DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON
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FORT GEORGE G. MEADE, MARYLAND 20755-5000

REPLY TO ATTENTION OF:

October 16, 2013

Environmental Division

Ms. Elisabeth Green
Federal Facilities Division
Maryland Department of the Environment
1800 Washington Boulevard, Suite 625
Baltimore, Maryland 21230

Dear Ms. Green:

Enclosed please find the September 2013 *Final* (signed) *Decision Document, Phoenix Military Reservation* for your records. The Maryland Department of the Environment approved the Final *Decision Document* on September 25, 2013. Copies of the document have been furnished to John Burchette (U.S. Environmental Protection Agency), Mick Butler (Fort George G. Meade), Francis Coulters (U.S. Army Environmental Command), and Kevin Koepenick (Baltimore County).

If you have any questions, please feel free to contact Ms. Denise Tegtmeyer at (301) 677-9559 or me at (301) 677-9365.

Sincerely,

Paul V. Fluck, PG, REP
Program Manager, Installation Restoration Program
Directorate of Public Works-Environmental Division

Enclosure

ARCADIS

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Final Decision Document

Phoenix Military Reservation, Jacksonville, Maryland

September 2013

DECISION DOCUMENT FOR THE PHOENIX MILITARY RESERVATION

JACKSONVILLE
MARYLAND

September 2013

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	microgram per liter
Army	U.S. Army
ARAR	Applicable or Relevant and Appropriate Requirement
ARCADIS	ARCADIS U.S., Inc.
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (1980)
COC	Contaminant of Concern
COPC	Constituent of Potential Concern
COPEC	Constituent of Potential Ecological Concern
DERP	Defense Environmental Restoration Program
DD	Decision Document
EC	Engineering Control
ESE	Environmental Science and Engineering, Inc.
FCA	Fire Control Area
FFA	Federal Facility Agreement
FFS	Focused Feasibility Study
FGGM	Fort George G. Meade
ft	feet
HHRA	Human Health Risk Assessment
HI	Hazard Index
IC	Institutional Control
LCA	Launch Control Area
LUC	Land Use Control
LUCIP	Land Use Control Implementation Plan
MCL	Maximum Contaminant Level
MD	Maryland
MDARNG	Maryland Army National Guard
MDE	Maryland Department of the Environment
MNA	Monitored Natural Attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PMR	Phoenix Military Range

LIST OF ACRONYMS AND ABBREVIATIONS

PP	Proposed Plan
RA	Remedial Action
RAO	Remedial Action Objective
RI	Remedial Investigation
ROI	Radius of Influence
RSL	Regional Screening Level
SARA	Superfund Amendments and Reauthorization Act (1986)
SCL	Site Cleanup Level
SLERA	Screening Level Ecological Risk Assessment
TCE	Trichloroethene
TPHC	Total Petroleum Hydrocarbon
U. S.	United States
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 PART 1: DECLARATION

1.1 SITE NAME AND LOCATION

Phoenix Military Reservation (PMR) is a sub-installation of Fort George G. Meade (FGGM). The PMR Fire Control Area (FCA) ("the Site") is located approximately one-half mile west of Jacksonville, Maryland, in northeastern Baltimore County (**Figure 1-1**). The PMR formerly consisted of two parcels of land: the FCA and the Launch Control Area (LCA). The FCA and LCA each occupy approximately 17 acres of land and are approximately one-half mile apart. They occupy two adjacent hilltops separated by a valley through which the Greene Branch flows (Environmental Science and Engineering, Inc. [ESE], 1983). The area surrounding these facilities is rural and residential. The LCA was divested by the Army prior to this investigation and is no longer considered to be part of the PMR.

The PMR was originally developed in 1954 as a Nike Ajax missile site. In 1958, the Site was modified to use the Nike Hercules missiles. Active-duty Army personnel under the command of the Army Air Defense Command manned the Site until 1962, when the Maryland Army National Guard (MDARNG) assumed command. In 1966, the Nike missile program was terminated, and the Site remained relatively inactive until 1974 (ESE, 1983). In 1974, the Army granted the MDARNG a five-year lease of the FCA and its improvements. The MDARNG used the facility as a year-round training ground for its Military Police Company. In 1979, the MDARNG requested and was granted a five-year extension. The MDARNG ceased active operations in 1982, with the buildings being demolished shortly thereafter; the Site has been unoccupied since that time. Historical photographs indicate that the area was farmed prior to the installation of the FCA and more recently maintained as lawn to facilitate site access and visibility. Since the cessation of Army activities on the Site, lawn maintenance has been suspended over most of the Site. Adjacent landowners maintain their properties as extensive lawn areas and pastureland for horses. The area is no longer being commercially farmed (ARCADIS U.S., Inc. [ARCADIS], 2013a). The PMR is currently vacant and surrounded by a fence. This Decision Document (DD) addresses environmental impacts at PMR including groundwater contamination resulting from historical property use.

1.2 STATEMENT OF BASIS AND PURPOSE

This DD for PMR presents the selected Remedial Action (RA). PMR is not on the National Priorities List (NPL). There is no Federal Facility Agreement (FFA) and, so the Maryland Department of the Environment (MDE) is the lead regulatory agency. However, in accordance with the Defense Environmental Restoration Program (DERP), Executive Order 12580, and Army policy, the RA is selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent possible, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The information supporting the selection of the RA is contained in the Administrative Record file. This DD is issued jointly by the United States (U.S.) Army (Army) and the MDE. The U.S. Environmental Protection Agency (USEPA) has reviewed the proposed remedy and concurs with the selected RA.

1.3 ASSESSMENT OF THE SITE

The RA selected in this DD is necessary to protect public health and welfare and the environment from potential risks under future land use scenarios associated with groundwater contamination at PMR.

1.4 DESCRIPTION OF THE SELECTED RESPONSE ACTION – DIRECTED GROUNDWATER RECIRCULATION, MONITORED NATURAL ATTENUATION, AND LAND USE CONTROLS

Based on previous investigations, groundwater contamination exists at PMR presenting potential risks under future land use scenarios. The selected RA for PMR incorporates the following components:

- Directed groundwater recirculation
- Monitored natural attenuation (MNA)
- Land use controls (LUCs)

The selected RA will actively treat contaminated groundwater, thereby reducing the potential unacceptable risks to human health and the environment under future land use scenarios. In addition to the active remedial components of the selected RA, natural attenuation processes, that have been effectively reducing concentrations of constituents of concern (COCs) since the 1980s, will continue to be monitored to ensure that plume migration is stabilized in the long-term and concentrations of COCs in groundwater continue to decrease. Further, existing LUCs at the PMR will be maintained and enhanced if necessary and include a restriction on groundwater use at PMR to prevent uncontrolled exposure to groundwater until it meets the groundwater protection standard and is returned to its beneficial use.

The selected RA was chosen based on the protection of human health and the environment by effectively addressing the potential risks posed by groundwater contamination at PMR under future land use scenarios. In addition, the selected RA is implementable and cost-effective, while satisfying the remaining selection criteria found in the NCP.

1.5 STATUTORY DETERMINATIONS

The selected RA complies with the chemical-specific and action-specific applicable or relevant and appropriate requirements (ARARs) presented in **Tables 1-1** and **1-2**, respectively. Statutory reviews will be conducted every five years after RA initiation, in accordance with the NCP. Five-year reviews will ensure that the selected RA continues to be protective of human health and the environment consistent with the approved RA.

Based on the results of the Human Health Risk Assessment (HHRA), completed as part of the Remedial Investigation (RI) and in accordance with the NCP (40 CFR 300.430(d)(4)), potential unacceptable risk to future hypothetical onsite residents exists at PMR due to the presence of contaminants in the groundwater. The selected RA was chosen to mitigate these risks. The selected RA was chosen over the other remedial alternatives considered, which included:

- No Action
- MNA and LUCs
- In-Situ Chemical Oxidation

The selection of the RA was made after considering the threshold, balancing, and modifying criteria, including, overall protection of human health and the environment; compliance with ARARs; reduction of toxicity, mobility, or volume through treatment; long- and short-term effectiveness; implementability; cost; and regulatory and community acceptance (40 CFR 300.430(e)(9)(iii)(A)-(I)).

1.6 DECISION DOCUMENT DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary (Section 2) of this DD. This decision is based on information located in the Administrative Record file for the PMR.

- COCs and their respective concentrations (Section 2.5).
- Baseline risk represented by the COCs. The HHRA identified potential risks under future land use scenarios (Sections 2.7 and 2.8).
- Site Cleanup Levels (SCLs) established for COCs and Remedial Action Objectives (RAOs) for groundwater contamination (Sections 2.8 and 2.9).
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessments and DD (Sections 2.6 and 2.7).
- How source materials constituting principal threats will be addressed (Section 2.12).
- Expected outcome as a result of the selected RA; 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 2.10, Section 2.13.3 and **Table 2-2**).

Key factors that lead to selecting the remedy (i.e., a description of how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, with emphasis on the criteria key to the decision) (Section 2.13.1).

1.7 AUTHORIZING SIGNATURES AND SUPPORT AGENCY ACCEPTANCE OF REMEDY

Brian P. Foley
Colonel, Signal Corps, Commanding

10/2/13
Date

2.0 PART 2: DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

This DD describes the selected RA at the PMR, a sub-installation to FGGM, located approximately one-half mile west of Jacksonville, Maryland, in northeastern Baltimore County. PMR is not on the NPL; however, the Army is the lead agency for CERCLA actions at the Site while the MDE is the lead regulatory agency, per Executive Order 12580 and the DERP.

The PMR is currently a vacant lot surrounded by a fence. All permanent structures have been demolished and removed. This DD addresses environmental impacts at the Site including groundwater contamination resulting from historical on-site activities. The selected RA will be funded by the Army.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Phoenix Military Reservation Background

PMR is a sub-installation to FGGM, located approximately one-half mile west of Jacksonville, Maryland, in northeastern Baltimore County (**Figure 1-1**). As described in Section 1.1, the PMR formerly consisted of two parcels of land: the FCA and LCA. The LCA was divested by the Army prior to this investigation and is no longer considered to be part of the PMR; the LCA is covered under the Formerly Used Defense Sites program. In 1974, the Army granted the MDARNG a five-year lease of the FCA and its improvements. The MDARNG used the facility as a year-round training ground for its Military Police Company. In 1979, the MDARNG requested and was granted a five-year extension. The MDARNG ceased active operations in 1982, with the buildings being demolished shortly thereafter; the Site has been unoccupied since that time. Historical photographs indicate that the area was farmed prior to the installation of the FCA and more recently maintained as lawn to facilitate site access and visibility. Since the cessation of Army activities on the Site, lawn maintenance has been suspended over most of the Site. Adjacent landowners maintain their properties as extensive lawn areas and pastureland for horses. The area is no longer being commercially farmed (ARCADIS, 2013a).

A summary of the historical investigations and remedial actions conducted at the Site and a summary of past activities, including the implementation of the 1999 groundwater sampling and analysis, are presented in the RI/ Focused Feasibility Study (FFS) Report (Malcolm Pirnie/Berger, 1999). To address data gaps identified within the RI/FFS, five additional phases of investigations were conducted between 2003 and 2012. These investigations include the following:

- Phase I – Investigated on-site source areas to determine constituent concentrations in the groundwater between the Site and the Greene Branch.
- Phase II – Delineated the identified dissolved phase trichloroethene (TCE) plume and total petroleum hydrocarbon (TPHC) groundwater plume and assessed impacts to discharge points (surface water or springs).
- Phase III – Conducted additional surface water sampling to document contaminant concentrations at plume discharge points.
- Supplemental RI – Initiated to further characterize volatile organic compound (VOC) contamination at PMR and address concerns that PMR constituents have migrated off-site and affected residential wells located southwest (Mollie Court) and east (Sunnybrook Road) of the Site.
- Groundwater Sampling – Completed in December 2012 to further evaluate attenuation mechanisms for constituents in on-site groundwater.

A summary of each of these investigations, as well as associated findings, are provided in the Final RI Report (ARCADIS, 2012) and Final FFS (ARCADIS, 2013a).

2.2.2 Enforcement Activities

No formal enforcement activities or actions have been taken by the regulatory agencies at this site.

2.3 COMMUNITY PARTICIPATION

A Final Proposed Plan (PP) (ARCADIS, 2013b) for PMR was completed and released to the public on August 15, 2013, at the information repositories listed below:

Fort George G. Meade Environmental Division Office
4215 Roberts Avenue, Room 320
Fort Meade, MD 20755

Cockeysville Branch Library
9833 Greenside Drive
Cockeysville, MD 21030

A newspaper notification was published to inform the public and comply with public notification requirements of the NCP (40 CFR 300.430(f)(3)) of the start of the PP comment period, to solicit comments from the public, and to announce the public meeting. The notification ran in the North County News on August 15, 2013, and in SoundOff on August 22, 2013. A copy of the certificate of publication is provided in **Appendix A**. Additional information, including a fact sheet, was published on the Fort Meade Environmental Management System website (www.ftmeade.army.mil/environment). A public meeting was held on August 29, 2013, to inform the public about the selected RA for PMR and to seek public comments. At this meeting, representatives from the Army and MDE were present to answer questions about the Site and remedial alternatives under consideration. A public comment period was held from August 15, 2013 to September 13, 2013, during which written comments from the public were received. Public comments and prepared responses are presented in Section 3.0 of this DD.

2.4 SCOPE AND ROLE OF RESPONSE ACTION

This RA represents the final selected remedy for PMR. The Site is one of many sites under FGGM jurisdiction that are in the CERCLA process, however FGGM proper is on the NPL and remediation activities are coordinated through an FFA with the USEPA.

Based on historical investigations, unacceptable risks were identified under future land use scenarios due to exposure to TCE in groundwater at the Site. These risks must be eliminated or controlled.

This DD provides a summary of the remedial alternatives considered for groundwater at the Site and selects Remedial Alternative 4 – Directed Groundwater Recirculation, MNA, and LUCs.

2.5 SITE CHARACTERISTICS

The Conceptual Site Model for the PMR is presented on **Figure 2-1**.

The Site is located within a residential area that is characterized by single family homes situated on lots that are greater than one acre in size. The Site and the majority of the surrounding area include mature mixed hardwood forests with isolated open lawns and fields. To the east, there is a large contiguous wooded area composed of mature mixed hardwoods. Areas of steep slope adjacent to the Site are wooded with mature hardwoods and understory. There are no records from the United States Fish and Wildlife Service or Baltimore County indicating any threatened or endangered species in this area.

There are no surface water bodies on the PMR site. Surface runoff from the site and groundwater beneath the site are mainly interpreted to flow into the Greene Branch, which is a swift-flowing erosional stream located about 1,400 feet to the north of the Site. The Greene Branch flows 2.5 miles from the Site to the 22,000-acre Loch Raven Reservoir. However, at the southernmost portion of the Site, surface runoff and underlying groundwater are interpreted to flow south toward an unnamed tributary of Overshot Run. In addition to the main water bodies, there are two intermittent streams to the north of the PMR and one to the south. These streams feed into the Greene Branch and Overshot Run, respectively (ARCADIS, 2013a). The ground elevation at PMR generally ranges between 540 and 587 feet above mean sea level, and the surface slopes to the north toward the Greene Branch (ARCADIS, 2013a).

Nature and Extent of Contamination

As discussed above, in addition to investigations detailed in the 1999 RI/FFS Report, five additional phases of investigation have since been completed at the Site. Results from these most recent investigations indicate TCE as the COC at the PMR. Investigations identified a former septic system (including a tank, three leaching wells, and a leaching trench) as the likely source of TCE contamination (ARCADIS, 2013a). After being discharged into the septic system, the TCE likely migrated into both the septic wells and the leaching trench. From these points, the TCE likely migrated through the soil column to the water table via gravity drainage and precipitation infiltration. The concentrations were low enough that the TCE was dissolved and moved with the flow of groundwater as opposed to being pure dense non-aqueous phase liquid. As the contaminants encountered the groundwater, they were dispersed both horizontally and vertically due to local variances in the hydraulic gradient (ARCADIS, 2013a). During the historical investigations, a TPHC groundwater plume was identified at the Site. Based on groundwater sampling conducted during these investigations, TPHC is no longer present at the Site and is, therefore, not discussed further in this report.

The nature and extent of contamination in soil, groundwater, air, surface water, and sediment were investigated during the RI. Assessments of each of these media are provided below.

Extent of Contamination in Soil

Soil sampling has been conducted at the Site in an attempt to identify additional sources of the dissolved phase TCE plume. The on-site Phase I activities included a membrane interface probe investigation and the collection of soil samples from borings. The soil borings and samples advanced at these and other locations did not show any evidence of soil contamination. As outlined in the 1999 RI/FFS Report (Malcolm Pirnie/Berger, 1999), it appears likely that the TCE source contaminants dissolved and migrated directly down to the water table from the septic system.

Extent of Contamination in Groundwater

The various groundwater investigations at PMR included the installation of 24 monitoring wells and multiple comprehensive rounds of groundwater sampling, with the most recent comprehensive groundwater sampling completed in 2011 and a supplemental sampling event (five monitoring wells) completed in 2012.

Of the 13 shallow wells sampled in 2011, no groundwater samples exhibited TCE concentrations above the maximum contaminant level (MCL) of 5 micrograms per liter (µg/L). For the deep portion of the aquifer, three of 11 remaining wells sampled in 2011 exhibited concentrations of TCE above its. TCE was detected at monitoring wells FCA-1, FCA-3, and FCA-7 at concentrations of 250 µg/L, 25 µg/L, and 7.4 µg/L, respectively.

