RECORD OF DECISION
December 2017

SS-01, Brandywine Defense Reutilization and Marketing Office
Brandywine, Maryland

United States Air Force

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	micrograms per liter
ABC®	Anaerobic BioChem®
AF332	Air Force Form 332
AF813	Air Force Form 813
AFCEC	Air Force Civil Engineer Center
AFCEC/CZOE	Air Force Civil Engineer Center, Operations Division – East Region
ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tank
bgs	below ground surface
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
COC	contaminant of concern
COMAR	Code of Maryland Regulations
COPC	contaminant of potential concern
CSM	conceptual site model
CSX	CSX Corporation
CTE	central tendency exposure
cy	cubic yard
DCB	dichlorobenzene
DCE	dichloroethene
DHC	dehalococcoides
DOD	Department of Defense
DNAPL	dense nonaqueous phase liquid
DRMO	Defense Reutilization and Marketing Office
EE/CA	Engineering Evaluation/Cost Analysis
EIAP	Environmental Impact Analysis Process
ERA	ecological risk assessment
ERH	electrical resistance heating
ERP	Environmental Restoration Program
EZVI	Emulsified Zero Valence Iron
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FS	Feasibility Study
ft	feet
GIS	Geographical Information System
GWETS	groundwater extraction and treatment system
HAZWRAP	hazardous waste remedial action program
HHRA	human health risk assessment
HGL	HydroGeoLogic, Inc.
HI	Hazard Index
HQ	hazard quotient
IC	institutional control

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

IDP	Installation Development Plan
IRACR	Interim Remedial Action Completion Report
IROD	Interim Record of Decision
ISCO	In Situ Chemical Oxidation
IST	Installation Support Team
JBA	Joint Base Andrews Naval Air Facility Washington
KAPSDIDS	Kinetically Adjustable Pore Space Dilation Injection Delivery System
LUC	land use control
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
mg/kg	milligrams per kilogram
MIP	membrane interface probe
M-NCPPC	Maryland National Capital Park and Planning Commission
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPL	National Priorities List
NPDES	National Pollutant Discharge Elimination System
O&M	operation and maintenance
OU	Operable Unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene (perchloroethene)
PGC	Prince George's County
PP	Proposed Plan
PVC	polyvinyl chloride
RA	remedial action
RAB	Restoration Advisory Board
RAO	remedial action objective
RBSL	risk-based screening level
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision
ROI	radius of influence
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act
SI	Site Inspection
SS-01	Spill Site 01
SVOC	semivolatile organic compound
TCE	trichloroethene
UCL	Upper Confidence Limit
URS	URS Corporation
USAF	U.S. Air Force
U.S.C.	United States Code

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UST	underground storage tank
UU/UE	unlimited use and unrestricted exposure
VC	vinyl chloride
VOC	volatile organic compound
WSSC	Washington Suburban Sanitary Commission

RECORD OF DECISION

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

This Record of Decision (ROD) presents the selected remedial action for the Environmental Restoration Program (ERP) Spill Site 01 (SS-01), the Brandywine Defense Reutilization and Marketing Office (DRMO) yard and its surroundings (hereinafter "Brandywine DRMO site" or "SS-01"). SS-01 is located in Brandywine, Maryland, and is administered by the Joint Base Andrews Naval Air Facility Washington (formerly known as Andrews Air Force Base), Maryland (hereafter referred to as JBA). The U.S. Environmental Protection Agency (USEPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number for the site is MD9570024803.

1.2 STATEMENT OF BASIS AND PURPOSE

This ROD documents the selected remedy of in situ thermal treatment and land use controls (LUCs) for groundwater and the source zone within the upper Calvert formation (Operable Unit 1, or OU-1) and no further action (NFA) for surface soils, subsurface soils, and sediment (Operable Unit 2, or OU-2) at SS-01. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR), Part 300. This determination is the final remedy for OU-1 and OU-2.

The U.S. Air Force (USAF) and USEPA have selected the remedy for SS-01 based on information contained in the Administrative Record file for the site. The Maryland Department of the Environment (MDE) concurs with the selected remedy. A letter from MDE indicating its concurrence is provided in Appendix A.

The Department of Defense (DOD) and USEPA entered into a Federal Facility Agreement (FFA) effective March 30, 2010 to address contamination at SS-01. The FFA established a procedural framework for developing and implementing response actions as required by CERCLA.

1.3 ASSESSMENT OF THE SITE

The response action selected in this ROD for OU-1 is necessary to protect the public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment.

The results of environmental studies and previous remedial actions for OU-2 have demonstrated that no hazardous substances, pollutants, or contaminants are present in the surface soil, subsurface soil, and sediment at concentrations posing an unacceptable risk to human health or the environment. Therefore, no response action for OU-2 is necessary.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The remedy selected for SS-01 is in situ thermal treatment to remediate source areas and contaminated groundwater, and implementation of LUCs for OU-1. Of the four alternatives evaluated for OU-1, the selected remedy is the alternative best suited to address site

contamination based on SS-01 site conditions and reasonably anticipated future land use. Near surface and subsurface soil sampling results from samples collected in December 2013 indicated that the remedy previously implemented for OU-2 (excavation and offsite disposal of contaminated soil and sediment) had successfully eliminated any unacceptable risks associated with these media and that remedial action objectives (RAOs) for the OU had been met (HGL, 2016a). OU-2 has achieved a degree of cleanup that allows for unlimited use and unrestricted exposure (UU/UE). Therefore, no further action (NFA) is required for OU-2.

SS-01 is located at the Brandywine DRMO yard and its surroundings in Prince Georges County, Maryland. The Brandywine DRMO yard is located at 14180 Brandywine Road, Brandywine, Maryland, and is approximately 8 miles south-southeast of JBA. The Brandywine groundwater extraction and treatment system (GWETS) is located at 13709 Cherry Tree Crossing Road in Brandywine, Maryland. The Maryland National Capital Park and Planning Commission (M-NCPPC) defines the land use in the general area of SS-01 as a mix of industrial, commercial, and residential uses, and it is reasonably anticipated that future land use will remain the same. Currently, the Brandywine DRMO yard is bounded to the west and southwest by active CSX Corporation Inc. (CSX) railroad tracks and to the east and north by wooded areas. Residential areas are located east, southeast, south, southwest, and west of the site.

Groundwater at SS-01 is typically less than 10 feet (ft) below ground surface (bgs) and is contaminated to a depth of approximately 30 ft bgs by chlorinated solvents. The source area of volatile organic compounds (VOCs) is located beneath two active railroad lines, Cherry Tree Crossing Road, and federally owned property to the north of the DRMO yard (Parcel 314). Results from the Supplemental Remedial Investigation (RI) indicate that the majority of VOC mass lies beneath the shallow aquifer, and has sorbed into the upper 8 to 10 ft of the Calvert Formation, a regional aquitard, between the northwest corner of the DRMO yard and the groundwater extraction trench. Concentrations of VOCs (primarily trichloroethene [TCE]) continue to back diffuse into the shallow groundwater above the VOC mass, causing ongoing exceedances of maximum contaminant levels (MCLs) established under the Safe Drinking Water Act. In addition, concentrations of 1,4-dichlorobenzene (DCB), naphthalene, and 2-methylnaphthalene continue to leach from smear zone soils in the northwest corner of the DRMO yard into area groundwater. The smear zone is the area in the subsurfacewhere contamination was smeared across the soil when the water table fluctuated between historic high and low water table elevations.

The site remediation goals, hereafter referred to as cleanup criteria, for SS-01 have been identified for groundwater for the chlorinated solvent Contaminant(s) of Concern (COCs) (TCE, cis-1,2-dichloroethene [DCE], vinyl chloride [VC], and tetrachloroethene [PCE]) and smear zone COCs (1,4-DCB, 2-methylnaphthalene, and naphthalene). Cleanup criteria for iron and manganese, COCs resulting from geochemical changes as a consequence of the solvent releases, have also been identified. The COCs were determined through risk assessments that are discussed in Section 2.7. While the source material in the Calvert Formation appears to be relatively immobile and EPA has not established a threshold level of toxicity/risk to define a "principal threat waste," per EPA guidance where toxicity and mobility of source material combine to pose a potential risk of 1×10^{-3} or greater, generally treatment alternatives should be evaluated. The 2006 RI (URS, 2006a) concluded that site risks posed by TCE exceed 1×10^{-3}; as such, this source material represents a principal threat waste. The cleanup criteria for the COCs are based on either their respective federal MCLs pursuant to the Safe Drinking Water Act and established under 40 CFR § 141.61, or the latest USEPA Regional Screening Levels for the COCs without MCLs. Attainment of the cleanup criteria would indicate that groundwater quality has been restored and that the groundwater can be used safely by humans for any purpose.

The components of the selected remedy for OU-1 are as follow:

- Install an electrical resistance heating (ERH) thermal treatment system from the top of the water table to 8 to 10 feet within the Calvert Formation to address the source zone at the base of the shallow groundwater and to reduce the levels of naphthalene, 2-methylnaphthalene, and 1,4-DCB in smear zone soils;
- Perform groundwater monitoring to refine length of treatment time and determine the effectiveness of the remedy;
- Implement and maintain LUCs to limit land use and prevent current or future use of groundwater until cleanup criteria are achieved;

The selected remedy for OU-1 involves the installation of vertical sheet pile electrodes to operate an ERH thermal treatment system. Originally the conceptual design considered 44 horizontal electrodes arranged in four layers by depth underneath the CSX rail lines and 58 sheet pile electrodes installed to the east and west of the horizontal electrodes. During design efforts and in consultation with CSX, the design has been refined to include 101 sheet pile electrodes throughout the entire treatment areathat are designed to thermally treat the contamination down to 37 feet bgs. Each electrode will have a vapor recovery well buried in gravel above the top of the electrode.

The ERH treatment system would heat the subsurface to a depth that includes the contaminated portions of the Calvert Formation (37 ft bgs up to 100°C) to volatilize the contaminants, and the vapor recovery wells would be used to extract the contaminants. A surface plenum (consisting of a 3-inch layer of gravel and a 20-millimeter thick PVC liner) would provide a backup method of vapor capture near the tracks and Cherry Tree Crossing road and would divert rainfall from the thermal treatment region and reduce contaminant flux out of the treatment zone. Extracted vapors would be treated with vapor-phase granular activated carbon. Any water from the vapor recovery wells and condensate from the vapor treatment system will be treated in the existing groundwater treatment system, which is functional but not currently operating, and discharged under the existing discharge permit equivalency (HydroGeoLogic Inc. [HGL], 2008).

ERH is particularly well suited for this site because the primary COCs are VOCs that are present in heterogeneous, low permeability materials. ERH is particularly effective at heating low permeability subsurface materials and remediating the specific areas requiring treatment in heterogeneous strata. Heating the subsurface is also expected to increase microbial activity and degrade contamination in situ. Operational components of the remedy may be adjusted during the design or remedial action phase of the remedy.

It is anticipated that 17 existing polyvinyl chloride (PVC) monitoring wells would not be able to withstand the treatment and would need to be fully removed. To track the removal of the VOCs from the subsurface, approximately 8 stainless steel monitoring wells would be installed as illustrated on Figure 2.15. The monitoring wells within the treatment area would be sampled once before the start of the thermal treatment. It is expected that it will take up to 8 weeks for the subsurface to heat up to the required temperature. After this occurs, the stainless steel monitoring wells would be sampled weekly for VOCs to allow portions of the treatment system to be turned off as cleanup criteria are met. During ERH treatment, vapor samples would be collected from the vapor treatment system for the thermal treatment to determine air emission compliance, to

determine if the vapor carbon vessels require new media, and to quantify mass removed. Performance monitoring both during and after remedy implementation will be defined more specifically in the remedial design. It is anticipated that performance monitoring during ERH treatment would include monitoring subsurface temperatures, VOCs recovered from the extracted vapors, and TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, and 2-methylnaphthalene in monitoring wells. In addition, if the groundwater treatment system operates to treat recovered groundwater, samples will be collected from the influent and effluent to confirm discharge criteria established in the existing discharge permit equivalency are met.

The recently installed high-density polyethylene (HDPE) pressure sewer main that services the American Legion Post 227 east of the site will likely be compromised during ERH remediation. Therefore, the Air Force will replace it, or the appropriate length of the pipe necessary, once the thermal process is completed at the site. Temporary accomodations will be provided for the American Legion Post 227 while the line is out of service.

The feasibility study (FS) for this site estimated that it would take approximately 5 years to achieve response complete for the chlorinated VOCs. This timeframe includes the operation of the thermal treatment system, which is estimated to run 6 months. The actual timeframe of operations will depend on mass removal quantities and contamination degradation trends to achieve the cleanup criteria. After the thermal treatment system is shut down, post-remedial action (RA) groundwater sampling and at a minimum will occur at least quarterly for 1 year, semiannually for the following 2 years, then annually for 1 year. Sampling and analyses may be increased or decreased if necessary based upon degradation and mass removal. This post-treatment monitoring would ensure that RAOs have been met. The actual timeframe for confirmation sampling will be dependent upon the confirmation sampling results. The remedial timeframe will be refined as performance data are collected as part of the groundwater monitoring program. Additionally, the entire plume would be monitored, including the distal portions of the plume addressed during the interim remedy that have not yet achieved cleanup goals.

LUCs will be implemented to prevent exposure to groundwater contaminants until the cleanup criteria for COCs are achieved in groundwater. LUCs on the use of groundwater will be implemented at the Brandywine DRMO site by USAF and Prince George's County (PGC). The Air Force is ultimately responsible for ensuring that all LUCs are implemented; LUC tasks for which the Air Force is primarily responsible will be administered by the Joint Base Andrews Environmental Restoration Program through the Air Force Civil Engineer Center, Operations Division-East Region (AFCEC/CZOE). The LUCs described in the Interim ROD (USAF, 2006) will remain in place until LUCs included in this final ROD are implemented. The LUCs required by this final ROD will remain in place until the concentrations of contaminants at the site allow for UU/UE, which will be defined by attainment of the site remediation goals (hereafter referred to as cleanup criteria) in all MWs in the OU. Five-year reviews will be performed on OU-1 to evaluate the effectiveness of the remedy until the cleanup criteria are achieved. Any recommended changes to the operation and monitoring program will be documented in the five-year review report and reported in the groundwater monitoring reports.

The selected remedy will clean up groundwater contamination and groundwater contaminated media at SS-01 and fits into the overall USAF strategy of investigating and addressing ERP sites, including CERCLA sites managed by JBA. This remedy is selected jointly by USAF and USEPA, in consultation with MDE. The remedial actions selected in this ROD will be performed by USAF,

under the authority of CERCLA as delegated to USAF as lead agency for the site by Executive Order 12580.

1.5 STATUTORY DETERMINATIONS

The selected remedy for OU-1 is protective of human health and the environment, complies with federal and state applicable or relevant and appropriate requirements (ARARs), is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. Based on available data, no further action is necessary for OU-2 to ensure protection of human health and the environment.

Because the selected remedy will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for UU/UE, five-year reviews will continue to be conducted to ensure that the remedy continues to be protective of human health and the environment until concentrations of TCE, cis-1,2-DCE, VC, PCE, 1,4-DCB, 2-methylnaphthalene, naphthalene, iron, and manganese in groundwater demonstrate UU/UE conditions are achieved at the site.

1.6 ROD DATA CERTIFICATION CHECKLIST

Section 2.0, Decision Summary, of this ROD includes a description of the site and a summary of the investigations conducted there; more detailed information can be found in the Administrative Record file for Brandywine. USAF certifies that this ROD contains specific information on the following:

- COCs and their respective concentrations (Section 2.7.2 and 2.5.3.2, respectively);
- Risk represented by all COCs (Section 2.7);
- Cleanup criteria established for contaminants and contaminated media requiring remediation and the basis for these levels (Section 2.8);
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (Section 2.6);
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Section 2.13.4);
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section 2.13.3); and
- Key factor(s) that led to selecting the remedy (Section 2.13.1).

1.7 AUTHORIZING SIGNATURES

USAF and USEPA select this remedy for Brandywine with the concurrence of MDE.

Approved By:

3/20/18

J. DALE CLARK, P.E., GS-14, DAF **Date**
Deputy Director, Environmental Management
Directorate Air Force Civil Engineer Center

MAR 28 2018

KAREN MELVIN, Director **Date**
Hazardous Site Cleanup Division, USEPA Region 3

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

SS-01 includes the former Brandywine DRMO yard, which is an inactive facility administratively controlled by JBA, and portions of neighboring properties. The site is located in Brandywine, Maryland, approximately 8 miles southeast of JBA (Figure 2.1). The Brandywine DRMO yard is bounded to the west and southwest by active CSX railroad tracks and to the east and north by wooded areas. Residential areas are located east, southeast, south, southwest, and west of the site (Figure 2.2). In June 1999, Brandywine was added to the National Priorities List (NPL). The CERCLIS database identification number for the Brandywine DRMO is MD9570024803.

The DRMO yard (Parcel 172) is surrounded by a chain link fence to prevent unauthorized access. This area is predominantly open, partially paved, and mostly covered with grass and small trees. Remnants of former buildings and paved areas are also present. The DRMO yard was used from 1943 to 1987 as a storage area for waste and excess material generated by DOD operations at Navy and Air Force facilities. Historical activities conducted at the DRMO yard required the storage of VOCs in the form of organic solvents and materials containing PCBs, which have contributed to site contamination (Dames & Moore, 1992a). The former DRMO yard warehouse was destroyed by fire in January 1987. The property west of Cherry Tree Crossing Road (Parcels 61 and 279) was acquired by the U.S. Government to support the construction and operation of the GWETS. The property to the north of the DRMO yard (Parcel 314) also was acquired by the U.S. Government.

The site was subdivided into two OUs in March 2010 when the FFA became effective. Groundwater impacts (OU-1) were separated from the surface soil and sediment impacts (OU-2). USAF is the lead agency and provides funding from the USAF ERP account for the remedial action discussed in this ROD. The USAF and USEPA have selected the remedy for SS-01 with MDE's concurrence. This document is issued by USAF (the site owner) with the approval of USEPA (the federal regulatory agency responsible for overseeing compliance with CERCLA) and in consultation with MDE and the PGC Health Department.

2.2 SITE HISTORY, ENFORCEMENT ACTIVITIES, AND INVESTIGATIONS

2.2.1 Site History

Past operational activities at the former Brandywine DRMO have resulted in releases of hazardous substances, pollutants, and contaminants to soil, sediment, and groundwater at the Brandywine DRMO site. Environmental investigations began in 1985 and have continued under USAF's ERP. The ERP, formerly known as the Installation Restoration Program, was developed by the DOD in 1981 to identify, investigate, and clean up environmental releases on military installations. The Brandywine DRMO site, which includes both the DRMO yard and portions of neighboring properties, was identified as an environmental site through the ERP.

According to USAF records, hazardous materials and wastes have not been stored at the DRMO yard since 1980. Prior to 1980, drums of waste solvents were stored at the DRMO yard, and several concrete bins located in the northeast area of the yard were used to store capacitors and transformers, some of which contained PCBs (Dames & Moore, 1991). PCB contamination detected in the soil at the former DRMO yard may have resulted from the PCB-containing dielectric fluid in the capacitors and transformers stored at the yard. Detailed information on where

solvent drums were stored and how wastes were handled has not been located. There are no records of spills, leakage, or burial of wastes or PCBs at the yard (Dames & Moore, 1996). However, the results of soil and groundwater sampling indicate that releases of hazardous substances, pollutants, or contaminants occurred at the former Brandywine DRMO yard.

The primary COC in the surface and near surface soils (up to 4 ft bgs) at the Brandywine DRMO site was PCB-1260. Samples collected following soil removal within the DRMO yard indicated that contaminants (primarily PCB-1260 and lesser quantities of an insecticide [dieldrin] and metals) had spread beyond the former DRMO yard through the erosion of contaminated soil by surface water runoff (URS Corp. [URS], 2006b). The erosion of contaminated DRMO site soil and its transport via surface water runoff resulted in contamination spreading into drainage areas along the CSX railroad tracks north of the former DRMO yard and into the wetlands to the west of the former DRMO yard and CSX railroad tracks.

According to the groundwater data presented in the Brandywine RI Report (URS, 2006a), the releases of CERCLA-regulated contaminants at the former Brandywine DRMO site resulted in three distinct plumes of dissolved chlorinated solvents in the groundwater spreading over an area of approximately 21 acres (HGL, 2007). The chlorinated solvents TCE and PCE were the most prevalent COCs in groundwater (HGL, 2014b). Historically, soil/sediment and groundwater impacts were managed independently under separate actions.

2.2.2 Previous Investigations/Actions

Numerous investigations, removal actions, and remedial measures have been conducted at the Brandywine DRMO site. A complete history of past investigations and remedial activities can be found in the Brandywine Supplemental RI Report (HGL, 2013b), which is part of the Administrative Record file. The primary activities are listed below.

Year	Action
1985	Phase 1 Installation Restoration Program Records Search (Engineering-Science Inc., 1985)
1988–1990	U.S. Geological Survey (USGS) Groundwater and Soil Investigations (USGS, 1991)
1991	Hazardous Waste Remedial Action Program TCE Plume Delineation Study (Dames & Moore, 1992a)
1993–1994	Soil and Tank Removal Action (Halliburton NUS Corp, 1995)
1999	Groundwater Treatment System Operations and Emission Test (IT Corporation, 1999)
2002–2003	Remedial Investigation (URS, 2006a)
2006	Engineering Evaluation/Cost Analysis (Soil Contamination) (URS, 2006b)
2006	Focused Feasibility Study (Groundwater Contamination) (URS, 2006c)
2006	Interim ROD (USAF, 2006)
2007	Action Memorandum – Soil Removal (USAF, 2007)
2006–2007	Interim Remedial Action Completion Report - Soil (Cape, 2008)
2010	FFA (USAF, 2010)
2010–2011	Supplemental RI (HGL, 2013b)
2013	Interim Remedial Action Completion Report - Groundwater (HGL, 2013a)
2013/ 2014	Summary of Third Injection Event (HGL, 2014a)
2016	Revised Final FS (HGL, 2016a)

The more pertinent of these investigations/actions are summarized below.

2.2.2.1 1993-1994 Soil and Tank Removal Action

PCB-contaminated soils were removed from the former DRMO yard between 1993 and 1994. Three underground storage tanks (USTs) and three aboveground storage tanks (ASTs) also were removed. In addition, a deep burn pit was identified in the northwest portion of the DRMO yard, and burned debris and soil from the pit were excavated and disposed of.

During the removal action, approximately 14,000 cy of PCB-contaminated soil were removed. Results of the sampling of the remaining soil at the site indicated that all soil or other surface materials with PCB concentrations above 10 milligrams per kilogram (mg/kg) had been removed from the former DRMO yard (Halliburton NUS Corp, 1995).

2.2.2.2 Groundwater Treatment System

In September 1996 a groundwater treatment system that used air stripping and carbon adsorption to remove VOCs was constructed at the northwest corner of the former DRMO yard as part of a hazardous waste remedial action program (HAZWRAP) (Dames & Moore, 1996). This system operated on a part-time basis. The capture zone for this system was limited and did not capture the leading edge of the groundwater contamination. The groundwater contamination observed in the residential area was not captured or treated by this system (USAF, 2006). Operations ceased in 2008 because this system was ineffective at stopping the westward migration of the groundwater plume.

2.2.2.3 Remedial Investigation

In 2006 URS completed an RI report entitled *Final Remedial Investigation Report, Site SS-01, Brandywine DRMO, Andrews Air Force Base* (URS, 2006a) that summarized all past multi-media sampling and remedial activities at the site.

The RI evaluated groundwater, surface water, drinking water, sediment, surface soil (0 to 1 ft bgs), and subsurface soil (1 to 5 ft bgs). Groundwater, surface water, and water samples were collected in 2002 and 2003. Groundwater samples were collected from 30 shallow monitoring wells and 2 deep monitoring wells. Groundwater was also analyzed at an additional 54 locations using cone penetrometer testing. Samples from drinking water wells along with surface soil, sediment, and subsurface soil samples were collected as part of the RI.

In addition, the RI included a baseline human health risk assessment (HHRA) and an ecological risk assessment (ERA). The HHRA and ERA evaluated whether risks at the site warranted cleanup actions and are discussed in Section 2.7, Summary of Site Risks. The RI identified the most significant groundwater contaminants as PCE, TCE, cis-1,2-DCE, VC, 1,4-DCB, and 2-methylnaphthalene. Additionally, the RI identified PCBs, one pesticide, and several metals in soil and sediment at the site.

2.2.2.4 2006-2007 Soil Removal Action

2.2.2.4.1 Engineering Evaluation/Cost Analysis, Action Memo, Removal Action

In 2006 an Engineering Evaluation/Cost Analysis (EE/CA) was prepared for OU-2 and developed the removal action goals (URS, 2006b). Based on the results of the HHRA and the ERA, additional excavation of the PCB-contaminated surface soil and sediments was recommended. Excavation

activities occurred between September 2006 and December 2007; approximately 6,362.5 tons of contaminated soil, sediment, and other debris were removed from the site, and the site was restored. The removal action goals were documented in the 2007 Action Memo (USAF, 2007).

2.2.2.4.2 IRACR Soil

Post-excavation verification sampling confirmed that cleanup goals had been met (Cape, 2008). A final inspection of the removal event was conducted on October 17, 2007, and JBA and USEPA approved the final Interim Remedial Action Completion Report (IRACR) dated November 2008, indicating that the removal action selected by USAF had been implemented successfully. As documented in the IRACR, cleanup goals were achieved and no long-term operation, monitoring, or maintenance activities, and no institutional controls (ICs), were required (Cape, 2008).

2.2.2.5 Interim Remedial Action for Groundwater

2.2.2.5.1 Focused Feasibility Study/Proposed Plan

In 2006 a Focused Feasibility Study (FFS) evaluated alternatives for addressing groundwater contamination at the Brandywine DRMO site (URS, 2006c). The Proposed Plan detailed the preferred remedial alternative The preferred remedial action was successfully implemented and is described further in the following sections.

2.2.2.5.2 Interim Record of Decision

An Interim ROD (IROD), signed in 2006, selected an initial remedial action to clean up groundwater at the site. The selected interim remedial action for the site was bioaugmentation and carbon substrate injection with gradient control and LUCs, which used a combination of groundwater extraction and treatment and injections to clean up the distal groundwater contamination (USAF, 2006).

2.2.2.5.3 Groundwater Treatment System

A new GWETS was constructed at 13709 Cherry Tree Crossing Road in 2008. This GWETS was designed and constructed to control the groundwater hydraulic gradient in the Brandywine Formation within a dense nonaqueous phase liquid (DNAPL) source area and to function in concert with substrate injections/bioaugmentation. This GWETS replaced the GWETS that had been installed in 1996 in the northwest corner of the DRMO yard and had operated sporadically for approximately 10 years. Figure 2.2 identifies the locations of these two GWETS. This GWETS operated from December 2008 through May 2013, treated 12.5 million gallons of water, and removed 89.4 pounds of VOCs.

2.2.2.5.4 Substrate Injections

In 2008, 2010, and 2013/2014, carbon substrate was injected at nearly 2,000 locations to support the Interim ROD (IROD) for the site, which called for bioaugmentation and carbon substrate injections to enhance bioremediation in support of anaerobic dechlorination. During the first injection, bioaugmentation was also performed.

Site-specific approaches were designed using Anaerobic BioChem® (ABC®) (developed by Redox Tech, LLC) and EHC® (developed by Adventus) as the organic substrates. Based on the lack of

a suitable microbial population, bioaugmentation was performed by injecting KB-1® (dehalococcoides [DHC]) (produced by SiREM). Sodium bicarbonate was injected with the ABC® to increase the pH of the groundwater. Vitamin B12 was added during the third injection to supportVOC remediation.

2.2.2.5.5 IRACR – Groundwater

The final IRACR for groundwater summarizes the remedial action and certifies that the Interim ROD RAOs for the site had been attained (HGL, 2013a). The Interim ROD RAOs were met through the construction and operation of the GWETS and the 2008, 2010 and 2013/2014 substrate injections (HGL, 2014a).

2.2.2.5.6 Groundwater Monitoring

Between 2008 and 2015, 14 post-injection groundwater sampling events were conducted. In accordance with the Interim ROD, groundwater sampling occurred quarterly in 2008 and 2009, semiannually in 2010 and 2011, and annually from 2012 through 2015. The results from these sampling events indicate that the groundwater remedy has been very effective and that the groundwater plume has been reduced by 92 percent (20.7 acres to 1.5 acres), with the source area remaining as the primary focus for the final remedy (HGL, 2016a).

2.2.2.6 Final Remedial Action

2.2.2.6.1 Supplemental Remedial Investigation

A Supplemental RI completed between 2010 and 2011 confirmed that TCE in the Calvert Formation, and 1,4-DCB, naphthalene, and 2-methylnaphthalene in the smear zone of the northwest corner of the DRMO yard, were acting as the continuing sources of contamination to groundwater within the Brandywine Formation (HGL, 2013b). The Supplemental RI concluded, with regulatory stakeholder concurrence, that the risk assessment completed as part of the 2006 RI would not require reanalysis given that the groundwater COCs had remained the same. 1,4-DCB was added as a groundwater COC because it had been omitted from the COC list in the Interim ROD even though it had exceeded federal MCLs (HGL, 2016a). The list of current COCs is provided in Section 2.5.3.1.

2.2.2.6.2 Final Feasibility Study

The Revised Final FS (HGL, 2016a) evaluated remedial action alternatives that would address OU-1 (groundwater). The FS documents that no unacceptable risks to human health or the environment remain for OU-2 (soil and sediment); therefore, because UU/UE conditions have been met, no further action is warranted for OU-2.

For OU-1, the FS identified Cleanup criteria applicable to the compounds detected in the groundwater and smear zone soil. Reduction of contamination in the smear zone is included in the groundwater remedy to reduce the leaching of residual constituents in the smear zone to groundwater. The Final FS identified cleanup criteria for the COCs, which are discussed in detail in Section 2.8 of this ROD. Four remedial alternatives were developed for OU-1, and each alternative was then analyzed in accordance with the nine criteria specified in the NCP at 40 CFR § 300.430 (e)(9)(iii) to determine which alternative best meets the criteria. Additional details about

the remedial alternatives evaluated in the FS and the alternative selected in this ROD are provided in Sections 2.9, 2.10, and 2.13 of this ROD.

2.2.3 Enforcement Activities

No enforcement activities have occurred at the Brandywine DRMO Site. Environmental investigations have been conducted at the base since 1985 under the USAF's ERP, which identified the DRMO yard as an environmental site. On June 9, 1999, USEPA listed Brandywine on the NPL. As a result, USAF is working closely with USEPA, as well as with MDE, to ensure that risks at SS-01 have been evaluated and that the remedial alternative selected is protective of human health and the environment.

2.3 COMMUNITY PARTICIPATION

JBA continues to conduct outreach to the local community stakeholders via several means, including newsletters, a web page, participation in the Brandywine North Keys Civic Association, and public notices on cleanup activities. The base coordinates with the PGC Health Department on communications with the local community.

The Administrative Record was updated on December 1, 2016 to include the Proposed Plan. All documents related to SS-01 that were relied upon to make this remedial decision are part of the Administrative Record, which is kept at 1602 California Avenue, Suite 239, JBA, Maryland. The Administrative Record includes, but is not limited to, the Brandywine Supplemental RI, Revised Final FS, and the Proposed Plan. This ROD will be added to the Administrative Record after it is issued. For the convenience of the public, a copy of the Administrative Record is maintained in an Information Repository located at the following:

Prince George's County Memorial Library, Surratts-Clinton Branch
9400 Piscataway Road
Clinton, Maryland 20735
Phone: (301) 868-9200
Hours: Monday-Wednesday 10 a.m.-9 p.m., Thursday-Friday 10 a.m.-6 p.m.
Saturday 10 a.m.-5 p.m., Sunday closed

The Administrative Record can also be viewed and searched at the following USAF web-site http://afcec.publicadmin-record.us.af.mil/, A notice of the availability of the Proposed Plan was published in the *Enquirer-Gazette* and on the JBA website on December 1, 2016. A public comment period was held from December 1, 2016, to January 9, 2017. In addition, a public meeting was held on December 12, 2016, to present the PP to interested community members. At this meeting, representatives from USAF were present to answer questions about the conditions at the site and the remedial alternatives and to listen to any comments. The USAF's responses to the comments received during the public comment period are included in the Responsiveness Summary, which is Section 3.0 of this ROD.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

This ROD summarizes the four remedial alternatives evaluated for treating contaminated groundwater and provides the reasons for selecting NFA for soils at SS-01. The selected remedy is consistent with the USAF's overall strategy to investigate and appropriately address ERP sites.

2.5 SITE CHARACTERISTICS

2.5.1 Physical Setting

SS-01, the Brandywine DRMO yard and adjoining properties, is located on Brandywine Road near the intersection of Brandywine Road and Air Force Road in PGC, Maryland (Figure 2.1). The former Brandywine DRMO yard is relatively flat and is near a topographic high for the area (HGL, 2013b). According to M-NCPPC, the DRMO yard is located in a mixed industrial/commercial/residential area. The Brandywine DRMO yard is bounded to the west and southwest by active CSX railroad tracks and to the east and north by wooded areas. Residential areas are located east, southeast, south, southwest, and west of the site

The woodland area to the west beyond the CSX railroad tracks receives surface drainage from the former DRMO yard and is capable of supporting a variety of forest and wetland species. The intermittent nature of water flow through the small interconnected drainage channels that are separated by small areas of higher sediment deposition (i.e., islands) limits the viability of this area as an aquatic habitat, although it may support amphibious organisms when water is present. No rare, threatened, or endangered species have been identified in the vicinity of the former DRMO yard (URS, 2006a).

Located south of the site across the CSX railroad tracks is a patch of undeveloped land and several commercial properties zoned for light to heavy industrial use (M-NCPPC, 2007). To the west, beyond the CSX railroad tracks, are Cherry Tree Crossing Road, undeveloped woodlands, the GWETS and multiple residential properties. The land surrounding the site and the adjacent property boundaries are depicted on Figure 2.2.

The geological formations encountered at the Brandywine DRMO site, over several investigations (RI, Remedial Design/Remedial Action Work Plan, and Supplemental RI) included (from top to bottom) the Brandywine, Calvert, and Nanjemoy Formations. Investigations conducted by HGL since the Interim ROD have further characterized the Brandywine Formation and upper 12 ft of the Calvert Formation. The Brandywine Formation beneath the DRMO yard and immediate surroundings is composed of clay, silt, sand, and gravel and has been determined to be heterogeneous laterally and vertically across the site. Four distinct strata were identified: Shallow Brandywine, Upper Intermediate Brandywine, Lower Intermediate Brandywine, and Deep Brandywine. The Calvert Formation consists of relatively impermeable silt and clay with three distinct strata: Upper Calvert, Oxidized Calvert, and Green Calvert.

Groundwater in the unconfined shallow water table is derived primarily from precipitation. Water level measurements collected during operational activities encountered groundwater in the Brandywine Formation at a depth of approximately 0 to 10 ft bgs. The top of the Calvert Formation is located at depths of approximately 21 to 30 ft bgs (HGL, 2013). The Calvert Formation serves as an aquitard for the downward movement of groundwater and contaminants.

Higher groundwater levels occur near the DRMO yard, with lower groundwater levels west of Cherry Tree Crossing Road. The exact location, magnitude, and extent of the groundwater elevations vary due to seasonal variations in precipitation and complex hydrogeological conditions. Groundwater flows from the highest groundwater elevations on the DRMO yard westward. The average groundwater seepage velocity was estimated to be 35 ft per year (URS, 2005).

There are no known archaeological or historically significant cultural resources at or in the vicinity of the Brandywine DRMO site.

2.5.2 Conceptual Site Model

The conceptual site model (CSM) illustrates contaminant sources, release mechanisms, exposure pathways, migration routes, and potential receptors. It provides a basis for the risk assessments summarized later in this ROD (Section 2.7) and, as a result, the basis for necessary response actions. The CSM is depicted on Figure 2.3.

Historical operations and waste management practices have resulted in releases of hazardous substances, pollutants, and contaminants in the northwest corner of the DRMO yard. Releases in this area traveled vertically, slowing at the water table at approximately 10 ft bgs, until encountering the Calvert Formation. Naphthalene and 1,4-DCB are much less soluble and more likely to associate with organic matter than TCE, which likely accounts for their presence at higher concentrations than TCE in shallow soils. Concentrations of 2-methylnaphthalene in soils in this area are lower than naphthalene and 1,4-DCB due to its higher solubility.

The majority of groundwater contamination in the Brandywine Formation is the result of contamination contained in and back diffusing from the Calvert Formation. This main source of VOCs (primarily TCE) in the Calvert Formation likely accumulated via downward migration of DNAPL through the Brandywine Formation. Although remedial activities have addressed the Brandywine Formation, back diffusion of contamination is occurring from the Calvert Formation to the Brandywine Formation. The membrane interface probe (MIP) data collected in 2011 indicated that TCE concentrations west of the groundwater extraction trench are generally significantly lower than those east of the trench. The TCE mass estimated in the Final FS (HGL, 2016b) confirmed that the TCE mass east of the trench (128,698 grams) is higher than that west of the trench (16,881 grams). The areal distribution and concentration of TCE-contaminated media in the upper Calvert Formation source zone is shown in Figure 2-15.

USEPA and MDE classify the beneficial use of the groundwater at the Brandywine DRMO site as a potential water supply for human consumption. Therefore, the HHRA completed in the 2006 RI evaluated use of groundwater as drinking water by potential human receptors, which would involve direct contact, ingestion, and inhalation exposures. Potential human receptors evaluated for exposure to contaminants in soil and groundwater (including vapors originating from VOCs in the groundwater) at the Brandywine DRMO site included hypothetical future residents, current residents, future commercial workers, construction workers, other workers, and trespassers/visitors.

Groundwater use for drinking, washing, or industrial purposes has not been permitted in the vicinity of the Brandywine DRMO site since the implementation of LUCs defined in the Interim ROD (USAF, 2006). Water is supplied to the area by the Washington Suburban Sanitary Commission (WSSC). The State of Maryland prohibits the drilling of any individual water supply systems where municipal water supply is available (Code of Maryland Regulations [COMAR] § 26.03.01.05.A). Groundwater usage in the vicinity of the Brandywine DRMO site is monitored by USAF and PGC Health Department to ensure that contaminated groundwater is not being used (2006a, URS). There are no current receptors in the area of the plume that come into contact with groundwater at the Brandywine DRMO site. In addition, contaminated groundwater does not discharge to surface water viasprings or seeps. Potential risks to human health are identified in Section 2.7.

Exposure pathways for ecological receptors were evaluated for Brandywine, but given that contaminated groundwater does not discharge to the surface, the ERA found that groundwater contamination does not contribute to ecological risks. Post-excavation samples, collected after soil/sediment removal actions in 1988, 1993/1994, and 2006/2007, confirmed that these excavations achieved the PCB cleanup goals of 10 mg/kg in the DRMO yard (residential cleanup level) and 1 mg/kg outside of the DRMO yard (ecological cleanup level). Because the cleanup goals were attained, no additional action is required.

