Second Five-Year Review
for
OU 2 & OU 3 (Apple Orchard Landfill and Surface - and Groundwater)
Site 4 (Chemical Burial Area)
Site 5/13 (Open Burn and Oil Sludge Disposal Areas)
Site 7 (Ordnance Burn Area)
Site 9 (Industrial Wastewater Disposal 300 Area)
Site 11 (Industrial Wastewater Disposal 100 Area)
Site 49 (TCE Groundwater Plume in the 400 Area)
SWMU 87 (Building 611 Solid Waste Storage Area)

Naval Surface Warfare Center

White Oak, Maryland

Naval Facilities Engineering Command
Washington

Contract Number N62470-08-D-1001

Contract Task Order CTO 555

March 2012

011215/P

SECOND FIVE-YEAR REVIEW REPORT
FOR
OU 2 & OU 3 (APPLE ORCHARD LANDFILL, SURFACE WATER AND GROUNDWATER)
SITE 4 (CHEMICAL BURIAL AREA)
SITE 5/13 (OPEN BURN AND OIL SLUDGE DISPOSAL AREAS)
SITE 7 (ORDNANCE BURN AREA)
SITE 9 (INDUSTRIAL WASTEWATER DISPOSAL 300 AREA)
SITE 11 (INDUSTRIAL WASTEWATER DISPOSAL 100 AREA)
SITE 49 (TCE GROUNDWATER PLUME IN THE 400 AREA)
SWMU 87 (BUILDING 611 SOLID WASTE STORAGE AREA)

NAVAL SURFACE WARFARE CENTER
WHITE OAK, MARYLAND

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command Washington
1314 Harwood Street, S. E.
Washington Navy Yard, D. C. 20374

Submitted by:
Tetra Tech
234 Mall Boulevard, Suite 260
King of Prussia, Pennsylvania 19406

CONTRACT NUMBER N62470-08-D-1001
CONTRACT TASK ORDER 555

MARCH 2012

PREPARED UNDER THE DIRECTION OF:

Scott N. [signature]

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JOHN J. TREPANOWSKI, P.E.
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Navy Second Five-Year Review Signature Cover

Key Review Information

Site Identification		
Site Name: Naval Surface Warfare Center White Oak - Operable Units 2 and 3 (Apple Orchard Landfill and Surface- and Groundwater); Site 4 (Chemical Burial Area); Site 5/13 (Open Burn and Oil Sludge Disposal Area); Site 7 Ordnance Burn Area; Site 9 (Industrial Wastewater Disposal 300 Area); Site 11 (Industrial Wastewater Disposal Area 100 Area); Site 49 (TCE Groundwater Plume Area 400) and Solid Waste Management Unit 87(Building 611 Solid Waste Storage Area).		EPA ID: MDO 170023444
Region: 3	State: MD	City/County: Silver Spring/Montgomery and Prince Georges

Site Status	
NPL Status: Not Listed	
Remediation Status (under construction, operating, complete): Under Construction and Operating	
Multiple OU's* (highlight): **Y** N	Number of Sites/OUs: 8/2
Construction Completion Date: TBD	
Has site been put into reuse? (highlight): **Y** N	

Review Status	
Lead Agency (EPA, State, Tribe, Other Federal Agency): NAVFAC Washington	
Author Name: Armalia Berry-Washington	Author Title: Remedial Project Manager
Author Affiliation: Department of the Navy, Naval Facilities Engineering Command, Washington	
Review Period: May 2007 to February 2012	Date(s) of Site Inspection: October 11, 2011
Type of review: Post-SARA Pre-SARA **Non-NPL Remedial Action Site** NPL - Removal Only Regional Discretion NPL State/Tribe-Lead	Review Number (1, 2, etc) 2
Triggering Action Event: Initiation of the remedial action for Operable Unit 2 (Site 1 and Site 2 Landfill)	
Trigger Action Date: April*, 2002*	
Due Date: April*, 2012*	

* OU refers to Operable Unit

Issues:

Remedies implemented for the Sites addressed in this report are currently protective of human and ecological receptors, however documentation of completion of the remedial actions need to be developed. Land Control Remedial Designs are lacking for Sites 4, 9, 13, 49, and SWMU 87

Recommendations and Follow-Up Actions:

The following recommendations and actions are made for the sites at NSWC White Oak :

(1) Perform at least yearly monitoring of institutional control compliance and incorporate the results into future five-year reviews, continue O&M on existing treatment systems and the OU2 landfill cover.
(2) Finalize Land Use Control Remedial Designs for Sites 4, 9, 13, 49, and SWMU 87.
(3) Abandon wells at all sites were remedial action objectives have been met and no further long-term monitoring is required.
(4) Complete Remedial Action Completion Reports for Sites as appropriate.

Protectiveness Statement(s):

Remedies for the Sites identified above are currently protective of human and ecological receptors. Land Use Controls have been effective in preventing usage of groundwater as a potable water supply and have also restricted activities within the site boundaries that could potentially disturb the surface of the site. At OU 2/3, Site 4, Site 5/13, Site 7, Site 9, Site 11, Site 49, and SWMU 87, the source and groundwater treatment systems are effective in reducing the concentrations of contaminants that may migrate off-site. Groundwater monitoring and five-year reviews also help to ensure that the remedial actions continue to remain protective of human health and the environment.

Next Review:

The next five-year review of NSWC White Oak sites will be completed by April 2017.

Signature of U.S. Department of the Navy and Date

13 JUN 2012
Date

BRAC Environmental Coordinator
BRAC Program Management Office

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ACRONYMS

AEDC	Arnold Engineering Development Center
ALC	Adelphi Laboratory Center
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
AWQC	Ambient Water Quality Criteria
B&R	Brown & Root
BCT	BRAC Cleanup Team
BERA	Basewide Ecological Risk Assessment
bgs	below ground surface
BEHP	bis(2-ethylhexyl) phthalate
BRAC	Base Realignment and Closure
BTAG	Biological Technical Assistance Group
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CMS	Corrective Measures Study
COC	Contaminant of Concern
COMAR	Code of Maryland Regulations
COPC	Contaminant of Potential Concern
CS	Confirmation Study
CTE	Central Tendency Exposure
CTO	Contract Task Order
CVOC	chlorinated volatile organic compounds
DCE	Dichloroethene
DO	Dissolved Oxygen
DVS	Design Verification Study
EA	Engineering Science and Technology
EBS	Environmental Baseline Survey
EISB	Enhanced In-situ Bioremediation
EOS	Emulsified Oil Substrate
ERA	ecological risk assessment
FRC	Federal Research Center
FS	Feasibility Study
GSA	General Services Administration
HHRA	Human Health Risk Assessment

HI	Hazard Indices
HMX	High Melting Explosive
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
ICs	Institutional Controls
ILCR	Incremental Lifetime Cancer Risks
IRP	Installation Restoration Program
ISCO	in-situ chemical oxidation
IW	injection well
JMWA	J.M. Waller Associates, Inc.
LUC-RD	Land Use Controls — Remedial Design
LUCs	Land Use Controls
LTM	Long-term Monitoring
MCL	Maximum Contaminant Level
MCS	Media Clean-up Standard
MDE	Maryland Department of the Environment
mg/kg	milligrams per kilogram
MNA	Monitored Natural Attenuation
MOU	Memorandum of Understanding
msl	mean sea level
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Contingency Plan
NEESA	Naval Energy and Environmental Support Activity
NOL	Naval Ordnance Laboratory
NRWQC	National Recommended Water Quality Criteria
NSWC	Naval Surface Warfare Center
NT	Nitrotoluene
O&M	Operation and Maintenance
ORP	Oxidation-Reduction Potential
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
PAHs	Polynuclear Aromatic Hydrocarbons
PCA	Tetrachloroethane
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PCOC	Potential Contaminant of Concern

PRG	Preliminary Remediation Goal
RAB	Restoration Advisory Board
RAOs	Remedial Action Objectives
RBC	Risk-Based Concentration
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RSL	Regional Screening Levels
SERA	Screening-Level Ecological Risk Assessment
SI	Site Inspection
SSL	Soil Screening Level
SVE	Soil Vapor Extraction
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TBC	To Be Considered
TCE	Trichloroethene
TCL	Target Compound List
TNB	Trinitrobenzene
TNT	Trinitrotoluene
TPH	total petroleum hydrocarbons
TtNUS	Tetra Tech NUS, Inc.
UCL	Upper Confidence Limits
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
µg/L	microgram per liter
VOC	Volatile Organic Compound
WSSC	Washington Suburban Sanitary Commission
ZVI	Zero Valent Iron

1.0 INTRODUCTION

1.1 INTRODUCTION

The purpose of a five-year review is to determine whether implemented remedies are protective of human health and the environment. The methods, findings, and conclusions of the reviews are documented in Five-Year Review Reports. In addition, Five-Year Review Reports identify issues found during the review, if any, and identify recommendations to address them.

The Department of the Navy (Navy) is the lead agency for site activities at former Naval Surface Warfare Center (NSWC) White Oak. The US Environmental Protection Agency (USEPA) Region 3 and the Maryland Department of Environment (MDE) are the support agencies. Cleanup monies are provided by the Department of Defense.

The Navy is preparing this Five-Year Review report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121 states the following:

> "If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than every five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgement of the President that action is appropriate at such site in accordance with section [104] or [106], the president shall take or require such action. The President shall report to Congress a list of facilities at which such review is required, the results of all such reviews, and any actions taken as a result of such reviews."

Furthermore, the NCP; 40 Code of Federal Regulations (CFR) §300.430(f) (4) (ii) states:

> "If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action."

This Five-Year Review has been prepared under Contract Task Order (CTO) 555 as part of the Comprehensive Long-Term Environmental Action Navy (CLEAN) IV Contract No. N62470-08-D-1001 for

Naval Facilities Engineering Command (NAVFAC) Washington. Tetra Tech conducted this five-year review of the pending, completed, and ongoing remedial actions implemented at:

- Operable Unit 2 (OU2) & OU3 (Apple Orchard Landfill, Surface water and Groundwater)
- Site 4 (Chemical Burial Area)
- Site 5/13 (Open Burn and Oil Sludge Disposal Areas)
- Site 7 (Ordnance Burn Area)
- Site 9 (Industrial Wastewater Disposal 300 Area)
- Site 11 (Industrial Wastewater Disposal 100 Area)
- Site 49 [Trichloroethylene (TCE) Groundwater Plume in the 400 Area]
- Solid Waste Management Unit (SWMU) 87 (Building 611 Solid Waste Storage Area)

NSWC White Oak is located in Silver Spring, Maryland within both Prince Georges and Montgomery County. A site location map of NSWC White Oak is presented as Figure 1-1, and the locations of Installation Restoration Program (IRP) sites and SWMUs are shown on Figure 1-2. This five-year review was prepared based on remedial actions and monitoring activities that were conducted through 31 January 2012.

This is the second five-year review for NSWC White Oak. The triggering action for the policy review was the signature date of the Record of Decision (ROD) for OU2 in 2001. Due to the fact that hazardous substances, pollutants, or contaminants remain at OU2 and OU3, Sites 4, 5/13, 7, 9, 11, and 49, and SWMU 87 in excess of levels that allow for unlimited use and unrestricted exposure, five-year reviews are required.

1.2 ADMINISTRATIVE COMPONENTS AND COMMUNITY INVOLVEMENT

This Five-Year Review consisted of a review of relevant documents, interviews, and a site inspection. The NSWC Base Realignment and Closure (BRAC) Clean-up Team (BCT), with members as follows, assisted in the preparation of the Five-Year Review:

- Linda Gustafson, MDE, Remedial Project Manager
- Bruce Beach, EPA, Remedial Project Manager
- Armalia Berry-Washington, NAVFAC Washington, Remedial Project Manager
- Dalton Shaughnessy, NAVFAC Washington, Remedial Project Manager
- Cassandra Brown, CH2MHill, Remedial Project Manager
- Scott Nesbit, Tetra Tech, Project Manager

In addition, an announcement about the review will be provided to the Restoration Advisory Board (RAB), which is composed of concerned citizens and is supported by the White Oak Partnering Team. The completed Five-Year Review report will be available at NAVFAC Washington, Washington, DC.

The next five-year-review for NSWC White Oak is required by 2017, 5 years from the date of the finalization of this review.

1.3 ARAR AND SITE-SPECIFIC ACTION LEVELS CHANGES

The second five-year review is being conducted for two purposes:

- To determine if the remedial actions are being implemented, as specified in the RODs, to protect human health and the environment.

- To determine if there have been changes in the Applicable or Relevant and Appropriate Requirements (ARARs) or site-specific action levels that call into question the protectiveness of the remedy.

The chemical-specific ARARs identified in each of the RODs were reviewed, as were new federal and state regulations that have been promulgated. This section describes the overall impacts of the new or changed ARARs on the determination of the protectiveness of the remedy. It was determined that recalculation of risk or risk assessments was not necessary to determine whether a remedy continues to protect human health and the environment.

The human health risk assessments (HHRAs) for the sites were conducted primarily following the USEPA Human Health Evaluation Manual and supplemental documents (USEPA, 1989; 1991; 1992a). Since HHRAs were prepared, the USEPA has issued new guidance documents (USEPA, 2001b; 2002a; 2002b; 2004a; 2004b; 2005b; 2005c; and 2009a). The new guidance documents do not impact the conclusions of the original HHRAs. Future HHRAs and five-year reviews will consider the most recent USEPA guidance. If toxicity criteria change significantly for a known site contaminant, the Navy will evaluate whether the changes are likely to call into question the protectiveness of the remedy or the remedial action objectives (RAOs), and whether risks for those contaminant should be recalculated. If recalculation demonstrates that there are unacceptable risks, the target cleanup levels will be adjusted to address the risks so that the remedial actions remain protective of human health.

The benchmarks used to select chemicals of potential concern (COPCs) for direct contact with soil and sediment included USEPA Region 3 Risk-Based Concentrations (RBCs), USEPA Region 9 Preliminary Remedial Goals (PRGs), and USEPA Regional Screening Levels (RSLs). In addition, USEPA Soil

Screening Levels (SSLs) for the protection of migration from soil to groundwater and soil to air were used to select COPCs for soil migration pathways. In May 2008, the USEPA Region 3 RBCs were discontinued and replaced with the USEPA RSLs.

The benchmarks used to select COPCs for groundwater included USEPA Region 3 RBCs, USEPA Region 9 PRGs, USEPA RSLs, and USEPA Maximum Contaminant Levels (MCLs).

The benchmarks used to select COPCs for surface water included USEPA Ambient Water Quality Criteria (AWQC) [currently known as National Recommended Water Quality Criteria (NRWQC)]. The USEPA NRWQC were last updated in 2006 (USEPA, 2006).

The ecological risk assessments (ERAs) for the sites were conducted primarily following USEPA ERA guidance documents from 1992 (Framework for Ecological Risk Assessment) (USEPA, 1992b) and 1994 (Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Review Draft) (USEPA, 1994b). The 1994 ERA guidance did not change significantly when it was updated in 1997 as an interim final document (USEPA, 1997). The risk assessments also reevaluated some of the conservative assumptions used to obtain a “screening-level” risk, which corresponds to the Step 3a evaluation in the Navy Policy for Conducting ERAs (Navy, 1999a). Therefore, the risk assessment methodology has not changed significantly over the last five years.

An ARAR that has changed since the first five-year review is the promulgation of a drinking water standard for perchlorate. A PRG for perchlorate was calculated by the Office of Solid Waste and Emergency Response (OSWER) in its January 8, 2009, guidance. As described in the OSWER memorandum, the Agency has now issued an Interim Drinking Water Health Advisory (Interim Health Advisory) for exposure to perchlorate of 15 micrograms per liter (µg/L) in water. A health advisory provides technical guidance to federal, state, and other public health officials on health effects, analytical methods and treatment technologies associated with drinking water contamination.

The NCP (40 CFR 300.430(e)(2)(A)(1)) provides that when establishing acceptable exposure levels for use as remediation goals (for a Superfund site), consideration must be given to concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effects over a lifetime or part of a lifetime, incorporating an adequate margin of safety. As a result of the publication of the Interim Health Advisory for perchlorate, OSWER recommends that where no federal or state ARAR requirements exist under federal or state laws, 15 µg/L is recommended as the PRG for perchlorate when making CERCLA site-specific cleanup decisions where there is an actual or potential drinking water exposure pathway. However, where State regulations qualify as ARARs for perchlorate, the remediation goals established shall be developed considering the State regulations that qualify as ARARs, as well as other factors cited in the NCP (see 40 CFR 300.430(e)(2)(i)(ff)). Final remediation goals and remedy decisions are made in accordance with 40 CFR300.430 (e) and (f) and associated provisions.

1.4 REPORT ORGANIZATION

This report consists of nine sections and appendices:

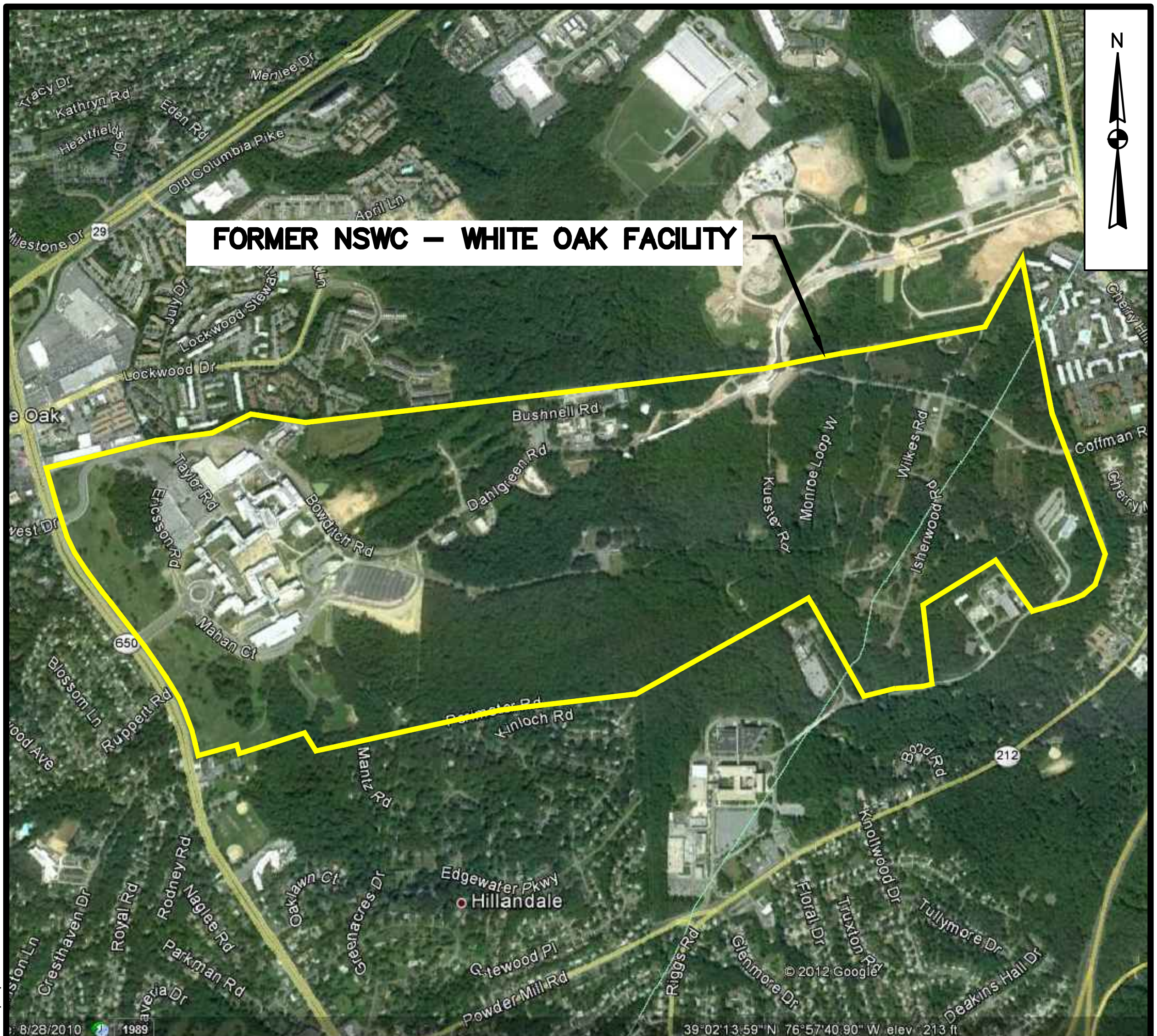
- Section 1.0 discusses the purpose of the report, provides a summary of the history and site chronology of NSWC White Oak, and identifies changes that have occurred in ARARs.

- Sections 2.0 thru 9.0 are the five-year reviews for the IRP Sites/SWMUs at NSWC White Oak. Each section includes a site chronology, background, summary of remedial actions performed, and five-year review findings, assessment, deficiency list, recommendations, and protectiveness statement.

- Appendix A contains photographs of each of the sites.

- Appendix B includes Site Inspection Checklists.

- Appendix C includes the most recent Long-Term Monitoring data available for each site.



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SCALE: 1" = 2000'

LEGEND:

PROPERTY LINE

SOURCE: GOOGLE EARTH PRO 2012.

DRAWN BY MF	DATE 2-28-12	NAVFAC	FACILITY VICINITY MAP FORMER NSWC – WHITE OAK SILVER SPRING, MARYLAND	CONTRACT NO. 3668
CHECKED BY	DATE			OWNER NO.
REVISED BY	DATE			APPROVED BY DATE
SCALE 1"=2000'				DRAWING NO. FIGURE 1-1 · SIZE A · REV. 0

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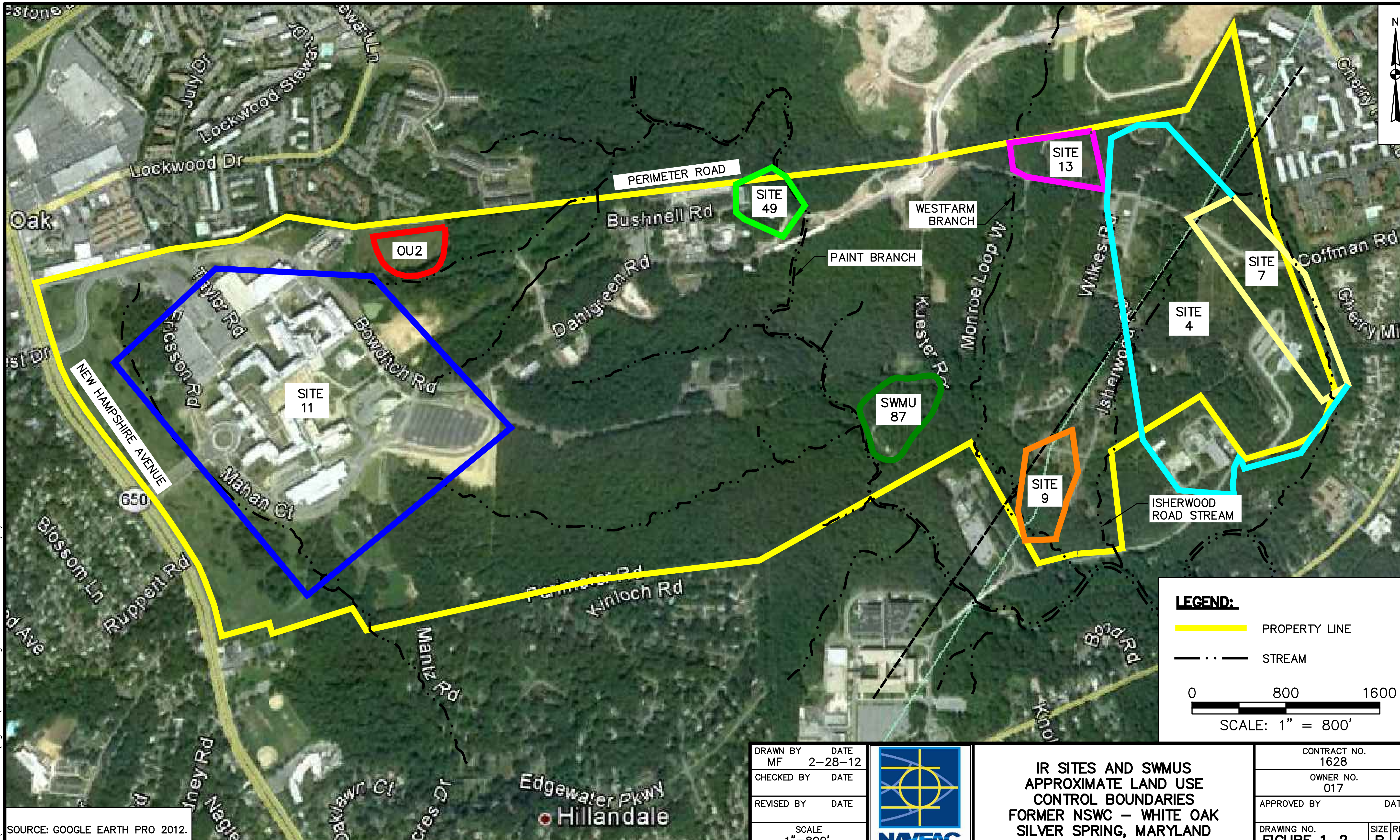

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NAVFAC

IR SITES AND SWMUS APPROXIMATE LAND USE CONTROL BOUNDARIES
FORMER NSWC – WHITE OAK
SILVER SPRING, MARYLAND

CONTRACT NO. 1628	
OWNER NO. 017	
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2.0 OPERABLE UNIT 2 AND OPERABLE UNIT 3

This five-year review of OU2 and OU3 (Apple Orchard Landfill, Surface water and Groundwater) is required by statute because hazardous substances, pollutants, or contaminants remain on site that do not allow for unlimited use or unrestricted exposure. OU2 and OU3 consist of the landfill waste and groundwater associated with Site 1, the Parking Lot Landfill and Site 2, the Apple Orchard Landfill. These adjacent sites were capped in 2001 and have been investigated together as OU2 (landfill waste) and OU3 (groundwater).

2.1 SITE HISTORY

Site 1 and Site 2 were identified as a Navy Installation Restoration Program (IRP) sites in an Initial Assessment Study (IAS) conducted by the Navy's Naval Energy and Environmental Support Activity (NEESA) in 1984.

The IAS found that Site 1 was used for waste disposal from 1948 to 1953. Material disposed of included trash, metal scrap, construction debris, lubricating oil, storage batteries, metal plating wastes, and vehicle maintenance shop wastes. Other than reports that 60 automobile batteries were disposed, the IAS reports no information regarding the quantity of wastes disposed. It is estimated that Site 1 contains a total of 10,000 cubic yards of fill and waste.

The IAS found that Site 2 was used from 1948 to 1982 for waste disposal. Wastes reportedly disposed of included fill dirt, construction rubble, polychlorinated biphenyls (PCBs), various solvents (including xylene, acetone, dry cleaning solvents, and lacquer thinner), paint residue, acids, phenols, and other waste chemicals. The IAS estimated that approximately 2,300 gallons of these materials were disposed of at Site 2 during each year of disposal. Additionally, the IAS found that carbon tetrachloride and methyl ketone may have been disposed of at the Apple Orchard Landfill and that between 500 and 1,000 gallons of oil containing PCBs were deposited in the landfill in 1957-58. In addition, an unknown quantity of ordnance shapes (metal vessels used during research at the former facility), were disposed in the landfill. Ordnance shapes are not likely to contain hazardous substances and are considered to be inert, low-hazard military wastes. It is estimated that OU2 contains a total of 75,000 cubic yards of fill and waste.

The findings of initial soil, surface water, groundwater, and sediment investigations are reported in a Confirmation Study/Verification Phase Report (Malcolm Pirnie, 1987). These investigations were conducted to confirm the findings of the IAS and to further characterize site conditions.

A remedial investigation (RI) was performed at Site 2 which included two phases of investigations in January 1989 and March 1992 and resulted in a draft RI in March 1992. Additional surface and subsurface soil, groundwater sediment and surface water samples were collected and a soil gas survey was performed during these investigations.

An additional investigation of Site 2 was completed as part of a Design Verification Study (TtNUS, 1995), which included record reviews, terrain conductivity surveys, test pit placement, and subsurface soil and sediment sampling.

In June 1996, the Navy, the General Services Administration (GSA), and the Army agreed on the disposition of the Federal Research Center (FRC) (formerly the Dahlgren Division, White Oak Detachment, Naval Surface Center) at White Oak in Silver Spring, Maryland, from the Navy to GSA (662 acres) and to the Army (48 acres).

The results of additional investigations of Site 2 completed between November 1998 and April 1999 are included in a RCRA Facility Investigation (RFI) report (TtNUS, 2000). The RFI included further characterization of soil (primarily surface), groundwater, surface water, and sediment.

The final investigation related to Site 2 was completed as part of a Base-wide Screening-level Ecological Risk Assessment (SERA) (TtNUS, 2001a).

A Corrective Measures Study (CMS) for OU2 (TtNUS, March 2001) was completed in 2001 and developed alternatives for eliminating unacceptable risks identified by the RI. The CMS also meets the requirements of a CERCLA Feasibility Study (FS).

The ROD for OU2 soil, waste and sediment was signed in July 2001.

A Memorandum of Understanding (MOU) was signed between the Navy and GSA in June 2005, which defines the rights and responsibilities of each party as they apply to the OU2 landfill.

2.1.1 OU3 — Surface Water and Groundwater Related to OU2

OU3 addresses the groundwater underlying OU2 and the surface water adjacent to it. An RI was performed to characterize the soils, groundwater, and surface water at OU2. The investigation, performed in two phases, January 1989 and March 1992, resulted in a draft RI in March 1992.

A facility-wide groundwater investigation was completed in the spring and summer of 1997. The investigation included the sampling of all existing groundwater monitoring wells and piezometers and the installation and sampling of new temporary and permanent groundwater monitoring wells in the areas of the base proposed for reuse. The groundwater quality was similar to that found during previous studies (B&R Environmental, 1997).

A CMS for OU2, which included groundwater, was completed in 2001 and developed corrective measures for eliminating unacceptable risks identified during the RI. Based on the CMS recommendation, a Proposed Plan was developed for the remedial action, and a public meeting was held in March 2001 to solicit comments.

The ROD for OU3 groundwater and surface water was signed in September 2004. The selected remedy includes natural attenuation, institutional controls, and long-term monitoring of surface water and groundwater.

2.2 BACKGROUND

2.2.1 OU2 and OU3 Physical Characteristics

The OU2 landfill source area is approximately 5.5 acres in size. The geology underlying OU2 has been characterized based on the results of borings located around the perimeter of the landfill and test pits along its northern edge. The physical features of OU2 are shown in Figure 2-1. The thickness of the landfill was estimated by comparing the topography prior to landfill activities to the present topography. The depth of the landfill thickens from approximately 4 feet at Perimeter Road, which is at the northern boundary of former NSWC White Oak, to about 36 feet at the edge of the landfill plateau. Test pits along the northern perimeter and northeastern corner of the landfill revealed sand with silt and gravel and concrete and asphalt as the fill material (Halliburton NUS, 1995c).

The native material surrounding OU2 consists of a thin mantle of soil resting on the saprolite of the Wissahickon gneiss. The shallow surface material is variable, ranging from clayey silt to sandy silt to gravel with a thickness of 2 to 6 feet. The saprolite ranges in thickness from 8 feet along the unnamed tributary to greater than 49 feet along the northern edge of the site. Bedrock was encountered along the southern perimeter of the landfill approximately 10 feet below ground surface (bgs), and 30 feet in the northwestern corner of OU2.

Groundwater at OU3 is unconfined and present in the saprolite, bedrock and, to a lesser extent, the surface soils along the surface drainage pathways. The depth to the water table at OU3 ranges from approximately 3 to 4 feet bgs along the toe of the landfill to 32.5 feet bgs along Perimeter Road. Based on a comparison of available groundwater elevations and predevelopment topographic maps of OU2, it is unlikely that groundwater would be in contact with wastes within OU2. Groundwater flows radially from the northwestern corner of the site to the southeast, discharging at least in part to the unnamed stream to the south. The mean hydraulic conductivity of the saprolite has been calculated to be 9.58 feet/day and 7.66 $X10^{-2}$ feet/day for the bedrock.

2.2.2 Land and Resource Use

Currently, the majority of property occupied by OU2 is wooded and/or open space with a small, paved parking area. The property is owned by the GSA. GSA has used Site 1 for the construction of a power plant to support the Food and Drug Administration complex and the property is not anticipated to be used for residential purposes. Adjacent property is to be developed for commercial/industrial purposes. The anticipated future use of Sites OU2 is also commercial/industrial use. Private property immediately north of the former NSWC White Oak is used for residential purposes. An apartment complex is located on private property less than 100 feet to the north of OU2.

Groundwater at OU3 is not used as a potable water supply at this time and there is no known plan to use the impacted groundwater. In addition, water for occupants of the former NSWC White Oak and the surrounding properties is, and is expected to continue to be supplied by a local municipal water authority. Local ordinances prevent the installation of new private potable wells where a public supply is readily available.

2.2.3 Nature and Extent of Contamination

Twenty surface soil samples were collected at OU2 for EPA Target Compound List (TCL) and Target Analyte List (TAL) analysis. An additional nine samples were analyzed for PCBs. Ten subsurface soil samples were collected at OU2. No contaminants of concern (COCs) were identified in OU2 soils for the anticipated commercial/industrial use of the property. While residential use is not anticipated, polynuclear aromatic hydrocarbons (PAHs) and PCBs were determined to be COCs under this use. PAHs were determined to be COCs for ecological receptors. Lead was detected at a maximum concentration of 1,510 milligrams per kilogram (mg/kg) in Site 1 surface soils and has been determined to be a COC under the planned industrial use of the property. Aroclor 1260, PAHs, mercury and zinc were COCs for ecological receptors in Site 1 soil, while the PAHs are COCs for ecological receptors in OU2 soils.

A total of nine groundwater monitoring wells at OU3 were sampled. The results of the groundwater sampling indicate that hazardous substances disposed in both the Site 1 and Site 2 landfills had migrated to downgradient groundwater.

Thirteen volatile organic compounds (VOCs) were detected in groundwater and three of them (TCE, 2-butanone and acetone) exceeded both MCLs and tap water RBCs for one or more rounds of sampling.

TCE was consistently detected at up to 35 µg/L in two wells (02GW32 and 02GW102) during the first four rounds of sampling in 1999. Since then, only one TCE exceedance has been detected at one location (02GW32) during post-closure monitoring.

Six semi-volatile organic compounds (SVOCs) were detected in groundwater samples, and only bis (2-ethylhexyl)phthalate exceeded both its MCL and tap water RBC for one round of sampling.

No pesticides or PCBs were detected in groundwater samples.

Four explosives were detected in groundwater samples and one of these (RDX) exceeded its tap water RBC concentration.

Eighteen metals were detected in groundwater samples and six of these (aluminum, arsenic, iron, lead, manganese and thallium) exceeded both their MCL and tap water RBC for one or more rounds of sampling.

Perchlorate was detected in one well (2GW101) during the first round of sampling (February 1999) at a concentration of 5.89 µg/L, below the drinking water standard of 15 µg/L.

A total of fourteen sediment samples were collected for TCL/TAL analysis and an additional nine samples were collected for PCB analysis. The results of sediment sampling indicate that Aroclor 1260 and PAHs have migrated from Site 1 and/or 2 to sediment within a drainage swale and intermittent stream and that these compounds are COCs for ecological receptors. The maximum detected concentrations for Aroclor 1260 and total PAHs in sediment are 143 mg/kg and 41 mg/kg, respectively. Sediments requiring remediation as part of this action were limited to a drainage swale and an intermittent stream which are part of OU2. This intermittent stream is a tributary of Paint Branch, which, is designated as Class III — Natural Trout Waters [Code of Maryland Regulations (COMAR) 26.08.02]. Based on the conceptual site model, the sediment COCs could eventually migrate to Paint Branch.

Eight VOCs were detected in surface water samples and only one, tetrachloroethene (PCE) at 5.6 µg/L, exceeded both its MCL and tap water RBC for one round of sampling.

A single detection of perchlorate (5.6 µg/L at SW-02 during the fourth round) was less than the drinking water standard of 15 µg/L. No other explosives were detected in surface water samples.

Twelve metals were detected in surface water samples and three of them (iron, lead and manganese) exceeded both their MCL and tap water RBC for one or more rounds of sampling.

2.2.4 Risk Assessment Summary

The following risk summaries were developed from the information in the ROD, before the remedy was implemented.

2.2.4.1 Human Health Risk Summary

A streamlined risk assessment was performed for the landfill source areas consisting of an evaluation of surface and subsurface soil data for OU2 to determine which hazardous substances may present an unacceptable risk to human health. Per EPA Military Landfill Guidance (USEPA, 1996), a detailed assessment of risk posed by these source areas and identification of COCs within a landfill source area is not required because any unacceptable risks posed by the source area will be mitigated by the presumptive containment remedy. However, in this case, part of the landfill source area will likely be excavated for consolidation under the planned containment area. As a result, COCs have been identified below based on an evaluation of available surface and subsurface soil data.

Based on available data, lead is the only known COC for human health in soils within the OU2 landfill source areas. While residential use of the property is not reasonably anticipated, Site 1 landfill source area soils have been found to present an unacceptable carcinogenic risk under this use where the primary contributors to the risk are PAHs, Aroclor 1260, dieldrin, and heptachlor epoxide, and Site 2 landfill source area soils were found to present an unacceptable carcinogenic risk for this residential use where the primary contributors were PAHs, PCBs, dieldrin, and arsenic (see Table 2-1).

There were no COCs for human health identified in sediment under the anticipated commercial/industrial future use scenario. However, manganese in sediment was found to present an unacceptable non-carcinogenic risk under potential residential use.

The following chemicals were retained as potential contaminants of concern (COPCs) in groundwater:

- Chlorinated VOCs: TCE
- Other VOCs: 2-butanone and acetone
- SVOCs: bis(2-ethylhexyl) phthalate (BEHP)
- Explosives: RDX, perchlorate
- Metals: aluminum, arsenic, iron, lead, manganese, and thallium

Table 2-2 summarizes the groundwater risk results for various exposure populations.

Under current conditions, there is no unacceptable human health risk associated with contaminants in groundwater and surface water because groundwater and surface water at OU3 is not being used as a potable water source.

Non carcinogenic HIs associated with exposure to OU3 groundwater and surface water under a construction or hypothetical future residential scenario exceeded the EPA's acceptable target of unity. In addition, the ILCRs associated with exposure to groundwater under a hypothetical future residential scenario were above the $1X10^{-4}$ upper limit of EPA's acceptable range. The presence of non-carcinogenic risk warrants that an evaluation of remedial alternatives be conducted to determine if action or institutional controls are needed to reduce groundwater concentrations or mitigate exposure.

2.2.4.2 Ecological Risk Assessment

A Base-wide Ecological Risk Assessment (BERA) was developed for base wide soil and sediment risk-based levels for several chemicals (TtNUS, 2001a). At Site 1, the maximum detected total PAHs, total PCBs, mercury (only via the food chain pathway), and zinc exceed the risk-based levels. Therefore, potential risk to soil invertebrates and wildlife exist from these contaminants in the surface soil. None of the COPCs were detected in the OU2 soils at concentrations that exceed the risk-based levels. Therefore, potential risk to soil invertebrates and wildlife from these contaminants in the surface soil is expected to be low.

Aroclor 1260 and PAHs in sediment have been determined to present unacceptable risk to ecological receptors and are COCs in sediment. PCB, PAH, mercury and zinc concentrations in soils within the Site 1 landfill source area also have been determined to present an unacceptable risk to ecological receptors and are COCs in soils within the Site 1 landfill source area.

Actual or potential releases of hazardous substances from the OU2 landfills and associated sediment, if not addressed by a remedial action, may present an imminent and substantial endangerment to public health, welfare and the environment.

2.3 REMEDY IMPLEMENTATION

Corrective measures for soil and sediment potentially impacted by Sites 1 and 2 are presented in the OU2 ROD. Corrective measures for groundwater and surface water potentially impacted by Sites 1 and 2 are presented in the OU3 ROD.

2.3.1 Remedial Action Objectives

The RAOs for OU2 have been developed assuming the site will be used for commercial/industrial purposes. The RAOs for the soil, waste and sediment at Sites 1 and 2, as presented in the ROD (Navy, 2001), include the following:

- Prevent direct contact with landfill contents/soil
- Minimize infiltration and resulting contaminant migration to groundwater
- Control surface water runoff and erosion
- Eliminate exposure of ecological receptors to sediments

The RAOs for groundwater for OU3, as presented in the ROD (Navy, 2004), include the following:

- Prevent human exposure through ingestion, inhalation, and dermal contact to groundwater having contaminants at concentrations in excess of maximum concentration standards (MCSs).
- Comply with ARARs and TBCs as appropriate.

Because it is not USEPA's policy to require a remedial action for groundwater beneath a landfill cap, no MCSs were developed and the following minimum RAOs were developed:

- Prevent human exposure through ingestion, inhalation, and dermal contact to groundwater with COC concentrations greater than screening criteria.
- Mitigate further migration of COCs.

Meeting the RAOs for groundwater is largely based on achieving the criteria in the following table.

2.3.2 Selected Remedy

The selected remedy for the OU2 landfill consists of seven major components:

- Excavation, regrading, and consolidation of soil and waste at Sites 1 and 2
- Treatment and disposal, as necessary, of any incompatible waste encountered during excavation and regarding of soil, waste, and of wastewater generated during excavation and/or regarding of waste, soil and sediment
- Restoration of disturbed areas
- Construction of engineered multimedia cap components for Sites 1 and 2
- Installation of surface water controls and vegetation of landfill cap

- Institutional controls
- Surface water and groundwater monitoring

The selected remedy for OU3 consists of three major components:

- Natural attenuation
- Institutional controls
- Groundwater and surface water monitoring

2.3.3 Remedial System Operation and Maintenance

An operation and maintenance (O&M) plan has been prepared for the OU2 landfill. Based on the site visit conducted on October 11, 2011, O&M activities appear to be adequate in maintain the integrity of the landfill cap.

The only O&M activities associated with OU3 are inspection and maintenance of the monitoring wells.

2.4 PROGRESS SINCE LAST REVIEW

This is the second five-year review of OU2 and OU3. The recommendations from the First Five-Year Review Report (JM Waller 2007) are provided below, along with the actions taken to address the recommendations. In general, the site inspection found that the cap system was working as intended, and that overall, the site is in very good condition.

- GSA should consider extending the existing fence along the south side of the landfill and any other locations along the landfill perimeter where there is currently no fence.

  Access to the landfill by vehicles or equipment from the south side of the landfill is restricted by the presence of the unnamed tributary to Paint Branch. The need for the fence along the perimeter is not believed to be necessary.

- The two monitoring wells (MW-32 and an unidentified well) between the south side of the landfill and the unnamed stream should either be repaired or abandoned due to their poor condition and inability to be secured. The remainder of the monitoring wells should be inspected for their physical condition and ability to be secured.

  The monitoring wells are inspected during each monitoring event. Of the damaged wells, MW-32 was repaired while the damaged monitoring (MW-30) was abandoned in December 2011.

- Groundwater monitoring should be continued at 15 month intervals to determine the type and concentration of contaminants leaving the landfill and to meet state and federal regulations.

  Groundwater monitoring has been conducted since landfill closure. The most recent sampling event was conducted in October 2011; the next event is scheduled for January 2013.

- The landfill cover and drainage structures should be inspected following major storm events to identify any obstructions or erosion.

  The drainage structures have been inspected periodically since landfill closure. Over this time, no damage has been noted following any major storm event. Semi-annual inspections are recommended to ensure the proper functioning of the cap and drainage system.

2.5 FIVE-YEAR REVIEW PROCESS

This section provides a summary of the five-year review process and the actions taken to complete this review.

2.5.1 Document Review

The documents reviewed for the third five-year review are listed below, and key information obtained from the documents is summarized in the following sections.

First Five-Year Review completed	April 2007
Round 8 - OU2 Sampling Memorandum	August 2008
Round 9 – OU2 Sampling Memorandum	January 2010
Round 10 – OU2 Sampling memorandum	February 2012

2.5.2 Data Review

2.5.2.1 Monitoring Data Review

Groundwater monitoring is being conducted as part of post-closure activities associated with OU2 to evaluate the effectiveness of the remedial action. The monitoring program was designed to determine the following:

- The effectiveness of the remedial action in preventing the migration of COPCs at concentrations greater than monitoring criteria to underlying groundwater and surface water.

- The effectiveness of the remedial action in eliminating health risks.
- Whether the criteria used for evaluating the data have been met.

Surface water quality at OU2 appears to have improved compared with prior sampling events. Inorganic compounds, VOCs, and perchlorate were detected in the surface water samples, whereas there were no detections of explosives. The data indicate that landfill has little to no impact on surface water quality at the site. The results of the October 2011 surface water sampling are presented in Appendix C (Tetra Tech, 2012a).

Chlorinated compounds were detected in several groundwater samples but at low concentrations. HMX was detected in several groundwater samples while perchlorate was detected in five of six monitoring wells sampled. Inorganic compounds were also found in the groundwater samples but at concentrations less than applicable screening criteria with the exception of arsenic and manganese within a single well within the limits of the landfill. The data indicate that groundwater quality within the limits of the landfill is not significantly impacted nor is contamination migrating from the site. The results of the October 2011 groundwater sampling are presented in Appendix C.

2.5.2.2 O&M Data Review

Inspections are being conducted as part of post-closure O&M activities associated with OU2. The goal of the inspections is to determine if appropriate O&M is being performed to maintain the effectiveness of the remedial action. As shown in the table below, three inspections have been performed at OU2 since the Second Five Year Review and within the period being evaluated in this Second Five-Year Review.

Year	Final Report Date
2008	August 2008
2009	January 2010
2011	April 2011

The overall conclusions of the inspections for each year were that the land use for the site had remained unchanged and in general, the landfill and its associated features appeared to be functioning as designed, were in overall good condition, and were meeting the long-term remedial objectives. The reports all described OU2 as being in very good condition.

The reports did identify the need to repair 2 monitoring wells at the site, work which was completed in December 2011.

2.5.3 Site Inspection

The Apple Orchard Landfill was inspected October 11, 2011. The focus of the inspection was on the engineered cap system installed over the Apple Orchard Landfill. Weather conditions during the inspection were warm (low-70s) and sunny. Photographs taken of site features during the inspection are provided in Appendix A. The site inspection checklist completed during the inspection is provided in Appendix B.

The site inspection included visual observations of the current condition of the engineered landfill cap system at OU2. During the inspection, it was observed that the site has remained unchanged since the remedial action. Signs were present during the inspection at the entrances to the site, warning that access is only for authorized users and personnel should not dig at the site.

The drainage structures consist of two main rip-rap drainage channels (one on the east side and one on the west side of the landfill), one culvert on the west side of the landfill, and several smaller rip-rap areas. All drainage structures appeared to be in good condition and functioning as intended.

The passive gas vents were briefly inspected and there were no signs of damage, cracking or leakage.

A double wire strand fence exists on three sides of the landfill (north, east and west sides) with site access from the south limited by the presence of a deep stream.

Land Use Controls (LUCs) include restrictions which prohibit the use of groundwater for potable use. In addition, there are land use controls in the form of deed restrictions to prohibit residential use of the property and to ensure that the integrity of the cap is maintained through restrictions on any excavation within the landfill cap boundary. The LUCs will remain in effect until contamination levels drop or the waste is removed from the site which allows for unrestricted use of the site. Based on the site inspection, there was no evidence that any of these LUCs have been violated.

Deficiencies

- No deficiencies with the landfill cover system were identified during the inspection.

O&M Issues

- Several small trees were observed on the landfill cap that should be removed. Any plant with woody roots and a root depth greater than the cap thickness could puncture the geomembrane.

2.5.4 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

2.5.5 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC Remedial Design was developed during the Design Phase and has been approved by EPA and MDE. The following institutional controls have been implemented:

Institutional controls are being implemented to further reduce the potential for exposure to contaminants and to ensure maintenance of the cap. The controls for OU2 consist of:

- Land use restrictions and/or deed notifications to prohibit residential use of the property and to ensure the integrity of the cap is maintained.

- In addition, access to the area of OU2 outside the cap will be restricted to exclude day-care children unless a post-excavation risk assessment demonstrates that there is no unacceptable risk for this use.

Institutional controls for OU3 include:

- Ensure no withdrawal of groundwater for any purpose (including drinking water) from within the restricted area shown until PRGs are met and risks from groundwater are reduced to acceptable levels.

- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area.

- Ensure adequate protection to minimize physical disruption of any remedial equipment, such as monitoring wells in the restricted area.

- Ensure adequate notification or pertinent use restrictions to current and future owners.

No violations of any of the above LUCs were observed during the site inspection.

2.5.6 Community Involvement

The Proposed Plan, RI and the CMS for OU2 became available for review by the public on March 28, 2001, and are among the documents that comprise the Administrative Record file for former NSWC White Oak, which is maintained by NAVFAC Washington at the Washington Navy Yard, Washington, DC. These documents are also located in the information repository for the NSWC White Oak, which is maintained at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland. The notice of the availability of these documents, the public comment period, and a public meeting was published in the *PG Journal, Silver Spring Gazette, College Park Gazette,* and *Burtonsville Gazette* on March 28, 2001. The public comment period was held from March 28, 2001 to April 27, 2001, and a public meeting was held on April 17, 2001.

The Proposed Plan for OU3 was released for public comment on January 2, 2004. The plan identified natural attenuation, institutional controls, and monitoring for groundwater as the preferred alternative. The Navy reviewed all comments received during the public comment period, January 2, to February 1, 2004, and at the public meeting held January 13, 2004. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Upon completion of this Second Five-Year Review, the results will be made available to the RAB members at their next meeting. The results of the five-year review and the report will be made available to the public at the Washington Navy Yard.

2.6 ASSESSMENT

The following conclusions support the determination that the remedy for the Apple Orchard Landfill is currently protective of human health and the environment.

Question 1. Is the remedy functioning as intended by the decision documents?

The review of documents, monitoring results, and the site inspection indicate that the final remedy consisting of a multimedia cap, monitored natural attenuation (MNA), institutional controls, and groundwater and surface water monitoring is functioning as intended by the RODs. The multimedia cap is effective in preventing direct contact between the landfilled waste and any human and ecological receptors. The cap also minimizes any infiltration of rainwater or runoff into the landfill and therefore minimizes the amount of leachate coming out of the landfill.

The institutional controls are responsible for controlling access to the landfill area and protecting human receptors from any direct contact with contaminated soil or ingestion of groundwater. The site inspections did not identify any disturbances of the ground surface at OU2 or signs of any residential use, which would have violated the institutional controls.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, clean-up levels, and RAOs identified in the RODs are still valid, except for perchlorate. The PRG for perchlorate has changed from 3.6 µg/L to 15 µg/L, which has expedited reaching the PRG and satisfaction of the cleanup RAOs that involve perchlorate.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

The multimedia cap, MNA, institutional controls, and groundwater and surface water monitoring are effective in protecting human receptors from any direct contact with or ingestion of groundwater. The multimedia cap is also minimizing the amount of leachate generated, which could potentially enter the surface water and sediments of the unnamed steam south of the landfill.

2.7 ISSUES

The multimedia cap, MNA, institutional controls and monitoring at OU2 and OU3 are functioning as intended by restricting exposure to groundwater and soil contaminants by human and ecological receptors. No issues were identified based on the site inspection and a review of the monitoring results.

2.8 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Based on the results of the site inspection and review, the following recommendations are made for OU2:

- Consistency is needed in the long-term monitoring (LTM) efforts; the 15 month period has not been met on a regular basis.

- Groundwater monitoring should be continued at 15 month intervals to determine the type and concentration of contaminants leaving the landfill and to meet state and federal regulations.

- A reduction in the parameter list for surface water is recommended given the lack of detection of contamination. This would include the removal of explosives, perchlorate, and all VOCs with the exception of TCE from the surface water sampling program. It is also recommended that the number of surface water sampling locations be reduced from six to four given the lack of contamination observed to date.

2.9 PROTECTIVENESS STATEMENT

Based on a review of the existing monitoring data and the site inspection, the selected remedy of a multimedia cap, MNA, institutional controls, and groundwater monitoring is functioning as intended and is protecting human and ecological receptors from exposure to soil and groundwater contamination.

2.10 NEXT REVIEW

The next Five-Year Review for OU2 and OU3 is required by 2017, five years from the date of this review.

TABLE 2-1

SUMMARY OF OU2 HUMAN HEALTH RISK
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Receptor	Medium	COC	Cancer Risk	Noncancer Risk
Adult resident	Soil and sediment	Benzo(a)pyrene, Aroclor 1260, dieldrin, arsenic	**1.3 E-04**	5.3 E-02
Child resident	Soil and sediment	Benzo(a)pyrene, Aroclor 1260, dieldrin, arsenic, manganese	**1.4 E-04**	**4.1**
Full-Time Worker	Soil	Benzo(a)pyrene, Aroclor 1260	1.1 E-05	
Maintenance Worker	Soil and sediment	Benzo(a)pyrene, Aroclor 1260	6.1 E-06	
Construction Worker	Sediment	Benzo(a)pyrene, Aroclor 1260	3.2 E-06	
Recreational User	Soil and sediment	Benzo(a)pyrene, Aroclor 1260	6.5 E-06	
Adolescent Trespasser	Soil and sediment	Benzo(a)pyrene, Aroclor 1260	6.6 E-06	
Day Care Child	Soil	Benzo(a)pyrene, Aroclor 1260	1.3 E-05	

Bold values exceed EPA health risk criteria.

TABLE 2-2

SUMMARY OF HEALTH RISK FOR OU3 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Hazard Index and Cancer Risk for OU3 Groundwater in Coastal Plain/Saprolite						
	Full Time Worker	Maintenance Worker	Construction Worker	Day Care Child	Adult Resident	Child Resident
Total HI - RME	0.0082	0.15	0.76	0.018	14	33
Total HI – CTE	0.0036	0.076	0.76	0.081	6.6	21
	Full Time Worker	Maintenance Worker	Construction Worker	Day Care Child	Adult Resident	Child Resident
Total ILCR -RME	1.5 E-7	2.2 E-7	4.5 E-8	8.3 E-8	1.2 E-4	6.9 E-5
Total ILCR – CTE	2.4 E-8	4.0 E-8	4.5 E-8	1.8 E-8	1.6 E-5	1.5 E-5

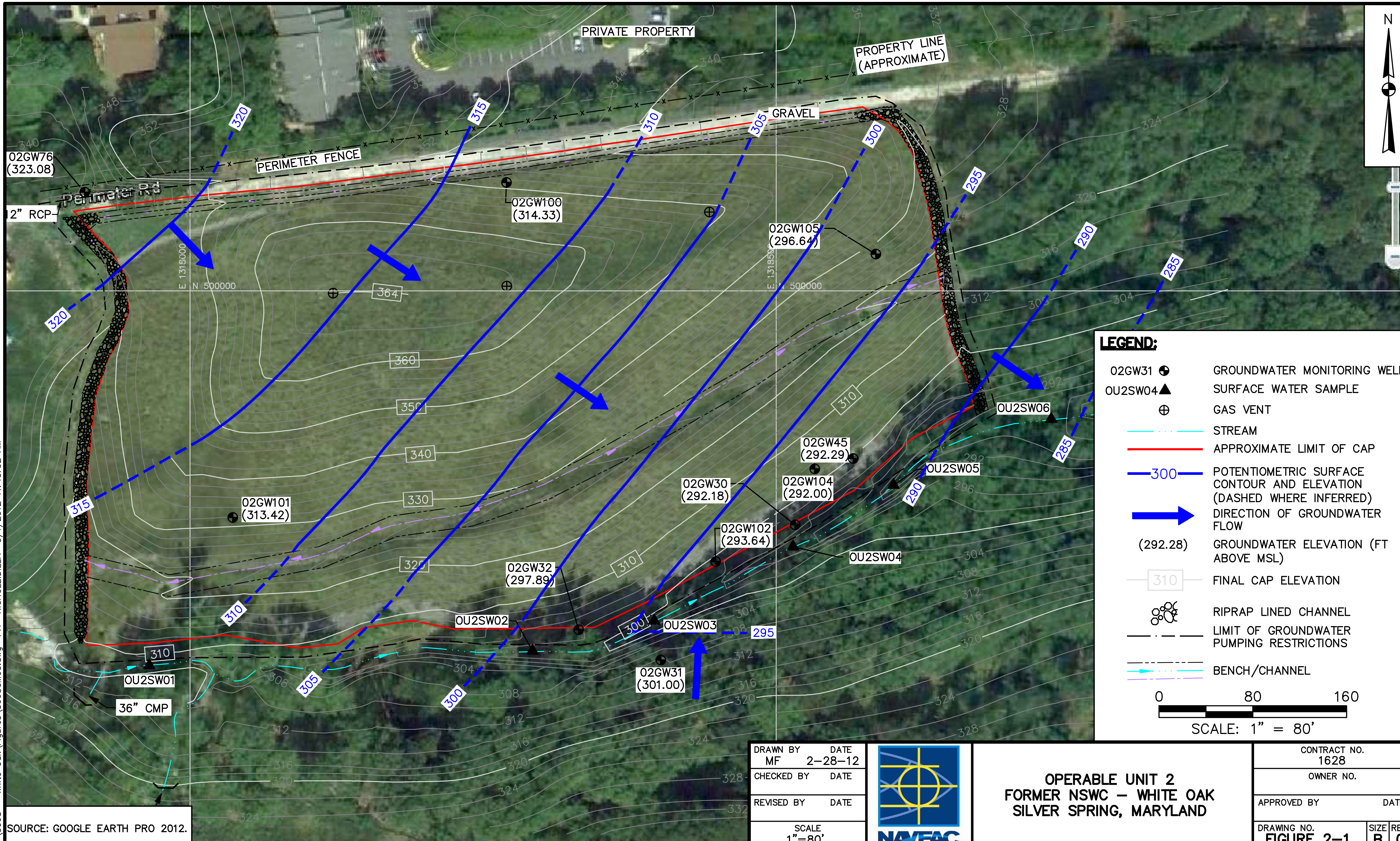
HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

TABLE 2-3

CRITERIA FOR CHEMICALS OF CONCERN AT OU3
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

GROUNDWATER		
COC	**CRITERIA (µg/L)**	**Basis**
TCE	5	MCL
acetone	610	Region III RBC
2-butanone	1,900	Region III RBC
Bis-(2ethylhexyl)phthalate	4.8	Region III RBC
RDX	0.61	Region III RBC
perchlorate	3.6	Region III RBC
Aluminum	50-200	NSDWR
Arsenic	10	MCL
Iron	300	NSDWR
Lead	15	MCL
Manganese	50	NSDWR
Thallium	2	MCL

MCL = Maximum Contaminant Level
RBC = Risk Based Concentration
NSDWR = National Secondary Drinking Water Regulation



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3.0 SITE 4 — CHEMICAL BURIAL AREA

3.1 SITE HISTORY

Site 4 was identified as a Navy IRP site in an IAS conducted by NEESA in 1984. The purpose of the IAS was to identify sites at NSWC White Oak that would undergo potential environmental investigation.

A Confirmation Study Verification Phase for NSWC White Oak was conducted in 1985 (Malcolm-Pirnie, April 1987). This study was performed to confirm the findings of the IAS and to obtain additional information in characterizing site hazards.

A Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) was conducted by Keamey/Centaur Division, November 1990. The RFA identified 97 SWMUs and 19 areas of concern (AOCs) at NSWC White Oak.

An RI was conducted in two phases between January 1989 and March 1992 (Malcolm-Pirnie, October 1992). The results of the RI confirmed the presence of soil and groundwater contamination at Site 4.

A Design Verification Study (DVS) was conducted in 1995 to prepare remedial designs for Sites 2, 3, 4, 8, 9, and 11. Activities included record reviews, terrain conductivity surveys, test pit excavation, and subsurface soil and sediment sampling. In conjunction with the Design Verification Study, a wetlands delineation and forest stand inventory were conducted for Sites 2, 3, 4, 8, 9, and 11.

In 1995, former NSWC White Oak was selected for closure on the BRAC IV list. A Phase I Environmental Baseline Survey (EBS) was conducted by EA Engineering Science and Technology (EA) to assess the existing environmental information related to storage, release, treatment, or disposal of hazardous substances or petroleum products and to document the environmental condition of the property.

In 1997, a site investigation (SI) was conducted at Site 46 to investigate the nature and extent of chlorinated VOCs detected in this area which is situated downgradient of Site 4.

An RFI was conducted for the immediate area around Site 4 (and five other sites) that further characterized the nature and extent of contamination in soil and groundwater at Site 4 (TtNUS, October 2000). The RFI concluded that elevated risks were present from exposure to Site 4 soil contaminated with chlorinated VOCs, most notably TCE.

An FS was conducted for OU1 in 2003 (CH2M HILL, June 2003). The FS included an evaluation of remedial alternatives for Site 4 soil and groundwater. A soil interim removal action was conducted at Site 4 in the summer of 1999. During the removal action, approximately 23,000 tons (18,000 cubic yards) of contaminated soil and solid waste were removed and transported to a municipal solid waste landfill for disposal. The cleanup goals, which were based on industrial use standards, were met.

As a result of the findings from the various groundwater investigations, three interim measures were implemented to address contamination in the Site 46 area located on the Army property downgradient of Site 4.

- An air stripper was also added to the storm water outfall for the Army Building 500 area by the Navy in 1997.

- A groundwater extraction trench and treatment system (air stripper) were constructed near the government property line in 1998 to intercept the VOC plume and prevent contaminated groundwater from migrating offsite and discharging to the Site W Swale.

- In 1999, a system of three groundwater extraction wells was installed further upgradient in this VOC plume in order to reduce contaminant concentrations and contain contaminated groundwater closer to the source.

The Site 4 ROD was finalized in September 2005

3.2 BACKGROUND

3.2.1 <u>Site 4 Physical Characteristics</u>

Site 4 is relatively flat and surrounded by a rising slope to the east, south and west. There are no surface water features near the former burial pits. Surface water runoff from the immediate vicinity of the site flows toward the center of the site and infiltrates the soil overlying the area of the former burial pits and migrates into the subsurface soils. Figure 3-1 shows the layout of the Site 4 features.

The three primary stratigraphic units underlying the former NSWC White Oak are the Coastal Plain sediments, saprolite, and bedrock. The Coastal Plain deposits consist of silty sand, sand and gravel underlain by clayey sand with gravel. Results of the surface geophysical survey and soil borings indicate Coastal Plain deposits vary between 50 and 100 feet throughout the majority of Site 4 and OU1 but abruptly reduce in thickness near the streams, and are completely weathered away in the major stream valleys. Furthermore, the deposits are thickest in the northern portion of the site and become thinner in a southerly direction. Site data also show the Coastal Plan/saprolite contact to be an undulating surface.

Groundwater flow in the vicinity of the plume is to the south-southeast. The average hydraulic gradient between the Site 4 source area and the toe of the plume is 0.013. However the gradient is slightly lower near the source area (approximately 0.008) compared to the midpoint of the plume (0.017). The geometric mean hydraulic conductivity for the Coastal Plain deposits is 5.25 feet per day based on recent aquifer pumping tests. Using the average hydraulic gradient (0.013) and the geometric mean hydraulic conductivity and assuming a porosity of 0.25, the average groundwater flow velocity is estimated at 100 feet per year.

3.2.2 Land and Resource Use

GSA, which owns the property overlying the groundwater containing the highest concentrations of contaminants, has no immediate plans to use this area. The Army property is currently being used for industrial purposes.

The private properties overlying the far southern extent of the plume cover approximately 16 acres. There are no drinking water supply wells located on these properties and all of the properties are provided with water from a public source. Groundwater at Site 4, and throughout the former NSWC White Oak, is not used as a potable water source at this time and is unlikely to be used for such purposes in the future. Local ordinances prevent the installation of new private potable supply wells without a permit. Nonetheless, for the purposes of the site assessment, the site was evaluated assuming the possibility of residential use for the entire area including the use of groundwater as a primary drinking water source (U.S. Navy, Site 4 Record of Decision, September 2005).

3.2.3 Nature and Extent of Contamination

The nature and extent of contamination at Site 4 can be summarized as follows:

The source of TCE and 1,1,2,2-tetrachloroethene (1,1,2,2-PCA) contamination was waste and contaminated soil in the Site 4 chemical burial area. These source materials were excavated at Site 4 as part of a non-time critical removal action conducted in June through August 1999. The excavation extended to a depth of 27 feet below the former ground surface in many locations. TCE and 1,1,2,2-PCA concentrations after removal presented an unacceptable risk to receptors from contact with the soil, and represented a potential source of groundwater contamination through leaching.