Additional groundwater sampling was completed in December 2012 in order to supplement the 2011 sampling data. In 2012, TCE concentrations were lower in all five groundwater samples than observed during the previous event. TCE MCL exceedances were observed in samples from monitoring wells FCA-1 (200 µg/L), FCA-3 (24 µg/L), and FCA-7 (7.1 µg/L). TCE concentrations in samples from FCA-5 (3.8 µg/L) and FCA-9 (0.64 µg/L) were below the MCL.

Shallow Groundwater Delineation

Upon review of the groundwater data collected during the 2011 and 2012 sampling events, contaminants in the shallow portions of the aquifer are at levels below regulatory criteria. Based on this finding and the sampling results of other nearby shallow monitoring wells, the shallow dissolved phase TCE plume is considered to be delineated.

Deep Groundwater Delineation

Upon review of the groundwater data collected during the 2011 and 2012 sampling events, the deep dissolved phase TCE plume has been delineated. No chlorinated compounds were detected above MCLs in samples from the Mollie Court off-site residential wells sampled in May 2011.

Extent of Contamination in Surface Water and Sediment

Analysis of the surface water samples identified only one sample location (SW-6) where analytes were detected (benzo[a]anthracene and chrysene); however, neither of these contaminants has been observed in nearby or on-site monitoring wells. These compounds were detected at relatively low concentrations, and are often associated with road construction materials; furthermore, there are no applicable USEPA comparison criteria for them. Therefore, these occurrences do not appear to be related to the PMR.

Although some VOCs and semi-volatile organic compounds were detected in RI sediment samples, none of those compounds were detected on-site (recently or historically) and are believed to be attributable to off-site sources, including paving operations (e.g., driveway in the vicinity of SED-4) and roadway runoff.

Additional surface water sampling was conducted along the topographic lineament feature that traverses from south to north immediately east-northeast of the Site, effectively between the existing groundwater monitoring wells FCA-13 and FCA-17 (where TCE had previously been observed) and the residential private wells to the east-northeast. No COCs were detected above MCLs.

2.6 CURRENT AND POTENTIAL FUTURE LAND USE

The PMR is currently vacant and surrounded by a fence. All structures have been demolished and removed. Currently groundwater is not used onsite. Residential dwellings are located directly adjacent to PMR to the north, south, east and west and multiple homes to the south/southwest and east are on potable wells. Continued use of the potable wells at these residential dwellings is anticipated for the foreseeable future. It should be noted that residential dwellings to the south along Sunnybrook Road and to the northwest of PMR are on a community water supply system not potable wells. The future use of the property at this point is undetermined. Transfer of the property is not anticipated, however, under the selected Alternative, LUCs include a groundwater use restriction at PMR to prevent uncontrolled exposure to groundwater until it meets the groundwater protection standard and is returned to its beneficial use

2.7 SUMMARY OF SITE RISKS

As presented in the RI Report (ARCADIS, 2012), baseline risk assessments were conducted to determine the current and future effects of contaminants on human health and the environment.

The baseline risk assessments estimate the level of risk the Site poses to human health and the environment if no action were taken to address contamination. As part of the baseline risk assessment, an HHRA was performed to identify constituents of potential concern (COPCs) at or from the Site to be evaluated as part of a hazard evaluation. Because there is no current use of PMR, there were no current potential exposures identified for the HHRA. Potential future exposures were evaluated for ingestion, inhalation, and direct contact to surface/subsurface soils (0 to 10 feet [ft] below ground surface [bgs]) and groundwater and for direct contact to surface water.

For the purposes of the screening evaluation, constituents were identified as COPCs when:

- Soil and sediment maximum concentrations exceeded the USEPA Regional screening levels (RSLs) for residential soil (USEPA, 2012a);
- Groundwater maximum concentrations exceeded the USEPA RSLs for ‘tap water’ which are protective of potable uses of groundwater and MCLs (USEPA, 2012b) to evaluate the potential for vapor intrusion; and
- Surface water maximum concentrations exceeded the MDE Ambient Water Quality Criteria.

Those RSLs based on non-cancer endpoints were divided by 10 to adjust from a target hazard quotient of 1 to 0.1 for identification of COPCs. If a constituent’s maximum concentration did not exceed its screening value, the constituent was excluded from the risk assessment. Details of the HHRA methodology are presented in the RI Report (ARCADIS, 2012).

A Screening-Level Ecological Risk Assessment (SLERA) was also performed as part of the baseline risk assessment to identify constituents of potential ecological concern (COPECs). For the purposes of the screening evaluation, constituents were identified as COPECs in soil, surface water, and sediment based

on the comparison of maximum detected constituent concentrations to media- and constituent-specific ecological screening values. Details of the SLERA methodology are presented in the RI Report (ARCADIS, 2012).

The risk assessments have been conducted in accordance with guidance developed by the USEPA, supplemented as necessary with related guidance developed by the MDE (the lead regulatory agency). Results of the baseline risk assessment are discussed in further detail below. The selected response action in this Decision Document is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances into the environment.

2.7.1 Summary of the Human Health Risk Assessment

Potential risks associated with exposure to chemicals in soil, groundwater, and surface water were evaluated for populations including:

- Current receptors
- Future on- and off-site construction workers
- Future on-site adult and child residents
- Future off-site adult and child residents (North of PMR)
- Future off-site adult and child residents (South of PMR)
- Future adolescent recreational users

Details of the HHRA methodology are presented in the RI Report, and results of the assessment are summarized below.

The results of the HHRA indicate that groundwater at the Site does not pose unacceptable risks to current receptors or to future on- and off-site construction workers, off-site adult and child residents (North and South of PMR), and adolescent recreational users. However, the remedial action selected in this DD is necessary to protect the public health from releases of contaminants from this site which present unacceptable risks under future land use scenarios for on-site adult and child residents.

According to the HHRA, cumulative cancer risks for hypothetical future on-site adult and child residents exposure to groundwater exceed the USEPA target risk range of $1x10^{-6}$ to $1x10^{-4}$ for health protectiveness and the cumulative non-cancer hazard indices are greater than 1, with the total incremental estimated cancer risk of $2x10^{-4}$ and a non-cancer hazard of $6x10^{1}$ indicating that adverse noncarcinogenic effects could potentially occur.

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these releases under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, an RME scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines exposure information and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a one-in-ten-thousand excess cancer risk; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a hazard index (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses at which no adverse effects are expected to occur. The key concept for a non-cancer HI is that a threshold level (measured as an HI of less than 1) exists below which non-cancer health effects are not expected.

2.7.2 Summary of the Ecological Risk Assessment

A SLERA was performed to determine the potential for adverse health effects in ecological receptors from exposure to constituents originating at the PMR. The SLERA was based on observations of the potential ecological habitat and receptor populations at the Site and on detected constituent concentrations in environmental media sampled. An ecological conceptual site model was developed to outline the potential exposure pathways between constituents in environmental media and the identified ecological receptors.

Given depth to groundwater at the PMR, it is not expected that ecological receptors would come into direct contact with constituents in groundwater. Based on the nature of contamination and the potential habitat present on and in the immediate vicinity of the PMR, the focus of the SLERA was on:

- Direct contact exposure to constituents in soil of the grass and early successional areas on the PMR, and
- Off-site exposure to constituents in surface water and sediment at the springs, the intermittent streams, and in the Greene Branch.

COPECs were initially identified in soil, surface water (on or off site), and sediment based on the comparison of maximum detected constituent concentrations to media- and constituent-specific ecological screening values. Twelve metals were initially selected as COPECs in soil. However, because concentrations of metals in soil cannot be traced to former activities at the PMR and the metals concentrations are generally comparable to published background soil concentrations, soil pathways were not evaluated further. Initially, four semi-volatile organic compounds were selected as COPECs in surface water and one VOC was selected as a COPEC in sediment in the southern intermittent stream. However, the southern intermittent stream is extremely localized, open water may only be found in a very small pool year-round, and it is not likely to sustain aquatic communities in either the small pool near the spring or in the seasonally dry channel down gradient of the spring. Therefore, surface water and sediment pathways were not evaluated further.

Based on the site characterization and data evaluation, adverse health effects in ecological receptors from exposure to site-related constituents in sampled environmental media at the PMR are unlikely. Therefore, further study or ecological evaluation is not necessary.

2.8 IDENTIFICATION OF CONSTITUENTS OF CONCERN AND SITE CLEANUP LEVELS

As part of the FFS for PMR (ARCADIS, 2013a), the contaminants detected in groundwater were screened to identify COCs. Details of the screening process are presented in the HHRA and Sections 3 and 4 of the FFS (ARCADIS, 2013a). In summary, COCs are defined as constituents that contribute to site-specific cancer risk or non-cancer hazards to human health based on the HHRA. Through the RI it has been determined that a remedial action is necessary to address risks presented by groundwater contamination at the Site under future land use scenarios.

Groundwater

COCs were established during the HHRA. No COCs were identified for groundwater under current use scenarios as there is no current groundwater use at the Site and, therefore, no health risks. There are no health risks to current off-site groundwater users. For the future hypothetical on-site resident receptor, risks above the upper end of the acceptable risk range were identified, and TCE is present at concentrations greater than its MCL on-site. The COC identified for groundwater for the future hypothetical resident receptor was TCE, which is the primary risk driver.

The risk and hazard estimates for all other receptor groups and exposure scenarios are either within or below USEPA risk management levels, including potential use of groundwater as a source of drinking water off the PMR property by current and future residents, soil exposures by future construction worker and hypothetical resident receptors, and dermal exposures by recreational users of the southern intermittent stream.

For groundwater, ARARs are USEPA MCLs. A detailed discussion of ARAR evaluation and analysis is provided in the FFS (ARCADIS, 2013a). The final ARARs are provided in **Tables 1-1** and **1-2** of this DD.

Site Cleanup Levels

SCLs for groundwater will be MCLs or non-zero MCLs in accordance with the requirements of CERCLA. Groundwater SCLs were identified only for COCs that exceeded MCLs and their breakdown products. The groundwater SCLs are as follows:

- TCE: 5 µg/L
- cis-1,2 DCE: 70 µg/L
- Vinyl Chloride: 2 µg/L

2.9 REMEDIAL ACTION OBJECTIVES

RAOs are based on human health and environmental factors, and provide the basis for the formulation and development of remedial alternatives. Such objectives are developed based on the criteria outlined in Section 300.430(e)(2) of the NCP and Section 121 of CERCLA

The RAOs for the Site have been developed in such a way that attainment of these goals will result in the protection of human health and the environment.

The RAOs for the Site are:

- Prevent human exposure to groundwater that would cause unacceptable risk over the duration of the response action.
- Achieve MCLs for the identified COCs in groundwater in a reasonable timeframe thereby restoring groundwater to its beneficial use.

2.10 DESCRIPTION OF REMEDIAL ALTERNATIVES

RAs for groundwater contamination at the Site were developed and evaluated in the FFS (ARCADIS, 2013a) based upon the results of a preliminary technology evaluation and screening. The remedial alternatives considered for groundwater remediation during the evaluation presented in the FFS included:

- No action
- MNA and LUCs
- In-Situ Chemical Oxidation, MNA, and LUCs
- Directed Groundwater Recirculation, MNA, and LUCs

The remedial alternatives are described below with their respective estimated capital costs, estimated cost for O&M activities, and an estimate of the present worth costs for each alternative.

2.10.1 Alternative 1: No Action

Estimated Capital Cost:	*$0*
Estimated O&M (cost over 30 years):	*$0*
Estimated Present Worth Cost:	*$0*

CERCLA and the NCP, 40 CFR 300.430(e)(6), require that a No Action alternative be evaluated at every site to establish a baseline for the comparison of other remedial alternatives. Under this alternative, no remedial action would take place at the PMR.

2.10.2 Alternative 2: MNA and LUCs

Estimated Capital Cost:	*$15,000*
Estimated O&M (cost over 50 years):	*$28,200*
Estimated Present Worth Cost:	*$532,000*

Alternative 2 includes MNA and LUCs. Based on the review of available data (ARCADIS, 2012), natural attenuation processes are controlling plume migration and steadily reducing COC concentrations in groundwater. Groundwater monitoring to support the MNA remedy would be performed annually to confirm the effectiveness of natural attenuation. Groundwater samples would be collected from a network of monitoring wells throughout the plume for VOCs, including parent compounds (TCE) and degradation products (cis-1,2-dichloroethene, vinyl chloride, and ethene), biogeochemical indicators, and water quality parameters.

Data indicate the location of the plume is stable and that the areal extent of the plume is decreasing. Based on the linear regression trend analysis presented in the RI Report (ARCADIS, 2012), it is estimated that natural attenuation will achieve cleanup goals within 10 years at the perimeter of the plume (wells FCA-3 and FCA-7) and within 50 years at the center of the plume (well FCA-1). Based on these trends, the monitoring network and frequency would be able to be reduced over time. These timeframes would be confirmed through ongoing groundwater monitoring.

Land Use Controls

As stated in Section 1.4, the existing LUCs already in place at the PMR, specifically institutional controls (ICs), will be maintained and enhanced and engineering controls (ECs) such as additional signage will be added. ICs are administrative measures put in place to affect human activity in order to control current and future land use. The four general categories of ICs evaluated or already in use at the PMR, and which provide layers of protection, are as follows: governmental controls, proprietary controls, enforcement and permitting, and informational devices, which assist with the management and implementation of LUCs. Most of these measures are already in place.

ECs, including signage (warning signs) describing restrictions of site use at key locations of the Site, will be installed. An existing perimeter fence surrounds the Site. Annual inspections of the Site will be performed to establish that all on-site LUCs (for example, fencing and signage) are in good condition, to confirm that the land use of the Site has not changed, and that through visual inspection that no unauthorized excavations were performed.

The five-year review process and the annual land use certifications/inspections will be used to document that the remedy remains protective. Additionally, the remedial design will specify notification requirements to the MDE should land use change occur, or be planned. The Baltimore County Department of Environmental Protection and Sustainability will also be copied on required notifications to MDE..

The specifics regarding the implementation of LUCs at the Site will be detailed in a separate document titled Land Use Control Implementation Plan (LUCIP). The LUC mechanisms identified in this DD are potentially applicable based on current or future land uses at the Site. However, actual LUC mechanisms to be implemented at the Site will be determined during the preparation of the LUCIP.

2.10.3 Alternative 3: In-Situ Chemical Oxidation, MNA, and LUCs

Estimated Capital Cost: *$181,000*
Estimated O&M (Cost over 15 years): *$133,400*
Estimated Present Worth Cost: *$859,000*

Alternative 3 consists of in-situ chemical oxidation, MNA, and LUCs. Under this alternative, two lines of three to four injection wells each would be installed to target TCE detected at concentrations greater than 100 µg/L. This area is centered at monitoring well FCA-1 (**Figure 2-2**). The impacted areas outside of the chemical oxidation treatment area would achieve SCLs through natural attenuation processes within 10 years or less. The injection wells, which are located within the general vicinity of monitoring well FCA-1, are assumed to be screened in the fractured schist bedrock from approximately 65 to 75 ft bgs. Routine injection of sodium persulfate solution would be used to chemically degrade TCE.

For evaluation purposes, the injected sodium persulfate solution is assumed to be at a 2 percent concentration. Based on a 10 ft screened interval and a radius of influence (ROI) of 15 ft, approximately 5,000 gallons is required for each of the six to eight injection wells. An injection rate of 0.6 gallons/minute/well results in a duration of 4 to 5 weeks assuming 8 hour injections/day. It is assumed that one injection event would be required per year for two years to reduce concentrations to a level to ultimately allow natural attenuation processes to achieve cleanup goals at the Site. Because of the reduced concentrations within the core of the plume, it is assumed that this remedy would require 10 to 15 years to achieve SCLs.

Data collected from monitoring wells located in the injection ROI will be used to evaluate the adequate concentration and distribution of the chemical reagent. Performance and operational data will be collected to satisfy the following criteria:

- Evaluation progress of the chemical oxidation process occurring within the reactive zone
- Trends in molar concentrations of TCE will be assessed over time in, and downgradient of, the reactive zone to evaluate system performance

It is estimated that approximately two years would be required to reduce TCE concentrations via chemical oxidation in the center of the plume to concentrations similar to those on the periphery of the plume. When TCE concentrations in the center of the plume are reduced, natural attenuation would reduce the remaining concentrations at a rate similar to the surrounding plume. This timeframe would be confirmed through ongoing groundwater monitoring, completing the transition from chemical oxidation to MNA. The estimated timeframe to achieve cleanup goals for the entire Site under this alternative is 10 to 15 years.

Land Use Controls

The same LUC components would be implemented under this Alternative as discussed above for Alternative 2.

2.10.4 Alternative 4: Directed Groundwater Recirculation, MNA, and LUCs

Estimated Capital Cost: *$170,500*
Estimated O&M (Cost over 15 years): *$73,600*
Estimated Present Worth Cost: *$837,000*

Alternative 4 consists of Directed Groundwater Recirculation, MNA, and LUCs. Under this alternative, a single extraction well would be installed approximately 30 ft to the east of monitoring well FCA-1 (**Figure 2-3**); and three wells to the southwest, south, and east will be used to re-inject the extracted water following treatment.

The Directed Groundwater Recirculation system is assumed to operate for five years under this alternative and would operate through any potential change in the future use of the property. Following system shutdown, natural attenuation would reduce remaining concentrations to achieve cleanup goals for the Site within a total time of 10 to 15 years from initiation of the remedial action.