Questions regarding COC concentrations beneath the CSX railroad bed/ballast were raised by EPA because data for this area had not been collected and could prevent the site from reaching UU/UE. In December 2013 borings were advanced beneath both CSX railroad lines, and collected soil samples were analyzed for PCBs and total organic carbon. Analytical data indicated that PCBs beneath the CSX railroad bed/ballast were less than the 10 mg/kg cleanup goal for residential soils, indicating that no unacceptable risk to human health or the environment remained for OU-2 (HGL, 2016b). Potential ecological risks pertaining to the contaminants present at SS-01 were evaluated in an ERA summarized in Section 2.7.3.

2.5.3 Nature and Extent of Contamination

The nature and extent of contamination at the Brandywine DRMO site are summarized below. Multiple investigations and remedial actions have been completed at SS-01. After completion of the 2006 RI, it was determined that groundwater impacts could be addressed independently of the surface soil and sediment impacts because the COCs for the two media types were different. Contamination in OU-1 (groundwater contamination) and OU-2 (soil contamination) is discussed below.

2.5.3.1 Groundwater Impacts (OU-1)

The extent of the groundwater contamination at the Brandywine DRMO site is discussed in depth in the Brandywine RI Report (URS, 2006a), the Baseline Groundwater Sampling in the Remedial Design (RD)/Remedial Action Work Plan (RAWP) Report (HGL, 2008), the Brandywine Supplemental RI Report (HGL, 2013b) and the Fourteenth Post-Injection (Second Annual) Groundwater Monitoring Report (2016a). Multiple interim remedial actions occurred to address groundwater contamination at this site and are discussed in depth in the IRACR (HGL, 2013a) and the Summary of Third Injection Event (HGL, 2014a). A summary of the extent of the groundwater contamination is provided below.

During the RI, baseline and supplemental groundwater samples were collected from multiple monitoring points to delineate the nature and extent of the contamination. Based on the results of this sampling, it was determined that a 20.7-acre VOC plume existed as a result of historical releases and poor waste management practices at the DRMO yard. The primary groundwater COCs in this plume are chlorinated VOCs (i.e., TCE, cis-1,2-DCE, VC). A much smaller plume of the VOC 1,4-DCB and SVOCs naphthalene and 2-methylnaphthalene is also present at the DRMO site (HGL, 2016b), emanating from the northwest corner of the DRMO yard and co-located with a portion of the chlorinated VOC plume. Iron and manganese are COCs throughout the current and former chlorinated VOC plume footprint resulting from geochemical changes as a consequence of the solvent releases. Toluene is not a site-related COC, but it is sporadically present above the MCL within the maximum COC plume extent. Poor waste management practices at an adjacent private property contribute to the presence of toluene (HGL, 2014b).

According to the data presented in the 2006 RI, TCE and PCE were the most prevalent COCs in groundwater. The two COCs formed two distinct plumes in the groundwater, one emanating from the northwest corner of the DRMO yard and one emanating from the west-central portion of the DRMO yard. In 2007, the area of highest contaminant concentrations was northwest of the DRMO yard and extended westward under the residential area on Bank Street. Prior to interim remedy implementation, the groundwater plume covered 20.7 acres. The distribution of COCs in the groundwater has been affected by a variety of processes, including interim RAs consisting of two different GWETSs and multiple substrate injection events to foster enhanced reductive dechlorination.

The interim remedy, completed in accordance with the Interim ROD (USAF, 2006), included the construction and operation of a GWETS and carbon substrate injections. As a result of the 2008, 2010, and 2013/2014 injections and the operation of the GWETS, nearly the entire distal area of the PCE and TCE plumes has been remediated to levels below federal MCLs. The size of the groundwater plume has been reduced by 92 percent (from 20.7 acres to 1.5 acres), with the source zone remaining as the focus for the final remedy. From December 2008 through May 2013 the GWETS treated 12.5 million gallons of water, resulting in the removal of 89.4 pounds of VOCs (HGL, 2016b).

The breakdown products of the reductive dechlorination bioremediation are summarized in the 14th post-injection groundwater monitoring report (HGL, 2016a), and the extent of the COCs has been well-defined by the 14 post-injection monitoring events. The following figures provide snapshots of the evolution of the plumes and show their extent as of March 2015:

- TCE – Figure 2.4;
- Cis-1,2-DCE – Figure 2.5;
- VC – Figure 2.6;
- 1,4-DCB – Figure 2.7;
- Naphthalene and 2-methylnaphthalene – Figure 2.8;
- Iron – Figure 2.9; and
- Manganese – Figure 2.10.

Following the multiple remedial actions and the success of those remedies, the current maximum concentration of each groundwater COC at the site is presented below. No figure is included for PCE because this contaminant has been remediated to levels below the MCL and has remained below the MCL for over 2 years. The following table lists the results compared to the SRG.

Contaminant	Maximum Concentration* (µg/L)	Sampling Location	Cleanup Criteria (µg/L)
TCE	19,400	DP58S	5**
Cis-1,2-DCE	963	DP58S	70**
PCE	below detection limits	All locations	5**
VC	11.5	DP59	2**
Naphthalene	732	DP58S	1.7^{+}
2-Methylnapthelene	479	DP58S	36^{+}
Iron	96,100	DP27	14,000^{+}
Manganese	6,540	DP40	430^{+}
1,4-DCB	647	DP58S	75**

*Data is from groundwater collected from monitoring wells during the March 2015 sampling event.

** SRG is derived based on MCLs.
+ SRG is derived based on May 2016 EPA RSLs using a Hazard Index equal to 1 for non-carcinogens and a target cancer risk equal to 1×10^{-5} for carcinogens.

The figures illustrate that the breakdown products of reductive dechlorination reside within the same footprint and general pattern of the contour lines, indicating that the daughter products have followed the parent compound flow path. The highest concentrations of cis-1,2-DCE, VC, 1,4-DCB, naphthalene, and 2-methylnaphthalene are approximately collocated with the highest TCE concentrations. Due to the additional injection event under the interim remedy in 2013/2014, all remaining PCE was remediated and, as of March 2015, has been below its MCL for 2 years. Most of the remaining TCE and other primary COCs in site groundwater are located upgradient of the groundwater extraction trench installed for the interim remedy in the source zone (Figures 2.4 through 2.10).

DNAPL soil screening was conducted during borehole advancement in the area of highest TCE groundwater concentrations. Dye testing of soil from 16 ft to 20 ft bgs in two borings from the 2006 RI in this area (SB-36 and SB-38) indicated the potential presence of DNAPL. In addition, soil borings were advanced in 2010 and soil samples were collected at discrete depth intervals that identified the highest TCE concentrations in the area between 24 and 32 ft bgs (see Figure 2.11), which corresponds to the interface between the Brandywine Formation and the Calvert Formation. MIP and passive flux meter data support the findings of maximum TCE concentrations in this depth interval. High concentrations of TCE and VOC daughter products are limited to the upper portion of the Calvert Formation, demonstrating that the Calvert Formation prevents further downward migration. However, the data demonstrates that back diffusion of TCE from the upper portion of the Calvert Formation into the more permeable Brandywine Formation represents a continuing source of TCE contamination to the Brandywine Formation groundwater. These data also potentially represent the diffusion or dissolution of TCE from DNAPL present at the contact within the uppermost portion of the Calvert Formation.

The area in need of remediation is approximately 49,967 square feet and is primarily beneath the CSX railroad bed/track. VOCs in te distal portion of the plume in the Brandywine Formation were remediated through the implementation of the remedial actions selected in the Interim ROD and remedial alternatives are not being evaluated for this portion of the site, although performance monitoring will continue as needed in this area.

Smear zone soils in the northwest corner of the DRMO yard occupying an area of approximately 4,244 square ft are contaminated with 1,4-DCB, 2-methylnaphthalene, and naphthalene. These soils are acting as a continuing source of groundwater contamination, thus they have been evaluated as part of OU-1. The remedial objective for these soils is to reduce concentrations of these constituents such that COC concentrations in the Brandywine Formation groundwater are reduced to levels below MCLs and risk-based levels for constituents without an MCL.

2.5.3.2 Soil and Sediment (OU-2)

The extent of the soil contamination at the Brandywine DRMO Site is discussed in depth in the Brandywine RI report (URS, 2006a), EE/CA (URS, 2006b), Final Action Memorandum – Soil Removal (USAF, 2007), IRACR – Soil (Cape, 2008), and the PCB sampling technical memorandum (HGL, 2013c). Current and potential future land and resource uses are discussed further in Section 2.6. A summary of the extent of the soil contamination is provided below.

No spills, releases, or burial of contaminants have been documented for the former DRMO yard with the exception of a May 1986 notification to the State of Maryland. Concrete bins storing PCB-contaminated transformers and capacitors are known to have leaked to the soils surrounding the bins (Engineering-Science, 1985). The storage bins were located in the northeast portion of the DRMO yard. Other source areas potentially resulting in a release of contaminants to the DRMO yard media included the three former USTs, the three ASTs, the former stockpile of waste solvent drums before 1980, and burn pits. From August 1993 through October 1994, 14,000 cy of PCB-contaminated soil was excavated (Halliburton, 1995).

PCBs, SVOCs, pesticides, and metals have been detected in site soils. The risk assessments completed as part of the 2006 RI (URS, 2006a) determined that PCBs (specifically Aroclor 1260) were at concentrations that could potentially pose an unacceptable risk to human and ecological receptors. Dieldrin and some metals also posed some unacceptable risk, but these constituents were co-located with the PCBs that warranted cleanup. The human health residential risk-based cleanup goal was a PCB concentration of 10 mg/kg within the former DRMO yard. An ecological risk-based cleanup goal of 1.0 mg/kg was established in the wetland and non-wetland forest areas and, to the extent practicable, in the right-of-way of the CSX railroad.

The EE/CA prepared for OU-2 developed the removal action goals (URS, 2006b). Based on the results of both the HHRA and the ERA, excavation of the PCB-contaminated surface soil and sediments was recommended. Excavation activities occurred between September 2006 and December 2007, and approximately 6,362.5 tons of contaminated soil, sediment, and other debris were removed from the site for proper disposal. Attainment of the removal action goals was documented in the 2007 Action Memorandum (USAF, 2007). Post-excavation sampling has confirmed that removal actions have attained the PCB cleanup goals of 10 mg/kg in the DRMO yard (residential cleanup level) and 1 mg/kg outside of the DRMO yard (ecological cleanup level). Because the cleanup goals were attained, no additional action was required.

In 2013, EPA raised concerns about the lack of soil data underlying the active railroad tracks. Specifically, EPA noted that while OU-2 cleanup goals had been achieved at the site, PCB concentrations in soil beneath the railroad bed/ballast, which would be subject to residential human health criterion of 10mg/kg, had never been evaluated. This situation represented the only outstanding data gap that prevented OU-2 from reaching UU/UE. To address these concerns, HGL advanced 12 borings in December 2013 beneath the ballast material of both lines of the CSX railroad tracks. Analytical data indicated that PCBs were present at levels below the 10 mg/kg cleanup goal for residential soils, indicating that no unacceptable risk to human health or the environment remained for OU-2 (HGL, 2016b).

Therefore, PCBs are not present at levels greater than the residential cleanup level in the vicinity of the CSX railroad tracks, and no unacceptable risk remains. As a result, OU-2 requires no further action under a UU/UE scenario. Consequently, the remainder of this ROD addresses the actionable risk posed by OU-1.

2.5.3.3 Vapor Intrusion

The EE/CA report (Dames & Moore, 1996) found that the potential pathway that poses the greatest potential risk was inhalation of vapors volatilized from groundwater. Human exposure scenarios for SS-01 evaluated in the RI (URS, 2006a) included exposure of construction workers through the inhalation of vapors from groundwater and of on-site-residents, future on-site residents, and future commercial workers through exposure to vapors in indoor air. Vapor

intrusion modeling was used to predict concentrations in indoor air using the actual groundwater concentrations of chemicals. The potential risks due to vapor intrusion were estimated based on the results of the modeling. Results indicated that there were no unacceptable risks due to vapor intrusion to current residents or workers. Given that all residents in the vicinity of the Brandywine DRMO site are connected to a municipal water supply and drilling of new drinking water wells is prohibited, the scenario of vapor inhalation is highly unlikely since no groundwater is used for drinking or showering.

Indoor air samples were collected from four residences located west of the former Brandywine DRMO yard, and an ambient air sample was also collected, to assess human health risk associated with vapor intrusion (URS, 2006d). Total risk was calculated using the chemical concentrations detected in indoor air samples, and site-related risk was determined using the indoor air concentrations with ambient air concentrations subtracted and chloroform eliminated. The upper boundary of the USEPA target risk range was exceeded in one residence for total cancer risk, but all estimates of site-related cancer risk were within or below the USEPA target risk range. Due to the successful implementation of the interim groundwater remedial action, VOCs are no longer present in groundwater underlying any residence; thus, no potential unacceptable risk associated with vapors emanating from groundwater remains to current residents. Potential unacceptable risk remains for potential future residents/commercial workers from exposure to vapor emanating from the contaminated groundwater in the source area, should buildings be constructed over the source area.

2.6 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

The Brandywine DRMO yard, which occupies approximately 8 acres, is located in a mixed industrial/commercial/residential area. The DRMO yard is bound to the north and east by undeveloped woodlands, to the southeast by a residential property, and to the west and southwest by active railroad tracks operated by CSX. Located south of the site across the CSX railroad tracks is a patch of undeveloped land and several commercial properties zoned for light to heavy industrial use (M-NCPPC, 2007). To the west, beyond the CSX railroad tracks, are Cherry Tree Crossing Road, undeveloped woodlands, the GWETS, and multiple residential properties. The JBA Installation Development Plan (February 2016), formerly known as the Base General Plan (dated January 2010). includes information to ensure that LUC management takes place and that the presence of LUCs is effectively communicated. JBA is completing a new Installation Development Plan, which will supersede the current Installation Development Plan. The LUCs required by this ROD will ensure that the site is reevaluated for potential unacceptable risk before any land use change is implemented.

Groundwater in the vicinity of the plume at the Brandywine DRMO site is not used for drinking, washing, or industrial uses because the area is served by public water supplied by WSSC. PGC enforces the state regulatory prohibition (COMAR § 26.03.01.05A) on issuing drilling permits to any individual water supply systems in the Brandywine area. Under this state regulation, new developments located within the envelope of the County 10-Year Water and Sewer Plan (PGC, 2006) are required to connect to public water supplies. In addition, the contaminated groundwater at the Brandywine DRMO site does not discharge to surface water.

The silt and clay that makes up the Calvert Formation underlying the surficial aquifer act as a semiconfining layer or aquitard that limits the vertical migration of contaminated groundwater from SS-01. Groundwater at SS-01 is not currently used as a potable water source, and the migration

of impacted groundwater appears to be limited to the upper 10 ft of the Calvert Formation between the northwest corner of the DRMO yard and the existing GWETS. The NCP at 40 CFR § 300.430(a)(1)(iii)(F) states the expectation that usable groundwater will be returned to beneficial use whenever practicable. To comply with the expectation stated in the NCP, the site was evaluated under a residential land use scenario, with shallow groundwater as the primary drinking water source for the residents.

Currently no plans for residential development at SS-01 exist, and such future use of the site is highly unlikely in the vicinity of the source zone. However, LUCs will be imposed on the site to ensure that it is not used for residential use until it meets unlimited use and unrestricted exposure requirements or mitigation measures make it safe for residential occupancy.

2.7 SUMMARY OF SITE RISKS

An HHRA and ERA were performed at SS-01 during the RI (URS, 2006a) to identify the COCs for the FS. Because a risk assessment was performed as part of the 2006 RI and none of the COCs changed for OU-1, it was determined that a new risk assessment did not need to be completed during the Supplemental RI (HGL, 2013b).

2.7.1 Human Health Risk Assessment Process

The HHRA evaluated the risks that exposure to soil, groundwater, and indoor air at the site would pose if no remedial action were taken. It provides the basis for taking remedial action and identifies the contaminants that need to be addressed. The HHRA determined the cleanup levels that are protective of human health and the environment, and it calculated total risk presented by various environmental media to all potential receptors.

Risk results for the Brandywine DRMO site included both site-related risk and total human health risk. In addition, a background HHRA was conducted. The background human health risk represents the chemical risks and hazards to which humans would be exposed if the site did not exist. The following sections outline the steps taken to conduct the HHRA for soil and groundwater at SS-01. The risk characterization results for soil, groundwater, and indoor air at SS-01 are discussed in Section 2.7.2.

2.7.1.1 Identification of Site-Related Contaminants of Potential Concern

The selection of contaminants of potential concern (COPCs) is a conservative screening process that identifies those chemicals that may be present at the site at concentrations that could result in unacceptable risks to potential receptors. The COPC selection process was conservative to ensure that potential unacceptable risks were not overlooked during the HHRA. The maximum detected concentration of each constituent in each medium (surface soil, subsurface soil, and groundwater) was compared to a screening value to select the COPCs. If the maximum detected concentration of a constituent exceeded the screening value, the constituent was selected as a COPC and retained for further evaluation.

USEPA Region III risk-based screening levels (RBSLs) and chemical-specific recommended daily allowances were used as the screening levels to identify COPCs (URS, 2006a). These RBSLs are chemical concentrations, based on standard default exposure assumptions, that correspond to an excess lifetime cancer risk of 1×10^{-6} (a 1 in 1,000,000 chance of developing cancer over a

70-year lifetime as a result of site-related exposure) or a non-cancer Hazard Index (HI) of 1.0 (threshold level below which noncancer health effects are not expected to occur).

Chemicals eliminated from further evaluation at this step do not present unacceptable risks to exposed human receptors. The COPCs were then further evaluated by comparing the COPC concentrations to the site background levels for soil and groundwater. Site-related COPCs were determined as those chemicals with concentrations significantly greater than background concentrations. The site-related COPCs were retained for the evaluation of site-related risk. For TCE, the 95 percent Upper Confidence Limit (UCL) exceeded the maximum detected concentration, and therefore the maximum concentration detected in monitoring wells was used as the exposure point concentrations in the risk assessment. For the remaining COPCs, the 95 percent upper confidence limit was used (URS, 2006a).

2.7.1.2 Exposure Assessment

The exposure assessment defines and evaluates the type and magnitude of human exposure to the chemicals present at a site or migrating from a site. The exposure assessment depicts the physical setting of the site, identifies potentially exposed populations, and estimates chemical intakes under the identified exposure scenarios. Six human-exposure scenarios (i.e., other worker, construction worker, trespasser/visitor, on-site resident, future commercial worker, and future on-site resident) were identified and addressed in the assessment of risks posed by SS-01. Exposure pathways and receptors were identified based on site characteristics and historical site data.

Measured and modeled exposure-point concentrations were determined for each receptor and were used in the risk assessment. The reasonable maximum exposure (RME) scenario was evaluated for each receptor. The RME scenario represents the highest level of human exposure that could be reasonably expected to occur. For scenarios where the RME hazard or risk was greater than the USEPA target level, the central tendency exposure (CTE) scenario was evaluated to provide additional information. The CTE scenario portrays the median exposure estimate and corresponding risk rather than upper limit or maximum exposure estimate. Exposure parameters used in the HHRA were compiled from USEPA data and professional judgment.

2.7.1.3 Toxicity Assessment

This section provides the methodologies for the characterization of the potential human health risks associated with exposure to site media. The toxicity assessment identifies the potential adverse health effects to populations exposed to site contaminants. Most of the toxicity values used in this HHRA were obtained from Integrated Risk Information System database searches conducted in spring 2004, from USEPA Region III's Risk-Based Concentration tables, and other sources in accordance with USEPA policy on human health toxicity values in Superfund risk assessments (USEPA, 2001).

The toxicity value used to evaluate carcinogenic effects is the cancer slope factor. The cancer slope factor is an upper-bound estimate of the probability that a person will develop cancer over a lifetime based on a given dosage. The toxicity value used to evaluate noncarcinogenic effects is the reference dose (RfD). The RfD is an estimate of the daily exposure level for the human population that is likely to be without appreciable risk during an established period of time, ranging from several weeks to a lifetime, depending on the exposure scenario being evaluated. In cases

where toxicity values were not available, COPCs were initially screened using assigned surrogate toxicity values based on chemicals with similar mechanisms of toxicity and chemical structure.

2.7.1.4 Risk Characterization

The results of the exposure assessment and toxicity assessment were used to develop numerical estimates of the potential health risks associated with site-related contamination. Cancer risk and noncancer hazard were calculated for each COPC under the RME scenario. For each potentially carcinogenic COPC, the incremental probability that an individual would develop cancer over a lifetime was estimated from projected intake levels and the cancer slope factor. An incremental lifetime cancer risk of 1×10^{-6} indicates a 1 in 1,000,000 chance of developing cancer as a result of exposure to site media. This risk is in addition to the risks of cancer individuals face from other causes such as smoking or exposure to too much sun. The USEPA site remediation goal set forth in the NCP designates a cancer risk range of 1×10^{-4} to 1×10^{-6}.

To characterize the potential noncancer effects of chemicals, comparisons were made between projected intakes of COPCs over a specified time using oral and inhalation RfD toxicity values. A hazard quotient (HQ), which is the ratio between exposure to a chemical and that chemical's toxicity value (i.e., RfD), was calculated for each noncarcinogenic COPC and exposure pathway. An HQ of less than or equal to 1 indicates that a receptor's dose of a single contaminant is less than the RfD and that toxic noncarcinogenic effects from that chemical are unlikely. The HI is the sum of the HQs for all COCs to which a receptor is exposed. An HI of less than 1 indicates that, based on the sum of all HQs from different contaminants and exposure routes, toxic noncarcinogenic effects from all contaminants are unlikely. An HI of greater than 1 indicates that site-related exposure may present an unacceptable risk to human health.

2.7.2 Human Health Risk Assessment Results

The COCs identified in the Brandywine FFS as site-related chemicals that need to be considered for a response action because they contribute to a significant excess cancer risk or noncancer hazard are a subset of the COPCs (URS, 2006c). The results of the HHRA identified six VOCs (TCE, cis-1,2-DCE, VC, PCE, 2-methylnaphthalene, and naphthalene) and two metals (iron and manganese) as COCs in the groundwater. The compound 1,4-DCB is a site-related contaminant detected above its MCL that was left off of the COC list in the Interim ROD.

Cancer risk estimates for several receptors significantly exceeded the upper boundary of the target risk range of $1 \text{ X } 10^{-4}$ and were driven by exposure to TCE in groundwater (or vapors in indoor air) and ingestion of and dermal contact with PCB-1260 in surface soil. This was also the case for the HI values for several receptors. Results of the risk assessment presented in the table below indicate that the cancer risk and noncancer risk hazard to current residents downgradient of the former DRMO yard and other current receptors were below USEPA target levels. Hypothetical future receptors would incur significant levels of risk and hazard if the site was developed for residential or commercial use without implementation of measures to limit exposure of future residents or commercial workers. The following table summarizes the human health site-related risks for SS-01.

Human Health Site-Related Risk Summary for SS-01							
Medium of Concern	**Other Worker**	**Trespasser/ Visitor**	**Construction Worker**	**Current Resident (vapor intrusion)**	**Current Resident (residential well)**	**Future Resident**	**Future Commercial Worker**
Receptor Hazard Index							
Surface Soil	0.10	0.07	0.40	NA	NA	2.5	0.15
Subsurface Soil	NA	NA	0.44	NA	NA	2.74	0.22
Groundwater	NA	NA	0.02	NA	NA	1094	40
Total	0.10	0.07	0.85	NA	NA	1099	40
Receptor Cancer Risk							
Surface Soil	$8*10^{-5}$	$3*10^{-6}$	$1*10^{-5}$	NA	NA	$7*10^{-4}$	$1*10^{-4}$
Subsurface Soil	NA	NA	$3*10^{-7}$	NA	NA	$2*10^{-5}$	$2*10^{-6}$
Groundwater	NA	NA	$1*10^{-6}$	$4*10^{-7}$	$4*10^{-7}$	$2*10^{-2}$	$9*10^{-4}$
Total	$8*10^{-5}$	$3*10^{-6}$	$1*10^{-5}$	$4*10^{-7}$	$4*10^{-7}$	$2*10^{-2}$	$1*10^{-3}$

NA=Not applicable; pathway incomplete or not evaluated

The primary site-related cancer risk drivers and noncancer hazard drivers for selected exposure scenarios at SS-01 are presented in the tables below. The tables include the receptor or exposure route cancer risk estimates that equaled or exceeded 1 X 10^{-4} or individual COCs with risk exceeding 1 X 10^{-5}. For noncancer hazards, only COCs that contributed to a receptor, exposure route, or target organ HI greater than 1 are listed in the table. Overall, it is evident that TCE was the primary driver for groundwater and that PCB-1260 was the primary driver for soil. Note that the RME values for future residents reported in the table below represent the combined risk estimates for an adult and a child.

Site Health Effects Due to Surface Soil and Groundwater at SS-01				
	Carcinogenic Risk (RME)		**Noncarcinogenic HQ (RME)**	
Contaminant	**Future Resident+**	**Future Commercial Worker**	**Future Resident+**	**Future Commercial Worker**
Surface Soil				
PCB-1260	$6.7.10^{-4}$	$1.1*10^{-4}$	-	-
Groundwater (water supply)				
1,4-DCB	$2.4*10^{-4}$	-	1.99	-
PCE	$1.8*10^{-4}$	-	-	-
TCE	1*10-2	-	951.85	-
cis-1,2-DCE	-	-	69.92	-
VC	$4.2*10^{-3}$	-	-	-
Iron	-	-	2.26	-
2-methylnaphthalene	-	-	2.74	-
Groundwater (vapor inhalation)				
1,4-DCB	$8.3*10^{-5}$			-
TCE	$4.4*10^{-3}$	$9.1*10^{-4}$	54	-
cis-1,2-DCE	-	-	1.8	1.30
2-methylnaphthalene	-	-	0.97	38.6
Naphthalene	-	-	0.94	-

- COC is not a major contributor to the receptor under the RME scenario.

[+] The carcinogenic and noncarcinogenic RME values for future residents combine the risk estimated for an adult and a child.

2.7.3 Ecological Risk Assessment

Site SS-01 is a relatively flat area of about 8 acres. Portions of the ground surface are paved with asphalt or covered with gravel, and the remainder is vegetated with grass or weeds. An active railroad track and two-lane road are situated along the western boundary of the site. Fairly large wooded areas are located to the east and north, and residential developments are located to the southeast, south, and west. A commercial petroleum products distribution operation with documented petroleum product releases is located northwest of the DRMO yard. In its present condition, the DRMO yard and the surrounding areas are very poor habitat for wildlife due to the regraded soil and the disruption caused by railroad operations. This area was not considered in the ERA.

Other areas with favorable habitat for wildlife are located to the east, north, and west (beyond the CSX railroad tracks) of the DRMO yard. The small forested area to the west received drainage from the DRMO yard and, in combination with an intermittent stream, it supports a variety of forest species. No other waterbodies are located at or near the DRMO yard except the drainage ditches that convey surface water runoff to the west of the site. Based on previous investigations and information obtained during the RI, the COPCs included PCBs, polynuclear aromatic hydrocarbons, and inorganics. VOCs have been detected frequently in groundwater but have been detected infrequently in other media.

Based on the physical characteristics of the site and the ecological receptors likely to be present in habitats at and near the site (i.e., terrestrial invertebrates, mammals, and birds), the potential exposure pathways were identified as direct exposure to soil or ingestion of food items. A screening-level risk calculation was conducted as part of the 2006 RI in three different areas of the site. The results from the DRMO yard, the forest area to the west beyond the CSX tracks, and the forest area to the east of the DRMO yard indicated that a baseline ERA should be completed because the screening ERA could not rule out potential adverse effects to ecological receptors resulting from contaminants present in media at and near the DRMO yard.

The RI baseline ERA determined that PCBs potentially posed an unacceptable risk to ecological receptors in soil and sediment in the higher quality habitat west of the DRMO yard. Dieldrin and some metals (chromium, vanadium, and zinc) also posed some unacceptable risk in soil, but these constituents were co-located with PCBs that posed potential unacceptable risk.

2.7.4 Conclusions of Risk Assessments and Basis for Action

The 2006 RI included a baseline HHRA and a screening and a baseline ERA. The HHRA calculated potential risks to human health from exposure to the contaminants at the Brandywine DRMO site. An unacceptable risk was defined as a cancer risk of greater than 1×10^{-4} or a noncancer risk with an HI greater than 1.0. The results of the HHRA indicated that contamination in surface soil and groundwater poses an unacceptable risk to the health of future residents and workers. However, the HHRA determined that current residents (surrounding the DRMO site) and commercial workers do not face unacceptable health risks due to the contamination at the Brandywine DRMO site.

The unacceptable future human health risks from the 2006 HHRA are as follows:

- Groundwater (OU-1)
  - Ingestion of and dermal contact with TCE, PCE, cis-1,2-DCE, VC, 2-methylnaphthalene, naphthalene, iron, and manganese used as water supply by future residents;
  - Inhalation of TCE, PCE, and naphthalene vapors by future residents while showering with groundwater; and
  - Inhalation of TCE vapors that migrated upward from groundwater to indoor air (vapor intrusion) by future residents and future commercial workers.
- Surface Soil (OU-2)
  - Ingestion of and dermal contact with the PCB Aroclor 1260 in surface soil by future residents and future commercial workers; and
  - Ingestion of and dermal contact with dieldrin in surface soil by future residents.

The RI ERA determined that there is limited ecological habitat within the DRMO yard but that high quality habitat was present in the forested area to the west of the yard. PCBs were detected at concentrations that could potentially pose an unacceptable risk to human and ecological receptors in soil and sediment. Dieldrin and some metals (chromium, vanadium, and zinc) also posed some unacceptable risk in soil, but these constituents were co-located with PCBs that warranted cleanup.

Based on the 2006 risk assessment results, PCB-contaminated surface soil and sediments were excavated, and post-excavation samples confirmed that through these excavations the PCB cleanup goals of 10 mg/kg in the DRMO yard (residential cleanup level) and 1 mg/kg outside of the DRMO yard (ecological cleanup level) were achieved (HGL, 2016b). After backfill and compaction, the site was restored to pre-excavation conditions. The drainage channel was reworked and the forested area to the west of the DRMO yard was restored with native trees and wetlands grasses following the removal of PCB-contaminated sediments and surface soils. Therefore, no further action is needed to address OU-2.

The Supplemental RI (HGL, 2013b) concluded, with regulatory stakeholder concurrence, that the risk assessment completed as part of the 2006 RI would not require reanalysis given that the groundwater COCs had remained the same. Consequently, this ROD selects a response action to mitigate the unacceptable risks potentially posed by TCE, PCE, cis-1,2-DCE, vinyl chloride, 1-4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese in groundwater at SS-01. Based on the latest analytical results (HGL, 2016a), the response action selected in this ROD is necessary to protect public health or welfare from actual or threatened releases of pollutants or contaminants from the site that may present an imminent and substantial endangerment to public health or welfare.

2.8 REMEDIAL ACTION OBJECTIVES

RAOs are site-specific and are based on an evaluation of site conditions, the nature and extent of site contaminants, the results of the risk assessments, and an analysis of ARARs. The FS (HGL, 2016b) determined that previous remedial actions achieved cleanup goals associated with OU-2 (soil and sediment) at SS-01; therefore, OU-2 requires no further action and no RAOs were developed for OU-2. For OU-1, the FS identified remaining COCs in groundwater and in the vadose zone (northwest corner of the DRMO yard). The vadose zone and the source zone within

the upper Calvert formation, is included in the groundwater remedy to ensure that residual contaminants in do not leach to groundwater at SS-01. The RAOs are intended to ensure that potential future human receptors are not exposed to the contaminants in groundwater at the site (i.e., through drinking or contact during construction activities) or to unacceptable risk associated with the vapor emanating from the groundwater.

The following RAOs were developed for OU-1 at SS-01:

- Reduce concentrations of VOCs (TCE, PCE, cis-1,2-DCE, and VC) in the Upper Calvert Formation and Oxidized Calvert Formation so that contaminant diffusion from the Calvert Formation back into the Brandywine Formation groundwater is arrested and COC concentrations in the Brandywine Formation groundwater are reduced to levels below MCLs.
- Reduce concentrations of 1,4-DCB, 2-methylnaphthalene, and naphthalene in smear zone soils in the northwest corner of the DRMO yard such that COC concentrations in the Brandywine Formation groundwater are reduced to levels below MCLs and risk-based levels for constituents without an MCL.
- Protect potential future human receptors from exposure to contaminated groundwater by dermal contact and ingestion, and to vapor emanating from the contaminated groundwater above unacceptable risk levels.
- Restrict exposure to vapors from vapor intrusion until there is no potential unacceptable risk.
- Restrict exposure to groundwater for dermal contact, ingestion, and inhalation while showering/bathing until cleanup is achieved.
- Restrict the use of groundwater for drinking or showering purposes until **site remediation goals (SRG)s** (herein referred to as cleanup criteria) for the COCs are achieved.
- Maintain land use controls to ensure that people are not exposed to contaminants in the groundwater until cleanup criteria are achieved.

Achievement of the RAOs will be quantitatively measured by the achievement of cleanup criteria in individual monitoring wells during implementation of the selected remedial alternative. Cleanup criteria for SS-01 were set to federal regulatory criteria for drinking water (i.e., MCLs). For COCs without MCLs, the May 2016 EPA RSLs were used to establish remedial goals. The SS-01 FS (HGL, 2016b) identified cleanup criteria for the COCs. The cleanup criteria for COCs at SS-01 are identified in the table below.

Groundwater COC	Cleanup Criteria (µg/L)	Basis of Criteria
TCE	5	MCL-based
Cis-1,2-DCE	70	MCL-based
PCE	5	MCL-based
VC	2	MCL-based
Naphthalene	1.7	RSL, May 2016
2-Methylnapthelene	36	RSL, May 2016
Iron	14,000	RSL, May 2016
Manganese	430	RSL, May 2016
1,4-DCB	75	MCL-based

The Air Force will monitor the plume (source area and the distal portions of the plume addressed during the interim remedy that have not met cleanup goals) and implement the LUCs described in the final ROD until RAOs are achieved. Attainment of the site cleanup criteria would indicate that the groundwater quality has been restored and that it can be used safely by humans. In addition to the cleanup criteria developed for SS-01, ARARs were identified that pertain to the COCs in groundwater, the response actions to be taken, and location of the site. These ARARs are listed and their applicability to the selected remedy is explained in Appendix B.

2.9 DESCRIPTION OF ALTERNATIVES

Since no further remediation action is required for OU-2, the following four remedial alternatives were developed to address groundwater contamination at OU-1:

- Alternative 1 – No Action
- Alternative 2 – Excavation, In Situ Enhanced Reduction, and LUCs
- Alternative 3 – Excavation, In Situ Chemical Oxidation (ISCO) Using Potassium Permanganate, and LUCs
- Alternative 4 – In Situ Thermal Treatment, and LUCs

The rationale, conceptual design, and performance monitoring of these alternatives are presented in the sections below.

2.9.1 Alternative 1: No Action

CERCLA requires that the No Action alternative be evaluated to establish a baseline for comparison to other remedial alternatives. Under this alternative, no active remedial alternatives or controls would be implemented. No LUCs or long-term monitoring would be implemented. No costs are associated with this alternative, and the time to reach cleanup criteria using this alternative is assumed to be 60 or more years.

2.9.2 Alternative 2: Excavation, In Situ Enhanced Reduction, and LUCs

Alternative 2 would involve excavating an area of the smear zone to reduce the levels of naphthalene, 2-methylnaphthalene, and 1,4-DCB and reduce the risk of these contaminants leaching from soil to groundwater. The total volume of soil warranting excavation is approximately 1,900 cubic yards. The excavation area is based on the area of naphthalene and 2-methylnaphthalene depicted on Figure 2.8, and the bounds of the excavation area are illustrated on Figure 2.12. Included in the excavation portion of this alternative is the off site disposal of the material at an approved facility, removal of two monitoring wells, replacement of one of the removed monitoring wells (PW01) to use in the performance monitoring program, and shoring up of the excavation near the former groundwater treatment building based on the excavation proximity to the railroad tracks.

In addition to the excavation, a carbon and/or iron-based substrate would be injected into the VOC-impacted portion of the upper 12 ft of the Calvert Formation. The total treatment area would be approximately 30,000 square ft, and the total treatment volume would be approximately 450,000 cubic ft, which is illustrated on Figure 2.13. It is assumed that substrate injected into the upper portion of the Calvert Formation would migrate into the Brandywine Formation and

effectively treat this area. Two injections are planned. The second injection event would occur 3 years after the first injection event based on the typical amount of time these substrates remain in the ground. The FS assumed that the substrate would be either EHC® or Emulsified Zero Valence Iron (EZVI). Both are proprietary mixtures that combine fermentable organic material and zero-valent iron that can be delivered into the subsurface with a range of technologies. The EHC® accelerates the rate at which native microorganisms biodegrade VOCs into harmless substances. The EZVI causes chemical reactions that reduce the contaminants into harmless substances.

2.9.2.1 Substrate Injection

Due to the silt and clay content of the Calvert Formation and the presence of the CSX railroad tracks, substrate delivery would be achieved with hydraulic fracturing, pneumatic fracturing with nitrogen gas, or pre-pathway development with nitrogen gas. A radius of influence (ROI) of approximately 10 ft might be possible. Due to concerns about altering the ground surface with this technology, the Badger Injection Solutions Kinetically Adjustable Pore Space Dilation Injection Delivery System (KAPSDIDS) might be used under the CSX right-of-way. The KAPSDIDS technology provides more effective delivery than traditional injection approaches and has increased ability to affect diffusion-limited pore spaces.

EHC® delivery with hydraulic fracturing would be implemented in the treatment zone located outside of the CSX railroad right-of-way. An ROI of 10 ft is expected, which translates to approximately 100 locations. There would be four treatment intervals per treatment location, with less than 1 ft of spacing between intervals. Approximately 160,000 pounds of EHC®, corresponding to 0.4 percent of the soil mass by weight, is estimated for the first round of injections. It is assumed that the EHC® would be injected as a 25 percent slurry by weight, requiring approximately 58,000 gallons of water. The use of potable water is assumed. A production rate of 12 injections per day (3 injection locations per day) is anticipated.

The KAPSDIDS technology would be implemented in the CSX railroad right-of-way to deliver EZVI (or emulsified vegetable oil) beneath and near the tracks. Due to expected challenges of injecting into the Calvert Formation, a 10-ft radius is assumed, which translates to approximately 37 locations. The treatment interval for injection is 4 ft. There would therefore be three treatment intervals per treatment location to treat the upper 12 ft of the Calvert Formation.