Confirmation soil samples collected from the bottom and the side walls of the excavation indicated that PAHs, total petroleum hydrocarbons (TPH), and VOCs, namely TCE, remain in the soil at depths of approximately 14 feet below the current ground surface. Of these contaminants, only TCE was also present in the groundwater at concentrations that exceed the PRGs. PAH contaminated soils remain in-place primarily in the northern half of the excavation (Burial Area 1), although several spots in the central and southern part of the excavation (Burial Area 2) also contained detectable concentrations. The concentrations of TPH in soil samples ranged from 170 µg/kg on the bottom of the Burial Area 1 excavation to 5,900 mg/kg on the bottom of the Burial Area 2 excavation. TCE was only detected in soil samples from the bottom of the excavation in Burial Area 2.

The contaminated soil and waste have resulted in a plume of contaminated groundwater that averages 800 feet wide from east to west and extends approximately 3,300 feet south of Site 4 where the groundwater discharges into several surface water streams. The thickness of the plume is estimated to be the entire saturated zone within the Coastal

Plain deposits, approximately 25 feet. The plume is generally defined by groundwater containing TCE at concentrations greater than 5 µg/L. The COCs in this area and maximum concentrations found since the 1999 removal action at Site 4 consist of (in order of prevalence):

- TCE: 4,300 µg/L
- 1,1,2,2 PCA: 317 µg/L
- Vinyl chloride: 73 µg/L
- cis-1,2-dichloroethene (DCE): 402 µg/L
- 1,2-dichloroethane (DCA): 285 µg/L
- 2-amino-4,6-dinitrotoluene (DNT): 0.8 µg/L
- 4-amino-2,6-DNT: 1.0 µg/L
- Iron: 38,500 µg/L
- Benzene: 1,710 µg/L (detected in one well)
- Toluene: 2,490 µg/L (detected in one well)
- Perchlorate: 76 µg/L

Contamination is believed to be limited to the Coastal Plain hydrogeologic unit within the majority of the Site 4 plume. This conclusion is based on the lower hydraulic conductivity of the saprolite compared to the Coastal Plain deposits, the absence of contamination in wells screened in the saprolite downgradient of Site 4, and the absence of contamination in bedrock wells in the vicinity of Site 4, Building 500, and well nest 46GW213S.

Although Site 4 contaminants have been detected in surface water streams, the concentrations are below risk-based screening levels for all applicable exposure routes. No site-related contaminants have been detected in sediments in the receiving surface water streams.

3.2.4 Risk Assessment Summary

The following risk summaries were developed from the information in the ROD, before the remedy was implemented.

3.2.4.1 Human Health Risk Summary

It was assumed that the only exposure scenarios that might result in unacceptable risks from groundwater at Site 4 are those where unacceptable risks are present for OU1 as a whole, i.e. residential child, adult, and age-adjusted. The COPCs for groundwater were selected by identifying those OU1 COPCs that are present at concentrations corresponding to a cancer risk of $5.0X10^{-6}$ or higher, or an HI of 0.1 or above, and were detected in monitoring wells within the Site 4 source area and plume. The following chemicals were retained as COPCs in Site 4 groundwater:

- 1,1,2,2 PCA
- TCE
- cis-1,2-DCE
- 1,1-DCE
- 1,2- DCA
- vinyl chloride
- benzene
- toluene
- 2,4,6-trinitrotoluene
- 2-amino-4,6-DNT
- 4-amino 2,6-DNT
- Arsenic
- cadmium
- iron
- Perchlorate

Table 3-1 summarizes the groundwater risk results for various exposure populations.

3.2.4.2 Ecological Risk Assessment

The Navy conducted a BERA at former NSWC White Oak. The BERA also concluded that the soil following the interim removal action, and sediment and surface water in the streams do not present unacceptable risks to ecological receptors. As groundwater exposure is not associated with ecological receptors, Site 4 groundwater poses no unacceptable ecological risks.

3.3 REMEDY IMPLEMENTATION

The selected soil remedial action, soil vapor extraction (SVE), and the enhanced bioremediation of the groundwater have been implemented at the site.

3.3.1 Remedial Action Objectives

The Chemical Burial Area RAOs for groundwater, as presented in the ROD (Navy, September 2005), include the following:

- Prevent unacceptable risks to human receptors from exposure to contaminants in the groundwater.
- Where practicable, restore contaminated groundwater to a quality amenable to beneficial use (i.e., meet the PRGs identified).

Meeting these objectives for Site 4 is based upon achieving the PRGs for Site 4; the original PRGs are shown in Table 3-2. These PRGs were re-calculated in 2010 for each of the COCs identified for the Site 4 groundwater, based on updated toxicity values, most recent risk assessment methodology, and combined risks from the COCs in the Site 4 area groundwater (CH2MHill, 2010). The PRG established was the MCL (for those compounds that have MCLs) and the calculated risk-based PRG for chemicals that do not have MCLs. The PRG for perchlorate was based on the EPA health advisory.

The PRGs which were modified from those presented in the ROD and approved by the White Oak BCT include:

- 1,1,2,2-PCA: 2.4 µg/L
- Perchlorate: 15 µg/L
- Iron: 11,000 µg/L
- 1,1,2,2-Tetrachloroethane: 2.4 µg/L
- 2,4,6-trinitrotoluene: 2 µg/L
- 2-amino-4,6-dinitrotoluene: 6 µg/L
- 4-amino-2,6-dinitrotoluene: 6 µg/L

3.3.2 Selected Remedy

The primary components of the selected remedy are:

- Enhanced In-situ Bioremediation (EISB) to treat dissolved phase groundwater contamination.
- Continued operation of the existing groundwater extraction wells and trench and associated treatment system.
- Long-term monitoring of the in-situ reductive dechlorination area, existing extraction system areas and downgradient portions of the plume.
- Preparation of annual technical memoranda and 5-year reports.
- Implementation of institutional controls until PRGs are met.

The remedial design was implemented for the source area at Site 4 and the remedial action (EISB) was implemented beginning in 2007 with electron donor injection in the source area wells. Additional substrate injection was performed in 2009 in areas downgradient of the Source Area at Site 4 (200 and 300 Series Injection Wells).

3.3.3 Remedial System Operation and Maintenance

The groundwater component of the remedy for Site 46 included the operation of three interim groundwater extraction and treatment systems including the Centrifuge Extraction System, Site W Swale, and the Building 502 Treatment Systems. Although these three systems comprised the Site 46 treatment systems, they were addressing the contaminated plume from Site 4. These systems were inspected monthly and repaired/replaced as necessary. The first of these systems was put into operation in 1997. These interim measures have since ceased operation as they were no longer deemed to be cost effective in reducing contaminant mass at the site and as potential risks to human health associated with exposure to untreated surface water were evaluated and found to be acceptable (Navy, April 2007 and Navy, September 2007).

The SVE system installed in 2007 was operated through 2009 to treat elevated VOC contamination in site soil. The monitoring data collected over time indicated a reduced performance and the system is no longer operational. The system remains in place and its future use will be evaluated as part of the continued O&M of the Site 4 remedial action.

3.4 PROGRESS SINCE THE LAST FIVE-YEAR

This is the second Five-year Review for the Site 4 Chemical Burial Area at the former NSWC White Oak facility. The recommendations from the First Five-Year Review Report (JM Waller 2007) are provided below, along with the actions taken to address the recommendations.

- Continue the routine O&M inspections of the Building 502 and Site W Swale on a monthly basis, given the age of the system.

  Operation of the Building 502 and Site W Swale treatment systems have ceased given the lack of contaminant mass removal and lack of associated risk.

- All the rotted wood pieces or panels on the Site W Swale treatment building should be replaced.

  Replacement of the rotted wood pieces is no longer needed as the Site W Swale treatment system is no longer active.

- Replace the contact information sign on the outside of Building 502.

  The contact information does not require updating given that the treatment system is not active.

3.5 FIVE-YEAR REVIEW PROCESS

3.5.1 Administrative Components

This section provides a summary of the five-year review process and the actions taken to complete this review. The components of the Five-Year Review process include the following:

- Community involvement
- Document review
- Site inspection
- Data and Performance Evaluation
- Five-Year Review report development and review

3.5.2 Community Involvement

The Proposed Plan for Site 4, the RI and FS for OU1 (including Site 4) and other documents relevant to the remedy selection for Site 4 groundwater and soil were made available to the public in June 2003 in an information repository for NSWC White Oak that is maintained at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland. The notice of the availability of these documents, the public comment period, and a public meeting was published in the Washington Post on June 19, 2003, and in the Silver Spring Gazette, College Park Gazette, and Burtonsville Gazette on June 18, 2003. The public comment period was held from June 24, 2003 to July 24, 2003, and a public meeting was held on July 8, 2003.

Upon completion of this Five-Year Review, the results will be made available to the RAB members at the next meeting. The results of the review will be made available to the public at the local Information Repository at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland.

3.5.3 Document Review

The documents reviewed for the second five-year review are listed below, and key information obtained from the documents is summarized in the following sections.

First Five-Year Review completed	April 2007
Disposition of the Building 502 Treatment System	April 2007
Disposition of Site 46 Groundwater Treatment System	September 2007
Baseline Groundwater Sampling Results Site 4 Remedial Action	July 2008
Summary of Monitoring Well and Injection Well Installation Activities, Site 4 (Series 300 Area) Wells	November 2009
White Oak SVE System Analysis and Recommendations	November 2009
Completion of Emulsified Vegetable Oil Injection Activities, September 2009 through November 2009 Site 4	December 2009
Baseline Groundwater Sampling Results for Site 4 300-Series Remedial Action	March 2010
Baseline Groundwater Sampling Results for Site 4 200-Series Remedial Action	March 2010
Revisions to Preliminary Remediation Goals Sites 4/46, 7, 9, 5/13, and 49. Former NSWC-White Oak, Silver Spring, Maryland	October 2010

3.5.4 Data Review

The results of the most recent sampling event are provided in Appendix C. These data along with the documents listed above were reviewed as part of the Five-Year review. The data were evaluated for the four areas of the Site 4 groundwater remediation, the Source Area, 100 Area, 200 Area, and 300 Area injection wells. The well locations are identified on Figure 3-1.

Source Area - Overall, the changes in VOC concentrations in the Source Area wells are consistent with those expected during the reductive dechlorination process and indicate that the system is performing as expected. Significant declines in TCE have been observed in each well. Daughter products of TCE have been produced and are being converted to ethene. Persistently elevated concentrations of cis-1,2-DCE in well 04GW413 suggest that additional residual TCE may remain present in the Source Area and may require further treatment. The continued declines in TCE and cis-1,2-DCE concentrations in well 04GW407 indicate that the VOC reductions achieved in the Source Area are having a positive influence in reducing the VOC mass flux downgradient of the site, even without additional substrate injection in the 50-series wells since 2007. Reducing conditions are being maintained within the Source Area. TOC data through December 2010 indicate that adequate TOC appears to be present in wells within the Source Area to sustain the reductive dechlorination process for some period of time.

100 Series Wells - Overall, the VOC, TOC and geochemistry data indicate that enhanced reductive dechlorination of VOCs was successfully achieved and, to some degree, continues to occur within the 100-series injection area. Significant reductions in VOC concentrations have been achieved throughout the treatment zone. TOC data over the last 4 monitoring events indicates that substrate injected in 2007 appears to be generally depleted. Groundwater conditions remain reducing throughout the 100-series area. The increase in TCE in well 04GW412 may indicate that the effectiveness of reductive dechlorination in this well is declining. However, TCE concentrations, as well as most other VOC concentrations, in other wells in this area remain low.

200 Series Wells - Overall, the VOC, TOC and geochemistry data indicate that enhanced reductive dechlorination of VOCs was successfully achieved and, to some degree, continues to occur within the 200-Series injection area. Groundwater conditions remain reducing throughout the 200-Series area. TCE concentrations declined significantly in most wells in the 200-Series. However, TCE concentrations appear to have rebounded to near 2009 baseline conditions in wells 04GW501D and 04GW504D. TOC data indicate that substrate injected in 2009 appears to be adequate to continue to supply organic carbon to promote reductive dechlorination in several wells, such as 04GW502D, 04GW503S, and 04GW504S. TOC in other wells, such as 04GW502S, 04GW501S, 04GW503D, and 04GW504D, has declined to below 50 mg/L. Declining substrate levels in the vicinity of these wells may lead to a decline in the amount of reductive dechlorination observed during future monitoring.

300 Series Wells - Overall, the VOC, TOC and geochemistry data indicate that enhanced reductive dechlorination of VOCs was successfully achieved and, to some degree, continues to occur within the 300-Series injection area. Groundwater conditions remain reducing throughout the 300-Series area. TCE concentrations declined significantly in most wells in the 300-Series. In general, TCE and total VOC concentrations in the 300-Series area appear to be somewhat lower than in the upgradient areas of the site. VC and ethene concentrations in the 300-Series wells were also lower than that observed in other areas of the site. This may indicate that this portion of the site may require additional time for a robust anaerobic microbial community to become established to facilitate complete degradation of VOCs. TOC data indicate that substrate injected in 2009 was effectively distributed in the aquifer but much of the TOC has been depleted. Declining substrate levels in the vicinity of the 300-Series wells may lead to a decline in the amount of reductive dechlorination observed during future monitoring. However, because of the significant reduction in VOC concentrations already achieved to-date, additional injection of substrate may not be required.

The EVO injection activities completed as a component of the EISB groundwater remedial action for Site 4 appear to have been effective with the overall reduction in the extent of the groundwater contaminant plume and an overall decrease in groundwater contaminant concentrations. The area of the TCE groundwater plume above the PRG of 5 μg/L has been reduced by approximately 45 percent across the site and average TCE groundwater concentrations are decreasing at all areas of Site 4. Trend analysis of TCE concentrations in wells at each of the Site 4 areas indicates the TCE concentrations are declining. Reductive dechlorination of VOCs was successfully achieved and, to some degree, the process continues to occur at Site 4 based on an evaluation of the VOCs and supporting geochemical data. The detection of ethene indicates that complete degradation of TCE is occurring.

3.5.5 Site Inspections

Site 4 was inspected on October 11, 2011. The purpose of the inspection was to assess the protectiveness of the implemented remedial action, including the presence of access restrictions and other LUCs. Appendix A contains the site inspection checklists. Photographs taken during the site inspection are included in Appendix B.

The monitoring wells were all locked and appeared to be in good condition at the time of inspection; however, there was insufficient time to inspect all the wells during the site visit.

The LUCs for Site 4 appear to be functioning as intended. Although there is no fence around Site 4, the site is located within a secured area of the facility, which in effect controls access to the site. A fence exists between the perimeter road (upgradient of Site 4) and Percontee Sand and Gravel. The fence in the vicinity of Site 4 appeared to be in good condition. Due to time constraints, the entire fenceline was not inspected. In addition there were no physical signs of any residential use or disturbance of the ground surface during the site inspection.

LUCs also include written restrictions, which control the conduct of activities on the site. These restrictions are typically found in documents such as deeds and other property transfer documents. At the time this Five-Year Review was prepared. The LUCs were still in the developmental stage. The LUCs will remain in effect until contamination levels drop to a level that allow for unrestricted use of the site.

3.5.6 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

3.5.7 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC Remedial Design was developed during the Design Phase, has been reviewed by EPA and MDE and the proposed language is currently being reviewed by the Navy. The following institutional controls have been or are in the process of being implemented:

- Ensure no withdrawal of groundwater for any purposes from within the restricted area until the PRGs are met and risks from groundwater use are shown to be reduced to acceptable levels.

- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area.

- Ensure adequate protection to minimize physical disruption of any remedial equipment, such as monitoring wells, or remedial operations in the restricted area.

- Ensure adequate notification of pertinent use restrictions to current and future owners.

Based on the site inspection on June 21, 2006, there is no evidence that any of these LUCs have been violated.

3.6 TECHNICAL ASSESSMENT

Question 1. Is the remedy functioning as intended by the decision documents?

The review of documents, monitoring results, and site inspection indicate that the final remedy, which included EISB at the Site 4 source area, continued operation of downgradient treatment systems, LUCs, and long-term monitoring, is functioning as intended by the ROD. The site inspections did not identify any problems or disturbances of the source area or the downgradient groundwater extraction/treatment areas. The LUCs are responsible for controlling access to the source area and protecting human receptors from any direct contact with contaminated soil and from ingestion of groundwater. The groundwater treatment activities have successfully reduced contaminant mass at the site. No evidence of any activities of an intrusive, residential, or disturbance nature were observed during the site inspection that would have violated any of the land use controls.

In summary, the EISB, land use controls, and long-term monitoring are successfully preventing human exposure to the site-related contaminants from the Chemical Burial Area.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, and RAOs used at the time of remedy are still valid.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has surfaced to question the protectiveness of the selected remedy.

The final remedy consisting of EISB, land use controls, and long-term monitoring, are closer to achieving the RAOs in the ROD by restricting exposure to site-related contaminants and reducing contaminant mass at the site. Analytical data from long-term monitoring of groundwater indicates that the PRGs for all COCs have not yet been attained at all monitoring wells however significant contaminant reduction has been observed across the site. The LUCs are effective in controlling access to the source area and protecting human receptors from any direct contact with contaminated soil and from ingestion of groundwater.

3.7 ISSUES

The Site 4 remedy of EISB, groundwater treatment, land use controls, and long-term monitoring have been implemented and are functioning as intended by reducing contaminant mass and restricting exposure to contaminants by human and ecological receptors.

The downgradient edge of the TCE and cis-1,2-DCE plumes contain concentrations above their respective PRGs. In order to further refine the understanding of the downgradient groundwater contaminant conditions and to give an indication of the downgradient edge of the TCE and cis-1,2-DCE plumes it is recommended the groundwater data from downgradient monitoring wells be evaluated along with the Site 4 LTM data.

3.8 RECOMMENDATIONS AND FOLLOW UP ACTIONS

The following recommendations are provided for the remedial action for Site 4 groundwater:

Continued Groundwater Monitoring – Continued post-injection LTM should be performed at Site 4, based on the Site 4 LTM Plan, with annual sampling events. These LTM events will be used to assess whether reductive dechlorination is continuing at Site 4 and whether additional treatment at Site 4 may be warranted. An evaluation of the EISB groundwater remedial action for Site 4 similar to the evaluation presented herein would be completed at the end of this 12-month period.

3.9 PROTECTIVENESS STATEMENT

The remedy for the Site 4 Chemical Burial Area is protective of human health and ecological receptors. The implementation of the EISB component has been effective in significantly reducing contaminant concentrations while LUCs have been effective in preventing usage of groundwater as a potable water supply and have also restricted activities within the site boundaries that could potentially disturb the surface of the site. Long-term monitoring of groundwater and five-year reviews help to ensure that the remedial actions are functioning as intended and that an overall reduction in groundwater contamination is being achieved.

3.10 NEXT REVIEW

The next Five-Year Review for Site 4 is required by 2017, five years from the date of this review.

TABLE 3-1

SUMMARY OF HEALTH RISK FOR SITE 4 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Hazard index for Site 4 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total HI - RME	30	48	NA
Total HI - CTE	5.7	9.7	NA
Incremental Lifetime Cancer Risk for Site 4 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total ILCR - RME	6.6 E-04	NA	5.5 E-03
Total ILCR - CTE	5.5 E-05	NA	1.0 E-03

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

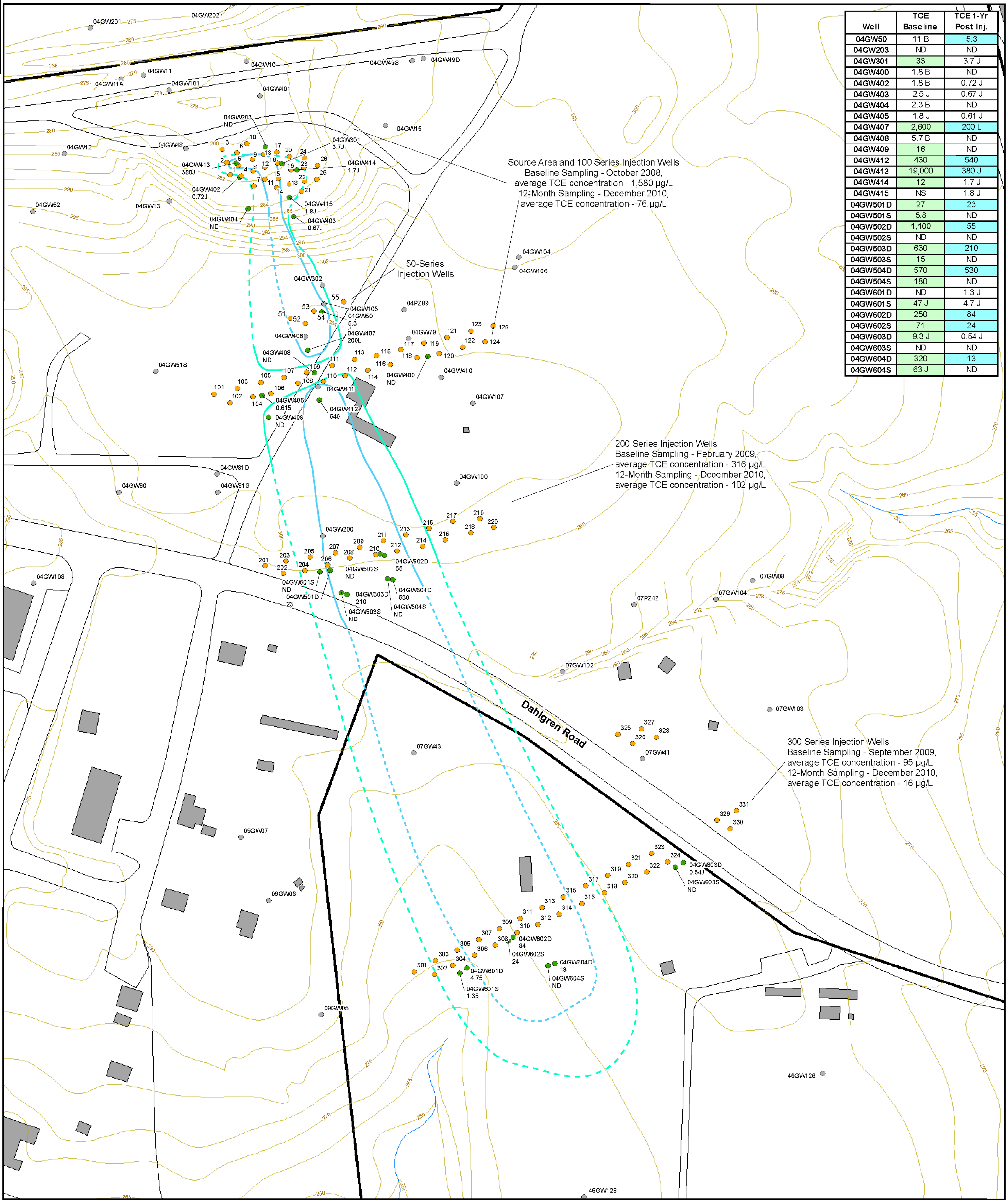
TABLE 3-2

PRGs FOR COCs IN SITE 4 ATTAINMENT AREA
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

COC	PRG (µg/L)	Basis
TCE	5	MCL
1,1,2,2 PCA	3	RBC
cis-1,2-DCE	70	MCL
1,2-DCA	5	MCL
Vinyl chloride	2	MCL
Iron (dissolved)	4,600	RBC

Source: ROD, Navy, September 2005

N



Well	TCE Baseline	TCE 1-Yr Post Inj.
04GW50	11 B	5.3
04GW203	ND	ND
04GW301	33	3.7 J
04GW400	1.8 B	ND
04GW402	1.8 B	0.72 J
04GW403	2.5 J	0.67 J
04GW404	2.3 B	ND
04GW405	1.8 J	0.61 J
04GW407	2,600	200 L
04GW408	5.7 B	ND
04GW409	16	ND
04GW412	430	540
04GW413	19,000	380 J
04GW414	12	1.7 J
04GW415	NS	1.8 J
04GW501D	27	23
04GW501S	5.8	ND
04GW502D	1,100	55
04GW502S	ND	ND
04GW503D	630	210
04GW503S	15	ND
04GW504D	570	530
04GW504S	180	ND
04GW601D	ND	1.3 J
04GW601S	47 J	4.7 J
04GW602D	250	84
04GW602S	71	24
04GW603D	9.3 J	0.54 J
04GW603S	ND	ND
04GW604D	320	13
04GW604S	63 J	ND

Legend

- Monitoring Well
- Long Term Monitoring Well
- Injection Well
- 12 Month TCE
- 12 Month TCE (inferred)
- Baseline TCE > 5 µg/L
- Baseline TCE > 5 µg/L (inferred)
- Topographic Contours (ft msl)
- White Oak/Army Property Line
- Buildings and Other Structures

Notes:
NS - Not Sampled
ND - Not Detected

90 0 90 Feet

Data courtesy of CH2M Hill.

DRAWN BY	DATE	TETRA TECH	CONTRACT NUMBER	CTO NUMBER
J. ENGLISH	02/01/12		3668	555
CHECKED BY	DATE	TCE PLUME BOUNDARIES	APPROVED BY	DATE
S. NESBIT	02/01/12	SITE 4	—	—
REVISED BY	DATE	NWSC WHITE OAK	APPROVED BY	DATE
—	—	SILVER SPRING, MARYLAND	—	—
SCALE			FIGURE NO.	REV
AS NOTED			FIGURE 3-1	0

4.0 SITE 5/13 — OPEN BURN AREA AND OIL SLUDGE DISPOSAL AREA

4.1. SITE HISTORY

Both Sites 5 and 13 were identified as Navy IRP sites in an Initial Assessment Study (IAS) conducted by NEESA in 1984. The purpose of the IAS was to identify sites at NSWC White Oak that would undergo potential environmental investigation.

NSWC White Oak operated under RCRA interim status for on-site storage of hazardous waste. The Navy first submitted an application for a final Part B permit to Maryland in 1985 and made subsequent resubmissions and modifications.

An RFA was conducted by Kearney/Centaur Division in November 1990. The RFA identified 97 SWMUs and 19 AOCs at NSWC White Oak. Forty SWMUs were recommended for further investigation in an RFI to assess the presence and migration of COPCs. SWMU 32 is associated with Site 5 while SWMU 7 is associated with Site 13. Both sites were recommended for investigation in an RFI.

In September 1992, Malcolm-Pirnie completed an RFA review for the Navy that evaluated the applicability of the general recommendations of the RFA to each individual SWMU. Site 5 and 13 were identified as sites of low to moderate priority based upon potential risk.

In 1995, former NSWC White Oak was selected for closure on the BRAC TV list. A Phase 1 EBS was conducted by EA Engineering Science and Technology to assess the existing environmental information related to storage, release, treatment, or disposal of hazardous substances or petroleum products and to document the environmental condition of the property.

Investigation activities specific to Sites 5 and 13 were first conducted in 1997 at part of the Site Screening Investigation for Sites 1, 5, 6, 12, 13, 28, 29, 31, 32, and 33 and AOC 100. The site screening investigation consisted of collecting a number of surface and subsurface soil samples at Sites 5 and 13 and installing and sampling 6 monitoring wells.

The groundwater impacted by Sites 5 and 13, as well as several other sites in this part of the NSWC White Oak was investigated further between 1999 and 2001 as part of the OU1 RI (CH2MHill, August 2002). OU1 includes the groundwater beneath IR sites in the eastern portion of White Oak, including the Site 5 and 13 areas. The OU1 RI showed that Site 13 groundwater contamination was separate from Site 4 and 46 and delineated the extent of contamination migrating northwestward from Site 13 onto the adjoining private property by installing and sampling 19 multi-depth monitoring wells.

A soil removal action was conducted in 2000, during which the circular soil berms were removed and used as clean backfill at nearby Site 3 and the top three feet of contaminated soil that made up the floor of the three bum rings was excavated and disposed of in an off-site landfill.

An RFI was conducted on the soil at Sites 5 and 13 in 2003. The RFI concluded that there were no risks presented by the Site 5 and 13 soil to either human or environmental receptors and that the soil did not represent a continuing source of contamination to the underlying groundwater.

An FS was conducted for OU1 in 2003 (CH2M HILL, June 2003). The FS included the evaluation of remedial alternatives for Site 13 groundwater.

The Site 5 and 13 ROD was finalized in September 2004.

4.2 BACKGROUND

4.2.1 <u>Site 5/13 Physical Characteristics</u>

The ground surface at Site 5 slopes generally to the south and southwest toward Dahlgren Road, and the maximum difference in elevation is approximately 30 feet. There are no surface water bodies within Site 5. The closest surface water body is a small, southward-flowing tributary (Westfarm Branch) of Paint Branch located approximately 420 feet west of BR-1. During rain events, surface water infiltrates into the surface soil or drains off-site toward drainage ditches along Dahlgren Road and ultimately to West Farm Branch. Figure 3-1 shows the layout of the Site 5 and 13 features.

The ground surface at Site 13 slopes gently to the west and consists of a relatively flat area. The maximum elevation relief across the site is approximately 5 feet, and the elevation of the site is approximately 260 feet. The topography immediately adjacent to Site 13 to the northwest, west and southwest drops steeply at a grade of approximately 33 percent into the valley formed by West Farm Branch approximately 300 feet west of the site. The steep slope between the Sites 5 and 13 area and West Farm Branch is the former location of Site 3, the Pistol Range Landfill, which was excavated in its entirety in 2000.

The soil underlying Sites 5 and 13 consists of a layer of silty sand and gravel (Coastal Plain deposits) ranging in thickness from 40 feet at the higher elevations on the east side of Site 5, to 10 feet on the west side of Site 13. The Coastal Plain is underlain by a 10 to 20-foot layer of decayed rock (saprolite). It grades from a micaceous silt or silty sand with varying amounts of clay and schist fragments to severely weathered schist with relief texture. Fractured rock underlies the saprolite, the competent bedrock is primarily a garnet schist; however, in the borings for the deep wells at NSWC White Oak, interbedded quartzites were observed.

The depth to the groundwater table varies from 25 feet on the east side of Site 5 to twelve feet at Site 13. While the upper portion of the water table aquifer resides in the relatively permeable Coastal Plain deposits on the east side of Site 5, the water table at Site 13 is present in the much-less permeable saprolitic soil. Groundwater flow beneath Site 5 is primarily to the south and southwest, while the flow beneath Site 13 is primarily to the northwest, toward and into Westfarm Branch.

4.2.2 Land and Resource Use

The combined area of Sites 5 and 13 consists of open field and woodlands approximately 3.5 acres in size. The area surrounding the field to the east, west and south is wooded property owned by the US Government. The property bounding the site to the north is an industrial property formerly operated as a sand and gravel quarry. The land overlying the groundwater contaminant plume originating in the Site 13 area and extending west and northwest to West Farm Branch consists of federal land owned by GSA and private property currently operated as a sand and gravel quarry.

GSA, which owns the property overlying the groundwater containing the highest concentrations of contaminants, has no immediate plans to use this area. The affected portion of the adjoining private property amounts to less than 1 acre and consists of an undeveloped and steeply sloped wooded hillside and floodplain of Westfarm Branch.

There are no water supply wells located on the property in the area within or downgradient of the plume. Groundwater at and downgradient of Sites 5 and 13, and throughout the former NSWC White Oak, is not used as a potable water source at this time and is unlikely to be used for such purposes in the future. Water for occupants of the former NSWC White Oak and the surrounding properties is (and is expected to continue to be) supplied by a local municipal water authority. Local ordinances prevent the installation of new private potable supply wells without a permit.

4.2.3 Nature and Extent of Contamination

4.2.3.1 Soil

The site screening investigation, conducted in 1997 and 1998 before the Site 5 soil removal action, identified miscellaneous fill material, discolored soil, and soil contaminated with petroleum hydrocarbons and SVOCs in the area of BR-1. The majority of the discoloration, odors, and elevated SVOC concentrations in the soil were in the top 2 to 3 feet. Contaminants that were still present in the Site 5 soil after the 2000 removal action consisted of low levels of SVOCs, PCBs, pesticides, explosives, and metals. Ten compounds slightly exceeded the risk-based screening criteria used by EPA Region 3 to identify potential risks to people in residential settings. These compounds were benzo(a)pyrene, dibenzo(a,h)anthracene, Aroclor 1260, dieldrin, 2-amino-4,6- dinitrotoluene, RDX, copper, selenium, and thallium.

At Site 13, soil samples were collected from above the water table during the 1997 Site Screening Investigation and as part of the 2002 RFI. The only contaminants that were detected above the EPA Region 3 risk-based screening criteria for residential soil were benzo(a)pyrene, dibenzo(a,h)anthracene, and several metals. While low levels of chlorinated VOCs (1,1,2,2-PCA, TCE, and 1,2-dibromo-3-chloropropane) were detected near the water table, they were not present at concentrations in excess of the risk-based criteria nor did they represent potential sources of groundwater contamination.

4.2.3.2 Groundwater

The Sites 5 and 13 groundwater contamination is centered in the area between the historically recognized area of Site 13 and the northern property line of the White Oak facility. The practices that led to this contamination and the exact location of the source are unknown. Based on groundwater screening data collected in 2001, the contaminants consist primarily of VOCs, which are 1,1,2,2-PCA, TCE, and cis-1,2-DCE, with lesser concentrations of PCE, trans-1,2-DCE and vinyl chloride. The well that consistently contains the highest VOC concentrations is well 13GW02, located on the north side of Site 13. A complete set of Sites 5 and 13 groundwater data collected since 1999 can be found in the FS for OU1 (CH2M Hill, June 2003).

The COCs in this plume, and the maximum concentrations of each, detected since 2000 are:

- 1,1,2,2-PCA: 1,100 µg/L
- cis-1,2-DCE: 581 µg/L
- TCE: 420 µg/L
- PCE: 150 µg/L
- Vinyl chloride: 20 µg/L
- RDX: 110 µg/L
- Iron (dissolved): 18,900 µg/L

4.2.4 <u>Risk Assessment Summary</u>

The following risk summaries were developed from the information in the ROD, before the remedy was implemented.

4.2.4.1 Human Health Risk Summary

Site specific risks were estimated for combined Sites .5 and 13 groundwater using the results of the OU1 wide risk assessment. Because the Sites 5 and 13 area is a sub-area of OU1 and many of the COPCs identified for OU1 are not found in Sites 5 and 13 groundwater, it is assumed the risks from Sites 5 and 13 will be less than those from the entire OU1 area. Also, it is assumed that the only exposure scenarios that might experience unacceptable risks from groundwater at Sites 5 and 13 are those where unacceptable risks are present for a residential child, adult, and age-adjusted resident. The COPCs for Sites 5 and 13 were selected by identifying those OU1 COPCs that are present at concentrations corresponding to a cancer risk of $5.0X10^{-6}$ or above, or an HI of 0.1 or above, and were detected in monitoring wells within the Site 13 source area and plume. The levels were selected to ensure that the overall risk from COCs across OU1 does not exceed a carcinogenic risk of $5.0\ X10^{-5}$ or noncancer hazard index of 1.

Inorganic compounds found in the groundwater at Sites 5 and 13 at concentrations that do not exceed base-wide background levels were excluded as COPCs for Sites 5 and 13 based on the background comparison conducted in the OU1 RI. The maximum detected chemical concentrations in groundwater were compared to the 95 percent upper tolerance limits calculated for the background data. Based on the Mann-Whitney U test; cobalt, manganese, and nickel are also present in the site groundwater at similar concentrations to the background groundwater.

The following chemicals were retained as COPCs in Sites 5 and 13 groundwater:

- 1,1,2,2-PCA
- PCE
- TCE
- cis-1,2- DCE
- vinyl chloride
- RDX
- Iron

Table 4-1 summarizes the groundwater risk results for various exposure populations.

4.2.4.2 Ecological Risk Assessment

At Site 5, one surface soil sample was collected for toxicity testing during the (BERA) due to elevated levels of PAHs in that sample. After a removal action was conducted at Site 5, the soil from the location of the toxicity test was no longer present. No other samples from Site 5 had chemical concentrations that exceeded the risk-based levels developed during the BERA; therefore risks to ecological receptors at Site 5 are expected to be within acceptable levels.

All chemical concentrations in surface soil samples collected at Site 13 were below the risk-based levels developed during the BERA; therefore risks to ecological receptors at Site 13 are expected to be within acceptable levels.

As groundwater exposure is not associated with ecological receptors, Sites 5 and 13 groundwater poses no ecological risks. No site-related chemicals were detected in the surface water or sediment in Westfarm Branch and therefore, risks to ecological receptors were not evaluated for this media relative to Sites 5 and 13.

4.3 REMEDY IMPLEMENTATION

An interim removal action was performed for soil prior to submittal of the ROD and no further action is required for soil. Only the groundwater remedial actions will be discussed here.

4.3.1 Remedial Action Objectives

The Open Burn Area and the Oil Sludge Disposal Area RAOs for groundwater, as presented in the ROD (Navy, September 2004), include:

- Prevent unacceptable risks to human receptors from exposure to contaminants in the groundwater.
- Where practicable, restore contaminated groundwater to a quality amenable to beneficial use (i.e., meet the PRGs identified).

Meeting these objectives for Site 5/13 is based primarily upon achieving the PRGs; the original PRGs are shown in Table 4-2. These PRGs were re-calculated in 2010 for each of the COCs identified for the Site 13 groundwater, based on updated toxicity values, most recent risk assessment methodology, and combined risks from the COCs in the Site 13 area groundwater (CH2MHill, 2010). The PRGs established were the MCL (for those compounds that have MCLs) and the calculated risk-based PRG for chemicals that do not have MCLs.

4.3.2 Selected Remedy

The primary components of the selected remedy are:

- Zero-valent iron injection (In-situ chemical reduction)
- Monitored Natural Attenuation
- Preparation of annual technical memoranda and 5-year review reports
- Implementation of institutional controls until PRGs are met.

4.3.3 Remedial System Operation and Maintenance

The remedial action consisting of zero-valent iron injection is complete. The only ongoing activity is monitored natural attenuation; therefore the only O&M activity is inspection and maintenance of the groundwater monitoring wells.

4.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second Five-year Review for the Site 5/13 area at the former NSWC White Oak facility. The recommendations from the First Five-Year Review Report (JM Waller 2007) are provided below, along with the actions taken to address the recommendations.

- GSA should replace or modify the gate and or fence so that there is insufficient space for a person to pass through. Also, inspect the remainder of the fence line in the vicinity of Sites 5 and 13 for any gaps or damage.

  A fence was installed on Percontee property along the Off-Site 13 LUC boundary, eliminating an access point on the White Oak property. Fencing adjacent to Sites 5 and 13 was inspected during and found to be secure.

In addition, a second ZVI injection activity was performed at Site 13 between April and November 2010. Implementation of ZVI injection was a component of the in situ remedial action to address the offsite groundwater contamination in the area northwest of Site 13.

Field activities began April 19, 2010, and were completed on November 5, 2010 and consisted of the following:

- Installation of a fence surrounding the Off-Site 13 target remediation zone (TRZ), partial removal of fence along the GSA property boundary, and completion of utility clearances at drilling locations.

- Drilling of 20 open injection boreholes and re-drilling of one existing injection borehole.

- Pneumatic fracturing and ZVI injection into open boreholes.

- Installation of three monitoring wells (screened in the saprolite) within and downgradient of the Off-Site 13 treatment zone.

- Well abandonment of 12 open injection boreholes on the Percontee property.

4.5 FIVE-YEAR REVIEW PROCESS

4.5.1 Administrative Components

The components of the Five-Year Review process include the following:

- Community involvement
- Document review
- Site inspection
- Data and Performance Evaluation
- Five-Year Review report development and review

4.5.2 Community Involvement

The Proposed Plan for Sites 5 and 13, the RI and FS for OU 1 (including Sites 5 and 13 groundwater), and the RFI for Sites 5 and 13 soil, became available to the public in September 2003 and are among the documents that comprise the Administrative Record file for NSWC White Oak , which is maintained by NAVFAC at the Washington Navy Yard, Washington, DC and are also in the information repository for the NSWC White Oak, which is maintained at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland. The notice of the availability of these documents, the public comment period, and a public meeting was published in the Washington Post on September 25, 2003, and in the Silver Spring Gazette, College Park Gazette, and Burtonsville Gazette on September 24, 2003. The public comment period was held from September 30, 2003 to October 30, 2003, and a public meeting was held on October 14, 2003.

Upon completion of this Five-Year Review, the results will be made available to the RAB members at their next meeting. The results of the five-year review and the report will be made available to the public at the NAVFAC Washington.

4.5.3 Document Review

The documents reviewed for the second five-year review are listed below, and key information obtained from the documents is summarized in the following sections.

First Five-Year Review completed	April 2007
Revisions to PRGs Sites 4/46, 7, 9, 5/13, and 49	October 2010
Completion of Monitoring Well Installation and Zero-Valent Iron Injection Activities, at Site 13 and Off-Site 13	June 2011
Monitoring Results – July 2011 Sampling Event	January 2012

4.5.4 Data Review

The data from most recent LTM event at Site 13 is presented in Appendix C. From a review of these data CVOC, RDX, and iron concentrations remain above PRGs at some sampling locations, however, significant contaminant reduction has been observed since the initiation of the remedial action.

Based on the Decision Rules presented in the Site 13 LTM Plan the following optimizations to the Site 13 LTM are recommended:

- Based on Decision Rule 2A – Discontinue the monitoring of well 13GW02 and 13GW200.

- Based on Decision Rule 2B - Eliminate VOC analysis at monitoring well 13GW205 and eliminate dissolved iron analysis at monitoring wells 13GW01 and 13GW04.

While there was a reduction in CVOC concentrations at several Off-Site 13 monitoring wells, additional data is needed before a trend analysis can be made.

4.5.5 Site Inspections

Site 5/13 was inspected on October 11, 2011. The purpose of the inspection was to assess the protectiveness of the implemented remedial action, including the presence of access restrictions and other land use controls (LUCs). Appendix A contains the site inspection checklists. Photographs taken during the site inspection are included in Appendix B.

The monitoring wells appeared to be in good condition at the time of inspection. Iron is observed at the surface adjacent to several injection locations.

The LUCs for Site 5/13 appear to be functioning as intended. A fence has been install recently at the site which corresponds with limits of the groundwater LUC.

LUCs also include written restrictions, which control the conduct of activities which could disturb the ground surface of the site. In addition, there are restrictions on the use of groundwater for consumption. There were no physical signs of any residential use or disturbance of the ground surface during the site inspection. At the time this Five-Year Review was prepared, the draft LUC RD is under review. The LUCs will remain in effect until contamination levels drop to a level that allow for unrestricted use of the site.

4.5.6 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

4.5.7 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC RD was developed during the Design Phase, has been reviewed by EPA and MDE and the proposed language is currently being reviewed by the Navy. The following institutional controls have been or are in the process of being implemented:

- Ensure no withdrawal of groundwater for any purposes from within the restricted area until the PRGs are met and risks from groundwater use are shown to be reduced to acceptable levels.

- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area.

- Ensure adequate protection to minimize physical disruption of any remedial equipment, such as monitoring wells, or remedial operations in the restricted area.

- Ensure adequate notification of pertinent use restrictions to current and future owners.

Based on the site inspection, there is no evidence that any of these LUCs have been violated. These institutional controls will be maintained until the concentrations of hazardous substances in the groundwater are at such levels to allow for unrestricted use and exposure.

4.6 TECHNICAL ASSESSMENT

Question 1. Is the remedy functioning as intended by the decision documents?

The review of documents, monitoring results, and site inspection indicate that the final remedy, which includes ZVI injection, LUCs, and monitored natural attenuation is functioning as intended by the ROD. The site inspections did not identify any problems or disturbances of Site 5/13. The land use controls are responsible for controlling access to the source area and protecting human receptors from ingestion of groundwater. No evidence of any activities of an intrusive, residential, or disturbance nature, that would have violated any of the land use controls, was observed during the site inspection.

Groundwater monitoring showed significant decreases for all the VOCs and in some cases the PRGs have been attained. In addition, the LUCs prevent use of groundwater at Site 5/13. In summary, the ZVI injection, LUCs, and monitored natural attenuation are in place to successfully prevent human exposure to the site-related contaminants from the Open Bum and the Oil Sludge Disposal Areas.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, clean-up levels, and RAOs identified in the ROD are still valid.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has surfaced to question the protectiveness of the selected remedy.

The final remedy consisting of ZVI injection, LUCs, and monitored natural attenuation is successful towards achieving the RAOs in the ROD. Analytical data from long-term monitoring of groundwater indicates that four of six COCs have met the PRGs and concentrations of the other COCs, except iron, have decreased dramatically. The LUCs are effective towards controlling access to the source area and protecting human receptors from any direct contact with contaminated soil and from ingestion of groundwater

4.7 ISSUES

The Site 5/13 remedy of ZVI injection, LUCs, and monitored natural attenuation has been implemented and is functioning as intended by restricting exposure to contaminants by human and ecological receptors. No issues were identified during the review.

4.8 RECOMMENDATIONS AND FOLLOW UP ACTIONS

Based on the issues identified in the previous sections, the following recommendations are provided:

- LTM should continue per the existing LTM plan.

4.9 PROTECTIVENESS STATEMENT

The remedies for the Site 5 Open Burn Area and Site 13 Oil Sludge Disposal Area are protective of human health and ecological receptors based on achieving the RAOs specified in the RODs. LUCs have been effective in preventing usage of groundwater as a potable water supply and have also restricted activities within the site boundaries that could potentially disturb the surface of the site. Monitored Natural Attenuation and five-year reviews help to ensure that the remedial actions are functioning as intended and that an overall reduction in groundwater contamination is being achieved.

4.10 NEXT REVIEW

The next Five-Year Review for Site 5/13 is required by 2017, five years from the date of this review.

TABLE 4-1

SUMMARY OF HEALTH RISK FOR SITE 5/13 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Hazard index for Site 5/13 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total HI - RME	9	21	NA
Total HI - CTE	0.6	1.9	NA
Incremental Lifetime Cancer Risk for Site 5/13 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total ILCR - RME	5.0 E-04	NA	1.7 E-03
Total ILCR - CTE	3.7 E-05	NA	2.8 E-04

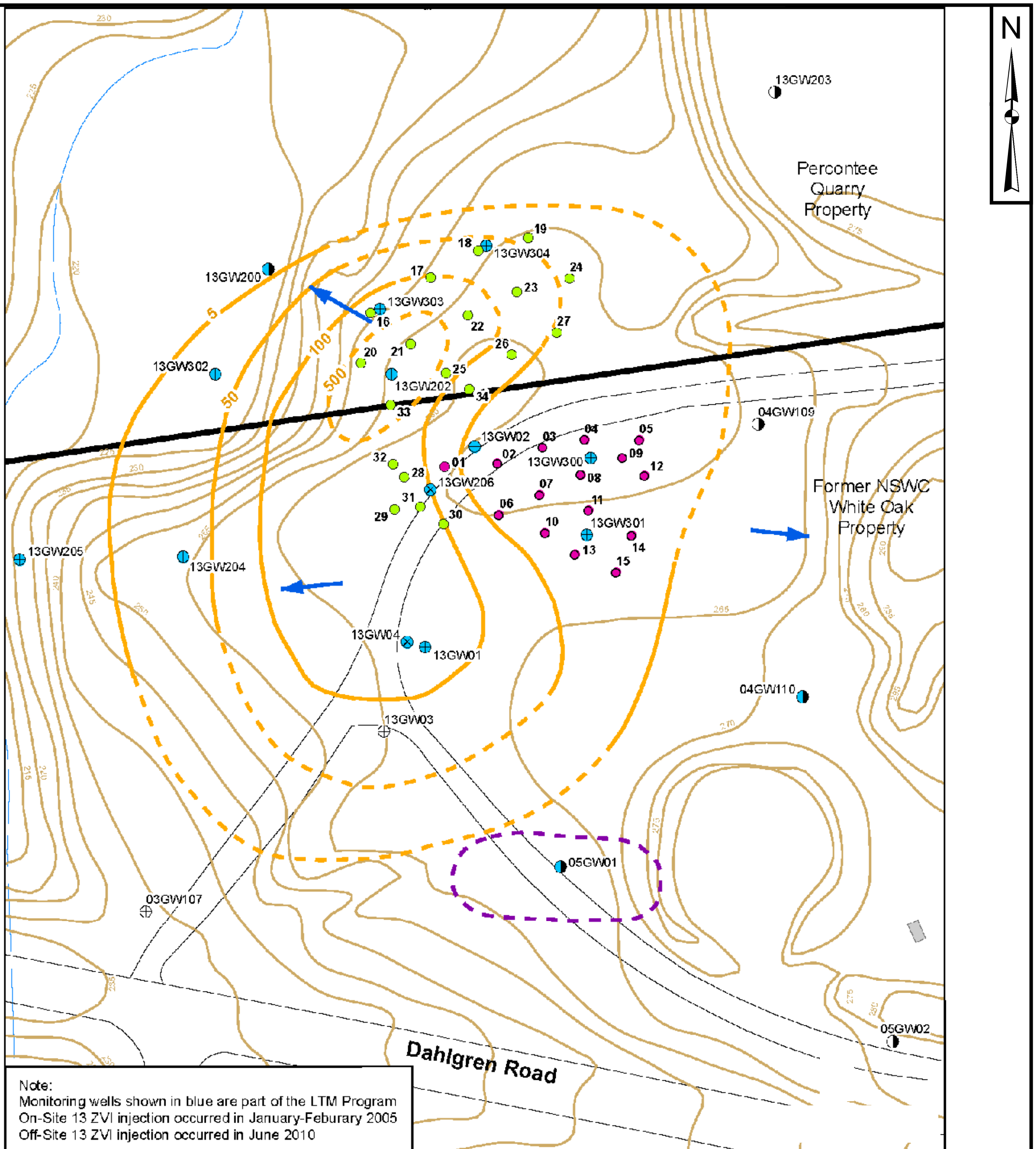
HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

TABLE 4-2

PRGs FOR COCs IN SITE 5/13 ATTAINMENT AREA
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

COC	PRG (µg/L)	Basis
TCE	5	MCL
PCE	5	MCL
1,1,2,2 PCA	3	RBC
cis-1,2-DCE	70	MCL
Vinyl chloride	2	MCL
RDX	6	RBC
Iron (dissolved)	4,600	RBC

Source: ROD, Navy, September 2004



Note:
Monitoring wells shown in blue are part of the LTM Program
On-Site 13 ZVI injection occurred in January-Feburary 2005
Off-Site 13 ZVI injection occurred in June 2010

Legend

- 2005 ZVI Injection Location
- 2010 ZVI Injection Location
- Saprolite
- Bedrock
- Coastal Plain or Alluvial
- RDX above PRG (6 µg/L) for Site 5
- Total CVOCs contour (µg/L: August 2009)
- Inferred Total CVOCs Contour
- Topography (5 feet Intervals)
- Water Bodies
- Roads
- Federal Research Center Property Line (Former Naval Surface Warfare Center-White Oak)
- Buildings
- Groundwater Flow Direction

0 100 Feet

Data courtesy of CH2M Hill.

DRAWN BY	DATE	TETRA TECH	CONTRACT NUMBER	CTO NUMBER
J. ENGLISH	02/01/12		3668	555
CHECKED BY	DATE	SITE AND OFF-SITE WELL AND ZVI INJECTION LOCATIONS	APPROVED BY	DATE
S. NESBIT	02/01/12	SITE 13	___	___
REVISED BY	DATE	NWSC WHITE OAK	APPROVED BY	DATE
___	___		___	___
SCALE		SILVER SPRINGS, MARYLAND	FIGURE NO.	REV
AS NOTED			FIGURE 4-1	0

5.0 SITE 7 — ORDNANCE BURN AREA

5.1 SITE HISTORY

Site 7, also known as the Ordnance Bum Area, consists of a large shallow ditch approximately 20 feet wide and 400 feet long which reportedly was used to dispose of waste ordnance materials between 1948 and 1968. Wastes disposed at this site included various types of explosives, primarily nitroaromatic and nitroaliphatic compounds, which were placed in the ditch and ignited. It has been reported that approximately 33.000 pounds of explosives were burned here over 20 years. The intent of the disposal operations was to burn all the waste residue, so that no solid wastes remained in the ditch. However, investigations indicate that surface soil and groundwater were affected by site operations, and that some wastes remain.

Site 7 was identified as a Navy IRP site in an IAS conducted by the Navy's NEESA in 1984. The purpose of the IAS was to identify sites at NSWC White Oak that would undergo potential environmental investigation.

NSWC White Oak operated under RCRA interim status for on-site storage of hazardous waste. The Navy first submitted an application for a final Part B permit to Maryland in 1985, and made subsequent resubmissions and modifications.

An RFA was conducted by Kearney/Centaur Division, November 1990. The RFA identified 97 SWMUs and 19 AOCs at NSWC White Oak. Forty SWMUs were recommended for further investigation in an RFI to assess the presence and migration of COPCs. SWMU 31 is associated with Site 7.

A Remedial Investigation (Malcolm Pirnie, October 1992) was performed, including among other things, soil and groundwater sampling at Site 7. This investigation suggested that soil contaminants at Site 7 might potentially affect groundwater quality.

In 1995, former NSWC White Oak was selected for closure on the BRAC IV list. A Phase I EBS was conducted by EA Engineering Science and Technology (EA) to assess the existing environmental information related to storage, release, treatment, or disposal of hazardous substances or petroleum products and to document the environmental condition of the property. The EBS was finalized and submitted in April 1996 (EA, April 1996).

An RFI (TtNUS, September 1999) was completed for six sites at White Oak, including Site 7; it included surface and subsurface soil sampling ad groundwater sampling at Site 7. The investigation concluded that elevated risks were present from exposure to soil contaminated with explosive compounds High Melting Explosive (HMX) and RDX. Additional groundwater data were obtained in 1999 during four rounds of sampling of numerous wells throughout White Oak, including the nine wells that existed at Site 7 at the time.

The groundwater affected by Site 7 was investigated further as part of the OU1 RI (CH2M Hill, August 2002). OU1 includes the groundwater beneath IR sites in the eastern portion of White Oak, including the Site 7. The OU1 RI focused primarily on the downgradient edges of the various groundwater plumes within OU1, as well as the surface water and sediment in the bounding streams. Initially, only one well in the Site 7 source area was sampled.

A soil removal action was conducted in November 2002, during which approximately 3,600 tons of soil contaminated with explosives residue was excavated and disposed off-site. The soil was disposed offsite in a permitted non-hazardous waste landfill. Following the removal action, verification sampling was conducted to confirm the removal of the contaminated soil to levels protective of human health and the environment. A 2-foot layer of mulch and 2,000 gallons of vegetable oil were added to the site soil during the restoration activities to aid in the creation of subsurface conditions favorable to anaerobic degradation of contaminants in the groundwater and any residuals in the soil. Three new groundwater monitoring wells were installed at Site 7 after the completion of the removal action to address data gaps identified in the OU1 RI and to allow more accurate cost estimates of remedial alternatives for the FS.

The Site 7 ROD was finalized in September 2004.

5.2 BACKGROUND

5.2.1 <u>Site 7 Physical Characteristics</u>

Site 7 consists of a slightly depressed swale. The rest of the area adjacent to the swale is relatively flat with a gentle eastward slope. Located just east of Site 7 is a dry swale leading south into Floral Drive stream, which runs along the eastern boundary of the former White Oak property and Floral Drive. The Floral Drive stream, which is southeast of Site 7, flows south into Paint Branch.

The subsurface geology of Site 7 consists primarily of Coastal Plain deposits, which are silty sand, sand, and gravel underlain by clayey sand with gravel or silt. The Coastal Plain deposits are approximately 50-75 feet thick through Site 7, and are underlain with saprolite of the Wissahickon Formation. The saprolite grades from a micaceous silt or silty sand with varying amounts of clay and schist fragments to a severely weathered schist with relict structure; it varies in thickness from 5 to 55 feet (and possibly greater).

The competent bedrock is a gneiss and begins at approximately 80 to 130 feet bgs.

The depth to groundwater is about 40 feet, increasing from north to south across the site from about 36 to 55 feet. The aquifer is about 25 feet thick. The site geology is silty sand/sand and gravel underlain by clayey sand with gravel or silt. Coastal Plain sediments are underlain with saprolite. Data from well 07GW201, screened in the saprolite, indicates that contamination is present only in the groundwater in the Coastal Plain sediments. Groundwater flow is to the southeast and south with the hydraulic gradient estimated at 0.006 ft/ft (CH2M Hill, August 2002). The hydraulic conductivity in the Coastal Plain deposits was estimated at 6.6 ft/day from slug tests performed at the site wells. Using an effective porosity of 0.25, an average groundwater flow rate of 59 feet per year is assumed.

5.2.2 Land and Resource Use

Site 7 consists of a slightly depressed 20 by 400 foot swale. The rest of the area adjacent to the swale is either cleared or covered by woodland or grass. Site 7 is located north of Dahlgren Road and the fenced area that contains Buildings 501, 506, and 508. GSA, which owns the property, has no immediate plans to use Site 7. For the purposes of the risk assessment, the site was evaluated assuming the possibility of future residential use.

Groundwater at Site 7, and throughout the former NSWC White Oak, is not used as a potable water source at this time and is unlikely to be used for such purposes in the future. Water for occupants of the former NSWC White Oak and the surrounding properties is (and is expected to continue to be) supplied by a local municipal water authority. Local ordinances prevent the installation of new private potable supply wells. Nonetheless, for the purposes of the site risk assessment, the groundwater was evaluated as a potential residential drinking water source.

5.2.3 Nature and Extent of Contamination

5.2.3.1 Soil

Contaminants found in the soil prior to the removal action and their maximum detected concentrations were 2,4,6-TNT (2,000 mg/kg), RDX (2,700 mg/kg), HMX (900 mg/kg), 2-amino 4,6-DNT (4 mg/kg), 4-amino-2,6-DNT (6 mg/kg), PCBs (0.38 mg/kg), and PAHs.

In November 2002, approximately 3,600 tons of soil were excavated and disposed of at an offsite facility. The area of excavation measured 400 feet long by 20 feet wide on average. The depth of soil excavation ranged from 4 feet bgs at the east and west ends of the trench, to approximately 12 feet bgs in the center of the trench near wells 07GW08 and 07GW104. Verification samples were collected and analyzed by an off-site laboratory in order to confirm cleanup and assess any remaining risks.

The contaminants with maximum concentrations detected in the soil remaining after the removal action were: RDX (2.1 mg/kg), HMX (9.7 mg/kg), 2-amino 4,6-DNT (2.2 mg/kg), 4-amino-2,6-DNT (1.3 mg/kg).

5.2.3.2 Groundwater

The nature and extent of groundwater contamination at Site 7 is based on the data presented in the RFI (TtNUS, September 1999), Addendum Rounds 1, 2, 3 & 4 (TtNUS, April 2000), the OU1 RI (CH2M Hill, August 2002), and the OU1 FS, (CH2M, June 2003). Complete data for the Site 7 wells from 1999 to 2003 is provided in the referenced documents.

The contaminants in the groundwater at the Site 7 source area consist of 5 explosives corning from an upgradient source at Site 4. These compounds and their maximum concentrations between 1999 and 2003 are listed below.

- 2-amino-4,6-DNT: 140 µg/L
- 4-amino-2,6-DNT: 210 µg/L
- 2,4,6-TNT: 410 µg/L
- HMX: 500 µg/L
- RDX: 1300 µg/L
- Perchlorate: 29 µg/L
- TCE: 17 µg/L

The area of greatest contamination in the groundwater coincides with the historic area of explosive residue burning and documented soil contamination at Site 7. This area is approximately 240 feet long and 10 to 20 feet wide. The width of the head of the plume is estimated based on the presence of contaminated soil found during the 2002 removal action and the 2003 groundwater data from wells 07GW200 and 07GW202, both of which show no contamination.

5.2.4 <u>Risk Assessment Summary</u>

The following risk summaries were developed from the information in the ROD, before the remedy was implemented.

5.2.4.1 Human Health Risk Summary

Site specific risks were estimated for the Site 7 groundwater using the results of the OU1 wide risk assessment. Because Site 7 is a sub-area of OU1 and many of the COPCs identified for OU1 are not found in the Site 7 groundwater, it is assumed the risks from Site 7 will be less than those from the entire OU1 area. Also, it is assumed that the only exposure scenarios that might experience unacceptable risks from groundwater at Site 7 are those where unacceptable risks are present for a residential child, adult, and age-adjusted resident. The COPCs for Site 7 were selected by identifying those OU1 COPCs that are present at concentrations corresponding to a cancer risk of $5.0X10^{-6}$ or above, or an HI of 0.1 or above, and were detected in monitoring wells within the Site 7 source area and plume. These levels were selected to ensure that the overall risk from COCs across OU1 does not exceed a carcinogenic risk of $5X10^{-5}$ or noncancer HI of 1.

Inorganic compounds found in the groundwater at Site 7 at concentrations that do not exceed base-wide background levels were excluded as COPCs for Site 7 based on the background comparison evaluation conducted in the 0U1 RI. The maximum detected chemical concentrations in groundwater were compared to the 95 percent upper tolerance limits calculated for the background data. Based on the Mann-Whitney U test; cobalt, manganese, and nickel are also present in the site groundwater at similar concentrations to the background groundwater.

The following chemicals were retained as COPCs in Site 7 groundwater:

- RDX
- 2,4,6-TNT
- 2-amino-4,6-DNT
- 4-amino-2,6-DNT
- TCE
- Perchlorate
- Cadmium
- Iron

Table 5-1 summarizes the groundwater risk results for various exposure populations.

5.2.4.2 Ecological Risk Assessment

The Navy conducted a BERA at former NSWC White Oak. The procedures followed in conducting the BERA are outlined in the April 2001 final report. The BERA consisted of screening all soil, surface water, and sediment data collected at the facility against applicable ecological risk-based screening criteria.

This data included soil data from Site 7 as well as sediment and surface water data from the Floral Drive stream. The BERA concluded that there was no risk from Site 7 soil prior to the 2002 removal action. The subsequent removal action, conducted to address potential risks to human receptors, has further mitigated the potential impact of the site contaminants on ecological receptors. The BERA also concluded that the sediment and surface water in the Floral Drive stream does not present unacceptable risks. As groundwater exposure is not associated with ecological receptors, Site 7 groundwater poses no unacceptable ecological risks.

5.3 REMEDY IMPLEMENTATION

An interim removal action was performed for soil prior to the ROD and no further action is required for soil. Only the groundwater remedial action will be discussed here.

5.3.1 Remedial Action Objectives

The Ordnance Burn Area RAOs for groundwater, as presented in the ROD (Navy, September 2004), include the following:

- Prevent unacceptable risks to human receptors from exposure to contaminants in the groundwater.
- Where practicable, restore contaminated groundwater to a quality amenable to beneficial use (i.e., meet the PRGs identified).

Meeting these objectives for Site 7 is based primarily upon achieving the PRGs; the original PRGs are shown in Table 5-2. The PRGs were re-calculated for each of the six COCs identified for the Site 7 groundwater attainment area, based on updated toxicity values, most recent risk assessment methodology, and combined risks from the COCs in the Site 7 area groundwater (CH2MHill, 2010). The PRG established was the MCL (for those compounds that have MCLs) and the calculated risk-based PRG for COCs that do not have MCLs. The PRG for perchlorate was based on the EPA health advisory.

5.3.2 Selected Remedy

The primary components of the selected remedy are:

- Enhanced Anaerobic Bioremediation (sodium lactate injection)
- Groundwater Monitoring
- Implementation of institutional controls until PRGs are met.

5.3.3 Remedial System Operation and Maintenance

The remedial action of enhanced bioremediation through injection of sodium lactate is complete. The only ongoing activity is groundwater monitoring; therefore O&M activities include inspection and maintenance of the injection and monitoring wells.

5.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second Five-year Review for the Site 7 Ordnance Burn Area at the former NSWC White Oak facility. The recommendations from the First Five-Year Review Report (JM Waller 2007) are provided below, along with the actions taken to address the recommendations.

- A follow-up injection to address the rebound in contaminant concentrations should be performed, and in fact has already been initiated by the Navy while this document was being prepared. Groundwater monitoring should be continued to ensure that the explosives and other COC concentrations remain below the PRGs.

  Groundwater monitoring has been continued since the follow-up injection and the results have identified significant contaminant reductions.

5.5 FIVE-YEAR REVIEW PROCESS 5.5.1 ADMINISTRATIVE COMPONENTS

This section provides a summary of the five-year review process and the actions taken to complete this review. The components of the Five-Year Review process include the following:

- Community involvement
- Document review
- Site inspection
- Data and Performance Evaluation
- Five-Year Review report development and review

5.5.1 Community Involvement

The Proposed Plan for Site 7, and the RI and FS for OU1 (including Site 7) became available to the public in June 2003 and are among the documents that comprise the Administrative Record file for NSWC White Oak, which is maintained by NAVFAC at the Washington Navy Yard, Washington, DC and also in the information repository for the NSWC White Oak, which is maintained at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland. The notice of the availability of these documents, the public comment period, and a public meeting was published in the Washington Post on June 19, 2003, and in the Silver Spring Gazette, College Park Gazette, and Burtonsville Gazette on June 18, 2003. The public comment period was held from June 24, 2003 to July 24, 2003, and a public meeting was held on July 8, 2003.