Data collected from monitoring wells located in the ROI of the extraction well will be used to evaluate the recirculation rates and contaminant trends. Performance and operational data will be collected to satisfy the following criteria:

- Collect water level data to assess the recirculation system and ensure contraction of the groundwater plume
- Trends in molar concentrations of TCE will be assessed over time to ensure cleanup goals will be achieved in the anticipated timeframes
- Confirm that Site COCs in groundwater are not migrating off-site towards residential dwellings in the future

Land Use Controls

The same LUC components would be implemented under this Alternative as discussed above for Alternative 2.

2.11 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

The advantages and disadvantages of each of the remedial alternatives were compared using the nine CERCLA evaluation criteria established by the USEPA in Section 300.430(e)(9)(iii)(A)-(I) of the NCP. The detailed comparative analysis of all the remedial alternatives is provided in the FFS (ARCADIS, 2013a); a summary of this comparison is provided in the following text. **Table 2-1** also presents the comparative analysis of the remedial alternatives compared to the two threshold and five balancing evaluation criteria under CERCLA.

2.11.1 Threshold Criteria

2.11.1.1 Overall Protection of Human Health and the Environment

Under current land use, all alternatives provide protection to human health and the environment as there are no current unacceptable risks. However, future land use scenarios at the Site present unacceptable risks. Alternatives 2, 3, and 4 either remove or control possible future exposure to COCs in impacted groundwater. Alternative 4 provides the highest level of overall protection because of the treatment and hydraulic control aspects of the alternative as well as the shortened timeframe. Alternative 3 provides the next highest level of overall protection because of in-situ treatment and reduced timeframe aspects of the alternative. Alternative 2 ranks lower than Alternatives 3 and 4 on overall protection because it lacks active treatment, and the timeframe to achieve cleanup goals at on-site monitoring well FCA-1 is greater than the other two alternatives. It is noted that the plume has been demonstrated to be shrinking in size with declining concentrations and ultimately Alternative 2 would meet the RAOs.

2.11.1.2 Compliance with ARARs

Alternatives 2, 3, and 4 comply with chemical-specific ARARs. All alternatives except Alternative 1 control exposure to site COCs through monitoring and LUCs while action-specific ARARs would be met by Alternatives 2, 3 and 4. They would not be met by Alternative 1, No Action.

2.11.2 Balancing Criteria

2.11.2.1 Long-Term Effectiveness and Permanence

Under Alternative 1, no monitoring would be conducted to assess COC declines. Alternatives 2, 3, and 4 are all effective and permanent in the long-term because they would reduce future risk to human health by controlling or removing pathways of exposure to COCs in groundwater. All alternatives except Alternative 1 use LUCs to restrict land use and remove potential future pathways of exposure. Alternative 3 includes in-situ treatment to more quickly achieve cleanup goals as compared to Alternative 2. Alternative 4 includes Directed Groundwater Recirculation to achieve cleanup goals in a timeframe similar

to Alternative 3, but also provides certainty through hydraulic control and maintains the natural subsurface geochemistry.

Of these four alternatives, Alternative 4 would be most effective and permanent in the long-term because it achieves cleanup goals in a reduced timeframe, maintains hydraulic control, and does not alter subsurface geochemistry. Alternative 3 is the next most effective and permanent alternative because it achieves the cleanup goals in a reduced timeframe. Alternative 2 ranks lower on this criterion because the timeframe to reach permanence and demonstrate effectiveness for monitoring well FCA-1 is longer than Alternatives 3 and 4. However, the plume has been demonstrated to be shrinking, and all wells besides monitoring well FCA-1 are expected to achieve cleanup goals in less than 10 years. Alternative 1 ranks lowest on this criterion.

2.11.2.2 Reduction of Toxicity, Mobility, and Volume through Treatment

Alternatives 1 and 2 would not reduce the toxicity, mobility, and volume of COCs through treatment of impacted groundwater at the Site other than through natural attenuation processes. Alternatives 3 and 4 would reduce the toxicity, mobility, and volume of COCs through treatment. Additionally, Alternative 4 provides hydraulic control to the core of the shrinking plume to further reduce mobility of COCs. Therefore, Alternative 4 ranks highest on this criterion.

2.11.2.3 Short-Term Effectiveness

Alternative 1 is considered effective in the short-term as there are no risks to human health under the current land use. However, Alternative 1 is ineffective overall because there is no action taken to address risk to human health under future land use scenarios. Alternative 2 is the most effective of the remaining alternatives for this criterion because the remedial components are already installed, so there would be almost no risk to the community and site workers. Alternatives 3 and 4 include additional risk in the short term because of the installation of wells and the construction of the remediation systems; however, these additional risks can be controlled and mitigated.

2.11.2.4 Implementability

Alternative 1 is not administratively feasible due to lack of monitoring to ensure protection of human health and the environment. Alternative 2 is the most readily implementable (technically and administratively) because the monitoring network is already in place and has proven effective. Alternatives 3 and 4 would require additional permitting for well installation, reagent injections, recirculation/reinjection of treated groundwater, and additional monitoring to ensure secondary water quality impacts. There is additional uncertainty to Alternative 3 and 4 as compared to Alternative 2 as to the performance of chemical oxidation and Directed Groundwater Recirculation with the Site geology.

2.11.2.5 Cost

Based on the present worth estimates of probable costs for the action alternatives, Alternative 2 has the lowest projected present worth cost ($532,000). Alternative 4 ($837,000) and Alternative 3 ($859,000) are the next most costly, respectively. Although there is no cost associated with Alternative 1, it does not adequately protect human health and the environment and does not comply with ARARs.

2.11.3 Modifying Criteria

2.11.3.1 State/Support Agency Acceptance

The MDE does not concur with Remedial Alternatives 1 through 3 as presented, but does concur with Remedial Alternative 4 because it fulfills the nine threshold criteria to the greatest degree.

2.11.3.2 Community Acceptance

Community acceptance is addressed in the Responsiveness Summary (Section 3) of this DD.

2.12 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable (NCP 300.430(a)(1)(iii)(A)). Identifying principal threat wastes combines concepts of both hazard and risk. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be contained in a reliable manner or

would present a significant risk to human health or the environment should exposure occur. Site related COCs would not be considered a principal threat because they are not highly toxic or mobile; however, the potential risk to future site users from the PMR COCs requires a response action.

2.13 SELECTED REMEDIAL ACTION

This DD presents the selected RA for the PMR, a sub-installation to FGGM, located in Jacksonville, MD, and was developed in accordance with CERCLA as amended and consistent with the NCP. Based on the results of the comparative analysis and comments received from the MDE and the public, the selected RA is:

- Alternative 4: Directed Groundwater Recirculation, MNA, and LUCs

2.13.1 Summary of the Rationale for the Selected Remedial Action

The selected RA achieves the RAOs, meets the threshold criteria, and provides the best balance of tradeoffs with respect to the balancing and modifying criteria. The selected RA addresses the risks to human receptors under future land use scenarios associated with groundwater contamination, and it is also consistent with CERCLA requirements.

2.13.2 Detailed Description of the Selected Remedial Action

As described in Section 2.10.4, the selected RA incorporates direct groundwater recirculation, MNA, and LUCs. Existing LUCs at the PMR will be maintained and enhanced. Under the selected RA, operation of the Directed Groundwater Recirculation system would actively treat COCs in groundwater. Installation and maintenance of LUCs to restrict future land use and implement a restriction on groundwater use would limit uncontrolled exposure to groundwater until it is returned to its beneficial use, thereby controlling potential future unacceptable risks to human health under future land use scenarios.

Directed Groundwater Recirculation System

A single extraction well would be located approximately 30 ft to the east of monitoring well FCA-1 (**Figure 2-3**). It is projected that up to three reinjection wells would be required to complete the recirculation loop. These wells would be located on site to the southwest, south, and east of the monitoring well FCA-1 as shown on **Figure 2-3**. It is assumed that the extraction and injection wells would be installed to a depth of 100 ft bgs and be screened in the fractured schist bedrock from approximately 50 to 100 ft bgs. Based on the available information, it is assumed that the extraction well would yield within a range of 1 to 5 gallons per minute. The extracted groundwater would be treated ex-situ via granular activated carbon vessels. At least two granular activated carbon units would be used in parallel to allow for continuous operation during carbon changeout or other maintenance. The treated groundwater would be sampled monthly prior to reinjection to ensure cleanup goals have been achieved.

The Directed Groundwater Recirculation system is assumed to operate for 5 years under this alternative. Operating the extraction at a rate of 1 to 5 gallons per minute and strategically reinjecting the treated groundwater at the extents of the contaminant plume is expected to decrease the TCE concentration at monitoring well FCA-1 by an order of magnitude within 5 years by greatly increasing the number of pore flushes in the aquifer. Based on the linear regressions completed for the Site, it is expected to take an additional 5 to 10 years (for a total remedial timeframe of 10 to 15 years) to achieve the cleanup goal of 5 parts per billion for TCE. The Directed Groundwater Recirculation system would operate through any potential change in the future use of the property. Following system shutdown, natural attenuation would reduce remaining concentrations. Following Directed Groundwater Recirculation, MNA would achieve cleanup goals for the site within 10 to 15 years.

Data collected from monitoring wells located within the ROI of the extraction well will be used to evaluate the recirculation rates and contaminant trends. Performance and operational data will be collected to satisfy the following criteria:

- Collect water level data to assess the recirculation system and ensure contraction of the groundwater plume
- Trends in molar concentrations of TCE will be assessed over time to ensure cleanup goals will be achieved in the anticipated timeframes

Land Use Controls

LUCs described in Section 2.10.2 will be implemented under this Alternative. The planned extent of LUCs is shown on **Figure 2-4**.

2.13.3 Summary of Estimated Remedial Action Costs

The costs associated with the implementation of the selected RA are provided in **Table 2-2**. Costs are also summarized in the following list:

Capital Costs

▪ LUC implementation	$5,000
▪ Remedial design and documentation	$25,000
▪ Aquifer testing	$30,000
▪ Injection permit	$5,000
▪ Extraction well (1)/injection well (3) installation	$48,000
▪ Granular activated carbon units	$1,500
▪ Controls (including remote monitoring)	$10,000
▪ Trenching/pipe installation	$18,000
▪ System install/testing	$10,000
▪ IDW management	$3,000
▪ Installation oversight/management	$18,000
Total Capital Costs	**$170,500**

O&M Costs (15 Years)

▪ Monitoring/Reporting Labor	$11,300
▪ Extraction System Maintenance Labor	$36,700
▪ Monitoring Subcontractors	$6,900
▪ Monitoring Expenses	$2,200
▪ Extraction System Expenses	$16,500
▪ Implementation Costs	
- Total Annual Monitoring/Reporting O&M Costs	$20,400
- Total Annual Extraction System O&M Costs	$53,200
- O&M Contingency (15 percent)	$109,500

Total Present Worth O&M Costs (0.45 percent Discount Rate, 15 years) $727,500

COMBINED TOTAL PRESENT WORTH of Capital and Annual Costs $837,000

The costing information in this section is based on the estimates created in support of the FFS (ARCADIS, 2013a).

2.13.4 Expected Outcomes of the Selected Remedial Action

Following completion of the selected RA, the PMR will be available for residential land use. LUCs will restrict groundwater use in the short-term, until concentrations of the COCs are at levels that allow for unlimited use of and unrestricted exposure to groundwater. The RA will provide socio-economic benefits in the form of allowing residential use of the Site, as current site conditions pose an unacceptable risk under potential residential future use scenarios (future on-site adult and child residents). Environmental benefits will include restoring groundwater to beneficial use.

2.14 STATUTORY DETERMINATIONS

Under CERCLA § 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity or mobility of hazardous wastes as a principal element, and a bias against offsite disposal of untreated wastes. The following sections discuss how the selected RA meets these statutory requirements.

2.14.1 Protection of Human Health and the Environment

Upon completion of the selected RA, there will be no unacceptable risk under future residential use scenarios. In addition, implementation of directed groundwater recirculation will return groundwater to its beneficial use within the shortest reasonable timeframe. Therefore, the selected RA provides the best protection to human health and the environment.

2.14.2 Compliance with Applicable or Relevant and Appropriate Requirements

The implementation of Directed Groundwater Recirculation, MNA, and LUCs will comply with ARARs. The ARARs and other criteria, advisories, and guidance to-be-considered which have been selected as performance standards are presented in **Tables 1-1** and **1-2**.

2.14.3 Cost Effectiveness

In the lead agency's judgment, the selected RA is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" (NCP §300.430(f)(1)(ii)(D)). This determination was accomplished by evaluating the "overall effectiveness" of those response actions that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; and short-term effectiveness). A comparison of the costs to the overall effectiveness was conducted to determine cost effectiveness. The relationship of the overall effectiveness of the selected RA was determined to be proportional to its costs; hence the selected RA represents a reasonable value for the money to be spent.

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

The selected RA employs permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable. The selected RA is effective in the long term in eliminating or reducing potential risks to future land users posed by groundwater contamination through the treatment of groundwater through directed groundwater recirculation.

2.14.5 Preference for Treatment as a Principal Element

The selected remedy satisfies the preference for treatment as a principal element that permanently and significantly reduces the volume of contaminated groundwater through treatment.

2.14.6 Five-Year Review Requirements

Because this remedy will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, statutory required reviews will be conducted every five years after RA initiation (40 CFR 300.430(F)(4)(ii)). Five-year reviews will ensure that the selected RA is, or will be, protective of human health and the environment.

2.15 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED REMEDIAL ALTERNATIVE FROM PROPOSED PLAN

The RA selected in this DD does not differ from the preferred remedy presented in the PP (ARCADIS, 2013b).

3.0 PART 3: RESPONSIVENESS SUMMARY

The purpose of the Responsiveness Summary is to provide a summary of the stakeholders' comments, concerns, and questions about the PP for the PMR and the Army's responses to these concerns.

A Final PP (ARCADIS, 2013b) for the PMR was completed and released to the public on August 15, 2013 at the information repositories listed in Section 2.3. A copy was also posted on the Fort Meade environmental web site.

A newspaper notification was published to inform the public of the start of the PP comment period, to solicit comments from the public, and to announce the public meeting. The notification was run in the North County News on August 15, 2013, and in SoundOff on August 22, 2013. A copy of the certificate of publication is provided in **Appendix A**. A public meeting was held on August 29, 2013, to inform the public about the proposed remedial alternatives for the Phoenix Military Reservation and to seek public comments. At this meeting, representatives from the Army, Baltimore County and MDE were present to answer questions about the site and the remedial alternatives under consideration. A fact sheet was provided to the public as part of the meeting. A public comment period was held from August 15, 2013 to September 13, 2013. Four written comments were received from the public during the public comment period.

Two of the four comments received agreed with the selected RA.

3.1 PUBLIC ISSUES AND LEAD AGENCY RESPONSES

Comments received during the public comment period on the PMR PP are summarized below. The comments are categorized by source.

3.1.1 Summary of Written Comments Received During the Public Comment Period

Comment No. 1: Community member: Chose Alternative 4 as the preferred Alternative. "If Alternative 4 is selected, or any alternative other than Alternative 1, the Corps should place restrictive covenants on the property prohibiting any residential or commercial use save for open space and/or recreational field."

Response No. 1: Comment acknowledged. The future land use of the PMR is undetermined at this point.

Comment No. 2: Community member: Chose Alternative 1 as the preferred Alternative. No written comment followed.

Response No. 2: Comment acknowledged. Alternative 1 does not meet the threshold criteria of being protective of human health and the environment under future land use scenarios and is not acceptable to MDE. Alternative 4 is necessary to protect the public health from releases of contaminants from this Site which present unacceptable risks under future land use scenarios for on-site adult and child residents.

Comment No. 3: Greater Jacksonville Association: Chose Alternative 4 as the preferred Alternative. "I agree that seems to be the safest and most controllable method to prevent further possible groundwater contamination such as Alternative 3 where even more chemicals are injected into the groundwater."

Response No. 3: Comment acknowledged.

Comment No. 4: Community member: Chose Alternative 1 as the preferred Alternative. "Zero financial cost with taking no action, property would remain vacant/undeveloped with Alternative 1; because as stated in the presentation, there is currently not unacceptable risks to on-site or off-site populations under current land uses; the unknown environmental impact potential with Alternatives 3 and 4; and our fear of the "unknown". The current state of this land does not negatively impact our properties in either value or health/safety. We thank you for the opportunity to provide our input prior to any action taken by the Army to clean up and dispose of this property.

Response No. 4: Comment acknowledged. Alternative 1 does not meet the threshold criteria of being protective of human health and the environment under future land use scenarios and is not acceptable to

MDE. Alternative 4 is necessary to protect the public health from releases of contaminants from this Site which present unacceptable risks under future land use scenarios for on-site adult and child residents.

3.1.2 Summary of Comments Received During the Public Meeting on the Proposed Plan and Agency Responses

Four oral comment(s) specific to the selected RA was received during the public meeting on August 29, 2013. A transcript from the public meeting has been included in the Administrative Record (located at the information repositories listed in Section 2.3) and is included as **Appendix B**.

Comment No. 1: Community Member: "I think some people thought it (an equipment building) would look like the Exxon on the corner. Also with respect to signage, certain types of signage could bring more attention and impact property values. Would like something aesthetically friendly."

Response No. 1: Paul Fluck, FGGM Environmental Division: "That is something we can do and that is the kind of comment that I really would like to get from folks here. How we can make this work in your community. This seems like a great technology for us, but we are also very sensitive that it will be in your backyard; so we want to do it in such a way as to be as unobtrusive as possible. We can do vegetative covers to hide the buildings and we can put insulation to make it as quiet as possible. "

Comment No. 2: Community Member: "I am concerned about aesthetics of buildings in that area and bringing attention back to what is going on in that area in terms of property values and aesthetics."

