



REPLY TO  
ATTENTION OF:

DEPARTMENT OF THE ARMY  
US ARMY INSTALLATION MANAGEMENT COMMAND  
HEADQUARTERS, UNITED STATES ARMY GARRISON  
4551 LLEWELLYN AVENUE, SUITE 5000  
FORT GEORGE G. MEADE, MARYLAND 20755-5000

August 22, 2013

Environmental Division

Mr. John Burchette  
NPL/BRAC/Federal Facilities Branch  
U.S. Environmental Protection Agency  
1650 Arch Street  
Philadelphia, PA 19103-2029

Dear Mr. Burchette:

Enclosed please find the July 2013 *Final Action Memorandum, Operable Unit 4* (Memo). This Final version includes responses to comments received from the United States Environmental Protection Agency (USEPA) on June 10, 2013, included as Attachment 2 of the Memo. The Maryland Department of the Environment (MDE) and the Architect of the Capitol (AOC) did not comment on the Memo. Copies of the Memo have been furnished to Mick Butler (Fort George G. Meade), Fran Coulters (U.S. Army Environmental Command), Sherry Deskins (AOC), Elisabeth Green (MDE), and the Fort Meade Restoration Advisory Board.

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

Sincerely,

For:

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

Enclosure

**ACTION MEMORANDUM**

**Non-Time Critical Removal Action  
For  
Operable Unit 4  
Fort George G. Meade, Maryland**

**July 2013**

## I. Purpose

The purpose of this Action Memorandum (U.S. Environmental Protection Agency [USEPA], 2009) is to document approval of the selected removal action for the Operable Unit 4/Lower Patapsco Aquifer (OU-4/LPA), Fort George G. Meade (FGGM), Anne Arundel County, Maryland.

## II. Site Conditions and Background

### Site Description

The Installation Restoration Program (IRP) activities at FGGM operate under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and National Oil and Hazardous Substances Pollution Contingency Plan (NCP) requirements (40 Code of Federal Regulations [CFR] 300), with coordination and input from the USEPA Region III, and as appropriate, with other signatories of the FGGM Federal Facility Agreement (FFA) including the Architect of the Capitol. Coordination and input are also provided by the Maryland Department of the Environment (MDE). FGGM was proposed for the National Priorities List on April 1, 1997, and listed on July 28, 1998. An FFA, Docket number: CERC-03-2009-0207FF, was signed on June 19, 2009, and went into effect on October 6, 2009, following a public comment period. The IRP remediation activities are a component of the Defense Environmental Restoration Program (DERP) and are compliant with the DERP Manual (Department of Defense (DoD), 2012).

OU-4 is located on the southeast portion of FGGM and is bounded approximately by Chisholm Avenue (east), Rock Avenue (south), Wilson Street (west), and Huber Road (north). The site currently consists of various administrative and industrial-use buildings, new buildings under construction, and open grass areas. Historical uses in existing and former buildings within OU-4 include the post laundry facility, a motor pool maintenance facility, tank maintenance and repair shops, a heavy gun cleaning shop, warehouse storage buildings, and administrative office buildings. The LPA Study Area includes the volatile organic compound (VOC) contaminant plume originating from within the OU-4 Study Area and migrating in a southeasterly direction within the LPA and extending off-post into the residential area of Odenton.

The OU-4/LPA Study Area (**Figure 1**) was created to streamline and focus the investigation and cleanup process for the multiple sites and buildings in the southeast corner of FGGM and the comingled plumes from former source areas. Various soil and groundwater investigations have been completed in the OU-4 and LPA Study Areas to date and have identified that tetrachloroethene (PCE), trichloroethene (TCE), and carbon tetrachloride (CCl<sub>4</sub>) are the principal constituents of concern (COCs) in addition to associated daughter products.

### Current Land Use

The Site use is administrative and industrial. Land use surrounding the Site is predominately industrial with some residential dwellings bordering the western portion of the Site. The on-post LPA Study Area is located southeast of the OU-4 Study Area and is densely wooded and vegetated in most areas. The Closed Sanitary Landfill (CSL) is also located southeast of OU-4 in the LPA Study Area. Impacted groundwater within the LPA migrates off the Army property several thousand feet and under the town of Odenton to the southeast. Land-use off-site is mixed use with light industrial, transportation corridors, retail, and residential neighborhoods.

