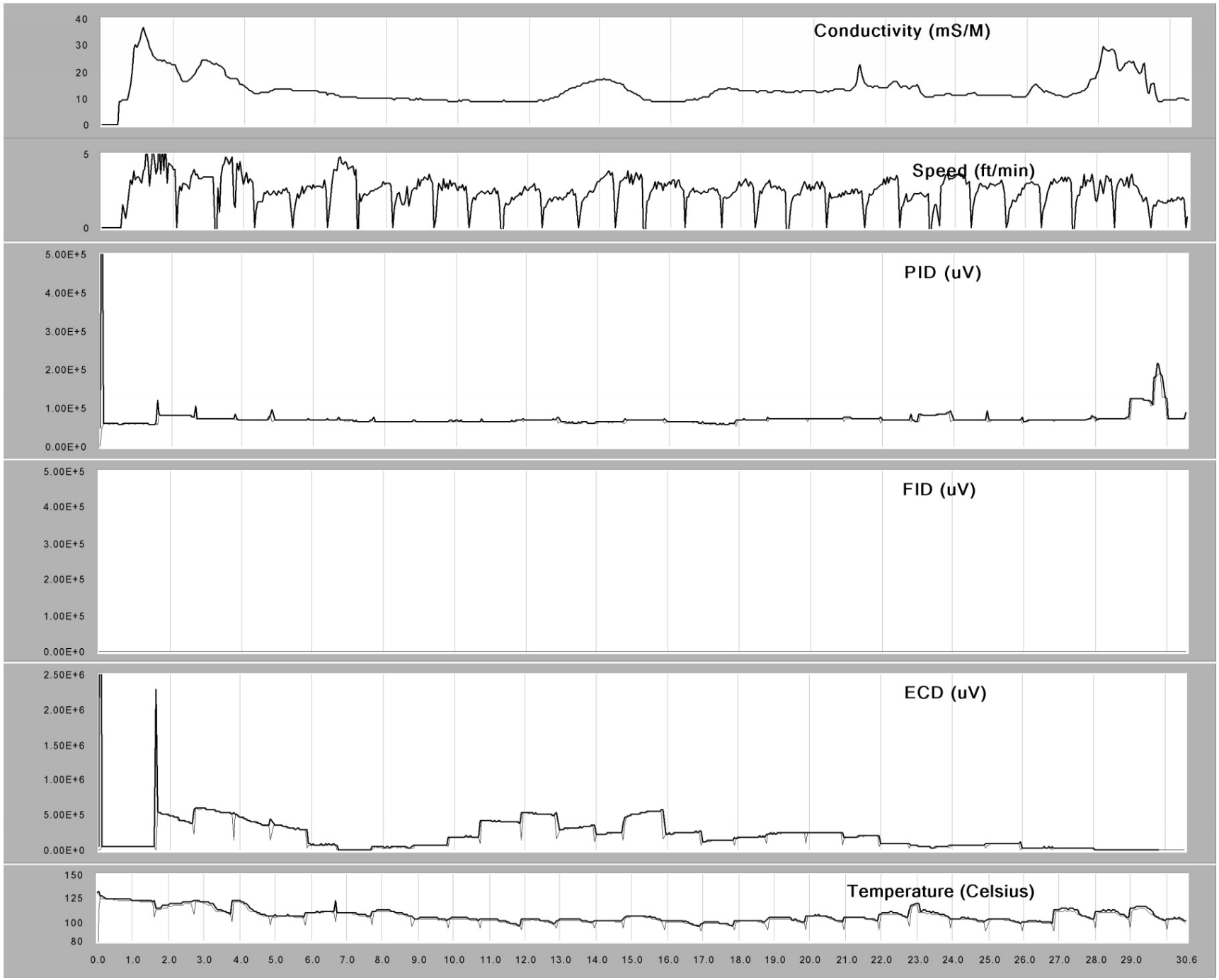
GP-106



CH2M Hill
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10/01/03

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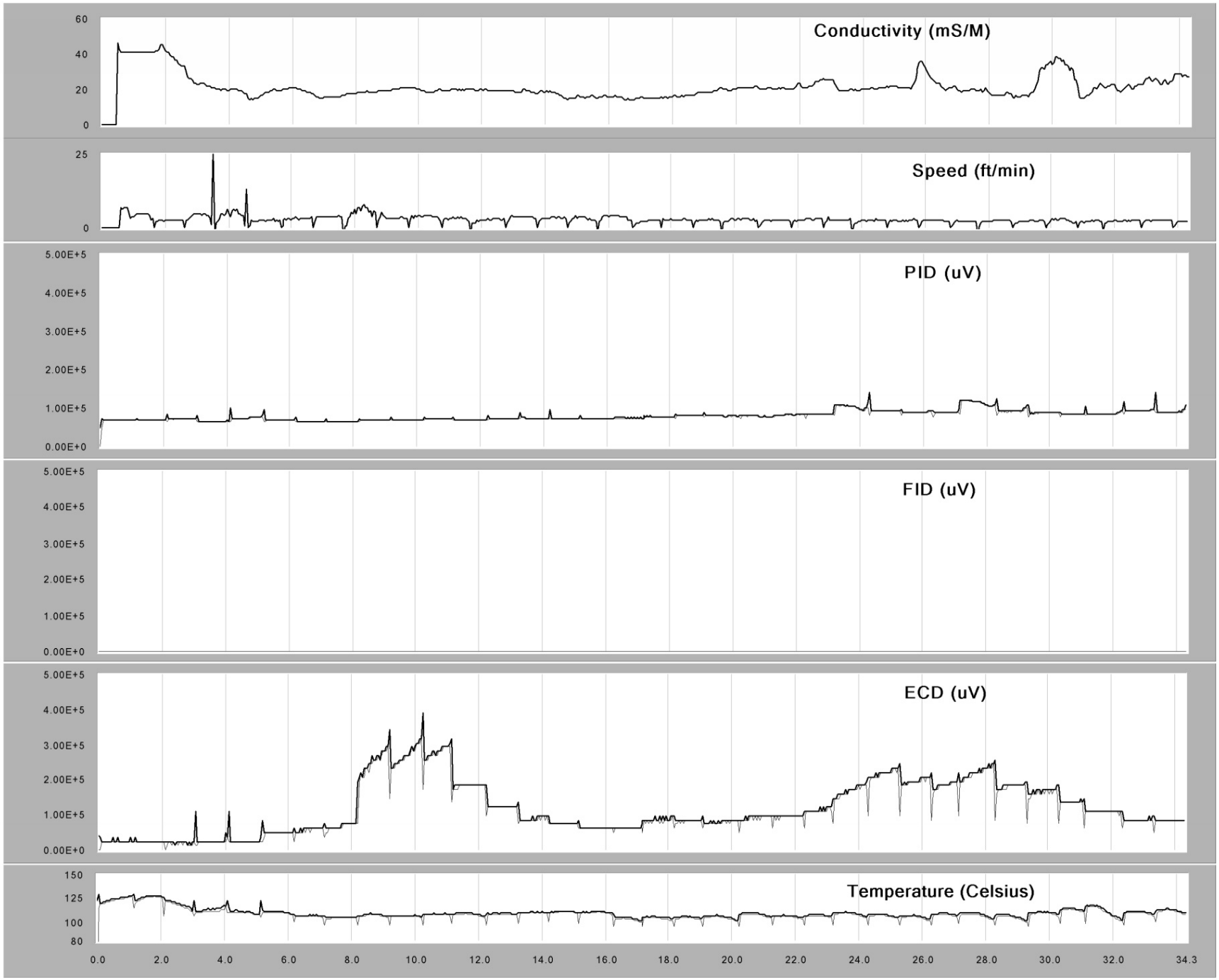
GP-107



CH2M Hill
NAB Little Creek, Site 11A
10/01/03

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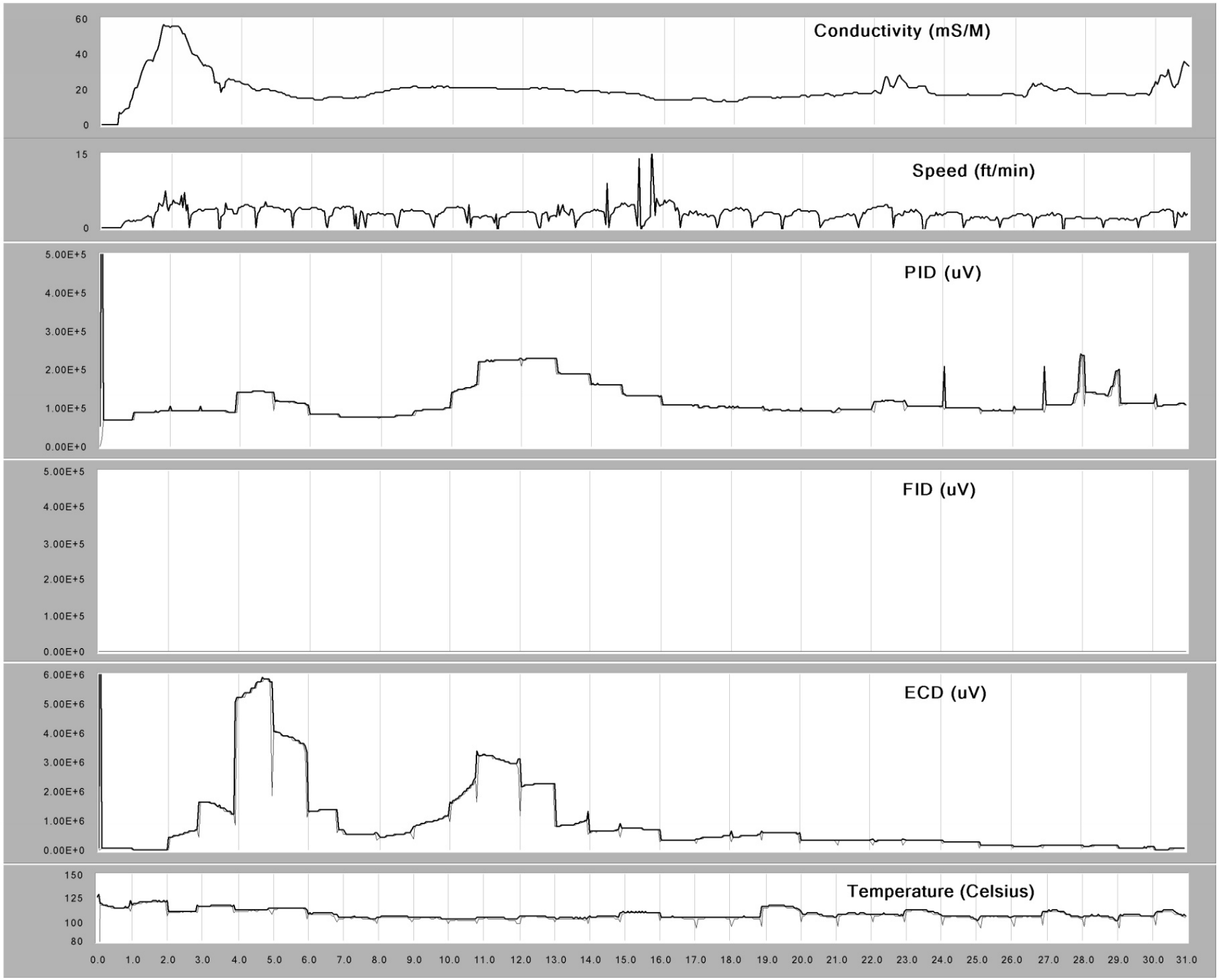
GP-108



CH2M Hill
NAB Little Creek, Site 11A
10/01/03

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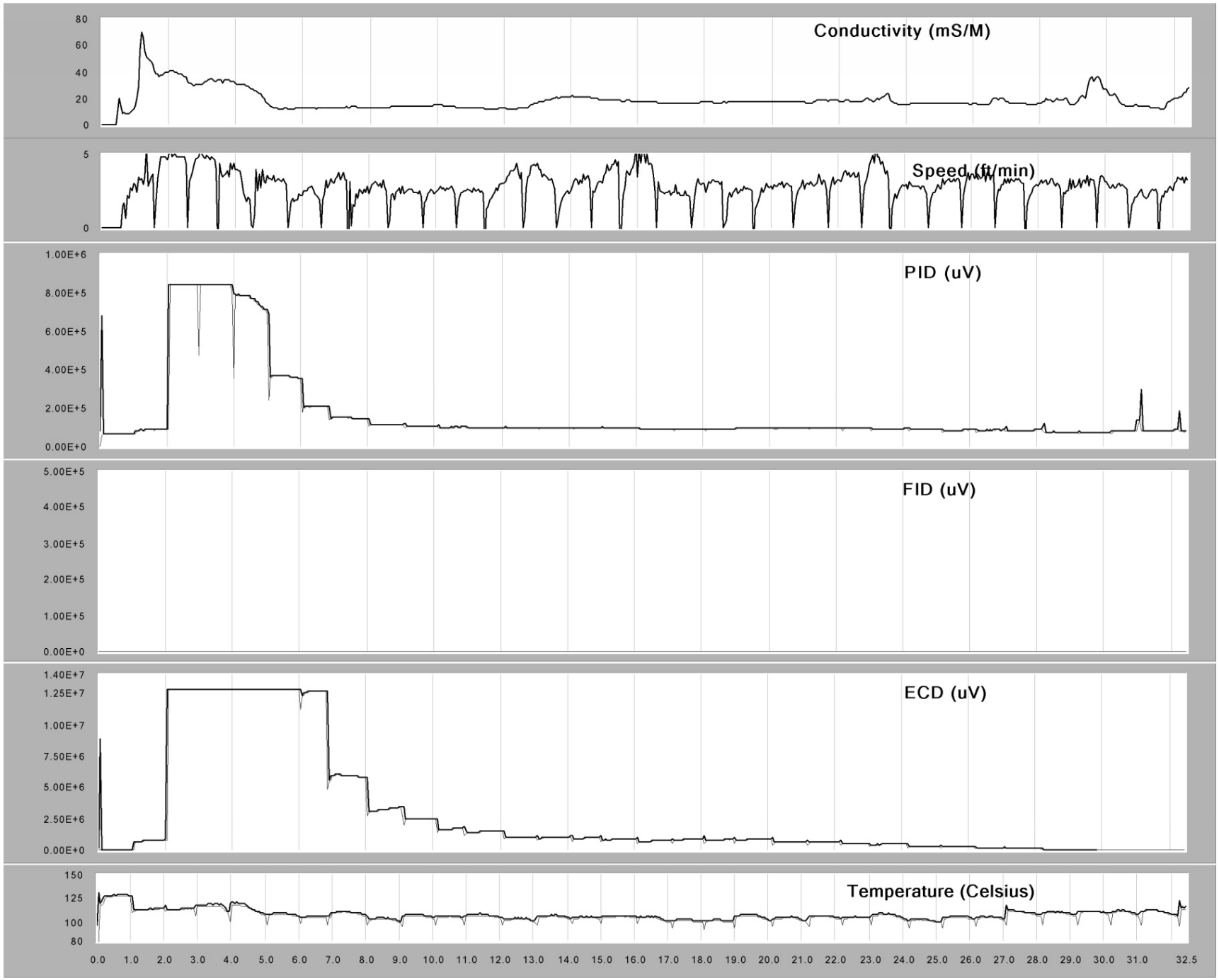

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10/01/03

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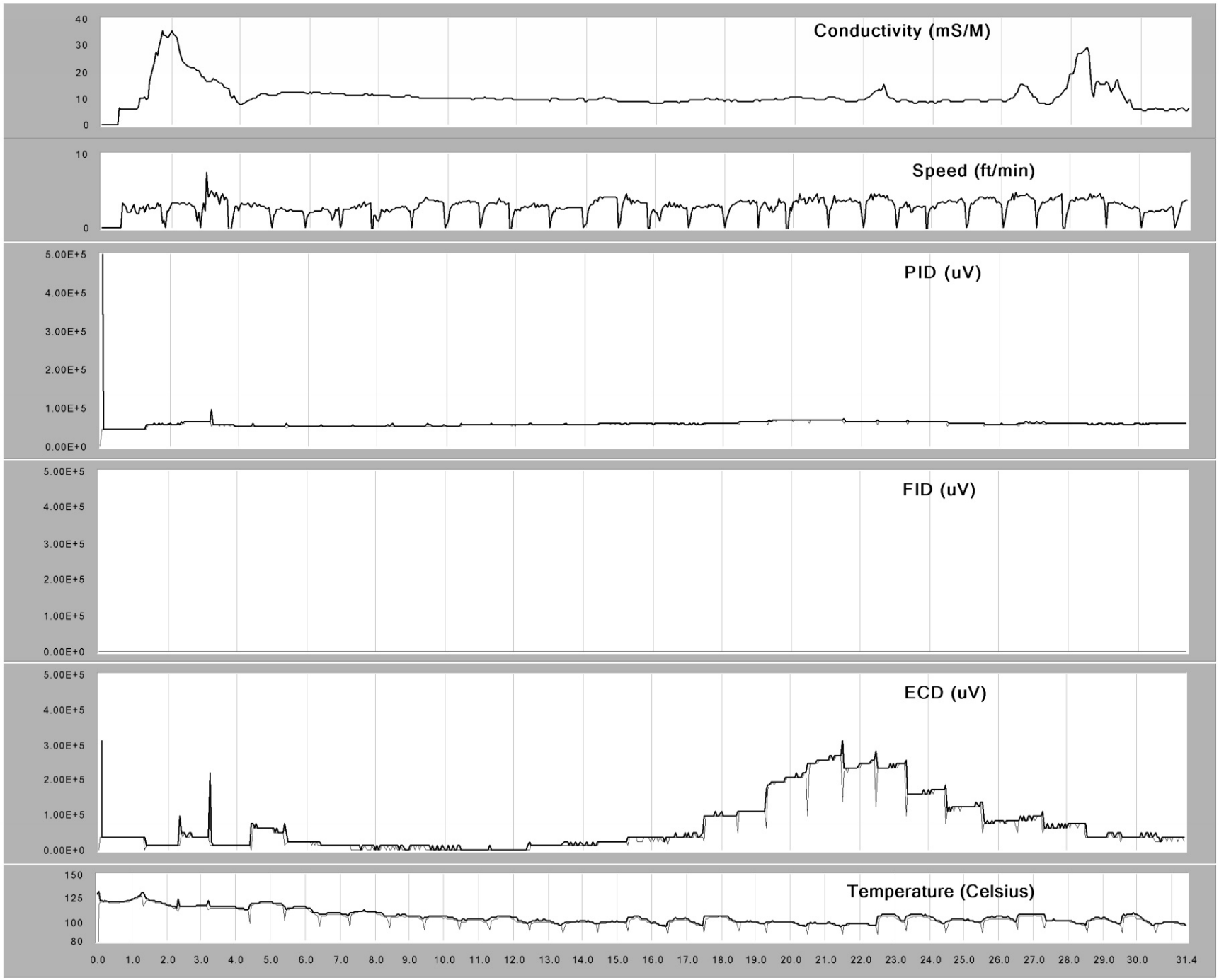

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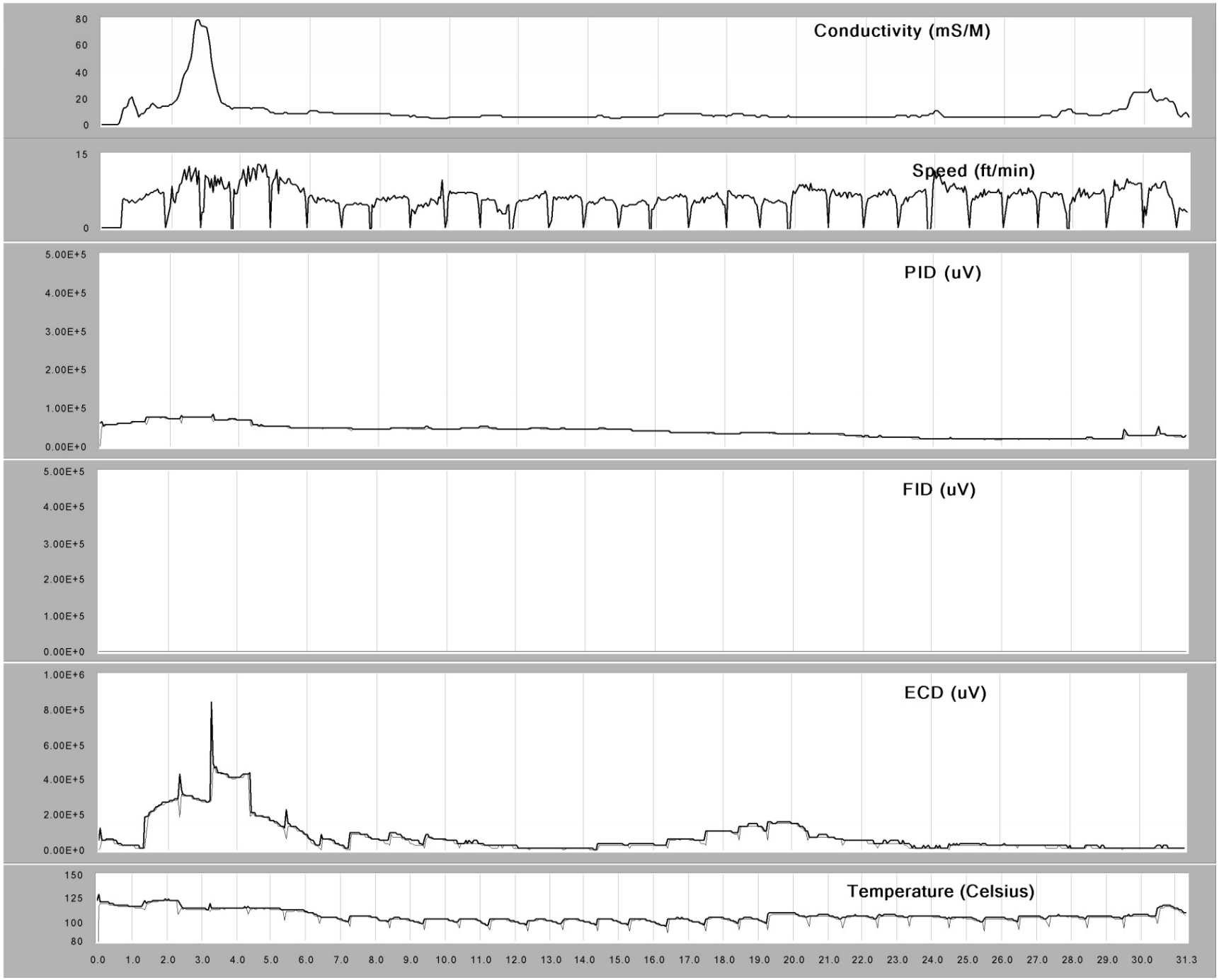
GP-111



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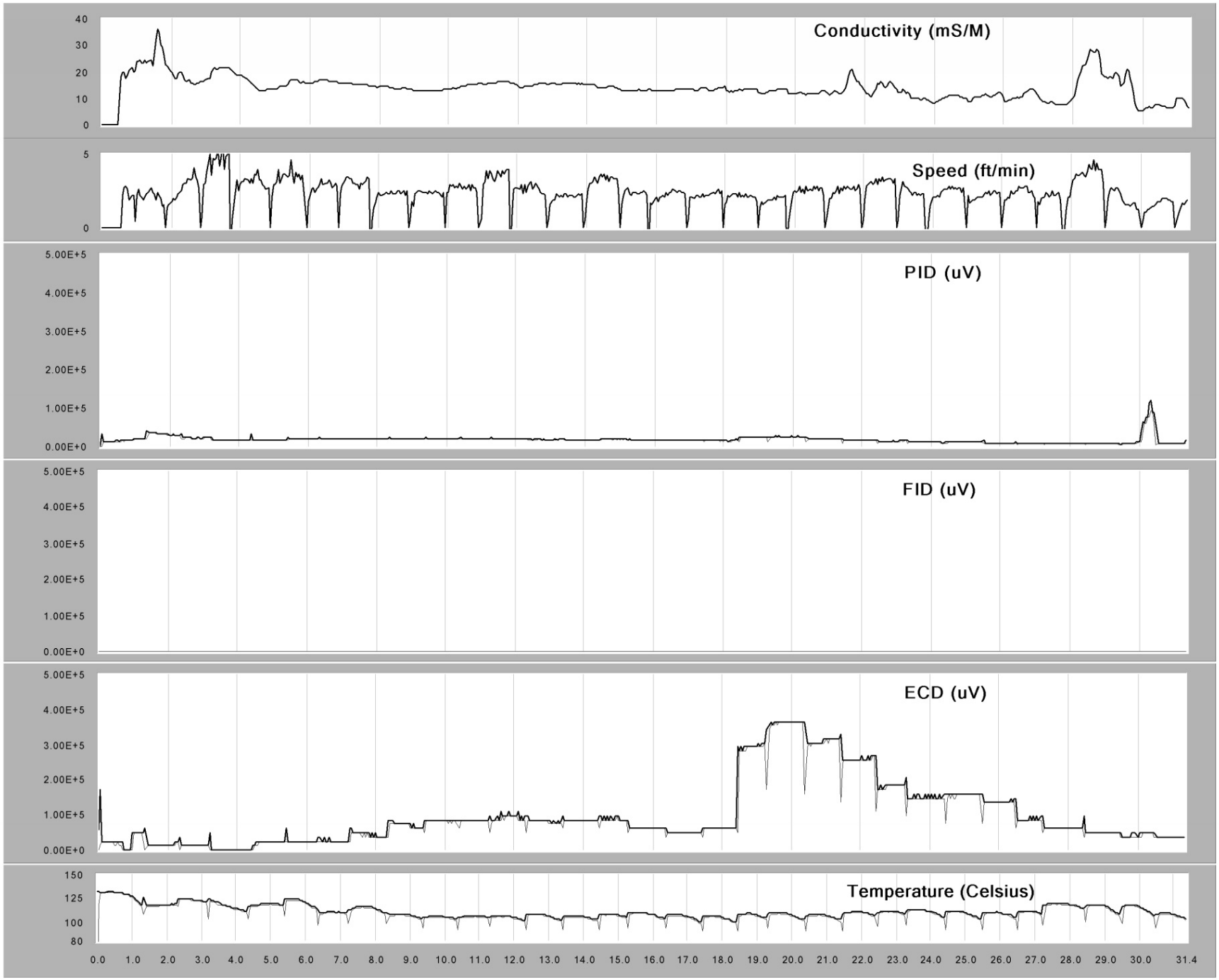

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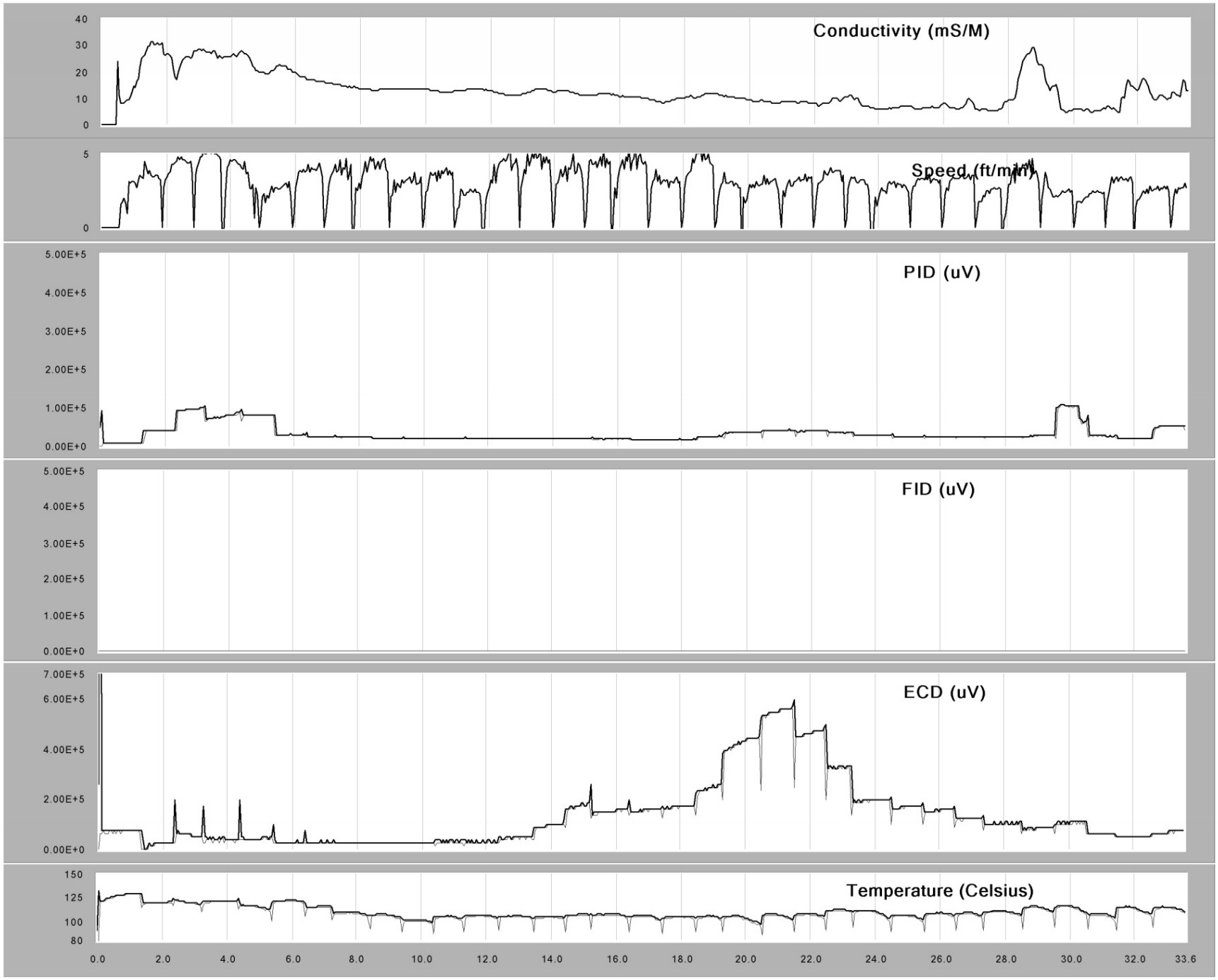

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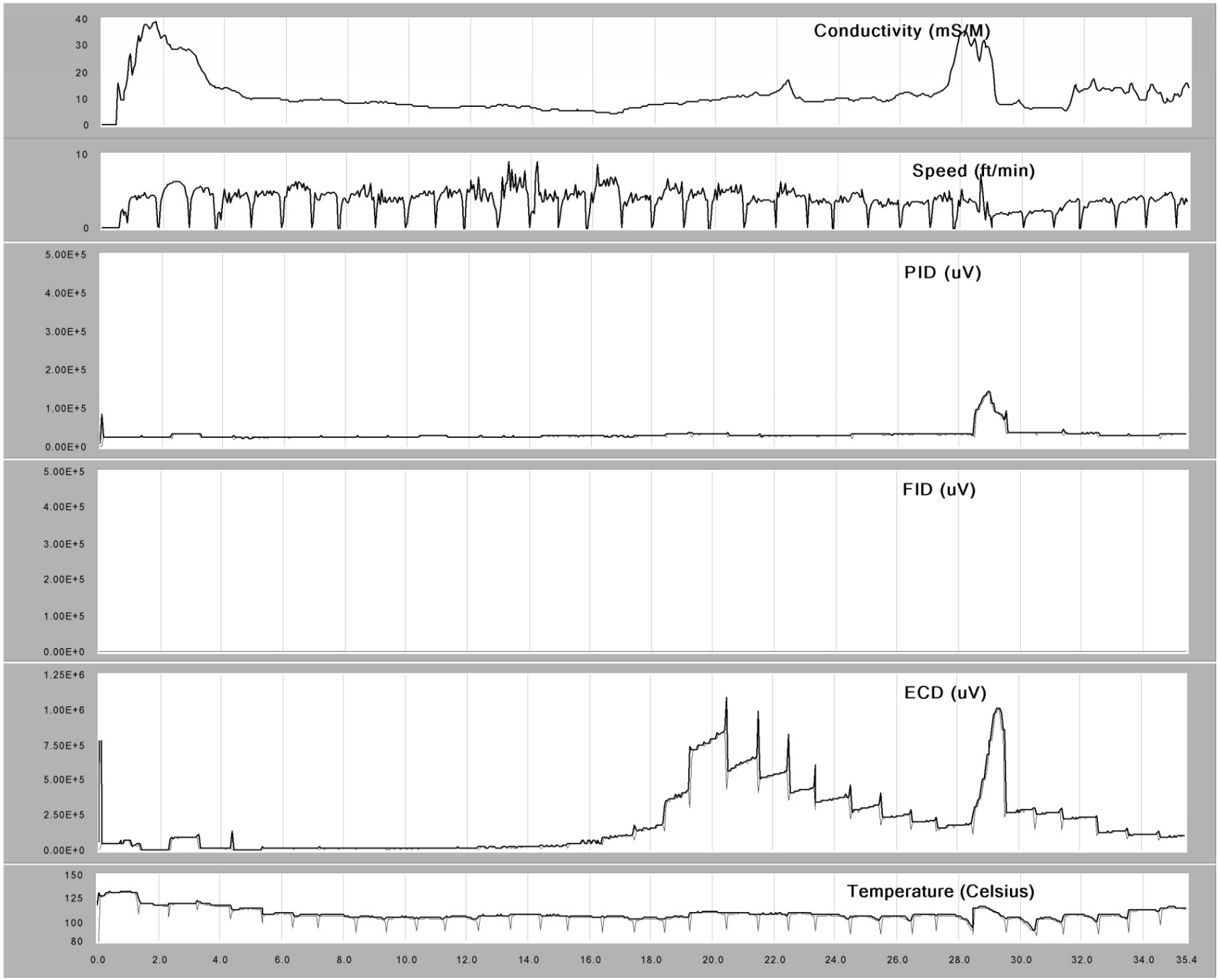

CH2M Hill
NAB Little Creek, Site 11A
10/02/03

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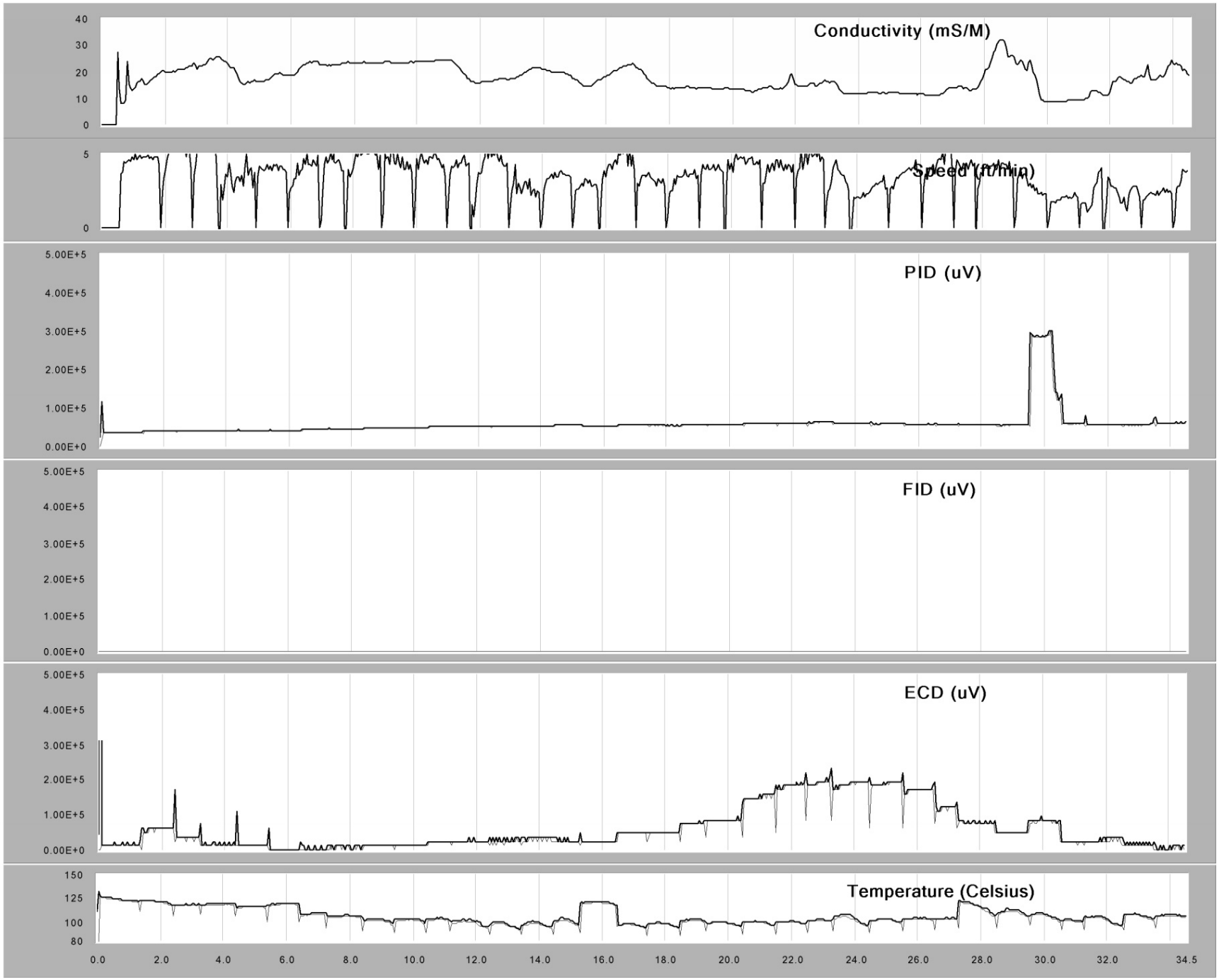
GP-115



CH2M Hill
NAB Little Creek, Site 11A
10/02/03

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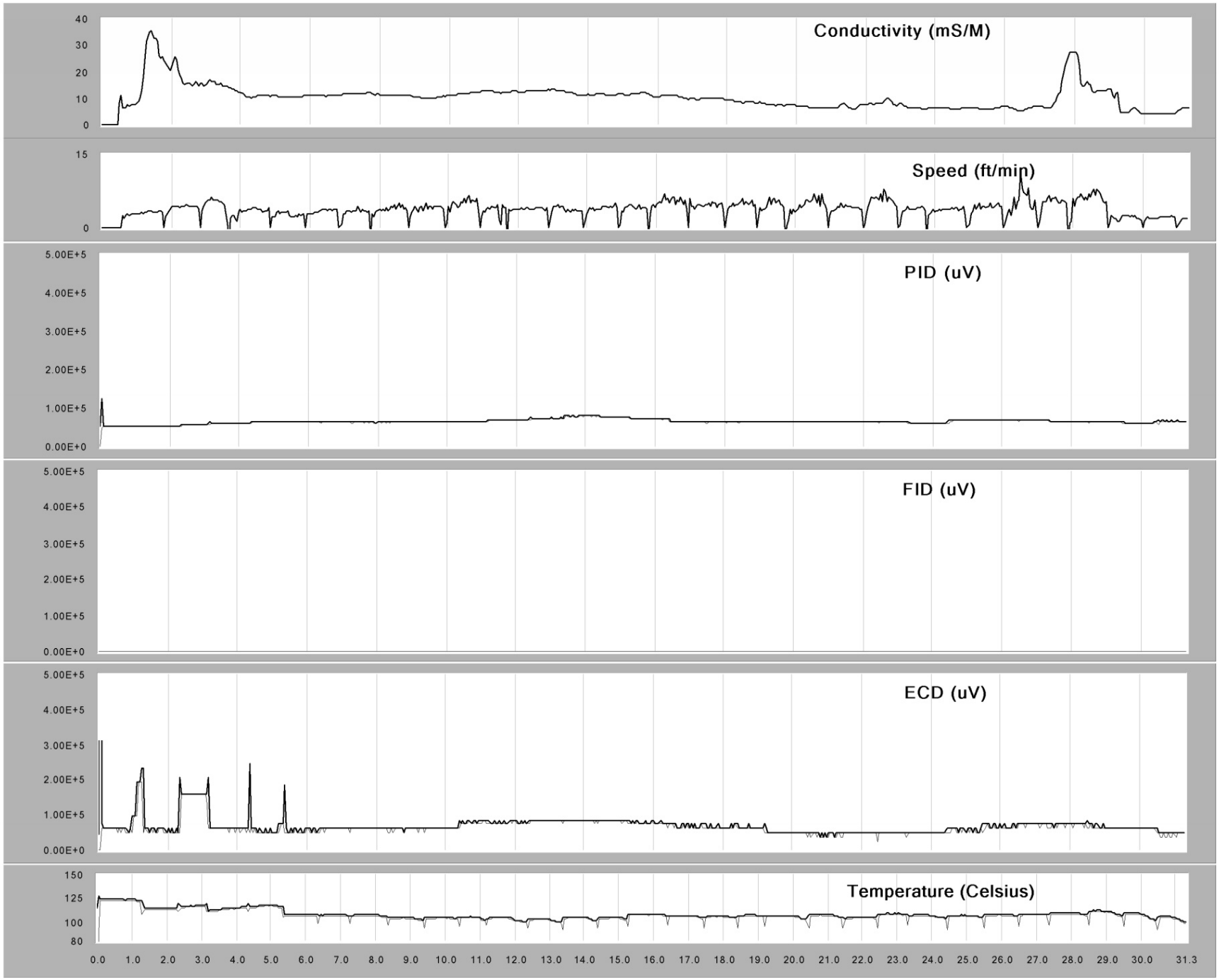
GP-116



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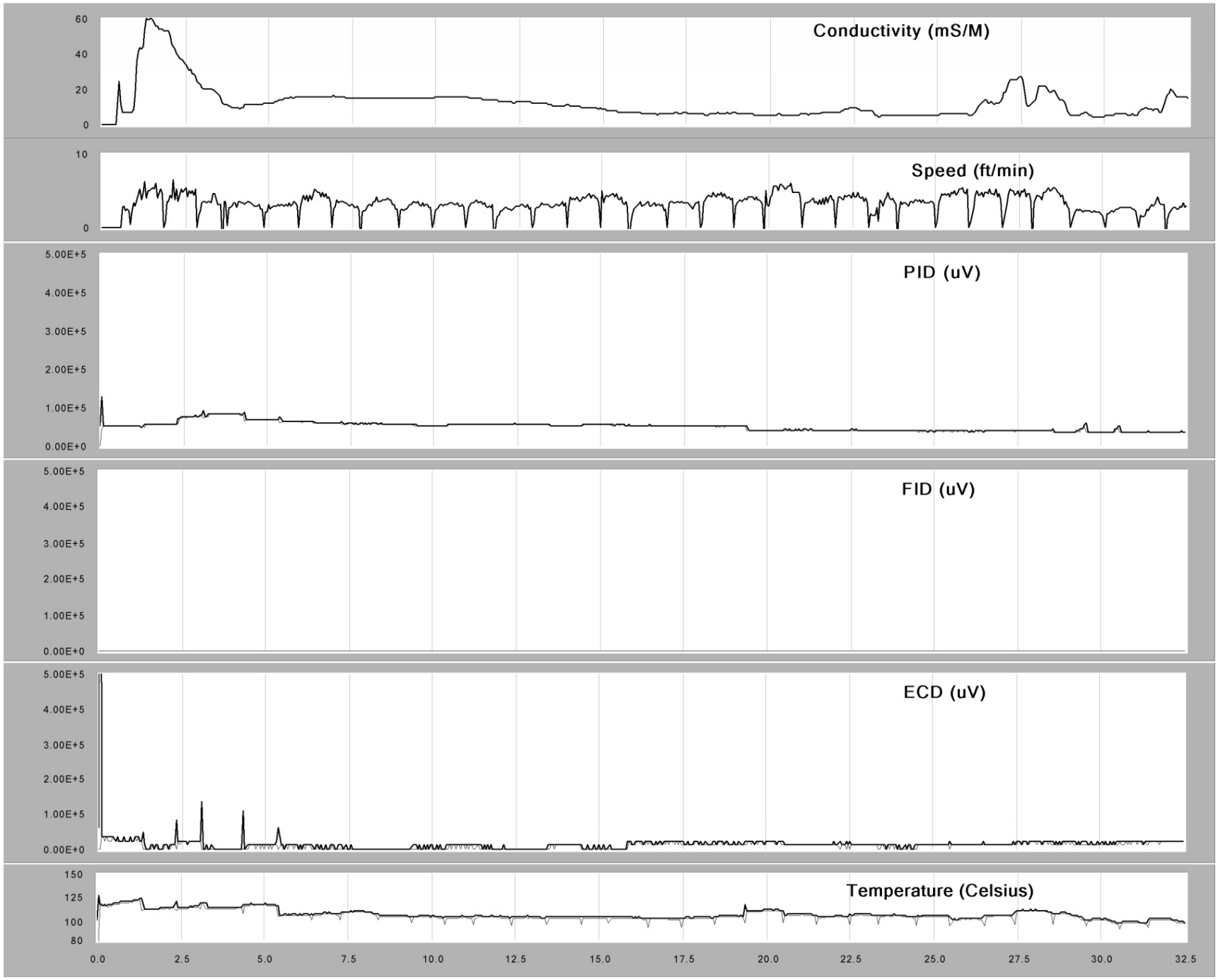

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10/02/03

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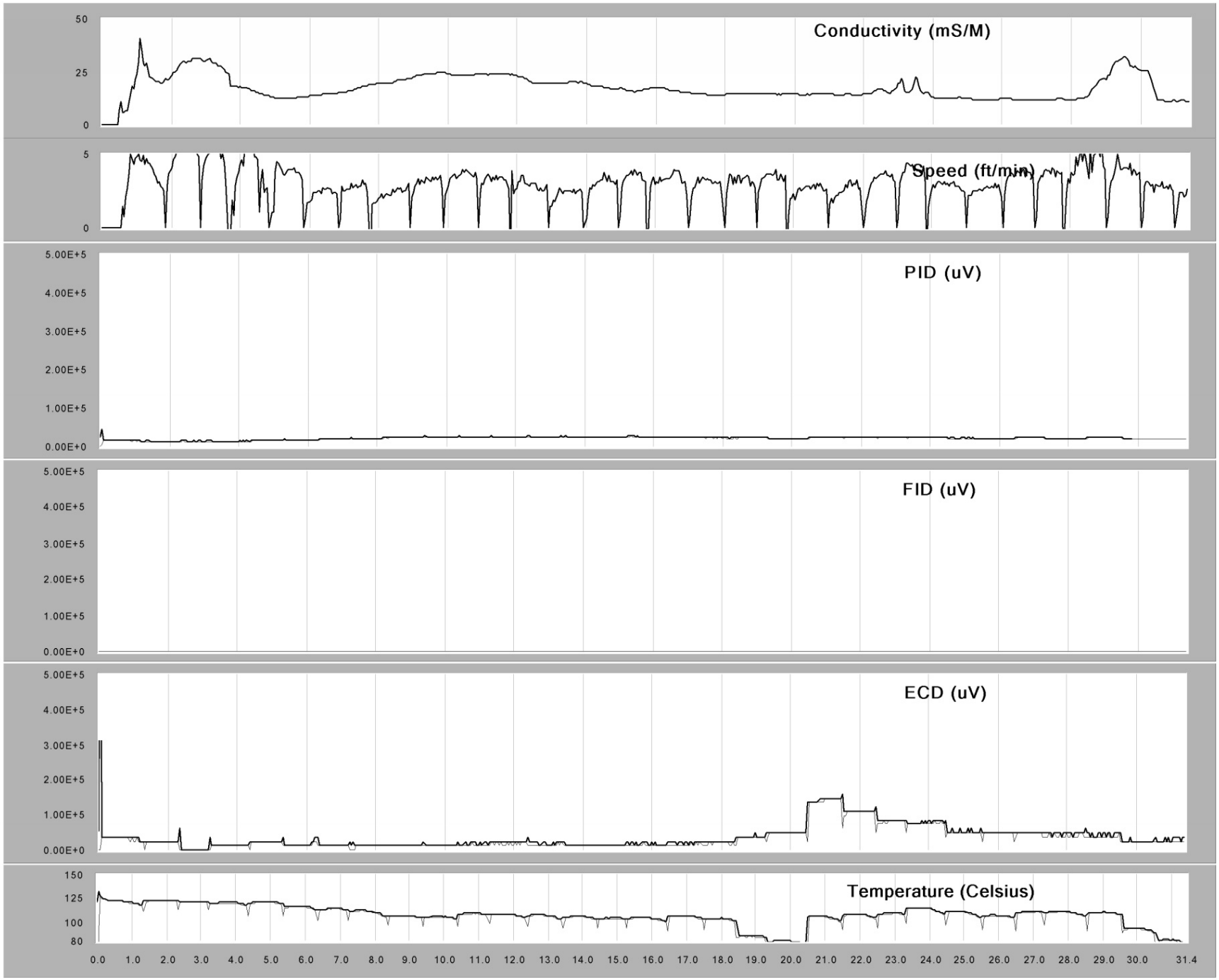

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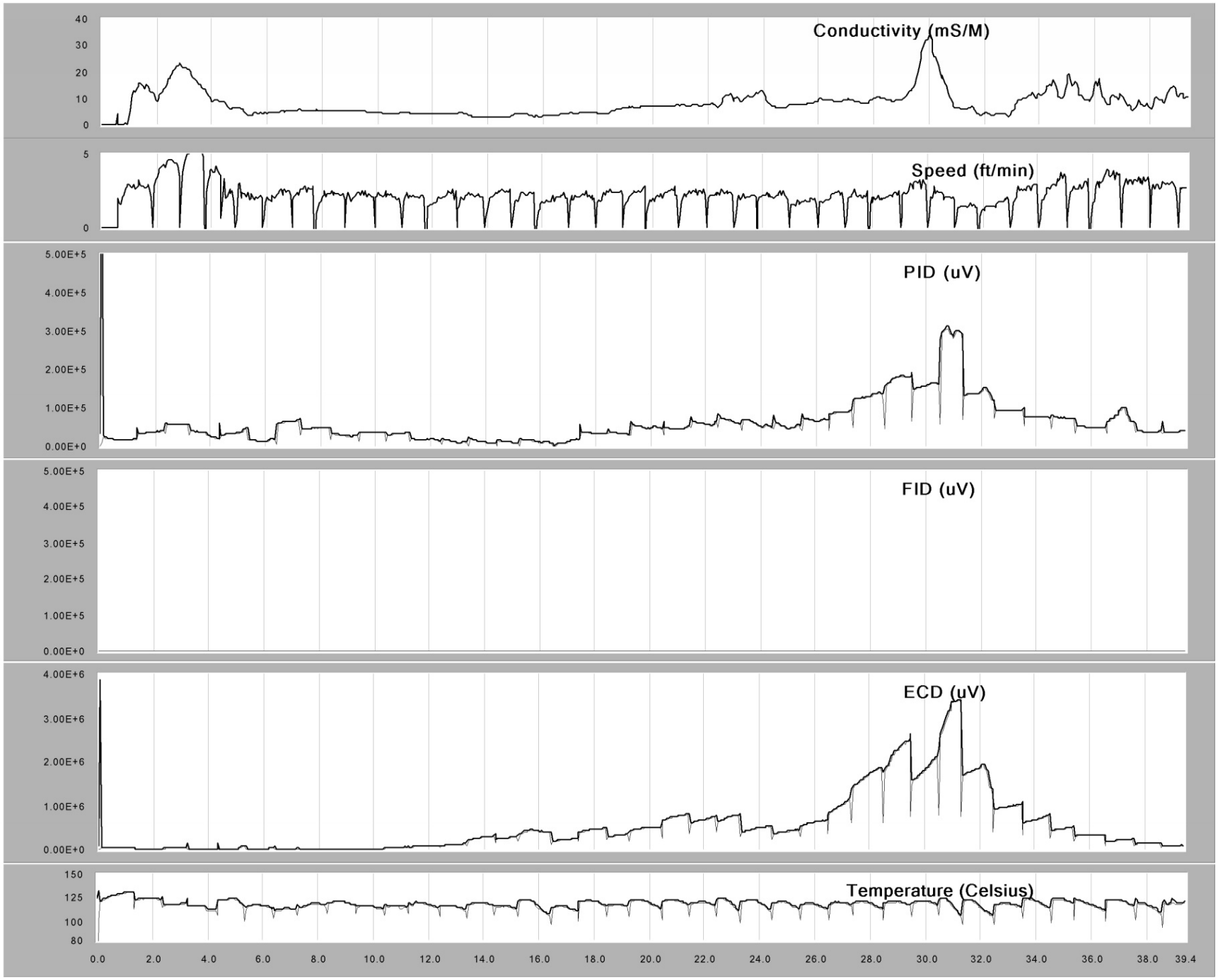

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10/03/03

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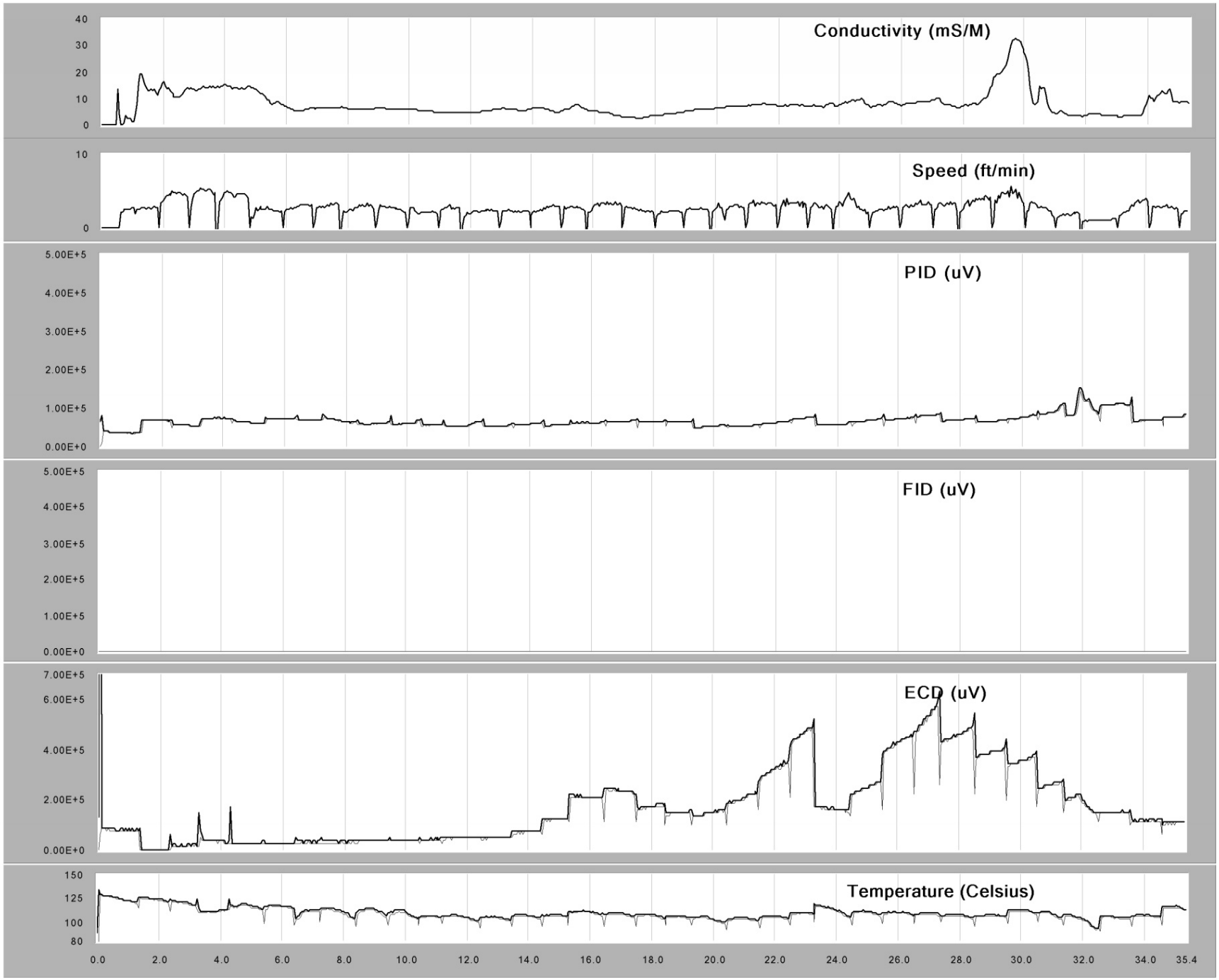

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10/03/03

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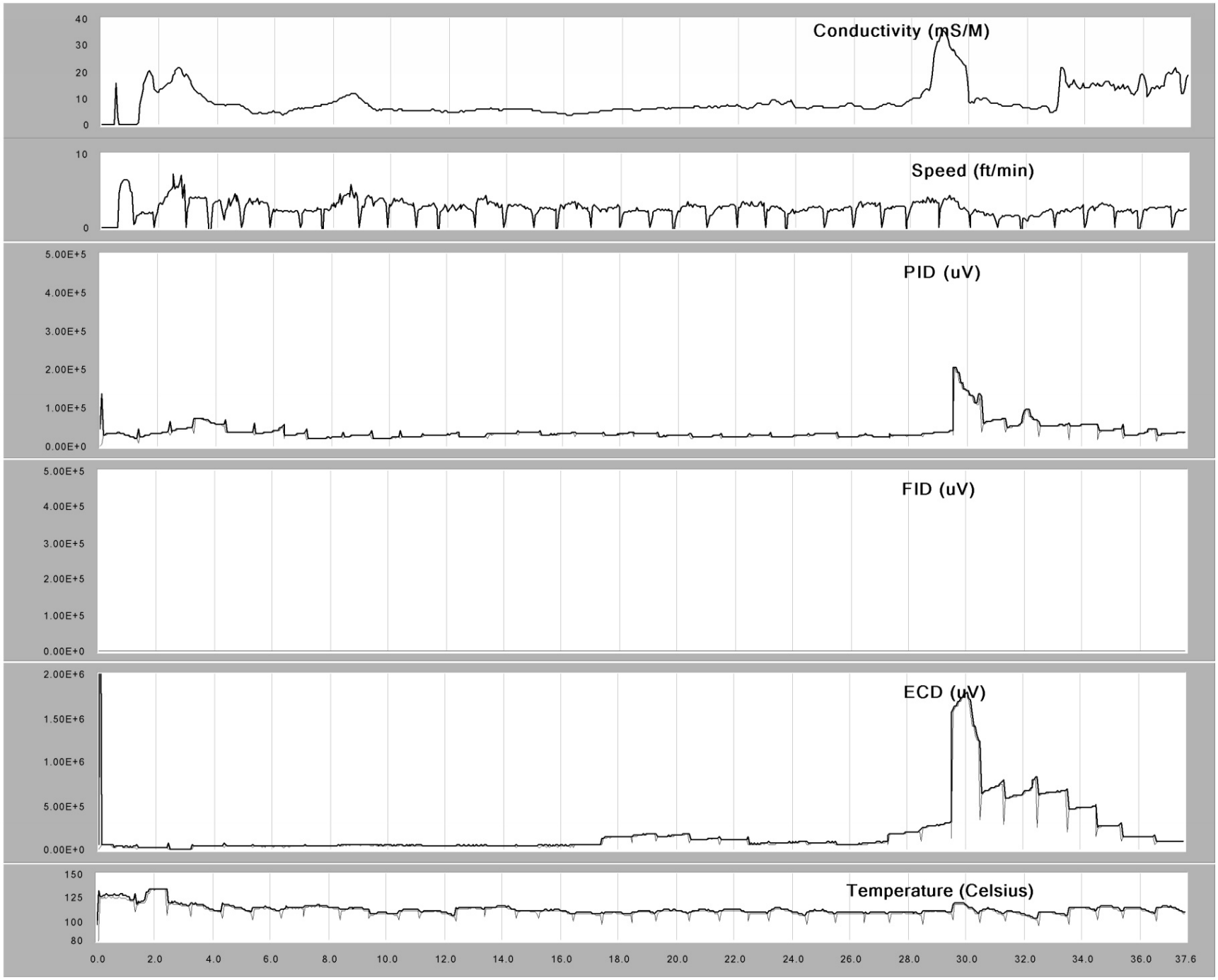

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10/03/03

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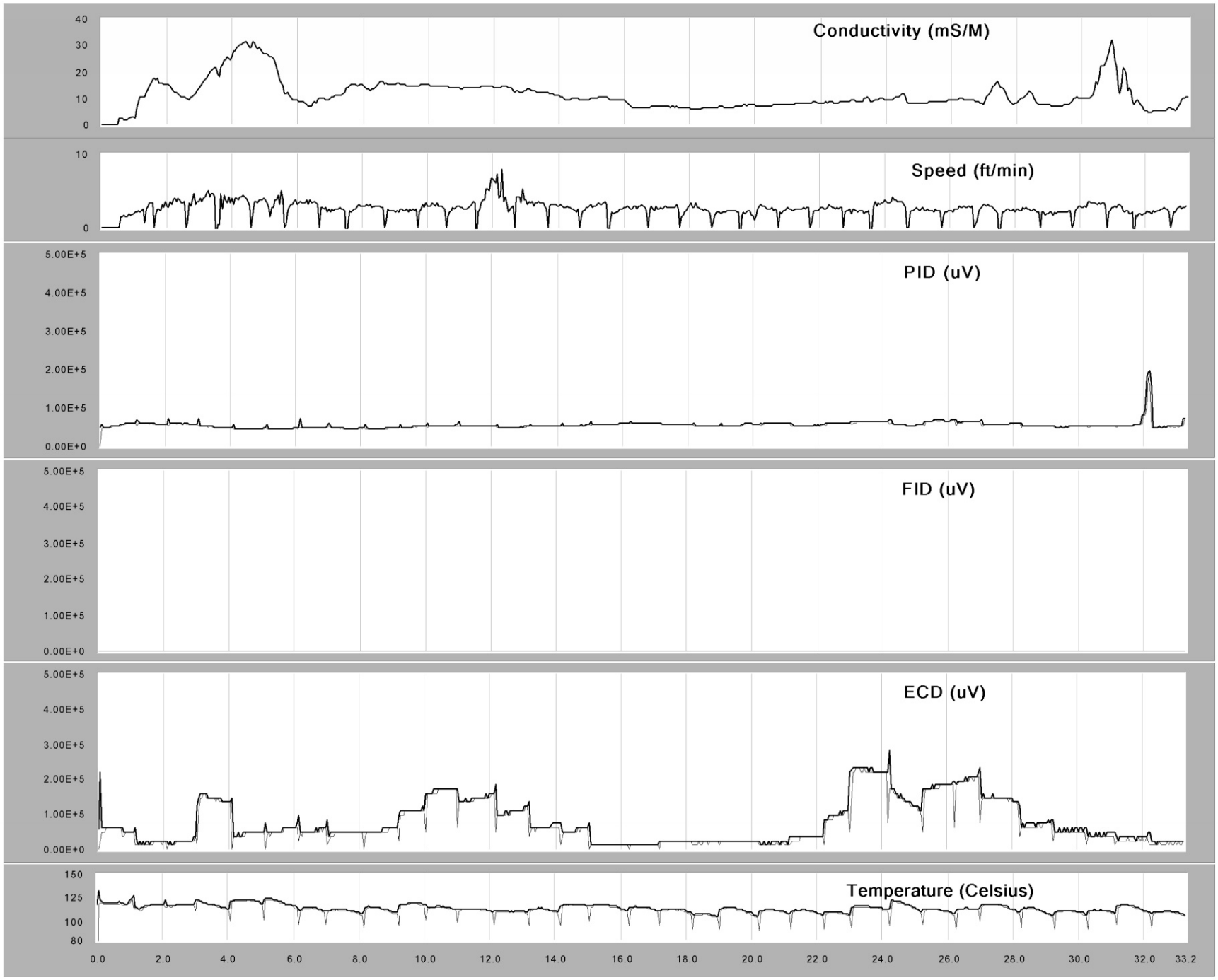

CH2M Hill
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10/03/03

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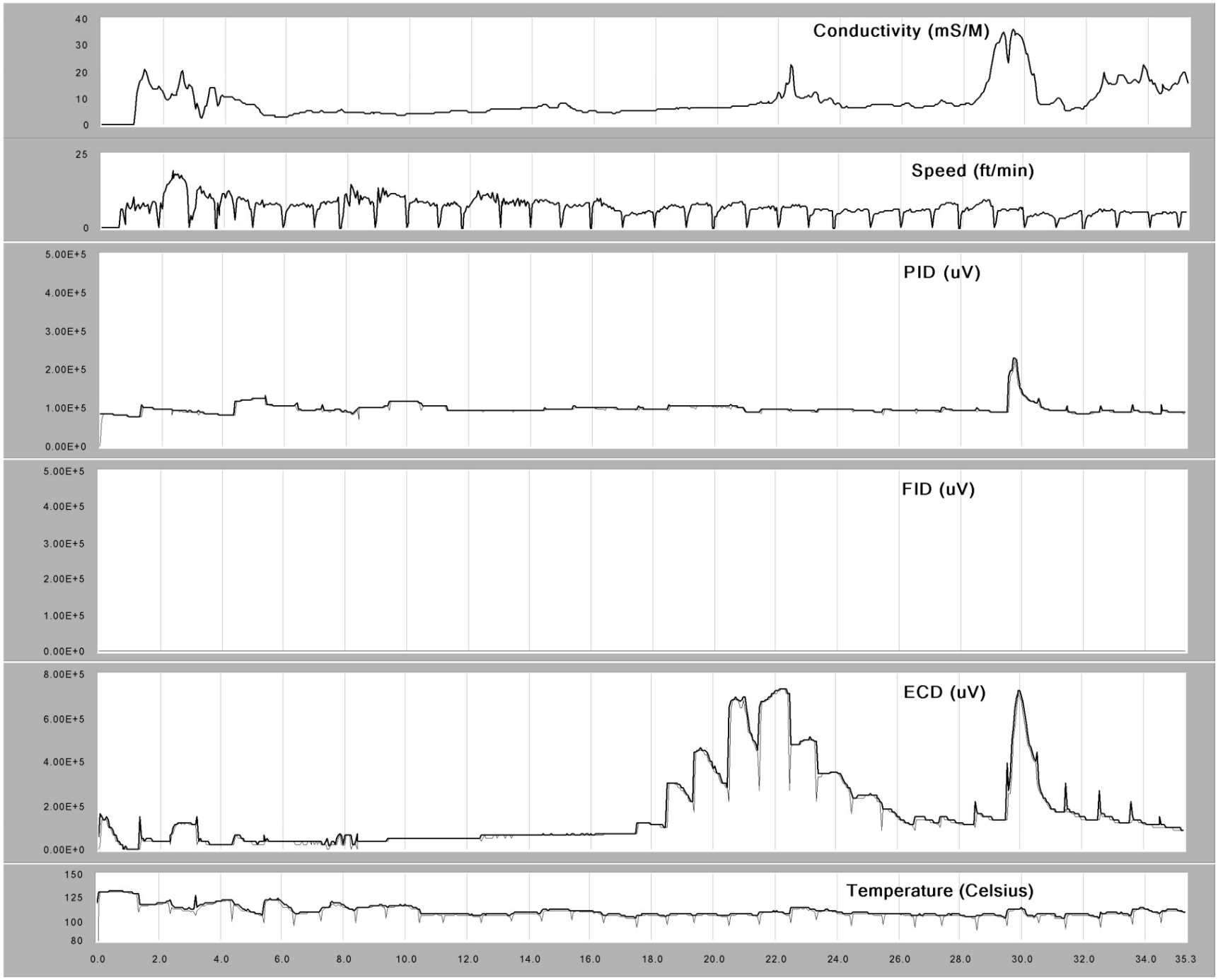

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10/06/03

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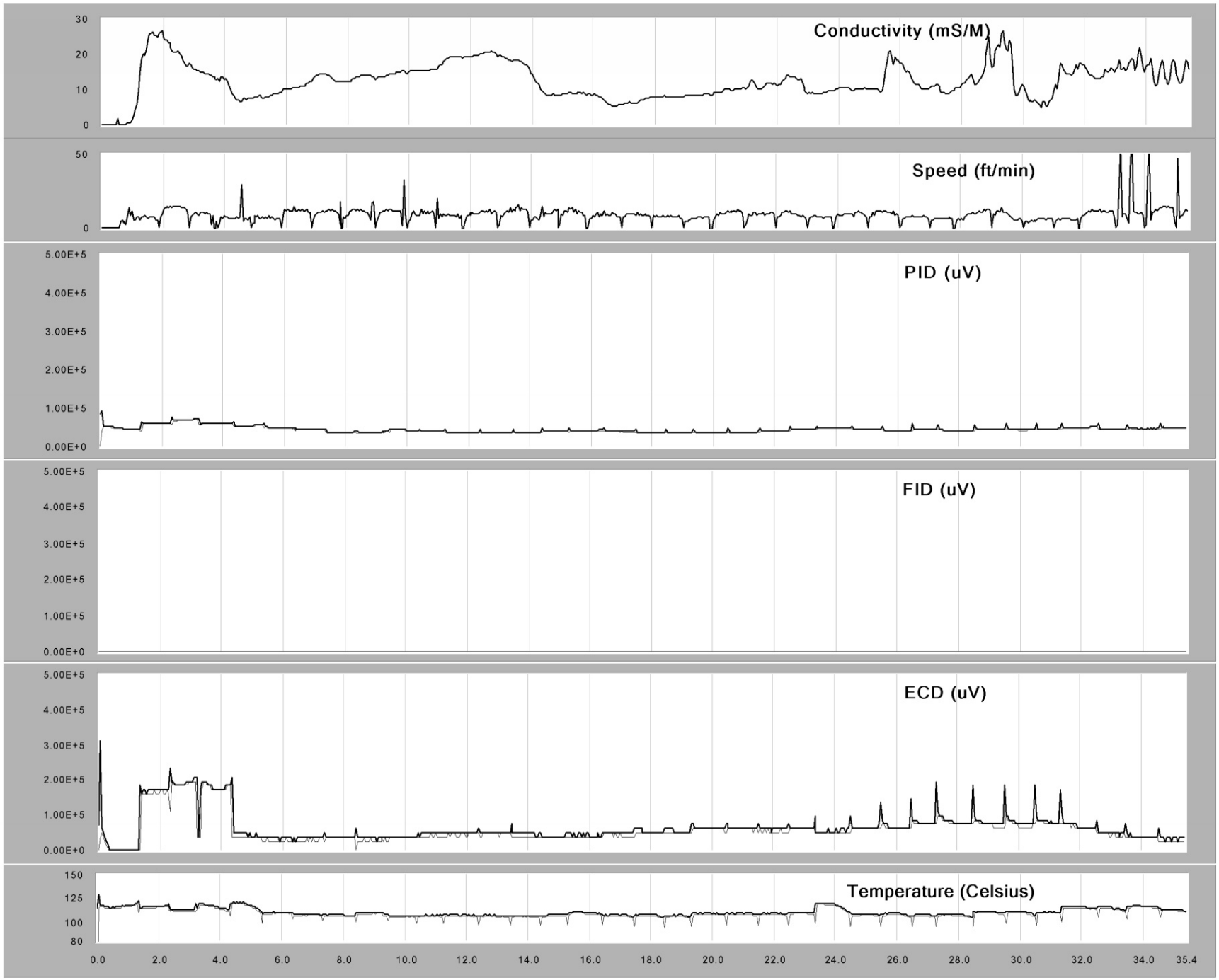

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10/06/03

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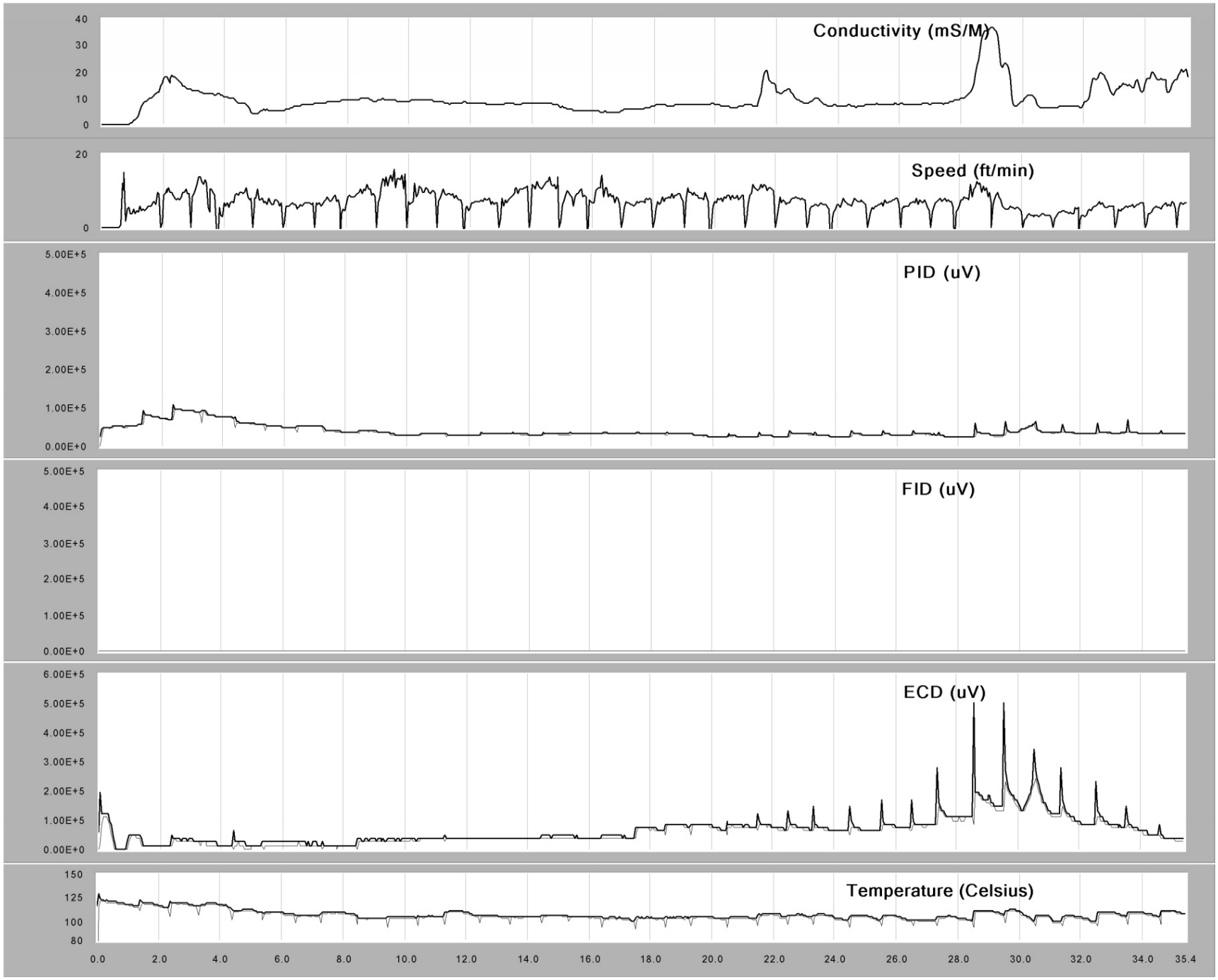

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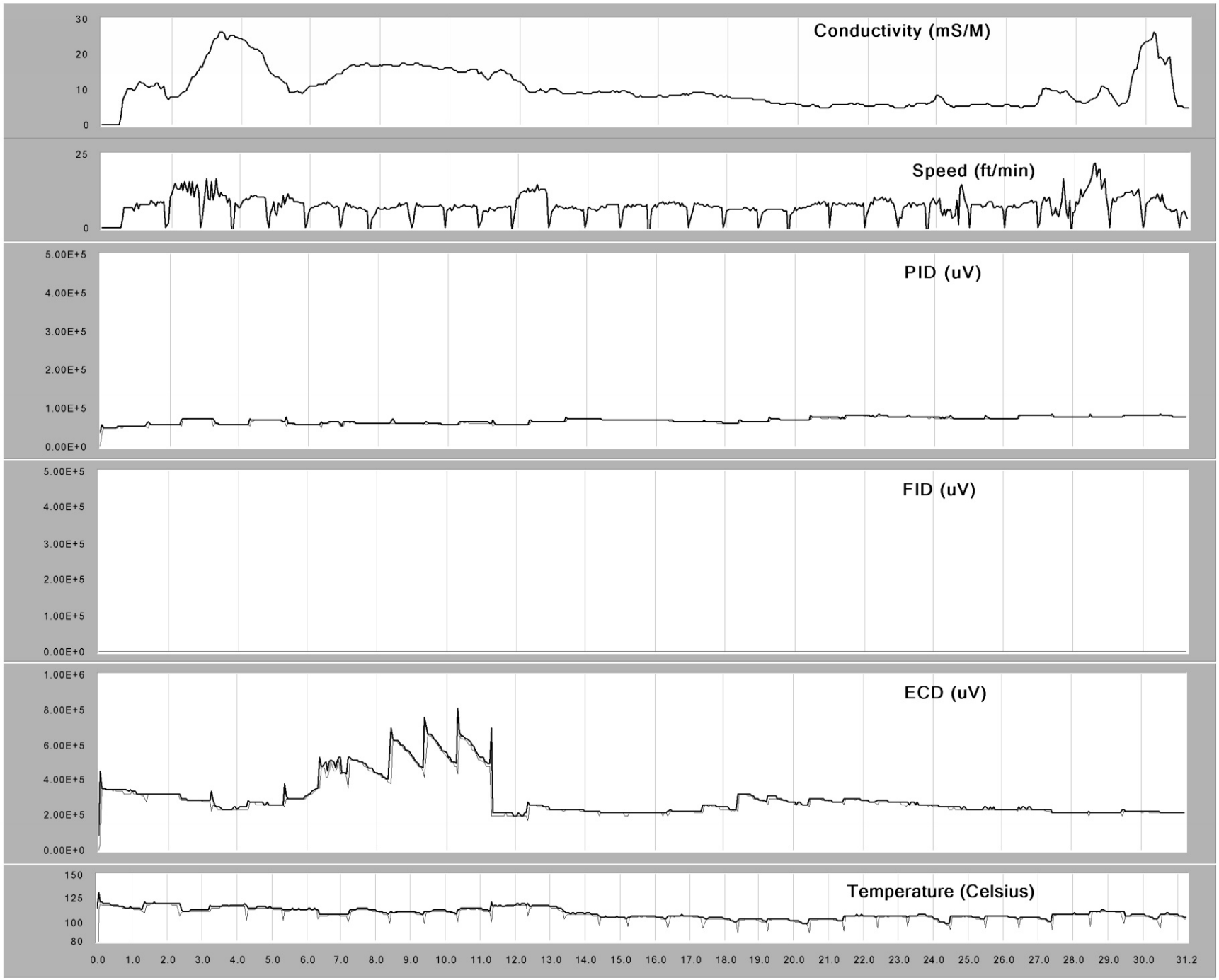

