

**Final**

**Feasibility Study Monitoring Well Installation Plan  
for RVAAP-66 Facility-wide Groundwater**

**Former Ravenna Army Ammunition Plant  
Portage and Trumbull Counties, Ohio**

**Contract No. W912QR-16-D-0003  
Delivery Order No. W912QR-18-F-0337**

**Prepared for:**



**US Army Corps  
of Engineers®**

**U.S. Army Corps of Engineers  
Louisville District  
600 Dr. Martin Luther King Jr. Place  
Louisville, Kentucky 40202**

**Prepared by:**



**Leidos  
1750 Presidents Street  
Reston, Virginia 20190**

**November 17, 2022**

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**Final**

**Feasibility Study Monitoring Well Installation Plan  
for RVAAP-66 Facility-wide Groundwater**

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**REPORT DOCUMENTATION PAGE**

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This plan specifies locations to install and sample new monitoring wells in four of the five areas going forward in the RVAAP-66 Facility-wide Groundwater feasibility study, as well as addresses concerns identified by the Ohio Environmental Protection Agency regarding the RVAAP-71 Barn No. 5 Petroleum Release AOC.

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Mike DeWine, Governor  
Jon Husted, Lt. Governor  
Anne M. Vogel, Director

January 11, 2023

**TRANSMITTED ELECTRONICALLY**

Mr. Kevin M. Sedlak  
Army National Guard  
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IPA Designation  
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**RE: US Army Ammunition Plt RVAAP  
Remediation Response  
Project Records  
Remedial Response  
Portage County  
267000859036**

**Subject: Approval of the "Final Feasibility Study Monitoring Well Installation Plan for RVAAP-66 Facility-wide Groundwater"**

Dear Mr. Sedlak:

The Ohio Environmental Protection Agency (Ohio EPA) has received the "Final Feasibility Study Monitoring Well Installation Plan for RVAAP-66 Facility-wide Groundwater" at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio dated November 17, 2022. This document was received via email at Ohio EPA's Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) on November 23, 2022. The document was prepared for the U.S Army Corps of Engineers on behalf of the Army National Guard Directorate by Leidos.

The final document was reviewed by personnel from Ohio EPA's DERR. Pursuant to the Director's Findings and Orders paragraph 39 (b), Ohio EPA considers the document final and approved.

If you have any questions, please contact me at [kevin.palombo@epa.ohio.gov](mailto:kevin.palombo@epa.ohio.gov) or call me at (330) 963-1292.

Sincerely,

A handwritten signature in black ink that reads "Kevin M. Palombo".

Kevin M. Palombo  
Environmental Specialist  
Division of Environmental Response and Revitalization

KP/cm

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**COMPLETION OF INDEPENDENT TECHNICAL REVIEW**

**Company Name:** Leidos

**Contract and Task Order Number:** Contract No. W912QR-21-D-0003, Task Order No. W912QR-18-F-0337

**Document Name:** Feasibility Study Monitoring Well Installation Plan for RVAAP-66 Facility-wide Groundwater, Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties

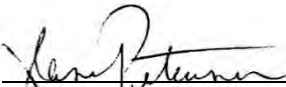
Notice is hereby given that an independent technical review, that is appropriate to the level of risk and complexity inherent in the project, has been conducted. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level obtained; and reasonableness of the result, including whether the product meets the customer's needs consistent with law and existing Corps policy. All concerns and comments resulting from these independent technical reviews have been resolved.



\_\_\_\_\_  
Jed Thomas, PE, PMP  
Study Team Leader

\_\_\_\_\_  
November 17, 2022

Date



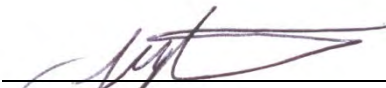
\_\_\_\_\_  
Vasudha Peterson, PE, PMP  
Independent Technical Review Team Member

\_\_\_\_\_  
November 17, 2022

Date

Significant concerns and explanation of the resolutions are documented within the project file.