### Interim Actions to Address Hazards

Contaminant plumes have been defined within the LPA to the FGGM southeast property boundary. Existing monitoring wells installed between 2002 and 2004 in off-post residential areas east/southeast of the FGGM property boundary indicate that VOCs originating from within the OU-4 Study Area have migrated off-post within the LPA. PCE, TCE, and CCl<sub>4</sub> have been detected above Maximum Contaminant Level (MCL) drinking water standards in off-post LPA monitoring wells MW-125D and/or MW-126D installed to depths of 224.5 and 240 feet below ground surface (ft bgs) in the residential neighborhood east of FGGM. The most recent sampling event was completed in January 2013, and detailed results are presented in the Revised Final Off-Post Monitoring Well Sampling Report – Year 2 (ARCADIS, 2013). As a result of these detections in deep LPA monitoring wells, in 2009 the Army initiated a comprehensive survey of Odenton properties to locate and sample groundwater wells used for potable purposes. Approximately 75 potable wells within a one-mile radius of MW-125D and MW-126D were identified and sampled. No OU-4-related contaminants were detected above MCLs in areas located down-gradient of the OU-4 Study Area (e.g., residential areas south of Annapolis Road/Route 175). However, low concentrations (below the MCL) of related contaminants including PCE, TCE, and CCl<sub>4</sub> were detected at concentrations below MCLs at various residential wells south of Annapolis Road/Route 175 within the one mile radius. Bottled water is being provided by the Army to residences on private wells in the LPA Study Area at their request.

### **III. Threats to Public Health, or Welfare, or the Environment**

Section 300.415(b)(2) of the NCP lists several criteria to determine whether a removal action authority is appropriate. The factors most applicable to current site conditions at the OU-4 and LPA Study Areas are as follows:

Section 300.415(b)(2)(i) – Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants. As summarized above, if left unabated, elevated VOC concentrations in shallow groundwater in former OU-4 source areas near Buildings 2286 and Former Building 2276 will continue to impact the LPA drinking water aquifer which is used for potable purposes by off-post residents southeast of the installation. Additionally at Building 2286, Former Building 2276, and Building 2250, elevated COCs in sub-slab vapor concentrations present the potential for human exposure via vapor intrusion into existing, new, and planned industrial or administrative buildings. At Building 2250, seepage of elevated groundwater concentrations into an adjacent intermittent stream bed also presents a potential surface water exposure to human populations.

Section 300.415(b)(2)(ii) – Actual or potential contamination of drinking water supplies or sensitive ecosystems. As summarized above, elevated VOC concentrations in shallow groundwater in former OU-4 source areas will continue to impact groundwater at FGGM and in off-post residential areas as the groundwater continues to migrate to the southeast. While to date no MCL exceedances have been identified in potable drinking water wells down-gradient of the OU-4 Study Area (south of Annapolis Road/Route 175), VOCs have been detected above the MCL in deep off-post LPA monitoring wells in this area and at the FGGM property line. Increasing COC groundwater concentration trends have been confirmed in both on-post and off-post monitoring wells. Groundwater sampling at mid-plume monitoring wells located up-gradient of the installation property boundary indicate COC concentrations up to approximately 400 micrograms per liter (µg/L) (e.g. 410 µg/L at MW-37 located about 1,800 feet from the

property boundary). If left unabated, these elevated concentrations will continue to migrate in a southeasterly direction toward the off-post residential wells.

Additionally, the Anne Arundel County, MD 2007-2010 Master Plan for Water Supply & Sewerage Systems establishes conditions that would warrant construction of a 3.8 million gallon per day Kings Height water supply plant by the year 2030. The location of the County's planned King's Height facility is 4,000 feet directly down-gradient of the off-site well MW-126D which has MCL exceedances.

#### **IV. Endangerment Determination**

A streamlined risk and hazard assessment was conducted during development of the engineering evaluation/cost analysis (EE/CA) (40 CFR 300.415(b)(4)(i)) and focused on the potential safety hazards posed by the groundwater contaminant plume. PCE, TCE, and CCl<sub>4</sub> have been detected on and off-post at concentrations above USEPA drinking water standards and in sub-slab vapor above screening criteria. Further, off-post monitoring wells exhibiting elevated levels of contaminants are situated directly up-gradient of residential potable wells). Superfund Removal Guidance for Preparing Action Memoranda (USEPA, 2009) includes the following statement applicable to OU-4/LPA Study Area for removals involving hazardous substances:

"Actual or threatened releases of hazardous substances from this site may present an Imminent and substantial endangerment to public health, or welfare, or the environment."

#### **V. Proposed Actions and Estimated Costs**

The Final EE/CA was prepared in May 2013 in order to conduct a Non-Time Critical Removal Action (NTCRA) at the Site to address safety hazards associated with the groundwater plume. Both the USEPA and the MDE have endorsed the EE/CA for this removal action. The executive summary from the EE/CA is included as **Attachment 1**. The final remedy selected at the OU-4/LPA Study Area will be presented in a Feasibility Study and Decision Document and submitted following the completion of the NTCRA. Any required institutional controls would be documented in these subsequent documents.