Similar to the EHC® injection dose, the EZVI dose with the KAPSDIDS technology is estimated to be 0.4 percent of soil mass by weight. The injection distribution of EZVI would vary with depth. For the upper injection interval (upper 4 ft), the target distribution area would be 80 percent of the 7,800 to 10,000 square ft. For this upper interval, approximately 15,000 pounds of EZVI and 72,000 gallons would be needed. For the middle injection interval (middle 4 ft), the target distribution area would be 40 percent of the 7,800 to 10,000 square ft. Approximately 15,000 pounds of EZVI and 36,000 gallons of water would be needed for this interval. For the lower injection interval (lower 4 ft), the target distribution area would be 20 percent of the 7,800 to 10,000 square ft. For the lower interval, approximately 15,000 pounds of EZVI and 18,000 gallons of water would be needed.

A second injection event is anticipated to improve distribution of EHC® and EZVI and replenish the substrates as they are depleted by natural demand and the high concentrations of VOCs. The timing of the second injection would consider site-specific geochemical monitoring data to evaluate remedy performance in determining reinjection frequency. The second injection event is expected to occur 3 years after the initial injection based on the typical longevity of these

substrates in the subsurface. This second injection event is assumed to include the same number of injection points (with locations offset by 5 to 10 ft from the initial injection round) and the same quantity of EHC® and EZVI as the first event.

2.9.2.2 Groundwater Monitoring Program

Post-injection groundwater monitoring would be needed to evaluate remedy performance. Monitoring would provide information about changes in contaminant levels, the status of the injected substrates, and the potential need for additional injections. Although the substrates are injected into the Calvert Formation, VOC concentrations, geochemistry, and metals (iron and manganese) would be monitored in the Brandywine Formation because the RAOs pertain to the Brandywine Formation. At least 14 monitoring wells are planned for inclusion in the performance monitoring network specific to the source zone. Additional monitoring wells immediately downgradient of groundwater flow direction would need to be monitored across the entire shallow groundwater column to the Calvert Formation.

The sampling frequency would be twice per year for the first 6 years following the initial injection, followed by 3 years of annual sampling. Additionally, the entire plume would be monitored, including the distal portions of the plume addressed during the interim remedy that have not yet achieved cleanup goals. The monitoring well network (Figure 2.14) would continually be evaluated and optimized with respect to analytes, monitoring frequency, and location based upon trends and achievement of cleanup goals. The frequency and duration of groundwater monitoring might need to be changed over the course of remedy implementation based upon site-specific conditions and the performance of the remedy over time.

2.9.2.3 Land Use Controls

LUCs would be implemented to restrict the use of, or limit access to, real property to prevent exposure to contaminants above permissible levels. The intent of using these controls is to protect human health by limiting the activities that may occur at the site to prevent exposure to COCs and to protect the remedy. Implementation of LUCs on the use of the groundwater is needed due to potential unacceptable risks to residents or workers from vapor intrusion, ingestion, or dermal contact with COCs in groundwater. LUCs would remain in place as long as the concentrations of COCs are above the cleanup criteria. The LUC boundary may be adjusted over time as new data are analyzed. Changes to the LUC boundary would require a ROD modification; because this would likely be a minor change to the remedy, the modification would entail regulator concurrence and a memorandum for the administrative record.

Groundwater use is not permitted in the vicinity of the Brandywine DRMO site because Maryland regulations forbid the installation of individual water supply systems when a community water supply system is available (COMAR § 26.03.01.05.A.). Public water is supplied to the area by the WSSC.

A more detailed description of the LUCs included in this and other alternatives is presented in Section 2.13.2.3.

2.9.3 Alternative 3: Excavation, ISCO Using Potassium Permanganate, and LUCs

The excavation component of this remedial alternative is the same as that described for Alternative 2. To address the source area, potassium permanganate would be injected in the upper 12 ft of the Calvert Formation. The total treatment area is similar to that for Alternative 2 and is illustrated on Figure 2.13. It is assumed that substrate injected into the contaminated portion of the Calvert Formation will migrate into the Brandywine Formation and effectively treat this zone. Following the initial injection, up to three additional injection events would be conducted to oxidize TCE, cis-1,2-DCE, and VC into harmless end products. The frequency of the injections is expected to be one per year.

Potassium permanganate has been demonstrated as an effective in situ oxidant for treating TCE, cis-1,2-DCE, and VC. The use of potassium permanganate has an added advantage over the use of EHC® and EZVI because potassium permanganate increases the oxidation reduction potential of the aquifer, which will help reduce the solubility of iron and manganese in groundwater, thereby decreasing iron and manganese concentrations in groundwater. In addition, by addressing the contamination in the vadose zone soil, which is the source of the 1,4-DCB, naphthalene, and 2-methylnaphthalene contamination in groundwater, attenuation of these contaminants in groundwater would be observed due to the absence of an ongoing source.

2.9.3.1 Substrate Injection

Similar to Alternative 2, hydraulic fracturing would be used to inject permanganate in "non-railroad" areas. Air would be used in place of nitrogen because, unlike the enhanced reduction of Alternative 2, air containing oxygen will not increase the reagent demand. The KAPSDIDS technology would be used to improve delivery to the Calvert Formation under the CSX railroad right-of-way. The same radii of influence, injection locations, and vertical injection intervals planned for Alternative 2 would be used for Alternative 3.

The dose of potassium permanganate is based on permanganate oxidant demand data collected in December 2013, other site-specific information, and professional judgement. It is anticipated that a dose of 3.5 grams of potassium permanganate per kilogram of soil would be sufficient to treat the chlorinated VOCs, which translates to a total injected potassium permanganate mass of 140,000 pounds in the "non-railroad" area and 46,000 pounds in the "railroad" area. An injection volume of approximately 240,000 gallons (7 percent saturated solution/slurry) would be used for the "non-railroad" area, and 126,000 gallons (4 percent solution) would be used for the "railroad" area.

It is assumed that up to three additional injection events would be executed with similar injection spacing but staggered locations. The second event would consist of the same number of injection points and the same oxidant dosage as the first injection event. The last two events (if needed) were assumed to require half the number of injection locations and permanganate mass used in the first event. The total oxidant dose for all four events would be 10.5 grams of potassium permanganate per kilogram of soil. The subsequent injection locations would be staggered by 5 to 10 ft to improve distribution of the permanganate in the subsurface.

2.9.3.2 Groundwater Monitoring Program

Similar to Alternative 2, performance monitoring would occur post-injection to evaluate remedy performance. Groundwater monitoring would be performed in the treatment area to evaluate

remedy performance. Monitoring would provide information about changes in contaminant levels, the status of the injected substrates, and the potential need for additional injections. Monitoring data would be used to evaluate the effectiveness of each injection event and to confirm that RAOs have been met. The sampling frequency would be quarterly, following each injection event, followed by 3 years of annual sampling after the last quarterly event. Annual monitoring of the distal plume would continue.. The frequency and duration of groundwater monitoring may be changed over the course of remedy implementation based upon site-specific conditions and performance of the remedy.

The performance monitoring network would be the same as that described for Alternative 2 and would include a replacement well for PW01, 3 new wells, and 14 monitoring points within the Brandywine Formation (Figure 2.14). Metals, including hexavalent chromium, would be monitored in the Brandywine Formation in addition to VOCs because oxidation has the capacity to oxidize relatively immobile trivalent chromium into the more mobile and toxic hexavalent chromium. Potassium and carbon dioxide would be monitored as markers for the dissolution of potassium permanganate and the oxidation reactions, respectively. The monitoring well network would continually be evaluated and optimized with respect to analytes, monitoring frequency, and location based upon trends and achievement of cleanup goals.

2.9.3.3 Land Use Controls

Similar to Alternative 2, LUCs would remain in place as long as the concentrations of COCs are above the cleanup criteria. The LUCs for Alternative 3 are the same as those described in Alternative 2 in Section 2.9.2.3.

2.9.4 Alternative 4: In Situ Thermal Treatment and LUCs

Alternative 4 is USAF'S preferred alternative to address groundwater contamination. Alternative 4 involves the use of an ERH thermal treatment system to address the source areas. The system (Figure 2.15) will be installed beneath the CSX tracks, within the northwest corner of the DRMO yard, and between Cherry Tree Crossing Road and the GWETS. ERH will heat the subsurface (up to 100°C) to volatilize the contaminants, and vapor recovery wells will be used to extract the contaminants. Extracted vapors will be treated with vapor-phase granular activated carbon. Heating the subsurface is also expected to increase microbial activity, which will serve as an additional polishing step to clean up groundwater by degrading contamination in situ. As the natural geochemistry of the aquifer is restored through the removal of the VOCs, iron and manganese concentrations will decrease to ambient levels.

ERH is particularly well suited for this site because the primary COCs are VOCs that are present in heterogeneous, low permeability materials. ERH is particularly effective at heating low permeability subsurface materials and remediating the specific areas requiring treatment in heterogeneous strata.

2.9.4.1 Installation of the ERH Thermal Treatment System

Vertical sheet pile electrodes are anticipated to be installed to operate the ERH thermal treatment system. Originally the conceptual design considered 44 horizontal electrodes arranged in four layers by depth underneath the CSX rail lines and 58 sheet pile electrodes installed to the east and west of the horizontal electrodes. During initial design efforts and in consultation with CSX, the design has been refined to include the installation of 101 sheet pile electrodes and 2 horizontal

borings throughout the entire treatment area (Figure 2.15). Each electrode will have a vapor recovery well buried in gravel above the top of the electrode.

Because of CSX requirements, the two horizontal borings installed nearest the rail lines will be installed utilizing the jack and bore drilling technique. This piping will serve as the corridor for vapor recovery and electrode supply cables between the rails. CSX requirements establish the minimum distances and depths from the tracks that must be maintained during remediation activities. The JBA 11th Civil Engineer Squadron Real Estate Office has a formal agreement with CSX (NYC-042652) that is amended periodically as remediation efforts progress to allow for right of entry. Operational components of this remedy may be adjusted during the design or remedial action phase of the remedy.

Each electrode will have a vapor recovery screen that is located next to or near the electrode. The vapor recovery screens will be installed within a surface plenum. The surface plenum will consist of a 3-inch layer of gravel and a 20-millimeter thick PVC liner. Surface vapor recovery wells will be routed through the gravel layer to ensure that no vapors escape to the surface. Vapor recovery lines to the plenum between the tracks will be connected to the vapor recovery jack-and-bore locations. In addition to providing vapor capture, the surface plenum will divert rainfall out of the treatment zone and assist to reduce contaminant flux during the remediation. Even though the surface plenum would reduce rainfall flux, there could be times when the water table rises to the level of the shallow VR wells at 5.75 feet bgs. These wells will be designed to extract any water that enters the well screen. This water, along with condensate from the vapor treatment system, may be treated in the existing groundwater treatment system (which is functional but not currently operating) and discharged under the existing discharge permit equivalency.

It is anticipated that, once installed and tested, the thermal treatment system will be operational for up to 6 months. Vapor recovery wells will operate for the 6-month period and perhaps longer, depending on mass removal quantities and trends.

Because work will be performed directly beneath the CSX tracks, a survey of the tracks will be performed before installation of the electrodes. This will determine the baseline elevation of the tracks. During treatment, additional surveys will be performed to determine if the thermal treatment of the subsurface has caused any subsidence or shifting of the tracks. A final survey would be performed 6 months after the system has been off. If the survey events find that subsidence or movement of the tracks has occurred more than the CSX threshold, mitigation of the subsidence would be required. Mitigation might include adding new railroad ballast material and realigning the rails.

The recently installed high-density polyethylene (HDPE) pressure sewer main that services the American Legion Post 227 east of the site will likely be compromised during ERH remediation. Therefore, the Air Force will replace it, or the appropriate length of the pipe necessary, once the thermal process is completed at the site. Temporary accomodations will be provided for the American Legion Post 227 while the line is out of service.

2.9.4.2 Groundwater Monitoring Program

Because the electrodes would heat the subsurface to close to the boiling point of water (100°C), the PVC monitoring wells would not be able to withstand the treatment. Therefore, approximately 17 monitoring wells would need to be removed. To track the removal of the VOCs from the subsurface, up to 8 stainless steel monitoring wells will be installed. During installation, soil

samples may be collected from the monitoring well boreholes for confirmation of VOC concentrations in the thermal treatment zone. The monitoring wells within the treatment area will be sampled once before the start of thermal treatment. The data will be used to refine the estimated length of time of treatment.

The stainless steel monitoring wells installed in the treatment area will be sampled weekly for 4 to 6 weeks starting approximately 6 to 8 weeks after system startup and analyzed for VOCs. This delay in sampling will allow the subsurface to heat up to the required temperature, which is expected to take up to 8 weeks. The weekly sampling will allow portions of the treatment area to be turned off as cleanup criteria are met to save on electrical costs. During ERH treatment, vapor samples will be collected from the vapor treatment system for the thermal treatment to determine air emission compliance, to determine if the vapor carbon vessels require new media, and to quantify mass removed. Performance monitoring both during and after remedy implementation will be defined more specifically in the Remedial Design. It is anticipated that performance monitoring during ERH treatment will include monitoring subsurface temperatures, VOCs recovered from the extracted vapors, and TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, and 2-methylnaphthalene in monitoring wells. In addition, if the groundwater extraction system operates to treat recovered groundwater, samples will be collected from the influent and effluent to confirm discharge criteria established in the existing discharge permit equivalency are met.

After the thermal treatment system has been shut down, post-remedial action groundwater sampling will occur within the thermal treatment area quarterly for the first year, semiannually for the following 2 years, then annually for 1 year. Performance monitoring after ERH treatment will include monitoring subsurface temperatures and TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, and 2-methylnaphthalene in monitoring wells. This post-treatment monitoring will ensure that RAOs have been met. Additionally, monitoring is included for the entire plume, including distal portions of the plume addressed during the interim remedy that have not yet met cleanup goals. The monitoring well network will be optimized and continually evaluated with respect to frequency and location based upon achievement of the RAOs.

2.9.4.3 Land Use Controls

Similar to Alternatives 2 and 3, LUCs will remain in place as long as the concentrations of COCs are above the cleanup criteria. The LUCs for Alternative 4 are the same as those described for Alternative 2 in Section 2.9.2.3, with three additional LUCs during actual operation of the ERH remedy. First, no digging will be allowed within 50 feet of the electrodes that will be used in the ERH remedy. Second, no extension cord use will be allowed within 50 feet of the electrodes that will be used in the ERH remedy to prevent potential migration of current. This boundary is the same as the “no dig” boundary. Third, these prohibitions on digging and the use of electrical cords will be captured in license agreements that the Air Force will enter into with landowners on whose property the remediation will occur. Short-term excavating/extension cord use will be possible with notification to the AF in order for the ERH system to be temporarily shut down to accommodate digging in the area.

2.9.5 Five-Year Reviews

A review will be conducted within 5 years after initiation of the remedial action under Alternatives 2, 3, and 4 to ensure that the remedy is, or will be, protective of human health and the environment, and every 5 years thereafter, until the concentrations of TCE, cis-1,2-DCE, VC, 1,4-

DCB, naphthalene, 2-methylnaphthalene, iron, and manganese are below cleanup criteria. For each five-year review, the USAF would perform the following:

- Evaluate the effect of any newly promulgated or modified ARARs that are based on the protection of human health and the environment,
- Evaluate changes in the toxicity values or exposure assumptions affecting the protectiveness of the remedy,
- Review the validity of land use and exposure assumptions on a site-specific basis, and
- Assess effectiveness/protectiveness of remedy and make recommendations to optimize or augment the remedy.

As part of the five-year review process, the concentrations of TCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese and their statistical trends will be reviewed to evaluate the protectiveness of the alternative. In addition, the effectiveness of LUCs will be evaluated, and the LUCs will be updated if necessary. One five-year review and a site closure evaluation were included in the cost estimates. Five-year reviews would continue until UU/UE conditions are achieved at SS-01.

2.9.6 Common Elements and Distinguishing Features of Each Alternative

One significant element that is common to all alternatives is that contaminants would remain in the groundwater at SS-01 for at least 5 years at concentrations above those consistent with UU/UE. Therefore, all alternatives would require five-year reviews and LUCs, except the No Action alternative, until the concentrations of TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese are consistent with UU/UE.

A distinguishing feature of Alternative 1 is that it does not include measures to prevent potential receptors from accidental exposure to contaminants in groundwater. Therefore, this alternative is not protective of human health and the environment. Alternatives 2, 3, and 4 include LUCs to prevent exposure to groundwater contaminants until cleanup criteria are achieved, and so are protective of human health.

A distinguishing feature of Alternatives 2 and 3 is the use of injected compounds to accelerate the remedial process, resulting in much shorter remedial timeframes (9 and 7 years to achieve RAOs for the primary COCs, respectively) than Alternative 1 (60 years or more). Alternative 2 would use two proprietary reagent mixtures that combine fermentable organic material and EZVI and can be delivered to the subsurface with a range of technologies and achieve in situ enhanced reduction through biotic and abiotic processes. Alternative 3 would use a persistent chemical oxidant to reduce the contaminants through a chemical reaction and achieve performance goals.

These injection alternatives would need to follow the guidelines specified in the Federal Underground Injection Program. In contrast to these alternatives, Alternative 4 uses electrical resistance heating to heat the less permeable, conductive soils observed in the vicinity of the source areas to vaporize contaminants. Compared to the other alternatives, Alternative 4 is the alternative that would most quickly reach RAOs. Alternative 4 requires aboveground infrastructure, but the disturbance to aboveground activities would be significantly limited.

Alternatives 2, 3, and 4 would allow for UU/UE to groundwater once the concentrations of TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese are below cleanup criteria. Under Alternative 1, returning groundwater to UU/UE may be possible through natural attenuation, but this cannot be verified without the five-year review process, which is not included as part of the no-action alternative.

No costs are associated with Alternative 1 since no controls or remedial technologies would be implemented. Of the other three alternatives, the present worth cost for Alternative 2 ($4,896,000) is the lowest, followed by Alternative 3 ($6,989,000) and then Alternative 4 ($8,973,000), which has the highest present worth cost.

2.9.7 Expected Outcomes of Each Alternative

Under Alternative 1, potential unacceptable risks to human health and the environment would continue, and there would be no mechanism for verifying any reduction in toxicity, mobility, or volume of the contaminants.

Alternatives 2, 3, and 4 would be protective of human health and the environment immediately through the use of LUCs to prevent contact with the groundwater contaminants and annual monitoring of the LUCs (i.e., annual monitoring report) to ensure that the controls are effective in preventing contact with contaminated groundwater.

Alternatives 2 and 3 would achieve the RAOs for the VOCs after 9 and 7 years, respectively. Alternative 4 would likely require the shortest timeframe (5 years) of the active remedies to achieve the RAOs for the VOCs.

For Alternatives 2, 3, and 4, groundwater would be restored to its beneficial use when cleanup criteria have been achieved and the groundwater no longer poses an unacceptable risk to human health and the environment.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The four remedial alternatives discussed above were evaluated individually and comparatively against the nine criteria identified in the NCP at 40 CFR § 300.430(e)(9)(iii) to help select a preferred alternative. Tables 2.1 and 2.2 summarize how well each alternative satisfies each evaluation criterion and indicate how they compare to the other alternatives under consideration. A more detailed analysis and evaluation is presented in the FS for SS-01 (HGL, 2016b). The purpose of this analysis is to identify the relative advantages and disadvantages for each of the four alternatives.

The NCP outlines the approach for comparing remedial alternatives. Evaluation of the alternatives uses threshold, primary balancing, and modifying criteria. To be considered for remedy selection, an alternative must meet the following two threshold criteria:

1. Overall protection of human health and the environment;
2. Compliance with ARARs or ARAR waiver in accordance with CERCLA § 121(d)(4).

The primary balancing criteria are then considered to determine which alternative provides the best combination of attributes. The primary balancing criteria are as follow:

3. Long-term effectiveness and permanence;
4. Reduction in toxicity, mobility, or volume through treatment;
5. Short-term effectiveness;
6. Implementability; and
7. Cost.

Then, the alternatives are considered against the modifying criteria to determine if the selected remedy should be modified in light of new information or opinion. The modifying criteria are as follows:

8. State acceptance; and
9. Community acceptance.

These criteria are discussed below as applied to the potential remedial alternatives identified for SS-01.

2.10.1 Threshold Criteria

Alternative 1 (No Action) does not meet the threshold criterion of protectiveness because it does not address the unacceptable risks remaining on the site. Therefore, Alternative 1 was not retained for further consideration as a preferred alternative because of its inability to meet the threshold criterion of protectiveness. All of the other alternatives meet this threshold criterion because LUCs would be immediately effective in protecting human health and the environment while the site remediation is implemented.

Alternatives 2, 3, and 4 comply with ARARs; no ARAR waivers would be necessary for any of these three alternatives. The estimated times for each alternative to remediate TCE, the primary contaminant, are 9 years, 7 years, and 5 years, respectively, with Alternative 4 expected to require the shortest amount of time. Alternative 4 will comply with Maryland air quality regulations and discharge of extracted groundwater requirements (Appendix B).

2.10.2 Balancing Criteria

Alternatives 2 and 3 meet all of the balancing criteria to a moderate degree, whereas Alternative 4 meets all of the balancing criteria to a moderate to high degree.

Long-Term Effectiveness and Permanence

Alternatives 2, 3, and 4 have the potential to be equally effective over the long term because the VOC source area will be remediated and the smear zone source area will be removed or treated. The least amount of uncertainty with respect to treatment effectiveness and efficiency on TCE is associated with Alternative 4, which is considered to be 99 percent effective, while Alternative 3 contains the greatest amount of uncertainty with respect to TCE. Alternative 4 has the greatest uncertainty with respect to naphthalene and 2-methylnaphthalene, but this area of contamination is limited and the contaminants are susceptible to degradation. The transformation processes associated with all three alternatives will be irreversible.

Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives 2, 3, and 4 would reduce the toxicity, mobility, and volume of the VOC source area through treatment. Alternative 2 would temporarily increase iron and manganese concentrations as substrate addition commonly leads to solubilization of metals, so it is ranked lower. Alternative 3 would decrease iron and manganese concentrations, but may temporarily change the valence state of chromium to a more toxic form. Alternative 4 is expected to have no net long-term effect on these inorganic COCs, but will achieve full reduction of the VOC source most quickly, resulting in a shorter timeframe for restoration of iron and manganese to background levels as the aquifer returns to less reducing conditions.

Alternative 4 is the only Alternative that would reduce the toxicity, mobility, and volume of the smear zone contamination through treatment.

Short-Term Effectiveness

Alternatives 2, 3, and 4 pose short-term impacts to the surrounding community due to increased vehicle traffic and noise from treatment, as well as an increased presence of personnel in the area. Traffic control measures will be implemented to reduce hazards. Alternatives 2, 3, and 4 would involve coordination with CSX, but the injections within the CSX right-of-way associated with Alternatives 2 and 3 would likely be shorter term and easier to coordinate than the approximately 6-month continuous active remediation effort associated with Alternative 4. Alternatives 2 and 3 would include hydraulic (or pneumatic) fracturing that has the potential to change surface elevations, which would be problematic for the railroad, and could result in preferential pathways for reagent and contaminant migration. Alternative 3 uses harsher chemicals than Alternative 2 and would pose greater potential unacceptable risk to on-site workers. Alternative 4 involves the application of power to the ground; fencing around the ERH treatment area and testing for stray voltage outside of this zone will ensure public safety. Alternatives 2 and 3 would require pilot studies to determine the actual delivery rate, delivery pressure for the injections, radius of influence, and appropriate injection technology.

To remediate TCE, the primary contaminant, Alternative 2 would take more than 9 years, Alternative 3 would take approximately 7 years, and Alternative 4 would take less than 5 years to achieve response complete.

Implementability

Alternatives 2 through 4 would be subject to CSX safety standards, and delays would be possible due to scheduling and train traffic. Alternative 2 is readily implementable based on previous experience at the site. Alternative 3 is also readily implementable, as it has been performed beneath CSX tracks at other sites and is very comparable in nature to Alternative 2. Alternative 4 is implementable beneath the CSX tracks and has the advantage over the other alternatives because it eliminates the risk associated with injections within an active rail road line, but requires the most significant construction and infrastructure. Alternatives 2 and 3 include an excavation component that will require coordination with CSX, dewatering, and shoring, which somewhat diminishes implementability for this portion of the work when compared to Alternative 4. Alternative 4 has been proven at over 100 sites throughout the United States. It is anticipated that the potential risks of mobilizing contaminants or damaging infrastructure are greater by implementing Alternative 4 than implementing Alternative 2 or Alternative 3. Alternative 4 has the shortest remedial timeframe of the 4 remedial alternatives.

Costs

Alternative 2 has the lowest cost ($4,986,000), with a majority of the costs associated with the injection events. Alternative 3 ($6,989,000) is similar to Alternative 2, with the majority of costs associated with the injection events. The costs of Alternatives 2 and 3 could change based on the findings of the pilot studies regarding the actual ROI and substrate or oxidant demand. The costs for Alternative 4 ($9,238,000) are highest, with the majority of costs associated with the installation of the ERH thermal system, but are the least subject to change because of the relative lack of uncertainty with respect to thermal treatment.

2.10.3 Modifying Criteria

This ROD has been developed in cooperation with the MDE, USEPA, USAF, and the PGC Health Department, which have concurred with the selection of Alternative 4 as the remedy for SS-01. No substantive changes to the ROD have been made based on written or oral comments from the public on the PP for SS-01 (see Section 3.3 and Appendix D).

2.11 GREEN AND SUSTAINABLE PRACTICES

USAF and EPA also evaluated the remedial alternatives to ensure that green and sustainable practices are incorporated when appropriate and that any potential negative impacts related to the remedy are reduced or eliminated.

Of the active remedial alternatives, Alternatives 2, and 3 include smear zone excavation with off-site disposal. Alternative 2 enhances biological processes that occur naturally in the environment to degrade chemicals by using long lasting biodegradable compounds; however, this treatment requires multiple rounds of injections and years of monitoring.

Alternative 3 would also degrade the contaminants, but it would do so by using harsher chemicals that are not natural to the environment and, when incorrectly handled, could cause harm to workers; additionally, this treatment requires multiple rounds of injections and years of monitoring.

Alternative 4 would require energy to power the thermal treatment. A partnership would be established with Carbonfund.org to offset energy purchased from the grid, resulting in zero net carbon dioxide emissions. This partnership incorporates green and sustainable principles that provide additional benefit to the environment.

Alternatives 2 and 3 both cause changes in the groundwater geochemistry, require more than one round of treatment, and result in more vehicle emissions than Alternative 4. Alternative 2 temporarily increases iron and manganese concentrations in the groundwater. Alternative 3 has the capacity to temporarily transform the valence state of chromium in the groundwater. Alternative 4 has no impacts to groundwater and does not have the risk of incomplete degradation that the other alternatives do.

Alternative 4 will achieve TCE cleanup in the shortest remedial timeframe and minimize the need for future sampling. Therefore, Alternative 4 is the most sustainable.

2.12 PRINCIPAL THREAT WASTES

The NCP, at 40 CFR § 300.430 (a)(1)(iii)(A), establishes an expectation that USEPA will use treatment to address “principal threats” posed by a site wherever practicable. The principal threat concept is applied to the characterization of source materials at NPL sites. A source material is material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or air, or acts as a source for direct exposure. Contaminated groundwater generally is not considered to be a source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. While the source material in the Calvert Formation appears to be relatively immobile and EPA has not established a threshold level of toxicity/risk to define a "principal threat waste," per EPA guidance where toxicity and mobility of source material combine to pose a potential risk of 1×10^{-3} or greater, generally treatment alternatives should be evaluated. The 2006 RI (URS, 2006a) concluded that site risk posed by TCE exceeded 1×10^{-3}. As such, this source material represents a principal threat waste.

2.13 SELECTED REMEDY

USAF and USEPA select Alternative 4 (In Situ Thermal Treatment and LUCs) as the remedy for SS-01. Alternative 4 is preferred because it has the shortest timeframe to achieve response complete (5 years), has the least amount of uncertainty with regard to treatment of chlorinated VOCs, and is the most sustainable.

2.13.1 Summary of the Rationale for the Selected Remedy

Based on the evaluation of the remedial alternatives, Alternative 1 was dismissed because the no action alternative does not meet the threshold criterion of protectiveness because it does not address the unacceptable risks remaining on the site. Moreover, taking no action would not comply with chemical-specific ARARs for groundwater. Verification that Cleanup criteria are achieved would not occur because groundwater would not be monitored for trends in contaminant concentrations over time.

Alternatives 2 through 4 meet the threshold criteria. The primary differences between these approaches is that Alternatives 2 and 3 involve shallow excavation and injection of substrates into low permeability material, whereas Alternative 4 uses a heating method to volatilize contaminants and reach RAOs for the VOCs in a shorter timeframe (5 years). Alternative 2 would increase iron and manganese concentrations and would therefore require the longest time for aquifer restoration. Alternatives 2 and 3 would require additional information to evaluate delivery rates, substrate demand, and the injection spacing, and would involve the most uncertainty because treatment to a large degree is dependent on contact with the contaminants. Alternatives 2 and 3 would include hydraulic (or pneumatic) fracturing that has the potential to change surface elevations, which would be problematic for the railroad, and could result in preferential pathways for reagent and contaminant migration. The most rapid treatment and least amount of uncertainty with regard to treatment of chlorinated VOCs is associated with Alternative 4. The tradeoff is that Alternative 4 would probably be the most difficult to implement, at the highest cost.

The three alternatives are ranked nearly equally. Alternative 4 has a slight advantage because of the lack of uncertainty and rapidity of treatment with regard to chlorinated VOCs. These two factors led to the selection of Alternative 4 as the preferred remedy.

Public comments received concerning the selection of Alternative 4 as the Preferred Alternative in the PP have been evaluated and addressed with concerned parties and stakeholders. Alternative 4 has been selected as the remedy.

2.13.2 Description of the Selected Remedy

The components of the selected remedy are as follow:

- Install an ERH thermal treatment system to address the source zones;
- Perform groundwater monitoring to refine length of treatment time and determine the effectiveness of the remedy; and
- Implement and maintain LUCs to limit land use and prevent current or future use of groundwater until cleanup criteria are achieved.

2.13.2.1 Installation of an ERH Thermal Treatment System

Vertical sheet pile electrodes are anticipated to be installed to operate the ERH thermal treatment system. Originally the conceptual design considered 44 horizontal electrodes arranged in four layers by depth underneath the CSX rail lines and 58 sheet pile electrodes installed to the east and west of the horizontal electrodes. During initial design efforts and in consultation with CSX, the design has been refined to include the installation of 101 sheet pile electrodes and 2 horizontal borings throughout the entire treatment area (Figure 2.15). Each electrode will have a vapor recovery well buried in gravel above the top of the electrode. 101 sheet pile electrodes will be installed within the treatment area.

Because of CSX requirements, the two horizontal borings installed nearest the rail lines will be installed utilizing the jack and bore drilling technique. This piping will serve as the corridor for vapor recovery and electrode supply cables between the rails. CSX requirements establish the minimum distances and depths from the tracks that must be maintained during remediation activities. The JBA 11th Civil Engineer Squadron Real Estate Office has a formal agreement with CSX (NYC-042652) that is amended periodically as remediation efforts progress to allow for right of entry. Operational components of the remedy may be adjusted during the design or remedial action phase of the remedy.

Each electrode will have a vapor recovery screen that is located next to or near the electrode. The vapor recovery screens will be installed within a surface plenum. The surface plenum will consist of a 3-inch layer of gravel and a 20-millimeter thick PVC liner. Surface vapor recovery wells will be routed through the gravel layer to ensure that no vapors escape to the surface. Vapor recovery lines to the plenum between the tracks will be connected to the vapor recovery jack-and-bore locations. In addition to providing vapor capture, the surface plenum will divert rainfall out of the treatment zone and assist to reduce contaminant flux during the remediation. Even though the surface plenum would reduce rainfall flux, there could be times when the water table rises to the level of the shallow vapor recovery wells at 5.75 feet bgs. These wells will be designed to extract any water that enters the well screen. This water, along with condensate from the vapor treatment system, may be treated in the existing groundwater treatment system (which is

functional but not currently operating) and discharged under the existing discharge permit equivalency.

It is anticipated that, once installed and tested, the thermal treatment system will be operational for up to 6 months. Vapor recovery wells will operate for the 6-month period and perhaps longer, depending on mass removal quantities and trends.

Because work will be performed directly beneath the CSX tracks, a survey of the tracks will be performed before installation of the electrodes. This will determine the baseline elevation of the tracks. During treatment, additional surveys will be performed to determine if the thermal treatment of the subsurface has caused any subsidence or shifting of the tracks. A final survey would be performed 6 months after the system has been off. If the survey events find that subsidence or movement of the tracks has occurred more than the CSX threshold, mitigation of the subsidence would be required. Mitigation might include adding new railroad ballast material and realigning the rails.

The recently installed high-density polyethylene (HDPE) pressure sewer main that services the American Legion Post 227 east of the site will likely be compromised during ERH remediation. Therefore, the Air Force will replace it, or the appropriate length of the pipe necessary, once the thermal process is completed at the site. Temporary accomodations will be provided for the American Legion Post 227 while the line is out of service.

2.13.2.2 Groundwater Monitoring Program

Because the electrodes would heat the subsurface to close to the boiling point of water (100°C), the PVC monitoring wells would not be able to withstand the treatment. Therefore, approximately 17 monitoring wells would need to be fully removed. To track the removal of the VOCs from the subsurface, stainless steel monitoring wells will be installed. During installation, soil samples may be collected from the monitoring well boreholes for confirmation of VOC concentrations in the thermal treatment zone. The monitoring wells within the treatment area will be sampled once before the start of thermal treatment. The data will be used to refine the estimated length of time of treatment.

The stainless steel monitoring wells installed in the treatment area will be sampled weekly for 4 to 6 weeks starting approximately 6 to 8 weeks after system startup and analyzed for VOCs. This delay in sampling will allow the subsurface to heat up to the required temperature, which is expected to take up to 8 weeks. The weekly sampling will allow portions of the treatment area to be turned off as cleanup criteria are met to save on electrical costs. During ERH treatment, vapor samples will be collected from the vapor treatment system for the thermal treatment to determine air emission compliance, to determine if the vapor carbon vessels require new media, and to quantify mass removed. Performance monitoring both during and after remedy implementation will be defined more specifically in the Remedial Design. It is anticipated that performance monitoring during ERH treatment will include monitoring subsurface temperatures, VOCs recovered from the extracted vapors, and TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, and 2-methylnaphthalene in monitoring wells. In addition, if the groundwater extraction system operates to treat recovered groundwater, samples will be collected from the influent and effluent to confirm discharge criteria established in the existing discharge permit equivalency are met.

After the thermal treatment system has been shut down, post-remedial action groundwater sampling would occur quarterly for the first year, semiannually for the following 2 years, then

annually for 1 year. Performance monitoring after ERH treatment would include monitoring subsurface temperatures and TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese in monitoring wells. This post-treatment monitoring would ensure that RAOs have been met. Monitoring is included for the entire plume, including distal portions of the plume addressed during the interim remedy that have not yet met cleanup goals. Attainment of cleanup criteria will be evaluated per EPA Guidance, currently *Guidance for Evaluating Completion of Groundwater Restoration Remedial Actions*, (November 2013), OSWER 9355.0-129, and *Recommended Approach for Evaluating Completion of Groundwater Restoration Remedial Actions at a Monitoring Well*, August 2014, OSWER 9283.1-44. The monitoring well network will be optimized and continually evaluated with respect to frequency and location based upon achievement of the RAOs.

2.13.2.3 Land Use Controls

As discussed in Section 2.9.2.3, LUCs are necessary to restrict the use of, or limit access to, real property to prevent exposure to contaminants above permissible levels. The intent of using these controls is to protect human health and the environment by limiting the activities that may occur at the site to prevent exposure to COCs and to protect the remedy. The approximately 90-acre area for which the LUCs will be implemented is shown on Figure 2.2 and might be adjusted over time as new data are analyzed. Changes to the LUC boundary would require a ROD modification; because this would likely be a minor change to the remedy, the modification would entail regulator concurrence and a memorandum for the administrative record.

Groundwater use is not permitted in the vicinity of the Brandywine DRMO site because Maryland regulations forbid the installation of individual water supply systems when a community water supply system is available (COMAR 26.03.01.05.A.). Public water is supplied to the area by the WSSC. Implementation of LUCs on the use of the groundwater is needed due to potential unacceptable risks to residents or workers from vapor intrusion, ingestion, or dermal contact with the COCs in groundwater. LUCs on the use of groundwater will be implemented at the Brandywine DRMO site by USAF and PGC. The Air Force will be ultimately responsible to ensure that all LUCs are implemented; LUC tasks for which the Air Force is primarily responsible will be administered by the Joint Base Andrews Environmental Restoration Program through the Air Force Civil Engineer Center, Operations Division-East Region (AFCEC/CZOE).

The LUC objectives are as follows:

- Ensure no potable use of potentially impacted shallow groundwater at the site until Cleanup criteria are met in order to limit exposure of residents to groundwater contaminants;
- Ensure that activities occurring within the areas identified do not damage the monitoring wells, interfere with the ability to undertake required environmental monitoring or testing, or cause the plume to spread;
- Ensure that land use is consistent with RAOs;
- Ensure that any proposed construction activities near the site are evaluated with regard to risks posed by contaminants at the site and the potential for construction and dewatering activities to exacerbate site conditions; and
- Ensure that any affected groundwater that exceeds relevant regulatory criteria is appropriately managed and disposed of during construction activities.

The LUCs described in the IROD will remain in place until the final ROD is signed and the LUCs set forth in the final remedy are implemented. Once implemented, the LUCs listed in the final ROD will remain in place until the concentrations of contaminants at the site allow for UU/UE, defined by attainment of the Cleanup criteria. LUCs will be implemented at the Brandywine DRMO site by USAF and PGC.

PGC has agreed to proceed in accordance with the following regulations and ordinances for the off-base portions of the SS-01 plume:

- Review groundwater well permit applications for conformance with Maryland regulations COMAR 26.04.01 and COMAR 26.04.04, and refuse to issue permits for private water supply wells in areas where public water is available, pursuant to COMAR 26.03.01.05A, and
- Review plans for developments, new construction, and building additions in accordance with the Prince George's County Code, Sections 32-124 through 32-166.