Response No. 2: Tim Llewellyn, ARCADIS: **"**This is going to be very unobtrusive. You'll see a drill rig similar to the one used about a year ago. It will be there for a week or perhaps two weeks. You'll see some minor construction activity while we are putting wells in, but these are not that much different from a domestic well. There will be a small unobtrusive building we can landscape. The noise level will be about the noise level in this room. I'd like to point out that the system is not going to be at the gate, but will be several hundred feet off the fence line inside the Site."

Comment No. 3: Community Member: "There are other houses back where the extraction well is going to be, and they have the same concern"

Response No. 3: Paul Fluck FGGM Environmental Division: "We can set that building back a little bit from the fence; it doesn't have to been right next to the extraction well. After the system is put in and operating, if there is a concern, call me and I'll do my best to address the concern."

Comment No. 4: Community Member: "Is there some way you can continuously inform the public what the Army is considering?

Response No. 4: Community Member: **"**There is one way already. The Jacksonville Association has a link to this on its web site and will be monitoring on an ongoing basis and keeping the community informed." The Army agreed with this comment and invited the Association to reach out to the Army when they wanted an update or briefing on the status of the site.

3.2 TECHNICAL AND LEGAL ISSUES

No technical or legal issues were raised on the selected RA.

4.0 PART 4: REFERENCES

ARCADIS U.S., Inc. (ARCADIS). 2012. Final Remedial Investigation Report. Phoenix Military Reservation. Jacksonville, Maryland. October 2012.

ARCADIS. 2013a. Focused Feasibility Study, Phoenix Military Reservation, Jacksonville, Maryland. Draft. January.

ARCADIS. 2013b. Proposed Plan, Phoenix Military Reservation, Jacksonville, Maryland. Internal Draft. June.

Environmental Science and Engineering, Inc (ESE). 1983. Assessment of Contamination - Phoenix Military Reservation.

Malcolm Pirnie / Berger. 1999. Draft Remedial Investigation/Focused Feasibility Study Report. Prepared for the United States Army Corps of Engineers, Baltimore District. Contract Number DACA31-94-D-0017.

USEPA. 2012a. Regional Screening Level (RSL) Resident Soil Table. Updated November 2012.

USEPA. 2012b. Regional Screening Level (RSL) Tapwater Supporting Table. Updated November 2012.

TABLES

Table 1-1
Chemical-Specific ARARs
Phoenix Military Reservation
Jacksonville, Maryland

Media	Authority	Regulation	Synopsis	Status
Groundwater	Federal Regulatory Requirement	Safe Drinking Water Act (SDWA) National Primary Drinking Water Regulations Act 40 CFR 141- 149 40 CFR 141.61 (a)(1,5,9)	This regulation sets Maximum Contamination Levels (MCLs), which are maximum allowable concentrations of specified contaminants, as enforceable standards for surface or groundwater to be used in the drinking water supply. Subsection cited for trichloroethene, cis1,2-dichloroethene, and vinyl chloride.	ARAR

Notes:

ARAR - Applicable or Relevant and Appropriate Requirement
CFR – Code of Federal Regulations

Table 1-2
Action-Specific ARARs
Phoenix Military Reservation
Jacksonville, Maryland

Activity	Authority	Regulation	Synopsis	Status
General Remediation Activities	State Regulatory Requirement	Control of Noise Pollution *COMAR 26.02.03.02 through 26.02.03.03*	This regulation applies to activities that produce regular or continuous sound that exceeds or may exceed established limits. It restricts noise to a level that protects the health, general welfare, and property of the people of the state. It also establishes an Environmental Noise Advisory Council and authorizes standards for ambient noise levels and equipment noise performance levels to be promulgated by the Department of Environment.	ARAR
Underground Injection	State Regulatory Requirement (federal regulations incorporated by reference)	Underground Injection Control *40 CFR 144.1(g)(1); 144.6; 144.11; 144.12(a); 144.80(e); 144.82; 144.83, 146.8; 146.10(c)*	Regulates the subsurface emplacement of liquids through any of five classes of injection wells in order to prevent contamination of underground sources of drinking water. An injection well is any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is the emplacement of fluids into the ground. This regulation is applicable because the injection wells are considered to be Class V wells through which fluids will be injected into the ground.	ARAR
Groundwater Extraction	State Regulatory Requirement	Groundwater Appropriation or Use *COMAR 26.17.06*	Regulates the appropriation and use of surface water or groundwater in order to conserve and protect water resources.	ARAR
Well Construction	State Regulatory Requirement	Well Construction, Maintenance, and Abandonment *COMAR 26.04.04.07, 26.04.04.10, and 26.04.04.11*	Establishes requirements for well construction (design, construction materials, and construction procedures), proper maintenance to protect groundwater supplies, and standards for proper abandonment of wells.	ARAR

Notes:
ARAR - Applicable or Relevant and Appropriate Requirement
CFR – Code of Federal Regulations
COMAR – Code of Maryland Regulation

Table 2-1
Comparative Analysis of the Remedial Alternatives
Phoenix Military Reservation
Jacksonville, Maryland

Criteria	Alternative 1 No Action	Alternative 2 Monitored Natural Attenuation and Land Use Controls	Alternative 3 In-Situ Chemical Oxidation, Monitored Natural Attenuation, and Land Use Controls	Alternative 4 Directed Groundwater Recirculation, Monitored Natural Attenuation, and Land Use Controls
Overall Protection of Human Health and the Environment	There is no unacceptable risk to human health for current use, but future use scenarios show unacceptable risk. There is no unacceptable risk to ecological receptors if no action is taken.	Protective of human health and the environment by eliminating potential exposure to COCs in groundwater through LUCs. The alternative provides for monitoring of groundwater impacts and documenting reduction of COCs by attenuation processes until chemical-specific ARARs are achieved.	Protective of human health and the environment by eliminating potential exposure to COCs in groundwater through LUCs. Potential future risks are addressed through in-situ treatment of COCs. Groundwater monitoring would document reduction of COCs and ensure protection of receptors until chemical-specific ARARs are achieved.	Protective of human health and the environment by eliminating potential exposure to COCs in groundwater through LUCs and providing control of the plume through recirculation. Potential risks are controlled through ex-situ treatment of COCs. Groundwater monitoring would document reduction of COCs until chemical-specific ARARs are achieved.
Compliance with ARARs	Does not comply with chemical-specific ARARs. Location- and action-specific ARARs would not apply to this alternative.	Complies with chemical-specific ARARs for COCs in groundwater. Complies with action-specific ARARs.	Complies with chemical-specific ARARs for COCs in groundwater. Complies with action-specific ARARs.	Complies with chemical-specific ARARs for COCs in groundwater. Complies with action-specific ARARs.
Long-Term Effectiveness and Permanence	Not effective or permanent. Potential exposure risks associated with COCs in groundwater would remain with no controls or long-term management plan.	Effective and permanent in protecting human health and the environment through LUCs as long as groundwater monitoring of COCs continues to ensure protection of receptors. Groundwater monitoring provides adequate and reliable controls to potential exposure.	Effective and permanent in protecting human health and the environment as long as groundwater monitoring of COCs continues to ensure protection of receptors. Chemical oxidation permanently destroys COCs and converts them to harmless end products.	Effective and permanent in protecting human health and the environment as long as groundwater monitoring of COCs continues and LUCs remain in place. The DGR system will treat the COCs at the surface and clean water will be re-injected.

Table 2-1
Comparative Analysis of the Remedial Alternatives
Phoenix Military Reservation
Jacksonville, Maryland

Criteria	Alternative 1 No Action	Alternative 2 Monitored Natural Attenuation and Land Use Controls	Alternative 3 In-Situ Chemical Oxidation, Monitored Natural Attenuation, and Land Use Controls	Alternative 4 Directed Groundwater Recirculation, Monitored Natural Attenuation, and Land Use Controls
Reduction of Toxicity, Mobility, and Volume through Treatment	This alternative does not employ treatment that would reduce the toxicity, mobility, or volume of impacted soil and groundwater; therefore, it does not meet this criterion.	Natural attenuation process would reduce mobility, toxicity, and volume in groundwater.	In addition to the natural attenuation processes, chemical oxidation would reduce the mobility, toxicity, and volume of COCs through in-situ treatment.	In addition to the natural attenuation process, DGR would reduce the mobility, toxicity, and volume of COCs through removal and ex-situ treatment.
Short-Term Effectiveness	No activities would be implemented that would present potential short-term exposure risks to human health or the environment.	Implementation of this alternative would result in no short-term exposure risks to the community, workers, and the environment as the monitoring wells are already installed.	Implementation of this alternative would result in minimal short-term exposure risks to the community, workers, and the environment. Implementation of this alternative includes installation of the injection well(s) and injection system infrastructure and operation of the injection system during injection events. Risks during these installation activities (primarily to workers) can be controlled and mitigated.	Implementation of this alternative would result in minimal short-term exposure risks to the community, workers, and the environment. Implementation of this alternative includes installation of the extraction and recirculation wells and ex-situ treatment system infrastructure. Risks during these installation activities (primarily to workers) can be controlled and mitigated.

Table 2-1
Comparative Analysis of the Remedial Alternatives
Phoenix Military Reservation
Jacksonville, Maryland

Criteria	Alternative 1 No Action	Alternative 2 Monitored Natural Attenuation and Land Use Controls	Alternative 3 In-Situ Chemical Oxidation, Monitored Natural Attenuation, and Land Use Controls	Alternative 4 Directed Groundwater Recirculation, Monitored Natural Attenuation, and Land Use Controls
Implementability	Technically feasible due to lack of technical components. However, not administratively feasible due to lack of monitoring to ensure protection of human health and the environment.	There are no implementability concerns posed by this option as this alternative requires minimal time and coordination of labor, materials, and resources for completion.	Technically and administratively feasible. Reagent injection would require permit approval. This alternative would present minimal limitations to future uses at the site and not significantly impact the ability to perform future remedial actions.	Technically and administratively feasible. Injection wells and extraction and recirculation would require permit approval. This alternative would present minimal limitations to future uses at the site and not significantly impact the ability to perform future remedial actions.
Cost	No capital cost to discontinue existing monitoring program/abandon monitoring wells. No O&M cost.	Low capital costs to implement monitoring program. Low O&M costs to conduct monitoring program.	Moderate capital cost to install injection well(s) and injection system; Moderate O&M costs to conduct chemical reagent injections, maintain injection system, and conduct monitoring program.	Moderate capital cost to install extraction well and reinjection wells; Moderate O&M costs to operate and maintain extraction and recirculation system and conduct monitoring program.

Notes:
ARAR – applicable or relevant and appropriate requirement
COC – constituent of concern
DGR – Directed Groundwater Recirculation
LUCs – land use controls
O&M – operation and maintenance

Table 2-2
Cost Estimate for Remedial Alternative 4:
Directed Groundwater Recirculation, Monitored Natural Attenuation, and Land Use Controls
Phoenix Military Reservation
Jacksonville, Maryland

Assumptions

Monitoring		
Total monitoring wells	10	annual groundwater sampling
Sampling frequency	1	per year
QA/QC samples	20%	of total samples
Sampling time	3.5	manhours per well per event
Prep time	0.7	manhours per well per event
Travel time	0.85	manhours per well per event
Wells per day	7	
Sampling days	2	per sampling round with 3 man crew
Clerical time	0.5	manhours per well per event
Project Manager time	0.4	manhours per well per event
Data analysis and reporting time for Project Engineer	1	manhours per well per event
Data analysis and reporting time for Junior Engineer	2	manhours per well per event

CAPITAL COSTS

Description	Unit	Unit Rate	Quantity	Revenue	Notes
LUC implementation	each	$5,000	1	$5,000	Engineering estimate for signs ($2000) and staff (30 hrs x $100/hr) to complete required LUC documentation
Remedial design and documentation	each	$25,000	1	$25,000	Engineering estimate for staff (250 hrs x $100/hr) to complete design
Aquifer testing	each	$30,000	1	$30,000	Week-long pump test (costs include installation of 1 extraction well and 2 monitoring wells)
Injection permit	each	$5,000	1	$5,000	Engineering estimate for staff (50 hrs x $100/hr) to complete permit requirements
Extraction well (1)/injection well (3) installation	each	$12,000	4	$48,000	
Granular activated carbon units (2)	each	$1,500	1	$1,500	
Controls (including remote monitoring)	each	$10,000	1	$10,000	
Trenching/pipe installation	feet	$30	600	$18,000	
System install/testing	each	$10,000	1	$10,000	
IDW management	each	$3,000	1	$3,000	
Installation oversight/management	each	$15,000	1	$15,000	Engineering estimate for staff (150 hrs x $100/hr) for oversight and management of system installation
			Total Capital Costs:	**$170,500**	

O&M COSTS

Monitoring/Reporting Labor

Description	Unit	Unit Rate	Quantity	Revenue	Notes
Senior Expert	hour	$153	1	$153	1 hour per event
Principal Sci/Eng/Arch/Designer	hour	$130	1	$130	1 hour per event
Senior Sci/Eng/Arch/Designer	hour	$130	4	$521	PM time
Project Sci/Eng/Arch/Designer	hour	$92	10	$919	Reporting
Staff Sci/Eng/Arch/Designer	hour	$92	20	$1,838	Reporting
Sci/Eng/Arch/Designer 2 - prep and reporting	hour	$68	26	$1,772	
Sci/Eng/Arch/Designer 2 - field work	hour	$68	29	$1,977	
Sci/Eng/Arch/Designer 1 - field work	hour	$55	15	$825	
Clerical	hour	$39	5	$195	
Annual LUC Inspections and Reporting	each	$1,000	1	$1,000	
Annual Reporting Costs for 5-Year Review Preparation	each	$2,000	1	$2,000	Annual engineering estimate for staff (20 hrs x $100/hr) to complete Draft, Draft-Final, and Final 5-Year Review
			MNA/Reporting Subtotal:	**$11,300**	

Extraction System Maintenance Labor

Description	Unit	Unit Rate	Quantity	Revenue	Notes
Labor (2 people, 2 days/month, 1 event/month)	hour	$80	384	$30,720	
Technical support	hour	$100	60	$6,000	
			Extraction System Subtotal:	**$36,700**	

Table 2-2
Cost Estimate for Remedial Alternative 4:
Directed Groundwater Recirculation, Monitored Natural Attenuation, and Land Use Controls
Phoenix Military Reservation
Jacksonville, Maryland

Monitoring Subcontractors					
Description	**Unit**	**Unit Rate**	**Quantity**	**Revenue**	**Notes**
Laboratory					
VOCs (monitoring wells)	each	$64	12	$768	
VOCs (influent/effluent sampling)	each	$64	24	$1,536	
Metals	each	$88	12	$1,056	
Light hydrocarbons (methane, ethane, ethene)	each	$75	12	$900	
Total Organic Carbon (TOC) - single analysis	each	$25	12	$300	
Anions (Br, Cl, F, PO4, SO4, NO3, NO2)	each	$75	12	$900	
Sulfide	each	$20	12	$240	
Ferrous Iron	each	$25	12	$300	
Waste Disposal					
Drum rate (soil or liquid, 55-gallon incl. drum purchase)	each	$70	3	$210	4 wells/drum
Transportation	each load	$675	1	$675	1 per round
			Subtotal:	**$6,900**	
Monitoring Expenses					
Description	**Unit**	**Unit Rate**	**Quantity**	**Revenue**	**Notes**
PID	day	$75	2	$150	
Submersible pump w/ control box	day	$205	2	$410	
Horiba U-22 with flow-through cell	day	$140	2	$280	
Generator	day	$75	2	$150	
Water level indicator	day	$30	2	$60	
Daily low-flow setup	day	$150	2	$300	
Tubing	100 ft	$22	2	$44	
Decon area setup/supplies	day	$25	2	$50	
Level D PPE	day/person	$25	2	$50	
Miscellaneous (photographs, gas, tolls, supplies, etc.)	day	$20	2	$40	
Shipping (Coolers)	each	$100	2	$200	
Truck/car rental	day/person	$75	2	$150	
Lodging	day/person	$100	2	$200	
Meals (overnight stay)	day/person	$40	2	$80	
Meals (day work)	day/person	$20	2	$40	
			Subtotal:	**$2,200**	
Extraction System Expenses					
Description	**Unit**	**Unit Rate**	**Quantity**	**Revenue**	**Notes**
Electrical costs	each	$500	1	$500	
Remote monitoring	month	$100	12	$1,200	
Granular activated carbon changeout	each	$1,500	2	$3,000	
Waste disposal	each	$1,000	2	$2,000	
Annual well redevelopment	each	$2,000	1	$2,000	
Level D PPE	day/person	$25	48	$1,200	
Miscellaneous (photographs, gas, tolls, supplies, etc.)	day	$20	24	$480	
Truck/car rental	day	$75	24	$1,800	
Lodging	day/person	$100	24	$2,400	
Meals	day/person	$40	48	$1,920	
			Subtotal:	**$16,500**	

Table 2-2
Cost Estimate for Remedial Alternative 4:
Directed Groundwater Recirculation, Monitored Natural Attenuation, and Land Use Controls
Phoenix Military Reservation
Jacksonville, Maryland

Total Annual Monitoring/Reporting O&M Costs:	**$20,400**	
Total Annual Extraction System O&M Costs:	**$53,200**	
Monitoring/Reporting Timeframe:	**15**	years
Extraction System Timeframe:	**5**	years
Present Worth Subtotal:	**$727,500**	
Contingency:	**15%**	
Total Present Worth:	**$837,000**	

Notes:

-15-year Discount Rate of 0.45% based on the 2013 Real Treasury Discount Rate from Circular A-94, Appendix C (White House Office of Management and Budget, 2013)
-All costs are based on an accuracy of +50/-30% (USEPA, 2000)

IDW - investigative derived waste
LUC - land use control
MNA - monitored natural attenuation
O&M - operation and maintenance
PID - photo ionization detector
PM - project management
PPE - personal protective equipment
QA/QC - quality assurance/quality control
USEPA - United States Environmental Protection Agency
VOC - volatile organic compound

FIGURES

CITY: MPLS DIV/GROUP: IM DB: MG LD: PIC: PM: TM: TR:
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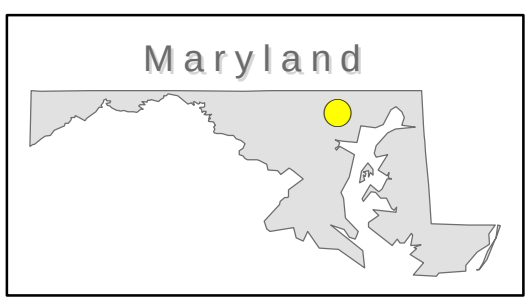

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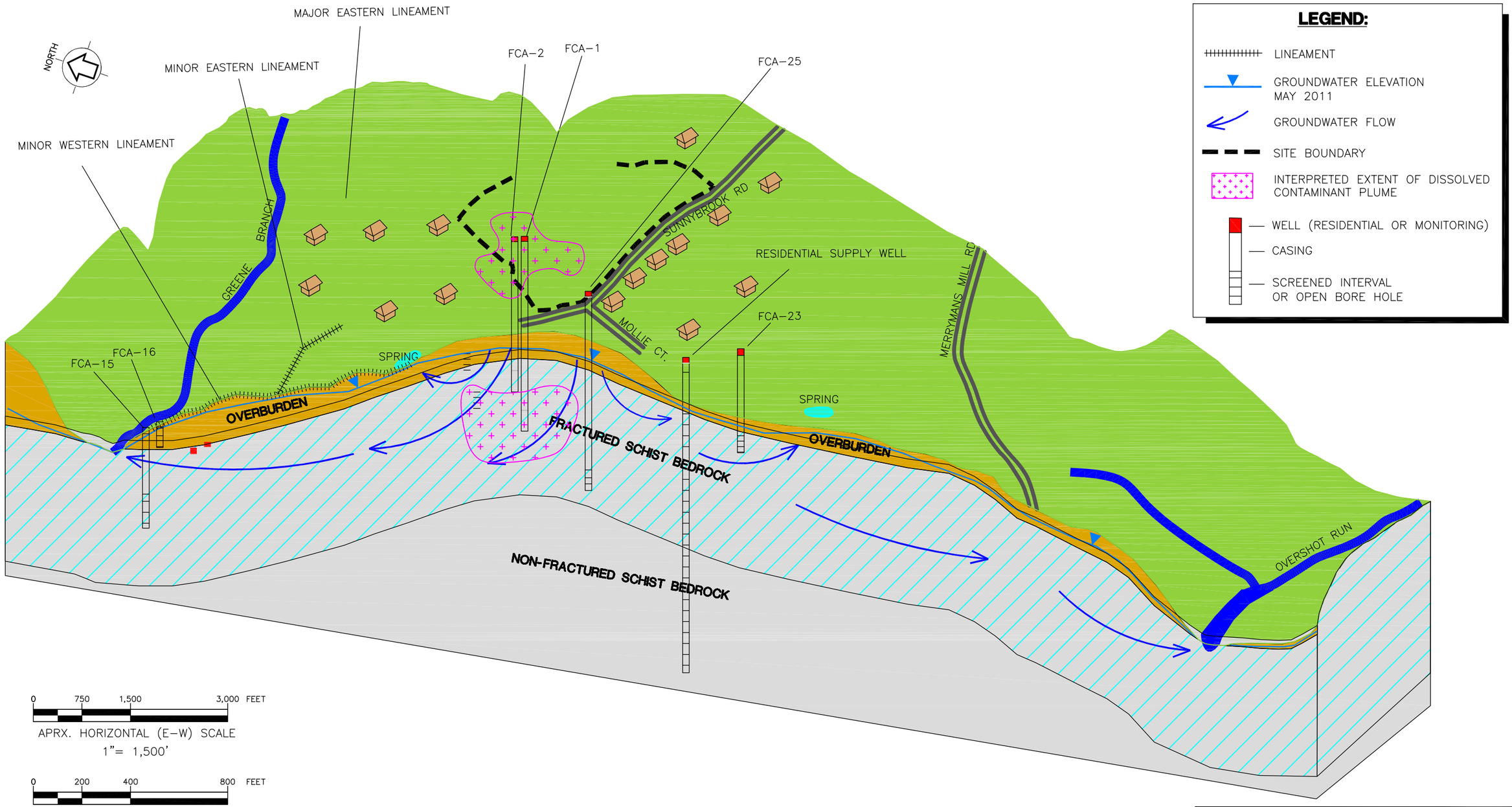
APPROXIMATE SCALE IN MILES

PHOENIX MILITARY RESERVATION
JACKSONVILLE, MARYLAND

SITE LOCATION

ARCADIS

FIGURE
1-1



0 750 1,500 3,000 FEET

APRX. HORIZONTAL (E-W) SCALE
1"= 1,500'

0 200 400 800 FEET

APRX. HORIZONTAL (N-S) SCALE
1"= 400'

0 50 100 150 FEET

APRX. VERTICAL SCALE
1"= 100'

PHOENIX MILITARY RESERVATION
JACKSONVILLE, MARYLAND

CONCEPTUAL SITE MODEL

ARCADIS

FIGURE
2-1

CITY:(Read) DIV/GROUP:(Read) DB:(Read) LD:(Opt) PIC:(Opt) PM:(Read) TM:(Opt) LYR:(Opt)ON=*;OFF=*REF* PAGESETUP: ---- PLOTSTYLETABLE: ACAD.CTB PLOTTED:
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10/12/2011 1:48 PM BY: GOFORTH, JOHN

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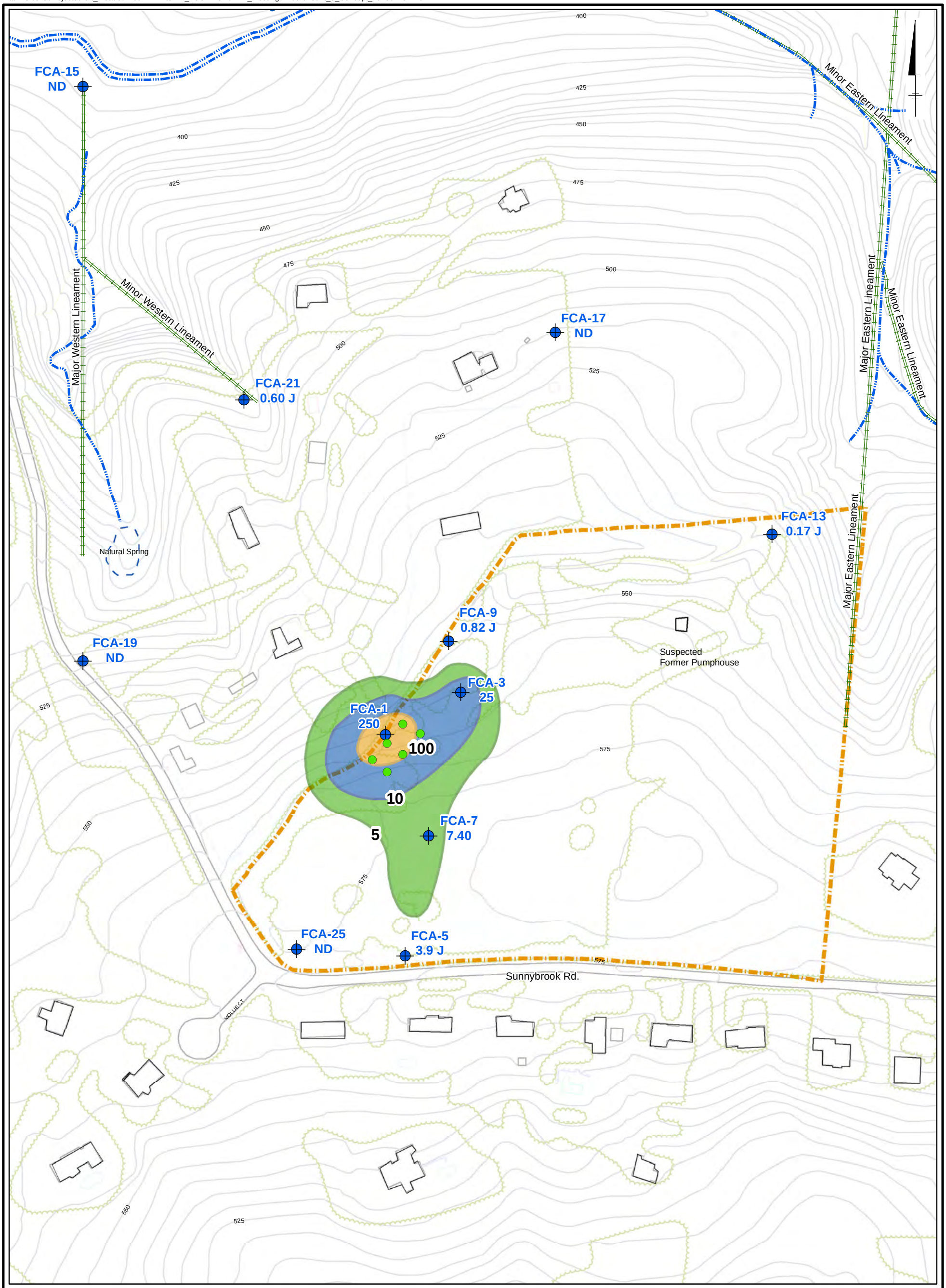

Legend

May 2011 Trichloroethene Concentration

- 5 µg/L
- 10 µg/L
- 100 µg/L

5 TCE concentration in µg/L

- Deep Well Location
- Lineament
- Stream
- Proposed Injection Well
- Natural Spring
- House
- Approximate Site Boundary

Note:
ND = Non-Detect
J = estimated concentration
µg/L = micrograms per liter

0 200 400
SCALE IN FEET

PHOENIX MILITARY RESERVATION
JACKSONVILLE, MARYLAND

**ALTERNATIVE 3 CONCEPTUAL LAYOUT:
IN-SITU CHEMICAL OXIDATION, MONITORED
NATURAL ATTENUATION, AND LAND USE CONTROLS**

ARCADIS

FIGURE
2-2

CITY: MPLS DIV/GROUP: IM DB: MG LD: KS
PHOENIX MR
Path: G:\GIS\Projects\Fort_Meade\Phoenix MR\SITE_LOCATION\MNA_Meeting\mxd\2013\Alt_4_Concept_20130718.mxd

Legend

May 2011 Trichloroethene Concentration

- 5 µg/L
- 10 µg/L
- 100 µg/L

5 TCE concentration in µg/L

- Deep Well Location
- Lineament
- Stream
- Natural Spring
- Extraction Well
- Recirculation Well
- House
- Approximate Site Boundary

Note:
ND = Non-Detect
J = estimated concentration
µg/L = micrograms per liter

0 200 400
SCALE IN FEET

PHOENIX MILITARY RESERVATION
JACKSONVILLE, MARYLAND

ALTERNATIVE 4 CONCEPTUAL LAYOUT: DIRECTED GROUNDWATER RECIRCULATION, MONITORED NATURAL ATTENUATION, AND LAND USE CONTROLS

ARCADIS

FIGURE
2-3

CITY: MPLS DIV/GROUP: IM DB: MG LD: KS
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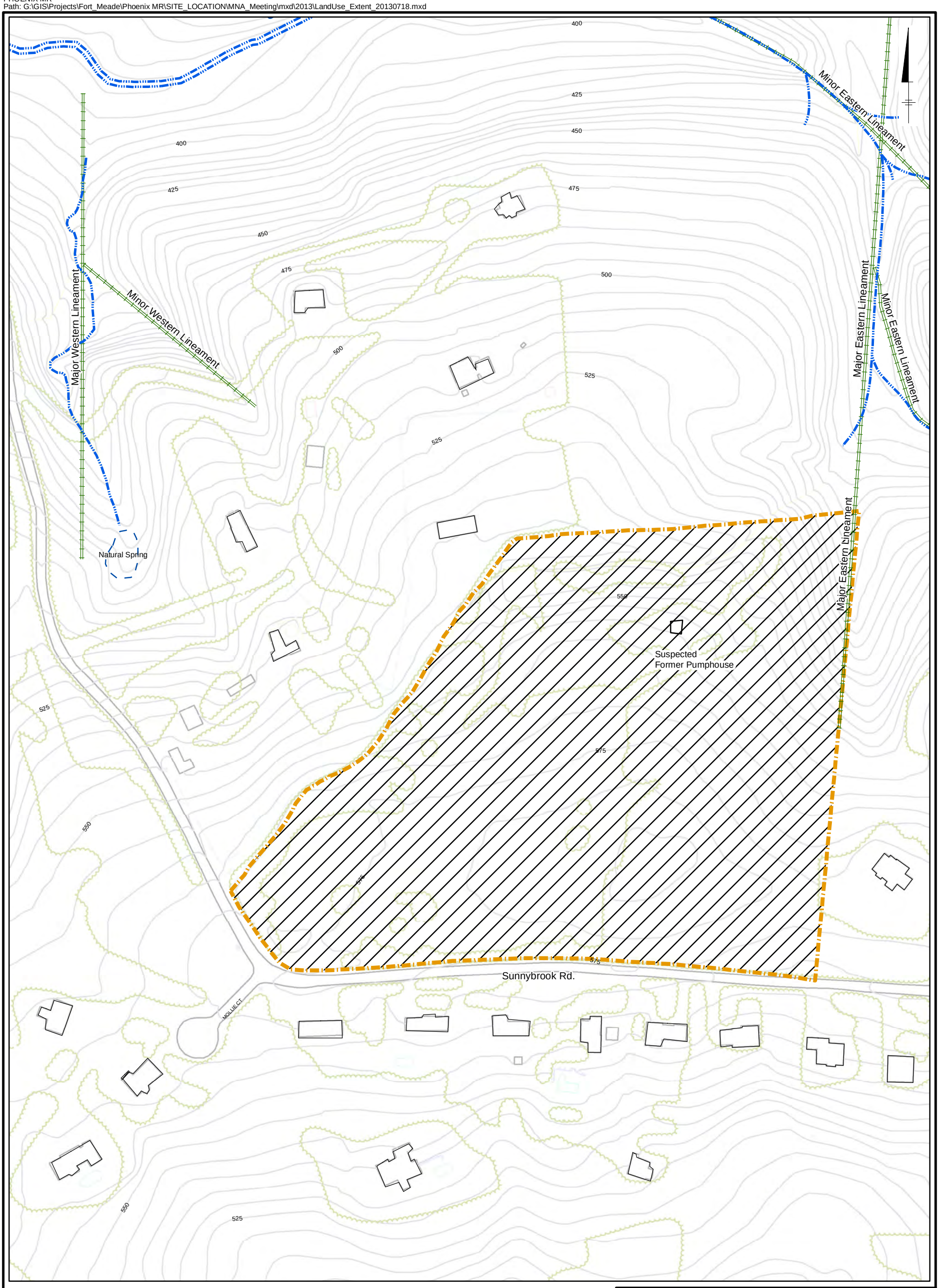

Legend

- Extent of Land Use Controls
- Approximate Site Boundary
- Lineament
- Stream
- Natural Spring
- House

0 200 400
SCALE IN FEET

PHOENIX MILITARY RESERVATION
JACKSONVILLE, MARYLAND

EXTENT OF LAND USE CONTROLS

ARCADIS

FIGURE
2-4

APPENDIX A
CERTIFICATES OF PUBLICATION

THE BALTIMORE SUN
MEDIA GROUP

Baltimore, Maryland 21278-0001

August 15, 2013

THIS IS TO CERTIFY, that the annexed advertisement was published in the following newspaper published in Baltimore County, Maryland, ONE TIME, the publication appearing on August 15, 2013

- ☐ The Jeffersonian
- ☐ Arbutus Times
- ☐ Catonsville Times
- ☐ Towson Times
- ☐ Owings Mills Times
- ☐ NE Booster/Reporter
- ☑ North County News

THE BALTIMORE SUN MEDIA GROUP

By: Susan Wilkinson

Susan Wilkinson

PUBLIC NOTICE
U.S. ARMY INVITES PUBLIC COMMENT ON PROPOSED PLAN FOR PHOENIX MILITARY RESERVATION JACKSONVILLE, MARYLAND

PROPOSED PLAN FOR PHOENIX MILITARY RESERVATION

The U.S. Army invites the public to comment on a Proposed Plan that evaluates proposed remedial action alternatives to address groundwater at the Phoenix Military Reservation, located approximately one-half mile west of Jacksonville, Maryland. Investigations and studies show no current unacceptable human health risks according to guidelines established by the U.S. Environmental Protection Agency. However, groundwater directly beneath the site has been impacted by a solvent (trichloroethene or TCE) and could present health risks in the future if the use of the site changes to residential use.

Phoenix Military Reservation was developed in 1954 as a Nike missile site and was manned by the Army until 1966. After a period of inactivity, the Army leased the property to the Maryland Army National Guard. The property has been unoccupied since 1982. The future use of the property is undetermined. The site is a sub-installation to Fort George G. Meade, Maryland.