The Remedial Action Objectives (RAOs) for this removal action, as stated in the EE/CA, are tailored for the three specific Areas of Concern (AOC) to mitigate, minimize, or eliminate the threat to human health and welfare from contaminated groundwater present within the OU-4/LPA Study Area. The RAOs and evaluated actions for the three areas addressed by the NTCRA at the OU-4/LPA Study Area are as follows:

##### **AOC 1 – Building 2286 and Former Building 2276**

*RAO: Abate hot spot groundwater concentrations (i.e., greater than 1,000 µg/L total VOCs) of chlorinated solvents (PCE, TCE, and associated daughter products) in the vicinity of FGGM86-MW08 (Building 2286) and OU4-SB-08 (Former Building 2276) to (a) prevent potential exposure to nearby human populations (via vapor intrusion into new/existing buildings; and (b) mitigate further degradation of the LPA drinking water aquifer due to continued contaminant migration from these hot spot areas toward off-post drinking water wells currently utilizing the LPA for potable water.*

The EE/CA evaluated the following Alternatives for AOC 1:

*Alternative 1: No Further Action*

*Alternative 2: In-Situ Enhanced Reductive Dechlorination (ERD) with Long-term Monitoring (LTM) of Groundwater*

*Alternative 3: In-Situ Chemical Oxidation (ISCO) with LTM of Groundwater*

The remedy selected in the EE/CA to attain this RAO is *Alternative 3: ISCO with LTM of Groundwater*. Alternative 3 would involve injection of sodium persulfate solution into the subsurface to achieve chemical oxidation of the COCs at this AOC. Alternative 3 proposes to deliver the sodium persulfate solution to the subsurface through an injection well network described in the Interim Remedial Action Work Plan (IRAWP) (U.S. Army, 2013a). The sodium persulfate solution would be mixed at the surface and pumped via a manifold to each of the injection wells. The selected concentration of sodium persulfate would be based on bench testing and the natural oxidant demand of the soil and groundwater at the Site. The frequency and durations of the injection events will be finalized following adaptive design testing.

#### AOC 2 – Building 2250

*RAO: Abate elevated sub-slab gas concentrations detected above industrial sub-slab screening criteria for PCE (2,100 micrograms per meter cubed) in sub-slab samples from the northwest corner of Building 2250 and the immediate vicinity to abate potential exposure to human populations currently working in the building via vapor intrusion into the building. Abate hot spot (i.e., greater than 1,000 µg/L total VOC) groundwater concentrations of chlorinated solvents (PCE, TCE, and associated daughter products) in the vicinity of VersarMW01, 02, and 03 to prevent potential exposure to nearby human populations from volatilization and vapor intrusion into the existing building and/or seepage into the adjacent intermittent stream bed.*

The EE/CA evaluated the following Alternatives for AOC 2:

*Alternative 1: No Further Action*

*Alternative 2: Air Sparge (AS)/Soil Vapor Extraction (SVE) with LTM of Groundwater*

*Alternative 3: ISCO with Vapor Mitigation with LTM of Groundwater*

The remedy selected in the EE/CA to attain this RAO is *Alternative 2: AS/SVE with LTM of Groundwater*. Alternative 2 would involve the installation of an AS/SVE system to treat COCs in the perched groundwater adjacent to Building 2250 and mitigate sub-slab soil gas through the SVE component of the remedy. Alternative 2 proposes the installation of a series of AS and SVE wells along with subsurface piping and manifolds described in the IRAWP (U.S. Army, 2013a). The adaptive design testing and anticipated system operation details are detailed in the IRAWP (U.S. Army, 2013a).

#### AOC 3 – LPA Study Area

*RAO: Abate elevated mid-plume concentrations of PCE, CCl<sub>4</sub>, and associated VOCs (e.g., 280 µg/L CCl<sub>4</sub> at SB38; and 410 µg/L PCE at MW37) to prevent continued migration of elevated VOC concentrations toward the FGGM property boundary where on- and off-post monitoring wells near*

*the FGGM property boundary are already showing increasing concentration trends as increasing VOC concentrations migrate off-post to the southeast toward existing residential wells.*

The EE/CA evaluated the following Alternatives for AOC 3:

*Alternative 1: No Further Action*

*Alternative 2: In-Situ ERD with LTM of Groundwater*

*Alternative 3: Hydraulic Containment with LTM of Groundwater*

The remedy selected in the EE/CA to attain this RAO is *Alternative 3: Hydraulic Containment with LTM of Groundwater*. Alternative 3 would involve the installation of a groundwater extraction/injection system in the LPA Study Area to pump extracted groundwater from the core of the plume, treat the extracted groundwater and re-inject down-gradient to enhance chemical flushing in the LPA. In this case, the captured groundwater will be treated via liquid phase granular activated carbon (LGAC). Alternative 3 proposes the installation of a series of extraction and injection wells along with subsurface piping, manifolds, and water treatment infrastructure described in the IRAWP (U.S. Army, 2013a). The adaptive design testing and anticipated system operation details are detailed in the IRAWP (U.S. Army, 2013a).