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10/06/03

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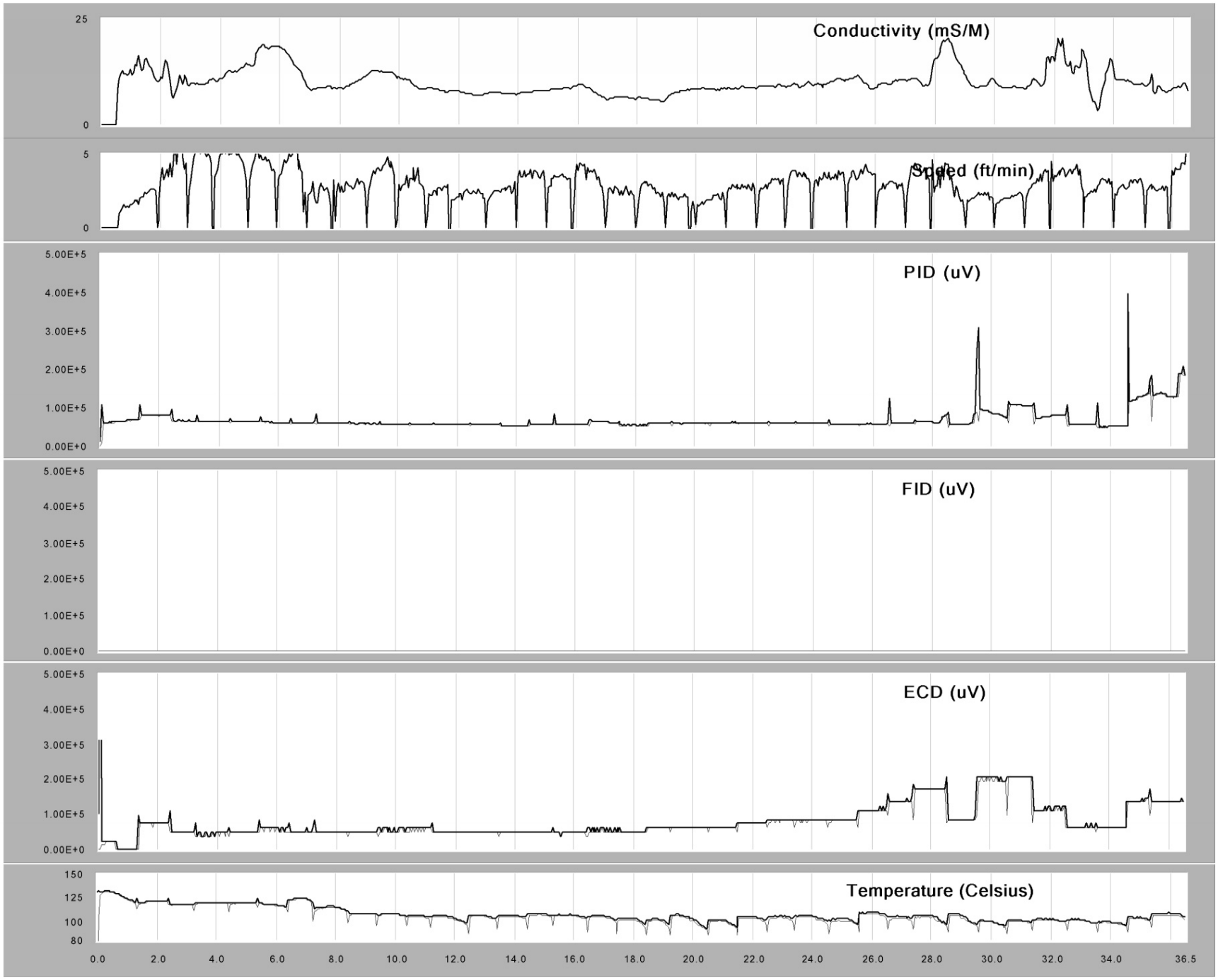
GP-127



CH2M Hill
NAB Little Creek, Site 11A
10/07/03

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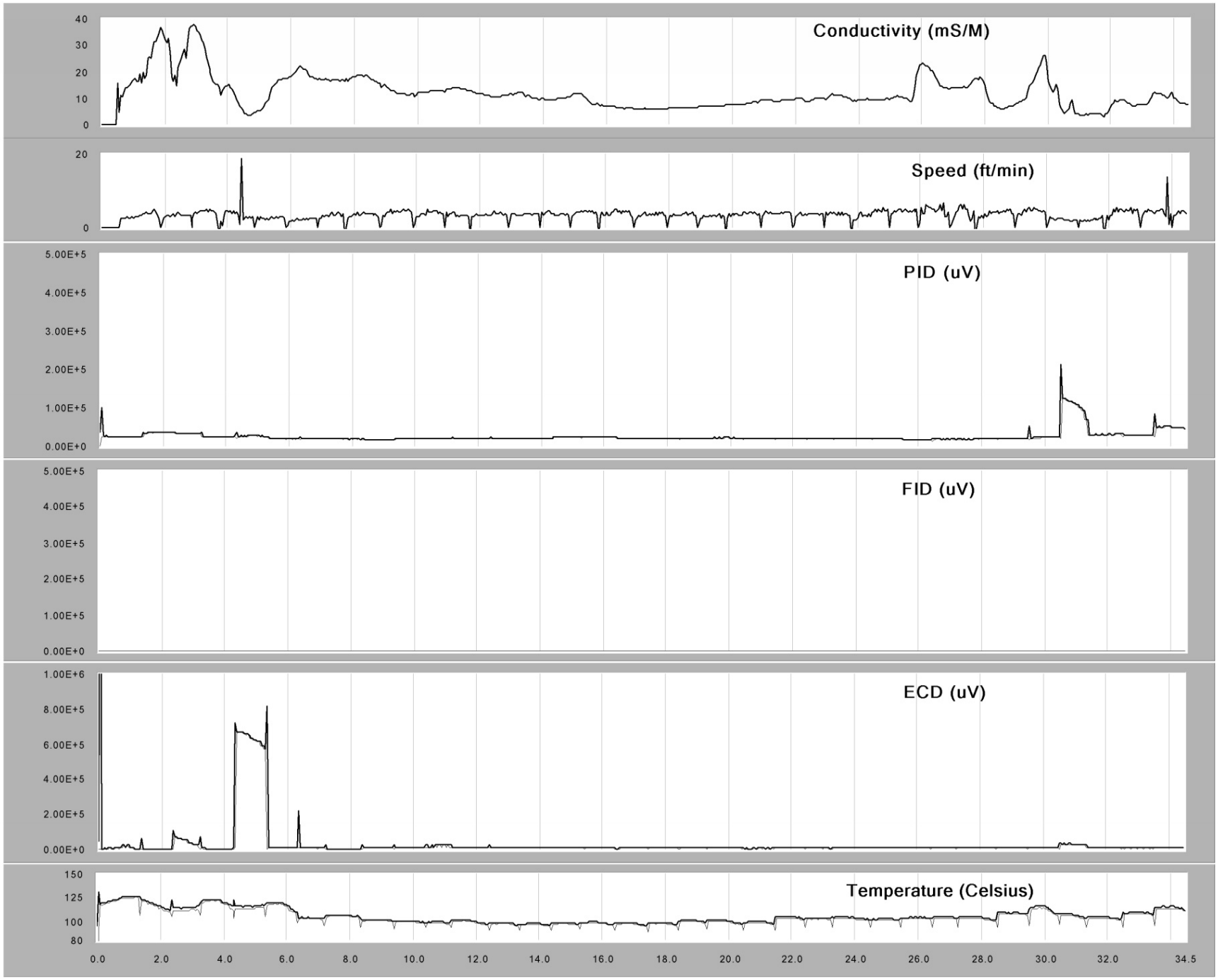
GP-128



CH2M Hill
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10/07/03

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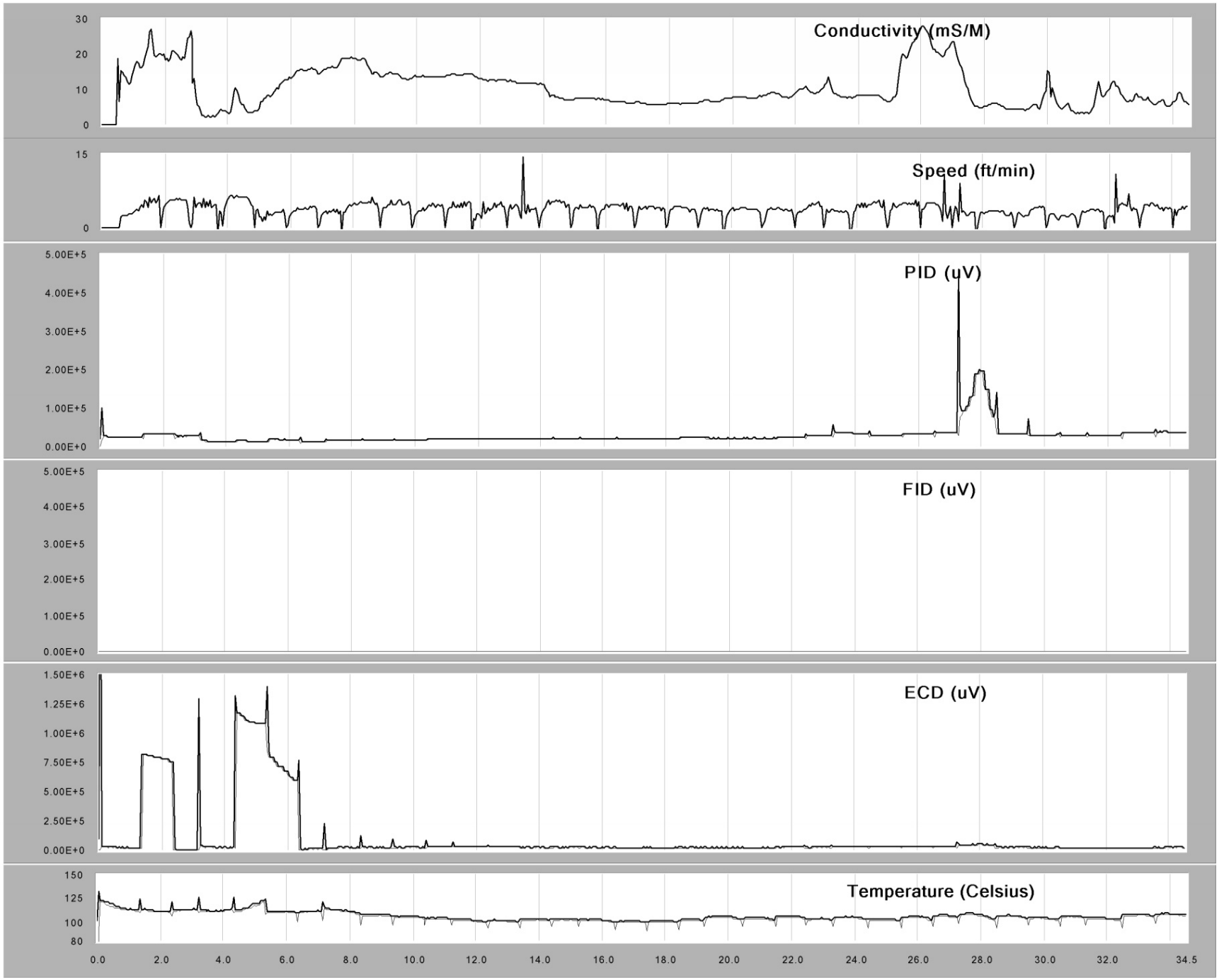

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COLUMBIA TECHNOLOGIES

Appendix C
Soil Boring Logs and Monitoring Well Construction Diagrams

PROJECT NUMBER	BORING NUMBER
142506.FI.FI	LS11-MW-15D SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION: Site 11

ELEVATION : | NORTHING: 3501288.2 | EASTING: 12169217.9

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" HSA; Mobile B-47 Truck Mounted Rig

WATER LEVELS : ~ 7' bgs during drilling | START : 06/08/1999 07:00 END: 06/08/1999 09:25 | LOGGER : M. LOUTH

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
					Surface is grass cover underlain by topsoil. Augered to 8' bgs.	
5						Water table estimated at 7' bgs
	8-10	16	SS	4-7-7-7 (14)	Medium **SAND** with some silt **(SM)**, medium dense, (10 YR 6/2), moderately sorted, saturated.	OVM = 0.0 ppm (sample) OVM = 0.0 ppm (breathing space)
10						
	13-15	18	SS	3-4-5-6 (9)	Fine to medium **SAND** with some silt **(SM)**, medium dense, (10 YR 6/2), moderately sorted, saturated.	OVM = 0.1 ppm (sample) OVM = 0.0 ppm (breathing space)
15						
	18-20	20	SS	2-2-1-2 (3)	18-18.5': Fine to Medium **SAND** with some SILT (SM), loose, moderately sorted (10 YR 5/4), saturated.	OVM = 0.1 ppm (sample) OVM = 0.0 ppm (breathing space)
20					18.5 - 20': Silty CLAY with some shells/shell fragments, (5B5/1-N4), soft, moist.	Monitoring well constructed with 2" PVC machine-slotted screen from 15-20' bgs.
					BORING TERMINATED 20' BGS	
25						

PROJECT NUMBER	BORING NUMBER
142506.FI.FI	LS11-MW-16D SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek DRILLING CONTRACTOR: Parratt Wolff LOCATION: Site 11

ELEVATION : NORTHING: 3501460.6 EASTING: 12169509.4

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" HSA; Mobile B-47 Truck Mounted Rig

WATER LEVELS : ~ 7' bgs during drilling START : 06/07/1999 18:10 END: 06/07/1999 20:00 LOGGER : M. LOUTH

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
					Surface is grass cover underlain by topsoil. Augered to 8' bgs.	
5						Water table estimated at 6.5 - 7' bgs
	8-10	20	SS	2-4-5-4 (9)	Fine to medium **SAND** with some silt **(SM)**, medium dense, (10 YR 6/2), moderately sorted, saturated.	OVM = 0.0 ppm (sample) OVM = 0.0 ppm (breathing space)
10						
	13-15	20	SS	3-3-5-6 (8)	Medium to coarse **SAND** with some silt **(SM)**, medium dense, (10 YR 6/6), moderately sorted, saturated.	OVM = 0.1 ppm (sample) OVM = 0.0 ppm (breathing space)
15						
	18-20	20	SS	3-4-5-6 (7)	Medium **SAND** with some silt **(SM)**; medium dense, (10 YR 5/4), moderately sorted, saturated.	OVM = 0.1 ppm (sample) OVM = 0.0 ppm (breathing space)
20	20-22	20	SS	4-6-5-7 (11)	Fine to medium **SAND** with some silt **(SM)**; medium dense, (10 YR 5/4), saturated.	OVM = 0.1 ppm (sample) OVM = 0.0 ppm (breathing space)
	23-25	20	SS	4-5-5-4 (10)	23 - 24': Fine to medium **SAND** with some silt **(SM)**; medium dense, (10 YR 5/4); saturated. 24 - 25': Silty **CLAY**, firm, moist N4 - 5B 5/1.	OVM = 0.1 ppm (sample) OVM = 0.0 ppm (breathing space)
25					**BORING TERMINATED 25' BGS**	Monitoring well constructed with 2" PVC machine-slotted screen from 20-25' bgs.

	PROJECT NUMBER	BORING NUMBER LS11A-MW20D	SHEET 1 OF 1
CH2MHILL		SOIL BORING LOG	

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 9.50' | NORTHING: 3501633.4299 | EASTING: 12169803.6149

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" hollow stem auger

WATER LEVELS : | START : 0753 6/4/02 | END : 0925 | LOGGER : E. Mathews

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'					
5	5-7'				5-7' Medium sand, SP, wet, loose 2.5Y 7/4	
10	10-12'				Medium sand w/some coarse sand, SW Wet, loose 2.5Y 7/4	
15	15-17'				Coarse sand, SP, wet, loose 2.5Y 7/4	
20	20-22'				Coarse to fine sand, SW, wet, loose 2.5Y 7/4	
	22-23.5'				Medium sand, SP, wet, loose, 2.5Y 7/4	
	23.5-24				Silty fine sand, SM, wet, loose, 2.5Y 7/4	
	24-25'				Medium sand, SP, wet, loose, 2.5Y 7/4	
25	25-25.5'				Gray silty fine sand, SM, wet, loose	
	25.5-26'				Gray clay, CL, moist, medium plasticity, tight	
					End of boring @ 26' bgs.	
30						

PROJECT NUMBER	BORING NUMBER	
	LS11A-MW21D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 8.30 | NORTHING: 3501503.0896 | EASTING: 12169660.9117

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" hollow stem auger

WATER LEVELS : | START : 1215 6/4/02 | END : 1400 | LOGGER : E. Mathews

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'					
5	5-7'				Medium sand, SP, wet, loose 2.5Y 7/4	
10	10-12'				Coarse to fine sand, SW, wet, loose 2.5Y 7/4	
15	15-17'				Same as above	
20	20-22'				Silty medium to fine sand, SP, wet, loose 2.5Y 7/4	
	22-23'				Medium sand, SM, some coarse material Wet, loose, 2.5Y 7/4	
	23-24'				Silty fine sand w/some clay nodules, wet, loose 2.5Y 7/4	
	24-25'				Fine sand with some clay stringers, orangy grey, Poorly sorted, wet, loose	
25	25-26'				Same as above, orage, <15% clay, no stringers of clay, more coarser material.	
	26-28'				Same as above, orage, <15% clay, no stringers	
	28-29'				Same as above.	
	29-30'				Grey clay, moist, tight, medium plasticity	
30					Bottom of boring at 30' bgs.	

PROJECT NUMBER	BORING NUMBER	
	LS11A-MW22D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 8.60' | NORTHING: 3501406.4402 | EASTING: 12169447.6693

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" hollow stem auger

WATER LEVELS : | START : 1255 6/3/02 | END : 1500 | LOGGER : E. Mathews

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'					
5	5-7'				Medium sand, SP, wet, loose 2.5Y 7/4	
10	10-12'				Silty sand, SM, wet, loose 10YR 6/6	
15	15-16'				Same as above	
	16-16.5' 16.5-17'				Clayey silt, ML, moist, loose, 2.5Y 5/6 Coarse sand with some fines, SW Wet, loose, 2.5Y 5/6	
20	20-22'				Same as above	
	22-24'				Same as above	
	24-25.5'				Same as above	
25	25.5-26' 26-28'				Silty fine sand, SM, wet, loose, 5Y 6/3 Same as above	
					End of boring @ 28' bgs.	
30						

PROJECT NUMBER	BORING NUMBER	
181794.SI.FQ	LS11A-MW31D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 9.60' | NORTHING: 3501585.1613 | EASTING: 12169593.9538

DRILLING METHOD AND EQUIPMENT USED : Ingersollrand A300 4.25" Diameter H.S.A

WATER LEVELS 7-10' | START : 1400 2/4/04 | END : 1620 | LOGGER : L. Cook

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
	0-2'	NS	Auger Cutting		Grass/topsoil at surface Sandy silt, some clay (ML) Olive 5Y 4/3, dry to moist	0.4	
5	5-7'	13"	1/SS	2-2-2-4 (4)	5-6' Silt (ML) w/some clay 2.5Y 4/4 Dry to moist, loose, olive brown 6-7' Silty fine sand (SM), trace clay Olive yellow 2.5Y 6/6 moist to wet, loose	0	
						Water table between 7 and 10' during drilling.	
10	10-12'	20"	2/SS	4-5-6-6 (11)	10-11' Silt, some sand, trace clay (ML) Olive 5Y 4/3, loose, wet 11-12' f/m silty sand (SM), loose, saturated Pale yellow 2.5Y 7/4	0	0
15	15-17'	24"	3/SS	8-8-11-9 (14)	Sand (SP) some silt Olive yellow (2.5Y 6/6) Medium dense, wet/saturated	1	0
20	20-22'	24"	4/SS	3-9-11-14 (20)	Same as above, coarsens w/depth, w/ some fine gravel		
25	25-27'	24"	5/SS	3-6-7-7 (13)	Same as above, 2.5Y 7/6 Yellow		
	27-29'	24"	6/SS	5-5-5-10 (10)	27-28.5 Same as above 28.5-29 Clayey fine to medium sand (SC) 10YR 6/1, gray		
	29-31'	20"	7/SS	3-3-6-6 (9)	Same as above		
30	31-33'	24"	8/SS	4-3-8-12 (11)	31-32' Same as above 32-33' Sandy clay (CL) 2.5Y 6/2 light brownish grey, medium stiff		

PROJECT NUMBER	BORING NUMBER	
181794.SI.FQ	LS11A-MW32D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 8.24' | NORTHING: 3501551.7637 | EASTING: 12169596.3116

DRILLING METHOD AND EQUIPMENT USED : Ingersollrand A300 4.25" Diameter H.S.A.

WATER LEVELS 6 ft. bgs | START : 0830 2/4/04 | END : 1200 | LOGGER : L. Cook

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
	0-2'	NS	Auger Cutting		Asphalt at surface Silt (ML) olive 5Y 4/4 Dry to moist, trace sand	0	0
5	5-7'	21"	1/SS	2-3-3-5 (6)	5-6' Clayey silt (ML) with some fine sand Yellowish brown 10YR 5/8 Coarsens w/depth, dry to moist 6-7'- fine to medium silty sand (SM), moist to saturated, yellowish brown, 10YR 5/4 loose		
10	10-12'	24"	2/SS	5-5-4-4 (9)	Same as above with clay lenses Yellowish brown, 10YR 5/8	0	0
15	15-17'	24"	3/SS	5-4-4-4 (8)	Same as above, a little finer		
20	20-22'	24"	4/SS	3-5-5-8 (10)	Same as above	0	0
25	25-27'	24"	5/SS	7-4-4-4 (8)	Same as above, light yellowish brown 2.5Y 6/9 fines w/depth Strong brown at bottom, 7.5YR 5/8	0	0
	27-29'	24"			Same as above, Last 4" clay, fine to medium sand (SC) 10YR 6/1 Gray		

PROJECT NUMBER	BORING NUMBER	
181794.SI.FQ	LS11A-MW33D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 9.00' | NORTHING: 3501569.2530 | EASTING: 12169433.1262

DRILLING METHOD AND EQUIPMENT USED : Ingersollrand A300 4.25" Diameter H.S.A.

WATER LEVELS 7-10' | START : 0700 2/5/04 | END : 1000 | LOGGER : L. Cook

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
	0-2'	NS	Auger Cutting		Silt, trace clay (ML) Light olive brown 2.5Y 5/6, loose, dry	0.3	0
5	5-7'	19"	1/SS	2-2-2-3 (4)	5-6' Clayey silt (ML) Olive 5Y 4/4 loose, dry to moist 6-7' Silty fine coarse sand (SM), some fine gravel very loose, moist to wet 2.5Y 6/4, light olive brown	0.6	0.7
10	10-12'	22"	2/SS	2-2-2-2 (4)	Sand, some silt, trace clay (SP) 2.5Y 6/4 very loose, wet to saturated	0.7	
15	15-17'	21"	3/SS	2-3-4-5 (7)	Same as above, finer w/depth, clay lense at 16.3	0.5	
20	20-22'	24"	4/SS	2-3-5-5 (8)	Same as above	0.5	0.6
25	25-27'		5/SS	2-2-2-2 (4)	25-26' Same as above 26-27' Clay (CH) 5Y 6/2, light olive gray Moist, medium siff		
	27-29'	24"		6-10-18-14 (28)	27-28' same as above 28-29' Sandy clay (SC), saturated, very stifl 10YR 5/6, Brownish yellow	1.1 1.0	

PROJECT NUMBER	BORING NUMBER	
181794.SI.FQ	LS11A-MW34D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 8.90' | NORTHING: 3501358.3803 | EASTING: 12169428.6729

DRILLING METHOD AND EQUIPMENT USED : Ingersoll Rand A300 4.25" Diameter H.S.A.

WATER LEVELS : 7-10' | START : 1000 2/5/04 | END : 1300 | LOGGER : L. Cook

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone	Above Hole
	0-2'	NS	Auger Cutting		Clayey silt (ML) Yellowish brown, 10 YR 5/6 Dry to moist Olive 5Y 4/3, dry to moist	1.1	1.1
5	5-7'	21"	1/SS	5-10-12-15 (22)	5-5.5' Same as above 5.5-7' Sand (SP), some silt, medium dense Moist to wet, pale yellow 5Y 7/3	1.3	1.1
10	10-12'		2/SS	2-2-3-4 (5)	Sitly sand (SM), fine to medium grained Olive yellow 2.5Y 6/6 Loose, saturated	1.4	1.2
15	15-17'		3/SS	5-7-9-11 (16)	Same as above Some coarse sand and fine quartz gravel 16-17'	1.4	1.2
20	20-22'		4/SS	3-3-3-4 (6)	Very course (1-2 mm) sand (SP) Olive yellow (2.5 Y 6/8) Loose, saturated	1.4	1.1
25	25-27'		5/SS	4-7-7-7 (14)	Silty f/m sand (SM) Medium dense; saturated Olive yellow 2.5 Y 6/8		1.3
	27-29'		6/SS	6-4-3-7 (7)	27-28' Same as above 28-29' Sandy clay (SC) (Yorktown) Saturated med stiff, light olive gray SY 6/2	1.2	1.1
30							

CH2MHILL	PROJECT NUMBER CTO 23	BORING NUMBER MW35D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : Site 11a | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Little Creek

ELEVATION : | NORTHING: | EASTING:

DRILLING METHOD AND EQUIPMENT USED : Hollow stem augering/split spoon sampling

WATER LEVELS : | START : 12/19/04 @ 0800 | END : 12/19/04 @ 1000 | LOGGER : Paul Landin

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'					
5	5-6'	24"			silty CLAY (CL); grayish brown (10YR 3/2); dry; stifl	
	6-7'				silty SAND (ML); tannish brown (10YR 5/8); moist; dense	
10	10'-12'	24"			SAND (SM); orange brown (10YR 6/4); wet; loose; medium to coarse grained	
15	15'-17'	18"			Same as above	
20	20'-22'	24"			Same as above; gray (10YR6/1)	
25	25-25.5'	24"			Same as above	
	25.5'-27'				CLAY (CL); greenish gray (10BG6/1); moist; stiff; some shell fragments; Yorktown Formation	
					End of boring: 27' bgs	

PROJECT NUMBER	BORING NUMBER	
345721.SI.SI	LS11A-MW36D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 7.97 ' | NORTHING: 3,501,525.19 | EASTING:12,169,666.63

DRILLING METHOD AND EQUIPMENT USED : 2 Foot Split Spoon

WATER LEVELS : 5.5' | START : 0800 | END : 1100 | LOGGER : Shaun Whitworth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-2'	24"	Auger Cutting		Construction fill. Sand and gravel.	0
	2-4'	24"	Auger Cutting		Construction fill. Sand and gravel.	0
5	4-6'	24"	1/SS		4-4.5' Clayey Silt (ML). Lt. olive brown 2.5Y5/4 Moist. Medium dense. 4.5-5.5' Silty sand (SM). Lt. brownish gray 2.5Y6/2. Moist. Medium dense. 5.5-6' Sand (SW). Pale yellow 5Y7/3. Wet. Loose.	0
	8-10'	24"	2/SS		8-10' Sand (SW). Brownish Yellow 10YR6/8. Moist Loose to medium dense.	0
10	10-12'	24"	3/SS		10-10.25' Clayey silt (ML). Dark yellowish brown 10YR4/6. Wet. Medium dense. 10.25-12'. Sand (SP). Olive yellow 2.5Y6/6. Wet. Medium dense.	0
	12-14'	24"	4/SS		12-14' Sand (SP). Olive yellow 2.5Y6/6. Wet. Dense.	0
	14-16'	24"	5/SS		14-16' Sand (SP). Olive yellow 2.5Y6/6. Wet. Dense	0
15	16-18'	24"	6/SS		16-17.5' Sand (SP). Brownish yellow 10YR6/8 Wet. Dense 17.5-18' Fine sand (SP). Lt yellowish brown 2.5Y6/4 Wet. Dense.	0
	18-20'	24"	7/SS		18-20' Fine to coarse sand (SW). Yellowish brown 2.5Y6/4 Wet,Dense	0
20	20-22'	24"	8/SS		20-22' Fine to coarse sand (SW). Pale yellow 2.5Y7/4. Wet. Dense. Iron staining.	0
					22-24' Fine to coarse sand (SW). Pale yellow 2.5Y7/4. Wet. Dense.	0
	24-26'	24"	9/SS		24-26' Fine to coarse sand (SW). Lt yellowish brown 2.5y6/4. Some clay.	0
25	26-28'	24"	10/SS		26-27.5' Fine to coarse sand (SW). Lt gray. Wet Dense.	0
					27.5-28' Silty sand (SM). Lt gray 2.5Y7/2. Wet. Dense.	0
	28-29'	12"	11/SS		28-29' Silty clay (CL). Lt gray 2.5Y7/2. Wet. S Iron mottles.	0
30						

PROJECT NUMBER	BORING NUMBER	
345721.SI.SI	LS11A-MW37D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 8.60 ' | NORTHING: 3,501,409.99 | EASTING:12,169,708.92

DRILLING METHOD AND EQUIPMENT USED : 4 foot Direct push technology

WATER LEVELS : 7 ' | START : 0920 | END : 1230 | LOGGER : Shaun Whitworth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
	0-4'	48"	Auger Cutting		Construction fill. Sand and gravel.	6.8
	4-8'	48"	1		4-5' Sand (SW). Brownish yellow 10YR6/6 Slightly moist. Loose. 5-8' Sand fine to medium (SW). Pale yellow 2.5Y8/4.Saturated. Loose.	0
	8-12'	48"	2		8-12' Sand fine to medium (SW). Pale yellow 2.5Y8/4.Saturated. Loose. Iron stain.	0
	12-16'	48"	3		12-15' Sand fine (SP).Olive Yellow 2.5Y6/4 Moist. Medium dense. 15-16' Coarse sand (SW). Brownish yellow 10YR6/6 Saturated. Loose.	0
	16-20"	48"	4		16-19' Fine to coarse sand (SW). Olive yellow 2.5Y6/6. Saturated. Medium dense 19-20' Fine sand (SP). Pale yellow 2.5Y7/4 Saturated.Meduim dense. Some clay	0
	20-24'	48"	5		20-22' Silty sand (SW). Brownish yellow 10YR6/6 Saturated. Medium dense. 22-23' Coarse sand (SW). Lt yellowish brown 10YR6/4. Saturated. Medium dense. 23-24' Silty clay (CL). Lt gray 5Y7/1. Saturated Dense. Iron stain.	0
	24-28'	48"	6		24-26' Silty sand (SM). Lt gray 5Y7/2. Saturated Medium dense. 26-28' Sandy clay (CL). Lt olive grey 5Y6/2. Saturated. Dense. Iron stain.	0

5 10 15 20 25

PROJECT NUMBER	BORING NUMBER	
345721.SI.SI	LS11A-MW38D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 8.97' | NORTHING: 3,501,400.38 | EASTING:12,169,553.55

DRILLING METHOD AND EQUIPMENT USED : 4 foot Direct push technology

WATER LEVELS : 7 ' | START : 0920 | END : 1230 | LOGGER : Shaun Whitworth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-4'	48"	Auger Cutting		Construction fill. Sand and gravel.	0
5	4-5'	12"	Auger Cutting		4-5' Construction fill. Sand and gravel. Hand augered.	0
	5-9'	48"	1		Silty sand (SM). Yellow 2.5Y7/6. Moist. Loose	0
10	9-13'	48"	2		9-13' Sand (SW). Yellowish brown 10YR5/6 Saturated at 10'. Loose	0
	13-17'	48"	3		13-17' Sand coarse (SP).Olive Yellow 2.5Y6/6 Saturated. Medium dense. 15-16' Coarse sand (SW). Brownish yellow 10YR6/6 Saturated. Loose.	0
15	17-21'	48"	4		17-21' Fine to medium sand (SW). Pale yellow 5Y7/3. Saturated. Medium dense. Iron stain.	0
20	21-25'	48"	5		21-25' Sand (SP). Olive yellow 2.5Y6/6 Saturated. Medium dense. Iron stain.	0
25	25-29'	48"	6		25-28.5' Sand (SP). Brownish yellow 10YR6/8. Saturated. Medium dense. 28.5-29' Clayey sand (SC). Pale yellow 5Y7/4. Saturated. Medium dense.	0

PROJECT NUMBER	BORING NUMBER	
345721.SI.SI	LS11A-MW39D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 8.90 ' | NORTHING: 3,501,307.42 | EASTING:12,169,507.03

DRILLING METHOD AND EQUIPMENT USED : 4 foot Direct push technology

WATER LEVELS : 8 ' | START : 1700 | END : 1930 | LOGGER : Shaun Whitworth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-4'	48"	Auger Cutting		Construction fill. Sand and gravel.	0
5	4-8'	48"	1		4-8' Sand (SW). Brownish yellow 10YR6/6 Slightly moist. Loose.	0
	8-12'	48"	2		8-12' Sand (SW). Lt gray 5Y7/2 Saturated. Loose.	0
10						
	12-16'	48"	3		12-14' Sand fine (SW).Lt gray 5Y7/2. Saturated Moist. Loose. 14-16' Sand (SW). Olive yellow 2.5Y6/6 Saturated. Medium dense. Some iron stain.	0
15	16-20''	48"	4		16-19' Sand (SW). Olive yellow 2.5Y6/6. Saturated. Medium dense 19-20' Silty sand (SM). Gray 10YR6/1 Saturated.Meduim dense. Iron stain.	0
20	20-24'	48"	5		20-24' Silty sand (SW). Brownish yellow 10YR6/6 Saturated. Medium dense.	0
	24-28'	48"	6		24-27.5' Sand (SW). Brownish yellow 10YR6/6. Saturated Loose.	0
25					27.5-28' Sandy clay (CL). Gray 10YR6/1 Saturated. Medium dense.	
	28-30'	24"	7		28-30' Clay (CL) Greenish gray Gley 5GY5/1 Moist. Medium plasticity. Stiff	0
30						

PROJECT NUMBER	BORING NUMBER	
345721.SI.SI	LS11A-MW40D	SHEET 1 OF 1

SOIL BORING LOG

PROJECT : NAB Little Creek | DRILLING CONTRACTOR : Parratt Wolff | LOCATION : Site 11a

ELEVATION : 9.37 ' | NORTHING: 3,501,283.05 | EASTING:12,169,637.19

DRILLING METHOD AND EQUIPMENT USED : 4 foot Direct push technology

WATER LEVELS : 7 ' | START : 1425 | END : 1400 | LOGGER : Shaun Whitworth

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	CORE DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0-4'	48"	Auger Cutting		Construction fill. Sand and gravel.	0
	4-8'				Lithology not recorded	0
5						
	8-12'				Lithology not recorded	0
10						
	12-16'				Lithology not recorded	0
15						
	16-20'				Lithology not recorded	0
20	20-24'	48"	1		20-24' Sand (SW). Lt yellowish brown 2.5Y6/4 Saturated. Loose Lense of sandy clay at 23.5'.	0
	24-28'	48"	2		24-28' Silty sand (SM). Brownish yellow 10YR6/8. Saturated Loose.Iron stain.	0
25						
	28-32'	48"	3		28-29' Clayey sand (SC) Lt gray 2.5Y7/2 Moist. Medium plasticity.	0
30					29-32' Silty clay (CL) Greenish gray 5GY5/1 Moist. Medium stiff.	

PROJECT NUMBER	WELL NUMBER	
142506.FI.FI	LS11-MW06D	SHEET 1 OF 1

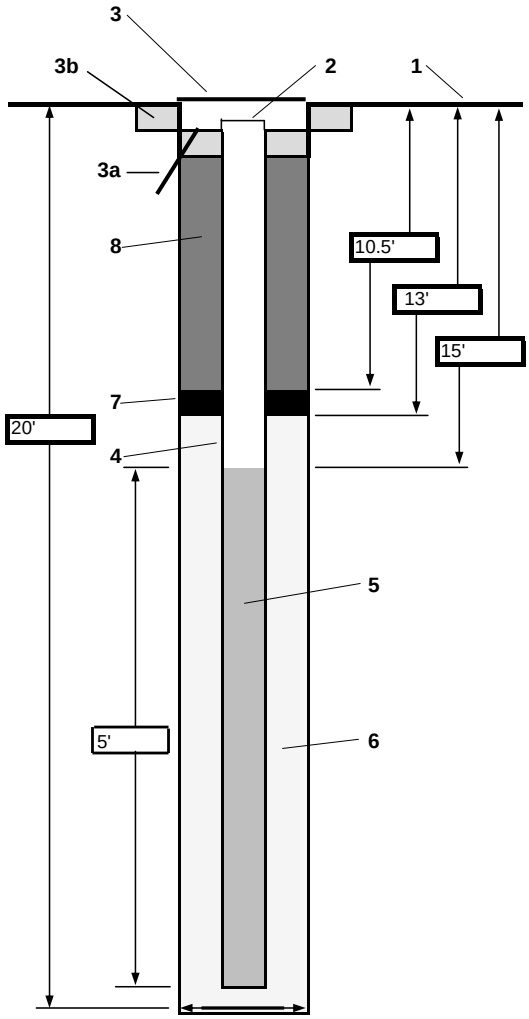
WELL COMPLETION DIAGRAM

PROJECT : NAB LITTLE CREEK IR PROGRAM SITE 11 LOCATION : NAB LITTLE CREEK, VIRGINIA BEACH, VIRGINIA

DRILLING CONTRACTOR : PARRATT WOLFF, INC.

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" HSA, CME 75 DRILL RIG

WATER LEVELS DURING DEVELOPMENT: START : 9/4/98 END :9/4/98 LOGGER : A. ERRETT



1-	Ground elevation at well	N/A
2-	Top of casing elevation	6.76
3-	Wellhead protection cover type	DSI Flushmount - (Circle)
	a) drain tube?	no
	b) concrete pad dimensions	Approximately 2' diameter
4-	Dia./type of well casing	2" PVC Sch. 40
5-	Type/slot size of screen	2" PVC Sch. 40 10 slot
6-	Type screen filter	DSI #1 Filter Sand
	a) Quantity used	4 BAGS
7-	Type of seal	Bentonite, 3/8" chips
	a) Quantity used	1 Bag
8-	Grout	
	a) Grout mix used	Portland cement/ Betonite Gell
	b) Method of placement	Tremie
	c) Vol. of well casing grout	~25 gallons
	Development method	
	Development time	
	Estimated purge volume	

Comments

PROJECT NUMBER	WELL NUMBER	
142506.FI.FI	LS11-MW15D	SHEET 1 OF 1

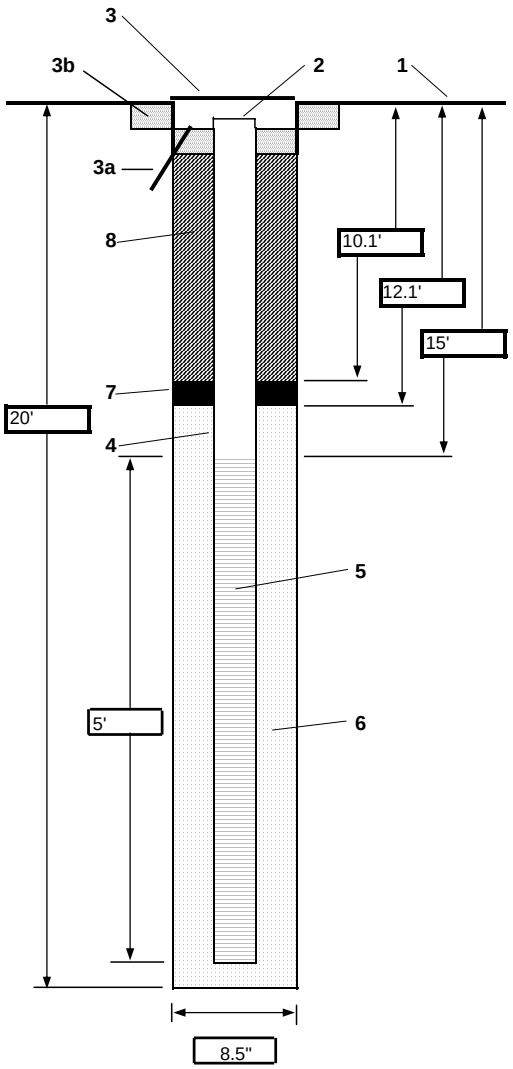
WELL COMPLETION DIAGRAM

PROJECT : NAB Littler Creek LOCATION : Site 11

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3501288.2 EASTING: 12169217.9

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" HSA, CME 75 DRILL RIG

WATER LEVELS DURING DEVELOPMENT: START : 6/8/99 END : 6/8/99 LOGGER : M. LOUTH



1- Ground elevation at well	N/A
2- Top of casing elevation	7.19' amsl
3- Wellhead protection cover type	DSI Flushmount - (Circle)
a) drain tube?	no
b) concrete pad dimensions	Approximately 2' diameter
4- Dia./type of well casing	2" PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40 10 slot
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	4 BAGS
7- Type of seal	Bentonite, 3/8" chips
a) Quantity used	1 Bag
8- Grout	
a) Grout mix used	Portland cement/ Betonite Gell
b) Method of placement	Trimming
c) Vol. of well casing grout	~25 gallons
Development method	Surge/ Submersible pump
Development time	40 mins
Estimated purge volume	45 gallons

Comments

PROJECT NUMBER	WELL NUMBER	
142506.FI.FI	LS11-MW16D	SHEET 1 OF 1

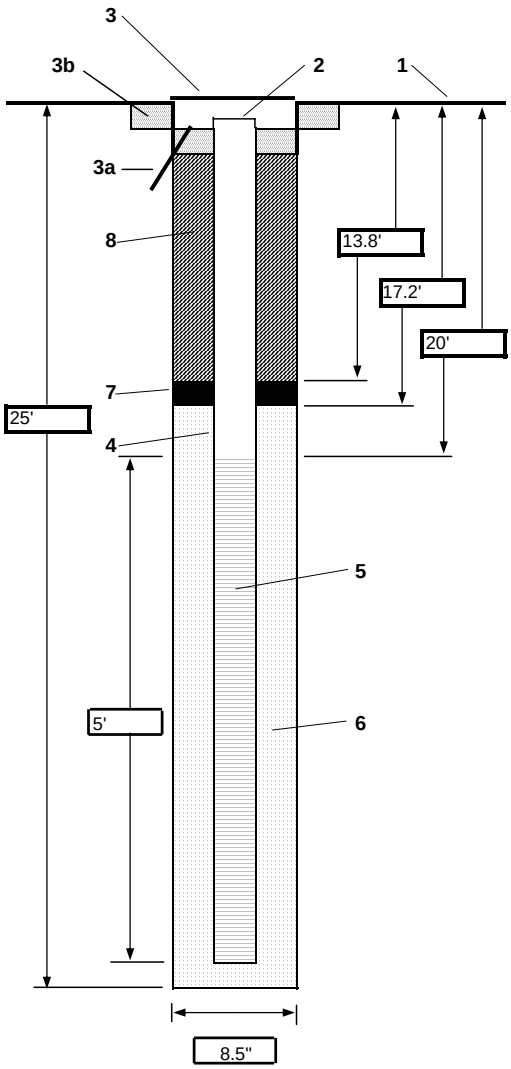
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11

DRILLING CONTRACTOR: Parratt Wolff NORTHING: 3501460.6 EASTING: 12169509.4

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" HSA, CME 75 DRILL RIG

WATER LEVELS DURING DEVELOPMENT: START : 6/7/99 END : 6/7/99 LOGGER : M. LOUTH



1- Ground elevation at well	N/A
2- Top of casing elevation	8.44' amsl
3- Wellhead protection cover type	DSI Flushmount - (Circle)
a) drain tube?	no
b) concrete pad dimensions	Approximately 2' diameter
4- Dia./type of well casing	2" PVC Sch. 40
5- Type/slot size of screen	2" PVC Sch. 40 10 slot
6- Type screen filter	DSI #1 Filter Sand
a) Quantity used	4 BAGS
7- Type of seal	Bentonite, 3/8" chips
a) Quantity used	1 Bag
8- Grout	
a) Grout mix used	Portland cement/ Betonite Gell
b) Method of placement	Trimming
c) Vol. of well casing grout	~25 gallons
Development method	Surge/ Submersible pump
Development time	40 mins
Estimated purge volume	45 gallons

Comments

PROJECT NUMBER	WELL NUMBER LS11A-MW20D	SHEET 1	OF 1

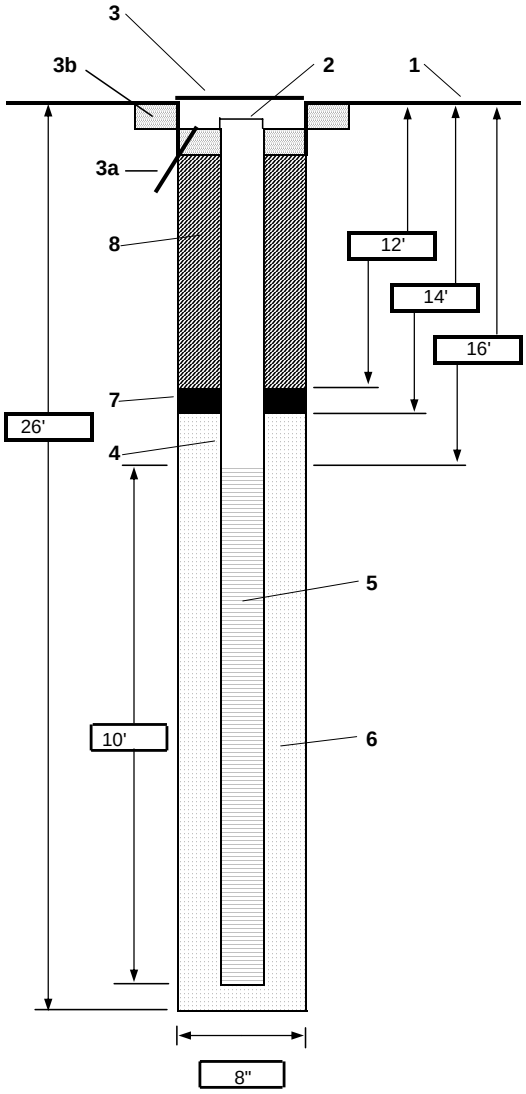
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11a

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3501633.4299 EASTING: 12169803.6149

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" hollow stem auger

WATER LEVELS : START : 0925 6/4/02 END : 1045 LOGGER : E. Mathews



1- Ground elevation at well: 9.50' amsl

2- Top of casing elevation: 9.17' amsl

3- Wellhead protection cover type: 8" steel flushmount protective casing
- a) drain tube?: no
- b) concrete pad dimensions:

4- Dia./type of well casing: 2" PVC

5- Type/slot size of screen: 0.010 slot PVC

6- Type screen filter: DSI #1 Sand
- a) Quantity used: 5 bags

7- Type of seal: Shur-plug 3/8" bentonite chips
- a) Quantity used: 2 bags

8- Grout
- a) Grout mix used: Portland Cement/bentonite slurry
- b) Method of placement:
- c) Vol. of well casing grout:

Development method: Surge/ Submersible pump

Development time:

Estimated purge volume:

Comments:

PROJECT NUMBER	WELL NUMBER LS11A-MW21D	SHEET 1	OF 1

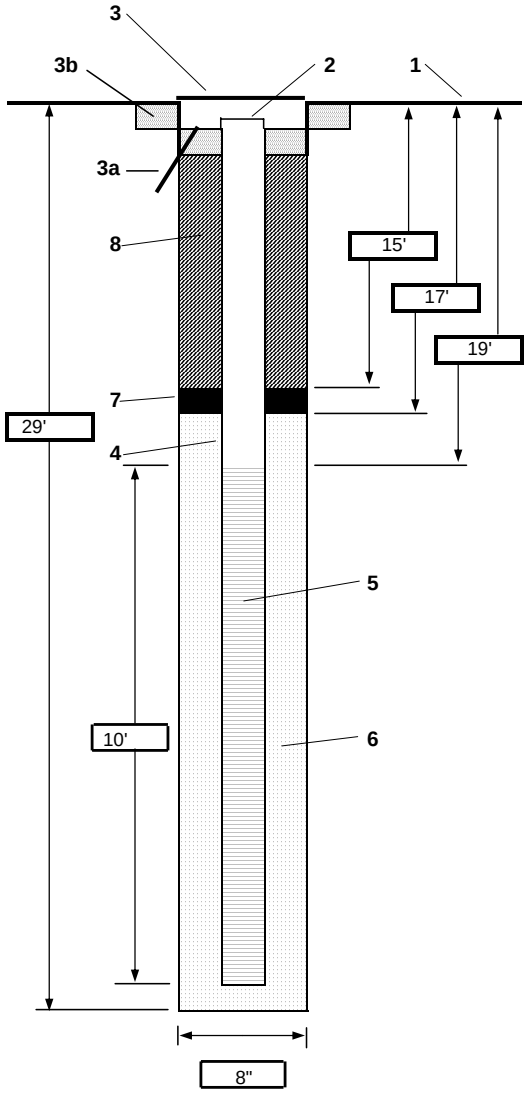
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11a

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3501503.0896 EASTING: 12169660.9117

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" hollow stem auger

WATER LEVELS : START : 1400 6/4/02 END : 1530 LOGGER : E. Mathews



1- Ground elevation at well: 8.30' amsl

2- Top of casing elevation: 8.03' amsl

3- Wellhead protection cover type: 8" steel flushmount protective casing
a) drain tube?: no
b) concrete pad dimensions:

4- Dia./type of well casing: 2" PVC

5- Type/slot size of screen: 0.010 slot PVC

6- Type screen filter: DSI #1 Sand
a) Quantity used: 4 bags

7- Type of seal: Shur-plug 3/8" bentonite chips
a) Quantity used: 1 bag

8- Grout
a) Grout mix used: Portland Cement/bentonite slurry
b) Method of placement:
c) Vol. of well casing grout:

Development method: Surge/ Submersible pump

Development time:

Estimated purge volume:

Comments:

PROJECT NUMBER	WELL NUMBER LS11A-MW22D	SHEET 1	OF 1

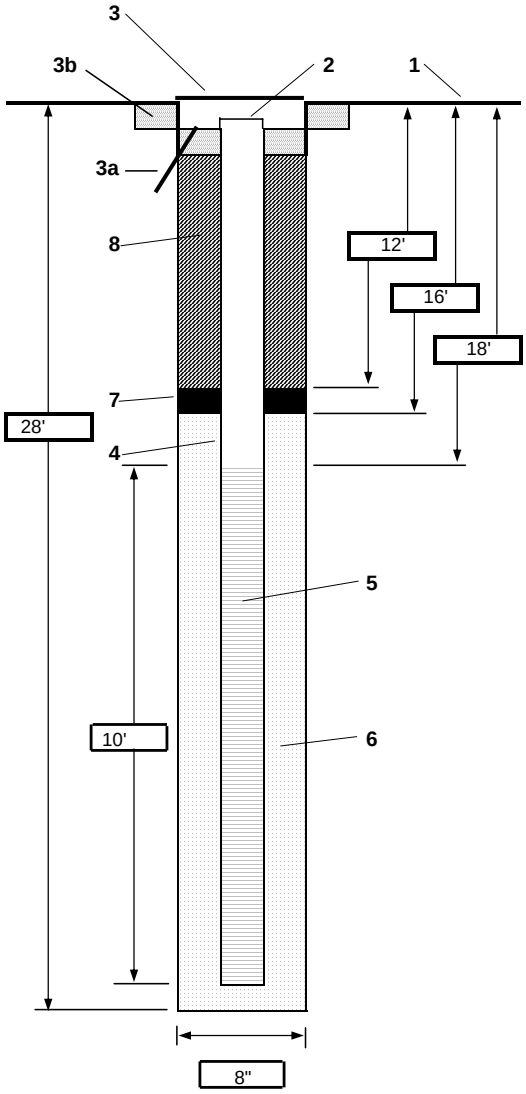
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11a

DRILLING CONTRACTOR : Parratt Wolff NORTHING: 3501406.4402 EASTING: 12169447.6693

DRILLING METHOD AND EQUIPMENT USED : 4 1/4" hollow stem auger

WATER LEVELS : START : 1500 6/3/02 END : 1635 LOGGER : E. Mathews



1- Ground elevation at well: 8.60' amsl

2- Top of casing elevation: 8.41' amsl

3- Wellhead protection cover type: 8" steel flushmount protective casing
- a) drain tube?: no
- b) concrete pad dimensions:

4- Dia./type of well casing: 2" PVC

5- Type/slot size of screen: 0.010 slot PVC

6- Type screen filter: DSI #1 Sand
- a) Quantity used: 4 bags

7- Type of seal: Shur-plug 3/8" bentonite chips
- a) Quantity used: 1 bag

8- Grout
- a) Grout mix used: Portland Cement/Bentonite slurry
- b) Method of placement:
- c) Vol. of well casing grout:

Development method: Surge/ Submersible pump

Development time:

Estimated purge volume:

Comments:

PROJECT NUMBER	WELL NUMBER	
181794.SI.FQ	LS11A-MW31D	SHEET 1 OF 1

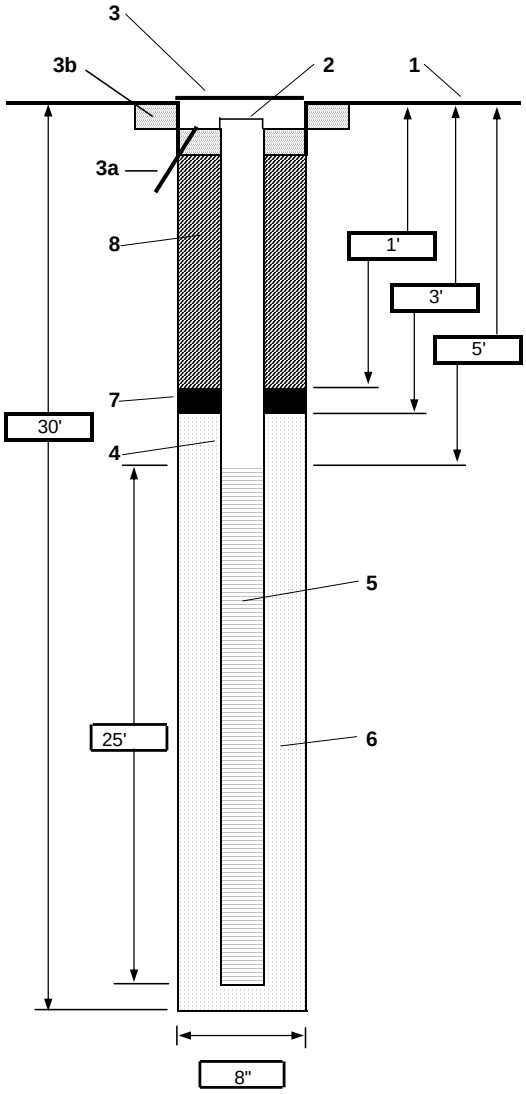
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11a

DRILLING CONTRACTOR : Parratt Wolff NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : Ingersollrand A300/ 4.25" hollow stem auger

WATER LEVELS : START : 1400 2/4/2004 END : 1620 LOGGER : Laura Cook



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: 8" steel flushmount protective casing
   a) drain tube? no
   b) concrete pad dimensions 24" round

4- Dia./type of well casing 2" PVC

5- Type/slot size of screen 0.010 slot PVC

6- Type screen filter DSI #1 Sand
   a) Quantity used

7- Type of seal Shur-plug 3/8" bentonite chips
   a) Quantity used

8- Grout
   a) Grout mix used Not applicable
   b) Method of placement
   c) Vol. of well casing grout

Development method Surge/ Submersible pump

Development time

Estimated purge volume

Comments

PROJECT NUMBER	WELL NUMBER	
181794.SI.FQ	LS11A-MW32D	SHEET 1 OF 1

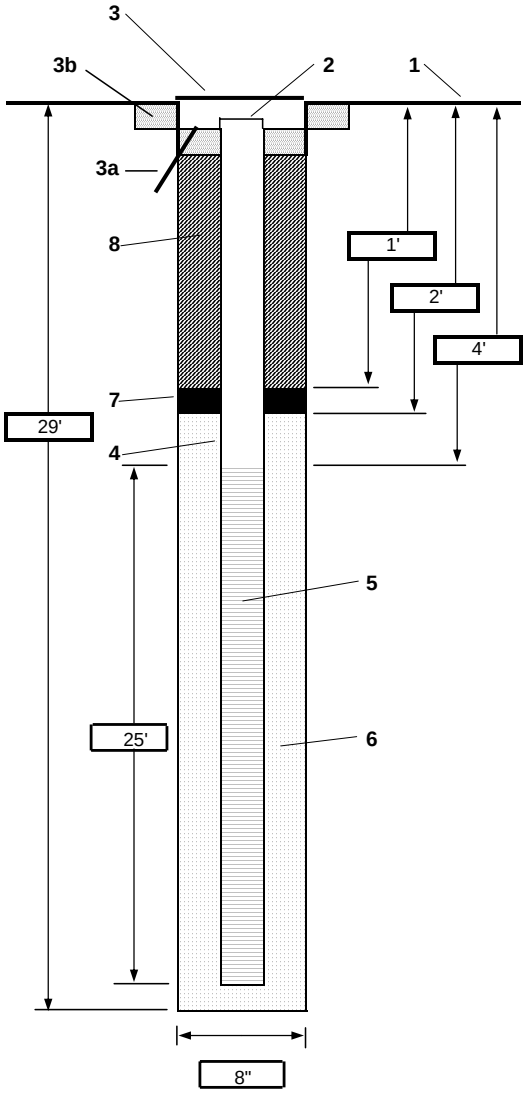
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11a

DRILLING CONTRACTOR : Parratt Wolff NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : Ingersollrand A300/ 4.25" hollow stem auger

WATER LEVELS : 6' bgs START : 0830 2/4/2004 END : 12:00 LOGGER : Laura Cook



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: 8" steel flushmount protective casing
a) drain tube? no
b) concrete pad dimensions 24" round

4- Dia./type of well casing 2" PVC

5- Type/slot size of screen 0.010 slot PVC

6- Type screen filter DSI #1 Sand
a) Quantity used 13 bags

7- Type of seal Not applicable
a) Quantity used

8- Grout
a) Grout mix used Not applicable
b) Method of placement
c) Vol. of well casing grout

Development method Surge/ Submersible pump

Development time

Estimated purge volume

Comments

PROJECT NUMBER	WELL NUMBER	
181794.SI.FQ	LS11A-MW33D	SHEET 1 OF 1

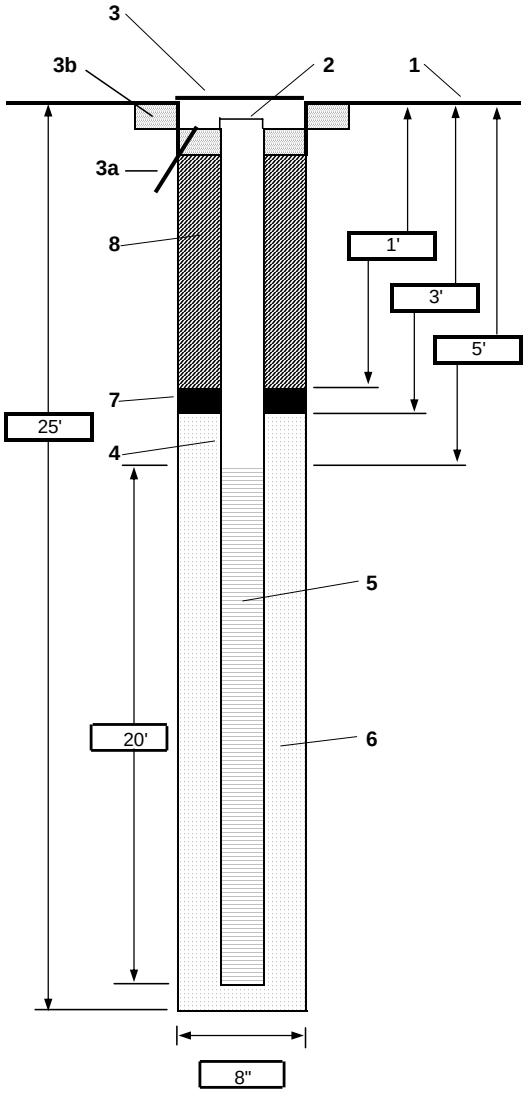
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11a

DRILLING CONTRACTOR : Parratt Wolff NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : Ingersollrand A300/ 4.25" hollow stem auger

WATER LEVELS : START : 0700 2/5/2004 END : 1000 LOGGER : Laura Cook



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: 8" steel flushmount protective casing
   a) drain tube? no
   b) concrete pad dimensions 24" round

4- Dia./type of well casing 2" PVC

5- Type/slot size of screen 0.010 slot PVC

6- Type screen filter DSI #1 Sand
   a) Quantity used 9 bags

7- Type of seal Shur-plug 3/8" bentonite chips
   a) Quantity used 1/2 bag

8- Grout
   a) Grout mix used Not applicable
   b) Method of placement
   c) Vol. of well casing grout

Development method Surge/ Submersible pump

Development time

Estimated purge volume

Comments

PROJECT NUMBER	WELL NUMBER	
181794.SI.FQ	LS11A-MW34D	SHEET 1 OF 1

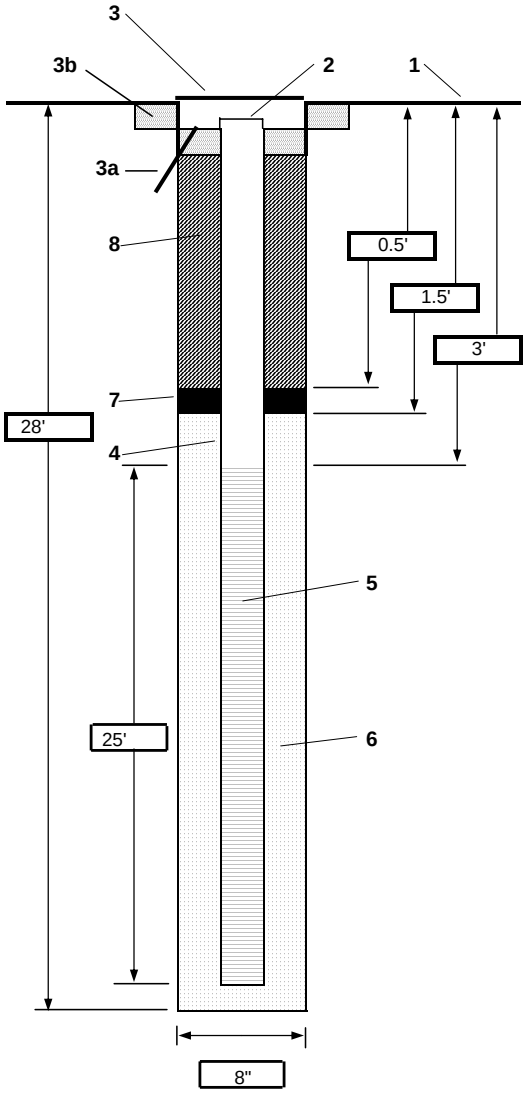
WELL COMPLETION DIAGRAM

PROJECT : NAB Little Creek LOCATION : Site 11a

DRILLING CONTRACTOR : Parratt Wolff NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : Ingersollrand A300/ 4.25" hollow stem auger

WATER LEVELS : START : 1000 2/5/2004 END : 13:00 LOGGER : Laura Cook



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type 8" manhole
a) drain tube? no
b) concrete pad dimensions 24" round

4- Dia./type of well casing 2" PVC

5- Type/slot size of screen 0.010 slot PVC

6- Type screen filter DSI #1 Sand
a) Quantity used

7- Type of seal Shur-plug 3/8" bentonite chips
a) Quantity used

8- Grout
a) Grout mix used Not applicable
b) Method of placement
c) Vol. of well casing grout

Development method

Development time

Estimated purge volume

Comments

PROJECT NUMBER	WELL NUMBER	
CTO 23 CLEAN III	MW35D	SHEET 1 OF 1

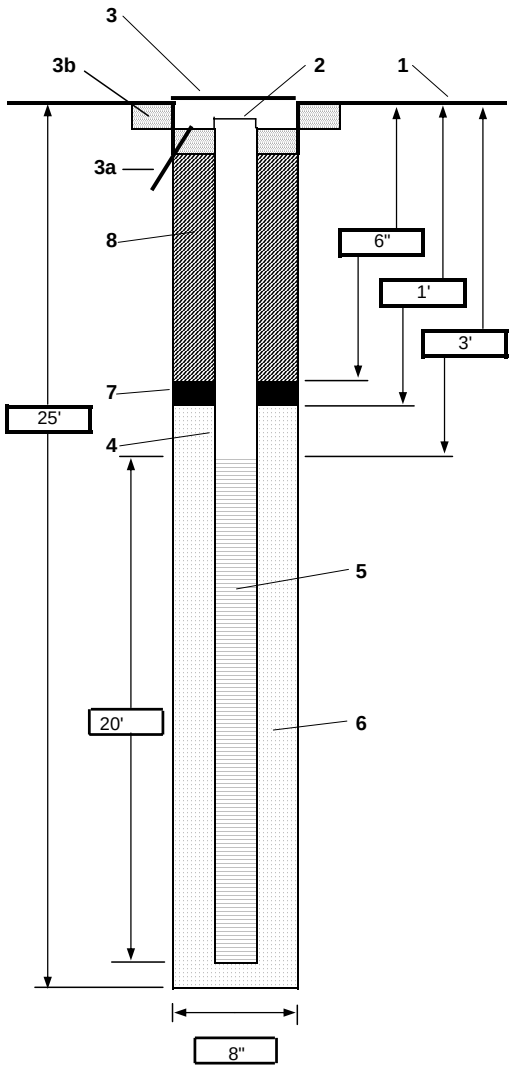
WELL COMPLETION DIAGRAM

PROJECT : Site 11a LOCATION : Little Creek

DRILLING CONTRACTOR : Parratt Wolff NORTHING: EASTING:

DRILLING METHOD AND EQUIPMENT USED : Hollow stem augers/split spoon sampling

WATER LEVELS : START : 12/19/04 @ 0800 END : 12/19/04 @ 1000 LOGGER : Paul Landin



1- Ground elevation at well _____

2- Top of casing elevation _____

3- Wellhead protection cover type: Flush Mount
   a) drain tube?: N/A
   b) concrete pad dimensions: 2' diameter x 4" thick

4- Dia./type of well casing: 2" diameter Schedule 40 PVC

5- Type/slot size of screen: 0.010 Slot Schedule 40 PVC

6- Type screen filter: DSI #1 Sand
   a) Quantity used: 8 bags

7- Type of seal: bentonite
   a) Quantity used: 1/2 bag

8- Grout
   a) Grout mix used: No grout used, sand filter to surface
   b) Method of placement: _____
   c) Vol. of well casing grout: _____

Development method: pump and surge

Development time: 90 minutes

Estimated purge volume: 55 gallons

Comments _____

PROJECT NUMBER	WELL NUMBER		
345721.SI.SI	LS11A-MW36D	SHEET 1	OF 1

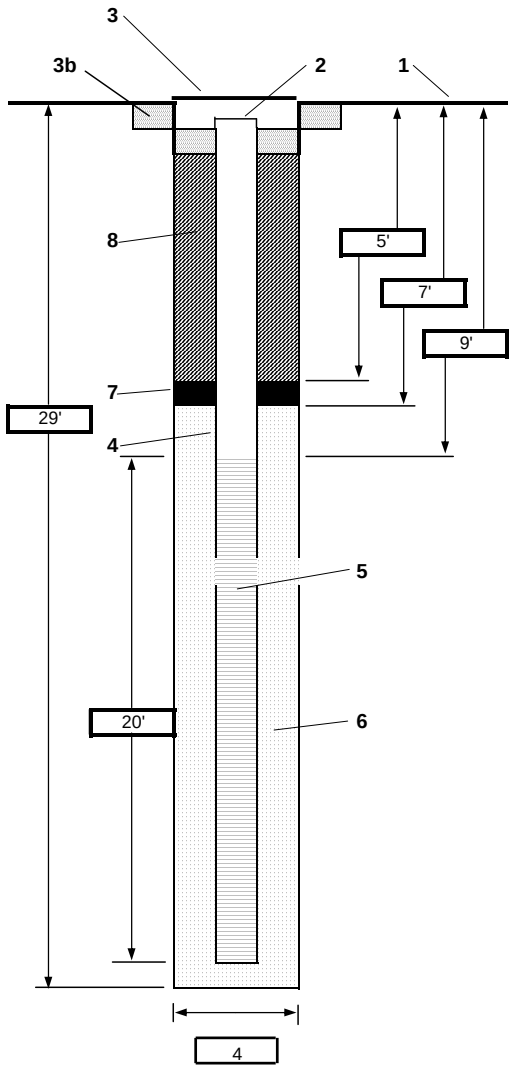
WELL COMPLETION DIAGRAM

PROJECT : CTO-125 LOCATION NAB Little Creek 11A

DRILLING CONTRACTOR : Parrat-Wolff NORTHING:3,501,525.19 EASTING:12,169,666.63

DRILLING METHOD AND EQUIPMENT USED : 4.25 in. hollow auger

WATER LEVELS : 6.0' bgs START : 10/5/2007 0755 END :10/5/2007 1100 LOGGER : Shaun Whitworth



1-	Ground elevation at well	8.3'
2-	Top of casing elevation	7.97'
3-	Wellhead protection cover type:	Flushmount
	a) drain tube?	No
	b) concrete pad dimensions	2 ft. Diameter Round
4-	Dia./type of well casing	2" PVC Sch 40
5-	Type/slot size of screen	2" Sch 40 PVC .01 slot
6-	Type screen filter	#1 Filter Sand
	a) Quantity used	
7-	Type of Seal	Shur Plug 3/8" chips
	a) Quantity used	
8-	Grout	
	a) Grout mix used	Portland cement/Bentonite
	b) Method of placement	Tremie pipe
	c) Vol. of well casing grout	
	Development method	Whale Pump
	Development time	1.25 hours
	Estimated purge volume	80 gallons

Comments

PROJECT NUMBER	WELL NUMBER		
345721.SI.SI	LS11A-MW37D	SHEET 1	OF 1

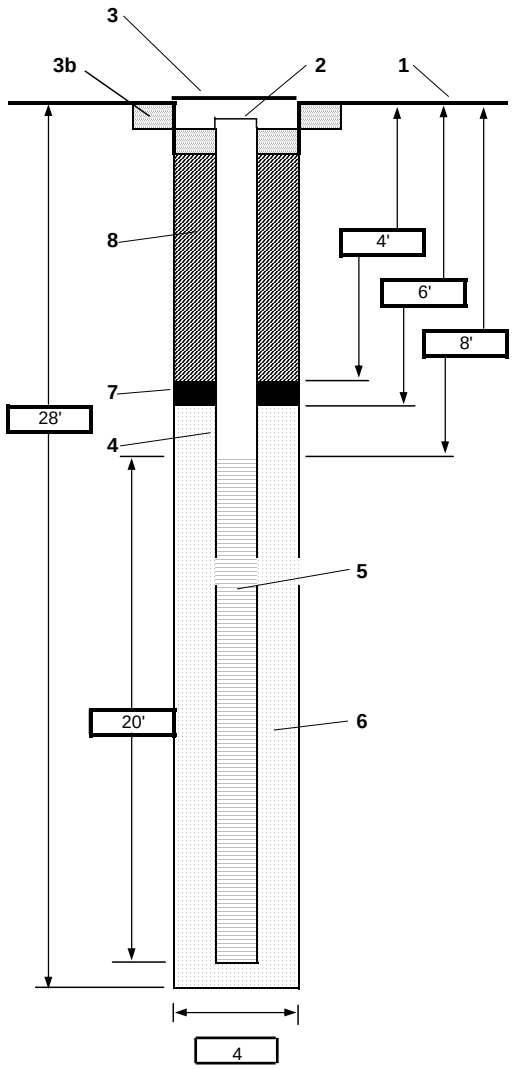
WELL COMPLETION DIAGRAM

PROJECT : CTO-125 LOCATION NAB Little Creek 11A

DRILLING CONTRACTOR : Parrat-Wolff NORTHING:3,501,429.99 EASTING:12,169,708.92

DRILLING METHOD AND EQUIPMENT USED : 4.25 in. hollow auger

WATER LEVELS : 6.7' bgs START : 10/3/2007 0930 END :10/3/2007 1230 LOGGER : Shaun Whitworth



1- Ground elevation at well	9.0'
2- Top of casing elevation	8.60'
3- Wellhead protection cover type:	Flushmount
a) drain tube?	No
b) concrete pad dimensions	2 ft. Diameter Round
4- Dia./type of well casing	2" PVC Sch 40
5- Type/slot size of screen	2" Sch 40 PVC .01 slot
6- Type screen filter	#1 Filter Sand
a) Quantity used	
7- Type of Seal	Shur Plug 3/8" chips
a) Quantity used	
8- Grout	
a) Grout mix used	Portland cement/Bentonite
b) Method of placement	Tremie pipe
c) Vol. of well casing grout	
Development method	Whale Pump
Development time	1 hour
Estimated purge volume	55 gallons

Comments

PROJECT NUMBER	WELL NUMBER		
345721.SI.SI	LS11A-MW38D	SHEET 1	OF 1

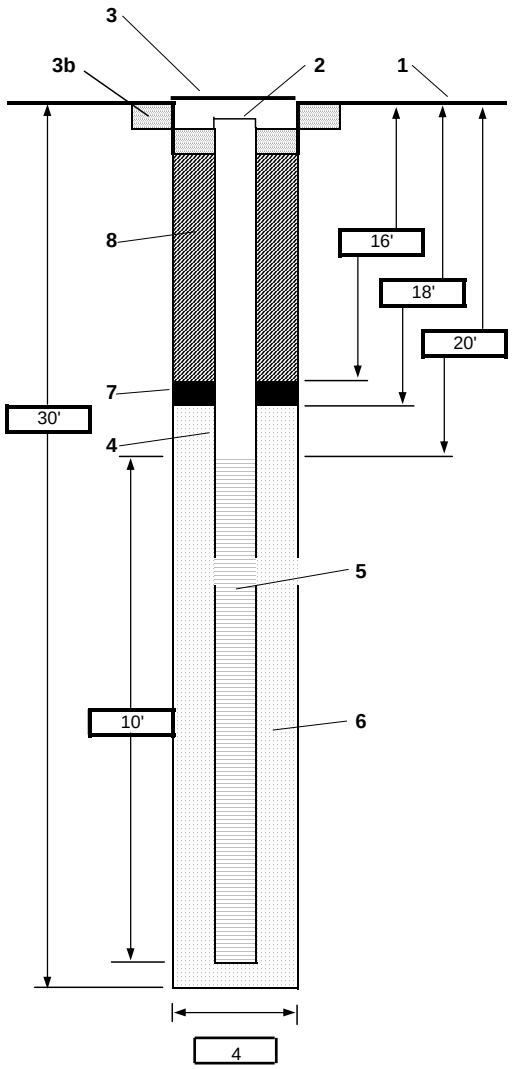
WELL COMPLETION DIAGRAM

PROJECT : CTO-125 LOCATION NAB Little Creek 11A

DRILLING CONTRACTOR : Parrat-Wolff NORTHING:3,501,400.38 EASTING:12,169,553.55

DRILLING METHOD AND EQUIPMENT USED : 4.25 in. hollow auger

WATER LEVELS : 7.1' bgs START : 10/4/2007 1305 END :10/4/2007 1600 LOGGER : Shaun Whitworth



1-	Ground elevation at well	9.4'
2-	Top of casing elevation	8.97'
3-	Wellhead protection cover type:	Flushmount
	a) drain tube?	No
	b) concrete pad dimensions	2 ft. Diameter Round
4-	Dia./type of well casing	2" PVC Sch 40
5-	Type/slot size of screen	2" Sch 40 PVC .01 slot
6-	Type screen filter	#1 Filter Sand
	a) Quantity used	
7-	Type of Seal	Shur Plug 3/8" chips
	a) Quantity used	
8-	Grout	
	a) Grout mix used	Portland cement/Bentonite
	b) Method of placement	Tremie pipe
	c) Vol. of well casing grout	
	Development method	Whale Pump
	Development time	2.25 hours
	Estimated purge volume	70 gallons

Comments

PROJECT NUMBER	WELL NUMBER		
345721.SI.SI	LS11A-MW39D	SHEET 1	OF 1

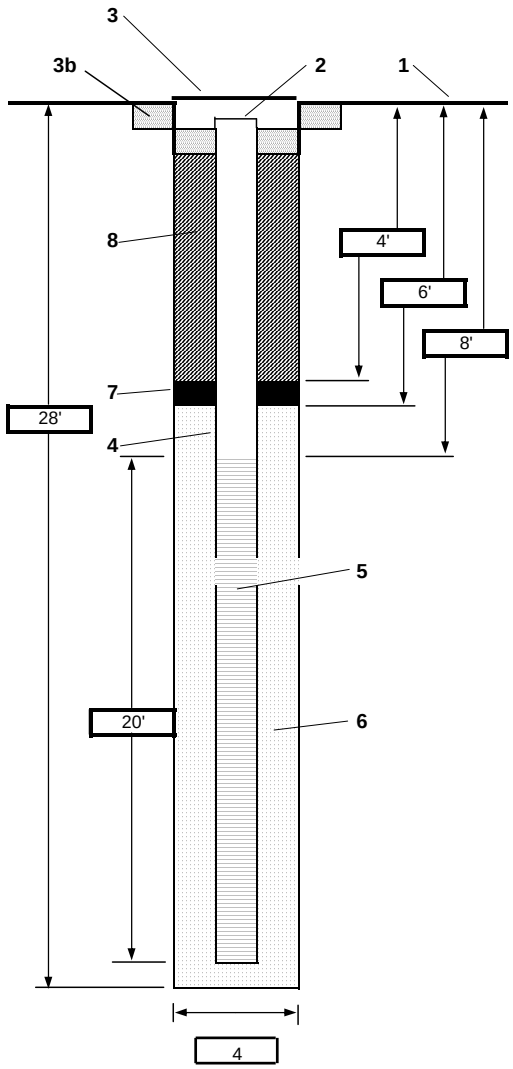
WELL COMPLETION DIAGRAM

PROJECT : CTO-125 LOCATION NAB Little Creek 11A

DRILLING CONTRACTOR : Parrat-Wolff NORTHING:3,501,307.42 EASTING:12,169,507.03

DRILLING METHOD AND EQUIPMENT USED : 4.25 in. hollow auger

WATER LEVELS : 9.4' bgs START : 10/4/2007 1655 END :10/4/2007 1930 LOGGER : Shaun Whitworth



1-	Ground elevation at well	9.1'
2-	Top of casing elevation	8.90'
3-	Wellhead protection cover type:	Flushmount
	a) drain tube?	No
	b) concrete pad dimensions	2 ft. Diameter Round
4-	Dia./type of well casing	2" PVC Sch 40
5-	Type/slot size of screen	2" Sch 40 PVC .01 slot
6-	Type screen filter	#1 Filter Sand
	a) Quantity used	
7-	Type of Seal	Shur Plug 3/8" chips
	a) Quantity used	
8-	Grout	
	a) Grout mix used	Portland cement/Bentonite
	b) Method of placement	Tremie pipe
	c) Vol. of well casing grout	
	Development method	Whale Pump
	Development time	0.5 hours
	Estimated purge volume	50 gallons

Comments

PROJECT NUMBER	WELL NUMBER		
345721.SI.SI	LS11A-MW40D	SHEET 1	OF 1

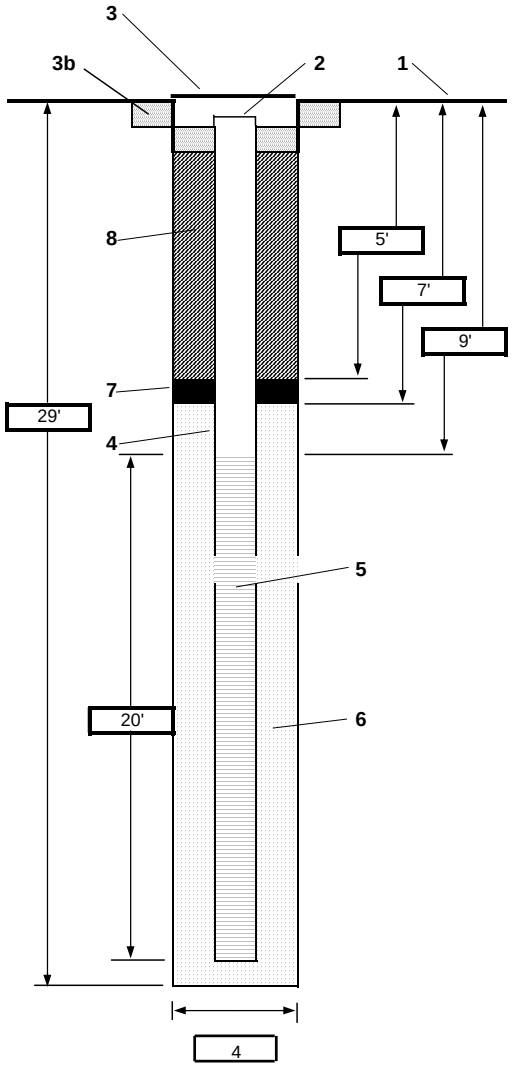
WELL COMPLETION DIAGRAM

PROJECT : CTO-125 LOCATION NAB Little Creek 11A

DRILLING CONTRACTOR : Parrat-Wolff NORTHING:3,501,525.19 EASTING:12,169,666.63

DRILLING METHOD AND EQUIPMENT USED : 4.25 in. hollow auger

WATER LEVELS : 7.5' bgs START : 10/5/2007 1415 END :10/5/2007 1615 LOGGER : Shaun Whitworth



1-	Ground elevation at well	9.6'
2-	Top of casing elevation	9.37'
3-	Wellhead protection cover type:	Flushmount
	a) drain tube?	No
	b) concrete pad dimensions	2 ft. Diameter Round
4-	Dia./type of well casing	2" PVC Sch 40
5-	Type/slot size of screen	2" Sch 40 PVC .01 slot
6-	Type screen filter	#1 Filter Sand
	a) Quantity used	
7-	Type of Seal	Shur Plug 3/8" chips
	a) Quantity used	
8-	Grout	
	a) Grout mix used	Portland cement/Bentonite
	b) Method of placement	Tremie pipe
	c) Vol. of well casing grout	
	Development method	Whale Pump
	Development time	1.00 hours
	Estimated purge volume	40 gallons

Comments

Appendix D
Data Validation Summaries

CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

December 29, 2007
SDG# 13921, CompuChem
NAB Little Creek- Site 11a

Dear Ms. Bennet,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG # 13921. The data validation was performed in accordance with the CLP OLC03.2 for low concentration volatiles. Also used in the validation of these samples were the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review) and the National Functional Guidelines for Low Concentration Organic Data Review (6/01). All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	LC-VOA
11A-DW619-0509-07C	1392101	water	X
11A-DW620-0509-07C	1392102	water	X
11A-DW621-0509-07C	1392103	water	X
11A-DW622-0509-07C	1392104	water	X
11A-DW622P-0509-07C	1392105	water	X
LS11A-TB100107	1392106	water	X

The following quality control samples were provided with this SDG: Sample 11A-DW622P-0509-07C was the field duplicate of sample 11A-DW622-0509-07C; Sample LS11A-TB100107-trip blank. All areas of concern are discussed in the body of the report and a summary of data qualification is provided. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- Initial/Continuing Calibrations *
- Blanks
- Internal Standards *
- Surrogates/DMC
- Laboratory Control Samples *
- Matrix Spike Recoveries NA
- Matrix Duplicate RPDs NA

- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *
- Tentatively Identified Compounds *

*- indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG that resulted in the rejection of data. All results rejected, R, should be considered unusable.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues for each fraction is presented in the following paragraphs. All results qualified as estimated J/UJ or biased high, K or biased low, L/UL, should be considered usable but estimated.