ALTERNATIVES EVALUATED

The Proposed Plan evaluates the following remedial action alternatives:

Alternative 1: No Further Action.
Alternative 2: Monitored Natural Attenuation and Land Use Controls.
Alternative 3: In-Situ Chemical Oxidation, Monitored Natural Attenuation, and Land Use Controls.
Alternative 4: Directed Groundwater Recirculation, Monitored Natural Attenuation, and Land Use Controls.

PREFERRED RESPONSE ACTION

Alternative 4 is the Preferred Response Action. Under this alternative, groundwater would be extracted, treated and re-injected. After five years of treatment, natural attenuation would additionally reduce the remaining concentrations. Land use controls would limit use of the property and groundwater. The Preferred Response Action may be modified or a new alternative may be developed based on public input. The final Response Action selected will be documented in a Decision Document that summarizes the decision-making process. The Army will summarize and respond to comments received during the comment period as part of the Decision Document.

PUBLIC COMMENT PERIOD

Starting August 15, 2013, copies of the Proposed Plan and the Administrative Record will be available for review at the **Cockeysville Branch Library**, 9833 Greenside Dr., Cockeysville, MD 21030. A copy of the Proposed Plan is also available at the **Fort Meade Environmental Division**, 4215 Roberts Ave., Room 320, Fort Meade, MD, 20755.

The public may submit written comments during the 30-day comment period (August 15 to September 13, 2013). Comments must be postmarked by September 13, 2013, and sent to Ms. Mary Doyle, U.S. Army Garrison Fort George G. Meade, Public Affairs Office, 4409 Llewellyn Ave., Fort Meade, MD, 20755-7058; 301-677-5592. Following the 30-day public comment period, written responses will be prepared and included in the Administrative Record.

PUBLIC MEETING

The U.S. Army invites the public to attend a meeting on **August 29, 2013, 7:00 p.m., at the Holiday Inn Express, 11200 York Rd., Hunt Valley, Maryland, 21030** to discuss the Proposed Plan.

NCN 8/404 Aug. 15

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APPENDIX B
PUBLIC MEETING TRANSCRIPT

PHOENIX MILITARY RESERVATION
Proposed Plan Public Meeting for Fire Control Area
Thursday, August 29, 2013
Holiday Inn Express, Hunt Valley, Maryland

The meeting opened at 7:09 p.m.

Introduction by Mr. Paul Fluck

Good evening everyone. My name is Paul Fluck, and I will be your moderator for this evening. Before we get started, I wanted to get a sense of who you are and give you a sense of who I am and who I represent. The Phoenix Military Reservation is a sub-installation of Fort Meade, and I run the Defense Environmental Restoration Program. By virtue of Phoenix being under the jurisdiction of Fort Meade, I have the distinction of being responsible for the health of the Phoenix Military Reservation.

As you know, we have been working here at Phoenix for quite some time, and we have made a lot of progress. We are at an exciting point in the process where we would like to report to you where we are.

Again, my name is Paul Fluck, and I run Fort Meade's cleanup program. I have been in the environmental business for almost 30 years. I have degrees in environmental science and geology from a university in New Jersey, and I have been a member of Fort Meade's team since 2007. I'd like to introduce a couple key members of the program starting with my boss, Mr. Mick Butler, who is the Chief of the Environmental Program.

Introduction by Mr. Michael (Mick) Butler

Good evening, everyone. This is a laudable event because the Army has been resource constrained through the last 12 years. When Paul arrived in 2007, he was a significant player in identifying some issues on Fort Meade proper as well as at Phoenix. His view of the process called out some issues where we needed to go out and do some more work, such as off-site monitoring wells, which has been done.

My background is I have been at Fort Meade since 2004. I've managed state environmental programs in the state of Maryland, MDE [Maryland Department of the Environment] and in Delaware. I am Coast Guard trained and have private sector response experience. As a regulator coming to the Army, I must say the Army has an exceptional record, in terms of my perspective, since I've been there since 2004.

Tonight is your opportunity to see what we have done, ask questions, learn more about what we have done, and submit comments. We have partnerships with MDE and EPA and are aggressively trying to identify sites. At Fort Meade proper, we are still identifying new sites from the 1940s and World Wars I and II, and there are significant challenges there as well. Tonight is a good milestone. Thank you for coming.

Introduction Continued by Mr. Paul Fluck

I'd like to introduce everyone to Mr. Tim Llewellyn of ARCADIS, a contractor to the U.S. Army at Fort Meade.

Introduction by Mr. Tim Llewellyn

I'm Tim Llewellyn. I'm a geologist by training, and I have been doing this work for over 20 years. I have been with ARCADIS for 11 years. ARCADIS is a fairly large environmental consulting firm, contracted to the Army for the Phoenix Military site, and I am based in the Millersville, Maryland office, just south of the city.

Introduction Continued by Mr. Paul Fluck

We also have some representatives from my command, Col. Coulters.

Introduction by Col. Francis Coulters

I'm Francis Coulters, and I work for the Army Environmental Command out of Fort Sam Houston, Texas. I'm glad Paul is making some progress at both Meade and Phoenix. I like that because it's work off my plate. My job is to serve Paul and his staff, and provide him with assistance on moving their programs forward. I don't usually wear this uniform. I am a civilian but on training right now with the Maryland National Guard. Like Paul, I have about 30 years in the business.

Introduction Continued by Mr. Paul Fluck

I'm also pleased to have representation from Maryland Department of the Environment, Ms. Lis Green.

Introduction by Ms. Elisabeth Green

Hi, I'm Elisabeth Green. I'm a project manager at the Maryland Department of the Environment. I have been working on Phoenix for a few years, and I'm excited also that we're at this point in the process.

Introduction Continued by Mr. Paul Fluck

I'm also very pleased to introduce Mr. Kevin Koepenick.

Introduction by Mr. Kevin Koepenick

I'm Kevin Koepenick with Baltimore County Department of Environmental Protection. I'm a geologist with the County and run the well/septic program. We also deal with groundwater contamination issues, helping residents with well and septic

primarily. The Army has kept in correspondence with our office on almost everything they have been doing. They have been out looking at this site for the past 30 years. I think it was the early 1980s when some of the contamination was first detected. Baltimore County now owns the other part of this particular Nike site and operates that as one of its DPW training facilities.

Introduction Continued by Mr. Paul Fluck

[Mr. Fluck then invited all members of the public who were present to introduce themselves. The names of members of the public who were present are not included in the transcript for privacy reasons.]

Thank you all for joining us and your participation. I have some administrative things I'd like to talk about very briefly. I'd ask that you mute your cell phones.

[Mr. Fluck introduced two other members of the Fort Meade team, Ms. Veronica Castro from the Public Affairs Office and Ms. Denise Tegtmeyer from the environmental program who has been working on Phoenix since 2000.]

We'll be talking about the Proposed Plan for the Phoenix Military Reservation. The Proposed Plan is a very important document. This document talks about what the responsible party, the United States Army, feels is the preferred remedy, the final remedy, to clean up the site. It is not the final remedy at this point as that happens when we go from the Proposed Plan to the Record of Decision. These terms are from CERCLA which is the Comprehensive Environmental Response, Compensation and Liability Act. The Proposed Plan is a great document in that it wraps up the life cycle of all the work that has been done at the Phoenix Military Reservation, and it comes to a conclusion based on an analysis of various remedial technologies what the best approach is to address the type of environmental issues we have at the site. At this particular site, we have a small plume of TCE that is limited to the confines of our boundary. Notwithstanding, we still have a statutory obligation to resolve that problem.

I'd also like to let everyone know we are being recorded as this is an official meeting. After the meeting, we will produce a document called a Record of Decision. [After the meeting, Mr. Fluck clarified the document would be a Decision Document.] The Record of Decision [Decision Document] will have your comments in that document, and your comments play a vital role in our final decision on the actual final remedy. We are here to tell you what we think is the right course of action based on the data we have collected over many years. Mr. Llewellyn is going to take you down that road, step by step, so you can see how we got to where we are now. We would ask that you all check it out, look at the Proposed Plan, listen to what Mr. Llewellyn tells you, and tender your comments. You can offer comments during the meeting or you can supply comments via email or in writing. In the fact sheet there is an insert where you are welcome to write down your comments and send them to our Public Affairs Office. Our Public Affairs Office will then assign the comments to the appropriate subject matter experts.

At this point, I'd like to say welcome and I really appreciate your attendance. It is very important for the Army to have your input. It is part of the core mission to have that type of transparency so I'm very pleased you are here. I would ask that in deference to Mr. Llewellyn that you write down your comments and ask them of Tim, me and others here at the end of the meeting. If you can't wait until the end of the meeting, just raise your hand and we'll try to address them.

Thank you so much for your time. I appreciate your patience and I'll turn the meeting over to Mr. Tim Llewellyn.

Presentation by Mr. Tim Llewellyn

Thank you, Paul.

We are here tonight for the public meeting. As Paul said, we are inviting comment on the Proposed Plan for the Phoenix Military Reservation. We opened the 30-day public comment period prior to this meeting. We set this meeting up about halfway through the public comment period, with a notice appearing in the newspaper about two weeks ago. The idea was that you would hopefully see that notice, have some time to look at some of the documentation, come with some questions, and then there would be another two weeks after this meeting where we hope to explain it all to you, to tender some additional comments. As Paul said, please feel free to ask questions as we are here to answer your questions and to hear your comments and thoughts.

Before I get into the bulk of my presentation, I thought it might be a good idea to talk about where we are in the CERCLA process. CERCLA is the set of environmental regulations that the Army is operating under at this site. CERCLA can also be known as Superfund. I want to be very clear that Phoenix Military Reservation is not a Superfund site. It has not been designated as a site on the National Priorities List. The Army is using the same environmental regulations to move the site forward to closure.

I am going to go through the main stages of the CERCLA process. There are a couple documents we are not going to talk about before the Remedial Investigation. What does Remedial Investigation mean? That means we go out and characterize the site. We recognize there are potentially some issues or contamination like we did at the Nike Site. We go out with our drill rigs and sampling crews. We drill wells in the ground, we take samples out of the ground, soil, surface water, and sediment. We send the samples off to the lab and try to understand if the historical activities at the site have contaminated the environment. If they have, and in the case of the Phoenix Military Reservation they had, we move to the next stage, the Feasibility Study. That is the document that has now gone final. It is where we take all the results of the Remedial Investigation, and we look at a series of potential remedies for those issues. We evaluate all those and at the end of that process, we get to the Proposed Plan which as Paul said is where we are tonight. That is a major step forward as the Army has come up with a preferred remedy to address the environmental contamination issues at this site. It is not

final until we go through the public comment period. We want to hear your comments; we want to make sure the community is on board with the plans. Once those comments come in, they will be reviewed by the Army and the Maryland Department of the Environment which is the lead regulatory agency for the site, and the comments will be addressed. Once they are addressed, we will go to a Decision Document which is the final document which legally obligates the Army to take that remedy at the site. After that we go to Remedial Design and Remedial Action and make it happen.

What are the components of the Proposed Plan? It documents the site history. It is intended to be a fairly brief document or that is our intent. There are a lot of other documents associated with this site in the Administrative Record which is available online and at the library. Paul and his staff can make those available to you. We have a few copies here of the Proposed Plan, a fairly small document. It summarizes the site history, investigations, and results of the risk assessments. It describes the remedial alternatives we considered and provides a comparative analysis of those alternatives. It presents the preferred remedy, and finally, contains information on community participation.

That brings us to our agenda for the evening which is very similar to what I just went through with the content of the Proposed Plan. We are going to start with information on the site history and its location.

I thought it would be a good idea to describe what a Nike Site is in case anyone has questions about what was done at the site in the past. That brings us to a discussion of the Nike Missile Program, a program created in the early 1950s during the height of the Cold War when everyone was worried about Soviet bombers coming over and wiping out cities. The Nike Missile defense system was set up as a surface to air missile system, the first guided missile system developed. The first operational missile system was at Fort Meade. Rings of Nike Missile sites were constructed around all major urban areas in the country; there are several in the Baltimore/Washington area, there are several on military installations and some in cities themselves. There are about 250 total. Each of these sites consisted of two areas. The Fire Control Area, the site we are going to talk about tonight, and the Launch Control area; these two locations needed to be separated by 3,000 or 4,000 feet based on the technology at the time and safety criteria. The program did not last that long. ICBMs [intercontinental ballistic missiles] were developed by the United States and Soviets rather quickly, the bombers were probably not going to come anyway, and the Nike Missile defense system would not have been effective against ICBMs, so the program was shut down in the 1960s.

Question by Mr. Paul Fluck: Just out of curiosity, by raising hands, how many folks knew there were two different Nike facilities—a fire control and a launch control? OK, about 50 percent of the audience. And, each one had unique operational activities. The fire control was an administrative, manned control center so that would have been administrative facilities, radar tower, electronics equipment, etc. The launch control was where the missiles would have been located. First started with the Ajax missile and then

went to the Hercules system. Folks interested in the different between Ajax and Hercules? [Several members of the audience responded with "No's."]

[Mr. Llewellyn displayed a site location map.] Normally I spend quite a bit of time on this, but I think everyone knows exactly where the site is. Here it is between 145 and Route 146 near Jacksonville. This is where we are tonight.

We're going to zoom in on the box on the side of the map and look at an aerial photograph illustrating the former launch control and the former fire control. Here is the Four Corners area, here's Route 145 and the hotel, Route 146, Sunnybrook Road and here is the former Fire Control Area, the area we are talking about tonight and the site which is the subject of the Proposed Plan. Three or four thousand feet away is the Launch Control Area and that is being handled by a separate team under a separate track and is not included in tonight's discussion or any of the documents.

Here is the site history. In 1954 the site was developed and set up as the Ajax Missile site. In 1966 the Nike missile program was terminated, and in 1974, the Maryland Air National Guard leased the site year-round for training of its Military Police Company. In 1982, they ceased operations and structures of the site were demolished; the site has been unused and empty since that time.

This slide is an important part of later discussions. We have zoomed in on the Fire Control Area, here's Sunnybrook Road. This is cerca 1950s, sometime when it was operational. Here are the former offices, barracks, generators, and obviously they had computer control systems that launched the missiles and guided them to the targets. They needed the radar towers to do that which are shown here. And then nothing to do with the missile defense system, was the former septic tanks and we will be talking about these tonight as unfortunately this is where we see the source of solvents, TCE, that is currently present in groundwater. Apparently what happened when the location was operational, they used degreasing solvents for equipment maintenance and vehicle maintenance, relatively common degreasing solvents, TCE, common at that time and still common as you can buy it at Home Depot. The TCE was dissolved into waste water that was flushed down sinks and into the septic tanks systems, and from there it entered the groundwater and is still there today.

Comment by Mr. Kevin Koepenick: From my perspective, a teachable moment as everybody is on septic systems. I try to get everyone to understand what you put down your drain does make it into the groundwater system. It can make it down to the streams, so everybody is responsible for ensuring they watch what they do to the environment. We have other cases of septic systems causing problems from homeowners as well as commercial facilities so it is not just Exxon or the Army, but we see this at residential situations throughout the County. Mainly it is petroleum, but we do see solvents quite a bit.

[Tim Llewellyn resumed.] Yes, one of the things we have discovered over the years, it is really easy to contaminate groundwater, car oil can do it in five minutes, but it takes years and years and years to recover it.

This is a photo of what the site looks like now; as I said, all the buildings were removed. One of our monitoring wells is present in the foreground of this picture, and of course we have a security fence around the site.

Comment by member of the audience: There are big holes in the fence.

Let's talk about the field investigations. As Paul and Kevin indicated, studies have been going on for a long time at this particular site, since the late 1970s. Homes on Sunnybrook were supplied with bottled water starting in 1981 due to impacts from heating oil tanks that were on-site. We don't actually know the size of those heating oil tanks, typically they are relatively small; the heating oil did leak out of these tanks and get into the environment. Those tanks were removed in 1982.

We had a number of other studies going on through the 1980s, and then in 1994 a community supply well system was hooked into many of the homes north and south of the site, due in part to the TCE degreasing solvent being detected in groundwater. In 1999 we started getting into the CERCLA process, and we developed a full RI/FS with a lot of detailed investigations and different companies working on the RI under the purview of the Army and under the purview and direction of the Maryland Department of the Environment. We have been continuing those investigations and monitoring up until the present time. We have a very long record at this site so we know TCE is present in the sub-surface. We know over the years it has dissipated and continues to dissipate through natural processes, but if we leave it there it will take a long time so the Army is proposing an active remedy at this site.

A little bit about the Remedial Investigation (RI) fieldwork. A lot of soil samples were collected from across the site from shallow and deeper soils between the area of the former underground storage tanks that leaked and have been removed. Soil samples were also collected from around the septic tanks where the TCE was released. There are a total of 23 wells on-site now. Thirteen shallows wells, probably less than 50 feet in depth, 10 deep wells up to 105 feet deep. The Army has sampled groundwater out of these wells numerous times. We are seeing declining concentrations of the contaminants but not as fast as we would like to see. The groundwater is moving through a fractured rock system. During the RI, 8 additional temporary wells were installed down to the first water encountered in the rock. Those wells were installed over a period of time and sampled to try and understand more about what was going on with the contaminant distribution off-site, particularly to the north of the site. None of those wells contained TCE above the drinking water standard which is 5 parts per billion. [A member of the audience asked how deep the additional wells were installed.] They went down 50 or 60 feet. We also sampled surface water and sediment in tributaries to Greene Branch and Greene Branch itself.