#### Anticipated Schedule

The Removal Action will commence in the summer of 2013 pending completion and approval of a NTCRA Work Plan. It is anticipated that field components associated with the system installation and startup in the three AOCs will be conducted over a three-month period. A proposed schedule will be included in the NTCRA Work Plan.

#### Estimated Cost

The estimated costs for the work described in this Action Memorandum are estimated as follows:

- Building 2250
  - Capital Costs - \$355,000
  - Present Worth Operation and Maintenance (O&M) Costs - \$218,000
  - Total Present Worth Costs - \$597,000
- Buildings 2276 and 2286
  - Capital Costs - \$526,000
  - Present Worth O&M Costs - \$1,368,000
  - Total Present Worth Costs - \$1,926,000
- LPA Study Area
  - Capital Costs - \$2,045,000
  - Present Worth Operation O&M Costs - \$2,234,000
  - Total Present Worth Costs - \$4,279,000

This includes contractor costs for performing the required site work, professional reporting and oversight fees, and follow up evaluations. A detailed estimate is provided in the EE/CA (U.S. Army, 2013b).

### Public Involvement

The EE/CA (U.S. Army, 2013b) is subject to a 30 day public comment period. The date for the public comment period is pending regulatory approval of the Final EE/CA document.

### Contribution to Remedial Performance

The proposed action will contribute to the efficient performance of any long-term remedial action selected at the OU-4/LPA Study Area by targeting hot-spot groundwater treatment on-post and enhancing flushing of the contaminant plume in the down-gradient LPA Study Area to returning the aquifer to its beneficial use. Although the final long-term remedy at OU-4/LPA Study Area is unknown at this time, this proposed action will begin treatment of the groundwater plume until the long-term remedy is in place.

### Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Section 300.415(i) of the NCP was considered when selecting applicable ARARs for the OU-4/LPA Study Area removal action. The EE/CA (U.S. Army, 2013b) included a full ARAR analysis of both Federal and State Regulations. The following ARARs were identified.

- Safe Drinking Water Act National Primary Drinking Water Regulations *40 CFR 141.61(a)*.
- Erosion and Sediment Control *Code of Maryland Regulations (COMAR) 26.17.01.07 and 26.17.01.11*
- Disposal of Controlled Hazardous Substances *COMAR 26.13.02.02, 26.13.02.03, 26.13.02.05A(2) and (3), and 26.13.03.01 through 26.13.03.06*
- Control of Noise Pollution *COMAR 26.02.03.02 - 03*
- Maryland Pollution Discharge Elimination System *COMAR 26.08.04*
- Underground Injection Control *40 CFR 144.1(g)(1); 144.3; 144.6; 144.11; 144.12(a); 144.24(a); 144.80(e); 144.82; 144.83, 146.8; 146.10(c)*
- General Emissions Standards, Prohibitions, and Restrictions *COMAR 26.11.06*
- Well Construction, Maintenance, and Abandonment *COMAR 26.04.04.02, 26.04.04.07, 26.04.04.10, and 26.04.04.11.*

The proposed action will, to the extent practicable considering the exigencies of the situation, attain the above ARARs.

### **VI. Expected Change in the Situation Should Action Be Delayed or Not Taken**

Should the response action be delayed or not taken, the continued migration of the groundwater plume will continue into the town of Odenton, Maryland, towards residential potable wells. Thus, there will be a continuation of conditions that are likely to pose an imminent and substantial danger to the public health and welfare.

**VII. Outstanding Policy Issues**

None.

**VIII. Enforcement**

Not applicable.

**IX. Recommendation**

This Action Memorandum describes the selected removal action to address groundwater contamination at the OU-4/LPA Study Area, Fort George G. Meade, Maryland, developed in accordance with CERCLA as amended, and is consistent with the NCP. This decision is based on the administrative record file for the OU-4/LPA Study Area.

The U.S. Army is the lead agency. This Action Memorandum will be incorporated into the larger Administrative Record File for Fort George G. Meade. Conditions at the Site meet the NCP Section 300.415(b) criteria for a removal action. This document, presenting a selected remedy with a present worth cost of \$6.8M, is approved by the undersigned. Based on analysis presented in the EE/CA, the recommended action is appropriate and will be implemented in accordance with CERCLA requirements.

Both the USEPA and the State of Maryland have endorsed the EE/CA for this removal action.

APPROVED:



Mark A. Lee  
COL, CM  
Commanding



Date

**Attachments**

Figure 1: Operable Unit 4 and the Lower Patapsco Study Areas

Attachment 1: EE/CA Executive Summary

Attachment 2: Response to Comments Table

**References**

ARCADIS, 2013. Revised Final Off-Post Monitoring Well Sampling Report – Year 2, Fort George G. Meade, Maryland. July.