Upon completion of this Five-Year Review, the results will be made available to the RAB members at their next meeting. The results of the five-year review and the report will be made available to the public at NAVFAC Washington.

5.5.2 Document Review

The documents reviewed for the second five-year review are listed below, and key information obtained from the documents is summarized in the following sections.

First Five-Year Review completed	April 2007
Revisions to PRGs Sites 4/46, 7, 9, 5/13, and 49	October 2010
2010 Annual Post-Injection Groundwater Sampling Results for Site 7	March 2011

5.5.3 Data Review

From a review of the most recent monitoring data, concentrations of all COCs were below PRGs, including RDX concentrations in wells 07GW105 and 07GW300, which exceeded PRGs during the prior sampling events. There were no COCs detected at concentrations greater than the PRGs in any of the samples collected during the September 2010 LTM sampling event.

5.5.4 Site Inspections

Site 11 was inspected on October 11, 2011. The purpose of the inspection was to assess the protectiveness of the implemented remedial action, including the presence of access restrictions and other LUCs. Appendix A contains the site inspection checklists. Photographs taken during the site inspection are included in Appendix B.

All monitoring wells appeared to be in good condition at the time of inspection.

The LUCs for Site 7 appear to be functioning as intended. Although there is no fence around Site 7, the site is located within a secured area of the facility, which in effect controls access to the site. LUCs also include written restrictions, which control the conduct of activities which could disturb the ground surface activities on the site. In addition, there are restrictions on the use of groundwater for consumption. There was no physical evidence of any residential use or disturbance of the ground surface during the site inspection. At the time this Five-Year Review was prepared, the LUC RD is being reviewed.. The LUCs will remain in effect until contamination levels drop to a level that allow for unrestricted use of the site.

5.4.5 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

5.4.6 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC Remedial Design was developed during the Design Phase, has been reviewed by EPA and MDE and the proposed language is currently being reviewed by the Navy. The following institutional controls have been or are in the process of being implemented:

- Ensure no withdrawal of groundwater for any purposes from within the restricted area until the PRGs are met and risks from groundwater use are shown to be reduced to acceptable levels.

- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area.

- Ensure adequate protection to maintain the integrity of any current or future remedial equipment, such as monitoring wells, or remedial operations in the restricted area.

- Ensure adequate notification of pertinent use restrictions to current and future property owners.

These institutional controls will be maintained until the concentrations of hazardous substances in the groundwater are at such levels as to allow for unrestricted use and exposure. Based on the site inspection, there is no evidence that any of these LUCs have been violated.

5.6 TECHNICAL ASSESSMENT

Question 1. Is the remedy functioning as intended by the decision documents?

The review of documents, monitoring results, and site inspection indicate that the final remedy which includes enhanced anaerobic bioremediation, LUC, and groundwater monitoring is functioning as intended by the ROD. The site inspections did not identify any problems or disturbances at Site 7. The LUCs are responsible for controlling access to the source area and protecting human receptors from ingestion of groundwater. The groundwater bioremediation systems are responsible for limiting the off-site migration of contaminated groundwater. No evidence of any activities of an intrusive, residential, or disturbance nature were observed during the site inspection that would have violated any of the institutional controls.

Groundwater monitoring showed significant decreases for all the contaminants identified at the site. There were no COCs detected at concentrations greater than the PRGs in any of the samples collected during the September 2010 LTM sampling event. If the detected COC concentrations are less than the current PRGs in the samples collected in September 2011, one additional regularly scheduled LTM event will be conducted per the LTM plan to confirm these results. Risks to human health will then be calculated using the contaminant concentration data from this last sampling event to determine if the overall combined risks from groundwater at the site are acceptable for future residential scenarios. If risks are determined to be acceptable, the site will be closed out.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, clean-up levels, and RAOs identified in the ROD are still valid.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has surfaced to question the protectiveness of the selected remedy.

The final remedy consisting of enhanced bioremediation, LUCs, and groundwater monitoring has been successful towards achieving the RAOs in the ROD. Analytical data from groundwater monitoring indicates no COCs are present in excess of the PRGs. The LUCs are effective in controlling access to the source and plume areas and protecting human receptors from any direct contact with contaminated soil and from ingestion of groundwater.

5.7 ISSUES

The Site 7 remedy of enhanced bioremediation, LUCs, and groundwater monitoring has been implemented and is functioning as intended by restricting exposure to contaminants by human and ecological receptors. No issues have been identified at Site 7.

5.8 RECOMMENDATIONS AND FOLLOW UP ACTIONS

Groundwater monitoring showed significant decreases for all the contaminants identified at the site. There were no COCs detected at concentrations greater than the PRGs in any of the samples collected during the September 2010 LTM sampling event. If the detected COC concentrations are less than the current PRGs in the samples collected in September 2011, one additional regularly scheduled LTM event will be conducted per the LTM plan to confirm these results. Risks to human health shall then be calculated using the contaminant concentration data from this last sampling event to determine if the overall combined risks from groundwater at the site are acceptable for future residential scenarios. If risks are determined to be acceptable, the site will be closed out.

5.9 PROTECTIVENESS STATEMENT

The remedy for the Ordnance Burn Area is protective of the human health and ecological receptors based on achieving the RAOs specified in the RODs. LUCs have been effective in preventing usage of groundwater as a potable water supply and have also restricted activities within the site boundaries that could potentially disturb the surface of the site. Groundwater monitoring and five-year reviews help to ensure that the remedial actions are functioning as intended and that an overall long-term reduction in groundwater contamination is being achieved.

5.10 NEXT REVIEW

The next Five-Year Review for Site 7 is required by 2017, five years from the date of this review.

TABLE 5-1

**SUMMARY OF HEALTH RISK FOR SITE 7 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND**

Hazard index for Site 7 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total HI RME	12	28	NA
Total HI CTE	2.2	7.4	NA
Incremental Lifetime Cancer Risk for Site 7 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total ILCR RME	NA	NA	8.4 E-05
Total ILCR CTE	NA	NA	1.3 E-05

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

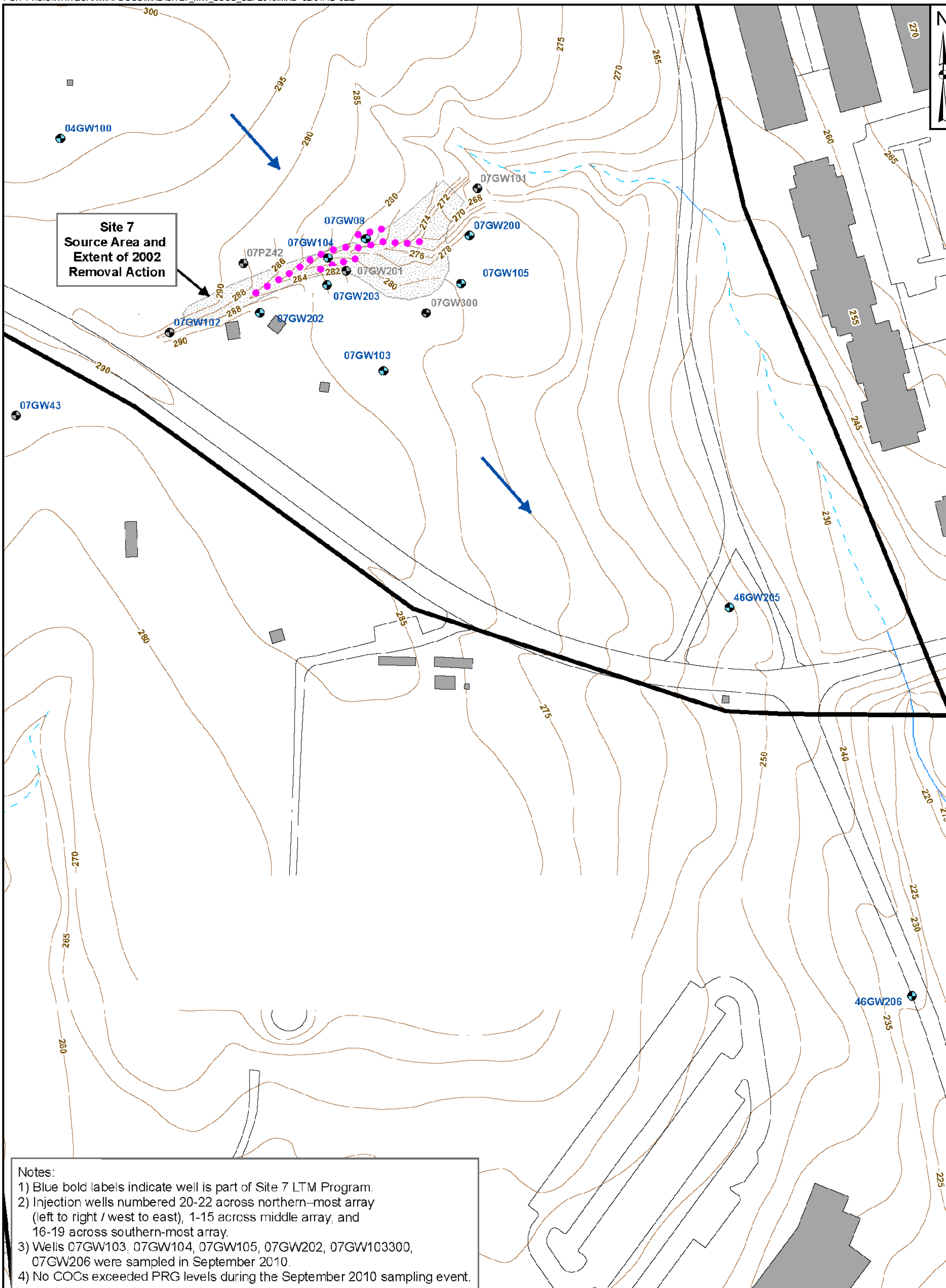
TABLE 5-2

PRGs FOR COCs IN SITE 7 ATTAINMENT AREA
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

COC	PRG (µg/L)	Basis
2-amino-4,6-DNT	0.75	RBC
4-amino-2,6-DNT	0.75	RBC
2,4.6-TNT	1.9	RBC
RDX	30	RBC
TCE	5	MCL

RBC = Risk based concentration
Source: ROD, Navy, September 2004.

PGH P:\GIS\WHITEOAK\MAPDOCS\MXD\SITE7_MW_LOCS_SEP2010.MXD 02/01/12 JEE



Notes:
1) Blue bold labels indicate well is part of Site 7 LTM Program.
2) Injection wells numbered 20-22 across northern–most array (left to right / west to east), 1-15 across middle array, and 16-19 across southern-most array.
3) Wells 07GW103, 07GW104, 07GW105, 07GW202, 07GW103300, 07GW206 were sampled in September 2010.
4) No COCs exceeded PRG levels during the September 2010 sampling event.

Legend

- Monitoring Wells Inlcuded in the LTM Program
- Other Monitoring Wells
- Injection Wells
- Base Boundary
- Roads
- Perennial
- Intermittent
- Groundwater Flow Direction

Data courtesy of CH2M Hill.

130 0 130 Feet

DRAWN BY	DATE		CONTRACT NUMBER	CTO NUMBER
J. ENGLISH	02/01/12	TETRA TECH	3668	555
CHECKED BY	DATE	SEPTEMBER 2010 MONITORING WELL LOCATIONS	APPROVED BY	DATE
S. NESBIT	02/01/12	SITE 7	__	__
REVISED BY	DATE	NSWC WHITE OAK	APPROVED BY	DATE
__	__		__	__
SCALE		SILVER SPRINGS, MARYLAND	FIGURE NO.	REV
AS NOTED			FIGURE 5-1	0

6.0 SITE 9 — INDUSTRIAL WASTEWATER DISPOSAL 300 AREA

6.1 SITE HISTORY

Site 9, also known as the Industrial Wastewater Disposal 300 Area, consists of various wastewater collection and disposal features in the 300 Area, which is located in the southeast portion of NSWC White Oak. The 300 Area is located between Westfarm Branch (a small southward-flowing tributary of Paint Branch) and the small intermittent stream running along the east side of Isherwood Road (the Isherwood Road stream), and extends south from Dahlgren Road to the NSWC White Oak boundary. The area occupied by Site 9 is located entirely within property currently owned by the GSA. However, the plume of contaminated groundwater originating on Site 9 extended onto property that has since been transferred to the Army and is now part of the Army's Adelphi Laboratory Center (ALC).

Site 9 consists of 17 former leaching wells, two former leach fields, the former location of an underground wastewater storage tank at Building 327, and a former industrial wastewater collection sump at Building 318, all of which are located within the 300 Area. Liquid wastes containing explosive compounds, including RDX and HMX, as well as TCE and other chemicals, reportedly were disposed in the leaching wells, were stored in the Building 327 underground storage tank (UST), and handled in the Building 318 sump.

Site 9 was identified as a Navy IRP site in an IAS conducted by NEESA in 1984. The purpose of the 1AS was to identify sites at NSWC White Oak that would undergo potential environmental investigation. The IAS included a records search, on-site survey, and site ranking and identified 14 sites as needing further investigation, including Site 9.

A Confirmation Study Verification Phase for NSWC White Oak was conducted in 1985 (Malcolm-Pirnie, April 1987) to confirm the findings of the 1AS and to obtain additional information to characterize site hazards. The study involved the installation of groundwater monitoring wells, the drilling of soil borings in areas of suspected soil contamination, and the collection of soil, surface water, groundwater, and sediment samples to characterize site contaminants. Site contamination was found in subsurface soil and groundwater. The study concluded that sufficient contamination existed in the groundwater at Site 9 to warrant additional study.

An RI was conducted at NSWC White Oak in two phases between January 1989 and March 1992 (Malcolm Pirnie, October 1992). The RI was conducted to further characterize hazards associated with the identified sites and to aid in the development of remedial action plans for each. The RI involved the placement of additional groundwater monitoring wells at most sites; collection of surface and subsurface soil, sediment, surface water, and groundwater samples throughout the areas of investigation; and collection of ecological data at all sites, including Site 9.

Generally, for those SWMUs that were being investigated under the IRP, it was concluded that the planned level of effort was sufficient to address potential impacts from each SWMU. It was also concluded that some level of sampling would probably be required for the SWMUs and AOCs that were recommended for an RFI or verification sampling.

In 1995, NSWC White Oak was selected for closure on the BRAC IV list. A Phase I EBS was conducted by EA Engineering Science and Technology (EA) to assess the existing environmental information related to storage, release, treatment, or disposal of hazardous substances or actions required prior to property transfer to ensure compliance with requirements of CERCLA 120(h), applicable state and real estate laws, compliance programs, and Department of Defense policy Environmental Requirements for Federal Agency-to-Agency Property Transfer at BRAC Installations. The EBS was finalized and submitted in April 1996.

Two leaching wells at Site 9 along with some surrounding soil that contained discolorations and elevated levels of PAHs, were excavated in a removal action conducted in October 1996. Post-excavation samples contained no unacceptable concentrations of constituents. The removal action is documented in a post-removal action report (TtNUS, November 2001). At approximately the same time in the mid-1990s, the UST used to store wastewater at Building 327 was excavated.

An RFI was conducted for the immediate area around Site 9 (and five other sites) that further characterized the nature and extent of contamination in soil and groundwater at Site 9 (TtNUS, October 2000). The RFI concluded that elevated risks were present from exposure to Site 9 groundwater contaminated with explosives compounds and chlorinated VOCs, most notably TCE. Additional groundwater data were obtained in 1999 during four rounds of sampling and analysis of groundwater from numerous wells through NSWC White Oak, including the wells that existed at and around Site 9 at the time (TtNUS, April 2000).

An FS was conducted for OU1 in 2003 (CH2M Hill, June 2003). The FS included the evaluation of remedial alternatives for Site 9 groundwater.

A pilot test was conducted at the site beginning in July 2003 to evaluate the effectiveness of enhanced in-situ anaerobic bioremediation to degrade contaminants in groundwater at the site (CH2M HILL, October 2003). The pilot test used sodium lactate as an electron donor to promote biodegradation of the site contaminants. Groundwater data from these wells identified the source as the former wastewater collection sump in Building 318.

Four additional leaching wells were excavated as a housekeeping measure in 2003 or were confirmed as having been previously removed. No physical evidence of the other 13 leaching wells/fields were found during the IRP activities, and it was assumed that they had been previously removed.

The Site 9 ROD was finalized in September 2004.

In January 2005, the sump area was excavated and 110 gallons of sodium lactate and approximately 500 gallons of water were placed into the excavation. The excavation was backfilled and a monitoring well was installed in the former location of the sump.

In November 2006, 55 gallons of emulsified oil substrate (EOS) and approximately 1.000 gallons of water were injected into the monitoring well at the sump.

In December 2006, an additional 110 gallons of EOS and water were injected into the same monitoring well.

6.2 BACKGROUND

6.2.1 Site 9 Physical Characteristics

The geology of the Site 9 area in the vicinity of Building 318 consists of silty sand and gravel (Coastal Plain sediments) to a depth of approximately 18 feet bgs. The Coastal Plain sediments are underlain by decayed rock (saprolite), which is significantly less conducive to groundwater flow than the Coastal Plain sand and gravel. The saprolite extends to a depth of about 30 to 40 feet where it grades to competent rock consisting of gneiss and schist. Groundwater flow in the rock occurs in fractures.

Groundwater flow near building 318 is to the south-southwest. The depth to groundwater is approximately 20 ft, so the upper portion of the aquifer is entirely in the saprolite. In the downgradient reaches of the contaminant plume, as it enters the Westfarm Branch valley, the Coastal Plain deposits thin and ultimately disappear.

The ground surface at Site 9 slopes generally to the south and southwest toward Westfarm Branch, and the maximum difference in elevation is approximately 100 feet. Site 9 is bounded by two surface water bodies, the site is located between Westfarm Branch, and the smaller intermittent stream running along the east side of Isherwood Road (the Isherwood Road stream) see Figure 3-1. Both streams are southward-flowing tributaries of Paint Branch. During rain events, surface water infiltrates into the surface soil or drains towards Westfarm Branch and the Isherwood Road stream.

6.2.2 Land and Resource Use

The area of Site 9 consists of open field and woodlands in the southwest part of OU1.

The area surrounding the field to the north, east, and west is wooded property owned by the U.S. government. GSA has no immediate plans to use this area. There are no water supply wells located on the property in the area within or downgradient of the plume. Groundwater at and downgradient of Site 9, and throughout the former NSWC White Oak, is not used as a potable water source at this time and is unlikely to be used for such purposes in the future. Water for occupants of the former NSWC White Oak and the surrounding properties is, and is expected to continue to be, supplied by a local municipal water authority. Local ordinances prevent the installation of new private potable wells where a public supply is readily available. However, for the purposes of the site assessment, the site was evaluated assuming the possibility of residential use for the entire area including the use of the groundwater as a primary drinking water source.

6.2.3 Nature and Extent of Contamination

6.2.3.1 Soil

No surface soil samples were collected at Site 9 because the potential sources of contamination were the leaching wells, a UST, and a building sump, none of which would impact surface soil. In addition, the RFI (TtNUS, October 2000), indicated that there was no evidence of surface soil contamination at the site.

Removal of two of the Site 9 leaching wells, LW-1 and LW-9, was completed in 1996 (TtNUS, November 2001). Elevated levels of PAHs were identified in the subsurface soil prior to the removal action, but post-excavation samples indicated no unacceptable levels of contamination.

The RFI, conducted in 1999, and the follow-up soil sampling in May 2003 did not identify any risks from exposure to Site 9 soil at any of the leaching wells (TtNUS, February 2004). The only constituent detected above Region 3 RBCs and site background concentrations in Site 9 soil is mercury, detected at a maximum concentration of 3.8 milligrams per kilogram in a soil sample collected in 2003 during the excavation of a drain pipe related to a former leaching well at Building 345. The sample was collected below the pipe at a depth of about 4 to 5 feet.

Low concentrations of explosives compounds (RDX at 1,200 µg/kg; HMX at 10,000 µg/kg; 2,4,6-TNT at 1,500 µg/kg; 1,3,5-TNB at 580 µg/kg; and 4 amino-2,6-dinitrotoluene at 150 µg/kg) and perchlorate at 1,400 µg/kg were detected in the soil beneath the former sump at Building 318 in a June 2003 sampling event. While these concentrations do not exceed EPA Region 3 RBCs, they may serve as a continuing source of groundwater contamination (CH2M Hill, October 2003).

6.2.3.2 Groundwater

The OU1 RI identified the center of the Site 9 groundwater contamination at a hot spot near well 09GW01, located within the southwest portion of OU1. Elevated levels of RDX and TCE were consistently detected above PRGs at this location. Perchlorate was also detected in the Site 9 groundwater at this location. PCE was detected in only two wells also located near this area. The maximum concentrations of these compounds detected at Site 9 between 1999 and just prior to the July 2003 groundwater pilot test in this area were:

- TCE: 44 µg/L
- RDX: 310 µg/L
- PCE: 6.5 µg/L
- Perchlorate: 880 µg/L

For the most part, the maximum concentrations were from samples collected from 1995 - 1998. Baseline sampling conducted in 2003 as part of the groundwater remediation pilot test at Site 9 showed that the source area of the explosives and perchlorate contamination was about 250 feet upgradient (north) of well 09GW01, the originally defined hot spot. Direct-push soil and groundwater samples, as well as three new monitoring wells, defined the source of contamination as the former wastewater collection sump in Building 318. At the start of the pilot test, the highest concentrations of the target contaminants RDX (190 µg/L) and perchlorate (250 µg/L) were found in well 09GW214, located 30 feet downgradient of the source sump. TCE was found at a maximum concentration of 11 µg/L in well 09GW205, approximately 225 feet downgradient of the sump.

The upgradient boundary of the target contamination zone is defined by well 09GW212, which is located upgradient of the source at Building 318 and serves as a background monitoring well. Low concentrations of TCE, RDX, and perchlorate extend to the south and southwest (downgradient) of the source area to the point at which the groundwater discharges to Westfarm Branch. It should be noted that these target contaminants, particularly RDX and perchlorate, are found in the groundwater throughout this portion of OU1 at low concentrations (below PRGs). TCE, RDX, and perchlorate have been detected at low concentrations in wells within 30 feet of Westfarm Branch; however, none of these contaminants have been detected in the surface water in the stream and none have been detected in wells located across the stream.

It is not clear whether the Building 318 sump was also the source of the TCE found in the groundwater. Historically, the highest concentration of TCE at the site was located in the area between wells 09GWO1 and 09GW57D, and the concentrations of TCE have decreased steadily and significantly since groundwater sampling was first conducted at Site 9 in 1986. For example the concentrations of TCE in well 09GW57D has decreased from 160 µg/L in 1991 to 11 µg/L in February 2004. Similarly, the concentration of TCE in well 09GWO1 has decreased from 225 µg/L in 1986 to 6.2 µg/L in 2004.

6.2.4 <u>Risk Assessment Summary</u>

6.2.4.1 Human Health Risk Summary

Site specific risks were estimated for the Site 9 groundwater using the results of the OU1 wide risk assessment. Because Site 9 is a sub-area of OU1 and many of the COPCs identified for OU1 are not found in the Site 9 groundwater, it is assumed the risks from Site 9 will be less than those from the entire OU1 area. Also, it is assumed that the only exposure scenarios that might experience unacceptable risks from groundwater at Site 9 are those where unacceptable risks are present for a residential child, adult, and age-adjusted resident. The COPCs for Site 9 were selected by identifying those OU1 COPCs that are present at concentrations corresponding to a cancer risk of $5.0X10^{-6}$ or above, or an HI of 0.1 or above, and were detected in monitoring wells within the Site 9 source area and plume. These levels were selected to ensure that the overall risk from COCs across OU1 does not exceed a carcinogenic risk of $5.0X10^{-5}$ or noncancer HI of 1.

Inorganic compounds found in the groundwater at Site 9 at concentrations that do not exceed base-wide background levels were excluded as COPCs for Site 9 based on the background comparison evaluation conducted in the OU1 RI. The maximum detected chemical concentrations in groundwater were compared to the 95 percent upper tolerance limits calculated for the background data. Additionally a population to population comparison was conducted using the Mann-Whitney U test since the site data and background data are not normally distributed.

The following chemicals were retained as COPCs in Site 9 groundwater:

- PCE
- TCE
- RDX

- Perchlorate
- Iron

Table 6-1 summarizes the groundwater risk results for various exposure populations.

6.2.4.2 Ecological Risk Assessment

A BERA was developed for the former NSWC White Oak to characterize the potential risks to ecological receptors from site-related chemicals found throughout the facility, including Site 9. The procedures followed in conducting the baseline ERA are outlined in the April 2001 final report.

There are no ecological risk exposure pathways related to soil at Site 9. No surface soil or shallow subsurface soil samples were collected at the site because the nature of any potential release from the Site 9 features would be several feet below the ground surface.

As groundwater exposure is not associated with ecological receptors, Site 9 groundwater poses no unacceptable ecological risks. No site-related chemicals were detected in the surface water or sediment in Westfarm Branch and therefore, risks to ecological receptors were not evaluated for this media relative to Site 9.

6.3 REMEDY IMPLEMENTATION

A soil removal action was conducted in October 1996, which consisted of removing two leaching wells at Site 9 along with some sunounding soil that contained discolorations and elevated levels of PAHs. Post-excavation samples contained no unacceptable concentrations of constituents.

A pilot test to remediate groundwater was conducted at the site beginning in July 2003 to evaluate the effectiveness of enhanced in-situ anaerobic bioremediation to degrade contaminants (explosives compounds and perchlorate) in groundwater at the site. The pilot test was incorporated as part of the final remedy and additional EOS was injected in 2006.

6.3.1 Remedial Action Objectives

The RAOs for groundwater for Site 9, as presented in the ROD (Navy, September 2004), include:

- Prevent unacceptable risks to human receptors from exposure to contaminants in the groundwater.

- Where practicable, restore contaminated groundwater to a quality amenable to beneficial use (meet the PRGs).

The RAO for the Site 9 soil beneath the Building 318 sump is:

- Prevent leaching of constituents from soil to groundwater at concentrations that would result in unacceptable risks to human receptors.

Meeting these objectives for Site 9 is based largely upon achieving the PRGs; the original PRGs are shown in Table 6-2. These PRGs were re-calculated in 2010 for each of the five COCs identified for the Site 9 groundwater, based on updated toxicity values, most recent risk assessment methodology, and combined risks from the COCs in the Site 9 area groundwater (CH2MHill, 2010). The PRG established was the MCL (for those compounds that have MCLs) and the calculated risk-based PRG for chemicals that do not have MCLs. The PRG for perchlorate was based on the EPA health advisory.

6.3.2 Selected Remedy

The primary components of the selected remedy are:

- Enhanced Anaerobic Bioremediation in the former Building 318 sump area (sodium lactate injection)
- Monitored Natural Attenuation
- Implementation of institutional controls until PRGs are met

6.3.3 Remedial System Operation and Maintenance

The remedial actions of lactate injection, groundwater monitoring, and institutional controls are currently being implemented. The need for additional lactate injections have been evaluated based on the long-term monitoring results. O&M activities include groundwater monitoring well inspection and maintenance.

6.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second Five-year Review for the Site 9 - Industrial Wastewater Disposal Area at the former NSWC White Oak facility. There were no recommendations made for Site 9 in the First Five-Year Review Report (JM Waller 2007).

6.5 FIVE-YEAR REVIEW PROCESS

6.5.1 Administrative Components

This section provides a summary of the five-year review process and the actions taken to complete this review. The components of the Five-Year Review process include the following:

- Community involvement
- Document review
- Site inspection
- Data and Performance Evaluation
- Five-Year Review report development and review

6.5.2 Community Involvement

The Proposed Plan, the RI, and RFI for Site 9, and FS for OU1 (including Site 9 groundwater), became available to the public on April 4, 2004 and are among the documents that comprise the Administrative Record file for former NSWC White Oak, which is maintained by NAVFAC Washington at the Washington Navy Yard, Washington, DC. These documents are also located in the information repository for the NSWC White Oak, which is maintained at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland. The notice of the availability of these documents, the public comment period, and a public meeting was published in the Washington Post on April 1, 2004, and in the Silver Spring Gazette, College Park Gazette, and Burtonsville Gazette on March 31, 2004. The public comment period was held from April 4, 2004 to May 4, 2004, and a public meeting was held on April 13, 2004.

Upon completion of this Five-Year Review, the results will be made available to the RAB) members at their next meeting. The results of the five-year review and the report will be made available to the public at the local Information Repository at NAVFAC Washington.

6.5.3 Document Review

The Five-Year Review consisted of a review of relevant investigation, decision, and remediation documents, including monitoring results.

First Five-Year Review completed	April 2007
6-Month” Post-Injection Sampling	May 2007
9-Month” Post-Injection Sampling	August 2007

2008 Annual" Post-Injection Sampling	December 2008
Revisions to PRGs Sites 4/46, 7, 9, 5/13, and 49	October 2010
2010 Annual Post-Injection Groundwater Sampling Memo	June 2011

6.5.4 Data Review

VOC concentrations, specifically TCE and PCE, have decreased to below their respective PRGs. However, RDX and iron remain higher than their PRGs at two locations. Perchlorate, which has been measured at concentrations in excess of its PRG at monitoring well 09GW215, has not been analyzed at this location since June 2006, therefore no evaluation of a perchlorate trend can be made.

At the request of MDE, a sample for 1,4-dioxane was collected from 09GW01 to determine whether this emerging contaminant was present in groundwater at Site 9. 1,4-Dioxane was not detected in the sample collected from 09GW01 during the September 2010 LTM sampling event.

The data for most recent sampling event is provided in Appendix C.

6.5.5 Site Inspections

Site 9 was inspected on October 11, 2011. The purpose of the inspection was to assess the protectiveness of the implemented remedial action, including the presence of access restrictions and other LUCs. Appendix A contains the site inspection checklists. Photographs taken during the site inspection are included in Appendix B.

At the time of the site inspection, the source area had been cleared and regraded and no evidence of site-related activities remained. A cursory inspection of the monitoring wells indicated that all the wells were in good physical condition and were secured with locks. Access to the site is well controlled because the site is located within a secured portion of the facility.

LUCs include written restrictions, which control the use of groundwater for potable use. There was no evidence that groundwater is being used for any purpose, nor is it likely that it ever will be. At the time this Five-Year Review was prepared, the LUC RD was being finalized. The LUCs will remain in effect until contamination levels drop to a level that allow for unrestricted use of the site.

6.5.6 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

6.5.7 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC Remedial Design was developed during the Design Phase, has been reviewed by EPA and MDE and the proposed language is currently being reviewed by the Navy. The following institutional controls have been or are in the process of being implemented:

- Ensure no withdrawal of groundwater for any purpose from within the restricted area until the PRGs are met and risks from groundwater use are shown to be reduced to acceptable levels.

- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area.

- Ensure adequate protection to minimize physical disruption of any remedial equipment, such as monitoring wells, or remedial operations in the restricted area.

- Ensure adequate notification of pertinent use restrictions to current and future property owners.

These institutional controls will be maintained until the concentrations of hazardous substances in the groundwater are at such levels as to allow for unrestricted use and exposure. Based on the site inspection, there is no evidence that any of these LUCs have been violated.

6.6 TECHNICAL ASSESSMENT

Question 1. Is the remedy functioning as intended by the decision documents?

The review of documents, monitoring results, and site inspection indicate that the portion of the final remedy which has been implemented, land use controls and groundwater monitoring, is functioning as intended by the ROD. The pilot scale test was effective in reducing the contaminant concentrations in the groundwater that could potentially migrate off-site. Additional lactate injections were performed in 2006, however, RDX remains above its PRG in the source area..

The land use controls are responsible for controlling access to the source area and protecting human receptors from any direct contact with contaminated soil or ingestion of groundwater. The site inspections did not identify any problems or disturbances at Site 9. No evidence of any activities of an intrusive or land disturbance nature and no signs of residential use were observed during the site inspection that would have violated any of the institutional controls.

Groundwater monitoring showed significant decreases for explosives and volatiles monitored, with PCE and TCE observed at concentrations less than their respective PRGs.. In addition, the LUCs prevent use of groundwater at Site 9. In summary, the enhanced bioremediation pilot test and additional electron donor injection, land use controls, and groundwater monitoring are in place to successfully prevent human exposure to the site-related contaminants from Site 9.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, clean-up levels, and RAOs identified in the ROD are still valid.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has surfaced to question the protectiveness of the selected remedy.

The final remedy consisting of lactose or EOS injections, land use controls, and groundwater monitoring has been successful towards achieving the RAOs in the ROD. Analytical data from groundwater monitoring indicates that four of five COCs have met the PRGs and concentrations of the other COC, have decreased significantly. The LUCs are effective in controlling access to the source and plume areas and protecting human receptors from any direct contact with contaminated soil from ingestion of groundwater.

6.7 ISSUES

The remedial action of electron donor injection is complete while groundwater monitoring and institutional controls are currently ongoing. The need for additional injections will be based on the results of the previous lactate injections.

- Perchlorate should be added to the list of analyses for 09GW215 during future sampling events as historic perchlorate concentrations in this monitoring well exceeded the PRG.

6.8 RECOMMENDATIONS AND FOLLOW UP ACTIONS

Based on the Five-year review, the following recommendation is provided:

- Groundwater monitoring should be continued to identify whether all the RAOs have been met.

6.9 PROTECTIVENESS STATEMENT

The remedy for the Industrial Wastewater Disposal Area — Site 9 is protective of the human health and ecological receptors based on achieving most of the RAOs specified in the RODs. LUCs have been effective in preventing usage of groundwater as a potable water supply and have also restricted activities within the site boundaries that could potentially disturb the surface of the site. Groundwater treatment through lactate and EOS injections have reduced VOC and explosives concentrations near the source area. Groundwater monitoring and five-year reviews help to ensure that the remedial actions are functioning as intended and that an overall long-term reduction in groundwater contamination is being achieved.

6.10 NEXT REVIEW

The next Five-Year Review for Site 9 is required by 2017, five years from the date of this review.

TABLE 6-1

SUMMARY OF HEALTH RISK FOR SITE 9 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Hazard index for Site 9 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total HI - RME	8.8	20	NA
Total HI - CTE	0.6	1.9	NA
Incremental Lifetime Cancer Risk for Site 9 Groundwater in the Coastal Plain/Saprolite			
	Adult Resident	**Child Resident**	**Age-adjusted Resident**
Total ILCR - RME	1.3 E-04	NA	7.6 E-04
Total ILCR - CTE	3.9 E-06	NA	1.7 E-04

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

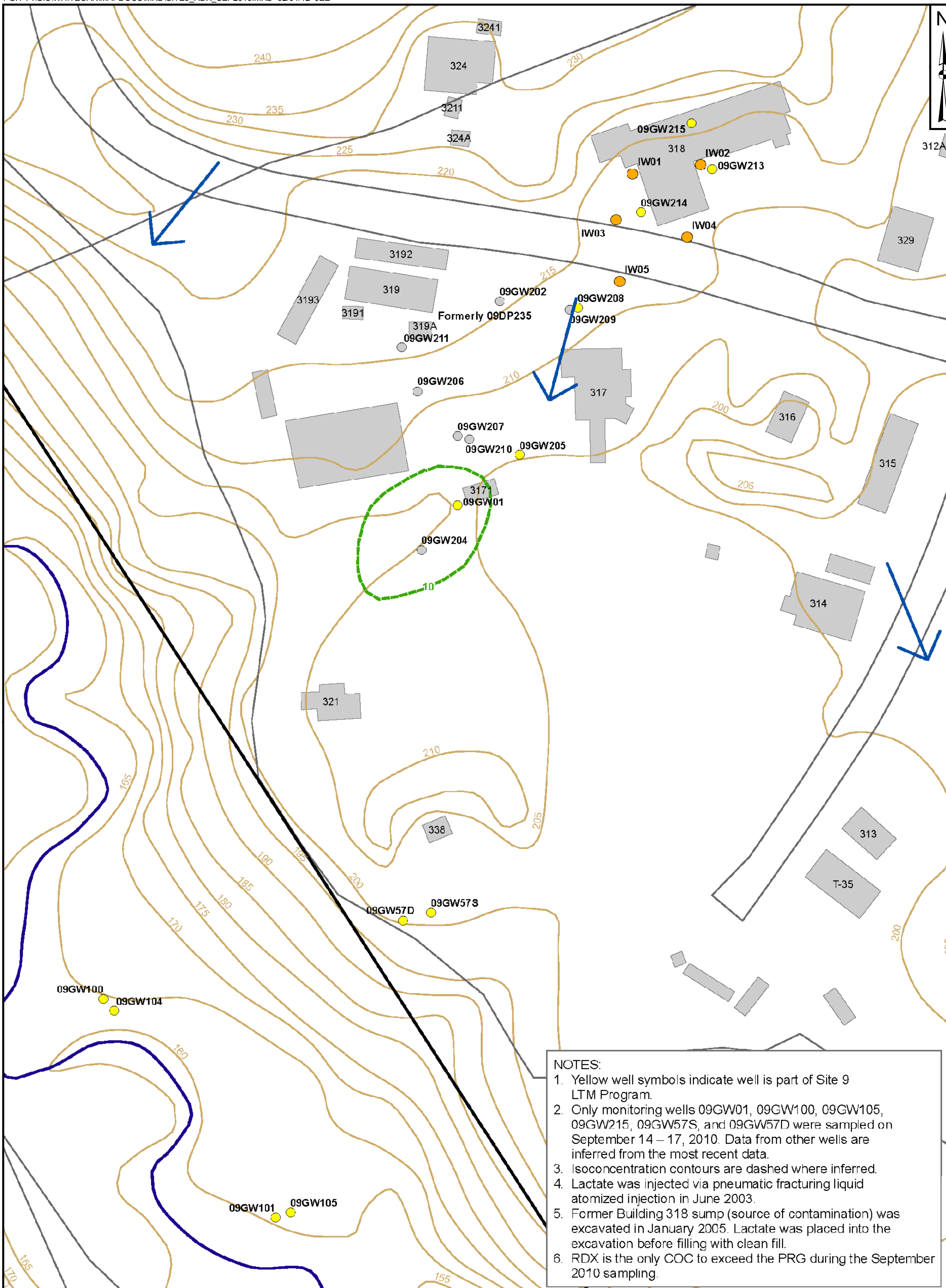
TABLE 6-2

PRGs FOR COCs IN SITE 9 ATTAINMENT AREA
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

COC	PRG (µg/L)	Basis
PCE	5	MCL
TCE	5	MCL
RDX	15	RB
Perchlorate	---	---

RB = Risk based criteria developed by EPA Region III. Source: ROD, Navy, September 2004.

PGH P:\GIS\WHITEOAK\MAPDOCS\MXD\SITE9_RDX_SEP2010.MXD 02/01/12 JEE



NOTES:

1. Yellow well symbols indicate well is part of Site 9 LTM Program.
2. Only monitoring wells 09GW01, 09GW100, 09GW105, 09GW215, 09GW57S, and 09GW57D were sampled on September 14 – 17, 2010. Data from other wells are inferred from the most recent data.
3. Isoconcentration contours are dashed where inferred.
4. Lactate was injected via pneumatic fracturing liquid atomized injection in June 2003.
5. Former Building 318 sump (source of contamination) was excavated in January 2005. Lactate was placed into the excavation before filling with clean fill.
6. RDX is the only COC to exceed the PRG during the September 2010 sampling.

Legend

- LTM Program Monitoring Wells
- Other Monitoring Wells
- Lactate Injection Boring (2003)
- RDX Isoconcentration Contours (µg/L)
- Base Boundary
- Stream
- Roads
- Topography (5 feet Intervals)
- Former Building
- Groundwater Flow Direction

Data courtesy of CH2M Hill.

65 0 65 Feet

DRAWN BY	DATE	TETRA TECH	CONTRACT NUMBER	CTO NUMBER
J. ENGLISH	02/01/12		3668	555
CHECKED BY	DATE	EXTENT OF RDX IN GROUNDWATER, SEPTEMBER 2010	APPROVED BY	DATE
S. NESBIT	02/01/12	SITE 9	__	__
REVISED BY	DATE	NSWC WHITE OAK	APPROVED BY	DATE
__	__		__	__
SCALE		SILVER SPRINGS, MARYLAND	FIGURE NO.	REV
AS NOTED			FIGURE 6-1	0

7.0 SITE 11— INDUSTRIAL WASTEWATER DISPOSAL 100 AREA

7.1 SITE HISTORY

Site 11, also known as the Industrial Wastewater Disposal Area 100, comprises approximately 16 acres. Reportedly, up to 14 leaching (or dry) wells were used to dispose of an estimated 20,000 gallons of liquid wastes generated by NSWC White Oak laboratories between 1951 and 1976. The wastes of concern were reported to include acids, metals, photographic wastes, solvents (including TCE), and organic explosive compounds. The liquid wastes were conveyed from the laboratories to the wells by subsurface piping. Through their operation, subsurface soil and groundwater were potentially impacted and are the media of concern associated with Site 11. Two RODs have been signed for this site, one for the soils and another for the groundwater.

Site 11 was identified as a Navy IRP site in an IAS conducted by NEESA in 1984. The purpose of the IAS was to identify sites at NSWC White Oak that would undergo potential environmental investigation. The IAS included a records search, on-site survey, and site ranking and identified 14 sites as needing further investigation, including Site 11.

A Confirmation Study Verification Phase for NSWC White Oak was conducted in 1985 (Malcolm-Pirnie, April 1987) to confirm the findings of the IAS and to obtain additional information to characterize site hazards. The study involved the installation of groundwater monitoring wells, the drilling of soil borings in areas of suspected soil contamination, and the collection of soil, surface water, groundwater, and sediment samples to characterize site contaminants. Site contamination was found in subsurface soil and groundwater. The study concluded that sufficient contamination existed in the groundwater at Site 11 to warrant additional study.

An RI was conducted at NSWC White Oak in two phases between January 1989 and March 1992 (Malcolm Pirnie, October 1992). The RI was conducted to further characterize hazards associated with the identified sites and to aid in the development of remedial action plans for each. The RI involved the placement of additional groundwater monitoring wells at all sites; collection of surface and subsurface soil, sediment, surface water, and groundwater samples throughout the areas of investigation; completion of slug tests and aquifer pumping tests; and collection of ecological data at all sites, including Site 11.

In September 1992, Malcolm Pirnie completed an RFA review for the Navy that evaluated the applicability of the general recommendations of the RFA to each individual SWMU. Generally, for those SWMUs that were being investigated under the IRP, it was concluded that the planned level of effort was sufficient to address potential impacts from each SWMU. It was also concluded that some level of sampling would probably be required for the SWMUs and AOCs that were recommended for an RFI or verification sampling.

In 1995, NSWC White Oak was selected for closure on the BRAC IV list. A Phase I EBS was conducted by EA Engineering Science and Technology (EA) to assess the existing environmental information related to storage, release, treatment, or disposal of hazardous substances or petroleum products and to document the environmental condition of the property. The EBS also addressed actions required prior to property transfer to ensure compliance with requirements of CERCLA 120(h), applicable state and real estate laws, compliance programs, and DOD policy Environmental Requirements for Federal Agency-to-Agency Property Transfer at BRAC Installations. The EBS was finalized and submitted in April 1996.

Source removal activities were completed at Sites 8, 9, and 11 during 1996 to address contaminant sources that may be impacting groundwater at NSWC White Oak. The activities included the excavation and off-site disposal of waste and contaminated media from these sites in conjunction with the findings of the Design Verification Study (B&R Environmental, 1995). The activities included the removal of five leaching wells (LW-2, LW-4, LW-5, LW-12, and LW-13) and surrounding subsurface soil from Site 11. Subsurface soil sampling was performed following completion of waste and soil removal activities to verify the removal of contamination.

Based in part on the removal of these leaching wells and an evaluation of the potential soils contamination at the other leaching wells, a No Further Action ROD was finalized in July 2002.

Additional groundwater data were obtained in 1999 during four rounds of sampling and analysis of groundwater from 32 wells. Data from this investigation are presented in the report titled Addendum Rounds 1, 2, 3 & 4 Groundwater Data, RCRA Facility Investigation for Site 11 (TtNUS, 2000b). Groundwater samples were analyzed for VOCs, SVOCs, pesticides and PCBs, explosives, and inorganic compounds. Results provided data for within-well comparisons over time.

To focus on the deeper bedrock groundwater contamination, an RFI Addendum was prepared (TtNUS, 2001a). The objectives of the RFI Addendum were to further delineate the lateral and vertical extent of contamination in the bedrock aquifer, better define groundwater flow directions in bedrock, evaluate natural attenuation mechanisms/potential, evaluate groundwater discharge impacts to local surface water bodies, and to gather data for a groundwater extraction and treatment system design, if needed.

Through the RFI-related site investigation work performed at Site 11, two VOC plumes, one perchlorate plume, and one chromium plume were identified in groundwater, as shown in figure 7-1. COCs at VOC Plume No. 2 include PCE (maximum detected concentration in 2001 -- 61 µg/L) and TCE (maximum detected concentration in 2001 — 27 µg/L). The highest concentrations of contamination related to this plume were found in the overburden (saprolite) aquifer.

Within VOC Plume No. 2, the zone of contamination in the saprolite is centered around groundwater monitoring well 11TW-03. It had been estimated that approximately 70 years would be required for naturally occurring degradation processes to reduce the concentration of the main COC within this area (PCE) to its MCS of 5 µg/L based on first-order rate trend projections. A remedial action was implemented to enhance natural biodegradation processes within VOC Plume No. 2 such that VOC concentrations in the saprolite zone are reduced to the contaminant-specific MCSs within a more reasonable timeframe.

The results of site investigations were used to prepare a CMS for the Site 11 groundwater (TtNUS, 2003). This CMS identified COCs and established MCSs. As part of the CMS, remedial technologies were screened; corrective measure alternatives were assembled, analyzed, and compared; and a preferred alternative was identified.

The ROD for Site 11 Soils was finalized in July 2002. The ROD for Site 11 Groundwater was finalized in April 2004.

7.2 BACKGROUND

7.2.1 Site 11 Physical Characteristics

Two west-east flowing, intermittent streams, located east of Site 11, flow into Paint Branch. One northwest-southeast flowing stream located at the western end of Site 11 discharges offsite and eventually flows into Paint Branch.

The surficial geology of Site 11 consists of the Upland Sand and Gravel Formation, which exists in the central and southern regions of Site 11, and the saprolite of the Wissahickon Formation, which exists in the northern region. A thin layer of the Upland Sand and Gravel thickens to the south and southeast and varies in thickness from 2 to 30 feet. It consists of brown silt and red-brown, fine to medium sand with some gravel. Clayey silt seams less than 1 foot thick interbedded with fine gravel occurs near the base of the unit. The saprolite of the Wissahickon Formation varies in thickness from 5 to 55 feet (and possibly greater). The saprolite grades from a micaceous silt or silty sand with varying amounts of clay and schist fragments to a severely weathered schist with relief texture. The competent bedrock is a wide gneiss and begins at approximately 23 to 47 feet bgs.

7.2.2 Land and Resource Use

The majority of the property occupied by Site 11 is open space with a few buildings and paved roads and parking areas. GSA, which owns the property, has plans to use Site 11 for nonresidential purposes. The buildings constricted as part of this development will be leased to the FDA. Nonetheless, for the purposes of the site assessment, the site was evaluated assuming the possibility of future residential use.

Former NSWC White Oak and the surrounding properties is, and is expected to continue to be, supplied by a local municipal water authority. Local ordinances prevent the installation of new private potable wells where a public supply is readily available.

7.2.3 Nature and Extent of Contamination

This summary of the nature and extent of contamination for the Site 11 groundwater is based on the discussions and data presented in the RFI (TtNUS, 2000a), Addendum Rounds 1,2,3 & 4 (TINUS, 2000b), Site 11 RFI Addendum (TtNUS, 2001a), Letter Report — March 2001 Groundwater Sampling Results — Site 11 (TtNUS, 2001b), and the Site 11 Groundwater Report (TtNUS, 2003). Chemicals detected in groundwater were screened against various criteria to identify chemicals of potential concern (COPCs).

- Results of the subsurface soil sampling activities conducted during the RFI indicate that subsurface soil is not a source of groundwater contamination.
- Chlorinated VOCs are the primary concern in regard to groundwater contamination.
- Contamination occurs primarily in the surficial aquifer at Site 11. However, the highest COC concentrations were mostly detected in groundwater samples from two bedrock wells (11GW110 and 11GW118). Elevated VOCs concentrations were also detected in samples collected from two other bedrock monitoring wells (11GW112, 11GW119S/D).
- Of the 16 VOCs detected, 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2- DCA), cis-1,2-DCE, PCE, and TCE were detected at concentrations greater than drinking water standards, indicating an unacceptable risk to potential groundwater users.
- Hexavalent chromium was detected above screening levels, but within background values, during the RFI (TtNUS, 2000a) and three additional sampling rounds (TtNUS, 2000b). Hexavalent chromium was detected at 410 µg/L in one (11GW27) of two groundwater wells sampled during the Data Gap

investigation (TtNUS, 2002). This concentration is above both the human health risk-based screening level of 110 µg/L and the EPA MCL of 100 µg/L.

- Perchlorate was detected at concentrations (5 to 130 µg/L) in 11 saprolite wells and two shallow bedrock wells sampled during one or more of three rounds of the RFI Addendum investigation for which this chemical was analyzed (TtNUS, 2000b).

- Unfiltered arsenic was detected at concentrations exceeding the human health risk-based screening level (0.07 µg/L) in most of the saprolite and bedrock wells sampled during the four rounds of the RFI Addendum investigation for which this chemical was analyzed. However, no concentrations of filtered arsenic exceeded the analytical detection limit.

- Four separate groundwater contaminant plumes have been identified, including two chlorinated VOC plumes, a hexavalent chromium plume, and a perchlorate plume. These plumes are shown in Figure 3-1.

- The chlorinated VOC plume with the highest COC concentrations and greatest areal extent is identified as VOC Plume No. 1 and is centered on saprolite well 11GW22. A much smaller plume with lower contaminant concentrations, identified as VOC Plume No. 2, is located in the vicinity of saprolite well 11GW28..

- The hexavalent chromium plume is centered on saprolite well 11GW27.

- The perchlorate plume overlaps almost all of VOC Plume No. 1 and approximately half of the hexavalent chromium plume.

- The contaminant plumes decrease in concentration rapidly with increasing distance from the sources. It is expected that contaminant concentrations are reduced through natural processes to trace/nondetectable levels prior to reaching the stream or any potential human receptors.

- The highest levels of groundwater contamination are in the portion of the bedrock aquifer less than 130 feet in depth. Packer sampling and subsequent deep well installations confirm that contaminant levels drop off with increasing depth below 130 feet.

- Based on the results of the Data Gap investigation, the vertical extent of Site 11 groundwater contaminated above MCLs is estimated to be approximately 200 feet, with the highest contaminant levels occurring at depths of less than 130 feet bgs.

- Based upon the screening, nine VOCs (1,1-DCE, 1,2-DCA, acetone, benzene, chloroform, PCE, TCE, and vinyl chloride) and four inorganic chemicals (arsenic, perchlorate, hexavalent chromium, and nitrate) were identified as groundwater COPCs.

7.2.4 Risk Assessment Summary

The following risk summaries were developed from the information in the groundwater ROD, before the remedy was implemented.

7.2.4.1 Human Health Risk Summary

The Risk assessment in the RI report contains an evaluation of all COPC and exposure pathways, including those that do not pose unacceptable risks to human health. COPCs are those chemicals that are identified as a potential threat to human health and are evaluated further in the baseline risk assessment. COPCs for groundwater were identified using EPA Region 3 RBCs for tap water use. These criteria are based on the assumption that groundwater is used for domestic purposes. This is a conservative assumption since groundwater at Site 11 is not currently used or expected to be used in the future as a potable water supply. MCLs are also used in the COPC screening process. Although these additional criteria are not used to select COPCs, they are used for informative purposes and for comparison of site data to applicable standards.

The following chemicals were retained as COPC in groundwater:

- Chlorinated VOCs: 1,1-DCE, 1,2-DCA, cis-1,2-DCE, chloroform, PCE, TCE, and vinyl chloride
- Other VOCs: acetone, benzene
- Inorganic chemicals: arsenic, hexavalent chromium, nitrate, and perchlorate

Table 7-1 summarizes the groundwater risk results for various exposure populations.

Under current conditions, there is no unacceptable human health risk associated with contaminants in groundwater because groundwater at Site 11 is not being used as a potable source. Non-carcinogenic HIs associated with exposure to Site 11 groundwater under a construction or hypothetical future residential scenario exceeded the EPA's acceptable target of unity. In addition, the Incremental Lifetime Cancer Risks (ILCRs) associated with exposure to groundwater under a hypothetical future residential scenario were above the $1X10^{-4}$ upper limit of EPA's acceptable range.

7.2.4.2 Ecological Risk Assessment

Since the surface soil, surface water, and sediment are unaffected (essentially uncontaminated) by the Site 11 activities, an ecological risk assessment was not necessary.

7.3 REMEDY IMPLEMENTATION

Source removal activities were completed at Sites 8, 9, and 11 during 1996 to address contaminant sources that may be impacting groundwater at NSWC White Oak. The activities included the excavation and off-site disposal of waste and contaminated media from these sites in conjunction with the findings of the Design Verification Study (B&R Environmental, 1995). The activities included the removal of five leaching wells (LW-2, LW-4, LW-5, LW-12, and LW-13) and surrounding subsurface soil from Site 11.

Although four groundwater plumes (VOC Plume 1, VOC Plume 2, the Hexavalent-Chromium Plume, and the Perchlorate Plume) were identified at Site 11, groundwater sampling results combined with numerical modeling suggested that only VOC Plume 2 required a remedy that included an active-phase.

The active-phase remedial action for VOC Plume 2 involved EISB using EOS delivered via high-pressure nitrogen gas. Injection occurred in 34 injection wells installed in November 2004. Pneumatic fracturing was performed to enhance the distribution of EOS within the subsurface. After fracturing, EOS was mixed with water into a solution (1 part EOS mixed with 10 parts water) and injected into the subsurface.

7.3.1 Remedial Action Objectives

The RAOs for groundwater at Site 11, as presented in the ROD (Navy, 2004), include the following:

- Prevent human exposure (through ingestion, inhalation, and dermal contact) to groundwater having contaminants at concentrations in excess of MCSs.
- Restore contaminated groundwater quality to MCSs taking the known future reuse of the Site 11 area into consideration.
- Comply with contaminant-, location-, and action-specific ARARs, and TBCs, as appropriate.

Meeting these objectives for Site 11 is based largely upon achieving the MCSs, which are shown in Table 7-2:

7.3.2 Selected Remedy

The selected remedy consists of five major components:

- Source removal — this has already been completed through removal of the leaching wells.
- For VOC Plume No. 2 - In-situ bioremediation through use of soybean oil emulsion (EOS).
- For the hexavalent chromium, perchlorate and VOC No. 1 plumes — MNA.
- Institutional controls — involves the implementation of LUCs and deed restrictions for groundwater use
- Groundwater monitoring

7.3.3 Remedial System Operation and Maintenance

The remedial action of source removal and EOS injection for VOC Plume No. 2 has been completed. Monitoring data will be evaluated to determine if additional treatment is necessary. MNA is ongoing for the remaining three plumes. Currently, the only ongoing activity is groundwater monitoring; therefore O&M activities include inspection and maintenance of the monitoring wells. The monitoring well network is being completed as development of the Site 11 continues.

7.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second five-year review of Site 11. The recommendations from the First Five-Year Review Report (JM Waller 2007) are provided below, along with the actions taken to address the recommendations. The institutional controls and groundwater monitoring portions of the Site 11 remedy are functioning as intended by restricting exposure to groundwater contaminants by human and ecological receptors.

- Enhanced bioremediation using EOS has not had a decreasing effect on the concentration of PCE and TCE.

Bioremediation using EOS has limited impact on VOC Plume No. 2, however, given the relatively low contaminant concentrations prior to the remedial action, and the contaminant reduction recorded in the other Site 11 groundwater plumes during long-term monitoring activities, it is anticipated that MNA will effectively reduce contaminant concentrations at VOC Plume No. 2 in an acceptable timeframe. Continued monitoring will be performed to confirm the reduction in contaminant concentrations.

- Groundwater monitoring has not been consistent due to ongoing construction activities.

The installation of the groundwater monitoring network has neared completion, with the remaining wells scheduled for installation in 2013.

7.5 FIVE-YEAR REVIEW PROCESS

7.5.1 Administrative Components

The components of the Five-Year Review process include the following:

- Community involvement
- Document review
- Site inspection
- Data and Performance Evaluation
- Five-Year Review report development and review

7.5.2 Community Involvement

The Proposed Plan for the Site 11 soils was released for public comment on January 25, 2002. The proposed plan identified no further action as the preferred alternative for soils. The Navy reviewed all comments received during the public comment period, January 25 to February 25, 2002, and the public meeting, held on February 6, 2002. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

The Proposed Plan for the Site 11 groundwater was released for public comment on May 9, 2003. The proposed plan identified EISB, source removal, institutional controls, and monitoring for groundwater as the preferred alternative. The Navy reviewed all comments received during the public comment period, May 9 to June 8, 2003, and the public meeting, held on May 22, 2003. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Upon completion of this Five-Year Review, the results will be made available to the RAB members at their next meeting. The results of the five-year review and the report will be made available to the public at the local Information Repository located at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland.

7.5.3 Document Review

The document reviewed for the second five-year review are listed below, and key information obtained from the documents is summarized in the following sections.

First Five-Year Review completed	April 2007
October 2009 Sampling Memo	March 2010

7.5.4 Data Review

Eight monitoring wells were sampled during the October 2009 field effort. The analytical data are summarized in Appendix C. The data collected showed only minimal contamination, with only a single well found with contamination in excess of an MCL [TCE was detected in 11MW207D at 9.5 µg/L, which exceeds its MCL of 5 µg/L. Contaminant concentrations were observed to be decreasing compared with prior sampling data.

7.5.5 Site Inspection

Site 11 was inspected on October 11, 2011. During the time of the inspection, a limited number of monitoring wells had been installed with additional wells scheduled for inspection in January 2012. The ongoing remedial activities for Site 11 included groundwater monitoring and MNA. The purpose of the inspection was to assess the protectiveness of the implemented remedial action, including the presence of access restrictions and other LUCs. Appendix A contains the site inspection checklists. Photographs taken during the site inspection are included in Appendix B.

The EOS injection has been completed and there are currently no ongoing remedial activities except groundwater monitoring and MNA. One existing monitoring well was observed to require a surface completion inside of the FDA campus (MW206S).

There was no evidence that groundwater is being used for any purpose, nor is it likely that it ever will be. LUCs include written restrictions, which control the use of groundwater for potable use. LUCs will remain in effect until contamination levels drop to a level that allow for unrestricted use of the site.

7.5.6 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

7.5.7 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC Remedial Design was developed during the Design Phase. The following institutional controls have been or are in the process of being implemented:

- Ensure that a deed notification is put into place that prohibits withdrawal of groundwater from within the restricted area for any purpose until the MCSs are met and risks from groundwater use are shown to be reduced to acceptable levels.

- Ensure adequate protection to minimize physical disruption of any remedial equipment, such as groundwater treatment systems and monitoring wells in the restricted area.

- Ensure adequate notification of pertinent use restrictions to current and future property owners.

These institutional controls will be maintained until the concentrations of hazardous substances in the groundwater are at such levels as to allow for unrestricted use and exposure. No violations of any of the above LUCs were observed during the site inspection.

7.6 ASSESSMENT

Question 1: Is the Remedy Functioning as Intended by the Decision Documents?

The review of documents and site inspection indicate that the source removal, institutional controls, and groundwater monitoring are functioning as intended by the ROD. The institutional controls in the form of groundwater use restrictions are responsible for protecting human receptors from any direct contact with or ingestion of groundwater. Groundwater monitoring has been utilized to document the effectiveness of the remedial actions and whether MCSs have been achieved.

The review of monitoring results has indicated that in situ groundwater treatment through EOS injection did not reduce VOC Plume 2 contaminant concentrations as intended by the ROD. In particular, the monitoring results for VOC Plume 2 have shown that bioremediation using EOS has not had a decreasing effect on the concentration of PCE and TCE. Considering that the treatment time was initially estimated to be 70 years, the ultimate achievement of the MCSs may eventually occur. Nevertheless, the data collected so far does not support achievement of the treatment goals. Considering the low initial concentrations, the presence of natural attenuation processes, decreasing contaminant concentrations observed in other plumes at Site 11, and the lack of exposure routes, the overall remedy is considered to be functioning adequately from a human health and ecological risk standpoint.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, clean-up levels, and RAOs identified in the ROD are still valid.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has surfaced to question the protectiveness of the selected remedy.

The institutional controls and groundwater monitoring are effective in protecting human receptors from any direct contact with or ingestion of groundwater. However, the groundwater monitoring results for VOC Plume 2 have shown that bioremediation using EOS did not reduce PCE and TCE concentrations as expected.

7.7 ISSUES

The institutional controls and groundwater monitoring portions of the Site 11 remedy are functioning as intended by restricting exposure to groundwater contaminants by human and ecological receptors. However, the following items were identified based on a review of the monitoring results:

- Groundwater monitoring has not been consistent due to ongoing construction activities.

7.8 RECOMMENDATIONS AND FOLLOW UP ACTIONS

Based on the issues identified in the previous section, the following recommendations are provided:

- Continued monitoring is recommended to evaluate if natural attenuation processes, either biological or physical, will continue to reduce contaminant concentrations to acceptable levels in all plumes within Site 11. Well installation should be coordinated with the continued development of the property. As additional data become available, groundwater elevation and flow mapping should be compiled to further characterize site conditions.

7.9 PROTECTIVEMENT STATEMENT

The remedy for the Industrial Wastewater Disposal 100 Area — Site 11 is protective of the human health and ecological receptors. Monitored natural attenuation is reducing contaminant concentrations in VOC

Plumes No. 1 and No. 2, perchlorate plume, and hexavalent chromium plume. Once the long-term monitoring well network is complete, monitoring of the other plumes should indicate decreasing contaminant concentrations across the entirety of Site 11. The institutional controls which prevent usage of groundwater as a potable water supply are protecting human receptors from exposure to groundwater contamination. Groundwater monitoring and five-year reviews help to ensure that the remedial actions are functioning as intended and that an overall long-term reduction in groundwater contamination is being achieved.

7.10 NEXT REVIEW

The next Five-Year Review for Site 11 is required by 2017, five years from the date of this review.

TABLE 7-1

SUMMARY OF HEALTH RISK FOR SITE 11 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Hazard index for Site 11 Groundwater in Coastal Plain/Saprolite						
	Full Time Worker	**Maintenance Worker**	**Construction Worker**	**DayCare Child**	**Adult Resident**	**Child Resident**
Total HI - RME	0.18	0,41	2.1	0.39	160	370
Total HI - CTE	0.04	0.21	2.1	0.17	73	240
Incremental Lifetime Cancer Risk for Site 11 Groundwater in the Coastal Plain/Saprolite						
	Full Time Worker	**Maintenance Worker**	**Construction Worker**	**DayCare Child**	**Adult Resident**	**Child Resident**
Total ILCR - RME	7.1 E-5	1.0 E-5	2.1 E-6	3.8 E-5	1.3 E-3	8.6 E-4
Total ILCR - CTE	5.8 E-6	1.8 E-6	2.1 E-6	8.4 E-6	1.8 E-4	1.7 E-4

HI --- Hazard Index
ILCR = Incremental Lifetime Cancer Risk
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

TABLE 7-2

MCSs FOR COCs IN SITE 11 ATTAINMENT AREA
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

COC	MCS (µg/L)	Basis
1,1-DCE	7	MCL
1,2-DCA	5	MCL
cis-1,2-DCE	70	MCL
PCE	5	MCL
TCE	5	MCL
Vinyl chloride	2	MCL
Chloroform	80	MCL
Hexavalent chromium	100	MCL

Source: ROD, Navy, April 2004.