It will be the responsibility of JBA to implement the following LUCs:

- All SS-01 ROD use limitations and exposure restrictions will be included in the Installation Development Plan. Records of groundwater contamination at the site and LUC area will be maintained in the Base geographic information system (GIS)/environmental database. SS-01 will be designated as a "land use control" area in the Land Management map layer of the Base GIS. This will be implemented by 11th Wing Civil Engineer Squadron Engineering Flight Execution Support (11 CES/CENME) with support and oversight by AFCEC/CZOE. This designation prohibits activities such as residential development and potable use of groundwater.
- Regular updates, no less frequently than once per year, will be provided to PGC and MDE regarding the extent of the plume and the required distance of wells and dewatering trenches from the edge of the plume for safe groundwater usage.
- The Base Environmental Impact Analysis Process will assess the potential environmental impact of any action proposed at the site. AFCEC/CZOE will review proposed construction activities as part of that process.
- AFCEC/CZOE will continue to maintain signs at the site identifying the area as a CERCLA site. The signs identify the nature of the contamination, state that no groundwater use or withdrawal is permitted without written authorization from JBA, and include contact information for both JBA and PGC.
- During actual operation of the ERH remedy, no digging will be allowed within 50 feet of the electrodes that will be used in the ERH remedy. Second, no extension cord use would be allowed within 50 feet of the electrodes that will be used in the ERH remedy to prevent potential migration of current. This boundary is the same as the "no dig" boundary. Third, these prohibitions on digging and the use of electrical cords will be captured in license agreements that the Air Force will enter into with landowners on whose property the remediation will occur.
- The Joint Base Andrews Facility Review Board, with support and oversight by AFCEC/CZOE, will review and approve of any proposed land use changes, including construction of new facilities or additions to existing facilities at SS-01.
- Review of work orders and dig permits by 11th Wing Civil Engineer Squadron Programs Flight (11 CES/CEPM) staff with responsibility and oversight by AFCEC/CZOE will ensure continued enforcement of the LUCs.

- The Air Force is responsible for implementing, maintaining, monitoring, reporting, and enforcing land use controls.
- The Air Force shall inform, monitor, enforce, and bind, where appropriate, authorized lessees, tenants, contractors and other authorized occupants of the site regarding the LUCs affecting the site.
- Although the Air Force may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Air Force shall retain ultimate responsibility for remedy integrity.
- Any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs will be addressed by the Air Force as soon as practicable, but in no case will the process be initiated later than 10 days after the Air Force becomes aware of the breach.
- The Air Force will notify EPA and MDE as soon as practicable but no longer than ten days after discovery of any activity that is inconsistent with the LUC objectives or use restrictions, or any other action that may interfere with the effectiveness of the LUCs. The Air Force will notify EPA and MDE regarding how the Air Force has addressed or will address the breach within 10 days of sending EPA and MDE notification of the breach.
- The Air Force shall notify EPA and MDE 45 days in advance of any proposed land use changes that are inconsistent with land use control objectives or the selected remedy.
- The Air Force must provide notice to EPA and MDE at least six (6) months prior to any transfer or sale of property containing land use controls so that EPA and MDE can be involved in discussions to ensure that appropriate provisions are included in the transfer or conveyance documents to maintain effective land use controls. If it is not possible for the facility to notify EPA and MDE at least six months prior to any transfer or sale, then the facility will notify EPA and MDE as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to land use controls. The Air Force agrees to provide EPA and MDE with such notice, within the same time frames, for federal-to-federal transfer of property accountability. The Air Force shall provide either access to or a copy of the executed deed or transfer assembly to the EPA and MDE.
- JBA shall not modify or terminate LUCs, implementation actions, or land use that are associated with the selected remedy without approval by EPA and the opportunity for concurrence by the State. JBA shall seek prior concurrence of EPA and the State before any anticipated action that may disrupt the effectiveness of the LUCs or any action that may alter or negate the need for LUCs.
- Monitoring of the environmental use restrictions and controls will be conducted annually by the Air Force. The monitoring results will be included in a separate report or as a section of another environmental report, if appropriate, and provided to the USEPA and the MDE. The annual monitoring reports will be used in preparation of the Five Year Review to evaluate the effectiveness of the remedy. The annual monitoring report, submitted to the regulatory agencies by the Air Force, will evaluate the status of the LUCs and how any LUC deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced above were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and whether use of the property has conformed to such restrictions and controls.

The internal procedures that JBA will use to implement the LUCs include but are not limited to the following:

- Base Civil Engineer Work Requests – One tool for achieving the LUC performance objectives is the AF Form 332 (AF332) or Base Civil Engineer Work Request. This form must be submitted and approved before the start of any construction project at Joint Base Andrews. One step in the approval process for this form is a comparison of the construction site with all constraints that are described in the Installation Development Plan. The AF332 serves as the document for communicating any construction constraints to the appropriate offices. Any constraints at the site result in the disapproval of the form unless the requester makes appropriate modifications to the construction plans.
- Excavation Permits – Joint Base Andrews also uses the 11th Wing, Air Force District of Washington Form AF IMT 103 or Excavation Permit to enforce soil and sediment disturbance restrictions. The requester submits the permit to the Civil Engineer Squadron for any project that involves soil or sediment excavation. If constraints involving soil disturbance or worker safety exist at the excavation area, the permit describes the appropriate procedures that workers must implement before the start of excavation to prevent unknowing exposure to contamination.
- The Base Environmental Impact Analysis Process (EIAP) – EIAP is conducted pursuant to the National Environmental Policy Act, as promulgated for the AF in 32 CFR 989, to assess the potential environmental impact of any federal action initiated by or involving Joint Base Andrews. An AF Form 813 (AF813) initiates the EIAP. Both AF332s and excavation permits are subject to an evaluation under the EIAP. The proponent of a proposed action is required to submit the AF332 or excavation permit with AF813 so that the appropriate environmental analysis of the proposed action and alternatives to the proposed action is accomplished prior to any construction or excavation activities. The EIAP works to ensure proposed construction and excavation sites take into account the constraints that are described in the Installation Development Plan and known to the AFCEC Environmental Restoration Installation Support Team (IST). The EIAP also ensures that all environmental factors, such as LUCs, are considered in the selection of locations for construction projects.
- The Installation Development Plan, which replaced the Base General Plan, is a long-range planning tool that designates current and future land uses. It also provides a framework for selecting the locations of future facilities needed to carry out the Base mission. The 2016 Installation Development Plan describes the specific LUCs for each site, the reasons for the controls, and the areas where the controls are applied. To ensure that LUCs remain protective, base personnel must have access to information concerning its existence, purpose, and maintenance requirements. The Installation Development Plan provides the important information to ensure that LUC management takes place and that the LUC's presence is effectively communicated.

The Air Force will notify USEPA in advance of any changes to internal procedures associated with the selected remedy that might affect the LUCs.

2.13.3 Five-Year Reviews

As discussed in Section 2.9.5, 5 year reviews will be conducted to ensure that the remedy is, or will be, protective of human health and the environment, and every 5 years thereafter, until the concentrations of TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene,

iron, and manganese are below cleanup criteria. As part of the five-year review process, the concentrations of TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese will be reviewed to evaluate the protectiveness of the remedy. Based on the groundwater monitoring program, adjustments may be recommended for implementing or monitoring the remedy. In addition, the effectiveness of LUCs will be evaluated, and the LUCs will be updated if necessary and by agreement among USAF, USEPA, and MDE.

2.13.4 Summary of the Estimated Remedy Costs

A summary of the estimated costs for the selected remedy is presented in Table 2.3. The estimated present worth cost of the selected remedy is $9,238,000. This cost estimate is based on the best available information regarding the anticipated scope of the remedy. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative.

The costs estimated in this ROD are based on the activities associated with the thermal treatment (electrode installation, operation of the vapor recovery and treatment system, cost of power hookup and system operation, etc.), replacement of sewer and water utilities in the area, temporary accommodations for the American Legion, removal of 17 monitoring wells within the treatment area, installation of up to 8 stainless steel monitoring wells in the treatment area, sampling and analysis of the monitoring wells for VOCs, sampling and analysis of vapor and process water collected from the vapor recovery wells, CSX oversight, surveys of the railroad tracks to determine any subsidence, post-RA sampling, one five-year review, and continued implementation of LUCs.

During the design phase or implementation of the remediation, the locations and number of electrodes or vapor recovery wells may be adjusted based on design data, design analysis, locations of utilities, and/or field observations. The timeframe estimated to achieve response complete for the primary contaminant, TCE, as well as the other VOCs, is approximately 5 years. Cleanup of the other contaminants is difficult to predict but will be longer, and assessed via trends observed during periodic groundwater monitoring. The time to achieve TCE cleanup criteria could be longer or shorter than predicted in this ROD, which may also alter actual costs from those predicted by increasing or decreasing the rounds of groundwater monitoring and number of five-year reviews. If the actual project cost deviates beyond the +50 to -30 percent range specified for cost estimates (USEPA, 2000), the changes will be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences, or a ROD amendment.

2.13.5 Estimated Outcomes of Selected Remedy

Once the remedy is implemented and the cleanup criteria are achieved, the site will be available for UU/UE. The timeframe estimated to achieve response complete for the primary contaminant, TCE, is approximately 5 years. The cleanup criteria for TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese in groundwater are presented in Section 2.8. The cleanup criteria for TCE, cis-1,2-DCE, VC, PCE, and 1,4-DCB are based on their respective MCLs.

The anticipated environmental benefit of the selected remedy is to restore the groundwater to its designated beneficial use as a potential water supply for human consumption.

2.14 STATUTORY DETERMINATIONS FOR GROUNDWATER REMEDY

The selected remedy for groundwater satisfies the statutory requirements of Section 121 of CERCLA, 42 United States Code (U.S.C.) § 9621. Under CERCLA, RAs at sites must achieve protection of human health and the environment, comply with federal and state ARARs, be cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element are preferred. The following discussion addresses how these statutory requirements and preferences are met by the selected remedy.

2.14.1 Protection of Human Health and the Environment

The selected remedy for groundwater will be protective of human health and the environment through the implementation of LUCs until cleanup criteria are achieved. The selected remedy would accelerate the cleanup of the site groundwater with minimal O&M costs and only short-term disruption to CSX operation during installation of the system. This would be accomplished through: in situ thermal treatment to volatilize contaminants and extraction of the volatilized vapors from the subsurface. There are no short-term threats associated with the selected remedy for groundwater that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the selected remedy. Monitoring and statistical evaluation of trends in concentrations of contaminants requiring remediation will ensure that the selected groundwater remedy is effective and that the plume is not expanding or unexpectedly increasing in concentration.

2.14.2 Compliance with ARARs

The selected remedy will comply with all chemical-, action-, and location-specific ARARs. The major ARARs identified for this remedy are the chemical-specific ARARs based on the federal MCLs for TCE, cis-1,2-DCE, VC, PCE, and 1,4-DCB. The ARARs are listed in Appendix B.

Under CERCLA, permits for compliance with the Resource Conservation and Recovery Act (RCRA), National Pollutant Discharge Elimination System (NPDES), and Clean Air Act (CAA) regulations for on-site RAs are not required. Although the substantive provisions of permits identified in the ARARs would apply to SS-01, federal facilities are not required to obtain permits for on-base remedial activities.

2.14.3 Cost Effectiveness

According to the NCP at 40 CFR § 300.430(f)(1)(ii)(D), a remedy is cost-effective if its costs are proportional to its overall effectiveness. USAF and USEPA have determined that the selected remedy is cost-effective. Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The estimated total present worth of the selected remedy for groundwater is $9,238,000, which is more than the present worth of Alternatives 3 ($6,989,000) and 2 ($4,896,000). The selected remedy is expected to be the most effective for purposes of reduction in toxicity, mobility, and volume through treatment, and more effective regarding short-term and long-term effectiveness and permanence. Even though Alternative 4 has a higher degree of complexity associated with implementation of the remedy,

Alternative 4 is preferred because it has the least amount of uncertainty with regard to treatment of chlorinated VOCs, the shortest TCE cleanup timeframe (5 years), and is the most sustainable. Therefore, the selected remedy is the most cost-effective alternative.

2.14.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner to remediate the hazardous substances present at the site. The selected remedy requires installation of electrodes to heat the subsurface to volatilize the contaminants. Upon completion of the remedy, the primary COCs will be reduced below the cleanup criteria.

2.14.5 Preference for Treatment as a Principal Element

The selected remedy for groundwater satisfies the statutory preference for treatment of principal threats as a principal element in accordance with 40 CFR § 300.430 (a)(1)(iii)(A). The contaminants will be volatilized and treated in vapor carbon vessels. Increased microbial community activity will further assist in the degradation of compounds that were not vaporized. The selected remedy does not involve any off site transfer and disposal of groundwater contamination without treatment.

2.14.6 Five-Year Review Requirements

Because the selected remedy for groundwater will result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for UU/UE for approximately 5 years, a statutory review will be conducted within 5 years after initiation of the RA to ensure that the remedy is, or will be, protective of human health and the environment, and every 5 years thereafter, until the concentrations of TCE, PCE, cis-1,2-DCE, VC, 1,4-DCB, naphthalene, 2-methylnaphthalene, iron, and manganese reach cleanup criteria.

2.15 DOCUMENTATION OF SIGNIFICANT CHANGES

The PP for SS-01 groundwater at Brandywine, PGC, Maryland, was released for public comment on December 1, 2016. The PP identified in situ thermal treatment to volatilize contaminants and extract them from the subsurface and LUCs as the preferred alternative for OU-1. Between issuance of the PP Plan and ROD, the plan for horizontal electrodes beneath the railroad tracks was changed in favor of vertical electrodes after discussions with CSX indicated that horizontal electrodes were not necessary to comply with CSX requirements. This change does not significantly alter the scope, performance, or cost of the remedy.

Oral and written comments were received from the public during the public comment period regarding the preferred alternative for SS-01. After review, no significant changes to the preferred alternative identified in the PP were necessary or appropriate. Some minor changes to the electrode configuration were made in response to WSSC comments in order to achieve the necessary offsets from their utilities. Furthermore, the recently installed high-density polyethylene (HDPE) pressure sewer main that services the American Legion Post 227 east of SS-01 will likely be compromised during ERH remediation. Therefore, the USAF will replace it, or an appropriate lesser length of the pipe as necessary, once the thermal process is completed at the site. Temporary accommodations will be provided for the American Legion Post 227 while the line is

out of service. With regard to the 10-inch water main in the ERH treatment area, while no immediate impacts are anticipated, the USAF is considering mitigation actions due to the uncertainty of long-term impacts.

No other changes to the remedy proposed in the PP are included in this ROD.

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3.0 RESPONSIVENESS SUMMARY

The Responsiveness Summary provides a summary of the public's comments, concerns, and questions about the SS-01 RA and the USAF responses to these concerns.

A public meeting was held on December 12, 2016, to describe the proposed remedy and to solicit and accept either written comments or verbal comments. The Notice of the Public Meeting was published on December 1, 2016, in the *Enquirer-Gazette* and on the JBA website. A copy of the Public Notice published in the newspaper and the transcript from the public meeting are presented in Appendices C and D, respectively.

3.1 OVERVIEW

The public comment period for the proposed remedy for SS-01 began on December 1, 2016. At the time of the public comment period, USAF had named a preferred alternative (Alternative 4) for OU-1 at SS-01. USAF also had named NFA as the chosen remedy for OU-2 at SS-01. USAF and USEPA have determined that NFA is suitable for OU-2 and that the selected remedy for OU1 will adequately and appropriately address groundwater contamination in accordance with CERCLA § 121 and the NCP. The preferred alternative presented to the public in the PP is the selected remedy in this ROD.

3.2 BACKGROUND ON COMMUNITY INVOLVEMENT

The USAF has maintained a public involvement and information program for the ERP since 1990. The Administrative Record is the collection of documents that were relied upon to make remediation decisions and includes items that document public participation in the remediation process. The Administrative Record is a growing archive, and is located at 1602 California Avenue, Suite 239, Joint Base Andrews, Maryland. To review the publicly available portion of the Administrative Record, please search the following USAF web site - http://afcec.publicadminrecord.us.af.mil/.

The publicly available portion of the Administrative Record also is included in the Information Repository. The Information Repository is contained on a set of CD-ROMs that consist of scanned images and fact sheets. The Information Repository contains the Proposed Plan, RI and FS reports, the reports from previous investigations, and news releases. The Information Repository is updated to reflect additions to the Administrative Record. To review the Information Repository, please visit:

Prince George's County Memorial Library-Surratts-Clinton Branch
9400 Piscataway Road
Clinton, MD 20735
Phone (301) 868-9200

While JBA has not established a Restoration Advisory Board (RAB) for SS-01, JBA does use the Brandywine North Keys Civic Association as a venue to solicit input regarding environmental activities at SS-01, as well as fact sheet mailings to share information with the community. RABs are described further below.

In April 2007 a Site Specific Community Relations Plan was developed, and was updated in March 2014 (HGL, 2014c). These plans identify issues of community interest and concerns as well as outline community relations efforts that may be implemented to ensure the community is appropriately informed about the remedial activities associated with the Brandywine DRMO site (HGL, 2014c). Based on community feedback, it was determined that fact sheets were the community's preferred method for receiving updates on the site cleanup activities. The base participated in 8 public meetings and published and distributed 12 fact sheets to the Brandywine community. These meeting and fact sheets provided updates on previous removal actions and interim remedial activities. The most recent Brandywine North Keys Civic Association meeting occurred in November 2016. At this meeting JBA provided an update on the environmental activities being conducted at the Brandywine DRMO site. Notices of public meetings are posted in local newspapers to encourage public involvement.

JBA community relations activities for the final selected remedy for SS-01 groundwater included the following:

- The documents concerning the investigation and analysis of SS-01 soil and groundwater (i.e., RI and FS reports), as well as copies of the PP, were placed in the Information Repository.
- Newspaper announcements on the availability of documents, the public meeting, and the public comment period were published in the *Enquirer-Gazette* on December 1, 2016, and on the JBA website, on December 1, 2016.
- The USAF established a 30-day public comment period for the PP starting December 1, 2016, and ending January 9, 2017.
- A public meeting was held on December 12, 2016, to present the PP, explain the proposed remedy for SS-01 OU-1 groundwater and the proposed NFA for OU-2, and answer questions concerning SS-01 groundwater, soil, and sediment contamination.

3.3 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND USAF RESPONSES

3.3.1 Summary and Response to Local Community Concerns

Members of the public, including local community members, attended the public meeting on December 12, 2016. Oral comments and questions during the public meeting were discussed at the meeting, and a summary transcript of the discussions at the meeting is provided in Appendix D of this ROD. Following is a summary of several of the issues raised:

- Several members of the public asked questions regarding the current plume extent and exposure with respect to residences. The USAF explained that the TCE plume is no longer beneath residences. Thus, exposure to water in basement sumps and the planting of gardens does not present an unacceptable risk with regard to the present extent of the TCE plume.
- Several questions concerned the schedule and potential obstacles to remedy implementation; the current timeline was provided, and the potential obstacle of obtaining access to some private properties in order to implement the remedy was noted.

- Several general questions were asked about the thermal remedy, and the community was assured that the heat would be indiscernible at the surface during operation, with only minor disruption to traffic patterns expected during its installation.
- Some residents voiced concerns about potential short and long-term restrictions to their own activities within the LUC boundary. The USAF reiterated that proposed activities would be carefully reviewed by Prince George's County Health Department and the USAF to assure that they are consistent with the remedy.

The majority of the local community comments and concerns were related to how the Mattawoman Energy project might affect the remedy. Mattawoman Energy, LLC has received a Certificate of Public Convenience and Necessity (CPCN) from the Maryland Public Service Commission (PSC) to construct and operate an electricity generation facility at 14175 Brandywine Road, approximately 4,500 feet from the Brandywine DRMO plume source area beneath the DRMO Yard and CSX tracks. Several construction projects associated with the Mattawoman energy plant will be located within the ~ 90 acre LUC area. Construction of the footings and foundation for the facility will require dewatering of the aquifer. Additional projects involve the construction, dewatering, and installation of a water pipeline immediately adjacent to the LUC boundary, and the construction of multiple transmission line poles within the LUC boundary. USAF initially intervened in the PSC proceedings regarding the Mattawoman Project because of the potential impact the project could have on infrastructure related to high frequency transmitter support to various civilian and military communications systems. When the scope of the Mattawoman project became more fully understood, USAF broadened its focus to include ensuring that the Project's construction and operation will not adversely affect environmental cleanup activities at SS01.

During the December 12, 2016 meeting the USAF explained how the land use controls will prevent any activities that are inconsistent with the remedy within the LUC boundary, and that the USAF and regulatory agencies were evaluating the Mattawoman project's plans to assess their potential impacts on the remedy. Residents expressed an interest in forming a RAB as a way to discuss the Mattawoman project in relation to SS-01; the USAF briefly described RAB requirements.

At the meeting, USAF urged attendees to put questions in writing if they wished to follow-up or had additional questions. Written questions were received following the meeting that largely restated concerns, comments and questions voiced at the public meeting. The following are the written comments received from the local community, with USAF responses in bold.

Comments Received from Joyce Dowling, nearby resident, e-mail dated January 5, 2017

1 My biggest concern about the DRMO operation is the dewatering of the Mattawoman Energy power plant. If I could be included in the Tier II discussions, or someone I know to be of interest in the health and well-being of the area residents, that would be of great interest to me. Public participation in a process to build a huge power plant in our area can have some devastating environmental impacts, but it appears the process for permitting was streamlined. The public would like some communication about the details to help assure us of the lack of consequential impacts.

Tier I teams are composed of DoD, Federal, and state regulators that discuss environmental restoration activities at an installation. Tier II members are composed of DoD, Federal, and state regulators, not the public, that discuss regional matters of interest and common issues among

Tier 1 teams in the area. **Dewatering activities associated with the Mattawoman Energy project are being assessed in accordance with the SS-01 LUCs. While the USAF acknowledges public concern with regard to the public participation and permitting processes associated with power plant construction, these processes are unrelated to SS-01 remedy implementation. Further information about the licensing proceeding of the Mattawoman plant, including JBA's actions to avoid an adverse impact on the cleanup of SS01 in that proceeding, is available at the Maryland Public Service Commission.**

2 There was also a mention of a public advisory group if there was enough interest. I think there is sufficient interest. If you need a petition to get it going, I would be interested in helping to make that happen.

The public advisory group is known as a Restoration Advisory Board (RAB). RAB is a stakeholder group that meets on a regular basis to discuss environmental restoration at a specific property, and offers members opportunities to influence cleanup decisions by providing input to the installation decision makers. RABs may only address issues associated with environmental restoration activities. As such, the RAB would not be the appropriate forum to discuss Mattawoman Energy project concerns.

Comments received from Michael Robert Fluharty and Ginger Ann Fluharty, nearby residents, e-mail dated January 8, 2017

1 We live about three hundred yards from the proposed activity. We are concerned that the accidental release of volatile chemicals from the activity will directly effect *(sic)* our health. What case history has there been on this method – both positive and negative – that makes you believe this is safe from way to proceed? And what is the plan for evacuation and potentially our relocation in dealing with an accidental malfunction in the event there is a problem?

TRS alone has safely completed 130 ERH projects over the past 18 years. As part of the electrical resistance heating (ERH) remediation, a robust vapor recovery (VR) and treatment system will control and treat steam, vapors, and contaminants from the subsurface during the ERH system operation. The VR system will operate under local air regulation standards, and the discharges from the VR system's stack will be below local air regulatory limits.

In the event of an ERH heating system failure, steam generation (the process that volatilizes site contaminants) in the subsurface ceases. Vapor recovery and treatment would continue until the heating system was restarted. In the event of a VR system failure, power will be discontinued to the heating system and the production of steam and volatilization of contaminants would cease until the vapor recovery system could be restarted. Therefore the risk of exposure to steam and vapors is eliminated during an ERH system failure.

2 Our WSSC drinking water and sewer lines run adjacent to the proposed site. What is the plan for ensuring neither one of those become paths for dangerous chemicals to breach into our home – either through groundwater contamination of the drinking water line and/or as a gas through the sewer line – if thermally or otherwise compromised

by the implementing Alternative 4? What is the monitoring plan for detecting such compromise? What is the plan for our relocation if there is a problem?

Based on available records, there is not an active residential sewer line that runs through the ERH treatment area. This pathway does not exist to any local residence. The purpose of the ERH remediation is to remove trichloroethene (TCE) contamination through volatilization. During ERH operation, TCE contact with drinking water is not anticipated because the drinking water is contained within WSSC infrastructure. That infrastructure includes asphalt-coated, mortar lined, ductile iron pipe with nitrile gaskets. The water line will be safe to use during the remediation.

3 Joint Base Andrews and Mattawoman Energy are discussing allowing installation of power generator lead line poles in the Spill Site 01 Land Use Control area, including one adjacent to the most highly concentrated Site 01 groundwater contamination area identified on Figure 4 in the proposed remediation plan. These will be large diameter 140 foot tall monopole structures requiring significant reinforced concrete shaft foundations as counter weight balances for stability, and these foundations will extend into the Brandywine and/or Calvert groundwater paths, thereby altering those groundwater paths. What analyses has been performed on these potential installations to evaluate their impacts on the proposed Spill Site 01 remediation plan? If this analyses has not been performed, or performed but without high confidence, it is suggested that any such negotiations be tabled until after the remediation plan has been implemented, and the success or failure of the remediation validated over time.

Activities associated with the Mattawoman Energy project within the LUC boundary are being assessed in accordance with the SS-01 LUCs.

4 An ancillary comment on the proposed generator pole placements, our home (those of our direct neighbors) are designated Maryland Historic Trust homes in a National Registry of Historic Places Historic District. Our home at 13904 Cherry Tree Crossing Road home may be found on https://protect-us.mimecast.com/s/4Qw2Bki5MErhO?domain=mncppcapps.org The National Register Historic District may be found on https://protectus.mimecast.com/s/dq19BDuW3rpuq?domain=mht.maryland.gov Federal agency involvement in potentially adversely effecting *(sic)* historic sites (in this case the historic district characteristic environment identified in the second URL due to the monopole placement) will require a Section 106 review in accordance with of the National Historic Preservation Act under 36 CFR Part 800, Protection of Historic Properties.

Public participation, permitting and review processes associated with power plant construction are unrelated to the selection of a SS-01 remedy.

5 Mattawoman Energy is requesting permission to greatly increase dewatering volume directly adjacent to the Land Use Control area along Brandywine Road. It is recommended that the potential impact on the groundwater path and the success of the proposed Spill Site 01 remediation be evaluated in light of this increased dewatering request.

Activities associated with the Mattawoman Energy project within the LUC boundary, are being assessed in accordance with the SS-01 LUCs.

Comments received from Henry S. Cole, Ph.D., Mike Fluharty, Race and Joyce Dowling, Joanne Flynn, Bonnie Bick, and Mildred and Harry Kriemelmeyer, Jr (nearby residents); Jim Long (Mattawoman Watershed Society), and Fred Tutman (Patuxent Riverkeeper); e-mail dated January 9, 2017

1 Our principal concerns include the potential interactions and risks related to the construction and operation of the proposed Mattawoman Energy Center (Mattawoman), located about a half mile from DRMO Spill Site 01. We write to request that Andrews AFB initiate a Restoration Advisory Board (RAB) that would [allow] community members to be fully involved in the ongoing interagency process involving JBA, Mattawoman, Prince George's County, the Maryland Department of Environment (MDE) and the Washington Suburban Sanitary Commission (WSSC). We believe that a RAB can help ensure that our questions and concerns are fully addressed prior to JBA's final Record of Decision (ROD), the legal document that spells out the details of the selected remedial actions and before Mattawoman receives required permits including the wetlands and construction permits.

Activities associated with the Mattawoman Energy project within the LUC boundary are being assessed in accordance with the SS-01 LUCs. RABs may only address issues associated with environmental restoration activities -- in this case USAF implementation of the SS-01 remedy. USAF further notes that the PSC proceedings provide an existing public forum to address community concerns with construction and operation of the Mattawoman project, including its impact on JBA's environmental restoration activities at SS01.

2 What potential impact will Mattawoman's dewatering have on the migration of contaminated groundwater? What analyses have been conducted to examine the likelihood of adverse effects associated with such plume migration? What measures are planned to prevent migration and to detect and control contaminant migration related to dewatering?

These questions are not related to the selection of a SS-01 remedy. Mattawoman Energy is performing these assessments as part of its CPCN requirements.

3 Mattawoman LLC's permit application states that its turning poles will be 8 ft. in diameter and its non-turning poles 4 ft. in diameter. The poles will be 140 ft. high, and the spans between poles will be between 700 and 900 ft. long. However, we are concerned these large poles will require very large foundations based well below the surface requiring significant excavations. We are concerned that the installations will adversely affect the cleanup process and spread contamination to potable water supplies or valuable reserves, especially if the excavations penetrate through the underlying aquitard into the aquifers below. Will the excavations and foundations require dewatering that could spur migration of contaminated groundwater?

Mattawoman Energy is performing these assessments as part of its CPCN requirements.

4 These issues are critical given that the planned lead power line extends northward from the Mattawoman power plant with its path intersecting one or more portions of the remaining groundwater contamination hot spots requiring remediation. In addition, we have recently learned that Mattawoman plans to site at least one of the lead line poles within the remediation zone, adding to potential contaminant migration risks and to impediments to a successful remediation.

Activities associated with the Mattawoman Energy project within the LUC boundary are being assessed in accordance with the SS-01 LUCs.

5 We are also aware that Mattawoman Energy LLC is currently attempting to purchase an area that lies within the remediation zone from Prince George's County. We have grave reservations about such a transaction because it yields control of public land to Mattawoman, a party that has a vested interest in completing its project as rapidly as possible. We believe retaining public ownership is necessary to give JBA the control it needs to ensure that the remediation will be effective and can proceed without subjecting further risk to the public.

The area in question lies within the LUC boundary and is subject to LUC requirements. However, the rest of the comment is not relevant to the selection of a SS-01 remedy.

6 In summary, we urge JBA to fully address these issues related to the final phases of the DRMO cleanup and to require that Mattawoman Energy LLC fully examine a preferable alternate lead line route that avoids areas of highly contaminated groundwater and all wetlands and areas that drain into wetlands. It is imperative that citizens including residents who live very close to the DRMO and power plant sites be given a seat at the table. We therefore urge Joint Base Andrews to establish a Restoration Advisory Board with sufficient resources and time necessary to participate in the critical decisions needed to protect public health and the environment in the short- and long-term.

RABs may only address issues associated with environmental restoration activities -- in this case USAF implementation of the SS-01 remedy -- not activities being conducted by Mattawoman.

3.3.2 Comprehensive Response to Specific Legal and Technical Questions

Comments Received from James R. O'Day, Associate Counsel II, of the Washington Suburban Sanitary Commission (WSSC), correspondence dated December 29, 2016

1 The Proposed Plan is legally unsupportable since it proposes to violate WSSC's regulations under the 2008 Pipeline Design Manual, Part 3, Section 3, Pipeline Crossings and Clearances, by placing the ERH heat treatment sheet piles within 2 feet of WSSC utility pipes. The provision requires a minimum five (5) foot horizontal clearance between WSSC's pipes and other structures.

The electrical resistance heating (ERH) system will include both sheet piles and borings, and the design has been revised to ensure a minimum 5-foot offset from the water main.

2 The Proposed Plan also creates a "no-dig" area that includes the area within which WSSC utilities are located. This would make necessary, unanticipated, emergency maintenance by WSSC of its assets impossible, creating a potential public safety and health risk.

Before the start of the ERH system, TRS will conduct a meeting with local emergency personnel, including WSSC. During the meeting, TRS will review emergency access procedures should emergency access to the Site or the "no-dig" area be required during ERH operations.

Emergency access instructions at an ERH remediation site typically consist of the following:

- **Check in with TRS personnel in site office trailer. If after normal work hours, call emergency contact described on signs located on fence.**
- **Press 'Emergency Stop' button located at fence to immediately cease energy application to the subsurface.**
- **Notify TRS personnel when work is complete.**

3 The Proposed Plan does not provide for removal of the sheet piles after completion of the process, which might interfere with maintenance or installation of new WSSC facilities in the future.

At the conclusion of ERH operations, the sheet pile electrodes will be removed if WSSC or Prince George's County requests they be removed. TRS proposed to leave the electrodes in the road in place to avoid additional disruption.

Comments Received from John Petr, Property Rights Specialist, Southern Maryland Electric Cooperative (SMECO), e-mail dated January 3, 2017

1 What is the required notification process for utility work within the Joint Base Andrews Land Use Control Area also referred to as the "Brandywine DRMO site"?

Work in this area is coordinated with Prince George's County Health Department as part of the permitting process, who notifies JBA. For example, the LUC boundary is provided in PG Atlas under the Administrative layer. The layer is noted as follows: "For LUC in question related to SS01 or LF05, please contact Ken Clare at the Prince George's County Health Department at 301-883-7689."

2 What are the required safety procedures/ personal protective equipment requirements for utility work within the Joint Base Andrews Land Use Control Area also referred to as the "Brandywine DRMO site"?

The need for respiratory protection is not anticipated during utility work in the Land Use Control Area. Personnel will wear Level D PPE when on site. Level D PPE provides no

respiratory protection and minimal skin protection. Level D PPE should be used when the workplace atmosphere contains less than regulatory limit and work functions preclude the potential for unexpected inhalation of, or other contact with, hazardous levels of any chemical. For Level D PPE, the workplace atmosphere must contain at least 19.5 percent oxygen. During operation of the ERH remedy, additional requirements include notification to JBA if intrusive utility work is to be conducted within the ERH footprint so that the ERH system can be temporarily shut down to allow for this work to proceed.

Comments Received from Mary C. Giles, P.E., Prince Georges County Department of Permitting, Inspections and Enforcement (DPIE), correspondence dated January 6, 2017

1 Please provide the latest plans for the proposed location of thermal treatment systems (pilings). The county has been advised that the plans previously provided are not the latest.

A map of the most recent plan for the location of the thermal treatment system is provided in the ROD. Prince George's County Health Department is on the Tier 1 team and receives a copy of the formal design.

2 DPIE is concerned with the following potential effects of the high temperatures that the soils and subgrade will be subjected to for a 1 year period: a) Damage to County maintained roadway infrastructure; b) Closure or interruption of roadway and traffic; c) Damage to County maintained culverts in the area; and d) Damage to other utilities in the area.

a) Heating of the soil will not cause desiccation of the soil beneath or around the road. Surface temperatures of the road will not exceed temperatures typically observed on the pavement during the summer months.
b) Construction activities in the roadway are planned to only require closure of one lane of traffic at a time. Road plates will be needed for interim passage during construction, but impacts to the roadway should at no time require complete closure of the road. Construction activities in the roadway should be accomplished in one week of less.
c) No culverts should be impacted by construction activities, and heating impacts on the culverts will be minimal as their exposure to open air will prevent significant heating.
d) Impacts to utilities depend on the materials of construction. Most utilities will be unaffected by the heating. As discussed above, any potentially impacted utilities made of HDPE will be analyzed for impacts and adjustments to the system or utility will be made as necessary.

3 Due to the above concerns, DPIE requests that Joint Base Andrews either select a different method of treatment OR provide mitigation to ensure that all concerns related to the thermal remediation approach are ameliorated by JBA.

Please see the response to DPIE Comment 2.

4 Any work within the County right of way will require a special utility permit and associated pavement repair and traffic control including detour plans, if appropriate.

As this is a CERCLA action, permits are not required. Substantive permit requirements will be met. Pavement will be restored and traffic control will be enacted during the brief periods of lane closure.

5 Any work outside the County right of way that disturbs more than 5000 SF of land will require a grading permit from MDE or the County.

A sediment and erosion control plan is part of the design; permits are not required for CERCLA actions but substantive requirements will be met.

Comments Received from Raymond A. Chicca, P.E., Group Leader, Development Services Group, WSSC, correspondence dated January 6, 2017

In correspondence dated January 6, 2017, from Raymond A. Chicca, P.E., Group Leader, Development Services Group, WSSC provided 26 comments, many of which required responses of a highly technical nature, with associated calculations. The ERH electrode placement was modified as a result of these comments to meet offset requirements from the mains. The majority of WSSC comments were related to the effects of heat transfer to the 10-inch ductile iron water main and the recently installed HDPE pressure sewer main that services the American Legion Post 227 east of the site. WSSC also expressed concern with respect to corrosion should current travel along the ductile iron pipe, and stray current to the fire hydrant west of the ERH footprint. The USAF sent responses to these comments on April 13, 2017. The USAF acknowledged in the response that due to the lack of continuous flow through the sewer line, the softening point of the HDPE would be reached, and that the pressure rating of the plastic would be reduced to the point that it could not remain in service until soils cool after operations. In anticipation that the 1 ¼ inch HDPE pressure sewer main will become compromised, the USAF will recommend removing it from service during the ERH remedy. The USAF will provide temporary accommodations to the American Legion Post while the line is out of service. Once the thermal treatment process is complete, the USAF will replace the pipe. Regarding the 10-ductile iron pipe, however, the AF indicated that deterioration of that pipe as a consequence of ERH was not anticipated, and therefore the pipe should not need to be replaced for installation of the remedy. This conclusion was based on two factors: (1) the low AC current density was not expected to significantly increase the rate of corrosion of the iron pipe, and (2) the minimal temperature rise of 3°F, provided a flowrate of at least 0.6 gpm was maintained within the water main, was unlikely to accelerate deterioration of the pipe or measurably impact downstream customers.

The USAF met with WSSC on May 11, 2017, and WSSC provided responses to these comments via email on May 19, 2017. While WSSC agreed with some of the responses, WSSC still expressed concern with respect to potential impacts to the water main and downstream customers, and provided a map that illustrated where shut-off valves could be placed to take the line temporarily out of service during remedy implementation, as well as the extent of the 10-inch water main WSSC recommended for replacement.

Upon further evaluation by a USACE corrosion engineer, immediate impacts to the water main are still not expected, but potential long-term impacts are uncertain. Therefore, USAF will work with WSSC during remedy implementation to determine if mitigation actions will be necessary. Such mitigation actions could include installing shut-off valves during

remedy implementation and replacing the water main after the ERH remedy has been completed.