Department of Defense (DoD). 2012. Department of Defense Manual 4715.20. March 9, 2012. United States Department of Defense.

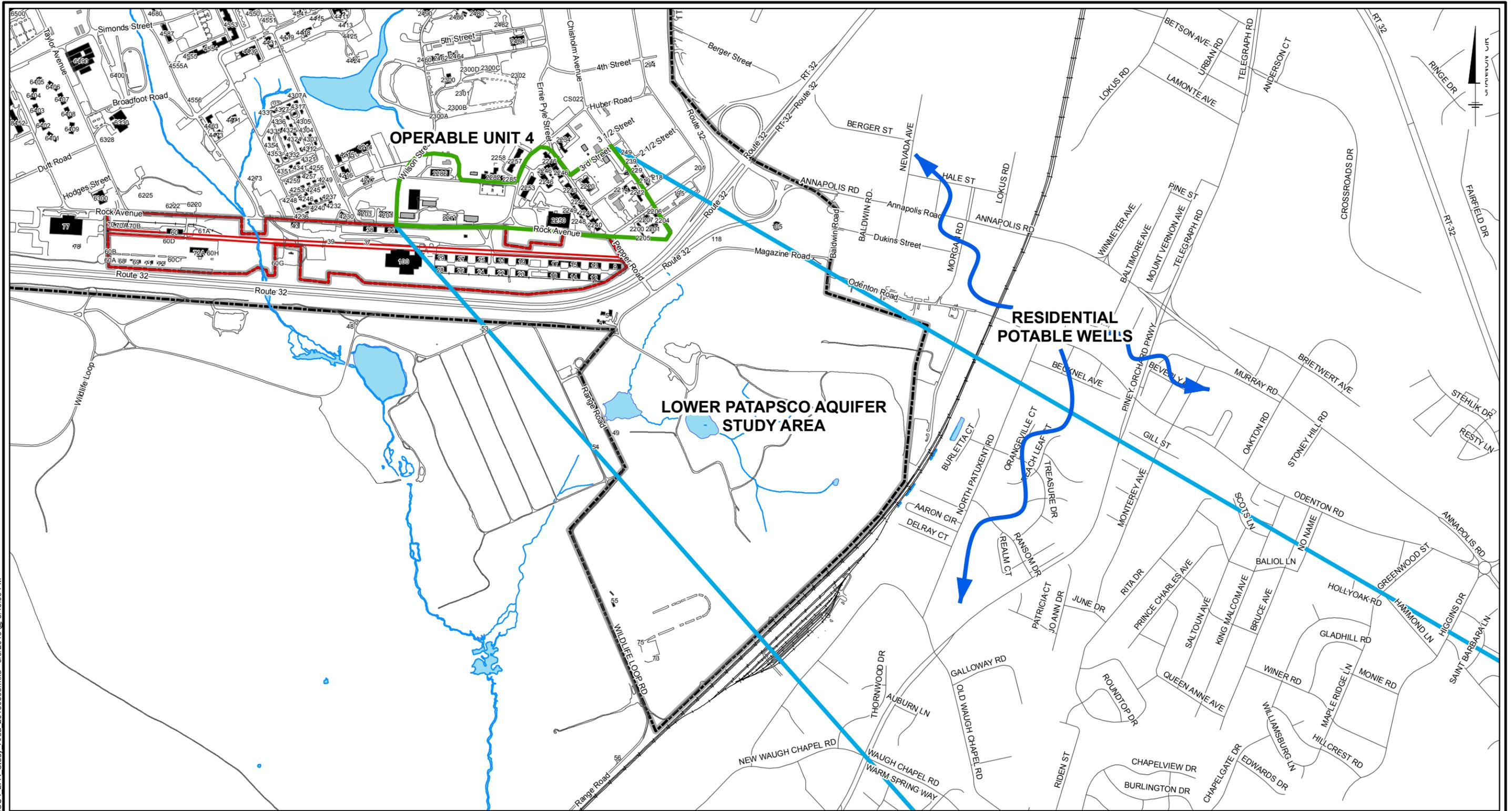
National Oil and Hazardous Substances Pollution Contingency Plan. 40 CFR Part 300.

U.S. Army, 2013a, Draft Interim Remedial Action Work Plan, Fort George G. Meade, Maryland, Prepared by ARCADIS U.S., Inc. May.

U.S. Army, 2013b, Final Engineering Analysis/Cost Analysis (EE/CA), Fort George G. Meade, Maryland, Prepared by ARCADIS U.S., Inc. May.

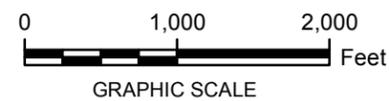
USEPA, 2009, Superfund Removal Guidance for Preparing Action Memoranda, Office of Emergency and Remedial Response, September.