VOA

Blank contamination was noted in method, QC and holding blanks associated with samples in this batch. Qualifications were added to the data.

One sample exhibited low DMC recovery that resulted in qualifying the associated compounds as estimated.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 10/01/07 and samples were received at the laboratory 10/02/07. All sample preparation and analysis was performed within Region III holding time requirements.

Blanks

LC-VOA

The associated QC and holding blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table.

Blank ID	Compound	Concentration	Reporting Limit	Action Level
VHBLKXA	acetone	4.5J ug/L	5.0 ug/L	45 ug/L
LS11A-TB101107	acetone	3.8J	5.0	38
	methylene chloride	0.16J	0.5	1.6
LS11A-FB100207	acetone	6.0J	5.0	60

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Qual Code
11A-DW619-0509-07C, 11A-DW620-0509-07C, 11A-DW621-0509-07C, 11A-DW622P-0509-07C	acetone	B	BL
11A-DW619-0509-07C, 11A-DW620-0509-07C, 11A-DW621-0509-07C, 11A-DW622-0509-07C, 11A-DW622P-0509-07C	methylene chloride	B	BL

Deuterated Monitoring Compounds

LC-VOA

Sample 11A-DW622-0509 exhibited a low recovery for 2-hexanone-d5 at 32% recovery (QC limits 37-169%); therefore, all compounds associated with this DMC were qualified as estimated (J/UJ).

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff
President

Summary of Data Qualifications

VOA

Sample ID	Compound	Results	Q Flag	Qual code
11A-DW619-0509-07C, 11A-DW620-0509-07C, 11A-DW621-0509-07C, 11A-DW622P-0509-07C	acetone	+	B	BL
11A-DW619-0509-07C, 11A-DW620-0509-07C, 11A-DW621-0509-07C, 11A-DW622-0509-07C, 11A-DW622P-0509-07C	methylene chloride	+	B	BL
11A-DW622-0509	all compounds associated with: 2-hexanone-d5	+/-	J/UJ	SSL

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

IDL	Instrument Detection Limit
MDL	Method Detection Limit
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

December 30, 2007
SDG# 13922, CompuChem
NAB Little Creek- Site 11a

Dear Ms. Bennet,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG # 13922. The data validation was performed in accordance with the CLP OLM04.3 for volatiles, semivolatiles, and pesticides/PCBs and ILM05.4 for metals and cyanide. Also used in the validation of these samples were the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Data Review, 4/93, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3/IM-2 review), as applicable. The region does not have a validation document for the ILM05.4 methods so method criteria were substituted but Region III qualification conventions and qualifiers were used. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	VOA	SVOA	Pest/PCB	Metals/CN
LS11A-SB-623-0103-07C	1392203	soil	X	X	X	X
LS11A-SB-625-0103-07C	1392204	soil	X	X	X	X
LS11A-SB-627-0103-07C	1392208	soil	X	X	X	X
LS11A-SB-628-0103-07C	1392210	soil	X	X	X	X
LS11A-SB-629-0103-07C	1392212	soil	X	X	X	X
LS11A-SB-630-0103-07C	1392214	soil	X	X	X	X
LS11A-SS623-07C	1392202	soil	X	X	X	X
LS11A-SS625-07C	1392201	soil	X	X	X	X
LS11A-S625P-07C	1392205	soil	X	X	X	X
LS11A-SS627-07C	1392207	soil	X	X	X	X
LS11A-SS628-07C	1392209	soil	X	X	X	X
LS11A-SS629-07C	1392211	soil	X	X	X	X
LS11A-SS630-07C	1392213	soil	X	X	X	X
LS11A-SS625-07C MS	152073	soil	X	X	X	X
LS11A-SS625-07C MSD	152074	soil	X	X	X	X

The following quality control samples were provided with this SDG: sample LS11A-SS625P-07C was the field duplicate of sample LS11A-SS625-07C. Associated field QC blanks were analyzed in SDG 13928. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- Initial/Continuing Calibrations
- CRI Standards *
- Interference Check Sample *
- Blanks
- Internal Standards *
- Surrogates
- Laboratory Control Samples *
- Matrix Spike Recoveries
- Matrix Duplicate RPDs
- Post Digestion Spike Recoveries *
- Serial Dilutions
- Field Duplicates
- Identification/Quantitation
- Reporting Limits *

*- indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG that resulted in the rejection of data. All results rejected, R, should be considered unusable. These rejections were the result of necessary dilution analyses and did not result in the loss of viable data points.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues for each fraction is presented in the following paragraphs. All results qualified as estimated J/UJ or biased high, K or biased low, L/UL, should be considered usable but estimated. When more than one qualifier is associated with a compound/analyte the validator has chosen the qualifier that best indicates possible bias in the results and flagged the data accordingly. However, information regarding all quality control issues is provided in the body of the report and on the qualification summary page.

VOA

Blank contamination was noted in field QC blanks associated with samples in this batch. Qualifications were added to the data.

SVOA

One of the continuing calibrations exhibited high %Ds for 2,4-dinitrophenol, which resulted in the qualification of this compound as estimated in several samples.

Blank contamination was noted in method blank associated with samples in this batch. Qualifications were added to the data.

One sample exhibited low surrogate recoveries for two of the base/neutral surrogates. Therefore, all base/neutral compounds were qualified as biased low in that sample.

One sample required a dilution to obtain results within the calibration range.

Pesticides/PCBs

The field duplicate pair exhibited two compounds with non-compliant RPDs. These results were flagged as estimated J.

One sample required a dilution to obtain a result within the calibration range.

All results that were reported with a P flag to indicate column quantitation %Ds greater than 25% were qualified as estimated J.

Metals

Blank contamination was noted in the laboratory and field QC blanks associated with the samples in this batch. Qualifications were added to the data. Specific information is provided below. Please note that field QC blanks were not flagged for laboratory blank contamination per CH2M HILL.

The matrix spike associated with the soil samples exhibited non-compliant %Rs for the analytes antimony and selenium. The results for these analytes were flagged as biased low L/UL in the soil samples. Please note that although the recovery for antimony was below 30%, the PDS was acceptable. For this reason, the non-detect results for antimony were not rejected. Please note that antimony was flagged B due to blank contamination in two samples. The B flag is used instead of the L flag in this case.

The matrix duplicate associated with the soil samples exhibited non-compliant %Ds for the analytes arsenic and manganese. The results for these analytes were flagged as estimated J/UJ in the soil samples.

The serial dilution associated with the soil samples exhibited a non-compliant %D for the analyte potassium. The result for this analyte was flagged as estimated J/UJ in the soil samples.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 10/01-02/07 and samples were received at the laboratory 10/02-03/07. All sample preparation and analysis was performed within Region III and/or method holding time requirements.

Initial/Continuing Calibration

SVOA

Calibration standards exhibited %Ds that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag	Q Code
CC 10/10/07	2,4-dinitrophenol	50.6%	LS11A-SS628-07C, LS11A-SB628-0103-07C, LS11A-SS629-07C, LS11A-SB629-0103-07C, LS11A-SS630-07C, LS11A-SB630-010307C	J/UJ	CCH

Blanks

VOA

The associated field QC blanks exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table.

Blank ID	Compound	Concentration	Reporting Limit	Action Level
LS11A-TB100207	acetone	3J ug/L	10 ug/L	30 ug/L
LS11A-EB100207	acetone	6J	10	60
LS11A-FB100207	acetone	6J	10	60

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Q Code
LS11A-SB-623-103-07C, LS11A-SB-625-0103-07C, LS11A-SB629-0103-07C, LS11A-SS623-07C, LS11A-SS629-07CLS11A-SS630-07C	acetone	B	BL

SVOA

The associated method blank exhibited contamination as noted in the following table. Compounds for which there was no action required, are not included in the following table.

Blank ID	Compound	Concentration	Reporting Limit	Action Level
SBLKAZ	acetophenone	97J ug/Kg	330 ug/Kg	485 ug/Kg

Associated samples and required qualifications are noted in the following table.

Sample ID	Compound	Q Flag	Q Code
LS11A-SB623-0103-07C, LS11A-SB625-0103-07C, LS11A-SB627-0103-07C, LS11A-SB628-0103-07C, LS11A-SB629-0103-07C, LS11A-SB630-0103-07C, LS11A-SS623-07C, LS11A-SS625-07C, LS11A-SS625P-07C, LS11A-SS627-07C, LS11A-SS628-07C, LS11A-SS629-07C, LS11A-SS630-07C	acetophenone	B	BL

The associated method blanks exhibited contamination for TICs. All B flagged TICs in the field samples are flagged B and crossed out in accordance with the Region III modifications to the National Functional Guidelines.

Metals

Preparation blank contamination was noted for which qualifications were required. Contamination and sample results qualifications are indicated in the following tables.

Blank ID	Analyte	Concentration	Action Level	Q Flag
PBLK	antimony	0.286J ug/L	1.43 ug/L	B
	sodium	23.168J ug/L	115.84 ug/L	B

Sample ID	analyte	Q Flag	Q Code
LS11A-SB630-0103-07C, LS11A-SS625P-07C	antimony	B	BL
all samples	sodium	B	BL

Surrogates

SVOA

Sample LS11A-SB627-07C exhibited low surrogate recoveries for 2-flurorbiphenyl at 27% (QC limit 30-115%) and 1,2-dichlorobenzene-d4 at 19% (QC limit 20-130%);

therefore, all base/neutral fraction compounds were qualified as biased low (L/UL), qualifier code: SSL.

Matrix Spike Recoveries

Metals

The matrix spike analysis of the sample LS11A-SS625-07C exhibited non-compliant %Rs (<75% or >125%) for the analytes antimony and selenium. Specific action is noted in the following table. The PDS was acceptable for both analytes so non-detect results for antimony were not rejected.

MS	Analytes	Samples Affected	%R	Q Flag	Q Code
LS11A-SS625-07C	antimony	all samples	23%	L/UL	MSL
	selenium		69%		

Matrix Duplicates

Metals

The matrix duplicate analysis of the sample LS11A-SS625-07C exhibited non-compliant %Ds (>20%) for the analytes arsenic and manganese. Specific action is noted in the following table.

MD	Analytes	Samples Affected	%D	Q Flag	Q Code
LS11A-SS625-07C	arsenic	all samples	53%	J/UJ	MDP
	manganese		21%		

Serial Dilution

Metals

The serial dilution analysis of the sample LS11A-SS625-07C exhibited a non-compliant %D (>10%) for the analyte potassium. Specific action is noted in the following table.

SD	Analytes	Samples Affected	%D	Q Flag	Q Code
LS11A-SS625-07C	potassium	all samples	12%	J/UJ	SD

Field Duplicates

Pesticides/PCBs

Please note that the field duplicate pair of samples LS11A-SS625-07C/LS11A-SS625-07C exhibited RPDs greater than 50% for the target compounds 4,4'-DDE and 4,4'-DDT. The results for these two compounds were qualified as estimated J in both the field sample and duplicate with a qualifier code of FD.

Identification/Quantitation

SVOA

A dilution was required for sample LS11A-SS629-07C to obtain results within the calibration range; therefore, E-flagged compound results were not used in the initial analysis in favor of the corresponding D-flagged compound result in the dilution.

Pesticides/PCBs

A dilution was required for sample LS11A-SS628-07C to obtain one result within the calibration range; therefore, the E-flagged compound result was not used in the initial analysis in favor of the corresponding D-flagged compound result in the dilution.

All P flagged compounds were qualified as estimated J with a qualifier code of 2C, to indicate column quantitation %Ds greater than 25%.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff
President

Jacqueline Cleveland
Vice-President

Summary of Data Qualifications

VOA

Sample ID	Compound	Results	Q Flag	Q code
LS11A-SB-623-103-07C, LS11A-SB-625-0103-07C, LS11A-SB629-0103-07C, LS11A-SS623-07C, LS11A-SS629-07CLS11A-SS630-07C	acetone	+	B	BL

SVOA

Sample ID	Compound	Results	Q Flag	Q code
LS11A-SS628-07C, LS11A-SB628-0103-07C, LS11A-SS629-07C, LS11A-SB629-0103-07C, LS11A-SS630-07C, LS11A-SB630-010307C	2,4-dinitrophenol	+/-	J/UJ	CCH
LS11A-SB623-0103-07C, LS11A-SB625-0103-07C, LS11A-SB627-0103-07C, LS11A-SB628-0103-07C, LS11A-SB629-0103-07C, LS11A-SB630-0103-07C, LS11A-SS623-07C, LS11A-SS625-07C, LS11A-SS625P-07C, LS11A-SS627-07C, LS11A-SS628-07C, LS11A-SS629-07C,LS11A-SS630-07C	acetophenone	+	B	BL
all samples	“B” flagged TICs	+	B	BL
LS11A-SB627-07C	all base/neutral compounds	+/-	L/UL	SSL
LS11A-SS629-07C	all E-flagged compounds	+	R	DL
LS11A-SS629-07C DL	all compounds except D-flagged results	+/-	R	DL

Pesticides/PCBs

Sample ID	Compound	Results	Q Flag	Q code
LS11A-SS625-07C, LS11A-SS625P-07C	4,4’-DDE, 4,4’-DDT	+	J	FD
LS11A-SS628-07C	all E-flagged compounds	+	R	DL
LS11A-SS628-07C DL	all compounds except D-flagged results	+/-	R	DL
all samples	all compounds	+P	J	2C

Metals

Sample ID	Analyte	Results	Q Flag	Q code
LS11A-SB630-0103-07C, LS11A-SS625P-07C	antimony	+ up to action limit	B	BL
all samples	sodium	+ up to action limit	B	BL
all samples	antimony	+/-	L/UL	MSL
	selenium			
all samples	arsenic	+/-	J/UJ	MDP
	manganese			
all samples	potassium	+/-	J/UJ	SD

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

IDL	Instrument Detection Limit
MDL	Method Detection Limit
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
Q Code	Qualifier Code
Q Flag	Qualifier Flag
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report
%Sol	High percent moisture

CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

December 29, 2007
SDG# 13923, CompuChem
NAB Little Creek- Site 11a

Dear Ms. Bennet,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG # 13923. The data validation was performed in accordance with the CLP OLM04.3 for volatiles. Also used in the validation of these samples were the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3 review). All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	VOA
LS11A-SB627-0612-07C	1392304	soil	X
LS11A-SB627-2028-07C	1392305	soil	X
LS11A-SB628-0612-07C	1392302	soil	X
LS11A-SB628-2028-07C	1392301	soil	X
LS11A-SB628P-2028-07C	1392303	soil	X
LS11A-SB629-0612-07C	1392308	soil	X
LS11A-SB629-2028-07C	1392309	soil	X
LS11A-SB630-0612-07C	1392311	soil	X
LS11A-SB630-2028-07C	1392312	soil	X
LS11A-SB628-2028-07C MS	152080	soil	X
LS11A-SB628-2028-07C MSD	152081	soil	X

The following quality control samples were provided with this SDG: Sample LS11A-SB628P-2080-07C was the field duplicate of sample LS11A-SB628-2080-07C. All areas of concern are discussed in the body of the report and a summary of data qualification is provided. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- Initial/Continuing Calibrations
- Blanks *
- Internal Standards *
- Surrogates *
- Laboratory Control Samples NA

- Matrix Spike Recoveries *
- Matrix Duplicate RPDs *
- Field Duplicates *
- Identification/Quantitation *
- Reporting Limits *

*- indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG that resulted in the rejection of data. All results rejected, R, should be considered unusable.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues for each fraction is presented in the following paragraphs. All results qualified as estimated J/UJ or biased high, K or biased low, L/UL, should be considered usable but estimated.

VOA

The continuing calibration exhibited high %Ds for acetone which resulted in qualifying this compound as estimated all samples.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 10/02/07 and samples were received at the laboratory 10/03/07. All sample preparation and analysis was performed within Region III holding time requirements.

Initial/Continuing Calibration

SVOA

Calibration standards exhibited %Ds that were non-compliant. A summary of these non-compliances and affected samples are noted in the following table. Sample results are qualified as indicated.

Standard ID	Compound(s)	RRF, %RSD, %D	Samples	Q Flag	Qualifier Code
CC 10/09/07	acetone	50.1%	all samples	J/UJ	CCH

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff
President

Summary of Data Qualifications

VOA

Sample ID	Compound	Results	Q Flag	Qual code
all samples	acetone	+/-	J/UJ	CCH

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

General Abbreviations

IDL	Instrument Detection Limit
MDL	Method Detection Limit
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report

CH2M HILL
5700 Cleveland Street
Suite 101
Virginia Beach, Virginia 23462

December 31, 2007
SDG# 13928, CompuChem
NAB Little Creek- Site 11a

Dear Ms. Bennet,

The following Data Validation report is provided as requested for the parameters noted in the table below for SDG # 13928. The data validation was performed in accordance with the CLP OLM04.3 for volatiles, semivolatiles, and pesticides/PCBs and ILM05.4 for metals. Also used in the validation of these samples were the Region III Modifications to the National Functional Guidelines for Organic Data Review, 9/94, and the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Data Review, 4/93, (as referred by the Region III document Innovative Approaches to Data Validation, 6/95, for Level M3/IM-2 review), as applicable. The region does not have a validation document for the ILM05.4 methods so method criteria were substituted but Region III qualification conventions and qualifiers were used. All areas of concern are discussed in the body of the report and a summary of data qualifications is provided.

Sample ID	Lab ID	Matrix	VOA	SVOA	Pest/PCB	Metals
LS11A-EB100207	1392802	water	X	X	X	X
LS11A-FB100207	1392801	water	X	X	X	X
LS11A-TB100207	1392803	water	X			

All areas of concern are discussed in the body of the report and a summary of data qualification is provided. The samples were evaluated based on the following criteria:

- Data Completeness *
- Technical Holding Times *
- Initial/Continuing Calibrations *
- CRI Standards *
- Interference Check Sample *
- Blanks *
- Internal Standards *
- Surrogates *
- Laboratory Control Samples *
- Matrix Spike Recoveries NA
- Matrix Duplicate RPDs NA
- Post Digestion Spike Recoveries NA

- Serial Dilutions NA
- Field Duplicates NA
- Identification/Quantitation *
- Reporting Limits *

*- indicates that no qualifications were required based on this criteria

Overall Evaluation of Data/Potential Usability Issues

Specific details regarding qualification of the data are addressed in the Specific Evaluation section of this narrative. If an issue is not addressed there were no actions required based on unmet quality criteria.

Major Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG that resulted in the rejection of data. All results rejected, R, should be considered unusable.

Minor Problems

Issues requiring qualification of the analytical data were found in the validation of this SDG. A summary of these issues for each fraction is presented in the following paragraphs. All results qualified as estimated J/UJ or biased high, K or biased low, L/UL, should be considered usable but estimated. When more than one qualifier is associated with a compound/analyte the validator has chosen the qualifier that best indicates possible bias in the results and flagged the data accordingly. However, information regarding all quality control issues is provided in the body of the report and on the qualification summary page.

VOA

No qualifications to the data were required.

SVOA

No qualifications to the data were required.

Pesticides/PCBs

No qualifications to the data were required.

Metals

No qualifications to the data were required.

Specific Evaluation of Data

Data Completeness

The SDG was received complete and intact. Resubmissions were not required.

Technical Holding Times

According to chain of custody records, sampling was performed on 10/02/07 and samples were received at the laboratory 10/03/07. All sample preparation and analysis was performed within Region III and/or method holding time requirements.

A summary of qualifications required is provided on the following page. Please do not hesitate to contact DataQual ES with any questions regarding this validation report.

Sincerely,

Laura Maschhoff
President

Jacqueline Cleveland
Vice-President

Summary of Data Qualifications

NO QUALIFICATIONS WERE REQUIRED

Glossary of Qualification Flags and Abbreviations

Qualification Flags (Q-Flags)

U	not detected above the reported sample quantitation limit
J	estimated value
UJ	reported quantitation limit is qualified as estimated
R	result is rejected; the presence or absence of the analyte cannot be verified
D	result value is based on dilution analysis result
NJ	analyte has been tentatively identified, estimated value
L	analyte present, biased low
UL	not detected, quantitation limit is probably higher
K	analyte present, biased high
Q	estimated dioxin/furan concentration
I	interferences present which may cause the results to be biased high

Method Blank Qualification Flags (Q-Flags)

NA	The sample result for the blank contaminant is greater than the sample RL and is greater than 5X the blank value. The sample result for the blank contaminant is not qualified with any blank qualifiers.
B	The sample result for the blank contaminant is less than or greater than the sample RL and is less than 5X the blank value. The sample result for the blank contaminant is qualified as B at the compound value reported.

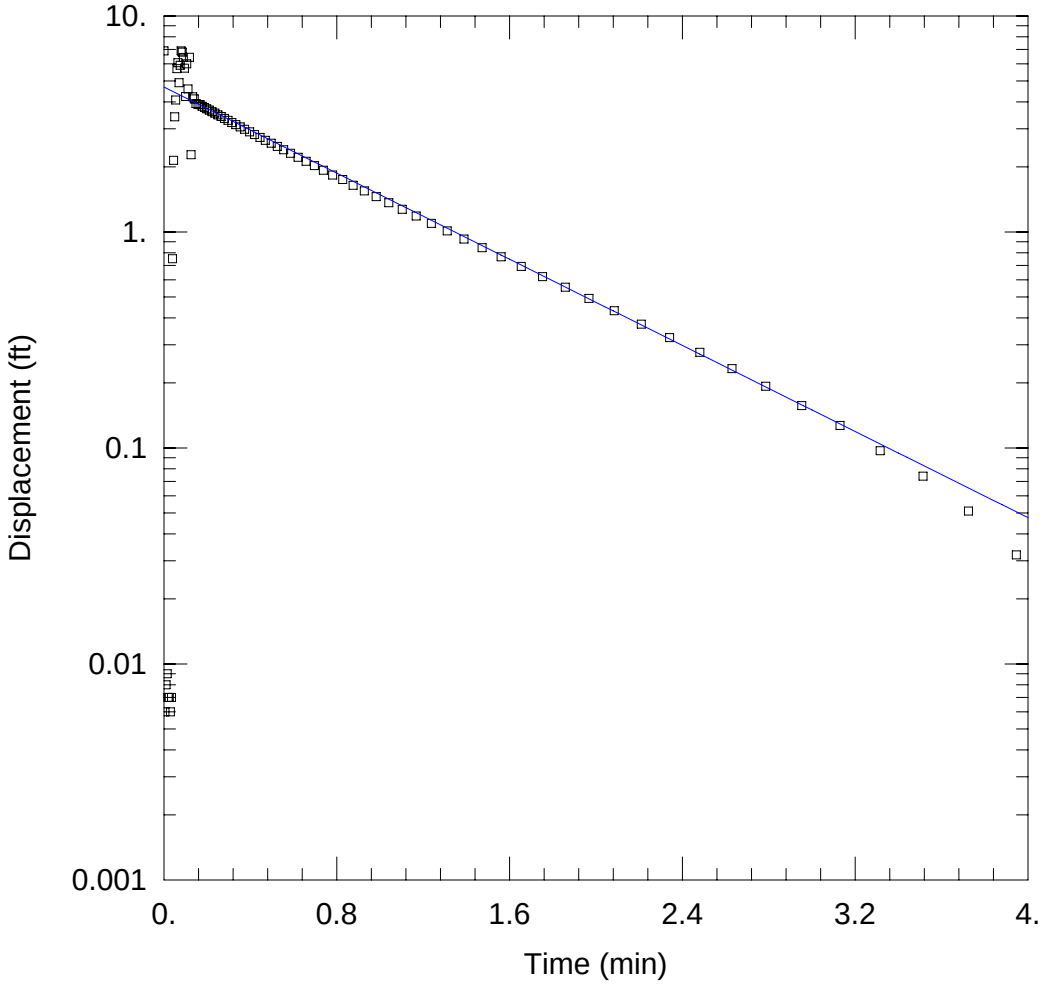
General Abbreviations

IDL	Instrument Detection Limit
MDL	Method Detection Limit
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
Q Code	Qualifier Code
Q Flag	Qualifier Flag
+	positive result
-	non-detect result

QUALIFIER CODE REFERENCE

Qualifier	Description
TN	Tune
BSL	Blank Spike/LCS - Low Recovery
BSH	Blank Spike/LCS - High Recovery
BD	Blank Spike/Blank Spike Duplicate (LCS/LCSD) Precision
BRL	Below Reporting Limit
EMPC	Estimated Possible Maximum Concentration
ISL	Internal Standard - Low Recovery
ISH	Internal Standard - High Recovery
MSL	Matrix Spike and/or Matrix Spike Duplicate - Low Recovery
MSH	Matrix Spike and/or Matrix Spike Duplicate - High Recovery
MI	Matrix interference obscuring the raw data
MDP	Matrix Spike/Matrix Spike Duplicate Precision
2S	Second Source - Bad reproducibility between tandem detectors
SSL	Spiked Surrogate - Low Recovery
SSH	Spiked Surrogate - High Recovery
SD	Serial Dilution Reproducibility
ICL	Initial Calibration - Low Relative Response Factors (RRF)
ICH	Initial Calibration - High Relative Response Factors (RRF)
ICB	Initial Calibration - Bad Linearity or Curve Function
CCL	Continuing Calibration - Low Recovery or %Difference
CCH	Continuing Calibration - High Recovery or %Difference
LD	Lab Duplicate Reproducibility
HT	Holding Time
PD	Pesticide Degradation
2C	Second Column - Poor Dual Column Reproducibility
LR	Concentration Exceeds Linear Range
BL	Blank Contamination- MBL, EBL, FBL, TBL
RE	Redundant Result - due to Re-analysis or Re-extraction
DL	Redundant Result - due to Dilution
FD	Field Duplicate
OT	Other - explained in data validation report
%Sol	High percent moisture

Appendix E
Slug Test Data



LS11-MW15D FALLING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW15DF1.aqt
Date: 02/19/08 Time: 16:17:58

AQUIFER DATA

Saturated Thickness: 13.24 ft Anisotropy Ratio (Kz/Kr): 1.

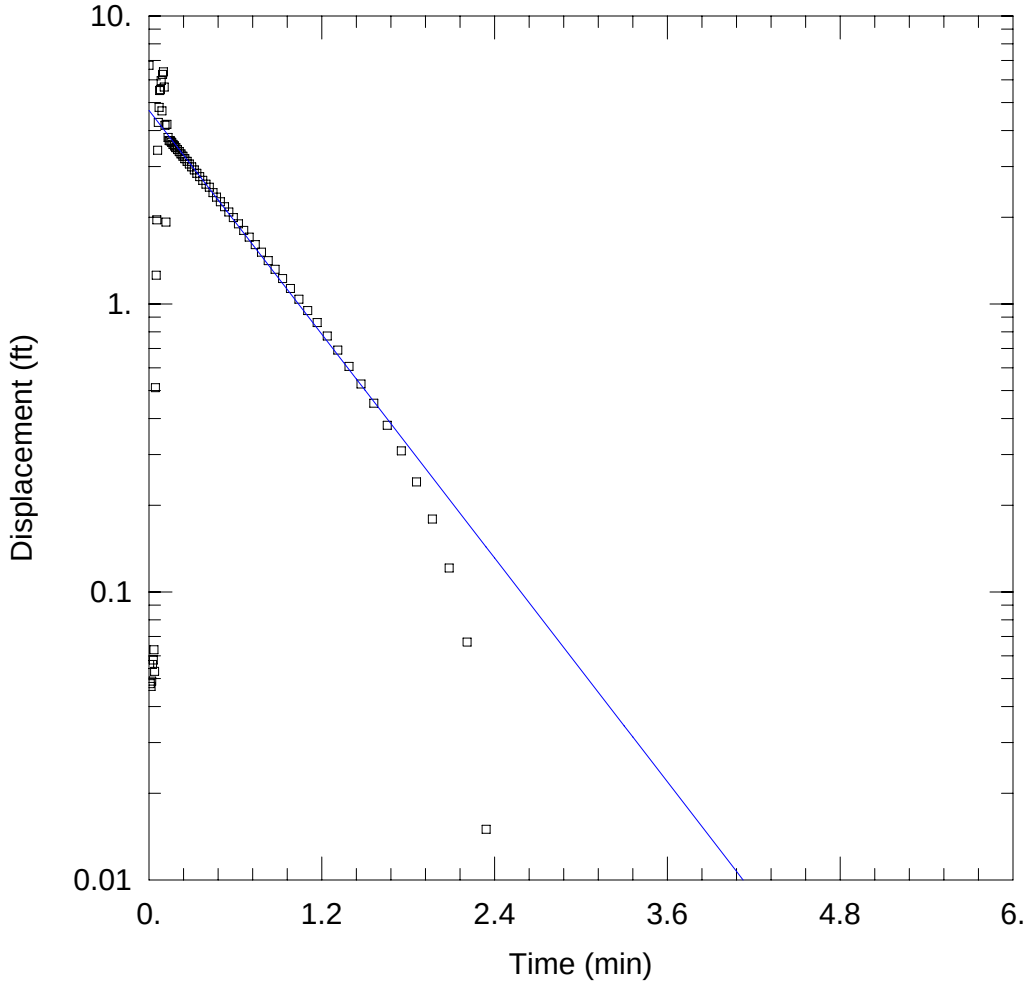
WELL DATA (MW15D)

Initial Displacement: 6.885 ft Static Water Column Height: 14.74 ft
Total Well Penetration Depth: 14.74 ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.226 ft/day y0 = 4.685 ft



LS11-MW15D FALLING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW15DF2.aqt
Date: 02/19/08 Time: 16:17:15

AQUIFER DATA

Saturated Thickness: 13.24 ft Anisotropy Ratio (Kz/Kr): 1.

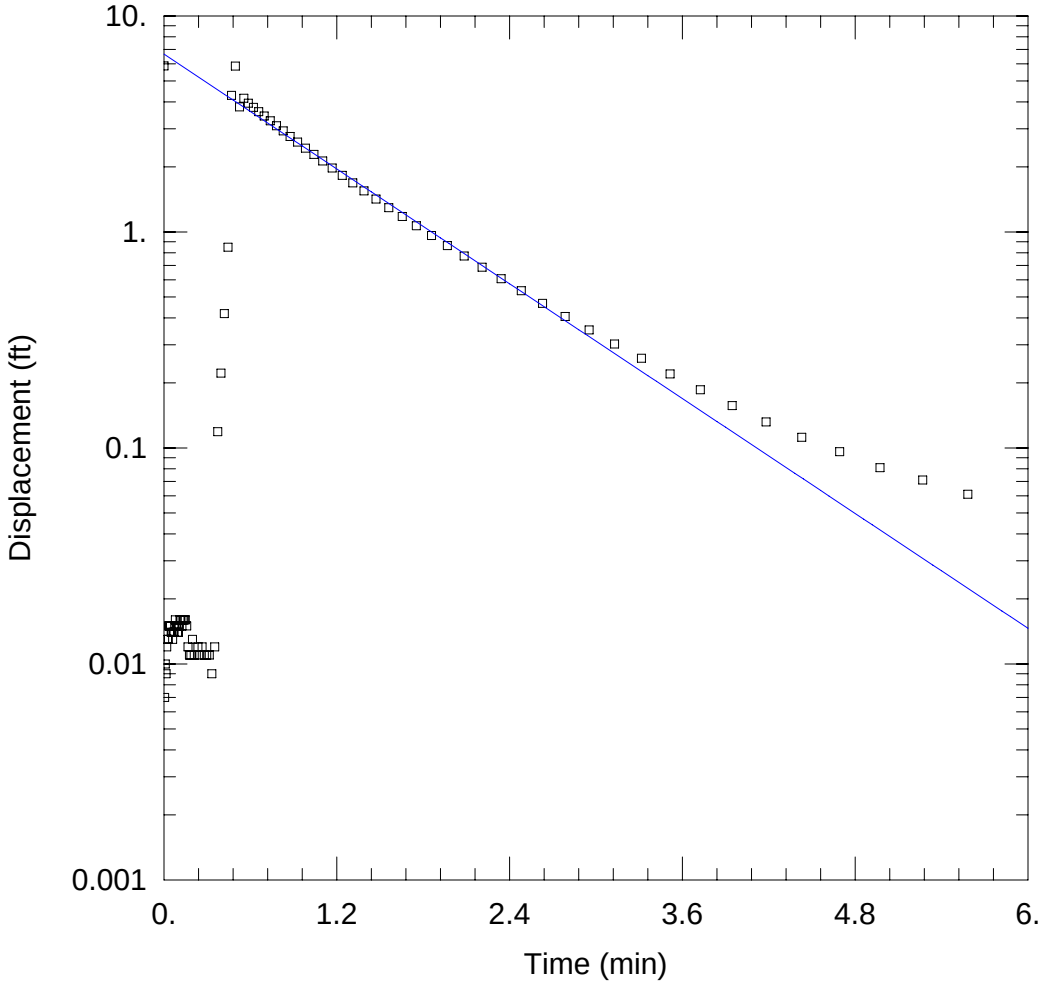
WELL DATA (MW15D)

Initial Displacement: 6.742 ft Static Water Column Height: 14.74 ft
Total Well Penetration Depth: 14.74 ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 4.192 ft/day y0 = 4.698 ft



LS11-MW15D FALLING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW15DF3.aqt
Date: 02/19/08 Time: 16:16:43

AQUIFER DATA

Saturated Thickness: 13.24 ft Anisotropy Ratio (Kz/Kr): 1.

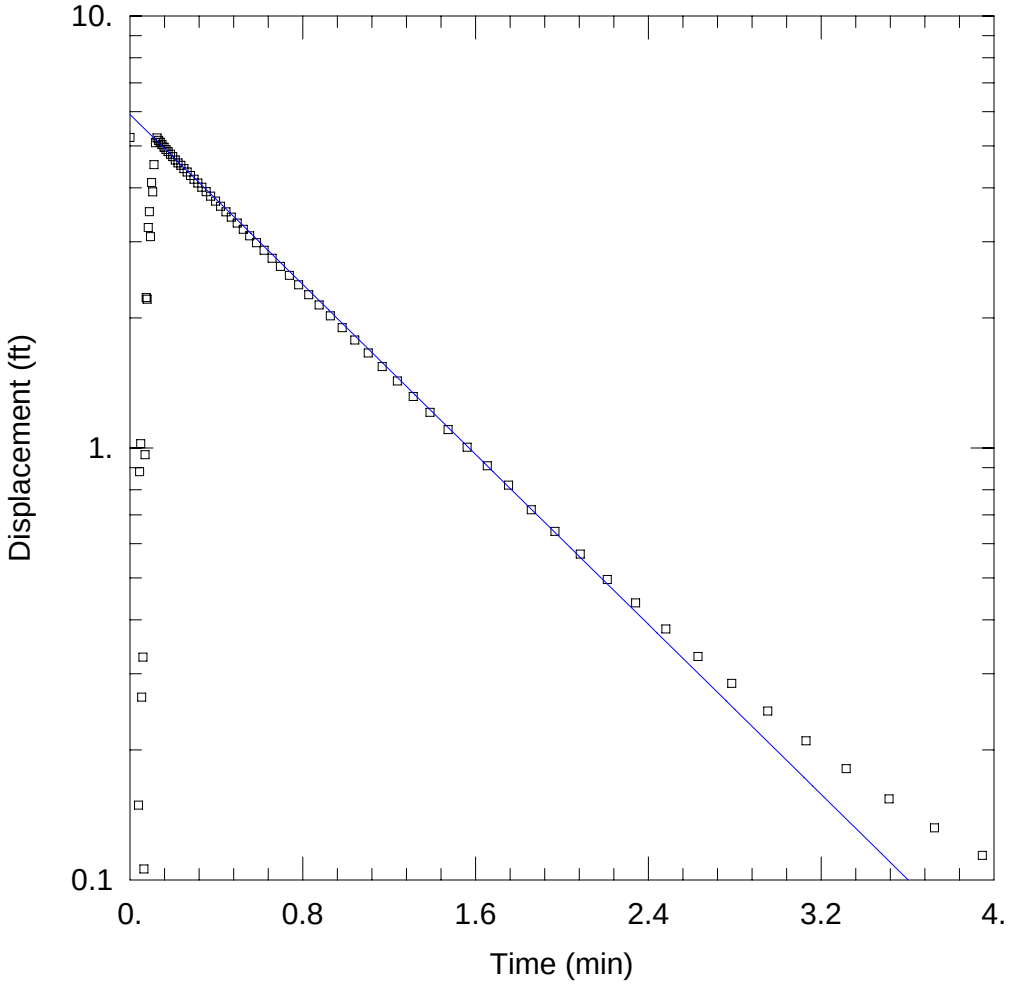
WELL DATA (MW15D)

Initial Displacement: 5.864 ft Static Water Column Height: 14.74 ft
Total Well Penetration Depth: 14.74 ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 2.867 ft/day y0 = 6.653 ft



LS11-MW15D RISING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW15DR1.aqt
Date: 02/19/08 Time: 16:15:31

AQUIFER DATA

Saturated Thickness: 13.24 ft Anisotropy Ratio (Kz/Kr): 1.

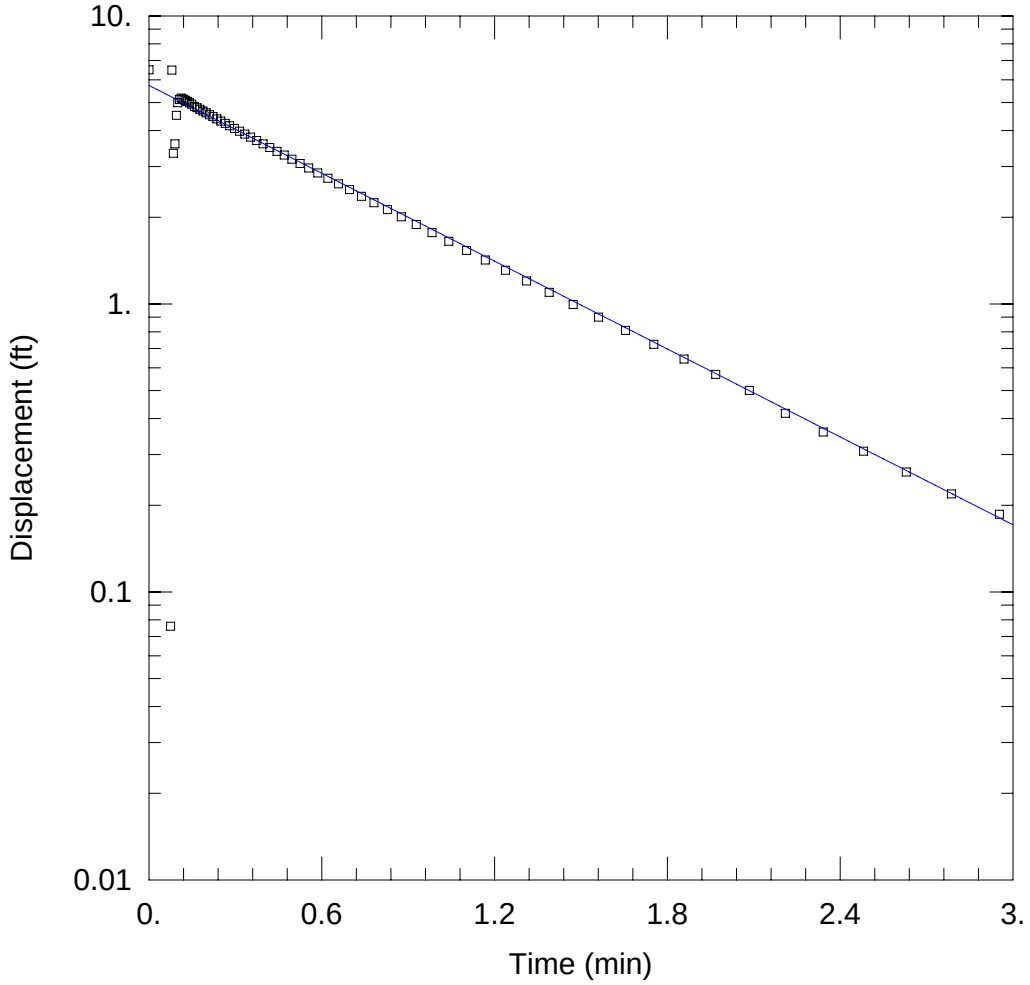
WELL DATA (MW15D)

Initial Displacement: 5.234 ft Static Water Column Height: 14.74 ft
Total Well Penetration Depth: 14.74 ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.183 ft/day y0 = 5.912 ft



LS11-MW15D RISING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW15DR2.aqt
Date: 02/19/08 Time: 16:14:47

AQUIFER DATA

Saturated Thickness: 13.24 ft Anisotropy Ratio (Kz/Kr): 1.

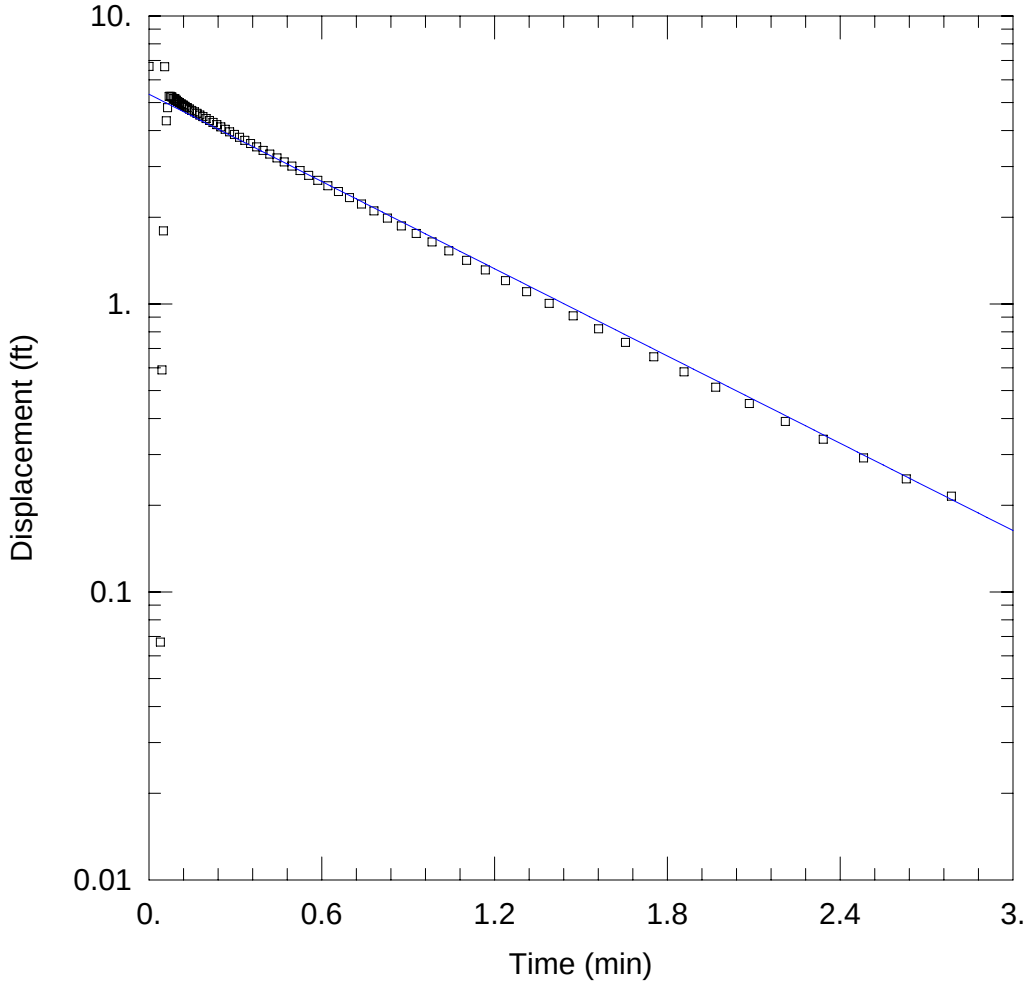
WELL DATA (MW15D)

Initial Displacement: 6.498 ft Static Water Column Height: 14.74 ft
Total Well Penetration Depth: 14.74 ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.291 ft/day y0 = 5.737 ft



LS11-MW15D RISING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW15DR3.aqt
Date: 02/19/08 Time: 16:14:06

AQUIFER DATA

Saturated Thickness: 13.24 ft Anisotropy Ratio (Kz/Kr): 1.

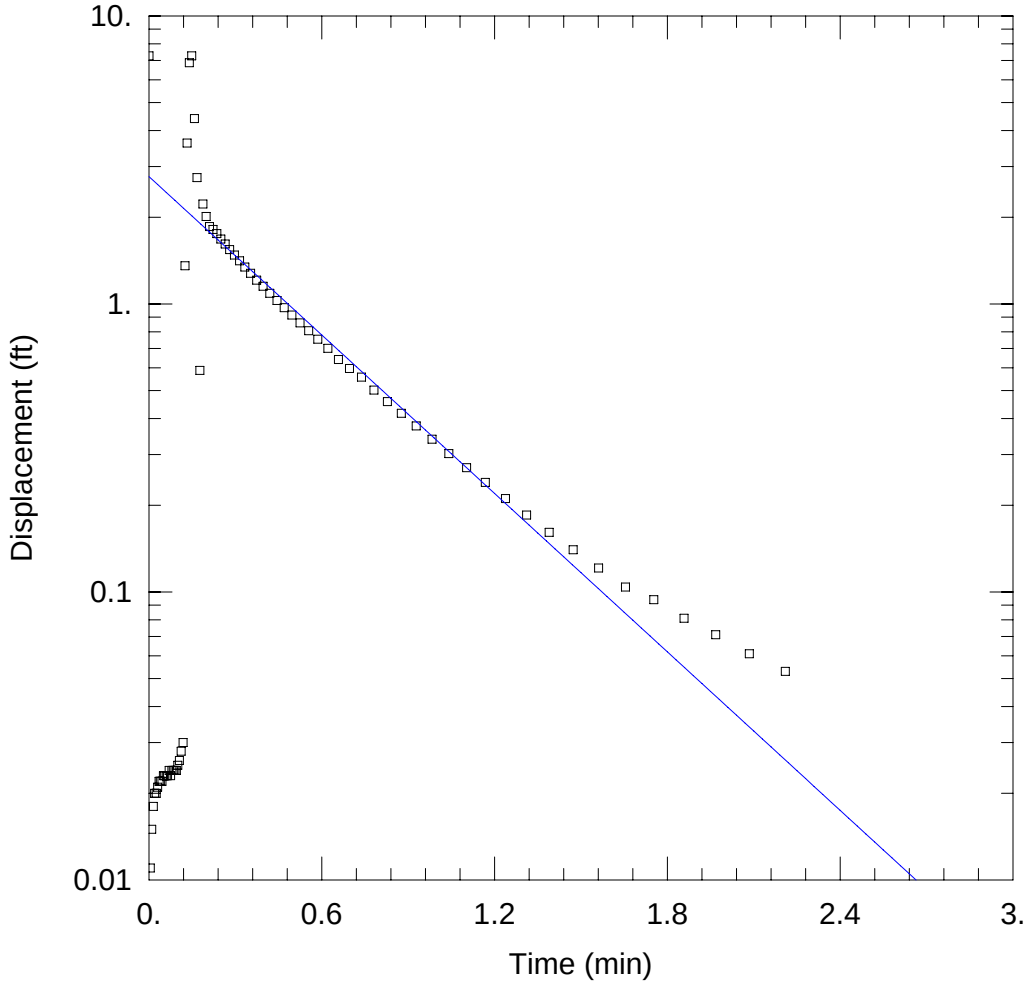
WELL DATA (MW15D)

Initial Displacement: 6.676 ft Static Water Column Height: 14.74 ft
Total Well Penetration Depth: 14.74 ft Screen Length: 5. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.268 ft/day y0 = 5.345 ft



LS11-MW20D FALLING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW20DF1.aqt
Date: 02/19/08 Time: 16:13:07

AQUIFER DATA

Saturated Thickness: 18.5 ft Anisotropy Ratio (Kz/Kr): 1.

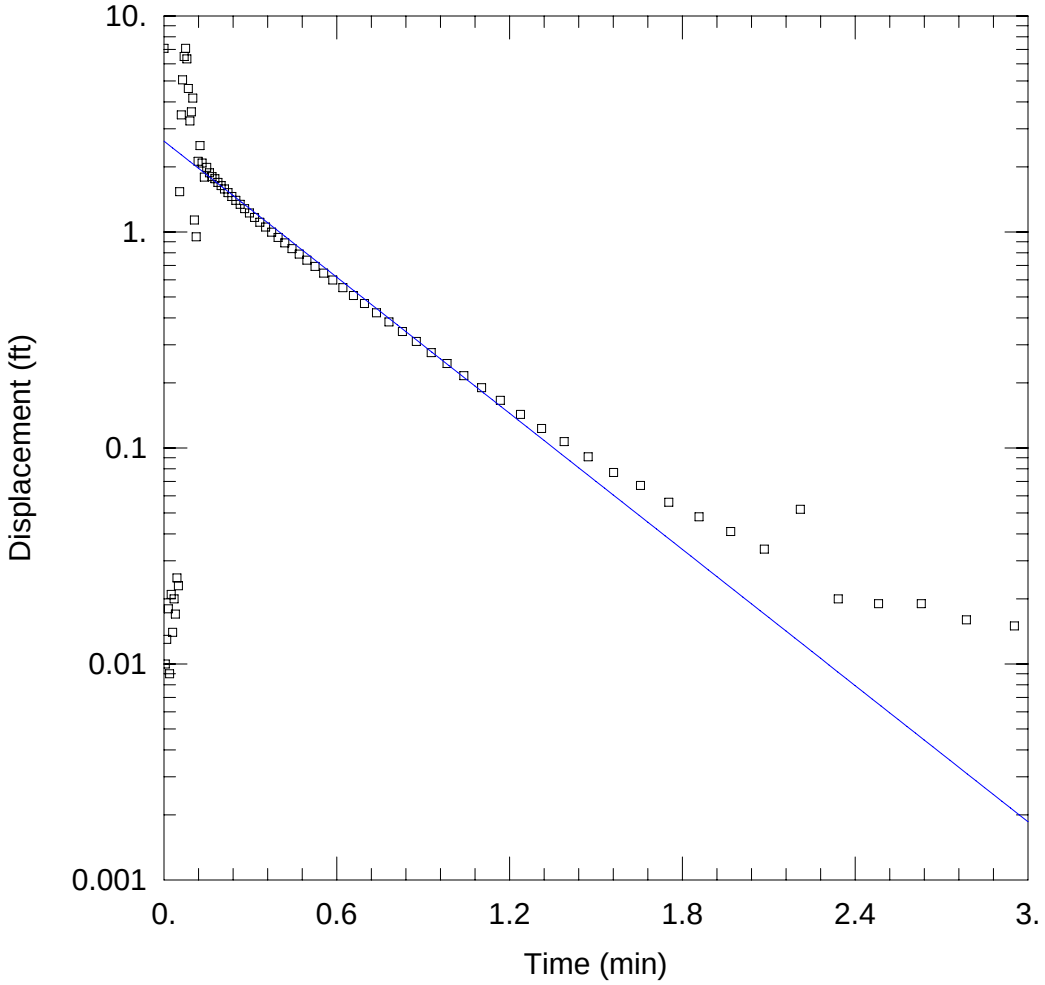
WELL DATA (MW20D)

Initial Displacement: 7.27 ft Static Water Column Height: 19. ft
Total Well Penetration Depth: 19. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.362 ft/day y0 = 2.768 ft



LS11-MW20D FALLING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW20DF2.aqt
Date: 02/19/08 Time: 16:12:13

AQUIFER DATA

Saturated Thickness: 18.5 ft Anisotropy Ratio (Kz/Kr): 1.

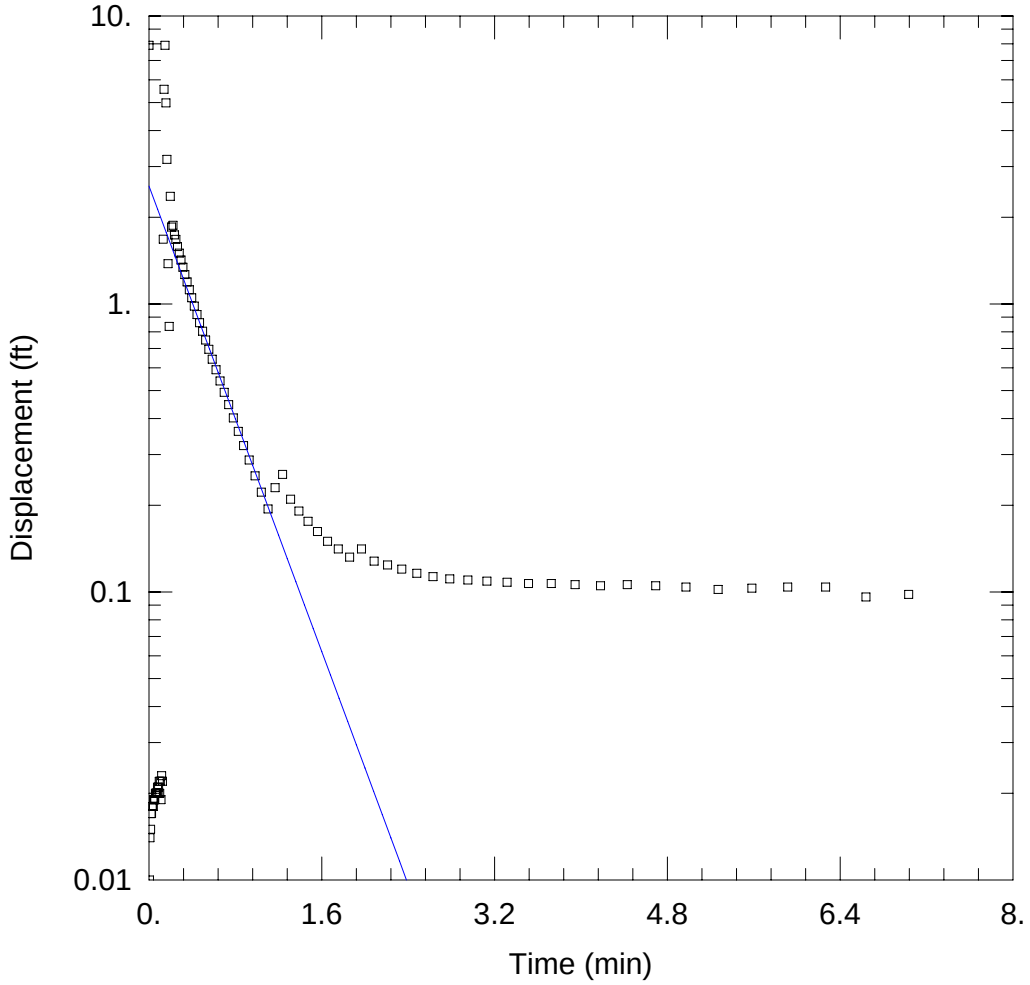
WELL DATA (MW20D)

Initial Displacement: 7.081 ft Static Water Column Height: 19. ft
Total Well Penetration Depth: 19. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.852 ft/day y0 = 2.633 ft



LS11-MW20D FALLING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW20DF3.aqt
Date: 02/19/08 Time: 16:37:35

AQUIFER DATA

Saturated Thickness: 18.5 ft Anisotropy Ratio (Kz/Kr): 1.

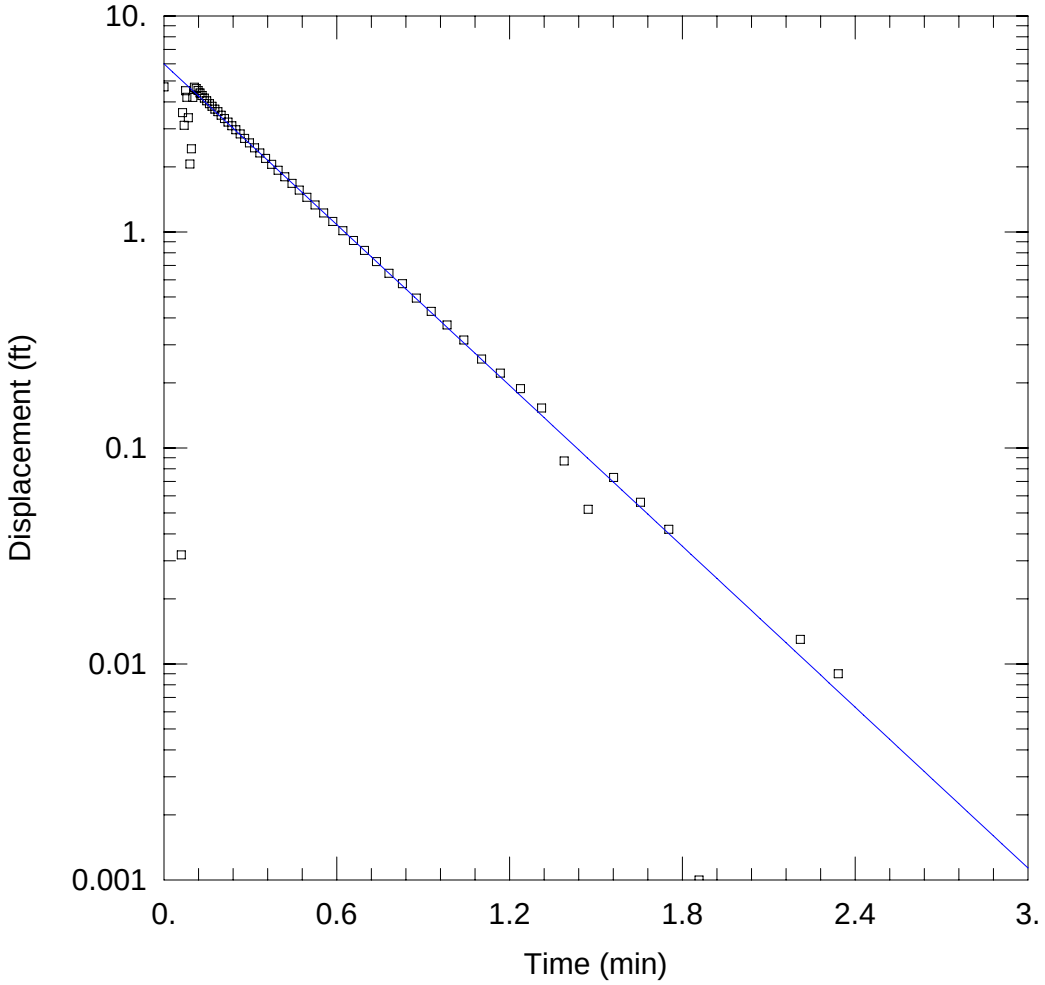
WELL DATA (MW20D)

Initial Displacement: 7.907 ft Static Water Column Height: 19. ft
Total Well Penetration Depth: 19. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.706 ft/day y0 = 2.566 ft



LS11-MW20D RISING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW20DR1.aqt
Date: 02/19/08 Time: 16:36:57

AQUIFER DATA

Saturated Thickness: 18.5 ft Anisotropy Ratio (Kz/Kr): 1.

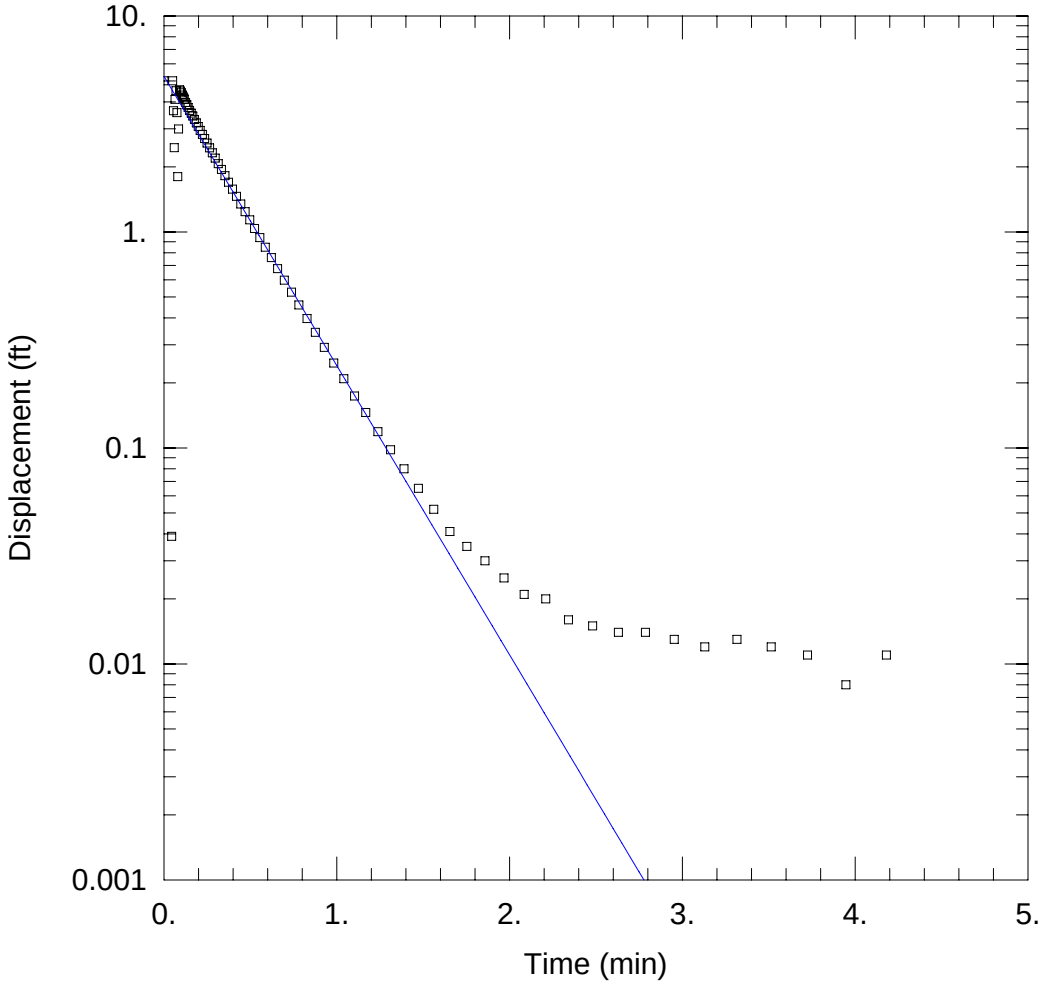
WELL DATA (MW20D)

Initial Displacement: 4.695 ft Static Water Column Height: 19. ft
Total Well Penetration Depth: 19. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 4.55 ft/day y0 = 5.996 ft



LS11-MW20D RISING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW20DR2.aqt
Date: 02/19/08 Time: 16:36:12

AQUIFER DATA

Saturated Thickness: 18.5 ft Anisotropy Ratio (Kz/Kr): 1.

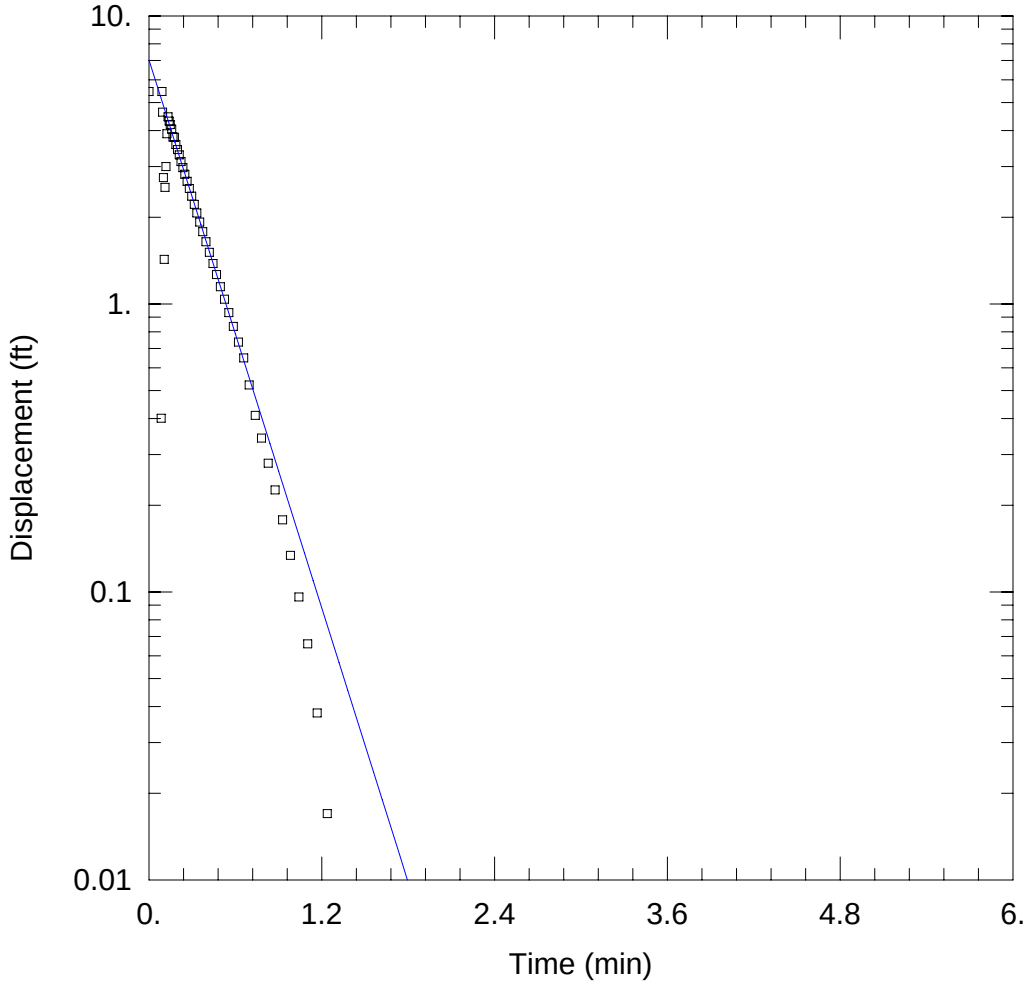
WELL DATA (MW20D)

Initial Displacement: 5.011 ft Static Water Column Height: 19. ft
Total Well Penetration Depth: 19. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 4.911 ft/day y0 = 5.25 ft



LS11-MW20D RISING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW20DR3.aqt
Date: 02/19/08 Time: 16:35:33

AQUIFER DATA

Saturated Thickness: 18.5 ft Anisotropy Ratio (Kz/Kr): 1.

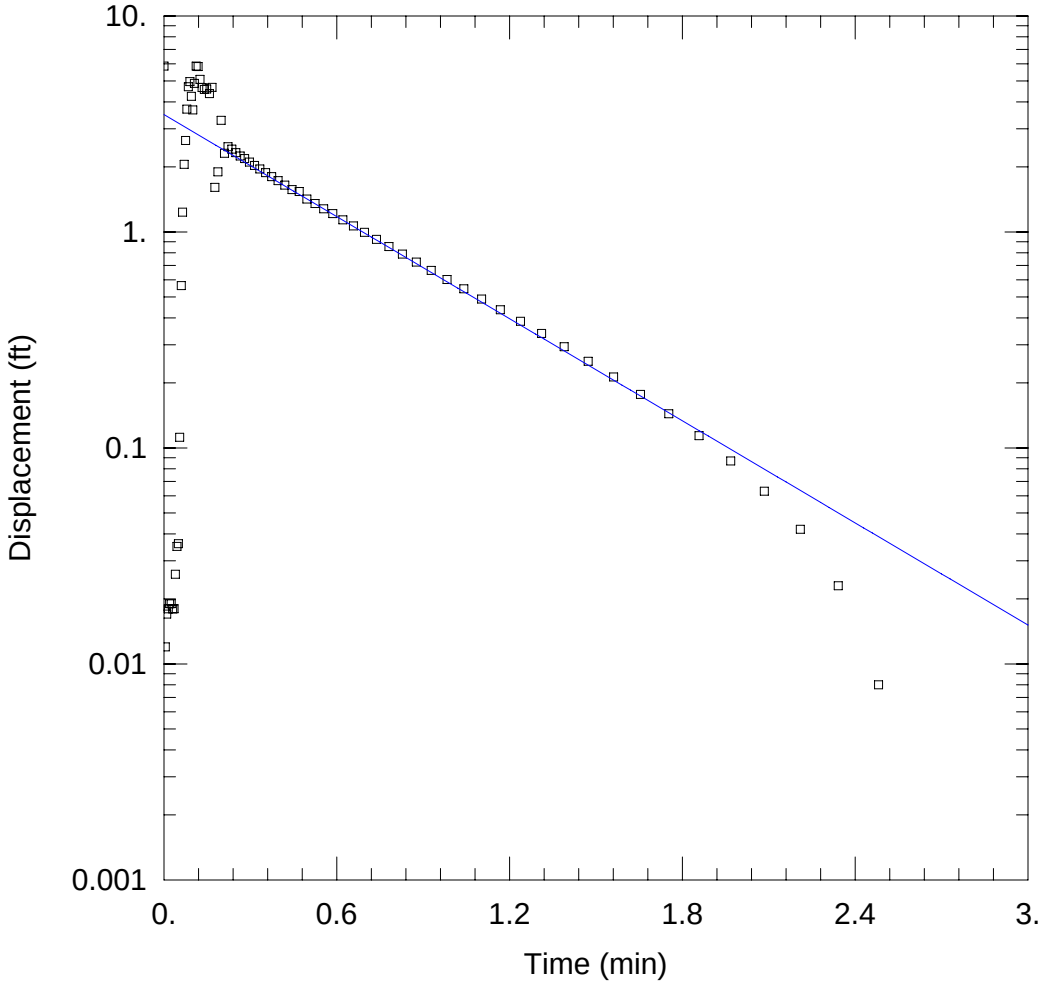
WELL DATA (MW20D)

Initial Displacement: 5.462 ft Static Water Column Height: 19. ft
Total Well Penetration Depth: 19. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 5.815 ft/day y0 = 7.032 ft



LS11-MW21D FALLING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW21DF1.aqt
Date: 02/19/08 Time: 16:34:43

AQUIFER DATA

Saturated Thickness: 23. ft Anisotropy Ratio (Kz/Kr): 1.