Here are the results. The investigation indicated the groundwater is flowing both to the north and south of the site. Nike Sites were typically put on top of hills because the radar needed to be on top of a hill, so there is radial flow. The groundwater is primarily

flowing to the north with some flow to the south. The groundwater and soil sampling around the former underground storage tanks did not show any evidence of the petroleum hydrocarbons, the fuel oil, associated with the heating oil tanks. They tend to dissipate on their own relatively rapidly. Unfortunately, the TCE takes a lot longer to go away and that remains present in the bedrock aquifer beneath the site above the drinking water standard. It is declining but still above its drinking water standard. The source of the TCE is likely from the septic field, but we didn't see any evidence there is any residual contamination or a continuing source from the soils around that septic tank. We sampled those soils, and no TCE in the soil continues to act as a continuing source and that is consistent with the declining concentrations we see in groundwater so we don't believe there is any TCE in the soils.

In 2011 and 2012, you may have seen us out there doing some drilling. We put an additional deep well in right by the gate to the western side of the site. There wasn't a deep well there, and we felt it was a potential data need to make sure there wasn't any TCE going off in that direction toward the houses. There was no TCE contamination found in that well above the drinking water standard.

Comment from Community Member: It would be very easy in the future to put on the slides up to a certain depth instead of saying a deep well.

Yes, I can easily add that information in the future.

TCE is still above the drinking water standard in three of the deep on-site wells, the wells that are screened between 50 and 100 feet. In shallower wells, TCE is below its drinking water standard.

We were concerned about the newer homes that were not on the community supply, such as Mollie Court, and we wanted to make sure they were not being impacted. We contacted the homeowners in 2011 and asked to sample their wells. At the same time, the Army offered bottled water in case there were any concerns while we were waiting for the results. The bottled water was not needed as the results came back quickly, and there were no impacts from the site above drinking water standards.

Here's a map showing Sunnybrook Road, the Fire Control Area boundary, and here's what this deeper groundwater plume of TCE looks like. Here is the property line. The highest detection is at 250 parts per billion, relative to the standard of 5 parts per billion, right on the property line, so we know there is probably some contamination going over this property line. We have a lot of wells over here, and we know we have dissipating concentrations, so probably it is not going very far. Here are the other wells above the drinking water standard at 25 parts per billion, again relative to a drinking water standard of 5 parts per billion. Here is the last one at 7.4 parts per billion, not much above the drinking water standard but still above the standard. This contour line is the 5 parts per billion standard. [An audience member asked if the data was from 2011 or 2012.] This is from 2012. So that's what the contamination in the deeper aquifer looks like. Again the shallower groundwater is not impacted.

Here are all the wells we have around here. The homes here are hooked up to the community well supply. Mollie Court wells that are not hooked up to the community supply and we wanted to make sure those were clean. We worked with MDE and the County and sampled these wells twice and did not see any impacts associated with the site.

That's a quick overview of the results of the remedial investigation. One of the things we do at the remedial investigation stage is we collect all this chemical data and then we run it through a risk assessment process. This is an EPA-approved quantitative method that will assess the possible human health and ecological effects associated with the chemicals we found. We can go through three steps. We go through a hazard assessment by taking all the chemical data we collected, and we screen it relative to health-based standards published by the EPA every six months. If we have any chemicals above those concentrations, we advance to a human health risk assessment. It does not mean there is risk, but it means we need to consider those chemicals and run through this concentrated evaluation. After that evaluation, there is an exposure assessment. We think about how populations could be exposed to these chemicals, for example, at the Phoenix site a trespasser would be the most likely scenario of an exposure pathway. There could also be exposure through a residential scenario if someone was to build a house there and put a well in the middle of that plume. Even though there are no plans to do that, the Army was conservative and assessed the risk for residential use which assumes someone built a house and put a well right in the middle of the plume. And finally, we do a toxicity assessment looking at the possible health effect of these chemicals based on their concentration and toxicity. We take these three elements and crank them through this quantitative risk assessment process, and you come out with some results showing if there are human health and ecological risk associated with the site.

We found for the current use, which is nothing, there is no unacceptable human health risk associated with the site. There are no risk drivers, there are no chemicals in the soil, surface water or sediment entering the environment. There are issues with deep groundwater but just walking around the site one is not going to be exposed to those. So currently the site is safe.

Under the hypothetical future use residential scenario, where someone would build a house and put in a well, there would be an unacceptable human health risk from that exposure.

No one is currently exposed to the contaminated groundwater. It is above drinking water standards, but no one is currently exposed to it. There are no issues with surface soils, sub-surface soils, surface water and sediment, just the groundwater.

A risk assessment is also done for ecological impacts. A screening level risk assessment was conducted, and no ecological impacts were identified.

Comment by Kevin Koepenick: We do keep track of every contamination case in the County that we are aware of. When Mollie Court was being developed, we looked at it very closely, and at the time we did not feel like it was a risk, so we let the wells be drilled, but required they all be sampled for volatile organic compounds prior to issuing any use and occupancy. We looked at it, did not think it was going to be a problem but required the testing, so we were aware of it at the time. The Army went ahead and sampled again as a follow-up. The worse-case scenario if something was detected, there are treatment technologies such as activated carbon that could be put on, and we would have required some sort of treatment technology had there been any problems. Just a side note so you know what Baltimore County is looking out for when we do issue well permits or building permits.

Questions by Community Member: You may have answered my question, but the only problem is with the groundwater? Nothing with leaching, the soil, no problems with dust? The only migration is in the groundwater itself? And, TCE dissipates in air? Are we breathing the TCE?

The deep groundwater is where the contamination is. The shallow groundwater levels have declined below the drinking water standard. And, yes a volatile organic compound will dissipate in the air, but at this site it is not an issue as the contamination is deep and there is clean water above it. So there would be no vapor issue at this site.

Question by Community Member: Were the people purchasing the homes informed of the potential problem or that there was consideration of a potential problem?

Response by Kevin Koepenick: There was no specific requirement that we had that anyone be notified. We did the well sampling prior to occupancy as a precautionary measure. The only issue would be if we did find something then we could, and we often do this, require something be recorded in the deed that some type of treatment technology would be required. But if it comes up clean, then telling someone there might be a problem is a false level of concern because we didn't find anything, and the Army still hasn't found anything. And, I don't believe the contamination on the site is moving in that direction.

[Tim Llewellyn continued.] Yes, we agree. The groundwater is flowing to the north and south primarily, so it would be a long shot that these would be impacted, but we wanted to cover all the bases.

Now, let's talk about the remedial alternatives that we evaluated. Again, we are proposing an active remedy. I talked about the Feasibility Study in the beginning of my presentation where we assess a spectrum of alternatives. We know we have a plume of TCE at depth in groundwater in fractured bedrock. We set three cleanup objectives for this site. The first is to prevent human exposure to groundwater that would cause unacceptable risk over the duration of the response action. I talked about the risk assessment, and we said if someone drank that groundwater at that spot, there would be an unacceptable health risk. It takes a long time to clean up groundwater so during the

period of time we are cleaning this up if we go forward with the proposed remedy, we want to make sure no one is going to access that water. We will do that through land use controls. We want to achieve the drinking water standard for TCE and its breakdown products in groundwater. And our final objective is we want to restore groundwater to beneficial use in a reasonable timeframe.

We looked at a broad spectrum of technologies, and we reduced those down to four alternatives. The first one is no action. Under CERCLA, we are required to look at no action as a baseline, what would happen if you didn't do anything. The second one is monitored natural attenuation combined with land use controls. We know the contamination is dissipating on its own, there are natural processes that are breaking down the compounds, but it is taking a lot longer than we would like it to. If we just let it go the way it is, we estimate it will take about 50 years for it to go down to drinking water standards. So it is an option to keep monitoring it and put land use controls in place, so no one can build a house and drink the groundwater there.

[Mr. Fluck asked Mr. Llewellyn to elaborate on land use controls.] The easiest way to explain it is a deed restriction. We would put a land use control plan in place which would prohibit any use of that site which would cause a risk such as putting a well in the ground or building a house. There would be a legal impediment on that property to building a house or putting a well.

Comment by Mr. Fluck: Other things that are land use controls are fences and posting signs. Land use controls is a very broad term.

Question by Community Member: We know with MTBE it can fluctuate. With this type of contamination, TCE, does it only go downward or can it fluctuate?

All contamination will fluctuate. Let's say we have TCE here at 250 parts per billion in a sample today. A week later it might be 240 parts per billion. A week later it might be 260 parts per billion. It is going to fluctuate slightly, but over the long trend, if you sample it in 2009 and its 500 parts per billion, and you sample it in 2010 and it is 400 parts per billion, and in 2011 300 parts per billion, it is slowly going down. It is always going to fluctuate slightly due to lab variances or water flow, but it is the long-term trend that we assess. When you start to get close to the drinking water standards, at the detection limits, the fluctuations become more important because all of a sudden apparently it is not there anymore but might reappear later due to these fluctuations.

Alternative 3 is the first active alternative that we considered and is where we would do in-situ chemical oxidation. In-situ means we would treat the contamination in the ground, we would inject additional chemicals that would breakdown quickly on their own but also breakdown in-situ the solvents in the groundwater. The chlorine atoms would break down from the carbon chains and slowly reduce those to harmless byproducts. We would put in some wells, inject the material into the ground, and treat it in-situ. We would combine that with monitored natural attenuation and the land use controls. The issue with active remedies is as the concentrations get lower and lower,

those active remedies because less effective. We want to knock down the contamination concentration and then let monitored natural attenuation take care of the rest.

Alternative 4, our preferred alternative, is a directed groundwater recirculation system combined with monitored natural attenuation and land use controls. This is an ex-situ system. We just talked about a system where we would inject chemicals into the ground. This is a system where we extract the groundwater, treat it at the surface with carbon, and then re-inject the water through a series of wells.

Question from Community Member: Is there is a risk these oxidating chemicals could cause another problem?

Part of the reason we didn't go with the oxidation alternative, that while it is an accepted technology used often, is that we are in a fractured rock environment here. We are never really quite sure where it may go in the fractures. There are residences around here, so it may also mobilize the metals just temporarily because the chemical is not long-lived in the environment.

Under CERCLA we are required to evaluate the alternatives against nine criteria. The first two are threshold criteria; in order to advance an alternative, it has to pass the threshold criteria and be protective of human health and the environment and comply with applicable regulations. Then we consider is it effective in the long-term, will it reduce toxicity, mobility and volume of the contaminant? Is it effective in the short-term? This is important as there are local populations around the site, there are site workers who will implement the remedy, and there could be short-term risk to the population or workers. Is it implementable? Is it cost effective? The final two criteria are state acceptance (MDE acceptance) and community acceptance which is why we are here tonight.

I'm going to discuss each of the alternatives and the nine criteria. The No Action alternative it not protective, does not meet applicable regulations, it is not effective in the long-term, it does not reduce toxicity or mobility more than it normally would. It is effective in the short-term because there is no risk under current land use as no one is drinking the water out there. Taking no action is always easy to do and does not cost much.

Here is the evaluation of the monitored natural attenuation and land use control alternative. The human health risk is controlled by eliminating the potential exposure to TCE in groundwater through land use controls. It does comply with applicable regulations as we are monitoring the groundwater and will get to drinking water standards but will take about 50 years. It is effective in the long-term through the land use controls. We do know natural attenuation processes are happening and reducing the toxicity and mobility. It is effective in the short-term because monitoring wells are already installed. The alternative is readily implementable at a relative low cost.

We talked about the chemical oxidation and why we are not leaning in this direction. There are issues with injecting the chemical into the ground even though we do this at other sites. It passes the criteria as we do control the health risks with the land use controls while this is happening and in-situ treatment of TCE. It does comply with the regulations, it is effective in the long-term, it does reduce the toxicity and mobility. It is effective in the short-term as we can control the risks to the workers. It is moderately complex, but we do this all the time. It is the highest cost alternative but still cost effective.

The preferred remedy is the directed groundwater recirculation. This also passes all the criteria through the treatment of TCE at the surface. It meets applicable regulations, is effective in the long-term by physically treating the TCE, it is effective in the short term, it is implementable, it is the second highest cost but still cost effective.

This is what we would propose to do. We would use a single extraction well on-site. We would use the existing well which is already contaminated since with the fractured rock you could put a well right next to it and not find contamination. We would extract the groundwater. There is not a lot of water in this rock, so we are probably looking at 10 or 15 gallons per minute. The extracted groundwater would be brought to the surface and treated with carbon units; TCE is stripped off with this pretty common technology. Sometimes carbon treatment systems are used in homes. Once that groundwater has been cleaned, it will be injected into three new wells we would install and set up a groundwater recirculation system on the Army property.

We would operate that for about five years and then begin to get diminishing returns and we would shut that system down. The concentrations would be substantially reduced at that point, and we would default back to monitored natural attenuation for the remaining years. We think we would meet the groundwater standards within 10 or 15 years of system start-up. Unfortunately, groundwater remedies are always long in duration, sometimes 30, 40, 50, or 100 years in duration. It takes a long time, particularly in fractured rock. Compared to the no action alternative time of 50 years, we can substantially reduce that time.

Question from Community Member: What is the time frame for Alternative 3?

It is the same time frame of 10 to 15 years for unrestricted use.

Question from Community Member: With re-injection do you risk disturbing the plume and pushing it to the west?

No, we don’t believe that to be the case as we will be pulling enough water from the extraction well and just flushing it back into the system so there is no net gain to the system.

Question from Community Member: What is the depth of the extraction well and the three re-injection wells?

All of them would be approximately 100 feet deep.

This is a graphic of what it would look like. Here is the high point of the plume where we want to knock down that concentration. We are going to go right to the center of the plume and start pumping it, 10 to 15 gallons per minute, that will start to pull the contamination back to where it started from. We will treat it and then re-inject it into these three wells that we would install on-site and set up a recirculation system. The water being re-injected will be clean.

Here is the extraction well, about 100 feet deep, pulling water out of here, coming to the surface, going through an activated carbon unit here, clean water comes out the other side. We re-inject the water into one of these three wells, and we set up our recirculation system. The dirty water comes out, it gets cleaned, and clean water starts to flush through the dirty water. We don't know what this system will look like as we have not built it yet. We have built a number of these systems, and these pictures show what it potentially could look like. We may have the sheds with the equipment inside and connected through buried trenching.

Question from Community Member: So the carbon system would be in sheds and how big would they be?

You can see we have a treatment building over here which is slightly larger than the well houses and there would be connections, in this case above ground. I would anticipate we would have some relatively small sheds for the well heads and a slightly larger treatment building with the carbon units, perhaps a 10 foot by 10 foot treatment building. It is also possible to not have sheds over the well heads, but there would need to be some type of small building for the treatment process.

Question by Mr. Paul Fluck: Does having a small building on the site cause any concerns?

Comments by Community Members: I think some people thought it would look like the Exxon on the corner. Also with respect to signage, certain types of signage could bring more attention and impact property values. Would like something aesthetically friendly.

Comment by Mr. Paul Fluck: That is something we can do and that is the kind of comment that I really would like to get from folks here. How we can make this work in your community. This seems like a great technology for us, but we are also very sensitive that it will be in your backyard so we want to do it in such a way as to be as unobtrusive as possible. We can do vegetative covers, we can put insulation to make it as quiet as possible. I would encourage you to write this down as a comment and share it with us.

Question by Community Member: Is this going to be monitored or manned?

There will be regular groundwater monitoring. Typically, we would do quarterly monitoring for the first two years. We would have secondary containment in case a spill happened, and we would have instrumentation so we would know something happened. It would automatically shut down. We would not have someone there on-site as it should run itself, but we would be able to monitor it from the office.

Question by Community Member: Is BGE going to supply the power or a generator?

BGE would supply the power.

Comment by Mr. Paul Fluck: I would encourage you to now state your comments. Our recorder will take them as a comment and we'll take it as an action item so you don't have to actually send us anything in the mail or email.

Comment by Community Member: I am concerned about aesthetics of buildings in that area and bringing attention back to what is going on in that area in terms of property values and aesthetics.

This is going to be very unobtrusive. You'll see a drill rig similar to the one used about a year ago. It will be there for a week or perhaps two weeks. You'll see some minor construction activity while we are putting wells in, but these are not that much different from a domestic well. There will be a small unobstrusive building we can landscape. The noise level will be about the noise level in this room.

Comment by Mr. Fluck: I'd like to point out that the system is not going to be at the gate, but will be several hundred feet off the fenceline inside the site.

Comment by Community Member: There are other houses back where the extraction well is going to be, and they have the same concern.

We can set that building back a little bit from the fence; it doesn't have to been right next to the extraction well.

Comment by Mr. Paul Fluck: After the system is put in and operating, if there is a concern, call me and I'll do my best to address the concern.

We would like to do the action this winter. We can continue to talk to you when we are on-site and show you what we are doing.

Comment by Community Member: After you gather comments and look at everybody's input, how will you notify us of the decision?

Under the CERCLA process, we gather all your comments and address them within the Decision Document. There will be a draft document you can look at and

review. When it goes final, there is a public notice in the newspaper announcing the final decision. In addition, Paul may want to do some additional outreach.

Comment by Mr. Paul Fluck: We also have other avenues to reach out to the community. We can email the participants here, we can do a press release, and we can put notices in additional newspapers.

Comment by Community Member: We want to absolutely make sure that our neighbors who are not present know what is going on. They did not get the information about the meeting. I let some of them know, but they already had other commitments and could not be here tonight.

Comment by Community Member: What is the Federal government's plan for use of the property? Are you looking to sell the land as surplus?