**Figure**



LEGEND:

- ROADS
- RAILROAD
- DEMOLISHED STRUCTURES
- EXISTING STRUCTURES
- STREAM
- SURFACE WATER
- ARCHITECT OF THE CAPITOL PROPERTY BOUNDARY
- INSTALLATION BOUNDARY
- OU4 BOUNDARY
- LOWER PATAPSCO AQUIFER STUDY AREA



OPERABLE UNIT 4  
FORT MEADE, MARYLAND

**OPERABLE UNIT 4 AND  
LOWER PATAPSCO AQUIFER STUDY AREA**

**ARCADIS**

FIGURE  
1

CITY: MPLS. DIV/GROUP: IM DB: MG LD: KS  
FORT MEADE  
G:\GIS\Projects\Fort Meade\ArcMap\OU4\2013\OU4 LPA Study Area 20130305.mxd - 3/5/2013 @ 3:45:06 PM

**Attachment 1**

Executive Summary of the  
Engineering Evaluation /Cost  
Analysis

## Executive Summary from the Final Engineering Evaluation/Cost Analysis

This Engineering Evaluation / Cost Analysis (EE/CA) addresses the investigation of proposed groundwater remedial alternatives at Operable Unit 4 (OU-4) located on Fort George G. Meade (FGGM) and the Lower Patapsco Aquifer (LPA) Study Area located downgradient of OU-4, in the town of Odenton, Maryland. The OU-4 site consists of various buildings and demolished buildings with historical industrial uses and open grass areas. The LPA study area is located downgradient of OU-4 to the southeast and consists of a confined aquifer that outcrops at OU-4. The LPA is a drinking water aquifer dipping to the southeast and is approximately 110 - 140 feet (ft) thick, outcropping along the western portion of the OU-4 boundary. The depth to the LPA along the southeast FGGM property boundary varies between 100 and 120 ft below ground surface (bgs) and extends off-post beneath a residential area within the town of Odenton. The OU-4/LPA combined study area was created to streamline and focus the investigation and cleanup process for the multiple sites and buildings in the southeast corner of FGGM and the comingled plumes from known former source areas that are present at both OU-4 and within the LPA. This EE/CA evaluates three proposed remedial action alternatives to address groundwater contamination in three separate Areas of Concern (AOCs): Source Area 1 – Buildings 2286 / 2276, Source Area 2 – Building 2250, and the downgradient LPA study area. The EE/CA identifies the proposed response for conducting a Non-Time Critical Removal Action (NTCRA) for the treatment and/or containment of contaminated groundwater.

Various soil and groundwater investigations have been completed in the OU-4 and LPA study areas to date and have identified that tetrachloroethene (PCE), trichloroethene (TCE), and carbon tetrachloride (CCl<sub>4</sub>) are the principal constituents of concern (COCs) in addition to associated degradation breakdown (daughter) products.

- OU-4: Volatile Organic Compounds (VOCs) (primarily PCE and TCE) have been detected at elevated concentrations in the vicinity of two former sources areas, Buildings 2286/2276 (Former Motor Pool/Furniture Repair Shop buildings) and Building 2250 (Former Post Laundry). In 2009, PCE was detected at concentrations up to 2,400 micrograms per liter (µg/L) at FGG86-MW08 and 952 µg/L at VERSAR-MW03 which are located adjacent to Buildings 2286 and 2250, respectively. A Supplemental Remedial Investigation conducted between 2010 and 2012 defined the lateral and vertical extent of PCE, TCE, and CCl<sub>4</sub> contamination within the OU-4 Study area. In the Building 2286/2276 areas, hot spot groundwater concentrations exceeding 1,000 µg/L total VOCs provide an on-going source for downgradient migration of PCE, TCE, and associated breakdown products and continued degradation of the LPA drinking water aquifer. Additionally, these groundwater concentrations provide the potential for the accumulation of elevated sub-slab gas concentrations and vapor intrusion into existing, new, and planned industrial buildings located in close proximity to the hot spot areas. Similarly, at Building 2250, elevated concentrations of PCE have been detected in sub-slab gas samples exceeding sub-slab gas industrial screening criteria. Although no unacceptable health risks to building occupants have been identified, the elevated sub-slab concentrations represent an on-going potential health risk that is currently not controlled. Elevated hot spot concentrations of PCE in groundwater on the north side of Building 2250 provide the potential for continued accumulation of PCE in sub-slab gas beneath the building, as well as the potential for elevated PCE concentrations to seep into an adjacent intermittent stream bed.
- LPA: Contaminant plumes have been defined within the LPA to the FGGM property line. Existing monitoring wells installed between 2002 and 2004 in off-post residential areas east/southeast of the