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FIGURES

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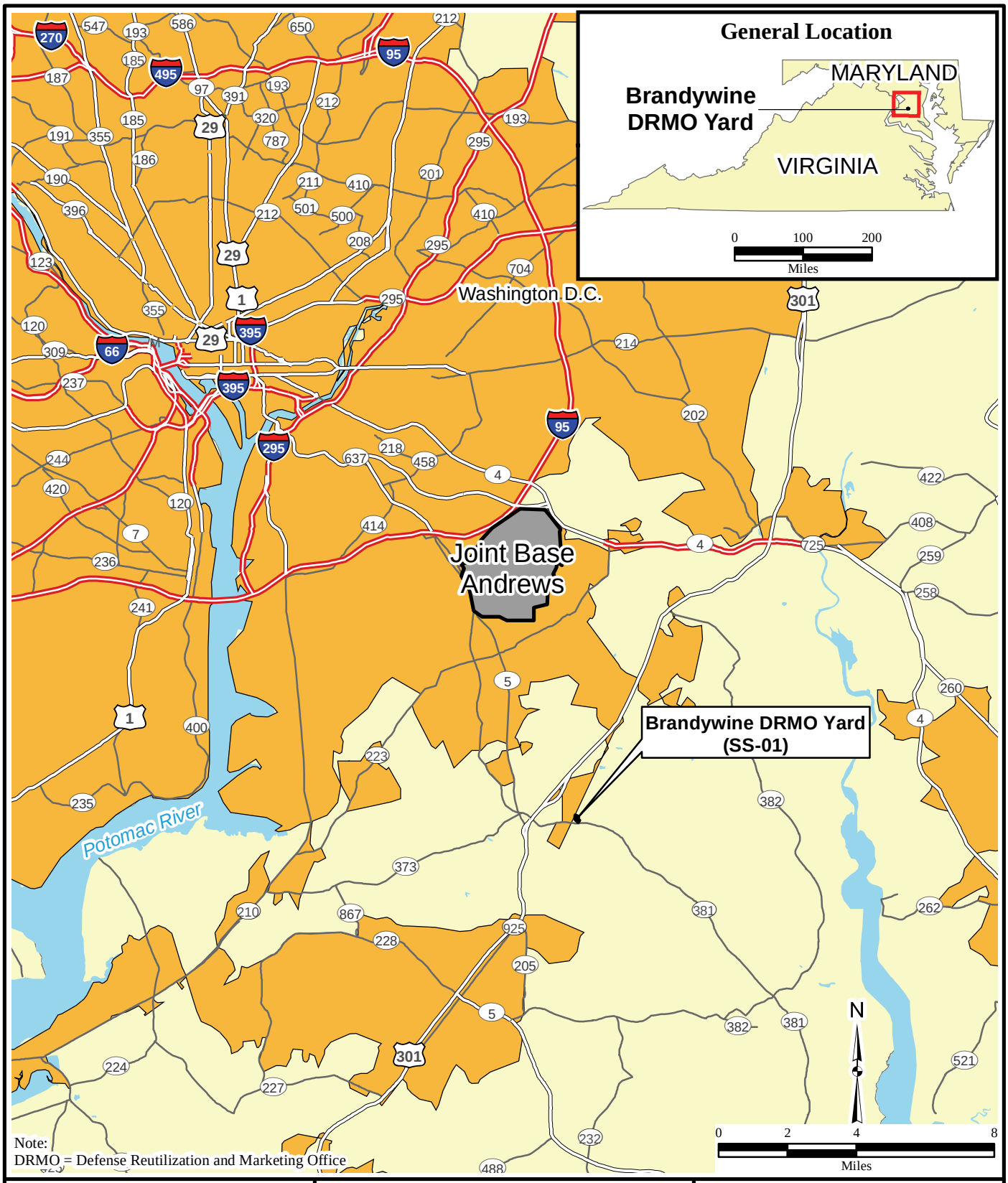

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9/10/2015 JP
Map Source: HGL, ESRI

Legend

- Major Road
- Highway
- Limited Access Highway
- Joint Base Andrews and Brandywine DRMO Yard
- Surface Water Body
- Urban Area

Figure 2.1
Site Location

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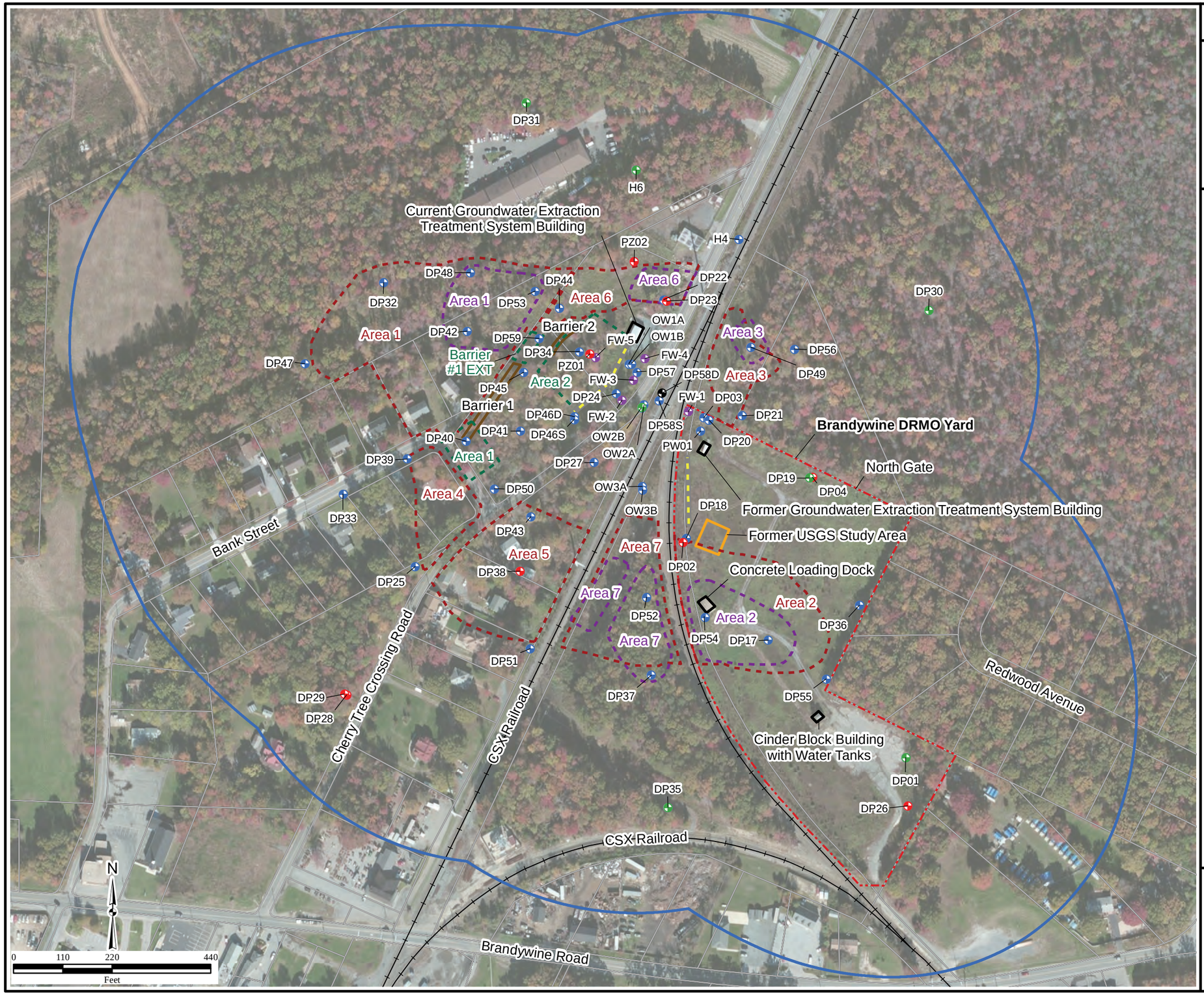
Figure 2.2
Site Layout



Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 — Monitoring Well Identification
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Land Use Control Boundary (500 feet from maximum plume extent in 2007)
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Former USGS Study Area
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area, 2008

Notes:
DRMO=Defense Reutilization and Marketing Office
USGS=U.S. Geological Survey

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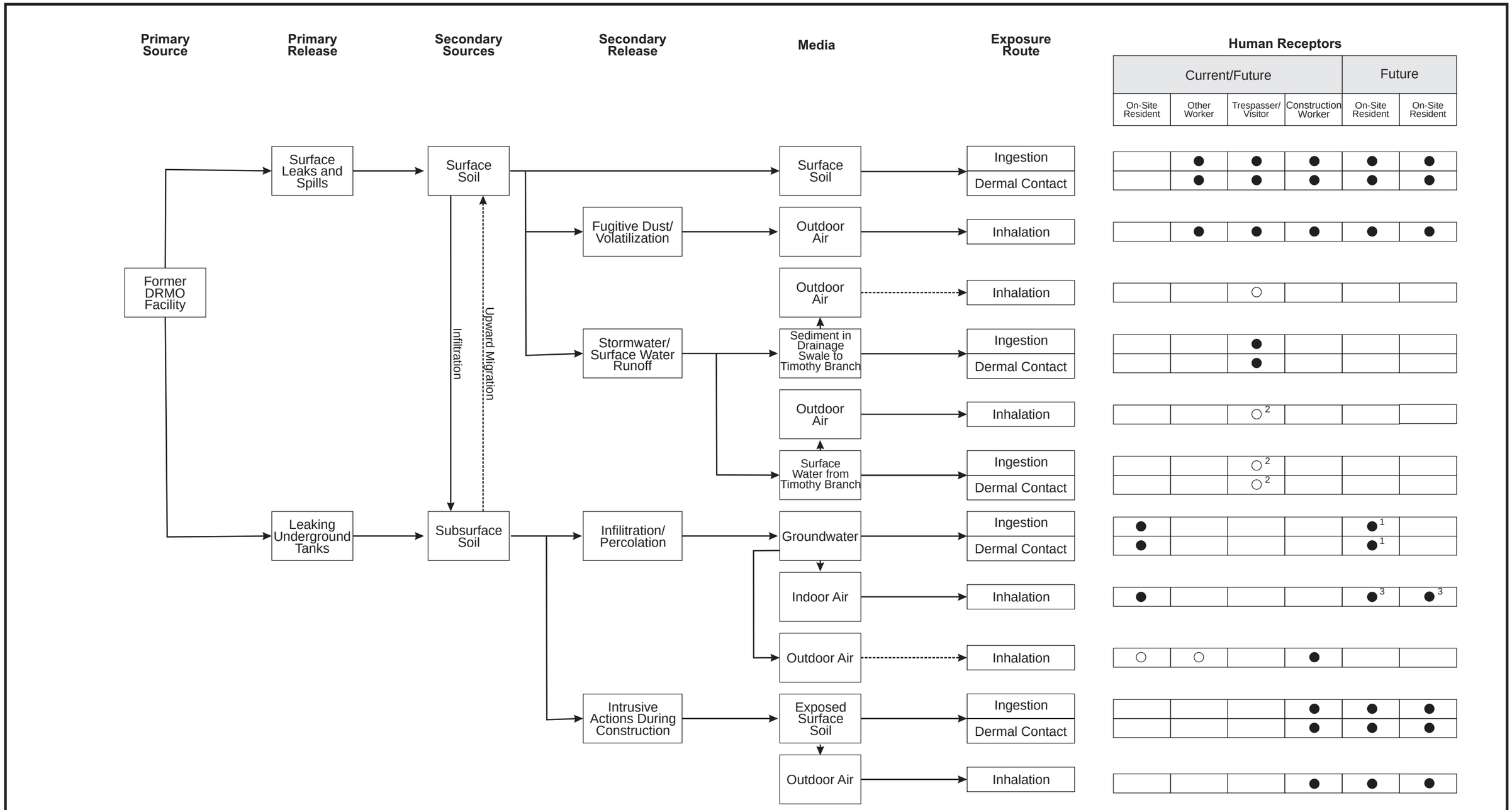
9/10/2015 JP
Map Source: HGL, URS, ArcGIS Online Imagery

HGL HydroGeoLogic, Inc



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(2-03)CSM.cdr
9/11/2015 JP
Source: HGL, URS

HydroGeoLogic, Inc

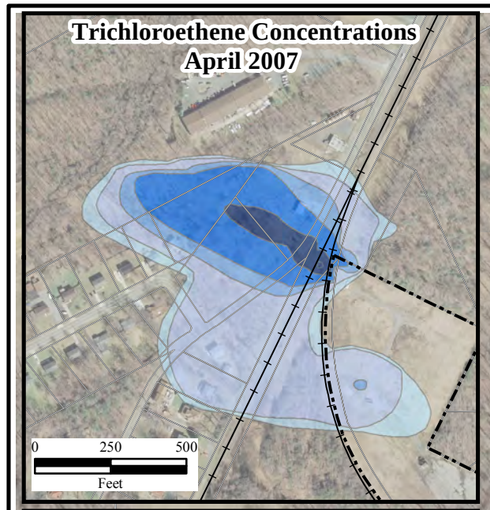
Legend

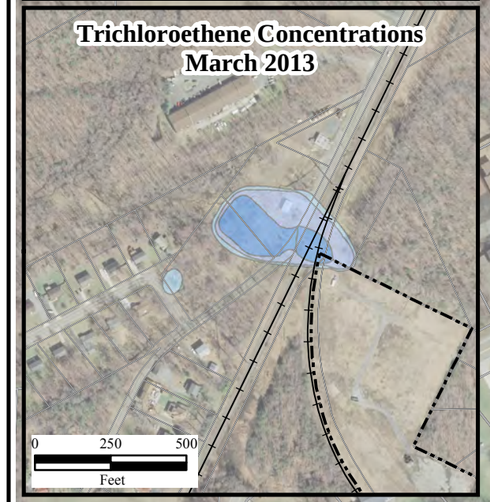
- ● Potentially Complete Pathway (will be quantified)
- ○ Potentially Incomplete Pathway - Insignificant Risk (will not be quantified)
- Empty Boxes Represent Incomplete Pathways
- -------- Dashed Lines Indicate Lower Migration Potential

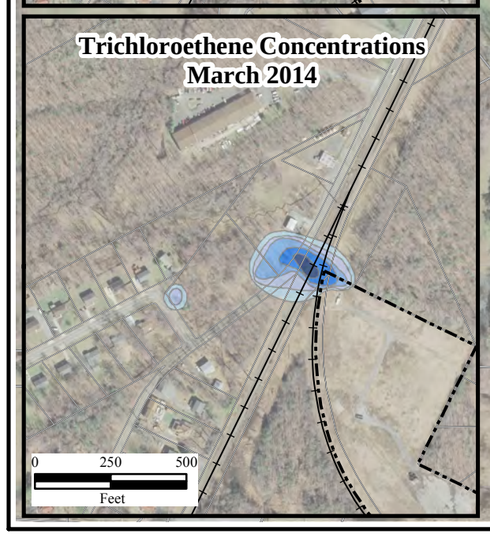
Notes:
1.Not considered a complete pathway.
2.Stream only present intermittently.
3.Upward migration of vapors through slab.

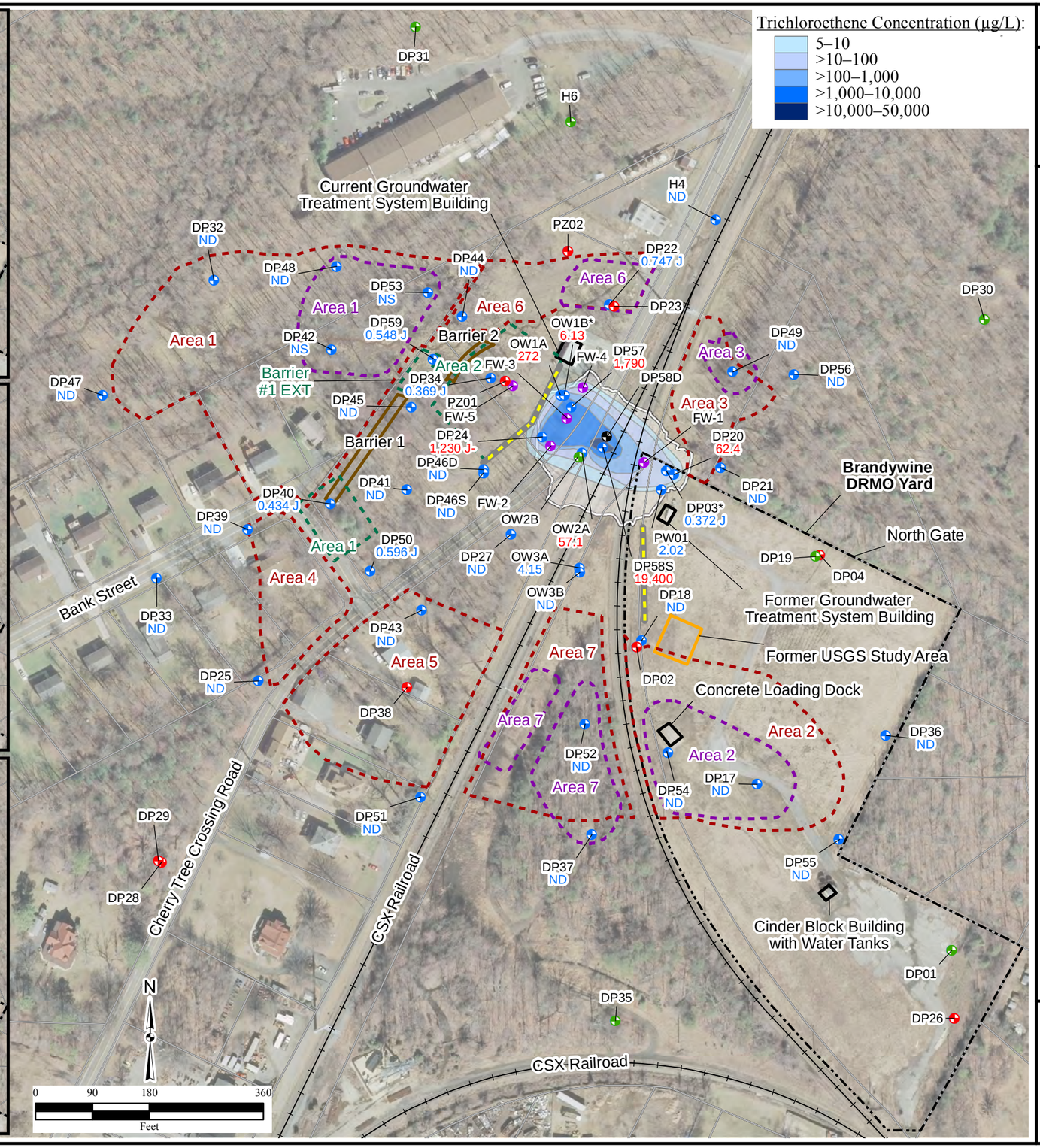
Figure 2.3
Human Health
Conceptual Site Model

Figure 2.4
Trichloroethene Concentration Levels, March 2015









Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 — Monitoring Well Identification
- 4.15 — Trichloroethene Concentration below MCL (<5 µg/L)
- 549 — Trichloroethene Concentration above MCL (>5 µg/L)
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Former USGS Study Area
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area, 2008
- Source Area

Notes:
For cluster wells, contour represents well screened in lower portion of Brandywine Formation.
For wells with a duplicate sample, the highest detected concentration is shown.
Analyte concentrations in micrograms per liter (µg/L).
Maryland State Imagery Acquisition Partnership (MSIAP), 2011
*=Data not used in contouring
DRMO=Defense Reutilization and Marketing Office
J=positive detection, estimated value
J-=positive detection, estimated low value
MCL=maximum contaminant level
ND=not detected
NS=not sampled

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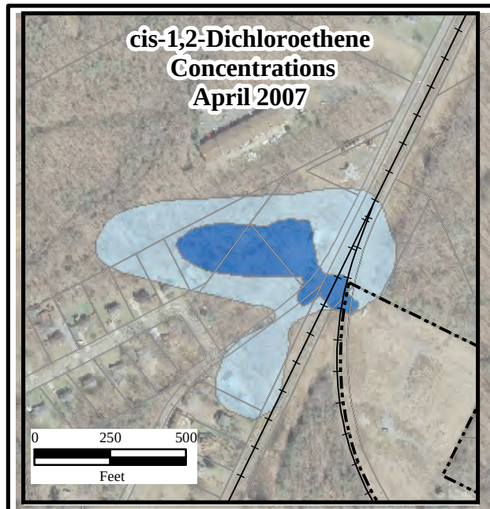
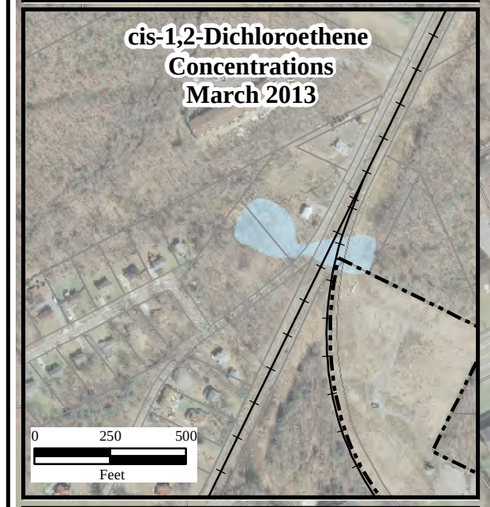
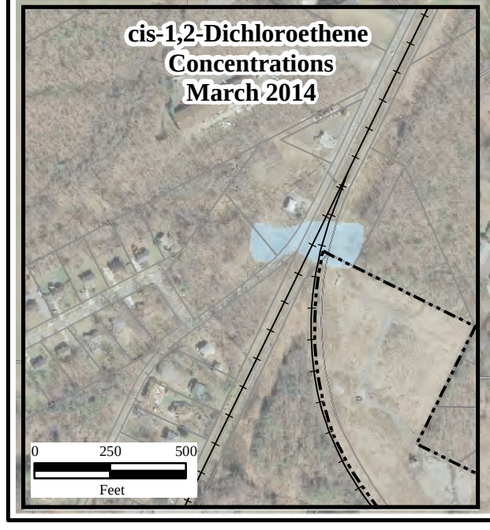
9/24/2015 JP
Map Source: HGL, URS, MSIAP, 2011

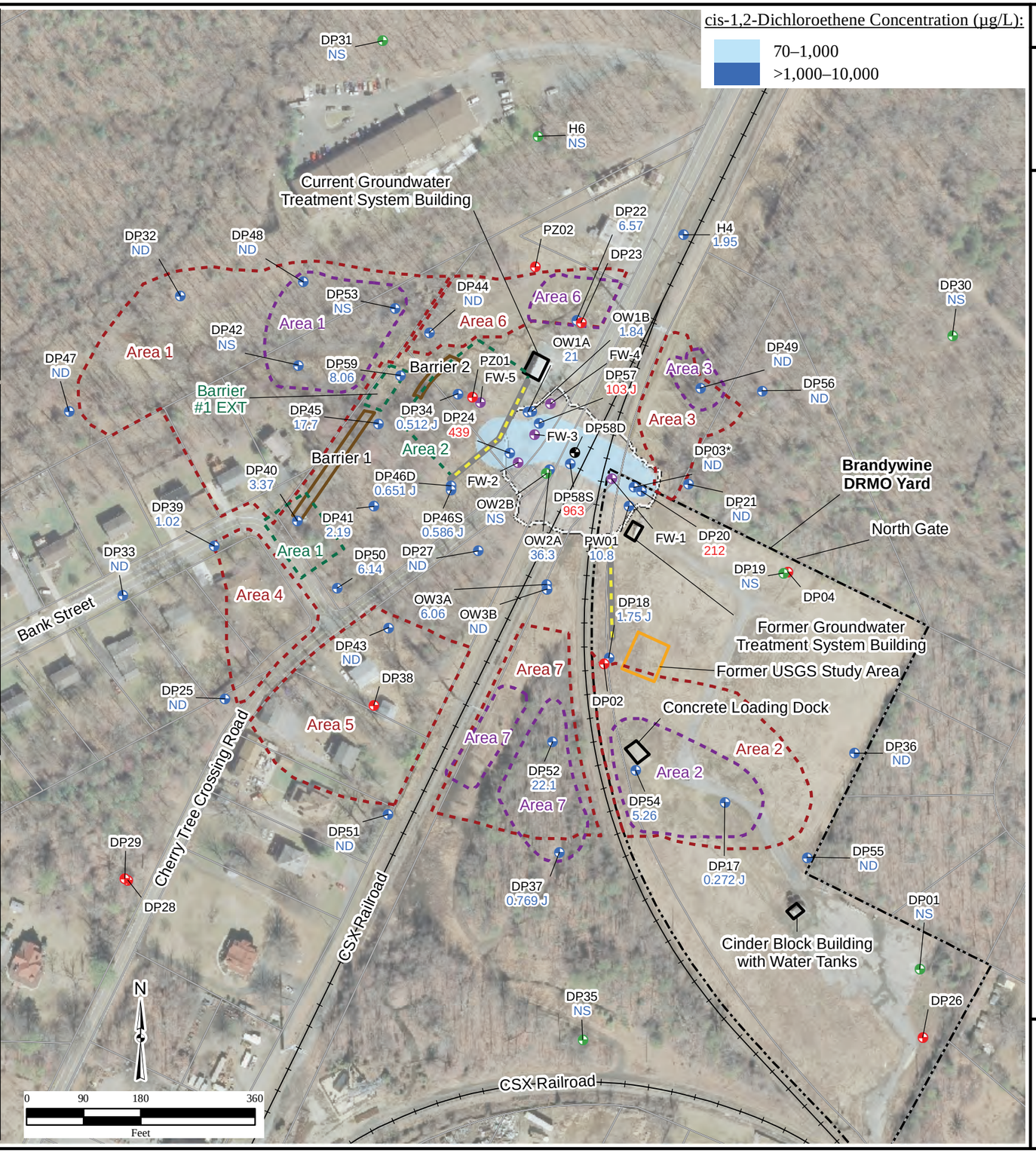
HGL HydroGeoLogic, Inc

Figure 2.5
cis-1,2-Dichloroethene Concentration Levels March 2015









Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 — Monitoring Well Identification
- 10.8 — cis-1,2-Dichloroethene Concentration Below MCL (<70 µg/L)
- 240 — cis-1,2-Dichloroethene Concentration Above MCL (>70 µg/L)
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Former USGS Study Area
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area, 2008
- Source Area

Notes:
For cluster wells, contour represents well screened in lower portion of Brandywine Formation.
For wells with a duplicate sample, the highest detected concentration is presented.
Analyte concentrations in micrograms per liter (µg/L).
Maryland State Imagery Acquisition Partnership, (MSIAP) 2011

*=Data not used in contouring
DRMO=Defense Reutilization and Marketing Office
J=positive detection, estimated value
MCL=Maximum Contaminant Level
ND=not detected
NS=not sampled

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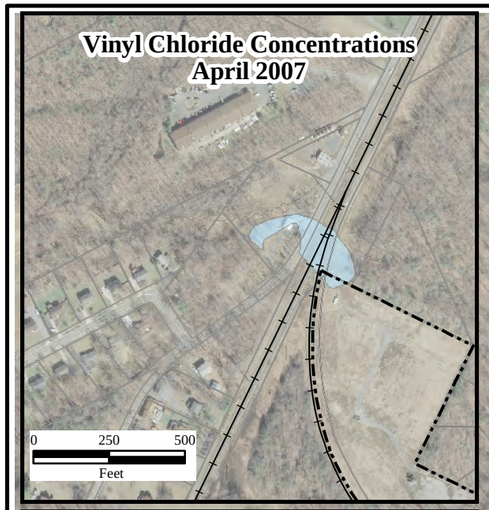
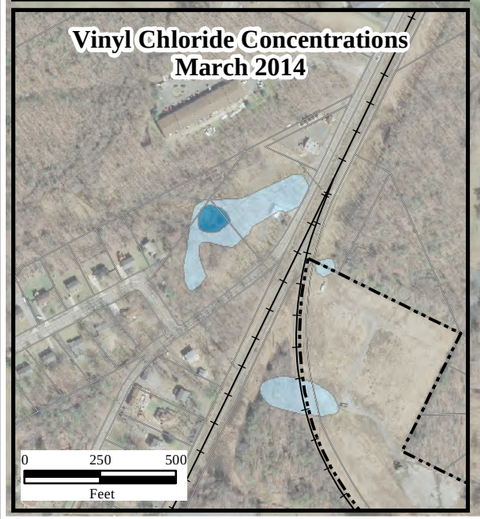
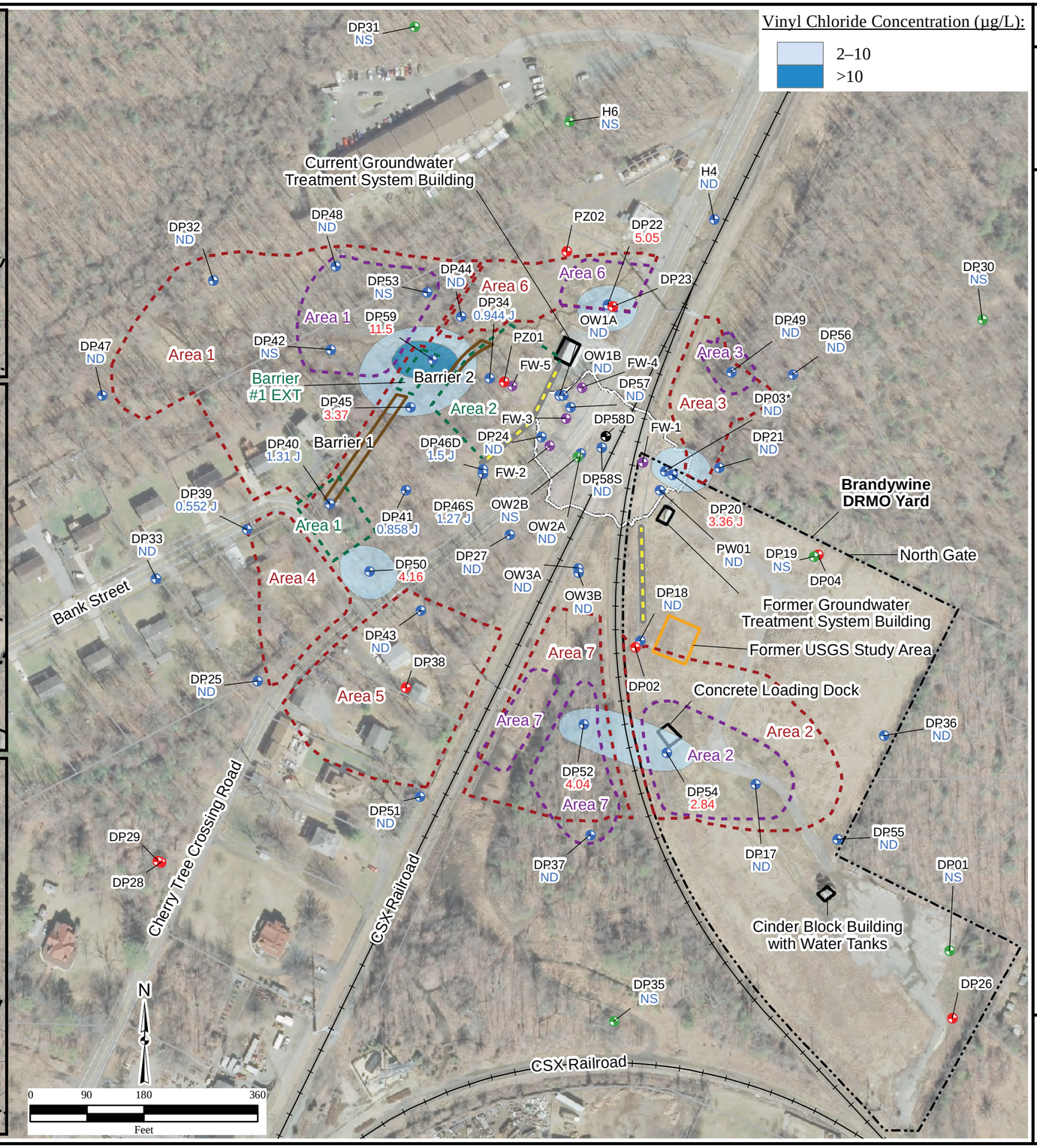
9/10/2015 JP
Map Source: HGL, URS, MSIAP, 2011

HGL HydroGeoLogic, Inc

Figure 2.6
Vinyl Chloride Concentration Levels March 2015







Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 — Monitoring Well Identification
- 1.31 — Vinyl Chloride Concentration below MCL (<2 µg/L)
- 2.46 — Vinyl Chloride Concentration above MCL (>2 µg/L)
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Former USGS Study Area
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area, 2008
- Source Area

Notes:
For cluster wells, contour represents well screened in lower portion of Brandywine Formation.
For wells with a duplicate sample, the highest detected concentration is presented.
Analyte concentrations in micrograms per liter (µg/L).
Maryland State Imagery Acquisition Partnership, (MSIAP) 2011
*=data not used in contouring
DRMO=Defense Reutilization and Marketing Office
J=positive detection, estimated value
MCL=maximum contaminant level
ND=not detected
NS=not sampled

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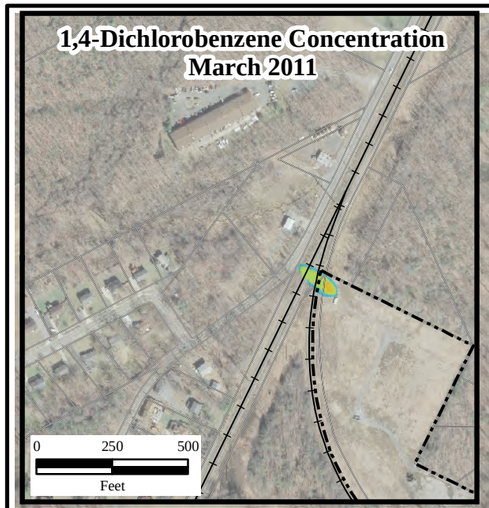
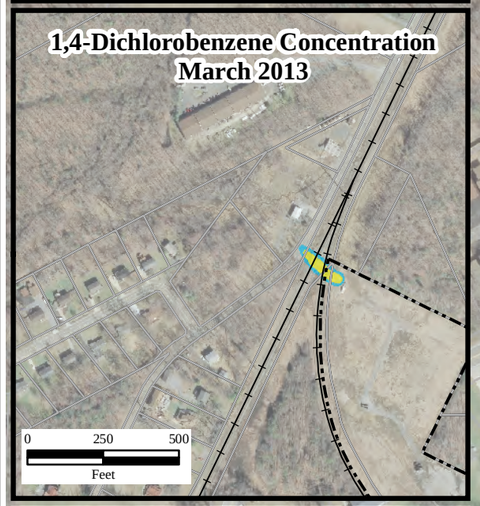
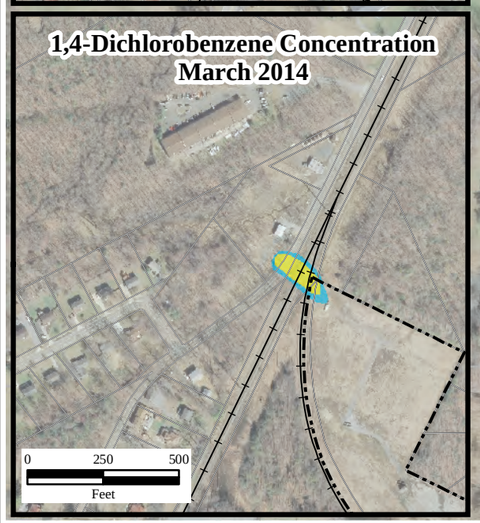
9/10/2015 JP
Map Source: HGL, URS, MSIAP, 2011

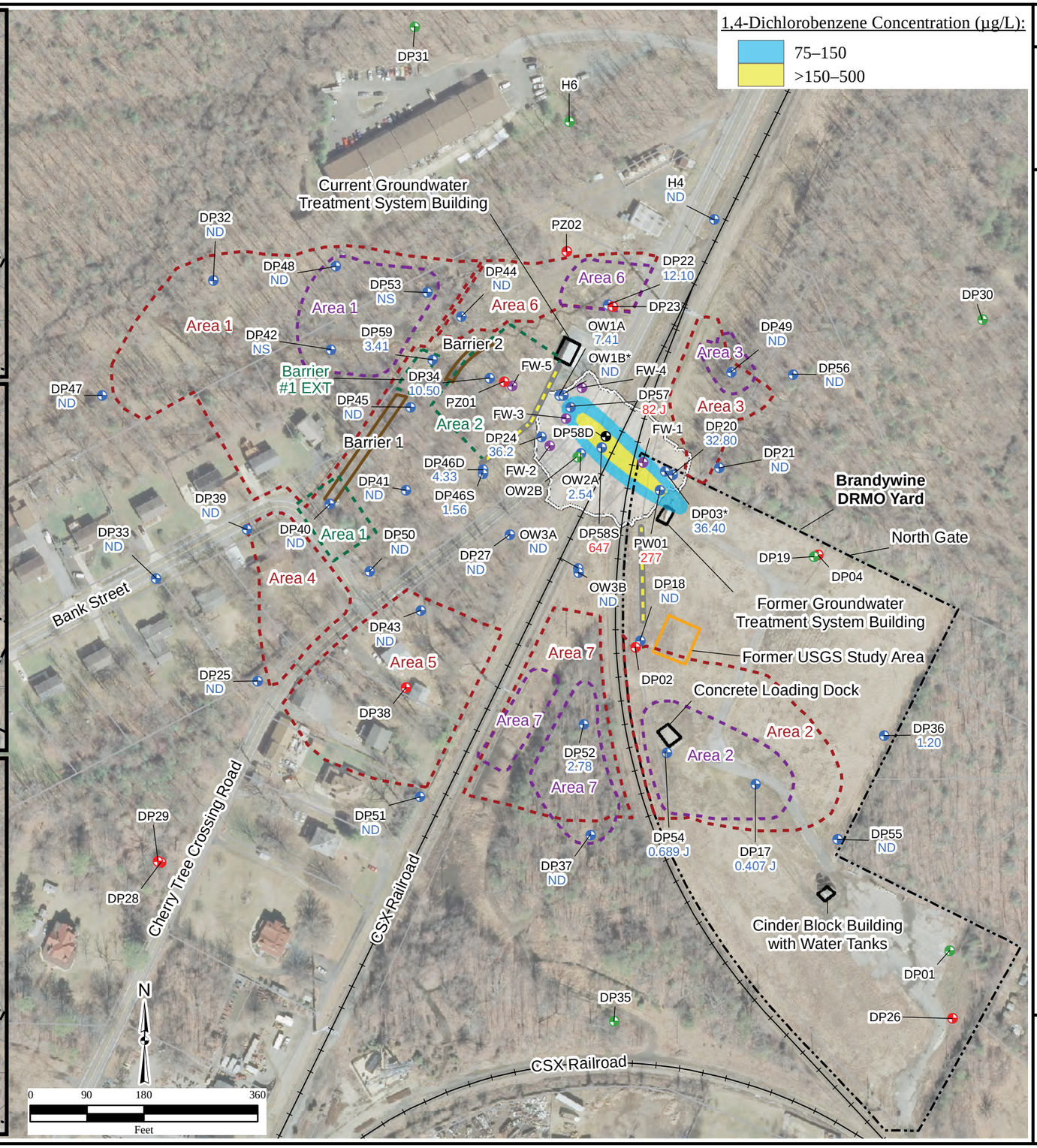
HGL HydroGeoLogic, Inc

Figure 2.7
1,4-Dichlorobenzene Concentration Levels March 2015









Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 — Monitoring Well Identification
- 14 — 1,4-Dichlorobenzene Concentration below MCL (<75 µg/L)
- 149 — 1,4-Dichlorobenzene Concentration above MCL (>75 µg/L)
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Former USGS Study Area
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area, 2008
- Source Area

Notes:
For cluster wells, contour represents well screened in lower portion of Brandywine Formation.
For wells with a duplicate sample, the highest detected concentration is presented.
Analyte concentrations in micrograms per liter (µg/L).
Maryland State Imagery Acquisition Partnership, (MSIAP) 2011

*=Data not used in contouring
DRMO=Defense Reutilization and Marketing Office
J=positive detection, estimated value
MCL=Maximum Contaminant Level
ND=not detected
NS=not sampled

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9/11/2015 JP
Map Source: HGL, URS, MSIAP, 2011

HGL HydroGeoLogic, Inc

Figure 2.8
Naphthalene and 2-Methylnaphthalene Concentration Levels
March 2015

ANALYSES	DP34-SS01											
	3/29/2012		9/27/2012		3/26/2013		3/19/2014			3/13/2015		
	Val	Q	Val	Q	Val	Q	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]
Naphthalene (µg/L)	ND		9.02		ND		4.32		4.36	1.13	J	2.57 J
2-Methylnaphthalene (µg/L)	NA		NA		NA		NA		NA	NA		NA

ANALYSES	OW1A-SS01											
	3/26/2012			9/27/2012			3/25/2013			3/13/2014			3/12/2015		
	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)]
Naphthalene (µg/L)	ND		ND	ND		ND	ND		ND	ND		ND	ND		ND
2-Methylnaphthalene (µg/L)	NA		NA	NA		NA	NA		NA	NA		NA	NA		NA

ANALYSES	OW1B							
	3/26/2012		3/25/2013		3/13/2014		3/12/2015	
	Val	Q	Val	Q	Val	Q	Val	Q
Naphthalene (µg/L)	ND		ND		ND		ND	
2-Methylnaphthalene (µg/L)	ND		ND		ND		ND	

ANALYSES	DP57-SS01									
	3/28/2012		9/27/2012		3/26/2013		3/19/2014		3/13/2015	
	Val	Q	Val	Q	Val	Q	Val	Q	Val	Q
Naphthalene (µg/L)	ND		2.3		1.13		145		ND	
2-Methylnaphthalene (µg/L)	NA		NA		NA		NA		NA	

ANALYSES	DP24-SS01									
	3/29/2012		9/27/2012		3/26/2013		3/18/2014		3/13/2015	
	Val	Q	Val	Q	Val	Q	Val	Q	Val	Q
Naphthalene (µg/L)	ND		ND		ND		ND		ND	
2-Methylnaphthalene (µg/L)	ND		ND		ND		ND		ND	

ANALYSES	DP58S-SS01									
	3/28/2012		9/27/2012		3/26/2013		3/19/2014		3/13/2015	
	Val	Q	Val	Q	Val	Q	Val	Q	Val	Q
Naphthalene (µg/L)	451		400		180		259		732	
2-Methylnaphthalene (µg/L)	355		274	L	0.394	J	278		479	

ANALYSES	DP03-SS01									
	3/20/2012		9/19/2012		3/19/2013		3/11/2014		3/9/2015	
	Val	Q	Val	Q	Val	Q	Val	Q	Val	Q
Naphthalene (µg/L)	6.67		ND		ND		ND		ND	
2-Methylnaphthalene (µg/L)	NA		NA		NA		NA		NA	

ANALYSES	PW01-SS01									
	3/23/2012			9/24/2012			3/20/2013			3/18/2014			3/11/2015		
	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)]
Naphthalene (µg/L)	242		237	286		264	167		170	95.1		97.5	140		130
2-Methylnaphthalene (µg/L)	75.9		71	15.3	J	20.8 J	ND		ND	7.29	J	9.18 J	10.4		10.4

ANALYSES	DP20-SS01									
	3/23/2012			9/24/2012			3/20/2013		3/18/2014		3/11/2015		
	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val[(1)] Q[(1)]	Val	Q	Val	Q	Val	Q	Val[(1)]
Naphthalene (µg/L)	ND		ND	ND		ND	ND		ND		ND		ND
2-Methylnaphthalene (µg/L)	NA		NA	NA		NA	NA		NA		NA		NA

Current Groundwater Treatment System Building
Former Groundwater Treatment System Building
Concrete Loading Dock
Cinder Block Building with Water Tanks
Barrier 1
Barrier 2
Barrier #1 EXT
Area 1
Area 2
Area 3
Area 4
Area 5
Area 6
Area 7
Bank Street
North Gate
Redwood Avenue
Cherry Tree Crossing Road
CSX Railroad

Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 — Monitoring Well Identification
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area 2008

Notes:
Analyte concentrations in micrograms per liter (µg/L).
Maryland State Imagery Acquistion Partnership (MSIAP) aerial photograph dated 2011.