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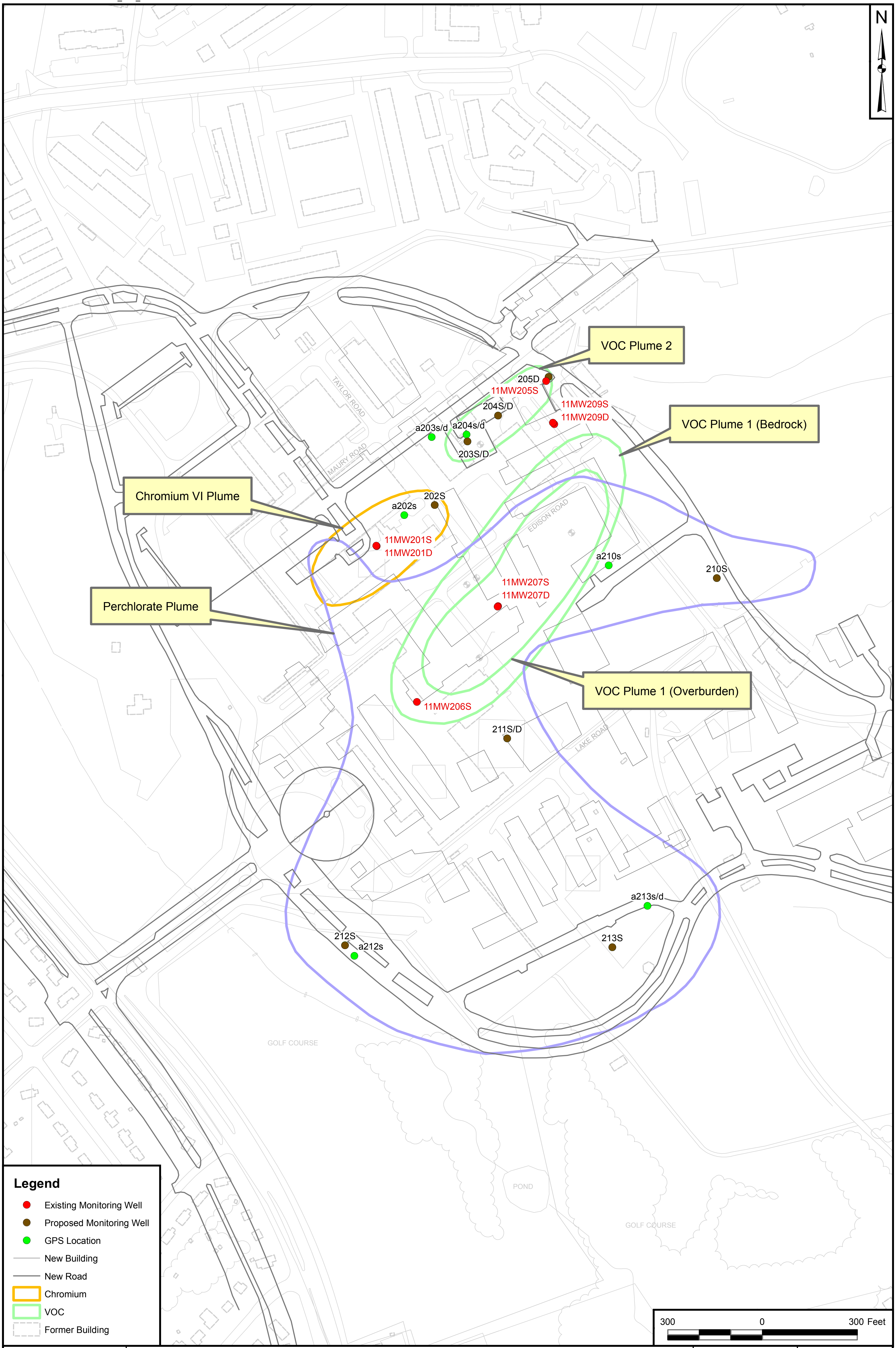


DRAWN BY	DATE	TETRA TECH	CONTRACT NUMBER	CTO NUMBER
S. STROZ	02/04/10		3668	555
CHECKED BY	DATE	MONITORING WELL NETWORK SITE 11 GROUNDWATER PLUMES FORMER NSWC - WHITE OAK SILVER SPRING, MARYLAND	APPROVED BY	DATE
S. NESBIT	02/01/12		__	__
REVISED BY	DATE		APPROVED BY	DATE
J. ENGLISH	02/01/12		__	__
SCALE			FIGURE NO.	REV
AS NOTED			FIGURE 7-1	0

8.0 SITE 49 — TRICHLOROETHENE GROUNDWATER PLUME IN THE 400 AREA

8.1 SITE HISTORY

Site 49 is located at the eastern edge of the 400 Area of the former NSWC White Oak facility in the north-central portion of the facility. The topography in this portion of the former Navy property contains considerable relief. The western portion of Site 49, including building 427, is relatively flat. The central and eastern portions of Site 49 include a steep-sided ravine formed by Paint Branch. The total elevation drop from west to east across Site 49 is approximately 49 feet.

Contamination at Site 49 was initially identified during the Washington Suburban Sanitary Commission (WSSC) and White Oak sanitary sewer lines investigation. TCE was detected in groundwater samples collected using direct-push technology on two occasions from one location (near WSSC Manhole 32142) along the bedding of a WSSC sewer that runs along Paint Branch hydraulically downgradient of the Building 427 area. Groundwater samples collected from sewer bedding up- and down-pipe of Building 427 did not contain TCE. A subsequent screening investigation indicated that TCE was present in groundwater near Building 427 at concentrations as high as 4,000 µg/L.

A "limestone pit" or leaching well was present on the west side of the building and, according to construction drawings, was to be used for disposing of acidic wastewater from the water treatment system used to pretreat water before filling the testing tank. Former building personnel stated that the leaching well was never used for its designed purpose and that the wastewater lines leading to the leaching well were reportedly connected to sinks in rooms that were initially designed to be laboratories but were in actuality used as offices. The leaching well was excavated in 2002 as part of the Site 49 remedial investigation.

It was noted by former building personnel that inert torpedoes used for testing in the tank were sometimes cleaned on the loading dock area on the north side of Building 427. It was also noted that a small area outside the east gate along Perimeter Road was used for debris disposal and may have conceivably been used for unauthorized dumping of wastes because it is relatively remote and hidden from view. Construction drawings also indicate that a subsurface foundation drain runs along the perimeter of the building about 17 to 27 feet below grade. The drain consists of 6-inch perforated clay pipe draining to two manholes, one at the northwest corner of the building and one near the southeast corner of the building. The northwest manhole is a sump that collects and pumps water to the southeast manhole. The southeast manhole also receives water from two interior basement sumps. Water was discharged from the southeast manhole to Paint Branch by a pipe and open channel.

The area was designated as Site 49 and the origin of the TCE and the nature and extent of the contamination in groundwater, surface water and soil was then fully characterized in the Site 49 RI (CH2M HILL, May 2004). The removal of the leaching well and a visual inspection of Building 427 was conducted as part of the RI. In addition, the Building 427 perimeter drain and basement sumps were sampled for VOCs. Soil, surface water and groundwater grab samples were collected and 12 permanent monitoring wells were installed and sampled.

An FS was subsequently performed to identify and evaluate remedial alternatives (CH2M HILL, June 2004).

The former leaching well mentioned above, also referred to on architectural drawings as a limestone pit, and was excavated on June 17, 2002 by Shaw E&I, Inc., as a housekeeping measure and a presumptive remedy. Two soil samples were collected for laboratory analyses during excavation. The first sample was collected from the bottom of the excavation and analyzed for VOCs.

Following removal of the leaching well, the excavation was backfilled and the area was seeded and covered with hay. The leaching well, which appeared to be constructed with an up-ended concrete sewer pipe with a diameter of 4 feet and a height of 5 feet, was disposed of as construction debris.

The Site 49 ROD was finalized in November 2004.

8.2 BACKGROUND

8.2.1 <u>Site 49 Physical Characteristics</u>

The terrain in the vicinity of Site 49 consists of locally steep hills, particularly in areas dissected by stream channels. The drainage pattern at Site 49 is dominated by Paint Branch. Land cover varies between woodland, grassland, paved areas and buildings. Elevations at Site 49 range from approximately 275 feet above mean sea level (msl) around Building 427 to approximately 180 feet above msl, at Paint Branch, see Figure 8-1.

The subsurface geology of Site 49 is primarily underlain by Piedmont bedrock and derived saprolite. Potomac group deposits and recent sediments are not present at Site 49. The saprolite is composed of the same materials as the underlying schist bedrock. The saprolite is strongly foliated, preserving the structures of the parent schist. Its thickness ranges from about 5 feet in the north and west to about 25 feet in the south and east. Underlying the saprolite is Precambrian to Cambrian, meta-sedimentary crystalline bedrock of the Wissahickon Formation.

8.2.2 Land and Resource Use

Site 49 is located at the eastern edge of the Arnold Engineering Development Center (AEDC). The topography in this portion of the former NSWC White Oak contains considerable relief. The western portions of Site 49, associated with AEDC including Building 427, are relatively flat. The central and eastern portions of Site 49 include a steep-sided ravine formed by Paint Branch. The total elevation drop from west to east across Site 49 is approximately 100 feet.

Groundwater at Site 49 and throughout the former NSWC White Oak is not used as a potable water source at this time and is unlikely to be used for such purposes in the future. Water for occupants of the former NSWC White Oak and the surrounding properties is (and is expected to continue to be) supplied by a local municipal water authority. Local ordinances prevent the installation of new private potable supply wells without a permit. Additionally, the rock aquifer matrix within the site is incapable of providing a supply in excess of 1 gallon per minute. Nonetheless, for the purposes of the site risk assessment, the groundwater was evaluated as a potential residential drinking water source.

8.2.3 Nature and Extent of Contamination

Soil was investigated in order to determine if a source of the TCE in groundwater could be identified. Investigation of soil conditions and potential source areas found no continuing sources for the TCE remaining in the soil. Analytical data for the Site 49 soil samples is presented in the Site 49 RI (CH2MHILL, May 2004).

PCE was detected at very low concentrations in seven samples from three boring locations (maximum concentration 3.0 µg/kg). Chloromethane (2.7 µg/kg), bromomethane (1.4 µg/kg) and carbon disulfide (1.7 µg/kg) were also detected in one area of the site at very low concentrations.

SVOCs were detected in one area at low concentrations. Only one SVOC, benzo(a)pyrene, was detected in a subsurface soil sample at a concentration exceeding the EPA Region 3 RBC for residential soil. The maximum concentration of benzo(a)pyrene was 590 µg/kg.

Maximum detections of arsenic, iron, and manganese at 2.7 mg/kg, 37,400 mg/kg and 2,090 mg/kg, respectively, exceeded EPA Region 3 RBCs for residential soil. However, the maximum detected concentration of arsenic was below the 95% upper confidence limits (UCLs) for background at NSWC White Oak. Although the maximum detected concentration of iron and manganese exceeded the calculated 95% UCLs for background, it is unlikely that the results indicate anthropogenic soil contamination. Rather, the variability in concentrations detected in Site 49 samples appears to be consistent with variability expected in natural soils, based on the background data set and regional-scale reference data sets.

The nature and extent of groundwater contamination for Site 49 is based on the discussions and the analytical data for groundwater presented in the Site 49 RI report (CH2M HILL, May 2004). The primary contaminants detected in groundwater are TCE and its breakdown products (cis-DCE and vinyl chloride). The maximum concentrations of these contaminants are listed below.

- TCE: 4,400 µg/L
- cis-DCE: 1,100 µg/L
- Vinyl chloride: 5.7 µg/L

The contaminant plume extends approximately 450 feet from Building 427 on the west and is bounded by Paint Branch on the east. The northern side of the TCE plume extends 100 to 200 feet onto property owned by the Maryland National Capital Park and Planning Commission and remains undefined due to lack of offsite access rights.

The vertical delineation program indicates TCE concentrations increase with depth near the source area and decrease with depth away from the source. It is postulated that this may be due to the complex vertical gradients and groundwater flow patterns near Paint Branch.

Five metals were detected in the groundwater at concentrations above applicable screening levels. The metals and their maximum concentrations in filtered groundwater are: aluminum (6,800 µg/L), chromium (75.5 µg/L), iron (14,100 µg/L), manganese (2,290 µg/L), and nickel (81 µg/L).

Surface water samples were collected along Paint Branch. Results indicate that surface water quality in Paint Branch, adjacent to Site 49, is consistent with background data and shows no anthropogenic influences from Site 49. The absence of detectable concentrations of VOCs indicates that any groundwater discharged to Paint Branch from Site 49 has no adverse effect on surface water quality.

8.2.4 Risk Assessment Summary

The following risk summaries were developed from the information in the ROD, before the remedy was implemented.

8.2.4.1 Human Health Risk Summary

COPCs were defined as those chemicals with maximum concentrations greater than the EPA Region 3 risk-based concentration for tap water in a residential setting. Constituents with maximum detected concentrations below the RBC were not retained as COPCs. Lead concentrations in groundwater were compared with the Safe Drinking Water Act action level. Comparison with background concentrations were not used in the screening process.

Thirteen COPCs were identified for the groundwater, consisting of seven VOCs and rive inorganics which are as follows:

- 1,2-Dibromomethane
- Chloroform
- PCE
- TCE
- Vinyl chloride
- cis-1,2-DCE
- trans-1,2-DCE
- Aluminum
- Chromium
- Iron
- Manganese
- Nickel

For the purposes of the risk assessment, it was assumed that groundwater from beneath the site would be used as a future residential potable water supply. Therefore, the future child and adult resident were evaluated for potential exposure to groundwater for potable use. Carcinogenic risks were calculated for a lifetime resident instead of for the individual child and adult resident, as directed by EPA Region 3 risk assessment guidance. The risk assessment also assumed that a future construction worker could be exposed to groundwater in an open excavation during any construction or excavation activities at the site.

His from an assumed exposure to groundwater under Reasonable Maximum Exposure (RME) and Central Tendency Exposure (CTE) conditions are summarized below. The cumulative HIs for the construction worker or adult resident under CTE conditions does not exceed the EPA target of unity (one), however the cumulative HIs under RME conditions does exceed unity. The cumulative HIs for a child resident exceeds unity for both RME and CTE conditions.

Table 8-1 summarizes the groundwater risk results for various exposure populations.

ILCRs from exposure to groundwater under RME and CTE conditions are summarized below. The cumulative ILCRs for the construction worker under CTE and RME conditions are within the EPA acceptable target range of $1.0X10^{-6}$ to $1.0X10^{-4}$. The cumulative ILCRs for the life time resident under both the RME and CTE conditions are greater than the upper bound of the EPA acceptable target range.

8.2.4.2 Ecological Risk Assessment

The Navy has completed a BERA for NSWC White Oak (TtNUS, October 1999 — 2001) that included an evaluation of surface water and sediment in Paint Branch, including the area of Paint Branch near Site 49. The BERA concluded that the surface water and sediment in Paint Branch did not pose an unacceptable risk to ecological receptors. The chemical concentrations in the surface water samples that were subsequently collected as part of the Site 49 RI were all less than the screening levels established as part of the BERA process.

Groundwater exposure is not associated with any ecological receptors, therefore no ecological risks are posed by Site 49 groundwater. Soil data collected at Site 49 was limited to subsurface soil because of the anticipated nature of any releases. Similarly, no ecological risks are posed by subsurface soil because there are no exposure routes for ecological receptors.

8.3 REMEDY IMPLEMENTATION

Interim source removal activities were completed at Site 49 during 2002 to address contaminant sources that may be impacting groundwater at NSWC White Oak. The activities included the excavation and off-site disposal of the leaching well and surrounding soil. The remedial action of in-situ chemical oxidation (ISCO) was conducted between August and September 2007.

8.3.1 Remedial Action Objectives

The RAOs for groundwater for Site 49, as presented in the ROD (Navy, November 2004), include the following:

- Prevent unacceptable risk to human receptors from exposure to contaminants in the groundwater.
- Restore contaminated groundwater to a quality amenable to beneficial use (meet the PRGs identified).
- Prevent further migration of contaminants.

Meeting these objectives for Site 49 is based largely upon achieving the PRGs, ; the original PRGs are shown in Table 8-2. These PRGs were re-calculated in 2010 for each of the COCs identified for the Site 49 groundwater, based on updated toxicity values, most recent risk assessment methodology, and combined risks from the COCs in the Site 9 area groundwater (CH2MHill, 2010). The PRG established was the MCL (for those compounds that have MCLs) and the calculated risk-based PRG for chemicals that do not have MCLs.

8.3.2 Selected Remedy

The selected remedy consisted of:

- ISCO through injection of sodium permanganate into wells and pneumatic fracturing
- Long-term monitoring of the plume until PRGs are met.
- Implementation of institutional controls until PRGs are met.

The remedy implementation at Site 49 was conducted in August and September 2007. The work was conducted by Shaw Environmental through the injection of sodium permanganate (NaMnO4) at injection wells 49INJ1S, 49INJ1D and 49INJ2 through 49INJ14.

Between August 21 – 29, 2007, sodium permanganate was injected at 49INJ1S, 49INJ1D and 49INJ2 – 49INJ14 via gravity feed in accordance with the project specifications. Eight-percent sodium permanganate solutions were mixed and prepared in an approximately 160-sq-ft, bermed, secondary containment area with four layers of six-mil polyethylene sheeting. During the mixing process, 40-percent sodium permanganate oxidant was pumped into potable water in plastic totes and mixed via pumping until an eight-percent dilute sodium permanganate solution was formed. The required volumes of 40-percent sodium permanganate and make-up water and chase water are shown for each injection well.

Following mixing, each tote was transported using a four-wheel drive forklift to the designated injection wells. A bermed polyethylene secondary containment area was assembled at each injection well and the sodium permanganate solution was injected via gravity feed directly from the tote. The eastern injection well array (49INJ2 – 49INJ8) and western injection well array (49INJ9 – 49INJ14) were simultaneously treated by alternating injections between the two well sets.

During the injection process, the wells were visually inspected to ensure that leakage or spillage did not occur.

During August 21 – 29, 2007, approximately 125 gallons of eight-percent sodium permanganate solution was injected via gravity feed into each of the eastern injection wells (49INJ1S, 49INJ1D and 49INJ2 –

49INJ8) and approximately 40 gallons of eight-percent sodium permanganate solution was injected via gravity feed into each of the western injection wells (49INJ9 – 49INJ14). Due to lower permeabilities and slower injection rates, injections of the required volumes of sodium permanganate solution in 49INJ1S, 49INJ1D, 49INJ3, 49INJ4 and 49INJ7 could not be completed in single, continuous events and multiple injections were necessary. During the mixing and injection procedure, 275 gallons of 40-percent dilute sodium permanganate solution was mixed with 1,092.5 gallons of potable water. The resulting 1,367.5 gallons of eight-percent dilute sodium permanganate solution was injected into 49INJ1S, 49INJ1D and 49INJ2 – 49INJ14.

Between August 23 and September 10, 2007, chase water was injected via gravity in wells 49INJ1S, 49INJ1D and 49INJ2 through 49INJ14 in accordance with the project specifications. Chase water consisted of potable water from the hydrant located south of Building 427. The goal was to add a minimum of 20 gallons of chase water to each well with the project objective being to add between 70 to 200 gallons. Approximately 2,220 gallons of chase water was gravity fed into the injection wells.

Pre-injection monitoring of physical parameters in the injection wells and groundwater monitoring wells located in Site 49 was performed to establish pre-treatment groundwater conditions. The physical parameters included color, oxidation-reduction potential (ORP), dissolved oxygen (DO), pH, temperature, conductivity, and water levels. Color was monitored using a colorimeter (DR/890-Hach), ORP, DO, pH, temperature and conductivity were monitored using a YSI 650MDS with a 600XLM probe, and water levels were gauged using a Heron Water Level Indicator. Field instruments were calibrated in accordance with manufacturer's specifications prior to use.

Monitoring of physical parameters in groundwater was conducted during sodium permanganate injection to provide real-time data in order to document the spread of injected fluids. Visual inspection of surface water in and along bank of Paint Branch was conducted during and following oxidant injection. Indications of sodium permanganate migration included visual color changes (slightly pink to purple), increasing DO and increases in ORP, specific conductance and pH.

The visual appearance of purple color in groundwater in 49GW201S adjacent to 49INJ14 indicated that sodium permanganate solution reached this groundwater monitoring well on August 22 and August 23, 2007. Besides color, sharp changes were noted in ORP (196.2 increasing to 602.8 mV) and conductivity (524 increasing to 2,556 μS/cm) in 49GW201S between August 22 and 23, 2007. Purple color was visually observed only in 49GW201S. Visual color changes were not seen along the bank of Paint Branch Creek during or following sodium permanganate injection.

Dissolved oxygen readings in the pre- and post-injection monitoring events were consistently high. Instrument calibrations were performed in accordance with manufacturer's specifications and the readings were recorded accurately in mg/L. High DO levels may be due to agitation caused by purging and sampling with a bailer. Low flow purging and sampling methods would be less likely to increase DO.

Decreasing ORP trends in several wells including 49GW206M, 49GW206D, 49GW207S, 49GW208S and 49GW209 indicate that sodium permanganate solution has not yet reached these locations. The prediction of groundwater flow paths and flow rates in fractured bedrock is complicated and both time and distance need to be considered.

8.3.3 Remedial System Operation and Maintenance

Currently, the only ongoing activity is groundwater monitoring; therefore the only O&M activity is the inspection and maintenance of monitoring wells. Since chemical injection occurs in periodic treatment episodes, limited O&M activities are anticipated over the duration of the remedial action process.

8.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second Five-year Review for Site 49 — TCE Groundwater Plume in the 400 Area at the former NSWC White Oak facility. At the time of the first review, the remedial action had not been implemented therefore no issues or actions had been identified (JM Waller 2007).

8.5 FIVE-YEAR REVIEW PROCESS

8.5.1 Administrative Components

This section provides a summary of the five-year review process and the actions taken to complete this review. The components of the Five-Year Review process include the following:

- Community involvement
- Document review
- Site inspection
- Data and Performance Evaluation
- Five-Year Review report development and review

8.5.2 Community Involvement

The Proposed Plan, RI, CMS, and FS for Site 49 became available to the public on July 1, 2004 and are among the documents that comprise the Administrative Record file for former NSWC White Oak, which is maintained by NAVFAC Washington at the Washington Navy Yard, Washington, DC. These documents are also located in the information repository for the NSWC White Oak, which is maintained at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland. The notice of availability of these documents, the public comment period, and a public meeting were published in the Washington Post, Silver Spring Gazette, College Park Gazette, and Burtonsville Gazette in June 2004. The public comment period was held from July 1, 2004 to July 30, 2004, and a public meeting was held on July 13, 2004.

Upon completion of this Five-Year Review, the results will be made available to the RAB members at their next meeting. The results of the five-year review and the report will be made available to the public at NAVFAC Washington.

8.5.3 Document Review

The documents reviewed for the second five-year review are listed below, and key information obtained from the documents is summarized in the following sections.

First Five-Year Review completed	April 2007
White Oak Site 49 Sodium Permanganate Injection Report	January 2008
Revisions to PRGs Sites 4/46, 7, 9, 5/13, and 49	October 2010
Three-Year Post-Injection Long-Term Monitoring Memo	July 2011

8.5.4 Data Review

The most recent monitoring data (December 2010) were reviewed as part of the data review process. The results are provided in Appendix C. Three years after completing the sodium permanganate injection at Site 49, an overall decrease in the areal extent of total chlorinated volatile organic compounds (CVOCs) concentrations at Site 49 is evident.

The concentration of one or more of CVOCs exceeded the PRGs in 11 of the 15 monitoring wells sampled during the December 2010 sampling event. CVOC concentrations, specifically cis-1,2-DCE, TCE and vinyl chloride, while showing decreases following the ISCO application, have generally stabilized, with the exception of concentrations from two wells screened in the deeper portion of the aquifer: 49GW207D and 49GW208D. The total CVOC concentrations in these continue to oscillate, possibly due to continued impact of untreated groundwater beneath Building 427. The permanganate oxidant likely was successful at treating the CVOC mass it contacted in the bedrock fractures and saprolite; however, the slow kinetics of back-diffusion (from bedrock matrix and fine-grained portions of the saprolite) are likely contributing to the newly equilibrated CVOC values measured in groundwater.

At the request of MDE, a sample for 1,4-dioxane was collected from well 49GW208D to determine whether this emerging contaminant was present in groundwater at Site 49. The 1,4-dioxane sample indicated a concentration of 0.4 J µg/L, which is below the current EPA Tap Water Regional Screening Level of 0.67 µg/L. Furthermore, 1,4-dioxane is typically detected where 1,1,1-trichloroethane is found in soil or groundwater, and this chlorinated solvent is not a COC for this site.

8.5.5 Site Inspections

Site 49 was inspected on October 11, 2011. The purpose of the inspection was to assess the protectiveness of the implemented remedial action, including the presence of access restrictions and other LUCs. Appendix A contains the site inspection checklists. Photographs taken during the site inspection are included in Appendix B.

A cursory inspection of the monitoring wells indicated that all the wells were in good physical condition and were secured with locks.

LUCs include written restrictions, which control the use of groundwater for potable use. There was no evidence that groundwater is being used for any purpose, nor is it likely that it ever will be. At the time this Five-Year Review was prepared, the exact wording of the LUCs were still in the developmental stage. The LUCs will remain in effect until contamination levels drop to a level that allow for unrestricted use of the site.

8.5.6 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

8.5.7 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC Remedial Design was developed during the Design Phase, has been reviewed by EPA and MDE and the proposed language is currently being reviewed by the Navy. The following institutional controls have been or are in the process of being implemented:

- Ensure no withdrawal of groundwater for any purpose (including drinking water) from within the restricted area until the PRGs are met and risks from groundwater use are reduced to acceptable levels.

- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area.

- Ensure adequate protection to minimize physical disruption of any remedial equipment, such as monitoring wells in the restricted area.

- Ensure adequate notification of pertinent use restrictions to current and future property owners.

These institutional controls will be maintained until the concentrations of hazardous substances in the groundwater are at such levels as to allow for unrestricted use and exposure. Based on the site inspection, there is no evidence that any of these LUCs have been violated.

8.6 TECHNICAL ASSESSMENT

Question 1. Is the remedy functioning as intended by the decision documents?

The review of documents and site inspection indicate that the portions of the selected remedy that have been implemented to date, institutional controls and groundwater monitoring, are functioning as intended by the ROD. The ISCO remedy applied at the site has been effective in reducing contaminant mass, however, inability for contact with contaminants within the bedrock fractures and the potential presence of contamination beneath Building 427 may limit the overall effectiveness of the remedy. Institutional controls in the form of groundwater use restrictions are responsible for protecting human receptors from any direct contact with or ingestion of groundwater. Groundwater monitoring has and will continue to be utilized to document the effectiveness of the remedial actions in achieving the PRGs.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, clean-up levels, and RAOs identified in the ROD are still valid.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has surfaced that questions the protectiveness of the selected remedy.

The institutional controls and groundwater monitoring are effective in protecting human receptors from any direct contact with or ingestion of groundwater. In particular, the institutional controls are responsible for preventing use of and therefore exposure to groundwater. Additional monitoring is needed to evaluate the effectiveness of the ISCO in treating contamination within the fractured bedrock of the site.

8.7 ISSUES

The institutional controls and groundwater monitoring portions of the Site 49 remedy are functioning as intended by restricting exposure to groundwater contaminants by human and ecological receptors. The remedial action of ISCO has been implemented and results have shown a reduction in the contaminant mass. To date, no issues have been identified for these activities.

8.8 RECOMMENDATIONS AND FOLLOW UP ACTIONS

Based on the review of documents and the site visit, there are no recommendations at this time.

Based on the site data and the Decision Rules presented in the Site 49 LTM plan, the following optimizations to the Site 49 LTM program and continued remediation are recommended:

- The injection of additional sodium permanganate to promote the continued destruction of CVOCs in groundwater at Site 49. A design should be developed to address the areas of highest remaining CVOCs, potentially including additional injection wells near Building 427.

- Performance monitoring of CVOCs 6 months post-ISCO application in monitoring wells across Site 49.

- Continue the annual LTM for CVOCs at Site 49 following the second injection of sodium permanganate and a performance monitoring event.

8.9 PROTECTIVEMENT STATEMENT

Based on the activities that have been implemented, the selected remedy is protective of human health and the environment. In particular, institutional controls which prevent usage of groundwater as a potable water supply are functioning as intended and are protecting human receptors from exposure to groundwater contamination while the application of ISCO to site groundwater has reduced the contaminant mass. Groundwater monitoring and five-year reviews will help ensure that the remedial actions are functioning as intended and that an overall long-term reduction in groundwater contamination is being achieved.

8.10 NEXT REVIEW

The next Five-Year Review for Site 49 is required by 2017, five years from the date of this review.

TABLE 8-1

SUMMARY OF HEALTH RISK FOR SITE 49 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Hazard index for Site 49 Groundwater				
	Adult Construction Worker	**Adult Resident**	**Child Resident**	**Life Time Resident**
Total HI - RME	3.7	34	79	NA
Total HI - CTE	0.11	0.79	2.5	NA
Incremental Lifetime Cancer Risk for Site 49 Groundwater				
	Adult Construction Worker	**Adult Resident**	**Child Resident**	**Life Time Resident**
Total ILCR - RME	9.7 E-05	NA	NA	1.3 E-01
Total ILCR - CTE	2.7 E-06	NA	NA	1.3 E-03

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

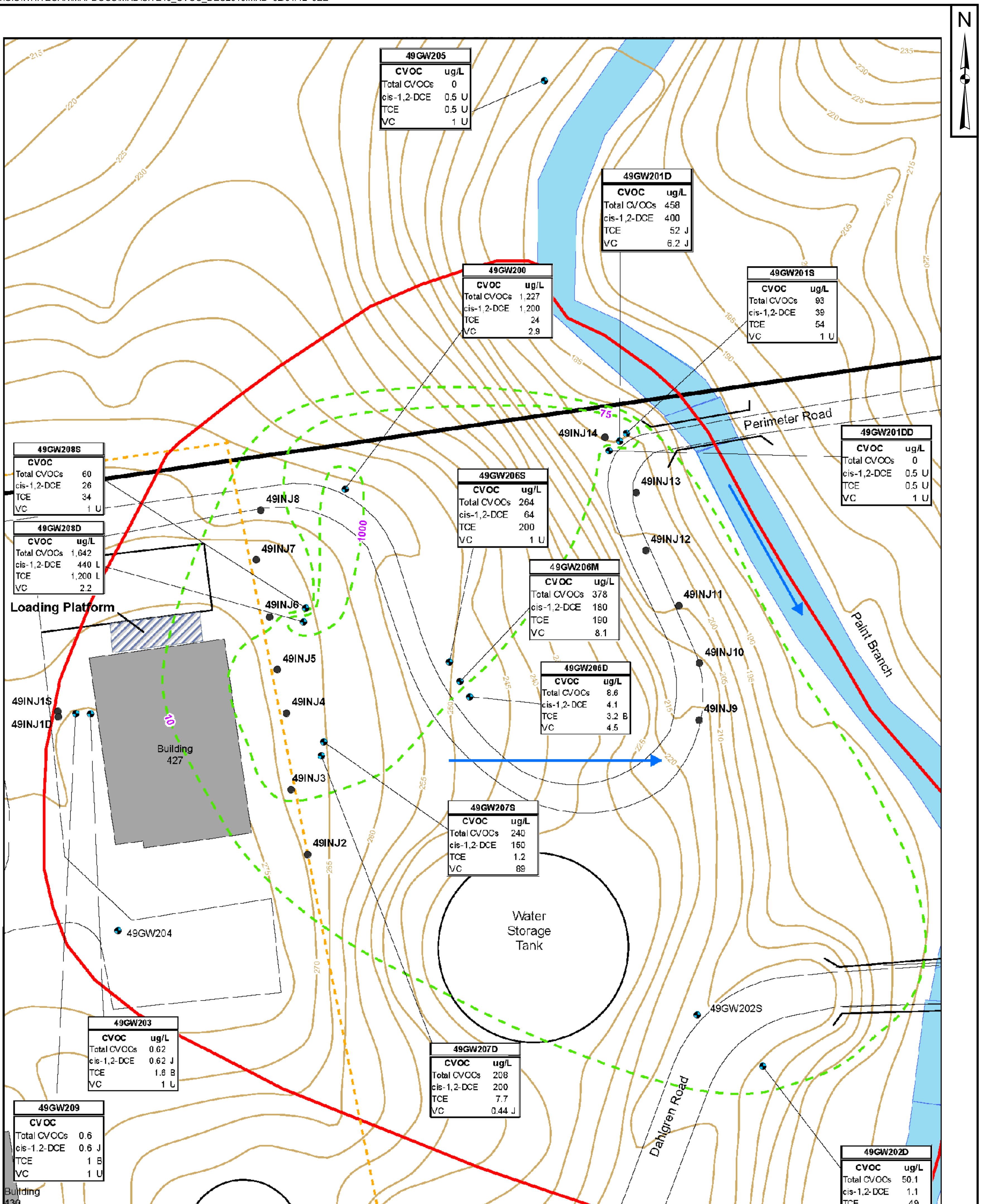
TABLE 8-2

PRGs FOR COCs AT SITE 49
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

COC	PRG (µgIL)	Basis
cis-1,2-DCE	70	MCL
TCE	5	MCL
Vinyl chloride	2	MCL
Iron	4,700	RBC

Source: ROD, Navy, November 2004.

PGH P:\GIS\WHITEOAK\MAPDOCS\MXD\SITE49_CVOC_DEC2010.MXD 02/01/12 JEE



Notes:
1. Total CVOCs were calculated using the detected values for TCE, cis-1,2-DCE, and VC only.
2. In the event of a duplicate sample, the higher result is reported.
3. Leaching well is located on the west side of Building 427, in the immediate vicinity of monitoring well 49GW203.
4. Monitoring well 49GW204 is not included in the Site 49 LTM program.
5. Monitoring well 49GW202S was buried during construction activities and could not be located.

Legend
- Injection Well
- Monitoring Well
- Total Chlorinated VOCs
- Base Boundary
- Fence
- Topography (5 feet Intervals)
- Site 49 Boundary
- Buildings and Other Structures

Direction of Groundwater and/or Stream Flow

CVOCs – Chlorinated Volatile Organic Compounds
cis-1,2-DCE – cis-1,2-Dichlorethene
TCE - Trichloroethene
VC – Vinyl chloride
U - The material was analyzed for, but not detected
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher

Data courtesy of CH2M Hill.

70 0 70 Feet

DRAWN BY	DATE	TETRA TECH	CONTRACT NUMBER	CTO NUMBER
J. ENGLISH	02/01/12		3668	555
CHECKED BY	DATE	EXTENT OF CVOCs IN GROUNDWATER, DECEMBER 2010	APPROVED BY	DATE
S. NESBIT	02/01/12	SITE 49	—	—
REVISED BY	DATE	NSWC WHITE OAK	APPROVED BY	DATE
—	—		—	—
SCALE		SILVER SPRINGS, MARYLAND	FIGURE NO.	REV
AS NOTED			FIGURE 8-1	0

9.0 SWMU 87 – BUILDING 611 SOLID WASTE STORAGE AREA

9.1 SITE HISTORY

SWMU 87 is located west and north of former Building 611 in the south-central portion of the facility (Figure 9-1). The unit is located within 50 feet of Paint Branch and was reportedly used to store wood, metal waste, and other debris. The site itself is level but slopes quickly to the west due to erosion from the stream. To the northeast and southeast, moderately steep slopes rise above the site.

Under the provisions of the Hazardous and Solid Waste Amendments (HSWA) to RCRA, treatment, storage, or disposal facilities seeking final permits are required to initiate corrective actions for releases of hazardous wastes or constituents from SWMUs. Former NSWC White Oak operated under an interim status for on-site storage of hazardous waste. The Navy first submitted an application for a final (Part B) permit to Maryland in 1985, and made subsequent resubmissions and modifications. The last permit application was submitted in 1992.

In September 1992, Malcolm-Pirnie completed an RFA review for the Navy that evaluated the applicability of the general recommendations of the RFA to each individual SWMU. Generally, for those SWMUs that were being investigated under the IRP, it was concluded that the planned level of effort was sufficient to address potential impacts from each SWMU. It was also concluded that some level of sampling would probably be required for the SWMUs and AOCs that were recommended for an RFI or verification sampling.

In 1995, former NSWC White Oak was selected for closure on the BRAC IV list. A Phase I EBS was conducted by EA Engineering Science and Technology (EA) to assess the existing environmental information related to storage, release, treatment, or disposal of hazardous substances or petroleum products and to document the environmental condition of the property. The EBS also addressed actions required prior to property transfer to ensure compliance with requirements of CERCLA 120(h), applicable state and real estate laws, compliance programs, and the DoD policy for Agency to agency property transfer at BRAC installations.

An investigation to characterize background soil, sediment, groundwater, and surface water quality was performed in the fall of 1997. A final background report was published in 1998 (TtNUS, December 1998).

The RFI for SWMU 87 (TtNUS 2005a) characterizes the nature and extent of contamination and associated environmental conditions that may impact human health and the environment. As described earlier, SWMU 87 is located within 50 feet of Paint Branch. AOC M was a storm drain in front of

Building 611 that discharged to Paint Branch through an outfall. Any potential impacts to the surface water and sediment of Paint Branch were evaluated in the investigation for AOC M (TtNUS, 2004).

Surface and subsurface soil samples were analyzed for TCL VOCs, SVOCs, Pesticides/PCBS, and TAL metals. Three temporary monitoring wells were installed within and downgradient of SWMU 87 during an investigation conducted in 1999, and three additional temporary monitoring wells were installed during a supplemental investigation conducted in 2002. Based on the results of surface soil, subsurface soil, and groundwater samples collected during the 1999 and 2002 investigations, an additional field investigation was conducted at SWMU 87 in June 2003. The purpose of this investigation was to identify the source of VOCs in groundwater by the collection of surface and subsurface soil samples. Two potential source areas have been identified, the catch basin at the northern end of the building and the area near the former compressed air tanks slab on the eastern side of the building.

A CMS was conducted for SWMU 87 in 2005 (TtNUS, April 2005). The CMS included the evaluation of remedial alternatives for SWMU 87 groundwater.

The SWMU 87 Record of Decision was finalized in October 2005.

9.2 BACKGROUND

9.2.1 SWMU 87 Physical Characteristics

The subsurface materials encountered beneath SWMU 87 consist of fill, natural unconsolidated materials, saprolite, and bedrock. The fill consists of reworked natural materials and fill that was placed to support grading activities during original building construction at SWMU 87. The fill exists in these isolated areas of prior construction, and extends to depths of approximately 5 feet; but thickens in the vicinity of Paint Branch. The natural unconsolidated material underlies the fill in disturbed areas, and exists at the ground surface in undisturbed areas. The natural unconsolidated materials consist of silty sand and range from approximately 5 feet along the hillsides to greater than 10 feet in the valley along Paint Branch and along the plateau on the top materials, and ranges from 5 feet thick in the highlands and thickens in the valleys along Paint Branch. The bedrock consists of schist with isolated fracturing, and is found at shallower depths (less than 15 feet below ground surface) to greater than 25 feet along Paint Branch.

Groundwater exists in the fill, unconsolidated natural materials, saprolite, and bedrock. The depth to groundwater is less than 15 feet bgs in the lowlands along Paint Branch, and greater than 25 feet bgs in the higher elevations. Groundwater exists generally under unconfined conditions at shallow depths, although confined groundwater was encountered in well borings drilled in higher elevations in the bedrock. Groundwater, once encountered in the bedrock, was observed to rise in the borings until reaching equilibrium.

Shallow groundwater follows topography and flows from higher elevations to lower elevations, discharging into Paint Branch. Shallow groundwater in the highlands exists in the bedrock, and flows generally south, passing through the saprolite and unconsolidated materials in the lowlands, and ultimately discharges into Paint Branch. Groundwater flow in the bedrock is believed to be influenced by fracturing as evidenced by the varying groundwater yield in the bedrock wells. Drilling logs also indicated soft zones during drilling of some of the bedrock borings, which may be the result of fracturing.

Seepage velocity calculations were developed for the saprolite and bedrock using measured slug test data and the pneumatic surface map for the site. An average seepage velocity in the saprolite was calculated to be 5.4 feet/day and an average seepage velocity in the bedrock was calculated to be 0.48 feet per day.

9.2.2 Land and Resource Use

The area of SWMU 87 consists of open field adjacent to Paint Branch in south central portion of the property owned by the US government. GSA has no immediate plans to use this area. There are no water supply wells located on the property in the area within or downgradient of the plume. Groundwater at and downgradient of SWMU 87, and throughout the former NSWC White Oak, is not used as a potable water source at this time and is unlikely to be used for such purposes in the future. Water for occupants of the former NSWC White Oak and the surrounding properties is, and is expected to continue to be supplied by a local municipal water authority. Local ordinances prevent the installation of new private potable supply wells where a public supply is readily available.

However, for the purposes of the site risk assessment, the site was evaluated assuming the possibility of residential use for the entire area including the use of the groundwater as a primary drinking water source.

9.2.3 Nature and Extent of Contamination

Seven surface soil samples were collected and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and TAL metals. Based on the laboratory results, six metals (aluminum, arsenic, chromium, iron, manganese and nickel) exceeded screening levels for residential soil in surface soil. The six metals that exceeded the benchmarks were detected in all surface soil samples. Arsenic was detected within background concentrations. None of the VOCs, SVOCs, or pesticides/PCBs detected in the surface soil at SWMU 87 exceeded any benchmarks.

The maximum concentrations of arsenic, chromium, and nickel exceed the USEPA Region 3 Soil to Groundwater protection criteria. However, only the average arsenic concentration in surface soil exceeded the groundwater protection criterion. Because arsenic concentrations are within background levels, there would not be any significant, site-related impact to groundwater.

Twenty subsurface soil samples were collected from depths of 2 to 10 feet bgs and analyzed for TCL VOCs, TCL SVOCs, TCL pesticides/PCBs, and/or TAL metals. Based on the laboratory results, three metals (iron, manganese, and nickel) were retained as COPCs in subsurface soil. The remaining metals that exceeded screening levels for soil were not detected at levels significantly greater than background. In addition, several VOCs were detected in the subsurface soil at SWMU 87 in excess of groundwater protection criteria; however, the detections were limited in number and were estimated values.

The maximum and average concentrations of arsenic exceed the EPA Region 3 leaching-to-groundwater SSLs used to evaluate potential impacts to groundwater. However, arsenic concentrations are within background levels and would not pose a significant, site-related impact to groundwater.

Based on the results of the site investigations performed at and around SWMU 87, groundwater contamination (chlorinated ethenes, with PCE the primary contaminant) is present in both the overburden and fractured bedrock groundwater flow systems. Concentrations are generally low, with maximum detected PCE concentrations of 120 µg/L (overburden) and 34 µg/L (bedrock).

The overburden groundwater plume is located in the general vicinity of Building 611 (SWMU 87) near Paint Branch, and is somewhat limited in extent. Several monitoring wells associated with this plume had PCE concentrations of 100 µg/L or more in the most recent round of sampling. The bedrock plume appears to originate from the vicinity of Building 613, approximately 600 feet north-northeast of Building 611. This plume has much lower contaminant concentrations associated with it, with only one well having a PCE concentration (36 µg/L) above the MCL of 5 µg/L. The contaminant sources for the two plumes have not been identified, however, given the long time period since the area has been active and generally low concentrations, it is considered unlikely that there are any active, continuing sources.

For the bedrock plume, current data indicates that the area containing groundwater contamination above MCLs is extremely localized (one well) and is well away from any sensitive receptors (i.e. Paint Branch). The estimated mass of contamination present in the bedrock flow system based on the groundwater calculations is miniscule, approximately 0.003 pounds. of VOCs total. In addition, the bedrock wells closest to the stream have trace to no contamination, indicating that the plume is naturally attenuating through physical and to a lesser degree, biological processes as it migrates from the Building 613 area.

The presence of trace levels of the PCE biodegradation daughter products TCE and cis 1,2-DCE at the site indicates that there is some level of biodegradation occurring in the bedrock flow system. Due to the trace amounts and concentrations of contamination present, the lack of an identified source, and the lack of a completed risk pathway to a potential receptor, the bedrock plume will be allowed to continue to naturally attenuate.

9.2.4 Risk Assessment Summary

The following risk summaries were developed from the information in the ROD, before the remedy was implemented.

9.2.4.1 Human Health Risk Summary

Site specific risks were estimated for SWMU 87 groundwater. The maximum detected chemical concentrations in groundwater were compared to the 95 percent UCLs calculated for the background data. Additionally, a population-to-population comparison was conducted using the Wilcoxon Rank-Sum test since both the site data and background data are not statistically "normally" distributed. Inorganic compounds found in the groundwater at SWMU 87 at concentrations that do not exceed basewide background levels were excluded as COPCs for SWMU 87.

The following chemicals were retained as COPCs in SWMU 87 groundwater:

- TCE and PCE

Estimated HIs from exposure to SWMU 87 groundwater in the Coastal Plain/saprolite under the RME and CTE conditions are summarized in Table 9-1. The cumulative HIs for possible future child residents exceed 1 for the RME and CTE conditions and exceed 1 for future adult residents under the RME condition.

As stated above, iron, manganese, and thallium were eliminated as COPCs in groundwater on the basis of background levels. If these metals had been selected as COPCs and evaluated in the risk assessment, the groundwater HI for the child resident would increase from 2 to 12, and the adult resident groundwater HI would increase from 1 to 5. These increases would be due to the ingestion of manganese and thallium. The overall site HI (soil + groundwater) for the child resident would still exceed unity and the total HI for the adult resident would now exceed unity.

Estimated ILCRs from exposure to SWMU 87 groundwater in the Coastal Plain/saprolite under the RME and CTE conditions are summarized below. The cumulative ILCRs for possible future adult, child, and lifelong residents exceed $1.0X10^{-4}$ for the RME condition and exceed $1.0X10^{-4}$ for the lifelong resident under the CTE condition.

Table 9-1 summarizes the groundwater risk results for various exposure populations.

9.2.4.2 Ecological Risk Assessment

The Navy has completed a phased BERA for NSWC White Oak to characterize the potential risks to ecological receptors from site-related chemicals found throughout the facility, including at SWMU 87. The procedures followed in conducting the BERA are outlined in the April 2001 final report. Soil, surface water, and sediment data collected as part of the investigation of SWMU 87, AOC M, and Paint Branch were evaluated as part of the BERA. No chemicals, detected in these media at or near the site, were retained after the preliminary screening against ecological risk assessment values. Therefore, the BERA did not identify any potential unacceptable risks to ecological receptors.

Since the development of the BERA, additional surface soil samples were collected in 2002 and 2003 and analyzed for VOCs. The results were compared to screening levels developed by the USEPA Biological Technical Assistance Group (BTAG). In the additional surface soil samples, only low levels of dichlorodifluoromethane (30 to 38 µg/kg) and toluene (2 µg/kg) were detected. The toluene detection is less than the BTAG screening level of 100 µg/kg. There is no BTAG screening level for dichlorodifluoromethane, but the maximum detection is well below the BTAG screening level for most VOCs (100 to 300 µg/kg). Therefore, significant impacts to ecological receptors from these VOCs would be unlikely.

As groundwater exposure is not associated with any ecological receptors, SWMU 87 groundwater poses no ecological risks. No site-related chemicals were detected in the surface water or sediment in Paint Branch and therefore, risks to ecological receptors were not evaluated for these media relative to SWMU 87.

9.3 REMEDY IMPLEMENTATION

The remedial action at SWMU 87 was implemented between April and June 2007.

9.3.1 <u>Remedial Action Objectives</u>

The RAOs for groundwater for SWMU 87, as presented in the ROD (Navy, October 2005), include:

- Prevent human exposure (through ingestion, inhalation, and dermal contact) to groundwater having contaminants in excess of MCSs.

- Restore groundwater quality to MCSs.

- Comply with contaminant-, location-, and action-specific ARARs, and to-be-considered criteria to the extent appropriate.

Meeting these objectives for SWMU 87 is based largely upon achieving the MCSs, which are shown in the following Table 9-2:

The selected remedy consists of:

- In-situ bioremediation through injection of electron donor
- Long-term monitoring of groundwater
- Implementation of institutional controls until MCSs are met

9.3.2 Remedial System Operation and Maintenance

O&M activities ongoing at SWMU 87 include the inspection and maintenance of monitoring wells. All monitoring wells observed during the site inspection and LTM efforts were found to be in good condition.

9.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the second five-year review for SWMU 87 at the former NSWC White Oak facility. Progress since the initial five-year review included the implementation of the remedial action. The remedial action at SWMU 87 was implemented between April and June 2007.

Two monitoring wells and 45 injection wells were installed in accordance with the remedial action work plan. Detail related to the monitoring and injection well construction is provided in the construction completion report. Following the installation of the injection wells, each well was pneumatically fractured and the electron donor, EOS, was injected into the shallow bedrock aquifer by ARS Technologies, Inc. Fracturing was performed within the saprolitic bedrock in 3-feet intervals. The radius of influence was monitored via pressure gauges installed on nearby monitoring wells and injection boreholes, as well as visual observations such as ground heave.

In depth intervals with highly competent bedrock, pneumatic fracturing was not possible and only hydraulic EOS injection was attempted. The upper bedrock in two injection wells (87IW19 and 87IW7) was so competent that the formation could not be fractured. Damage sustained during fracturing attempts and low permeability prevented the hydraulic injection of EOS in these two injection wells. In lieu of hydraulic injection, approximately 100 gallons of EOS solution was gravity fed into 87IW7 and approximately 250 gallons of EOS solution was gravity fed into 87IW19. Hydraulic injection of EOS solution was completed in the other injection wells and a total of 14,159 gallons of EOS solution and 6,631 gallons of chase water were injected into the subsurface.

According to the construction completion report, observations of EOS solution in adjacent monitoring points and pressure influences in surrounding injection wells suggests that at least a 20 to 25 foot radial influence was observed surrounding each injection well. Field observations and pressure data indicated that the dispersion pattern of influence was uniformly spread 360 degrees around each injection well.

Post Remedial Action Monitoring has been conducted on one occasion prior to and 7 occasions following the implementation of the remedial action. The monitoring was performed in accordance with the LTM Plan for SWMU 87. Baseline monitoring was completed on April 24 and 25, 2007 at 12 monitoring wells at SWMU 87. These data will be used to evaluate the effectiveness of the remedial measures.

9.5 FIVE-YEAR REVIEW PROCESS

9.5.1 <u>Administrative Components</u>

This section provides a summary of the five-year review process and the actions taken to complete this review. The components of the Five-Year Review process include the following:

- Community involvement
- Document review
- Site inspection
- Data and Performance Evaluation
- Five-Year Review report development and review

9.5.2 <u>Community Involvement</u>

The Proposed Plan, CMS, and the RFI for SWMU 87 became available to the public on May 1, 2005 and are among the documents that comprise the Administrative Record file for former NSWC White Oak, which is maintained by NAVFAC Washington at the Washington Navy Yard, Washington, DC. These documents are also located in the information repository for the NSWC White Oak, which is maintained at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland. The notice of availability of these documents, the public comment period, and a public meeting was published in the

Washington Post, Silver Spring Gazette, College Park Gazette, and Burtonsville Gazette on April 27, 2005. The public comment period was held from May 1, 2005 to May 30, 2005, and a public meeting was held on May 10, 2005.

Upon completion of this Five-Year Review, the results will be made available to the RAB members at their next meeting. The Five-year Review Report will be made available to the public at the local Information Repository located at the Montgomery County Public Library, White Oak Branch in Silver Spring, Maryland.

9.5.3 Document Review

The documents reviewed for the second five-year review are listed below, and key information obtained from the documents is summarized in the following sections.

First Five-Year Review completed	April 2007
Post-Remedial Action Memo	April 2008
Post Remedial Action Monitoring Memo – October 2009	February 2010
Post Remedial Action Monitoring Memo – October 2011	February 2012

9.5.4 Data Review

At SWMU 87, PCE was the primary contaminant found in groundwater. The evidence for the biodegradation process as a result of the enhance natural attenuation remedy has been well established by the presence of breakdown products TCE, DCE and vinyl chloride in the treatment area as well as the presence of methane and carbon dioxide (indicators of biological activity) in the wells where active breakdown of PCE has been observed. There continues to be no detections of PCE in the wells within the treatment area based on the October 2011 sampling results (Appendix C). These results confirm that the primary site contaminant has been addressed through the remedial action. Low levels of daughter products TCE, cis-1,2-DCE and vinyl chloride continue to be detected in the treatment area with the highest concentrations of 7 µg/L for TCE, 3.4 µg/L for cis-1,2-DCE, and 2.2 µg/L for vinyl chloride at well 87WP201.

At 87WP201, the DO and ORP levels continue to show reductive conditions during the October 2011 event. The contamination in well 87WP201 suggests that some residual PCE, upgradient from the treatment area, has been mobilized and continues to be transformed by natural or enhanced biodegradation to daughter products, or a TCE plume has migrated in to the area.

Water quality parameters such as DO and ORP levels are often used to characterize the groundwater environment in regards to whether reducing (anaerobic) or oxidizing (aerobic) conditions are present, with DO levels of <0.5 milligrams per liter (mg/L) and ORP measurements of <50 millivolts generally considered indicative of a reducing environment. Based on field measurements, ORP readings and DO levels generally dropped in wells within the injection area following the EOS injection activities, indicating that reducing conditions were created. The DO levels measured in October 2009 were generally indicative of a borderline anaerobic environment. DO levels measured in October 2011 suggest that the enhanced anaerobic conditions created by injection are waning and returning to aerobic conditions in the downgradient portion of the treatment area, but the ORP readings measured during the 2011 event have remained within reducing range with in the treatment area.

Generally, the water quality parameters suggest that the EOS enhanced conditions to support biodegradation of contaminants are beginning to wane. The COD levels are decreasing indicating diminished organic materials in the groundwater. The alkalinity levels are decreasing but still slightly above pre-injection levels. Chloride concentrations have return to pre-injection levels. However, the soluble iron and soluble manganese continued to be found at elevated concentrations in the treatment area in comparison to baseline concentrations. CO2 levels continue to be significantly higher than the pre-injection levels indicating on-going biological respiration as a result of biotic transformation of the residual ethenes, possibly supported by the aerobic conditions as seen by the increase in DO levels in most of the treatment area. Methane continues to be detected throughout the treatment area indicative of ongoing reductive dechlorination.

The remaining analyses performed in support of the enhanced natural attenuation evaluation are general water quality parameters (i.e., pH, temperature, conductivity, turbidity, common ions, etc.) that do not directly indicate whether biodegradation is occurring or inconclusive in regards to biodegradation. The pH and temperature readings generally indicate a groundwater environment suitable for biological activity.

PCE and TCE were detected in two upgradient wells (87WP212, and 87WP213) at concentrations below the MCL and above the Oak Ridge National Laboratory Tap Water criteria.

The PCE concentration of 1 µg/L detected at 87WP212 is significantly lower than previous detections of 19 µg/L in October 2009, 25 µg/L in January 2008 and 12 µg/L in April 2007. The apparent downward trend suggests that the contamination may have attenuated. The TCE concentration of 4.8 µg/L at 87WP212 is also lower than the previous detections at this well, also suggesting that the contamination is attenuating.

Methylene chloride was also detected at 87WP212; this constituent has not been previously detected at the site and is known to be a laboratory contaminant. The result was reported as an estimated value of 13 µg/L, slightly above the MCL.

At 87WP213 concentrations of both PCE and TCE were observed below the MCL. This well historically has had minor PCE and TCE detections, but has not been sampled regularly as part of the LTM for the enhanced natural attenuation performance monitoring. The well is located approximately 300 feet downgradient from well 87WP212.

The LTM data shows the efficacy of the enhanced natural attenuation in the treatment area. The data also suggest that the enhanced reductive conditions in the treatment area are beginning to wane but there are still residual ethenes that continue to undergo degradation. The contaminants of concern still detected with in the treatment area are at very low levels. The highest concentrations (7 µg/L TCE and 2.2 µg/L vinyl chloride) are found in the upgradient portion of the treatment area.

Low concentrations (below MCLs) of PCE and TCE continue to be found in the upgradient area, and generally lower than historical levels.

9.5.5 Site Inspections

SWMU 87 was inspected on October 11, 2011. The purpose of the inspection was to assess the protectiveness of the implemented remedial action, including the presence of access restrictions and other land use controls (LUCs). Appendix A contains the site inspection checklists. Photographs taken during the site inspection are included in Appendix B.

At the time of the site inspection, the source area had been cleared and regraded and no evidence of site-related activities remained. A cursory inspection of the monitoring wells indicated that all the wells were in good physical condition and were secured with locks. Access to the site is well controlled because the site is located within a secured portion of the facility.

LUCs include written restrictions, which control the use of groundwater for potable use. There was no evidence that groundwater is being used for any purpose, nor is it likely that it ever will be. At the time this Five-Year Review was prepared, the LUC RD was being finalized. The LUCs will remain in effect until contamination levels drop to a level that allow for unrestricted use of the site.

9.5.6 Interviews

No official interviews were conducted as part of the second five-year review. Relevant discussions with the past and current partnering team members regarding the site are documented on the site inspection checklist.

9.5.7 Institutional Controls

The Navy is responsible for implementing, inspecting, reporting, and enforcing the LUC objectives in accordance with a LUC Remedial Design. The LUC Remedial Design was developed during the Design Phase has been reviewed by EPA and MDE and the proposed language is currently being reviewed by the Navy. The following institutional controls have been or are in the process of being implemented:

- Ensure no withdrawal of groundwater for any purpose (including drinking water) from within the restricted area until the MCSs are met and risks from groundwater use are reduced to acceptable levels.

- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area.

- Ensure adequate protection to minimize physical disruption of any remedial equipment, such as monitoring wells in the restricted area.

- Ensure adequate notification of pertinent use restrictions to current and future property owners.

These institutional controls will be maintained until the concentrations of hazardous substances in the groundwater are at such levels as to allow for unrestricted use and exposure. Based on the site inspection, there is no evidence that any of these LUCs have been violated.

9.6 TECHNICAL ASSESSMENT

Question 1. Is the remedy functioning as intended by the decision documents?

The review of documents and site inspection indicate that the portions of the selected remedy that have been implemented to date, institutional controls and groundwater monitoring, are functioning as intended by the ROD. The in-situ bioremediation has been implemented and has performed well with contaminant levels measured at concentration below MCSs in all but one monitoring well. The institutional controls in the form of groundwater use restrictions are responsible for protecting human receptors from any direct contact with or ingestion of groundwater. Groundwater monitoring has and will continue to be utilized to document the effectiveness of the remedial actions in achieving the MCSs.

Question 2. Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, clean-up levels, and RAOs identified in the ROD are still valid.

Question 3. Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has surfaced that questions the protectiveness of the selected remedy.

The institutional controls and groundwater monitoring are effective in protecting human receptors from any direct contact with or ingestion of groundwater. In particular, the institutional controls are responsible for preventing use of and exposure to groundwater.

9.7 ISSUES

The institutional controls and groundwater monitoring portions of the SWMU 87 remedy are functioning as intended by restricting exposure to groundwater contaminants by human and ecological receptors. No issues have been identified for either of these two activities.

9.8 RECOMMENDATIONS AND FOLLOW UP ACTIONS

The following recommendation is made for SWMU 87:

- Groundwater monitoring should be continued at 15 month intervals to evaluate the MNA of the groundwater contaminations.
- The LUC RD should be finalized to formalize the procedures needed to limit exposure to site contaminants.
- The sampling of the upgradient monitoring wells 87WP212, 87WP213, and 87WP211 is recommended to determine if the observed contamination is localized.

9.9 PROTECTIVENESS STATEMENT

Based on the activities implemented to date, the selected remedy is protective of human health and the environment. The institutional controls, which prevent usage of groundwater as a potable water supply, are functioning as intended and are protecting human receptors from exposure to groundwater contamination following implementation of the remedial action.

9.10 NEXT REVIEW

The next Five-Year Review for SWMU 87 is required by 2017, five years from the date of this review.

TABLE 9-1

SUMMARY OF HEALTH RISK FOR SWMU 87 GROUNDWATER
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

Hazard index for Site 87 Groundwater						
	Full Time Worker	**Maintenance Worker**	**Construction Worker**	**Day Care Child**	**Adult Resident**	**Child Resident**
Total HI – RME	0.01	0.02	0.09	0.02	1	2
Total HI – CTE	0.002	0.009	0.09	0.02	0.5	I
Incremental Lifetime Cancer Risk for SWMU 87 Groundwater						
	Full Time Worker	**Maintenance Worker**	**Construction Worker**	**Day Care Child**	**Adult Resident**	**Child Resident**
Total ILCR –RME	8 E-6	5 E-5	5 E-6	5 E-6	9 E-4	5 E-4
Total ILCR - CTE	7 E-7	5 E-6	5 E-6	5 E-6	1 E-4	1 F-4

HI = Hazard Index
ILCR = Incremental Lifetime Cancer Risk
CTE = Central Tendency Exposure
RME = Reasonable Maximum Exposure

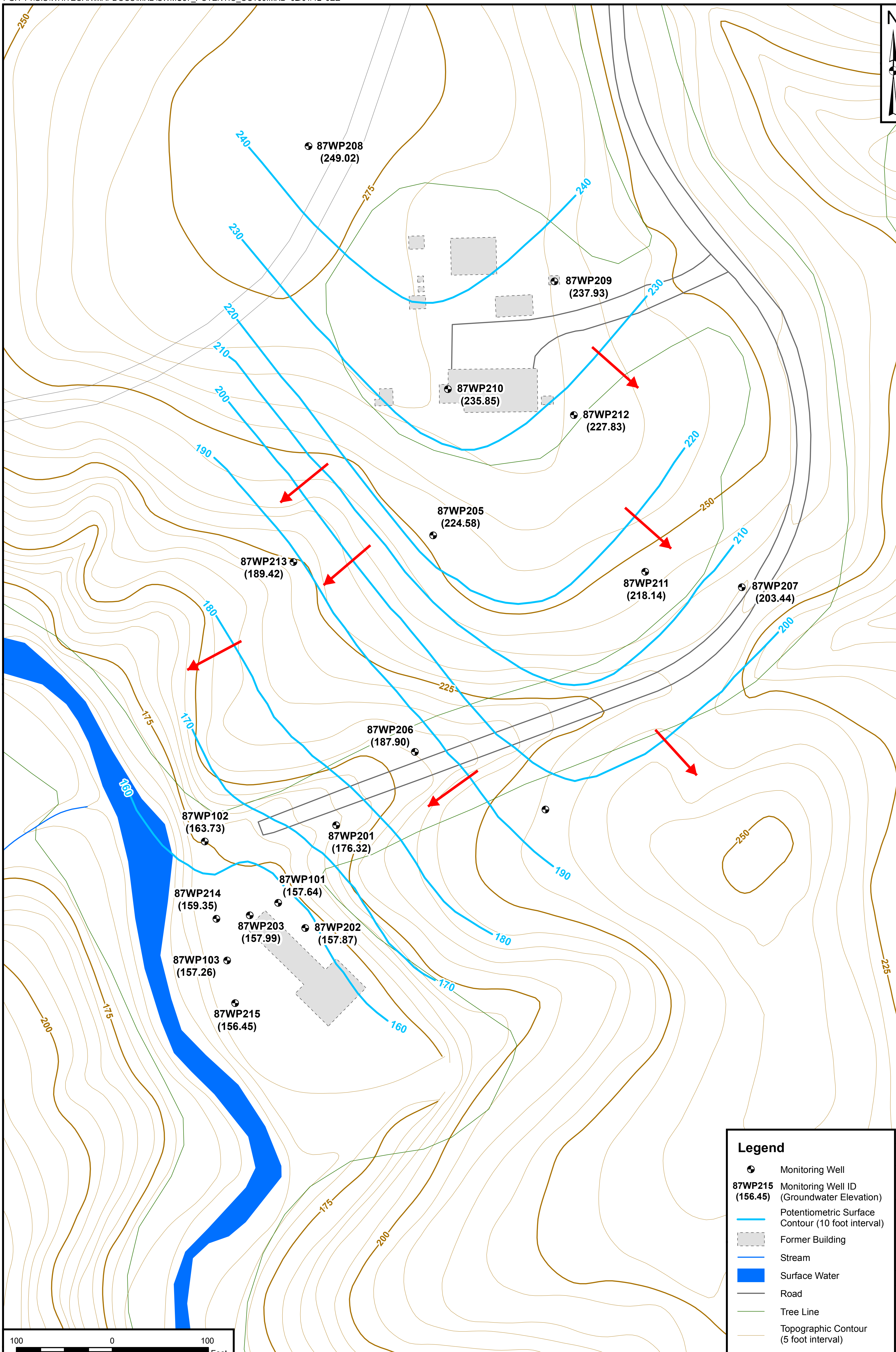
TABLE 9-2

MCSS FOR COCS AT SWMU 87
SECOND FIVE-YEAR REVIEW
FORMER NAVAL SURFACE WARFARE CENTER
SILVER SPRING, MARYLAND

COC	MCS (µg/L)	Basis
cis-1,2-DCE	70	MCL
TCE	5	MCL
PCE	5	MCL

Source: ROD, Navy, October 2005.