FGGM property boundary indicate that VOCs originating from within the OU-4 study area have migrated off-post within the LPA. PCE, TCE, and CCl<sub>4</sub> have been detected above Maximum Contaminant Level (MCL) drinking water standards in off-post LPA monitoring wells MW-125D and/or MW-126D installed to depths of 224.5 and 240 ft bgs in the residential neighborhood east of FGGM. As a result of these detections in deep LPA monitoring wells, in 2009 the Army initiated a comprehensive survey of Odenton properties to locate and sample groundwater wells used for potable purposes. Approximately 75 potable wells within a one-mile radius of MW-125D and MW-126D were identified and sampled. While no OU-4-related contaminants were detected above MCLs in areas located downgradient of the OU-4 study area (e.g., residential areas south of Annapolis Road/Route 175), low concentrations (below the MCL) of related contaminants including PCE, TCE, and CCl<sub>4</sub> were detected at concentrations at various residential wells south of Annapolis Road/Route 175 within the one mile radius. The United States Environmental Protection Agency (USEPA) and the Maryland Department of the Environment (MDE) have approved an Army work plan for the installation of additional off-post deep monitoring wells to define the nature and extent of the impacted groundwater within the LPA in off-post areas. The Army and its contractors are currently negotiating access agreements with Anne Arundel County to drill the planned wells on public rights-of-ways. Drilling is expected to commence in late 2012 or early 2013. It should be noted that off-post plume delineation activities are not anticipated to impact the selection of the remedial alternatives presented in Section 4. Historical PCE and CCl<sub>4</sub> analytical trend plots for MW-126D (installed off-post in Odenton, Maryland) and MW-101D (installed on the FGGM southeast installation boundary) are provided as **Appendix A**. Five rounds of sampling at off-site well MW-126D have been conducted and have documented increasing contaminant concentrations. CCl<sub>4</sub> concentrations have steadily increased from 4.1 µg/L in 2004 to 64.3 µg/L in February 2012. Additionally, increasing PCE trends have been identified in an on-site well located on the downgradient Installation property line, MW-101D. At MW-101D, PCE concentrations have increased from 0.71 µg/L in 2004 to 23 µg/L in March 2012. The increasing trends at these downgradient wells indicate the arrival of the toe of the OU4/LPA PCE plume in this area. It is likely that this plume will continue migrating at increasingly higher concentrations toward residential wells southeast of the installation if left unabated.

Further justification for implementing a NTCRA is detailed in the OU-4 Approval Memorandum dated October 18, 2012 provided as **Appendix B**. The following bullet points summarize key points that warrant implementation of a NTCRA at OU-4/LPA Study Area:

- The actions proposed in the EE/CA will be presented as interim actions with final actions to be defined later in a ROD.
- At OU-4, the time-sensitivity is tied to vapor intrusion exposure scenarios where hot spot areas are in close proximity to existing, new, or planned buildings and elevated sub-slab gas concentrations exceeding industrial use screening criteria have been documented at existing buildings and are a potential concern for future buildings.
- If the groundwater plume is left unabated, the OU-4 hot spot areas provide on-going contaminant sources for continued degradation of the LPA drinking water aquifer. USEPA's 2/2000 NTCRA guidance states it is "appropriate to use removal authority to address "hot spots," control the source of contamination, or take other interim actions."

- For the LPA Study Area, increasing contaminant concentration trends at on- and off-post wells near the property boundary indicate the toe of an unstable VOC plume migrating off-post toward known residential wells and planned future municipal supply wells. Prompt action is necessary before higher mid-plume concentrations migrate off-post where residential wells would be further threatened and access limitations would prevent effective remediation.

All investigations were conducted consistent with Section 300.415 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). These various investigations have confirmed that the vicinity around Buildings 2286 and 2276 are likely sources for the VOC groundwater plume observed downgradient in the LPA study area.

Section 300.415(b)(2) of the NCP lists eight criteria to determine whether removal action authority is appropriate. The two criteria most applicable to current site conditions are as follows:

- Section 300.415(b)(2)(i) – Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.
- Section 300.415(b)(2)(ii) – Actual or potential contamination of drinking water supplies or sensitive ecosystems.

As summarized above, elevated VOC concentrations in shallow groundwater in former OU-4 source area Building 2286/2276 will continue to impact groundwater at FGGM and in off-post residential areas as the groundwater continues to migrate to the southeast if left untreated. Additionally, while to date no MCL exceedances have been identified in potable drinking water wells downgradient of the OU-4 study area (south of Annapolis Road/Route 175), VOCs have been detected above the MCL in deep off-post LPA monitoring wells in this area and at the FGGM property boundary.