(1)=duplicate sample
DRMO=Defense Reutilization and Marketing Office
J=estimated value
NA=not analyzed
ND=not detected
Q=data qualifier
Val=validated result

0 90 180 360
Feet

N

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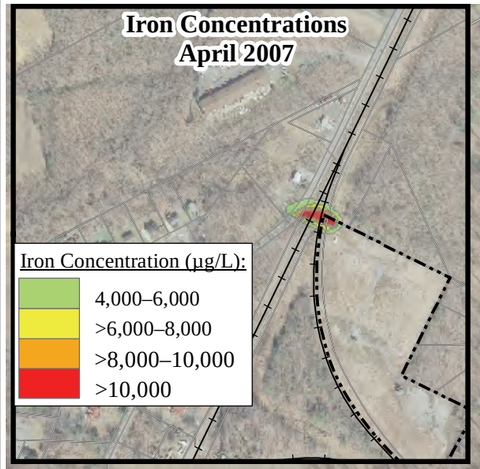
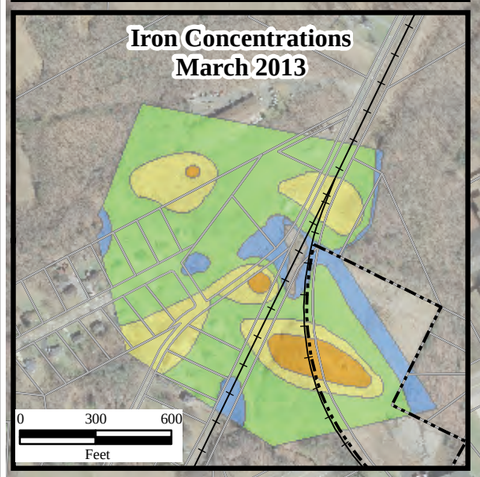
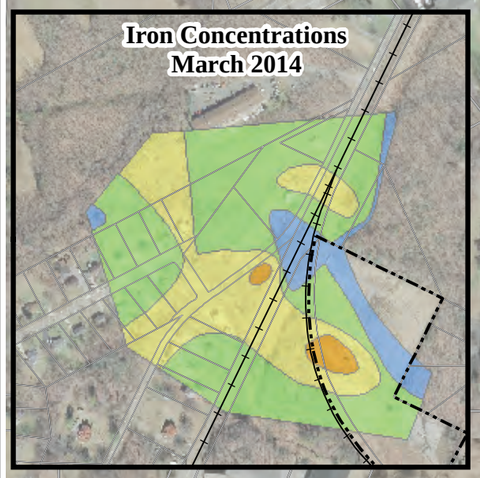
9/10/2015 JP
Map Source: HGL, URS, MSIAP, 2011

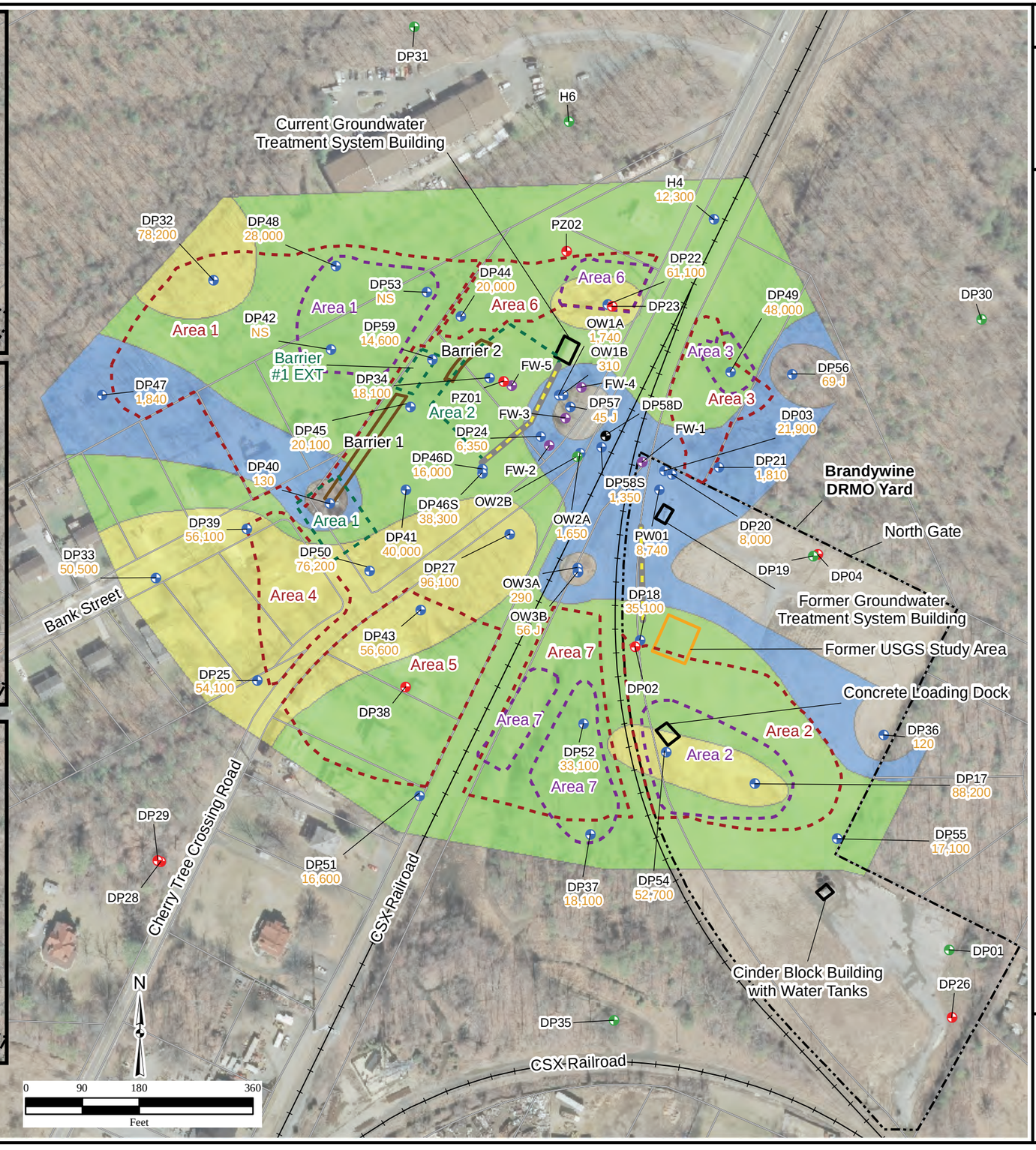
HGL HydroGeoLogic, Inc

Figure 2.9
Iron Concentration Levels
March 2015









Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 220 — Monitoring Well Identification / Iron Concentration (µg/L)
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Former USGS Study Area
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area, 2008

Iron Concentration (µg/L):

- 1,000–10,000
- >10,000–50,000
- >50,000–100,000
- >100,000

Notes:
For cluster wells, contour represents well screened in lower portion of Brandywine Formation.
For wells with a duplicate sample, the highest detected concentration is presented.
Analyte concentrations in micrograms per liter (µg/L).
Maryland State Imagery Acquisition Partnership, (MSIAP) 2011

DRMO=Defense Reutilization and Marketing Office
J=positive detection, estimated value
NS=not sampled

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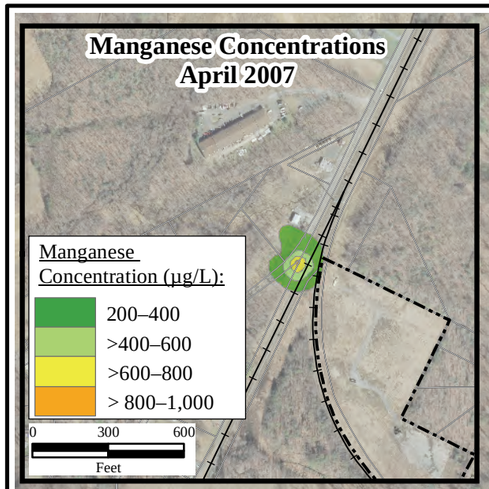
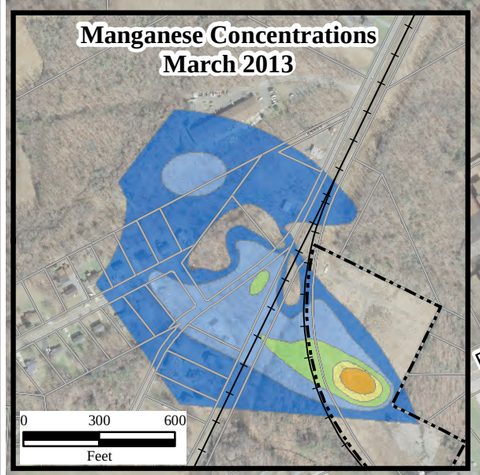
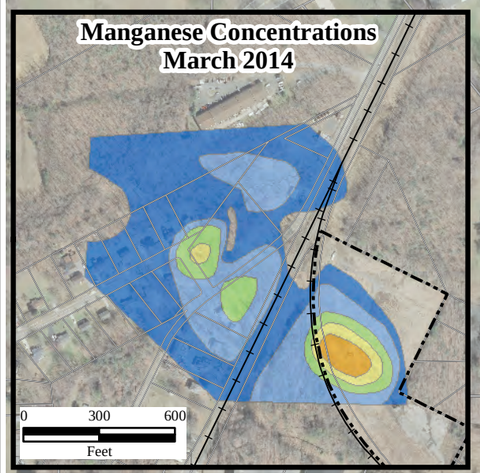
9/10/2015 JP
Map Source: HGL, URS, MSIAP, 2011

HGL HydroGeoLogic, Inc

Figure 2.10
Manganese Concentration Levels
March 2015







Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- DP01 220 — Monitoring Well Identification Manganese Concentration (µg/L)
- Brandywine DRMO Property Boundary
- Railroad
- Parcel Boundary
- Groundwater Extraction Trench
- Barrier
- Existing Structure
- Former USGS Study Area
- Area — Injection Area, 2013/2014
- Area — Injection Area, 2010
- Area — Injection Area, 2008

Manganese Concentration (µg/L):

- 250–500
- >500–1,000
- >1,000–2,000
- >2,000–3,000
- >3,000

Notes:
For cluster wells, contour represents well screened in lower portion of Brandywine Formation.
For wells with a duplicate sample, the highest detected concentration is presented.
Analyte concentrations in micrograms per liter (µg/L). Maryland State Imagery Acquisition Partnership (MSIAP), 2011
*=Data not used in contouring
DRMO=Defense Reutilization and Marketing Office
J=positive detection, estimated value
J+=positive detection, estimated high value
NS=not sampled

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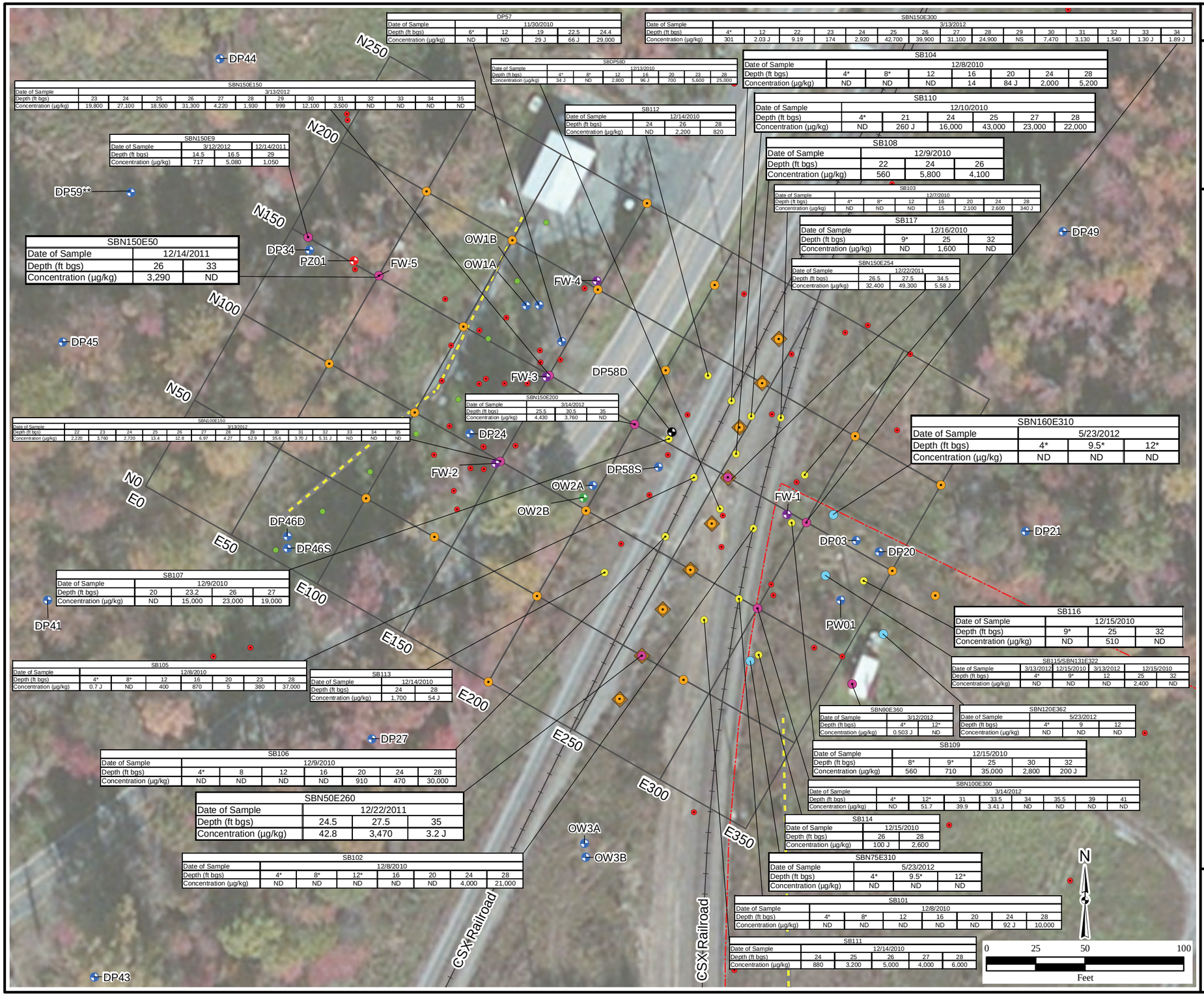
9/10/2015 JP
Map Source: HGL, URS, MSIAP, 2011

HGL HydroGeoLogic, Inc

Figure 2.11
TCE Concentrations in Vadose Zone/Non-Vadose Zone



DP57					
Date of Sample	11/30/2010				
Depth (ft bgs)	6*	12	19	22.5	24.4
Concentration (µg/kg)	ND	ND	29 J	66 J	29,000

SBDP58D							
Date of Sample	12/13/2010						
Depth (ft bgs)	4*	8*	12	16	20	23	28
Concentration (µg/kg)	34 J	ND	2,800	96 J	700	5,600	25,000

SBN150E300																
Date of Sample	3/13/2012															
Depth (ft bgs)	4*	12	22	23	24	25	26	27	28	29	30	31	32	33	34	
Concentration (µg/kg)	301	2.03 J	9.19	174	2,920	42,700	39,900	31,100	24,900	NS	7,470	3,130	1,540	1.30 J	1.89 J	

SB104							
Date of Sample	12/8/2010						
Depth (ft bgs)	4*	8*	12	16	20	24	28
Concentration (µg/kg)	ND	ND	ND	14	84 J	2,000	5,200

SBN150E150													
Date of Sample	3/13/2012												
Depth (ft bgs)	23	24	25	26	27	28	29	30	31	32	33	34	35
Concentration (µg/kg)	19,800	27,100	18,500	31,300	4,220	1,930	999	12,100	3,500	ND	ND	ND	ND

SB112			
Date of Sample	12/14/2010		
Depth (ft bgs)	24	26	28
Concentration (µg/kg)	ND	2,200	820

SB110						
Date of Sample	12/10/2010					
Depth (ft bgs)	4*	21	24	25	27	28
Concentration (µg/kg)	ND	260 J	16,000	43,000	23,000	22,000

SBN150E9			
Date of Sample	3/12/2012		12/14/2011
Depth (ft bgs)	14.5	16.5	29
Concentration (µg/kg)	717	5,080	1,050

SB108			
Date of Sample	12/9/2010		
Depth (ft bgs)	22	24	26
Concentration (µg/kg)	560	5,800	4,100

SB103							
Date of Sample	12/7/2010						
Depth (ft bgs)	4*	8*	12	16	20	24	28
Concentration (µg/kg)	ND	ND	ND	15	2,100	2,600	340 J

SBN150E50		
Date of Sample	12/14/2011	
Depth (ft bgs)	26	33
Concentration (µg/kg)	3,290	ND

SB117			
Date of Sample	12/16/2010		
Depth (ft bgs)	9*	25	32
Concentration (µg/kg)	ND	1,600	ND

SBN150E254			
Date of Sample	12/22/2011		
Depth (ft bgs)	26.5	27.5	34.5
Concentration (µg/kg)	32,400	49,300	5.58 J

SBN100E150													
Date of Sample	3/13/2012												
Depth (ft bgs)	22	23	24	25	26	27	28	29	30	31	32	33	34	35
Concentration (µg/kg)	2,220	3,760	2,720	13.4	12.8	6.97	4.27	52.9	35.6	3.70 J	5.31 J	ND	ND	ND

SBN150E200			
Date of Sample	3/14/2012		
Depth (ft bgs)	25.5	30.5	35
Concentration (µg/kg)	4,430	3,760	ND

SBN160E310			
Date of Sample	5/23/2012		
Depth (ft bgs)	4*	9.5*	12*
Concentration (µg/kg)	ND	ND	ND

SB107				
Date of Sample	12/9/2010			
Depth (ft bgs)	20	23.2	26	27
Concentration (µg/kg)	ND	15,000	23,000	19,000

SB116			
Date of Sample	12/15/2010		
Depth (ft bgs)	9*	25	32
Concentration (µg/kg)	ND	510	ND

SB105							
Date of Sample	12/8/2010						
Depth (ft bgs)	4*	8*	12	16	20	23	28
Concentration (µg/kg)	0.7 J	ND	400	870	5	380	37,000

SB113			
Date of Sample	12/14/2010		
Depth (ft bgs)	24	28	
Concentration (µg/kg)	1,700	54 J	

SB115/SBN131E322					
Date of Sample	3/13/2012	12/15/2010	3/13/2012	12/15/2010	
Depth (ft bgs)	4*	9*	12	25	32
Concentration (µg/kg)	ND	ND	ND	2,400	ND

SBN90E360			
Date of Sample	3/12/2012		
Depth (ft bgs)	4*	12*	
Concentration (µg/kg)	0.503 J	ND	

SBN120E362			
Date of Sample	5/23/2012		
Depth (ft bgs)	4*	9	12
Concentration (µg/kg)	ND	ND	ND

SB106							
Date of Sample	12/9/2010						
Depth (ft bgs)	4*	8	12	16	20	24	28
Concentration (µg/kg)	ND	ND	ND	ND	910	470	30,000

SB109					
Date of Sample	12/15/2010				
Depth (ft bgs)	8*	9*	25	30	32
Concentration (µg/kg)	560	710	35,000	2,800	200 J

SBN50E260			
Date of Sample	12/22/2011		
Depth (ft bgs)	24.5	27.5	35
Concentration (µg/kg)	42.8	3,470	3.2 J

SBN100E300								
Date of Sample	3/14/2012							
Depth (ft bgs)	4*	12*	31	33.5	34	35.5	39	41
Concentration (µg/kg)	ND	51.7	39.9	3.41 J	ND	ND	ND	ND

SB114		
Date of Sample	12/15/2010	
Depth (ft bgs)	26	28
Concentration (µg/kg)	100 J	2,600

SB102							
Date of Sample	12/8/2010						
Depth (ft bgs)	4*	8*	12*	16	20	24	28
Concentration (µg/kg)	ND	ND	ND	ND	ND	4,000	21,000

SBN75E310			
Date of Sample	5/23/2012		
Depth (ft bgs)	4*	9.5*	12*
Concentration (µg/kg)	ND	ND	ND

SB101							
Date of Sample	12/8/2010						
Depth (ft bgs)	4*	8*	12	16	20	24	28
Concentration (µg/kg)	ND	ND	ND	ND	ND	92 J	10,000

SB111					
Date of Sample	12/14/2010				
Depth (ft bgs)	24	25	26	27	28
Concentration (µg/kg)	880	3,200	5,000	4,000	6,000

Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- Soil Boring, URS
- Soil Boring, HGL (2007)
- Soil Boring, HGL (2010)
- MIP Investigation Location
- MIP Investigation Location With Soil Samples
- 2012 Supplemental RI Soil Samples
- Tight Traverse
- Brandywine DRMO Property Boundary
- Railroad
- Groundwater Extraction Trench
- 50' x 50' Grid

Notes:
Only borings with data discussed in the Supplemental RI are labeled.

*=Sample collected above the water table
**=DP59 installed December 2013
J=positive detection, estimated value
ND=non-detect
µg/kg=micrograms per kilogram
bgs=below ground surface
DRMO=Defense Reutilization and Marketing Office
TCE=trichloroethene
MIP=membrane investigation probe
RI=remedial investigation

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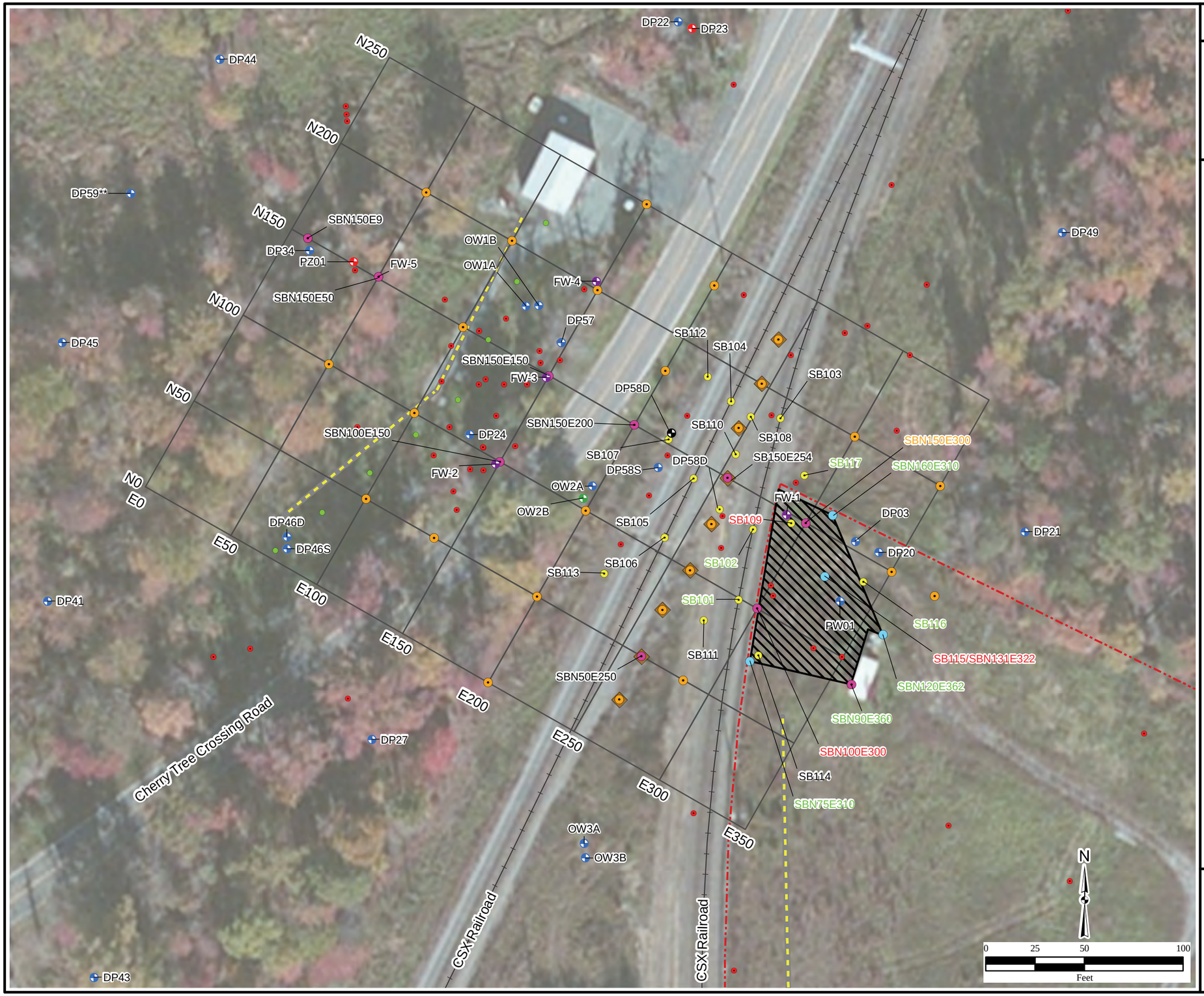
9/10/2015 JP
Source: HGL, URS, ESRI, ArcGIS Online Imagery

HGL HydroGeoLogic, Inc

Figure 2.12
Area of 1,4-DCB and Naphthalene Remediation



Legend

- Brandywine Formation Monitoring Well (part of Monitoring Well Network)
- Brandywine Formation Monitoring Well (not part of Monitoring Well Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- Soil Boring, URS
- Soil Boring, HGL (2007)
- Soil Boring, HGL (2010)
- MIP Investigation Location
- MIP Investigation Location With Soil Samples
- 2012 Supplemental RI Soil Samples
- Tight Traverse
- SBN160E310 — 1,4-DCB and naphthalene concentrations non-detect or below cleanup levels
- SBN100E300 — 1,4-DCB and naphthalene concentrations exceed respective cleanup levels
- SBN150E300 — 1,4-DCB concentration exceeds cleanup level
- Brandywine DRMO Property Boundary
- Railroad
- Groundwater Extraction Trench
- 50' x 50' Grid
- Remediation Area

Notes:
Only borings with data discussed in the Supplemental RI are labeled.
*=Sample collected above the water table.
**=DP59 installed December 2013
DRMO=Defense Reutilization and Marketing Office
DCB=dichlorobenzene
MIP=membrane investigation probe
RI=remedial investigation

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9/10/2015 JP
Source: HGL, URS, ESRI, ArcGIS Online Imagery

HGL HydroGeoLogic, Inc

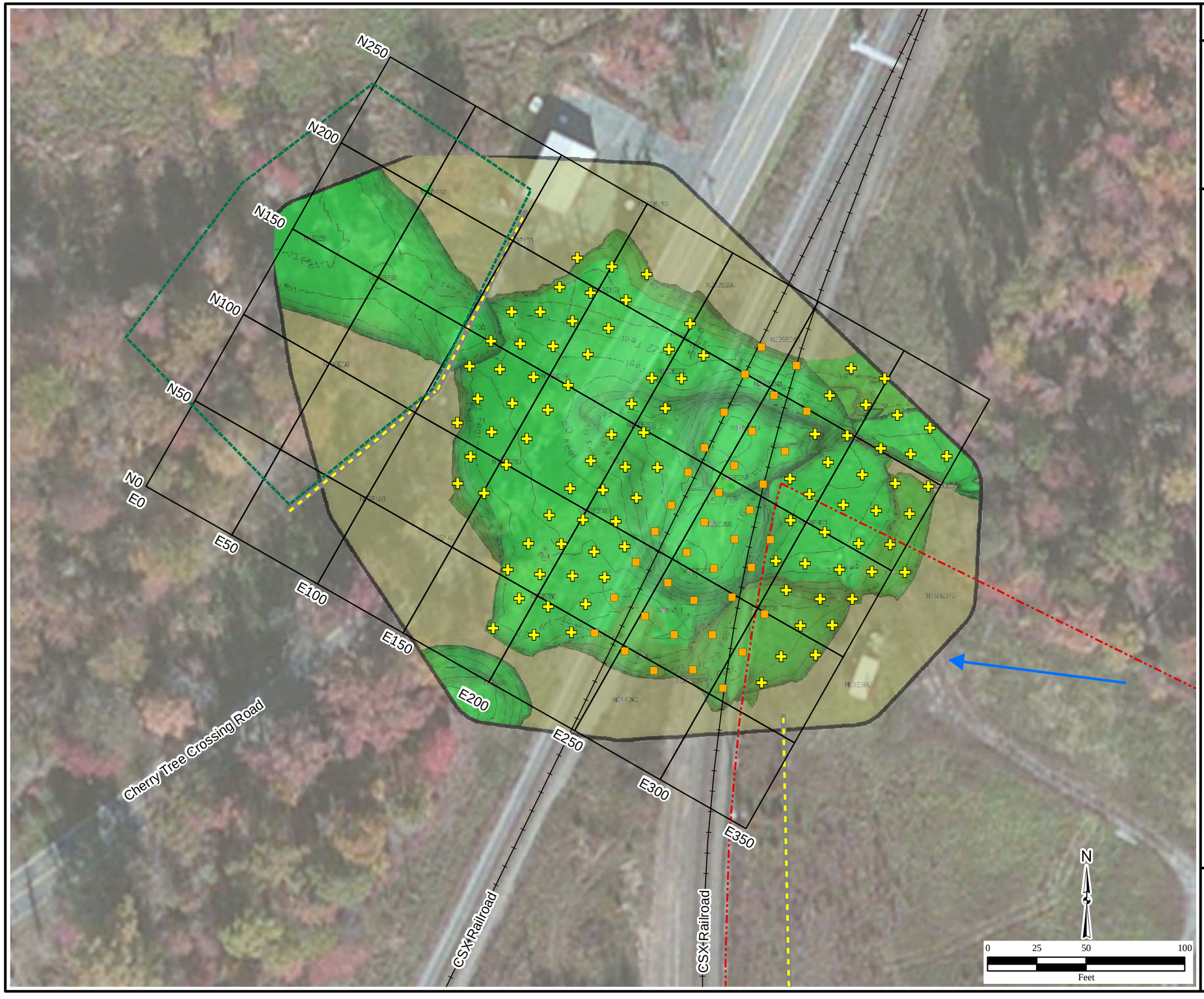

Figure 2.13
Proposed Injection Locations for Alternatives 2 and 3

Legend

- Hydraulic Fracturing Injection Locations*
- Injection Locations using the KAPSDIDS Technology†
- Brandywine DRMO Property Boundary
- Railroad
- Groundwater Extraction Trench
- General Groundwater Flow Direction
- Injection Area, 2013/2014
- 50' x 50' Grid
- ECD Result >4.0x10^5 µV, ~1-5 mg/kg TCE

Notes:
DRMO=Defense Reutilization and Marketing Office
ECD=electron capture detector, sensitive to TCE
MIP=membrane interface probe
mg/kg=milligram per kilogram
TCE=trichloroethene
µV=microvolt
*=Hydraulic fracturing injection locations have four 2.5 ft treatment depth intervals. Each injection is assumed to have a 10 ft radius of influence and the spacing between the locations is 15 ft.
†=Injection locations with the KAPSDIDS technology, each location has three 4 ft treatment depth intervals. Each injection is assumed to have a 10 ft radius of influence and the spacing between the locations is 20 ft.