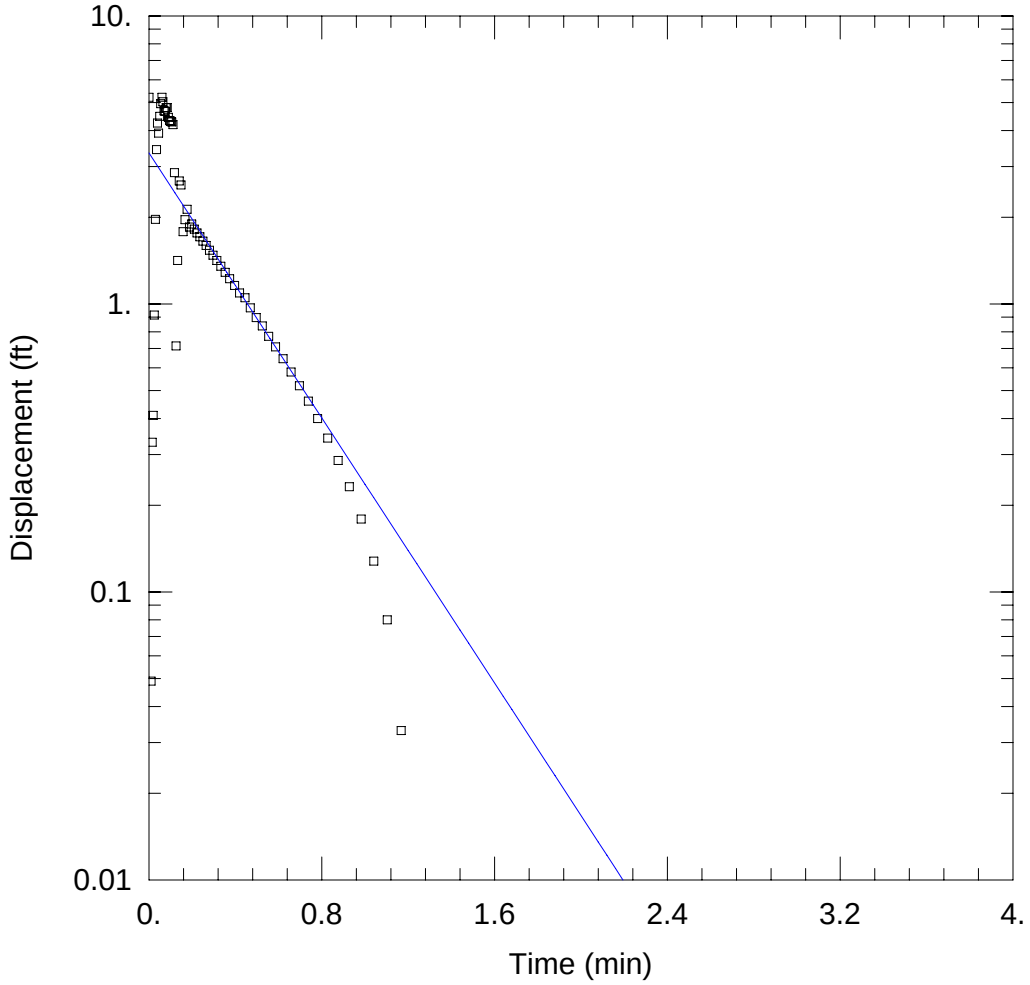
WELL DATA (MW21D)

Initial Displacement: 5.862 ft Static Water Column Height: 23. ft
Total Well Penetration Depth: 23. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 2.991 ft/day y0 = 3.493 ft



LS11-MW21D FALLING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW21DF2.aqt
Date: 02/19/08 Time: 16:33:41

AQUIFER DATA

Saturated Thickness: 23. ft Anisotropy Ratio (Kz/Kr): 1.

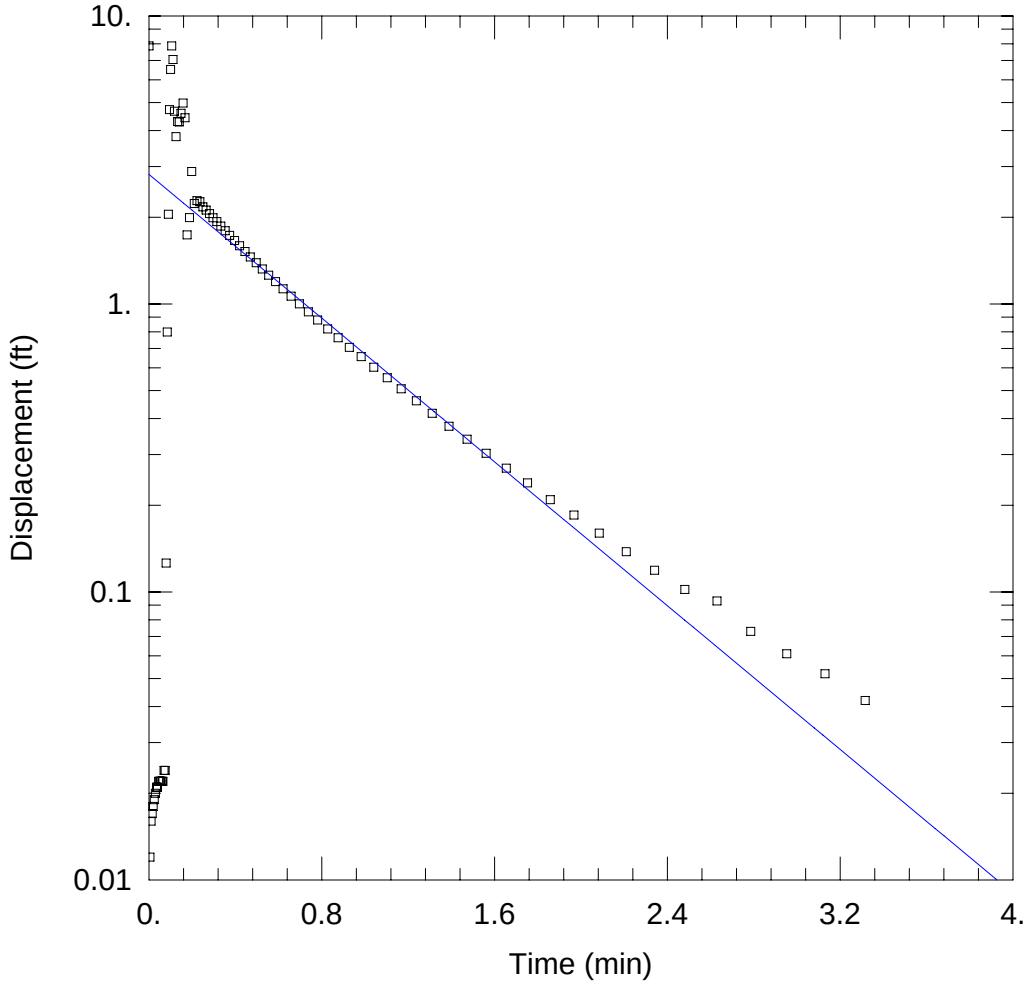
WELL DATA (MW21D)

Initial Displacement: 5.219 ft Static Water Column Height: 23. ft
Total Well Penetration Depth: 23. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 4.369 ft/day y0 = 3.343 ft



LS11-MW21D FALLING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW21DF3.aqt
Date: 02/19/08 Time: 16:32:50

AQUIFER DATA

Saturated Thickness: 23. ft Anisotropy Ratio (Kz/Kr): 1.

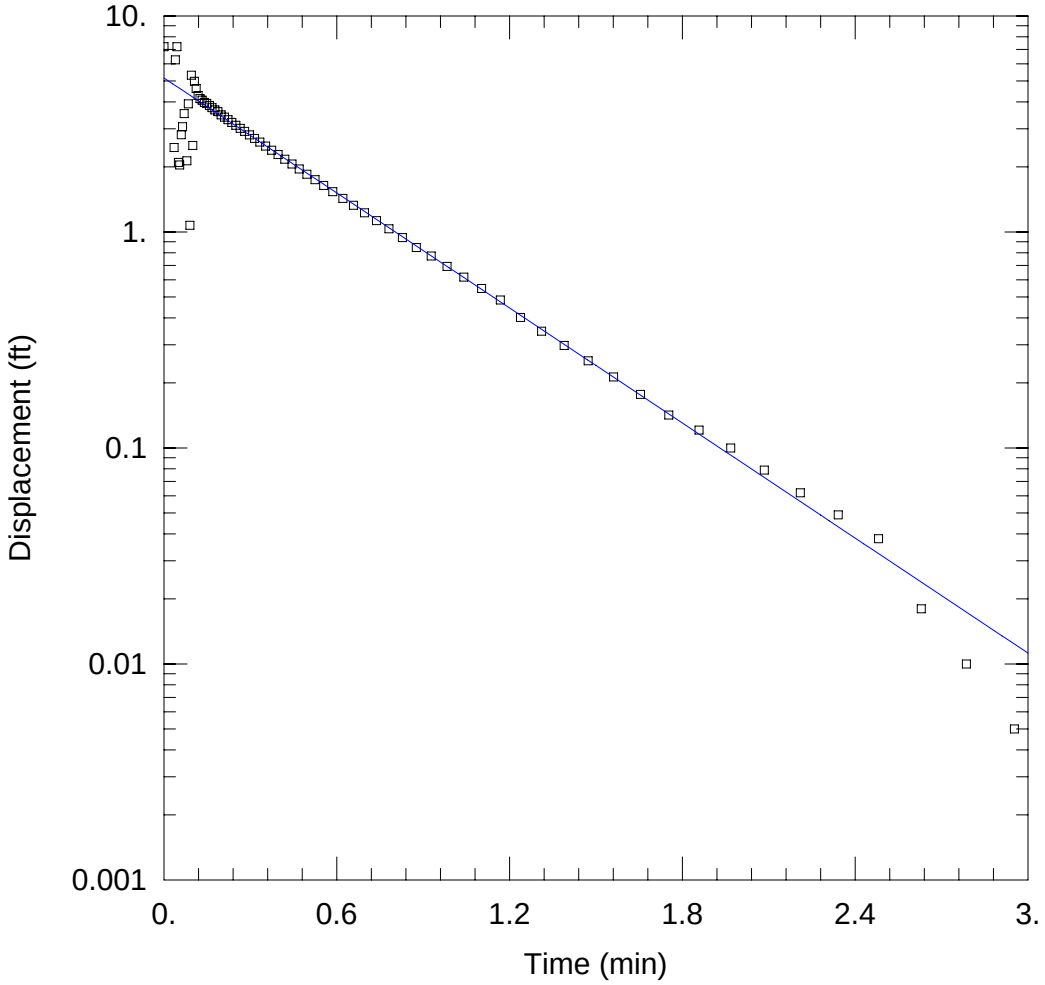
WELL DATA (MW21D)

Initial Displacement: 7.869 ft Static Water Column Height: 23. ft
Total Well Penetration Depth: 23. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 2.37 ft/day y0 = 2.817 ft



LS11-MW21D RISING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW21DR1.aqt
Date: 02/19/08 Time: 16:32:04

AQUIFER DATA

Saturated Thickness: 23. ft Anisotropy Ratio (Kz/Kr): 1.

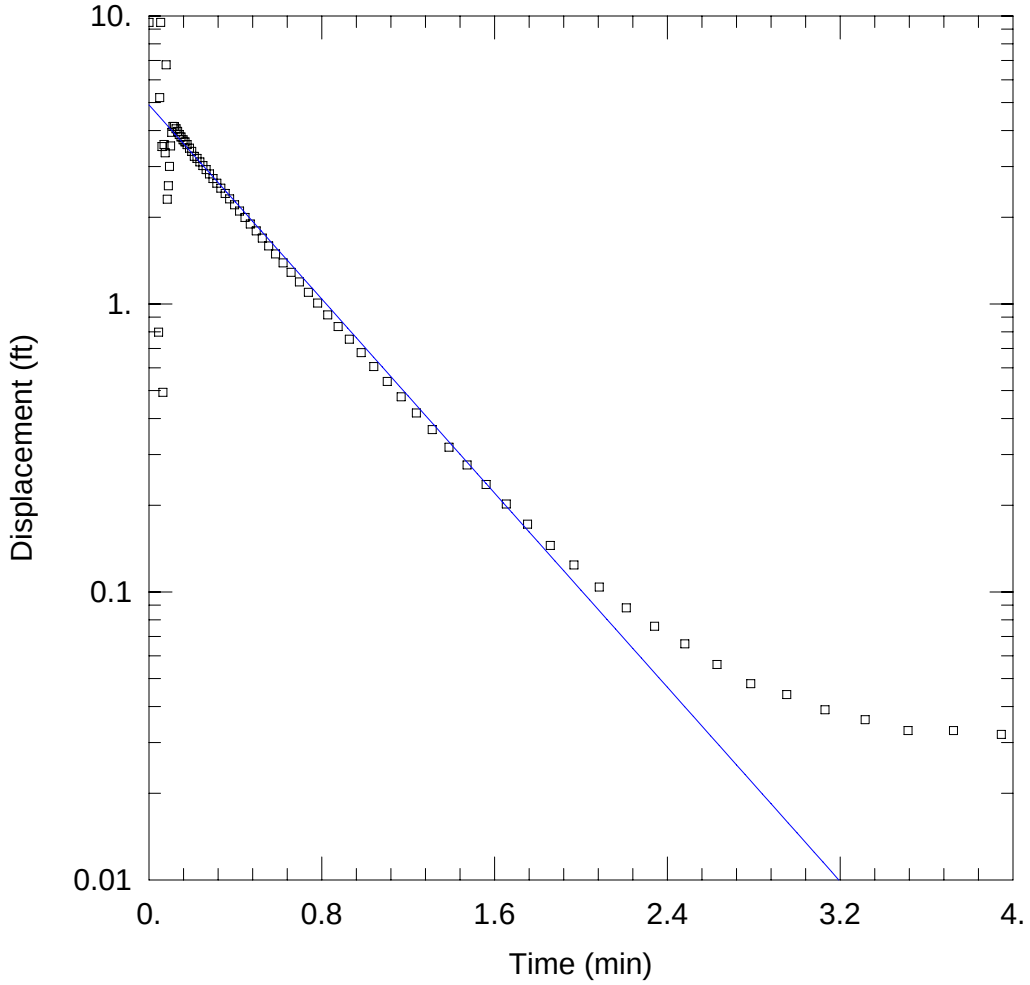
WELL DATA (MW21D)

Initial Displacement: 7.203 ft Static Water Column Height: 23. ft
Total Well Penetration Depth: 23. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.37 ft/day y0 = 5.159 ft



LS11-MW21D RISING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW21DR2.aqt
Date: 02/19/08 Time: 16:31:16

AQUIFER DATA

Saturated Thickness: 23. ft Anisotropy Ratio (Kz/Kr): 1.

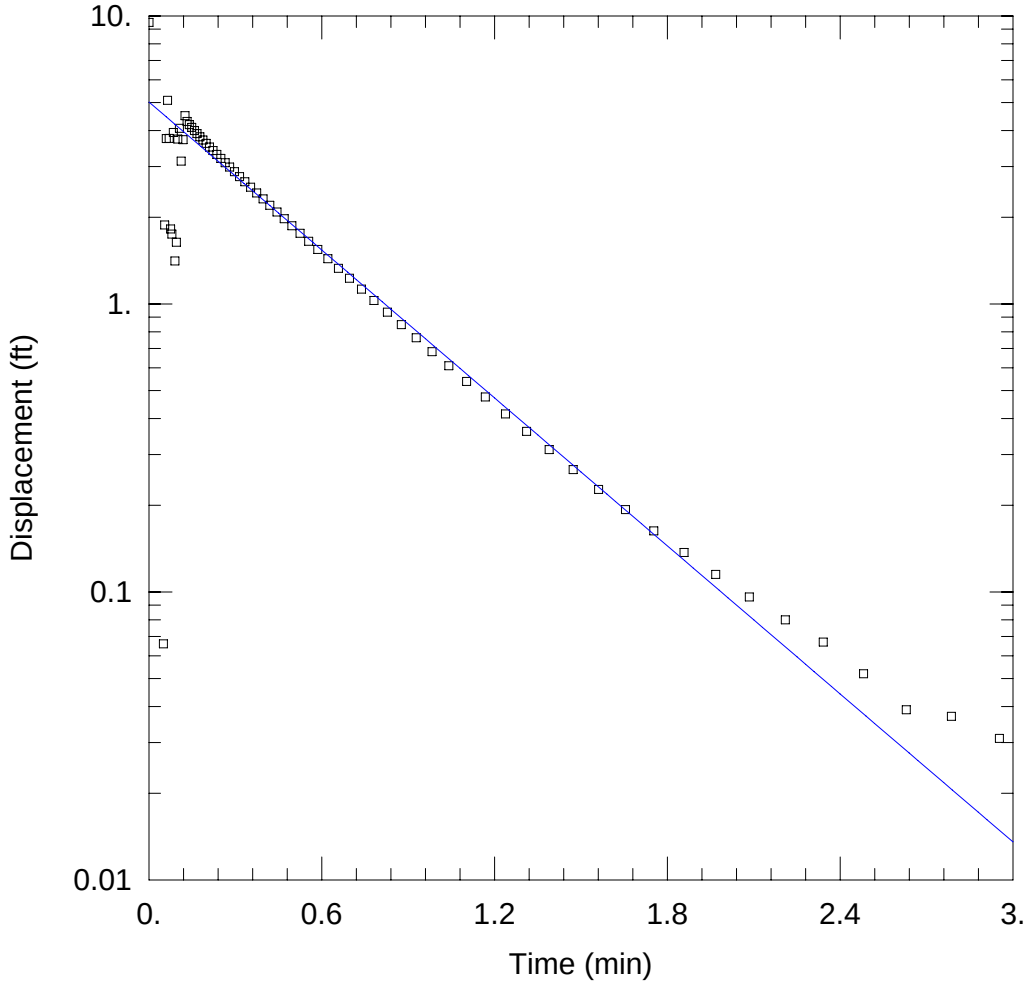
WELL DATA (MW21D)

Initial Displacement: 9.495 ft Static Water Column Height: 23. ft
Total Well Penetration Depth: 23. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.2 ft/day y0 = 4.91 ft



LS11-MW21D RISING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW21DR3.aqt
Date: 02/19/08 Time: 16:30:28

AQUIFER DATA

Saturated Thickness: 23. ft Anisotropy Ratio (Kz/Kr): 1.

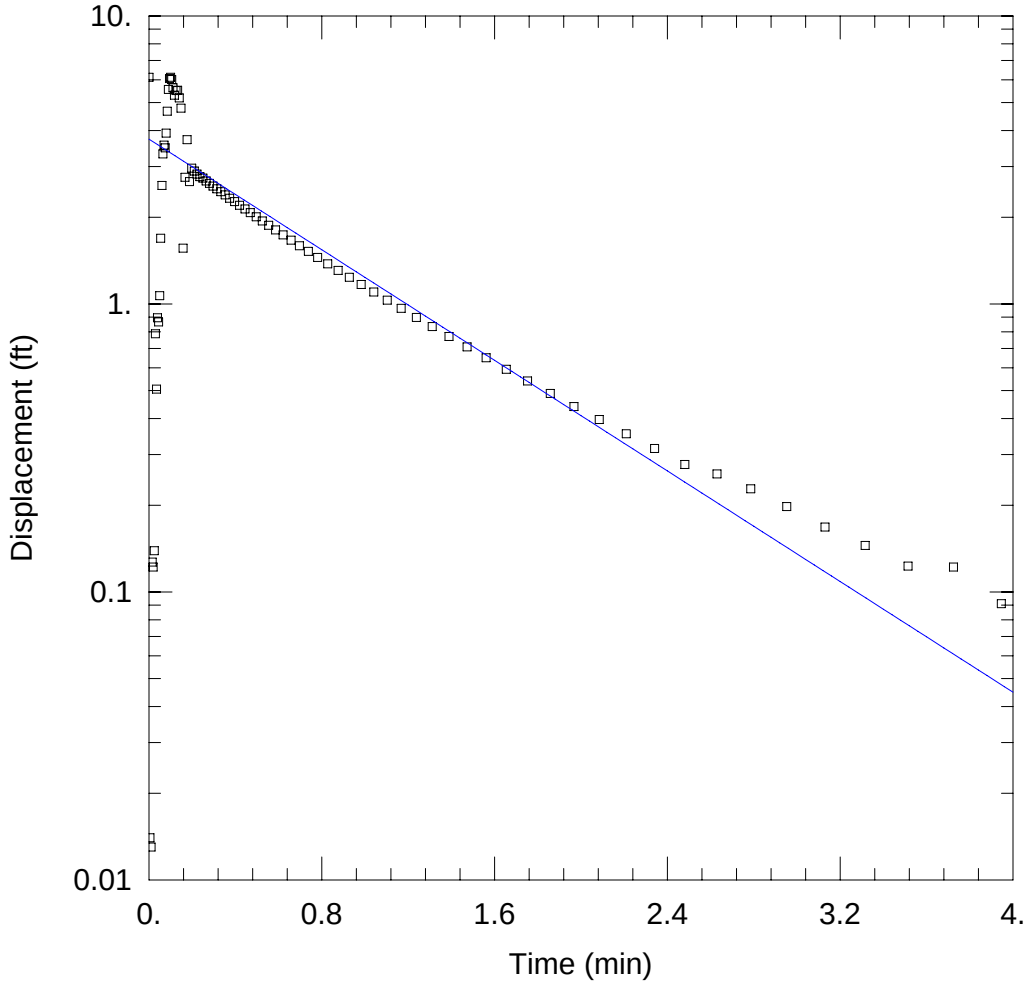
WELL DATA (MW21D)

Initial Displacement: 9.495 ft Static Water Column Height: 23. ft
Total Well Penetration Depth: 23. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 3.252 ft/day y0 = 5.021 ft



LS11-MW22D FALLING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW22DF1.aqt
Date: 02/19/08 Time: 16:29:36

AQUIFER DATA

Saturated Thickness: 22.4 ft Anisotropy Ratio (Kz/Kr): 1.

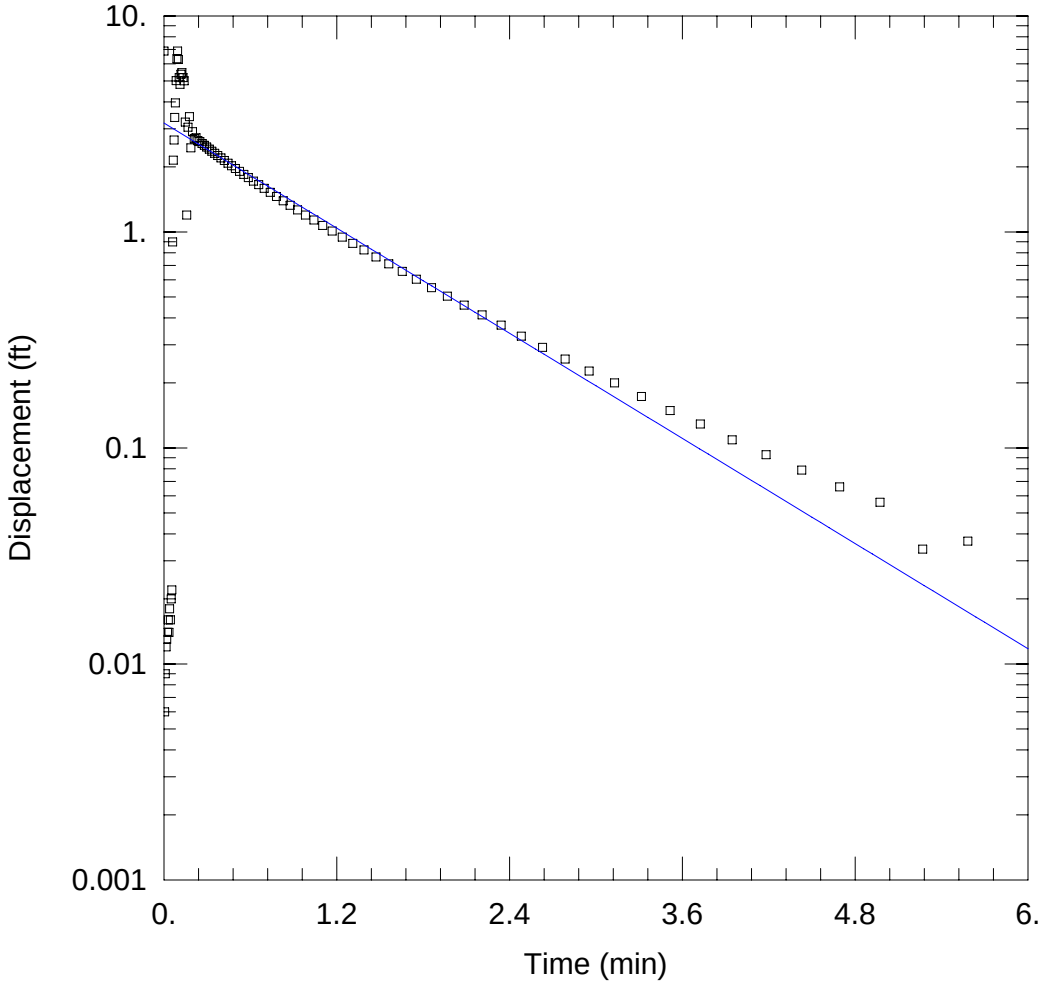
WELL DATA (MW22D)

Initial Displacement: 6.12 ft Static Water Column Height: 21.4 ft
Total Well Penetration Depth: 21.4 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.653 ft/day y0 = 3.734 ft



LS11-MW22D FALLING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW22DF2.aqt
Date: 02/19/08 Time: 16:26:48

AQUIFER DATA

Saturated Thickness: 22.4 ft Anisotropy Ratio (Kz/Kr): 1.

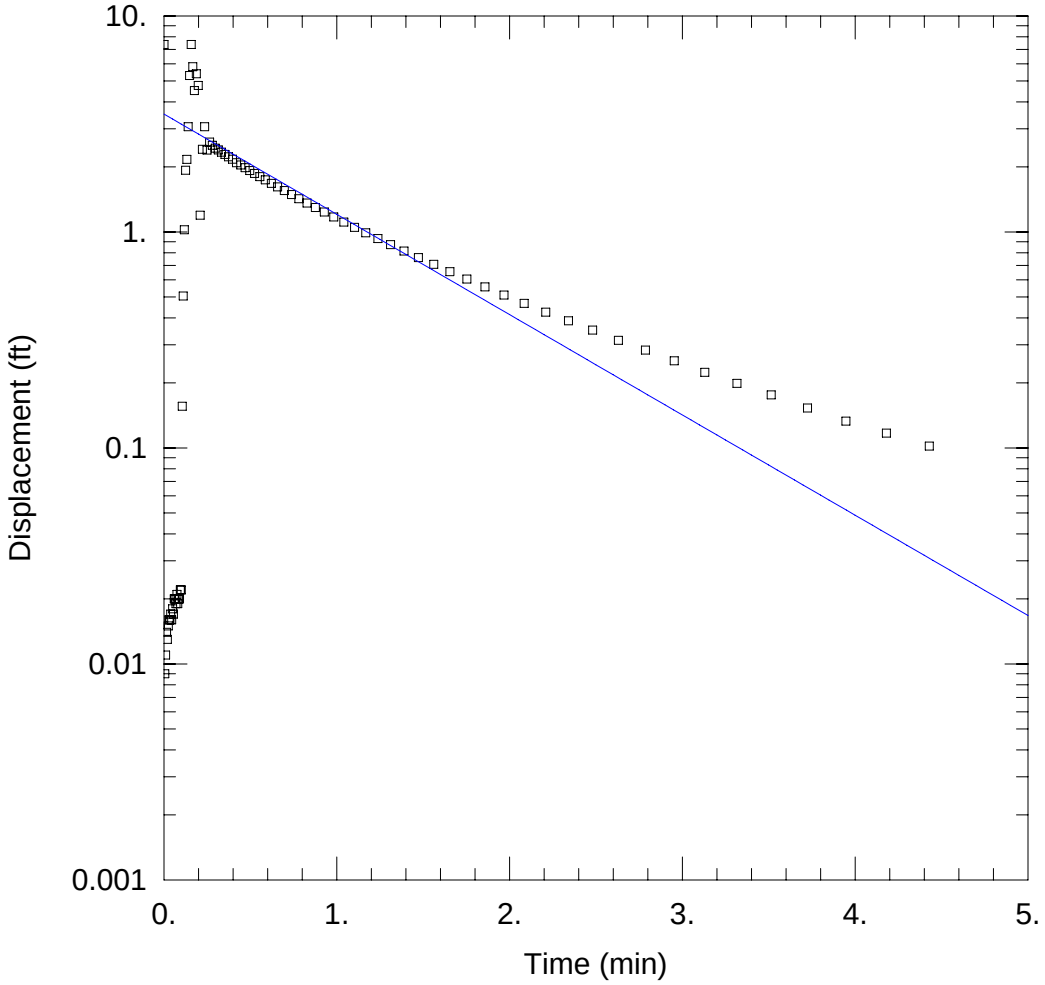
WELL DATA (MW22D)

Initial Displacement: 6.876 ft Static Water Column Height: 21.4 ft
Total Well Penetration Depth: 21.4 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.396 ft/day y0 = 3.191 ft



LS11-MW22D FALLING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW22DF3.aqt
Date: 02/19/08 Time: 16:25:17

AQUIFER DATA

Saturated Thickness: 22.4 ft Anisotropy Ratio (Kz/Kr): 1.

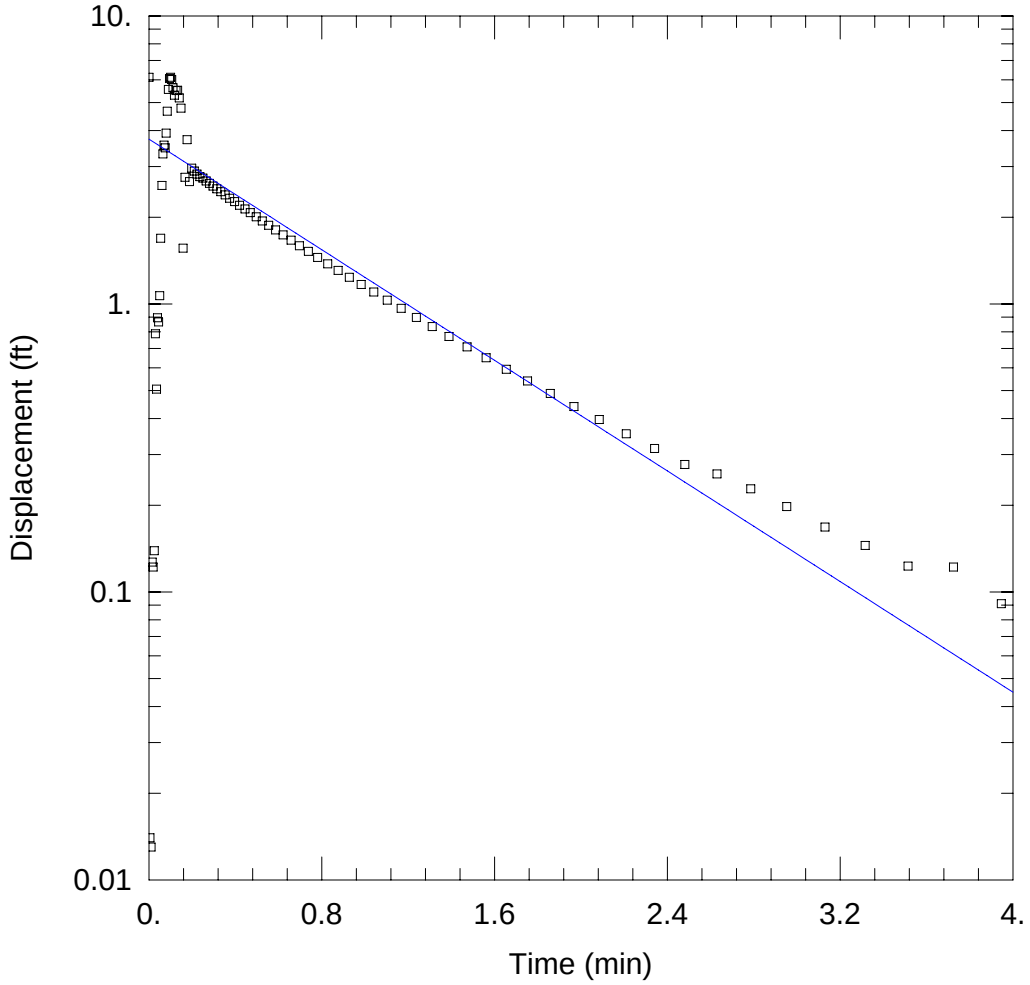
WELL DATA (MW22D)

Initial Displacement: 7.371 ft Static Water Column Height: 21.4 ft
Total Well Penetration Depth: 21.4 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.598 ft/day y0 = 3.512 ft



LS11-MW22D FALLING HEAD TEST #1

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW22DR1.aqt
Date: 02/19/08 Time: 16:24:26

AQUIFER DATA

Saturated Thickness: 22.4 ft Anisotropy Ratio (Kz/Kr): 1.

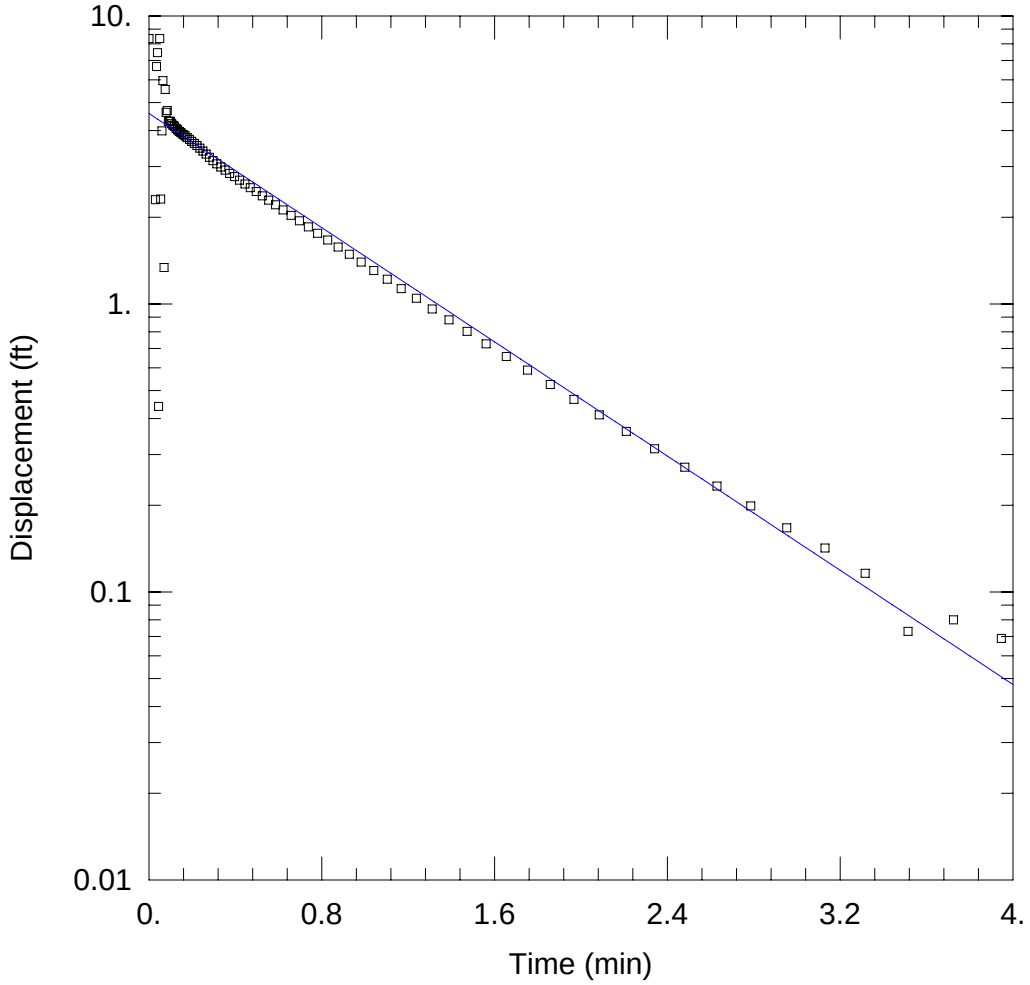
WELL DATA (MW22D)

Initial Displacement: 6.12 ft Static Water Column Height: 21.4 ft
Total Well Penetration Depth: 21.4 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.653 ft/day y0 = 3.734 ft



LS11-MW22D RISING HEAD TEST #2

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW22DR2.aqt
Date: 02/19/08 Time: 16:22:36

AQUIFER DATA

Saturated Thickness: 22.4 ft Anisotropy Ratio (Kz/Kr): 1.

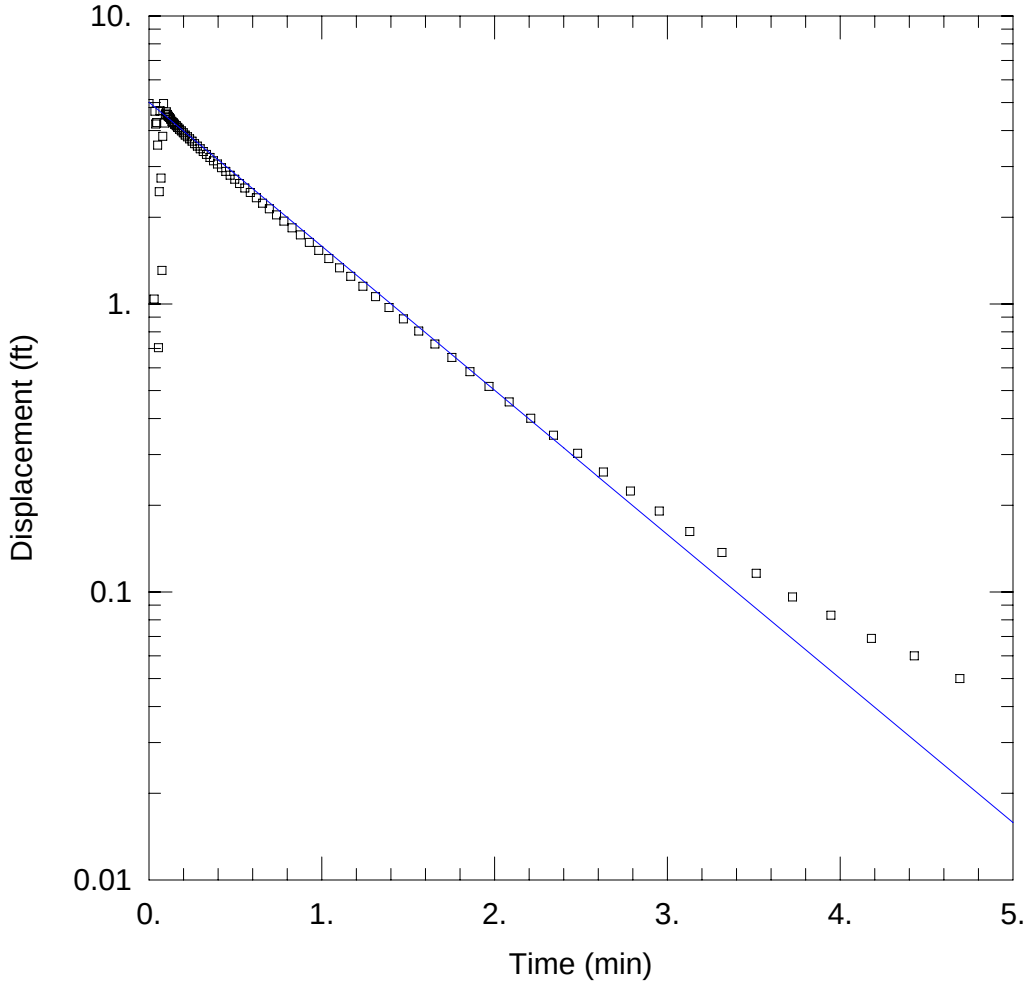
WELL DATA (MW22D)

Initial Displacement: 8.345 ft Static Water Column Height: 21.4 ft
Total Well Penetration Depth: 21.4 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.707 ft/day y0 = 4.586 ft



LS11-MW22D RISING HEAD TEST #3

Data Set: \\Ariadne\Proj\CLEANII\BASES\Little Creek\Site 11a\Slug Test Data\MW22DR3.aqt
Date: 02/19/08 Time: 16:21:24

AQUIFER DATA

Saturated Thickness: 22.4 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW22D)

Initial Displacement: 4.967 ft Static Water Column Height: 21.4 ft
Total Well Penetration Depth: 21.4 ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.25 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.722 ft/day y0 = 5.015 ft

Appendix F
HHRA Table

TABLE F-1

SELECTION OF EXPOSURE PATHWAYS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

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	Groundwater	Groundwater	Shallow Aquifer - Tap Water	Resident	Adult	Dermal Absorption	On-Site	None	Shallow groundwater not currently used as potable or industrial water supply for base.
						Ingestion	On-Site	None	Shallow aquifer groundwater not currently used as potable or industrial water supply for base.
		Indoor Air	Barracks	Resident	Adult	Inhalation	On-site	Quant	Current resident of barracks may inhale vapors that have migrated from groundwater through building foundation.
	Surface Soil	Surface Soil	Surface Soil	Resident	Adult	Dermal Absorption	On-site	Quant	There are current barracks on site. Adult residents living in the barracks may contact surface soil.
						Ingestion	On-site	Quant	There are current barracks on site. Adult residents living in the barracks may contact surface soil.
		Air	Surface Soil	Resident	Adult	Inhalation	On-site	Quant	There are current barracks on site. Adult residents living in thye barracks may inhale vapors and dust from the soil.
Future	Groundwater	Groundwater	Shallow Aquifer - Tap Water	Resident*	Adult	Dermal	On-site	Quant	Groundwater is not currently used on-site as a water supply and is not expected to be used as a future water supply; however, the residential scenario is included for a conservative evaluation of unrestricted land use.
						Ingestion	On-site	Quant	Groundwater is not currently used on-site as a water supply and is not expected to be used as a future water supply; however, the residential scenario is included for a conservative evaluation of unrestricted land use.
					Child	Dermal	On-site	Quant	Groundwater is not currently used on-site as a water supply and is not expected to be used as a future water supply; however, the residential scenario is included for a conservative evaluation of unrestricted land use.
						Ingestion	On-site	Quant	Groundwater is not currently used on-site as a water supply and is not expected to be used as a future water supply; however, the residential scenario is included for a conservative evaluation of unrestricted land use.
					Child/Adult	Dermal	On-site	Quant	Groundwater is not currently used on-site as a water supply and is not expected to be used as a future water supply; however, the residential scenario is included for a conservative evaluation of unrestricted land use.
						Ingestion	On-site	Quant	Groundwater is not currently used on-site as a water supply and is not expected to be used as a future water supply; however, the residential scenario is included for a conservative evaluation of unrestricted land use.
			Shallow Aquifer - Water in Excavation	Construction Worker	Adult	Dermal	On-site	Quant	Construction workers may contact groundwater while performing construction or excavation activities.
						Ingestion	On-site	None	Incidental ingestion of groundwater by construction workers would be minimal during construction or excavation activities.
		Indoor Air***	Barracks	Resident	Adult	Inhalation	On-site	Quant	Future resident of barracks may inhale vapors that have migrated from groundwater through building foundation.
		Air	Shallow Aquifer - Water Vapors at Showerhead	Resident*	Adult	Inhalation	On-site	Quant	Groundwater is not currently used on-site as a water supply and is not expected to be used as a future water supply; however, the residential scenario (including inhalation of volatiles while showering) is included for a conservative evaluation of unrestricted land use.
					Child	Inhalation	On-site	None	Children are assumed to take baths, not showers, resulting in minimal inhalation exposure during bathing.
					Child/Adult	Inhalation	On-site	None	Children are assumed to take baths, not showers, resulting in minimal inhalation exposure during bathing.
			Shallow Aquifer - Water Vapors at Excavation	Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors from groundwater while performing construction or excavation activities.

TABLE F-1

SELECTION OF EXPOSURE PATHWAYS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

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
Future	Soil**	Soil**	Soil**	Industrial Worker	Adult	Ingestion	On-site	Quant	Industrial workers may contact soil while working at the site.
						Dermal	On-site	Quant	Industrial workers may contact soil while working at the site.
				Trespasser/Visitor	Adult	Dermal	On-site	Quant	Trespassers/visitors may contact soil while on the site.
						Ingestion	On-site	Quant	Trespassers/visitors may contact soil while on the site.
					Adolescent	Dermal	On-site	Quant	Trespassers/visitors may contact soil while on the site.
						Ingestion	On-site	Quant	Trespassers/visitors may contact soil while on the site.
				Resident*	Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Exposure to resident could occur if subsurface soil becomes surface soil following excavation activities.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Exposure to resident could occur if subsurface soil becomes surface soil following excavation activities.
					Child	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Exposure to resident could occur if subsurface soil becomes surface soil following excavation activities.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Exposure to resident could occur if subsurface soil becomes surface soil following excavation activities.
					Child/Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Exposure to resident could occur if subsurface soil becomes surface soil following excavation activities.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Exposure to resident could occur if subsurface soil becomes surface soil following excavation activities.
				Construction Worker	Adult	Ingestion	On-site	Quant	Construction workers could contact soil while performing construction.
						Dermal	On-site	Quant	Construction workers could contact soil while performing construction.

TABLE F-1

SELECTION OF EXPOSURE PATHWAYS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

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
Future (continued)	Soil**	Air	Emissions from Soil**	Industrial Worker	Adult	Inhalation	On-site	Quant	Industrial workers may inhale vapors and dust while performing work activities.
				Trespasser/Visitor	Adult	Inhalation	On-site	Quant	Trespassers/visitors may inhale vapors and dust emanating from soil.
					Adolescent	Inhalation	On-site	Quant	Trespassers/visitors may inhale vapors and dust emanating from soil.
				Resident*	Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Future residents could inhale vapors and dust at site.
					Child	Inhalation	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Future residents could inhale vapors and dust at site.
					Child/Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use in addition to the current barracks; however, the residential scenario is included for a conservative evaluation of unrestricted land use. Future residents could inhale vapors and dust at site.
				Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors and dust while performing construction activities.

* Noncarcinogenic hazard evaluated separately for adult and child receptors, combined lifetime carcinogenic risk evaluated on an age-adjusted basis for residential scenario.

** Subsurface soil becomes surface soil following excavation activities.

Table F-2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration 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
Surface Soil	120-82-1	1,2,4-Trichlorobenzene	3.3E-03 J	3.3E-03 J	mg/kg	LS11-SS319P-00	1/16	0.01 - 0.012	3.3E-03	N/A	8.7E+00 N	1.3E-02	SSL	NO	BSL
	95-50-1	1,2-Dichlorobenzene	1.8E-03 J	1.8E-03 J	mg/kg	LS11-SS319P-00	1/16	0.01 - 0.012	1.8E-03	N/A	2.2E+02 NS	4.0E-01	SSL	NO	BSL
	106-46-7	1,4-Dichlorobenzene	1.8E-03 J	1.8E-03 J	mg/kg	LS11-SS319P-00	1/16	0.01 - 0.012	1.8E-03	N/A	2.6E+00 C	4.6E-04	SSL	NO	BSL
	78-93-3	2-Butanone	4.2E-03 J	4.2E-03 J	mg/kg	LS11-SS319-00	1/16	0.01 - 0.012	4.2E-03	N/A	4.7E+03 N	2.9E+00	SSL	NO	BSL
	100-41-4	Ethylbenzene	1.2E-03 J	1.2E-03 J	mg/kg	LS11-SS306-00	1/16	0.01 - 0.012	1.2E-03	N/A	5.7E+00 C	1.9E-03	SSL	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	1.2E-03 J	1.2E-03 J	mg/kg	LS11-SS306-00	1/16	0.01 - 0.012	1.2E-03	N/A	3.9E+01 C	2.7E-03	SSL	NO	BSL
	75-09-2	Methylene chloride	1.1E-02 J	1.1E-02 J	mg/kg	LS11-SS313P-00	1/16	0.01 - 0.012	1.1E-02	N/A	1.1E+01 C	1.2E-03	SSL	NO	BSL
	127-18-4	Tetrachloroethene	2.9E-03 J	8.2E-03 J	mg/kg	LS11-SS319P-00	7/16	0.01 - 0.012	8.2E-03	N/A	5.7E-01 C	5.2E-05	SSL	NO	BSL
	79-01-6	Trichloroethene	4.1E-03 J	5.0E-03 J	mg/kg	LS11A-SS629-07C	2/16	0.01 - 0.012	5.0E-03	N/A	2.8E+00 C	6.1E-04	SSL	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.3E-03 J	3.0E-03 J	mg/kg	LS11A-SS629-07C	2/16	0.01 - 0.012	3.0E-03	N/A	7.8E+01 N	1.1E-01	SSL	NO	BSL
	129-00-0	Pyrene	7.8E-02 J	7.8E-02 J	mg/kg	LS11A-SS625P-07C	1/6	0.34 - 0.38	7.8E-02	N/A	1.7E+02 N	1.5E+02	SSL	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	7.9E-02 J	1.3E+01	mg/kg	LS11A-SS629-07C	5/6	0.34 - 1.8	1.3E+01	N/A	3.5E+01 C	1.6E+00	SSL	NO	BSL
	72-54-8	4,4'-DDD	1.2E-03 J	8.4E-03	mg/kg	LS11A-SS625-07C	2/6	0.0034 - 0.0038	8.4E-03	N/A	2.0E+00 C	8.6E-02	SSL	NO	BSL
	72-55-9	4,4'-DDE	1.1E-03 J	4.5E-02 J	mg/kg	LS11A-SS625-07C	3/6	0.0034 - 0.0038	4.5E-02	2.4E-01	1.4E+00 C	6.0E-02	SSL	NO	BSL
	50-29-3	4,4'-DDT	1.3E-03 J	7.9E-03 J	mg/kg	LS11A-SS625-07C	3/6	0.0034 - 0.0038	7.9E-03	1.4E-01	1.7E+00 C	8.7E-02	SSL	NO	BSL
	309-00-2	Aldrin	3.8E-03	3.8E-03	mg/kg	LS11A-SS628-07C	1/6	0.0018 - 0.0019	3.8E-03	N/A	2.9E-02 C	8.4E-04	SSL	NO	BSL
	60-57-1	Dieldrin	2.1E-03 J	8.0E-02	mg/kg	LS11A-SS628-07C	3/6	0.0034 - 0.0073	8.0E-02	N/A	3.0E-02 C	9.0E-05	SSL	YES	ASL
	959-98-8	Endosulfan I	5.5E-04 J	5.5E-04 J	mg/kg	LS11A-SS627-07C	1/6	0.0018 - 0.0019	5.5E-04	N/A	3.7E+01 N	9.7E+00	SSL	NO	BSL
	1031-07-8	Endosulfan sulfate	1.9E-03 J	1.9E-03 J	mg/kg	LS11A-SS623-07C	1/6	0.0034 - 0.0038	1.9E-03	N/A	3.7E+01 N	9.7E+00	SSL	NO	BSL
	72-20-8	Endrin	1.6E-03 J	1.6E-03 J	mg/kg	LS11A-SS628-07C	1/6	0.0034 - 0.0038	1.6E-03	N/A	1.8E+00 N	2.3E-01	SSL	NO	BSL
	7421-93-4	Endrin aldehyde	1.1E-03 J	1.4E-03 J	mg/kg	LS11A-SS627-07C	2/6	0.0034 - 0.0038	1.4E-03	N/A	1.8E+00 N	2.3E-01	SSL	NO	BSL
	53494-70-5	Endrin ketone	1.1E-03 J	1.1E-03 J	mg/kg	LS11A-SS628-07C	1/6	0.0034 - 0.0038	1.1E-03	N/A	1.8E+00 N	2.3E-01	SSL	NO	BSL
	1024-57-3	Heptachlor epoxide	6.8E-04 J	6.8E-04 J	mg/kg	LS11A-SS627-07C	1/6	0.0018 - 0.0019	6.8E-04	N/A	5.3E-02 C	7.9E-05	SSL	NO	BSL
	72-43-5	Methoxychlor	4.6E-03 J	4.6E-03 J	mg/kg	LS11A-SS627-07C	1/6	0.018 - 0.019	4.6E-03	N/A	3.1E+01 N	1.6E+01	SSL	NO	BSL
	5103-71-9	alpha-Chlordane	4.3E-04 J	2.6E-03 J	mg/kg	LS11A-SS627-07C	3/6	0.0018 - 0.0019	2.6E-03	N/A	1.6E+00 C	3.3E-02	SSL	NO	BSL
	5103-74-2	gamma-Chlordane	4.9E-04 J	1.4E-03 J	mg/kg	LS11A-SS625-07C	4/6	0.0018 - 0.0019	1.4E-03	N/A	1.6E+00 C	3.3E-02	SSL	NO	BSL
	7429-90-5	Aluminum	4.8E+03	2.4E+04	mg/kg	LS11-SS313-00	16/16	20.5 - 33.46	2.4E+04	8.5E+03	7.7E+03 N	5.5E+04	SSL	YES	ASL
	7440-38-2	Arsenic	1.1E+00 J	6.2E+00 J	mg/kg	LS11A-SS625P-07C	16/16	1 - 1.67	6.2E+00	5.6E+00	3.9E-01 C	1.3E-03	SSL	YES	ASL
	7440-39-3	Barium	3.3E+01	8.5E+01	mg/kg	LS11-SS319P-00	16/16	20.5 - 33.46	8.5E+01	6.9E+01	1.5E+03 N	3.0E+02	SSL	NO	BSL
	7440-41-7	Beryllium	2.3E-01 J	4.6E-01 J	mg/kg	LS11-SS319P-00	15/16	0.51 - 0.84	4.6E-01	6.0E-01	1.6E+01 N	5.8E+01	SSL	NO	BSL
	7440-70-2	Calcium	6.1E+02 J	3.1E+03	mg/kg	LS11-SS311-00	16/16	512 - 836.4	3.1E+03	1.8E+03	N/A	N/A		NO	NUT
	7440-47-3	Chromium	7.6E+00	2.2E+01	mg/kg	LS11-SS308-00	16/16	1 - 1.67	2.2E+01	2.0E+01	2.8E+02 C	9.9E+07	SSL	NO	BSL
	7440-48-4	Cobalt	9.6E-01 J	3.5E+00 J	mg/kg	LS11-SS311-00 LS11-SS313-00	16/16	5.1 - 8.36	3.5E+00	5.1E+00	2.3E+00 N	4.9E-01	SSL	YES	ASL
	7440-50-8	Copper	4.0E+00	1.5E+01	mg/kg	LS11A-SS630-07C	14/16	2.6 - 4.18	1.5E+01	N/A	3.3E+02 N	5.1E+01	SSL	NO	BSL
	7439-89-6	Iron	4.8E+03	2.1E+04	mg/kg	LS11-SS308-00	16/16	10.2 - 16.73	2.1E+04	1.5E+04	5.5E+03 N	6.4E+02	SSL	YES	ASL
	7439-92-1	Lead	4.5E+00	3.8E+01	mg/kg	LS11A-SS625P-07C	16/16	1 - 1.67	3.8E+01	1.1E+02	4.0E+02	N/A		NO	BSL

Table F-2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration 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
	7439-95-4	Magnesium	5.0E+02 J	2.4E+03	mg/kg	LS11A-SS630-07C	16/16	512 - 836.4	2.4E+03	1.3E+03	N/A	N/A		NO	NUT
	7439-96-5	Manganese	3.7E+01	1.9E+02 J	mg/kg	LS11A-SS630-07C	16/16	1.5 - 2.51	1.9E+02	2.7E+02	1.8E+02 N	5.7E+01	SSL	YES	ASL
	7439-97-6	Mercury	2.0E-02 J	1.7E-01	mg/kg	LS11-SS313-00	13/16	0.03 - 0.11	1.7E-01	N/A	2.3E+00 N	5.7E-01	SSL	NO	BSL
	7440-02-0	Nickel	3.9E+00 J	1.0E+01	mg/kg	LS11-SS313-00	16/16	4.1 - 6.69	1.0E+01	9.5E+00	1.5E+02 N	4.8E+01	SSL	NO	BSL
	7440-09-7	Potassium	1.9E+02 J	1.0E+03	mg/kg	LS11-SS314-00	16/16	512 - 836.4	1.0E+03	1.4E+03	N/A	N/A		NO	NUT
	7782-49-2	Selenium	4.9E-01 J	1.0E+00 J	mg/kg	LS11-SS319-00	4/16	0.66 - 3.9	1.0E+00	N/A	3.9E+01 N	9.5E-01	SSL	NO	BSL
	7440-28-0	Thallium	3.5E-01 J	8.0E-01 J	mg/kg	LS11A-SS625P-07C	6/16	1.33 - 2.8	8.0E-01	N/A	5.1E-01 N	1.7E-01	SSL	YES	ASL
	7440-62-2	Vanadium	8.0E+00	3.5E+01	mg/kg	LS11-SS308-00	16/16	5.1 - 8.36	3.5E+01	3.4E+01	3.9E+01 N	1.8E+02	SSL	NO	BSL
	7440-66-6	Zinc	1.3E+01	6.6E+01	mg/kg	LS11A-SS630-07C	16/16	2.66 - 6.6	6.6E+01	1.2E+02	2.3E+03 N	6.8E+02	SSL	NO	BSL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Table 5-2, NAB Little Creek Background 95% UTLs for Urban Soils, *Background Investigation for Naval Amphibious Base Little Creek,* CH2M HILL, December 2000

[4] Risk Screening Level Table, May 2009, U.S. EPA. Residential Soil RSL (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RSL value for total chromium (1:6 ratio CRVI:CR III) used for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RBC value for mercury, inorganic salts used for mercury.
RSL value for endosulfan used as surrogate for endosulfan I and endosulfan sulfate.
RSL value for endrin used as surrogate for endrin aldehyde and endrin ketone.
RSL value for chlordane used as surrogate for alpha- and gamma-chlordane.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

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
S = Concentration exceeded saturation concentration (Csat), use Csat as screening value.
SSL = Soil Screening Level for Protection of Groundwater, from RSL Table
N/A = Not available or not applicable

Table F-2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	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
Emissions from Surface Soil	120-82-1	1,2,4-Trichlorobenzene	1.0E-03	J	1.0E-03	J	µg/m^3	LS11-SS319P-00	1/16	N/A	1.0E-03	N/A	4.2E-01	N	N/A	N/A	NO	BSL
	95-50-1	1,2-Dichlorobenzene	3.0E-03	J	3.0E-03	J	µg/m^3	LS11-SS319P-00	1/16	N/A	3.0E-03	N/A	2.1E+01	N	N/A	N/A	NO	BSL
	106-46-7	1,4-Dichlorobenzene	6.4E-03	J	6.4E-03	J	µg/m^3	LS11-SS319P-00	1/16	N/A	6.4E-03	N/A	2.2E-01	C	N/A	N/A	NO	BSL
	78-93-3	2-Butanone	1.2E-04	J	1.2E-04	J	µg/m^3	LS11-SS319-00	1/16	N/A	1.2E-04	N/A	5.2E+02	N	N/A	N/A	NO	BSL
	100-41-4	Ethylbenzene	3.0E-03	J	3.0E-03	J	µg/m^3	LS11-SS306-00	1/16	N/A	3.0E-03	N/A	9.7E-01	C	N/A	N/A	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	5.7E-05	J	5.7E-05	J	µg/m^3	LS11-SS306-00	1/16	N/A	5.7E-05	N/A	9.4E+00	C	N/A	N/A	NO	BSL
	75-09-2	Methylene chloride	4.5E-03	J	4.5E-03	J	µg/m^3	LS11-SS313P-00	1/16	N/A	4.5E-03	N/A	5.2E+00	C	N/A	N/A	NO	BSL
	127-18-4	Tetrachloroethene	1.2E-02	J	3.5E-02	J	µg/m^3	LS11-SS319P-00	7/16	N/A	3.5E-02	N/A	4.1E-01	C	N/A	N/A	NO	BSL
	79-01-6	Trichloroethene	3.2E-03	J	3.9E-03	J	µg/m^3	LS11A-SS629-07C	2/16	N/A	3.9E-03	N/A	1.2E+00	C	N/A	N/A	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.1E-03	J	2.5E-03	J	µg/m^3	LS11A-SS629-07C	2/16	N/A	2.5E-03	N/A	6.3E+00	N	N/A	N/A	NO	BSL
	129-00-0	Pyrene	9.2E-01	J	9.2E-01	J	µg/m^3	LS11A-SS625P-07C	1/6	N/A	9.2E-01	N/A	N/A		N/A	N/A	NO	NTX
	117-81-7	bis(2-Ethylhexyl)phthalate	2.6E-03	J	4.2E-01		µg/m^3	LS11A-SS629-07C	5/6	N/A	4.2E-01	N/A	1.0E+00	C	N/A	N/A	NO	BSL
	72-54-8	4,4'-DDD	8.8E-10	J	6.2E-09		µg/m^3	LS11A-SS625-07C	2/6	N/A	6.2E-09	N/A	3.5E-02	C	N/A	N/A	NO	BSL
	72-55-9	4,4'-DDE	8.1E-10	J	3.3E-08	J	µg/m^3	LS11A-SS625-07C	3/6	N/A	3.3E-08	N/A	2.5E-02	C	N/A	N/A	NO	BSL
	50-29-3	4,4'-DDT	9.6E-10	J	5.8E-09	J	µg/m^3	LS11A-SS625-07C	3/6	N/A	5.8E-09	N/A	2.5E-02	C	N/A	N/A	NO	BSL
	309-00-2	Aldrin	2.8E-09		2.8E-09		µg/m^3	LS11A-SS628-07C	1/6	N/A	2.8E-09	N/A	5.0E-04	C	N/A	N/A	NO	BSL
	60-57-1	Dieldrin	1.5E-09	J	5.9E-08		µg/m^3	LS11A-SS628-07C	3/6	N/A	5.9E-08	N/A	5.3E-04	C	N/A	N/A	NO	BSL
	959-98-8	Endosulfan I	4.0E-10	J	4.0E-10	J	µg/m^3	LS11A-SS627-07C	1/6	N/A	4.0E-10	N/A	N/A		N/A	N/A	NO	NTX
	1031-07-8	Endosulfan sulfate	1.4E-09	J	1.4E-09	J	µg/m^3	LS11A-SS623-07C	1/6	N/A	1.4E-09	N/A	N/A		N/A	N/A	NO	NTX
	72-20-8	Endrin	1.2E-09	J	1.2E-09	J	µg/m^3	LS11A-SS628-07C	1/6	N/A	1.2E-09	N/A	N/A		N/A	N/A	NO	NTX
	7421-93-4	Endrin aldehyde	8.1E-10	J	1.0E-09	J	µg/m^3	LS11A-SS627-07C	2/6	N/A	1.0E-09	N/A	N/A		N/A	N/A	NO	NTX
	53494-70-5	Endrin ketone	8.1E-10	J	8.1E-10	J	µg/m^3	LS11A-SS628-07C	1/6	N/A	8.1E-10	N/A	N/A		N/A	N/A	NO	NTX
	1024-57-3	Heptachlor epoxide	5.0E-10	J	5.0E-10	J	µg/m^3	LS11A-SS627-07C	1/6	N/A	5.0E-10	N/A	9.4E-04	C	N/A	N/A	NO	BSL
	72-43-5	Methoxychlor	3.4E-09	J	3.4E-09	J	µg/m^3	LS11A-SS627-07C	1/6	N/A	3.4E-09	N/A	N/A		N/A	N/A	NO	NTX
	5103-71-9	alpha-Chlordane	3.2E-10	J	1.9E-09	J	µg/m^3	LS11A-SS627-07C	3/6	N/A	1.9E-09	N/A	2.4E-02	C	N/A	N/A	NO	BSL
	5103-74-2	gamma-Chlordane	3.6E-10	J	1.0E-09	J	µg/m^3	LS11A-SS625-07C	4/6	N/A	1.0E-09	N/A	2.4E-02	C	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	3.6E-03		1.8E-02		µg/m^3	LS11-SS313-00	16/16	N/A	1.8E-02	N/A	5.2E-01	N	N/A	N/A	NO	BSL
	7440-38-2	Arsenic	8.1E-07	J	4.6E-06	J	µg/m^3	LS11A-SS625P-07C	16/16	N/A	4.6E-06	N/A	5.7E-04	C	N/A	N/A	NO	BSL
	7440-39-3	Barium	2.5E-05		6.2E-05		µg/m^3	LS11-SS319P-00	16/16	N/A	6.2E-05	N/A	5.2E-02	N	N/A	N/A	NO	BSL
	7440-41-7	Beryllium	1.7E-07	J	3.4E-07	J	µg/m^3	LS11-SS319P-00	15/16	N/A	3.4E-07	N/A	1.0E-03	C	N/A	N/A	NO	BSL
	7440-70-2	Calcium	4.5E-04	J	2.2E-03		µg/m^3	LS11-SS311-00	16/16	N/A	2.2E-03	N/A	N/A		N/A	N/A	NO	NUT
	7440-47-3	Chromium	5.6E-06		1.6E-05		µg/m^3	LS11-SS308-00	16/16	N/A	1.6E-05	N/A	2.9E-05	C	N/A	N/A	NO	BSL
	7440-48-4	Cobalt	7.1E-07	J	2.6E-06	J	µg/m^3	LS11-SS311-00 LS11-SS313-00	16/16	N/A	2.6E-06	N/A	2.7E-04	C	N/A	N/A	NO	BSL
	7440-50-8	Copper	2.9E-06		1.1E-05		µg/m^3	LS11A-SS630-07C	14/16	N/A	1.1E-05	N/A	N/A		N/A	N/A	NO	NTX
	7439-89-6	Iron	3.5E-03		1.5E-02		µg/m^3	LS11-SS308-00	16/16	N/A	1.5E-02	N/A	N/A		N/A	N/A	NO	NTX
	7439-92-1	Lead	3.3E-06		2.8E-05		µg/m^3	LS11A-SS625P-07C	16/16	N/A	2.8E-05	N/A	N/A		N/A	N/A	NO	NTX

Table F-2.2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration 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
	7439-95-4	Magnesium	3.7E-04 J	1.7E-03	$\mu g/m^3$	LS11A-SS630-07C	16/16	N/A	1.7E-03	N/A	N/A	N/A	N/A	NO	NUT
	7439-96-5	Manganese	2.7E-05	1.4E-04 J	$\mu g/m^3$	LS11A-SS630-07C	16/16	N/A	1.4E-04	N/A	5.2E-03 N	N/A	N/A	NO	BSL
	7439-97-6	Mercury	1.5E-08 J	1.3E-07	$\mu g/m^3$	LS11-SS313-00	13/16	N/A	1.3E-07	N/A	3.1E-02 N	N/A	N/A	NO	BSL
	7440-02-0	Nickel	2.9E-06 J	7.4E-06	$\mu g/m^3$	LS11-SS313-00	16/16	N/A	7.4E-06	N/A	9.4E-03 C	N/A	N/A	NO	BSL
	7440-09-7	Potassium	1.4E-04 J	7.4E-04	$\mu g/m^3$	LS11-SS314-00	16/16	N/A	7.4E-04	N/A	N/A	N/A	N/A	NO	NUT
	7782-49-2	Selenium	3.6E-07 J	7.4E-07 J	$\mu g/m^3$	LS11-SS319-00	4/16	N/A	7.4E-07	N/A	2.1E+00 N	N/A	N/A	NO	BSL
	7440-28-0	Thallium	2.6E-07 J	5.9E-07 J	$\mu g/m^3$	LS11A-SS625P-07C	6/16	N/A	5.9E-07	N/A	N/A	N/A	N/A	NO	NTX
	7440-62-2	Vanadium	5.9E-06	2.6E-05	$\mu g/m^3$	LS11-SS308-00	16/16	N/A	2.6E-05	N/A	2.9E-04 C	N/A	N/A	NO	BSL
	7440-66-6	Zinc	9.4E-06	4.8E-05	$\mu g/m^3$	LS11A-SS630-07C	16/16	N/A	4.8E-05	N/A	N/A	N/A	N/A	NO	NTX

[1] Minimum/Maximum calculated air concentrations. Air concentration (ug/m3) = soil concentration (mg/kg) x (1/VF + 1/PEF) x 1000 μg/mg.
VF used only for VOCs, and calculated on Table 2.2A. PEF = $1.36x10^9$ μ3/kg.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk Screening Level Table, May 2009, U.S. EPA. Residential Air RSL (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RSL value for chlordane used as surrogate for alpha- and gamma-chlordane.
RSL value for elemental mercury used as surrogate for mercury.
RSL value for hexavalent chromium particulates used for chromium.
RSL value for trans-1,2-dichloroethene used as surrogate for cis-1,2-dichloroethene.
RSL value for vanadium pentoxide used as surrogate for vanadium.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

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
N/A = Not available or not applicable

Table F-2.2A

Calculation of Volatilization Factor - Surface Soil

Site 11a Remedial Investigation Report

NABLittle Creek, Virginia Beach, Virginia

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)	Soil Saturation Concentration (C_{sat}) (mg/kg)
1,2,4-Trichlorobenzene	3.00E-02	5.82E-02	8.23E-06	1.78E+03	1.07E+01	3.00E+02	8.63E-06	5.59E+04	3.24E+03
1,2-Dichlorobenzene	6.90E-02	7.79E-02	7.90E-06	6.17E+02	3.70E+00	1.56E+02	7.50E-05	1.90E+04	5.95E+02
1,4-Dichlorobenzene	6.90E-02	9.96E-02	7.90E-06	6.17E+02	3.70E+00	7.38E+01	9.58E-05	1.68E+04	2.82E+02
2-Butanone	8.95E-02	1.12E-03	9.80E-06	4.50E+00	2.70E-02	2.68E+05	4.26E-05	2.52E+04	3.41E+04
Ethylbenzene	7.50E-02	3.23E-01	7.80E-06	3.63E+02	2.18E+00	1.69E+02	5.52E-04	6.99E+03	3.95E+02
Methyl-tert-butyl ether (MTBE)	8.00E-02	2.41E-02	1.00E-05	6.00E+00	3.60E-02	1.50E+05	7.30E-04	6.08E+03	2.11E+04
Methylene chloride	1.01E-01	8.98E-02	1.17E-05	1.17E+01	7.02E-02	1.30E+04	2.58E-03	3.23E+03	2.43E+03
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	2.00E+02	2.47E-03	3.31E+03	2.35E+02
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	1.29E+03
cis-1,2-Dichloroethene	7.36E-02	1.67E-01	1.13E-05	3.55E+01	2.13E-01	3.50E+03	1.90E-03	3.77E+03	1.21E+03
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	8.51E+01
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	3.08E+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)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (C_{sat}) =

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a of a 0.5-acre-square source for Philadelphia (g/m2-s per kg/m3)	90.24
T - Exposure interval(s)	9.5E+08
ρ_b - Soil bulk density (g/cm^3)	1.5
Θ_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Θ_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (ρ_b/ρ_s)	0.43
Θ_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
ρ_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.
Physical/chemical properties not listed in USEPA, 1996 obtained from USEPA Region 9 Preliminary Remediation Goal support tables, 2002.

Table F-2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	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
Shallow Aquifer Tap Water and Water in Excavation Pit	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	5.2E-01		8.7E-01		UG_L	LS11-MW31D-07C	3/16	0.5 - 50	8.7E-01	N/A	5.9E+03	N	N/A		NO	BSL
	75-34-3	1,1-Dichloroethane	1.7E-01	J	1.2E+00		UG_L	LS11-MW06D-07C	2/16	0.5 - 50	1.2E+00	N/A	2.4E+00	C	N/A		NO	BSL
	75-35-4	1,1-Dichloroethene	2.7E-01	J	3.0E+00		UG_L	LS11-MW06D-07C	4/16	0.5 - 50	3.0E+00	N/A	3.4E+01	N	7.0E+00	MCL	NO	BSL
	75-27-4	Bromodichloromethane	1.7E-01	J	4.8E-01	J	UG_L	LS11-MW22D-07C	4/16	0.5 - 50	4.8E-01	N/A	1.2E-01	C	8.0E+01	MCL	YES	ASL
	108-90-7	Chlorobenzene	1.2E-01	J	1.2E-01	J	UG_L	LS11-MW31D-07C	1/16	0.5 - 50	1.2E-01	N/A	9.1E+00	N	1.0E+02	MCL	NO	BSL
	67-66-3	Chloroform	6.2E-01		2.2E+01		UG_L	LS11-MW22D-07C	6/16	0.5 - 50	2.2E+01	N/A	1.9E-01	C	8.0E+01	MCL	YES	ASL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	1.0E-01	J	1.1E+01		UG_L	LS11A-MW40D-07C	10/16	0.5 - 50	1.1E+01	N/A	1.2E+01	C	N/A		NO	BSL
	127-18-4	Tetrachloroethene	1.2E-01	J	4.3E+02	J	UG_L	LS11-MW32D-07C	10/16	0.5 - 50	4.3E+02	N/A	1.1E-01	C	5.0E+00	MCL	YES	ASL
	79-01-6	Trichloroethene	1.9E+00		7.3E+02		UG_L	LS11A-MW38D-07C	11/16	0.5 - 50	7.3E+02	N/A	1.7E+00	C	5.0E+00	MCL	YES	ASL
	75-69-4	Trichlorofluoromethane(Freon-11)	1.9E-01	J	5.6E-01		UG_L	LS11-MW33D-07C	4/16	0.5 - 50	5.6E-01	N/A	1.3E+02	N	N/A		NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.9E-01	J	2.4E+01		UG_L	LS11-MW06D-07C	9/16	0.5 - 50	2.4E+01	N/A	3.7E+01	N	7.0E+01	MCL	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	1.3E-01	J	1.0E+00		UG_L	LS11-MW06D-07C	4/16	0.5 - 50	1.0E+00	N/A	1.1E+01	N	1.0E+02	MCL	NO	BSL
	121-14-2	2,4-Dinitrotoluene	3.0E+00	J	3.0E+00	J	UG_L	LS11-MW20D-07C	1/16	10 - 11	3.0E+00	N/A	2.2E-01	C	N/A		YES	ASL
	87-86-5	Pentachlorophenol	6.0E+00	J	6.0E+00	J	UG_L	LS11-MW20D-07C	1/16	25 - 28	6.0E+00	N/A	5.6E-01	C	1.0E+00	MCL	YES	ASL
	129-00-0	Pyrene	4.0E+00	J	4.0E+00	J	UG_L	LS11-MW20D-07C	1/16	10 - 11	4.0E+00	N/A	1.1E+02	N	N/A		NO	BSL
	72-54-8	4,4'-DDD	4.4E-03	J	7.5E-03	J	UG_L	LS11A-MW37D-07C	3/16	0.02 - 0.022	7.5E-03	N/A	2.8E-01	C	N/A		NO	BSL
	60-57-1	Dieldrin	5.7E-02		2.6E-01		UG_L	LS11A-MW40D-07C	3/16	0.02 - 0.022	2.6E-01	1.0E-01	4.2E-03	C	N/A		YES	ASL
	72-20-8	Endrin	4.8E-03	J	4.8E-03	J	UG_L	LS11A-MW37D-07C	1/16	0.02 - 0.022	4.8E-03	N/A	1.1E+00	N	2.0E+00	MCL	NO	BSL
	1024-57-3	Heptachlor epoxide	5.7E-03	J	2.0E-02	J	UG_L	LS11-MW20D-07C	2/16	0.01 - 0.011	2.0E-02	N/A	7.4E-03	C	2.0E-01	MCL	YES	ASL
	319-84-6	alpha-BHC	3.1E-03	J	3.1E-03	J	UG_L	LS11-MW15D-07C	1/16	0.01 - 0.011	3.1E-03	N/A	1.1E-02	C	N/A		NO	BSL
	5103-71-9	alpha-Chlordane	5.9E-03	J	6.1E-03	J	UG_L	LS11-MW20D-07C	2/16	0.01 - 0.011	6.1E-03	N/A	1.9E-01	C	2.0E+00	MCL	NO	BSL
	58-89-9	gamma-BHC (Lindane)	2.8E-03	J	3.9E-03	J	UG_L	LS11A-MW38D-07C	5/16	0.01 - 0.011	3.9E-03	N/A	6.1E-02	C	2.0E-01	MCL	NO	BSL
	5103-74-2	gamma-Chlordane	6.6E-03	J	6.6E-03	J	UG_L	LS11-MW20D-07C	1/16	0.01 - 0.011	6.6E-03	N/A	1.9E-01	C	2.0E+00	MCL	NO	BSL
	7429-90-5	Aluminum	1.2E+01	J	1.9E+02	J	UG_L	LS11-MW21D-07C	11/16	200 - 200	1.9E+02	7.1E+02	3.7E+03	N	50 - 2,000	2-MCL	NO	BSL
	7440-38-2	Arsenic	3.8E+00	K	3.8E+00	K	UG_L	LS11-MW15D-07C	1/16	1 - 1	3.8E+00	4.0E+00	4.5E-02	C	1.0E+01	MCL	YES	ASL
	7440-39-3	Barium	7.6E+00	J	5.7E+01		UG_L	LS11-MW22D-07C	16/16	10 - 10	5.7E+01	2.8E+04	7.3E+02	N	2.0E+03	MCL	NO	BSL
	7440-41-7	Beryllium	5.2E-01	J	5.2E-01	J	UG_L	LS11-MW31D-07C	1/16	1 - 1	5.2E-01	5.0E-01	7.3E+00	N	4.0E+00	MCL	NO	BSL
	7440-43-9	Cadmium	6.4E-02	J	3.1E-01	J	UG_L	LS11-MW34D-07C	10/16	1 - 1	3.1E-01	2.1E+00	1.8E+00	N	5.0E+00	MCL	NO	BSL
	7440-70-2	Calcium	1.3E+03	J	6.5E+04	J	UG_L	LS11-MW15D-07C	16/16	5000 - 5000	6.5E+04	1.3E+05	N/A		N/A		NO	NUT
	7440-47-3	Chromium	9.5E-01	J	2.7E+00		UG_L	LS11-MW31D-07C	4/16	2 - 2	2.7E+00	4.1E+00	7.3E+01	N	1.0E+02	MCL	NO	BSL
	7440-48-4	Cobalt	1.6E-01	J	5.8E+00		UG_L	LS11A-MW39D-07C	16/16	1 - 1	5.8E+00	2.6E+00	1.1E+00	N	N/A		YES	ASL
	7440-50-8	Copper	1.9E+01		1.9E+01		UG_L	LS11-MW35D-07C	1/16	2 - 2	1.9E+01	N/A	1.5E+02	N	1.3E+03	AL	NO	BSL
	7439-89-6	Iron	1.7E+02		1.8E+03		UG_L	LS11-MW15D-07C	4/16	100 - 100	1.8E+03	1.1E+04	2.6E+03	N	3.0E+02	2-MCL	NO	BSL
	7439-92-1	Lead	6.3E-01	J	6.4E-01	J	UG_L	LS11-MW34D-07C	2/16	1 - 1	6.4E-01	N/A	1.5E+01		1.5E+01	AL	NO	BSL
	7439-95-4	Magnesium	9.7E+02	J	1.2E+04		UG_L	LS11-MW22D-07C	16/16	5000 - 5000	1.2E+04	4.6E+04	N/A		N/A		NO	NUT
	7439-96-5	Manganese	2.5E+01	J	6.7E+02	J	UG_L	LS11-MW35DP-07C	16/16	1 - 1	6.7E+02	1.5E+03	8.8E+01	N	5.0E+01	2-MCL	YES	ASL

Table F-2.3

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	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	7.4E-02	J	8.0E-01		UG_L	LS11-MW31D-07C	4/16	0.2 - 0.2	8.0E-01	3.0E-01	1.1E+00	N	2.0E+00	MCL	NO	BSL
	7440-02-0	Nickel	3.1E+00		4.2E+00		UG_L	LS11-MW31D-07C	2/16	1 - 1	4.2E+00	1.4E+01	7.3E+01	N	N/A		NO	BSL
	7440-09-7	Potassium	2.3E+02	J	2.5E+03	J	UG_L	LS11-MW33D-07C	16/16	5000 - 5000	2.5E+03	1.7E+04	N/A		N/A		NO	NUT
	7782-49-2	Selenium	3.2E-01	J	2.5E+00	J	UG_L	LS11-MW31D-07C	14/16	5 - 5	2.5E+00	8.0E+00	1.8E+01	N	5.0E+01	MCL	NO	BSL
	7440-23-5	Sodium	5.8E+03	J	4.4E+04	J	UG_L	LS11-MW22D-07C	16/16	5000 - 5000	4.4E+04	6.5E+04	N/A		N/A		NO	NUT
	7440-28-0	Thallium	1.2E-01	J	1.2E-01	J	UG_L	LS11-MW22D-07C	1/16	1 - 1	1.2E-01	2.5E+00	2.4E-01	N	2.0E+00	MCL	NO	BSL
	7440-66-6	Zinc	1.8E+01		1.2E+03		UG_L	LS11A-MW39D-07C	3/16	2 - 2	1.2E+03	5.9E+01	1.1E+03	N	5.0E+03	2-MCL	YES	ASL

[1] Minimum/Maximum detected concentration. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

[2] Maximum concentration is used for screening.