Response by Mr. Paul Fluck: What is driving this is our overall concern for the community's well being. We want to move as fast as we can, not just for this one, but for all of our cleanup projects. We have metrics and our metrics are developed to be as protective as possible. So it appears that we are rushing, but we are not. We are moving in a very deliberate fashion, but we are doing so as quickly as possible for a lot of different reasons. One, for economic reasons. Two, because we have our own metrics to be protective. And, of course, this property as it stands right now is a liability to us and that is not something that is in the government's best interest. This property is not being used for any military operational activities. I have talked to the appropriate people at Fort Meade, and they don't see any future operational activities occurring at this site. Therefore, that makes this site a liability as we still have to mow it and take care of it, so there is a cost. We are very much a cost-constrained organization right now so we want to unload this property as soon as we can. There is a very specific way of disposing of property like this, and there is a pecking order. What would happen is the Garrison Commander or senior commander would have to make a determination that this is excess or surplus to Fort Meade's mission. It would then go up the chain of command and through a series of approvals. If all the senior leaders agree it is surplus, we will dispose of the property. The property would first be made available to other Army agencies to see if they had any interest in the property. Next, it would be made available to other Federal agencies. If there is interest, we would have to entertain that interest. The base commander has the option to say no. After that, it would go to state and local government, and after that it would go on the commercial market, and the General Services Administration is responsible for ultimately disposing of it; in this case, it would probably be auctioned off. We have options as to when that process starts happening. Regulation 405-90 allows for the Army to dispose of property that is contaminated under certain circumstances, and we can dispose of it now, we can dispose of it sometime in the near future, or we can simply wait until it is clean, meaning all the Federal criteria for groundwater quality standards have been met. That is a decision the Army has to make and also a cost-benefit analysis. We are talking about a parcel of land that will have a certain value and that gets considered with the liability associated with that land.

Question from Community Member: If you sell it now, do you still retain the liability of doing the cleanup?

Response from Mr. Paul Fluck: We will still clean it up, but there will be certain encumbrances on the deed and that potentially affects the marketability of the property. Right now, the preliminary thinking, which can change, is we want to give the system a few years to make sure it is operating successfully. We want the system to demonstrate the contaminant levels have decreased significantly, and at that time several years from now, the Army will re-visit the issue of should we dispose of it now with some liability or wait a few more years until all the liabilities are gone.

Question from Community Member: Is there some way you can continuously inform the public what the Army is considering?

Comment from Community Member: There is one way already. The Jacksonville Association has a link to this on its web site and will be monitoring on an ongoing basis and keeping the community informed.

Response from Mr. Mick Butler: We have another Nike Site, Granite. For years, they had a homeowners association or community association that would write to my boss, the Director of Public Works, and ask for an update. Sometimes they would ask for a person to come out, and periodically we went out in person to say this is where we are in the process. Some years we just wrote them a letter. If you have that community interest group that takes it upon themselves to query us, we'll keep the communication going back and forth.

Response from Mr. Paul Fluck: One of the things we have done in the past is we have made ourselves available to local community and civic groups. For example, your organization is welcome to call me and invite us down for a briefing. We have another way that we communicate with the community and that is through our web site which is updated on a regular basis. The web site address is www.ftmeade.army.mil and you'll see a link for Environmental Programs and then follow the link for Phoenix. The important documents that Tim has talked about, including the Proposed Plan, are on the web site, and we update the text on the web page with the status of where we are. We already have a mechanism to keep the community informed with a running update of what we are doing, but we are always available to communicate.

Comment from County Councilman Todd Huff: If you provide the information to my office, we can send the information directly to each address.

Comment from Mr. Paul Fluck: Yes, we will work with the homeowners association and Councilman Huff's office.

Question from Community Member: When eventually the water is cleaned up and potable, is the water of those of us on the community well system going to be affected? Will we always have that water?

Response from Mr. Paul Fluck: No, ma'am, it will not be affected and yes, you will continue to have that water.

Question from Community Member: I know 10 to 15 gallons per minute is a small amount, but you are sure that is not going to impact homes on Mollie Court or other homes with wells? Is the extraction well going to pull water away from the homes?

Response from Mr. Tim Llewellyn: We do not believe that is the case. If this is the selected remedy, we will do some pre-design work and verify that. We have already done some of that work and don't believe that to be the case. As you pointed out, we are not extracting any water from the aquifer, we are putting it all right back in again, and that is part of the reason we are doing that.

Response from Mr. Paul Fluck: If for some reason, it did not work out in the way we had anticipated, the Army still remains responsible, we will still meet our statutory obligations and our obligations to the community. Just because we are going to do this and we are going to finish, does not mean we are going to walk away until we are absolutely sure it is right.

Question from Mr. Kevin Koepenick: I am very happy the Army is where they are right now with this, but in all sincerity, why did it take 30 years to get to this point? It was in the early 1980s that this was identified. I'm curious what the process was and what the hold-ups were.

Response from Mr. Mick Butler: My perspective is when the Army knew it had a problem, it put the community water system in place to address the most risk and have effectively been doing monitored natural attenuation every since. Unfortunately Fort Meade proper had more than 150 sites that had to go through a similar process and that took the lion's share of the money. However, when throughout Maryland, we saw groundwater contamination, we saw studies that made assumptions that were incorrect, not just at the Army but at other sites across Maryland, that shed a light on our process and we said we can't make it worse by not doing anything. It was a process of prioritizing the sites we knew had potential exposures, and this site from a priority perspective and risk perspective was a lot lower down on the list than the ones where the Army lives and plays at Fort Meade. Again, I was not here before 2004, but we basically got into a process where they thought they had fixed the problem by putting in the community water system. Our metric now is to restore the groundwater to productive use. Doing nothing, which is what we are doing now, would get us there in 50 years and as long as no one else is going to use the water, it really didn't surface to the top of the list. We changed our perspective based on where the contamination is and the other groundwater issues across the state. We said we are not going to be on that list of causing additional problems in the future and that logic changed since 2004.

Response from Mr. Paul Fluck: I would simply add there were for a particular period of time some structural difficulties in how the Army was contracting. There were

some funding constraints and there were some priority issues. When we got our hands around those issues and started to understand those issues, we realized those issues were constraining our ability to move in an affirmative and rapid fashion. I'm talking from the mid-1990s up until the early to mid 2000s. Things were happening but they were happening very slowly and one little chunk at a time. We looked at that process which was causing this ad hoc approach and said this is not how the Army wants to do business. The Army wants to do things in a more holistic fashion and more comprehensively and more smartly. Environmental problems don't get less expensive as time goes by, they generally get more expensive because they often grow larger before they start attenuating. From a structural perspective, we realized we had these problems and we fixed them. That fix was quite literally a different contracting method, a different procurement method and that eliminated a lot of constraints our contractors had and with that we added a different type of metric within the contract. Prior contracts were something like do this, one thing at a time, and we would struggle to find the money and the contractor would do it. In this particular case since 2009 when ARCADIS was awarded this particular contract, this is just one of many sites they are responsible for, the metric was much different. The metric was in simple terms to clean up the site and you have so much time to do it. So no more ad hoc stuff. We removed a lot of the procurement problems, we removed a lot of the funding issues, and as a result ARCADIS in collaboration with the Army and regulatory community was able and is able to move much more rapidly.

Question from Mr. Kevin Koepenick: Why is this site being handled differently than the Launch Control Area which also has residual contamination and which the County owns?

Response from Mr. Paul Fluck: The way the law is written, the Defense Environmental Restoration Program which was enacted in 1986 under the Superfund Amendments and Reauthorization Act, there are three basic programs under which the Army can clean up sites. There is the Installation Restoration Program, the Military Munitions Response Program, and a separate category called Formerly Used Defense Sites. Formerly Used Defense Sites are not cleaned up, are not addressed, and don't fall under the responsibility of a garrison commander or senior leader. They are cleaned up by the Corps of Engineers, so it is a very different structure and different color of money, different organization and they have different procedures. We recently talked to the project manager for the launch control site, and they are still having some of the problems we had in the 1990s and early 2000s with the funding and procurement procedures and they are getting over that right now. I am to understand they are in the RI/FS phase, slightly behind us, but they don't have the kinds of problems we have. From what I am told, their problems are smaller and more confined. It is a soil problem not a groundwater problem.

Response from Ms. Lis Green: The Formerly Used Defense Sites are sites that were transferred out of DoD control prior to 1986, so the launch control site goes through the Army Corps of Engineers. This site is still owned by the Army so it is handled through Fort Meade.

Comment from Community Member: The extraction well and reinjection wells are about 100 feet in depth. In the event anywhere around here someone wants to build a new house and drill a well, the likelihood of getting away through Kevin with a well as shallow as 100 feet would be about an impossibility in Baltimore County. I wonder if you would care to comment on considerations of depths below the 100 feet. I think most people that are here with wells are way beyond that depth.

Response from Mr. Tim Llewellyn: We don't believe there are potential problems below the 100 feet depth. Most of the groundwater is circulating in that first 100 feet. The reason a lot of the domestic wells around here are much deeper is as we've said a number of times it's hard to get water out of this type of rock. Basically domestic wells are drilled deep enough to actually serve as a storage tank as we may only be able to get 10 gallons a minute. Most of that water is probably coming from the upper 100 feet. Going down to 300 feet provides a lot more water, not necessarily water coming from fractures, but the well fills up.

Response from Kevin Koepenick: Bedrock wells are cased usually just in the bedrock so if your bedrock is 30 or 40 feet, the casing goes down just inside the bedrock and the rest of the well is an open borehole. Between 40 feet and whatever depth it is, say a 600 foot well, you actually have about 500 feet of open borehole so the water can come in at any point. The reason people go deep is because of well yield; they want a bigger reservoir to pump water so they can meet their minimum well yield of one gallon a minute or 500 gallons in a two-hour period. There are some state requirements that dictate the depth and that is why people say we are drilling deeper now when in actuality it is really just measuring under a different standard. You are trying to meet a certain gallon per minute yield and the way they measure yields have changed from before the 1970s to what they do now. It is a little bit of a misunderstanding about depths and where the water is coming from as it is often coming from a much shallower area of the aquifer. The frequency of fractures significantly decreases below 300 feet.

Mr. Llewellyn continued his presentation.

The Proposed Plan is available for public review in the local library, at Fort Meade, and on the web site at www.ftmeade.army.mil/environment and then click the link for Phoenix.

Question from Community Member: Will the slides and graphics from tonight be available on that web site?

Response from Mr. Tim Llewellyn: Yes, all the slides will be on the web site.

Written Comments will be accepted until September 13 and must be postmarked by September 13. They can be sent to Mary Doyle at the Fort Meade Garrison or to Lis Green at MDE.

Question from Community Member: Do you have all your permits?

Response from Kevin Koepenick: They do get their permits through us for wells and they will get building permits for putting structures on the site. With being the Federal government, we don't charge them a fee but we go through the process to make sure it is documented in the system.

[Tim Llewellyn resumed.] I want to make sure we've addressed all your concerns and questions.

Comment from Col. Francis Coulters: Paul and his staff's job is to keep the public informed of activities specifically related to restoration of the site. Another organization is responsible for public outreach for when we transfer the property, so it may not be Paul. If Paul has information during these meetings, he can provide it but it is not Paul's specific task to let the public know of the property being transferred out of Army control.

Comment from Community Member: That is very important to us.

Comment from Col. Francis Coulters: It is a completely separate organization. I think it is the Corps of Engineers who is responsible.

Comment from Mr. Paul Fluck: The Corps of Engineers is ultimately responsible for disposal of the property. Up until a point, I would be your technical point of contact. When it is decided the Garrison Commander and senior leaders want to dispose of the property and they reach out to the Corps of Engineers, that is when I would reach out to the community and advise of the new point of contact. However, that is several years away. In the meantime, I will keep you informed.

Question from Community Member: If the plan goes through, what would be the timing for seeing someone on site?

Response from Mr. Tim Llewellyn: We would like to do the work this winter.

Closing by Mr. Paul Fluck

Since this is our first meeting, I would like some feedback if this is the kind of information that you found useful, did we convey the information to you in a manner that you found understandable, and were you satisfied with what we had to say. Several members of the audience said "Yes."

We are available to do this again sometime in the future. I may actively reach out to the community when we get to another important milestone, and we may decide collectively to have another meeting. The restoration process is very important to us and the community as we want to ensure the community's water supply is safe and that is the top priority for me personally and for the Army. We want to have a clear and transparent

program and we are going to demonstrate that and you can challenge us on that. Keep asking questions, keep participating, and keep working me for in a sense I work for you.

The meeting was adjourned at 8:56 p.m.

Katrina A. Harris
Bridge Consulting Corp.
Meeting Recorder

APPENDIX C
RESPONSES TO COMMENTS

Response to Comments Table

Draft Decision Document, Phoenix Military Reservation, Jacksonville, Maryland

August 2013

Response Code: A = Agree with comment D = Disagree with comment C = Comment requires clarification N = Comment noted, no action required or taken

Comment Number	Commenter	Date of Comment	Page(s)	Section	Line(s)	Comment	Response Code	Response
1	MDE	9/4/2013				For non-National Priority List sites in Maryland, the Maryland Department of the Environment (MDE) does not typically sign the Decsion Document. Instead, MDE provides concurrence in letter form. Please remove the signature line for MDE from § 1.7 of this document.	A	Revised as requested.
2	MDE	9/4/2013				Upon completion of the Public Comment period, MDE will review the Army's responsiveness summary prior to final approval of the the Decision Document.	N	Comment noted.
3	MDE	9/4/2013				Appendix A (Certificates of Publication) did not contain the certificate of publication in either the paper copy of the document or the electronic copy provided on CD. Please ensure that this is certificate is included in the final version of this document.	N	Appendix A will be included with the Final version of the Decision Document.
4	MDE	9/4/2013	2-4	2.6		This section needs to be expanded to include a discussion on the use of groundwater in the vicinity, and also the potential future use of groundwater as a drinking water source, should the property be transferred. Please refer to § 6.3.6 of US Environmental Protection Agency (USEPA) guidance ("A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Remedy Selection Decision Documents", USEP A, 1999) regarding the level of detail that should be included in this section.	A	Supporting information was added to Section 2.6. The revised paragraph is provided below: "The PMR is currently vacant and surrounded by a fence. All structures have been demolished and removed. Currently groundwater is not used onsite. Residential dwellings are located directly adjacent to PMR to the north, south, east and west and multiple homes to the south/southwest and east are on potable wells. Continued use of the potable wells at these residential dwellings is anticipated for the forseeable future. It should be noted that residential dwellings to the south along Sunnybrook Road and to the northwest of PMR are on a community water supply system not potable wells. The future use of the property at this point is undetermined. Transfer of the property is not anticipated, however, under the selected Alternative, LUCs include a groundwater use restriction at PMR to prevent uncontrolled exposure to groundwater until it meets the groundwater protection standard and is returned to its beneficial use."
5	MDE	9/4/2013	2-5	2.7.1		Please include the actual calculated risk numbers for hypothetical future on-site adult and child resident exposure to groundwater, rather than just stating that the number exceeds UPEPA's target risk range.	A	The calculated risk values were added to the paragraph below: "According to the HHRA, cumulative cancer risks for hypothetical future on-site adult and child residents exposure to groundwater exceed the USEPA target risk range of $1x10^{-6}$ to $1x10^{-4}$ for health protectiveness and the cumulative non-cancer hazard indices are greater than 1, with the total incremental estimated cancer risk of $2x10^{-4}$ and a non-cancer hazard of $6x10^{1}$ indicating that adverse noncarcinogenic effects could potentially occur."
6	MDE	9/4/2013	2-5	2.7.1	Paragraph 3	The final two sentences of this paragraph indicate that Altemative 4 would limit uncontrolled exposure to groundwater until it is retumed to its beneficial use. This statement is not appropriate to include in the discussion of risks at the site. Please remove this statement or move it to another section of the document, such as the description of the selected remedial action. The "Summary of Site Risks" section should only include discussion of site risks, not how those risks will be addressed by the preferred Remedial Altemative (RA).	A	The referenced sentence was deleted from Section 2.7.1 and relocated in Section 2.6.

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7	MDE	9/4/2013	2-6	2.7.2		The "Summary of Site Risks" section should conclude with a clear statement regarding the basis for action at the site(§ 6.3.7, USEPA, 1999), such as the following: "The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment."	A	The following sentence was added to conclude Section 2.7: "The selected response action in this Decision Document is necessary to protect public health or welfare and the environment from actual or threatened releases of hazardous substances into the environment."
8	MDE	9/4/2013	2-11	2.11.3.1		Please expand the text of this section to include that MDE does not concur with RAs l, 2, or 3, and concurs with RA 4 because it fulfills the nine criteria to the greatest degree.	A	The following sentence was added to Section 2.11.3.1: "The MDE does not concur with Remedial Alternatives 1 through 3 as presented, but does concur with Remedial Alternative 4 because it fulfills the nine threshold criteria to the greatest degree."
9	MDE	9/4/2013	2-12	2.13.2	Paragraph 2	The text states that the Directed Groundwater Recirculation system is assumed to operate for 5 years. What criteria will be used to determine when the system can be shut down? This should be discussed in this section of the document.	A	The following paragraph was added to Section 2.13.2: "Operating the extraction at a rate of 1 to 5 gallons per minute and strategically reinjecting the treated groundwater at the extents of the contaminant plume is expected to decrease the TCE concentration at monitoring well FCA-1 by an order of magnitude within 5 years by greatly increasing the number of pore flushes in the aquifer. Based on the linear regressions completed for the Site, it is expected to take an additional 5 to 10 years (for a total remedial timeframe of 10 to 15 years) to achieve the cleanup goal of 5 parts per billion for TCE.