PGH P:\GIS\WHITEOAK\MAPDOCS\MXD\SWMU87_POTENTIO_OCT09.MXD 02/01/12 JEE



DRAWN BY	DATE	TETRA TECH	CONTRACT NUMBER	CTO NUMBER
T. WHEATON	12/04/09		3668	555
CHECKED BY	DATE	POTENTIOMETRIC SURFACE CONTOURS - OCTOBER 2009	APPROVED BY	DATE
S. NESBIT	02/01/12	SWMU 87	___	___
REVISED BY	DATE	NSWC WHITE OAK	APPROVED BY	DATE
___	___		___	___
SCALE		SILVER SPRING, MARYLAND	FIGURE NO.	REV
AS NOTED			FIGURE 9-1	0

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APPENDIX A

PHOTOS

OU2/OU3 - Southern Slope of Landfill with Gas Vent

OU2/OU3 – Northern Access Ramp with Sign

Site 4 - Source Area

Site 4 - Monitoring Wells

Site 5/13 – Source Area (Former Pistol Range)

Site 5/13 - Fence along Percontee Property

Site 7 – Swale/Source Area (looking southeast)

Site 9 - Former Building 318 Area

Site 11 - Monitoring Wells 209S/D

Site 11 - Monitoring Wells 207S/D

Site 49 - Monitoring Wells

Site 49 - Building 427

SWMU 87 - Former Building 611 Area

APPENDIX B

FIVE-YEAR REVIEW SITE INSPECTION CHECKLISTS

OPERABLE UNIT 2 – APPLE ORCHARD LANDFILL

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Operable Unit 2	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☒ Landfill cover/containment
- ☒ Access controls (signage)
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site ______ ______
Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

______

______

2. **O&M staff** ______ ______
Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency NAVFAC Washington
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency EPA
Contact ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency MDE
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency GSA
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

4. **Other interviews** (optional) ☐Report attached.

Margaret Wright, NAVFAC
Dennis Barksdale, GSA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A

Remarks ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ______	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

7. **Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A

Remarks Records kept at NAVFAC Washington

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other ______

2. **O&M Cost Records**
☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate ______ ☐ Breakdown attached

Total annual cost by year for review period if available

From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost
From ______ To ______ ______ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
Remarks ______

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks Signs in place @ perimeter of landfill

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes [X] No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes [X] No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by
Frequency Periodic
Responsible party/agency ~~GSA~~ GSA Security
Contact ______ ______ ______ ______
Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached
Comment:

2. **Adequacy** [X] ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map [X] No vandalism evident
Remarks

2. **Land use changes on site** [X] N/A
Remarks

3. **Land use changes off site** ☐ N/A
Remarks . FDA Campus construction adjacent to site.

VI. GENERAL SITE CONDITIONS

A. Roads [X] Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map [X] Roads adequate ☐ N/A
Remarks

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B. Other Site Conditions

Remarks ______________________________

VII. LANDFILL COVER ☒ Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☒ Settlement not evident
   Areal extent ________ Depth ________
   Remarks ______________________________

2. **Cracks** ☐ Location shown on site map ☒ Cracking not evident
   Lengths ________ Widths ________ Depths ________
   Remarks ______________________________

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
   Areal extent ________ Depth ________
   Remarks ______________________________

4. **Holes** ☐ Location shown on site map ☒ Holes not evident
   Areal extent ________ Depth ________
   Remarks ______________________________

5. **Vegetative Cover** ☒ Grass ☒ Cover properly established ☒ No signs of stress
   ☒ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks Tree present on east end, within drainage swale.

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks Rip-rap at toe shows no sign of erosion/movement

7.	**Bulges**	☐ Location shown on site map ☒ Bulges not evident Areal extent ______ Height ______ Remarks ______
8.	**Wet Areas/Water Damage**	☒ Wet areas/water damage not evident ☐ Wet areas ☐ Location shown on site map Areal extent ______ ☐ Ponding ☐ Location shown on site map Areal extent ______ ☐ Seeps ☐ Location shown on site map Areal extent ____ ☐ Soft subgrade ☐ Location shown on site map Areal extent ______ Remarks ______
9.	**Slope Instability**	☐ Slides ☐ Location shown on site map ☒ No evidence of slope instability Areal extent ______ Remarks ______
B. Benches		☒ Applicable ☐ N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)
1.	**Flows Bypass Bench**	☐ Location shown on site map ☒ N/A or okay Remarks ______
2.	**Bench Breached**	☐ Location shown on site map ☒ N/A or okay Remarks ______
3.	**Bench Overtopped**	☐ Location shown on site map ☒ N/A or okay Remarks ______
C. Letdown Channels		☐ Applicable ☒ N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)
1.	**Settlement**	☐ Location shown on site map ☒ No evidence of settlement Areal extent ______ Depth ______ Remarks ______

2. **Material Degradation** ☐ Location shown on site map ☒ No evidence of degradation
Material type________ Areal extent________
Remarks ________

3. **Erosion** ☐ Location shown on site map ☒ No evidence of erosion
Areal extent________ Depth________
Remarks ________

4. **Undercutting** ☐ Location shown on site map ☒ No evidence of undercutting
Areal extent________ Depth________
Remarks ________

5. **Obstructions** Type________ ☒ No obstructions
☐ Location shown on site map Areal extent________
Size________
Remarks ________

6. **Excessive Vegetative Growth** Type________
☒ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent________
Remarks ________

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☒ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks ________

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks ________

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☒ Needs Maintenance ☐ N/A
Remarks Monitoring well undercut @ stream - to be abandoned. Monitoring well casing missing; scheduled for repair.

4. **Leachate Extraction Wells**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☒ N/A
Remarks

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

F. Cover Drainage Layer ☒ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☒ N/A
Remarks

2. **Outlet Rock Inspected** ☒ Functioning ☐ N/A
Remarks

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement ____
Rotational displacement
Remarks

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent ________ Depth ________
Remarks

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☒ Vegetation does not impede flow
Areal extent ______ Depth ______
Remarks ______

3. **Erosion** ☐ Location shown on site map ☒ Erosion not evident
Areal extent ______ Depth ______
Remarks ______

4. **Discharge Structure** ☐ Functioning ☒ N/A
Remarks ______

J. Monitoring Wells (off site)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☒ N/A
Remarks ______

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☐ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks ______

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks ______

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks ______

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks ______

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks____________________

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided
Remarks____________________

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters____________________
☐ Additive (*e.g.*, chelation agent, flocculent)____________________
☐ Others____________________
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually____________________
☐ Quantity of surface water treated annually____________________
Remarks____________________

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition G Needs Maintenance
Remarks____________________

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks____________________

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks____________________

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks____________________

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐All required wells located ☐Needs Maintenance ☐ N/A
Remarks____________________

D. Monitoring Data

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1.	Monitoring Data ☐ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☐ Good condition ☐ All required wells located ☒ Needs Maintenance ☐ N/A Remarks Locks needed.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The landfill cover appears to be in good condition.
No signs of erosion or vegetative stress.
Monitoring data indicates that groundwater contaminants not migrating beyond cap.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

GSA responsible for periodic mowing. At time of inspection grass was low.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Review LTM program to identify potential changes.

SITE 4 – CHEMICAL BURIAL AREA

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I. SITE INFORMATION	
Site name: Site 4	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Monitored natural attenuation
- ☒ Access controls (signage)
- ☐ Groundwater containment
- ☐ Institutional controls
- ☐ Vertical barrier walls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site ____________ ____________

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ____________

Problems, suggestions; ☐ Report attached ____________________________________

2. **O&M staff** ____________________ ____________________

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ____________

Problems, suggestions; ☐ Report attached ____________________________________

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency NAVFAC Washington
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency EPA
Contact ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency MDE
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency GSA
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

4. **Other interviews** (optional) ☐Report attached.

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FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ________	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

7. **Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A

Remarks Records Kept @ NAVFAC Washington

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   - ☐ Other ______________________________

2. **O&M Cost Records**
   - ☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate ____________ ☐ Breakdown attached

   Total annual cost by year for review period if available

From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: ______________________________

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
   Remarks ______________________________

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks ______________________________

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C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by
Frequency Periodic
Responsible party/agency GSA Security
Contact ______ ______ ______ ______
Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached
Comment:

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☐ N/A
Remarks Development ongoing on adjacent property.

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks ______________________________

VII. LANDFILL COVER ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent ______ Depth ______
   Remarks ______________________________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths ______ Widths ______ Depths ______
   Remarks ______________________________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent ______ Depth______
   Remarks ______________________________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent ______ Depth______
   Remarks ______________________________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ______________________________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ______________________________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent ______ Height ______
Remarks ______

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent ______
☐ Ponding ☐ Location shown on site map Areal extent ______
☐ Seeps ☐ Location shown on site map Areal extent ____
☐ Soft subgrade ☐ Location shown on site map Areal extent ______
Remarks ______

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐No evidence of slope instability
Areal extent ______
Remarks ______

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐N/A or okay
Remarks ______

2. **Bench Breached** ☐ Location shown on site map ☐N/A or okay
Remarks ______

3. **Bench Overtopped** ☐ Location shown on site map ☐N/A or okay
Remarks ______

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent______ Depth______
Remarks ______

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type__________ Areal extent__________
Remarks __________

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent__________ Depth__________
Remarks __________

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent__________ Depth__________
Remarks __________

5. **Obstructions** Type__________ ☐ No obstructions
☐ Location shown on site map Areal extent__________
Size__________
Remarks __________

6. **Excessive Vegetative Growth** Type__________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent__________
Remarks __________

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks __________

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks __________

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

4. **Leachate Extraction Wells**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks ____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks ____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks ____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement ____
Rotational displacement ____
Remarks ____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks ____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent ______________ Depth ______________
Remarks ____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Areal extent ______________ Depth ______________

Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Areal extent ______________ Depth ______________

Remarks ____

4. **Discharge Structure** ☐Functioning ☐ N/A

Remarks ____

J. Monitoring Wells (off site)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A

Remarks ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**

☐ Good condition ☐All required wells properly operating ☐ Needs Maintenance ☐ N/A

Remarks____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks____

3. **Spare Parts and Equipment**

☐Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒N/A

1. **Collection Structures, Pumps, and Electrical**

☐ Good condition ☐ Needs Maintenance

Remarks____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks______________________________

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided
Remarks______________________________

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters______________________________
☐ Additive (*e.g.*, chelation agent, flocculent)______________________________
☐ Others______________________________
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually______________
☐ Quantity of surface water treated annually______________
Remarks SVE System use has been discontiued

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition G Needs Maintenance
Remarks______________________________

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks______________________________

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks______________________________

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks______________________________

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks______________________________

D. Monitoring Data

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

1. Monitoring Data
   ☒ Is routinely submitted on time   ☒ Is of acceptable quality

2. Monitoring data suggests:
   ☒ Groundwater plume is effectively contained   ☒ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   ☒ Properly secured/locked   ☒ Functioning   ☒ Routinely sampled   ☒ Good condition
   ☐ All required wells located   ☐ Needs Maintenance   ☐ N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy appears to be effective.

COC concentrations have decreased, and the contaminant plume appears to be reducing in size.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

LTM efforts appear to be adequate.

Additional sampling at downgradient edge of site may be warranted.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Removal of prior treatment system infrastucture should be considered.

SITE 5/13 – OPEN BURN AND OIL SLUDGE DISPOSAL AREAS

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Site 5/13	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Monitored natural attenuation
- ☐ Access controls (signage)
- ☐ Groundwater containment
- ☒ Institutional controls
- ☐ Vertical barrier walls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site ______ ______

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

2. **O&M staff** ______ ______

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency NAVFAC Washington

Contact ______ ______ ______ ______
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

Agency EPA

Contact ______ ______ ______
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

Agency MDE

Contact ______ ______ ______ ______
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

Agency GSA

Contact ______ ______ ______ ______
Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

4. **Other interviews** (optional) ☐Report attached.

Margaret Wright, NAVFAC Washington
Cassandra Brown, CH2M Hill
Dennis Barksdale, GSA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☐ O&M manual — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits ______ — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

7. **Groundwater Monitoring Records** — ☒ Readily available — ☐ Up to date — ☐ N/A

   Remarks Records kept @ NAVFAC Washington

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**
   ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP
   ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   ☐ Other ______

2. **O&M Cost Records**
   ☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
   Original O&M cost estimate ______ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost
   From ______ To ______ ______ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks New fence installed along property line.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks ______

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by
Frequency Periodic
Responsible party/agency GSA Security
Contact ______ ______ ______ ______
Name Title Date Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached
Comment:

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☐ N/A
Remarks . Property development on adjacent properties.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks ____

VII. LANDFILL COVER ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent ____________ Depth ____________
   Remarks ____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths ________ Widths ________ Depths ________
   Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent ____________ Depth____________
   Remarks ____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent ____________ Depth____________
   Remarks ____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident

Areal extent ______________ Height ___________

Remarks ____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident

☐ Wet areas ☐ Location shown on site map Areal extent ___________

☐ Ponding ☐ Location shown on site map Areal extent ___________

☐ Seeps ☐ Location shown on site map Areal extent ____

☐ Soft subgrade ☐ Location shown on site map Areal extent ___________

Remarks ____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐No evidence of slope instability

Areal extent ______________

Remarks ____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐N/A or okay

Remarks ____

2. **Bench Breached** ☐ Location shown on site map ☐N/A or okay

Remarks ____

3. **Bench Overtopped** ☐ Location shown on site map ☐N/A or okay

Remarks ____

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement

Areal extent____________________ Depth______________________

Remarks ____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type________________ Areal extent________________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent________________ Depth________________
Remarks ____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent________________ Depth________________
Remarks ____

5. **Obstructions** Type__________ ☐ No obstructions
☐ Location shown on site map Areal extent____________
Size____________
Remarks ____

6. **Excessive Vegetative Growth** Type________________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent____________
Remarks ____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks ____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks ____

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

4. **Leachate Extraction Wells**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks ____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks ____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks ____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement ____
Rotational displacement ____
Remarks ____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks ____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent ______________ Depth ______________
Remarks ____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent ______________ Depth ______________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent ______________ Depth ______________
Remarks ____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks ____

J. Monitoring Wells (off site)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks ____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks ____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks ____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks ____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks______________________________

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided
Remarks______________________________

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters______________________________
☐ Additive (*e.g.*, chelation agent, flocculent)______________________________
☐ Others______________________________
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually______________
☐ Quantity of surface water treated annually______________
Remarks______________________________

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition G Needs Maintenance
Remarks______________________________

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks______________________________

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks______________________________

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks______________________________

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐All required wells located ☐Needs Maintenance ☐ N/A
Remarks______________________________

D. Monitoring Data

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy has been successful in reducing COC concentrations

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The LTM efforts are sufficient; recommendations for LTM optimization are provided in monitoring reports

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Refer to LTM reports.

SITE 7 – ORDNANCE BURN AREA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Site 7	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Monitored natural attenuation
- ☐ Access controls (signage)
- ☐ Groundwater containment
- ☒ Institutional controls
- ☐ Vertical barrier walls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site ______ ______
Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

2. **O&M staff** ______ ______
Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency: NAVFAC Washington

Contact: ______ ______ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; ☐ Report attached: None

Agency: EPA

Contact: ______ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; ☐ Report attached: None

Agency: MDE

Contact: ______ ______ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; ☐ Report attached: None

Agency: GSA

Contact: ______ ______ ______ ______

Name | Title | Date | Phone no.

Problems; suggestions; ☐ Report attached: None

4. **Other interviews** (optional) ☐ Report attached.

Margaret Wright, NAVFAC Washington
Cassandra Brown, CH2M Hill
Dennis Barksdale, GSA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ________	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

7. **Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A

Remarks Records Kept @ NAVFAC Washington

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   - ☐ Other ____________________

2. **O&M Cost Records**
   - ☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate ____________ ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: ____________________

V. ACCESS AND INSTITUTIONAL CONTROLS ~~☒ Applicable~~ ☒ N/A (SN)

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
   Remarks ~~[illegible]~~ installed N.A.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
   Remarks ____________________

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by
Frequency Periodic
Responsible party/agency GSA Security
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached
Comment:

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☒ N/A

1. **Roads damaged** ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks ____

____

____

____

VII. LANDFILL COVER ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent ____________ Depth ____________
   Remarks ____
   ____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths ________ Widths ________ Depths ________
   Remarks ____
   ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent ____________ Depth____________
   Remarks ____
   ____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent ____________ Depth____________
   Remarks ____
   ____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ____
   ____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ____
   ____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent ______ Height ______
Remarks ______

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent ______
☐ Ponding ☐ Location shown on site map Areal extent ______
☐ Seeps ☐ Location shown on site map Areal extent ______
☐ Soft subgrade ☐ Location shown on site map Areal extent ______
Remarks ______

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐No evidence of slope instability
Areal extent ______
Remarks ______

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐N/A or okay
Remarks ______

2. **Bench Breached** ☐ Location shown on site map ☐N/A or okay
Remarks ______

3. **Bench Overtopped** ☐ Location shown on site map ☐N/A or okay
Remarks ______

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent ______ Depth ______
Remarks ______

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____________ Areal extent_____________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____________ Depth_____________
Remarks ____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____________ Depth_____________
Remarks ____

5. **Obstructions** Type_________ ☐ No obstructions
☐ Location shown on site map Areal extent_________
Size_________
Remarks ____

6. **Excessive Vegetative Growth** Type_____________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_________
Remarks ____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks ____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks ____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ______________________________

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ______________________________

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks ______________________________

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks ______________________________

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks ______________________________

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement ____
Rotational displacement ______________________________
Remarks ______________________________

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks ______________________________

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent ______________ Depth ______________
Remarks ______________________________

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent ______________ Depth ______________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent ______________ Depth ______________
Remarks ____

4. **Discharge Structure** ☐Functioning ☐ N/A
Remarks ____

J. Monitoring Wells (off site)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks____

3. **Spare Parts and Equipment**
☐Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks______________________________

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided
Remarks______________________________

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters______________________________
☐ Additive (*e.g.*, chelation agent, flocculent)______________________________
☐ Others______________________________
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually______________
☐ Quantity of surface water treated annually______________
Remarks______________________________

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition G Needs Maintenance
Remarks______________________________

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks______________________________

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks______________________________

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks______________________________

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐All required wells located ☐Needs Maintenance ☐ N/A
Remarks______________________________

D. Monitoring Data

1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy has been succesful in reducing COC concentrations

No PRGs were identified during last LTM effort

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The LTM efforts are sufficient.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

None.

SITE 9 – INDUSTRIAL WASTEWATER DISPOSAL 300 AREA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Site 9	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls (signage)
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring
- ☒ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site ______ ______

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

2. **O&M staff** ______ ______

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency NAVFAC Washington
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency EPA
Contact ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency MDE
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency GSA
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

4. **Other interviews** (optional) ☐Report attached.

Margaret Wright, NAVFAC Washington

Dennis Barksdale, GSA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks ____________________

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks ____________________

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ____________________

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ________	☐ Readily available	☐ Up to date	☒ N/A

Remarks ____________________

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ____________________

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ____________________

7. **Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A

Remarks Records Kept at NAVFAC Washington

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ____________________

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks ____________________

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks ____________________

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ Contractor for State
   - ☐ PRP in-house
   - ☐ Contractor for PRP
   - ☐ Federal Facility in-house
   - ☒ Contractor for Federal Facility
   - ☐ Other ______

2. **O&M Cost Records**
   - ☒ Readily available
   - ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate ______
   - ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☒ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
   Remarks Fence at Perimeter of White Oak property

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
   Remarks ______

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by
Frequency Periodic
Responsible party/agency GSA Security
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached
Comment:

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks All buildings in 300 Area have been removed.

3. **Land use changes off site** ☒ N/A
Remarks .

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks ______________________________

VII. LANDFILL COVER ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent __________ Depth __________
   Remarks ______________________________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths __________ Widths __________ Depths __________
   Remarks ______________________________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent __________ Depth__________
   Remarks ______________________________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent __________ Depth__________
   Remarks ______________________________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ______________________________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ______________________________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent ______________ Height __________
Remarks ____
____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent __________
☐ Ponding ☐ Location shown on site map Areal extent __________
☐ Seeps ☐ Location shown on site map Areal extent ____
☐ Soft subgrade ☐ Location shown on site map Areal extent __________
Remarks ____
____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐No evidence of slope instability
Areal extent ______________
Remarks ____
____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐N/A or okay
Remarks ____
____

2. **Bench Breached** ☐ Location shown on site map ☐N/A or okay
Remarks ____
____

3. **Bench Overtopped** ☐ Location shown on site map ☐N/A or okay
Remarks ____
____

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent____________________ Depth______________________
Remarks ____
____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type________________ Areal extent________________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent________________ Depth________________
Remarks ____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent________________ Depth________________
Remarks ____

5. **Obstructions** Type__________ ☐ No obstructions
☐ Location shown on site map Areal extent____________
Size____________
Remarks ____

6. **Excessive Vegetative Growth** Type______________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent____________
Remarks ____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks ____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks ____

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

4. **Leachate Extraction Wells**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks ____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks ____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks ____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement ____
Rotational displacement ____
Remarks ____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks ____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent _______________ Depth _______________
Remarks ____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Areal extent ______________ Depth ______________

Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Areal extent ______________ Depth ______________

Remarks ____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks ____

J. Monitoring Wells (off site)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A

Remarks ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A

Remarks ____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**

☐ Good condition ☐ Needs Maintenance

Remarks ____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks ____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**

☐ Good condition ☐ Needs Maintenance

Remarks ____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided
Remarks____

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters____
☐ Additive (*e.g.*, chelation agent, flocculent)________________________
☐ Others____
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually____________________
☐ Quantity of surface water treated annually____________________
Remarks____

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition G Needs Maintenance
Remarks____

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks____

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks____

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks____

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐All required wells located ☐Needs Maintenance ☐ N/A
Remarks____

D. Monitoring Data

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

1. Monitoring Data
   - [x] Is routinely submitted on time
   - [ ] Is of acceptable quality

2. Monitoring data suggests:
   - [x] Groundwater plume is effectively contained
   - [x] Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   - [x] Properly secured/locked
   - [x] Functioning
   - [ ] Routinely sampled
   - [x] Good condition
   - [ ] All required wells located
   - [ ] Needs Maintenance
   - [ ] N/A

   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The remedy has been successful in reducing contaminant concentrations.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

The LTM efforts are sufficient to monitor remedy progress.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

None.

SITE 11 – INDUSTRIAL WASTEWATER DISPOSAL 100 AREA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Site 11	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Monitored natural attenuation
- ☐ Access controls (signage)
- ☐ Groundwater containment
- ☒ Institutional controls
- ☐ Vertical barrier walls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ____________

Problems, suggestions; ☐ Report attached ____________

2. **O&M staff** ____________ ____________

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ____________

Problems, suggestions; ☐ Report attached ____________

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency NAVFAC Washington

Contact ________ ________ ________ ________

Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

Agency EPA

Contact ________ ________ ________

Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

Agency MDE

Contact ________ ________ ________ ________

Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

Agency GSA

Contact ________ ________ ________ ________

Name Title Date Phone no.

Problems; suggestions; ☐ Report attached None

4. **Other interviews** (optional) ☐Report attached.

Margaret Wright, NAVFAC Washington

Dennis Barksdale, GSA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A
Remarks ______

2. Site-Specific Health and Safety Plan ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks ______

3. O&M and OSHA Training Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______

4. Permits and Service Agreements

☐ Air discharge permit ☐ Readily available ☐ Up to date ☒ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☒ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☒ N/A
☐ Other permits ______ ☐ Readily available ☐ Up to date ☒ N/A
Remarks ______

5. Gas Generation Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______

6. Settlement Monument Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______

7. Groundwater Monitoring Records ☒ Readily available ☐ Up to date ☐ N/A

Remarks Records kept @ NAVFAC washington

8. Leachate Extraction Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______

9. Discharge Compliance Records

☐ Air ☐ Readily available ☐ Up to date ☒ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A
Remarks ______

10. Daily Access/Security Logs ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house [X] Contractor for Federal Facility
☐ Other ______________________________

2. **O&M Cost Records**
[X] Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate ________ ☐ Breakdown attached

Total annual cost by year for review period if available

From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached
From ______ (Date) To ______ (Date) ______ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ______________________________

V. ACCESS AND INSTITUTIONAL CONTROLS [X] Applicable [X] N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured [X] N/A
Remarks ______________________________

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map [X] N/A
Remarks ______________________________

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by
Frequency Periodic
Responsible party/agency GSA security
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up to date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached
Comment:

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☐ N/A
Remarks FDA campus construction overlies Site 11

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks ______________________________

VII. LANDFILL COVER ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent ____________ Depth ____________
Remarks ______________________________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
Lengths ________ Widths ________ Depths ________
Remarks ______________________________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent ____________ Depth____________
Remarks ______________________________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
Areal extent ____________ Depth____________
Remarks ______________________________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
☐Trees/Shrubs (indicate size and locations on a diagram)
Remarks ______________________________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
Remarks ______________________________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident

Areal extent ______________ Height __________

Remarks ____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident

☐ Wet areas ☐ Location shown on site map Areal extent ___________

☐ Ponding ☐ Location shown on site map Areal extent ___________

☐ Seeps ☐ Location shown on site map Areal extent ____

☐ Soft subgrade ☐ Location shown on site map Areal extent ___________

Remarks ____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐No evidence of slope instability

Areal extent ______________

Remarks ____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐N/A or okay

Remarks ____

2. **Bench Breached** ☐ Location shown on site map ☐N/A or okay

Remarks ____

3. **Bench Overtopped** ☐ Location shown on site map ☐N/A or okay

Remarks ____

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement

Areal extent____________________ Depth______________________

Remarks ____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_______________ Areal extent_______________
Remarks ____
____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_______________ Depth_______________
Remarks ____
____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_______________ Depth_______________
Remarks ____
____

5. **Obstructions** Type__________ ☐ No obstructions
☐ Location shown on site map Areal extent__________
Size__________
Remarks ____
____

6. **Excessive Vegetative Growth** Type_______________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent__________
Remarks ____
____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks ____
____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks ____
____

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A

Remarks ____

4. **Leachate Extraction Wells**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A

Remarks ____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks ____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks ____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A

Remarks ____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement _____ Vertical displacement ____
Rotational displacement ____
Remarks ____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks ____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Areal extent _______________ Depth _______________
Remarks ____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent ______________ Depth ______________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent ______________ Depth ______________
Remarks ____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks ____

J. Monitoring Wells (off site)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks ____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks ____

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks ____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks ____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters
☐ Additive (*e.g.*, chelation agent, flocculent)
☐ Others
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually
☐ Quantity of surface water treated annually
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition G Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐All required wells located ☐Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

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FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

1.	Monitoring Data ☐ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☐ Routinely sampled ☒ Good condition ☐ All required wells located ☒ Needs Maintenance ☐ N/A Remarks Well MW206S requires well pad.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Remedy appears to be effective,

ICs limit exposure; monitoring data shows decline in COC concentrations.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

No issues observed.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Following completion of monitoring well network construction, review should be conducted to optimize program.

SITE 49 – TCE GROUNDWATER PLUME IN 400 AREA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: Site 49	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Monitored natural attenuation
- ☐ Access controls (signage)
- ☐ Groundwater containment
- ☒ Institutional controls
- ☐ Vertical barrier walls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site ______ ______
Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

2. **O&M staff** ______ ______
Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ______

Problems, suggestions; ☐ Report attached ______

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency NAVFAC Washington
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency EPA
Contact ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency MDE
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency GSA
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

4. **Other interviews** (optional) ☐Report attached.

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FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☐ O&M manual	☐ Readily available	☐ Up to date	☒ N/A
☐ As-built drawings	☒ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

2. Site-Specific Health and Safety Plan ☐ Readily available ☐ Up to date ☒ N/A

☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

3. O&M and OSHA Training Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

4. Permits and Service Agreements

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits ____________	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

5. Gas Generation Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

6. Settlement Monument Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

7. Groundwater Monitoring Records ☒ Readily available ☐ Up to date ☐ N/A

Remarks Records Kept at NAVFAC Washington

8. Leachate Extraction Records ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

9. Discharge Compliance Records

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks ______________________________

10. Daily Access/Security Logs ☐ Readily available ☐ Up to date ☒ N/A

Remarks ______________________________

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP
   - ☐ Federal Facility in-house ☒ Contractor for Federal Facility
   - ☐ Other ______

2. **O&M Cost Records**
   - ☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate ______ ☐ Breakdown attached

   Total annual cost by year for review period if available

From (Date)	To (Date)	Total cost	
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached
			☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: ______

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
   Remarks Fencing along property line adjacent to site in good condition

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
   Remarks ______

NSWC WHITE OAK
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C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	☐ Yes	☒ No	☐ N/A
Site conditions imply ICs not being fully enforced	☐ Yes	☒ No	☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive by
Frequency Periodic
Responsible party/agency GSA Security
Contact ______ Name ______ Title ______ Date ______ Phone no.

Reporting is up to date	☐ Yes	☐ No	☐ N/A
Reports are verified by the lead agency	☐ Yes	☐ No	☐ N/A
Specific requirements in deed or decision documents have been met	☐ Yes	☐ No	☐ N/A
Violations have been reported	☐ Yes	☐ No	☐ N/A

Other problems or suggestions: ☐ Report attached
Comment:

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks:

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks Tree across access road near monitoring wells

B. Other Site Conditions

Remarks ______________________________

VII. LANDFILL COVER ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent ______ Depth ______
   Remarks ______________________________

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths ______ Widths ______ Depths ______
   Remarks ______________________________

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent ______ Depth______
   Remarks ______________________________

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent ______ Depth______
   Remarks ______________________________

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ______________________________

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ______________________________

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
Areal extent ______________ Height __________
Remarks ____
____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent __________
☐ Ponding ☐ Location shown on site map Areal extent __________
☐ Seeps ☐ Location shown on site map Areal extent ____
☐ Soft subgrade ☐ Location shown on site map Areal extent __________
Remarks ____
____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐No evidence of slope instability
Areal extent ______________
Remarks ____
____

B. Benches ☐ Applicable ☐ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐N/A or okay
Remarks ____
____

2. **Bench Breached** ☐ Location shown on site map ☐N/A or okay
Remarks ____
____

3. **Bench Overtopped** ☐ Location shown on site map ☐N/A or okay
Remarks ____
____

C. Letdown Channels ☐ Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent__________________ Depth____________________
Remarks ____
____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____________ Areal extent_____________
Remarks _____________

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____________ Depth_____________
Remarks _____________

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____________ Depth_____________
Remarks _____________

5. **Obstructions** Type_____________ ☐ No obstructions
☐ Location shown on site map Areal extent_____________
Size_____________
Remarks _____________

6. **Excessive Vegetative Growth** Type_____________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____________
Remarks _____________

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks _____________

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks _____________

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

4. **Leachate Extraction Wells**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks ____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks ____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks ____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement ____
Rotational displacement ______________________________
Remarks ____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks ____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent _____________ Depth _______________
Remarks ____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent ______________ Depth ______________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent ______________ Depth ______________
Remarks ____

4. **Discharge Structure** ☐Functioning ☐ N/A
Remarks ____

J. Monitoring Wells (off site)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks____

3. **Spare Parts and Equipment**
☐Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks____

2.	**Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances** ☐ Good condition ☐ Needs Maintenance Remarks______
3.	**Spare Parts and Equipment** ☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided Remarks______
C. Treatment System	☐ Applicable ☒ N/A
1.	**Treatment Train** (Check components that apply) ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation ☐ Air stripping ☐ Carbon adsorbers ☐ Filters______ ☐ Additive (*e.g.*, chelation agent, flocculent)______ ☐ Others______ ☐ Good condition ☐ Needs Maintenance ☐ Sampling ports properly marked and functional ☐ Sampling/maintenance log displayed and up to date ☐ Equipment properly identified ☐ Quantity of groundwater treated annually______ ☐ Quantity of surface water treated annually______ Remarks______
2.	**Electrical Enclosures and Panels** (properly rated and functional) ☐ N/A ☐ Good condition G Needs Maintenance Remarks______
3.	**Tanks, Vaults, Storage Vessels** ☐ N/A ☐Good condition ☐ Proper secondary containment ☐ Needs Maintenance Remarks______
4.	**Discharge Structure and Appurtenances** ☐ N/A ☐ Good condition ☐ Needs Maintenance Remarks______
5.	**Treatment Building(s)** ☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair ☐ Chemicals and equipment properly stored Remarks______
6.	**Monitoring Wells** (pump and treatment remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐All required wells located ☐Needs Maintenance ☐ N/A Remarks______
D. Monitoring Data	

1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks_______________

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

SWMU 87 – BUILDING 611 SOLID WASTE STORAGE AREA

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION	
Site name: SWMU 87	**Date of inspection: 10/11/11**
Location and Region: NSWC White Oak – Region 3	**EPA ID: MD0170023444**
Agency, office, or company leading the five-year review: NAVFAC Washington	**Weather/temperature: 70 °F, sunny**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls (signage)
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other Long-Term Groundwater Monitoring
- ☒ Monitored natural attenuation
  - ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Not Applicable – BRAC Site ____ ____

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ____

Problems, suggestions; ☐ Report attached ____

2. **O&M staff** ____ ____

Name Title Date

Interviewed ☐ at site ☐ at office ☐ by phone Phone no. ____

Problems, suggestions; ☐ Report attached ____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency NAVFAC Washington
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency EPA
Contact ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency MDE
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

Agency GSA
Contact ______ ______ ______ ______
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached None

4. **Other interviews** (optional) ☐Report attached.

Margaret Wright, NAVFAC
Dennis Barksdale, GSA

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐ O&M manual ☐ Readily available ☐ Up to date ☐ N/A
☐ As-built drawings ☐ Readily available ☐ Up to date ☐ N/A
☐ Maintenance logs ☐ Readily available ☐ Up to date ☐ N/A
Remarks N.A.

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
Remarks

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

4. **Permits and Service Agreements**

☐ Air discharge permit ☐ Readily available ☐ Up to date ☐ N/A
☐ Effluent discharge ☐ Readily available ☐ Up to date ☐ N/A
☐ Waste disposal, POTW ☐ Readily available ☐ Up to date ☐ N/A
☐ Other permits ______ ☐ Readily available ☐ Up to date ☐ N/A
Remarks N.A.

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

7. **Groundwater Monitoring Records** ☒ Readily available ☐ Up to date ☐ N/A
Remarks Records kept @ NAVFAC Washington

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

9. **Discharge Compliance Records**

☐ Air ☐ Readily available ☐ Up to date ☐ N/A
☐ Water (effluent) ☐ Readily available ☐ Up to date ☐ N/A
Remarks N.A.

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
Remarks

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

IV. O&M COSTS

1. **O&M Organization**
☐ State in-house ☐ Contractor for State ☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☒ Contractor for Federal Facility
☐ Other ____________________

2. **O&M Cost Records**
☒ Readily available ☐ Up to date ☐ Funding mechanism/agreement in place
Original O&M cost estimate ____________ ☐ Breakdown attached

Total annual cost by year for review period if available

From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached
From ________ (Date) To ________ (Date) ________ (Total cost) ☐ Breakdown attached

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: ____________________

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☒ N/A
Remarks Fencing not required; Fence surrounds entire installation.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☒ N/A
Remarks ____________________

NSWC WHITE OAK
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☐ No ☒ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☐ No ☒ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Drive By
Frequency Periodic - through GSA security
Responsible party/agency ____
Contact ____ ____ ____ ____
Name Title Date Phone no.

Reporting is up to date ☒ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☒ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A

Other problems or suggestions: ☐ Report attached
Comment: ____

2. **Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks: ____

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks ____

2. **Land use changes on site** ☒ N/A
Remarks ____

3. **Land use changes off site** ☐ N/A
Remarks FDA campus development at former White Oak 100 Area.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks ____

B. Other Site Conditions

Remarks ~~[illegible]~~ Vegetation covers site.

VII. LANDFILL COVER ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent ______ Depth ______
   Remarks ______

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths ______ Widths ______ Depths ______
   Remarks ______

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent ______ Depth______
   Remarks ______

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent ______ Depth______
   Remarks ______

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐Trees/Shrubs (indicate size and locations on a diagram)
   Remarks ______

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks ______

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident

Areal extent ______________ Height __________

Remarks ____

____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident

☐ Wet areas ☐ Location shown on site map Areal extent __________

☐ Ponding ☐ Location shown on site map Areal extent __________

☐ Seeps ☐ Location shown on site map Areal extent ____

☐ Soft subgrade ☐ Location shown on site map Areal extent __________

Remarks ____

____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐No evidence of slope instability

Areal extent ______________

Remarks ____

____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐N/A or okay

Remarks ____

____

2. **Bench Breached** ☐ Location shown on site map ☐N/A or okay

Remarks ____

____

3. **Bench Overtopped** ☐ Location shown on site map ☐N/A or okay

Remarks ____

____

C. Letdown Channels ☐ Applicable ☐ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement

Areal extent____________________ Depth____________________

Remarks ____

____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type________________ Areal extent________________
Remarks ________________________________

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent________________ Depth________________
Remarks ________________________________

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent________________ Depth________________
Remarks ________________________________

5. **Obstructions** Type__________ ☐ No obstructions
☐ Location shown on site map Areal extent__________
Size__________
Remarks ________________________________

6. **Excessive Vegetative Growth** Type______________
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent__________
Remarks ________________________________

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks ________________________________

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks ________________________________

3. **Monitoring Wells** (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

4. **Leachate Extraction Wells**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks ____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
Remarks ____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
Remarks ____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement _____ Vertical displacement ____
Rotational displacement ____
Remarks ____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks ____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent ______________ Depth ______________
Remarks ____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent ______________ Depth ______________
Remarks ____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent ______________ Depth ______________
Remarks ____

4. **Discharge Structure** ☐Functioning ☐ N/A
Remarks ____

J. Monitoring Wells (off site)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐N/A
Remarks ____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☐N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks____

3. **Spare Parts and Equipment**
☐Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition G Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☐ Applicable ☒ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
☐ Air stripping ☐ Carbon adsorbers
☐ Filters
☐ Additive (*e.g.*, chelation agent, flocculent)
☐ Others
☐ Good condition ☐ Needs Maintenance
☐ Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
☐ Equipment properly identified
☐ Quantity of groundwater treated annually
☐ Quantity of surface water treated annually
Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
☐ N/A ☐ Good condition G Needs Maintenance
Remarks

3. **Tanks, Vaults, Storage Vessels**
☐ N/A ☐Good condition ☐ Proper secondary containment ☐ Needs Maintenance
Remarks

4. **Discharge Structure and Appurtenances**
☐ N/A ☐ Good condition ☐ Needs Maintenance
Remarks

5. **Treatment Building(s)**
☐ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair
☐ Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐All required wells located ☐Needs Maintenance ☐ N/A
Remarks

D. Monitoring Data

1.	Monitoring Data ☐Is routinely submitted on time ☒Is of acceptable quality
2.	Monitoring data suggests: ☒Groundwater plume is effectively contained ☒Contaminant concentrations are declining
D. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☐All required wells located ☐ Needs Maintenance ☐ N/A Remarks______

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Site is secure; monitoring wells in place.

Data collected to date shows decline in COC; evidence that MNA remedy is effective

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Periodic monitoring needed to ensure protectiveness. LTM efforts to date have been effective.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

None.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Evaluation of LTM program to identify reduction in analyte list is recommended.

APPENDIX C

LONGTERM MONITORING DATA

OPERABLE UNIT 2 – APPLE ORCHARD LANDFILL

SUMMARY OF ROUND 10 SURFACE WATER DETECTIONS
OPERABLE UNIT 2
FORMER NSWC WHITE OAK, SILVER SPRING, MARYLAND

Parameters	ORNL Tap	Federal MCL	OU2SW01 OU2SW01-1011 10/21/2011	OU2SW02 OU2SW02-1011 10/21/2011	OU2SW03 OU2SW03-1011 10/21/2011	OU2SW03 OU2SW03-1011-D 10/21/2011	OU2SW04 OU2SW04-1011 10/21/2011	OU2SW05 OU2SW05-1011 10/21/2011	OU2SW06 OU2SW06-1011 10/21/2011
METALS (UG/L)									
ALUMINUM	16000	--	325	203	204	183	175	168	161
BARIUM	2900	2000	93.1	80.4	78.1	78.8	75	73.9	71.9
CHROMIUM	--	100	1.77 J	1.43 J	1.21 J	1.61 J	1.53 J	2.5 U	1.21 J
IRON	11000	--	662	555	430	454	434	402	398
MANGANESE	320	--	466 [TAP]	389 [TAP]	401 [TAP]	402 [TAP]	365 [TAP]	304	247
NICKEL	300	--	10.8 J	8.44 J	9.02 J	8.89 J	8.39 J	7.77 J	7.21 J
SELENIUM	78	50	5.22 J	5 U	5 U	5 U	5 U	5 U	5 U
ZINC	4700	--	21	19.4 J	22.3	18.3 J	24.7	28.8	19.2 J
MISCELLANEOUS PARAMETERS									
PERCHLORATE (UG/L)	11	15	0.37	0.39	0.4	0.4	0.39	0.4	0.4
VOLATILES (UG/L)									
CHLOROMETHANE	190	--	0.5 UJ	0.5 UJ	0.5 U	0.78 J	0.83 J	0.42 J	0.5 U
TRICHLOROETHENE	0.44	5	0.5 UJ	0.5 UJ	0.4 J	0.5 UJ	0.5 UJ	0.5 U	0.5 U
TRICHLOROFLUOROMETHANE	1100	--	0.54 J	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 U	0.5 U

UG/L - microgram per liter
J = The chemical was detected but the concentration reported is an estimated value.
U = The chemical was not detected.
UJ = The chemical was not detected and the concentration reported is an estimated value.
Federal MCL = Federal Maximum Contaminant Level (EPA, 2006).
ORNL Tap = Oak Ridge National Laboratory Regional Screening Level, 2011.

SUMMARY OF ROUND 10 GROUNDWATER DETECTIONS
OPERABLE UNIT 2
FORMER NSWC WHITE OAK, SILVER SPRING, MARYLAND

Parameters	ORNL Tap	Federal MCL	02GW103 02GW103-1011 10/20/2011	02GW104 02GW104-1011 10/20/2011	02GW31 02GW31-1011 10/20/2011	02GW32 02GW32-1011 10/20/2011	02GW45 02GW45-1011 10/20/2011	02GW45 02GW45-1011-D 10/20/2011	02GW76 02GW76-1011 10/20/2011
EXPLOSIVES (UG/L)									
HMX	780	--	4.8	0.21 U	0.2 U	0.205 U	2.1	2	0.2 U
RDX	0.61	--	0.31 J	0.21 U	0.2 U	0.205 U	0.22 U	0.21 U	0.2 U
METALS (UG/L)									
ALUMINUM	16000	--	25.9 B	15.8 B	35.4 B	34.2 B	29.6 B	27.1 B	168
BARIUM	2900	2000	87.9	378	30.4 B	27.9 B	184	185	69.7
BERYLLIUM	16	4	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	0.871 J
CADMIUM	6.9	5	1.5 U	1.5 U	1.5 U	1.5 U	0.914 B	0.954 J	1.5 U
CALCIUM	--	--	13700	59200	3670	6220	87900	86900	7480
CHROMIUM	--	100	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	1.67 J	2.5 U
COBALT	4.7	--	7.5 U	7.5 U	7.5 U	7.5 U	6.62 J [TAP]	6.18 J [TAP]	7.01 J [TAP]
IRON	11000	--	54.1 K	1390	39.6 J	237	32.4 J	39.6 J	176
MAGNESIUM	--	--	6010	19800	2410	9530	49200	48600	3420
MANGANESE	320	--	25.4	1330 [TAP]	31.1	635 [TAP]	4660 [TAP]	4630 [TAP]	844 [TAP]
NICKEL	300	--	10 U	10 U	10 U	10 U	16.4 J	16 J	10 U
POTASSIUM	--	--	2720	6680	1500	1110	6650	6630	2650
SODIUM	--	--	10800	15700	5940	13600	154000	156000	67800
ZINC	4700	--	8.62 J	12.3 J	10.2 J	10 J	14.2 J	13.7 J	14.8 J
MISCELLANEOUS PARAMETERS									
PERCHLORATE (UG/L)	11	15	1.2	0.2 U	0.81	0.2 U	1.3	1.3	0.29
VOLATILES (UG/L)									
CHLOROMETHANE	190	--	0.5 UJ	0.5 UJ	0.63 J	0.42 J	0.82 J	0.57 J	0.48 J
CIS-1,2-DICHLOROETHENE	28	70	0.5 UJ	0.5 UJ	0.5 U	0.5 U	1.8 L	1.8	0.5 U
TRICHLOROETHENE	0.44	5	0.5 UJ	0.5 UJ	0.5 U	0.5 U	6.3 L [FED][TAP]	6.1 [FED][TAP]	0.5 U
TRICHLOROFLUOROMETHANE	1100	--	8.4 J	0.5 UJ	0.5 U	0.5 U	23 L	22	0.5 U

UG/L - microgram per liter
J = The chemical was detected but the concentration reported is an estimated value.
U = The chemical was not detected.
UJ = The chemical was not detected and the concentration reported is an estimated value.
B = The chemical was detected as an artifact in a laboratory method blank.
L = The chemical was detected and biased low due to low quality control noncompliance.
K = The chemical was detected but biased high due to high quality control noncompliance.
Federal MCL = Federal Maximum Contaminant Level (EPA, 2006).
ORNL Tap = Oak Ridge National Laboratory Regional Screening Level, 2011.

SITE 4 – CHEMICAL BURIAL AREA

Table 5.1
Former NSWC White Oak
Site 4 Source Area
Groundwater Detected Analytical Results
October 2008 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), and December 2010 (12-Month Post Inj)

Station ID	04GW203										04GW301								
Sample ID	004GW203-0108	004GW203-0408	**004GW203-1008**	004GW203-0210	004GW203-0510	004GW203P-0510	004GW203-0810	004GW203P-0810	004GW203-1210	004GW203P-1210	004GW301-0108	004GW301-0408	004GW301P-0408	**004GW301-1008**	004GW301-0210	004GW301P-0210	004GW301-0510	004GW301-0810	004GW301-1210
Sample Date	01/16/08	04/16/08	**10/30/08**	02/04/10	05/13/10	05/13/10	08/24/10	08/24/10	12/01/10	12/01/10	01/16/08	04/16/08	04/16/08	**10/30/08**	02/03/10	02/03/10	05/12/10	08/25/10	12/01/10
Chemical Name																			
Volatile Organic Compounds (UG/L)																			
1,1,1-Trichloroethane	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	5.2	5.1	4.2	2.4 J	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	2 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	210	180	180	49	24	22	5.4	3.3	2.6
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	14	15	14	5 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	14	12	11	5	2.5 J	2.2 J	1.2 J	1 J	0.9 J
1,1-Dichloroethane	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.5	3	2.5	4.4 J	5 U	5 U	1 J	0.5 U	0.5 U
1,1-Dichloroethene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	6.7	8.2	5.5	4.7 J	5 U	5 U	1.5 J	1.4 J	0.85 J
1,2-Dibromoethane	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	13	12	11	12	12	9.2	9.4	9.9
1,2-Dichloropropane	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.67 J	0.8 J	0.72 J
1,4-Dichlorobenzene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.1 J	2.2	2 U	1.1 J	5 U	5 U	1.5 J	1.8 J	1.6 J
2-Butanone	2 U	2 U	5 R	5 R	5 U	5 U	2.5 R	2.5 R	2.5 R	2.5 R	18	2 U	2 U	400 R	570 L	580 L	2.5 J	2.5 R	2.5 R
2-Hexanone	2 UJ	2 UJ	5 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	3.6 J	2 UJ	2 UJ	21 J	18	18	15	2.5 U	17
4-Methyl-2-pentanone	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	1 U	2.5 J
Acetone	2 U	2 U	5 R	29 L	5 R	5 R	2.5 R	2.5 R	2.5 R	2.5 R	23 J	70 J	93 J	60 L	91 L	94 L	85 L	140 L	110 L
Benzene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.2	3	2.9	3.3 J	3.3 J	3.1 J	3.3 J	2.9 J	3.2 J
Carbon disulfide	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	7.4	12	13	7	6.5	6.1	7.3	5.9	5.7
Chloroethane	2.2	2 U	2.4 J	5 U	5 U	5 U	0.67 J	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	4.6 J	5.5	3.7 J
Chloroform	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.1 J	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloromethane	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	0.69 J	0.5 U
cis-1,2-Dichloroethene	2 U	2 U	1.6 J	4.6 J	1.1 J	0.91 J	3.9 J	3.5 J	1.5 J	1.6 J	2,500	3,300	3,300	5,200	2,700	2,500	1,000	990	1,100
Cyclohexane	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	0.93 J	0.75 J	1.1 J	0.52 J	0.77 J
Isopropylbenzene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	0.59 J	5 U	1.2 J	0.82 J	0.79 J
Methyl acetate	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	25	13	17	5 U	5 U	5 U	5 U	1 U	6.2
Methylcyclohexane	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	3.9 J	3.9 J	2.1 J	1.9 J	1.7 B
Methyl-tert-butyl ether (MTBE)	7.5	7.4	4.7 J	5 U	0.93 J	0.92 J	0.56 J	0.58 J	0.83 J	0.91 J	2 U	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Styrene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Toluene	2 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	1.4 J	1.2 J	1.3 J	1.2 B	1.2 J
trans-1,2-Dichloroethene	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	9.1	15	14	32	11	9.4	14	6.4	5.5
Trichloroethene	2 U	2 U	5 U	5 U	5 U	5 U	1.3 J	0.5 U	0.5 U	0.5 U	260	190	140	33	15	14	5.6	2.4 J	3.7 J
Vinyl chloride	2 U	2 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	93	120	96	120	200	180	150	130	160 J
Xylene, total	2 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	1 U	1.4 J	1.6 J	1.4 J	3.9 J	6.4	5.9	7.8	4.5 J	5.2
Semivolatile Organic Compounds (UG/L)																			
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)																			
Perchlorate	NA	NA	NA	NA	NA	NA	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.2 U	NA	0.2 U	0.2 U	0.2 U	NA	NA
Dissolved Metals (UG/L)																			
Iron, Dissolved	13,400	9,230	9,300	92,600	73,800	76,500	67,600	69,500	62,700	64,800	171,000	169,000	NA	85,300	204,000	214,000	213,000	148,000	188,000
Sodium, Dissolved	38,600	38,800	37,400	33,000	22,500	23,200	21,800	21,700	21,800	22,400	41,300	18,500	NA	29,100	83,600	86,100	63,500	61,800	54,900
Wet Chemistry																			
Acetate (mg/l)	5 U	5 U	5 U	47	2.1 L	2.1 L	0.5 U	NA	0.5 U	NA	320	220	NA	110	470	460	430 L	360	320
Alkalinity (mg/l)	45	47	110	240	230	220	150	NA	100	NA	680	260	NA	170	630	640	40	400	550
Butyrate (mg/l)	5 U	5 U	5 U	5 U	5 U	5 U	1 U	NA	1 U	NA	40	15	NA	5 U	51	49	42	34	36
Carbon dioxide (ug/l)	250,000	280,000	86,000	744	85,700	90,100	56,700	NA	38,900	NA	710,000	200,000	NA	84,000	550	663	125,000	90,200	69,000
Chemical oxygen demand (mg/l)	20 U	20 U	38	90	33	30	27	NA	34	NA	1,000	130	NA	190	1,700	1,700	1,200	1,000	770
Chloride (mg/l)	48	47	NA	27	31	31	24	NA	24	NA	24	18	NA	NA	26	26	21	20	15.9
Ethane (ug/l)	0.56 J	0.88 J	1.2 U	1.2 U	1.2 U	1.3 U	1.3 U	NA	1.2 U	NA	5.6	8	NA	1.2 U	1.3 U	1.3 U	1.2 U	1.3 U	3.9
Ethene (ug/l)	1 U	1 U	1.5 U	1.5 U	1.5 U	1.6 U	1.6 U	NA	1.5 U	NA	7.2	15	NA	14	18	1.6 U	28	9.6	55
Lactic Acid (mg/l)	NA	NA	NA	5 U	5 U	5 U	2 U	NA	2 U	NA	NA	NA	NA	NA	5 U	5 U	1.9 B	2 U	2 U
Methane (ug/l)	1,700	1,900	1,500	3,900	4,700	5,100	4,400	NA	9,900	NA	410	5,000	NA	5,900	8,900 J	84 J	6,900	6,000	39,000
Nitrate (mg/l)	0.13 U	0.13 U	0.13 U	0.13 U	0.056 B	0.052 B	0.042 U	NA	0.072 U	NA	0.13 U	0.13 U	NA	0.13 U	0.0081 J	0.0081 J	0.041 B	0.042 U	0.12
Nitrite (mg/l)	NA	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	NA	0.055 J	NA	NA	0.13 U	NA	0.13 U	0.074 J	0.072 J	0.13 J	0.15	0.1
pH (ph)	5.6	5.5	NA	NA	NA	NA	NA	NA	NA	NA	6.3	6.4	NA	NA	NA	NA	NA	NA	NA
Propane (ug/l)	0.68 J	0.39 J	NA	NA	NA	NA	NA	NA	NA	NA	5 U	1 U	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	5 U	5 U	5 U	3.4 J	5 U	5 U	0.5 U	NA	0.5 U	NA	290	67	NA	5 U	270	270	140	98	75
Pyruvate (mg/l)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	NA	5 U	5 U	NA	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	230	260	260	44	97	98	140	NA	213 J	NA	5 U	5 U	NA	7.5	0.14 B	0.2 B	0.21 B	0.75 J	1.7 B
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 UL	0.03 U	NA	0.03 U	NA	0.03 U	0.03 U	NA	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 U	0.14
Total organic carbon (TOC) (mg/l)	10 U	11	10 U	28	7.6 J	7.6 J	4.8 J	NA	7.2 J	NA	330	140	NA	61	470	560	410	320	270

#REF!

Notes:
Shading indicates detections
Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

Table 5.1
Former NSWC White Oak
Site 4 Source Area
Groundwater Detected Analytical Results
October 2008 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), and December 2010 (12-Month Post Inj)

Station ID	04GW400									04GW402							
Sample ID	004GW4000507	004GW4000507P	004GW400-0108	004GW400-0408	**004GW400-1008**	004GW400-0210	004GW400-0510	004GW400-0810	004GW400-1210	004GW4020507	004GW402-0108	004GW402-0408	**004GW402-1008**	004GW402-0210	004GW402-0510	004GW402-0810	004GW402-1110
Sample Date	05/23/07	05/23/07	01/17/08	04/15/08	**10/29/08**	02/04/10	05/12/10	08/25/10	12/03/10	05/22/07	01/16/08	04/16/08	**10/30/08**	02/03/10	05/13/10	08/25/10	11/30/10
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,1-Trichloroethane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	2 U	2 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dibromoethane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloropropane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
2-Butanone	2 U	2 U	4.3	2 U	5 R	5 R	5 U	2.5 R	2.5 R	2 U	2 U	2 U	13 L	5 R	5 U	2.5 R	2.5 R
2-Hexanone	2 U	2 U	2 UJ	2 UJ	5 U	5 U	5 U	2.5 U	2.5 U	2 U	2 UJ	2 UJ	5 U	5 U	5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Acetone	2 UJ	2 UJ	5.2 J	2 U	56 L	48 L	25 L	4.7 B	8.2 L	2 UJ	2 U	2 U	19 L	5 R	5 R	2.5 R	2.5 R
Benzene	2 U	2 U	2 U	2 U	5 U	5 U	1.7 J	0.5 U	0.5 U	2 U	2 U	2 U	1.2 J	5 U	0.59 J	0.6 J	0.5 U
Carbon disulfide	2 U	2 U	2.6	2 U	5 U	5 U	0.59 J	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroethane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroform	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloromethane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	1.5 B	2 U	5 U	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	2 U	2 U	2 U	2 U	5 U	1.5 J	0.75 J	0.56 J	4.4 B	29	86	3.7	20 B	27	5.9	7.3 J	6
Cyclohexane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Isopropylbenzene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl acetate	2 U	2 U	4.8	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Methylcyclohexane	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	2 UJ	2 UJ	1.7 J	1.4 J	5 U	5 U	5 U	0.5 U	0.5 U	2 UJ	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	2 U	2 U	2 U	2 U	5 U	5 U	0.54 J	0.61 J	0.57 J	2 U	2 U	2 U	5 U	5 U	5 U	0.55 J	0.62 J
Styrene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Toluene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Trichloroethene	2 B	2 B	2 U	1 J	1.8 B	5 U	5 U	0.72 J	0.5 U	120 J	38	2.2	1.8 B	5 U	5 U	0.5 U	0.72 J
Vinyl chloride	2 U	2 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U	2 U	39	2 U	6.7	6.4	14	16	16 J
Xylene, total	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)																	
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)																	
Perchlorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																	
Iron, Dissolved	707 L	670 L	17,300	69,800	144,000	273,000	232,000	118,000	133,000	280 L	4,830	37,500	95,500	57,300	42,700	44,300	32,300
Sodium, Dissolved	12,200	NA	28,700	17,700	12,300	14,700	13,600	13,300	13,500	110,000	46,400	48,000	27,700	15,900	16,800	21,000	19,200
Wet Chemistry																	
Acetate (mg/l)	1 UL	NA	21	61	96	210	120 L	3.1 J	10	1 UL	5 U	15	81	5 U	5 UL	1.7 J	0.5 U
Alkalinity (mg/l)	20	NA	180	230	240	230	120	130	140	180	190	320	390	190	300	150	100
Butyrate (mg/l)	1 UL	NA	5 U	5 U	5 U	5 U	5 U	1 U	1 U	1 UL	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Carbon dioxide (ug/l)	15,000	NA	180,000	110,000	150,000	616	60,000	36,100	35,200	23000	55000	130,000	150,000	499	109,000	65,700	48,700
Chemical oxygen demand (mg/l)	20 U	NA	110	20 U	240	190	180	44	55	20 U	20 U	58	150	27	24	35	29
Chloride (mg/l)	15	NA	16	17	NA	20	20	19	20.2	9.3	7	14	NA	21	26	24	20.3
Ethane (ug/l)	0.16 J	NA	0.72 J	2.8	1.2 U	1.2 U	1.2 U	1.3 U	1.2 U	4.3	4.1	6.7	2.2	1.2 U	1.2 U	1.3 U	1.2 U
Ethene (ug/l)	1 U	NA	1 U	0.79 J	1.5 U	1.5 U	1.5 U	1.6 U	1.5 U	14	18	74	52	37	26	21	21
Lactic Acid (mg/l)	NA	NA	NA	NA	NA	5 U	5 U	2 U	2 U	NA	NA	NA	NA	5 U	5 U	2 U	2 U
Methane (ug/l)	5.7	NA	110	580	3,200	13,000	7,900	6,300	47,000	16	42	400	5,300	4,000	3,500	4,000	7,600
Nitrate (mg/l)	0.12	NA	0.13 U	0.13 U	0.13 U	0.13 U	0.032 B	0.042 U	0.072 U	0.032	0.13 U	0.13 U	0.13 U	0.13 U	1.7	0.042 U	0.096 J
Nitrite (mg/l)	0.025 U	NA	NA	0.13 U	0.13 U	0.019 J	0.13 U	0.042 U	0.062 J	0.025 U	NA	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	0.057 J
pH (ph)	5.4	NA	6.3	6.6	NA	NA	NA	NA	NA	7.2	6.8	6.7	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	1 U	1 U	NA	NA	NA	NA	NA	NA	1 U	1 U	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	1 UL	NA	14	38	52	2.6 J	5 U	0.5 U	0.5 U	1 UL	5 U	15	22	5 U	5 U	0.5 U	0.5 U
Pyruvate (mg/l)	1 UL	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	1 UL	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	46	NA	16	8.9	5 U	0.69 J	0.65 J	25	17.2	65	11	5 U	5 U	16	34	44	59.4
Sulfide (mg/l)	0.03 U	NA	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 U	0.056
Total organic carbon (TOC) (mg/l)	1.01 L	NA	40	45	70	89	51	4.9 J	9 J	1.51 L	10 U	24	47	7 B	7.7 J	6.3 J	5.4 B

#REF!

Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event. as discussed in the text

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

Table 5.1
Former NSWC White Oak
Site 4 Source Area
Groundwater Detected Analytical Results
October 2008 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), and December 2010 (12-Month Post Inj)

Station ID	04GW403							04GW404									04GW405						
Sample ID	004GW4030507	004GW403-0408	**004GW403-1008**	004GW403-0210	004GW403-0510	004GW403-0810	004GW403-1110	004GW4040507	004GW404-0408	004GW404P-0408	**004GW404-1008**	004GW404-0210	004GW404-0510	004GW404-0810	004GW404-1110	004GW4050507	**004GW405-1008**	**004GW405P-1008**	004GW405-0210	004GW405P-0210	004GW405-0510	004GW405-0810	004GW405-1210
Sample Date	05/24/07	04/17/08	**10/30/08**	02/02/10	05/12/10	08/23/10	11/30/10	05/24/07	04/17/08	04/17/08	**10/30/08**	02/02/10	05/13/10	08/23/10	11/30/10	05/23/07	**10/28/08**	**10/28/08**	02/05/10	02/05/10	05/13/10	08/25/10	12/03/10
Chemical Name																							
Volatile Organic Compounds (UG/L)																							
1,1,1-Trichloroethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	5	27	1 U	1 U	1 U	1 U	1 U	4 U	2 U	2 U	1 U	1 U	1 U	1 U	1 U	8 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	3 J	1.6 J	1.6 J	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dibromoethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	2 U	2 U	3.4 J	0.63 J	0.94 J	1.1 J	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloropropane	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
2-Butanone	2 U	2 U	20 L	5 U	5 U	2.5 R	2.5 R	4 U	2 U	2 U	14 L	5 U	5 U	2.5 R	2.5 R	8 U	5 R	5 R	5 R	5 R	5 U	2.5 R	2.5 R
2-Hexanone	2 U	2 UJ	3.5 J	5 U	5 U	2.5 U	2.5 U	4 U	2 UJ	2 UJ	5 U	3.9 J	3.6 J	2.5 U	2.5 U	8 U	5 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Acetone	2 UJ	2 U	34 L	5 R	7 L	4.4 B	3.5 L	4 UJ	2 U	2 U	8.7 L	6.7 L	8.9 L	6.2 B	4.3 L	8 UJ	39 L	37 L	5 R	5 R	5.6 L	2.5 R	2.5 R
Benzene	2 U	2 U	5 U	5 U	0.5 J	0.55 J	0.58 J	4 U	1.4 J	1.4 J	5 U	3.7 J	3.1 J	2.5 J	2.9 J	8 U	1.5 J	1.4 J	5 U	5 U	0.77 J	0.51 J	0.6 J
Carbon disulfide	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	2 U	2 U	1.7 J	1 J	0.78 J	0.7 J	0.5 U	4 U	2 U	2 U	5 U	0.94 J	0.79 J	0.95 J	1.5 J	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroethane	2 U	2 U	5 U	0.79 J	5 U	1.9 J	1.2 J	4 U	2 U	2 UJ	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroform	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	11	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloromethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	13	110	130	2.5 J	1.8 J	2.2 J	1.5 J	140	430	420	65 B	5.3	7.1	10	5.4	140	220	220	5 U	5 U	1.3 J	3.1 J	4.9 B
Cyclohexane	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Isopropylbenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl acetate	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	5.6	2 U	5 U	6.2	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Methylcyclohexane	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	2 UJ	2 U	5 U	0.92 J	5 U	0.5 U	0.5 U	4 UJ	2 U	2 U	5 U	5 U	0.54 J	0.5 U	0.71 B	8 UJ	1.1 B	1.1 B	5 U	5 U	5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	2	2 U	1.7 J	1.2 J	1.4 J	1.2 J	1 J	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Styrene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	0.83 J	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Toluene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	4 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U	8 U	5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	2 U	3	2.2 J	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	1.4 J	1.2 J	5 U	5 U	5 U	1 U	1 U
Trichloroethene	58	120	2.5 J	0.81 J	5 U	0.89 J	0.67 J	330	24	10 J	2.3 B	0.86 J	5 U	0.57 J	0.5 U	520 J	1.8 J	1.6 J	5 U	5 U	5 U	0.5 U	0.61 J
Vinyl chloride	2 U	5.9	18	1.5	1.3	1.5	1.4 J	4 U	280	320	24	4.8	10	14	9.1 J	8 U	19	19	1 U	1 U	1 U	1.8	5.9
Xylene, total	2 U	2 U	5 U	5 U	5 U	1 U	1 U	4 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U	8 U	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)																							
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)																							
Perchlorate	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																							
Iron, Dissolved	612 L	2,590	99,700	74,000	76,200	60,600	53,200	13,300 L	36,300	NA	53,000	65,300	61,600	62,900	78,100	1,280 L	131,000	NA	134,000	136,000	94,800	64,700	54,500
Sodium, Dissolved	33,700	23,100	34,400	30,800	33,100	31,400	30,400	10,300	14,500	NA	11,700	18,200	16,000	17,600	22,200	6,820	9,010	NA	7,730	8,040	8,400	7,360	5,970
Wet Chemistry																							
Acetate (mg/l)	1 UL	5 U	64	15	39 L	21	0.86 J	1 UL	44	NA	86	67	69 L	60	0.38 J	1 UL	160	NA	1.5 J	1.2 J	5 UL	0.5 U	0.5 U
Alkalinity (mg/l)	74	60	350	310	330	240	210	69	200	NA	270	250	350	200	190	41	240	NA	180	150	130	180	100
Butyrate (mg/l)	1 UL	5 U	5 U	5 U	5 U	1 U	1 U	1 UL	5 U	NA	5 U	1.7 J	5 U	1 U	1 U	1 UL	13	NA	5 U	5 U	5 U	1 U	1 U
Carbon dioxide (ug/l)	37000	170,000	140,000	541	102,000	54,300	36,800	72,000	120,000	NA	71,000	450	96,200	33,600	54,500	130,000	95,000	NA	811	682	104,000	62,100	26,900
Chemical oxygen demand (mg/l)	20 U	20 U	130	44	96	53	30	20 U	110	NA	140	150	150	120	110	20 U	430	NA	39	37	28	25	20 U
Chloride (mg/l)	26	21	NA	24	27	24	22	12	12	NA	NA	19	19	18	19.9	10	NA	NA	8.2	8.2	12	7.5	7
Ethane (ug/l)	0.7 J	1.9	1.8	1.7	1.2 U	1.3 U	1.4	2.8	2.4	NA	1.4	3	3.8	2.9	6.1	0.41 J	1.2 U	NA	1.6	1.5	1.8	2	5.2
Ethene (ug/l)	0.88 J	1.2	18	17	20	14	34	4.6	17	NA	110	420	350	240	400	0.4 J	1.5 U	NA	1.5 U	1.5 U	1.5 U	1.6 U	5.6
Lactic Acid (mg/l)	NA	NA	NA	5 U	5 U	1.6 J	2 U	NA	NA	NA	NA	5 U	5 U	2 U	2 U	NA	NA	NA	4.1 B	5 U	5 U	2 U	2 U
Methane (ug/l)	8.3	310	5,600	7,300	7,000	6,300	33,000	83	630	NA	4,700	8,300	8,200	6,200	27,000	0.9 B	10,000	NA	15,000	16,000	8,900	6,300	41,000
Nitrate (mg/l)	0.025 U	0.13 U	0.13 U	0.13 U	0.015 B	0.042 U	0.072 U	0.025 U	0.13 U	NA	0.13 U	0.13 U	0.03 B	0.042 U	0.072 U	0.11	0.13 U	NA	0.018 L	0.015 L	0.026 B	0.042 U	0.072 U
Nitrite (mg/l)	0.025 U	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	0.06 J	0.025 U	0.13 U	NA	0.13 U	0.0082 J	0.0052 J	0.042 U	0.082 J	0.025 U	0.13 U	NA	0.13 UL	0.13 UL	0.13 U	0.042 U	0.072 J
pH (ph)	6.6	5.8	NA	NA	NA	NA	NA	6.3	6.5	NA	NA	NA	NA	NA	NA	5.8	NA	NA	NA	NA	NA	NA	NA
Propane (ug/l)	NA	1 U	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	1 UL	5 U	18	11	15	1.3 J	0.5 U	1 UL	58	NA	21	35	18	12	0.5 U	1 UL	25	NA	5 U	5 U	5 U	0.5 U	0.5 U
Pyruvate (mg/l)	1 UL	5 U	5 U	5 U	5 U	1.6 J	5 U	4.4 J	5 U	NA	5 U	5 U	5 U	5 U	5 U	4.3 J	5 U	NA	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	120	150	11	13	5 J	15	18	31	5 U	NA	5 U	4.7 J	7	15	30.1	32	5 U	NA	1.5 J	1.5 J	4.6 J	12	17.5
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 U	0.03 U	0.03 U	0.03 U	NA	0.03 U	0.03 U	0.03 UL	0.03 U	0.03 U	0.03 U	0.03 U	NA	0.03 U	0.03 U	0.03 UL	0.03 U	0.061
Total organic carbon (TOC) (mg/l)	2 L	10 U	41	17	30	11	8.1 B	1.31 L	60	NA	47	60	46	36	33	1.28 L	120	NA	11	11	7 J	2.9 J	2.5 J

#REF!

Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event. as discussed in the text

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

Table 5.1
Former NSWC White Oak
Site 4 Source Area
Groundwater Detected Analytical Results
October 2008 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), and December 2010 (12-Month Post Inj)

Station ID	04GW407							
Sample ID	004GW4070507	004GW407-0408	**004GW407-1008**	004GW407-0210	004GW407-0510	004GW407P-0510	004GW407-0810	004GW407-1210
Sample Date	05/23/07	04/18/08	**10/29/08**	02/03/10	05/12/10	05/12/10	08/24/10	12/01/10
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	32 U	27	14	1 U	1 U	1.8	0.93 J	1.1
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	32 U	2.5	1.7 J	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	32 U	37	20	4.9 J	1.5 J	2.1 J	1.3 J	1 J
1,2-Dibromoethane	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloropropane	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
2-Butanone	32 U	2 U	80 R	5 R	5 U	5 U	2.5 R	2.5 R
2-Hexanone	32 U	2 UJ	5 U	5 U	5 U	5 U	2.5 UL	2.5 U
4-Methyl-2-pentanone	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Acetone	32 UJ	2 U	80 R	5 R	5 R	5 R	2.5 R	2.5 R
Benzene	32 U	2.4	1.3 J	1.4 J	1 J	0.99 J	1.1 J	1.4 J
Carbon disulfide	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	32 U	2.5	1.3 J	5 U	0.62 J	0.56 J	0.57 J	0.61 J
Chloroethane	32 U	2 UJ	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroform	32 U	5.2	7.1	5.2	3.4 B	3.1 B	2.6 J	2.3 B
Chloromethane	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	150	600	460	490	270	250	190	160
Cyclohexane	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Isopropylbenzene	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl acetate	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Methylcyclohexane	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	32 UJ	2 U	5 U	5 U	0.85 J	0.55 J	0.77 B	1.4 B
Methyl-tert-butyl ether (MTBE)	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Styrene	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Toluene	32 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	32 U	3.1	1 J	5 U	5 U	5 U	1 U	1 U
Trichloroethene	1,400	5,200	2,600	980	410	400	260 L	200 L
Vinyl chloride	32 U	18 J	5.5	14	9.8	11	31	45 J
Xylene, total	32 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)								
No Detections	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)								
Perchlorate	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U
Dissolved Metals (UG/L)								
Iron, Dissolved	2,910 L	11,600	5,410	3,750	1,720	1,910	1,740	1,570
Sodium, Dissolved	10,300	12,200	8,430	9,000 B	8,270	8,620	7,890	8,050
Wet Chemistry								
Acetate (mg/l)	1 UL	28	5 U	5 U	5 UL	5 UL	0.5 U	0.5 U
Alkalinity (mg/l)	99	150	250	89	860 J	85 J	150	130
Butyrate (mg/l)	1 UL	5 U	5 U	5 U	5 U	5 U	1 U	1 U
Carbon dioxide (ug/l)	190,000	260,000	100,000	530	89,700	82,900	57,200	46,200
Chemical oxygen demand (mg/l)	20 U	47	30	21 U	20 U	20 U	20 U	20 U
Chloride (mg/l)	17	18	NA	12	13	12	11	10.9
Ethane (ug/l)	1.7	0.45 J	1.2 U	1.2 U	1.2 U	1.3 U	1.3 U	2
Ethene (ug/l)	3.7	4.2	1.5 U	3.2	5.1	5.4	22	130
Lactic Acid (mg/l)	NA	NA	NA	2.1 B	5 U	5 U	2 U	2 U
Methane (ug/l)	16	120	7.9	280	330	350	910	5,300
Nitrate (mg/l)	0.025 U	0.13 U	0.13 U	0.0076 J	0.067 B	0.62	0.042 U	0.072 U
Nitrite (mg/l)	0.025 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	0.062 U
pH (ph)	6	6.1	NA	NA	NA	NA	NA	NA
Propane (ug/l)	NA	1 U	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	1 UL	9.7	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Pyruvate (mg/l)	1 UL	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	56	42	52	49	52	52	50	56.9
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 UL	0.03 U	0.03 U
Total organic carbon (TOC) (mg/l)	2.31 L	14	10 U	4.1 B	5.8 J	4.4 J	2.9 J	5.4 J

Station ID	04GW408						
Sample ID	004GW4080507	004GW408-0408	**004GW408-1008**	004GW408-0210	004GW408-0510	004GW408-0810	004GW408-1210
Sample Date	05/23/07	04/16/08	**10/29/08**	02/01/10	05/12/10	08/25/10	12/03/10
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1,1-Trichloroethane	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	16 U	5.3	4.5	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	16 U	2 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	16 U	2 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	16 U	12	3.8 J	5 U	5 U	0.5 U	0.5 U
1,2-Dibromoethane	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	16 U	2 U	5 U	0.58 J	5 U	0.5 U	0.5 U
1,2-Dichloropropane	16 U	2 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
2-Butanone	16 U	2 U	5 R	5 U	5 U	2.5 R	2.5 R
2-Hexanone	16 U	2 UJ	4.4 J	3 J	1.9 J	2.5 U	2.5 U
4-Methyl-2-pentanone	16 U	2 U	5 U	5 U	5 U	1 U	1 U
Acetone	16 UJ	2 U	5 R	8.2 L	5.3 L	2.5 R	2.6 L
Benzene	16 U	2 U	5 U	0.53 J	0.51 J	0.5 U	0.5 U
Carbon disulfide	16 U	2 U	5 U	5 U	5 U	1 J	0.5 U
Chlorobenzene	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroethane	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroform	10 J	10	3.2 B	5 U	5 U	0.5 U	0.5 U
Chloromethane	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	120	2,200	1,200	19	12	4.1 J	1.8 B
Cyclohexane	16 U	2 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Isopropylbenzene	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl acetate	16 U	5.1	5 U	4.1 J	5 U	1 U	1 U
Methylcyclohexane	16 U	2 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	16 UJ	3.2 B	3.2 B	0.83 B	0.7 J	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	16 U	2 U	5 U	5 U	0.55 J	0.5 U	0.5 U
Styrene	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	16 U	2 U	5 U	5 U	5 U	1 U	1 U
Toluene	16 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	16 U	1.4 J	5 U	0.6 J	1.4 J	1 U	1 U
Trichloroethene	1,000 J	14	5.7 B	0.88 J	5 U	2.1 J	0.5 U
Vinyl chloride	16 U	62	190	7.7	7.1	2	0.93 J
Xylene, total	16 U	2 U	5 U	5 U	5 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)							
No Detections	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)							
Perchlorate	0.06 J	0.2 U	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)							
Iron, Dissolved	1,230 L	83,600	88,100	79,800	70,000	59,000	91,000
Sodium, Dissolved	10,100	11,400	7,510	9,580	9,190	7,670	7,230
Wet Chemistry							
Acetate (mg/l)	1 UL	120	150	82	18 L	12	8.3
Alkalinity (mg/l)	87	210	260	190	180	190	200
Butyrate (mg/l)	1 UL	9.6	11	2.2 J	5 U	1 U	1 U
Carbon dioxide (ug/l)	140,000	340,000	88,000	289	100,000	93,400	53,600
Chemical oxygen demand (mg/l)	20 U	900	530	170	53	51	50
Chloride (mg/l)	14	13	NA	15	18	11	10.6
Ethane (ug/l)	3.7	2.7	1.4	8.7	14	12	33
Ethene (ug/l)	3.3	4.4	66	41	6.6	4.2	5.7
Lactic Acid (mg/l)	NA	NA	NA	5 U	5 U	2 U	2 U
Methane (ug/l)	7.1	540	4,600	6,600	8,600	18,000	79,000
Nitrate (mg/l)	0.1	0.13 U	0.13 U	0.13 U	0.016 B	0.042 U	0.072 U
Nitrite (mg/l)	0.025 U	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	0.062 U
pH (ph)	6.1	6.1	NA	NA	NA	NA	NA
Propane (ug/l)	NA	1 U	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	1 UL	75	26	3.4 J	5 U	0.5 U	0.5 U
Pyruvate (mg/l)	1 UL	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	51	5 U	5 U	0.28 B	0.76 J	0.57 J	1.1 B
Sulfide (mg/l)	0.03 U	0.082	0.054	0.03 U	0.03 UL	0.03 U	0.03 U
Total organic carbon (TOC) (mg/l)	1.49 L	220	100	43	17	8.9 J	9.5 B

Station ID	04GW409						
Sample ID	004GW4090507	004GW409-0408	**004GW409-1008**	004GW409-0210	004GW409-0510	004GW409-0810	004GW409-1210
Sample Date	05/23/07	04/15/08	**10/28/08**	02/05/10	05/12/10	08/25/10	12/03/10
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1,1-Trichloroethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	2 U	2 U	1 U	1 U	1 U	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dibromoethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloropropane	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
2-Butanone	2 U	2 U	5 R	5 R	5 U	2.5 R	2.5 R
2-Hexanone	2 U	2 UJ	5 U	5 U	5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Acetone	2 UJ	2 U	5 R	14 L	5 R	3.3 B	2.5 R
Benzene	2 U	2 U	1.3 J	2 J	1.7 J	1.2 J	1 J
Carbon disulfide	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroform	2	2.2	5 U	5 U	5 U	0.5 U	0.5 U
Chloromethane	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	24	170	270	12	5.7	4.4 J	2.1 B
Cyclohexane	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Isopropylbenzene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl acetate	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Methylcyclohexane	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	2 UJ	1.7 J	2 B	5 U	5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Styrene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Toluene	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	2 U	2 U	5 U	5 U	1.4 J	0.67 J	1 U
Trichloroethene	30	78	16	5 U	5 U	0.5 U	0.5 U
Vinyl chloride	1 J	7.8	13	2.9	1.9	1.5	0.82 J
Xylene, total	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)							
No Detections	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)							
Perchlorate	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)							
Iron, Dissolved	5,420 L	23,300	80,200	170,000	151,000	128,000	110,000
Sodium, Dissolved	8,720	11,300	8,760	8,210	7,730	7,500	7,100
Wet Chemistry							
Acetate (mg/l)	1 UL	5 U	48	28	11 L	4.1 J	0.87 J
Alkalinity (mg/l)	32	100	220	250	380	200	120
Butyrate (mg/l)	1 UL	5 U	5 U	5 U	5 U	1 U	1 U
Carbon dioxide (ug/l)	200,000	140,000	120,000	703	65,100	52,600	38,300
Chemical oxygen demand (mg/l)	20 U	190	78	63	49	43	33
Chloride (mg/l)	12	9.7	NA	9	13	8.7	7.4
Ethane (ug/l)	2.1	0.53 J	1.2 U	1.2 U	1.2 U	1.3 U	1.2
Ethene (ug/l)	1.9	0.78 J	1.5 U	5.8	3.8	4.1	5.1
Lactic Acid (mg/l)	NA	NA	NA	5 U	5 U	2 U	2 U
Methane (ug/l)	4.4	170	1,600	18,000	7,100	7,400	46,000
Nitrate (mg/l)	0.21	0.13 U	0.13 U	0.13 UL	0.014 B	0.042 U	0.072 U
Nitrite (mg/l)	0.025 U	0.13 U	0.13 U	0.13 UL	0.13 U	0.042 U	0.066 J
pH (ph)	5.5	6.2	NA	NA	NA	NA	NA
Propane (ug/l)	NA	1 U	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	1 UL	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Pyruvate (mg/l)	1 UL	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	47	51	13	1.5 J	1.6 J	2.2 J	3 B
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 U	0.03 U
Total organic carbon (TOC) (mg/l)	1.35 L	10 U	22	17	11	4.9 J	3.7 J

#REF!

Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

Table 5.1
Former NSWC White Oak
Site 4 Source Area
Groundwater Detected Analytical Results
October 2008 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), and December 2010 (12-Month Post Inj)

Station ID	04GW412							04GW413								04GW414						
Sample ID	004GW4120507	**004GW412-1008**	004GW412-0210	004GW412-0510	004GW412-0810	004GW412P-0810	004GW412-1210	004GW4130507	004GW413-0408	**004GW413-1008**	004GW413-0210	004GW413-0510	004GW413-0810	004GW413-1210	004GW413P-1210	004GW4140507	**004GW414-1008**	**004GW414P-1008**	004GW414-0210	004GW414-0510	004GW414-0810	004GW414-1210
Sample Date	05/23/07	**10/28/08**	02/01/10	05/11/10	08/25/10	08/25/10	12/03/10	05/22/07	04/17/08	**10/29/08**	02/03/10	05/13/10	08/24/10	12/03/10	12/03/10	05/22/07	**10/30/08**	**10/30/08**	02/04/10	05/12/10	08/24/10	12/01/10
Chemical Name																						
Volatile Organic Compounds (UG/L)																						
1,1,1-Trichloroethane	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	5.7	5 UJ	5 U	1.8 J	0.5 U	2.9 J	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	32 U	1.4	0.84 J	1.4	2.2	2.7	1.5	3,000	210 J	270 J	180 J	260 J	220	270 J	240 J	190	42	60	1.9	1 U	1.3	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	32 U	5 U	5 U	5 U	1 U	1 U	1 U	2 J	2 U	5 U	5 UJ	5 U	1 U	1 U	1 U	2 J	5 U	1.6 J	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	32 U	5 U	5 U	5 U	1 U	1 U	1 U	12	14	8.2	5.1 J	7.8	6.6	8	7.3	7	1.4 J	2.1 J	5 U	5 U	1 U	1 U
1,1-Dichloroethane	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2 U	1.3 J	5 U	5 UJ	5 U	0.5 U	0.52 J	0.53 J	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	32 U	2.4 J	0.67 J	0.81 J	0.68 J	0.5 U	0.5 U	20	44	100	37 J	83	76	88	78	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dibromoethane	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2	1.2 J	5 U	5 UJ	5 U	0.5 U	0.5 U	0.5 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	32 U	5 U	0.61 J	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	5 U	5 UJ	3.6 J	2.9 J	4.9 J	4.8 J	5	5 U	5 U	5 U	5 U	3.9 J	8
1,2-Dichloropropane	32 U	5 U	5 U	5 U	1 U	1 U	1 U	2 U	2 U	5 U	5 UJ	5 U	1 U	1.3 J	1.1 J	2 U	5 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	5 U	5 UJ	5 U	0.5 U	0.5 U	0.5 U	3	5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	32 U	5 U	0.5 J	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	5 U	5 UJ	5 U	0.5 U	0.5 U	0.5 U	6	1.2 J	1.5 J	5 U	5 U	0.5 U	0.5 U
2-Butanone	32 U	5 R	5 U	5 U	2.5 R	2.5 R	2.5 R	2 U	2 U	2,000 R	5 R	5 U	2.5 R	2.5 R	2.5 R	240 J	11 L	16 L	26 L	5 U	2.5 R	2.5 R
2-Hexanone	32 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U	2 U	2 UJ	5 U	5 UJ	4.1 J	2.5 U	6.3	5.1	2 U	7 J	11 J	13	5 U	2.5 U	12
4-Methyl-2-pentanone	32 U	5 U	5 U	5 U	1 U	1 U	1 U	2 U	2 U	4.5 J	5 UJ	5.6	1 U	6.7	7.1	2 U	5 U	5 U	4.1 J	5 U	1 U	2.8 J
Acetone	32 UJ	5 R	5 R	5 R	2.5 R	2.5 R	2.5 R	2 UJ	2 U	21 L	5 R	28 L	27 L	30 L	26 L	2 UJ	17 L	23 L	84 L	27 L	210 L	170 L
Benzene	32 U	5 U	0.63 J	0.76 J	0.54 J	0.54 J	0.72 J	240 J	130	150	28 J	80	72	100	89	1 J	5 U	5 U	5 U	5 U	0.69 J	0.67 J
Carbon disulfide	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	7	3.1	6.5	5 UJ	0.78 J	2.3 J	0.5 U	0.5 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	32 U	5 U	1 J	0.93 J	0.51 J	0.5 U	0.52 J	2	3.2	5 U	5 UJ	1 J	1.5 J	1.2 J	0.99 J	9	1.8 J	2.3 J	5 U	5 U	0.5 U	0.5 U
Chloroethane	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	5 U	5 UJ	5 U	0.5 U	0.5 U	0.5 U	2 U	5 U	5 U	5 U	5 U	1.3 J	1.7 J
Chloroform	32 U	5.4	1.9 J	3.4 B	6.8	6	4.5 B	11	5.8	4.3 B	5 UJ	1.6 B	1.5 J	2.6 B	2.2 B	2 U	5 U	5 U	1.5 J	5 U	0.5 U	0.5 U
Chloromethane	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	5 U	5 UJ	5 U	0.5 U	0.5 U	0.5 U	2 U	5 U	5 U	5 U	5 U	0.55 J	0.5 U
cis-1,2-Dichloroethene	100	280	140	230	210	210	84	5,200	62,000	53,000	27,000	72,000	57,000	51,000	50,000	37	30	35	8	30	24	23
Cyclohexane	32 U	5 U	5 U	5 U	1 U	1 U	1 U	2	2 U	5 U	5 UJ	5 U	1 U	1 U	1 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	17	6.1	10	1.9 J	6.9	7.6	7.6	6.8	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Isopropylbenzene	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	4	1.8 J	2.6 J	5 UJ	1.5 J	1.6 J	1.5 J	1.5 J	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl acetate	32 U	5 U	2.3 J	5 U	1 U	1 U	1 U	2 UJ	2 U	5 U	5 UJ	5 U	1 U	6.4	7.4	2 U	5 U	5 U	5 U	5 U	1 U	3.9 J
Methylcyclohexane	32 U	5 U	5 U	5 U	1 U	1 U	1 U	2 U	2 U	1.2 J	5 UJ	5 U	1 U	1 U	1 U	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	32 UJ	5 U	1.9 B	2.7 J	1.3 J	1.2 J	0.92 B	2 U	1.8 J	5 U	5 UJ	5 U	1.1 B	1.6 B	1.4 B	2 UJ	5 U	5 U	5 U	0.54 J	1.5 B	1.2 B
Methyl-tert-butyl ether (MTBE)	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	5 U	5 UJ	5 U	0.5 U	0.5 U	0.5 U	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Styrene	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	2 U	2 U	1.3 J	5 UJ	5 U	0.5 U	0.57 J	0.55 J	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	32 U	5 U	5 U	5 U	1 U	1 U	1 U	2 U	2 U	5 U	5 UJ	5 U	1 U	1 U	1 U	1 J	5 U	5 U	5 U	5 U	1 U	1 U
Toluene	32 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	20	18	12	2.7 J	8.9	9.1	11	9.9	2 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	32 U	5 U	0.88 J	0.77 J	0.74 J	1 U	1 U	2 U	13	8.4	15 J	28	22	17	12	3	10	14	5 U	5 U	2.3 J	2 J
Trichloroethene	1,600	430	74	170	420	450	540	33,000	19,000	19,000	57 J	500	1,100	380 J	370 J	810	9.5	12	5.2	3.4 J	1.6 J	1.7 J
Vinyl chloride	32 U	5.2	24	81	150	130	32	28	100	74	330	920	1,900	2,400	2,400	6	3.2	5.1	1 U	1.4	5.3	5.1 J
Xylene, total	32 U	5 U	5 U	5 U	1 U	1 U	1 U	45	20	32	5.5 J	20	24	22	21	2 U	5 U	5 U	5 U	5 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)																						
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)																						
Perchlorate	NA	NA	NA	NA	NA	NA	NA	0.08 J	0.2 U	NA	NA	NA	NA	NA	NA	85	0.2 U	0.2 U	NA	NA	NA	NA
Dissolved Metals (UG/L)																						
Iron, Dissolved	19,300 L	3,660	77,300	61,000	55,400	52,200	53,100	29,400 L	NA	NA	91,300	111,000	119,000	132,000	133,000	3,910 L	NA	NA	94,100	67,500	273,000	164,000
Sodium, Dissolved	6,560	8,370	6,480	5,320	5,590	5,510	5,760	20,400	NA	NA	28,400	34,500	42,800	37,700	38,000	7,420	NA	NA	31,800	25,300	33,900	25,700
Wet Chemistry																						
Acetate (mg/l)	1 UL	5 U	75	50 L	2 J	NA	6.6	1 UL	NA	18	95	120 L	150	170	NA	1 UL	NA	NA	150	150 L	520	170
Alkalinity (mg/l)	76	150	240	220	280	NA	150	44	30	NA	150	350	180	200	NA	71	NA	NA	250	250	520	320
Butyrate (mg/l)	1 UL	5 U	5 U	5 U	1 U	NA	1 U	1 UL	NA	5 U	11	10	12	15	NA	1 UL	NA	NA	32	18	97	36
Carbon dioxide (ug/l)	110,000	62,000	345	46,100	41,700	NA	21,700	150,000	210,000	NA	518	88,300	89,500	49,300	NA	190,000	NA	NA	681	76,000	91,500	85,400
Chemical oxygen demand (mg/l)	20 U	22	93	70	27	NA	38	49	130	NA	390	390	310	490	NA	20 U	NA	NA	370	360	1,700	890
Chloride (mg/l)	10	NA	12	13	10	NA	10	30	69	NA	52	66	69	73.9	NA	9.3	NA	NA	9.9	9.5	12	6.6
Ethane (ug/l)	7.2	1.3 U	1.2 U	1.3 U	1.3 U	NA	1.3	21	1.3	1.2 U	1.2 U	1.3 U	1.3 U	12	NA	1.4	1.2 U	NA	1.2 U	1.3 U	1.3 U	1.2 U
Ethene (ug/l)	8.5	1.6 U	190	110	82	NA	230	77	5.8	7.9	2.4	45	42	87	NA	3.4	6.9	NA	1.5 U	1.6 U	2.9	2.8
Lactic Acid (mg/l)	NA	NA	1.6 B	5 U	2 U	NA	2 U	NA	NA	NA	5 U	5 U	2 U	2 U	NA	NA	NA	NA	5 U	2.5 B	2 U	2 U
Methane (ug/l)	21	37	2,500	2,700	1,200	NA	4,200	19	720	4,300	450	6,900	4,600	29,000	NA	120	3,400	NA	3,600	3,300	4,000	9,800
Nitrate (mg/l)	0.12	0.3	0.014 J	0.035 B	0.042 U	NA	0.072 U	0.025 U	0.13 U	NA	0.13 U	0.022 B	0.073 J	0.072 U	NA	0.43	NA	NA	0.0064 J	0.008 B	0.042 U	0.072 U
Nitrite (mg/l)	0.025 U	0.13 U	0.13 U	0.13 U	0.042 U	NA	0.062 U	0.025 U	0.13 U	NA	0.13 U	0.13 U	0.042 U	0.062 U	NA	0.025 U	NA	NA	0.024 J	0.0051 J	0.042 U	0.051 J
pH (ph)	6.2	NA	NA	NA	NA	NA	NA	5.8	5.5	NA	NA	NA	NA	NA	NA	5.9	NA	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	1 UL	5 U	2.4 J	5 U	0.5 U	NA	0.5 U	1 UL	NA	5 U	17	26	23	29	NA	1 UL	NA	NA	76	15	110	57
Pyruvate (mg/l)	1 UL	5 U	5 U	5 U	5 U	NA	5 U	1 UL	NA	5 U	5 U	5 U	5 U	5 U	NA	1 UL	NA	NA	5 U	5 U	5 U	5 U
Sulfate (mg/l)	41	46	7.8	6.9	5.4	NA	12	8.3	5 U	NA	0.24 B	0.59 J	1.6 J	1.8 B	NA	52	NA	NA	0.39 J	0.57 J	0.97 J	1.1 B
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 U	NA	0.077	0.03 U	0.03 U	NA	0.03 U	0.03 UL	0.03 U	0.28	NA	0.03 U	NA	NA	0.03 U	0.03 UL	0.03 U	0.084
Total organic carbon (TOC) (mg/l)	1.58 L	10 U	34	23	4.1 J	NA	8.7 B	6.64 L	NA	NA	83	110	110	130	NA	1.97 L	NA	NA	200	100	490	240

#REF!

Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

Table 5.1
Former NSWC White Oak
Site 4 Source Area
Groundwater Detected Analytical Results
October 2008 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), and December 2010 (12-Month Post Inj)

Station ID	04GW415					04GW50									
Sample ID	004GW4150507	004GW415-0210	004GW415-0510	004GW415-0810	004GW415-1110	004GW0500507	004GW0500507P	004GW050-0108	004GW050P-0108	004GW050-0408	**004GW050-1008**	004GW050-0210	004GW050-0510	004GW050-0810	004GW050-1210
Sample Date	05/24/07	02/03/10	05/12/10	08/23/10	11/30/10	05/22/07	05/22/07	01/17/08	01/17/08	04/16/08	**10/29/08**	02/03/10	05/12/10	08/25/10	12/03/10
Chemical Name															
Volatile Organic Compounds (UG/L)															
1,1,1-Trichloroethane	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1,2,2-Tetrachloroethane	32 U	3.8	4.1	3.4	1.3	5	5	9.7	8.9	5.3	1.4	1 U	0.51 J	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	32 U	5 U	5 U	1 U	1 U	2 U	2 U	1.3 J	1.3 J	2 U	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	32 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	32 U	5 U	0.85 J	1.1 J	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dibromoethane	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,2-Dichloropropane	32 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
2-Butanone	32 U	44 L	5 U	2.5 R	2.5 R	2 U	2 U	2 U	2 U	2 U	5 R	5 R	5 U	2.5 R	2.5 R
2-Hexanone	32 U	3.1 J	2.5 J	2.5 U	2.5 U	2 U	2 U	2 UJ	2 UJ	2 UJ	5 U	5 U	5 U	2.5 U	2.5 U
4-Methyl-2-pentanone	32 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Acetone	32 UJ	56 L	37 L	13 B	54 L	2 UJ	2 UJ	2 U	3.6 J	2 U	5 R	5 R	5 R	2.5 R	2.5 R
Benzene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Carbon disulfide	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroethane	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloroform	32 U	3.3 J	1.9 B	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Chloromethane	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	1 B	2 U	5 U	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	570	34	8.6	110	110	2	2	47	45	79	1.4 J	1.2 B	2.1 J	0.55 J	6.4 B
Cyclohexane	32 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Ethylbenzene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Isopropylbenzene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl acetate	32 U	5 U	5 U	1 U	5.6	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Methylcyclohexane	32 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Methylene chloride	32 UJ	5 U	5 U	0.74 J	0.63 B	2 UJ	2 UJ	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	1.4 J	1.4 J	1.4 J	2.7 J	5 U	1.9 J	2.7 J	2.9 J
Styrene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	32 U	5 U	4.1 B	1 U	1 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Toluene	32 U	5 U	5 U	0.5 U	0.5 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	32 U	5 U	5 U	1.7 J	1.4 J	2 U	2 U	2 U	2 U	4	5 U	5 U	5 U	1 U	1 U
Trichloroethene	2,000	5.3	4.3 J	3.2 J	1.8 J	21	23	23	22	7.4	11 B	9.3	7.6	4.9 J	5.3
Vinyl chloride	33 J	1 U	22	74	35 J	2 U	2 U	1.6 J	1.6 J	2.9	1 U	1 U	1 U	1 U	0.68 J
Xylene, total	32 U	5 U	5 U	1 U	1 U	2 U	2 U	2 U	2 U	2 U	5 U	5 U	5 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)															
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)															
Perchlorate	NA	NA	NA	NA	NA	1	1.1	0.44	0.44	0.12 J	0.25	NA	NA	NA	NA
Dissolved Metals (UG/L)															
Iron, Dissolved	2,230 L	52,000	68,300	89,400	122,000	34.2 B	22.1 B	4,340	4,320	25,900	753	53.1 B	200 U	450	99.4 J
Sodium, Dissolved	7,230	12,300 B	16,600	8,050	11,600	9,790	NA	5,970	NA	8,990	4,670	5,410 B	5,650	4,410	3,780
Wet Chemistry															
Acetate (mg/l)	1 UL	110	110 L	200	280	1 UL	NA	5 U	NA	10	5 U	5 U	5 UL	0.5 U	0.5 U
Alkalinity (mg/l)	22	110	120	210	320	55	NA	38	NA	110	30	23	29	40	30
Butyrate (mg/l)	1 UL	21	21	32	34	1 UL	NA	5 U	NA	5 U	5 U	5 U	5 U	1 U	1 U
Carbon dioxide (ug/l)	180,000	567	50,900	41,800	44,400	180,000	NA	100000	NA	88000	19,000	890	31,700	11,100	9,600
Chemical oxygen demand (mg/l)	20 U	560	490	480	680	20 U	NA	29	NA	21 U	27	20 U	20 U	21 U	20 U
Chloride (mg/l)	8.3	9.6	13	7.7	5.7	15	NA	9.7	NA	13	NA	8.5	8.1	6.5	6.1
Ethane (ug/l)	0.93 J	1.2 U	1.3 U	1.3 U	1.2 U	1 U	NA	0.43 J	NA	2 U	1.2 U	1.3 U	1.3 U	1.3 U	1.2 U
Ethene (ug/l)	7	1.5 U	4.3	4.1	2.9	1 U	NA	1.4	NA	2 U	1.5 U	1.6 U	1.6 U	1.6 U	1.5 U
Lactic Acid (mg/l)	NA	5 U	5 U	2 U	2 U	NA	NA	NA	NA	NA	NA	5 U	5 U	2 U	2 U
Methane (ug/l)	8.9	2,000	7,800	5,100	17,000	2 U	NA	14	NA	170	3.2	1.2	5.4	11	17
Nitrate (mg/l)	0.025 U	0.13 U	0.013 B	0.042 U	0.092 J	0.12	NA	0.13 U	NA	0.13 U	0.13 U	0.024 J	6.9	0.042 U	0.094 J
Nitrite (mg/l)	0.025 U	0.012 J	0.009 J	0.042 U	0.052 J	0.025 U	NA	NA	NA	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	0.062 U
pH (ph)	5.4	NA	NA	NA	NA	5.8	NA	5.9	NA	6.4	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	NA	NA	NA	NA	NA	1 U	NA	2 U	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	1 UL	120	59	21	23	1 UL	NA	5 U	NA	5 U	5 U	5 U	5 U	0.5 U	0.5 U
Pyruvate (mg/l)	1 UL	5 U	5 U	5 U	5 U	1 UL	NA	5 U	NA	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	14	0.19 B	1.2 J	0.5 U	1.1	47	NA	5 U	NA	9.7	7.5 K	14	15	9.4	8.1
Sulfide (mg/l)	0.03 U	0.03 U	0.03 UL	0.03 U	0.056	0.03 U	NA	0.03 U	NA	0.03 U	0.033	0.03 U	0.03 UL	0.03 U	0.03 U
Total organic carbon (TOC) (mg/l)	2.4 L	120	130	130	160	1.1 L	NA	10 U	NA	10 U	10 U	3.9 B	10 U	5 U	2.4 J

#REF!

Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

Table 5.2
Former NSWC, White Oak
Site 4, 200-Series Area
Groundwater Detected Analytical Results
February 2009 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), December 2010 (12-Month Post Inj)

Station ID	04GW501D					04GW501S					04GW502D							
Sample ID	**004GW501D-0209**	004GW501D-0210	004GW501D-0510	004GW501D-0810	004GW501D-1210	**004GW501S-0209**	004GW501S-0210	004GW501S-0510	004GW501S-0810	004GW501S-1210	**004GW502D-0209**	004GW502D-0210	004GW502DP-0210	004GW502D-0510	004GW502DP-0510	004GW502D-0810	004GW502DP-0810	004GW502D-1210
Sample Date	02/05/09	02/04/10	05/10/10	08/26/10	12/02/10	02/05/09	02/04/10	05/10/10	08/26/10	12/02/10	02/04/09	02/04/10	02/04/10	05/10/10	05/10/10	08/26/10	08/26/10	12/02/10
Chemical Name																		
Volatile Organic Compounds (UG/L)																		
1,1,2,2-Tetrachloroethane	1.6	1 U	1.1	1 U	1 U	1 U	1 U	1 U	1 U	1 U	18	10	10	9.3	10	4	4.9	2.5
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	5 U	5 U	5 U	1 U	1 U	5 U	5 U	5 U	1 U	1 U	1.9 J	5 U	5 U	13 U	13 U	1 U	1 U	1 U
1,1,2-Trichloroethane	5 U	5 U	5 U	1 U	1 U	5 U	5 U	5 U	1 U	1 U	1.3 J	5 U	5 U	13 U	13 U	1 U	1 U	1 U
1,1-Dichloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	13 U	13 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	7.9	3.5 J	2.7 J	2 J	3.2 J	1.4 J	1.7 J	2 J
1,2-Dichloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5.7	5.8	4.8 J	5.3 J	5 J	4.7 J	4.3 J
1,3-Dichlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	13 U	13 U	0.5 U	0.59 J	0.5 U
1,4-Dichlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	1.1 J	5 U	5 U	13 U	13 U	1 J	1.1 J	1.1 J
2-Butanone	5 R	88 L	5 U	2.5 R	2.5 R	5 R	5 R	5 U	2.5 R	2.5 R	5 R	63 L	65 L	13 U	13 U	2.5 R	2.5 R	2.5 R
Acetone	5 R	5 R	5 R	45 B	17 L	5.3 B	5 R	5 R	6 B	2.5 R	5 R	5 R	5 R	13 R	12 L	6 B	2.5 R	6.6 L
Benzene	1.6 J	1.6 J	1.1 J	0.8 J	0.67 J	5 U	0.93 J	5 U	0.5 U	0.5 U	3.8 J	5.2	5.1	5 J	5.1 J	5.7	6.2	5
Chlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	2.6 J	3.2 J	3.1 J	2.4 J	2.5 J	3.3 J	3.4 J	3.5 J
Chloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	13 U	13 U	0.5 U	0.5 U	0.5 U
Chloroform	5 U	1.2 J	1.5 B	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	2.4 J	1.9 J	2 J	1.5 J	1.4 J	0.84 J	0.61 J	0.5 U
Chloromethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	13 U	13 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	43	43	31	26	28	57	1.7 J	2.8 J	0.5 U	0.5 U	420	580	550	280 B	290	310	350	410
Methyl acetate	5 U	5 U	5 U	1 U	1 U	5 U	5 U	5 U	1 U	1 U	5 U	5 U	5 U	13 U	13 U	1 U	1 U	12
Methylene chloride	5 U	4 B	6.3	2 J	1.8 J	5 U	5 U	5 U	0.5 U	0.5 U	2.7 B	3.1 B	3.2 B	3.1 B	4.2 B	2.9 J	2.9 J	1.8 B
Tetrachloroethene	5 U	5 U	5 U	1 U	1 U	5 U	5 U	0.7 J	1 U	1 U	5 U	5 U	5 U	13 U	13 U	1 U	1 U	1 U
Toluene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	13 U	13 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	5 U	5 U	5 U	1 U	1 U	5 U	5 U	5 U	1 U	1 U	1.6 J	3.1 J	3.3 J	3.9 J	3.2 J	5.1	5.6	3.6 J
Trichloroethene	27	96	18	12	23	5.8	1.1 J	5 U	0.5 U	0.5 U	1,100	310	300	260	280	85	100	55
Vinyl chloride	11	6.7	6.4	5.6	9	3.8	1 U	1.3	1 U	1 U	44	44	44	51	41	64	71	53
Semivolatile Organic Compounds (UG/L)																		
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)																		
Perchlorate	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.03 J	0.2 U	0.2 U	0.2 U	0.1 U
Total Metals (UG/L)																		
Iron	59,400	NA	NA	NA	NA	24,600	NA	NA	NA	NA	23,500	NA	NA	NA	NA	NA	NA	NA
Sodium	9,230	NA	NA	NA	NA	6,580	NA	NA	NA	NA	13,300	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																		
Iron, Dissolved	NA	168,000	285,000	247,000	163,000	NA	83,000	110,000	78,600	65,500	NA	214,000	196,000	287,000	287,000	281,000	289,000	271,000
Sodium, Dissolved	NA	39,600	42,800	29,200	16,100	NA	11,200	7,380	5,310	8,290	NA	38,100	37,700	57,700	55,900	42,800	44,300	33,800
Wet Chemistry																		
Acetate (mg/l)	5 U	230 K	380	310	120	5 U	56 K	170	32	5.8	5 U	290 K	260 K	390	400	450	NA	500
Alkalinity (mg/l)	140	330	600	400	240	230	230	180	300	160	120	400	420	450	470	160	NA	510
Butyrate (mg/l)	5 U	31	13	7	2.8 J	5 U	3.1 J	3.9 J	1 U	1 U	5 U	26	24	26	31	24	NA	16
Carbon dioxide (ug/l)	120,000	643	108,000	32,700	42,300	180,000	592	111,000	40,800	37,300	96,000	939	602	134,000	148,000	71,500	NA	41,100
Chemical oxygen demand (mg/l)	NA	860	2,300	460	340	NA	350	250	62	40	NA	780	880	1,100	1,200	1,100	NA	850
Chloride (mg/l)	13	17	20	12	11.7	8.9	15	9.5	6.4	12.8	15	19	18	21	21	18	NA	14.3
Ethane (ug/l)	1.3 U	1.7	3	1.3 U	1.9	1.2 U	1.3 U	1.2 U	1.3 U	1.2 U	12	12	11	3.6	4.6	4.3	NA	4.9
Ethene (ug/l)	57	5.7	5.9	10	8	2.4	6.8	2.7	2.3	13	48	69	59	58	68	130	NA	64
Lactic Acid (mg/l)	NA	5 U	5 U	0.88 J	2 U	NA	5 U	3.2 B	2 U	2 U	NA	5 U	5 U	5 U	5 U	2 U	NA	2 U
Methane (ug/l)	4,000	2,500	5,400	11,000	41,000	5,900	6,200	4,700	10,000	34,000	710	4,200	4,100	4,200	3,300	7,000	NA	33,000
Nitrate (mg/l)	0.13 U	0.026 J	0.021 B	0.042 U	0.086 J	0.13 U	0.0085 J	0.027 B	0.042 U	0.072 U	0.13 U	0.017 J	0.0036 J	0.0096 B	0.0098 B	0.042 U	NA	0.072 U
Nitrite (mg/l)	0.13 U	0.0087 L	0.11 J	0.042 U	0.062 U	0.13 U	0.13 UL	0.02 J	0.042 U	0.08 J	0.13 U	0.13 UL	0.13 UL	0.032 J	0.033 J	0.042 U	NA	0.05 J
Propionate (mg/l)	5 U	NA	NA	NA	NA	5 U	NA	NA	NA	NA	5 U	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	150 K	190	60	9.7	NA	5.5 K	4.5 J	0.5 U	0.5 U	NA	120 K	110 K	230	230	120	NA	56
Sulfate (mg/l)	7.4	3.4 J	1.6 J	1 J	8.7	5 U	0.069 B	0.16 J	0.21 J	0.95 J	42	2.4 J	2.6 J	3.2 J	3.4 J	2.7 J	NA	14.5
Sulfide (mg/l)	0.03 UL	0.03 U	0.041	0.03 U	0.03 U	0.03 UL	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.13	0.03 U	0.03 U	0.03 U	0.03 U	NA	0.03 U
Total organic carbon (TOC) (mg/l)	10 U	210	440	170	58	10 U	51	74	13 B	4.9 B	10 U	190	210	370	370	310	NA	240

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Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event. as discussed in the text

B - Analyte not detected above the level reported in blanks

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MG/L - Milligrams per liter

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Table 5.2
Former NSWC, White Oak
Site 4, 200-Series Area
Groundwater Detected Analytical Results
February 2009 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), December 2010 (12-Month Post Inj)

Station ID	04GW502S					04GW503D				
Sample ID	**004GW502S-0209**	004GW502S-0210	004GW502S-0510	004GW502S-0810	004GW502S-1210	**004GW503D-0209**	004GW503D-0210	004GW503D-0510	004GW503D-0810	004GW503D-1210
Sample Date	**02/04/09**	02/04/10	05/10/10	08/26/10	12/02/10	**02/05/09**	02/01/10	05/10/10	08/26/10	12/02/10
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	11 J	9.2	8.3	8	4.5
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	5 U	5 U	5 U	1 U	1 U	5 U	0.65 J	13 U	1 U	1 U
1,1,2-Trichloroethane	5 U	5 U	5 U	1 U	1 U	5 U	5 U	13 U	1 U	0.61 J
1,1-Dichloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	13 U	0.5 U	0.5 U
1,1-Dichloroethene	5 U	5 U	5 U	0.5 U	0.5 U	1.6 J	1.3 J	13 U	1.8 J	1.5 J
1,2-Dichloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	1.3 J	13 U	0.5 U	0.5 U
1,3-Dichlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	13 U	0.5 U	0.5 U
1,4-Dichlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	13 U	0.5 U	0.5 U
2-Butanone	5 R	6.9 L	5 U	2.5 R	2.5 R	5 R	12	6.2 J	2.5 R	2.5 R
Acetone	18 B	5 R	15 L	11 B	3 L	5 R	5 R	13 R	2.5 R	2.5 R
Benzene	1.4 J	1.2 J	1.4 J	0.78 J	0.6 J	4.6 J	5.6	5.8 J	5.6	4.9 J
Chlorobenzene	5 U	5 U	0.66 J	0.5 U	0.5 U	5 U	0.97 J	13 U	0.93 J	0.67 J
Chloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	13 U	0.5 U	0.5 U
Chloroform	5 U	5 U	5 U	0.5 U	0.5 U	1.4 J	1.5 J	13 U	1.3 J	0.5 U
Chloromethane	5 U	5 U	5 U	0.64 J	0.5 U	5 U	5 U	13 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	42	5 U	5 U	0.5 U	0.5 U	78	110	210	280	320
Methyl acetate	5 U	5 U	5 U	1 U	1 U	5 U	5 U	13 U	1 U	1 U
Methylene chloride	1 B	5 U	5 U	0.5 U	0.5 U	1.5 B	1.6 B	13 U	1.9 J	2.1 B
Tetrachloroethene	5 U	5 U	5 U	1 U	1 U	5 U	0.65 J	13 U	1 U	1 U
Toluene	5 U	5 U	5 U	0.5 U	0.57 J	5 U	5 U	13 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	1.9 J	1.7 J	1.5 J	1 U	1 U	5 U	0.57 J	13 U	0.81 J	0.92 J
Trichloroethene	5 U	1.9 J	5 U	0.5 U	0.5 U	630	500	400	410	210
Vinyl chloride	13	1 U	1 U	1 U	1 U	14	15	14	22	23
Semivolatile Organic Compounds (UG/L)										
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)										
Perchlorate	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	0.16 J	0.07 J	0.07 J	0.05 J	0.1 U
Total Metals (UG/L)										
Iron	61,000	NA	NA	NA	NA	29,200	NA	NA	NA	NA
Sodium	20,400	NA	NA	NA	NA	7,310	NA	NA	NA	NA
Dissolved Metals (UG/L)										
Iron, Dissolved	NA	72,300	98,200	86,800	71,100	NA	13,300	17,400	14,500	48,500
Sodium, Dissolved	NA	24,300	18,100	15,300	31,700	NA	9,480	10,600	10,600	10,100
Wet Chemistry										
Acetate (mg/l)	90	170 K	280	130	42	5 U	5 U	5 U	0.5 U	1.6 J
Alkalinity (mg/l)	270	280	430	280	140	54	35	50	440	130
Butyrate (mg/l)	5 U	12	5.1	2.4 J	1 U	5 U	5 U	5 U	1 U	1 U
Carbon dioxide (ug/l)	82,000	628	101,000	44,600	20,700	83,000	452	97,100	35,900	39,100
Chemical oxygen demand (mg/l)	NA	2,100	430	170	77	NA	20 U	21 U	23	33
Chloride (mg/l)	28	32	29	27	57	11	12	14	10	10.4
Ethane (ug/l)	1.3 U	2.8	3	3.1	5.5	16	1.3 U	1.2 U	1.3 U	12
Ethene (ug/l)	1.6 U	51	34	31	250	6.6	3.1	1.7	1.8	79
Lactic Acid (mg/l)	NA	5 U	5 U	2 U	2 U	NA	2.7 B	5 U	2 U	2 U
Methane (ug/l)	1,700	4,600	6,000	7,000	47,000	110	130	100	600	41,000
Nitrate (mg/l)	0.13 U	0.022 J	0.13 U	0.048 B	0.072 U	0.13 U	0.021 J	0.016 B	0.042 U	0.098 J
Nitrite (mg/l)	0.13 U	0.13 UL	0.0099 J	0.042 U	0.15	0.13 U	0.13 U	0.13 U	0.042 U	0.062 U
Propionate (mg/l)	5.9	NA	NA	NA	NA	5 U	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	42 K	8.8	0.82 J	0.5 U	NA	5 U	5 U	0.5 U	0.5 U
Sulfate (mg/l)	5.2	3.4 J	0.18 J	0.5 U	0.92 J	8.7	20	20	17	5.8
Sulfide (mg/l)	0.03 UL	0.081	0.03 U	0.03 U	0.03 U	0.03 UL	0.03 U	0.03 U	0.03 U	0.037
Total organic carbon (TOC) (mg/l)	37	250	120	46	16	10 U	10 U	5.6 J	4.1 B	3.6 B

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Notes:

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Former NSWC, White Oak
Site 4, 200-Series Area
Groundwater Detected Analytical Results
February 2009 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), December 2010 (12-Month Post Inj)

Station ID	04GW503S					04GW504D							04GW504S				
Sample ID	**004GW503S-0209**	004GW503S-0210	004GW503S-0510	004GW503S-0810	004GW503S-1210	**004GW504D-0209**	**004GW504DP-0209**	004GW504D-0210	004GW504D-0510	004GW504D-0810	004GW504D-1210	004GW504DP-1210	**004GW504S-0209**	004GW504S-0210	004GW504S-0510	004GW504S-0810	004GW504S-1210
Sample Date	**02/05/09**	02/01/10	05/10/10	08/26/10	12/02/10	**02/04/09**	**02/04/09**	02/04/10	05/10/10	08/26/10	12/02/10	12/02/10	**02/04/09**	02/04/10	05/10/10	08/26/10	12/02/10
Chemical Name																	
Volatile Organic Compounds (UG/L)																	
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	18	18	10	13	8.9	13	13	4.2	1 U	0.51 J	1 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	5 U	5 U	5 U	1 U	1 U	1.7 J	1.2 J	1.6 J	5 U	1.2 J	1.6 J	1.6 J	5 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	5 U	5 U	5 U	1 U	1 U	1.3 J	1.4 J	5 U	0.74 J	1 U	1 U	1 U	5 U	5 U	5 U	1 U	1 U
1,1-Dichloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	0.5 U	0.52 J	0.55 J	5 U	5 U	5 U	0.5 U	0.5 U
1,1-Dichloroethene	5 U	5 U	5 U	0.5 U	0.5 U	6.8	5.9	2.8 J	0.84 J	1.9 J	2.5 J	2.5 J	2.5 J	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	5 U	0.67 J	5 U	0.5 U	0.5 U	5 U	5 U	9.5	8.4	7.6	13	13	5 U	5 U	5 U	0.93 J	0.5 U
1,3-Dichlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	1.4 J	1 J	1.5 J	1.6 J	5 U	5 U	5 U	0.5 U	0.5 U
2-Butanone	5 R	5 U	5 U	2.5 R	2.5 R	5 R	5 R	46 L	5 U	2.5 R	2.5 R	2.5 R	5 R	12 L	5 U	2.5 R	13 L
Acetone	5 R	37 L	52 L	24 B	39 L	5 R	5 R	5 R	5 R	5.7 B	2.5 R	3.1 L	13 B	5 R	17 L	21 B	10 L
Benzene	1.9 J	1.6 J	1.6 J	1.2 J	2.1 J	2.4 J	2.3 J	4.9 J	4.6 J	5.1	6.8	6.5	1.1 J	1.8 J	1.7 J	1.3 J	1 J
Chlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	1.8 J	1.5 J	2.3 J	2 J	1.8 J	2.6 J	2.6 J	5 U	1.4 J	0.79 J	0.57 J	0.5 U
Chloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.57 J	0.5 U
Chloroform	5 U	5 U	5 U	0.5 U	0.5 U	2.5 J	2.4 J	3.8 J	2 J	1.8 J	2.9 B	3.1 B	5 U	5 U	0.51 B	0.5 U	0.5 U
Chloromethane	5 U	0.66 B	5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.61 J	0.5 U
cis-1,2-Dichloroethene	30	1.1 J	1.8 J	1.2 J	0.5 U	460	440	260	170	220	300	330	190	60	4.6 J	0.54 J	0.5 U
Methyl acetate	5 U	7.2	5 U	1 U	5.7	5 U	5 U	5 U	5 U	0.68 J	3.8 J	4.6 J	5 U	5 U	5 U	1 U	7.1
Methylene chloride	1.2 B	1.9 B	0.61 B	0.5 U	0.5 U	2.6 B	2.3 B	3.6 J	5.3 B	5 J	6.5 B	6.2 B	5 U	5 U	1.8 B	1.8 J	1.7 B
Tetrachloroethene	5 U	5 U	5 U	1 U	1 U	5 U	5 U	5 U	5 U	1 U	1 U	1 U	5 U	5 U	5 U	1 U	1 U
Toluene	5 U	5 U	5 U	0.5 U	0.5 U	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U	5 U	5 U	5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	2.3 J	5 U	1.1 J	1 U	0.74 J	1.5 J	1.4 J	5.8	4.5 J	5.8	8	7.8	1.6 J	2.5 J	1.8 J	0.93 J	1 U
Trichloroethene	15	1.1 J	2 J	1.4 J	0.5 U	570	540	340	180	220	500	530	180	28	5 U	0.5 U	0.5 U
Vinyl chloride	27	0.82 J	1.3	1 U	1 U	44	39	59	36	91	150	140	26	10	3.7	1 U	1 U
Semivolatile Organic Compounds (UG/L)																	
No Detections	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)																	
Perchlorate	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.09 J	0.09 J	0.12 J	0.2 U	0.2 U	0.2 U	0.1 U
Total Metals (UG/L)																	
Iron	75,600	NA	NA	NA	NA	41,700	NA	NA	NA	NA	NA	NA	36,400	NA	NA	NA	NA
Sodium	12,600	NA	NA	NA	NA	11,600	NA	NA	NA	NA	NA	NA	16,700	NA	NA	NA	NA
Dissolved Metals (UG/L)																	
Iron, Dissolved	NA	215,000	237,000	247,000	303,000	NA	NA	89,000	148,000	190,000	86,800	85,700	NA	88,900	102,000	135,000	141,000
Sodium, Dissolved	NA	25,300	13,000	10,400	13,000	NA	NA	32,600	34,600	33,300	20,300	19,800	NA	23,800	26,300	36,900	33,300
Wet Chemistry																	
Acetate (mg/l)	14	360	530	510	420	5 U	NA	40 K	180	320	84	NA	26	140 K	170	220	170
Alkalinity (mg/l)	330	390	520	210	360	76	NA	290	440	350	180	NA	220	240	360	370	320
Butyrate (mg/l)	5 U	37	49	20	5.4	5 U	NA	5 U	0.97 J	4.3 J	1 U	NA	5 U	3.6 J	5 U	1.2 J	1 U
Carbon dioxide (ug/l)	120,000	471	73,000	43,300	54,600	150,000	NA	669	94,100	55,000	38,700	NA	260,000	583	112,000	48,500	39,100
Chemical oxygen demand (mg/l)	NA	1,100	780	730	560	NA	NA	130	420	480	150	NA	NA	220	340	360	400
Chloride (mg/l)	15	21	17	12	16.3	16	NA	17	20	16	14.8	NA	25	25	30	21	34.6
Ethane (ug/l)	1.3 U	6.6	3.4	2.2	1.5	14	NA	3.6	5.7	5.6	6.2	NA	1.3 U	3.1	5.6	4.6	5.6
Ethene (ug/l)	150	35	21	13	13	34	NA	99	83	99	150	NA	80	57	67	43	71
Lactic Acid (mg/l)	NA	5 U	5 U	2 U	2 U	NA	NA	5 U	5 U	2 U	2 U	NA	NA	5 U	5 U	2 U	2 U
Methane (ug/l)	2,500	6,500	8,300	17,000	42,000	300	NA	1,700	2,800	11,000	9,100	NA	610	4,300	5,400	11,000	70,000
Nitrate (mg/l)	0.13 U	0.13 U	0.13 U	0.028 B	0.089 J	0.13 U	NA	0.018 J	0.031 B	0.042 U	0.072 U	NA	0.13 U	0.011 J	0.014 B	0.042 U	0.072 U
Nitrite (mg/l)	0.13 U	0.13 U	0.088 J	0.042 U	0.053 J	0.13 U	NA	0.13 UL	0.022 J	0.042 U	0.049 J	NA	0.13 U	0.024 L	0.13 U	0.042 U	0.057 J
Propionate (mg/l)	5 U	NA	NA	NA	NA	5 U	NA	NA	NA	NA	NA	NA	5 U	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	91	12	5.3	12	NA	NA	38 K	110	69	11	NA	NA	9.3 K	41	64	35
Sulfate (mg/l)	5 U	0.086 B	0.22 J	0.4 J	1.1	47	NA	7	1.1 J	1 J	2.9	NA	24	12	0.3 J	2.2 J	0.96 J
Sulfide (mg/l)	0.03 UL	0.44	0.03 U	0.03 U	0.03 U	0.03 UL	NA	0.03 U	0.03 U	0.03 U	0.03 U	NA	0.03 UL	0.03 U	0.03 U	0.03 U	0.03 U
Total organic carbon (TOC) (mg/l)	10 U	270	260	220	150	10 U	NA	40	140	160	35	NA	14	66	96	140	81

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Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Table 5.3
Former NSWC White Oak
Site 4 300-Series Area
Groundwater Detected Analytical Results
September 2009 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), December 2010 (12-Month Post Inj)

Station ID	04GW601D					04GW601S				
Sample ID	**004GW601D-0909**	004GW601D-0210	004GW601D-0510	004GW601D-0810	004GW601D-1110	**004GW601S-0909**	004GW601S-0210	004GW601S-0510	004GW601S-0810	004GW601S-1210
Sample Date	**09/30/09**	02/02/10	05/11/10	08/24/10	11/30/10	**09/29/09**	02/02/10	05/11/10	08/25/10	12/01/10
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.91 J	0.5 U
1,2-Dichloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
2-Butanone	5 R	5 U	5 U	2.5 R	2.5 R	5 R	5 U	5 U	2.5 R	2.5 R
Acetone	5 R	5 R	5 R	2.5 R	2.5 R	5 R	5 R	39 L	42 B	19 L
Carbon disulfide	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
Chloroform	5 U	5 U	5 U	0.5 U	0.5 U	0.8 J	5 U	5 U	0.5 U	0.5 U
Chloromethane	5 U	0.88 B	5 U	0.5 U	0.5 U	5 UJ	0.56 B	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	5 U	4.8 J	16	14 J	17	65 J	17	19	15	4.8 J
Methyl acetate	5 U	2.2 J	5 U	1 U	1 U	5 UJ	4.2 J	5 U	1 U	1.8 J
Methylene chloride	2.2 B	1.3 J	5 U	0.5 U	0.5 U	5 UJ	0.57 J	5 U	0.5 U	0.5 U
Tetrachloroethene	5 U	5 U	5 U	1 U	1 U	5 UJ	5 U	5 U	1 U	1 U
trans-1,2-Dichloroethene	5 U	5 U	5 U	1 U	1 U	5 UJ	5 U	5 U	1 U	1 U
Trichloroethene	5 U	5 U	1.2 J	0.76 J	1.3 J	47 J	20	18	11	4.7 J
Vinyl chloride	1 U	1 U	1 U	1 U	0.55 J	0.94 J	1.8	1.1	1 U	1 U
Explosives (UG/L)										
Perchlorate	0.03 J	0.2 U	0.2 U	0.2 U	0.1 U	0.42	0.2 U	0.2 U	0.2 U	0.1 U
Total Metals (UG/L)										
Aluminum	1,420	NA	NA	NA	NA	4,220	NA	NA	NA	NA
Barium	15.5 J	NA	NA	NA	NA	64.3 J	NA	NA	NA	NA
Beryllium	0.16 B	NA	NA	NA	NA	0.22 B	NA	NA	NA	NA
Calcium	8,150	NA	NA	NA	NA	6,520	NA	NA	NA	NA
Chromium	12.3 B	NA	NA	NA	NA	6.2 B	NA	NA	NA	NA
Cobalt	1.5 J	NA	NA	NA	NA	4.6 J	NA	NA	NA	NA
Copper	7.9 B	NA	NA	NA	NA	5.7 J	NA	NA	NA	NA
Iron	5,640 B	NA	NA	NA	NA	3,440	NA	NA	NA	NA
Lead	10 U	NA	NA	NA	NA	10 U	NA	NA	NA	NA
Magnesium	6,270	NA	NA	NA	NA	5,690	NA	NA	NA	NA
Manganese	625	NA	NA	NA	NA	136	NA	NA	NA	NA
Nickel	7.8 B	NA	NA	NA	NA	4.9 B	NA	NA	NA	NA
Potassium	17,200	NA	NA	NA	NA	3,870	NA	NA	NA	NA
Sodium	15,000	NA	NA	NA	NA	16,900	NA	NA	NA	NA
Vanadium	2.5 B	NA	NA	NA	NA	11.1 J	NA	NA	NA	NA
Dissolved Metals (UG/L)										
Iron, Dissolved	NA	342	1,570	1,090	953	NA	78,000	61,900	80,500	52,400
Sodium, Dissolved	NA	24,600	37,200	34,100	39,800	NA	24,600	25,400	21,900	21,900
Wet Chemistry										
Acetate (mg/l)	1.9 J	30	11 L	0.5 U	54	5 U	76	70 L	98	57
Alkalinity (mg/l)	67	63	70	120	100	29	180	120	170	140
Butyrate (mg/l)	5 U	5 U	5 U	1 U	5.3	5 U	17	7.6	6.9	3.1 J
Carbon dioxide (ug/l)	1,460	718	2,770	835	2,060	26,300	697	45,400	49,600	23,200
Chemical oxygen demand (mg/l)	11 B	37	20 U	21 U	20 U	9.2 B	650	370	190	110
Chloride (mg/l)	12	11	11	12	11.6	17	18	17	21	8.9
Ethane (ug/l)	12	23	13	5.3	7.8	1.3 U	1.3 U	1.3 U	1.3 U	1.2 U
Ethene (ug/l)	5.1	10	14	12	26	1.6 U	1.6 U	1.6 U	1.6 U	1.5 U
Lactic Acid (mg/l)	5 U	5 U	5 U	2 U	2 U	5 U	2.2 J	5 U	2 U	2 U
Methane (ug/l)	17	56	42	53	260	0.88	33	710	4,100	27,000
Nitrate (mg/l)	0.13 U	0.13 U	0.13 U	0.042 U	0.072 U	0.58	0.012 J	0.011 B	0.042 U	0.13
Nitrite (mg/l)	0.13 U	0.13 U	0.13 U	0.042 U	0.051 J	0.0083 J	0.0073 J	0.13 U	0.042 U	0.059 J
Propionic Acid (mg/l)	5 U	5 U	5 U	0.5 U	7.1	5 U	58	29	14	12
Pyruvate (mg/l)	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	14	13	32	14	4.4	21	0.88 J	0.42 J	0.23 J	2.3 B
Sulfide (mg/l)	0.03 UL	0.03 U	0.03 UL	0.03 U	0.059	0.03 UL	0.03 U	0.03 UL	0.03 U	0.11
Total organic carbon (TOC) (mg/l)	10 U	15	8.4 J	3.3 J	5 U	10 U	79	57	53	36