[3] Background values from Table B-1, Final Background Investigation Addendum for Summer Groundwater Sampling Event (CH2M HILL, 2003)

[4] Risk Screening Level Table, May 2009, U.S. EPA. Tap water RSL (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RBC value for hexavalent chromium used for total chromium.
The tap water value of 15 ug/L for lead is the action level provided in the Drinking Water Regulations and Health Advisories.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

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
MCL = USEPA's Maximum Contaminant Level (USEPA, Winter 2004)
2-MCL = USEPA's National Secondary Drinking Water Standard (USEPA, Winter 2004)
AL = Action Level, Safe Drinking Water Act (USEPA, Winter 2004)
N/A = Not available or not applicable

Table F-2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air (Groundwater Data)

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	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
Shallow Aquifer Water Vapors at Showerhead and at Excavation	76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	5.2E-01		8.7E-01		UG_L	LS11-MW31D-07C	3/16	0.5 - 50	8.7E-01	N/A	5.9E+03	N	N/A		NO	BSL
	75-34-3	1,1-Dichloroethane	1.7E-01	J	1.2E+00		UG_L	LS11-MW06D-07C	2/16	0.5 - 50	1.2E+00	N/A	2.4E+00	C	N/A		NO	BSL
	75-35-4	1,1-Dichloroethene	2.7E-01	J	3.0E+00		UG_L	LS11-MW06D-07C	4/16	0.5 - 50	3.0E+00	N/A	3.4E+01	N	7.0E+00	MCL	NO	BSL
	75-27-4	Bromodichloromethane	1.7E-01	J	4.8E-01	J	UG_L	LS11-MW22D-07C	4/16	0.5 - 50	4.8E-01	N/A	1.2E-01	C	8.0E+01	MCL	YES	ASL
	108-90-7	Chlorobenzene	1.2E-01	J	1.2E-01	J	UG_L	LS11-MW31D-07C	1/16	0.5 - 50	1.2E-01	N/A	9.1E+00	N	1.0E+02	MCL	NO	BSL
	67-66-3	Chloroform	6.2E-01		2.2E+01		UG_L	LS11-MW22D-07C	6/16	0.5 - 50	2.2E+01	N/A	1.9E-01	C	8.0E+01	MCL	YES	ASL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	1.0E-01	J	1.1E+01		UG_L	LS11A-MW40D-07C	10/16	0.5 - 50	1.1E+01	N/A	1.2E+01	C	N/A		NO	BSL
	127-18-4	Tetrachloroethene	1.2E-01	J	4.3E+02	J	UG_L	LS11-MW32D-07C	10/16	0.5 - 50	4.3E+02	N/A	1.1E-01	C	5.0E+00	MCL	YES	ASL
	79-01-6	Trichloroethene	1.9E+00		7.3E+02		UG_L	LS11A-MW38D-07C	11/16	0.5 - 50	7.3E+02	N/A	1.7E+00	C	5.0E+00	MCL	YES	ASL
	75-69-4	Trichlorofluoromethane(Freon-11)	1.9E-01	J	5.6E-01		UG_L	LS11-MW33D-07C	4/16	0.5 - 50	5.6E-01	N/A	1.3E+02	N	N/A		NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.9E-01	J	2.4E+01		UG_L	LS11-MW06D-07C	9/16	0.5 - 50	2.4E+01	N/A	3.7E+01	N	7.0E+01	MCL	NO	BSL
	156-60-5	trans-1,2-Dichloroethene	1.3E-01	J	1.0E+00		UG_L	LS11-MW06D-07C	4/16	0.5 - 50	1.0E+00	N/A	1.1E+01	N	1.0E+02	MCL	NO	BSL

[1] Minimum/Maximum detected concentration. Unfiltered results for metals since in general no significant difference between filtered and unfiltered results.

[2] Maximum concentration is used for screening.

[3] Background values from Table B-1, Final Background Investigation Addendum for Summer Groundwater Sampling Event (CH2M HILL, 2003)

[4] Risk Screening Level Table, May 2009, U.S. EPA. Tap water RSL (Cancer benchmark value = 1E-06, adjusted HQ=0.1).

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

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

MCL = USEPA's Maximum Contaminant Level (USEPA, Winter 2004)

2-MCL = USEPA's National Secondary Drinking Water Standard (USEPA, Winter 2004)

AL = Action Level, Safe Drinking Water Act

N/A = Not available or not applicable

Table F-2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	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
Soil*	120-82-1	1,2,4-Trichlorobenzene	3.3E-03	J	3.3E-03	J	MG_KG	LS11-SS319P-00	1/38	0.01 - 0.014	3.3E-03	N/A	8.7E+00	N	1.3E-02	SSL	NO	BSL
	95-50-1	1,2-Dichlorobenzene	1.8E-03	J	1.8E-03	J	MG_KG	LS11-SS319P-00	1/38	0.01 - 0.014	1.8E-03	N/A	2.2E+02	NS	4.0E-01	SSL	NO	BSL
	106-46-7	1,4-Dichlorobenzene	1.8E-03	J	1.8E-03	J	MG_KG	LS11-SS319P-00	1/38	0.01 - 0.014	1.8E-03	N/A	2.6E+00	C	4.6E-04	SSL	NO	BSL
	78-93-3	2-Butanone	4.2E-03	J	4.2E-03	J	MG_KG	LS11-SS319-00	1/38	0.01 - 0.057	4.2E-03	N/A	4.7E+03	N	2.9E+00	SSL	NO	BSL
	100-41-4	Ethylbenzene	1.2E-03	J	1.2E-03	J	MG_KG	LS11-SS306-00	1/38	0.01 - 0.014	1.2E-03	N/A	5.7E+00	C	1.9E-03	SSL	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	1.2E-03	J	4.7E-03	J	MG_KG	LS11-SB306-03	2/38	0.01 - 0.014	4.7E-03	N/A	3.9E+01	C	2.7E-03	SSL	NO	BSL
	75-09-2	Methylene chloride	1.1E-02	J	1.1E-02	J	MG_KG	LS11-SS313P-00	1/38	0.01 - 0.014	1.1E-02	N/A	1.1E+01	C	1.2E-03	SSL	NO	BSL
	127-18-4	Tetrachloroethene	2.7E-03	J	1.1E-01		MG_KG	LS11A-SB109-04-03D	13/38	0.01 - 0.014	1.1E-01	N/A	5.7E-01	C	5.2E-05	SSL	NO	BSL
	79-01-6	Trichloroethene	3.0E-03	J	1.1E-02	J	MG_KG	LS11A-SB109-04-03D	4/38	0.01 - 0.014	1.1E-02	N/A	2.8E+00	C	6.1E-04	SSL	NO	BSL
	75-69-4	Trichlorofluoromethane(Freon-11)	2.1E-03	J	2.1E-03	J	MG_KG	LS11-SB314-03	1/38	0.01 - 0.014	2.1E-03	N/A	8.0E+01	N	8.4E-01	SSL	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.3E-03	J	3.0E-03	J	MG_KG	LS11A-SS629-07C	2/38	0.01 - 0.014	3.0E-03	N/A	7.8E+01	N	1.1E-01	SSL	NO	BSL
	129-00-0	Pyrene	7.8E-02	J	7.8E-02	J	MG_KG	LS11A-SS625P-07C	1/12	0.34 - 0.45	7.8E-02	N/A	1.7E+02	N	1.5E+02	SSL	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	7.9E-02	J	1.3E+01		MG_KG	LS11A-SS629-07C	9/12	0.34 - 1.8	1.3E+01	N/A	3.5E+01	C	1.6E+00	SSL	NO	BSL
	72-54-8	4,4'-DDD	1.2E-03	J	8.4E-03		MG_KG	LS11A-SS625-07C	3/12	0.0034 - 0.0045	8.4E-03	N/A	2.0E+00	C	8.6E-02	SSL	NO	BSL
	72-55-9	4,4'-DDE	1.1E-03	J	4.5E-02	J	MG_KG	LS11A-SS625-07C	4/12	0.0034 - 0.0045	4.5E-02	2.4E+02	1.4E+00	C	6.0E-02	SSL	NO	BSL
	50-29-3	4,4'-DDT	1.3E-03	J	7.9E-03	J	MG_KG	LS11A-SS625-07C	4/12	0.0034 - 0.0045	7.9E-03	6.2E+00	1.7E+00	C	8.7E-02	SSL	NO	BSL
	309-00-2	Aldrin	3.8E-03		3.8E-03		MG_KG	LS11A-SS628-07C	1/12	0.0018 - 0.0023	3.8E-03	N/A	2.9E-02	C	8.4E-04	SSL	NO	BSL
	60-57-1	Dieldrin	2.1E-03	J	8.0E-02		MG_KG	LS11A-SS628-07C	4/12	0.0034 - 0.0073	8.0E-02	N/A	3.0E-02	C	9.0E-05	SSL	YES	ASL
	959-98-8	Endosulfan I	5.5E-04	J	5.5E-04	J	MG_KG	LS11A-SS627-07C	1/12	0.0018 - 0.0023	5.5E-04	N/A	3.7E+01	N	9.7E+00	SSL	NO	BSL
	1031-07-8	Endosulfan sulfate	1.9E-03	J	1.9E-03	J	MG_KG	LS11A-SS623-07C	1/12	0.0034 - 0.0045	1.9E-03	N/A	3.7E+01	N	9.7E+00	SSL	NO	BSL
	72-20-8	Endrin	1.6E-03	J	1.6E-03	J	MG_KG	LS11A-SS628-07C	1/12	0.0034 - 0.0045	1.6E-03	N/A	1.8E+00	N	2.3E-01	SSL	NO	BSL
	7421-93-4	Endrin aldehyde	1.1E-03	J	1.4E-03	J	MG_KG	LS11A-SS627-07C	2/12	0.0034 - 0.0045	1.4E-03	N/A	1.8E+00	N	2.3E-01	SSL	NO	BSL
	53494-70-5	Endrin ketone	1.1E-03	J	1.1E-03	J	MG_KG	LS11A-SS628-07C	1/12	0.0034 - 0.0045	1.1E-03	N/A	1.8E+00	N	2.3E-01	SSL	NO	BSL
	1024-57-3	Heptachlor epoxide	6.8E-04	J	6.8E-04	J	MG_KG	LS11A-SS627-07C	1/12	0.0018 - 0.0023	6.8E-04	N/A	5.3E-02	C	7.9E-05	SSL	NO	BSL
	72-43-5	Methoxychlor	4.6E-03	J	4.6E-03	J	MG_KG	LS11A-SS627-07C	1/12	0.018 - 0.023	4.6E-03	N/A	3.1E+01	N	1.6E+01	SSL	NO	BSL
	5103-71-9	alpha-Chlordane	4.3E-04	J	2.6E-03	J	MG_KG	LS11A-SS627-07C	3/12	0.0018 - 0.0023	2.6E-03	N/A	1.6E+00	C	3.3E-02	SSL	NO	BSL
	5103-74-2	gamma-Chlordane	4.9E-04	J	1.4E-03	J	MG_KG	LS11A-SS625-07C	4/12	0.0018 - 0.0023	1.4E-03	N/A	1.6E+00	C	3.3E-02	SSL	NO	BSL
	7429-90-5	Aluminum	7.3E+02		2.4E+04		MG_KG	LS11-SS313-00	32/32	20.5 - 35	2.4E+04	8.5E+03	7.7E+03	N	5.5E+04	SSL	YES	ASL
	7440-36-0	Antimony	4.0E-01	J	4.0E-01	J	MG_KG	LS11-SB307-03	1/32	6.1 - 10.04	4.0E-01	N/A	3.1E+00	N	6.6E-01	SSL	NO	BSL
	7440-38-2	Arsenic	7.9E-01	J	6.2E+00	J	MG_KG	LS11A-SS625P-07C	25/32	1 - 1.7	6.2E+00	5.6E+00	3.9E-01	C	1.3E-03	SSL	YES	ASL
	7440-39-3	Barium	6.0E+00	J	8.5E+01		MG_KG	LS11-SS319P-00	27/32	20.5 - 35	8.5E+01	6.9E+01	1.5E+03	N	3.0E+02	SSL	NO	BSL
	7440-41-7	Beryllium	1.1E-01	J	4.6E-01	J	MG_KG	LS11-SS319P-00	23/32	0.51 - 0.87	4.6E-01	6.0E-01	1.6E+01	N	5.8E+01	SSL	NO	BSL
	7440-70-2	Calcium	5.1E+02	J	3.1E+03		MG_KG	LS11-SS311-00	23/32	512 - 868	3.1E+03	1.8E+03	N/A		N/A		NO	NUT
	7440-47-3	Chromium	1.4E+00		2.2E+01		MG_KG	LS11-SS308-00	32/32	1 - 1.7	2.2E+01	2.0E+01	2.8E+02	C	9.9E+07	SSL	NO	BSL
	7440-48-4	Cobalt	8.7E-01	J	3.5E+00	J	MG_KG	LS11-SS311-00 LS11-SS313-00	26/32	5.1 - 8.7	3.5E+00	5.1E+00	2.3E+00	N	4.9E-01	SSL	YES	ASL
	7440-50-8	Copper	3.7E+00		1.5E+01		MG_KG	LS11A-SS630-07C	20/32	2.6 - 4.3	1.5E+01	N/A	3.3E+02	N	5.1E+01	SSL	NO	BSL

Table F-2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration	Qualifier	Maximum [1] Concentration	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
	7439-89-6	Iron	3.8E+02		2.1E+04		MG_KG	LS11-SS308-00	32/32	10.2 - 17	2.1E+04	1.5E+04	5.5E+03	N	6.4E+02	SSL	YES	ASL
	7439-92-1	Lead	5.5E-01	J	3.8E+01		MG_KG	LS11A-SS625P-07C	32/32	1 - 1.7	3.8E+01	1.6E+01	4.0E+02		N/A		NO	BSL
	7439-95-4	Magnesium	8.2E+01	J	2.4E+03		MG_KG	LS11A-SS630-07C	31/32	512 - 868	2.4E+03	1.3E+03	N/A		N/A		NO	NUT
	7439-96-5	Manganese	6.2E+00		1.9E+02	J	MG_KG	LS11A-SS630-07C	31/32	1.5 - 2.6	1.9E+02	2.7E+02	1.8E+02	N	5.7E+01	SSL	YES	ASL
	7439-97-6	Mercury	2.0E-02	J	1.7E-01		MG_KG	LS11-SS313-00	13/32	0.02 - 0.14	1.7E-01	N/A	2.3E+00	N	5.7E-01	SSL	NO	BSL
	7440-02-0	Nickel	3.5E+00	J	1.0E+01		MG_KG	LS11-SS313-00	24/32	4.1 - 6.9	1.0E+01	9.5E+00	1.5E+02	N	4.8E+01	SSL	NO	BSL
	7440-09-7	Potassium	8.8E+01	J	1.0E+03		MG_KG	LS11-SS314-00	29/32	512 - 868	1.0E+03	1.4E+03	N/A		N/A		NO	NUT
	7782-49-2	Selenium	4.9E-01	J	1.0E+00	J	MG_KG	LS11-SS319-00	4/32	0.65 - 4.7	1.0E+00	N/A	3.9E+01	N	9.5E-01	SSL	NO	BSL
	7440-28-0	Thallium	3.5E-01	J	1.2E+00	J	MG_KG	LS11A-SB623-0103-07C	10/32	1.31 - 3.4	1.2E+00	N/A	5.1E-01	N	1.7E-01	SSL	YES	ASL
	7440-62-2	Vanadium	9.7E-01	J	3.5E+01		MG_KG	LS11-SS308-00	32/32	5.1 - 8.7	3.5E+01	3.4E+01	3.9E+01	N	1.8E+02	SSL	NO	BSL
	7440-66-6	Zinc	1.1E+01		6.6E+01		MG_KG	LS11A-SS630-07C	22/32	2.62 - 8.1	6.6E+01	3.9E+01	2.3E+03	N	6.8E+02	SSL	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Table 5-2, NAB Little Creek Background 95% UTLs for Urban Soils, Background Investigation for Naval Amphibious Base Little Creek, CH2M HILL, December 2000

[4] Risk Screening Level Table, May 2009, U.S. EPA. Residential Soil RSL (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RSL value for total chromium (1:6 ratio CRVI:CR III) used for chromium.
The soil value of 400 mg/kg for lead is from the Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, USEPA, July 14, 1994.
RBC value for mercury, inorganic salts used for mercury.
RSL value for endosulfan used as surrogate for endosulfan I and endosulfan sulfate.
RSL value for endrin used as surrogate for endrin aldehyde and endrin ketone.
RSL value for chlordane used as surrogate for alpha- and gamma-chlordane.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

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
S = Concentration exceeded saturation concentration (Csat), use Csat as screening value.
SSL = Soil Screening Level for Protection of Groundwater, from RSL Table
N/A = Not available or not applicable

Table F-2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration 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
Emissions from Soil*	120-82-1	1,2,4-Trichlorobenzene	1.0E-03 J	1.0E-03 J	µg/m^3	LS11-SS319P-00	1/38	0.01 - 0.014	1.0E-03	N/A	4.2E-01 N	N/A	N/A	NO	BSL
	95-50-1	1,2-Dichlorobenzene	3.0E-03 J	3.0E-03 J	µg/m^3	LS11-SS319P-00	1/38	0.01 - 0.014	3.0E-03	N/A	2.1E+01 N	N/A	N/A	NO	BSL
	106-46-7	1,4-Dichlorobenzene	6.4E-03 J	6.4E-03 J	µg/m^3	LS11-SS319P-00	1/38	0.01 - 0.014	6.4E-03	N/A	2.2E-01 C	N/A	N/A	NO	BSL
	78-93-3	2-Butanone	1.2E-04 J	1.2E-04 J	µg/m^3	LS11-SS319-00	1/38	0.01 - 0.057	1.2E-04	N/A	5.2E+02 N	N/A	N/A	NO	BSL
	100-41-4	Ethylbenzene	3.0E-03 J	3.0E-03 J	µg/m^3	LS11-SS306-00	1/38	0.01 - 0.014	3.0E-03	N/A	9.7E-01 C	N/A	N/A	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	5.7E-05 J	2.2E-04 J	µg/m^3	LS11-SB306-03	2/38	0.01 - 0.014	2.2E-04	N/A	9.4E+00 C	N/A	N/A	NO	BSL
	75-09-2	Methylene chloride	4.5E-03 J	4.5E-03 J	µg/m^3	LS11-SS313P-00	1/38	0.01 - 0.014	4.5E-03	N/A	5.2E+00 C	N/A	N/A	NO	BSL
	127-18-4	Tetrachloroethene	1.2E-02 J	4.7E-01	µg/m^3	LS11A-SB109-04-03D	13/38	0.01 - 0.014	4.7E-01	N/A	4.1E-01 C	N/A	N/A	YES	ASL
	79-01-6	Trichloroethene	2.3E-03 J	8.5E-03 J	µg/m^3	LS11A-SB109-04-03D	4/38	0.01 - 0.014	8.5E-03	N/A	1.2E+00 C	N/A	N/A	NO	BSL
	75-69-4	Trichlorofluoromethane(Freon-11)	1.1E-03 J	1.1E-03 J	µg/m^3	LS11-SB314-03	1/38	0.01 - 0.014	1.1E-03	N/A	3.1E+02 N	N/A	N/A	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.1E-03 J	2.5E-03 J	µg/m^3	LS11A-SS629-07C	2/38	0.01 - 0.014	2.5E-03	N/A	6.3E+00 N	N/A	N/A	NO	BSL
	129-00-0	Pyrene	9.2E-01 J	9.2E-01 J	µg/m^3	LS11A-SS625P-07C	1/12	0.34 - 0.45	9.2E-01	N/A	N/A	N/A	N/A	NO	NTX
	117-81-7	bis(2-Ethylhexyl)phthalate	2.6E-03 J	4.2E-01	µg/m^3	LS11A-SS629-07C	9/12	0.34 - 1.8	4.2E-01	N/A	1.0E+00 C	N/A	N/A	NO	BSL
	72-54-8	4,4'-DDD	8.8E-10 J	6.2E-09	µg/m^3	LS11A-SS625-07C	3/12	0.0034 - 0.0045	6.2E-09	N/A	3.5E-02 C	N/A	N/A	NO	BSL
	72-55-9	4,4'-DDE	8.1E-10 J	3.3E-08 J	µg/m^3	LS11A-SS625-07C	4/12	0.0034 - 0.0045	3.3E-08	N/A	2.5E-02 C	N/A	N/A	NO	BSL
	50-29-3	4,4'-DDT	9.6E-10 J	5.8E-09 J	µg/m^3	LS11A-SS625-07C	4/12	0.0034 - 0.0045	5.8E-09	N/A	2.5E-02 C	N/A	N/A	NO	BSL
	309-00-2	Aldrin	2.8E-09	2.8E-09	µg/m^3	LS11A-SS628-07C	1/12	0.0018 - 0.0023	2.8E-09	N/A	5.0E-04 C	N/A	N/A	NO	BSL
	60-57-1	Dieldrin	1.5E-09 J	5.9E-08	µg/m^3	LS11A-SS628-07C	4/12	0.0034 - 0.0073	5.9E-08	N/A	5.3E-04 C	N/A	N/A	NO	BSL
	959-98-8	Endosulfan I	4.0E-10 J	4.0E-10 J	µg/m^3	LS11A-SS627-07C	1/12	0.0018 - 0.0023	4.0E-10	N/A	N/A	N/A	N/A	NO	NTX
	1031-07-8	Endosulfan sulfate	1.4E-09 J	1.4E-09 J	µg/m^3	LS11A-SS623-07C	1/12	0.0034 - 0.0045	1.4E-09	N/A	N/A	N/A	N/A	NO	NTX
	72-20-8	Endrin	1.2E-09 J	1.2E-09 J	µg/m^3	LS11A-SS628-07C	1/12	0.0034 - 0.0045	1.2E-09	N/A	N/A	N/A	N/A	NO	NTX
	7421-93-4	Endrin aldehyde	8.1E-10 J	1.0E-09 J	µg/m^3	LS11A-SS627-07C	2/12	0.0034 - 0.0045	1.0E-09	N/A	N/A	N/A	N/A	NO	NTX
	53494-70-5	Endrin ketone	8.1E-10 J	8.1E-10 J	µg/m^3	LS11A-SS628-07C	1/12	0.0034 - 0.0045	8.1E-10	N/A	N/A	N/A	N/A	NO	NTX
	1024-57-3	Heptachlor epoxide	5.0E-10 J	5.0E-10 J	µg/m^3	LS11A-SS627-07C	1/12	0.0018 - 0.0023	5.0E-10	N/A	9.4E-04 C	N/A	N/A	NO	BSL
	72-43-5	Methoxychlor	3.4E-09 J	3.4E-09 J	µg/m^3	LS11A-SS627-07C	1/12	0.018 - 0.023	3.4E-09	N/A	N/A	N/A	N/A	NO	NTX
	5103-71-9	alpha-Chlordane	3.2E-10 J	1.9E-09 J	µg/m^3	LS11A-SS627-07C	3/12	0.0018 - 0.0023	1.9E-09	N/A	2.4E-02 C	N/A	N/A	NO	BSL
	5103-74-2	gamma-Chlordane	3.6E-10 J	1.0E-09 J	µg/m^3	LS11A-SS625-07C	4/12	0.0018 - 0.0023	1.0E-09	N/A	2.4E-02 C	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	5.3E-04	1.8E-02	µg/m^3	LS11-SS313-00	32/32	20.5 - 35	1.8E-02	N/A	5.2E-01 N	N/A	N/A	NO	BSL
	7440-36-0	Antimony	2.9E-07 J	2.9E-07 J	µg/m^3	LS11-SB307-03	1/32	6.1 - 10.04	2.9E-07	N/A	2.1E-02 N	N/A	N/A	NO	BSL
	7440-38-2	Arsenic	5.8E-07 J	4.6E-06 J	µg/m^3	LS11A-SS625P-07C	25/32	1 - 1.7	4.6E-06	N/A	5.7E-04 C	N/A	N/A	NO	BSL
	7440-39-3	Barium	4.4E-06 J	6.2E-05	µg/m^3	LS11-SS319P-00	27/32	20.5 - 35	6.2E-05	N/A	5.2E-02 N	N/A	N/A	NO	BSL
	7440-41-7	Beryllium	8.1E-08 J	3.4E-07 J	µg/m^3	LS11-SS319P-00	23/32	0.51 - 0.87	3.4E-07	N/A	1.0E-03 C	N/A	N/A	NO	BSL
	7440-70-2	Calcium	3.8E-04 J	2.2E-03	µg/m^3	LS11-SS311-00	23/32	512 - 868	2.2E-03	N/A	N/A	N/A	N/A	NO	NUT
	7440-47-3	Chromium	1.0E-06	1.6E-05	µg/m^3	LS11-SS308-00	32/32	1 - 1.7	1.6E-05	N/A	2.9E-05 C	N/A	N/A	NO	BSL
	7440-48-4	Cobalt	6.4E-07 J	2.6E-06 J	µg/m^3	LS11-SS311-00 LS11-SS313-00	26/32	5.1 - 8.7	2.6E-06	N/A	2.7E-04 C	N/A	N/A	NO	BSL
	7440-50-8	Copper	2.7E-06	1.1E-05	µg/m^3	LS11A-SS630-07C	20/32	2.6 - 4.3	1.1E-05	N/A	N/A	N/A	N/A	NO	NTX

Table F-2.6

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration 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
	7439-89-6	Iron	2.8E-04	1.5E-02	$\mu g/m^3$	LS11-SS308-00	32/32	10.2 - 17	1.5E-02	N/A	N/A	N/A	N/A	NO	NTX
	7439-92-1	Lead	4.0E-07 J	2.8E-05	$\mu g/m^3$	LS11A-SS625P-07C	32/32	1 - 1.7	2.8E-05	N/A	N/A	N/A	N/A	NO	NTX
	7439-95-4	Magnesium	6.0E-05 J	1.7E-03	$\mu g/m^3$	LS11A-SS630-07C	31/32	512 - 868	1.7E-03	N/A	N/A	N/A	N/A	NO	NUT
	7439-96-5	Manganese	4.6E-06	1.4E-04 J	$\mu g/m^3$	LS11A-SS630-07C	31/32	1.5 - 2.6	1.4E-04	N/A	5.2E-03 N	N/A	N/A	NO	BSL
	7439-97-6	Mercury	1.5E-08 J	1.3E-07	$\mu g/m^3$	LS11-SS313-00	13/32	0.02 - 0.14	1.3E-07	N/A	3.1E-02 N	N/A	N/A	NO	BSL
	7440-02-0	Nickel	2.6E-06 J	7.4E-06	$\mu g/m^3$	LS11-SS313-00	24/32	4.1 - 6.9	7.4E-06	N/A	9.4E-03 C	N/A	N/A	NO	BSL
	7440-09-7	Potassium	6.5E-05 J	7.4E-04	$\mu g/m^3$	LS11-SS314-00	29/32	512 - 868	7.4E-04	N/A	N/A	N/A	N/A	NO	NUT
	7782-49-2	Selenium	3.6E-07 J	7.4E-07 J	$\mu g/m^3$	LS11-SS319-00	4/32	0.65 - 4.7	7.4E-07	N/A	2.1E+00 N	N/A	N/A	NO	BSL
	7440-28-0	Thallium	2.6E-07 J	8.8E-07 J	$\mu g/m^3$	LS11A-SB623-0103-07C	10/32	1.31 - 3.4	8.8E-07	N/A	N/A	N/A	N/A	NO	NTX
	7440-62-2	Vanadium	7.1E-07 J	2.6E-05	$\mu g/m^3$	LS11-SS308-00	32/32	5.1 - 8.7	2.6E-05	N/A	2.9E-04 C	N/A	N/A	NO	BSL
	7440-66-6	Zinc	8.0E-06	4.8E-05	$\mu g/m^3$	LS11A-SS630-07C	22/32	2.62 - 8.1	4.8E-05	N/A	N/A	N/A	N/A	NO	NTX

* Surface soil & subsurface soil combined

[1] Minimum/Maximum calculated air concentrations. Air concentration (ug/m3) = soil concentration (mg/kg) x (1/VF + 1/PEF) x 1000 μg/mg.
VF used only for VOCs, and calculated on Table 2.2A. PEF = 1.36×10^9 μ3/kg.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk Screening Level Table, May 2009, U.S. EPA. Residential Air RSL (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
Ambient air RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
RSL value for chlordane used as surrogate for alpha- and gamma-chlordane.
RSL value for elemental mercury used as surrogate for mercury.
RSL value for Facilities, USEPA, July 14, 1994.
RSL value for trans-1,2-dichloroethene used as surrogate for cis-1,2-dichloroethene.
RSL value for vanadium pentoxide used as surrogate for vanadium.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

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
N/A = Not available or not applicable

Table F-2.6A

Calculation of Volatilization Factor - Surface Soil and Subsurface Soil

Site 11a Remedial Investigation Report

NAB Llittle Creek, Virginia Beach, Virginia

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)	Soil Saturation Concentration (C_{sat}) (mg/kg)
1,2,4-Trichlorobenzene	3.00E-02	5.82E-02	8.23E-06	1.78E+03	1.07E+01	3.00E+02	8.63E-06	5.59E+04	3.24E+03
1,2-Dichlorobenzene	6.90E-02	7.79E-02	7.90E-06	6.17E+02	3.70E+00	1.56E+02	7.50E-05	1.90E+04	5.95E+02
1,4-Dichlorobenzene	6.90E-02	9.96E-02	7.90E-06	6.17E+02	3.70E+00	7.38E+01	9.58E-05	1.68E+04	2.82E+02
2-Butanone	8.95E-02	1.12E-03	9.80E-06	4.50E+00	2.70E-02	2.68E+05	4.26E-05	2.52E+04	3.41E+04
Ethylbenzene	7.50E-02	3.23E-01	7.80E-06	3.63E+02	2.18E+00	1.69E+02	5.52E-04	6.99E+03	3.95E+02
Methyl-tert-butyl ether (MTBE)	8.00E-02	2.41E-02	1.00E-05	6.00E+00	3.60E-02	1.50E+05	7.30E-04	6.08E+03	2.11E+04
Methylene chloride	1.01E-01	8.98E-02	1.17E-05	1.17E+01	7.02E-02	1.30E+04	2.58E-03	3.23E+03	2.43E+03
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	2.00E+02	2.47E-03	3.31E+03	2.35E+02
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	1.29E+03
Trichlorofluoromethane(Freon-11)	8.70E-02	3.98E+00	1.30E-05	1.60E+02	9.60E-01	1.10E+03	1.02E-02	1.63E+03	1.99E+03
cis-1,2-Dichloroethene	7.36E-02	1.67E-01	1.13E-05	3.55E+01	2.13E-01	3.50E+03	1.90E-03	3.77E+03	1.21E+03
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	8.51E+01
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	3.08E+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)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (C_{sat}) =

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a of a 0.5-acre-square source for Philadelphia (g/m2-s per kg/m3)	90.24
T - Exposure interval(s)	9.5E+08
ρ_b - Soil bulk density (g/cm^3)	1.5
Θ_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Θ_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (ρ_b/ρ_s)	0.43
Θ_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
ρ_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.
Physical/chemical properties not listed in USEPA, 1996 obtained from USEPA Region 9 Preliminary Remediation Goal support tables, 2002.

Table F-3.1.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Surface Soil											
	Dieldrin	mg/kg	1.5E-02	1.6E-01	NP	8.0E-02		8.0E-02	mg/kg	Max	1,6
	Aluminum	mg/kg	1.5E+04	1.8E+04	N	2.4E+04		1.8E+04	mg/kg	95% Stud-t	2, 3, 4
	Arsenic	mg/kg	3.5E+00	4.1E+00	N	6.2E+00	J	4.1E+00	mg/kg	95% Stud-t	1, 2, 3, 4
	Cobalt	mg/kg	2.8E+00	3.1E+00	N	3.5E+00	J	3.1E+00	mg/kg	95% Stud-t	5
	Iron	mg/kg	1.4E+04	1.6E+04	N	2.1E+04		1.6E+04	mg/kg	95% Stud-t	1, 2, 3, 4
	Manganese	mg/kg	9.1E+01	1.2E+02	G	1.9E+02	J	1.2E+02	mg/kg	App. Gamma	2, 3, 4
	Thallium	mg/kg	4.3E-01	5.0E-01	NP	8.0E-01	J	5.0E-01	mg/kg	95% KM-t	1, 2, 3, 4

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: 95% Student-t UCL (95% Stud-t); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Approximate Gamma (App. Gamma);
Maximum Detected Value (Max)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

mg/kg = milligrams per kilogram
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.2.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer - Tap Water and Water in Excavation Pit	Bromodichloromethane	ug/l	2.0E-01	2.5E-01	NP	4.8E-01	J	2.5E-01	ug/l	95% KM-t	3, 4
	Chloroform	ug/l	3.0E+00	6.1E+00	NP	2.2E+01		6.1E+00	ug/l	95% KM-t	1, 3, 4
	Tetrachloroethene	ug/l	3.8E+01	3.2E+02	NP	4.3E+02	J	3.2E+02	ug/l	99% KM	1
	Trichloroethene	ug/l	1.1E+02	1.9E+02	NP	7.3E+02		1.9E+02	ug/l	95% KM (BCA)	1, 3, 4
	2,4-Dinitrotoluene	ug/l	5.0E+00	5.3E+00	N	3.0E+00	J	3.0E+00	ug/l	Max	5, 6
	Pentachlorophenol	ug/l	1.3E+01	1.3E+01	N	6.0E+00	J	6.0E+00	ug/l	Max	5, 6
	Dieldrin	ug/l	7.5E-02	2.6E-01	NP	2.6E-01		2.6E-01	ug/l	95% KM (Bookstrap)	1, 2
	Heptachlor epoxide	ug/l	6.6E-03	2.0E-02	NP	2.0E-02	J	2.0E-02	ug/l	95% KM (Bookstrap)	5
	Arsenic	ug/l	6.2E-01	1.6E+00	NP	3.8E+00	K	1.6E+00	ug/l	95% Cheb-m	5
	Cobalt	ug/l	1.9E+00	2.7E+00	N	5.8E+00		2.7E+00	ug/l	95% Stud-t	2, 3, 4
	Manganese	ug/l	2.4E+02	3.2E+02	N	6.7E+02	J	3.2E+02	ug/l	95% Stud-t	1, 2, 3, 4
	Zinc	ug/l	7.6E+01	9.2E+02	NP	1.2E+03		9.2E+02	ug/l	99% KM	1

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: 95% Student-t UCL (95% Stud-t); 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Kaplan-Meier (BCA) UCL (95% KM (BCA)); 95% Chebyshev(Mean, Sd) UCL (95% Cheb-m); 95% Kaplan-Meier (percentile Bootstrap) (95% KM (Bootstrap)); 99% Kaplan-Meier Chebyshev (99% KM); Maximum Detected Value (Max); 95% Student-t UCL (95% Stud-t)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

ug/l = micrograms per liter
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.3.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air (Groundwater Data)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer - Water Vapors at Showerhead and Excavation	Bromodichloromethane	ug/l	2.0E-01	2.5E-01	G	4.8E-01	J	2.5E-01	ug/l	95% KM-t	3, 4
	Chloroform	ug/l	3.0E+00	6.1E+00	NP	2.2E+01		6.1E+00	ug/l	95% KM-t	1, 3, 4
	Tetrachloroethene	ug/l	3.8E+01	3.2E+02	NP	4.3E+02	J	3.2E+02	ug/l	99% KM	1
	Trichloroethene	ug/l	1.1E+02	1.9E+02	NP	7.3E+02		1.9E+02	ug/l	95% KM (BCA)	1, 3, 4

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: 95% Kaplan-Meier (t) UCL (95% KM-t); 95% Kaplan-Meier (BCA) UCL (95% KM (BCA)); 99% Kaplan-Meier Chebyshev (99% KM); Maximum Detected Value (Max)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

ug/l = micrograms per liter
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.4.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Soil*											
	Dieldrin	mg/kg	8.8E-03	5.4E-02	NP	8.0E-02		5.4E-02	mg/kg	97.5% KM	1
	Aluminum	mg/kg	1.1E+04	2.4E+04	NP	2.4E+04		2.4E+04	mg/kg	99% Cheb-m	5
	Arsenic	mg/kg	2.6E+00	3.0E+00	NP	6.2E+00	J	3.0E+00	mg/kg	95% KM (Bootstrap)	2, 3, 4
	Cobalt	mg/kg	2.2E+00	2.9E+00	NP	3.5E+00	J	2.9E+00	mg/kg	95% KM	5
	Iron	mg/kg	1.0E+04	2.1E+04	NP	2.1E+04		2.1E+04	mg/kg	Max	6
	Manganese	mg/kg	7.1E+01	9.7E+01	G	1.9E+02	J	9.7E+01	mg/kg	App Gamma	3, 4
	Thallium	mg/kg	4.7E-01	6.1E-01	NP	1.2E+00	J	6.1E-01	mg/kg	95% KM (Bootstrap)	1, 2, 3, 4

* Surface soil & subsurface soil combined.
ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: 95% Approximate Gamma (App. Gamma); 95% Kaplan-Meier (percentile Bootstrap) (95% KM (Bootstrap)); 97.5% Kaplan-Meier Chebyshev (97.5% KM); 95% KM (Chebyshev) UCL (95% KM); 99% Chebyshev (mean, std) UCL (99% Cheb-m); Maximum Detected Value (Max)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

mg/kg = milligrams per kilogram
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.5.RME

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Emissions from Soil*	Tetrachloroethene	mg/m^3	3.2E-05	5.8E-05	NP	4.7E-04	5.8E-05	mg/m^3	97.5% KM (BCA)	5

* Surface soil & subsurface soil combined.

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: 95% Kaplan-Meier (BCA) UCL (95% KM (BCA))

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

$\mu g/m^3$ = micrograms per cubic meter
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.5A

Calculation of Volatilization Factor - Surface Soil and Subsurface Soil

Site 11a Remedial Investigation Report

NAB Llittle Creek, Virginia Beach, Virginia

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)	Soil Saturation Concentration (C_{sat}) (mg/kg)
Tetrachloroethene	7.20E-02	7.54E-01	8.20E-06	1.55E+02	9.30E-01	2.00E+02	2.47E-03	3.31E+03	2.35E+02

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)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (C_{sat}) =

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a of a 0.5-acre-square source for Philadelphia (g/m2-s per kg/m3)	90.24
T - Exposure interval(s)	9.5E+08
ρ_b - Soil bulk density (g/cm^3)	1.5
Θ_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Θ_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (ρ_b/ρ_s)	0.43
Θ_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
ρ_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.
Physical/chemical properties not listed in USEPA, 1996 obtained from USEPA Region 9 Preliminary Remediation Goal support tables, 2002.

Table F-3.1.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Surface Soil											
	Dieldrin	mg/kg	1.5E-02	1.6E-01	NP	8.0E-02		1.5E-02	mg/kg	Mean-KM	1
	Aluminum	mg/kg	1.5E+04	1.8E+04	N	2.4E+04		1.5E+04	mg/kg	Mean-N	2, 3, 4
	Arsenic	mg/kg	3.5E+00	4.1E+00	N	6.2E+00	J	3.5E+00	mg/kg	Mean-N	1, 2, 3, 4
	Iron	mg/kg	1.4E+04	1.6E+04	N	2.1E+04		1.4E+04	mg/kg	Mean-N	1, 2, 3, 4
	Cobalt	mg/kg	2.8E+00	3.1E+00	N	3.5E+00	J	2.8E+00	mg/kg	Mean-N	5
	Manganese	mg/kg	9.1E+01	1.2E+02	G	1.9E+02	J	9.1E+01	mg/kg	Mean-N	2, 3, 4
	Thallium	mg/kg	4.3E-01	5.0E-01	NP	8.0E-01	J	4.3E-01	mg/kg	Mean-KM	1, 2, 3, 4
	Vanadium	mg/kg	2.5E+01	2.9E+01	N	3.5E+01		2.5E+01	mg/kg	Mean-N	2, 3, 4

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: Mean Detected Value (Mean-N), Kaplan-Meier Method Mean (Mean-KM)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

mg/kg = milligrams per kilogram
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.2.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer - Tap Water and Water in Water and Water in Excavation Pit	Bromodichloromethane	ug/l	2.0E-01	2.5E-01	NP	4.8E-01	J	2.0E-01	ug/l	Mean-KM	3, 4
	Chloroform	ug/l	3.0E+00	6.1E+00	NP	2.2E+01		3.0E+00	ug/l	Mean-KM	1, 3, 4
	Tetrachloroethene	ug/l	3.8E+01	3.2E+02	NP	4.3E+02	J	3.8E+01	ug/l	Mean-KM	1
	Trichloroethene	ug/l	1.1E+02	1.9E+02	NP	7.3E+02		1.1E+02	ug/l	Mean-KM	1, 3, 4
	2,4-Dinitrotoluene	ug/l	5.0E+00	5.3E+00	N	3.0E+00	J	3.0E+00	ug/l	Max	5, 6
	Pentachlorophenol	ug/l	1.3E+01	1.3E+01	N	6.0E+00	J	6.0E+00	ug/l	Max	5, 6
	Dieldrin	ug/l	7.5E-02	2.6E-01	NP	2.6E-01		7.5E-02	ug/l	Mean-KM	1, 2
	Heptachlor epoxide	ug/l	6.6E-03	2.0E-02	NP	2.0E-02	J	6.6E-03	ug/l	Mean-KM	5
	Arsenic	ug/l	6.2E-01	1.6E+00	NP	3.8E+00	K	6.2E-01	ug/l	Mean-N	5
	Cobalt	ug/l	1.9E+00	2.7E+00	N	5.8E+00		1.9E+00	ug/l	Mean-N	2, 3, 4
	Manganese	ug/l	2.4E+02	3.2E+02	N	6.7E+02	J	2.4E+02	ug/l	Mean-N	1, 2, 3, 4
	Zinc	ug/l	7.6E+01	9.2E+02	NP	1.2E+03		9.0E+01	ug/l	Mean-KM	1

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: Kaplan-Meier Mean (Mean-KM); Mean Detected Value (Mean-N)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because mean greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

ug/l = micrograms per liter
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.3.CTE

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air (Groundwater data)

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Shallow Aquifer - Tap Water and Water in Excavation Pit	Bromodichloromethane	ug/l	2.0E-01	2.5E-01	G	4.8E-01	J	2.0E-01	ug/l	Mean-KM	3, 4
	Chloroform	ug/l	3.0E+00	6.1E+00	NP	2.2E+01		3.0E+00	ug/l	Mean-KM	1, 3, 4
	Tetrachloroethene	ug/l	3.8E+01	3.2E+02	NP	4.3E+02	J	3.8E+01	ug/l	Mean-KM	1
	Trichloroethene	ug/l	1.1E+02	1.9E+02	NP	7.3E+02		1.1E+02	ug/l	Mean-KM	1, 3, 4

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: Kaplan-Meier Mean (Mean-KM); Mean Detected Value (Mean-N)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

ug/l = micrograms per liter
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.4.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Soil*											
	Dieldrin	mg/kg	8.8E-03	5.4E-02	NP	8.0E-02		8.8E-03	mg/kg	Mean-KM	1
	Aluminum	mg/kg	1.1E+04	2.4E+04	NP	2.4E+04		1.1E+04	mg/kg	Mean-N	5
	Arsenic	mg/kg	2.6E+00	3.0E+00	NP	6.2E+00	J	2.6E+00	mg/kg	Mean-KM	2, 3, 4
	Cobalt	mg/kg	2.2E+00	2.9E+00	NP	3.5E+00	J	2.2E+00	mg/kg	Mean-KM	5
	Iron	mg/kg	1.0E+04	2.1E+04	NP	2.1E+04		1.0E+04	mg/kg	Mean-N	6
	Manganese	mg/kg	7.1E+01	9.7E+01	G	1.9E+02	J	7.1E+01	mg/kg	Mean-N	3, 4
	Thallium	mg/kg	4.7E-01	6.1E-01	NP	1.2E+00	J	4.7E-01	mg/kg	Mean-KM	1, 2, 3, 4

* Surface soil & subsurface soil combined.
ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).
Options: Kaplan-Meier Mean (Mean-KM); Mean Detected Value (Mean-N)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

mg/kg = milligrams per kilogram
L = Biased Low
J = Estimated Value
K = Biased High

Table F-3.5.CTE

MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Emissions from Soil*	Tetrachloroethene	mg/m^3	3.2E-05	5.8E-05	NP	4.7E-01	3.2E-05	$\mu g/m^3$	Mean-KM	5

* Surface soil & subsurface soil combined.

ProUCL, Version 4.0 used to determine distribution of data and calculate RME EPC and arithmetic mean, following recommendations from model and users guide (USEPA. April 2007. ProUCL, Version 4.0. Prepared by Lockheed Martin Environmental Services).

Options: Kaplan-Meier Mean (Mean-KM)

(1) Shapiro-Wilk W Test/Lilliefors test indicates data (based on detects only) are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data (based on detects only) are normally distributed.
(3) Anderson-Darling Test indicates data (based on detects only) are gamma distributed.
(4) Kolmogorov-Smirnov Test indicates data (based on detects only) are gamma distributed.
(5) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Max value used because 95% UCL greater than max.

N = Normal
T = Log-Transformed
NP = Non-Parametric
G = Gamma

$\mu g/m^3$ = micrograms per cubic meter
L = Biased Low
J = Estimated Value
K = Biased High

TABLE H-4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Surface Soil	CS	Chemical Concentration in Soil	See Table H-3.1.RME	mg/kg	See Table H-3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	(1)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
Dermal	Resident	Adult	Surface Soil	CS	Chemical Concentration in Soil	See Table H-3.1.RME	mg/kg	See Table H-3.1.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	(1)	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	

(1) Professional Judgment based typical duration of 4 to 6 years for military worker stationed at Base.

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, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE H-4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.RME	µg/l	See Table H-3.2.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.RME	µg/l	See Table H-3.2.RME	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.RME	µg/l	See Table H-3.2.RME	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE H-4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.RME	µg/l	See Table H-3.2.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	24	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.RME	µg/l	See Table H-3.2.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1.0	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE H-4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child/Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.RME	µg/l	See Table H-3.2.RME	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2004	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + 3B^2)/(1+B)^2)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
	Construction Worker	Adult	Shallow Aquifer - Water in Excavation Trench	CW	Chemical Concentration in Water	See Table H-3.2.RME	µg/l	See Table H-3.2.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	8	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (3)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	250	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF2 x CF3

TABLE H-4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (cont.)	Construction Worker (cont.)	Adult	Shallow Aquifer - Water in Excavation Trench	AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

(1) Professional Judgement based on construction activities that would occur 8 hrs per day.

(2) Professional Judgement assuming a construction project could take up to one year, with two weeks off for vacation/holiday.

(3) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

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, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE H-4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Shallow Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table H-3.3.RME	µg/l	See Table H-3.3.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	Foster & Chrostowski Shower Inhalation Model
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	for InhExp
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Construction Worker	Adult	Shallow Aquifer - Water Vapors at Excavation	CW	Chemical Concentration in Water	See Table H-3.3.RME	µg/l	See Table H-3.3.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x IN x EF x ED x 1/BW x 1/AT
				IN	Inhalation Rate	20	m^3/day	EPA, 2002	
				EF	Exposure Frequency	250	days/year	(1)	CA calculated using the methods presented in the Virginia
				ED	Exposure Duration	1	years	EPA, 1991	Department of Environmental Voluntary Remediation
				BW	Body Weight	70	kg	EPA, 1991	Program Risk Assessment Guidance
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming a construction project could take up to one year, with two weeks off for vacation/holiday.

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, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

TABLE H-4.4.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
	Trespasser/Visitor	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Trespasser/Visitor	Adolescent	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Resident	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	EPA, 1989	

TABLE H-4.4.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	200	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	EPA, 1989	
		Child/Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S-A	Ingestion Rate of Soil, Adult	100	mg/day	EPA, 1991	CS x IR-S-Adj x EF x CF1 x 1/AT
				IR-S-C	Ingestion Rate of Soil, Child	200	mg/day	EPA, 1991	
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	114	mg-year/kg-day	Calculated	IR-S-Adj (mg-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-S-C / BW-C)
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	+ (ED-A x IR-S-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg		
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Constuction Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	480	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	(4)	
				ED	Exposure Duration	1	years	(4)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
Dermal	Industrial Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	

TABLE H-4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser/Visitor	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,300	cm2	EPA, 2004, (5)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2004, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Resident	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE H-4.4.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				SA-A	Skin Surface Area Available for Contact, Ad	5,700	cm2	EPA, 2004	CS x DA-Adj x DABS x CF1 x EF x 1/AT
				SA-C	Skin Surface Area Available for Contact, Ch	2,800	cm2	EPA, 2004	
				SSAF-A	Soil to Skin Adherence Factor	0.07	mg/cm2-day	EPA, 2004	DA-Adj (mg-year/kd-day) =
				SSAF-C	Soil to Skin Adherence Factor	0.2	mg/cm2-day	EPA, 2004	[(ED-C x SA-C x SSAF-C / BW-C) +
				DA-Adj	Dermal Absorption, Age-adjusted	361	mg-year/kg-day	calculated	(ED-A x SA-A x SSAF-A / BW-A)]
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
	Construction Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.RME	mg/kg	See Table H-3.4.RME	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	250	days/year	(4)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

TABLE H-4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

Notes:
*Surface and subsurface soil combined.
(1) Professional Judgment assuming 1 day per week for 52 weeks per year.
(2) Professional Judgement assuming adolescents from 9 to 18 years of age.
(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.
(4) Professional Judgement assuming a construction project could take up to one year, with two weeks off for vacation/holiday.
(5) SA is the total of the head, hands, forearms, lower legs and feet for the 7 through 18 year old, EPA, 2004, Exhibit C-1.
(6) SSAF is the 95th percentile for soil adherence for Soccer Players # 1 (teens).

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, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE H-4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Worker	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.RME	mg/kg	see Table H-3.5.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				IN	Inhalation Rate	20	m^3/day	EPA, 2002	CA (mg/m^3) = CS x (1/PEF)
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Noncancer)	9,125	days	EPA, 1989	
	Trespasser/Visitor	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.RME	mg/kg	see Table H-3.5.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 2002	
				ET	Exposure Time	1.5	hr/day	Prof. Judgement	CA (mg/m^3) = CS x (1/PEF)
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.RME	mg/kg	see Table H-3.5.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 2002	
				ET	Exposure Time	1.5	hr/day	Prof. Judgement	CA (mg/m^3) = CS x (1/PEF)
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Inhalation	Resident	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.RME	mg/kg	see Table H-3.5.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	CA (mg/m^3) = CS x (1/PEF)
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.RME	mg/kg	see Table H-3.5.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				IN	Inhalation Rate	15	m^3/day	EPA, 1997	CA (mg/m^3) = CS x (1/PEF)
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
									Carcinogenic
		Child/Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.RME	mg/kg	see Table H-3.5.RME	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN-Adj x EF x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				INc	Inhalation Rate Child	15	m^3/day	EPA, 1997	
				EDc	Exposure Duration Child	6	years	EPA, 1991	CA (mg/m^3) = CS x (1/PEF)
				BWc	Body Weight CHild	15	kg	EPA, 1991	
				INa	Inhalation Rate Adult	20	m^3/day	EPA, 1991	
				EDa	Exposure Duration Adult	24	years	EPA, 1991	IN = (EDc * INc/ BWc) + (EDa * INa/BWa)
				BWa	Body Weight Adult	70	kg	EPA, 1991	
				IN-Adj	Inhalation Rate	13	m^3-year/kg-hour	calc	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

	Construction Worker	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table 3.4.CTE	mg/kg	see Table 3.4.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				IN	Inhalation Rate	20	$m^3/hour$	EPA, 2002	
				EF	Exposure Frequency	250	days/year	(4)	CA (mg/m^3) = CS x (1/PEF)
				ED	Exposure Duration	1	years	Prof. Judgement	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

(1) Professional Judgment assuming 1 day per week for 52 weeks per year.

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(4) Professional Judgement assuming a construction project could take up to one year, with two weeks off for vacation/holiday.

TABLE H-4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Site 24 Surface Soil	CS	Chemical Concentration in Soil	See Table H-3.1.CTE	mg/kg	See Table H-3.1.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	5	years	(1)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	1,825	days	EPA, 1989	
Dermal	Resident	Adult	Site 24 Surface Soil	CS	Chemical Concentration in Soil	See Table H-3.1.CTE	mg/kg	See Table H-3.1.CTE	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	Chemical specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	5	years	(1)	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	1,825	days	EPA, 1989	

Notes:
(1) Professional Judgment based typical duration of 4 to 6 years for military worker stationed at Base. Chose 5 years as central 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, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE H-4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.CTE	µg/l	See Table H-3.2.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1.4	liters/day	EPA, 1993	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.CTE	µg/l	See Table H-3.2.CTE	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.CTE	µg/l	See Table H-3.2.CTE	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.58	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE H-4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.CTE	µg/l	See Table H-3.2.CTE	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.CTE	µg/l	See Table H-3.2.CTE	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.33	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE H-4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child/Adult	Shallow Aquifer - Tap Water	CW	Chemical Concentration in Water	See Table H-3.2.CTE	µg/l	See Table H-3.2.CTE	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	((1 + 3B + 3B^2)/(1+B)^2)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
	Construction Worker	Adult	Shallow Aquifer - Water in Excavation Trench	CW	Chemical Concentration in Water	See Table H-3.2.CTE	µg/l	See Table H-3.2.CTE	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	4	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004, (2)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF2 x CF3

TABLE H-4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (cont.)	Construction Worker (cont.)	Adult	Shallow Aquifer - Water in Excavation Trench	AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

(1) Professional judgement assuming 1/2 RME value for CTE.

(2) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

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, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE H-4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Shallow Aquifer - Water Vapors at Showerhead	CW	Chemical Concentration in Water	See Table H-3.3.CTE	µg/l	See Table H-3.3.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	Foster & Chrostowski Shower Inhalation Model
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	for InhExp
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Construction Worker	Adult	Shallow Aquifer - Water Vapors at Excavation	CW	Chemical Concentration in Water	See Table H-3.3.CTE	µg/l	See Table H-3.3.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x IN x EF x ED x 1/BW x 1/AT
				IN	Inhalation Rate	20	m^3/day	EPA, 2002	
				EF	Exposure Frequency	125	days/year	(1)	CA calculated using the methods presented in the Virginia
				ED	Exposure Duration	1	years	EPA, 1991	Department of Environmental Voluntary Remediation
				BW	Body Weight	70	kg	EPA, 1991	Program Risk Assessment Guidance
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional judgement assuming 1/2 RME value for CTE.

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, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

TABLE H-4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Industrial Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Trespasser/Visitor	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Trespasser/Visitor	Adolescent	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Resident	Adult	Soil*	CS	Chemical Concentration in Soil	See Table 3.4.CTE	mg/kg	See Table 3.4.CTE	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

TABLE H-4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	EPA, 1989	
		Child/Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S-A	Ingestion Rate of Soil, Adult	50	mg/day	EPA, 1993	CS x IR-S-Adj x EF x CF1 x 1/AT
				IR-S-C	Ingestion Rate of Soil, Child	100	mg/day	EPA, 1993	
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	46	mg-year/kg-day	Calculated	IR-S-Adj (mg-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1991	(ED-C x IR-S-C / BW-C)
				ED-A	Exposure Duration, Adult	9	years	EPA, 2004	+ (ED-A x IR-S-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg		
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Constuction Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	280	mg/day	(1)	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	(4)	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
Dermal	Industrial Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.02	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

TABLE H-4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser/Visitor	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 2004	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Adolescent	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,300	cm^2	EPA, 2004, (5)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm^2-day	EPA, 2004, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Resident	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.01	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

TABLE H-4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm^2	EPA, 2004	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm^2-day	EPA, 2004	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				SA-A	Skin Surface Area Available for Contact, Ad	5,700	cm^2	EPA, 2004	CS x DA-Adj x DABS x CF1 x EF x 1/AT
				SA-C	Skin Surface Area Available for Contact, Ch	2,800	cm^2	EPA, 2004	
				SSAF-A	Soil to Skin Adherence Factor	0.01	mg/cm^2-day	EPA, 2004	DA-Adj (mg-year/kd-day) =
				SSAF-C	Soil to Skin Adherence Factor	0.04	mg/cm^2-day	EPA, 2004	[(ED-C x SA-C x SSAF-C / BW-C) +
				DA-Adj	Dermal Absorption, Age-adjusted	52	mg-year/kg-day	calculated	(ED-A x SA-A x SSAF-A / BW-A)]
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
	Construction Worker	Adult	Soil*	CS	Chemical Concentration in Soil	See Table H-3.4.CTE	mg/kg	See Table H-3.4.CTE	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,100	cm^2	EPA, 2004, (7)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.1	mg/cm^2-day	EPA, 2004, (8)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2004	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	125	days/year	(1)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

TABLE H-4.4.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

Notes:

*Surface and subsurface soil combined.

(1) Professional Judgement assuming 1/2 the RME value for the CTE.

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(4) Professional Judgement assuming a construction project could take up to one year.

(5) SA is the total of the head, hands, forearms, lower legs and feet for the 7 through 18 year old, EPA, 2004, Exhibit C-1.

(6) Soil to skin adherence factor is based on geometric mean adherence factor for soccer players (age 13-15 years).

(7) Surface area includes head and hands.

(8) Soil to skin adherence factor is based on geometric mean adherence factor for construction workers.

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, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. EPA/540/R/99/005.

TABLE H-4.5.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

Site 11a - NAB Little Creek, Virginia Beach , Virginia

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Industrial Worker	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.CTE	mg/kg	see Table H-3.5.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor	chem specific	m^3/kg	calc	
				IN	Inhalation Rate	20	m^3/day	EPA, 2002	CA (mg/m^3) = CS x (1/PEF + 1/VF)
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Noncancer)	3,285	days	EPA, 1989	
	Trespasser/Visitor	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.CTE	mg/kg	see Table H-3.5.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor	chem specific	m^3/kg	calc	
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 2002	
				ET	Exposure Time	1.5	hr/day	Prof. Judgement	CA (mg/m^3) = CS x (1/PEF + 1/VF)
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 2004	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Adolescent	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.CTE	mg/kg	see Table H-3.5.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor	chem specific	m^3/kg	calc	
				IN	Inhalation Rate	0.83	$m^3/hour$	EPA, 2002	
				ET	Exposure Time	1.5	hr/day	Prof. Judgement	CA (mg/m^3) = CS x (1/PEF + 1/VF)
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Inhalation	Resident	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.CTE	mg/kg	see Table H-3.5.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor	chem specific	m^3/kg	calc	
				IN	Inhalation Rate	20	m^3/day	EPA, 1991	CA (mg/m^3) = CS x (1/PEF + 1/VF)
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.CTE	mg/kg	see Table H-3.5.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor	chem specific	m^3/kg	calc	
				IN	Inhalation Rate	15	m^3/day	EPA, 1997	CA (mg/m^3) = CS x (1/PEF + 1/VF)
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
									Carcinogenic
		Child/Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.CTE	mg/kg	see Table H-3.5.CTE	CDI (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN-Adj x EF x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor	chem specific	m^3/kg	calc	
				IN	Inhalation Rate	15	m^3/day	EPA, 1997	
				EDc	Exposure Duration Child	6	years	EPA, 1991	CA (mg/m^3) = CS x (1/PEF + 1/VF)
				BWc	Body Weight CHild	15	kg	EPA, 1991	
				INa	Inhalation Rate Adult	20	m^3/day	EPA, 1991	
				EDa	Exposure Duration Adult	9	years	EPA, 1993	IN = (EDc * INc/ BWc) + (EDa * INa/BWa)
				BWa	Body Weight Adult	70	kg	EPA, 1991	
				IN-Adj	Inhalation Rate	9	m^3-year/kg-hour	calc	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

	Construction Worker	Adult	Emissions from Soil*	CS	Chemical Concentration in Soil	see Table H-3.5.CTE	mg/kg	see Table H-3.5.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calc	mg/m^3	calc	CA x IN x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.36E+09	m^3/kg	EPA, 2002	
				VF	Volatilization Factor	chem specific	m^3/kg	calc	
				IN	Inhalation Rate	20	$m^3/hour$	EPA, 2002	
				EF	Exposure Frequency	125	days/year	(1)	CA (mg/m^3) = CS x (1/PEF + 1/VF)
				ED	Exposure Duration	1	years	Prof. Judgement	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

(1) Professional Judgement assuming 1/2 the RME value for the CTE.

(2) Professional Judgement assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

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, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2002: Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, OSWER 9355.4-24, December, 2002.

TABLE F-5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal	Absorbed RfD for Dermal (2)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units	(1)	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Bromodichloromethane	Chronic	2.0E-02	mg/kg-day	generally > 50%	2.0E-02	mg/kg-day	Kidney	1000/1	IRIS	2/20/2008
	Subchronic	2.0E-02	mg/kg-day	generally > 50%	2.0E-02	mg/kg-day	Kidney	1000	HEAST	7/1/1997
Chloroform	Chronic	1.0E-02	mg/kg-day	generally > 50%	1.0E-02	mg/kg-day	Liver	1000/1	IRIS	2/20/2008
	Subchronic	1.0E-02	mg/kg-day	generally > 50%	1.0E-02	mg/kg-day	Liver	1000	HEAST	7/1/1997
Tetrachloroethene	Chronic	1.0E-02	mg/kg-day	generally > 50%	1.0E-02	mg/kg-day	Liver, Whole body	1000/1	IRIS	2/20/2008
	Subchronic	1.0E-02	mg/kg-day	generally > 50%	1.0E-02	mg/kg-day	Liver, Whole body	1000	HEAST	7/1/1997
Trichloroethene	Chronic	6.0E-03	mg/kg-day	generally > 50%	6.0E-03	mg/kg-day	Liver	3000	NCEA	3/5/1992
	Subchronic	6.0E-03	mg/kg-day	generally > 50%	6.0E-03	mg/kg-day	Liver	3000	NCEA	3/5/1992
2,4-Dinitrotoluene	Chronic	2.0E-03	mg/kg-day	generally > 50%	2.0E-03	mg/kg-day	Nervous System	100/1	IRIS	10/7/2009
	Subchronic	2.0E-03	mg/kg-day	generally > 50%	2.0E-03	mg/kg-day	Nervous System	100/1	HEAST	07/01/97
Pentachlorophenol	Chronic	3.0E-02	mg/kg-day	76%-100%	3.0E-02	mg/kg-day	Liver, Kidney	100	IRIS	2/18/2008
	Subchronic	3.0E-02	mg/kg-day	76%-100%	3.0E-02	mg/kg-day	Fetus	100	HEAST	7/1/1997
Dieldrin	Chronic	5.0E-05	mg/kg-day	generally > 50%	5.0E-05	mg/kg-day	Liver	100	IRIS	2/18/2008
	Subchronic	5.0E-05	mg/kg-day	generally > 50%	5.0E-05	mg/kg-day	Liver	100	IRIS	2/18/2008
Heptachlor epoxide	Chronic	1.3E-05	mg/kg/day	generally > 50%	1.3E-05	mg/kg/day	Liver	1000	IRIS	2/20/2008
	Subchronic	1.3E-05	mg/kg/day	generally > 50%	1.3E-05	mg/kg/day	Liver	1000	HEAST	7/1/1997
Aluminum	Chronic	1.0E+00	mg/kg-day	N/A	1.0E+00	mg/kg-day	Neurological	100	PPRTV	10/23/2006
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin, Vascular	3/1	IRIS	2/4/2008
	Subchronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin	3	HEAST	7/1/1997
Cobalt	Chronic	3.0E-04	mg/kg-day	N/A	3.0E-04	mg/kg-day	Thyroid	3000	PPRTV	8/25/2008
	Subchronic	3.0E-03	mg/kg-day	N/A	3.0E-03	mg/kg-day	Thyroid	300	PPRTV	8/25/2008
Iron	Chronic	7.0E-01	mg/kg/day	N/A	7.0E-01	mg/kg/day	Gastrointestinal	1.5	PPRTV	7/29/2005
	Subchronic	7.0E-01	mg/kg/day	N/A	7.0E-01	mg/kg/day	Gastrointestinal	1.5	PPRTV	7/29/2005
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	CNS	1/1	IRIS	2/18/2008
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	Chronic	6.5E-04	mg/kg-day	N/A	6.5E-04	mg/kg-day	Liver, Blood, Hair	N/A	IRIS	10/072008
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	Chronic	3.0E-01	mg/kg-day	variable	3.0E-01	mg/kg-day	Blood	N/A	IRIS	2/18/2008
	Subchronic	3.0E-01	mg/kg-day	variable	3.0E-01	mg/kg-day	Blood	3	HEAST	7/1/1997

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemental Guidance for Dermal Risk Assessment(Interim). Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) See Risk Assessment text for the derivation of the "Absorbed RfD for Dermal"

Definitions:

HEAST = Health Effects Assessment Summary Tables

IRIS = Integrated Risk Information System

N/A = Not Available

NCEA = National Center for Environmental Assessment

PPRTV = Provisional Peer Reviewed Toxicity Value

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 PPRTV values, provide the date of the article provided by NCEA.

TABLE F-5.2

NON-CANCER TOXICITY DATA -- INHALATION

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD (1)		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Bromodichloromethane	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Chloroform	Chronic	9.8E-02	mg/m^3	2.8E-02	mg/kg-day	Liver	NA	ATSDR	9/1/1997
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Tetrachloroethene	Chronic	2.7E-01	mg/m^3	8.0E-02	mg/kg-day	Kidney, Liver	NA	ATSDR	9/1/1997
	Subchronic	2.7E-01	mg/m^3	8.0E-02	mg/kg-day	Kidney, Liver	NA	ATSDR	9/1/1997
Trichloroethene	Chronic	6.0E-01	mg/m^3	1.7E-01	mg/kg-day	Nervous System, Eyes	N/A	CalEPA	2/20/2008
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2,4-Dinitrotoluene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pentachlorophenol	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Dieldrin	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Heptachlor epoxide	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Aluminum	Chronic	5.0E-03	mg/m^3	1.4E-03	mg/kg-day	Neurological	300	PPRTV	10/23/2006
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	Chronic	1.5E-05	mg/m^3	4.3E-06	mg/kg-day	Development, Cardiovascular system, Nervous system	N/A	CalEPA	10/7/2009
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese	Chronic	5.0E-05	mg/m^3	1.4E-05	mg/kg-day	CNS	1000/1	IRIS	2/4/2008
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Thallium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2/4/2008
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Subchronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(1) Extrapolated RfD = Inhalation RfC x 20 m^3/day x 1/70 kg

For ATSDR values, provide the date of the ATSDR toxicity profile.

For IRIS values, provide the date IRIS was searched.

For CalEPA values, provide date CalEPA toxicity database was searched.

For PPRTV values, provide the date of the article provided by NCEA.

Definitions: ATSDR = Agency for Toxic Substances and Disease Registry

CalEPA = California EPA

IRIS = Integrated Risk Information System

N/A = Not Available

PPRTV = Provisional Peer Reviewed Toxicity Value

TABLE F-6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

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)
Bromodichloromethane	6.2E-02	Generally > 50%	6.2E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	1/0/1900
Chloroform	3.1E-02	Generally > 50%	3.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	10/7/2009
Tetrachloroethene	5.4E-01	Generally > 50%	5.4E-01	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA	2/20/2008
Trichloroethene	1.3E-02	Generally > 50%	1.3E-02	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA	2/20/2008
2,4-Dinitrotoluene	3.1E-01	Generally > 50%	3.1E-01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	10/7/2009
Pentachlorophenol	1.2E-01	76%-100%	1.2E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/20/2008
Dieldrin	1.6E+01	Generally > 50%	1.6E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/18/2008
Heptachlor epoxide	9.1E+00	Generally > 50%	9.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/20/2008
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	1.5E+00	95%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/18/2008
Cobalt	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
Manganese (nonfood)	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
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A-Not available

IRIS = Integrated Risk Information System

CalEPA = California EPA

(1) Refer to RAGS, Part E. July 2004.

(2) For IRIS values, provide the date IRIS was searched.
For CalEPA values, provide date CalEPA toxicity database was searched.

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

TABLE F-6.2

CANCER TOXICITY DATA -- INHALATION

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

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)
Bromodichloromethane	3.7E-05	$(ug/m3)^{-1}$	3500	1.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	10/7/2009
Chloroform	2.3E-05	$(ug/m3)^{-1}$	3500	8.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	1/0/1900
Tetrachloroethene	5.9E-06	$(ug/m3)^{-1}$	3500	2.0E-02	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA	2/20/2008
Trichloroethene	2.0E-06	$(ug/m3)^{-1}$	3500	7.0E-03	$(mg/kg\text{-}day)^{-1}$	N/A	CalEPA	2/20/2008
2,4-Dinitrotoluene	8.9E-05	$(ug/m3)^{-1}$	3500	3.1E-01	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	10/7/2009
Pentachlorophenol	4.6E-06	$(ug/m3)^{-1}$	3500	1.6E-02	$(mg/kg\text{-}day)^{-1}$	B2	CalEPA	10/7/2009
Dieldrin	4.6E-03	$(ug/m3)^{-1}$	3500	1.6E+01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/18/2008
Heptachlor epoxide	2.6E-03	$(ug/m3)^{-1}$	3500	9.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/20/2008
Aluminum	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic	4.3E-03	$(ug/m3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	2/18/2008
Cobalt	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
Thallium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

IRIS = Integrated Risk Information System

CalEPA = California EPA

(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 CalEPA values, provide date CalEPA toxicity database was searched.