Various site COCs are listed or designated as hazardous substances under the statutory provisions in Section 101(14) or Section 104(a)(2) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Thus, OU-4 and the associated LPA Study Area are eligible for response under Section 104(a)(1) of CERCLA and three remedial action alternatives were developed for each AOC and selected for further evaluation. The remedial action alternatives for each AOC are presented below:

1. Buildings 2286 / 2276:

- Alternative 1: No Further Action;
- Alternative 2: In-Situ Enhanced Reductive Dechlorination (ERD) with Long-term Monitoring (LTM); and
- Alternative 3: In-Situ Chemical Oxidation (ISCO) with LTM.

2. Building 2250:

- Alternative 1: No Further Action;
- Alternative 2: Air Sparge (AS)/Soil Vapor Extraction (SVE) with LTM of Groundwater; and
- Alternative 3: ISCO with Vapor Mitigation with LTM of Groundwater

### 3. LPA Study Area:

- Alternative 1: No Further Action;
- Alternative 2: In-Situ ERD with LTM of Groundwater; and
- Alternative 3: Hydraulic Containment with LTM of Groundwater.

Explicit to each AOC, these alternatives were evaluated based on the merits of the individual and comparative analyses in regards to implementability, effectiveness, and cost. Based on this evaluation, the recommended alternative at each AOC for the NTCRA is presented below:

- Buildings 2286 / 2276 - Alternative 3: In-Situ Chemical Oxidation with LTM;
- Building 2250 – Alternative 2: AS/SVE with LTM of Groundwater; and
- LPA Study Area – Alternative 3: Hydraulic Containment with LTM of Groundwater.

It should be noted that the recommended alternatives proposed in this EE/CA for each AOC will be implemented within a 2 year time frame. An Action Memorandum detailing the implementation of the selected alternatives will be submitted under separate cover. These alternatives were selected for each AOC because they will most effectively attain the following Remedial Action Objective (RAOs) explicit to each AOC.

#### Buildings 2276 & 2286:

Abate hot spot groundwater concentrations (e.g., greater than 1,000 µg/L total VOCs) of chlorinated solvents (PCE, TCE, and associated daughter products) in the vicinity of FGGM86-MW08 (Building 2286) and OU4-SB-08 (Former Building 2276) to (a) prevent potential exposure to nearby human populations (via vapor intrusion into new/existing buildings; and (b) mitigate further degradation of the LPA drinking water aquifer due to continued contaminant migration from these hot spot areas toward off-post drinking water wells currently utilizing the LPA for potable water.

#### Building 2250:

Abate elevated sub-slab gas concentrations detected above industrial sub-slab screening criteria for PCE (2,100 micrograms per meter cubed [ $\mu\text{g}/\text{m}^3$ ]) in sub-slab samples from the northwest corner of Building 2250 and the immediate vicinity to Abate potential exposure to human populations currently working in the building via vapor intrusion into the building. Abate hot spot (e.g., greater than 1,000 µg/L total VOC) groundwater concentrations of chlorinated solvents (PCE, TCE, and associated daughter products) in the vicinity of Versar-MW01, 02, and 03 to prevent potential exposure to nearby human populations from volatilization and vapor intrusion into the existing building and/or seepage into the adjacent intermittent stream bed.

#### LPA Study Area:

Abate elevated mid-plume concentrations of PCE, CCl<sub>4</sub>, and associated VOCs (e.g., 280 µg/L CCl<sub>4</sub> at SB38; and 410 µg/L PCE at MW37) to prevent continued migration of elevated VOC concentrations toward the FGGM property boundary where on- and off-post monitoring wells near the FGGM property boundary

are already showing increasing concentration trends as increasing VOC concentrations migrate off-post to the southeast toward existing residential wells.

**Attachment 2**

Responses to Comments

**Response to Comments Table**

**Draft Action Memorandum Operable Unit 4**

**June 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	Comment	Response Code	Response
1	EPA RPM	6/10/13	2	Section II, 2nd Paragraph	"new buildings under construction". Has the potential for VI been investigated or mitigated for these buildings.	N	Potential vapor intrusion from contaminated shallow groundwater in the Operable Unit 4 (OU-4) Study Area was considered during new building construction. A representative from the FGGM Environmental Division confirmed that a vapor barrier was installed underneath the building recently constructed in the OU-4 Study Area.
2	EPA RPM	6/10/13		General Remedy Discussions	Does the Army believe that the current monitoring network is sufficient to evaluate the effects of the remedies that are proposed or will additional wells be installed as part of the remedy implementation?	N	Additional monitoring wells will be installed as part of the In-Situ Chemical Oxidation (ISCO) response action taken at the Former Bldg. 2276 / Bldg. 2286 Area of Concern (AOC). Figure 15 included with the Interim Remedial Action Work Plan displays the well network at this AOC. The current monitoring well networks at the Building 2250 AOC and the down-gradient Lower Patapsco Aquifer (LPA) Study Area are sufficient to monitor the response actions in those respective areas.