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9/11/2015
JP
Source: HGL, URS, ArcGIS Online Imagery

HGL HydroGeoLogic, Inc

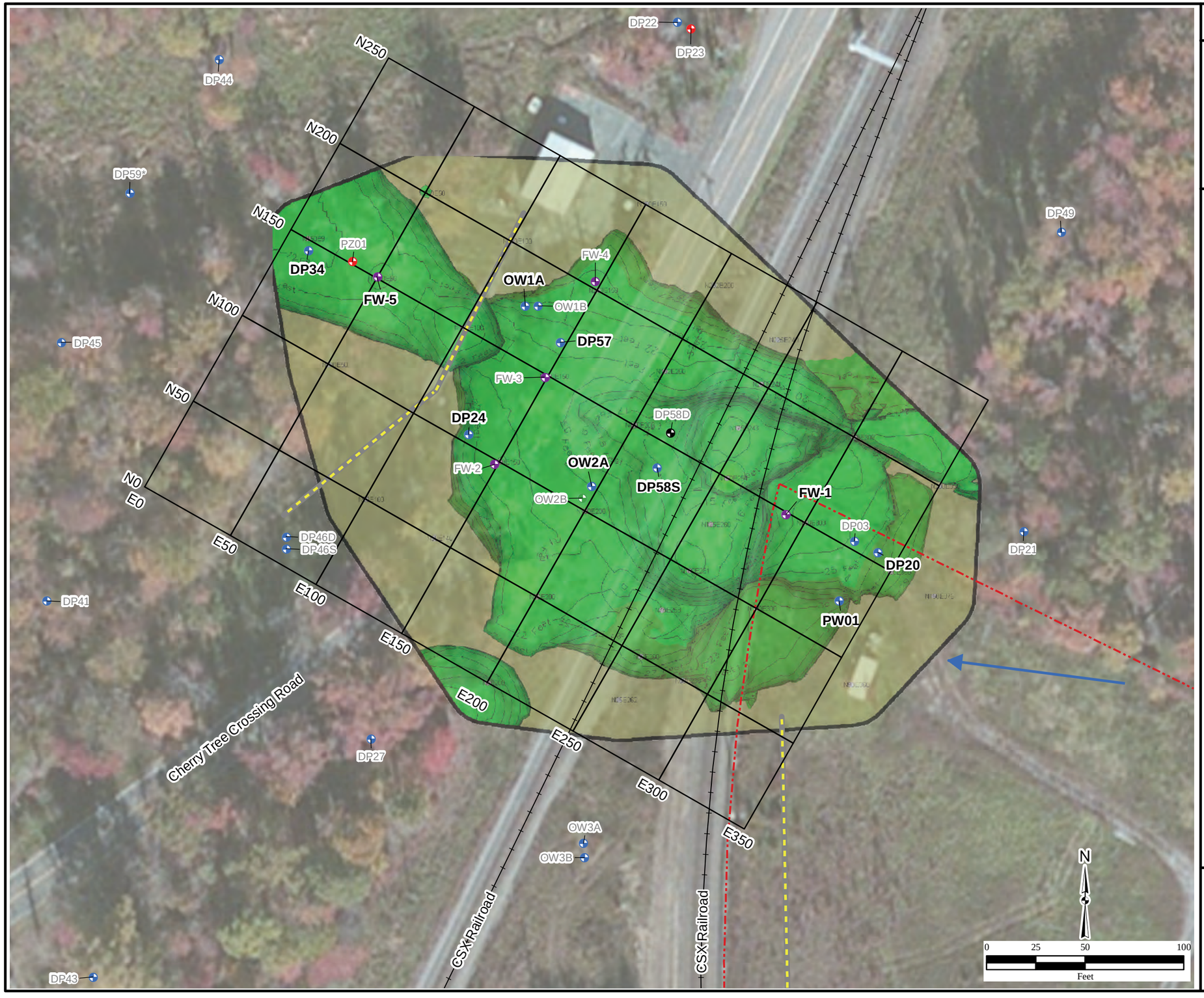

Figure 2.14
Proposed Performance Monitoring Well Network for Alternatives 2 and 3

Legend

- Brandywine Formation Monitoring Well (part of the Proposed Performance Monitoring Network)
- Brandywine Formation Monitoring Well (not part of the Proposed Performance Monitoring Network)
- Deeper Formation Monitoring Well
- Abandoned Monitoring Well
- Flux Monitoring Well
- Proposed Performance Monitoring Wells
- Brandywine DRMO Property Boundary
- Railroad
- Groundwater Extraction Trench
- General Groundwater Flow Direction
- 50' x 50' Grid
- ECD Result >4.0x10^5 µV, ~1-5 mg/kg TCE

Notes:
DRMO=Defense Reutilization and Marketing Office
ECD=electron capture detector, sensitive to TCE
MIP=membrane interface probe
mg/kg=milligram per kilogram
TCE=trichloroethene
µV=microvolt
Bold=Proposed Performance Monitoring Program

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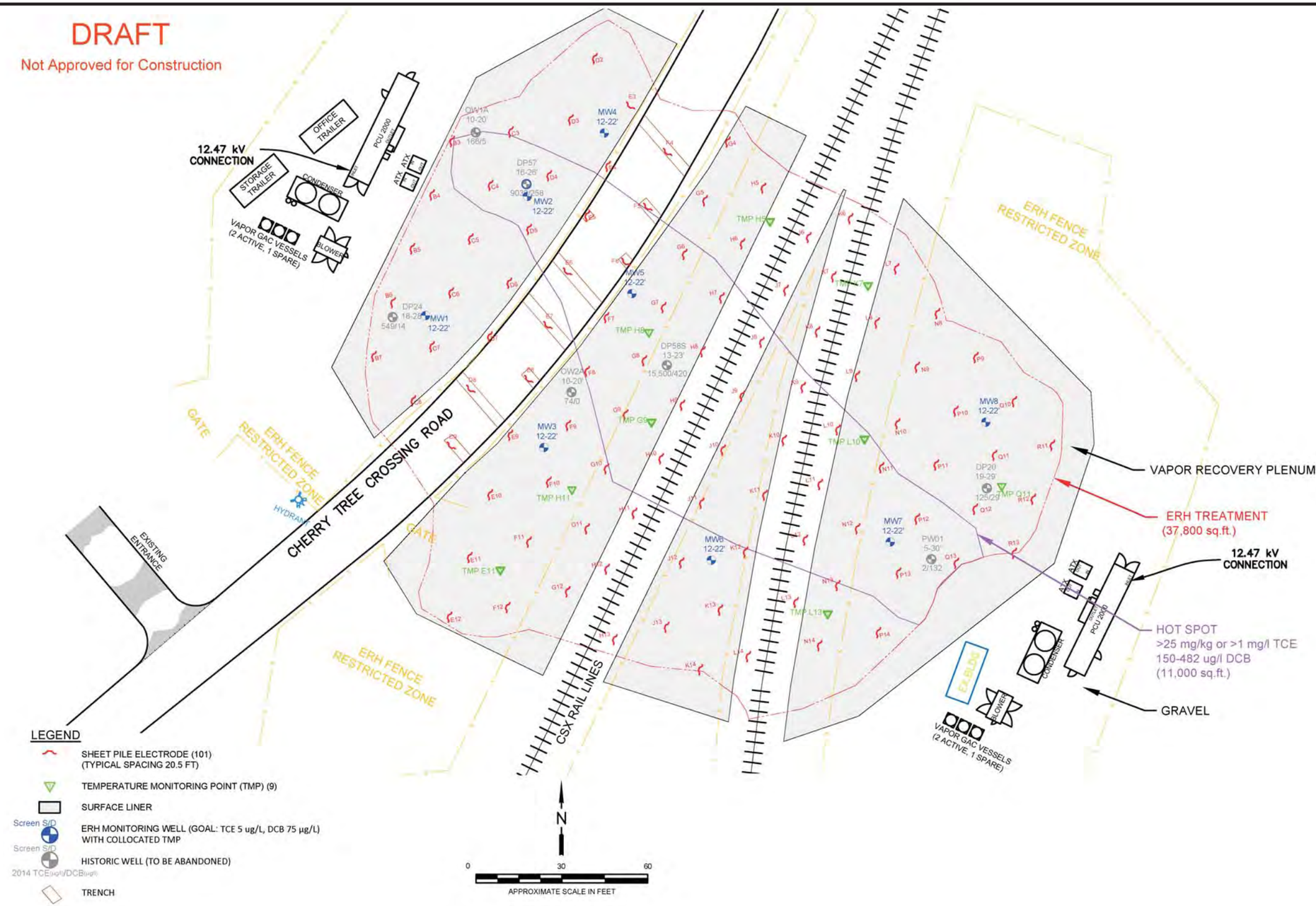
9/11/2015 JP
Source: HGL, URS, ArcGIS Online Imagery

HydroGeoLogic, Inc

DRAFT

Not Approved for Construction



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11/17/2016 ARW
Source: HGL, TRS Group, Inc. 2014

Figure 2.15
Proposed Thermal Treatment Layout for Alternative 4

TABLES

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Table 2.1
Comparative Analysis Summary of the Remedial Alternatives

Criteria	Alternative 1: No Action	Alternative 2: Excavation, In Situ Enhanced Reduction, LUCs	Alternative 3: Excavation, ISCO using Potassium Permaganate, LUCs	Alternative 4: Insitu Thermal Treatment, LUCs
Threshold				
Overall Protectiveness of Human Health and the Environment	0	2	2	2
Compliance with ARARs	0	2	2	2
Balancing				
Long-term Effectiveness and Permanence	NA	2	1	3
Short-Term Effectiveness	NA	1	2	3
Reduction of Toxicity, Mobility, or Volume Through Treatment	NA	1	2	3
Implementability	NA	2	2	1
Cost	NA ($0)	3 ($4,896,014)	2 ($6,989,241)	1 ($9,237,934)
Modifying				
State/Support Agency Acceptance	NA	TBD	TBD	TBD
Community Acceptance	NA	TBD	TBD	TBD
Total Score:	***0***	***13***	***13***	***15***

0 = Does not satisfy criterion
1 = Satisfies criterion to a lower degree
2 = Satisfies criterion
3 = Satisfies criterion to a higher degree

Notes:
ARARs = Applicable or Relevant and Appropriate Requirements
TBD = to be determined
ISCO= In situ Chemical Oxidation
LUCs = land use controls
N/A = Not Applicable
= most sustainable

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Table 2.2
Comparative Analysis of NCP Evaluation Criteria for the Remedial Alternatives

Alternatives	Overall Protection of Human Health and of the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost (Present Worth 2015)	Time to TCE Response Complete
Alternative 1 **No Action**	Not protective of human health or environment.	Does not comply with ARARs	Not effective in reducing the magnitude of risk associated with groundwater. Does not put LUCs in place to protect human health.	No reduction in Toxicity, Mobility, Volume. Does not meet statutory preference for treatment.	No risk to workers during implementation. Continued impact from existing conditions.	No construction or operation involved. May require ROD amendment if future problems arise. No monitoring involved. State of groundwater will not be known. No approval necessary. No equipment/ materials required.	$0	60+ years
Alternative 2 **Excavation, In Situ Enhanced Reduction, and LUCs**	Protective of human health through LUCs by preventing use of groundwater**.**	Complies with ARARs.	Risk will be reduced due to the dechlorination, destruction and excavation of contaminant mass. Controls used for these methods have been proven adequate and reliable over the years.	Moderate to High Degree of Treatment - Toxicity/mobility/volume will be reduced through reductive dechlorination of VOCs to less toxic end products. Treatment is irreversible. Temporarily increase mobility of dissolved iron and manganese. Meets statutory preference for treatment.	Residents and workers will be protected by implementation of LUCs (preventing use of VOC contaminated groundwater). No additional impacts are expected due to implementation of alternative. CSX train traffic may extend injection schedule.	Moderate level of difficulty to construct due to the presence of the CSX tracks. Pilot studies would be required to determine optimal injection spacing and rates. Groundwater monitoring in place to monitor effectiveness of treatment. Amendments and experienced injection firms are commercially available.	$4,896,014	9 years

Table 2.2
Comparative Analysis of NCP Evaluation Criteria for the Remedial Alternatives

Alternatives	Overall Protection of Human Health and of the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, and Volume through Treatment	Short-Term Effectiveness	Implementability	Cost (Present Worth 2015)	Time to TCE Response Complete
Alternative 3 **Excavation, ISCO Using Potassium Permanganate, and LUCs**	Protective of human health through LUCs by preventing use of groundwater**.**	Complies with ARARs.	Risk will be reduced due to the oxidation destruction and excavation of contaminant mass. Controls used for these methods have been proven adequate and reliable over the years.	Moderate to High Degree of Treatment - Toxicity/mobility/volume will be reduced through chemical oxidation or destruction of VOCs to less harmless end products. Treatment is irreversible. Meets statutory preference for treatment.	Residents and workers will be protected by implementation of LUCs (preventing use of VOC contaminated groundwater). No additional impacts are expected due to implementation of alternative. CSX train traffic may extend injection schedule.	Moderate level of difficulty to construct due to the presence of the CSX tracks. Pilot studies would be required to determine optimal injection spacing and rates. Groundwater monitoring in place to monitor effectiveness of treatment. Amendments and experienced injection firms are commercially available.	$6,989,241	7 years
Alternative 4 **In Situ Thermal Treatment, and LUCs**	Protective of human health through LUCs by preventing use of groundwater**.**	Complies with ARARs.	Risk will be reduced due to thermal treatment. Controls used for these methods have been proven adequate and reliable over the years.	High Degree of Treatment - Toxicity/mobility/volume will be reduced through volatilization of VOCs and vapor recovery. Treatment is irreversible. Meets statutory preference for treatment.	Residents and workers will be protected by implementation of LUCs (preventing use of VOC contaminated groundwater). CSX track elevation will be monitored during operation.	Readily used and proven technology. Due to CSX tracks, extensive coordination with CSX is required. Replacement of monitoring wells is required due to high subsurface temperatures. Experienced installation firm is available.	$9,237,934	5 years

Table 2.3
Cost Summary Estimate
In Situ Thermal Treatment, LUCs
Brandywine DRMO Yard, Site SS-01

CAPITAL COST	Year	QTY	Unit	Unit Cost	Total
Logistics, Security, Base Coordination	2014	1	LS	$ 8,000	$ 8,000
Plans	2014	1	LS	$ 15,000	$ 15,000
Temporary Facilities & Utilities	2014	1	LS	$ 245,000	$ 245,000
Land Use Control (LUC) Plan	2014	1	LS	$ 15,000	$ 15,000
Implement Institutional Controls	2014	1	LS	$ 15,000	$ 15,000
ERH Thermal Treatment System					
Install Fifteen New Steel Monitoring Wells	2014	15	EA	$ 10,000	$ 150,000
ERH Vendor (including carbon and electricity)		1	LS	$ 5,400,000	$ 5,400,000
	2015				
Drilling	2015	1	LS	$ 1,600,000	$ 1,600,000
Oversight	2015	100	Days	$ 1,500	$ 150,000
Other	2016	1	LS	$ 50,000	$ 50,000
Capital Cost Subtotal					$ 7,598,000
Capital Cost Subtotal NPV					$ 7,220,269
Contingency		15%			$ 1,139,700
Project Management		3%			$ 227,940
Total Capital Cost					$ 8,965,640
NPV of Capital Cost					$ 8,587,909
MONITORING AND REPORTING COST					
Baseline Groundwater Monitoring	2014	2	Events	$ 35,000	$ 70,000
Monitoring, reporting, data management, LUCs	2015-2019	15	Events	$ 26,000	$ 390,000
Effluent monitoring/ Survey	2015	24	Events	$ 5,000	$ 120,000
Monitoring Cost Subtotal					$ 580,000
Monitoring Cost Subtotal NPV					$ 527,885
Project Management		7.5%			$ 43,500
Technical Support		5%			$ 29,000
Total Routine Monitoring and Reporting Cost					$ 652,500
NPV of Routine Monitoring and Reporting Cost					$ 600,385
PERIODIC COST					
First Five Year Review	2019	1	LS	$ 35,000	$ 35,000
Site Close-Out (reports, sampling, well abandonment	2020	1	LS	$ 25,000	$ 25,000
Total Periodic Cost					$ 60,000
NPV of Periodic Cost					$ 49,639
Total Present Value of Alternative					$ 9,678,140
Net Present Value					$ 9,237,934

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APPENDIX A

Maryland Department of the Environment Concurrence Letter

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Maryland
Department of
the Environment

Larry Hogan, Governor
Boyd K. Rutherford, Lt. Governor

Ben Grumbles, Secretary
Horacio Tablada, Deputy Secretary

December 20, 2017

Mr. David Connolly
AFCEC/CZOE
1602 California Avenue, Suite 239
Joint Base Andrews, MD 20762-6441

RE: Maryland Department of the Environment concurrence letter for the final Record of Decision, Brandywine Defense Reutilization and Marketing Office, Brandywine, Maryland (December 2017).

Dear Mr. Connolly:

The Federal Facilities Installation Restoration Program (FFIRP) of the Maryland Department of the Environment has reviewed the above referenced document. The FFIRP concurs with this Record of Decision (ROD), which was jointly agreed upon and signed by the United States Environmental Protection Agency and the Unites States Air Force. The remedial action specified in the ROD includes the installation of an electrical resistance heating thermal treatment system to treat shallow subsurface soil and groundwater contaminated with chlorinated volatile organic compounds, naphthalene, 2-methylnaphthalene, and 1,4-dichlorobenzene. The remedy also includes monitoring contaminant levels, both during and after treatment. The ROD also includes land use controls to restrict groundwater use until cleanup criteria are achieved.

The public meeting for this proposed remedial action was held at the Brandywine Volunteer Fire Department on December 12, 2016. The public comment period extended from December 1, 2016 through January 6, 2017. All comments, questions and disputed matters were resolved prior to signing of the final ROD and are documented in the responsiveness summary (Section 3). A transcript of the proceedings of the public meeting is included in Appendix D of the ROD.

Sincerely,

Rick Grills

Rick Grills
Geologist Program Consultant
FFIRP

RG:rg

cc: Mr. S. Andrew Sochanski
Mr. Kenneth A. Clare
Ms. Hilary Miller
Mr. James Carroll
Mr. Ira May

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APPENDIX B

SUMMARY OF FEDERAL AND STATE ARARS

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Summary of Federal and State ARARs
SS-01 Record of Decision

Federal or State Statute, Regulation or Guidance	Summary of Requirement	Type of ARAR	Comments
Hazardous Waste			
Maryland Hazardous Waste Regulations, COMAR 26.13.03.02 and .05	Standard applicable to generators of hazardous waste, including procedures for identification, listing, satellite accumulation, transportation, and disposal of hazardous wastes.	A	Activities at SS-01 will result in investigation- and remediation-derived waste that may be hazardous waste.
Water			
National Primary Drinking Water Regulations, 93-253, 40 CFR 141.61(a)(1), (5), (6), (9), and (15)	Provides MCLs for the concentration of common contaminants in public drinking water supplies.	RA	MCL listing includes site-specific COCs, including vinyl chloride, trichloroethene, 1,4-dichlorobenzene, cis-1,2-dichloroethene, and tetrachlorethene.
United States Environmental Protection Agency. Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites. (accessed 01/11/2017). https://www.epa.gov/risk/regional-screening-levels-rsls	The RSL tables provide comparison values for residential and commercial/industrial exposures to soil, air, and tapwater (drinking water). RSLs are calculated using the latest toxicity values, default exposure assumptions and physical and chemical properties,	TBC	RSLs used to establish cleanup levels for those constituents that do not have an MCL (naphthalene, 2-methylnapthalene, iron, and manganese).
Maryland Water Pollution Regulations, COMAR 26.08.02.03 and 26.08.03.01	State general water quality criteria restricting water pollution sources, and effluent limitations on quantity and polluting substances	A	The remedial action at SS-01 may include operation of the groundwater extraction and treatment system; treatment system effluent is subject to these regulations.
Maryland Stormwater Management Regulations, COMAR 26.17.02.05; 26.17.02.06 (Min. Control Requirements); 26.17.02.08 (Stormwater Management Measures); 26.17.02.09 (Stormwater Management Plans) 26.17.01.11 (Standards and Specifications)	Provides for the management of stormwater runoff to reduce impacts on land and water resources; development and construction actions must have an approved plan.	RA	Installation of the surface plenum needs to account for the proper management of stormwater runoff
Maryland Erosion and Sediment Control Regulations, COMAR 26.17.01.05; 26.17.01.07B (E&S Plans); 26.17.01.11 (Standards and Specifications)	Provides for the conservation and protection of the water resources of the state by requiring that any land-clearing, grading, or other earth disturbances greater than 5,000 square feet require an erosion and sediment control plan.	A	Construction activities at the site will disturb greater than 5,000 square feet, thus a sediment and erosion control plan will be part of the remedial action and implemented to protect water resources from erosion and sedimentation.
Air			
Maryland Air Quality Regulations, COMAR 26.11.04 and .06	Provides ambient air quality standards, general emission standards, and restrictions for air emissions from construction activities, vents, and treatment technologies such as air strippers. Also includes nuisance and odor control.	A	The remedial action at SS-01 will include treatment of vapor captured from the subsurface, as well as potentially air emissions from the groundwater extraction and treatment system should it be used to treat groundwater or condensate.
Miscellaneous			
Maryland well construction and abandonment regulations, COMAR 26.04.04.16, .25, and .34	Provides specifications for well construction and abandonment.	A	The remedial action at SS-01 will include abandonment of existing monitoring wells and installation of new monitoring wells to assess the remedy.

Notes:

A = Applicable

ARAR = applicable or relevant and appropriate requirements

COMAR 26 = Code of Maryland Regulations, Title 26, Department of the Environment (August 2015)

RA = Relevant and Appropriate

TBC = To Be Considered

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APPENDIX C

PUBLIC COMMENT AND PUBLIC MEETING NEWSPAPER NOTICE

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The United States Air Force Requests Public Comment on the Proposed Plan for Brandywine DRMO Yard (SS-01)

The U.S. Air Force (USAF), in consultation with the U.S. Environmental Protection Agency (USEPA) and the Maryland Department of the Environment, has issued a Proposed Plan to recommend "Alternative 4 – In Situ Thermal Treatment, and Land Use Controls" as its preferred groundwater (Operable Unit [OU]-1) cleanup remedy at Environmental Restoration Program Spill Site 01 (SS-01), also referred to as the "Brandywine site," located in Brandywine, Prince George's County, Maryland. No further action is necessary for soils and sediments at the site (OU-2). You are invited to review the Proposed Plan and its supporting documents, and submit your comments on the plan during the public comment period, beginning **December 1, 2016** and ending **January 9, 2017.**

SITE DESCRIPTION: The former Brandywine Defense Reutilization and Marketing Office (DRMO) yard is an inactive facility administratively controlled by Joint Base Andrews. The site is located in Brandywine, Maryland, approximately 8 miles southeast of Joint Base Andrews. The former DRMO yard occupies approximately 8 acres, and is bound to the west and south by an active railroad track, and to the east and north by wooded areas.

Past operational activities at the DRMO yard have resulted in releases of hazardous substances, pollutants, and contaminants to the soil, sediment, surface water, and groundwater. According to USAF records, hazardous materials and wastes have not been stored at the DRMO yard since 1980. Prior to 1980, drums of waste solvents were stored at the DRMO yard, and several concrete bins located in the northeast area of the yard were used to store capacitors and transformers, some of which contained polychlorinated biphenyls (PCBs).

Based on previous investigation, the primary contaminant of concern in surface and near surface soils (OU-2) at the Brandywine site was PCB-1260. Three soil removal actions have been conducted, the last of which occurred in 2006 and 2007. During the last soil removal action, soil and sediment containing contamination along the CSX railroad and the wetlands to the west of the DRMO were removed and disposed of offsite, and the habitat restored. There are no human health and ecological risks associated with soils and sediments remaining following the 2006 to 2007 removal action. Therefore, no further action is recommended for OU-2

Groundwater contamination (OU-1) resulted in three distinct plumes of dissolved chlorinated solvents, mainly trichloroethene (TCE), tetrachloroethene (PCE), and the breakdown constituents cis-1,2-dichloroethene and vinyl chloride. Additional contaminants of concern include 1,4-dichlorobenzene, naphthalene, and 2-methylnaphthalene. A groundwater extraction and treatment system was installed in 2008 to control and treat contamination in the source area, and carbon substrate injections to treat dilute portions of the plume, were performed as part of the remedy associated with an interim Record of Decision.

Based on the risk assessment conducted at the site, there are no human health risks to current residents from contaminated groundwater or vapor intrusion. There would be an elevated human health risk for potential future residents and future commercial workers if buildings were to be constructed over the source area at the site, or if contaminated groundwater were to be used as a potable source. Groundwater contaminants do not contribute to ecological risks as the groundwater does not reach the surface at the DRMO yard.

PROPOSED PLAN: No further action is necessary for soils and sediments at the site (OU-2). The USAF has proposed Alternative 4 – In Situ Thermal Treatment and Land Use Controls as the recommended alternative for OU-1. This alternative has been proposed based on the evaluation of four remedial alternatives. The proposed alternative involves the use of an electrical resistance heating thermal treatment system to address the source area. The thermal treatment system would be installed beneath the CSX tracks, within the northwest corner of the DRMO yard, and between Cherry Tree Crossing Road and the current groundwater extraction treatment system. The thermal treatment system would heat the subsurface up to 100°C to volatilize and increase the mobility of the contaminants, and vapor recovery wells would be used to extract contaminants. Extracted vapors would be treated with vapor-phase granular activated carbon. Heating the subsurface is also anticipated to increase microbial activity which will enhance contaminant reduction.

The proposed land use controls would limit groundwater use in the area until cleanup goals are met, prevent the further spread of contamination while cleanup is being conducted, and protect residents from infrastructure associated with thermal treatment.

FOR REVIEW: The SS-01 Proposed Plan and all supporting documents are available for review at the **Prince George's County Library System, Surratts-Clinton Branch**, 9400 Piscataway Road, Clinton, Maryland (301-868-9200).

TO LEARN MORE: The USAF and USEPA invite you to attend an information session on the SS-01 Proposed Plan on **December 12, 2016, from 7:30 to 8:30 p.m. at the Brandywine Fire Department, 14201 Brandywine Road, Brandywine, Maryland.** The USAF will present and explain the Proposed Plan and will receive oral and written comments at the meeting. If you need special consideration to attend this meeting, please contact Kara-Beth Dambaugh of HydroGeoLogic, Inc. (USAF contractor) by telephone at (518) 877-0390 or by email at kdambaugh@hgl.com at least 1 week before the meeting.

TO SUBMIT COMMENTS: Written comments may be submitted by mail or e-mail to:

11th Wing Public Affairs Office
William A. Jones III Building
1500 West Perimeter Road, Room 2330
Joint Base Andrews, MD 20762

Email: **community.relations@us.af.mil**

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APPENDIX D

SUMMARY TRANSCRIPT OF THE PUBLIC MEETING FOR THE SS-01 PROPOSED REMEDIAL ACTION PLAN, DECEMBER 12, 2016

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PUBLIC MEETING AND COMMENTS

ON THE PROPOSED PLAN FOR THE

BRANDYWINE DRMO PROJECT

Monday, May 12, 2008

7:42 p.m.

Brandywine Volunteer Fire Department

14201 Brandywine Road

Brandywine, MD 20613

Reported by: Nate Riveness

Capital Reporting Company

A P P E A R A N C E S

David Connelly, Remedial Program Manager, Joint Base Andrews

Mike Rooney, Joint Base Andrews

Ken Cottrell, Program Manager, HGL

Dan Bostwick, Joint Base Andrews

Fred Kelley, Power Plant Research Program

P R O C E E D I N G S

MR. CONNELLY: If I can have your attention briefly? My name is David Connelly. I am the remedial program manager for Joint Base Andrews, which means that I'm in charge of cleaning all of the contamination that's present on the site. We also have some ancillary sites that are associated with Joint Base Andrews, one of which of course exists the Brandywine DRMO site. We also have one in Davidsonville as well.

So the reason for this meeting, and I appreciate all of your attendance here, this is proposed plan public meeting. We have a proposed final remedy for the Brandywine DRMO, and it's part of a long process of the Superfund cleanup process, and after we have completed the long interim remedy, we are proposing the final remedy to treat the remaining contamination in place.

The Air Force contracted in 2012 with a company called HGL and they've been managing the site collection since 2006, where they were doing the interim remedy as well. The interim remedy, if you're

not familiar, that was really more towards addressing the distal portions of the plume, the parts that were extended in the neighborhood.

The significant, the most significant amount of contamination actually resides deeper in the clay layer underneath the railroad tracks and the church across the road. So arguably, the most important part of the remedy is still to come. If we were to stop moving forward now, the entire plume would recreate itself over the next period of time, years into the future.

So it's very important that we get a final remedy in place, and we're looking forward to having the public input. We have proposed a thermal treatment remedy. This remedy was not really in existence when this contamination was put in place. A lot of developments have occurred and we're looking forward to installing this thermal remedy.

HGL company, I'm sorry, this is Ken Cottrell. He's the program manager for HGL, and he's contracted with the PRS (ph) to do the final remedy. So we have those experts here to help answer any

questions that we may have about the remedy. There's a number of folks here. Mike Rooney represents the -- he works for Joint Base Andrews. He's one of our contracting support.

Dan Bostwick is here as well. I recognize most, many of you at least. We have folks I see from PPRP and, you know, our regulatory partners with the Health Department and the State of Maryland, PPRP. WSSC is sitting here, Mattawoman, our neighbors, and a number of folks that I met at the Brandywine Northeast Civic Association meetings.

And for those that I haven't met, I look forward to talking with you. I'll pass it over to Mr. Ken Cottrell, and he may have a few things to say. But essentially what we have a couple of posters over here, and we're willing to answer any questions that you may have about the proposed remedy.

This commences the public comment period, and so we're -- we have I believe a 30-day public comment period for public comments to be considered about this final remedy.

MALE SPEAKER: That's from this date.

MR. CONNELLY: Does it start today?

MALE SPEAKER: December 1st.

MR. CONNELLY: December 1st.

MALE SPEAKER: And it's a little more than 30 days given the holidays. So the public comment period ends, I think it's January 7th.

FEMALE SPEAKER: 9th.

MALE SPEAKER: 9th, thanks.

MR. CONNELLY: So I apologize for the fact that it's over the holiday period, but we're working hard trying to keep this project moving and we're -- the longer we wait, the more likely there's a chance that we will not be protecting both human health and the environment, and that is the ultimate goal of this program, is to cleanup to remedial standards, drinking water standards and ground water, and ensure protection of human health and the environment. Ken, do you have anything that you'd like to say?

MR. COTTRELL: I can walk folks through the remedy a bit, if that would be helpful. There's a fact sheet on the table over there, which is sort of the Cliff notes version of what's happened here in the

past ten years, and I'm going to give you the Cliff notes version of the Cliff notes version.

So as David mentioned, the Record of Decision for the interim remedy was signed in 2006, and that remedy included a pump and treat system, as well as injections of basically a food grade material that would stimulate bacteria that would naturally degrade the contamination.

That remedy, the pump and treat system started in 2008. It did its job. It was shut down in 2013. There were three sets of injections throughout that period. To my left, there's a poster on the left-hand side which in the upper left-hand corner describes the extent of the contamination as it was in 2007, before remedy implementation.

Then the larger part of that graphic shows what that contamination looks like now. So the pump and treat system and injections were very successful in cleaning up approximately 19 acres of the plume.

MALE SPEAKER: Are we allowed to ask question as you talk or do we wait?

MR. COTTRELL: You can ask questions as I'm

talking. That would probably be helpful. This should be a dialogue.

MALE SPEAKER: That's -- those are TCE?

MR. COTTRELL: Yes sir.

MALE SPEAKER: Then there's like 12 different bad things.

MR. COTTRELL: They're all co-located. So TCE represents the largest plume area. Those treatments treat most of those contaminants that were co-located. So extent of blue on that figure is the extent of contamination that was above drinking water standards for all contaminants.

MALE SPEAKER: Now does that include --

MR. COTTRELL: That's the entire plume cloud.

MALE SPEAKER: --the Brandywine water table ground water as well as the Calvert ground water?

MR. COTTRELL: The Calvert ground water is not the drinking water source. It can't be extracted in viable quantities. So that ground water is not sampled. That's not to say we have not sampled it for the purpose of this final remedy in determining

whether this actual source of contamination is.

MALE SPEAKER: Because it's coming up, right?

MR. COTTRELL: That's correct.

MALE SPEAKER: And getting back into the --

MR. COTTRELL: That's correct. Now the Brandywine --

MALE SPEAKER: It's at my house. I live inside that.

MR. COTTRELL: Yeah. Let me explain how the contamination is just for --

MALE SPEAKER: I'm just saying it's not maybe a little misleading to say that it's that big.

MR. COTTRELL: Yeah. I can elaborate on the vertical extent of contamination. The shallow Brandywine, at one point the shallowest ground water probably was contaminated. The thickness of that water column, it's approximately I would say about 15 feet thick. At this point in time, and probably for most of the time because TCE in its pure state is heavier than water. The contamination was always kind of at the bottom of the Brandywine.

We have shallow and deep wells that we monitor in the Brandywine. The shallow wells are clean. It's the deep wells, the ground water that in immediate contact with that clay where the source is, that's the part of the water column that's contaminated.

MALE SPEAKER: Did you find the dense phase --

MR. COTTRELL: That's questionable. Some of the tests indicated yes; others indicated no. Based on concentration, there is probably a separate phase Deanapple (ph) there, but it's what they term residual and not mobile. So it's little globules, if you know, in the core spaces. But it's not this pool.

MALE SPEAKER: And does the ground water, the first contaminated layer at Brandywine **15:43, is there any of that that goes underneath people's home?

MR. COTTRELL: At the present time, no.

MALE SPEAKER: Oh, the ground water does, yes.

MR. COTTRELL: The ground water does, but there's no contamination in the ground water that

meets people's sumps.

MALE SPEAKER: Were there -- was there at some point?

MR. COTTRELL: At some point there was, and the Air Force took steps back then, measured indoor air, did some indoor air quality monitoring, monitored the ground water. The only risk of exposure, I think, since the Air Force became involved with cleaning up the contamination was the drinking water, and it's my understanding that everyone is hooked up to the municipal supply.

MALE SPEAKER: How about planting a home garden or something or gardening in the back yard?

MR. COTTRELL: That's perfectly fine.

MALE SPEAKER: During this time period it was fine?

MALE SPEAKER: I mean because I don't plan -- I live in that plume. I live very close the railroad tracks on that -- over there by that area, you know. I don't plant vegetables.

MR. COTTRELL: You can. I didn't plant vegetables this year because it's too much work. You

can plant vegetables.

FEMALE SPEAKER: So it was always safe throughout the whole thing to --

MR. COTTRELL: I can only speak for the time period that, you know, we've been involved, and that the Air Force has been doing cleanups.

FEMALE SPEAKER: So that's like from 2013?

MR. COTTRELL: Before that.

MALE SPEAKER: Mike, when was that?

MR. COTTRELL: HGL's been under contract since about 2006-07 time frame?

MR. CONNELLY: The way the EPA has the site divided, and they have two operable units and this is formalized in our federal facilities agreement. One operable unit is for soils and sediments, and the other one is ground water. So what this proposed plan is actually doing is acknowledging that through the numerous removal action processes that we've taken over the last 20 years, that we've addressed all of the risks associated with soils and sediments, and it will -- upon signature of the Record of Decision, that operable unit will be closed.

It would be determined that that area has been -- upon that signature, it will be determined that there is a UUUE is what the term is. It's Unlimited Use and Unrestricted Exposure. So we have regulatory concurrence that our removal actions have met that requirement and it really will be something that needs to be formalized in the Record of Decision. So future actions will be addressing the ground water operable unit.

MR. COTTRELL: So if I could continue with the history a little bit. So we talked about the interim remedy, and how that addressed the -- what we called the distal part of the plume. Back in 2013 when we saw that that was working, we started working towards a final remedy for the site. So we did a lot more site characterization to determine where exactly the source was, and it was at this time that we really focused and narrowed down that the source of contamination was about a ten foot wedge of clay about 30 feet down, in the area that coincides with the blue on that -- on that figure.

So the source area is in the clay beneath

the railroad tracks at Hammond Road, which of course poses its own -- its own share of challenges. Once we had that nailed down, given those challenges, we did what's called a feasibility study. A feasibility study takes the almost universe of things that you can do to cleanup a site, and narrows them down to, in this case it was four.

So there were four remedial alternatives evaluated. One of them is do nothing, because you need to evaluate what would happen if you did nothing, versus send all this money to cleanup, and do nothing alternative obviously doesn't work in almost all cases. So there were three other alternatives evaluated. The thermal, which we'll talk about a little more at length, because that's the one that's being recommended.

There were two others. One was to do injections like we did before. It worked, right. The difference here is that that type of remedy relies on contact with the contaminant. If you're in a real porous permeable medium, that contact is easy. When you're in the clay, it's not so easy, and the

technology that relies on contact in a tight clay, there's a lot of uncertainty with that.

The other two alternatives were injection-type alternatives, just injecting different materials. The other problem with that, besides that uncertainty, is that multiple injections are required, which would mean multiple incursions onto CXS property and the time and disruption and expense of those incursions.

One of the reasons why the thermal remedy is so attractive is that it doesn't rely on contact to do the cleanup. It essentially keeps the subsurface indiscriminately. So the entire area that you're wanting to treat is heated, and it's heated to a point where the contaminants even that deep will volatilize and come up to the surface.

At the surface, as part of the technology, those vapors are captured and sent for treatment and off gas to the atmosphere. That's a very simple explanation of a somewhat complex remedial technology, but that's the best I can do at this point. And that was -- that's the alternative that the Air Force is recommending in its proposed plan.

In the long term it is more cost-effective. Thermal is quick. Once the subsurface achieves the temperature it needs to achieve, it will take between 90 and 150 days and the clay will be cleaned up.

MR. CONNELLY: Which brings up the matter of question of when would this start? What else do you have go through before it's a construction phase? So what does that whole schedule look like?

MR. COTTRELL: That's an excellent question. You led me right into that, so I appreciate that. The proposed plan, we have the comment period. Once the comment period closes, we consider the public comments, and the next stage is called the Record of Decision. The Record of Decision is the actual legal document that the Air Force signs, the EPA signs and the State of Maryland has to provide concurrence with the remedy decision. The County is also a stakeholder.

That document should be signed and it goes through an intense review, as all these documents do. It goes through a legal review because it is a legal document. I think the current schedule has that for

signature in May.

MALE SPEAKER: What's the Record of Decision?

MR. COTTRELL: The Record of Decision. So once the Record of Decision is signed, the remedy can be implemented. So while not unique to this project, it is somewhat atypical. Right now you are proceeding with the design, because as Dave mentioned earlier, we want to get this remedy in place as soon as possible.

So the design is being done concurrently with the proposed plan and the Record of Decision, and the hope is that the design is finalized at the time the Record of Decision is signed, which we're forecasting for May of next year, and then construction will start very soon thereafter, late May or June.

FEMALE SPEAKER: Do you foresee any obstacles?

MR. COTTRELL: Outside of the normal obstacles that all these projects face, there -- I wouldn't call it an obstacle. But there are offsite properties that we require access to. There are non-

government home properties that we require access to to implement the remedy. We've been working very closely with CSX. The Air Force has an existing agreement with CSX and has had one for --

MALE SPEAKER: Over a decade.

MR. COTTRELL: Over a decade. So CSX, while we need access from them, that is already underway. We're far down the road with CSX.

MALE SPEAKER: Okay. So a lot of people, I'm going to guess, from the community are here because we understand there's a relationship between this site its cleanup and the proposed power plant, the Mattawoman Panda Plant, which is in the midst or adjacent to this area. There's a lot of concern about the relationship between the construction of that plant and the Superfund site.

So either you or perhaps someone else could let us know what's going with that. I understand agreement is necessary. There are some conditions within the consent, within the conditions of the -- not the **15:53, but in the certificate of public convenience.

MR. COTTRELL: The CPCF.

MALE SPEAKER: And the conditions, the associated conditions. So I understand that there may be some conflicts and some problems trying to coordinate what are two (coughing) projects, that may impact one another. So if someone could address that, I think we'd appreciate it.

MR. COTTRELL: I defer that to the Air Force, that question. I mean they are two separate projects.

MR. CONNELLY: Right. So for -- I think in this context what would probably best to address that is under the interim Record of Decision, there are land use controls, and under the final Record of Decision there will also be land use controls. Those are considered part of the remedy, similar to injections or thermal -- or one of the requirements is to ensure protection of human health and the environment is to prevent exposures, and land use controls is one of the mechanisms that we have to ensure that, between now and when the site achieves full cleanup.

So the land use controls that are in the interim ROD will be revised in the final ROD, partly due to the change in the technology and to ensure that the thermal remedy can be implemented safely and effectively. Yeah, we've been working with Mattawoman very closely for the last two and a half years, working with the Power Plant Research Program for a number of years as well, and the Air Force is committed to protection of human health and the environment and cleanup of the Brandywine DRMO site.

FEMALE SPEAKER: When is expected cleanup to be achieved, approximately?

MR. COTTRELL: So it's a little tricky to answer that, in part because there's numerous different contaminants of concern, and each one of them would need to independently achieve cleanup goals across the entirety of the site before we can say that have fully cleaned up the site.

That said, the thermal technology will very, very quickly cleanup these chlorinated solvents. Air Force is likely to be monitoring for a long time to come, to make sure these cleanup levels are being

achieved as quickly as we are designing this remedy to. However, we will be here for a long time monitoring to verify. I'll defer to Ken to have a more specific time line on achievement of some of these different COCs.

MR. CONNELLY: The chlorinated solvents should cleanup within a year. There are some other contaminants that have a much smaller footprint. That may take a little longer. There are also secondary contaminants like iron and manganese that have secondary drinking water standards for aesthetic qualities. They're not good for your pipes and what not. Those will take the longest as the ground water geochemistry comes back a more natural setting.

But iron and manganese are not chlorinated solvents and are not in and of themselves **15:57.

MALE SPEAKER: I do have a question. You said that you worked with Mattawoman. That's the people who are not currently building the plant but the ones across the street behind this firehouse. Are those the power plant or the first one?

MR. CONNELLY: The one that is currently

proposed, or actually they've begun construction.

MALE SPEAKER: Well there's two. There's one that's --

MR. COTTRELL: Yeah. That one's Keys.

MALE SPEAKER: That's Keys.

MR. COTTRELL: Yeah. The one we're talking about is right behind the fire department.

MALE SPEAKER: You're working with them, then how is it that they've planned to drill inside of that contaminated area, to put down posts for power lines. Why are they allowed to do that, propose that?