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 F-7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Surface Soil	Ingestion	Dieldrin	8.0E-02	mg/kg	9.4E-09	mg/kg/day	1.6E+01	mg/kg/day	1.5E-07	1.1E-07	mg/kg/day	5.0E-05	mg/kg/day	2.2E-03
				Aluminum	1.8E+04	mg/kg	2.1E-03	mg/kg/day	N/A		N/A	2.4E-02	mg/kg/day	1.0E+00	mg/kg/day	2.4E-02
				Arsenic	4.1E+00	mg/kg	4.8E-07	mg/kg/day	1.5E+00	mg/kg/day	7.1E-07	5.6E-06	mg/kg/day	3.0E-04	mg/kg/day	1.9E-02
				Cobalt	3.1E+00	mg/kg	3.6E-07	mg/kg/day	N/A		N/A	4.3E-06	mg/kg/day	3.0E-04	mg/kg/day	1.4E-02
				Iron	1.6E+04	mg/kg	1.8E-03	mg/kg/day	N/A		N/A	2.2E-02	mg/kg/day	7.0E-01	mg/kg/day	3.1E-02
				Manganese	1.2E+02	mg/kg	1.4E-05	mg/kg/day	N/A		N/A	1.6E-04	mg/kg/day	2.0E-02	mg/kg/day	8.0E-03
				Thallium	5.0E-01	mg/kg	5.9E-08	mg/kg/day	N/A		N/A	6.8E-07	mg/kg/day	6.5E-04	mg/kg/day	1.1E-03
			Exp. Route Total								8.7E-07					9.9E-02
			Dermal Absorption	Dieldrin	8.0E-02	mg/kg	3.7E-09	mg/kg/day	1.6E+01	mg/kg/day	6.0E-08	4.4E-08	mg/kg/day	5.0E-05	mg/kg/day	8.7E-04
				Aluminum	1.8E+04	mg/kg	8.3E-05	mg/kg/day	N/A		N/A	9.6E-04	mg/kg/day	1.0E+00	mg/kg/day	9.6E-04
				Arsenic	4.1E+00	mg/kg	5.7E-08	mg/kg/day	1.5E+00	mg/kg/day	8.6E-08	6.7E-07	mg/kg/day	3.0E-04	mg/kg/day	2.2E-03
				Cobalt	3.1E+00	mg/kg	1.5E-08	mg/kg/day	N/A		N/A	1.7E-07	mg/kg/day	3.0E-04	mg/kg/day	5.7E-04
				Iron	1.6E+04	mg/kg	7.4E-05	mg/kg/day	N/A		N/A	8.6E-04	mg/kg/day	7.0E-01	mg/kg/day	1.2E-03
				Manganese	1.2E+02	mg/kg	5.5E-07	mg/kg/day	N/A		N/A	6.4E-06	mg/kg/day	8.0E-04	mg/kg/day	8.0E-03
				Thallium	5.0E-01	mg/kg	2.3E-09	mg/kg/day	N/A		N/A	2.7E-08	mg/kg/day	6.5E-04	mg/kg/day	4.2E-05
			Exp. Route Total								1.5E-07					1.4E-02
		Exposure Point Total									1.0E-06					1.1E-01
	Exposure Medium Total										1.0E-06					1.1E-01
Surface Soil Total											1.0E-06					1.1E-01
Total of Receptor Risks Across All Media											1.0E-06	Total of Receptor Hazards Across All Media				1.1E-01

Notes:

1. Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

TABLE F-7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Tap Water	Ingestion													
				Bromodichloromethane	2.5E-01	ug/L	N/A		N/A		N/A	6.7E-06	mg/kg/day	2.0E-02	mg/kg/day	3.4E-04
				Chloroform	6.1E+00	ug/L	N/A		N/A		N/A	1.7E-04	mg/kg/day	1.0E-02	mg/kg/day	1.7E-02
				Tetrachloroethene	3.2E+02	ug/L	N/A		N/A		N/A	8.8E-03	mg/kg/day	1.0E-02	mg/kg/day	8.8E-01
				Trichloroethene	1.9E+02	ug/L	N/A		N/A		N/A	5.2E-03	mg/kg/day	6.0E-03	mg/kg/day	8.7E-01
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	8.2E-05	mg/kg/day	2.0E-03	mg/kg/day	4.1E-02
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	1.6E-04	mg/kg/day	3.0E-02	mg/kg/day	5.5E-03
				Dieldrin	2.6E-01	ug/L	N/A		N/A		N/A	7.1E-06	mg/kg/day	5.0E-05	mg/kg/day	1.4E-01
				Heptachlor epoxide	2.0E-02	ug/L	N/A		N/A		N/A	5.5E-07	mg/kg/day	1.3E-05	mg/kg/day	4.2E-02
				Arsenic	1.6E+00	ug/L	N/A		N/A		N/A	4.3E-05	mg/kg/day	3.0E-04	mg/kg/day	1.4E-01
				Cobalt	2.7E+00	ug/L	N/A		N/A		N/A	7.3E-05	mg/kg/day	3.0E-04	mg/kg/day	2.4E-01
				Manganese	3.2E+02	ug/L	N/A		N/A		N/A	8.8E-03	mg/kg/day	2.0E-02	mg/kg/day	4.4E-01
				Zinc	9.2E+02	ug/L	N/A		N/A		N/A	2.5E-02	mg/kg/day	3.0E-01	mg/kg/day	8.4E-02
			Exp. Route Total								N/A					2.9E+00
			Dermal Absorption													
				Bromodichloromethane	2.5E-01	ug/L	N/A		N/A		N/A	5.5E-07	mg/kg/day	2.0E-02	mg/kg/day	2.8E-05
				Chloroform	6.1E+00	ug/L	N/A		N/A		N/A	1.5E-05	mg/kg/day	1.0E-02	mg/kg/day	1.5E-03
				Tetrachloroethene	3.2E+02	ug/L	N/A		N/A		N/A	5.3E-03	mg/kg/day	1.0E-02	mg/kg/day	5.3E-01
				Trichloroethene	1.9E+02	ug/L	N/A		N/A		N/A	8.8E-04	mg/kg/day	6.0E-03	mg/kg/day	1.5E-01
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	5.1E-06	mg/kg/day	2.0E-03	mg/kg/day	2.6E-03
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	2.0E-03	mg/kg/day	3.0E-02	mg/kg/day	6.6E-02
				Dieldrin	2.6E-01	ug/L	N/A		N/A		N/A	5.0E-06	mg/kg/day	5.0E-05	mg/kg/day	9.9E-02
				Heptachlor epoxide	2.0E-02	ug/L	N/A		N/A		N/A	1.3E-06	mg/kg/day	1.3E-05	mg/kg/day	9.8E-02
				Arsenic	1.6E+00	ug/L	N/A		N/A		N/A	2.2E-07	mg/kg/day	3.0E-04	mg/kg/day	7.5E-04
				Cobalt	2.7E+00	ug/L	N/A		N/A		N/A	1.5E-07	mg/kg/day	3.0E-04	mg/kg/day	5.1E-04
				Manganese	3.2E+02	ug/L	N/A		N/A		N/A	4.6E-05	mg/kg/day	8.0E-04	mg/kg/day	5.7E-02
				Zinc	9.2E+02	ug/L	N/A		N/A		N/A	7.9E-05	mg/kg/day	3.0E-01	mg/kg/day	2.6E-04
			Exp. Route Total								N/A					1.0E+00
		Exposure Point Total									N/A					3.9E+00
	Exposure Medium Total										N/A					3.9E+00
Groundwater	Air	Shallow Aquifer Water Vapors at Showerhead	Inhalation													
				Bromodichloromethane	2.5E-01	ug/L	1.4E-06	mg/kg/day	1.3E-01	1/mg/kg/day	1.8E-07	4.2E-06	mg/kg/day	N/A		N/A
				Chloroform	6.1E+00	ug/L	4.4E-05	mg/kg/day	8.1E-02	1/mg/kg/day	3.6E-06	1.3E-04	mg/kg/day	2.8E-02	mg/kg/day	4.6E-03
				Tetrachloroethene	3.2E+02	ug/L	2.1E-03	mg/kg/day	2.0E-02	1/mg/kg/day	4.2E-05	6.1E-03	mg/kg/day	8.0E-02	mg/kg/day	7.7E-02
				Trichloroethene	1.9E+02	ug/L	1.4E-03	mg/kg/day	7.0E-03	1/mg/kg/day	9.8E-06	4.1E-03	mg/kg/day	1.7E-01	mg/kg/day	2.4E-02
			Exp. Route Total								5.6E-05					1.1E-01
		Exposure Point Total									5.6E-05					1.1E-01
	Exposure Medium Total										5.6E-05					1.1E-01
Medium Total											5.6E-05					4.0E+00

TABLE F-7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	5.4E-02	mg/kg	N/A		N/A		N/A	7.3E-08	mg/kg/day	5.0E-05	mg/kg/day	1.5E-03
				Aluminum	2.4E+04	mg/kg	N/A		N/A		N/A	3.2E-02	mg/kg/day	1.0E+00	mg/kg/day	3.2E-02
				Arsenic	3.0E+00	mg/kg	N/A		N/A		N/A	4.1E-06	mg/kg/day	3.0E-04	mg/kg/day	1.4E-02
				Cobalt	2.9E+00	mg/kg	N/A		N/A		N/A	4.0E-06	mg/kg/day	3.0E-04	mg/kg/day	1.3E-02
				Iron	2.1E+04	mg/kg	N/A		N/A		N/A	2.8E-02	mg/kg/day	7.0E-01	mg/kg/day	4.1E-02
				Manganese	9.7E+01	mg/kg	N/A		N/A		N/A	1.3E-04	mg/kg/day	2.0E-02	mg/kg/day	6.6E-03
				Thallium	6.1E-01	mg/kg	N/A		N/A		N/A	8.4E-07	mg/kg/day	6.5E-04	mg/kg/day	1.3E-03
			Exp. Route Total								N/A					1.1E-01
			Dermal Absorption	Dieldrin	5.4E-02	mg/kg	N/A		N/A		N/A	2.9E-08	mg/kg/day	5.0E-05	mg/kg/day	5.8E-04
				Aluminum	2.4E+04	mg/kg	N/A		N/A		N/A	1.3E-03	mg/kg/day	1.0E+00	mg/kg/day	1.3E-03
				Arsenic	3.0E+00	mg/kg	N/A		N/A		N/A	5.0E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
				Cobalt	2.9E+00	mg/kg	N/A		N/A		N/A	1.6E-07	mg/kg/day	3.0E-04	mg/kg/day	5.3E-04
				Iron	2.1E+04	mg/kg	N/A		N/A		N/A	1.1E-03	mg/kg/day	7.0E-01	mg/kg/day	1.6E-03
				Manganese	9.7E+01	mg/kg	N/A		N/A		N/A	5.3E-06	mg/kg/day	8.0E-04	mg/kg/day	6.6E-03
				Thallium	6.1E-01	mg/kg	N/A		N/A		N/A	3.3E-08	mg/kg/day	6.5E-04	mg/kg/day	5.1E-05
			Exp. Route Total								N/A					1.2E-02
		Exposure Point Total									N/A					1.2E-01
	Exposure Medium Total										N/A					1.2E-01
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	5.8E-05	mg/m^3	N/A		N/A		N/A	1.6E-05	mg/kg/day	8.0E-02	mg/kg/day	2.0E-04
			Exp. Route Total								N/A					2.0E-04
		Exposure Point Total									N/A					2.0E-04
	Exposure Medium Total										N/A					2.0E-04
Medium Total											5.6E-05					1.2E-01
							Total of Receptor Risks Across All Media				5.6E-05	Total of Receptor Hazards Across All Media				4.1E+00

Notes-

N/A = Not applicable.

DAevent for exposure to groundwater while showering is calculated on Table F-7.2.RME Supplement A.

Shower exposure calculated on Table F-7.2.RME Supplement B.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

Table F-7.2.RME Supplement A
Calculation of DAevent, Resident Adult Ground Water
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient[1] (Kp) (cm/hr)	B[1] (dimensionless)	Lag Time[1] (τ_{event}) (hr)	t*[1] (hr)	Fraction Absorbed Water[1] (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Bromodichloromethane	2.5E-01	4.6E-03	2.3E-02	8.8E-01	2.1E+00	1.0E+00	0.58	2.2E-09	2
Chloroform	6.1E+00	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.58	6.1E-08	2
Tetrachloroethene	3.2E+02	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	0.58	2.2E-05	2
Trichloroethene	1.9E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.58	3.6E-06	2
2,4-Dinitrotoluene	3.0E+00	3.1E-03	1.6E-02	1.1E+00	2.7E+00	1.0E+00	0.58	2.1E-08	2
Pentachlorophenol	6.0E+00	3.9E-01	2.5E+00	3.3E+00	1.4E+01	9.0E-01	0.58	8.1E-06	2
Dieldrin	2.6E-01	1.2E-02	1.0E-01	1.5E+01	3.5E+01	8.0E-01	0.58	2.0E-08	2
Heptachlor epoxide[2]	2.0E-02	3.8E-02	2.9E-01	1.6E+01	3.8E+01	8.0E-01	0.58	5.2E-09	2
Arsenic	1.6E+00	1.0E-03	NA	NA	NA	NA	0.58	9.1E-10	1
Cobalt	2.7E+00	4.0E-04	NA	NA	NA	NA	0.58	6.2E-10	1
Manganese	3.2E+02	1.0E-03	NA	NA	NA	NA	0.58	1.9E-07	1
Zinc	9.2E+02	6.0E-04	NA	NA	NA	NA	0.58	3.2E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
If t_{event} < t* then

$$DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

If t_{event} > t* then

$$DA_{event} = FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:
[1] Values from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
[2] Values from Virginia Remediation Program, Risk Assessment Guidance, gwcalcs.xls, revised 6/7/07
NA - not applicable.

Table F-7.2.RME Supplement B

Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Chemical	Exposure Point Concentration Cwo (μg/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (μg/l)	S (μg/m^3 -min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Bromodichloromethane	2.5E-01	1.6E+02	1.6E-03	9.9E+02	1.0E+01	9.0E+00	1.2E+01	2.4E-02	2.0E-02	4.3E-06
Chloroform	6.1E+00	1.2E+02	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	7.3E-01	6.1E-01	1.3E-04
Tetrachloroethene	3.2E+02	1.7E+02	1.8E-02	9.9E+02	1.0E+01	1.0E+01	1.4E+01	3.5E+01	2.9E+01	6.4E-03
Trichloroethene	1.9E+02	1.3E+02	4.0E-01	1.1E+03	1.2E+01	1.2E+01	1.6E+01	2.3E+01	1.9E+01	4.3E-03

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	μg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	μg/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
Variables	**Units**	**Exposure Assumptions**
BW = body weight	kg	70
Ds = duration of shower	min	30
Dt = total duration in shower room	min	60
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	μg/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Equation 1:	Kg(VOC) =	3000 * (18 / HH)$^{0.5}$	
Equation 2:	Kl(VOC) =	20 * (44 / HH)$^{0.5}$	
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$	
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	Einh =	If t>Ds	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

TABLE F-7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Tap Water	Ingestion													
				Bromodichloromethane	2.5E-01	ug/L	N/A		N/A		N/A	1.6E-05	mg/kg/day	2.0E-02	mg/kg/day	7.9E-04
				Chloroform	6.1E+00	ug/L	N/A		N/A		N/A	3.9E-04	mg/kg/day	1.0E-02	mg/kg/day	3.9E-02
				Tetrachloroethene	3.2E+02	ug/L	N/A		N/A		N/A	2.1E-02	mg/kg/day	1.0E-02	mg/kg/day	2.1E+00
				Trichloroethene	1.9E+02	ug/L	N/A		N/A		N/A	1.2E-02	mg/kg/day	6.0E-03	mg/kg/day	2.0E+00
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	1.9E-04	mg/kg/day	2.0E-03	mg/kg/day	9.6E-02
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	3.8E-04	mg/kg/day	3.0E-02	mg/kg/day	1.3E-02
				Dieldrin	2.6E-01	ug/L	N/A		N/A		N/A	1.7E-05	mg/kg/day	5.0E-05	mg/kg/day	3.3E-01
				Heptachlor epoxide	2.0E-02	ug/L	N/A		N/A		N/A	1.3E-06	mg/kg/day	1.3E-05	mg/kg/day	9.8E-02
				Arsenic	1.6E+00	ug/L	N/A		N/A		N/A	1.0E-04	mg/kg/day	3.0E-04	mg/kg/day	3.3E-01
				Cobalt	2.7E+00	ug/L	N/A		N/A		N/A	1.7E-04	mg/kg/day	3.0E-04	mg/kg/day	5.7E-01
				Manganese	3.2E+02	ug/L	N/A		N/A		N/A	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	1.0E+00
				Zinc	9.2E+02	ug/L	N/A		N/A		N/A	5.9E-02	mg/kg/day	3.0E-01	mg/kg/day	2.0E-01
			Exp. Route Total								N/A					6.8E+00
			Dermal Absorption													
				Bromodichloromethane	2.5E-01	ug/L	N/A		N/A		N/A	1.2E-06	mg/kg/day	2.0E-02	mg/kg/day	6.2E-05
				Chloroform	6.1E+00	ug/L	N/A		N/A		N/A	3.4E-05	mg/kg/day	1.0E-02	mg/kg/day	3.4E-03
				Tetrachloroethene	3.2E+02	ug/L	N/A		N/A		N/A	1.2E-02	mg/kg/day	1.0E-02	mg/kg/day	1.2E+00
				Trichloroethene	1.9E+02	ug/L	N/A		N/A		N/A	2.0E-03	mg/kg/day	6.0E-03	mg/kg/day	3.3E-01
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	1.3E-05	mg/kg/day	2.0E-03	mg/kg/day	6.4E-03
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	4.5E-03	mg/kg/day	3.0E-02	mg/kg/day	1.5E-01
				Dieldrin	2.6E-01	ug/L	N/A		N/A		N/A	1.1E-05	mg/kg/day	5.0E-05	mg/kg/day	2.2E-01
				Heptachlor epoxide	2.0E-02	ug/L	N/A		N/A		N/A	2.9E-06	mg/kg/day	1.3E-05	mg/kg/day	2.2E-01
				Arsenic	1.6E+00	ug/L	N/A		N/A		N/A	6.6E-07	mg/kg/day	3.0E-04	mg/kg/day	2.2E-03
				Cobalt	2.7E+00	ug/L	N/A		N/A		N/A	4.5E-07	mg/kg/day	3.0E-04	mg/kg/day	1.5E-03
				Manganese	3.2E+02	ug/L	N/A		N/A		N/A	1.3E-04	mg/kg/day	8.0E-04	mg/kg/day	1.7E-01
				Zinc	9.2E+02	ug/L	N/A		N/A		N/A	2.3E-04	mg/kg/day	3.0E-01	mg/kg/day	7.8E-04
			Exp. Route Total								N/A					2.3E+00
		Exposure Point Total									N/A					9.1E+00
	Exposure Medium Total										N/A					9.1E+00
Medium Total											N/A					9.1E+00

TABLE F-7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	5.4E-02	mg/kg	N/A		N/A		N/A	6.8E-07	mg/kg/day	5.0E-05	mg/kg/day	1.4E-02
				Aluminum	2.4E+04	mg/kg	N/A		N/A		N/A	3.0E-01	mg/kg/day	1.0E+00	mg/kg/day	3.0E-01
				Arsenic	3.0E+00	mg/kg	N/A		N/A		N/A	3.9E-05	mg/kg/day	3.0E-04	mg/kg/day	1.3E-01
				Cobalt	2.9E+00	mg/kg	N/A		N/A		N/A	3.7E-05	mg/kg/day	3.0E-04	mg/kg/day	1.2E-01
				Iron	2.1E+04	mg/kg	N/A		N/A		N/A	2.6E-01	mg/kg/day	7.0E-01	mg/kg/day	3.8E-01
				Manganese	9.7E+01	mg/kg	N/A		N/A		N/A	1.2E-03	mg/kg/day	2.0E-02	mg/kg/day	6.2E-02
				Thallium	6.1E-01	mg/kg	N/A		N/A		N/A	7.8E-06	mg/kg/day	6.5E-04	mg/kg/day	1.2E-02
			Exp. Route Total								N/A					1.0E+00
			Dermal Absorption	Dieldrin	5.4E-02	mg/kg	N/A		N/A		N/A	1.9E-07	mg/kg/day	5.0E-05	mg/kg/day	3.8E-03
				Aluminum	2.4E+04	mg/kg	N/A		N/A		N/A	8.5E-03	mg/kg/day	1.0E+00	mg/kg/day	8.5E-03
				Arsenic	3.0E+00	mg/kg	N/A		N/A		N/A	3.2E-06	mg/kg/day	3.0E-04	mg/kg/day	1.1E-02
				Cobalt	2.9E+00	mg/kg	N/A		N/A		N/A	1.0E-06	mg/kg/day	3.0E-04	mg/kg/day	3.5E-03
				Iron	2.1E+04	mg/kg	N/A		N/A		N/A	7.4E-03	mg/kg/day	7.0E-01	mg/kg/day	1.1E-02
				Manganese	9.7E+01	mg/kg	N/A		N/A		N/A	3.5E-05	mg/kg/day	8.0E-04	mg/kg/day	4.3E-02
				Thallium	6.1E-01	mg/kg	N/A		N/A		N/A	2.2E-07	mg/kg/day	6.5E-04	mg/kg/day	3.4E-04
			Exp. Route Total								N/A					8.1E-02
		Exposure Point Total									N/A					1.1E+00
	Exposure Medium Total										N/A					1.1E+00
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	5.8E-05	mg/m^3	N/A		N/A		N/A	5.6E-05	mg/kg/day	8.0E-02	mg/kg/day	7.0E-04
			Exp. Route Total								N/A					7.0E-04
		Exposure Point Total									N/A					7.0E-04
	Exposure Medium Total										N/A					7.0E-04
Medium Total											N/A					1.1E+00
							Total of Receptor Risks Across All Media				N/A	Total of Receptor Hazards Across All Media				1.0E+01

Notes-

N/A = Not applicable.

DAevent for exposure to groundwater while showering is calculated on Table F-7.3.RME Supplement A.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

Table F-7.3.RME Supplement A
Calculation of DAevent, Resident Child Ground Water
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient[1] (Kp) (cm/hr)	B[1] (dimensionless)	Lag Time[1] (τ_{event}) (hr)	t*[1] (hr)	Fraction Absorbed Water[1] (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Bromodichloromethane	2.5E-01	4.6E-03	2.3E-02	8.8E-01	2.1E+00	1.0E+00	1	3.0E-09	2
Chloroform	6.1E+00	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	1	8.0E-08	2
Tetrachloroethene	3.2E+02	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	1	2.8E-05	2
Trichloroethene	1.9E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	1	4.7E-06	2
2,4-Dinitrotoluene	3.0E+00	3.1E-03	1.6E-02	1.1E+00	2.7E+00	1.0E+00	1	3.0E-08	2
Pentachlorophenol	6.0E+00	3.9E-01	2.5E+00	3.3E+00	1.4E+01	9.0E-01	1	1.1E-05	2
Dieldrin	2.6E-01	1.2E-02	1.0E-01	1.5E+01	3.5E+01	8.0E-01	1	2.6E-08	2
Heptachlor epoxide[2]	2.0E-02	3.8E-02	2.9E-01	1.6E+01	3.8E+01	8.0E-01	1	6.8E-09	2
Arsenic	1.6E+00	1.0E-03	NA	NA	NA	NA	1	1.6E-09	1
Cobalt	2.7E+00	4.0E-04	NA	NA	NA	NA	1	1.1E-09	1
Manganese	3.2E+02	1.0E-03	NA	NA	NA	NA	1	3.2E-07	1
Zinc	9.2E+02	6.0E-04	NA	NA	NA	NA	1	5.5E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
If t_{event} < t* then

$$DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

If t_{event} > t* then

$$DA_{event} = FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:
[1] Values from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
[2] Values from Virginia Remediation Program, Risk Assessment Guidance, gwcalcs.xls, revised 6/7/07
NA - not applicable.

TABLE F-7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Tap Water	Ingestion													
				Bromodichloromethane	2.5E-01	ug/L	3.7E-06	mg/kg/day	6.2E-02	mg/kg/day	2.3E-07	N/A		N/A		N/A
				Chloroform	6.1E+00	ug/L	9.0E-05	mg/kg/day	3.1E-02	mg/kg/day	2.8E-06	N/A		N/A		N/A
				Tetrachloroethene	3.2E+02	ug/L	4.8E-03	mg/kg/day	5.4E-01	mg/kg/day	2.6E-03	N/A		N/A		N/A
				Trichloroethene	1.9E+02	ug/L	2.8E-03	mg/kg/day	1.3E-02	mg/kg/day	3.7E-05	N/A		N/A		N/A
				2,4-Dinitrotoluene	3.0E+00	ug/L	4.5E-05	mg/kg/day	3.1E-01	mg/kg/day	1.4E-05	N/A		N/A		N/A
				Pentachlorophenol	6.0E+00	ug/L	9.0E-05	mg/kg/day	1.2E-01	mg/kg/day	1.1E-05	N/A		N/A		N/A
				Dieldrin	2.6E-01	ug/L	3.9E-06	mg/kg/day	1.6E+01	mg/kg/day	6.2E-05	N/A		N/A		N/A
				Heptachlor epoxide	2.0E-02	ug/L	3.0E-07	mg/kg/day	9.1E+00	mg/kg/day	2.7E-06	N/A		N/A		N/A
				Arsenic	1.6E+00	ug/L	2.3E-05	mg/kg/day	1.5E+00	mg/kg/day	3.5E-05	N/A		N/A		N/A
				Cobalt	2.7E+00	ug/L	4.0E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese	3.2E+02	ug/L	4.8E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Zinc	9.2E+02	ug/L	1.4E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								2.8E-03					N/A
			Dermal Absorption													
				Bromodichloromethane	2.5E-01	ug/L	3.0E-07	mg/kg/day	6.2E-02	mg/kg/day	1.8E-08	N/A		N/A		N/A
				Chloroform	6.1E+00	ug/L	8.1E-06	mg/kg/day	3.1E-02	mg/kg/day	2.5E-07	N/A		N/A		N/A
				Tetrachloroethene	3.2E+02	ug/L	2.8E-03	mg/kg/day	5.4E-01	mg/kg/day	1.5E-03	N/A		N/A		N/A
				Trichloroethene	1.9E+02	ug/L	4.7E-04	mg/kg/day	1.3E-02	mg/kg/day	6.1E-06	N/A		N/A		N/A
				2,4-Dinitrotoluene	3.0E+00	ug/L	2.8E-06	mg/kg/day	3.1E-01	mg/kg/day	8.8E-07	N/A		N/A		N/A
				Pentachlorophenol	6.0E+00	ug/L	1.1E-03	mg/kg/day	1.2E-01	mg/kg/day	1.3E-04	N/A		N/A		N/A
				Dieldrin	2.6E-01	ug/L	2.7E-06	mg/kg/day	1.6E+01	mg/kg/day	4.2E-05	N/A		N/A		N/A
				Heptachlor epoxide	2.0E-02	ug/L	6.8E-07	mg/kg/day	9.1E+00	mg/kg/day	6.2E-06	N/A		N/A		N/A
				Arsenic	1.6E+00	ug/L	1.3E-07	mg/kg/day	1.5E+00	mg/kg/day	2.0E-07	N/A		N/A		N/A
				Cobalt	2.7E+00	ug/L	9.1E-08	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese	3.2E+02	ug/L	2.7E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Zinc	9.2E+02	ug/L	4.7E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								1.7E-03					N/A
		Exposure Point Total									4.5E-03					N/A
	Exposure Medium Total										4.5E-03					N/A
Medium Total											4.5E-03					N/A

TABLE F-7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	5.4E-02	mg/kg	8.4E-08	mg/kg/day	1.6E+01	mg/kg/day	1.3E-06	N/A		N/A		N/A
				Aluminum	2.4E+04	mg/kg	3.7E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic	3.0E+00	mg/kg	4.7E-06	mg/kg/day	1.5E+00	mg/kg/day	7.1E-06	N/A		N/A		N/A
				Cobalt	2.9E+00	mg/kg	4.5E-06	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron	2.1E+04	mg/kg	3.2E-02	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese	9.7E+01	mg/kg	1.5E-04	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Thallium	6.1E-01	mg/kg	9.5E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								8.4E-06					N/A
			Dermal Absorption	Dieldrin	5.4E-02	mg/kg	2.6E-08	mg/kg/day	1.6E+01	mg/kg/day	4.2E-07	N/A		N/A		N/A
				Aluminum	2.4E+04	mg/kg	1.2E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic	3.0E+00	mg/kg	4.5E-07	mg/kg/day	1.5E+00	mg/kg/day	6.7E-07	N/A		N/A		N/A
				Cobalt	2.9E+00	mg/kg	1.4E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron	2.1E+04	mg/kg	1.0E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese	9.7E+01	mg/kg	4.8E-06	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Thallium	6.1E-01	mg/kg	3.0E-08	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								1.1E-06					N/A
		Exposure Point Total									9.5E-06					N/A
	Exposure Medium Total										9.5E-06					N/A
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	5.8E-05	mg/m^3	6.9E-06	mg/kg/day	2.0E-02	mg/kg/day	1.4E-07	N/A		N/A		N/A
			Exp. Route Total								1.4E-07					N/A
		Exposure Point Total									1.4E-07					N/A
	Exposure Medium Total										1.4E-07					N/A
Medium Total											9.7E-06					N/A
										Total of Receptor Risks Across All Media	4.5E-03			Total of Receptor Hazards Across All Media		N/A

Notes-

N/A = Not applicable.

DAevent for exposure to groundwater while showering is calculated on Table F-7.2.RME Supplement A and F-7.3.RME Supplement A.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

TABLE F-7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Water in Excavation Trench	Dermal Absorption	Bromodichloromethane	2.5E-01	ug/L	8.7E-09	mg/kg/day	6.2E-02	mg/kg/day	5.4E-10	6.1E-07	mg/kg/day	2.0E-02	mg/kg/day	3.1E-05
				Chloroform	6.1E+00	ug/L	2.9E-07	mg/kg/day	3.1E-02	mg/kg/day	9.0E-09	2.0E-05	mg/kg/day	1.0E-02	mg/kg/day	2.0E-03
				Tetrachloroethene	3.2E+02	ug/L	7.7E-05	mg/kg/day	5.4E-01	mg/kg/day	4.2E-05	5.4E-03	mg/kg/day	1.0E-02	mg/kg/day	5.4E-01
				Trichloroethene	1.9E+02	ug/L	1.6E-05	mg/kg/day	1.3E-02	mg/kg/day	2.0E-07	1.1E-03	mg/kg/day	6.0E-03	mg/kg/day	1.8E-01
				2,4-Dinitrotoluene	3.0E+00	ug/L	7.5E-08	mg/kg/day	3.1E-01	mg/kg/day	2.3E-08	5.3E-06	mg/kg/day	2.0E-03	mg/kg/day	2.6E-03
				Pentachlorophenol	6.0E+00	ug/L	2.4E-05	mg/kg/day	1.2E-01	mg/kg/day	2.9E-06	1.7E-03	mg/kg/day	3.0E-02	mg/kg/day	5.6E-02
				Dieldrin	2.6E-01	ug/L	5.9E-08	mg/kg/day	1.6E+01	mg/kg/day	9.5E-07	4.2E-06	mg/kg/day	5.0E-05	mg/kg/day	8.3E-02
				Heptachlor epoxide	2.0E-02	ug/L	1.5E-08	mg/kg/day	9.1E+00	mg/kg/day	1.4E-07	1.1E-06	mg/kg/day	1.3E-05	mg/kg/day	8.2E-02
				Arsenic	1.6E+00	ug/L	1.0E-08	mg/kg/day	1.5E+00	mg/kg/day	1.5E-08	7.0E-07	mg/kg/day	3.0E-04	mg/kg/day	2.3E-03
				Cobalt	2.7E+00	ug/L	6.8E-09	mg/kg/day	N/A		N/A	4.8E-07	mg/kg/day	3.0E-03	mg/kg/day	1.6E-04
				Manganese	3.2E+02	ug/L	2.0E-06	mg/kg/day	N/A		N/A	1.4E-04	mg/kg/day	8.0E-04	mg/kg/day	1.8E-01
				Zinc	9.2E+02	ug/L	3.5E-06	mg/kg/day	N/A		N/A	2.5E-04	mg/kg/day	3.0E-01	mg/kg/day	8.2E-04
			Exp. Route Total								4.6E-05					1.1E+00
		Exposure Point Total									4.6E-05					1.1E+00
	Exposure Medium Total										4.6E-05					1.1E+00
	Air	Shallow Aquifer Water Vapors at Excavation	Inhalation	Bromodichloromethane	2.5E-01	ug/L	4.3E-06	mg/kg/day	1.3E-01	mg/kg/day	5.6E-07	3.0E-04	mg/kg/day	N/A		N/A
				Chloroform	6.1E+00	ug/L	1.3E-04	mg/kg/day	8.1E-02	mg/kg/day	1.0E-05	8.9E-03	mg/kg/day	2.8E-02	mg/kg/day	3.2E-01
				Tetrachloroethene	3.2E+02	ug/L	5.8E-03	mg/kg/day	2.0E-02	mg/kg/day	1.2E-04	4.1E-01	mg/kg/day	8.0E-02	mg/kg/day	5.1E+00
				Trichloroethene	1.9E+02	ug/L	3.9E-03	mg/kg/day	7.0E-03	mg/kg/day	2.7E-05	2.7E-01	mg/kg/day	1.7E-01	mg/kg/day	1.6E+00
			Exp. Route Total								1.5E-04					7.0E+00
		Exposure Point Total									1.5E-04					7.0E+00
	Exposure Medium Total										1.5E-04					7.0E+00
Medium Total											2.0E-04					8.1E+00

TABLE F-7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	5.4E-02	mg/kg	3.6E-09	mg/kg/day	1.6E+01	mg/kg/day	5.7E-08	2.5E-07	mg/kg/day	5.0E-05	mg/kg/day	5.0E-03
				Aluminum	2.4E+04	mg/kg	1.6E-03	mg/kg/day	N/A		N/A	1.1E-01	mg/kg/day	1.0E+00	mg/kg/day	1.1E-01
				Arsenic	3.0E+00	mg/kg	2.0E-07	mg/kg/day	1.5E+00	mg/kg/day	3.0E-07	1.4E-05	mg/kg/day	3.0E-04	mg/kg/day	4.7E-02
				Cobalt	2.9E+00	mg/kg	1.9E-07	mg/kg/day	N/A		N/A	1.4E-05	mg/kg/day	3.0E-03	mg/kg/day	4.5E-03
				Iron	2.1E+04	mg/kg	1.4E-03	mg/kg/day	N/A		N/A	9.7E-02	mg/kg/day	7.0E-01	mg/kg/day	1.4E-01
				Manganese	9.7E+01	mg/kg	6.5E-06	mg/kg/day	N/A		N/A	4.5E-04	mg/kg/day	2.0E-02	mg/kg/day	2.3E-02
				Thallium	6.1E-01	mg/kg	4.1E-08	mg/kg/day	N/A		N/A	2.9E-06	mg/kg/day	6.5E-04	mg/kg/day	4.4E-03
			Exp. Route Total								3.6E-07					3.3E-01
			Dermal Absorption	Dieldrin	5.4E-02	mg/kg	7.4E-10	mg/kg/day	1.6E+01	mg/kg/day	1.2E-08	5.2E-08	mg/kg/day	5.0E-05	mg/kg/day	1.0E-03
				Aluminum	2.4E+04	mg/kg	3.3E-05	mg/kg/day	N/A		N/A	2.3E-03	mg/kg/day	1.0E+00	mg/kg/day	2.3E-03
				Arsenic	3.0E+00	mg/kg	1.3E-08	mg/kg/day	1.5E+00	mg/kg/day	1.9E-08	8.8E-07	mg/kg/day	3.0E-04	mg/kg/day	2.9E-03
				Cobalt	2.9E+00	mg/kg	4.0E-09	mg/kg/day	N/A		N/A	2.8E-07	mg/kg/day	3.0E-03	mg/kg/day	9.4E-05
				Iron	2.1E+04	mg/kg	2.9E-05	mg/kg/day	N/A		N/A	2.0E-03	mg/kg/day	7.0E-01	mg/kg/day	2.9E-03
				Manganese	9.7E+01	mg/kg	1.3E-07	mg/kg/day	N/A		N/A	9.4E-06	mg/kg/day	8.0E-04	mg/kg/day	1.2E-02
				Thallium	6.1E-01	mg/kg	8.4E-10	mg/kg/day	N/A		N/A	5.9E-08	mg/kg/day	6.5E-04	mg/kg/day	9.1E-05
			Exp. Route Total								3.1E-08					2.1E-02
		Exposure Point Total									3.9E-07					3.5E-01
	Exposure Medium Total										3.9E-07					3.5E-01
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	5.8E-05	mg/m^3	1.6E-07	mg/kg/day	2.0E-02	mg/kg/day	3.2E-09	1.1E-05	mg/kg/day	8.0E-02	mg/kg/day	1.4E-04
			Exp. Route Total								3.2E-09					1.4E-04
		Exposure Point Total									3.2E-09					1.4E-04
	Exposure Medium Total										3.2E-09					1.4E-04
Medium Total											4.0E-07					3.5E-01
									Total of Receptor Risks Across All Media		2.0E-04	Total of Receptor Hazards Across All Media				8.5E+00

Notes-
N/A = Not applicable.
Subchronic RfD values used when available

DAevent for exposure to shallow aquifer groundwater during excavation activities calculated on Table F-7.5.RME Supplement A.
EPC for inhalation of volatiles from excavation trench calculated on Table F-7.5.RME Supplement B.
Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

Table F-7.5.RME Supplement A
Calculation of DAevent, Construction Worker
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient[1] (Kp) (cm/hr)	B[1] (dimensionless)	Lag Time[1] (τ_{event}) (hr)	t*[1] (hr)	Fraction Absorbed Water[1] (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Bromodichloromethane	2.5E-01	4.6E-03	2.3E-02	8.8E-01	2.1E+00	1.0E+00	8	1.1E-08	3
Chloroform	6.1E+00	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	8	3.6E-07	3
Tetrachloroethene	3.2E+02	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	8	9.6E-05	3
Trichloroethene	1.9E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	8	2.0E-05	3
2,4-Dinitrotoluene	3.0E+00	3.1E-03	1.6E-02	1.1E+00	2.7E+00	1.0E+00	8	9.4E-08	3
Pentachlorophenol	6.0E+00	3.9E-01	2.5E+00	3.3E+00	1.4E+01	9.0E-01	8	3.0E-05	2
Dieldrin	2.6E-01	1.2E-02	1.0E-01	1.5E+01	3.5E+01	8.0E-01	8	7.5E-08	2
Heptachlor epoxide[2]	2.0E-02	3.8E-02	2.9E-01	1.6E+01	3.8E+01	8.0E-01	8	1.9E-08	2
Arsenic	1.6E+00	1.0E-03	NA	NA	NA	NA	8	1.3E-08	1
Cobalt	2.7E+00	4.0E-04	NA	NA	NA	NA	8	8.5E-09	1
Manganese	3.2E+02	1.0E-03	NA	NA	NA	NA	8	2.6E-06	1
Zinc	9.2E+02	6.0E-04	NA	NA	NA	NA	8	4.4E-06	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
If t_{event} < t* then

$$DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \quad 2)$$

If t_{event} > t* then

$$DA_{event} = FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \quad 3)$$

Notes:
[1] Values from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental*

Table F-7.5.RME Supplement B
Inhalation of Volatiles from Water in Excavation Trench
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

VRP Table 3.8 Exposure-point concentrations (inhalation) for construction/utility workers in a trench: Groundwater less than 15 feet deep	CAS No.	Molecular Weight MWi g/mol	Henry's Law Constant Hi atm-m3/mol	Gas-Phase Mass Transfer Coefficient KiG cm/s	Liquid-Phase Mass Transfer Coefficient KiL cm/s	Overall Mass Transfer Coefficient Ki cm/s	Concentration of Contaminant in Groundwater Cgw ug/L	Volatilization Factor VF L/m3	Concentration of Contaminant in Trench Ctrench ug/m3
Volatile Organic Compounds (VOCs)									
Bromodichloromethane	75-27-4	163.83	1.60E-03	3.98E-01	8.84E-04	8.55E-04	2.46E-01	6.31E+00	1.55E+00
Chloroform	67-66-3	119.38	3.67E-03	4.42E-01	1.04E-03	1.02E-03	6.06E+00	7.53E+00	4.56E+01
Tetrachloroethene	127-18-4	165.83	1.84E-02	3.96E-01	8.79E-04	8.76E-04	3.22E+02	6.47E+00	2.08E+03
Trichloroethene	79-01-6	131.39	1.03E-02	4.28E-01	9.87E-04	9.82E-04	1.90E+02	7.25E+00	1.38E+03

TABLE F-7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	5.4E-02	mg/kg	1.9E-08	mg/kg/day	1.6E+01	1/mg/kg-day	3.0E-07	5.2E-08	mg/kg/day	5.0E-05	mg/kg/day	1.0E-03
				Aluminum	2.4E+04	mg/kg	8.3E-03	mg/kg/day	N/A		N/A	2.3E-02	mg/kg/day	1.0E+00	mg/kg/day	2.3E-02
				Arsenic	3.0E+00	mg/kg	1.1E-06	mg/kg/day	1.5E+00	1/mg/kg-day	1.6E-06	3.0E-06	mg/kg/day	3.0E-04	mg/kg/day	9.9E-03
				Cobalt	2.9E+00	mg/kg	1.0E-06	mg/kg/day	N/A		N/A	2.8E-06		3.0E-04		
				Iron	2.1E+04	mg/kg	7.2E-03	mg/kg/day	N/A		N/A	2.0E-02	mg/kg/day	7.0E-01	mg/kg/day	2.9E-02
				Manganese	9.7E+01	mg/kg	3.4E-05	mg/kg/day	N/A		N/A	9.5E-05	mg/kg/day	2.0E-02	mg/kg/day	4.7E-03
				Thallium	6.1E-01	mg/kg	2.1E-07	mg/kg/day	N/A		N/A	6.0E-07	mg/kg/day	6.5E-04	mg/kg/day	9.2E-04
			Exp. Route Total								1.9E-06					6.9E-02
			Dermal Absorption	Dieldrin	5.4E-02	mg/kg	1.2E-08	mg/kg/day	1.6E+01	1/mg/kg-day	2.0E-07	3.5E-08	mg/kg/day	5.0E-05	mg/kg/day	6.9E-04
				Aluminum	2.4E+04	mg/kg	5.4E-04	mg/kg/day	N/A		N/A	1.5E-03	mg/kg/day	1.0E+00	mg/kg/day	1.5E-03
				Arsenic	3.0E+00	mg/kg	2.1E-07	mg/kg/day	1.5E+00	1/mg/kg-day	3.1E-07	5.9E-07	mg/kg/day	3.0E-04	mg/kg/day	2.0E-03
				Cobalt	2.9E+00	mg/kg	6.7E-08	mg/kg/day	N/A		N/A	1.9E-07	mg/kg/day	3.0E-04	mg/kg/day	6.3E-04
				Iron	2.1E+04	mg/kg	4.8E-04	mg/kg/day	N/A		N/A	1.3E-03	mg/kg/day	7.0E-01	mg/kg/day	1.9E-03
				Manganese	9.7E+01	mg/kg	2.2E-06	mg/kg/day	N/A		N/A	6.2E-06	mg/kg/day	8.0E-04	mg/kg/day	7.8E-03
				Thallium	6.1E-01	mg/kg	1.4E-08	mg/kg/day	N/A		N/A	3.9E-08	mg/kg/day	6.5E-04	mg/kg/day	6.1E-05
			Exp. Route Total								5.1E-07					1.5E-02
		Exposure Point Total									2.4E-06					8.3E-02
	Exposure Medium Total										2.4E-06					8.3E-02
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	5.8E-05	mg/m^3	4.1E-06	mg/kg/day	2.0E-02	mg/kg/day	8.1E-08	1.1E-05	mg/kg/day	8.0E-02	mg/kg/day	1.4E-04
			Exp. Route Total								8.1E-08					1.4E-04
		Exposure Point Total									8.1E-08					1.4E-04
	Exposure Medium Total										8.1E-08					1.4E-04
Medium Total											2.5E-06					8.3E-02
										Total of Receptor Risks Across All Media	2.5E-06				Total of Receptor Hazards Across All Media	8.3E-02

*Soil = surface and subsurface soil combined.

N/A = Not applicable.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

TABLE F-7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	5.4E-02	mg/kg	3.7E-09	mg/kg/day	1.6E+01	1/mg/kg-day	6.0E-08	1.1E-08	mg/kg/day	5.0E-05	mg/kg/day	2.2E-04
				Aluminum	2.4E+04	mg/kg	1.6E-03	mg/kg/day	N/A		N/A	4.8E-03	mg/kg/day	1.0E+00	mg/kg/day	4.8E-03
				Arsenic	3.0E+00	mg/kg	2.1E-07	mg/kg/day	1.5E+00	1/mg/kg-day	3.2E-07	6.2E-07	mg/kg/day	3.0E-04	mg/kg/day	2.1E-03
				Cobalt	2.9E+00	mg/kg	2.0E-07	mg/kg/day	N/A		N/A	5.9E-07	mg/kg/day	3.0E-04	mg/kg/day	2.0E-03
				Iron	2.1E+04	mg/kg	1.4E-03	mg/kg/day	N/A		N/A	4.2E-03	mg/kg/day	7.0E-01	mg/kg/day	6.0E-03
				Manganese	9.7E+01	mg/kg	6.7E-06	mg/kg/day	N/A		N/A	2.0E-05	mg/kg/day	2.0E-02	mg/kg/day	9.8E-04
				Thallium	6.1E-01	mg/kg	4.3E-08	mg/kg/day	N/A		N/A	1.2E-07	mg/kg/day	6.5E-04	mg/kg/day	1.9E-04
			Exp. Route Total								3.8E-07					1.6E-02
			Dermal Absorption	Dieldrin	5.4E-02	mg/kg	1.5E-09	mg/kg/day	1.6E+01	1/mg/kg-day	2.4E-08	4.3E-09	mg/kg/day	5.0E-05	mg/kg/day	8.7E-05
				Aluminum	2.4E+04	mg/kg	6.6E-05	mg/kg/day	N/A		N/A	1.9E-04	mg/kg/day	1.0E+00	mg/kg/day	1.9E-04
				Arsenic	3.0E+00	mg/kg	2.5E-08	mg/kg/day	1.5E+00	1/mg/kg-day	3.8E-08	7.4E-08	mg/kg/day	3.0E-04	mg/kg/day	2.5E-04
				Cobalt	2.9E+00	mg/kg	8.1E-09		N/A		N/A	2.4E-08	mg/kg/day	3.0E-04	mg/kg/day	7.9E-05
				Iron	2.1E+04	mg/kg	5.8E-05	mg/kg/day	N/A		N/A	1.7E-04	mg/kg/day	7.0E-01	mg/kg/day	2.4E-04
				Manganese	9.7E+01	mg/kg	2.7E-07	mg/kg/day	N/A		N/A	7.9E-07	mg/kg/day	8.0E-04	mg/kg/day	9.8E-04
				Thallium	6.1E-01	mg/kg	1.7E-09	mg/kg/day	N/A		N/A	5.0E-09	mg/kg/day	6.5E-04	mg/kg/day	7.6E-06
			Exp. Route Total								6.2E-08					1.8E-03
		Exposure Point Total									4.4E-07					1.8E-02
	Exposure Medium Total										4.4E-07					1.8E-02
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	5.8E-05	mg/m^3	5.0E-08	mg/kg/day	2.0E-02	mg/kg/day	1.0E-09	1.5E-07	mg/kg/day	8.0E-02	mg/kg/day	1.8E-06
			Exp. Route Total								1.0E-09					1.8E-06
		Exposure Point Total									1.0E-09					1.8E-06
	Exposure Medium Total										1.0E-09					1.8E-06
Medium Total											1.0E-09					1.8E-06
										Total of Receptor Risks Across All Media	4.4E-07				Total of Receptor Hazards Across All Media	1.8E-02

*Soil = surface and subsurface soil combined.

N/A = Not applicable.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

TABLE F-7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	5.4E-02	mg/kg	1.9E-09	mg/kg/day	1.6E+01	1/mg/kg-day	3.1E-08	1.5E-08	mg/kg/day	5.0E-05	mg/kg/day	3.0E-04
				Aluminum	2.4E+04	mg/kg	8.5E-04	mg/kg/day	N/A		N/A	6.6E-03	mg/kg/day	1.0E+00	mg/kg/day	6.6E-03
				Arsenic	3.0E+00	mg/kg	1.1E-07	mg/kg/day	1.5E+00	1/mg/kg-day	1.6E-07	8.5E-07	mg/kg/day	3.0E-04	mg/kg/day	2.8E-03
				Cobalt	2.9E+00	mg/kg	1.0E-07	mg/kg/day	N/A		N/A	8.1E-07	mg/kg/day	3.0E-04	mg/kg/day	2.7E-03
				Iron	2.1E+04	mg/kg	7.4E-04	mg/kg/day	N/A		N/A	5.8E-03	mg/kg/day	7.0E-01	mg/kg/day	8.3E-03
				Manganese	9.7E+01	mg/kg	3.5E-06	mg/kg/day	N/A		N/A	2.7E-05	mg/kg/day	2.0E-02	mg/kg/day	1.4E-03
				Thallium	6.1E-01	mg/kg	2.2E-08	mg/kg/day	N/A		N/A	1.7E-07	mg/kg/day	6.5E-04	mg/kg/day	2.6E-04
			Exp. Route Total								1.9E-07					2.2E-02
			Dermal Absorption	Dieldrin	5.4E-02	mg/kg	3.1E-09	mg/kg/day	1.6E+01	1/mg/kg-day	4.9E-08	2.4E-08	mg/kg/day	5.0E-05	mg/kg/day	4.8E-04
				Aluminum	2.4E+04	mg/kg	1.3E-04	mg/kg/day	N/A		N/A	1.0E-03	mg/kg/day	1.0E+00	mg/kg/day	1.0E-03
				Arsenic	3.0E+00	mg/kg	5.2E-08	mg/kg/day	1.5E+00	1/mg/kg-day	7.8E-08	4.0E-07	mg/kg/day	3.0E-04	mg/kg/day	1.3E-03
				Cobalt	2.9E+00	mg/kg	1.7E-08	mg/kg/day	N/A		N/A	1.3E-07	mg/kg/day	3.0E-04	mg/kg/day	4.3E-04
				Iron	2.1E+04	mg/kg	1.2E-04	mg/kg/day	N/A		N/A	9.2E-04	mg/kg/day	7.0E-01	mg/kg/day	1.3E-03
				Manganese	9.7E+01	mg/kg	5.5E-07	mg/kg/day	N/A		N/A	4.3E-06	mg/kg/day	8.0E-04	mg/kg/day	5.4E-03
				Thallium	6.1E-01	mg/kg	3.5E-09	mg/kg/day	N/A		N/A	2.7E-08	mg/kg/day	6.5E-04	mg/kg/day	4.2E-05
			Exp. Route Total								1.3E-07					1.0E-02
		Exposure Point Total									3.2E-07					3.2E-02
	Exposure Medium Total										3.2E-07					3.2E-02
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	5.8E-05	mg/m^3	2.6E-08	mg/kg/day	2.0E-02	mg/kg/day	5.2E-10	2.0E-07	mg/kg/day	8.0E-02	mg/kg/day	2.5E-06
			Exp. Route Total								5.2E-10					2.5E-06
		Exposure Point Total									5.2E-10					2.5E-06
	Exposure Medium Total										5.2E-10					2.5E-06
Medium Total											5.2E-10					2.5E-06
										Total of Receptor Risks Across All Media	3.2E-07				Total of Receptor Hazards Across All Media	3.2E-02

*Soil = surface and subsurface soil combined.

N/A = Not applicable.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

TABLE F-7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Tap Water	Ingestion													
				Bromodichloromethane	2.0E-01	ug/L	N/A		N/A		N/A	2.6E-06	mg/kg/day	2.0E-02	mg/kg/day	1.3E-04
				Chloroform	3.0E+00	ug/L	N/A		N/A		N/A	3.9E-05	mg/kg/day	1.0E-02	mg/kg/day	3.9E-03
				Tetrachloroethene	3.8E+01	ug/L	N/A		N/A		N/A	4.9E-04	mg/kg/day	1.0E-02	mg/kg/day	4.9E-02
				Trichloroethene	1.1E+02	ug/L	N/A		N/A		N/A	1.4E-03	mg/kg/day	6.0E-03	mg/kg/day	2.3E-01
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	3.8E-05	mg/kg/day	2.0E-03	mg/kg/day	1.9E-02
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	7.7E-05	mg/kg/day	3.0E-02	mg/kg/day	2.6E-03
				Dieldrin	7.5E-02	ug/L	N/A		N/A		N/A	9.6E-07	mg/kg/day	5.0E-05	mg/kg/day	1.9E-02
				Heptachlor epoxide	6.6E-03	ug/L	N/A		N/A		N/A	8.4E-08	mg/kg/day	1.3E-05	mg/kg/day	6.5E-03
				Arsenic	6.2E-01	ug/L	N/A		N/A		N/A	8.0E-06	mg/kg/day	3.0E-04	mg/kg/day	2.7E-02
				Cobalt	1.9E+00	ug/L	N/A		N/A		N/A	2.5E-05	mg/kg/day	3.0E-04	mg/kg/day	8.3E-02
				Manganese	2.4E+02	ug/L	N/A		N/A		N/A	3.1E-03	mg/kg/day	2.0E-02	mg/kg/day	1.6E-01
				Zinc	9.0E+01	ug/L	N/A		N/A		N/A	1.1E-03	mg/kg/day	3.0E-01	mg/kg/day	3.8E-03
			Exp. Route Total								N/A					6.0E-01
			Dermal Absorption													
				Bromodichloromethane	2.0E-01	ug/L	N/A		N/A		N/A	2.0E-07	mg/kg/day	2.0E-02	mg/kg/day	9.9E-06
				Chloroform	3.0E+00	ug/L	N/A		N/A		N/A	3.3E-06	mg/kg/day	1.0E-02	mg/kg/day	3.3E-04
				Tetrachloroethene	3.8E+01	ug/L	N/A		N/A		N/A	2.8E-04	mg/kg/day	1.0E-02	mg/kg/day	2.8E-02
				Trichloroethene	1.1E+02	ug/L	N/A		N/A		N/A	2.2E-04	mg/kg/day	6.0E-03	mg/kg/day	3.6E-02
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	2.2E-06	mg/kg/day	2.0E-03	mg/kg/day	1.1E-03
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	8.8E-04	mg/kg/day	3.0E-02	mg/kg/day	2.9E-02
				Dieldrin	7.5E-02	ug/L	N/A		N/A		N/A	6.3E-07	mg/kg/day	5.0E-05	mg/kg/day	1.3E-02
				Heptachlor epoxide	6.6E-03	ug/L	N/A		N/A		N/A	1.8E-07	mg/kg/day	1.3E-05	mg/kg/day	1.4E-02
				Arsenic	6.2E-01	ug/L	N/A		N/A		N/A	2.6E-08	mg/kg/day	3.0E-04	mg/kg/day	8.5E-05
				Cobalt	1.9E+00	ug/L	N/A		N/A		N/A	3.2E-08	mg/kg/day	3.0E-04	mg/kg/day	1.1E-04
				Manganese	2.4E+02	ug/L	N/A		N/A		N/A	1.0E-05	mg/kg/day	8.0E-04	mg/kg/day	1.3E-02
				Zinc	9.0E+01	ug/L	N/A		N/A		N/A	2.2E-06	mg/kg/day	3.0E-01	mg/kg/day	7.4E-06
			Exp. Route Total								N/A					1.3E-01
		Exposure Point Total									N/A					7.3E-01
	Exposure Medium Total										N/A					7.3E-01

TABLE F-7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Air	Shallow Aquifer Water Vapors at Showerhead	Inhalation	Bromodichloromethane	2.0E-01	ug/L	1.3E-07	mg/kg/day	1.3E-01	1/mg/kg/day	1.6E-08	9.8E-07	mg/kg/day	N/A	mg/kg/day	N/A
				Chloroform	3.0E+00	ug/L	2.4E-06	mg/kg/day	8.1E-02	1/mg/kg/day	1.9E-07	1.9E-05	mg/kg/day	2.8E-02	mg/kg/day	6.6E-04
				Tetrachloroethene	3.8E+01	ug/L	2.7E-05	mg/kg/day	2.0E-02	1/mg/kg/day	5.4E-07	2.1E-04	mg/kg/day	8.0E-02	mg/kg/day	2.6E-03
				Trichloroethene	1.1E+02	ug/L	8.5E-05	mg/kg/day	7.0E-03	1/mg/kg/day	6.0E-07	6.6E-04	mg/kg/day	1.7E-01	mg/kg/day	3.9E-03
			Exp. Route Total								1.3E-06					7.2E-03
		Exposure Point Total									1.3E-06					7.2E-03
	Exposure Medium Total										1.3E-06					7.2E-03
Medium Total											1.3E-06					7.4E-01
Soil*	Soil*	Soil*	Ingestion	Dieldrin	8.8E-03	mg/kg	N/A		N/A		N/A	4.0E-09	mg/kg/day	5.0E-05	mg/kg/day	8.1E-05
				Aluminum	1.1E+04	mg/kg	N/A		N/A		N/A	4.9E-03	mg/kg/day	1.0E+00	mg/kg/day	4.9E-03
				Arsenic	2.6E+00	mg/kg	N/A		N/A		N/A	1.2E-06	mg/kg/day	3.0E-04	mg/kg/day	3.9E-03
				Cobalt	2.2E+00	mg/kg	N/A		N/A		N/A	9.9E-07	mg/kg/day	3.0E-04	mg/kg/day	3.3E-03
				Iron	1.0E+04	mg/kg	N/A		N/A		N/A	4.6E-03	mg/kg/day	7.0E-01	mg/kg/day	6.5E-03
				Manganese	7.1E+01	mg/kg	N/A		N/A		N/A	3.3E-05	mg/kg/day	2.0E-02	mg/kg/day	1.6E-03
				Thallium	4.7E-01	mg/kg	N/A		N/A		N/A	2.1E-07	mg/kg/day	6.5E-04	mg/kg/day	3.3E-04
			Exp. Route Total								N/A					2.1E-02
			Dermal Absorption	Dieldrin	8.8E-03	mg/kg	N/A		N/A		N/A	4.6E-10	mg/kg/day	5.0E-05	mg/kg/day	9.2E-06
				Aluminum	1.1E+04	mg/kg	N/A		N/A		N/A	5.5E-05	mg/kg/day	1.0E+00	mg/kg/day	5.5E-05
				Arsenic	2.6E+00	mg/kg	N/A		N/A		N/A	4.0E-08	mg/kg/day	3.0E-04	mg/kg/day	1.3E-04
				Cobalt	2.2E+00	mg/kg	N/A		N/A		N/A	1.1E-08	mg/kg/day	3.0E-04	mg/kg/day	3.7E-05
				Iron	1.0E+04	mg/kg	N/A		N/A		N/A	5.2E-05	mg/kg/day	7.0E-01	mg/kg/day	7.4E-05
				Manganese	7.1E+01	mg/kg	N/A		N/A		N/A	3.7E-07	mg/kg/day	8.0E-04	mg/kg/day	4.6E-04
				Thallium	4.7E-01	mg/kg	N/A		N/A		N/A	2.4E-09	mg/kg/day	6.5E-04	mg/kg/day	3.8E-06
			Exp. Route Total								N/A					7.8E-04
		Exposure Point Total									N/A					2.1E-02
	Exposure Medium Total										N/A					2.1E-02
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	3.2E-05	mg/m^3	N/A		N/A		N/A	5.9E-06	mg/kg/day	8.0E-02	mg/kg/day	7.4E-05
			Exp. Route Total								N/A					7.4E-05
		Exposure Point Total									N/A					7.4E-05
	Exposure Medium Total										N/A					7.4E-05
Medium Total											N/A					2.1E-02
									Total of Receptor Risks Across All Media		1.3E-06	Total of Receptor Hazards Across All Media				7.6E-01

Notes-

N/A = Not applicable.

DAevent for exposure to groundwater while showering is calculated on Table F-7.1.CTE Supplement A.

Shower exposure calculated on Table F-7.1.CTE Supplement B.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

Table F-7.1.CTE Supplement A
Calculation of DAevent, Resident Adult Ground Water
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient[1] (Kp) (cm/hr)	B[1] (dimensionless)	Lag Time[1] (τ_{event}) (hr)	t*[1] (hr)	Fraction Absorbed Water[1] (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Bromodichloromethane	2.0E-01	4.6E-03	2.3E-02	8.8E-01	2.1E+00	1.0E+00	0.25	1.2E-09	2
Chloroform	3.0E+00	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.25	2.0E-08	2
Tetrachloroethene	3.8E+01	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	0.25	1.7E-06	2
Trichloroethene	1.1E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.25	1.3E-06	2
2,4-Dinitrotoluene	3.0E+00	3.1E-03	1.6E-02	1.1E+00	2.7E+00	1.0E+00	0.25	1.4E-08	2
Pentachlorophenol	6.0E+00	3.9E-01	2.5E+00	3.3E+00	1.4E+01	9.0E-01	0.25	5.3E-06	2
Dieldrin	7.5E-02	1.2E-02	1.0E-01	1.5E+01	3.5E+01	8.0E-01	0.25	3.8E-09	2
Heptachlor epoxide[2]	6.6E-03	3.8E-02	2.9E-01	1.6E+01	3.8E+01	8.0E-01	0.25	1.1E-09	2
Arsenic	6.2E-01	1.0E-03	NA	NA	NA	NA	0.25	1.6E-10	1
Cobalt	1.9E+00	4.0E-04	NA	NA	NA	NA	0.25	1.9E-10	1
Manganese	2.4E+02	1.0E-03	NA	NA	NA	NA	0.25	6.1E-08	1
Zinc	9.0E+01	6.0E-04	NA	NA	NA	NA	0.25	1.3E-08	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
If t_{event} < t* then

$$DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

If t_{event} > t* then

$$DA_{event} = FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:
[1] Values from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
[2] Values from Virginia Remediation Program, Risk Assessment Guidance, gwcalcs.xls, revised 6/7/07
NA - not applicable.

Table F-7.1.CTE Supplement B
Inhalation Exposure Concentrations from Foster and Chrostowski Shower Model
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Chemical	Exposure Point Concentration Cwo (µg/l)	Molecular weight (HH) (g/mole)	Henry's Law Constant (H) (atm-m^3/mole)	Kg (VOC) (cm/hr)	Kl(VOC) (cm/hr)	KL (cm/hr)	Kal (cm/hr)	Cwd (µg/l)	S (µg/m^3 -min)	Calculated Inhalation Exposure (Einh) (mg/kg/shower)
Bromodichloromethane	2.0E-01	1.6E+02	1.6E-03	9.9E+02	1.0E+01	9.0E+00	1.2E+01	1.9E-02	1.6E-02	1.5E-06
Chloroform	3.0E+00	1.2E+02	3.7E-03	1.2E+03	1.2E+01	1.1E+01	1.5E+01	3.6E-01	3.0E-01	2.9E-05
Tetrachloroethene	3.8E+01	1.7E+02	1.8E-02	9.9E+02	1.0E+01	1.0E+01	1.4E+01	4.1E+00	3.4E+00	3.3E-04
Trichloroethene	1.1E+02	1.3E+02	4.0E-01	1.1E+03	1.2E+01	1.2E+01	1.6E+01	1.3E+01	1.1E+01	1.0E-03

Variables	Units	Exposure Assumptions
Kg(VOC) = gas-film mass transfer coefficient	cm/hr	Solved by Eq 1
Kl(VOC) = liquid-film mass transfer coefficient	cm/hr	Solved by Eq 2
KL = overall mass transfer coefficient	cm/hr	Solved by Eq 3
Kal = adjusted overall mass transfer coeff.	cm/hr	Solved by Eq 4
Tl = Calibration temp. of water	K (20C +273)	293
Ts = Shower water temperature	k (45C)	318
Us = water viscosity at Ts	centipoise	0.596
Ul = water viscosity at Tl	cp	1.002
Cwd = conc. leaving droplets after time sdt	µg/l	Solved by Eq 5
sdt = shower droplet drop time	sec	0.5
d = shower droplet diameter	mm	1
FR = shower water flow rate	l/min	10
SV = shower room air volume	m^3	12
S = indoor VOC generation rate	µg/m^3-min	Solved by Eq 6
VR = ventilation rate	l/min	13.8
Variables	**Units**	**Exposure Assumptions**
BW = body weight	kg	70
Ds = duration of shower	min	15
Dt = total duration in shower room	min	45
R = air exchange rate	min^{-1}	0.0083
Ca = indoor air concentration of VOCs	µg/m^3	Solved by Eq 7
Einh = inhalation exposure per shower	mg/kg/shower	Solved by Eq 8

Equation 1:	Kg(VOC) =	3000 * (18 / HH)$^{0.5}$	
Equation 2:	Kl(VOC) =	20 * (44 / HH)$^{0.5}$	
Equation 3:	KL =	((1 / Kl(VOC)) + (0.024 / (Kg (VOC) * H)))$^{-1}$	
Equation 4:	Kal =	(KL * (((Tl * Us) / (Ts * Ul))$^{-0.5}$))	
Equation 5:	Cwd =	(Cwo * (1-EXP((-1 * Kal * sdt)/(60 * d))))	
Equation 6:	S =	(Cwd * FR / SV)	
Equation 7:	see time series example on Table I-GW-5		
Equation 8:	Einh =	If t>Ds	(((VR * S) / (BW * R * 1000000)) * ((Ds + (EXP(-R * Dt) / R)-(EXP(R * (Ds - Dt))) / R)))

TABLE F-7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Tap Water	Ingestion													
				Bromodichloromethane	2.0E-01	ug/L	N/A		N/A		N/A	8.6E-06	mg/kg/day	2.0E-02	mg/kg/day	4.3E-04
				Chloroform	3.0E+00	ug/L	N/A		N/A		N/A	1.3E-04	mg/kg/day	1.0E-02	mg/kg/day	1.3E-02
				Tetrachloroethene	3.8E+01	ug/L	N/A		N/A		N/A	1.6E-03	mg/kg/day	1.0E-02	mg/kg/day	1.6E-01
				Trichloroethene	1.1E+02	ug/L	N/A		N/A		N/A	4.6E-03	mg/kg/day	6.0E-03	mg/kg/day	7.6E-01
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	1.3E-04	mg/kg/day	2.0E-03	mg/kg/day	6.4E-02
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	2.6E-04	mg/kg/day	3.0E-02	mg/kg/day	8.5E-03
				Dieldrin	7.5E-02	ug/L	N/A		N/A		N/A	3.2E-06	mg/kg/day	5.0E-05	mg/kg/day	6.4E-02
				Heptachlor epoxide	6.6E-03	ug/L	N/A		N/A		N/A	2.8E-07	mg/kg/day	1.3E-05	mg/kg/day	2.2E-02
				Arsenic	6.2E-01	ug/L	N/A		N/A		N/A	2.7E-05	mg/kg/day	3.0E-04	mg/kg/day	8.8E-02
				Cobalt	1.9E+00	ug/L	N/A		N/A		N/A	8.3E-05	mg/kg/day	3.0E-04	mg/kg/day	2.8E-01
				Manganese	2.4E+02	ug/L	N/A		N/A		N/A	1.0E-02	mg/kg/day	2.0E-02	mg/kg/day	5.2E-01
				Zinc	9.0E+01	ug/L	N/A		N/A		N/A	3.8E-03	mg/kg/day	3.0E-01	mg/kg/day	1.3E-02
			Exp. Route Total								N/A					2.0E+00
			Dermal Absorption													
				Bromodichloromethane	2.0E-01	ug/L	N/A		N/A		N/A	3.9E-07	mg/kg/day	2.0E-02	mg/kg/day	2.0E-05
				Chloroform	3.0E+00	ug/L	N/A		N/A		N/A	6.5E-06	mg/kg/day	1.0E-02	mg/kg/day	6.5E-04
				Tetrachloroethene	3.8E+01	ug/L	N/A		N/A		N/A	5.4E-04	mg/kg/day	1.0E-02	mg/kg/day	5.4E-02
				Trichloroethene	1.1E+02	ug/L	N/A		N/A		N/A	4.2E-04	mg/kg/day	6.0E-03	mg/kg/day	7.1E-02
				2,4-Dinitrotoluene	3.0E+00	ug/L	N/A		N/A		N/A	4.4E-06	mg/kg/day	2.0E-03	mg/kg/day	2.2E-03
				Pentachlorophenol	6.0E+00	ug/L	N/A		N/A		N/A	1.7E-03	mg/kg/day	3.0E-02	mg/kg/day	5.7E-02
				Dieldrin	7.5E-02	ug/L	N/A		N/A		N/A	1.2E-06	mg/kg/day	5.0E-05	mg/kg/day	2.5E-02
				Heptachlor epoxide	6.6E-03	ug/L	N/A		N/A		N/A	3.6E-07	mg/kg/day	1.3E-05	mg/kg/day	2.8E-02
				Arsenic	6.2E-01	ug/L	N/A		N/A		N/A	5.8E-08	mg/kg/day	3.0E-04	mg/kg/day	1.9E-04
				Cobalt	1.9E+00	ug/L	N/A		N/A		N/A	7.2E-08	mg/kg/day	3.0E-04	mg/kg/day	2.4E-04
				Manganese	2.4E+02	ug/L	N/A		N/A		N/A	2.3E-05	mg/kg/day	8.0E-04	mg/kg/day	2.8E-02
				Zinc	9.0E+01	ug/L	N/A		N/A		N/A	5.0E-06	mg/kg/day	3.0E-01	mg/kg/day	1.7E-05
			Exp. Route Total								N/A					2.7E-01
		Exposure Point Total									N/A					2.3E+00
	Exposure Medium Total										N/A					2.3E+00
Medium Total											N/A					2.3E+00

TABLE F-7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	8.8E-03	mg/kg	N/A		N/A		N/A	3.8E-08	mg/kg/day	5.0E-05	mg/kg/day	7.5E-04
				Aluminum	1.1E+04	mg/kg	N/A		N/A		N/A	4.5E-02	mg/kg/day	1.0E+00	mg/kg/day	4.5E-02
				Arsenic	2.6E+00	mg/kg	N/A		N/A		N/A	1.1E-05	mg/kg/day	3.0E-04	mg/kg/day	3.6E-02
				Cobalt	2.2E+00	mg/kg	N/A		N/A		N/A	9.2E-06	mg/kg/day	3.0E-04	mg/kg/day	3.1E-02
				Iron	1.0E+04	mg/kg	N/A		N/A		N/A	4.3E-02	mg/kg/day	7.0E-01	mg/kg/day	6.1E-02
				Manganese	7.1E+01	mg/kg	N/A		N/A		N/A	3.0E-04	mg/kg/day	2.0E-02	mg/kg/day	1.5E-02
				Thallium	4.7E-01	mg/kg	N/A		N/A		N/A	2.0E-06	mg/kg/day	6.5E-04	mg/kg/day	3.1E-03
			Exp. Route Total								N/A					1.9E-01
			Dermal Absorption	Dieldrin	8.8E-03	mg/kg	N/A		N/A		N/A	4.2E-09	mg/kg/day	5.0E-05	mg/kg/day	8.4E-05
				Aluminum	1.1E+04	mg/kg	N/A		N/A		N/A	5.1E-04	mg/kg/day	1.0E+00	mg/kg/day	5.1E-04
				Arsenic	2.6E+00	mg/kg	N/A		N/A		N/A	3.7E-07	mg/kg/day	3.0E-04	mg/kg/day	1.2E-03
				Cobalt	2.2E+00	mg/kg	N/A		N/A		N/A	1.0E-07	mg/kg/day	3.0E-04	mg/kg/day	3.4E-04
				Iron	1.0E+04	mg/kg	N/A		N/A		N/A	4.8E-04	mg/kg/day	7.0E-01	mg/kg/day	6.8E-04
				Manganese	7.1E+01	mg/kg	N/A		N/A		N/A	3.4E-06	mg/kg/day	8.0E-04	mg/kg/day	4.3E-03
				Thallium	4.7E-01	mg/kg	N/A		N/A		N/A	2.2E-08	mg/kg/day	6.5E-04	mg/kg/day	3.4E-05
			Exp. Route Total								N/A					7.1E-03
		Exposure Point Total									N/A					2.0E-01
	Exposure Medium Total										N/A					2.0E-01
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	3.2E-05	mg/m^3	N/A		N/A		N/A	2.1E-05	mg/kg/day	8.0E-02	mg/kg/day	2.6E-04
			Exp. Route Total								N/A					2.6E-04
		Exposure Point Total									N/A					2.6E-04
	Exposure Medium Total										N/A					2.6E-04
Medium Total											N/A					2.0E-01
									Total of Receptor Risks Across All Media		N/A	Total of Receptor Hazards Across All Media				2.5E+00

Notes-

N/A = Not applicable.

DAevent for exposure to groundwater while showering is calculated on Table F-7.2.CTE Supplement A.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

Table F-7.2.CTE Supplement A
Calculation of DAevent, Resident Child Ground Water
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient[1] (Kp) (cm/hr)	B[1] (dimensionless)	Lag Time[1] (τ_{event}) (hr)	t*[1] (hr)	Fraction Absorbed Water[1] (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Bromodichloromethane	2.0E-01	4.6E-03	2.3E-02	8.8E-01	2.1E+00	1.0E+00	0.33	1.4E-09	2
Chloroform	3.0E+00	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	0.33	2.3E-08	2
Tetrachloroethene	3.8E+01	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	0.33	1.9E-06	2
Trichloroethene	1.1E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	0.33	1.5E-06	2
2,4-Dinitrotoluene	3.0E+00	3.1E-03	1.6E-02	1.1E+00	2.7E+00	1.0E+00	0.33	1.6E-08	2
Pentachlorophenol	6.0E+00	3.9E-01	2.5E+00	3.3E+00	1.4E+01	9.0E-01	0.33	6.1E-06	2
Dieldrin	7.5E-02	1.2E-02	1.0E-01	1.5E+01	3.5E+01	8.0E-01	0.33	4.4E-09	2
Heptachlor epoxide[2]	6.6E-03	3.8E-02	2.9E-01	1.6E+01	3.8E+01	8.0E-01	0.33	1.3E-09	2
Arsenic	6.2E-01	1.0E-03	NA	NA	NA	NA	0.33	2.0E-10	1
Cobalt	1.9E+00	4.0E-04	NA	NA	NA	NA	0.33	2.6E-10	1
Manganese	2.4E+02	1.0E-03	NA	NA	NA	NA	0.33	8.0E-08	1
Zinc	9.0E+01	6.0E-04	NA	NA	NA	NA	0.33	1.8E-08	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
If t_{event} < t* then

$$DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

If t_{event} > t* then

$$DA_{event} = FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:
[1] Values from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
[2] Values from Virginia Remediation Program, Risk Assessment Guidance, gwcalcs.xls, revised 6/7/07
NA - not applicable.

TABLE F-7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Tap Water	Ingestion													
				Bromodichloromethane	2.0E-01	ug/L	1.1E-06	mg/kg/day	6.2E-02	mg/kg/day	6.6E-08	N/A		N/A		N/A
				Chloroform	3.0E+00	ug/L	1.6E-05	mg/kg/day	3.1E-02	mg/kg/day	5.0E-07	N/A		N/A		N/A
				Tetrachloroethene	3.8E+01	ug/L	2.0E-04	mg/kg/day	5.4E-01	mg/kg/day	1.1E-04	N/A		N/A		N/A
				Trichloroethene	1.1E+02	ug/L	5.7E-04	mg/kg/day	1.3E-02	mg/kg/day	7.4E-06	N/A		N/A		N/A
				2,4-Dinitrotoluene	3.0E+00	ug/L	1.6E-05	mg/kg/day	3.1E-01	mg/kg/day	4.9E-06	N/A		N/A		N/A
				Pentachlorophenol	6.0E+00	ug/L	3.2E-05	mg/kg/day	1.2E-01	mg/kg/day	3.8E-06	N/A		N/A		N/A
				Dieldrin	7.5E-02	ug/L	4.0E-07	mg/kg/day	1.6E+01	mg/kg/day	6.4E-06	N/A		N/A		N/A
				Heptachlor epoxide	6.6E-03	ug/L	3.5E-08	mg/kg/day	9.1E+00	mg/kg/day	3.2E-07	N/A		N/A		N/A
				Arsenic	6.2E-01	ug/L	3.3E-06	mg/kg/day	1.5E+00	mg/kg/day	4.9E-06	N/A		N/A		N/A
				Cobalt	1.9E+00	ug/L	1.0E-05	mg/kg/day	N/A	mg/kg/day	N/A	N/A		N/A		N/A
				Manganese	2.4E+02	ug/L	1.3E-03	mg/kg/day	N/A	mg/kg/day	N/A	N/A		N/A		N/A
				Zinc	9.0E+01	ug/L	4.8E-04	mg/kg/day	N/A	mg/kg/day	N/A	N/A		N/A		N/A
			Exp. Route Total								1.4E-04					N/A
			Dermal Absorption													
				Bromodichloromethane	2.0E-01	ug/L	5.9E-08	mg/kg/day	6.2E-02	mg/kg/day	3.7E-09	N/A		N/A		N/A
				Chloroform	3.0E+00	ug/L	9.9E-07	mg/kg/day	3.1E-02	mg/kg/day	3.1E-08	N/A		N/A		N/A
				Tetrachloroethene	3.8E+01	ug/L	8.2E-05	mg/kg/day	5.4E-01	mg/kg/day	4.4E-05	N/A		N/A		N/A
				Trichloroethene	1.1E+02	ug/L	6.4E-05	mg/kg/day	1.3E-02	mg/kg/day	8.3E-07	N/A		N/A		N/A
				2,4-Dinitrotoluene	3.0E+00	ug/L	6.7E-07	mg/kg/day	3.1E-01	mg/kg/day	2.1E-07	N/A		N/A		N/A
				Pentachlorophenol	6.0E+00	ug/L	2.6E-04	mg/kg/day	1.2E-01	mg/kg/day	3.1E-05	N/A		N/A		N/A
				Dieldrin	7.5E-02	ug/L	1.9E-07	mg/kg/day	1.6E+01	mg/kg/day	3.0E-06	N/A		N/A		N/A
				Heptachlor epoxide	6.6E-03	ug/L	5.5E-08	mg/kg/day	9.1E+00	mg/kg/day	5.0E-07	N/A		N/A		N/A
				Arsenic	6.2E-01	ug/L	8.2E-09	mg/kg/day	1.5E+00	mg/kg/day	1.2E-08	N/A		N/A		N/A
				Cobalt	1.9E+00	ug/L	1.0E-08	mg/kg/day	N/A	mg/kg/day	N/A	N/A		N/A		N/A
				Manganese	2.4E+02	ug/L	3.2E-06	mg/kg/day	N/A	mg/kg/day	N/A	N/A		N/A		N/A
				Zinc	9.0E+01	ug/L	7.1E-07	mg/kg/day	N/A	mg/kg/day	N/A	N/A		N/A		N/A
			Exp. Route Total								8.0E-05					N/A
		Exposure Point Total									2.2E-04					N/A
	Exposure Medium Total										2.2E-04					N/A
Medium Total											2.2E-04					N/A

TABLE F-7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	8.8E-03	mg/kg	3.7E-09	mg/kg/day	1.6E+01	mg/kg/day	5.9E-08	N/A		N/A		N/A
				Aluminum	1.1E+04	mg/kg	4.5E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic	2.6E+00	mg/kg	1.1E-06	mg/kg/day	1.5E+00	mg/kg/day	1.6E-06	N/A		N/A		N/A
				Cobalt	2.2E+00	mg/kg	9.1E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron	1.0E+04	mg/kg	4.2E-03	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese	7.1E+01	mg/kg	3.0E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Thallium	4.7E-01	mg/kg	2.0E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								1.7E-06					N/A
			Dermal Absorption	Dieldrin	8.8E-03	mg/kg	4.2E-10	mg/kg/day	1.6E+01	mg/kg/day	6.7E-09	N/A		N/A		N/A
				Aluminum	1.1E+04	mg/kg	5.1E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Arsenic	2.6E+00	mg/kg	3.7E-08	mg/kg/day	1.5E+00	mg/kg/day	5.5E-08	N/A		N/A		N/A
				Cobalt	2.2E+00	mg/kg	1.0E-08	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Iron	1.0E+04	mg/kg	4.7E-05	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Manganese	7.1E+01	mg/kg	3.4E-07	mg/kg/day	N/A		N/A	N/A		N/A		N/A
				Thallium	4.7E-01	mg/kg	2.2E-09	mg/kg/day	N/A		N/A	N/A		N/A		N/A
			Exp. Route Total								6.2E-08					N/A
		Exposure Point Total									1.7E-06					N/A
	Exposure Medium Total										1.7E-06					N/A
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	3.2E-05	mg/m^3	2.7E-06	mg/kg/day	2.0E-02	mg/kg/day	5.3E-08	N/A		N/A		N/A
			Exp. Route Total								5.3E-08					N/A
		Exposure Point Total									5.3E-08					N/A
	Exposure Medium Total										5.3E-08					N/A
Medium Total											1.8E-06					N/A
										Total of Receptor Risks Across All Media	2.2E-04				Total of Receptor Hazards Across All Media	N/A

Notes-

N/A = Not applicable.

DAevent for exposure to groundwater while showering is calculated on Table F-7.1.CTE Supplement A and F-7.2.CTE Supplement A.

Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

TABLE F-7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Shallow Aquifer Water in Excavation Trench	Dermal Absorption	Bromodichloromethane	2.0E-01	ug/L	2.1E-09	mg/kg/day	6.2E-02	mg/kg/day	1.3E-10	1.5E-07	mg/kg/day	2.0E-02	mg/kg/day	7.4E-06
				Chloroform	3.0E+00	ug/L	4.0E-08	mg/kg/day	3.1E-02	mg/kg/day	1.3E-09	2.8E-06	mg/kg/day	1.0E-02	mg/kg/day	2.8E-04
				Tetrachloroethene	3.8E+01	ug/L	2.8E-06	mg/kg/day	5.4E-01	mg/kg/day	1.5E-06	2.0E-04	mg/kg/day	1.0E-02	mg/kg/day	2.0E-02
				Trichloroethene	1.1E+02	ug/L	2.5E-06	mg/kg/day	1.3E-02	mg/kg/day	3.2E-08	1.7E-04	mg/kg/day	6.0E-03	mg/kg/day	2.9E-02
				2,4-Dinitrotoluene	3.0E+00	ug/L	2.3E-08	mg/kg/day	3.1E-01	mg/kg/day	7.1E-09	1.6E-06	mg/kg/day	2.0E-03	mg/kg/day	8.1E-04
				Pentachlorophenol	6.0E+00	ug/L	8.5E-06	mg/kg/day	1.2E-01	mg/kg/day	1.0E-06	5.9E-04	mg/kg/day	3.0E-02	mg/kg/day	2.0E-02
				Dieldrin	7.5E-02	ug/L	6.1E-09	mg/kg/day	1.6E+01	mg/kg/day	9.7E-08	4.2E-07	mg/kg/day	5.0E-05	mg/kg/day	8.5E-03
				Heptachlor epoxide	6.6E-03	ug/L	1.8E-09	mg/kg/day	9.1E+00	mg/kg/day	1.6E-08	1.2E-07	mg/kg/day	1.3E-05	mg/kg/day	9.6E-03
				Arsenic	6.2E-01	ug/L	9.9E-10	mg/kg/day	1.5E+00	mg/kg/day	1.5E-09	6.9E-08	mg/kg/day	3.0E-04	mg/kg/day	2.3E-04
				Cobalt	1.9E+00	ug/L	3.9E-07	mg/kg/day	N/A	mg/kg/day	N/A	2.7E-05	mg/kg/day	3.0E-03	mg/kg/day	9.0E-03
				Manganese	2.4E+02	ug/L	8.6E-08	mg/kg/day	N/A	mg/kg/day	N/A	6.0E-06	mg/kg/day	8.0E-04	mg/kg/day	7.5E-03
				Zinc	9.0E+01	ug/L	0.0E+00	mg/kg/day	N/A	mg/kg/day	N/A	6.0E-06	mg/kg/day	3.0E-01	mg/kg/day	2.0E-05
			Exp. Route Total								2.7E-06					1.0E-01
		Exposure Point Total									2.7E-06					1.0E-01
	Exposure Medium Total										2.7E-06					1.0E-01
	Air	Shallow Aquifer Water Vapors at Excavation	Inhalation	Bromodichloromethane	2.0E-01	ug/L	1.8E-06	mg/kg/day	1.3E-01	mg/kg/day	2.3E-07	1.5E-04	mg/kg/day	N/A		N/A
				Chloroform	3.0E+00	ug/L	3.2E-05	mg/kg/day	8.1E-02	mg/kg/day	2.6E-06	4.5E-03	mg/kg/day	2.8E-02	mg/kg/day	1.6E-01
				Tetrachloroethene	3.8E+01	ug/L	3.4E-04	mg/kg/day	2.0E-02	mg/kg/day	6.9E-06	2.0E-01	mg/kg/day	8.0E-02	mg/kg/day	2.5E+00
				Trichloroethene	1.1E+02	ug/L	1.1E-03	mg/kg/day	7.0E-03	mg/kg/day	7.6E-06	1.3E-01	mg/kg/day	1.7E-01	mg/kg/day	7.9E-01
			Exp. Route Total								1.7E-05					3.5E+00
		Exposure Point Total									1.7E-05					3.5E+00
	Exposure Medium Total										1.7E-05					3.5E+00
Medium Total											2.0E-05					3.6E+00

TABLE F-7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Soil*	Ingestion	Dieldrin	8.8E-03	mg/kg	1.7E-10	mg/kg/day	1.6E+01	mg/kg/day	2.8E-09	1.2E-08	mg/kg/day	5.0E-05	mg/kg/day	2.4E-04
				Aluminum	1.1E+04	mg/kg	2.1E-04	mg/kg/day	N/A		N/A	1.5E-02	mg/kg/day	1.0E+00	mg/kg/day	1.5E-02
				Arsenic	2.6E+00	mg/kg	5.0E-08	mg/kg/day	1.5E+00	mg/kg/day	7.5E-08	3.5E-06	mg/kg/day	3.0E-04	mg/kg/day	1.2E-02
				Cobalt	2.2E+00	mg/kg	4.2E-08	mg/kg/day	N/A		N/A	3.0E-06	mg/kg/day	3.0E-03	mg/kg/day	9.8E-04
				Iron	1.0E+04	mg/kg	2.0E-04	mg/kg/day	N/A		N/A	1.4E-02	mg/kg/day	7.0E-01	mg/kg/day	2.0E-02
				Manganese	7.1E+01	mg/kg	1.4E-06	mg/kg/day	N/A		N/A	9.7E-05	mg/kg/day	2.0E-02	mg/kg/day	4.9E-03
				Thallium	4.7E-01	mg/kg	9.2E-09	mg/kg/day	N/A		N/A	6.4E-07	mg/kg/day	6.5E-04	mg/kg/day	9.9E-04
			Exp. Route Total								7.8E-08					5.3E-02
			Dermal Absorption	Dieldrin	8.8E-03	mg/kg	1.3E-11	mg/kg/day	1.6E+01	mg/kg/day	2.1E-10	9.0E-10	mg/kg/day	5.0E-05	mg/kg/day	1.8E-05
				Aluminum	1.1E+04	mg/kg	1.6E-06	mg/kg/day	N/A		N/A	1.1E-04	mg/kg/day	1.0E+00	mg/kg/day	1.1E-04
				Arsenic	2.6E+00	mg/kg	1.1E-09	mg/kg/day	1.5E+00	mg/kg/day	1.7E-09	7.9E-08	mg/kg/day	3.0E-04	mg/kg/day	2.6E-04
				Cobalt	2.2E+00	mg/kg	3.2E-10	mg/kg/day	N/A		N/A	2.2E-08	mg/kg/day	3.0E-03	mg/kg/day	7.4E-06
				Iron	1.0E+04	mg/kg	1.5E-06	mg/kg/day	N/A		N/A	1.0E-04	mg/kg/day	7.0E-01	mg/kg/day	1.5E-04
				Manganese	7.1E+01	mg/kg	1.0E-08	mg/kg/day	N/A		N/A	7.3E-07	mg/kg/day	8.0E-04	mg/kg/day	9.1E-04
				Thallium	4.7E-01	mg/kg	6.9E-11	mg/kg/day	N/A		N/A	4.8E-09	mg/kg/day	6.5E-04	mg/kg/day	7.4E-06
			Exp. Route Total								1.9E-09					1.5E-03
		Exposure Point Total									8.0E-08					5.4E-02
	Exposure Medium Total										8.0E-08					5.4E-02
	Air	Emissions from Soil	Inhalation	Tetrachloroethene	3.2E-05	mg/m^3	4.5E-08	mg/kg/day	2.0E-02	mg/kg/day	9.1E-10	3.2E-06	mg/kg/day	8.0E-02	mg/kg/day	4.0E-05
			Exp. Route Total								9.1E-10					4.0E-05
		Exposure Point Total									9.1E-10					4.0E-05
	Exposure Medium Total										9.1E-10					4.0E-05
Medium Total											8.1E-08					5.4E-02
										Total of Receptor Risks Across All Media	2.0E-05				Total of Receptor Hazards Across All Media	3.7E+00

Notes-
N/A = Not applicable.
Subchronic RfD values used when available

DAevent for exposure to shallow aquifer groundwater during excavation activities calculated on Table F-7.4.CTE Supplement A.
EPC for inhalation of volatiles from excavation trench calculated on Table F-7.4.CTE Supplement B.
Dermal absorption factors (DABs) used to calculated dermal absorption intake from soil are chemical specific. DABS of 0.13 used for the PAHs, DABS of 0.03 used for arsenic, 0.01 for other inorganics.

Table F-7.4.CTE Supplement A
Calculation of DAevent, Construction Worker
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient[1] (Kp) (cm/hr)	B[1] (dimensionless)	Lag Time[1] (τ_{event}) (hr)	t*[1] (hr)	Fraction Absorbed Water[1] (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Bromodichloromethane	2.0E-01	4.6E-03	2.3E-02	8.8E-01	2.1E+00	1.0E+00	4	5.3E-09	3
Chloroform	3.0E+00	6.8E-03	2.9E-02	5.0E-01	1.2E+00	1.0E+00	4	1.0E-07	3
Tetrachloroethene	3.8E+01	3.3E-02	1.7E-01	9.1E-01	2.2E+00	1.0E+00	4	7.0E-06	3
Trichloroethene	1.1E+02	1.2E-02	5.1E-02	5.8E-01	1.4E+00	1.0E+00	4	6.2E-06	3
2,4-Dinitrotoluene	3.0E+00	3.1E-03	1.6E-02	1.1E+00	2.7E+00	1.0E+00	4	5.8E-08	3
Pentachlorophenol	6.0E+00	3.9E-01	2.5E+00	3.3E+00	1.4E+01	9.0E-01	4	2.1E-05	2
Dieldrin	7.5E-02	1.2E-02	1.0E-01	1.5E+01	3.5E+01	8.0E-01	4	1.5E-08	2
Heptachlor epoxide[2]	6.6E-03	3.8E-02	2.9E-01	1.6E+01	3.8E+01	8.0E-01	4	4.5E-09	2
Arsenic	6.2E-01	1.0E-03	NA	NA	NA	NA	4	2.5E-09	1
Cobalt		4.0E-04	NA	NA	NA	NA	4	0.0E+00	1
Manganese	2.4E+02	1.0E-03	NA	NA	NA	NA	4	9.7E-07	1
Zinc	9.0E+01	6.0E-04	NA	NA	NA	NA	4	2.2E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =
If $t_{event} < t^*$ then

$$DA_{event} = 2 \times FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \quad 2)$$

If $t_{event} > t^*$ then

$$DA_{event} = FA \times K_p \times C_w \times 0.001 \quad mg/ug \times 0.001 \quad l/cm^3 \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \quad 3)$$

Notes:
[1] Values from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
[2] Values from Virginia Remediation Program, Risk Assessment Guidance, gwcalcs.xls, revised 6/7/07
NA - not applicable.

Table F-7.4.CTE Supplement B
Inhalation of Volatiles from Water in Excavation Trench
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

VRP Table 3.8 Exposure-point concentrations (inhalation) for construction/utility workers in a trench: Groundwater less than 15 feet deep	CAS No.	Molecular Weight MWi g/mol	Henry's Law Constant Hi atm-m3/mol	Gas-Phase Mass Transfer Coefficient KiG cm/s	Liquid-Phase Mass Transfer Coefficient KiL cm/s	Overall Mass Transfer Coefficient Ki cm/s	Concentration of Contaminant in Groundwater Cgw ug/L	Volatilization Factor VF L/m3	Concentration of Contaminant in Trench Ctrench ug/m3
Volatile Organic Compounds (VOCs)									
Bromodichloromethane	75-27-4	163.83	1.60E-03	3.98E-01	8.84E-04	8.55E-04	2.01E-01	6.31E+00	1.27E+00
Chloroform	67-66-3	119.38	3.67E-03	4.42E-01	1.04E-03	1.02E-03	3.04E+00	7.53E+00	2.28E+01
Tetrachloroethene	127-18-4	165.83	1.84E-02	3.96E-01	8.79E-04	8.76E-04	3.80E+01	6.47E+00	2.46E+02
Trichloroethene	79-01-6	131.39	1.03E-02	4.28E-01	9.87E-04	9.82E-04	1.07E+02	7.25E+00	7.74E+02

TABLE F-9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Current
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Surface Soil										
			Dieldrin	1.5E-07	N/A	6.0E-08	2.1E-07	Liver	2.2E-03	N/A	8.7E-04	3.1E-03
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	2.4E-02	N/A	9.6E-04	2.5E-02
			Arsenic	7.1E-07	N/A	8.6E-08	8.0E-07	Skin, Vascular	1.9E-02	N/A	2.2E-03	2.1E-02
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	1.4E-02	N/A	5.7E-04	1.5E-02
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	3.1E-02	N/A	1.2E-03	3.2E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	8.0E-03	N/A	8.0E-03	1.6E-02
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	1.1E-03	N/A	4.2E-05 0.0E+00	1.1E-03
			Chemical Total	8.7E-07	0.0E+00	1.5E-07	1.0E-06		9.9E-02	0.0E+00	1.4E-02	1.1E-01
		Exposure Point Total					1.0E-06					1.1E-01
	Exposure Medium Total						1.0E-06					1.1E-01
Medium Total							1.0E-06					1.1E-01
Receptor Total							1.0E-06				Receptor HI Total	1.1E-01

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	1.1E-03
Total Gastrointestinal HI Across All Media =	3.2E-02
Total Hair HI Across All Media =	1.1E-03
Total Liver HI Across All Media =	4.2E-03
Total Neurological HI Across All Media =	4.1E-02
Total Skin HI Across All Media =	2.1E-02
Total Vascular HI Across All Media =	2.1E-02

TABLE F-9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Bromodichloromethane	N/A	N/A	N/A	0.0E+00	Kidney	3.4E-04	N/A	2.8E-05	3.6E-04
			Chloroform	N/A	N/A	N/A	0.0E+00	Liver	1.7E-02	N/A	1.5E-03	1.8E-02
			Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Liver, Whole body	8.8E-01	N/A	5.3E-01	1.4E+00
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Liver	8.7E-01	N/A	1.5E-01	1.0E+00
			2,4-Dinitrotoluene	N/A	N/A	N/A	0.0E+00	Nervous System	4.1E-02	N/A	2.6E-03	4.4E-02
			Pentachlorophenol	N/A	N/A	N/A	0.0E+00	Liver, Kidney	5.5E-03	N/A	6.6E-02	7.2E-02
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	1.4E-01	N/A	9.9E-02	2.4E-01
			Heptachlor epoxide	N/A	N/A	N/A	0.0E+00	Liver	4.2E-02	N/A	9.8E-02	1.4E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	1.4E-01	N/A	7.5E-04	1.4E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	2.4E-01	N/A	5.1E-04	2.4E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	4.4E-01	N/A	5.7E-02	4.9E-01
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	8.4E-02	N/A	2.6E-04	8.5E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.9E+00	0.0E+00	1.0E+00	3.9E+00
		Exposure Point Total					0.0E+00					3.9E+00
	Exposure Medium Total						0.0E+00					3.9E+00
	Air	Shallow Aquifer - Water Vapors at Showerhead	Bromodichloromethane	N/A	1.8E-07	N/A	1.8E-07	N/A	N/A	N/A	N/A	0.0E+00
			Chloroform	N/A	3.6E-06	N/A	3.6E-06	Liver	N/A	4.6E-03	N/A	4.6E-03
			Tetrachloroethene	N/A	4.2E-05	N/A	4.2E-05	Kidney, Liver	N/A	7.7E-02	N/A	7.7E-02
			Trichloroethene	N/A	9.8E-06	N/A	9.8E-06	Nervous System, Eyes	N/A	2.4E-02	N/A	2.4E-02
			Chemical Total	0.0E+00	5.6E-05	0.0E+00	5.6E-05		0.0E+00	1.1E-01	0.0E+00	1.1E-01
		Exposure Point Total					5.6E-05					1.1E-01
	Exposure Medium Total						5.6E-05					1.1E-01
Medium Total							5.6E-05					4.0E+00

TABLE F-9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	1.5E-03	N/A	5.8E-04	2.1E-03
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	3.2E-02	N/A	1.3E-03	3.4E-02
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	1.4E-02	N/A	1.7E-03	1.5E-02
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	1.3E-02	N/A	5.3E-04	1.4E-02
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	4.1E-02	N/A	1.6E-03	4.2E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	6.6E-03	N/A	6.6E-03	1.3E-02
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	1.3E-03	N/A	5.1E-05	1.3E-03
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.1E-01	0.0E+00	1.2E-02	1.2E-01
		Exposure Point Total					0.0E+00					1.2E-01
	Exposure Medium Total						0.0E+00					1.2E-01
	Air	Emissions from Soil	Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Kidney, Liver	N/A	2.0E-04	N/A	2.0E-04
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	2.0E-04	0.0E+00	2.0E-04
		Exposure Point Total					0.0E+00					2.0E-04
	Exposure Medium Total						0.0E+00					2.0E-04
Medium Total							0.0E+00					1.2E-01
Receptor Total							5.6E-05				Receptor HI Total	4.1E+00

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	8.6E-02
Total Gastrointestinal HI Across All Media =	4.2E-02
Total Hair HI Across All Media =	1.3E-03
Total Kidney HI Across All Media =	1.5E-01
Total Liver HI Across All Media =	3.0E+00
Total Neurological HI Across All Media =	6.1E-01
Total Ocular HI Across All Media =	2.4E-02
Total Skin HI Across All Media =	1.6E-01
Total Thyroid HI Across All Media =	2.6E-01
Total Vascular HI Across All Media =	1.6E-01
Total Whole Body HI Across All Media =	1.4E+00

TABLE F-9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Bromodichloromethane	N/A	N/A	N/A	0.0E+00	Kidney	7.9E-04	N/A	6.2E-05	8.5E-04
			Chloroform	N/A	N/A	N/A	0.0E+00	Liver	3.9E-02	N/A	3.4E-03	4.2E-02
			Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Liver, Whole body	2.1E+00	N/A	1.2E+00	3.3E+00
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Liver	2.0E+00	N/A	3.3E-01	2.4E+00
			2,4-Dinitrotoluene	N/A	N/A	N/A	0.0E+00	Nervous System	9.6E-02	N/A	6.4E-03	1.0E-01
			Pentachlorophenol	N/A	N/A	N/A	0.0E+00	Liver, Kidney	1.3E-02	N/A	1.5E-01	1.6E-01
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	3.3E-01	N/A	2.2E-01	5.6E-01
			Heptachlor epoxide	N/A	N/A	N/A	0.0E+00	Liver	9.8E-02	N/A	2.2E-01	3.2E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	3.3E-01	N/A	2.2E-03	3.4E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	5.7E-01	N/A	1.5E-03	5.7E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	1.0E+00	N/A	1.7E-01	1.2E+00
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	2.0E-01	N/A	7.8E-04	2.0E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.8E+00	0.0E+00	2.3E+00	9.1E+00
		Exposure Point Total					0.0E+00					9.1E+00
	Exposure Medium Total						0.0E+00					9.1E+00
Medium Total							0.0E+00					9.1E+00

TABLE F-9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	1.4E-02	N/A	3.8E-03	1.8E-02
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	3.0E-01	N/A	8.5E-03	3.1E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	1.3E-01	N/A	1.1E-02	1.4E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	1.2E-01	N/A	3.5E-03	1.3E-01
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	3.8E-01	N/A	1.1E-02	3.9E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	6.2E-02	N/A	4.3E-02	1.1E-01
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	1.2E-02	N/A	3.4E-04	1.2E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.0E+00	0.0E+00	8.1E-02	1.1E+00
		Exposure Point Total					0.0E+00					1.1E+00
	Exposure Medium Total						0.0E+00					1.1E+00
	Air	Emissions from Soil	Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Kidney, Liver	N/A	7.0E-04	N/A	7.0E-04
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	7.0E-04	0.0E+00	7.0E-04
		Exposure Point Total					0.0E+00					7.0E-04
	Exposure Medium Total						0.0E+00					7.0E-04
Medium Total							0.0E+00					1.1E+00
Receptor Total							0.0E+00				Receptor HI Total	1.0E+01

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	2.1E-01
Total Gastrointestinal HI Across All Media =	3.9E-01
Total Hair HI Across All Media =	1.2E-02
Total Kidney HI Across All Media =	1.6E-01
Total Liver HI Across All Media =	6.7E+00
Total Neurological HI Across All Media =	1.7E+00
Total Skin HI Across All Media =	4.8E-01
Total Thyroid HI Across All Media =	7.0E-01
Total Vascular HI Across All Media =	4.8E-01
Total Whole Body HI Across All Media =	3.3E+00

TABLE F-9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water										
			Bromodichloromethane	2.3E-07	N/A	1.8E-08	2.5E-07	Kidney	N/A	N/A	N/A	0.0E+00
			Chloroform	2.8E-06	N/A	2.5E-07	3.1E-06	Liver	N/A	N/A	N/A	0.0E+00
			Tetrachloroethene	2.6E-03	N/A	1.5E-03	4.1E-03	Liver, Whole body	N/A	N/A	N/A	0.0E+00
			Trichloroethene	3.7E-05	N/A	6.1E-06	4.3E-05	Liver	N/A	N/A	N/A	0.0E+00
			2,4-Dinitrotoluene	1.4E-05	N/A	8.8E-07	1.5E-05	Nervous System	N/A	N/A	N/A	0.0E+00
			Pentachlorophenol	1.1E-05	N/A	1.3E-04	1.4E-04	Liver, Kidney	N/A	N/A	N/A	0.0E+00
			Dieldrin	6.2E-05	N/A	4.2E-05	1.0E-04	Liver	N/A	N/A	N/A	0.0E+00
			Heptachlor epoxide	2.7E-06	N/A	6.2E-06	8.9E-06	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic	3.5E-05	N/A	2.0E-07	3.5E-05	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	N/A	0.0E+00
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	N/A	N/A	N/A	0.0E+00
			Chemical Total	2.8E-03	0.0E+00	1.7E-03	4.5E-03		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					4.5E-03					0.0E+00
	Exposure Medium Total						4.5E-03					0.0E+00
Medium Total							4.5E-03					0.0E+00

TABLE F-9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	1.3E-06	N/A	4.2E-07	1.8E-06	Liver	N/A	N/A	N/A	0.0E+00
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	N/A	N/A	N/A	0.0E+00
			Arsenic	7.1E-06	N/A	6.7E-07	7.8E-06	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	N/A	0.0E+00
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	N/A	N/A	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	N/A	0.0E+00
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	N/A	N/A	N/A	0.0E+00
			Chemical Total	8.4E-06	0.0E+00	1.1E-06	9.5E-06		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					9.5E-06					0.0E+00
	Exposure Medium Total						9.5E-06					0.0E+00
	Air	Emissions from Soil	Tetrachloroethene	N/A	1.4E-07	N/A	1.4E-07	Kidney, Liver	N/A	N/A	N/A	0.0E+00
			Chemical Total	0.0E+00	1.4E-07	0.0E+00	1.4E-07		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					1.4E-07					0.0E+00
	Exposure Medium Total						1.4E-07					0.0E+00
Medium Total							9.7E-06					0.0E+00
Receptor Total							4.5E-03				Receptor HI Total	0.0E+00

TABLE F-9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Water in Excavation Trench	Bromodichloromethane	N/A	N/A	5.4E-10	5.4E-10	Kidney	N/A	N/A	3.1E-05	3.1E-05
			Chloroform	N/A	N/A	9.0E-09	9.0E-09	Liver	N/A	N/A	2.0E-03	2.0E-03
			Tetrachloroethene	N/A	N/A	4.2E-05	4.2E-05	Liver, Whole body	N/A	N/A	5.4E-01	5.4E-01
			Trichloroethene	N/A	N/A	2.0E-07	2.0E-07	Liver	N/A	N/A	1.8E-01	1.8E-01
			2,4-Dinitrotoluene	N/A	N/A	2.3E-08	2.3E-08	Nervous System	N/A	N/A	2.6E-03	2.6E-03
			Pentachlorophenol	N/A	N/A	2.9E-06	2.9E-06	Fetus	N/A	N/A	5.6E-02	5.6E-02
			Dieldrin	N/A	N/A	9.5E-07	9.5E-07	Liver	N/A	N/A	8.3E-02	8.3E-02
			Heptachlor epoxide	N/A	N/A	1.4E-07	1.4E-07	Liver	N/A	N/A	8.2E-02	8.2E-02
			Arsenic	N/A	N/A	1.5E-08	1.5E-08	Skin	N/A	N/A	2.3E-03	2.3E-03
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	1.6E-04	1.6E-04
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	1.8E-01	1.8E-01
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	N/A	N/A	8.2E-04	8.2E-04
			Chemical Total	0.0E+00	0.0E+00	4.6E-05	4.6E-05		0.0E+00	0.0E+00	1.1E+00	1.1E+00
		Exposure Point Total					4.6E-05					1.1E+00
	Exposure Medium Total						4.6E-05					1.1E+00
	Air	Shallow Aquifer - Water Vapors at Excavation	Bromodichloromethane	N/A	5.6E-07	N/A	5.6E-07	N/A	N/A	N/A	N/A	0.0E+00
			Chloroform	N/A	1.0E-05	N/A	1.0E-05	Liver	N/A	3.2E-01	N/A	3.2E-01
			Tetrachloroethene	N/A	1.2E-04	N/A	1.2E-04	Kidney, Liver	N/A	5.1E+00	N/A	5.1E+00
			Trichloroethene	N/A	2.7E-05	N/A	2.7E-05	Nervous System, Eyes	N/A	1.6E+00	N/A	1.6E+00
			Chemical Total	0.0E+00	1.5E-04	0.0E+00	1.5E-04		0.0E+00	7.0E+00	0.0E+00	7.0E+00
		Exposure Point Total					1.5E-04					7.0E+00
	Exposure Medium Total						1.5E-04					7.0E+00
Medium Total							2.0E-04					8.1E+00

TABLE F-9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	5.7E-08	N/A	1.2E-08	6.9E-08	Liver	5.0E-03	N/A	1.0E-03	6.1E-03
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	1.1E-01	N/A	2.3E-03	1.1E-01
			Arsenic	3.0E-07	N/A	1.9E-08	3.2E-07	Skin	4.7E-02	N/A	2.9E-03	5.0E-02
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	4.5E-03	N/A	9.4E-05	4.6E-03
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	1.4E-01	N/A	2.9E-03	1.4E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	2.3E-02	N/A	1.2E-02	3.4E-02
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	4.4E-03	N/A	9.1E-05	4.5E-03
			Chemical Total	3.6E-07	0.0E+00	3.1E-08	3.9E-07		3.3E-01	0.0E+00	2.1E-02	3.5E-01
		Exposure Point Total					3.9E-07					3.5E-01
	Exposure Medium Total						3.9E-07					3.5E-01
	Air	Emissions from Soil	Tetrachloroethene	N/A	3.2E-09	N/A	3.2E-09	Kidney, Liver	N/A	1.4E-04	N/A	1.4E-04
			Chemical Total	0.0E+00	3.2E-09	0.0E+00	3.2E-09		0.0E+00	1.4E-04	0.0E+00	1.4E-04
		Exposure Point Total					3.2E-09					1.4E-04
	Exposure Medium Total						3.2E-09					1.4E-04
Medium Total							4.0E-07					3.5E-01
Receptor Total							2.0E-04				Receptor HI Total	8.5E+00

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	5.3E-03
Total Fetus HI Across All Media =	5.6E-02
Total Gastrointestinal HI Across All Media =	1.4E-01
Total Hair HI Across All Media =	4.5E-03
Total Kidney HI Across All Media =	5.1E+00
Total Liver HI Across All Media =	6.3E+00
Total Neurological HI Across All Media =	1.9E+00
Total Ocular HI Across All Media =	1.6E+00
Total Skin HI Across All Media =	5.3E-02
Total Thyroid HI Across All Media =	4.8E-03
Total Whole Body HI Across All Media =	5.4E-01

TABLE F-9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	3.0E-07	N/A	2.0E-07	5.0E-07	Liver	1.0E-03	N/A	6.9E-04	1.7E-03
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	2.3E-02	N/A	1.5E-03	2.5E-02
			Arsenic	1.6E-06	N/A	3.1E-07	1.9E-06	Skin, Vascular	9.9E-03	N/A	2.0E-03	1.2E-02
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	0.0E+00	N/A	6.3E-04	6.3E-04
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	2.9E-02	N/A	1.9E-03	3.1E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	4.7E-03	N/A	7.8E-03	1.3E-02
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	9.2E-04	N/A	6.1E-05	9.8E-04
			Chemical Total	1.9E-06	0.0E+00	5.1E-07	2.4E-06		6.9E-02	0.0E+00	1.5E-02	8.3E-02
		Exposure Point Total					2.4E-06					8.3E-02
	Exposure Medium Total						2.4E-06					8.3E-02
	Air	Emissions from Soil	Tetrachloroethene	N/A	8.1E-08	N/A	8.1E-08	Kidney, Liver	N/A	1.4E-04	N/A	1.4E-04
			Chemical Total	0.0E+00	8.1E-08	0.0E+00	8.1E-08		0.0E+00	1.4E-04	0.0E+00	1.4E-04
		Exposure Point Total					8.1E-08					1.4E-04
	Exposure Medium Total						8.1E-08					1.4E-04
Medium Total							2.5E-06					8.3E-02
Receptor Total							2.5E-06				Receptor HI Total	8.3E-02

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	9.8E-04
Total Gastrointestinal HI Across All Media =	3.1E-02
Total Hair HI Across All Media =	9.8E-04
Total Kidney HI Across All Media =	1.4E-04
Total Liver HI Across All Media =	2.9E-03
Total Neurological HI Across All Media =	3.7E-02
Total Skin HI Across All Media =	1.2E-02
Total Thyroid HI Across All Media =	6.3E-04
Total Vascular HI Across All Media =	1.2E-02

TABLE F-9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	6.0E-08	N/A	2.4E-08	8.4E-08	Liver	2.2E-04	N/A	8.7E-05	3.0E-04
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	4.8E-03	N/A	1.9E-04	5.0E-03
			Arsenic	3.2E-07	N/A	3.8E-08	3.5E-07	Skin, Vascular	2.1E-03	N/A	2.5E-04	2.3E-03
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	2.0E-03	N/A	7.9E-05	2.0E-03
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	6.0E-03	N/A	2.4E-04	6.3E-03
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	9.8E-04	N/A	9.8E-04	2.0E-03
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	1.9E-04	N/A	7.6E-06	2.0E-04
			Chemical Total	3.8E-07	0.0E+00	6.2E-08	4.4E-07		1.6E-02	0.0E+00	1.8E-03	1.8E-02
		Exposure Point Total					4.4E-07					1.8E-02
	Exposure Medium Total						4.4E-07					1.8E-02
	Air	Emissions from Soil	Tetrachloroethene	N/A	1.0E-09	N/A	1.0E-09	Kidney, Liver	N/A	1.8E-06	N/A	1.8E-06
			Chemical Total	0.0E+00	1.0E-09	0.0E+00	1.0E-09		0.0E+00	1.8E-06	0.0E+00	1.8E-06
		Exposure Point Total					1.0E-09					1.8E-06
	Exposure Medium Total						1.0E-09					1.8E-06
Medium Total							4.4E-07					1.8E-02
Receptor Total							4.4E-07				Receptor HI Total	1.8E-02

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	2.0E-04
Total Gastrointestinal HI Across All Media =	6.3E-03
Total Hair HI Across All Media =	2.0E-04
Total Kidney HI Across All Media =	1.8E-06
Total Liver HI Across All Media =	5.1E-04
Total Neurological HI Across All Media =	7.0E-03
Total Skin HI Across All Media =	2.3E-03
Total Thyroid HI Across All Media =	2.0E-03
Total Vascular HI Across All Media =	2.3E-03

TABLE F-9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Trespasser/Visitor
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	3.1E-08	N/A	4.9E-08	8.0E-08	Liver	3.0E-04	N/A	4.8E-04	7.7E-04
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	6.6E-03	N/A	1.0E-03	7.6E-03
			Arsenic	1.6E-07	N/A	7.8E-08	2.4E-07	Skin, Vascular	2.8E-03	N/A	1.3E-03	4.2E-03
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	2.7E-03	N/A	4.3E-04	3.1E-03
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	8.3E-03	N/A	1.3E-03	9.6E-03
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	1.4E-03	N/A	5.4E-03	6.7E-03
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	2.6E-04	N/A	4.2E-05	3.0E-04
			Chemical Total	1.9E-07	0.0E+00	1.3E-07	3.2E-07		2.2E-02	0.0E+00	1.0E-02	3.2E-02
		Exposure Point Total					3.2E-07					3.2E-02
	Exposure Medium Total						3.2E-07					3.2E-02
	Air	Emissions from Soil	Tetrachloroethene	N/A	5.2E-10	N/A	5.2E-10	Kidney, Liver	N/A	2.5E-06	N/A	2.5E-06
			Chemical Total	0.0E+00	5.2E-10	0.0E+00	5.2E-10		0.0E+00	2.5E-06	0.0E+00	2.5E-06
		Exposure Point Total					5.2E-10					2.5E-06
	Exposure Medium Total						5.2E-10					2.5E-06
Medium Total							3.2E-07					3.2E-02
Receptor Total							3.2E-07				Receptor HI Total	3.2E-02

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	3.0E-04
Total Gastrointestinal HI Across All Media =	9.6E-03
Total Hair HI Across All Media =	3.0E-04
Total Kidney HI Across All Media =	2.5E-06
Total Liver HI Across All Media =	1.1E-03
Total Neurological HI Across All Media =	1.4E-02
Total Skin HI Across All Media =	4.2E-03
Total Thyroid HI Across All Media =	3.1E-03
Total Vascular HI Across All Media =	4.2E-03

TABLE F-9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Bromodichloromethane	N/A	N/A	N/A	0.0E+00	Kidney	1.3E-04	N/A	9.9E-06	1.4E-04
			Chloroform	N/A	N/A	N/A	0.0E+00	Liver	3.9E-03	N/A	3.3E-04	4.2E-03
			Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Liver, Whole body	4.9E-02	N/A	2.8E-02	7.6E-02
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Liver	2.3E-01	N/A	3.6E-02	2.6E-01
			2,4-Dinitrotoluene	N/A	N/A	N/A	0.0E+00	Nervous System	1.9E-02	N/A	1.1E-03	2.0E-02
			Pentachlorophenol	N/A	N/A	N/A	0.0E+00	Liver, Kidney	2.6E-03	N/A	2.9E-02	3.2E-02
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	1.9E-02	N/A	1.3E-02	3.2E-02
			Heptachlor epoxide	N/A	N/A	N/A	0.0E+00	Liver	6.5E-03	N/A	1.4E-02	2.1E-02
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	2.7E-02	N/A	8.5E-05	2.7E-02
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	8.3E-02	N/A	1.1E-04	8.3E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	1.6E-01	N/A	1.3E-02	1.7E-01
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	3.8E-03	N/A	7.4E-06	3.8E-03
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.0E-01	0.0E+00	1.3E-01	7.3E-01
		Exposure Point Total					0.0E+00					7.3E-01
	Exposure Medium Total						0.0E+00					7.3E-01
	Air	Shallow Aquifer - Water Vapors at Showerhead	Bromodichloromethane	N/A	1.6E-08	N/A	1.6E-08	N/A	N/A	N/A	N/A	0.0E+00
			Chloroform	N/A	1.9E-07	N/A	1.9E-07	Liver	N/A	6.6E-04	N/A	6.6E-04
			Tetrachloroethene	N/A	5.4E-07	N/A	5.4E-07	Kidney, Liver	N/A	2.6E-03	N/A	2.6E-03
			Trichloroethene	N/A	6.0E-07	N/A	6.0E-07	Nervous System, Eyes	N/A	3.9E-03	N/A	3.9E-03
			Chemical Total	0.0E+00	1.3E-06	0.0E+00	1.3E-06		0.0E+00	7.2E-03	0.0E+00	7.2E-03
		Exposure Point Total					1.3E-06					7.2E-03
	Exposure Medium Total						1.3E-06					7.2E-03
Medium Total							1.3E-06					7.4E-01

TABLE F-9.1.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	8.1E-05	N/A	9.2E-06	9.0E-05
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	4.9E-03	N/A	5.5E-05	4.9E-03
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	3.9E-03	N/A	1.3E-04	4.0E-03
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	3.3E-03	N/A	3.7E-05	3.3E-03
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	6.5E-03	N/A	7.4E-05	6.6E-03
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	1.6E-03	N/A	4.6E-04	2.1E-03
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	3.3E-04	N/A	3.8E-06	3.3E-04
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.1E-02	0.0E+00	7.8E-04	2.1E-02
		Exposure Point Total					0.0E+00					2.1E-02
	Exposure Medium Total						0.0E+00					2.1E-02
	Air	Emissions from Soil	Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Kidney, Liver	N/A	7.4E-05	N/A	7.4E-05
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	7.4E-05	0.0E+00	7.4E-05
		Exposure Point Total					0.0E+00					7.4E-05
	Exposure Medium Total						0.0E+00					7.4E-05
Medium Total							0.0E+00					2.1E-02
Receptor Total							1.3E-06				Receptor HI Total	7.6E-01

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	4.2E-03
Total Gastrointestinal HI Across All Media =	6.6E-03
Total Hair HI Across All Media =	3.3E-04
Total Kidney HI Across All Media =	3.5E-02
Total Liver HI Across All Media =	4.3E-01
Total Neurological HI Across All Media =	2.0E-01
Total Ocular HI Across All Media =	3.9E-03
Total Skin HI Across All Media =	3.1E-02
Total Thyroid HI Across All Media =	8.6E-02
Total Vascular HI Across All Media =	3.1E-02
Total Whole Body HI Across All Media =	7.6E-02

TABLE F-9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Bromodichloromethane	N/A	N/A	N/A	0.0E+00	Kidney	4.3E-04	N/A	2.0E-05	4.5E-04
			Chloroform	N/A	N/A	N/A	0.0E+00	Liver	1.3E-02	N/A	6.5E-04	1.4E-02
			Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Liver, Whole body	1.6E-01	N/A	5.4E-02	2.2E-01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Liver	7.6E-01	N/A	7.1E-02	8.3E-01
			2,4-Dinitrotoluene	N/A	N/A	N/A	0.0E+00	Nervous System	6.4E-02	N/A	2.2E-03	6.6E-02
			Pentachlorophenol	N/A	N/A	N/A	0.0E+00	Liver, Kidney	8.5E-03	N/A	5.7E-02	6.6E-02
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	6.4E-02	N/A	2.5E-02	8.9E-02
			Heptachlor epoxide	N/A	N/A	N/A	0.0E+00	Liver	2.2E-02	N/A	2.8E-02	4.9E-02
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	8.8E-02	N/A	1.9E-04	8.9E-02
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	2.8E-01	N/A	2.4E-04	2.8E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	5.2E-01	N/A	2.8E-02	5.5E-01
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	1.3E-02	N/A	1.7E-05	1.3E-02
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.0E+00	0.0E+00	2.7E-01	2.3E+00
		Exposure Point Total					0.0E+00					2.3E+00
	Exposure Medium Total						0.0E+00					2.3E+00
Medium Total							0.0E+00					2.3E+00

TABLE F-9.2.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	7.5E-04	N/A	8.4E-05	8.4E-04
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	4.5E-02	N/A	5.1E-04	4.6E-02
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	3.6E-02	N/A	1.2E-03	3.8E-02
			Coablt	N/A	N/A	N/A	0.0E+00	Thyroid	3.1E-02	N/A	3.4E-04	3.1E-02
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	6.1E-02	N/A	6.8E-04	6.2E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	1.5E-02	N/A	4.3E-03	1.9E-02
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	3.1E-03	N/A	3.4E-05	3.1E-03
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.9E-01	0.0E+00	7.1E-03	2.0E-01
		Exposure Point Total					0.0E+00					2.0E-01
	Exposure Medium Total						0.0E+00					2.0E-01
	Air	Emissions from Soil	Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Kidney, Liver	N/A	2.6E-04	N/A	2.6E-04
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		0.0E+00	2.6E-04	0.0E+00	2.6E-04
		Exposure Point Total					0.0E+00					2.6E-04
	Exposure Medium Total						0.0E+00					2.6E-04
Medium Total							0.0E+00					2.0E-01
Receptor Total							0.0E+00				Receptor HI Total	2.5E+00

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	1.6E-02
Total Gastrointestinal HI Across All Media =	6.2E-02
Total Hair HI Across All Media =	3.1E-03
Total Kidney HI Across All Media =	6.7E-02
Total Liver HI Across All Media =	1.3E+00
Total Neurological HI Across All Media =	6.8E-01
Total Skin HI Across All Media =	1.3E-01
Total Thyroid HI Across All Media =	3.1E-01
Total Vascular HI Across All Media =	1.3E-01
Total Whole Body HI Across All Media =	2.2E-01

TABLE F-9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Bromodichloromethane	6.6E-08	N/A	3.7E-09	7.0E-08	Kidney	N/A	N/A	N/A	0.0E+00
			Chloroform	5.0E-07	N/A	3.1E-08	5.3E-07	Liver	N/A	N/A	N/A	0.0E+00
			Tetrachloroethene	1.1E-04	N/A	4.4E-05	1.5E-04	Liver, Whole body	N/A	N/A	N/A	0.0E+00
			Trichloroethene	7.4E-06	N/A	8.3E-07	8.2E-06	Liver	N/A	N/A	N/A	0.0E+00
			2,4-Dinitrotoluene	4.9E-06	N/A	2.1E-07	5.1E-06	Nervous System	N/A	N/A	N/A	0.0E+00
			Pentachlorophenol	3.8E-06	N/A	3.1E-05	3.5E-05	Liver, Kidney	N/A	N/A	N/A	0.0E+00
			Dieldrin	6.4E-06	N/A	3.0E-06	9.3E-06	Liver	N/A	N/A	N/A	0.0E+00
			Heptachlor epoxide	3.2E-07	N/A	5.0E-07	8.2E-07	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic	4.9E-06	N/A	1.2E-08	5.0E-06	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	N/A	0.0E+00
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	N/A	N/A	N/A	0.0E+00
			Chemical Total	1.4E-04	0.0E+00	8.0E-05	2.2E-04		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.2E-04					0.0E+00
	Exposure Medium Total						2.2E-04					0.0E+00
Medium Total							2.2E-04					0.0E+00

TABLE F-9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	5.9E-08	N/A	6.7E-09	6.6E-08	Liver	N/A	N/A	N/A	0.0E+00
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	N/A	N/A	N/A	0.0E+00
			Arsenic	1.6E-06	N/A	5.5E-08	1.7E-06	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	N/A	0.0E+00
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	N/A	N/A	N/A	0.0E+00
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	N/A	0.0E+00
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	N/A	N/A	N/A	0.0E+00
			Chemical Total	1.7E-06	0.0E+00	6.2E-08	1.7E-06		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					1.7E-06					0.0E+00
	Exposure Medium Total						1.7E-06					0.0E+00
	Air	Emissions from Soil	Tetrachloroethene	N/A	5.3E-08	N/A	5.3E-08	Kidney, Liver	N/A	N/A	N/A	0.0E+00
			Chemical Total	0.0E+00	5.3E-08	0.0E+00	5.3E-08		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					5.3E-08					0.0E+00
	Exposure Medium Total						5.3E-08					0.0E+00
Medium Total							1.8E-06					0.0E+00
Receptor Total							2.2E-04				Receptor HI Total	0.0E+00

TABLE F-9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Water in Excavation Trench	Bromodichloromethane	N/A	N/A	1.3E-10	1.3E-10	Kidney	N/A	N/A	7.4E-06	7.4E-06
			Chloroform	N/A	N/A	1.3E-09	1.3E-09	Liver	N/A	N/A	2.8E-04	2.8E-04
			Tetrachloroethene	N/A	N/A	1.5E-06	1.5E-06	Liver, Whole body	N/A	N/A	2.0E-02	2.0E-02
			Trichloroethene	N/A	N/A	3.2E-08	3.2E-08	Liver	N/A	N/A	2.9E-02	2.9E-02
			2,4-Dinitrotoluene	N/A	N/A	7.1E-09	7.1E-09	Nervous System	N/A	N/A	8.1E-04	8.1E-04
			Pentachlorophenol	N/A	N/A	1.0E-06	1.0E-06	Fetus	N/A	N/A	2.0E-02	2.0E-02
			Dieldrin	N/A	N/A	9.7E-08	9.7E-08	Liver	N/A	N/A	8.5E-03	8.5E-03
			Heptachlor epoxide	N/A	N/A	1.6E-08	1.6E-08	Liver	N/A	N/A	9.6E-03	9.6E-03
			Arsenic	N/A	N/A	1.5E-09	1.5E-09	Skin	N/A	N/A	2.3E-04	2.3E-04
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	N/A	N/A	9.0E-03	9.0E-03
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	7.5E-03	7.5E-03
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	N/A	N/A	2.0E-05	2.0E-05
			Chemical Total	0.0E+00	0.0E+00	2.7E-06	2.7E-06		0.0E+00	0.0E+00	1.0E-01	1.0E-01
		Exposure Point Total					2.7E-06					1.0E-01
	Exposure Medium Total						2.7E-06					1.0E-01
	Air	Shallow Aquifer - Water Vapors at Excavation	Bromodichloromethane	N/A	2.3E-07	N/A	2.3E-07	N/A	N/A	N/A	N/A	N/A
			Chloroform	N/A	2.6E-06	N/A	2.6E-06	Liver	N/A	1.6E-01	N/A	1.6E-01
			Tetrachloroethene	N/A	6.9E-06	N/A	6.9E-06	Kidney, Liver	N/A	2.5E+00	N/A	2.5E+00
			Trichloroethene	N/A	7.6E-06	N/A	7.6E-06	Nervous System, Eyes	N/A	7.9E-01	N/A	7.9E-01
			Chemical Total	0.0E+00	1.7E-05	0.0E+00	1.7E-05		0.0E+00	3.5E+00	0.0E+00	3.5E+00
		Exposure Point Total					1.7E-05					3.5E+00
	Exposure Medium Total						1.7E-05					3.5E+00
Medium Total							2.0E-05					3.6E+00

TABLE F-9.4.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

Site 11a Remedial Investigation Report

NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Soil*										
			Dieldrin	2.8E-09	N/A	2.1E-10	3.0E-09	Liver	2.4E-04	N/A	1.8E-05	2.6E-04
			Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	1.5E-02	N/A	1.1E-04	1.5E-02
			Arsenic	7.5E-08	N/A	1.7E-09	7.7E-08	Skin	1.2E-02	N/A	2.6E-04	1.2E-02
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	9.8E-04	N/A	7.4E-06	9.9E-04
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	2.0E-02	N/A	1.5E-04	2.0E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	4.9E-03	N/A	9.1E-04	5.8E-03
			Thallium	N/A	N/A	N/A	0.0E+00	Liver, Blood, Hair	9.9E-04	N/A	7.4E-06	9.9E-04
			Chemical Total	7.8E-08	0.0E+00	1.9E-09	8.0E-08		5.3E-02	0.0E+00	1.5E-03	5.4E-02
		Exposure Point Total					8.0E-08					5.4E-02
	Exposure Medium Total						8.0E-08					5.4E-02
	Air	Emissions from Soil	Tetrachloroethene	N/A	9.1E-10	N/A	9.1E-10	Kidney, Liver	N/A	4.0E-05	N/A	4.0E-05
			Chemical Total	0.0E+00	9.1E-10	0.0E+00	9.1E-10		0.0E+00	4.0E-05	0.0E+00	4.0E-05
		Exposure Point Total					9.1E-10					4.0E-05
	Exposure Medium Total						9.1E-10					4.0E-05
Medium Total							8.1E-08					5.4E-02
Receptor Total							2.0E-05				Receptor HI Total	3.7E+00

HI - Hazard Index

CNS = Central Nervous System

Total Blood HI Across All Media =	1.0E-03
Total Fetus HI Across All Media =	2.0E-02
Total Gastrointestinal HI Across All Media =	2.0E-02
Total Hair HI Across All Media =	9.9E-04
Total Kidney HI Across All Media =	2.5E+00
Total Liver HI Across All Media =	2.8E+00
Total Neurological HI Across All Media =	8.2E-01
Total Ocular HI Across All Media =	7.9E-01
Total Skin HI Across All Media =	1.2E-02
Total Thyroid HI Across All Media =	1.0E-02
Total Whole Body HI Across All Media =	2.0E-02

TABLE F-10.1.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Liver, Whole body	8.8E-01	N/A	5.3E-01	1.4E+00
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Liver	8.7E-01	N/A	1.5E-01	1.0E+00
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	1.4E-01	N/A	9.9E-02	2.4E-01
			Heptachlor epoxide	N/A	N/A	N/A	0.0E+00	Liver	4.2E-02	N/A	9.8E-02	1.4E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	1.4E-01	N/A	7.5E-04	1.4E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	2.4E-01	N/A	5.1E-04	2.4E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	4.4E-01	N/A	5.7E-02	4.9E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		2.8E+00	0.0E+00	9.3E-01	3.7E+00
		Exposure Point Total					0.0E+00					3.7E+00
	Exposure Medium Total						0.0E+00					3.7E+00
Receptor Total							0.0E+00				Receptor HI Total	3.7E+00

HI - Hazard Index
CNS = Central Nervous System

Total Liver HI Across All Media =	2.8E+00
Total Neurological HI Across All Media =	4.9E-01
Total Skin HI Across All Media =	1.4E-01
Total Thyroid HI Across All Media =	2.4E-01
Total Vascular HI Across All Media =	1.4E-01
Total Whole Body HI Across All Media =	1.4E+00

TABLE F-10.2.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Liver, Whole body	2.1E+00	N/A	1.2E+00	3.3E+00
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Liver	2.0E+00	N/A	3.3E-01	2.4E+00
			2,4-Dinitrotoluene	N/A	N/A	N/A	0.0E+00	Nervous System	9.6E-02	N/A	6.4E-03	1.0E-01
			Pentachlorophenol	N/A	N/A	N/A	0.0E+00	Liver, Kidney	1.3E-02	N/A	1.5E-01	1.6E-01
			Dieldrin	N/A	N/A	N/A	0.0E+00	Liver	3.3E-01	N/A	2.2E-01	5.6E-01
			Heptachlor epoxide	N/A	N/A	N/A	0.0E+00	Liver	9.8E-02	N/A	2.2E-01	3.2E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	3.3E-01	N/A	2.2E-03	3.4E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	5.7E-01	N/A	1.5E-03	5.7E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	1.0E+00	N/A	1.7E-01	1.2E+00
			Zinc	N/A	N/A	N/A	0.0E+00	Blood	2.0E-01	N/A	7.8E-04	2.0E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		6.7E+00	0.0E+00	2.3E+00	9.0E+00
		Exposure Point Total					0.0E+00					9.0E+00
	Exposure Medium Total						0.0E+00					9.0E+00
Medium Total							0.0E+00					9.0E+00
Soil*	Soil*	Soil*	Aluminum	N/A	N/A	N/A	0.0E+00	Neurological	3.0E-01	N/A	8.5E-03	3.1E-01
			Arsenic	N/A	N/A	N/A	0.0E+00	Skin, Vascular	1.3E-01	N/A	1.1E-02	1.4E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	1.2E-01	N/A	3.5E-03	1.3E-01
			Iron	N/A	N/A	N/A	0.0E+00	Gastrointestinal	3.8E-01	N/A	1.1E-02	3.9E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	6.2E-02	N/A	4.3E-02	1.1E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		9.9E-01	0.0E+00	7.7E-02	1.1E+00
		Exposure Point Total					0.0E+00					1.1E+00
	Exposure Medium Total						0.0E+00					1.1E+00
Medium Total							0.0E+00					1.1E+00
Receptor Total							0.0E+00				Receptor HI Total	1.0E+01

TABLE F-10.2.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total

HI - Hazard Index
CNS = Central Nervous System

Total Blood HI Across All Media =	2.0E-01
Total Gastrointestinal HI Across All Media =	3.9E-01
Total Kidney HI Across All Media =	1.6E-01
Total Liver HI Across All Media =	6.6E+00
Total Neurological HI Across All Media =	1.7E+00
Total Skin HI Across All Media =	4.8E-01
Total Thyroid HI Across All Media =	7.0E-01
Total Vascular HI Across All Media =	4.8E-01
Total Whole Body HI Across All Media =	3.3E+00

TABLE F-10.3.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Chloroform	2.8E-06	N/A	2.5E-07	3.1E-06	Liver	N/A	N/A	N/A	0.0E+00
			Tetrachloroethene	2.6E-03	N/A	1.5E-03	4.1E-03	Liver, Whole body	N/A	N/A	N/A	0.0E+00
			Trichloroethene	3.7E-05	N/A	6.1E-06	4.3E-05	Liver	N/A	N/A	N/A	0.0E+00
			2,4-Dinitrotoluene	1.4E-05	N/A	8.8E-07	1.5E-05	Nervous System	N/A	N/A	N/A	0.0E+00
			Pentachlorophenol	1.1E-05	N/A	1.3E-04	1.4E-04	Liver, Kidney	N/A	N/A	N/A	0.0E+00
			Dieldrin	6.2E-05	N/A	4.2E-05	1.0E-04	Liver	N/A	N/A	N/A	0.0E+00
			Heptachlor epoxide	2.7E-06	N/A	6.2E-06	8.9E-06	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic	3.5E-05	N/A	2.0E-07	3.5E-05	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Chemical Total	2.8E-03	0.0E+00	1.7E-03	4.5E-03		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					4.5E-03					0.0E+00
	Exposure Medium Total						4.5E-03					0.0E+00
Medium Total							4.5E-03					0.0E+00
Soil*	Soil*	Soil*	Dieldrin	1.3E-06	N/A	4.2E-07	1.8E-06	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic	7.1E-06	N/A	6.7E-07	7.8E-06	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Chemical Total	8.4E-06	0.0E+00	1.1E-06	9.5E-06		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					9.5E-06					0.0E+00
	Exposure Medium Total						9.5E-06					0.0E+00
Medium Total							9.5E-06					0.0E+00
Receptor Total							4.5E-03				Receptor HI Total	0.0E+00

TABLE F-10.4.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Water in Excavation Trench	Tetrachloroethene	N/A	N/A	4.2E-05	4.2E-05	Liver, Whole body	N/A	N/A	5.4E-01	5.4E-01
			Trichloroethene	N/A	N/A	2.0E-07	2.0E-07	Liver	N/A	N/A	1.8E-01	1.8E-01
			Pentachlorophenol	N/A	N/A	2.9E-06	2.9E-06	Fetus	N/A	N/A	5.6E-02	5.6E-02
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	N/A	N/A	1.8E-01	1.8E-01
			Chemical Total	0.0E+00	0.0E+00	4.5E-05	4.5E-05		0.0E+00	0.0E+00	9.5E-01	9.5E-01
		Exposure Point Total					4.5E-05					9.5E-01
	Exposure Medium Total						4.5E-05					9.5E-01
	Air	Shallow Aquifer - Water Vapors at Excavation	Chloroform	N/A	1.0E-05	N/A	1.0E-05	Liver	N/A	3.2E-01	N/A	3.2E-01
			Tetrachloroethene	N/A	1.2E-04	N/A	1.2E-04	Kidney, Liver	N/A	5.1E+00	N/A	5.1E+00
			Trichloroethene	N/A	2.7E-05	N/A	2.7E-05	Nervous System, Eyes	N/A	1.6E+00	N/A	1.6E+00
			Chemical Total	0.0E+00	1.5E-04	0.0E+00	1.5E-04		0.0E+00	7.0E+00	0.0E+00	7.0E+00
		Exposure Point Total					1.5E-04					7.0E+00
	Exposure Medium Total						1.5E-04					7.0E+00
Medium Total							2.0E-04					7.9E+00
Receptor Total							2.0E-04				Receptor HI Total	7.9E+00

HI - Hazard Index
CNS = Central Nervous System

Total Fetus HI Across All Media =	5.6E-02
Total Kidney HI Across All Media =	5.1E+00
Total Liver HI Across All Media =	6.1E+00
Total Neurological HI Across All Media =	1.8E+00
Total Ocular HI Across All Media =	1.6E+00
Total Whole Body HI Across All Media =	5.4E-01

TABLE F-10.1.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Tetrachloroethene	N/A	N/A	N/A	0.0E+00	Liver, Whole body	1.6E-01	N/A	5.4E-02	2.2E-01
			Trichloroethene	N/A	N/A	N/A	0.0E+00	Liver	7.6E-01	N/A	7.1E-02	8.3E-01
			Cobalt	N/A	N/A	N/A	0.0E+00	Thyroid	2.8E-01	N/A	2.4E-04	2.8E-01
			Manganese	N/A	N/A	N/A	0.0E+00	CNS	5.2E-01	N/A	2.8E-02	5.5E-01
			Chemical Total	0.0E+00	0.0E+00	0.0E+00	0.0E+00		1.7E+00	0.0E+00	1.5E-01	1.9E+00
		Exposure Point Total					0.0E+00					1.9E+00
	Exposure Medium Total						0.0E+00					1.9E+00
Medium Total							0.0E+00					1.9E+00
Receptor Total							0.0E+00				Receptor HI Total	1.9E+00

HI - Hazard Index
CNS = Central Nervous System

Total Liver HI Across All Media =	1.0E+00
Total Neurological HI Across All Media =	5.5E-01
Total Thyroid HI Across All Media =	2.8E-01
Total Whole Body HI Across All Media =	2.2E-01

TABLE F-10.2.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Shallow Aquifer - Tap Water	Tetrachloroethene	1.1E-04	N/A	4.4E-05	1.5E-04	Liver, Whole body	N/A	N/A	N/A	0.0E+00
			Trichloroethene	7.4E-06	N/A	8.3E-07	8.2E-06	Liver	N/A	N/A	N/A	0.0E+00
			2,4-Dinitrotoluene	4.9E-06	N/A	2.1E-07	5.1E-06	Nervous System	N/A	N/A	N/A	0.0E+00
			Pentachlorophenol	3.8E-06	N/A	3.1E-05	3.5E-05	Liver, Kidney	N/A	N/A	N/A	0.0E+00
			Dieldrin	6.4E-06	N/A	3.0E-06	9.3E-06	Liver	N/A	N/A	N/A	0.0E+00
			Arsenic	4.9E-06	N/A	1.2E-08	5.0E-06	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Chemical Total	1.4E-04	0.0E+00	7.9E-05	2.2E-04		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					2.2E-04					0.0E+00
	Exposure Medium Total						2.2E-04					0.0E+00
Medium Total							2.2E-04					0.0E+00
Soil*	Soil*	Soil*	Arsenic	1.6E-06	N/A	5.5E-08	1.7E-06	Skin, Vascular	N/A	N/A	N/A	0.0E+00
			Chemical Total	1.6E-06	0.0E+00	5.5E-08	1.7E-06		0.0E+00	0.0E+00	0.0E+00	0.0E+00
		Exposure Point Total					1.7E-06					0.0E+00
	Exposure Medium Total						1.7E-06					0.0E+00
Medium Total							1.7E-06					0.0E+00
Receptor Total							2.2E-04				Receptor HI Total	0.0E+00

TABLE F-10.3.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 11a Remedial Investigation Report
NAB Little Creek, Virginia Beach, Virginia

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
	Air	Shallow Aquifer - Water Vapors at Excavation	Chloroform	N/A	2.6E-06	N/A	2.6E-06	Liver	N/A	1.6E-01	N/A	1.6E-01
			Tetrachloroethene	N/A	6.9E-06	N/A	6.9E-06	Kidney, Liver	N/A	7.9E-01	N/A	2.5E+00
			Trichloroethene	N/A	7.6E-06	N/A	7.6E-06	Nervous System, Eyes	N/A	0.0E+00	N/A	7.9E-01
			Chemical Total	0.0E+00	1.7E-05	0.0E+00	1.7E-05		0.0E+00	9.5E-01	0.0E+00	3.5E+00
		Exposure Point Total					1.7E-05					3.5E+00
	Exposure Medium Total						1.7E-05					3.5E+00
Medium Total							1.7E-05					3.5E+00
Receptor Total							1.7E-05				Receptor HI Total	3.5E+00

HI - Hazard Index
CNS = Central Nervous System

Total Kidney HI Across All Media =	2.5E+00
Total Liver HI Across All Media =	2.7E+00
Total Neurological HI Across All Media =	7.9E-01
Total Ocular HI Across All Media =	7.9E-01

ProUCL input file
Surface Soil

Dieldrin	d_Dieldrin	Aluminum	d_Aluminum	Arsenic	d_Arsenic	Iron	d_Iron	Manganese	d_Manganese	Thallium	d_Thallium	Vanadium	d_Vanadium
1.8	0	4840	1	1.1	1	4790	1	36.7	1	0.28	0	8	1
1.8	0	5440	1	1.6	1	7640	1	42.2	1	0.3	0	15.7	1
1.9	0	6020	1	2.6	1	9450	1	49.3	1	0.305	0	18.6	1
2.1	1	6520	1	2.9	1	10100	1	49.8	1	0.31	0	20.4	1
3.8	1	7190	1	2.9	1	10600	1	51.2	1	0.335	0	21.3	1
80	1	11100	1	3	1	11300	1	55.8	1	0.34	0	22	1
		13100	1	3.2	1	12900	1	58.3	1	0.34	0	22.6	1
		13400	1	3.6	1	13800	1	67.1	1	0.345	0	23	1
		17300	1	3.8	1	14000	1	79.3	1	0.35	0	26.4	1
		17700	1	3.9	1	16000	1	90.1	1	0.35	0	29	1
		20000	1	3.9	1	16500	1	105	1	0.35	1	30.3	1
		20200	1	4	1	16900	1	123	1	0.43	1	32.2	1
		21700	1	4.3	1	17200	1	133	1	0.48	1	33	1
		22200	1	4.3	1	18500	1	140	1	0.59	1	33.5	1
		22800	1	5	1	19300	1	188	1	0.74	1	33.7	1
		23800	1	6.2	1	20700	1	189	1	0.8	1	35.2	1

ProUCL Output
Surface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Dieldrin											
10												
11						General Statistics						
12						Number of Valid Samples	6			Number of Detected Data		3
13						Number of Unique Samples	3			Number of Non-Detect Data		3
14										Percent Non-Detects		50.00%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	2.1			Minimum Detected		0.742
18						Maximum Detected	80			Maximum Detected		4.382
19						Mean of Detected	28.63			Mean of Detected		2.153
20						SD of Detected	44.49			SD of Detected		1.953
21						Minimum Non-Detect	1.8			Minimum Non-Detect		0.588
22						Maximum Non-Detect	1.9			Maximum Non-Detect		0.642
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		3
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		3
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		50.00%
27												
28						UCL Statistics						
29				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.766			Shapiro Wilk Test Statistic		0.868
31						5% Shapiro Wilk Critical Value	0.767			5% Shapiro Wilk Critical Value		0.767
32				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
33												
34				Assuming Normal Distribution						Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	14.78			Mean		1.033
37						SD	31.97			SD		1.741
38						95% DL/2 (t) UCL	41.08			95% H-Stat (DL/2) UCL		3150
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41				MLE yields a negative mean						Mean in Log Scale		-1
42										SD in Log Scale		3.747
43										Mean in Original Scale		14.33
44										SD in Original Scale		32.21
45										95% Percentile Bootstrap UCL		40.37
46										95% BCA Bootstrap UCL		41.62
47												
48				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
49						k star (bias corrected)	N/A			Data appear Lognormal at 5% Significance Level		
50						Theta Star	N/A					
51						nu star	N/A					
52												
53						A-D Test Statistic	0.483			Nonparametric Statistics		
54						5% A-D Critical Value	N/A			Kaplan-Meier (KM) Method		
55						K-S Test Statistic	N/A			Mean		15.37
56						5% K-S Critical Value	N/A			SD		28.91
57				Data not Gamma Distributed at 5% Significance Level						SE of Mean		14.46

ProUCL Output
Surface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
58											95% KM (t) UCL	44.5
59				Assuming Gamma Distribution							95% KM (z) UCL	39.14
60				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	40.98
61					Minimum	N/A					95% KM (bootstrap t) UCL	643.8
62					Maximum	N/A					95% KM (BCA) UCL	80
63					Mean	N/A					95% KM (Percentile Bootstrap) UCL	80
64					Median	N/A					95% KM (Chebyshev) UCL	78.38
65					SD	N/A					97.5% KM (Chebyshev) UCL	105.6
66					k star	N/A					99% KM (Chebyshev) UCL	159.2
67					Theta star	N/A						
68					Nu star	N/A			Potential UCLs to Use			
69					AppChi2	N/A					99% KM (Chebyshev) UCL	159.2
70				95% Gamma Approximate UCL		N/A						
71				95% Adjusted Gamma UCL		N/A						
72					Warning: Recommended UCL exceeds the maximum observation							
73	Note: DL/2 is not a recommended method.											
74												
75												
76	Aluminum											
77												
78					General Statistics							
79					Number of Valid Samples	16					Number of Unique Samples	16
80												
81				Raw Statistics					Log-transformed Statistics			
82					Minimum	4840					Minimum of Log Data	8.485
83					Maximum	23800					Maximum of Log Data	10.08
84					Mean	14582					Mean of log Data	9.451
85					Median	15350					SD of log Data	0.575
86					SD	6959						
87					Coefficient of Variation	0.477						
88					Skewness	-0.173						
89												
90					Relevant UCL Statistics							
91				Normal Distribution Test					Lognormal Distribution Test			
92					Shapiro Wilk Test Statistic	0.891					Shapiro Wilk Test Statistic	0.864
93					Shapiro Wilk Critical Value	0.887					Shapiro Wilk Critical Value	0.887
94				Data appear Normal at 5% Significance Level					Data not Lognormal at 5% Significance Level			
95												
96				Assuming Normal Distribution					Assuming Lognormal Distribution			
97					95% Student's-t UCL	17632					95% H-UCL	20604
98				95% UCLs (Adjusted for Skewness)							95% Chebyshev (MVUE) UCL	24499
99					95% Adjusted-CLT UCL	17363					97.5% Chebyshev (MVUE) UCL	28683
100					95% Modified-t UCL	17619					99% Chebyshev (MVUE) UCL	36902
101												
102				Gamma Distribution Test					Data Distribution			
103					k star (bias corrected)	3.14			Data appear Normal at 5% Significance Level			
104					Theta Star	4643						
105					nu star	100.5						
106					Approximate Chi Square Value (.05)	78.36			Nonparametric Statistics			
107					Adjusted Level of Significance	0.0335					95% CLT UCL	17443
108					Adjusted Chi Square Value	76.14					95% Jackknife UCL	17632
109											95% Standard Bootstrap UCL	17348
110					Anderson-Darling Test Statistic	0.808					95% Bootstrap-t UCL	17595
111					Anderson-Darling 5% Critical Value	0.742					95% Hall's Bootstrap UCL	17265
112					Kolmogorov-Smirnov Test Statistic	0.196					95% Percentile Bootstrap UCL	17294
113					Kolmogorov-Smirnov 5% Critical Value	0.216					95% BCA Bootstrap UCL	17149
114				Data follow Appr. Gamma Distribution at 5% Significance Level							95% Chebyshev(Mean, Sd) UCL	22165

ProUCL Output
Surface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
115										97.5% Chebyshev(Mean, Sd) UCL		25446
116				Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL		31892
117					95% Approximate Gamma UCL	18699						
118					95% Adjusted Gamma UCL	19245						
119												
120				Potential UCL to Use						Use 95% Student's-t UCL		17632
121												
122												
123	Arsenic											
124												
125						General Statistics						
126					Number of Valid Samples	16				Number of Unique Samples		13
127												
128				Raw Statistics						Log-transformed Statistics		
129					Minimum	1.1				Minimum of Log Data		0.0953
130					Maximum	6.2				Maximum of Log Data		1.825
131					Mean	3.519				Mean of log Data		1.187
132					Median	3.7				SD of log Data		0.421
133					SD	1.231						
134					Coefficient of Variation	0.35						
135					Skewness	0.0445						
136												
137						Relevant UCL Statistics						
138				Normal Distribution Test						Lognormal Distribution Test		
139					Shapiro Wilk Test Statistic	0.969				Shapiro Wilk Test Statistic		0.889
140					Shapiro Wilk Critical Value	0.887				Shapiro Wilk Critical Value		0.887
141				Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
142												
143				Assuming Normal Distribution						Assuming Lognormal Distribution		
144					95% Student's-t UCL	4.058				95% H-UCL		4.439
145				95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL		5.23
146					95% Adjusted-CLT UCL	4.029				97.5% Chebyshev (MVUE) UCL		5.953
147					95% Modified-t UCL	4.059				99% Chebyshev (MVUE) UCL		7.374
148												
149				Gamma Distribution Test						Data Distribution		
150					k star (bias corrected)	5.864				Data appear Normal at 5% Significance Level		
151					Theta Star	0.6						
152					nu star	187.7						
153					Approximate Chi Square Value (.05)	157				Nonparametric Statistics		
154					Adjusted Level of Significance	0.0335				95% CLT UCL		4.025
155					Adjusted Chi Square Value	153.8				95% Jackknife UCL		4.058
156										95% Standard Bootstrap UCL		4.016
157					Anderson-Darling Test Statistic	0.519				95% Bootstrap-t UCL		4.077
158					Anderson-Darling 5% Critical Value	0.74				95% Hall's Bootstrap UCL		4.091
159					Kolmogorov-Smirnov Test Statistic	0.166				95% Percentile Bootstrap UCL		4
160					Kolmogorov-Smirnov 5% Critical Value	0.216				95% BCA Bootstrap UCL		3.981
161				Data appear Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL		4.86
162										97.5% Chebyshev(Mean, Sd) UCL		5.44
163				Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL		6.58
164					95% Approximate Gamma UCL	4.207						
165					95% Adjusted Gamma UCL	4.294						
166												
167				Potential UCL to Use						Use 95% Student's-t UCL		4.058
168												
169												
170	Iron											
171												

ProUCL Output
Surface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
172	General Statistics											
173					Number of Valid Samples	16				Number of Unique Samples		16
174												
175	Raw Statistics						Log-transformed Statistics					
176					Minimum	4790				Minimum of Log Data		8.474
177					Maximum	20700				Maximum of Log Data		9.938
178					Mean	13730				Mean of log Data		9.465
179					Median	13900				SD of log Data		0.388
180					SD	4489						
181					Coefficient of Variation	0.327						
182					Skewness	-0.325						
183												
184	Relevant UCL Statistics											
185	Normal Distribution Test						Lognormal Distribution Test					
186					Shapiro Wilk Test Statistic	0.974				Shapiro Wilk Test Statistic		0.913
187					Shapiro Wilk Critical Value	0.887				Shapiro Wilk Critical Value		0.887
188	Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level					
189												
190	Assuming Normal Distribution						Assuming Lognormal Distribution					
191					95% Student's-t UCL	15697				95% H-UCL		16910
192	95% UCLs (Adjusted for Skewness)									95% Chebyshev (MVUE) UCL		19814
193					95% Adjusted-CLT UCL	15479				97.5% Chebyshev (MVUE) UCL		22396
194					95% Modified-t UCL	15682				99% Chebyshev (MVUE) UCL		27470
195												
196	Gamma Distribution Test						Data Distribution					
197					k star (bias corrected)	6.726	Data appear Normal at 5% Significance Level					
198					Theta Star	2041						
199					nu star	215.2						
200					Approximate Chi Square Value (.05)	182.3	Nonparametric Statistics					
201					Adjusted Level of Significance	0.0335				95% CLT UCL		15576
202					Adjusted Chi Square Value	178.8				95% Jackknife UCL		15697
203										95% Standard Bootstrap UCL		15502
204					Anderson-Darling Test Statistic	0.337				95% Bootstrap-t UCL		15616
205					Anderson-Darling 5% Critical Value	0.74				95% Hall's Bootstrap UCL		15442
206					Kolmogorov-Smirnov Test Statistic	0.152				95% Percentile Bootstrap UCL		15474
207					Kolmogorov-Smirnov 5% Critical Value	0.215				95% BCA Bootstrap UCL		15434
208	Data appear Gamma Distributed at 5% Significance Level									95% Chebyshev(Mean, Sd) UCL		18622
209										97.5% Chebyshev(Mean, Sd) UCL		20738
210	Assuming Gamma Distribution									99% Chebyshev(Mean, Sd) UCL		24896
211					95% Approximate Gamma UCL	16212						
212					95% Adjusted Gamma UCL	16525						
213												
214	Potential UCL to Use									Use 95% Student's-t UCL		15697
215												
216												
217	Manganese											
218												
219	General Statistics											
220					Number of Valid Samples	16				Number of Unique Samples		16
221												
222	Raw Statistics						Log-transformed Statistics					
223					Minimum	36.7				Minimum of Log Data		3.603
224					Maximum	189				Maximum of Log Data		5.242
225					Mean	91.11				Mean of log Data		4.377
226					Median	73.2				SD of log Data		0.532
227					SD	50.18						
228					Coefficient of Variation	0.551						

ProUCL Output
Surface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
229					Skewness	0.9						
230												
231					Relevant UCL Statistics							
232			Normal Distribution Test						Lognormal Distribution Test			
233					Shapiro Wilk Test Statistic	0.872				Shapiro Wilk Test Statistic		0.935
234					Shapiro Wilk Critical Value	0.887				Shapiro Wilk Critical Value		0.887
235			Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level			
236												
237			Assuming Normal Distribution						Assuming Lognormal Distribution			
238					95% Student's-t UCL	113.1				95% H-UCL		122.2
239			95% UCLs (Adjusted for Skewness)							95% Chebyshev (MVUE) UCL		145.3
240					95% Adjusted-CLT UCL	114.8				97.5% Chebyshev (MVUE) UCL		168.9
241					95% Modified-t UCL	113.6				99% Chebyshev (MVUE) UCL		215.3
242												
243			Gamma Distribution Test						Data Distribution			
244					k star (bias corrected)	3.176			Data appear Gamma Distributed at 5% Significance Level			
245					Theta Star	28.69						
246					nu star	101.6						
247					Approximate Chi Square Value (.05)	79.38			Nonparametric Statistics			
248					Adjusted Level of Significance	0.0335				95% CLT UCL		111.7
249					Adjusted Chi Square Value	77.14				95% Jackknife UCL		113.1
250										95% Standard Bootstrap UCL		111.2
251					Anderson-Darling Test Statistic	0.514				95% Bootstrap-t UCL		116.9
252					Anderson-Darling 5% Critical Value	0.742				95% Hall's Bootstrap UCL		115.2
253					Kolmogorov-Smirnov Test Statistic	0.176				95% Percentile Bootstrap UCL		112
254					Kolmogorov-Smirnov 5% Critical Value	0.216				95% BCA Bootstrap UCL		113.4
255			Data appear Gamma Distributed at 5% Significance Level							95% Chebyshev(Mean, Sd) UCL		145.8
256										97.5% Chebyshev(Mean, Sd) UCL		169.5
257			Assuming Gamma Distribution							99% Chebyshev(Mean, Sd) UCL		215.9
258					95% Approximate Gamma UCL	116.7						
259					95% Adjusted Gamma UCL	120						
260												
261			Potential UCL to Use							Use 95% Approximate Gamma UCL		116.7
262												
263												
264	Thallium											
265												
266					General Statistics							
267					Number of Valid Samples	16				Number of Detected Data		6
268					Number of Unique Samples	6				Number of Non-Detect Data		10
269										Percent Non-Detects		62.50%
270												
271			Raw Statistics						Log-transformed Statistics			
272					Minimum Detected	0.35				Minimum Detected		-1.05
273					Maximum Detected	0.8				Maximum Detected		-0.223
274					Mean of Detected	0.565				Mean of Detected		-0.613
275					SD of Detected	0.178				SD of Detected		0.321
276					Minimum Non-Detect	0.28				Minimum Non-Detect		-1.273
277					Maximum Non-Detect	0.35				Maximum Non-Detect		-1.05
278												
279	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		10
280	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		6
281	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		62.50%
282												
283					UCL Statistics							
284			Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only			
285					Shapiro Wilk Test Statistic	0.942				Shapiro Wilk Test Statistic		0.956

ProUCL Output
Surface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
286					5% Shapiro Wilk Critical Value	0.788					5% Shapiro Wilk Critical Value	0.788
287					Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level	
288												
289					Assuming Normal Distribution						Assuming Lognormal Distribution	
290					DL/2 Substitution Method						DL/2 Substitution Method	
291					Mean	0.314					Mean	-1.366
292					SD	0.226					SD	0.633
293					95% DL/2 (t) UCL	0.413					95% H-Stat (DL/2) UCL	0.447
294												
295					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
296					Mean	0.255					Mean in Log Scale	-1.282
297					SD	0.305					SD in Log Scale	0.578
298					95% MLE (t) UCL	0.388					Mean in Original Scale	0.329
299					95% MLE (Tiku) UCL	0.452					SD in Original Scale	0.216
300											95% Percentile Bootstrap UCL	0.42
301											95% BCA Bootstrap UCL	0.434
302												
303					Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only	
304					k star (bias corrected)	6.097					Data appear Normal at 5% Significance Level	
305					Theta Star	0.0927						
306					nu star	73.17						
307												
308					A-D Test Statistic	0.241					Nonparametric Statistics	
309					5% A-D Critical Value	0.698					Kaplan-Meier (KM) Method	
310					K-S Test Statistic	0.698					Mean	0.431
311					5% K-S Critical Value	0.332					SD	0.144
312					Data appear Gamma Distributed at 5% Significance Level						SE of Mean	0.0394
313											95% KM (t) UCL	0.5
314					Assuming Gamma Distribution						95% KM (z) UCL	0.495
315					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.497
316					Minimum	0.295					95% KM (bootstrap t) UCL	0.511
317					Maximum	0.8					95% KM (BCA) UCL	0.622
318					Mean	0.543					95% KM (Percentile Bootstrap) UCL	0.559
319					Median	0.518					95% KM (Chebyshev) UCL	0.602
320					SD	0.167					97.5% KM (Chebyshev) UCL	0.677
321					k star	8.907					99% KM (Chebyshev) UCL	0.823
322					Theta star	0.061						
323					Nu star	285					Potential UCLs to Use	
324					AppChi2	246.9					95% KM (t) UCL	0.5
325					95% Gamma Approximate UCL	0.627					95% KM (Percentile Bootstrap) UCL	0.559
326					95% Adjusted Gamma UCL	0.637						
327	Note: DL/2 is not a recommended method.											
328												
329												
330	Vanadium											
331												
332					General Statistics							
333					Number of Valid Samples	16					Number of Unique Samples	16
334												
335					Raw Statistics						Log-transformed Statistics	
336					Minimum	8					Minimum of Log Data	2.079
337					Maximum	35.2					Maximum of Log Data	3.561
338					Mean	25.31					Mean of log Data	3.174
339					Median	24.7					SD of log Data	0.38
340					SD	7.67						
341					Coefficient of Variation	0.303						
342					Skewness	-0.6						