Station ID	04GW602D							
Sample ID	**004GW602D-0909**	004GW602D-0210	004GW602DP-0210	004GW602D-0510	004GW602DP-0510	004GW602D-0810	004GW602DP-0810	004GW602D-1110
Sample Date	**09/30/09**	02/02/10	02/02/10	05/11/10	05/11/10	08/24/10	08/24/10	11/30/10
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1,2,2-Tetrachloroethane	3 J	0.53 J	0.52 J	1.4	1.4	1.7	1.5	0.56 J
1,1-Dichloroethene	5 UJ	0.84 J	0.85 J	3.3 J	3.2 J	2.2 J	1.9 J	1.3 J
1,2-Dichloroethane	5 UJ	0.56 J	0.65 J	5 U	5 U	1 J	0.81 J	0.5 U
2-Butanone	5 R	5 U	5 U	5 U	5 U	2.5 R	2.5 R	2.5 R
Acetone	5 R	5 R	5 R	5 R	5 R	3.9 L	3.4 L	4.7 L
Carbon disulfide	5 UJ	0.51 J	5 U	5 U	5 U	0.5 U	0.5 U	1.1 J
Chlorobenzene	5 UJ	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.57 J
Chloroform	1.4 J	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U
Chloromethane	5 UJ	5 U	5 U	5 U	5 U	0.5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	29 J	62	65	220	230	230	220	220
Methyl acetate	5 UJ	4.8 J	4.2 J	5 U	5 U	1 U	1 U	1 U
Methylene chloride	5 UJ	2 J	2.1 J	5 U	5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	5 UJ	5 U	5 U	5 U	5 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	0.56 J	5 U	0.56 J	1 J	0.71 J	1 U	0.72 J	0.83 J
Trichloroethene	250	69	73	100	100	110	120	84
Vinyl chloride	1 UJ	1.7	1.7	2.7	2.6	3.1 J	3.7	1.8 J
Explosives (UG/L)								
Perchlorate	2.7	0.29	0.3	0.1 J	0.09 J	0.08 J	0.09 J	0.1 J
Total Metals (UG/L)								
Aluminum	18 B	NA	NA	NA	NA	NA	NA	NA
Barium	33.1 J	NA	NA	NA	NA	NA	NA	NA
Beryllium	5 U	NA	NA	NA	NA	NA	NA	NA
Calcium	5,340	NA	NA	NA	NA	NA	NA	NA
Chromium	1.1 B	NA	NA	NA	NA	NA	NA	NA
Cobalt	2.4 J	NA	NA	NA	NA	NA	NA	NA
Copper	30 U	NA	NA	NA	NA	NA	NA	NA
Iron	6,330 B	NA	NA	NA	NA	NA	NA	NA
Lead	10 U	NA	NA	NA	NA	NA	NA	NA
Magnesium	3,900	NA	NA	NA	NA	NA	NA	NA
Manganese	537	NA	NA	NA	NA	NA	NA	NA
Nickel	6.7 B	NA	NA	NA	NA	NA	NA	NA
Potassium	5,250	NA	NA	NA	NA	NA	NA	NA
Sodium	24,800	NA	NA	NA	NA	NA	NA	NA
Vanadium	50 U	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)								
Iron, Dissolved	NA	108,000	108,000	86,800	86,900	67,000	65,300	51,000
Sodium, Dissolved	NA	46,400	45,400	18,600	18,600	16,000	16,000	15,000
Wet Chemistry								
Acetate (mg/l)	2.1 J	67	68	59 L	59 L	43	NA	41
Alkalinity (mg/l)	42	250	240	110	120	140	NA	100
Butyrate (mg/l)	5 U	3.7 J	3.7 J	17	17	3.9 J	NA	2.2 J
Carbon dioxide (ug/l)	21,000	871	489	29,300	34,400	35,200	NA	30,600
Chemical oxygen demand (mg/l)	11 B	610	590	150	140	83	NA	71
Chloride (mg/l)	39	33	34	24	24	25	NA	17.9
Ethane (ug/l)	3.4	3.3	3.5	2.9	2.7	1.3 U	NA	1.2 U
Ethene (ug/l)	1.5	1.8	1.9	1.6 U	1.5 U	1.6 U	NA	1.5 U
Lactic Acid (mg/l)	5 U	5 U	5 U	3.3 J	5 U	2 U	NA	2 U
Methane (ug/l)	5.4	81	84	900	770	3,500	NA	37
Nitrate (mg/l)	0.39	0.13 U	0.13 U	0.041 B	0.13 U	0.031 J	NA	0.072 U
Nitrite (mg/l)	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	NA	0.062 U
Propionic Acid (mg/l)	5 U	170	170	17	18	3.9 J	NA	1.5 J
Pyruvate (mg/l)	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U
Sulfate (mg/l)	5.5	0.69 J	0.76 J	2.4 J	0.76 J	1.1 J	NA	2
Sulfide (mg/l)	0.03 UL	0.03 U	0.03 U	0.03 UL	0.03 UL	0.03 U	NA	0.11
Total organic carbon (TOC) (mg/l)	10 U	130	130	47	45	21	NA	19

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Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text

B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
UG/L - Micrograms per liter

Table 5.3
Former NSWC White Oak
Site 4 300-Series Area
Groundwater Detected Analytical Results
September 2009 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), December 2010 (12-Month Post Inj)

Station ID	04GW602S					04GW603D					04GW603S				
Sample ID	**004GW602S-0909**	004GW602S-0210	004GW602S-0510	004GW602S-0810	004GW602S-1210	**004GW603D-0909**	004GW603D-0210	004GW603D-0510	004GW603D-0810	004GW603D-1210	**004GW603S-0909**	004GW603S-0210	004GW603S-0510	004GW603S-0810	004GW603S-1210
Sample Date	**09/30/09**	02/03/10	05/11/10	08/24/10	12/01/10	**09/29/09**	02/02/10	05/11/10	08/23/10	12/01/10	**09/29/09**	02/02/10	05/11/10	08/23/10	12/01/10
Chemical Name															
Volatile Organic Compounds (UG/L)															
1,1,2,2-Tetrachloroethane	1 U	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
1,2-Dichloroethane	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
2-Butanone	5 R	5 R	5 U	2.5 R	2.5 R	5 R	5 U	5 U	2.5 R	2.5 R	5 R	5 U	5 U	2.5 R	5.2 L
Acetone	5 R	5 R	5 R	2.5 R	2.5 R	5 R	5 R	5 R	23 B	23 L	5 R	71 L	5 R	17 B	71 L
Carbon disulfide	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
Chlorobenzene	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
Chloroform	0.6 J	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U	5 UJ	0.66 J	5 U	0.5 U	0.5 U
Chloromethane	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.51 J	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	46	49	41	39 J	33	2.3 J	1.5 J	2.2 J	1.8 J	2.1 J	5 UJ	5 U	0.7 J	0.5 U	0.5 U
Methyl acetate	5 U	5 U	5 U	1 U	1.3 J	5 UJ	5 U	5 U	1 U	1.8 J	5 UJ	3.1 J	5 U	1 U	9.6
Methylene chloride	5 U	5 U	5 U	0.5 U	0.5 U	5 UJ	5 U	5 U	0.5 U	0.5 U	5 UJ	1.1 J	5 U	0.5 U	0.5 U
Tetrachloroethene	5 U	5 U	5 U	1 U	1 U	5 UJ	0.55 J	5 U	1 U	1 U	5 UJ	5 U	5 U	1 U	1 U
trans-1,2-Dichloroethene	0.57 J	5 U	5 U	1 U	1 U	5 UJ	5 U	5 U	1 U	0.68 J	5 UJ	5 U	5 U	1 U	1 U
Trichloroethene	71	60	24	26	24	9.3 J	4 J	4.4 J	0.5 U	0.54 J	5 UJ	5 U	5 U	0.5 U	0.5 U
Vinyl chloride	0.68 J	1 U	1 U	1 U	1 U	1 UJ	1 U	1 U	0.62 J	0.71 J	1 UJ	1 U	1 U	1 U	1 U
Explosives (UG/L)															
Perchlorate	0.33	0.2 U	0.2 U	0.07 J	0.05 J	0.42	0.2 U	0.2 U	0.2 U	0.1 U	0.23	0.2 U	0.2 U	0.2 U	0.1 U
Total Metals (UG/L)															
Aluminum	1,140	NA	NA	NA	NA	127 B	NA	NA	NA	NA	1,240	NA	NA	NA	NA
Barium	38 J	NA	NA	NA	NA	55.5 J	NA	NA	NA	NA	46.6 J	NA	NA	NA	NA
Beryllium	0.089 B	NA	NA	NA	NA	5 U	NA	NA	NA	NA	0.12 B	NA	NA	NA	NA
Calcium	3,560	NA	NA	NA	NA	22,700	NA	NA	NA	NA	1,800	NA	NA	NA	NA
Chromium	3.5 B	NA	NA	NA	NA	12.2 B	NA	NA	NA	NA	18.4 B	NA	NA	NA	NA
Cobalt	2.4 J	NA	NA	NA	NA	1.9 J	NA	NA	NA	NA	4.8 J	NA	NA	NA	NA
Copper	10.9 B	NA	NA	NA	NA	30 U	NA	NA	NA	NA	12 J	NA	NA	NA	NA
Iron	1,720 B	NA	NA	NA	NA	12,500	NA	NA	NA	NA	1,100	NA	NA	NA	NA
Lead	10 U	NA	NA	NA	NA	10 U	NA	NA	NA	NA	10 U	NA	NA	NA	NA
Magnesium	4,480	NA	NA	NA	NA	13,700	NA	NA	NA	NA	3,510	NA	NA	NA	NA
Manganese	171	NA	NA	NA	NA	300	NA	NA	NA	NA	94.5	NA	NA	NA	NA
Nickel	4.1 B	NA	NA	NA	NA	10.5 B	NA	NA	NA	NA	15.1 B	NA	NA	NA	NA
Potassium	1,580	NA	NA	NA	NA	2,620	NA	NA	NA	NA	2,090	NA	NA	NA	NA
Sodium	13,600	NA	NA	NA	NA	22,200	NA	NA	NA	NA	13,600	NA	NA	NA	NA
Vanadium	2.5 B	NA	NA	NA	NA	50 U	NA	NA	NA	NA	3.6 J	NA	NA	NA	NA
Dissolved Metals (UG/L)															
Iron, Dissolved	NA	24,100	17,900	27,800	27,400	NA	6,080	18,400	76,900	67,000	NA	19,700	15,100	73,100	91,500
Sodium, Dissolved	NA	15,200 B	15,400	14,100	15,100	NA	20,700	20,700	21,000	18,200	NA	24,600	11,000	16,400	17,300
Wet Chemistry															
Acetate (mg/l)	5 U	6.1	9.1 L	36	26	1.5 J	5 U	5 UL	76	45	5 U	31	2.2 L	78	180
Alkalinity (mg/l)	25	61	23	100	190	81	220	250	290	200	20 U	66	40	200	130
Butyrate (mg/l)	5 U	5 U	5 U	2.8 J	0.99 J	5 U	5 U	5 U	1 U	1 U	5 U	6.8	5 U	5.8	10
Carbon dioxide (ug/l)	1,380	484	36,900	46,000	29,200	2,840	451	32,000	19,700	31,700	7,950	441	20,800	32,100	54,000
Chemical oxygen demand (mg/l)	20 U	610	400	120	48	13 B	20 U	20 U	100	83	11 B	220	25	100	450
Chloride (mg/l)	15	18	16	20	23.1	40	24	34	30	25.9	19	16	14	25	26.9
Ethane (ug/l)	1.2	1.4	2.2	1.3 U	1.3 U	1.2 U	1.2 U	1.2 U	1.3 U	1.2 U	1.2 U	1.2 U	1.3 U	1.3 U	1.8
Ethene (ug/l)	1.5 U	1.5 U	1.6 U	1.6 U	1.6 U	1.5 U	1.5 U	1.5 U	2	1.5 U	1.5 U	1.5 U	1.6 U	1.6 U	32
Lactic Acid (mg/l)	5 U	5 U	5 U	2 U	2 U	3.7 J	2 J	2.6 J	2 U	2 U	2.1 J	5 U	1.4 J	2 U	2 U
Methane (ug/l)	3.6	11	110	1,500	6,300	400	1,200	2,200	4,200	14,000	4.6	2.6	1.7	810	28,000
Nitrate (mg/l)	1.2	0.13 U	0.0099 B	0.042 U	0.072 U	0.054 J	0.014 J	0.034 B	0.042 U	0.072 U	1.3	0.0067 J	0.059 B	0.042 U	0.072 U
Nitrite (mg/l)	0.13 U	0.13 U	0.13 U	0.042 U	0.062 U	0.13 U	0.13 U	0.13 U	0.042 U	0.062 U	0.0093 J	0.13 U	0.13 U	0.042 U	0.091 J
Propionic Acid (mg/l)	5 U	3.7 J	3.4 J	0.66 J	0.5 U	5 U	5 U	5 U	2.5 J	0.6 J	5 U	49	5 U	8.9	3.5 J
Pyruvate (mg/l)	5 U	5 U	5 U	5 U	5 U	6.5	5 U	5 U	1 J	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	12	1.3 J	1.4 J	1.3 J	4.3	29	31	13	1.2 J	0.98 B	8.8	5.4	5.1	0.28 J	2.8 B
Sulfide (mg/l)	0.03 UL	0.031	0.038 L	0.03 U	0.17	0.03 UL	0.03 U	0.03 UL	0.03 U	0.03 U	0.03 UL	0.03 U	0.03 UL	0.03 U	0.39
Total organic carbon (TOC) (mg/l)	10 U	32	29	21	13	10 U	7.6 J	5.4 J	26	18	10 U	64	8.1 J	45	81

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Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Table 5.3
Former NSWC White Oak
Site 4 300-Series Area
Groundwater Detected Analytical Results
September 2009 (Baseline), February 2010 (3-Month Post Inj), May 2010 (6-Month Post Inj), August 2010 (9-Month Post Inj), December 2010 (12-Month Post Inj)

Station ID	04GW604D						04GW604S					
Sample ID	**004GW604D-0909**	004GW604D-0210	004GW604D-0510	004GW604D-0810	004GW604D-1210	004GW604DP-1210	**004GW604S-0909**	**004GW604SP-0909**	004GW604S-0210	004GW604S-0510	004GW604S-0810	004GW604S-1210
Sample Date	**09/29/09**	02/02/10	05/11/10	08/24/10	12/01/10	12/01/10	**09/29/09**	**09/29/09**	02/02/10	05/11/10	08/23/10	12/01/10
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,2,2-Tetrachloroethane	1 UJ	0.96 J	1 U	0.64 J	0.53 J	1 U	1 UJ	1 UJ	1 U	1 U	1 U	1 U
1,1-Dichloroethene	5 UJ	5 U	0.76 J	2.4 J	2.3 J	2.7 J	5 UJ	5 UJ	0.78 J	5 U	0.5 U	0.5 U
1,2-Dichloroethane	5 UJ	5 U	5 U	0.73 J	0.5 U	0.5 U	5 UJ	5 UJ	5 U	5 U	0.5 U	0.5 U
2-Butanone	5 R	5 U	5 U	2.5 R	2.5 R	2.5 R	5 R	5 R	5 U	5 U	2.5 R	2.5 R
Acetone	5 R	11 L	18 L	9.7 B	5 L	5.4 L	5 R	5 R	5 R	5 R	660 L	2.5 R
Carbon disulfide	5 UJ	5.1	1.1 J	0.5 U	0.5 U	0.5 U	5 UJ	5 UJ	5 U	5 U	1.5 J	0.5 U
Chlorobenzene	5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	5 UJ	5 UJ	5 U	5 U	0.5 U	0.5 U
Chloroform	1.8 J	0.55 J	5 U	0.5 U	0.5 U	0.5 U	0.51 J	5 UJ	5 U	5 U	0.5 U	0.5 U
Chloromethane	5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	5 UJ	5 UJ	5 U	5 U	0.5 U	0.5 U
cis-1,2-Dichloroethene	40 J	20	18	250	250	250	29 J	26 J	15	18	16	42
Methyl acetate	5 UJ	2 J	5 U	1 U	7.2	7.7	5 UJ	5 UJ	5 U	5 U	1 U	3.7 J
Methylene chloride	5 UJ	3.6 J	6.4	2.5 J	2.2 B	2.1 B	5 UJ	5 UJ	5 U	5 U	0.5 U	0.5 U
Tetrachloroethene	5 UJ	5 U	5 U	1 U	1 U	1 U	5 UJ	5 UJ	5 U	5 U	1 U	1 U
trans-1,2-Dichloroethene	5 UJ	5 U	5 U	1 U	0.69 J	0.83 J	5 UJ	5 UJ	5 U	5 U	1 U	1 U
Trichloroethene	320	97	110	20	13	13	63 J	56 J	43	22	0.5 U	0.5 U
Vinyl chloride	1 UJ	1 U	1 U	5.4 J	19 J	19 J	1 UJ	1 UJ	1.5	1 U	1 U	0.59 J
Explosives (UG/L)												
Perchlorate	1.4	0.6	0.17 J	0.18 J	0.19 J	0.18 J	0.33	0.32	0.2 U	0.1 J	0.2 U	0.1 U
Total Metals (UG/L)												
Aluminum	279	NA	NA	NA	NA	NA	5,160 J	145 B	NA	NA	NA	NA
Barium	36.9 J	NA	NA	NA	NA	NA	46.8 J	36.5 J	NA	NA	NA	NA
Beryllium	5 U	NA	NA	NA	NA	NA	0.34 J	5 U	NA	NA	NA	NA
Calcium	4,190	NA	NA	NA	NA	NA	2,950	2,650	NA	NA	NA	NA
Chromium	1.9 B	NA	NA	NA	NA	NA	80.5 J	9.1 B	NA	NA	NA	NA
Cobalt	5.5 J	NA	NA	NA	NA	NA	2.1 J	50 U	NA	NA	NA	NA
Copper	5.4 B	NA	NA	NA	NA	NA	15.1 J	8.3 J	NA	NA	NA	NA
Iron	4,320	NA	NA	NA	NA	NA	4,980 J	281 J	NA	NA	NA	NA
Lead	10 U	NA	NA	NA	NA	NA	2.4 J	10 U	NA	NA	NA	NA
Magnesium	5,880	NA	NA	NA	NA	NA	4,430	4,350	NA	NA	NA	NA
Manganese	261	NA	NA	NA	NA	NA	46.4 J	32.6 J	NA	NA	NA	NA
Nickel	5.8 B	NA	NA	NA	NA	NA	48.6 J	8.4 B	NA	NA	NA	NA
Potassium	2,790	NA	NA	NA	NA	NA	1,600	1,290	NA	NA	NA	NA
Sodium	22,800	NA	NA	NA	NA	NA	8,710	9,530	NA	NA	NA	NA
Vanadium	0.8 B	NA	NA	NA	NA	NA	17.5 J	0.37 B	NA	NA	NA	NA
Dissolved Metals (UG/L)												
Iron, Dissolved	NA	26,000	45,600	192,000	199,000	195,000	NA	NA	39,300	22,000	46,000	67,500
Sodium, Dissolved	NA	79,400	55,500	32,400	24,800	25,300	NA	NA	8,760	6,390	7,140	10,400
Wet Chemistry												
Acetate (mg/l)	0.85 J	42	140 L	210	190	NA	5 U	5 U	14	24 L	80	90
Alkalinity (mg/l)	23	190	420	380	270	NA	20 U	20 U	120	66	130	100
Butyrate (mg/l)	5 U	5 U	45	22	2.8 J	NA	5 U	5 U	4 J	5 U	3.4 J	1.6 J
Carbon dioxide (ug/l)	2,470	108	76,400	35,700	37,100	NA	11,500	6,000	452	42,500	25,500	33,900
Chemical oxygen demand (mg/l)	9.9 B	98	590	500	590	NA	19 B	9.4 B	35	39	130	110
Chloride (mg/l)	34	35	32	31	27.7	NA	12	11	12	9.9	9.4	20.2
Ethane (ug/l)	1.7	1.3 U	1.3 U	1.3 U	1.3	NA	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.2 U
Ethene (ug/l)	1.6 U	1.6 U	1.6 U	1.6 U	4.4	NA	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.5 U
Lactic Acid (mg/l)	5 U	5 U	3 B	2 U	2 U	NA	5 U	5 U	5 U	5 U	2 U	2 U
Methane (ug/l)	3	3.9	76	840	15,000	NA	0.82	0.78	2.1	18	870	14,000
Nitrate (mg/l)	0.46	0.01 J	0.011 B	0.042 U	0.072 U	NA	1.5	1.5	0.087 J	0.11 B	0.07 J	0.072 U
Nitrite (mg/l)	0.13 U	0.13 U	0.014 J	0.039 J	0.05 J	NA	0.13 U	0.13 U	0.13 U	0.13 U	0.042 U	0.091 J
Propionic Acid (mg/l)	5 U	2.4 J	180	140	110	NA	5 U	5 U	5 U	5 U	5.2	0.5 U
Pyruvate (mg/l)	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U	5 U	5 U	5 U	5 U
Sulfate (mg/l)	14	38	6.4	0.64 J	1.4 B	NA	10	10	1.4 J	6.3	4.4 J	3.2 B
Sulfide (mg/l)	0.03 UL	0.03 U	0.03 UL	0.03 U	0.03 U	NA	0.03 UL	0.03 UL	0.03 U	0.03 UL	0.03 U	0.082
Total organic carbon (TOC) (mg/l)	10 U	33	190	170	140	NA	10 U	10 U	10 J	16	31	35

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Notes:

Shading indicates detections

Bold sample ID and sample date indicate Baseline sampling event, as discussed in the text

B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
UG/L - Micrograms per liter

SITE 5/13 – OPEN BURN AND OIL SLUDGE DISPOSAL AREAS

Station ID	04GW110						05GW01									
Sample ID	004GW1100804	004GW1100805	004GW110-0206	004GW1100407	004GW110-0809	004GW110-0711	005GW0010804	005GW0010805	005GW9010805	005GW001-0206	005GW901-0206	005GW0010407	005GW001-0809	005GW001P-0809	005GW01-1110	005GW01P-1110
Sample Date	08/05/04	08/25/05	02/16/06	04/04/07	08/14/09	07/28/11	08/04/04	08/24/05	08/24/05	02/16/06	02/16/06	04/04/07	08/14/09	08/14/09	11/09/10	11/09/10
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,2,2-Tetrachloroethane	1 U	2 U	2 U	2 U	1 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	1 U	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	1 U	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	1 U	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	1 U	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	10 U	10 U	2 U	5 R	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	10 U	10 U	2 U	5 U	2.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	10 U	10 U	2 U	5 R	4.9 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	1 U	10 U	10 U	2 U	5 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	1 U	10 U	10 U	2 U	5 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	1 U	10 U	10 U	2 U	5 U	0.9 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	10 U	10 U	2 U	5 U	0.75 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	0.52 J	2 U	3	1 J	1.1 J	3.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	1 U	10 U	10 U	2 U	5 U	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	1 U	2 U	2	2 U	5 U	1.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	1 U	2 U	2 U	2 U	1 U	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, total	NA	10 U	10 U	2 U	5 U	1.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)																
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	2 U	0.22	0.25 J	0.16 U	0.16 U	0.2 UL	0.13 J	0.13 J	0.12 U	0.12 U
HMX	NA	NA	NA	NA	NA	NA	48	29	25	31	32	24 L	19 J	22 J	19	18
RDX	NA	NA	NA	NA	NA	NA	63	33	31	39	37	27 L	12	14	13	13
Total Metals (UG/L)																
Iron	NA	NA	NA	NA	997 B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	13,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																
Iron, Dissolved	25.3 B	80 B	71.6 B	68.2 B	NA	2,330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	04GW110						05GW01									
Sample ID	004GW1100804	004GW1100805	004GW110-0206	004GW1100407	004GW110-0809	004GW110-0711	005GW0010804	005GW0010805	005GW9010805	005GW001-0206	005GW901-0206	005GW0010407	005GW001-0809	005GW001P-0809	005GW01-1110	005GW01P-1110
Sample Date	08/05/04	08/25/05	02/16/06	04/04/07	08/14/09	07/28/11	08/04/04	08/24/05	08/24/05	02/16/06	02/16/06	04/04/07	08/14/09	08/14/09	11/09/10	11/09/10
Chemical Name																
Wet Chemistry																
Acetate (mg/l)	NA	NA	NA	NA	5 U	0.036 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity (mg/l)	6.1 J	20 U	NA	20 U	21	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyrate (mg/l)	NA	NA	NA	NA	5 U	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide (mg/l)	93	13	790	280	6.2	130	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	10 U	20 U	20 U	21 U	9 B	9 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	11.5	4.4	51 K	9.4	16	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane (ug/l)	0.005 U	0.5 U	0.5 U	1 U	1.2 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	0.005 U	0.5 U	0.5 U	1 U	1.5 U	2 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lactic Acid (mg/l)	NA	NA	NA	NA	NA	0.048 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	1	0.5 U	0.5 U	2 U	0.6 U	4.4 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate (mg/l)	2.4	4.2	2.7 L	3.3	2.5	2.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	NA	0.17	0.025 R	0.025 U	0.13 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (ph)	NA	NA	NA	4.9 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	NA	NA	NA	NA	0.048 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	5 U	0.15 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	46.3	230	48 K	36	35	49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (mg/l)	1 U	0.03 U	0.03 U	0.03 UL	0.03 U	1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC) (mg/l)	2	10 U	10 U	10 U	10 U	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

M - Duplicate injection precision criteria not met

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

MG/LCACO3 - Milligrams per liter as CaCO3

NG/L - Nanograms per liter

PH - pH units

UG/L - Micrograms per liter

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID			13GW01													
Sample ID	005GW01-0711	005GW01P-0711	013GW0010804	13GW0010205	013GW0010305	013GW0010505	013GW0010805	013GW001-1105	013GW001-0206	013GW0010407	013GW001-0809	013GW01-1110	013GW01P-1110	013GW01-0711	013GW0020804	13GW0020205
Sample Date	07/27/11	07/27/11	08/04/04	02/17/05	03/10/05	05/09/05	08/25/05	11/10/05	02/15/06	04/06/07	08/13/09	11/10/10	11/10/10	07/29/11	08/04/04	02/17/05
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,2,2-Tetrachloroethane	NA	NA	74	97	170	79	97	110	46	36	30	150	190	110	700	99
1,1,2-Trichloroethane	NA	NA	5 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	1.6	1.1	0.79 J	50 U	100
1,1-Dichloroethane	NA	NA	5 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	50 U	10 U
1,1-Dichloroethene	NA	NA	5 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	50 U	3 J
1,2,4-Trichlorobenzene	NA	NA	NA	10 U	10 UJ	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
1,2-Dichlorobenzene	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
1,2-Dichloroethane	NA	NA	5 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	50 U	1 J
1,2-Dichloropropane	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
1,3-Dichlorobenzene	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
1,4-Dichlorobenzene	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 R	2.5 U	2.5 U	2.5 U	NA	10 U
2-Hexanone	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	2.5 U	2.5 U	2.5 U	NA	10 U
Acetone	NA	NA	NA	10 U	10 UJ	10 U	10 U	10 U	10 U	2 U	5 R	2.5 U	2.5 U	4.3 B	NA	10 U
Benzene	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
Carbon disulfide	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	0.82 B	0.5 U	0.5 U	0.5 U	NA	10 U
Chlorobenzene	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
Chloroethane	NA	NA	5 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	1 U	1 U	1 U	50 U	10 U
Chloroform	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.36 J	0.5 U	0.5 U	NA	10 U
Chloromethane	NA	NA	5 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	1 U	1 U	1 U	50 U	10 U
cis-1,2-Dichloroethene	NA	NA	47	10	9 J	4 J	190	120	5 J	41	220	48	69	220	84	21
Cyclohexane	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
Ethylbenzene	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
Methyl acetate	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.75 U	0.75 U	0.75 U	NA	5 J
Tetrachloroethene	NA	NA	6.8	11	14	7 J	6	10	6	5	9.3	27	19	12	46 J	5 J
Toluene	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	NA	10 U
trans-1,2-Dichloroethene	NA	NA	8.1	4 J	3 J	2 J	39	26	2 J	8	60	14	18	41	50 U	4 J
Trichloroethene	NA	NA	41	46	57	22	99	94	19	30	120	100	86	130	150	16
Vinyl chloride	NA	NA	5 U	10 U	10 U	10 U	2	2 U	2 U	2 U	7.8	0.38 J	0.79 J	4.1	50 U	1 J
Xylene, total	NA	NA	NA	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	1.5 U	1.5 U	1.5 U	NA	10 U
Explosives (UG/L)																
2-Amino-4,6-dinitrotoluene	0.12 U	0.12 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	20	20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	14	15 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)																
Iron	NA	NA	NA	38.8	62.1 B	NA	NA	NA	NA	NA	945 B	NA	NA	NA	NA	8,850
Sodium	NA	NA	5,330	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	36,900	NA
Dissolved Metals (UG/L)																
Iron, Dissolved	NA	NA	531	NA	NA	37.1 B	112	17.7 B	41.4 B	72.6 B	NA	87.1 B	85.3 B	100 B	61.6 B	NA

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID			13GW01													
Sample ID	005GW01-0711	005GW01P-0711	013GW0010804	13GW0010205	013GW0010305	013GW0010505	013GW0010805	013GW001-1105	013GW001-0206	013GW0010407	013GW001-0809	013GW01-1110	013GW01P-1110	013GW01-0711	013GW0020804	13GW0020205
Sample Date	07/27/11	07/27/11	08/04/04	02/17/05	03/10/05	05/09/05	08/25/05	11/10/05	02/15/06	04/06/07	08/13/09	11/10/10	11/10/10	07/29/11	08/04/04	02/17/05
Chemical Name																
Wet Chemistry																
Acetate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	0.051 J	NA	NA
Alkalinity (mg/l)	NA	NA	55 J	86	85	110	70	70	NA	110	97	74	NA	80	9.1 J	28
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	0.05 U	NA	NA
Carbon dioxide (mg/l)	NA	NA	100	100	130	140	76	150	280	44	5.9	150	NA	110	88	23
Chemical oxygen demand (mg/l)	NA	NA	10 U	20 U	20 U	21 U	20 U	20 U	20 U	20 U	9.3 B	10 U	NA	15 J	10 U	36
Chloride (mg/l)	NA	NA	18.5	16	19	9.8	42	36	20 K	13	37	29	NA	53	96.4	77
Ethane (ug/l)	NA	NA	0.05	26	27 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1.2 U	2 U	NA	2 U	0.021	27
Ethene (ug/l)	NA	NA	0.18	35	36 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1.5 U	1.5 J	NA	2 U	0.027	36
Lactic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.18	NA	NA
Methane (ug/l)	NA	NA	2.6	14	14 U	0.5 U	0.67 B	0.5 U	0.5 U	2 U	1.6 B	1.8 J	NA	2.5 J	4.2	14
Nitrate (mg/l)	NA	NA	0.74	0.89	1	0.95 L	0.88	1.4 J	2 L	1.3 L	0.58	0.66	NA	0.025 U	0.72	0.025 U
Nitrite (mg/l)	NA	NA	NA	0.14	0.24	0.12	0.093	0.025 UJ	0.025 R	0.025 UL	0.13 U	NA	NA	NA	NA	0.025 U
pH (ph)	NA	NA	NA	6.2	6.1	NA	NA	6	NA	6.7 J	NA	NA	NA	NA	NA	6.4
Propane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.05	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	0.15 U	NA	NA
Sulfate (mg/l)	NA	NA	90.3	70	74	61	56	58	95 K	42	35	47	NA	30	3.1	5.1
Sulfide (mg/l)	NA	NA	1 U	0.03 U	0.032	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.9 J	NA	0.8 U	1 U	0.03 U
Total organic carbon (TOC) (mg/l)	NA	NA	2	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1.3	NA	1.1	1	14

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Notes:

Shading indicates detections
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M - Duplicate injection precision criteria not met
NA - Not analyzed
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UJ - Analyte not detected, quantitation limit may be inaccurate
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MG/L - Milligrams per liter
MG/LCACO3 - Milligrams per liter as CaCO3
NG/L - Nanograms per liter
PH - pH units
UG/L - Micrograms per liter

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW02															
Sample ID	13GW9000205	013GW0020305	013GW9000305	013GW0020505	013GW9000505	013GW0020805	013GW9000805	013GW002-1105	013GW900-1105	013GW002-0206	013GW0020407	013GW002-0809	013GW02-1010	013GW002-0111	013GW02-0411	013GW02P-0411
Sample Date	02/17/05	03/10/05	03/10/05	05/09/05	05/09/05	08/24/05	08/24/05	11/10/05	11/10/05	02/15/06	04/05/07	08/14/09	10/26/10	01/31/11	04/28/11	04/28/11
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,2,2-Tetrachloroethane	130	130	110	46	51	17	19	2 U	2 U	2 U	2 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloroethane	100	160	160	99	100	28	28	5 J	5 J	8 J	2	5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	3 J	4 J	4 J	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	1.3 J	2 B	1.2	2.1	2.5
1,2-Dichloroethane	10 U	10 U	10 U	9 J	10	23	21	22	23	39	29	12	5.2 K	0.5 U	4.7	3.6
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	10 U	10 U	10 U	3 J	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 R	2.5 U	2.5 U	2.5 U	2.5 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U
Acetone	10 U	10 UJ	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 R	9 B	2.5 U	2.5 U	2.5 U
Benzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.44 K	0.5 U	0.41 J	0.39 J
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	0.97 J	0.5 U	1.3	2.2	2.3
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	1 U	1 U	1 U	1 U
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	1 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	20	34	35	30	32	32	31	14	16	16	14	0.89 J	1.4 K	0.87 J	2	2.1
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	3 J	10 U	20	11	10	10 U	3 J	10 U	10 U	8 J	16	2 J	0.75 U	0.75 U	0.75 U	0.75 U
Tetrachloroethene	6 J	3 J	4 J	3 J	3 J	1 J	2	2 U	2 U	2 U	2 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U
Toluene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	0.4 B	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	4 J	6 J	7 J	5 J	5 J	6 J	7 J	10 U	10 U	3 J	3	0.59 J	1.5 K	0.86 J	3	3.1
Trichloroethene	22	15	17	5 J	8 J	3	3	2 U	2 U	2 U	2 U	5 U	0.4 K	0.28 J	0.62 J	0.62 J
Vinyl chloride	1 J	10 U	2 J	3 J	3 J	9	9	4	6	32	6	1 U	0.5 K	1 U	1.6 J	0.96 J
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2 U	5 U	1.5 U	1.5 U	1.5 U	1.5 U
Explosives (UG/L)																
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)																
Iron	8,810	5,430	5,260	NA	NA	NA	NA	NA	NA	NA	NA	4,520 J	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																
Iron, Dissolved	NA	NA	NA	8,570	8,400	10,400	10,600	9,420	9,290	9,470	6,010	NA	611	79 J	871 J	273 J

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW02															
Sample ID	13GW9000205	013GW0020305	013GW9000305	013GW0020505	013GW9000505	013GW0020805	013GW9000805	013GW002-1105	013GW900-1105	013GW002-0206	013GW0020407	013GW002-0809	013GW02-1010	013GW002-0111	013GW02-0411	013GW02P-0411
Sample Date	02/17/05	03/10/05	03/10/05	05/09/05	05/09/05	08/24/05	08/24/05	11/10/05	11/10/05	02/15/06	04/05/07	08/14/09	10/26/10	01/31/11	04/28/11	04/28/11
Chemical Name																
Wet Chemistry																
Acetate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14	NA	NA	NA	NA
Alkalinity (mg/l)	34	35	42	46	42	50	45	30	33	NA	29	25	14	9.3	17	NA
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	NA	NA
Carbon dioxide (mg/l)	27	10 U	12	31	36	57	52	42	45	180	200	1.2	0.62 J	5 U	NA	NA
Chemical oxygen demand (mg/l)	30	24	30	43	43	54	53	59	52	64	34	28	10 U	10 U	10 J	NA
Chloride (mg/l)	73	71	71	77	77	87	80	84	91	130 K	61	46	49	46	44	NA
Ethane (ug/l)	26	30	29	12	6.8	19	19	12	13	12	12	5.4	12	3.8 J	9.2 J	NA
Ethene (ug/l)	35	36 U	36 U	3	2.2	5.6	5.4	5.7	5.7	7.7	4.1	2.3	1.5 J	2 U	2.9 J	NA
Lactic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	14	14 U	14 U	2.3	1.5	240	300	190	200	150	1,400	2,400	4,900	5,800	7,700	NA
Nitrate (mg/l)	0.025 U	0.025 U	0.025 U	0.025 UL	0.025 UL	0.025 U	0.025 U	0.035 B	0.025 B	0.035 L	0.025 U	0.022 J	0.025 U	0.025 U	0.025 U	NA
Nitrite (mg/l)	0.027	0.03	0.028	0.025 U	0.025 U	0.025 U	0.025 U	0.025 UJ	0.025 UJ	0.025 R	0.025 U	0.13 U	NA	NA	NA	NA
pH (ph)	6.4	7	6.9	NA	NA	NA	NA	6.2	6.2	NA	5.5 J	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	NA	NA	NA
Sulfate (mg/l)	7.1	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.049 B	0.5 U	1.1	0.5 U	NA
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.7 J	0.8 U	0.8 U	NA
Total organic carbon (TOC) (mg/l)	12	15	15	21	21	27	24	24	24	23	17	6.8 J	2.6	1.6	2.1	NA

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Notes:

Shading indicates detections
B - Analyte not detected above the level reported in blanks
D - Compound identified in an analysis at a secondary dilution factor
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
M - Duplicate injection precision criteria not met
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
MG/LCACO3 - Milligrams per liter as CaCO3
NG/L - Nanograms per liter
PH - pH units
UG/L - Micrograms per liter

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID		13GW04							13GW200							
Sample ID	013GW02-0711	013GW0040804	013GW004-0206	013GW900-0206	013GW0040407	013GW004-0809	013GW04-1110	013GW04-0711	013GW2000804	013GW200-0206	013GW2000407	013GW200-0809	013GW200-1110	013GW200-0711	013GW2020804	013GW9000804
Sample Date	07/28/11	08/04/04	02/15/06	02/15/06	04/06/07	08/13/09	11/10/10	07/28/11	08/04/04	02/15/06	04/05/07	08/14/09	11/10/10	07/29/11	08/04/04	08/04/04
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,2,2-Tetrachloroethane	0.5 U	4 U	2 U	2 U	2 U	1 U	0.5 U	0.5 U	12	14	10	0.96 J	1.8	0.64 J	25 U	25 U
1,1,2-Trichloroethane	0.5 U	4 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 U	0.5 U	25 U	25 U
1,1-Dichloroethane	0.5 U	4 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 U	0.5 U	25 U	25 U
1,1-Dichloroethene	0.5 U	4 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 U	0.5 U	25 U	25 U
1,2,4-Trichlorobenzene	0.5 U	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
1,2-Dichlorobenzene	2.2	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
1,2-Dichloroethane	3.2	4 U	10 U	10 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 U	0.5 U	25 U	25 U
1,2-Dichloropropane	0.5 U	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
1,3-Dichlorobenzene	0.5 U	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
1,4-Dichlorobenzene	0.61 J	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	2.5 U	NA	10 U	10 U	2 U	5 R	2.5 U	2.5 U	NA	10 U	2 U	5 R	2.5 U	2.5 U	NA	NA
2-Hexanone	2.5 U	NA	10 U	10 U	2 U	5 U	2.5 U	2.5 U	NA	10 U	2 U	5 U	2.5 U	2.5 U	NA	NA
Acetone	3 B	NA	10 U	10 U	2 U	5 R	2.5 U	10 B	NA	10 U	2 U	5 R	2.5 U	2.9 B	NA	NA
Benzene	0.38 J	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
Carbon disulfide	0.5 U	NA	10 U	10 U	2 U	0.96 B	0.5 U	0.5 U	NA	10 U	2 U	0.61 B	0.5 U	0.5 U	NA	NA
Chlorobenzene	1.9	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
Chloroethane	1 U	4 U	10 U	10 U	2 U	5 U	1 U	1 U	1 U	10 U	2 U	5 U	1 U	1 U	25 U	25 U
Chloroform	0.5 U	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
Chloromethane	1 U	4 U	10 U	10 U	2 U	5 U	1 U	1 U	1 U	10 U	2 U	5 U	1 U	1 U	25 U	25 U
cis-1,2-Dichloroethene	2.2	57	59	54	58	110	130	130	1.3	1 J	2	5 U	0.78 J	0.38 J	400	390
Cyclohexane	0.5 U	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
Ethylbenzene	0.5 U	NA	10 U	10 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
Methyl acetate	0.75 U	NA	10 U	10 U	2 U	5 U	0.75 U	0.75 U	NA	10 U	2 U	5 U	0.75 U	0.75 U	NA	NA
Tetrachloroethene	0.5 U	4 U	2 U	2 U	2 U	0.81 J	0.76 J	0.47 J	1 U	2 U	2 U	5 U	0.5 U	0.5 U	25 U	13 J
Toluene	0.5 U	NA	10 U	10 U	2 U	5 U	0.28 B	0.5 U	NA	10 U	2 U	5 U	0.5 U	0.5 U	NA	NA
trans-1,2-Dichloroethene	4.6	7.1	17	16	17	17	15	17	1 U	10 U	2 U	5 U	0.5 U	0.5 U	46	51
Trichloroethene	0.78 J	7	8	9	7	11	8.2	7.3	2	2	2	5 U	0.62 J	0.5 U	69	69
Vinyl chloride	1.2 J	4 U	17	16	12	2.6	3.8	11	1 U	2 U	2 U	1 U	1 U	1 U	25 U	25 U
Xylene, total	1.5 U	NA	10 U	10 U	2 U	5 U	1.5 U	1.5 U	NA	10 U	2 U	5 U	1.5 U	1.5 U	NA	NA
Explosives (UG/L)																
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)																
Iron	NA	NA	NA	NA	NA	1,720 B	NA	NA	NA	NA	NA	672 B	NA	NA	NA	NA
Sodium	NA	10,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5,690	5,720
Dissolved Metals (UG/L)																
Iron, Dissolved	322	35.3 B	2,090	2,090	2,550	NA	1,930	2,340	504	34.8 B	65.2 B	NA	606	996	24,000	24,100

Station ID		13GW04							13GW200							
Sample ID	013GW02-0711	013GW0040804	013GW004-0206	013GW900-0206	013GW0040407	013GW004-0809	013GW04-1110	013GW04-0711	013GW2000804	013GW200-0206	013GW2000407	013GW200-0809	013GW200-1110	013GW200-0711	013GW2020804	013GW9000804
Sample Date	07/28/11	08/04/04	02/15/06	02/15/06	04/06/07	08/13/09	11/10/10	07/28/11	08/04/04	02/15/06	04/05/07	08/14/09	11/10/10	07/29/11	08/04/04	08/04/04
Chemical Name																
Wet Chemistry																
Acetate (mg/l)	1.5	NA	NA	NA	NA	5 U	NA	0.078	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity (mg/l)	18	66 J	NA	NA	54	56	50	51	NA	NA	NA	NA	71	NA	28 J	29 J
Butyrate (mg/l)	0.05 U	NA	NA	NA	NA	5 U	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide (mg/l)	0.21 J	8.8	38	37	10 U	0.59	10	11	NA	580	NA	NA	230	NA	100	77
Chemical oxygen demand (mg/l)	4.4 J	10 U	20 U	20 U	20 U	5.3 B	3.9 J	4.1 J	NA	20 U	NA	NA	3.9 J	NA	10 U	10 U
Chloride (mg/l)	37	11.1	28 K	29 K	25	36	23	24	NA	33 K	NA	NA	29	NA	99.8	100
Ethane (ug/l)	10	0.019	0.5 U	0.5 U	1 U	1.2 U	2 U	2 U	NA	0.5 U	NA	NA	2 U	NA	0.093	0.086
Ethene (ug/l)	1.8 J	0.22	5.8	6.2	13	1.5 U	1.2 J	1.7 J	NA	0.5 U	NA	NA	2 U	NA	1.6	1.3
Lactic Acid (mg/l)	0.1 U	NA	NA	NA	NA	NA	NA	0.35	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	7,500	2.6	80	47	49	1.9 B	110	160	NA	0.5 U	NA	NA	5.9 J	NA	720	340
Nitrate (mg/l)	0.025 U	0.024 B	0.025 R	0.025 R	0.025 UL	0.57	0.025 U	0.067	NA	0.2 L	NA	NA	0.025 U	NA	0.1 U	0.1 U
Nitrite (mg/l)	NA	NA	0.025 R	0.025 R	0.025 UL	0.13 U	NA	NA	NA	0.025 R	NA	NA	NA	NA	NA	NA
pH (ph)	NA	NA	NA	NA	7.1 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	0.12	NA	NA	NA	NA	NA	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvate (mg/l)	0.064 J	NA	NA	NA	NA	5 U	NA	0.15 U	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	0.46 J	9	17 K	18 K	10 B	35	9.1	8.8	NA	150 K	NA	NA	140	NA	4.1	4
Sulfide (mg/l)	1.2	1 U	0.03 U	0.03 U	0.03 U	0.03 U	0.8 U	2.2	NA	0.03 U	NA	NA	0.9 J	NA	1 U	1 U
Total organic carbon (TOC) (mg/l)	1.3	0.3 B	10 U	10 U	10 U	10 U	3.6	0.28 J	NA	10 U	NA	NA	3.2	NA	1	1

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Notes:

Shading indicates detections

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J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
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M - Duplicate injection precision criteria not met
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
MG/LCACO3 - Milligrams per liter as CaCO3
NG/L - Nanograms per liter
PH - pH units
UG/L - Micrograms per liter

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW202															
Sample ID	13GW2020205	013GW2020305	013GW2020505	013GW2020805	013GW202-1105	013GW202-0206	013GW2020407	013GW202-0809	013GW202P-0809	013GW202-1010	013GW202P-1010	013GW202-0111	013GW202-0411	013GW202-0711	013GW2040804	13GW2040205
Sample Date	02/17/05	03/10/05	05/09/05	08/24/05	11/10/05	02/15/06	04/05/07	08/14/09	08/14/09	10/26/10	10/26/10	01/31/11	04/28/11	07/26/11	08/05/04	02/17/05
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,2,2-Tetrachloroethane	10 U	10 UJ	10 R	6 U	72	5 J	12	27	29	32 K	32 K	1.9	0.5 U	0.5 UJ	100	50
1,1,2-Trichloroethane	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	0.91 J	0.96 J	1.9 K	2.1 K	0.5 U	0.5 U	0.5 UJ	5 U	10 U
1,1-Dichloroethane	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	5 U	10 U
1,1-Dichloroethene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	5 U	10 U
1,2,4-Trichlorobenzene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	10 U
1,2-Dichlorobenzene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.32 B	0.3 B	0.16 J	0.4 J	0.18 J	NA	10 U
1,2-Dichloroethane	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	1.6 K	1.8 K	0.5 U	1.8	1.9 J	5 U	10 U
1,2-Dichloropropane	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	10 U
1,3-Dichlorobenzene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	10 U
1,4-Dichlorobenzene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	10 U
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	37	54	NA	NA	NA	NA	NA	NA	NA
2-Butanone	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 R	5 R	13 K	13 K	6.8	5.2	3.4 J	NA	10 U
2-Hexanone	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 UJ	NA	10 U
Acetone	10 U	10 UJ	10 R	30 U	30 UJ	30 U	8 U	5 R	5 R	4.3 B	5.3 B	2.5 U	2.5 U	3.8 B	NA	10 U
Benzene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	0.53 J	0.54 J	0.96 K	0.93 K	0.56 J	0.52 J	0.44 J	NA	10 U
Carbon disulfide	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	0.54 B	0.76 B	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	10 U
Chlorobenzene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	1 J
Chloroethane	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	1 U	1 U	1 U	1 U	1 UJ	5 U	10 U
Chloroform	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	10 U
Chloromethane	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	1 U	1.4 K	1 U	1.7 J	1 UJ	5 U	10 U
cis-1,2-Dichloroethene	510	420 R	430 L	400	610	460	360	240	320	190 K	200 K	150	4.1	0.5 UJ	12	8 J
Cyclohexane	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 UJ	NA	10 U
Ethylbenzene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.33 K	0.37 K	0.5 U	0.23 J	0.5 UJ	NA	10 U
Methyl acetate	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 UJ	NA	10 U
Tetrachloroethene	30	17 J	16 L	13	29	17	16	16	16	1.7 K	1.6 K	0.5 U	0.5 U	0.5 UJ	5.4	3 J
Toluene	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	0.88 B	0.88 B	0.28 B	0.5 U	0.28 B	NA	10 U
trans-1,2-Dichloroethene	140	92 J	75 L	62	100	74	55	57	58	28 K	28 K	21	16	4.7 J	4.4 J	4 J
Trichloroethene	130	83 J	92 L	66	140	88	72	71	71	3.2 K	3.3 K	0.36 J	0.5 U	0.5 UJ	28	18
Vinyl chloride	13	11 J	8 L	9	20	34	8	7.7	7.9	4.4 K	4.5 K	23	3.6	1 UJ	5 U	3 J
Xylene, total	10 U	10 UJ	10 R	30 U	30 U	30 U	8 U	5 U	5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 UJ	NA	10 U
Explosives (UG/L)																
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)																
Iron	22,700	22,900	NA	NA	NA	NA	NA	33,600 J	30,500 J	NA	NA	NA	NA	NA	NA	33,200
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	31,800	NA
Dissolved Metals (UG/L)																
Iron, Dissolved	NA	NA	8,640	18,500	21,000	19,200	18,300	NA	NA	24,200	24,100	22,800	18,300	11,600	14,300	NA

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW202															
Sample ID	13GW2020205	013GW2020305	013GW2020505	013GW2020805	013GW202-1105	013GW202-0206	013GW2020407	013GW202-0809	013GW202P-0809	013GW202-1010	013GW202P-1010	013GW202-0111	013GW202-0411	013GW202-0711	013GW2040804	13GW2040205
Sample Date	02/17/05	03/10/05	05/09/05	08/24/05	11/10/05	02/15/06	04/05/07	08/14/09	08/14/09	10/26/10	10/26/10	01/31/11	04/28/11	07/26/11	08/05/04	02/17/05
Chemical Name																
Wet Chemistry																
Acetate (mg/l)	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	NA	NA	NA	NA	18 D	NA	NA
Alkalinity (mg/l)	30	20 U	29	50	21	NA	20 U	47 J	76 J	32	NA	27	21	26	150 J	340
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	NA	NA	NA	NA	0.05 U	NA	NA
Carbon dioxide (mg/l)	49	13	92	56	57	72	110	22.9	10.5	10	NA	8.4	NA	17	120	200
Chemical oxygen demand (mg/l)	20 U	20 U	20 U	26	20 U	20 U	20 U	9.5 B	9 B	32	NA	38	30	26	15.7	36
Chloride (mg/l)	97	91	100	110	110	180 K	92	79	79	65	NA	62	63	54	35.1	48
Ethane (ug/l)	27	27 U	0.5 U	0.5 U	0.51	0.5 U	1 U	1.2 U	1.2 U	30	NA	24	25	26	0.23	140
Ethene (ug/l)	36	36 U	0.57	1.7	2.2	2	1 U	1.5 U	1.5 U	9.8 J	NA	13	27	16	0.21	180
Lactic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 D	NA	NA
Methane (ug/l)	150	470	2,000	410	230	340	150	83	100	210	NA	3,200	600	6,000	870	1,500
Nitrate (mg/l)	0.025 U	0.025 U	0.025 UL	0.025 U	0.053 B	0.025 R	0.025 U	0.016 B	0.02 J	0.025 U	NA	0.025 U	0.025 U	0.05 U	0.43	0.12
Nitrite (mg/l)	0.025 U	0.2	0.025 U	0.025 U	0.025 UJ	0.025 R	0.025 U	0.13 U	0.13 U	NA	NA	NA	NA	NA	NA	0.23
pH (ph)	6.1	6.2	NA	NA	5.9	NA	5.5 J	NA	NA	NA	NA	NA	NA	NA	NA	6.5
Propane (ug/l)	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.2 D	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA	NA	5 U	5 U	NA	NA	NA	NA	0.15 U	NA	NA
Sulfate (mg/l)	6.2	5 U	5 U	5.7	7.3	19 K	5.2 B	2.7 J	2.8 J	0.44 J	NA	1.7	0.5 U	0.45 J	54.6	90
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.8 U	NA	0.8 U	0.8 U	0.8 U	1 U	0.03 U
Total organic carbon (TOC) (mg/l)	10 U	10 U	10 U	25	10 U	10 U	10 U	10 U	10 U	21	NA	18	13	9	6	14

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Notes:

Shading indicates detections

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

M - Duplicate injection precision criteria not met

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

MG/LCACO3 - Milligrams per liter as CaCO3

NG/L - Nanograms per liter

PH - pH units

UG/L - Micrograms per liter

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW204										13GW205					
Sample ID	013GW2040305	013GW2040505	013GW2040805	013GW204-1105	013GW204-0206	013GW2040407	013GW2040407P	013GW204-0809	013GW204-1110	013GW204-0711	013GW2050804	013GW205-0206	013GW2050407	013GW205-0809	013GW205-1110	013GW205-0711
Sample Date	03/10/05	05/09/05	08/24/05	11/10/05	02/16/06	04/05/07	04/05/07	08/17/09	11/11/10	07/27/11	08/04/04	02/16/06	04/05/07	08/17/09	11/11/10	07/27/11
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,2,2-Tetrachloroethane	110	73 L	140	120	22	8	9	3	3.6	2.6	1 U	2 U	2 U	1 U	0.5 UJ	0.5 U
1,1,2-Trichloroethane	10 U	10 R	1 J	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 UJ	0.5 U
1,1-Dichloroethane	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 UJ	0.5 U
1,1-Dichloroethene	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 UJ	0.5 U
1,2,4-Trichlorobenzene	1 J	1 L	10 U	10 U	2 J	2 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
1,2-Dichlorobenzene	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.24 J	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
1,2-Dichloroethane	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	1 U	10 U	2 U	5 U	0.5 UJ	0.5 U
1,2-Dichloropropane	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
1,3-Dichlorobenzene	1 J	2 L	10 U	10 U	3 J	1 J	1 J	1.7 J	0.32 J	2.1	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
1,4-Dichlorobenzene	1 J	2 L	10 U	10 U	2 J	1 J	1 J	1.3 J	0.5 U	2.3	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 R	2.5 U	2.5 U	NA	10 U	2 U	5 R	2.5 UJ	2.5 U
2-Hexanone	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	2.5 U	2.5 U	NA	10 U	2 U	5 U	2.5 UJ	2.5 U
Acetone	10 UJ	10 R	10 U	10 UJ	10 U	2 U	2 U	5 R	2.5 U	2.5 U	NA	10 U	2 U	5 R	2.5 UJ	8.7 B
Benzene	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.41 J	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
Carbon disulfide	10 U	10 R	10 U	10 U	10 U	2 U	2 U	0.66 B	0.5 U	0.5 U	NA	10 U	2 U	0.7 B	0.5 UJ	0.5 U
Chlorobenzene	1 J	3 L	1 J	10 U	4 J	3	2	3.3 J	0.5 U	4.9	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
Chloroethane	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	1 U	1 U	1 U	10 U	2 U	5 U	1 UJ	1 U
Chloroform	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
Chloromethane	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	1 U	1 U	1 U	10 U	2 U	5 U	1 UJ	1 U
cis-1,2-Dichloroethene	7 J	5 L	21	35	5 J	6	5	5.3	24	11	0.88 J	10 U	2 U	5 U	0.5 UJ	0.72 J
Cyclohexane	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
Ethylbenzene	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
Methyl acetate	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.75 U	0.75 U	NA	10 U	2 U	5 U	0.75 UJ	0.75 U
Tetrachloroethene	4 J	2 L	10	9	2	2 U	1 J	5 U	0.59 J	0.58 J	1 U	2 U	2 U	5 U	0.5 UJ	0.5 U
Toluene	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	0.5 U	0.5 U	NA	10 U	2 U	5 U	0.5 UJ	0.5 U
trans-1,2-Dichloroethene	2 J	2 L	11	26	2 J	4	3	2.1 J	6.9	2.4	1 U	10 U	2 U	5 U	0.5 UJ	0.28 J
Trichloroethene	28	14 L	38	43	7	5	5	2.3 J	6.5	3.2	1 U	2 U	2 U	5 U	0.5 UJ	0.5 U
Vinyl chloride	2 J	2 L	8	19	7	3	2	2	8.1	3.9	1 U	2 U	2 U	1 U	1 UJ	0.26 J
Xylene, total	10 U	10 R	10 U	10 U	10 U	2 U	2 U	5 U	1.5 U	1.5 U	NA	10 U	2 U	5 U	1.5 UJ	1.5 U
Explosives (UG/L)																
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)																
Iron	32,900	NA	NA	NA	NA	NA	NA	22,100 J	NA	NA	NA	NA	NA	17,400 J	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																
Iron, Dissolved	NA	42,700	13,400	11,200	29,800	23,100	23,500	NA	9,490	24,600	12,400	12,300	13,400	NA	18,900	25,900

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW204										13GW205					
Sample ID	013GW2040305	013GW2040505	013GW2040805	013GW204-1105	013GW204-0206	013GW2040407	013GW2040407P	013GW204-0809	013GW204-1110	013GW204-0711	013GW2050804	013GW205-0206	013GW2050407	013GW205-0809	013GW205-1110	013GW205-0711
Sample Date	03/10/05	05/09/05	08/24/05	11/10/05	02/16/06	04/05/07	04/05/07	08/17/09	11/11/10	07/27/11	08/04/04	02/16/06	04/05/07	08/17/09	11/11/10	07/27/11
Chemical Name																
Wet Chemistry																
Acetate (mg/l)	NA	NA	NA	NA	NA	NA	NA	5 U	NA	0.11	NA	NA	NA	NA	NA	0.1
Alkalinity (mg/l)	250	380	130	100	NA	330	NA	510	60	180	NA	NA	NA	NA	120	110
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA	NA	5 U	NA	0.05 U	NA	NA	NA	NA	NA	0.05 U
Carbon dioxide (mg/l)	79	170	140	180	350	140	NA	10.5	110	110	NA	280	NA	NA	120	130
Chemical oxygen demand (mg/l)	27	40	21 U	21 U	39	50 K	NA	49	12 J	28	NA	20 U	NA	NA	11 J	15
Chloride (mg/l)	41	50	29	31	57 K	61	NA	35	22	21	NA	39 K	NA	NA	62	49
Ethane (ug/l)	140 U	0.5 U	0.5 U	0.5 U	0.5 U	0.72 J	NA	1.2 U	2 U	2 U	NA	0.5 U	NA	NA	2 U	2 U
Ethene (ug/l)	180 U	0.5 U	0.5 U	4.1	0.5 U	1 U	NA	1.5 U	2 U	2 U	NA	0.5 U	NA	NA	2 U	2 U
Lactic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.34	NA	NA	NA	NA	NA	0.52
Methane (ug/l)	2,200	720	190	480	870	1,800	NA	730	530	2,400	NA	79	NA	NA	270	340
Nitrate (mg/l)	0.33	0.18 L	0.36	0.44 B	0.19 L	0.092	NA	0.037 B	0.025 U	0.025 U	NA	0.047 L	NA	NA	0.025 U	0.025 U
Nitrite (mg/l)	0.61	0.025 U	0.064	0.025 UJ	0.025 R	0.025 U	NA	0.13 U	NA	NA	NA	0.025 R	NA	NA	NA	NA
pH (ph)	6.8	NA	NA	6	NA	6.7 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.064	NA	NA	NA	NA	NA	0.06
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA	NA	5 U	NA	0.15 U	NA	NA	NA	NA	NA	0.15 U
Sulfate (mg/l)	80	87	32	35	120 K	42	NA	25	22	29	NA	210 K	NA	NA	68	59
Sulfide (mg/l)	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	NA	0.03 U	0.8 U	0.8 U	NA	0.03 U	NA	NA	0.8 U	0.8 U
Total organic carbon (TOC) (mg/l)	10	18	10 U	10 U	15	15	NA	13	5.1	7.9	NA	10 U	NA	NA	5.7	4.2

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Notes:

Shading indicates detections
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D - Compound identified in an analysis at a secondary dilution factor
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K - Analyte present, value may be biased high, actual value may be lower
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NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
MG/LCACO3 - Milligrams per liter as CaCO3
NG/L - Nanograms per liter
PH - pH units
UG/L - Micrograms per liter

Station ID	13GW206												13GW300			
Sample ID	013GW2060804	13GW2060205	013GW2060305	013GW2060505	013GW2060805	013GW206-1105	013GW206-0206	013GW2060407	013GW206-0809	013GW206-1110	013GW206-0711	013GW206P-0711	013GW3000407	013GW300-1110	013GW300-0711	013GW300P-0711
Sample Date	08/05/04	02/17/05	03/10/05	05/09/05	08/25/05	11/10/05	02/15/06	04/05/07	08/17/09	11/10/10	07/27/11	07/27/11	04/04/07	11/11/10	07/28/11	07/28/11
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,2,2-Tetrachloroethane	17 U	10 U	10 U	10 R	6 U	6 U	10 U	8 U	1 U	0.5 U	0.5 U	0.5 U	2 U	93	88	86
1,1,2-Trichloroethane	17 U	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	3.3	5.4	5.4
1,1-Dichloroethane	17 U	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
1,1-Dichloroethene	17 U	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	1.3	3	2.6
1,2,4-Trichlorobenzene	NA	10 U	10 UJ	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	17 U	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2	2.1	4	4
1,2-Dichloropropane	NA	10 U	10 U	1 L	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 R	2.5 U	2.5 U	2.5 U	2 U	2.5 U	2.5 U	2.5 U
2-Hexanone	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	2.5 U	2.5 U	2.5 U	2 U	2.5 U	2.5 U	2.5 U
Acetone	NA	10 U	10 UJ	10 R	30 U	30 UJ	50 U	8 U	5 R	2.5 U	5.9 B	17 B	2 U	2.5 U	4.7 B	8.5 B
Benzene	NA	1 J	2 J	1 L	30 U	30 U	50 U	8 U	5 U	0.5 U	0.33 J	0.28 J	2 U	0.29 J	0.36 J	0.36 J
Carbon disulfide	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	0.7 B	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
Chloroethane	17 U	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.92 J	1 U	1 U	2 U	1 U	1 U	1 U
Chloroform	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
Chloromethane	17 U	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	1 U	1 U	1 U	2 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	320	380	540	530 L	520	540	490	340	240	310	340	350	47	68	110	100
Cyclohexane	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.34 J	0.5 U	2 U	0.5 U	0.45 J	0.36 J
Ethylbenzene	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.5 U	0.5 U	0.5 U	2 U	0.5 U	0.5 U	0.5 U
Methyl acetate	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.75 U	0.75 U	0.75 U	2 U	0.75 U	0.75 U	0.75 U
Tetrachloroethene	17 U	10 U	10 U	2 L	6 U	6 U	10 U	8 U	5 U	0.47 J	0.5 U	0.5 U	2 U	4.6	3.2	2.8
Toluene	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	0.27 B	0.5 U	0.5 U	3	0.5 U	0.3 J	0.41 J
trans-1,2-Dichloroethene	19	43	41	68 L	63	79	57	28	16	15	13	13	6	110	120	120
Trichloroethene	9.5 J	20	24	40 L	35	45	30	18	7.1	7.6	4.8	3.7	5	28	39	35
Vinyl chloride	17 U	11	8 J	9 J	6 U	6 U	17	8 U	2.1	7.3	20	20	4	41	66	64
Xylene, total	NA	10 U	10 U	10 R	30 U	30 U	50 U	8 U	5 U	1.5 U	1.5 U	1.5 U	2 U	1.5 U	1.5 U	1.5 U
Explosives (UG/L)																
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)																
Iron	NA	3,990	1,660	NA	NA	NA	NA	NA	8,750 J	NA	NA	NA	NA	NA	NA	NA
Sodium	17,400	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)																
Iron, Dissolved	14.4 U	NA	NA	394	58.8 B	204 B	809	4,720	NA	6,150	6,990	6,820	37.1 B	10,500	13,400	13,500