MR. CONNELLY: Well, that is something that is currently being evaluated, as to whether or not it can happen and still achieve the requirements of protection of human health in the environment.

MALE SPEAKER: So they haven't received permission to do it. It's they propose doing it, and you're working to see if that meets the --

MR. CONNELLY: That's correct.

MALE SPEAKER: So what -- if someone could explain, those points of potential, I'm going to use the word potential interference, between these two

concurrent projects, one's the cleanup and the other is the power plant. So clearly there are some concerns about the relationship of these two projects and what that -- what the public health implications are or what implications.

We have to see what remedy there may be. So I would appreciate it if someone would sort of give an outline of what the problem areas that are being worked out. What are those?

MR. CONNELLY: There are several issues with drilling in a contaminated area. So I'm just going to speak in generalities, not specifics to this project.

MALE SPEAKER: Drilling? I'm sorry.

MR. CONNELLY: Drilling. So in other words, drilling to put in the power posts, for example. Well, I do need to get specific, because the land use controls really dictate that you cannot have an activity that is inconsistent with the remedy. So as Mattawoman puts forth their plans, the Air Force and the agencies need to evaluate their project in terms of the impacts that it could have on the remedy. That evaluation is still in progress.

FEMALE SPEAKER: By whom, by you or --

MR. CONNELLY: By the Air Force.

MALE SPEAKER: I would like to recommend and I'll put these in some comments as well, that there be a public hearing and a public process on these -- the issues of the relationship between the power plants that's construction and the Superfund site and its remedy. There should be a meeting. The public needs to be informed that there are public, potential public health issues involved in this, or issues involving the Air Force and taxpayer dollars.

MALE SPEAKER: And also Title VI, the Civil Rights Act. We're looking at one more cumulative impact on the majority minority community. You don't like that, and that's a big problem here. You're going to -- well allegedly you supposedly remedied one situation, but created -- well, we've got two more coming.

What this -- this is really alarming. I mean this is one more thing we've got, and possibly in the next couple of years we're talking about adding another 10,000 homes in this area, not a mile from

here. What do we, I mean, these are the things that we worry about here.

So when we add one more cumulative effect, we prefer not to have that cumulative impact on our community. We're 45 years into this and we don't get the testing. We don't get the things that are required in terms of testing, checking medical records, seeing what's actually going on in the homes with the families here. We don't get that. All we get is you will come here and clean it up, which I appreciate. I think that's great.

But we don't get the looking at the medical records, what's going on and is cancer -- is this a cancer area, things like that that we need to know more about. So in doing that, we hope that maybe Air Force would actually come in and interview the community and try to find out a little bit more about what's going on here, in evaluating whether to drill into ground.

MR. ROONEY: One thing unfortunately, the EPA is not here tonight, but I don't know if the State or County could mention this. As I understand it,

there's a civil lawsuit that's been filed.

MALE SPEAKER: Not a lawsuit.

MR. ROONEY: Not a lawsuit?

MALE SPEAKER: No, administrative action with the state.

MR. ROONEY: Okay. So there's something filed that's being investigated by EPA with respect to the civil rights and social justice. I unfortunately don't have any information to provide in the status or updates on that.

MALE SPEAKER: No, no, no. That's not my issue. That's not what I'm saying. Are you using Title VI in dealing with this? Are you saying okay, we need to look at -- we're affecting a large minority community here, and are we taking that as an impact in what is about to happen here?

MR. ROONEY: With respect to the Air Force cleaning up the contamination?

MALE SPEAKER: The pollution. The cumulative effects. Not cleaning up. You guys are doing a great job cleaning up, and that's an about time thing. The drilling for that pond for the power

plant. That needs to be considered here. This is something that we're dealing with. It's, you know, it's -- it's epic proportions in this area. I mean we're trying to investigate now, just trying to find out what the impacts have been and even including the DRMO site. We want to see exactly what long term effects has that imposed on this area.

MR. ROONEY: Yes sir. I mean ultimately what we're trying to do tonight is provide the information with respect to the proposed plan for the cleanup. I'm definitely getting the sense that there's a lot of energy with respect to the Mattawoman energy plant, and we'll consider all of that respect to how it impacts the project and language controls and implementation of us trying to cleanup the contamination out here, and we'll definitely get everything we can documented, so that --

MALE SPEAKER: Yeah. I'm just -- yeah, you're fine. It's the -- because you're cleaning up. It's the other side of this where they're polluting again. Here we go again.

MR. ROONEY: Sure, and Fred, I don't want to

put you on the spot, but I would like to introduce Mr. Fred Kelley. He's with the Power Plant Research Program, and he's the guy we're working with to coordinate with Mattawoman Energy and everything it is they're trying to do.

So again, I don't want to put Fred on the spot, but I just want to let you guys know, we do have Fred in the room. At some point, please feel free. We do want to get concerns documented, but at the same time I do want to make the distinction that, you know, we have the cleanup and then there's the Mattawoman end.

MALE SPEAKER: Two different things.

FEMALE SPEAKER: I have two additional -- well, I don't know if y'all know about the Southern Region Aquatic Center that was in -- we're getting ready to start construction on that. Have y'all looked at whether that will affect anything?

MR. ROONEY: The only information I know about that is what we learned at attendance at the Brandywine Northeast Civic Association meeting, was it last week or the week before?

FEMALE SPEAKER: Two weeks ago, two weeks ago.

MR. ROONEY: Yeah.

FEMALE SPEAKER: That's unfortunate. The other thing is that we have a **16:05 that has contaminated and leached into the waterways. So there's -- is there any connection there to see how far or what, or if that's gotten into the site also?

MR. ROONEY: I'm not sure where that is with relation to the contamination here, but the focus of what we're trying to cleanup as a result of the contamination that is within this footprint.

MALE SPEAKER: John, I'm not sure I can say --

FEMALE SPEAKER: There's nobody that's looked into that.

MALE SPEAKER: We have done extensive sampling of soil over the decades, and so if there was some type of deposition or contamination that was positive here in our site that met cleanup requirements under CERCLA, the Comprehensive Environment Response Compensation and Liability Act,

that's the Superfund law that drives our programs. If there was unacceptable levels of contaminants in soil from type of depositional activity, we would have captured that and addressed it.

So unless you're talking about something that's happening more recently than our data, then --

FEMALE SPEAKER: Well I mean, it hasn't stopped. It hasn't stopped happening. So I mean it's still happening. I don't know whether you're testing that. But it's of concern to us in this area because of the water.

MR. CONNELLY: It wasn't a cause of the ground water contamination.

MALE SPEAKER: Could I -- let me just ask a question. So you're going to heat up the soil and all this stuff is going to evaporate. Meanwhile, I'm standing on my porch, my front yard about 150 yards from it, 200 yards, and it's going to do that for 180 days or say whatever, and I'm going to be exposed to these chemicals. You're going to put a blanket on it and somehow use carbon?

MR. CONNELLY: Exactly. That's exactly

right what's going to happen. There will be a gravel layer and plastic heater above it, and there will be perforated pipe within that area to capture all these vapors. Pressure will be applied to capture those vapors and treat them with carbon as you said.

MALE SPEAKER: Uh-huh. Now if you -- that's for all the volatile chemicals? Do they all react like this TCE because all the other ones --

MR. COTTRELL: The other ones are breakdowns of TCE. One other advantage of this technology is that you don't have a sequential breakdown. So right now, all we have in terms of TCE and its breakdown, all we have is TCE and when we essentially boil off the TCE, that's all we'll have and that's all we'll be treating.

So the other contaminants, the dichloride, the vinyl chloride, they won't even come into play. But this technology works on them as well.

MALE SPEAKER: So you'll have air quality monitoring there?

(Simultaneous speaking.)

MR. COTTRELL: Yes. We'll be testing the

vapors. The vapors will be tested. Part of that testing also tells you when you can --

MALE SPEAKER: I was under the impression there was also PCB contamination in the site.

MR. COTTRELL: The PCBs were in soil alone, not ground water, and that was fully cleaned up. EPA has agreed, as well as the State. The County stakeholder has just agreed that that's -- that's done.

MALE SPEAKER: Okay.

MALE SPEAKER: And now what's with the removal actions that are referenced?

MALE SPEAKER: Okay.

MALE SPEAKER: One more question. Well now when you're done, so I heard you say that the State was not allowed a well. I mean they used to have a well before the Superfund site.

MR. COTTRELL: There's a common --

MALE SPEAKER: I'm sorry to interrupt.

MR. COTTRELL: I just -- that's all right.

MALE SPEAKER: So will I be able to drink the water from my -- will be able to put my well back

in, in terms of just cleanliness of the water, the potability or whatever it is of the water, regardless of what the State, you know, has on that? Because I might have other uses for it.

MR. COTTRELL: I believe the County, and I think that for some of this that the County -- the County has an ordinance and most municipalities do, that if there's municipal water available you have to use it, for potable purposes.

MALE SPEAKER: One of the reasons -- but I'm just wondering, would it be clean? Let's say I never intended to actually put a well in. Would the water underneath my house, I'll call it, in my sump pump. I reach down in that, reach down there and clean it out periodically. It's always there because the water table's so high.

I thought something was wrong, but it's just the water table is within two feet of where I'm -- where my basement is.

MR. COTTRELL: I wouldn't wash my car with it. I would maybe water my garden with it. I wouldn't clean my clothes in it because of the iron

content. That's naturally there already. That's been exacerbated by some of this contamination, and I wouldn't drink it because of the iron.

MALE SPEAKER: But when I reach down into it to change, I have to -- I recently changed my sump pump, and all I could think of is what am I reaching down into? So when you're --

MR. COTTRELL: When we do risk assessment in the environmental industry, we look at more routes of exposure than just drinking. We look at touching, we look at vapors leaving. We look at a host of different exposure scenarios. So while water may not be safe to drink, you could certainly wash your car with it, you could certainly touch it, you can roll around in it.

MALE SPEAKER: And there's no reason to believe that the body of water that's right there is in fact evaporative carcinogens in my sump?

MR. COTTRELL: Since the contamination is the -- there's really no reason to believe that there's anything in the water.

MALE SPEAKER: But it's coming up.

MR. GRILLS: I would like to, just to reassure you, Rick Grills, State of Maryland. EPA is not here, but we're of the same mind and the same regulatory concerns. All of the carcinogenic and other contaminants that are not natural to the aquifer will be cleaned up to drinking water standards.

So that means, and what Ken was referring to, that he wouldn't drink the water, he's referring to it might taste bad or something like that. But all the carcinogenic and other contaminants that were in place as a result of whatever activities that took place at the DRMO historically will be gone, and they will be gone to very low levels.

MALE SPEAKER: Even in the -- even the aquifer? I mean what I'm hearing is you're going to cleanup the top one but not the bottom one. The bottom one is going to keep coming up if --

MR. GRILLS: Exactly, and that's why we have to continue monitoring. This monitoring will go on for many years, and each five years, along with reviewing the monitoring results of the ground water as they happen, we will come back and reevaluate the

effectiveness of the remedy every five years, until that five year period expires and there has been absolutely no contaminants measured in the monitoring period, during that five year period.

So really I guess what we're saying is the water quality may not be that good, but it won't be the contaminants from the site.

(Off mic comment.)

MALE SPEAKER: But it seems it's hard for me -- it's hard for me to understand how you can separate. I don't know how you model or predict when you're going to put a large structure like what's being proposed, which you're saying a separate, kind of separate issue, the **16:13 structure. Very even to the ground, and change that ground water flow.

I'm not sure how you say oh, that will be the day, and in the past that's kind of -- we're relying on others to say oh, the contractors themselves, the power plant. They'll say oh yeah, that will be fine, and we have experts to prove it. And I'll tell you, I'm looking to you guys.

MR. COTTRELL: Sure. I'm a part of that.

(Simultaneous speaking.)

MALE SPEAKER: I'm not sure. Just to say, you know, this really makes sense and not just glossed over in the interest of making a dollar, you know what I mean?

MR. ROONEY: So the land use controls require us to evaluate any proposed construction activity within the 90 acre linings control area. So the projects that Mattawoman has within those areas are addressed in the CPCN under various conditions.

So the Tier 1 team, which is comprised of the Air Force, the EPA, MDE and the County will be reviewing the data that's prepared by Mattawoman with respect to the projects within those areas, to make sure that they do not impact human health or the environment within that 90 acre linings control area.

So that information will be submitted by the Mattawoman project team to the CERCLA team, like I mentioned before, the EPA, MDE, County and the Air Force to evaluate that information as they prepare it.

MALE SPEAKER: Is there a way of monitoring the depth though? I mean is there really a way of

monitoring the deeper -- okay. I'll accept it. I just -- I'm just not sure how you --

MALE SPEAKER: Well, we're not really just going to moderate. We're going to monitor as well. So it will be -- we will be monitoring the water, the impact of whatever operation goes on there.

MALE SPEAKER: For the -- but a year from then or three years from then, when it -- when it comes up again, will you be there then too?

MR. ROONEY: Yeah. So the CERCLA project that's managing this Brandywine site is going to be here for a long time. But the project related to Mattawoman Energy, like I said, I introduced Mr. Fred Kelley. He's the person who's in charge of ensuring that the compliance with the conditions of the CPCN --

MALE SPEAKER: You know, I don't know that the CPCN, as the people that were involved, have the adequate scientific knowledge or data to make that decision of whether it's okay.

MR. COTTRELL: That's why these stakeholders are reviewing it.

MALE SPEAKER: Which is why I don't --

(Simultaneous speaking.)

MR. COTTRELL: Whether they --

MALE SPEAKER: Well but --

MALE SPEAKER: This gentleman has had a question for a long time. He's been very patient.

MALE SPEAKER: All right, sorry. I won't ask any more questions.

MALE SPEAKER: Yeah. So you're not allowed to drill a well for drinking water. It's the only reason to drill wells. You want to drop well points in to do irrigation. You want to put in a geothermal system. I can't do any of that because I'm in that area. I'm not allowed to drill at all into my backyard.

I found it ironic to see that giant pole being put in 100 yards away when I can't, you know, drop in a well for a geothermal system. So that's one of my concerns, and the concern of this community quite frankly is we've had a lot of stuff crammed down our throats, and so we're very highly skeptical of anyone who comes in here wanting to do anything. So that's some of what you're seeing here.

And so that's what concerns me, is when am I going to be allowed to put in my geothermal system? Thirty years from now?

MR. COTTRELL: Were you denied -- were you denied --

MALE SPEAKER: I haven't put it in because I've been told I can't drill. I haven't even bothered to put in for one.

MR. COTTRELL: Yeah. I mean I would suggest a formal review of that, similar to what the Air Force would do for -- and the County would do for any request like that, and send it through the channels.

MALE SPEAKER: Where do you start? I mean the contractors will tell me no, they can't do it.

MR. COTTRELL: Yeah, there's certain -- it is not an a priori prohibition, but there are certain activities that need to be evaluated.

So if you were putting a well because you were building a car wash and were going to withdraw a 100 gallons a day, with the potential to draw contamination, spread contamination from the DRMO, that would be frowned upon and not approved.

Some other type of boring in a non-contaminated area that did not have the potential to spread contamination, that could be looked on more favorably and the stakeholders will review something like that.

MALE SPEAKER: But what I need to do to make that happen?

MALE SPEAKER: I think that --

MALE SPEAKER: I would suggest that in order to do that, or a geothermal well for instance, you would need to get a construction permit with the County. Now that process would trigger our land use control review, and so it will end up on my desk shortly after it ends up on the County's desk at the County.

MALE SPEAKER: Okay, thanks.

MALE SPEAKER: So my understanding of the process is that Mattawoman is coming up with a plan to satisfy your concerns about the construction as potential interference or complications with the Superfund cleanup, such as the peephole that will go in and may have something to do with contamination?

Is that right? Then they'll be a review. You said there's a Tier 1 stakeholder review process; is that right?

MR. CONNELLY: That's correct. We're evaluating the proposed construction activities in accordance with the CPCN. It's separate from the CERCLA process, but in order to ensure land use controls are being properly implemented, and of course we're closely involved with Mattawoman in their project.

MALE SPEAKER: You had mentioned -- I think someone said that Mattawoman was giving you some proposals to deal with the land use issue, is that right?

MR. CONNELLY: That is correct.

MALE SPEAKER: Okay.

MR. CONNELLY: Mattawoman is currently trying to figure out how to design their station under the requirements that would be necessary to ensure there's no increased environmental liability on the Air Force to achieve cleanup of all of our contaminants and pollution, ultimately pollution from

the National Priority List. So that's the objective of the Air Force, and if there's construction activity within our land use control that has the potential to increase that cost to complete, then that's our concern. So that's why we're doing a very thorough evaluation of that project, to determine whether or not it's feasible or not.

MALE SPEAKER: And would the Air Force --

MR. CONNELLY: And if it is, how can we -- how can it be altered in such a manner to ensure that there's adequate protection of human health in the environment, and not an increase to environmental liability that has to be paid for by the Air Force.

MALE SPEAKER: So my point is this. My request is this. Tier 1 stakeholder, that should include the public. As you -- there are people who live within 100 yards or so of both the power plant site and this contamination. So they're affected. The most affected are the people who live on top of these two situations.

What I'm requesting here is a commitment to have the documents and the information from the power

company, from Mattawoman, to be made public and there to be a process where the public can review those documents, and secondly any response that the regulators made to those documents. The public needs to be involved in this process. It has been -- not been involved to this point, in that part of the process.

So I think you need to -- if the Air Force could make a commitment to open this up to the public in the area, which would win friends for the Air Force, which is a good thing because budgets might be cut some day and you'll need support.

MR. COTTRELL: We all need support.

MALE SPEAKER: So what's your response to that?

MR. CONNELLY: Well, I would say first that not all work within the land use control boundary would require public involvement. Some of it's very mundane. So having a universal statement that the public should always be involved in reviewing any activity in the land use control, I don't think that would be appropriate.

However, in the case that you're referencing, I completely understand, and I would suggest that we evaluate that under the requirements of the Power Plant Research Program and the CPCN and the conditions, and we'll take a look at that.

MALE SPEAKER: And David, I'm going to just say, since I work with the State of Maryland and these are my constituents, the people that I represent. I will be working to try to set up a meeting, a public meeting whereby whatever decision is made by the Air Force and Mattawoman, we will be able to understand how that was made and how it is not going to be a problem to exacerbating --

MALE SPEAKER: That's not what I meant. What I'm asking for is that the community have a place at the table in evaluating, just as -- because we have scientists in this community. So I worked for EPA for five years. I have been a technical assistance advisor on dozens of Superfund sites, and I understand the technical issues.

I've evaluated cleanup technologies at 20 sites, and we need to have representation in this

process, and what we have seen when -- well, when the DNR and the MDE and the power companies and the Public Service Commission get together and have their meetings and do their reviews, the public is told the outcome. Then we have input at the outcome. That's what you suggested. No.

MALE SPEAKER: No.

MALE SPEAKER: What I'm suggesting is a public meeting after a plan has come forth. That's how it's always done and then we're left out. No matter what we say, the decision has been made.

MR. COTTRELL: Okay. Can I -- let me interject just for a second. The Air Force has public requirements, notification requirements under CERCLA. This meeting is an opportunity for the public to put, to provide input before this remedial decision is made.

So in terms of the Air Force's responsibilities in this cleanup decision, the public by virtue of the public comment period and this meeting, can provide input before that Record of Decision, that legal document is signed and it's set

in stone.

To your question, to your other question now, I strongly urge to put in a comment, because I don't think we can resolve this sitting here at the table, because there's other parties involved outside of this room. Put it in as a comment and we'll respond to it.

MALE SPEAKER: Thank you.

MR. COTTRELL: This lady. You've been patient.

FEMALE SPEAKER: I have a couple of questions on how the thermal treatment will impact the ability for people to access the County roadway, their driveways and from a physical standpoint will it impact paved surface, people's driveways, and then everything underneath the roadways and driveways. **16:26

I'm aware this oil column isn't going to get very high temperature if the surface of the ground **16:26.

MR. COTTRELL: That's a lot. I'll try to answer some of that. I may defer to our thermal

experts that are -- that have been off the hook so far this evening. In terms of the road, the road will have to be -- lanes will have to be closed, because some of the work will be done in the road. So --

FEMALE SPEAKER: Well, how long --

MR. ROONEY: And just real quick. The area we're talking about is limited in scope and scale. So when we're talking about the thermal remedy, we're talking about this little section here. We're not talking the whole swath of Cherry Tree Crossing Road. We're talking about this area here that's still blue, where the contamination is.

MR. COTTRELL: So I think it's about 150 linear feet give or take. DOT rules say depending on the speed limit of the road and the distance to the curb, you have to have your cones and size and everything else for the distances. But the actual disruption, if you will, will be about **16:27 where they need access.

In terms of your other questions, the area will be fenced off. There's a security system which if you need more detail, QRS (ph) can give you a lot

of detail on their security system and the fact that if there's an incursion, the thermal treatment system will automatically shut down. Voltage outside of that fenced in area is limited to about five volts, so it's less than a nine volt battery, if there is any stray voltage. So your other --

FEMALE SPEAKER: Will it impact the pavement, the quality of the pavement? Is the pavement going to be replaced?

MR. COTTRELL: No. I mean the thermal -- the temperature dissipates very, very rapidly outside of the treatment area. The technology has been used under buildings, under restaurants, in various public areas without any of those **16:28.

MALE SPEAKER: A little bit of a technical question. Are you going to have diesel generators running 24-7 in the area? Are you going to take it off of the grid or what?

MR. COTTRELL: It's going to go off the grid.

MALE SPEAKER: Okay.

FEMALE SPEAKER: How about the utilities

under the ground? I think there's culverts under the roadway.

MR. COTTRELL: We are in active discussion with WSSC on those, on some of those issues, in terms of how it affects utilities. Utilities are somewhat limited in the area, but there's a water line and a small sewer line serving the --

MALE SPEAKER: VFW.

MR. COTTRELL: VFW, thank you, VFW Lodge. Those two utilities, yes.

FEMALE SPEAKER: I think there's a culvert under the -- culverts under the roadway.

MR. COTTRELL: Yeah. There's culverts for drainage. They will not be affected.

FEMALE SPEAKER: Okay. So the heat really doesn't get close to the surface. Is that what you're saying?

MR. COTTRELL: It dissipates by the time you get to the surface, right? Otherwise I mean --

FEMALE SPEAKER: So if you're ten feet --

MR. COTTRELL: If you're walking on it, you're not really going to have --

FEMALE SPEAKER: But if it's ten feet down, how hot is it five feet down?

MR. COTTRELL: Drew, Chad.

MALE SPEAKER: The temperature will basically approach the boiling point of water at that depth. So we're treating the column down to about 39 -- well, 37 feet is the targeted depth.

FEMALE SPEAKER: Okay, but boiling water, the temperature of boiling water all the way up to the surface?

MALE SPEAKER: Not all the way to the surface, and the soils that are dry that are below the saturated portion where the ground water sits, those will maybe be temperatures of 90 degrees C. So it's slightly less than boiling water, and the temperature from the water table below will increase based on the pressure provided by the water. So it will be 100 degrees C right at the surface of the water, with an increase of --

MR. ROONEY: And again, just to reiterate, because I see some looks on some faces here, of people wondering what this is, we're talking again about the

area here at the source area being heated. We're not talking about the larger area. We're talking about an acre give or take in size, in this general vicinity here, which is **16:30. It's not a very grand area. It's just that specific location.

MR. COTTRELL: If it provides a comfort level, CSF --

FEMALE SPEAKER: I'm trying to figure out whether people are going to lose their access, we're going to lose our roads.

MALE SPEAKER: Gotcha.

FEMALE SPEAKER: That's what we're thinking.

MALE SPEAKER: Okay.

MALE SPEAKER: Yeah. The surface temperature will be -- the snow will melt there first, but it's -- we're not talking temperatures that would be able to perceive **16:30.

FEMALE SPEAKER: Okay, and that's ten feet down?

MALE SPEAKER: Ten feet down. The ground water is around five feet. It varies across the site seasonally somewhat.

FEMALE SPEAKER: **16:31

MALE SPEAKER: Yes, 100 degrees C.

FEMALE SPEAKER: ** be replaced if it's defective?

MALE SPEAKER: In terms of utilities, that's what we'll work with WSSC on, and the only --

FEMALE SPEAKER: Well, the County **16:31.

MALE SPEAKER: Yeah. Any concrete pipes would be affected by the heating.

FEMALE SPEAKER: **

MALE SPEAKER: Her question is metal would melt?

MALE SPEAKER: Yeah. The metal again, as long as -- well, a metal pipe would be affected by **. We could look at accelerating erosion. It's very minor in AC, the alternating current that we apply in the field. That's all part of the evaluation as we go through the planning process.

MR. COTTRELL: So if there's any specific metal pipes in the area that you know of, that you want us to specifically answer? If you could please put a question or comment in writing and we'll

definitely follow up on the specific pipe.

FEMALE SPEAKER: Let me ask you, have you charted **16:32?

MALE SPEAKER: Yeah. We've met -- we've met **16:32.

MALE SPEAKER: Yeah.

FEMALE SPEAKER: But do you have the **16:32 that shows all these?

MALE SPEAKER: Yeah. There's about a 40 page design document in progress right now that has all these, all those ** in it. Once that's finalized, that becomes a matter of public record as well.

MALE SPEAKER: Is that area a wetlands at all, just out of curiosity?

MALE SPEAKER: Which area?

MR. CONNELLY: The area of treatment is not.

MALE SPEAKER: Okay, thanks.

MR. ROONEY: Just to expand on that though real quick, we had discussions earlier where he was curious about a number of areas where Mattawoman wants to do work, and was saying now it has a high water table, and he was wondering if that's wetland or not.

MALE SPEAKER: Right.

MR. COTTRELL: No. The area under the tracks and the road is not considered a wetland, in that northwest --

MALE SPEAKER: I was just curious **16:32.

MR. CONNELLY: There was an area for the removal for PCBs that we did ten years ago that was within wetland areas. But that's not part of this action.

MALE SPEAKER: Again, this is actually for a separate area so --

MR. COTTRELL: Okay. Beth had a question.

FEMALE SPEAKER: Hi, I'm Beth Kilbourne. I'm with the Washington Suburban Sanitary Commission and it's **16:33. We work in the development **, and so we're here representing WSSC. So we have a number of concerns that we -- I'm just going to read down a list for the record. I don't intend for you guys to answer them tonight.

So in terms of the proposed in situ thermal treatment plan, we have a number of concerns. The first are related to water quality. As you know, we

own and operate a **16:33 to our main that runs along the Cherry Tree Crossing. It is 37 years old, and we are concerned that the heat treatment will lower chlorine residuals in the water, and increase bacteria growth due to the higher temperatures.

We are concerned about corrosion within the pipes themselves, resulting in discolored water due to the stray current, and we are concerned that there may be permeation of TCE within the pipe joints, due to failure of gaskets due to temperature exposure. We also have some safety concerns. We are concerned about the increased ** due to high temperatures in the water in the main.

We are concerned about the safety of our workers in unplanned and emergency situations such as a water main break, and we are also concerned about electrical contact issues from fire hydrants, valves and other appurtenances in the main. We're also concerned about the long term effects on our infrastructure, particularly the melting of our high density polyethylene main, with a low pressure sewer that runs along the Cherry Tree Crossing and serves

the American Legion.

We're concerned about the exposure of our mains to stray current for extended periods, which may result in degradation of the cement liner, as the interior pipe grows and of course corrosion to the exterior of the pipe, which may increase the risk of failure and **16:35. We are also concerned, as I said before, about the gaskets **.

We have a concern about the location of the piles to be drilled and their horizontal relationship to our main, and which may subsequently affect the main and their stabilized backfill embedding. We have a concern that test kits have not been completed to confirm the location of our infrastructure. The plan that we have doesn't appear to have the location correct.

We have a number of other concerns which I'm not going to go into but -- because they're even more technical and beyond the scope of our meeting today. But we want to thank you for meeting with us today, and we've requested additional information and will continue to request that from you guys, to determine

whether we have additional concerns beyond what I said already, and we appreciate the attention that your team has given to our concerns, and we look forward to more discussion in the future.

MR. COTTRELL: So to your point, when you say that people get involved after the decision is made, WSSC is certainly very involved before this decision is being made, and there's a continued dialogue between the Air Force, their contractors and WSSC, to work out all these issues --

FEMALE SPEAKER: Are they part of the Tier 1?

MR. COTTRELL: Pardon me?

FEMALE SPEAKER: Are they part of the Tier 1?

MR. COTTRELL: No, they are not. But they're an important stakeholder in this.

MALE SPEAKER: Okay. So what I'm suggesting, I appreciate the level of your comments and concerns, and I think -- I think we would like to get involved at exactly that level. But we don't have the information at this point to be able to do that.

So the kind of process that I'm talking about I think would be good **16:37.

I think it would help your agency. I think it would be good for the Air Force. I think it would be good for all concerned, to make sure that the power plant and its construction would not interfere with the cleanup, would not interfere with vital structures that we've heard about, because there's a lot of stuff that's concentrated in one small area.

And it's essential that all of that not be looked at piecemeal in stovepipes, but that the stakeholders get together and are allowed to see the overlay, the interaction of the parts. Because it's the system as a whole and the structures as a whole that determines the long-term impacts, be it on your pipelines, be it on worker safety, be it on any of these issues.

I think the kind of process that I'm talking about would be helpful.

MR. COTTRELL: We try to address this **16:38 as you're suggesting. Sometimes when you're in the process, that's when issues sort of rear their

heads.

MALE SPEAKER: I totally trust it. I have no complaints about the cleanup process. I have concerns about the relationship of all these different things that come together. So I think the public needs to have a deeper involvement in this, so that we can -- we can take a look at -- because are concerned about their basements, people are concerned about the sidewalks. They're concerned about traffic.

We're going to have traffic not only from what you're doing, but from the power plant and all that construction that's going on. How does all of that -- what is all of that overlay?

MR. COTTRELL: Yes. So we're doing our best to address, you know, verbally some of your concerns. But I can only urge that get written comments in that can become part of the record.

MALE SPEAKER: And then you of course can formally respond.

MR. COTTRELL: So I just want to be mindful of the facilities. We had it until 8:30. We sort of have a little buffer, and I don't know how much we're

encroaching on that buffer at this point. But I would like to, if there's maybe three more questions if folks have any more questions, if we could maybe address those and then -- and then wrap it up.

MALE SPEAKER: Well, I don't have a question but I have suggestion that you all be very, very involved because no one's going to go to the County, no one's going to go to the Air Force. The customers who aren't there will never go to them, the WSSC with their complaints and concerns and ball them up, and not knowing what's going to go on. So please make sure they're an integral part of this process.

MR. COTTRELL: You okay? You want to -- you can give me **16:40. Okay.

FEMALE SPEAKER: ** That's not really bad. Oh, I had a question. When you say that you're going to have discussions with Mattawoman, not just about the poles but there's a good bit of dewatering that's going on along Brandywine Road and also at the power plant site. There's a lot of water issues, and are they part of the discussion?

MR. COTTRELL: That is part of the

discussion as well. Any activity within the land use control boundary that could potentially have an effect on the remedy is part of the discussion.

FEMALE SPEAKER: And the land use control boundary is 90 acres?

MR. ROONEY: Yeah. So the land use control boundary is the area that falls within the envelope of this blue line that surrounds this entire area. So any forecasted activities within there are evaluated with respect to the post-construction activities, and that's been ongoing since the land use controls were established in the 2006 Interim Record of Decision.

FEMALE SPEAKER: And after this cleanup is completed, what can you do on that property? Or what are going to be the land use controls you will manage? I mean I know you're going to continue testing for 100 years or something like that but --

MR. ROONEY: Well, the end goal is to have it cleaned up to unlimited use. So unlimited use means you can do whatever you like. But again --

FEMALE SPEAKER: Like in two years.

MR. ROONEY: In the very near term --

MR. ROONEY: No, not that soon.

FEMALE SPEAKER: I mean --

MR. COTTRELL: What I want to stress --

MR. CONNELLY: The cleanup will take much longer than two years.

MR. COTTRELL: But what I do want to stress again, as I told this gentleman earlier, each specific thing you want to do in the land use control boundary will land on the County's desk and on the Air Force's desk to be evaluated. So again, I'll go back to the car wash example.

If you're going to build a car wash and withdraw hundreds of gallons of water, maybe even that might be okay in two years. That probably won't **16:43. But other activities will be. But it's really a case by case scenario that's being evaluated. I can't give a more detailed answer than that, but that's the right answer.

MR. CONNELLY: I will say that when that land use control boundary was crafted back in the 2006 time frame, it was considered more residential extraction scenarios that were typical in this area.

So even though the main Mattawoman power plant is outside of that boundary, when the Air Force learned of their intentions, their dewatering and the volume of water that was intended to be extracted, we got involved, even though it was outside of the land use control boundary.

We hadn't really conceived of that amount of extraction. So we have been involved with that for quite some time, and that was a consideration that the PPRP considered under CPCN, and their Condition C-13 was specific to that dewatering.

MR. COTTRELL: Are there any more questions folks?

FEMALE SPEAKER: I just want to mention notification. I'm representing the Greater Bay Aquasco Citizens Association, and we weren't notified at all. I think there's more than one civic association in this area, and we'd like to have a better notification for meetings. I mean I imagine if we submit something, we'll be notified. But it's not always --

MR. COTTRELL: Right. If you could submit,

if we don't have it already on our mailing list, if you could submit your information, we'll be **16:44 for all future fact sheets and meetings.

FEMALE SPEAKER: If we submit it to this process, right?

MR. COTTRELL: Yes **.

MR. CONNELLY: Yeah we -- Air Force has surveyed the community a number of different times over the past few decades, to determine the level of community interest that there is. Part of that is to evaluate whether or not our resident, I'm sorry, remedial advisory board is something that the community has an interest in, or RAB.

To date, there hasn't been enough sustained interest in the RAB. What we've done --

FEMALE SPEAKER: That you know of. Don't say that --

MR. CONNELLY: Correct, that we're aware of. But what we've been doing over the past decade or so is meeting with Brandywine Northeast Civic Association.

FEMALE SPEAKER: That's very annoying as we

live in Brandywine. I will just say that I've been doing this community work for 14 years. I have asked y'all since May to contact me, and there's been no contact whatsoever, as again as far -- as late as two months ago, and there's been no contact.

That is inefficient. That is not sufficient for this community, and there should have been a board set up.

MR. CONNELLY: Yeah. So I'm actually --

FEMALE SPEAKER: And then I would just say that anything past Indianhead Road is cruel. It's not Brandywine. We share a zip code, and that is unfair to the Brandywine community.

MR. CONNELLY: And what I would suggest is that there seems to be a significant amount of community interest, and it has been sustained for some time. I think it's worth reevaluating whether we should formalize a RAB. There's a significant amount of requirements that community members need to be able to sustain, to maintain a RAB.

It's not an occasional meeting once in a while. It actually is a lot of work. But if there is

an interest, we're absolutely for it and there's funding available from the Department of Defense, to be able to support that.

MALE SPEAKER: Can you explain that acronym RAB?

MR. CONNELLY: RAB. That's --

MALE SPEAKER: Restoration Advisory Board.

MR. CONNELLY: Restoration Advisory Board.

MR. ROONEY: And we would gladly share additional information with the details of what it involves to do that.

MR. CONNELLY: Of course.

MALE SPEAKER: Another question. I don't know if it's appropriate, just a question about the DRMO site itself. Are there hazards there that I might have to worry about if **16:47 decided to break in or something, I mean surface hazards on the site?

MR. CONNELLY: Not anymore. So there would have been PCBs in the surface soil, but those have all been excavated and disposed of safely in the landfill.

MALE SPEAKER: So we won't encourage our youth to do that, to make some kind of **16:47.

MR. CONNELLY: Right. So yeah, you would find as a -- in the original building, there was a fire suppression system, and that is the only building still standing. So if you go in there there's -- I think there some traffic cones and stuff like that, maybe a snake, yeah. So that's about all you'd find out there.

MALE SPEAKER: Okay, thank you.

MR. CONNELLY: There's a -- the loading dock from the old warehouse is still there, that **16:47 triangle. Other than that, you're not really going to find much besides ticks and leaves.

MR. COTTRELL: A lot of ticks. A lot of ticks in there. I wouldn't encourage it.

MR. CONNELLY: So the guidance for a RAB states that there should be sustained community interest of 50 or more members of the community. So if there is that, we can certainly set up a RAB. But we can also create an exemption for that particular rule if there's strong interest but it's 50. So you know, contact me and we can do a further survey.

MR. COTTRELL: So just in closing, again,

you know, this is part of the -- this is part of the process. Please provide written comments, so that the Air Force can formally respond, and we appreciate all your attention Dave, all that you --

MR. CONNELLY: Kind of closing remarks. Okay, sure. Again, I thank you all for coming out and your interest and attendance tonight. We look forward to receiving your comments on the proposed plan, and addressing them properly and documenting that in the responsiveness summary of the Record of Decision. I look forward to cleaning up Brandywine DRMO site, and achieving unlimited use and unrestricted exposure, protection of human health and the environment. With your support, we'll get there soon.

MALE SPEAKER: Do comments go to you?

MR. CONNELLY: Yes, they'll all come to you. They'll go to Public Affairs at the Air Force, but they'll all end up -- they'll all end up with me and **16:49.

MALE SPEAKER: The address?

MR. CONNELLY: Yes. The address for Public Affairs is on there, and it's in the proposed plan as

well. So if you inadvertently send a comment to me, that's fine. I request that you route it through the Public Affairs Office.

MALE SPEAKER: What's the easiest way to get your hands on the proposed plan?

MR. ROONEY: I'd just encourage everybody to sign in. There's a fact sheet here with all the information of how to get the proposed plan, in addition to the point of contact information for the EPA, MDE, Air Force and the County. If you haven't picked one up, you're welcome to one. They're all over here.

MR. CONNELLY: But in short, the proposed plan is available in the library, at the Prince George's County Library System at the Surratts branch, and electronically online as well.

(Whereupon, at 8:58 p.m., the meeting was concluded.)

CERTIFICATE OF NOTARY PUBLIC

I, Nate Riveness, the officer before whom the foregoing proceeding was taken, do hereby certify that the proceedings were recorded by me and thereafter reduced to typewriting under my direction; that said proceedings are a true and accurate record to the best of my knowledge, skills, and ability; that I am neither counsel for, related to, nor employed by any of the parties to the action in which this was taken; and, further, that I am not a relative or employee of any counsel or attorney employed by the parties hereto, nor financially or otherwise interested in the outcome of this action.

NATE RIVENESS
Notary Public in and for the
State of Maryland

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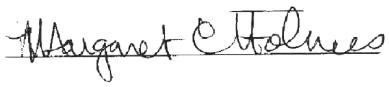
I, Margaret Caraway Holmes, do hereby certify that this transcript was prepared from audio to the best of my ability.

I am neither counsel for, related to, nor employed by any of the parties to this action, nor financially or otherwise interested in the outcome of this action.



December 22, 2016 Margaret Caraway Holmes

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