ProUCL Output
Surface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
343												
344						Relevant UCL Statistics						
345				Normal Distribution Test						Lognormal Distribution Test		
346					Shapiro Wilk Test Statistic	0.935				Shapiro Wilk Test Statistic		0.843
347					Shapiro Wilk Critical Value	0.887				Shapiro Wilk Critical Value		0.887
348				Data appear Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
349												
350				Assuming Normal Distribution						Assuming Lognormal Distribution		
351					95% Student's-t UCL	28.67				95% H-UCL		31.08
352				95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL		36.36
353					95% Adjusted-CLT UCL	28.15				97.5% Chebyshev (MVUE) UCL		41.03
354					95% Modified-t UCL	28.62				99% Chebyshev (MVUE) UCL		50.2
355												
356				Gamma Distribution Test						Data Distribution		
357					k star (bias corrected)	7.306				Data appear Normal at 5% Significance Level		
358					Theta Star	3.464						
359					nu star	233.8						
360					Approximate Chi Square Value (.05)	199.4				Nonparametric Statistics		
361					Adjusted Level of Significance	0.0335				95% CLT UCL		28.46
362					Adjusted Chi Square Value	195.8				95% Jackknife UCL		28.67
363										95% Standard Bootstrap UCL		28.42
364					Anderson-Darling Test Statistic	0.561				95% Bootstrap-t UCL		28.43
365					Anderson-Darling 5% Critical Value	0.739				95% Hall's Bootstrap UCL		28.22
366					Kolmogorov-Smirnov Test Statistic	0.139				95% Percentile Bootstrap UCL		28.13
367					Kolmogorov-Smirnov 5% Critical Value	0.215				95% BCA Bootstrap UCL		27.93
368				Data appear Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL		33.66
369										97.5% Chebyshev(Mean, Sd) UCL		37.28
370				Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL		44.39
371					95% Approximate Gamma UCL	29.67						
372					95% Adjusted Gamma UCL	30.22						
373												
374				Potential UCL to Use						Use 95% Student's-t UCL		28.67
375												

ProUCL input file
Groundwater, COPCs with greater than one detection

Bromodichloromethane	D_Bromodichloromethane	Chloroform	D_Chloroform	Methyl-tert-butyl ether	D_Methyl-tert-butyl ether	Tetrachloroethene	D_Tetrachloroethene	Trichloroethene	D_Trichloroethene	cis-1,2-Dichloroethene	D_cis-1,2-Dichloroethene	Dieldrin	D_Dieldrin	Heptachlor epoxide
0.17	1	0.25	0	0.1	1	0.1	0	0.105	0	0.19	1	0.00375	0	0.005
0.17	1	0.25	0	0.12	1	0.12	1	0.25	0	0.25	0	0.0042	0	0.005
0.2	1	0.25	0	0.15	1	0.13	1	0.25	0	0.25	0	0.0042	0	0.005
0.25	0	0.25	0	0.17	1	0.195	0	0.25	0	0.25	0	0.0085	0	0.005
0.25	0	0.25	0	0.25	0	0.21	1	1.9	1	0.25	0	0.009	0	0.005
0.25	0	0.25	0	0.25	0	0.25	0	2.3	1	0.25	0	0.01	0	0.005
0.25	0	0.25	0	0.25	0	0.25	0	8	0	0.25	0	0.01	0	0.005
0.25	0	0.25	0	0.25	0	0.25	0	10	1	0.54	1	0.01	0	0.005
0.25	0	0.62	1	0.32	1	0.45	1	24	1	0.86	1	0.01	0	0.005
0.25	0	0.92	1	0.41	1	0.46	1	61	1	1.3	1	0.0105	0	0.005
0.25	0	1.4	1	1.6	1	2.8	1	110	1	1.5	1	0.0105	0	0.0055
0.25	0	1.6	1	2.3	1	5.1	1	140	1	1.8	1	0.0105	0	0.0055
0.25	0	11	1	3.9	1	6.8	1	150	1	5.4	1	0.0105	0	0.0055
0.48	1	22	1	11	1	25	0	210	1	13	1	0.057	1	0.0055
25	0	25	0	25	0	160	1	260	1	24	1	0.14	1	0.0057
25	0	25	0	25	0	430	1	730	1	25	0	0.26	1	0.02

ProUCL input file
Groundwater, COPCs with greater than one detection

D_Heptachlor epoxide	Manganese	D_Manganese	Zinc	D_Zinc
0	25	1	1.75	0
0	47.1	1	2.15	0
0	69.6	1	2.25	0
0	116	1	2.35	0
0	140	1	2.35	0
0	146	1	2.4	0
0	161	1	2.5	0
0	161	1	3.05	0
0	231	1	3.45	0
0	248	1	4.35	0
0	281	1	4.5	0
0	327	1	5	0
0	367	1	5.1	0
0	415	1	17.8	1
1	481	1	35	1
1	670	1	1150	1

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	Bromodichloromethane											
10												
11						General Statistics						
12						Number of Valid Samples	16			Number of Detected Data		4
13						Number of Unique Samples	3			Number of Non-Detect Data		12
14										Percent Non-Detects		75.00%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	0.17			Minimum Detected		-1.772
18						Maximum Detected	0.48			Maximum Detected		-0.734
19						Mean of Detected	0.255			Mean of Detected		-1.472
20						SD of Detected	0.151			SD of Detected		0.498
21						Minimum Non-Detect	0.25			Minimum Non-Detect		-1.386
22						Maximum Non-Detect	25			Maximum Non-Detect		3.219
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		16
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		0
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		100.00%
27												
28						UCL Statistics						
29				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.698			Shapiro Wilk Test Statistic		0.738
31						5% Shapiro Wilk Critical Value	0.748			5% Shapiro Wilk Critical Value		0.748
32				Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
33												
34				Assuming Normal Distribution						Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	1.704			Mean		-1.352
37						SD	4.215			SD		1.553
38						95% DL/2 (t) UCL	3.552			95% H-Stat (DL/2) UCL		3.743
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41				MLE method failed to converge properly						Mean in Log Scale		-1.625
42										SD in Log Scale		0.355
43										Mean in Original Scale		0.21
44										SD in Original Scale		0.0878
45										95% Percentile Bootstrap UCL		0.249
46										95% BCA Bootstrap UCL		0.26
47												
48				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
49						k star (bias corrected)	1.393			Data Follow Appr. Gamma Distribution at 5% Significance Level		
50						Theta Star	0.183					
51						nu star	11.15					
52												
53						A-D Test Statistic	0.726			Nonparametric Statistics		
54						5% A-D Critical Value	0.659			Kaplan-Meier (KM) Method		
55						K-S Test Statistic	0.659			Mean		0.201
56						5% K-S Critical Value	0.396			SD		0.0785
57				Data follow Appr. Gamma Distribution at 5% Significance Level						SE of Mean		0.0254

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
58											95% KM (t) UCL	0.246
59			Assuming Gamma Distribution								95% KM (z) UCL	0.243
60				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	0.244
61					Minimum	0.0852					95% KM (bootstrap t) UCL	0.309
62					Maximum	0.48					95% KM (BCA) UCL	0.269
63					Mean	0.226					95% KM (Percentile Bootstrap) UCL	0.265
64					Median	0.199					95% KM (Chebyshev) UCL	0.312
65					SD	0.104					97.5% KM (Chebyshev) UCL	0.36
66					k star	4.43					99% KM (Chebyshev) UCL	0.454
67					Theta star	0.0509						
68					Nu star	141.8			Potential UCLs to Use			
69					AppChi2	115.2					95% KM (t) UCL	0.246
70					95% Gamma Approximate UCL	0.278						
71					95% Adjusted Gamma UCL	N/A						
72	Note: DL/2 is not a recommended method.											
73												
74												
75	Chloroform											
76												
77					General Statistics							
78					Number of Valid Samples	16					Number of Detected Data	6
79					Number of Unique Samples	6					Number of Non-Detect Data	10
80											Percent Non-Detects	62.50%
81												
82					Raw Statistics						Log-transformed Statistics	
83					Minimum Detected	0.62					Minimum Detected	-0.478
84					Maximum Detected	22					Maximum Detected	3.091
85					Mean of Detected	6.257					Mean of Detected	0.956
86					SD of Detected	8.67					SD of Detected	1.442
87					Minimum Non-Detect	0.25					Minimum Non-Detect	-1.386
88					Maximum Non-Detect	25					Maximum Non-Detect	3.219
89												
90	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	16
91	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
92	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
93												
94					UCL Statistics							
95			Normal Distribution Test with Detected Values Only								Lognormal Distribution Test with Detected Values Only	
96					Shapiro Wilk Test Statistic	0.733					Shapiro Wilk Test Statistic	0.868
97					5% Shapiro Wilk Critical Value	0.788					5% Shapiro Wilk Critical Value	0.788
98			Data not Normal at 5% Significance Level								Data appear Lognormal at 5% Significance Level	
99												
100			Assuming Normal Distribution								Assuming Lognormal Distribution	
101					DL/2 Substitution Method						DL/2 Substitution Method	
102					Mean	3.971					Mean	-0.366
103					SD	6.689					SD	2.018
104					95% DL/2 (t) UCL	6.903					95% H-Stat (DL/2) UCL	56.25
105												
106					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
107			MLE method failed to converge properly								Mean in Log Scale	-1.727
108											SD in Log Scale	2.689
109											Mean in Original Scale	2.42
110											SD in Original Scale	5.874
111											95% Percentile Bootstrap UCL	5.069
112											95% BCA Bootstrap UCL	6.411
113												
114			Gamma Distribution Test with Detected Values Only								Data Distribution Test with Detected Values Only	

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
115					k star (bias corrected)	0.456	Data Follow Appr. Gamma Distribution at 5% Significance Level					
116					Theta Star	13.72						
117					nu star	5.472						
118												
119					A-D Test Statistic	0.628	Nonparametric Statistics					
120					5% A-D Critical Value	0.725				Kaplan-Meier (KM) Method		
121					K-S Test Statistic	0.725				Mean		3.036
122					5% K-S Critical Value	0.345				SD		5.885
123	Data follow Appr. Gamma Distribution at 5% Significance Level									SE of Mean		1.723
124										95% KM (t) UCL		6.056
125			Assuming Gamma Distribution							95% KM (z) UCL		5.87
126			Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL		5.787
127					Minimum	0				95% KM (bootstrap t) UCL		42.97
128					Maximum	71.68				95% KM (BCA) UCL		6.74
129					Mean	14.34				95% KM (Percentile Bootstrap) UCL		6.206
130					Median	8.73				95% KM (Chebyshev) UCL		10.55
131					SD	19.09				97.5% KM (Chebyshev) UCL		13.79
132					k star	0.211				99% KM (Chebyshev) UCL		20.18
133					Theta star	68.1						
134					Nu star	6.738	Potential UCLs to Use					
135					AppChi2	2.028				95% KM (t) UCL		6.056
136					95% Gamma Approximate UCL	47.64						
137					95% Adjusted Gamma UCL	55.29						
138	Note: DL/2 is not a recommended method.											
139												
140												
141	Methyl-tert-butyl ether (MTBE)											
142												
143					General Statistics							
144					Number of Valid Samples	16				Number of Detected Data		10
145					Number of Unique Samples	10				Number of Non-Detect Data		6
146										Percent Non-Detects		37.50%
147												
148			Raw Statistics				Log-transformed Statistics					
149					Minimum Detected	0.1				Minimum Detected		-2.303
150					Maximum Detected	11				Maximum Detected		2.398
151					Mean of Detected	2.007				Mean of Detected		-0.506
152					SD of Detected	3.401				SD of Detected		1.653
153					Minimum Non-Detect	0.25				Minimum Non-Detect		-1.386
154					Maximum Non-Detect	25				Maximum Non-Detect		3.219
155												
156	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		16
157	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		0
158	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		100.00%
159												
160					UCL Statistics							
161			Normal Distribution Test with Detected Values Only				Lognormal Distribution Test with Detected Values Only					
162					Shapiro Wilk Test Statistic	0.636				Shapiro Wilk Test Statistic		0.903
163					5% Shapiro Wilk Critical Value	0.842				5% Shapiro Wilk Critical Value		0.842
164			Data not Normal at 5% Significance Level				Data appear Lognormal at 5% Significance Level					
165												
166			Assuming Normal Distribution				Assuming Lognormal Distribution					
167					DL/2 Substitution Method					DL/2 Substitution Method		
168					Mean	2.848				Mean		-0.52
169					SD	4.67				SD		1.877
170					95% DL/2 (t) UCL	4.895				95% H-Stat (DL/2) UCL		27.29
171												

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
172					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
173					**MLE method failed to converge properly**						Mean in Log Scale	-0.959
174											SD in Log Scale	1.526
175											Mean in Original Scale	1.355
176											SD in Original Scale	2.779
177											95% Percentile Bootstrap UCL	2.593
178											95% BCA Bootstrap UCL	3.231
179												
180					**Gamma Distribution Test with Detected Values Only**						**Data Distribution Test with Detected Values Only**	
181					k star (bias corrected)	0.434					**Data appear Gamma Distributed at 5% Significance Level**	
182					Theta Star	4.628						
183					nu star	8.673						
184												
185					A-D Test Statistic	0.659					**Nonparametric Statistics**	
186					5% A-D Critical Value	0.775					Kaplan-Meier (KM) Method	
187					K-S Test Statistic	0.775					Mean	1.472
188					5% K-S Critical Value	0.28					SD	2.855
189					**Data appear Gamma Distributed at 5% Significance Level**						SE of Mean	0.804
190											95% KM (t) UCL	2.882
191					**Assuming Gamma Distribution**						95% KM (z) UCL	2.795
192					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	2.867
193					Minimum	0					95% KM (bootstrap t) UCL	5.73
194					Maximum	11					95% KM (BCA) UCL	2.954
195					Mean	1.984					95% KM (Percentile Bootstrap) UCL	2.911
196					Median	0.633					95% KM (Chebyshev) UCL	4.979
197					SD	3.082					97.5% KM (Chebyshev) UCL	6.496
198					k star	0.215					99% KM (Chebyshev) UCL	9.476
199					Theta star	9.238						
200					Nu star	6.873					**Potential UCLs to Use**	
201					AppChi2	2.101					95% KM (BCA) UCL	2.954
202					95% Gamma Approximate UCL	6.49						
203					95% Adjusted Gamma UCL	7.516						
204	**Note: DL/2 is not a recommended method.**											
205												
206												
207	**Tetrachloroethene**											
208												
209						**General Statistics**						
210					Number of Valid Samples	16					Number of Detected Data	10
211					Number of Unique Samples	10					Number of Non-Detect Data	6
212											Percent Non-Detects	37.50%
213												
214					**Raw Statistics**						**Log-transformed Statistics**	
215					Minimum Detected	0.12					Minimum Detected	-2.12
216					Maximum Detected	430					Maximum Detected	6.064
217					Mean of Detected	60.61					Mean of Detected	0.842
218					SD of Detected	139					SD of Detected	2.89
219					Minimum Non-Detect	0.1					Minimum Non-Detect	-2.303
220					Maximum Non-Detect	25					Maximum Non-Detect	3.219
221												
222	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	14
223	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	2
224	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	87.50%
225												
226						**UCL Statistics**						
227					**Normal Distribution Test with Detected Values Only**						**Lognormal Distribution Test with Detected Values Only**	
228					Shapiro Wilk Test Statistic	0.523					Shapiro Wilk Test Statistic	0.884

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
229					5% Shapiro Wilk Critical Value	0.842				5% Shapiro Wilk Critical Value		0.842
230				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
231												
232				Assuming Normal Distribution						Assuming Lognormal Distribution		
233					DL/2 Substitution Method						DL/2 Substitution Method	
234					Mean	38.69					Mean	-0.0386
235					SD	111.6					SD	2.781
236					95% DL/2 (t) UCL	87.6					95% H-Stat (DL/2) UCL	3463
237												
238					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
239				MLE method failed to converge properly							Mean in Log Scale	-0.802
240											SD in Log Scale	3.306
241											Mean in Original Scale	37.91
242											SD in Original Scale	111.8
243											95% Percentile Bootstrap UCL	90.74
244											95% BCA Bootstrap UCL	118.7
245												
246				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
247					k star (bias corrected)	0.222				Data appear Lognormal at 5% Significance Level		
248					Theta Star	273						
249					nu star	4.44						
250												
251					A-D Test Statistic	1.059				Nonparametric Statistics		
252					5% A-D Critical Value	0.845					Kaplan-Meier (KM) Method	
253					K-S Test Statistic	0.845					Mean	38
254					5% K-S Critical Value	0.293					SD	108.2
255				Data not Gamma Distributed at 5% Significance Level							SE of Mean	28.53
256											95% KM (t) UCL	88.01
257				Assuming Gamma Distribution							95% KM (z) UCL	84.92
258					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	87
259					Minimum	0					95% KM (bootstrap t) UCL	2012
260					Maximum	430					95% KM (BCA) UCL	91.8
261					Mean	42.06					95% KM (Percentile Bootstrap) UCL	91.34
262					Median	0.455					95% KM (Chebyshev) UCL	162.3
263					SD	111					97.5% KM (Chebyshev) UCL	216.1
264					k star	0.124					99% KM (Chebyshev) UCL	321.8
265					Theta star	338.1						
266					Nu star	3.98				Potential UCLs to Use		
267					AppChi2	0.714					99% KM (Chebyshev) UCL	321.8
268					95% Gamma Approximate UCL	234.5						
269					95% Adjusted Gamma UCL	290.6						
270	Note: DL/2 is not a recommended method.											
271												
272												
273	Trichloroethene											
274												
275					General Statistics							
276					Number of Valid Samples	16					Number of Detected Data	11
277					Number of Unique Samples	11					Number of Non-Detect Data	5
278											Percent Non-Detects	31.25%
279												
280				Raw Statistics						Log-transformed Statistics		
281					Minimum Detected	1.9					Minimum Detected	0.642
282					Maximum Detected	730					Maximum Detected	6.593
283					Mean of Detected	154.5					Mean of Detected	3.929
284					SD of Detected	209.9					SD of Detected	1.954
285					Minimum Non-Detect	0.105					Minimum Non-Detect	-2.254

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
286					Maximum Non-Detect	8					Maximum Non-Detect	2.079
287												
288	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	7
289	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	9
290	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	43.75%
291												
292						UCL Statistics						
293				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
294					Shapiro Wilk Test Statistic	0.716					Shapiro Wilk Test Statistic	0.914
295					5% Shapiro Wilk Critical Value	0.85					5% Shapiro Wilk Critical Value	0.85
296				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
297												
298				Assuming Normal Distribution						Assuming Lognormal Distribution		
299					DL/2 Substitution Method						DL/2 Substitution Method	
300					Mean	106.5					Mean	2.214
301					SD	186.5					SD	3.196
302					95% DL/2 (t) UCL	188.2					95% H-Stat (DL/2) UCL	430460
303												
304					Maximum Likelihood Estimate(MLE) Method						Log ROS Method	
305					Mean	15.87					Mean in Log Scale	2.541
306					SD	271.6					SD in Log Scale	2.693
307					95% MLE (t) UCL	134.9					Mean in Original Scale	106.4
308					95% MLE (Tiku) UCL	154					SD in Original Scale	186.5
309											95% Percentile Bootstrap UCL	187.6
310											95% BCA Bootstrap UCL	222.3
311												
312				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
313					k star (bias corrected)	0.469				Data appear Gamma Distributed at 5% Significance Level		
314					Theta Star	329.3						
315					nu star	10.32						
316												
317					A-D Test Statistic	0.24				Nonparametric Statistics		
318					5% A-D Critical Value	0.777					Kaplan-Meier (KM) Method	
319					K-S Test Statistic	0.777					Mean	106.8
320					5% K-S Critical Value	0.268					SD	180.4
321				Data appear Gamma Distributed at 5% Significance Level							SE of Mean	47.3
322											95% KM (t) UCL	189.7
323				Assuming Gamma Distribution							95% KM (z) UCL	184.6
324					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	188.4
325					Minimum	0					95% KM (bootstrap t) UCL	269.4
326					Maximum	730					95% KM (BCA) UCL	190.2
327					Mean	109					95% KM (Percentile Bootstrap) UCL	189.2
328					Median	23.31					95% KM (Chebyshev) UCL	313
329					SD	185.1					97.5% KM (Chebyshev) UCL	402.2
330					k star	0.156					99% KM (Chebyshev) UCL	577.5
331					Theta star	696.8						
332					Nu star	5.007				Potential UCLs to Use		
333					AppChi2	1.156					95% KM (BCA) UCL	190.2
334					95% Gamma Approximate UCL	472.4						
335					95% Adjusted Gamma UCL	567.6						
336	Note: DL/2 is not a recommended method.											
337												
338												
339	cis-1,2-Dichloroethene											
340												
341						General Statistics						
342					Number of Valid Samples	16					Number of Detected Data	9

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
343					Number of Unique Samples	9					Number of Non-Detect Data	7
344											Percent Non-Detects	43.75%
345												
346				Raw Statistics						Log-transformed Statistics		
347					Minimum Detected	0.19					Minimum Detected	-1.661
348					Maximum Detected	24					Maximum Detected	3.178
349					Mean of Detected	5.399					Mean of Detected	0.695
350					SD of Detected	8.063					SD of Detected	1.538
351					Minimum Non-Detect	0.25					Minimum Non-Detect	-1.386
352					Maximum Non-Detect	25					Maximum Non-Detect	3.219
353												
354	Note: Data have multiple DLs - Use of KM Method is recommended										Number treated as Non-Detect	16
355	For all methods (except KM, DL/2, and ROS Methods),										Number treated as Detected	0
356	Observations < Largest ND are treated as NDs										Single DL Non-Detect Percentage	100.00%
357												
358						UCL Statistics						
359				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
360					Shapiro Wilk Test Statistic	0.695					Shapiro Wilk Test Statistic	0.966
361					5% Shapiro Wilk Critical Value	0.829					5% Shapiro Wilk Critical Value	0.829
362				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
363												
364				Assuming Normal Distribution						Assuming Lognormal Distribution		
365					DL/2 Substitution Method						DL/2 Substitution Method	
366					Mean	3.865					Mean	-0.231
367					SD	6.83					SD	1.91
368					95% DL/2 (t) UCL	6.858					95% H-Stat (DL/2) UCL	41.48
369												
370					Maximum Likelihood Estimate(MLE) Method	N/A					Log ROS Method	
371				MLE method failed to converge properly							Mean in Log Scale	-0.497
372											SD in Log Scale	1.935
373											Mean in Original Scale	3.13
374											SD in Original Scale	6.461
375											95% Percentile Bootstrap UCL	5.86
376											95% BCA Bootstrap UCL	7.125
377												
378				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
379					k star (bias corrected)	0.488				Data appear Gamma Distributed at 5% Significance Level		
380					Theta Star	11.07						
381					nu star	8.779						
382												
383					A-D Test Statistic	0.496				Nonparametric Statistics		
384					5% A-D Critical Value	0.761					Kaplan-Meier (KM) Method	
385					K-S Test Statistic	0.761					Mean	3.315
386					5% K-S Critical Value	0.292					SD	6.417
387				Data appear Gamma Distributed at 5% Significance Level							SE of Mean	1.757
388											95% KM (t) UCL	6.396
389				Assuming Gamma Distribution							95% KM (z) UCL	6.206
390					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	6.23
391					Minimum	0					95% KM (bootstrap t) UCL	15.22
392					Maximum	24					95% KM (BCA) UCL	6.895
393					Mean	4.843					95% KM (Percentile Bootstrap) UCL	6.539
394					Median	1.65					95% KM (Chebyshev) UCL	10.98
395					SD	6.767					97.5% KM (Chebyshev) UCL	14.29
396					k star	0.215					99% KM (Chebyshev) UCL	20.8
397					Theta star	22.57						
398					Nu star	6.868				Potential UCLs to Use		
399					AppChi2	2.098					95% KM (BCA) UCL	6.895

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
400					95% Gamma Approximate UCL	15.85						
401					95% Adjusted Gamma UCL	18.36						
402	Note: DL/2 is not a recommended method.											
403												
404												
405	Dieldrin											
406												
407						General Statistics						
408					Number of Valid Samples	16				Number of Detected Data		3
409					Number of Unique Samples	3				Number of Non-Detect Data		13
410										Percent Non-Detects		81.25%
411												
412			Raw Statistics						Log-transformed Statistics			
413					Minimum Detected	0.057				Minimum Detected		-2.865
414					Maximum Detected	0.26				Maximum Detected		-1.347
415					Mean of Detected	0.152				Mean of Detected		-2.059
416					SD of Detected	0.102				SD of Detected		0.763
417					Minimum Non-Detect	0.00375				Minimum Non-Detect		-5.586
418					Maximum Non-Detect	0.0105				Maximum Non-Detect		-4.556
419												
420	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		13
421	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		3
422	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		81.25%
423												
424						UCL Statistics						
425			Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only			
426					Shapiro Wilk Test Statistic	0.989				Shapiro Wilk Test Statistic		0.989
427					5% Shapiro Wilk Critical Value	0.767				5% Shapiro Wilk Critical Value		0.767
428			Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level			
429												
430			Assuming Normal Distribution						Assuming Lognormal Distribution			
431					DL/2 Substitution Method					DL/2 Substitution Method		
432					Mean	0.0321				Mean		-4.865
433					SD	0.0704				SD		1.464
434					95% DL/2 (t) UCL	0.0629				95% H-Stat (DL/2) UCL		0.0844
435												
436					Maximum Likelihood Estimate(MLE) Method					Log ROS Method		
437					Mean	0.165				Mean in Log Scale		-5.31
438					SD	0.0833				SD in Log Scale		1.904
439					95% MLE (t) UCL	0.201				Mean in Original Scale		0.0316
440					95% MLE (Tiku) UCL	0.248				SD in Original Scale		0.0706
441										95% Percentile Bootstrap UCL		0.0614
442										95% BCA Bootstrap UCL		0.0766
443												
444			Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only			
445					k star (bias corrected)	N/A			Data appear Normal at 5% Significance Level			
446					Theta Star	N/A						
447					nu star	N/A						
448												
449					A-D Test Statistic	0.247			Nonparametric Statistics			
450					5% A-D Critical Value	N/A				Kaplan-Meier (KM) Method		
451					K-S Test Statistic	N/A				Mean		0.0749
452					5% K-S Critical Value	N/A				SD		0.0518
453			Data not Gamma Distributed at 5% Significance Level							SE of Mean		0.0159
454										95% KM (t) UCL		0.103
455			Assuming Gamma Distribution							95% KM (z) UCL		0.101
456					Gamma ROS Statistics using Extrapolated Data					95% KM (jackknife) UCL		0.13

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
457					Minimum	N/A				95% KM (bootstrap t) UCL		0.0904
458					Maximum	N/A				95% KM (BCA) UCL		0.26
459					Mean	N/A				95% KM (Percentile Bootstrap) UCL		0.26
460					Median	N/A				95% KM (Chebyshev) UCL		0.144
461					SD	N/A				97.5% KM (Chebyshev) UCL		0.174
462					k star	N/A				99% KM (Chebyshev) UCL		0.233
463					Theta star	N/A						
464					Nu star	N/A				**Potential UCLs to Use**		
465					AppChi2	N/A				95% KM (t) UCL		0.103
466					95% Gamma Approximate UCL	N/A				95% KM (Percentile Bootstrap) UCL		0.26
467					95% Adjusted Gamma UCL	N/A						
468	**Note: DL/2 is not a recommended method.**											
469												
470												
471	**Heptachlor epoxide**											
472												
473						**General Statistics**						
474					Number of Valid Samples	16				Number of Detected Data		2
475					Number of Unique Samples	2				Number of Non-Detect Data		14
476										Percent Non-Detects		87.50%
477												
478			**Raw Statistics**				**Log-transformed Statistics**					
479					Minimum Detected	0.0057				Minimum Detected		-5.167
480					Maximum Detected	0.02				Maximum Detected		-3.912
481					Mean of Detected	0.0129				Mean of Detected		-4.54
482					SD of Detected	0.0101				SD of Detected		0.888
483					Minimum Non-Detect	0.005				Minimum Non-Detect		-5.298
484					Maximum Non-Detect	0.0055				Maximum Non-Detect		-5.203
485												
486	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		14
487	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		2
488	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		87.50%
489												
490						**UCL Statistics**						
491			**Normal Distribution Test with Detected Values Only**				**Lognormal Distribution Test with Detected Values Only**					
492					Shapiro Wilk Test Statistic	1				Shapiro Wilk Test Statistic		1
493					5% Shapiro Wilk Critical Value	N/A				5% Shapiro Wilk Critical Value		N/A
494			**Data not Normal at 5% Significance Level**				**Data not Lognormal at 5% Significance Level**					
495												
496			**Assuming Normal Distribution**				**Assuming Lognormal Distribution**					
497					DL/2 Substitution Method					DL/2 Substitution Method		
498					Mean	0.00386				Mean		-5.786
499					SD	0.00438				SD		0.539
500					95% DL/2 (t) UCL	0.00577				95% H-Stat (DL/2) UCL		0.00475
501												
502					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
503			**MLE method failed to converge properly**							Mean in Log Scale		N/A
504										SD in Log Scale		N/A
505										Mean in Original Scale		N/A
506										SD in Original Scale		N/A
507										95% Percentile Bootstrap UCL		N/A
508										95% BCA Bootstrap UCL		N/A
509												
510			**Gamma Distribution Test with Detected Values Only**				**Data Distribution Test with Detected Values Only**					
511					k star (bias corrected)	N/A	**Data do not follow a Discernable Distribution (0.05)**					
512					Theta Star	N/A						
513					nu star	N/A						

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
514												
515					A-D Test Statistic	0.359			**Nonparametric Statistics**			
516					5% A-D Critical Value	N/A					Kaplan-Meier (KM) Method	
517					K-S Test Statistic	N/A					Mean	0.00659
518					5% K-S Critical Value	N/A					SD	0.00346
519		**Data not Gamma Distributed at 5% Significance Level**									SE of Mean	0.00122
520											95% KM (t) UCL	0.00874
521			**Assuming Gamma Distribution**								95% KM (z) UCL	0.00861
522			Gamma ROS Statistics using Extrapolated Data								95% KM (jackknife) UCL	0.0162
523					Minimum	N/A					95% KM (bootstrap t) UCL	#NUM!
524					Maximum	N/A					95% KM (BCA) UCL	0.02
525					Mean	N/A					95% KM (Percentile Bootstrap) UCL	0.02
526					Median	N/A					95% KM (Chebyshev) UCL	0.0119
527					SD	N/A					97.5% KM (Chebyshev) UCL	0.0142
528					k star	N/A					99% KM (Chebyshev) UCL	0.0188
529					Theta star	N/A						
530					Nu star	N/A			**Potential UCLs to Use**			
531					AppChi2	N/A					95% KM (t) UCL	0.00874
532					95% Gamma Approximate UCL	N/A					95% KM (% Bootstrap) UCL	0.02
533					95% Adjusted Gamma UCL	N/A						
534	**Note: DL/2 is not a recommended method.**											
535												
536												
537	**Manganese**											
538												
539					**General Statistics**							
540					Number of Valid Samples	16					Number of Unique Samples	15
541												
542				**Raw Statistics**						**Log-transformed Statistics**		
543					Minimum	25					Minimum of Log Data	3.219
544					Maximum	670					Maximum of Log Data	6.507
545					Mean	242.9					Mean of log Data	5.197
546					Median	196					SD of log Data	0.877
547					SD	174.8						
548					Coefficient of Variation	0.72						
549					Skewness	1.012						
550												
551					**Relevant UCL Statistics**							
552				**Normal Distribution Test**						**Lognormal Distribution Test**		
553					Shapiro Wilk Test Statistic	0.927					Shapiro Wilk Test Statistic	0.956
554					Shapiro Wilk Critical Value	0.887					Shapiro Wilk Critical Value	0.887
555			**Data appear Normal at 5% Significance Level**							**Data appear Lognormal at 5% Significance Level**		
556												
557				**Assuming Normal Distribution**						**Assuming Lognormal Distribution**		
558					95% Student's-t UCL	319.5					95% H-UCL	471
559				**95% UCLs (Adjusted for Skewness)**							95% Chebyshev (MVUE) UCL	523.6
560					95% Adjusted-CLT UCL	326.5					97.5% Chebyshev (MVUE) UCL	638.7
561					95% Modified-t UCL	321.3					99% Chebyshev (MVUE) UCL	865
562												
563				**Gamma Distribution Test**						**Data Distribution**		
564					k star (bias corrected)	1.539				**Data appear Normal at 5% Significance Level**		
565					Theta Star	157.8						
566					nu star	49.25						
567					Approximate Chi Square Value (.05)	34.14				**Nonparametric Statistics**		
568					Adjusted Level of Significance	0.0335					95% CLT UCL	314.7
569					Adjusted Chi Square Value	32.71					95% Jackknife UCL	319.5
570											95% Standard Bootstrap UCL	313.9

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
571					Anderson-Darling Test Statistic	0.134				95% Bootstrap-t UCL		336.6
572					Anderson-Darling 5% Critical Value	0.752				95% Hall's Bootstrap UCL		342.7
573					Kolmogorov-Smirnov Test Statistic	0.105				95% Percentile Bootstrap UCL		315.6
574					Kolmogorov-Smirnov 5% Critical Value	0.218				95% BCA Bootstrap UCL		323.3
575			Data appear Gamma Distributed at 5% Significance Level							95% Chebyshev(Mean, Sd) UCL		433.3
576										97.5% Chebyshev(Mean, Sd) UCL		515.7
577			Assuming Gamma Distribution							99% Chebyshev(Mean, Sd) UCL		677.6
578					95% Approximate Gamma UCL	350.4						
579					95% Adjusted Gamma UCL	365.7						
580												
581			Potential UCL to Use							Use 95% Student's-t UCL		319.5
582												
583												
584	Zinc											
585												
586					General Statistics							
587					Number of Valid Samples	16				Number of Detected Data		3
588					Number of Unique Samples	3				Number of Non-Detect Data		13
589										Percent Non-Detects		81.25%
590												
591			Raw Statistics							Log-transformed Statistics		
592					Minimum Detected	17.8				Minimum Detected		2.879
593					Maximum Detected	1150				Maximum Detected		7.048
594					Mean of Detected	400.9				Mean of Detected		4.494
595					SD of Detected	648.8				SD of Detected		2.237
596					Minimum Non-Detect	1.75				Minimum Non-Detect		0.56
597					Maximum Non-Detect	5.1				Maximum Non-Detect		1.629
598												
599	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		13
600	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		3
601	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		81.25%
602												
603					UCL Statistics							
604			Normal Distribution Test with Detected Values Only							Lognormal Distribution Test with Detected Values Only		
605					Shapiro Wilk Test Statistic	0.761				Shapiro Wilk Test Statistic		0.868
606					5% Shapiro Wilk Critical Value	0.767				5% Shapiro Wilk Critical Value		0.767
607			Data not Normal at 5% Significance Level							Data appear Lognormal at 5% Significance Level		
608												
609			Assuming Normal Distribution							Assuming Lognormal Distribution		
610					DL/2 Substitution Method					DL/2 Substitution Method		
611					Mean	76.46				Mean		1.167
612					SD	286.4				SD		1.87
613					95% DL/2 (t) UCL	202				95% H-Stat (DL/2) UCL		143.1
614												
615					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
616			MLE yields a negative mean							Mean in Log Scale		-4.823
617										SD in Log Scale		4.787
618										Mean in Original Scale		75.18
619										SD in Original Scale		286.8
620										95% Percentile Bootstrap UCL		216.7
621										95% BCA Bootstrap UCL		290.8
622												
623			Gamma Distribution Test with Detected Values Only							Data Distribution Test with Detected Values Only		
624					k star (bias corrected)	N/A				Data appear Lognormal at 5% Significance Level		
625					Theta Star	N/A						
626					nu star	N/A						
627												

ProUCL Output
Groundwater, COPCs with more than one detection

	A	B	C	D	E	F	G	H	I	J	K	L
628					A-D Test Statistic	0.484			**Nonparametric Statistics**			
629					5% A-D Critical Value	N/A					Kaplan-Meier (KM) Method	
630					K-S Test Statistic	N/A					Mean	89.64
631					5% K-S Critical Value	N/A					SD	273.8
632		**Data not Gamma Distributed at 5% Significance Level**									SE of Mean	83.84
633											95% KM (t) UCL	236.6
634			**Assuming Gamma Distribution**								95% KM (z) UCL	227.5
635			Gamma ROS Statistics using Extrapolated Data								95% KM (jackknife) UCL	203.6
636					Minimum	N/A					95% KM (bootstrap t) UCL	5026
637					Maximum	N/A					95% KM (BCA) UCL	N/A
638					Mean	N/A					95% KM (Percentile Bootstrap) UCL	1150
639					Median	N/A					95% KM (Chebyshev) UCL	455.1
640					SD	N/A					97.5% KM (Chebyshev) UCL	613.2
641					k star	N/A					99% KM (Chebyshev) UCL	923.8
642					Theta star	N/A						
643					Nu star	N/A			**Potential UCLs to Use**			
644					AppChi2	N/A					99% KM (Chebyshev) UCL	923.8
645					95% Gamma Approximate UCL	N/A						
646					95% Adjusted Gamma UCL	N/A						
647	**Note: DL/2 is not a recommended method.**											
648												

ProUCL input file
Groundwater, COPCs with one detection

Pentachlorophenol	Arsenic
6	0.32
25	0.37
25	0.39
25	0.41
25	0.46
25	0.49
26	0.64
26	1
26	1
26	1
26	1
26	1
27	1
27	1.6
28	1.6
28	3.8

ProUCL Output
Groundwater, COPCs with one detection

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Full Data Sets								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	pentachlorophenol											
10												
11						General Statistics						
12						Number of Valid Samples	16			Number of Unique Samples	5	
13												
14						Raw Statistics				Log-transformed Statistics		
15						Minimum	6			Minimum of Log Data	1.792	
16						Maximum	28			Maximum of Log Data	3.332	
17						Mean	24.81			Mean of log Data	3.168	
18						Median	26			SD of log Data	0.369	
19						SD	5.115					
20						Coefficient of Variation	0.206					
21						Skewness	-3.736					
22												
23						Relevant UCL Statistics						
24						Normal Distribution Test				Lognormal Distribution Test		
25						Shapiro Wilk Test Statistic	0.447			Shapiro Wilk Test Statistic	0.362	
26						Shapiro Wilk Critical Value	0.887			Shapiro Wilk Critical Value	0.887	
27						Data not Normal at 5% Significance Level				Data not Lognormal at 5% Significance Level		
28												
29						Assuming Normal Distribution				Assuming Lognormal Distribution		
30						95% Student's-t UCL	27.05			95% H-UCL	30.57	
31						95% UCLs (Adjusted for Skewness)				95% Chebyshev (MVUE) UCL	35.69	
32						95% Adjusted-CLT UCL	25.64			97.5% Chebyshev (MVUE) UCL	40.17	
33						95% Modified-t UCL	26.86			99% Chebyshev (MVUE) UCL	48.98	
34												
35						Gamma Distribution Test				Data Distribution		
36						k star (bias corrected)	9.585			Data do not follow a Discernable Distribution (0.05)		
37						Theta Star	2.589					
38						nu star	306.7					
39						Approximate Chi Square Value (.05)	267.1			Nonparametric Statistics		
40						Adjusted Level of Significance	0.0335			95% CLT UCL	26.92	
41						Adjusted Chi Square Value	262.9			95% Jackknife UCL	27.05	
42										95% Standard Bootstrap UCL	26.83	
43						Anderson-Darling Test Statistic	4.23			95% Bootstrap-t UCL	26.34	
44						Anderson-Darling 5% Critical Value	0.739			95% Hall's Bootstrap UCL	26.08	
45						Kolmogorov-Smirnov Test Statistic	0.487			95% Percentile Bootstrap UCL	26.31	
46						Kolmogorov-Smirnov 5% Critical Value	0.215			95% BCA Bootstrap UCL	26.13	
47						Data not Gamma Distributed at 5% Significance Level				95% Chebyshev(Mean, Sd) UCL	30.39	
48										97.5% Chebyshev(Mean, Sd) UCL	32.8	
49						Assuming Gamma Distribution				99% Chebyshev(Mean, Sd) UCL	37.54	
50						95% Approximate Gamma UCL	28.49					
51						95% Adjusted Gamma UCL	28.94					
52												
53						Potential UCL to Use				Use 95% Student's-t UCL	27.05	
54										or 95% Modified-t UCL	26.86	
55												
56												
57	arsenic											

ProUCL Output
Groundwater, COPCs with one detection

	A	B	C	D	E	F	G	H	I	J	K	L
58												
59						General Statistics						
60					Number of Valid Samples	16				Number of Unique Samples		10
61												
62				Raw Statistics						Log-transformed Statistics		
63					Minimum	0.32				Minimum of Log Data		-1.139
64					Maximum	3.8				Maximum of Log Data		1.335
65					Mean	1.005				Mean of log Data		-0.227
66					Median	1				SD of log Data		0.667
67					SD	0.849						
68					Coefficient of Variation	0.845						
69					Skewness	2.598						
70												
71						Relevant UCL Statistics						
72				Normal Distribution Test						Lognormal Distribution Test		
73					Shapiro Wilk Test Statistic	0.691				Shapiro Wilk Test Statistic		0.915
74					Shapiro Wilk Critical Value	0.887				Shapiro Wilk Critical Value		0.887
75				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
76												
77				Assuming Normal Distribution						Assuming Lognormal Distribution		
78					95% Student's-t UCL	1.377				95% H-UCL		1.467
79				95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL		1.73
80					95% Adjusted-CLT UCL	1.502				97.5% Chebyshev (MVUE) UCL		2.054
81					95% Modified-t UCL	1.4				99% Chebyshev (MVUE) UCL		2.692
82												
83				Gamma Distribution Test						Data Distribution		
84					k star (bias corrected)	1.919				Data appear Lognormal at 5% Significance Level		
85					Theta Star	0.524						
86					nu star	61.41						
87					Approximate Chi Square Value (.05)	44.38				Nonparametric Statistics		
88					Adjusted Level of Significance	0.0335				95% CLT UCL		1.354
89					Adjusted Chi Square Value	42.74				95% Jackknife UCL		1.377
90										95% Standard Bootstrap UCL		1.345
91					Anderson-Darling Test Statistic	0.771				95% Bootstrap-t UCL		1.687
92					Anderson-Darling 5% Critical Value	0.748				95% Hall's Bootstrap UCL		2.839
93					Kolmogorov-Smirnov Test Statistic	0.228				95% Percentile Bootstrap UCL		1.382
94					Kolmogorov-Smirnov 5% Critical Value	0.217				95% BCA Bootstrap UCL		1.527
95				Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL		1.931
96										97.5% Chebyshev(Mean, Sd) UCL		2.331
97				Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL		3.118
98					95% Approximate Gamma UCL	1.39						
99					95% Adjusted Gamma UCL	1.444						
100												
101				Potential UCL to Use						Use 95% H-UCL		1.467
102												

ProUCL input file
Groundwater, PCP with 2009 Results

Pentachlorophenol	Pentachlorophenol
6	6
25	12.5
25	12.5
25	12.5
25	12.5
25	12.5
26	13
26	13
26	13
26	13
26	13
26	13
27	13.5
27	13.5
28	14
28	14
1.1	0.55
0.94	0.47
1.1	0.55
0.94	0.47
0.94	0.47
0.94	0.47
0.95	0.475
1.1	0.55
0.94	0.47
0.94	0.47
1.1	0.55
1	0.5
0.97	0.485
0.94	0.47
1	0.5
0.94	0.47

ProUCL Output
Groundwater, PCP with 2009 Results

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Full Data Sets								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	PCP											
10												
11					General Statistics							
12					Number of Valid Observations	32			Number of Distinct Observations			10
13												
14					Raw Statistics				Log-transformed Statistics			
15					Minimum	0.47			Minimum of Log Data			-0.755
16					Maximum	14			Maximum of Log Data			2.639
17					Mean	6.544			Mean of log Data			0.906
18					Median	3.275			SD of log Data			1.644
19					SD	6.276						
20					Coefficient of Variation	0.959						
21					Skewness	0.0877						
22												
23					Relevant UCL Statistics							
24					Normal Distribution Test				Lognormal Distribution Test			
25					Shapiro Wilk Test Statistic	0.684			Shapiro Wilk Test Statistic			0.668
26					Shapiro Wilk Critical Value	0.93			Shapiro Wilk Critical Value			0.93
27					Data not Normal at 5% Significance Level				Data not Lognormal at 5% Significance Level			
28												
29					Assuming Normal Distribution				Assuming Lognormal Distribution			
30					95% Student's-t UCL	8.426			95% H-UCL			25.32
31					95% UCLs (Adjusted for Skewness)				95% Chebyshev (MVUE) UCL			23.16
32					95% Adjusted-CLT UCL	8.388			97.5% Chebyshev (MVUE) UCL			29.39
33					95% Modified-t UCL	8.428			99% Chebyshev (MVUE) UCL			41.64
34												
35					Gamma Distribution Test				Data Distribution			
36					k star (bias corrected)	0.593			Data do not follow a Discernable Distribution (0.05)			
37					Theta Star	11.04						
38					MLE of Mean	6.544						
39					MLE of Standard Deviation	8.501						
40					nu star	37.93						
41					Approximate Chi Square Value (.05)	24.83			Nonparametric Statistics			
42					Adjusted Level of Significance	0.0416			95% CLT UCL			8.369
43					Adjusted Chi Square Value	24.26			95% Jackknife UCL			8.426
44									95% Standard Bootstrap UCL			8.35
45					Anderson-Darling Test Statistic	4.854			95% Bootstrap-t UCL			8.416
46					Anderson-Darling 5% Critical Value	0.799			95% Hall's Bootstrap UCL			8.334
47					Kolmogorov-Smirnov Test Statistic	0.329			95% Percentile Bootstrap UCL			8.338
48					Kolmogorov-Smirnov 5% Critical Value	0.163			95% BCA Bootstrap UCL			8.42
49					Data not Gamma Distributed at 5% Significance Level				95% Chebyshev(Mean, Sd) UCL			11.38
50									97.5% Chebyshev(Mean, Sd) UCL			13.47
51					Assuming Gamma Distribution				99% Chebyshev(Mean, Sd) UCL			17.58
52					95% Approximate Gamma UCL	9.998						
53					95% Adjusted Gamma UCL	10.23						
54												
55					Potential UCL to Use				Use 99% Chebyshev (Mean, Sd) UCL			17.58
56					Recommended UCL exceeds the maximum observation							
57												

ProUCL input file
Surface and Subsurface Soil

Dieldrin	D_Dieldrin	Aluminum	d_Aluminum	Arsenic	d_arsenic	Iron	d_iron	Manganese	d_Manganese	Thallium	d_Thallium	Vanadium	D_Vanadium
1.8	0	726	1	0.23	0	379	1	1.05	0	0.275	0	0.97	1
1.8	0	1090	1	0.235	0	620	1	6.2	1	0.28	0	1.4	1
1.8	0	1130	1	0.245	0	650	1	7.1	1	0.285	0	1.5	1
1.9	0	1370	1	0.25	0	722	1	7.7	1	0.285	0	1.5	1
1.9	0	1520	1	0.26	0	760	1	11.3	1	0.29	0	1.7	1
1.95	0	2020	1	0.28	0	1120	1	11.4	1	0.3	0	2.6	1
1.95	0	2140	1	0.28	0	1190	1	12.3	1	0.3	0	2.7	1
1.95	0	3470	1	0.79	1	1670	1	25.4	1	0.305	0	3.6	1
2.1	1	4840	1	1.1	1	4790	1	25.6	1	0.31	0	8	1
2.9	1	5440	1	1.1	1	5070	1	26.2	1	0.315	0	11.3	1
3.8	1	6020	1	1.6	1	6730	1	36.7	1	0.32	0	12.9	1
80	1	6430	1	1.7	1	7640	1	37.6	1	0.335	0	15.7	1
		6520	1	2.4	1	9450	1	42.2	1	0.335	0	18.6	1
		7190	1	2.6	1	10100	1	49.3	1	0.34	0	18.8	1
		8510	1	2.6	1	10400	1	49.8	1	0.34	0	19	1
		11100	1	2.6	1	10600	1	51.2	1	0.34	0	20.4	1
		11300	1	2.7	1	11300	1	55.8	1	0.345	0	21.3	1
		11600	1	2.9	1	11900	1	58.3	1	0.35	0	21.9	1
		12900	1	2.9	1	12900	1	67.1	1	0.35	0	22	1
		13100	1	2.9	1	13300	1	71.1	1	0.35	1	22.6	1
		13300	1	3	1	13800	1	79.3	1	0.365	0	22.7	1
		13400	1	3.2	1	14000	1	80	1	0.43	1	23	1
		14300	1	3.3	1	14100	1	90.1	1	0.48	1	23.1	1
		15000	1	3.6	1	14500	1	105	1	0.59	1	24.2	1
		17300	1	3.8	1	16000	1	123	1	0.63	1	26.4	1
		17700	1	3.9	1	16200	1	133	1	0.74	1	29	1
		20000	1	3.9	1	16500	1	140	1	0.8	1	30.3	1
		20200	1	4	1	16900	1	148	1	0.86	1	32.2	1
		21700	1	4.3	1	17200	1	164	1	0.96	1	33	1
		22200	1	4.3	1	18500	1	182	1	1.2	1	33.5	1
		22800	1	5	1	19300	1	188	1	1.35	0	33.7	1
		23800	1	6.2	1	20700	1	189	1	1.7	0	35.2	1

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	dieldrin											
10												
11						General Statistics						
12						Number of Valid Samples	12			Number of Detected Data		4
13						Number of Unique Samples	4			Number of Non-Detect Data		8
14										Percent Non-Detects		66.67%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	2.1			Minimum Detected		0.742
18						Maximum Detected	80			Maximum Detected		4.382
19						Mean of Detected	22.2			Mean of Detected		1.881
20						SD of Detected	38.54			SD of Detected		1.685
21						Minimum Non-Detect	1.8			Minimum Non-Detect		0.588
22						Maximum Non-Detect	1.95			Maximum Non-Detect		0.668
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		8
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		4
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		66.67%
27												
28						UCL Statistics						
29				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.647			Shapiro Wilk Test Statistic		0.762
31						5% Shapiro Wilk Critical Value	0.748			5% Shapiro Wilk Critical Value		0.748
32				Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
33												
34				Assuming Normal Distribution						Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	8.027			Mean		0.586
37						SD	22.69			SD		1.3
38						95% DL/2 (t) UCL	19.79			95% H-Stat (DL/2) UCL		16.41
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41				MLE yields a negative mean						Mean in Log Scale		-2.151
42										SD in Log Scale		3.37
43										Mean in Original Scale		7.426
44										SD in Original Scale		22.89
45										95% Percentile Bootstrap UCL		20.5
46										95% BCA Bootstrap UCL		27.1
47												
48				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
49						k star (bias corrected)	0.296			Data appear Lognormal at 5% Significance Level		
50						Theta Star	74.95					
51						nu star	2.37					
52												
53						A-D Test Statistic	0.758			Nonparametric Statistics		
54						5% A-D Critical Value	0.68			Kaplan-Meier (KM) Method		
55						K-S Test Statistic	0.68			Mean		8.8
56						5% K-S Critical Value	0.41			SD		21.47
57				Data not Gamma Distributed at 5% Significance Level						SE of Mean		7.158

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
58											95% KM (t) UCL	21.65
59				**Assuming Gamma Distribution**							95% KM (z) UCL	20.57
60				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	20.02
61					Minimum	0.648					95% KM (bootstrap t) UCL	387.1
62					Maximum	80					95% KM (BCA) UCL	80
63					Mean	20.56					95% KM (Percentile Bootstrap) UCL	22.25
64					Median	18.07					95% KM (Chebyshev) UCL	40
65					SD	22.9					97.5% KM (Chebyshev) UCL	53.5
66					k star	0.579					99% KM (Chebyshev) UCL	80.02
67					Theta star	35.49						
68					Nu star	13.9				**Potential UCLs to Use**		
69					AppChi2	6.505					97.5% KM (Chebyshev) UCL	53.5
70					95% Gamma Approximate UCL	43.94						
71					95% Adjusted Gamma UCL	N/A						
72	**Note: DL/2 is not a recommended method.**											
73												
74												
75	**aluminum**											
76												
77					**General Statistics**							
78					Number of Valid Samples	32					Number of Unique Samples	32
79												
80				**Raw Statistics**						**Log-transformed Statistics**		
81					Minimum	726					Minimum of Log Data	6.588
82					Maximum	23800					Maximum of Log Data	10.08
83					Mean	10629					Mean of log Data	8.889
84					Median	11200					SD of log Data	1.038
85					SD	7384						
86					Coefficient of Variation	0.695						
87					Skewness	0.261						
88												
89					**Relevant UCL Statistics**							
90				**Normal Distribution Test**						**Lognormal Distribution Test**		
91					Shapiro Wilk Test Statistic	0.923					Shapiro Wilk Test Statistic	0.881
92					Shapiro Wilk Critical Value	0.93					Shapiro Wilk Critical Value	0.93
93				**Data not Normal at 5% Significance Level**						**Data not Lognormal at 5% Significance Level**		
94												
95				**Assuming Normal Distribution**						**Assuming Lognormal Distribution**		
96					95% Student's-t UCL	12842					95% H-UCL	19663
97				**95% UCLs (Adjusted for Skewness)**							95% Chebyshev (MVUE) UCL	23391
98					95% Adjusted-CLT UCL	12840					97.5% Chebyshev (MVUE) UCL	28267
99					95% Modified-t UCL	12852					99% Chebyshev (MVUE) UCL	37843
100												
101				**Gamma Distribution Test**						**Data Distribution**		
102					k star (bias corrected)	1.338				**Data do not follow a Discernable Distribution (0.05)**		
103					Theta Star	7946						
104					nu star	85.61						
105					Approximate Chi Square Value (.05)	65.28				**Nonparametric Statistics**		
106					Adjusted Level of Significance	0.0416					95% CLT UCL	12776
107					Adjusted Chi Square Value	64.33					95% Jackknife UCL	12842
108											95% Standard Bootstrap UCL	12737
109					Anderson-Darling Test Statistic	0.813					95% Bootstrap-t UCL	13005
110					Anderson-Darling 5% Critical Value	0.765					95% Hall's Bootstrap UCL	12898
111					Kolmogorov-Smirnov Test Statistic	0.161					95% Percentile Bootstrap UCL	12778
112					Kolmogorov-Smirnov 5% Critical Value	0.158					95% BCA Bootstrap UCL	12835
113				**Data not Gamma Distributed at 5% Significance Level**							95% Chebyshev(Mean, Sd) UCL	16318
114											97.5% Chebyshev(Mean, Sd) UCL	18780

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
115	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					23616
116				95% Approximate Gamma UCL		13938						
117				95% Adjusted Gamma UCL		14144						
118												
119	Potential UCL to Use						Use 99% Chebyshev (Mean, Sd) UCL					23616
120												
121												
122	arsenic											
123												
124	General Statistics											
125				Number of Valid Samples		32				Number of Detected Data		25
126				Number of Unique Samples		18				Number of Non-Detect Data		7
127										Percent Non-Detects		21.88%
128												
129	Raw Statistics						Log-transformed Statistics					
130				Minimum Detected		0.79				Minimum Detected		-0.236
131				Maximum Detected		6.2				Maximum Detected		1.825
132				Mean of Detected		3.056				Mean of Detected		1.017
133				SD of Detected		1.258				SD of Detected		0.493
134				Minimum Non-Detect		0.23				Minimum Non-Detect		-1.47
135				Maximum Non-Detect		0.28				Maximum Non-Detect		-1.273
136												
137	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		7
138	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		25
139	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		21.88%
140												
141	UCL Statistics											
142	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
143				Shapiro Wilk Test Statistic		0.97				Shapiro Wilk Test Statistic		0.911
144				5% Shapiro Wilk Critical Value		0.918				5% Shapiro Wilk Critical Value		0.918
145	Data appear Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level					
146												
147	Assuming Normal Distribution						Assuming Lognormal Distribution					
148				DL/2 Substitution Method						DL/2 Substitution Method		
149				Mean		2.415				Mean		0.343
150				SD		1.655				SD		1.366
151				95% DL/2 (t) UCL		2.911				95% H-Stat (DL/2) UCL		7.257
152												
153				Maximum Likelihood Estimate(MLE) Method						Log ROS Method		
154				Mean		2.223				Mean in Log Scale		0.793
155				SD		1.957				SD in Log Scale		0.612
156				95% MLE (t) UCL		2.81				Mean in Original Scale		2.605
157				95% MLE (Tiku) UCL		2.844				SD in Original Scale		1.406
158										95% Percentile Bootstrap UCL		3.022
159										95% BCA Bootstrap UCL		3.02
160												
161	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
162				k star (bias corrected)		4.553	Data appear Normal at 5% Significance Level					
163				Theta Star		0.671						
164				nu star		227.7						
165												
166				A-D Test Statistic		0.593	Nonparametric Statistics					
167				5% A-D Critical Value		0.747				Kaplan-Meier (KM) Method		
168				K-S Test Statistic		0.747				Mean		2.56
169				5% K-S Critical Value		0.175				SD		1.437
170	Data follow Appr. Gamma Distribution at 5% Significance Level									SE of Mean		0.259
171										95% KM (t) UCL		3

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
172					Assuming Gamma Distribution						95% KM (z) UCL	2.986
173					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	2.969
174					Minimum	0.79					95% KM (bootstrap t) UCL	2.988
175					Maximum	6.2					95% KM (BCA) UCL	3.097
176					Mean	2.711					95% KM (Percentile Bootstrap) UCL	3.025
177					Median	2.65					95% KM (Chebyshev) UCL	3.69
178					SD	1.293					97.5% KM (Chebyshev) UCL	4.179
179					k star	3.956					99% KM (Chebyshev) UCL	5.14
180					Theta star	0.685						
181					Nu star	253.2				Potential UCLs to Use		
182					AppChi2	217.4					95% KM (t) UCL	3
183					95% Gamma Approximate UCL	3.158					95% KM (Percentile Bootstrap) UCL	3.025
184					95% Adjusted Gamma UCL	3.184						
185	Note: DL/2 is not a recommended method.											
186												
187												
188	iron											
189												
190					General Statistics							
191					Number of Valid Samples	32					Number of Unique Samples	32
192												
193					Raw Statistics					Log-transformed Statistics		
194					Minimum	379					Minimum of Log Data	5.938
195					Maximum	20700					Maximum of Log Data	9.938
196					Mean	9968					Mean of log Data	8.729
197					Median	10950					SD of log Data	1.259
198					SD	6514						
199					Coefficient of Variation	0.653						
200					Skewness	-0.23						
201												
202					Relevant UCL Statistics							
203					Normal Distribution Test					Lognormal Distribution Test		
204					Shapiro Wilk Test Statistic	0.909					Shapiro Wilk Test Statistic	0.784
205					Shapiro Wilk Critical Value	0.93					Shapiro Wilk Critical Value	0.93
206					Data not Normal at 5% Significance Level					Data not Lognormal at 5% Significance Level		
207												
208					Assuming Normal Distribution					Assuming Lognormal Distribution		
209					95% Student's-t UCL	11921					95% H-UCL	25347
210					95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL	28520
211					95% Adjusted-CLT UCL	11812					97.5% Chebyshev (MVUE) UCL	35197
212					95% Modified-t UCL	11913					99% Chebyshev (MVUE) UCL	48314
213												
214					Gamma Distribution Test					Data Distribution		
215					k star (bias corrected)	1.095				Data do not follow a Discernable Distribution (0.05)		
216					Theta Star	9108						
217					nu star	70.05						
218					Approximate Chi Square Value (.05)	51.78				Nonparametric Statistics		
219					Adjusted Level of Significance	0.0416					95% CLT UCL	11862
220					Adjusted Chi Square Value	50.94					95% Jackknife UCL	11921
221											95% Standard Bootstrap UCL	11798
222					Anderson-Darling Test Statistic	2.227					95% Bootstrap-t UCL	11718
223					Anderson-Darling 5% Critical Value	0.771					95% Hall's Bootstrap UCL	11658
224					Kolmogorov-Smirnov Test Statistic	0.225					95% Percentile Bootstrap UCL	11847
225					Kolmogorov-Smirnov 5% Critical Value	0.159					95% BCA Bootstrap UCL	11715
226					Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL	14988
227											97.5% Chebyshev(Mean, Sd) UCL	17159
228					Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL	21425

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
229					95% Approximate Gamma UCL	13485						
230					95% Adjusted Gamma UCL	13708						
231												
232				Potential UCL to Use						Use 99% Chebyshev (Mean, Sd) UCL		21425
233					Recommended UCL exceeds the maximum observation							
234												
235												
236	thallium											
237												
238					General Statistics							
239					Number of Valid Samples	32				Number of Detected Data		10
240					Number of Unique Samples	10				Number of Non-Detect Data		22
241										Percent Non-Detects		68.75%
242												
243				Raw Statistics						Log-transformed Statistics		
244					Minimum Detected	0.35				Minimum Detected		-1.05
245					Maximum Detected	1.2				Maximum Detected		0.182
246					Mean of Detected	0.704				Mean of Detected		-0.415
247					SD of Detected	0.261				SD of Detected		0.383
248					Minimum Non-Detect	0.275				Minimum Non-Detect		-1.291
249					Maximum Non-Detect	1.7				Maximum Non-Detect		0.531
250												
251	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		32
252	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		0
253	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		100.00%
254												
255					UCL Statistics							
256				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
257					Shapiro Wilk Test Statistic	0.973				Shapiro Wilk Test Statistic		0.985
258					5% Shapiro Wilk Critical Value	0.842				5% Shapiro Wilk Critical Value		0.842
259				Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level		
260												
261				Assuming Normal Distribution						Assuming Lognormal Distribution		
262					DL/2 Substitution Method					DL/2 Substitution Method		
263					Mean	0.367				Mean		-1.298
264					SD	0.308				SD		0.747
265					95% DL/2 (t) UCL	0.46				95% H-Stat (DL/2) UCL		0.481
266												
267					Maximum Likelihood Estimate(MLE) Method	N/A				Log ROS Method		
268				MLE method failed to converge properly						Mean in Log Scale		-1.255
269										SD in Log Scale		0.64
270										Mean in Original Scale		0.357
271										SD in Original Scale		0.279
272										95% Percentile Bootstrap UCL		0.44
273										95% BCA Bootstrap UCL		0.45
274												
275				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
276					k star (bias corrected)	5.639				Data appear Normal at 5% Significance Level		
277					Theta Star	0.125						
278					nu star	112.8						
279												
280					A-D Test Statistic	0.132				Nonparametric Statistics		
281					5% A-D Critical Value	0.727				Kaplan-Meier (KM) Method		
282					K-S Test Statistic	0.727				Mean		0.468
283					5% K-S Critical Value	0.267				SD		0.22
284				Data appear Gamma Distributed at 5% Significance Level						SE of Mean		0.0423
285										95% KM (t) UCL		0.54

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
286					Assuming Gamma Distribution						95% KM (z) UCL	0.538
287					Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL	0.534
288					Minimum	0.35					95% KM (bootstrap t) UCL	0.546
289					Maximum	1.2					95% KM (BCA) UCL	0.671
290					Mean	0.707					95% KM (Percentile Bootstrap) UCL	0.61
291					Median	0.706					95% KM (Chebyshev) UCL	0.652
292					SD	0.145					97.5% KM (Chebyshev) UCL	0.732
293					k star	21.5					99% KM (Chebyshev) UCL	0.889
294					Theta star	0.0329						
295					Nu star	1376				Potential UCLs to Use		
296					AppChi2	1291					95% KM (t) UCL	0.54
297					95% Gamma Approximate UCL	0.754					95% KM (Percentile Bootstrap) UCL	0.61
298					95% Adjusted Gamma UCL	0.757						
299	Note: DL/2 is not a recommended method.											
300												
301												
302	vanadium											
303												
304					General Statistics							
305					Number of Valid Samples	32					Number of Unique Samples	31
306												
307					Raw Statistics					Log-transformed Statistics		
308					Minimum	0.97					Minimum of Log Data	-0.0305
309					Maximum	35.2					Maximum of Log Data	3.561
310					Mean	17.96					Mean of log Data	2.471
311					Median	20.85					SD of log Data	1.154
312					SD	11.31						
313					Coefficient of Variation	0.63						
314					Skewness	-0.249						
315												
316					Relevant UCL Statistics							
317					Normal Distribution Test					Lognormal Distribution Test		
318					Shapiro Wilk Test Statistic	0.901					Shapiro Wilk Test Statistic	0.781
319					Shapiro Wilk Critical Value	0.93					Shapiro Wilk Critical Value	0.93
320					Data not Normal at 5% Significance Level					Data not Lognormal at 5% Significance Level		
321												
322					Assuming Normal Distribution					Assuming Lognormal Distribution		
323					95% Student's-t UCL	21.35					95% H-UCL	39.5
324					95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL	45.87
325					95% Adjusted-CLT UCL	21.16					97.5% Chebyshev (MVUE) UCL	56.08
326					95% Modified-t UCL	21.34					99% Chebyshev (MVUE) UCL	76.13
327												
328					Gamma Distribution Test					Data Distribution		
329					k star (bias corrected)	1.235				Data do not follow a Discernable Distribution (0.05)		
330					Theta Star	14.55						
331					nu star	79.01						
332					Approximate Chi Square Value (.05)	59.53				Nonparametric Statistics		
333					Adjusted Level of Significance	0.0416					95% CLT UCL	21.25
334					Adjusted Chi Square Value	58.63					95% Jackknife UCL	21.35
335											95% Standard Bootstrap UCL	21.14
336					Anderson-Darling Test Statistic	2.287					95% Bootstrap-t UCL	21.12
337					Anderson-Darling 5% Critical Value	0.768					95% Hall's Bootstrap UCL	21.03
338					Kolmogorov-Smirnov Test Statistic	0.255					95% Percentile Bootstrap UCL	21.09
339					Kolmogorov-Smirnov 5% Critical Value	0.159					95% BCA Bootstrap UCL	20.98
340					Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL	26.68
341											97.5% Chebyshev(Mean, Sd) UCL	30.45
342					Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL	37.85

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
343					95% Approximate Gamma UCL	23.84						
344					95% Adjusted Gamma UCL	24.21						
345												
346				**Potential UCL to Use**						Use 99% Chebyshev (Mean, Sd) UCL		37.85
347				**Recommended UCL exceeds the maximum observation**								
348												
349				**General UCL Statistics for Full Data Sets**								
350			**User Selected Options**									
351			From File	WorkSheet.wst								
352			Full Precision	OFF								
353			Confidence Coefficient	95%								
354			Number of Bootstrap Operations	2000								
355												
356												
357	**mangansese**											
358												
359					**General Statistics**							
360					Number of Valid Samples	32				Number of Unique Samples		32
361												
362				**Raw Statistics**						**Log-transformed Statistics**		
363					Minimum	1.05				Minimum of Log Data		0.0488
364					Maximum	189				Maximum of Log Data		5.242
365					Mean	71.09				Mean of log Data		3.768
366					Median	53.5				SD of log Data		1.218
367					SD	58.54						
368					Coefficient of Variation	0.823						
369					Skewness	0.76						
370												
371					**Relevant UCL Statistics**							
372				**Normal Distribution Test**						**Lognormal Distribution Test**		
373					Shapiro Wilk Test Statistic	0.89				Shapiro Wilk Test Statistic		0.911
374					Shapiro Wilk Critical Value	0.93				Shapiro Wilk Critical Value		0.93
375				**Data not Normal at 5% Significance Level**						**Data not Lognormal at 5% Significance Level**		
376												
377				**Assuming Normal Distribution**						**Assuming Lognormal Distribution**		
378					95% Student's-t UCL	88.63				95% H-UCL		163.8
379				**95% UCLs (Adjusted for Skewness)**						95% Chebyshev (MVUE) UCL		186.8
380					95% Adjusted-CLT UCL	89.59				97.5% Chebyshev (MVUE) UCL		229.7
381					95% Modified-t UCL	88.86				99% Chebyshev (MVUE) UCL		314
382												
383				**Gamma Distribution Test**						**Data Distribution**		
384					k star (bias corrected)	1.06				**Data appear Gamma Distributed at 5% Significance Level**		
385					Theta Star	67.03						
386					nu star	67.87						
387					Approximate Chi Square Value (.05)	49.91				**Nonparametric Statistics**		
388					Adjusted Level of Significance	0.0416				95% CLT UCL		88.11
389					Adjusted Chi Square Value	49.08				95% Jackknife UCL		88.63
390										95% Standard Bootstrap UCL		88.19
391					Anderson-Darling Test Statistic	0.305				95% Bootstrap-t UCL		91.82
392					Anderson-Darling 5% Critical Value	0.772				95% Hall's Bootstrap UCL		90.22
393					Kolmogorov-Smirnov Test Statistic	0.0872				95% Percentile Bootstrap UCL		87.46
394					Kolmogorov-Smirnov 5% Critical Value	0.16				95% BCA Bootstrap UCL		88.19
395				**Data appear Gamma Distributed at 5% Significance Level**						95% Chebyshev(Mean, Sd) UCL		116.2
396										97.5% Chebyshev(Mean, Sd) UCL		135.7
397				**Assuming Gamma Distribution**						99% Chebyshev(Mean, Sd) UCL		174
398					95% Approximate Gamma UCL	96.67						
399					95% Adjusted Gamma UCL	98.29						

ProUCL Output
Surface and Subsurface Soil

	A	B	C	D	E	F	G	H	I	J	K	L
400												
401	**Potential UCL to Use**						Use 95% Approximate Gamma UCL					96.67

ProUCL input file
Surface and Subsurface Soil - Air Pathway

Tetrachloroethene	D_Tetrachloroethene
0.95	0
0.95	0
1.05	0
1.1	0
1.15	0
1.15	0
1.15	0
1.15	0
1.2	0
1.2	0
1.3	0
2.7	1
2.7	1
2.9	1
2.9	1
3.1	1
3.2	1
3.5	1
3.5	1
4	1
5	0
5	0
5.5	0
5.5	0
5.5	0
5.5	0
5.5	0
5.5	0
5.5	0
5.5	0
6	0
6	0
6	0
7	0
8	1
8.2	1
64	1
110	1

ProUCL Output
Surface and Subsurface Soil - Air Pathway

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2			User Selected Options									
3			From File	WorkSheet.wst								
4			Full Precision	OFF								
5			Confidence Coefficient	95%								
6			Number of Bootstrap Operations	2000								
7												
8												
9	PCE											
10												
11						General Statistics						
12						Number of Valid Samples	38			Number of Detected Data		13
13						Number of Unique Samples	10			Number of Non-Detect Data		25
14										Percent Non-Detects		65.79%
15												
16				Raw Statistics						Log-transformed Statistics		
17						Minimum Detected	2.7			Minimum Detected		0.993
18						Maximum Detected	110			Maximum Detected		4.7
19						Mean of Detected	16.82			Mean of Detected		1.796
20						SD of Detected	32.58			SD of Detected		1.23
21						Minimum Non-Detect	0.95			Minimum Non-Detect		-0.0513
22						Maximum Non-Detect	7			Maximum Non-Detect		1.946
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended									Number treated as Non-Detect		34
25	For all methods (except KM, DL/2, and ROS Methods),									Number treated as Detected		4
26	Observations < Largest ND are treated as NDs									Single DL Non-Detect Percentage		89.47%
27												
28						UCL Statistics						
29				Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only		
30						Shapiro Wilk Test Statistic	0.504			Shapiro Wilk Test Statistic		0.673
31						5% Shapiro Wilk Critical Value	0.866			5% Shapiro Wilk Critical Value		0.866
32				Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level		
33												
34				Assuming Normal Distribution						Assuming Lognormal Distribution		
35						DL/2 Substitution Method				DL/2 Substitution Method		
36						Mean	6.957			Mean		0.827
37						SD	19.93			SD		1.196
38						95% DL/2 (t) UCL	12.41			95% H-Stat (DL/2) UCL		7.821
39												
40						Maximum Likelihood Estimate(MLE) Method	N/A			Log ROS Method		
41						MLE yields a negative mean				Mean in Log Scale		0.338
42										SD in Log Scale		1.488
43										Mean in Original Scale		6.448
44										SD in Original Scale		20.07
45										95% Percentile Bootstrap UCL		12.55
46										95% BCA Bootstrap UCL		15.5
47												
48				Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only		
49						k star (bias corrected)	0.514			Data do not follow a Discernable Distribution (0.05)		
50						Theta Star	32.73					
51						nu star	13.36					
52												
53						A-D Test Statistic	2.493			Nonparametric Statistics		
54						5% A-D Critical Value	0.782			Kaplan-Meier (KM) Method		
55						K-S Test Statistic	0.782			Mean		7.609
56						5% K-S Critical Value	0.248			SD		19.48
57				Data not Gamma Distributed at 5% Significance Level						SE of Mean		3.289

ProUCL Output
Surface and Subsurface Soil - Air Pathway

	A	B	C	D	E	F	G	H	I	J	K	L
58											95% KM (t) UCL	13.16
59				**Assuming Gamma Distribution**							95% KM (z) UCL	13.02
60				Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL	13.01
61					Minimum	0					95% KM (bootstrap t) UCL	94.86
62					Maximum	170.8					95% KM (BCA) UCL	13.62
63					Mean	29.51					95% KM (Percentile Bootstrap) UCL	13.1
64					Median	6					95% KM (Chebyshev) UCL	21.95
65					SD	43.71					97.5% KM (Chebyshev) UCL	28.15
66					k star	0.173					99% KM (Chebyshev) UCL	40.34
67					Theta star	170.5						
68					Nu star	13.16				**Potential UCLs to Use**		
69					AppChi2	6					95% KM (BCA) UCL	13.62
70					95% Gamma Approximate UCL	64.73						
71					95% Adjusted Gamma UCL	66.96						
72	**Note: DL/2 is not a recommended method.**											
73												

StationID	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO313	LS11-SO31
SampleID	LS11-SS306-00	LS11-SS307-00	LS11-SS308-00	LS11-SS309-00	LS11-SS310-00	LS11-SS311-00	LS11-SS312-00	LS11-SS313-00	LS11-SS31
SampleDate	5/28/2002	5/28/2002	5/28/2002	5/29/2002	5/29/2002	5/29/2002	5/29/2002	5/29/2002	5/29/2002
AnalyteName									
Cobalt	2.9 J	3 J	3.3 J	2.8 J	2.9 J	3.5 J	3.2 J	3.5 J	2.9

Cobalt	d_Cobalt
2.9	1
3	1
3.3	1
2.8	1
2.9	1
3.5	1
3.2	1
3.5	1
2.9	1
2.7	1
1.7	1
0.87	1
0.53	0
1.3	1
0.3	0
0.22	0
0.55	0
0.36	0
0.44	0
2.5	1
3.1	1
1.5	1
1.2	1
0.96	1
3.2	1
3.4	1
3.1	1
2.2	1
1.8	1
1.9	1
2.1	1
2.2	1

14	LS11-SO319	LS11-SO306	LS11-SO307	LS11-SO308	LS11-SO309	LS11-SO310	LS11-SO311	LS11-SO312	LS11-SO313
14-00	LS11-SS319-00	LS11-SB306-03	LS11-SB307-03	LS11-SB308-03	LS11-SB309-03	LS11-SB310-03	LS11-SB311-03	LS11-SB312-03	LS11-SB313-03
	5/30/2002	5/28/2002	5/28/2002	5/28/2002	5/29/2002	5/29/2002	5/29/2002	5/29/2002	5/29/2002
J	2.7 J	1.7 J	0.87 J	0.53 B	1.3 J	0.3 B	0.22 B	0.55 B	0.36 B

LS11-SO314	LS11-SO319	LS11A-SO623	LS11A-SO625	LS11A-SO627	LS11A-SO628	LS11A-SO629	LS11A-SO630	LS11A-SO623	LS11A-SO(
LS11-SB314-03	LS11-SB319-03	LS11A-SS623-07C	LS11A-SS625-07C	LS11A-SS627-07C	LS11A-SS628-07C	LS11A-SS629-07C	LS11A-SS630-07C	LS11A-SB623-0103-07C	LS11A-SB6
5/29/2002	5/30/2002	10/1/2007	10/1/2007	10/2/2007	10/2/2007	10/2/2007	10/2/2007	10/1/2007	10/1/2007
0.44 B	2.5 J	3.1 J	1.5 J	1.2 J	0.96 J	3.2 J	3.4 J	3.1 J	2.2

625	LS11A-SO627	LS11A-SO628	LS11A-SO629	LS11A-SO630
625-0103-0	LS11A-SB627-0103-0	LS11A-SB628-0103-0	LS11A-SB629-0103-0	LS11A-SB630-0103-07C
	10/2/2007	10/2/2007	10/2/2007	10/2/2007
J	1.8 J	1.9 J	2.1 J	2.2 J