Station ID	13GW206												13GW300			
Sample ID	013GW2060804	13GW2060205	013GW2060305	013GW2060505	013GW2060805	013GW206-1105	013GW206-0206	013GW2060407	013GW206-0809	013GW206-1110	013GW206-0711	013GW206P-0711	013GW3000407	013GW300-1110	013GW300-0711	013GW300P-0711
Sample Date	08/05/04	02/17/05	03/10/05	05/09/05	08/25/05	11/10/05	02/15/06	04/05/07	08/17/09	11/10/10	07/27/11	07/27/11	04/04/07	11/11/10	07/28/11	07/28/11
Chemical Name																
Wet Chemistry																
Acetate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	0.082	NA	NA	NA	0.082	NA
Alkalinity (mg/l)	73 J	46	23	22	30	20 U	NA	25	39	22	20	NA	35	60	58	NA
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	0.05 U	NA	NA	NA	0.05 U	NA
Carbon dioxide (mg/l)	8.5	33	36	51	36	170	360	76	5.25	58	40	NA	10 U	38	35	NA
Chemical oxygen demand (mg/l)	10 U	44	21 U	20 U	20 U	20 U	20 U	20 U	13 B	3.9 J	4.1 J	NA	20 U	10 U	7 J	NA
Chloride (mg/l)	60.2	63	67	74	85	81	150 K	81	79	86	86	NA	47	64	66	NA
Ethane (ug/l)	0.032	26	27 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U	1.2 U	2 U	1.5 J	NA	8.2	24	21	NA
Ethene (ug/l)	1.8	35	36 U	0.5 U	0.5 U	0.5 U	0.89	1 U	1.5 U	1.8 J	5.3 J	NA	6.8	84	87	NA
Lactic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.24	NA	NA	NA	0.33	NA
Methane (ug/l)	0.67	14	14 U	1.9	1.4 B	1.7	2.2	2.2	1.3 B	21	160	NA	440	3,200	2,400	NA
Nitrate (mg/l)	0.16	0.45	0.55	0.24 L	0.059	3.6 J	0.99 L	1.5	0.52	0.11	0.071	NA	0.025 U	0.025 U	0.025 U	NA
Nitrite (mg/l)	NA	0.074	0.053	0.025 U	0.025 U	0.025 UJ	0.025 R	0.025 U	0.13 U	NA	NA	NA	0.025 U	NA	NA	NA
pH (ph)	NA	6.4	6.1	NA	NA	5	NA	5.8 J	NA	NA	NA	NA	9.6 J	NA	NA	NA
Propane (ug/l)	NA	NA	NA	NA	NA	NA	NA	1 U	NA	NA	NA	NA	3	NA	NA	NA
Propionic Acid (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.059	NA	NA	NA	0.053	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	5 U	NA	0.15 U	NA	NA	NA	0.15 U	NA
Sulfate (mg/l)	28.8	28	23	29	21	19	50 K	29	26	35	24	NA	5 U	0.5 U	0.55 J	NA
Sulfide (mg/l)	1 U	0.03 U	0.031	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.8 U	0.8 U	NA	0.03 UL	0.8 U	0.8 U	NA
Total organic carbon (TOC) (mg/l)	1	11	10 U	10 U	10 U	10 U	10 U	10 U	10 U	1.7	0.75 J	NA	10 U	1	0.43 J	NA

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Notes:

Shading indicates detections
B - Analyte not detected above the level reported in blanks
D - Compound identified in an analysis at a secondary dilution factor
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
M - Duplicate injection precision criteria not met
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
MG/LCACO3 - Milligrams per liter as CaCO3
NG/L - Nanograms per liter
PH - pH units
UG/L - Micrograms per liter

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW301			13GW302			
Sample ID	013GW3010407	013GW301-1110	013GW301-0711	013GW302-0510	013GW302-1010	013GW302-0211	013GW302P-0211
Sample Date	04/04/07	11/11/10	07/28/11	05/26/10	10/26/10	02/01/11	02/01/11
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1,2,2-Tetrachloroethane	5	0.5 U	0.5 U	3.2	0.47 J	0.89 J	1
1,1,2-Trichloroethane	1 J	0.5 U	0.5 U	0.92 J	0.5 U	0.5 U	0.5 U
1,1-Dichloroethane	2 U	0.5 U	0.5 U	5 U	0.22 J	0.5 U	0.5 U
1,1-Dichloroethene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
1,2,4-Trichlorobenzene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	5	1.2	1.5	5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloropropane	2 U	0.5 U	0.67 J	5 U	0.5 U	0.5 U	0.5 U
1,3-Dichlorobenzene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
1,4-Dichlorobenzene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA
2-Butanone	2 U	2.5 U	1.6 J	5 U	2.5 U	2.5 U	2.5 U
2-Hexanone	2 U	2.5 U	2.5 U	5 U	2.5 U	2.5 U	2.5 U
Acetone	2 U	2.5 U	5.3 B	5 R	2.5 U	2.5 U	2.5 U
Benzene	2 U	0.5 U	0.35 J	5 U	0.5 U	0.5 U	0.5 U
Carbon disulfide	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
Chloroethane	2 U	1 U	1 U	5 U	1 U	1 U	1 U
Chloroform	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
Chloromethane	2 U	1 U	1 U	5 U	1 U	1 U	1 U
cis-1,2-Dichloroethene	8	2.2	3.2	9	3.7	8.5	8.5
Cyclohexane	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
Ethylbenzene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
Methyl acetate	2 U	0.75 U	0.75 U	5 U	0.75 U	0.75 U	0.75 U
Tetrachloroethene	2 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U
Toluene	2 U	0.32 B	0.5 U	5 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	2	1	2.7	4.4 J	1.9	2.8	2.9
Trichloroethene	2	0.36 J	0.61 J	2.9 J	1.3	2.1	2.1
Vinyl chloride	2 U	0.61 J	0.87 J	1.9	0.58 J	1.4 J	1.4 J
Xylene, total	2 U	1.5 U	1.5 U	5 U	1.5 U	1.5 U	1.5 U
Explosives (UG/L)							
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)							
Iron	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)							
Iron, Dissolved	3,000	6,310	10,200	52,000	60,700	56,500	56,000

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW301			13GW302			
Sample ID	013GW3010407	013GW301-1110	013GW301-0711	013GW302-0510	013GW302-1010	013GW302-0211	013GW302P-0211
Sample Date	04/04/07	11/11/10	07/28/11	05/26/10	10/26/10	02/01/11	02/01/11
Chemical Name							
Wet Chemistry							
Acetate (mg/l)	NA	NA	1.1	5 U	NA	0.036 J	NA
Alkalinity (mg/l)	31	3.2 J	6	88	70	78	NA
Butyrate (mg/l)	NA	NA	0.094	5 U	NA	0.05 U	NA
Carbon dioxide (mg/l)	18	5.1	7.6	63.5	120	100	NA
Chemical oxygen demand (mg/l)	31	3.9 J	5.4 J	21	7.5 J	15 J	NA
Chloride (mg/l)	37	86	96	36	57	40	NA
Ethane (ug/l)	21	33	46	1.2 U	2 U	2 U	NA
Ethene (ug/l)	9.4	1.3 J	0.97 J	1.5 U	2 U	2 U	NA
Lactic Acid (mg/l)	NA	NA	0.1 U	3 J	NA	0.18 M	NA
Methane (ug/l)	1,900	5,200	6,900	49	220	59	NA
Nitrate (mg/l)	0.025 U	0.025 U	0.025 U	0.0085 B	0.025 U	0.025 U	NA
Nitrite (mg/l)	0.025 U	NA	NA	NA	NA	NA	NA
pH (ph)	6.5 J	NA	NA	NA	NA	NA	NA
Propane (ug/l)	5.5	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	NA	0.091	5 U	NA	0.05 U	NA
Pyruvate (mg/l)	NA	NA	0.15 U	5.1	NA	0.15 U	NA
Sulfate (mg/l)	5 U	0.5 U	0.44 J	60	74	72	NA
Sulfide (mg/l)	0.03 UL	0.8 U	0.8 U	0.03 U	0.8 U	0.8 U	NA
Total organic carbon (TOC) (mg/l)	13	2.2	1.1	10 U	4.2	3.3	NA

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NG/L - Nanograms per liter
PH - pH units
UG/L - Micrograms per liter

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW302		13GW303					13GW304					
Sample ID	013GW302-0411	013GW302-0711	013GW303-0510	013GW303-1010	013GW303-0111	013GW303-0411	013GW303-0711	013GW304-0510	013GW304P-0510	013GW304-1010	013GW304-0111	013GW304-0411	013GW304-0711
Sample Date	04/29/11	07/29/11	05/26/10	10/26/10	01/31/11	04/29/11	07/26/11	05/26/10	05/26/10	10/26/10	01/31/11	04/28/11	07/26/11
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,2,2-Tetrachloroethane	3.8 J	1.2	8.5	90 K	180 J	220 J	210	230	210	160	180 L	61 J	12 L
1,1,2-Trichloroethane	1 J	0.33 J	5 U	2 K	2.8 J	5.3	5.5 J	5.1	5 J	5.9	5.7	4.5	0.5 UL
1,1-Dichloroethane	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 UL
1,1-Dichloroethene	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 UL
1,2,4-Trichlorobenzene	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 UL
1,2-Dichlorobenzene	0.5 UJ	0.5 U	5 U	0.15 B	0.5 UJ	0.22 J	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 UJ	0.5 UL
1,2-Dichloroethane	0.5 UJ	0.5 U	5 U	0.36 K	0.5 UJ	0.69 J	0.5 UJ	5 U	5 U	0.5 U	0.5 U	1.2	0.5 UL
1,2-Dichloropropane	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 UL
1,3-Dichlorobenzene	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 UJ	0.5 UL
1,4-Dichlorobenzene	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 UJ	0.5 UL
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	2.5 UJ	2.5 U	5 R	2.5 U	2.5 UJ	2.5 U	2.5 UJ	5 R	9.5 L	2.5 U	2.5 U	11	3.5 L
2-Hexanone	2.5 UJ	2.5 U	5 U	2.5 U	2.5 UJ	2.5 U	2.5 UJ	5 U	5 U	2.5 U	2.5 U	1.7 J	2.5 UL
Acetone	2.5 UJ	5.6 B	7.8 L	2.5 U	2.5 UJ	2.5 U	2.5 UJ	5 R	5 R	3.5 B	2.5 U	16 B	10 B
Benzene	0.5 UJ	0.5 U	5 U	1.6 K	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	1.2	0.5 U	0.53 J	0.73 L
Carbon disulfide	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.31 J	0.5 U	0.5 U	0.38 L
Chlorobenzene	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 UJ	0.5 UL
Chloroethane	1 UJ	1 U	5 U	1 U	1 UJ	1 U	1 UJ	5 U	5 U	1 U	1 U	1 U	1 UL
Chloroform	0.5 UJ	0.5 U	5 U	0.5 UJ	0.5 UJ	0.34 B	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 UL
Chloromethane	1 UJ	1 U	5 U	1 U	1 UJ	1 U	1 UJ	5 U	5 U	1 J	1 U	1.9 J	1 UL
cis-1,2-Dichloroethene	18 J	8.1	210	380	330	82	48 J	67	80	73	70	20	61 L
Cyclohexane	0.5 UJ	0.5 U	5 U	0.5 K	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 UL
Ethylbenzene	0.5 UJ	0.5 U	5 U	0.5 U	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	0.28 J	0.5 U	0.44 J	0.5 UL
Methyl acetate	0.75 UJ	0.75 U	5 U	0.75 U	0.75 UJ	0.75 U	0.75 UJ	5 U	5 U	0.75 U	0.75 U	0.75 U	0.75 UL
Tetrachloroethene	0.5 UJ	0.5 U	1.3 J	11 K	15 J	14	12 J	6.5	7.8	9.5	14	3.9	5.2 L
Toluene	0.5 UJ	0.5 U	5 U	0.85 B	0.5 UJ	0.5 U	0.5 UJ	5 U	5 U	1.5 B	0.5 U	0.68 B	0.47 B
trans-1,2-Dichloroethene	4.9 J	2.8	11	61 K	49 J	18	7.7 J	20	23	25	26	7.8	38 L
Trichloroethene	4.8 J	2.3	12	67 K	73 J	57	39 J	39	44	40	50	14	17 L
Vinyl chloride	2 J	1.1 J	7.1	7.6 K	5.9 J	1 U	1 UJ	1.3	1.8	0.61 J	0.47 J	1 U	2.6 L
Xylene, total	1.5 UJ	1.5 U	5 U	1.5 U	1.5 UJ	1.5 U	1.5 UJ	5 U	5 U	0.88 J	1.5 U	0.29 J	1.5 UL
Explosives (UG/L)													
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)													
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)													
Iron, Dissolved	41,000	54,100	1,550	7,680	9,620	1,520	61 B	1,460	1,700	25,600	20,300	14,400	23,400 J

White Oak
CTO-JU38
Groundwater Detected Analytical Results
2004-2011

Station ID	13GW302		13GW303					13GW304					
Sample ID	013GW302-0411	013GW302-0711	013GW303-0510	013GW303-1010	013GW303-0111	013GW303-0411	013GW303-0711	013GW304-0510	013GW304P-0510	013GW304-1010	013GW304-0111	013GW304-0411	013GW304-0711
Sample Date	04/29/11	07/29/11	05/26/10	10/26/10	01/31/11	04/29/11	07/26/11	05/26/10	05/26/10	10/26/10	01/31/11	04/28/11	07/26/11
Chemical Name													
Wet Chemistry													
Acetate (mg/l)	NA	0.58	5 U	NA	0.039 J	NA	0.042 J	5 U	NA	NA	7.1	NA	7.3
Alkalinity (mg/l)	51	65	28	27	16	12	5.9	20 U	NA	32	28	4.5 J	24
Butyrate (mg/l)	NA	0.05 U	5 U	NA	0.05 U	NA	0.05 U	5 U	NA	NA	0.05 U	NA	0.05 U
Carbon dioxide (mg/l)	NA	120	17.4	66	58	NA	70	18.4	NA	66	73	NA	47
Chemical oxygen demand (mg/l)	11 J	18	42	10 U	10 U	10 U	3.8 J	20 U	NA	7.5 J	8 J	57	19
Chloride (mg/l)	39	58	66	70	63	58	60	79	NA	65	59	92	52
Ethane (ug/l)	2 U	2 U	1.2 U	2.5 J	1.1 J	2 U	2 U	1.3 U	NA	18	22	23	2.9 J
Ethene (ug/l)	2 U	2 U	1.5 U	2.1 J	1.3 J	2 U	2 U	1.6 U	NA	2.9 J	9.4 J	6 J	1.9 J
Lactic Acid (mg/l)	NA	0.18	5 U	NA	0.18 B	NA	0.1	5 U	NA	NA	0.11 B	NA	0.074 J
Methane (ug/l)	240	320	0.72	38	31	5.2 J	13	2.1	NA	20	100	230	120
Nitrate (mg/l)	0.025 U	0.46	0.04 B	0.025 U	0.025 U	0.018 J	0.019 J	0.022 B	NA	0.025 U	0.025 U	0.025 U	0.05 U
Nitrite (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (ph)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propane (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid (mg/l)	NA	0.069	5 U	NA	0.05 U	NA	0.055	5 U	NA	NA	0.26	NA	0.05 U
Pyruvate (mg/l)	NA	0.15 U	5 U	NA	0.15 U	NA	0.15 U	5 U	NA	NA	0.15 U	NA	0.15 U
Sulfate (mg/l)	40	54	8.4	2.1	0.39 J	0.78 J	1 J	3.1 J	NA	0.48 J	0.63 J	0.5 U	0.56 J
Sulfide (mg/l)	0.8 U	0.8 U	0.03 U	0.8 U	0.8 U	0.8 U	0.92 J	0.03 U	NA	0.8 U	0.8 U	6.4 J	0.8 U
Total organic carbon (TOC) (mg/l)	3.2	3.2	59	1.8	0.46 J	0.35 J	0.4 J	10 U	NA	6.2	4.6	5	4.4

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Notes:

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M - Duplicate injection precision criteria not met

R - Unreliable Result

U - The material was analyzed for, but not detected

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UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

MG/LCACO3 - Milligrams per liter as CaCO3

NG/L - Nanograms per liter

PH - pH units

UG/L - Micrograms per liter

SITE 7 – ORDNANCE BURN AREA

Table 5
Current and Historic Analytical Results
Site 7 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		07GW103							
Sample ID	**PRG**	007GW1030804	007GW1030905	007GW103-1205	007GW103-0306	007GW103-0807	007GW103-1208	007GW103-0910	007GW103P-0910
Sample Date	**(µg/l)**	08/06/04	09/21/05	12/12/05	03/08/06	08/13/07	12/18/08	09/15/10	09/15/10
Chemical Name									
Volatile Organic Compounds (µg/l)									
Trichloroethene	5	1 U	2 U	2 U	2 U	NA	NA	NA	NA
Explosives (µg/l)									
2,4,6-Trinitrotoluene	2.5	2.5	0.83	0.15 U	0.24	0.2 U	1.9 U	0.12 U	0.12 U
2-Amino-4,6-dinitrotoluene	9.9	3	1.3 J	0.15 U	1.5 J	0.2 U	0.5 U	0.12 U	0.12 U
4-Amino-2,6-dinitrotoluene	9.9	3.7	0.2 U	0.15 U	0.2 U	0.2 U	0.75 U	0.12 U	0.12 U
Perchlorate	15	1 U	NA	NA	NA	NA	NA	0.25 U	0.25 U
RDX	15	11	11	0.15 U	9.7	0.2 U	6 U	0.12 U	0.12 U
Wet Chemistry									
Acetate (mg/l)	NA	NA	NA	NA	NA	40	7.6	NA	NA
Alkalinity (mg/l)	NA	NA	21	NA	NA	130	NA	NA	NA
Butyrate (mg/l)	NA	NA	NA	NA	NA	1 U	5 U	NA	NA
Carbon dioxide (mg/l)	NA	NA	150	150 J	150	150	NA	130	NA
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	NA	140,000	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	21 U	20 U	20 U	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	6.4	7.3	5 L	7.4	5.8	12	NA
Ethane (ug/l)	NA	NA	0.5 U	0.5 U	0.5 U	1 U	1.2 U	2 U	NA
Methane (ug/l)	NA	NA	0.5 U	0.5 U	0.5 U	5,300	14,000	10,000	NA
Nitrate (mg/l)	NA	NA	1	1.3	1.7 L	0.025 UJ	0.13 U	0.04 U	NA
Nitrate/Nitrite (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	NA	NA	0.025 U	0.025 U	0.025 U	0.025 UJ	0.13 U	0.034 B	NA
pH (ph)	NA	NA	5.5	NA	NA	6.2	NA	NA	NA
Propionate (mg/l)	NA	NA	NA	NA	NA	2	5 U	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	1 U	5 U	NA	NA
Sulfate (mg/l)	NA	NA	14	20	17	5 U	5 U	18	NA
Sulfide (mg/l)	NA	NA	0.03 U	0.03 U	0.03 U	0.03 U	0.03 R	0.75 U	NA
Total organic carbon (TOC) (mg/l)	NA	NA	10 U	10 U	10 U	33.6	31 J	3.5	NA

Notes:
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U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
deg/f - Degrees Fahrenheit
mg/l - Milligrams per liter
ms/cm - Milliseimens per centimeter
ntu - Nephelometric turbidity units
pct - Percent
ph - pH units
µg/l - Micrograms per liter

Table 5
Current and Historic Analytical Results
Site 7 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		07GW104						07GW104				
Sample ID	**PRG**	007GW1040804	007GW1040305	007GW1040405	007GW1040605	007GW104P0605	007GW1040905	007GW104-1205	007GW104-0306	007GW1040407	007GW104-1208	007GW104-0910
Sample Date	**(µg/l)**	08/05/04	03/11/05	04/05/05	06/09/05	06/09/05	09/21/05	12/12/05	03/07/06	04/04/07	12/17/08	09/17/10
Chemical Name												
Volatile Organic Compounds (µg/l)												
Trichloroethene	5	1 U	10 U	10 R	10 U	10 U	2 U	2 U	2 U	NA	NA	NA
Explosives (µg/l)												
2,4,6-Trinitrotoluene	2.5	29	160	170 L	38	28	180	0.1 U	180	0.4 UJ	1.9 U	0.12 U
2-Amino-4,6-dinitrotoluene	9.9	17	61	78 L	25	18	79	0.1 U	83	0.4 UJ	0.5 U	0.12 U
4-Amino-2,6-dinitrotoluene	9.9	21	0.34 U	0.16 L	0.13 U	0.12 U	0.18 UJ	0.1 U	0.2 U	0.4 UJ	0.75 U	0.12 U
Perchlorate	15	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	15	120	230	300 L	110	75	270	0.54	380	0.4 UJ	6 U	0.12 U
Wet Chemistry												
Acetate (mg/l)	NA	1 U	1	1 U	1 U	1 U	NA	NA	NA	91	71	NA
Alkalinity (mg/l)	NA	24 J	20 U	20 U	20 U	20 U	20 U	NA	NA	210	NA	NA
Butyrate (mg/l)	NA	1 U	1	1 U	1 U	1 U	NA	NA	NA	32	5 U	NA
Carbon dioxide (mg/l)	NA	72	80	120	20	21	150	150 J	150	750	NA	290
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	120,000	NA
Chemical oxygen demand (mg/l)	NA	10 U	20 U	20 U	20 U	20 U	20 U	20 U	35	NA	NA	NA
Chloride (mg/l)	NA	5	7.1	7.1 B	6.8	6.7	8.3	9.5	37 L	8.1	4.9	6.3
Ethane (ug/l)	NA	NA	27 U	27 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	1.7	1.2 U	2 U
Methane (ug/l)	NA	0.42	14 U	14 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2 U	7,700	14,000
Nitrate (mg/l)	NA	1.6	1.4	2.1 L	9	9.1	1.6	1.3	1.7 L	0.025 U	0.13 U	0.04 U
Nitrate/Nitrite (mg/l)	NA	NA	NA	2.3	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	NA	NA	0.15	0.049 L	0.46 B	0.92	0.25	0.025 U	0.025 U	0.025 U	0.13 U	0.041 J
pH (ph)	NA	NA	5.4	NA	NA	NA	5.2	NA	NA	5.8 J	NA	NA
Propionate (mg/l)	NA	1 U	1	1 U	1 U	1 U	NA	NA	NA	42	5 U	NA
Pyruvate (mg/l)	NA	10 U	2.9	2.7	1 U	1 U	NA	NA	NA	1 U	5 U	NA
Sulfate (mg/l)	NA	102	8.6	19 B	28	30	13	13	17 L	12 B	5 U	1.3
Sulfide (mg/l)	NA	1 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 UL	0.04 L	0.75 U
Total organic carbon (TOC) (mg/l)	NA	2	10 U	46	10 U	10 U	10 U	10 U	10 U	190	1,000 U	36

Notes:
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mg/l - Milligrams per liter
ms/cm - Milliseimens per centimeter
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pct - Percent
ph - pH units
µg/l - Micrograms per liter

Table 5
Current and Historic Analytical Results
Site 7 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		07GW105						07GW202					
Sample ID	**PRG**	007GW1050804	007GW1050905	007GW105-1205	007GW105-0306	007GW105-1208	007GW105-0910	007GW2020804	007GW2020305	007GW2020407	007GW202-0807	007GW202-1208	007GW202-0910
Sample Date	**(µg/l)**	08/06/04	09/21/05	12/12/05	03/08/06	12/18/08	09/15/10	08/06/04	03/11/05	04/03/07	08/14/07	12/16/08	09/14/10
Chemical Name													
Volatile Organic Compounds (µg/l)													
Trichloroethene	5	1 U	2 U	2 U	2 U	NA	NA	86	14	2 U	2 U	5 U	NA
Explosives (µg/l)													
2,4,6-Trinitrotoluene	2.5	1.5	0.18 U	0.2 U	0.2 U	1.9 U	0.12 U	0.2 U	0.2 U	3.6 L	1	1.9 U	0.12 U
2-Amino-4,6-dinitrotoluene	9.9	0.97	2.1 J	3.5	2.8 J	0.58	0.12 U	0.2 U	0.2 U	1.2 L	0.53	0.18 J	0.12 U
4-Amino-2,6-dinitrotoluene	9.9	0.8	0.18 U	0.2 U	0.2 U	0.66 J	0.12 U	0.2 U	0.2 U	1.8 L	0.94 J	0.3 J	0.12 U
Perchlorate	15	3	NA	NA	NA	NA	NA	1.9	NA	NA	NA	NA	NA
RDX	15	14	26	38	36	23	7.6	0.5 U	0.16 J	13 L	6.8	2.1 J	0.92
Wet Chemistry													
Acetate (mg/l)	NA	NA	NA	NA	NA	5 U	NA	NA	1	NA	1 U	NA	NA
Alkalinity (mg/l)	NA	NA	20 U	NA	NA	NA	NA	NA	20 U	NA	34	NA	NA
Butyrate (mg/l)	NA	NA	NA	NA	NA	5 U	NA	NA	1	NA	1 U	NA	NA
Carbon dioxide (mg/l)	NA	NA	200	200 J	250	NA	150	NA	56	NA	350	NA	160
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	93,000	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	20 U	21 U	20 U	NA	NA	NA	21 U	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	8.3	8.6	9.1 L	11	14	NA	12	NA	18	NA	19
Ethane (ug/l)	NA	NA	0.5 U	0.5 U	0.5 U	1.2 U	2 U	NA	27 U	NA	1 U	NA	2 U
Methane (ug/l)	NA	NA	0.5 U	0.5 U	0.5 U	5,400	7,300	NA	14 U	NA	1.2 J	NA	1 J
Nitrate (mg/l)	NA	NA	4.1	3.9	2.7 L	0.13 U	0.04 U	NA	0.75	NA	1.3	NA	0.89
Nitrate/Nitrite (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	NA	NA	0.025 U	0.025 U	0.025 U	0.13 U	0.12	NA	0.25	NA	0.025 U	NA	0.0079 B
pH (ph)	NA	NA	5.2	NA	NA	NA	NA	NA	5.7	NA	5.3	NA	NA
Propionate (mg/l)	NA	NA	NA	NA	NA	5 U	NA	NA	1	NA	1 U	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	5 U	NA	NA	3	NA	1 U	NA	NA
Sulfate (mg/l)	NA	NA	18	18	17	9.9	20	NA	38	NA	59	NA	47 L
Sulfide (mg/l)	NA	NA	0.03 U	0.03 U	0.03 U	0.03 R	0.75 U	NA	0.03 U	NA	0.03 U	NA	0.75 U
Total organic carbon (TOC) (mg/l)	NA	NA	10 U	10 U	10 U	3.6 J	1.7	NA	10 U	NA	1.31	NA	1.9

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Table 5
Current and Historic Analytical Results
Site 7 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		07GW300				46GW206		
Sample ID	**PRG**	007GW3000407	007GW300-0807	007GW300-1208	007GW300-0910	046GW206-0306	046GW206-1208	046GW206-0910
Sample Date	**(µg/l)**	04/03/07	08/13/07	12/18/08	09/15/10	03/06/06	12/16/08	09/15/10
Chemical Name								
Volatile Organic Compounds (µg/l)								
Trichloroethene	5	NA	NA	NA	NA	18	1.9 J	1
Explosives (µg/l)								
2,4,6-Trinitrotoluene	2.5	0.2 UL	0.2 U	0.62 J	0.12 U	0.55	1.9 U	0.12 U
2-Amino-4,6-dinitrotoluene	9.9	1.2 L	3.2	3.2	0.12 U	0.92 J	0.56	0.12 U
4-Amino-2,6-dinitrotoluene	9.9	1 L	4.7	3.6	0.12 U	0.2 U	0.49 J	0.12 U
Perchlorate	15	NA	NA	NA	NA	NA	NA	1.9
RDX	15	8.9 L	28	48	1.9	7.1	5 J	2
Wet Chemistry								
Acetate (mg/l)	NA	94	5	5 U	NA	NA	NA	NA
Alkalinity (mg/l)	NA	200	86	NA	NA	NA	NA	NA
Butyrate (mg/l)	NA	12	1 U	5 U	NA	NA	NA	NA
Carbon dioxide (mg/l)	NA	520	120	NA	160	NA	NA	160
Carbon dioxide (ug/l)	NA	NA	NA	130,000	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	11	9.3	10	11	NA	NA	14
Ethane (ug/l)	NA	0.83 J	1 U	1.2 U	2 U	NA	NA	2 U
Methane (ug/l)	NA	75	3,300	28,000	13,000	NA	NA	6,000
Nitrate (mg/l)	NA	0.12	0.28 J	0.13 U	0.019 J	NA	NA	0.23
Nitrate/Nitrite (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite (mg/l)	NA	0.025 U	0.025 UJ	0.13 U	0.0083 B	NA	NA	0.033 B
pH (ph)	NA	5.9 J	6.2	NA	NA	NA	NA	NA
Propionate (mg/l)	NA	61	1.9	5 U	NA	NA	NA	NA
Pyruvate (mg/l)	NA	1 U	1 U	5 U	NA	NA	NA	NA
Sulfate (mg/l)	NA	5 U	5 U	5 U	22	NA	NA	28
Sulfide (mg/l)	NA	0.03 UL	0.03 U	0.03 R	0.75 U	NA	NA	0.75 U
Total organic carbon (TOC) (mg/l)	NA	99	8.92	1.5	1.9	NA	NA	1.6 B

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mg/l - Milligrams per liter
ms/cm - Milliseimens per centimeter
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pct - Percent
ph - pH units
µg/l - Micrograms per liter

SITE 9 – INDUSTRIAL WASTEWATER DISPOSAL 300 AREA

TABLE 5
Current and Historic Analytical Results
Site 9 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		09GW01						
Sample ID	**PRG**	009GW001PTR8	009GW0010905	009GW001-0606	009GW001-0807	009GW001-1208	009GW001-0910	009GW001P-0910
Sample Date	**(µg/l)**	08/02/04	09/21/05	06/07/06	08/14/07	12/15/08	09/17/10	09/17/10
Chemical Name								
Volatile Organic Compounds (µg/l)								
Tetrachloroethene	5	1 U	2 U	2 U	2 U	5 U	0.5 U	0.5 U
Trichloroethene	5	5.6	9	4	5	4.5 J	2.9	3
Explosives (µg/l)								
Perchlorate	15	54	29	12	8.9	NA	NA	NA
RDX	10	87	58	37	39	30	29	27
Total Metals (µg/l)								
Iron	11,000	NA	NA	NA	NA	NA	66.2 B	NA
Wet Chemistry								
Acetate (mg/l)	NA	1 J	NA	1 U	NA	NA	NA	NA
Alkalinity (mg/l)	NA	37	28	26	26	NA	NA	NA
Butyrate (mg/l)	NA	1 U	NA	1 UL	NA	NA	NA	NA
Carbon dioxide (mg/l)	NA	130	230	160	230	NA	170	NA
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	99,000	NA	NA
Chemical oxygen demand (mg/l)	NA	6.4	20 U	20 U	NA	NA	NA	NA
Chloride (mg/l)	NA	16	17	18	22	19	17	NA
Ethane (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	0.5 U	0.5 U	1 U	1.5 U	2 U	NA
Lactate (mg/l)	NA	25 U	NA	1 U	NA	NA	NA	NA
Methane (ug/l)	NA	NA	130	230	540	840	2,000	NA
Nitrate (mg/l)	NA	0.47	1.8	0.36	0.47	0.22	0.23	NA
Nitrite (mg/l)	NA	NA	0.025 U	0.025 U	0.025 U	0.13 U	0.04 U	NA
pH (ph)	NA	NA	5.4	5.5	5.4	NA	NA	NA
Propionate (mg/l)	NA	1 U	NA	1 UL	NA	NA	NA	NA
Pyruvate (mg/l)	NA	10 U	NA	1 U	NA	NA	NA	NA
Sulfate (mg/l)	NA	0.33	5 U	5 U	5 U	5 U	0.45 J	NA
Sulfide (mg/l)	NA	2 U	0.03 U	0.03 UL	0.03 U	0.03 R	NA	NA
Total organic carbon (TOC) (mg/l)	NA	NA	10 U	25	NA	10 U	0.77 B	NA

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mg/l - Milligrams per liter
ms/cm - Milliseimens per centimeter
ng/l - Nanograms per liter
ntu - Nephelometric turbidity units
pct - Percent
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TABLE 5
Current and Historic Analytical Results
Site 9 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		09GW100				09GW105					
Sample ID	**PRG**	009GW100PTR8	009GW1000905	009GW100-0606	009GW100-0910	009GW105PTR8	009GW1050905	009GW105-0606	009GW105-0807	009GW105-1208	009GW105-0910
Sample Date	**(µg/l)**	08/03/04	09/20/05	06/07/06	09/16/10	08/03/04	09/20/05	06/07/06	08/14/07	12/15/08	09/16/10
Chemical Name											
Volatile Organic Compounds (µg/l)											
Tetrachloroethene	5	1 U	2 U	2 U	NA	1 U	2 U	2 U	2 U	5 U	0.5 U
Trichloroethene	5	3.3	2 U	2 U	NA	4.8 K	14	7	6	2.9 J	4.2
Explosives (µg/l)											
Perchlorate	15	NA	2 U	10 U	NA	NA	9.9	10	NA	NA	4.3
RDX	10	NA	NA	NA	0.15 J	NA	NA	NA	NA	1.3 J	0.99
Total Metals (µg/l)											
Iron	11,000	NA	NA	NA	847	NA	NA	NA	NA	NA	896
Wet Chemistry											
Acetate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	20	NA	NA
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide (mg/l)	NA	NA	NA	NA	36	NA	NA	NA	140	NA	93
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	110	NA	NA	NA	12	NA	10
Ethane (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	2 U	NA	NA	NA	1 U	NA	2 U
Lactate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	3.2 J	NA	NA	NA	0.37 J	NA	4.3 J
Nitrate (mg/l)	NA	NA	NA	NA	0.19	NA	NA	NA	0.43	NA	0.3
Nitrite (mg/l)	NA	NA	NA	NA	0.049 J	NA	NA	NA	0.025 U	NA	0.057
pH (ph)	NA	NA	NA	NA	NA	NA	NA	NA	5.5	NA	NA
Propionate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	NA	NA	28	NA	NA	NA	5 U	NA	5.7
Sulfide (mg/l)	NA	NA	NA	NA	1.4	NA	NA	NA	0.03 U	NA	0.75 U
Total organic carbon (TOC) (mg/l)	NA	NA	NA	NA	3.2	NA	NA	NA	NA	NA	0.56 B

Notes:

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TABLE 5
Current and Historic Analytical Results
Site 9 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		09GW205				09GW215				
Sample ID	**PRG**	009GW205PTR8	009GW2050905	009GW205-0606	009GW205-0910	009GW2150305	009GW2150605	009GW2150905	009GW215-0606	009GW215-0910
Sample Date	**(µg/l)**	08/02/04	09/19/05	06/06/06	09/17/10	03/11/05	06/09/05	09/19/05	06/06/06	09/17/10
Chemical Name										
Volatile Organic Compounds (µg/l)										
Tetrachloroethene	5	1 U	2 U	2 U	NA	10 U	10 U	2 U	2 U	5 U
Trichloroethene	5	3.8	4	3	NA	10 U	10 U	2 U	2 U	5 U
Explosives (µg/l)										
Perchlorate	15	14	5.2	10 U	NA	64 J	410 J	970	1,100	NA
RDX	10	18	7.6	5.5	2	6.5	99	190	360	0.12 UL
Total Metals (µg/l)										
Iron	11,000	NA	NA	NA	542	NA	NA	NA	NA	54,800
Wet Chemistry										
Acetate (mg/l)	NA	NA	NA	1 U	NA	1	1 U	NA	2	NA
Alkalinity (mg/l)	NA	NA	31	25	NA	90	55	20 U	28	NA
Butyrate (mg/l)	NA	NA	NA	1 UL	NA	1	1 U	NA	1 UL	NA
Carbon dioxide (mg/l)	NA	NA	200	210	75	62	62	10 U	89	180
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	21 U	20 U	NA	77	20 U	20 U	85	NA
Chloride (mg/l)	NA	NA	24 L	24 L	24	16	6.2	5.3 L	5.9 L	23
Ethane (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	0.5 U	0.5 U	2 U	36 U	0.5 U	0.5 U	0.5 U	1.2 J
Lactate (mg/l)	NA	NA	NA	1 U	NA	1 U	1 U	NA	1 U	NA
Methane (ug/l)	NA	NA	110	230	930	60	2.2	1.4 B	42	7,200
Nitrate (mg/l)	NA	NA	0.22 L	0.2 L	0.15	0.079	6.2	1.8 L	2.7 L	0.04 U
Nitrite (mg/l)	NA	NA	0.025 UL	0.025 UL	0.04 U	0.24	0.66 B	0.025 UL	0.025 UL	0.021 J
pH (ph)	NA	NA	5.5	5.4	NA	6.5	NA	6.3	5.8	NA
Propionate (mg/l)	NA	NA	NA	1 UL	NA	1	1 U	NA	1 UL	NA
Pyruvate (mg/l)	NA	NA	NA	1 U	NA	2.8	1 U	NA	1 U	NA
Sulfate (mg/l)	NA	NA	5 UL	5 UL	0.83 J	22	10	5 UL	5 UL	10
Sulfide (mg/l)	NA	NA	0.03 U	0.03 UL	1.4	0.03 U	0.03 U	0.03 U	0.03 UL	NA
Total organic carbon (TOC) (mg/l)	NA	NA	10 U	10 U	1.2 B	18	10 U	10 U	25	1,100

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TABLE 5
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Site 9 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		09GW057D							
Sample ID	**PRG**	009GW057DPTR8	009GW57D0905	009GW57D-0606	009GW57DP-0606	009GW57D-0807	009GW57D-1208	009GW57DP-1208	009GW57D-0910
Sample Date	**(µg/l)**	08/03/04	09/20/05	06/07/06	06/07/06	08/14/07	12/15/08	12/15/08	09/16/10
Chemical Name									
Volatile Organic Compounds (µg/l)									
Tetrachloroethene	5	1 U	2 U	2 U	2 U	2 U	5 U	5 U	0.5 U
Trichloroethene	5	10	23	14	13	11	3.1 J	3.3 J	1.3
Explosives (µg/l)									
Perchlorate	15	NA	14	12	12	NA	NA	NA	NA
RDX	10	NA	NA	NA	NA	NA	1.5 J	1.5 J	1.2
Total Metals (µg/l)									
Iron	11,000	NA	NA	NA	NA	NA	NA	NA	42.4 B
Wet Chemistry									
Acetate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alkalinity (mg/l)	NA	NA	NA	NA	NA	20 U	NA	NA	NA
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon dioxide (mg/l)	NA	NA	NA	NA	NA	190	100	NA	100
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	NA	13	11	NA	11
Ethane (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ng/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	1 U	2 U	NA	2 U
Lactate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	0.54 J	2.8 J	NA	2.8 J
Nitrate (mg/l)	NA	NA	NA	NA	NA	0.71	0.64	NA	0.64
Nitrite (mg/l)	NA	NA	NA	NA	NA	0.025 U	0.04 U	NA	0.04 U
pH (ph)	NA	NA	NA	NA	NA	5.2	NA	NA	NA
Propionate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	NA	NA	NA	5 U	2.5	NA	2.5
Sulfide (mg/l)	NA	NA	NA	NA	NA	0.03 U	0.75 J	NA	0.75 J
Total organic carbon (TOC) (mg/l)	NA	NA	NA	NA	NA	NA	0.83 B	NA	0.83 B

Notes:
Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lowe
L - Analyte present, value may be biased low, actual value may be highe
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
deg/f - Degrees Fahrenheit
mg/l - Milligrams per liter
ms/cm - Milliseimens per centimeter
ng/l - Nanograms per liter
ntu - Nephelometric turbidity units
pct - Percent
ph - pH units
µg/l - Micrograms per liter

TABLE 5
Current and Historic Analytical Results
Site 9 2010 Annual Post-Injection Groundwater Sampling Event, September 2010
Former NSWC-White Oak, Silver Spring, Maryland

Station ID		09GW057S				
Sample ID	**PRG**	009GW057SPTR8	009GW57S0905	009GW57S-0606	009GW57S-1208	009GW57S-0910
Sample Date	**(µg/l)**	08/03/04	09/20/05	06/07/06	12/15/08	09/16/10
Chemical Name						
Volatile Organic Compounds (µg/l)						
Tetrachloroethene	5	1 U	2 U	2 U	5 U	0.5 U
Trichloroethene	5	4.4 K	5	3	5 U	0.5 U
Explosives (µg/l)						
Perchlorate	15	NA	7.9	6.2 J	NA	3.3
RDX	10	NA	NA	NA	0.44 J	0.35
Total Metals (µg/l)						
Iron	11,000	NA	NA	NA	NA	87.4 J
Wet Chemistry						
Acetate (mg/l)	NA	NA	NA	NA	NA	NA
Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA
Butyrate (mg/l)	NA	NA	NA	NA	NA	NA
Carbon dioxide (mg/l)	NA	NA	NA	NA	NA	99
Carbon dioxide (ug/l)	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (mg/l)	NA	NA	NA	NA	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	NA	8.8
Ethane (ng/l)	NA	NA	NA	NA	NA	NA
Ethene (ng/l)	NA	NA	NA	NA	NA	NA
Ethene (ug/l)	NA	NA	NA	NA	NA	2 U
Lactate (mg/l)	NA	NA	NA	NA	NA	NA
Methane (ug/l)	NA	NA	NA	NA	NA	2.6 J
Nitrate (mg/l)	NA	NA	NA	NA	NA	0.48
Nitrite (mg/l)	NA	NA	NA	NA	NA	0.04 U
pH (ph)	NA	NA	NA	NA	NA	NA
Propionate (mg/l)	NA	NA	NA	NA	NA	NA
Pyruvate (mg/l)	NA	NA	NA	NA	NA	NA
Sulfate (mg/l)	NA	NA	NA	NA	NA	2.9
Sulfide (mg/l)	NA	NA	NA	NA	NA	2.7
Total organic carbon (TOC) (mg/l)	NA	NA	NA	NA	NA	0.86 B

Notes:
Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lowe
L - Analyte present, value may be biased low, actual value may be highe
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
deg/f - Degrees Fahrenheit
mg/l - Milligrams per liter
ms/cm - Milliseimens per centimeter
ng/l - Nanograms per liter
ntu - Nephelometric turbidity units
pct - Percent
ph - pH units
µg/l - Micrograms per liter

SITE 11 – INDUSTRIAL WASTEWATER DISPOSAL 100 AREA

GROUNDWATER DETECTIONS
SITE 11 - INDUSTRIAL WASTEWATER 100 AREA
FORMER NSWC WHITE OAK, SILVER SPRING, MARYLAND

Parameter	Federal MCL	11MW201D 11GW201D-1009 10/7/2009	11MW201S 11GW201S-1009 10/7/2009	11MW205S 11GW205S-1009 10/7/2009	11MW206S 11GW206S-1009 10/7/2009
Volatile Organics (ug/l)					
1,1,2-TRICHLOROTRIFLUOROETHANE	NA			0.15 U	0.15 U
1,1-DICHLOROETHANE	NA			0.10 U	0.10 U
1,2-DICHLOROETHANE	5			0.10 U	0.10 U
ACETONE	NA			1.2 U	1.2 U
BENZENE	5			0.45 J	0.10 U
BROMODICHLOROMETHANE	80			0.10 U	0.10 U
CHLOROBENZENE	100			0.26 J	0.10 U
CHLOROFORM	80			0.10 U	0.19 J
CHLOROMETHANE	NA			0.10 U	1.8
CIS-1,2-DICHLOROETHENE	70			2	0.10 U
DICHLORODIFLUOROMETHANE	NA			0.10 U	0.10 U
ISOPROPYLBENZENE	NA			0.30 J	0.10 U
METHYL TERT-BUTYL ETHER	NA			0.48 J	0.10 U
METHYLENE CHLORIDE	5			0.44 J	0.10 U
TETRACHLOROETHENE	5			0.82	0.21 J
TOTAL 1,2-DICHLOROETHENE	NA			2	0.10 U
TRANS-1,2-DICHLOROETHENE	100			0.10 U	0.10 U
TRICHLOROETHENE	5			0.63	1.3
TRICHLOROFLUOROMETHANE	NA			0.10 U	12
VINYL CHLORIDE	2			0.95	0.10 U
Volatile Gases (ug/l)					
METHANE	NA			42	0.40 B
Filtered Inorganics (ug/l)					
IRON	NA			207	15.4 U
MANGANESE	NA			7110	23
Miscellaneous Parameters (mg/l)					
HEXAVALENT CHROMIUM	0.1	0.00284	0.00912		
Miscellaneous Parameters (ug/l)					
PERCHLORATE	15	0.42	0.26		

µg/l — micrograms per liter
mg/l — milligrams per liter
U - Nondetect as Reported by the Laboratory
J - Estimated Result

Federal MCL - Federal Maximum Contaminant Level (EPA, 2006).

GROUNDWATER DETECTIONS
SITE 11 - INDUSTRIAL WASTEWATER 100 AREA
FORMER NSWC WHITE OAK, SILVER SPRING, MARYLAND

Parameter	Federal MCL	11MW207D 11GW207D-1009 10/7/2009	11MW207S 11GW207S-1009 10/7/2009	11MW209D 11GW209D-1009 10/12/2009	11MW209S 11GW209S-1009 10/12/2009	11MW209S 11GW209S-1009-D 10/12/2009
Volatile Organics (ug/l)						
1,1,2-TRICHLOROTRIFLUOROETHANE	NA	0.35 J	0.15 U	0.15 U	0.15 U	0.15 U
1,1-DICHLOROETHANE	NA	0.35 J	0.10 U	0.10 U	0.10 U	0.10 U
1,2-DICHLOROETHANE	5	1	0.10 U	0.10 U	0.10 U	0.10 U
ACETONE	NA	1.2 U	1.2 U	1.2 U	1.2 U	1.6 J
BENZENE	5	0.10 U	0.10 U	0.18 J	0.10 U	0.10 U
BROMODICHLOROMETHANE	80	0.11 J	0.10 U	0.10 U	0.10 U	0.10 U
CHLOROBENZENE	100	0.10 U	0.10 U	0.20 J	0.10 U	0.10 U
CHLOROFORM	80	1.2	0.28 J	0.79	0.37 J	0.39 J
CHLOROMETHANE	NA	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
CIS-1,2-DICHLOROETHENE	70	5	0.22 J	0.10 U	0.10 U	0.10 U
DICHLORODIFLUOROMETHANE	NA	0.10 U	0.10 U	1	0.45 J	0.46 J
ISOPROPYLBENZENE	NA	0.10 U	0.10 U	0.10 U	0.10 U	0.10 U
METHYL TERT-BUTYL ETHER	NA	0.35 J	0.10 U	0.39 J	0.26 J	0.26 J
METHYLENE CHLORIDE	5	0.10 U	0.10 U	0.27 B	0.20 B	0.21 B
TETRACHLOROETHENE	5	0.34 J	0.11 U	0.11 U	0.11 U	0.11 U
TOTAL 1,2-DICHLOROETHENE	NA	5.2	0.22 J	0.10 U	0.10 U	0.10 U
TRANS-1,2-DICHLOROETHENE	100	0.14 J	0.10 U	0.10 U	0.10 U	0.10 U
TRICHLOROETHENE	5	**9.5 [FED]**	0.56	0.10 U	0.10 U	0.10 U
TRICHLOROFLUOROMETHANE	NA	2.3	0.77	7.1	3.1	3.2
VINYL CHLORIDE	2	0.22 J	0.10 U	0.10 U	0.10 U	0.10 U
Volatile Gases (ug/l)						
METHANE	NA	0.30 B	0.30 B	1 B	0.60 B	0.50 B
Filtered Inorganics (ug/l)						
IRON	NA	15.4 U	18.5	15.4 U	15.4 U	15.4 U
MANGANESE	NA	11	113	168	237	234
Miscellaneous Parameters (mg/l)						
HEXAVALENT CHROMIUM	0.1					
Miscellaneous Parameters (ug/l)						
PERCHLORATE	15					

μg/l — micrograms per liter
mg/l — milligrams per liter
U - Nondetect as Reported by the Laboratory
J - Estimated Result

Federal MCL - Federal Maximum Contaminant Level (EPA, 2006).

SITE 49 – TCE GROUNDWATER PLUME IN 400 AREA

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID		49GW200				
Sample ID	**PRG**	049GW200-1205	049GW200-0408	049GW200-0908	049GW200-0809	49GW200-1210
Sample Date		12/15/05	03/31/08	09/18/08	08/10/09	12/17/10
Chemical Name						
Volatile Organic Compounds (UG/L)						
cis-1,2-Dichloroethene	70	550	850	1,300	970	1,200
Trichloroethene	5	1,700	390	2.8 J	5.7	24
Vinyl chloride	2	4	2 U	1.4	1.7	2.9
Semivolatile Organic Compounds (UG/L)						
1,4-Dioxane		NA	NA	5 U	NA	NA
Dissolved Metals (UG/L)						
Iron, Dissolved	11,000	427 J	870	753	2,060	1,570

Notes:

Shading indicates detections
B - Analyte not detected at significantly greater than that in an associated blank.
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW201D					
Sample ID	049GW201D-1205	049GW201D-1207	049GW201D-0408	049GW201D-0908	049GW201D-0809	49GW201D-1210
Sample Date	12/14/05	12/18/07	03/31/08	09/18/08	08/12/09	12/15/10
Chemical Name						
Volatile Organic Compounds (UG/L)						
cis-1,2-Dichloroethene	310	770	480	620	140	400
Trichloroethene	550	300	170	170	25	52 J
Vinyl chloride	2 U	19	4.3	14	3.5	6.2 J
Semivolatile Organic Compounds (UG/L)						
1,4-Dioxane	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)						
Iron, Dissolved	2,640 J	7,170	1,500	4,900	122 J	1,630

Notes:

Shading indicates detections
B - Analyte not detected at significantly greater than that in an associated blank.
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW201DD			
Sample ID	049GW201DD-1205	049GW201DD-0908	049GW201DD-0809	49GW201DD-1210
Sample Date	12/15/05	09/18/08	08/13/09	12/15/10
Chemical Name				
Volatile Organic Compounds (UG/L)				
cis-1,2-Dichloroethene	10 U	5 U	5 U	0.5 U
Trichloroethene	4	5 U	5 U	0.5 U
Vinyl chloride	2 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)				
1,4-Dioxane	NA	NA	NA	NA
Dissolved Metals (UG/L)				
Iron, Dissolved	60.2 B	74.5 J	238	295

Notes:

Shading indicates detections

B - Analyte not detected at significantly greater than that in an associated blank.

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW201S							
Sample ID	049GW201S-1205	049GW201S-1207	049GW201S-0408	049GW201SP-0408	049GW201S-0908	049GW201S-0809	49GW201S-1210	49GW201SP-1210
Sample Date	12/13/05	12/19/07	03/31/08	03/31/08	09/18/08	08/12/09	12/15/10	12/15/10
Chemical Name								
Volatile Organic Compounds (UG/L)								
cis-1,2-Dichloroethene	38	26	69	66	150	88	39	38
Trichloroethene	150	43	53	50	180	130	54	49
Vinyl chloride	2 U	2 U	2 U	2 U	1 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)								
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)								
Iron, Dissolved	188 B	100 U	99.8 J	221	65 J	62.3 J	41 B	26.3 B

Notes:

Shading indicates detections

B - Analyte not detected at significantly greater than that in an associated blank.

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW202D				
Sample ID	049GW202D-1205	049GW202D-0408	049GW202D-0908	049GW202D-0809	049GW202D-0111
Sample Date	12/13/05	04/02/08	09/18/08	08/11/09	01/05/11
Chemical Name					
Volatile Organic Compounds (UG/L)					
cis-1,2-Dichloroethene	2 J	1.5 J	1.1 J	0.87 J	1.1
Trichloroethene	17	12	6.9	9.6	49
Vinyl chloride	2 U	2 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)					
1,4-Dioxane	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)					
Iron, Dissolved	39.4 B	87.3 J	61 U	92.2 J	237

Notes:

Shading indicates detections

B - Analyte not detected at significantly greater than that in an associated blank.

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW202S			
Sample ID	049GW202S-1205	049GW202S-0408	049GW202S-0908	049GW202S-0809
Sample Date	12/15/05	04/01/08	09/16/08	08/12/09
Chemical Name				
Volatile Organic Compounds (UG/L)				
cis-1,2-Dichloroethene	10	5.5	4.4 J	5.2
Trichloroethene	29	25	18	16
Vinyl chloride	2 U	2 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)				
1,4-Dioxane	NA	NA	NA	NA
Dissolved Metals (UG/L)				
Iron, Dissolved	2,680 J	505	337	1,700

Notes:
Shading indicates detections
B - Analyte not detected at significantly greater than that in an associated blank.
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW203					
Sample ID	049GW203-1205	049GW203-0408	049GW203-0908	049GW203-0809	049GW203P-0809	49GW203-1210
Sample Date	12/13/05	04/01/08	09/19/08	08/13/09	08/13/09	12/17/10
Chemical Name						
Volatile Organic Compounds (UG/L)						
cis-1,2-Dichloroethene	19	18	5 U	5 U	5 U	0.62 J
Trichloroethene	120	110	2.4 J	2 J	1.8 J	1.6 B
Vinyl chloride	2 U	2 U	1 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)						
1,4-Dioxane	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)						
Iron, Dissolved	11,600 J	11,100	13,800	6,020	5,880	6,830

Notes:

Shading indicates detections

B - Analyte not detected at significantly greater than that in an associated blank.

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW205				
Sample ID	049GW205-1205	049GW205-0408	049GW205-0908	049GW205-0809	49GW205-1210
Sample Date	12/14/05	04/02/08	09/18/08	08/12/09	12/15/10
Chemical Name					
Volatile Organic Compounds (UG/L)					
cis-1,2-Dichloroethene	10 U	2 U	5 U	5 U	0.5 U
Trichloroethene	7	1.1 J	5 U	5 U	0.5 U
Vinyl chloride	2 U	2 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)					
1,4-Dioxane	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)					
Iron, Dissolved	5,220 J	471	5,340	502	186

Notes:
Shading indicates detections
B - Analyte not detected at significantly greater than that in an associated blank.
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW206D			
Sample ID	049GW206D-1205	049GW206D-0908	049GW206D-0809	49GW206D-1210
Sample Date	12/15/05	09/17/08	08/12/09	12/17/10
Chemical Name				
Volatile Organic Compounds (UG/L)				
cis-1,2-Dichloroethene	85	44	1.4 J	4.1
Trichloroethene	46	6.7	1.1 J	3.2 B
Vinyl chloride	2 U	12	1.4	4.5
Semivolatile Organic Compounds (UG/L)				
1,4-Dioxane	NA	NA	NA	NA
Dissolved Metals (UG/L)				
Iron, Dissolved	260 J	409	612	1,990

Notes:

Shading indicates detections
B - Analyte not detected at significantly greater than that in an associated blank.
J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW206M				
Sample ID	049GW206M-1205	049GW206M-0408	049GW206M-0908	049GW206M-0809	49GW206M-1210
Sample Date	12/15/05	04/01/08	09/17/08	08/12/09	12/15/10
Chemical Name					
Volatile Organic Compounds (UG/L)					
cis-1,2-Dichloroethene	210	190	230	170	180
Trichloroethene	210	210	200	150	190
Vinyl chloride	81	11	18	15	8.1
Semivolatile Organic Compounds (UG/L)					
1,4-Dioxane	NA	NA	5 U	NA	NA
Dissolved Metals (UG/L)					
Iron, Dissolved	16,100 J	11,400	20,900	25,500	18,600

Notes:
Shading indicates detections
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J - Analyte present, value may or may not be accurate or precise
L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW206S					
Sample ID	049GW206S-1205	049GW206S-0408	049GW206S-0908	049GW206S-0809	049GW206SP-0809	49GW206S-1210
Sample Date	12/16/05	04/01/08	09/17/08	08/11/09	08/11/09	12/15/10
Chemical Name						
Volatile Organic Compounds (UG/L)						
cis-1,2-Dichloroethene	87	67	61	36	36	64
Trichloroethene	180	250	290	180	170	200
Vinyl chloride	2 U	2 U	1 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)						
1,4-Dioxane	NA	NA	5 U	NA	NA	NA
Dissolved Metals (UG/L)						
Iron, Dissolved	2,000 J	280	198 J	200	192 J	393

Notes:

Shading indicates detections

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L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW207D						
Sample ID	049GW207D-1205	049GW207D-1207	049GW207DP-1207	049GW207D-0408	049GW207D-0908	049GW207D-0809	49GW207D-1210
Sample Date	12/16/05	12/18/07	12/18/07	04/01/08	09/16/08	08/10/09	12/16/10
Chemical Name							
Volatile Organic Compounds (UG/L)							
cis-1,2-Dichloroethene	130	2	1 J	60	3.2 J	490	200
Trichloroethene	520	6	4	2.3	36	1,100	7.7
Vinyl chloride	2 U	2 U	2 U	2 U	1 U	3.6	0.44 J
Semivolatile Organic Compounds (UG/L)							
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)							
Iron, Dissolved	53.9 B	116	139	23.3 B	75.1 J	200 U	589

Notes:

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NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW207S						
Sample ID	049GW207S-1205	049GW207S-1207	049GW207S-0408	049GW207S-0908	049GW207S-0809	49GW207S-1210	49GW207SP-1210
Sample Date	12/16/05	12/18/07	03/31/08	09/16/08	08/11/09	12/16/10	12/16/10
Chemical Name							
Volatile Organic Compounds (UG/L)							
cis-1,2-Dichloroethene	140	480	420	610	290	150	150
Trichloroethene	650	9	1.9 J	8.1	240	1.2	1.1
Vinyl chloride	2 U	2 U	2 U	1.7	45	89	83
Semivolatile Organic Compounds (UG/L)							
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)							
Iron, Dissolved	27,500 J	38,000	42,100	39,200	17,800	8.1 B	13.7 B

Notes:

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B - Analyte not detected at significantly greater than that in an associated blank.
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L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW208D							
Sample ID	049GW208D-1205	049GW208D-1207	049GW208D-0408	049GW208D-0908	049GW208DP-0908	049GW208D-0809	049GW208DP-0809	49GW208D-1210
Sample Date	12/14/05	12/19/07	04/01/08	09/17/08	09/17/08	08/11/09	08/11/09	12/17/10
Chemical Name								
Volatile Organic Compounds (UG/L)								
cis-1,2-Dichloroethene	450	350	320	490	460	60	NA	440 L
Trichloroethene	3,100	830	920	2,500	2,300	270	NA	1,200 L
Vinyl chloride	6 J	1 J	2 U	3.1	3.4	1 U	NA	2.2
Semivolatile Organic Compounds (UG/L)								
1,4-Dioxane	NA	NA	NA	NA	NA	5 U	5 U	0.4 J
Dissolved Metals (UG/L)								
Iron, Dissolved	999 J	100 U	20.5 B	61 U	NA	200 U	NA	80 U

Notes:

Shading indicates detections

B - Analyte not detected at significantly greater than that in an associated blank.

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW208S						
Sample ID	049GW208S-1205	049GW208SP-1205	049GW208S-1207	049GW208S-0408	049GW208S-0908	049GW208S-0809	49GW208S-1210
Sample Date	12/14/05	12/14/05	12/18/07	03/31/08	09/17/08	08/11/09	12/16/10
Chemical Name							
Volatile Organic Compounds (UG/L)							
cis-1,2-Dichloroethene	120	120	74	63	65	29	26
Trichloroethene	270	290	110	140	130	48	34
Vinyl chloride	2 U	2 U	2 U	2 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)							
1,4-Dioxane	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)							
Iron, Dissolved	67 B	68.8 B	271	556	61 U	26,000	136

Notes:

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L - Analyte present, value may be biased low, actual value may be higher
NA - Not analyzed
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
PH - pH units
UG/L - Micrograms per liter

TABLE 5
White Oak
CTO-JU38, Site 49
Historic COC CVOC Concentrations in Groundwater 2005-2010

Station ID	49GW209					
Sample ID	049GW209-1205	049GW209-1207	049GW209-0408	049GW209-0908	049GW209-0809	49GW209-1210
Sample Date	12/13/05	12/19/07	04/02/08	09/19/08	08/13/09	12/17/10
Chemical Name						
Volatile Organic Compounds (UG/L)						
cis-1,2-Dichloroethene	180	1 J	97	2.5 J	5 U	0.6 J
Trichloroethene	1,400	10	470	6.2	1.3 J	1 B
Vinyl chloride	2 U	2 U	2 U	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)						
1,4-Dioxane	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)						
Iron, Dissolved	14,000 J	100 U	3,740	5,300	3,010	1,860

Notes:

Shading indicates detections

B - Analyte not detected at significantly greater than that in an associated blank.

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

NA - Not analyzed

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

PH - pH units

UG/L - Micrograms per liter

SWMU 87 – BUILDING 611 SOLID WASTE STORAGE AREA

SUMMARY OF OCTOBER 2011
GROUNDWATER DETECTIONS
SWMU - 87
FORMER NSWC WHITE OAK, SILVER SPRING, MARYLAND

PARAMETER	ORNL Tap	Federal MCL	87WP101 87WP101-1011 10/18/2011	87WP103 87WP103-1011 10/19/2011	87WP201 87WP201-1011 10/19/2011	87WP203 87WP203-1011 10/19/2011	87WP204 87WP204-1011 10/19/2011	87WP204 87WP204-1011-D 10/19/2011	87WP206 87WP206-1011 10/18/2011	87WP212 87WP212-1011 10/18/2011	87WP213 87WP213-1011 10/18/2011	87WP214 87WP214-1011 10/19/2011
DISSOLVED METALS (UG/L)												
IRON	11000	--	34100[TAP]	29800[TAP]	19400[TAP]	41500[TAP]	3780	3710	142	5600	7020	1720
MANGANESE	320	--	9110[TAP]	4470[TAP]	4240[TAP]	7160[TAP]	725[TAP]	712[TAP]	40.3	744[TAP]	684[TAP]	398[TAP]
MISCELLANEOUS PARAMETERS												
ALKALINITY (MG/L)	--	--	130	170	96	110	99	98	140	69	45	290
CHEMICAL OXYGEN DEMAND (MG/L)	--	--	26.3	15.4 J	7.41 J	13.4 J	19.4 J	12.4 J	2.5 U	2.5 U	3.43 J	27.3 J
CHLORIDE (MG/L)	--	--	12	11 K	12 K	12 K	9.9 K	9.9 K	43	11	3.4	15 K
NITRATE-N (MG/L)	--	--	0.05 U	0.05 U	0.05 U	0.05 U	0.315	0.313	0.05 U	0.05 U	0.05 U	0.05 U
SULFATE (MG/L)	--	--	5 L	3.7 L	8.9 L	7.5 L	11 L	10 L	43 L	19 L	8.3 L	34 L
SULFIDE (MG/L)	--	--	0.16 J	0.08 J	0.5 U	0.5 U	0.5 U	0.08 J	0.5 U	0.5 U	0.5 U	0.08 J
TOTAL ORGANIC CARBON (MG/L)	--	--	6.3	3.9	1.7 B	2.7	3.4	3.4	0.972 B	2.1	0.98 B	3.1
VOLATILES (UG/L)												
ACETONE	12000	--	2.5 UL	2.5 UJ	2.5 UJ	2.5 U	5 J	6 J	2.5 UL	2.5 UL	2.5 UL	2.5 U
CHLOROMETHANE	190	--	0.5 UL	0.7 J	0.5 UJ	0.5 U	0.92 J	0.5 UJ	0.5 UL	0.5 UL	0.5 UL	1.3
CIS-1,2-DICHLOROETHENE	28	70	2.2 J	0.5 UJ	3.4 J	0.56 J	0.5 UJ	0.5 UJ	0.5 UL	6.6 J	0.5 UL	0.5 U
DICHLORODIFLUOROMETHANE	190	--	0.5 UL	1.2 J	0.5 UJ	1.2	0.5 UJ	0.5 UJ	0.5 UL	0.5 UL	0.5 UL	0.5 U
METHYLENE CHLORIDE	4.7	5	0.5 UL	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 UL	13 J [TAP][FED]	0.5 UL	0.5 U
TETRACHLOROETHENE	0.072	5	0.5 UL	0.5 UJ	0.5 UJ	0.5 U	0.5 UJ	0.5 UJ	0.5 UL	1 L[TAP]	1.2 L[TAP]	0.5 U
TRICHLOROETHENE	0.44	5	0.5 UL	0.49 J[TAP]	7 J[TAP][FED]	0.62 J[TAP]	0.5 UJ	0.5 UJ	0.5 UL	4.8 L[TAP]	1 L[TAP]	0.5 U
VINYL CHLORIDE	0.015	2	1.2 L[TAP]	0.52 J[TAP]	2.2 J[TAP][FED]	0.83 J[TAP]	0.5 UJ	0.5 UJ	0.5 UL	0.5 UL	0.5 UL	0.59 J[TAP]
VOLATILE GASES (UG/L)												
METHANE	--	--	570	2400	530	640	20 J	32 J	0.5 U	0.5 U	0.5 U	120

UG/L - microgram per liter
J = The chemical was detected but the concentration reported is an estimated value.
U = The chemical was not detected.
UJ = The chemical was not detected and the concentration reported is an estimated value.
UL = The chemical was not detected and the concentration reported is biased low due to quality control noncompliance.
B = The chemical was detected as an artifact in a laboratory method blank.
L = The chemical was detected and biased low due to low quality control noncompliance.
K = The chemical was detected but biased high due to high quality control noncompliance.
Federal MCL = Federal Maximum Contaminant Level (EPA, 2006).
ORNL Tap = Oak Ridge National Laboratory Regional Screening Level, 2011.