As noted above, all concerns resulting from the independent technical review of the document have been fully resolved.



\_\_\_\_\_  
Lisa Jones-Bateman, REM, PMP  
Program Manager

\_\_\_\_\_  
November 17, 2022

Date

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ARNG = Army National Guard  
CO = Central Office  
NEDO = Northeast District Office  
OHARNG = Ohio Army National Guard  
Ohio EPA = Ohio Environmental Protection Agency  
SWDO = Southwest District Office  
USACE = U.S. Army Corps of Engineers

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## ACRONYMS

1,3-DNB	1,3-Dinitrobenzene
amsl	Above Mean Sea Level
AOC	Area of Concern
ARNG	Army National Guard
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CJAG	Camp James A. Garfield
COC	Chemical of Concern
DFFO	Director's Final Findings and Orders
DNT	Dinitrotoluene
DRO	Diesel-Range Organics
ERA	Ecological Risk Assessment
FS	Feasibility Study
FWGW	Facility-wide Groundwater
FWGWMP	Facility-wide Groundwater Monitoring Program
GRO	Gasoline-Range Organics
HHRA	Human Health Risk Assessment
IDW	Investigation-Derived Waste
NACA	National Advisory Committee for Aeronautics
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
RDX	1,3,5-Trinitro-1,3,5-Triazine
RI	Remedial Investigation
RVAAP	Ravenna Army Ammunition Plant
SI	Site Inspection
SVOC	Semivolatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TNT	2,4,6-Trinitrotoluene
USACE	U.S. Army Corps of Engineers
VOC	Volatile Organic Compound

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## 1.0 INTRODUCTION

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Leidos has been contracted by the U.S. Army Corps of Engineers (USACE), Louisville District to execute the performance work statement titled “Groundwater Investigation and Reporting Services, Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage and Trumbull Counties, Ohio.” This work is being conducted under a firm-fixed price basis in accordance with USACE, Louisville District Contract No. W912QR-16-D-0003, Delivery Order No. W912QR-18-F-0337.

### 1.1 PURPOSE

The *Remedial Investigation Report for RVAAP-66 Facility-wide Groundwater* (Leidos 2022, herein referred to as the Facility-wide Groundwater [FWGW] Remedial Investigation [RI] Report) identified five areas within the former RVAAP, now known as Camp James A. Garfield (CJAG), requiring further evaluation in a Feasibility Study (FS). In addition, one temporary monitoring well will be installed and sampled at the RVAAP-71 Barn No. 5 Petroleum Release area of concern (AOC). The purpose of this plan is to specify locations to install and sample new monitoring wells in four of the five areas going forward in the FWGW FS, as well as address concerns identified by the Ohio Environmental Protection Agency (Ohio EPA) regarding the RVAAP-71 Barn No. 5 Petroleum Release AOC.

The data collected from the permanent monitoring wells will refine the conceptual site model and supplement the FS. The FS will be conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations 300). The Ohio EPA Director’s Final Findings and Orders (DFFO), dated June 10, 2004 (Ohio EPA 2004), acknowledges the Army’s responsibility to address the site under CERCLA/NCP.

### 1.2 SCOPE

Due to the size and structure of the FWGW AOC, CJAG was divided into 15 “groups” of monitoring wells and potential contaminant source areas based on spatial and contaminant characteristics. The “groups” were established based on geography and decisions made during RI data evaluation. The recommendations for proceeding to an FS is targeted to more refined areas (or wells), as presented in Section 9 of the FWGW RI Report. The targeted areas proceeding to the FWGW FS and the associated “group” that it was evaluated in the FWGW RI Report are as follows:

- RVAAP-05 Winklepeck Burning Grounds, evaluated in Group M;
- RVAAP-08 Load Line 1, evaluated in Group H;
- RVAAP-10 Load Line 3, evaluated in Group G;
- RVAAP-12 Load Line 12, evaluated in Group E; and
- RVAAP-16 Fuze and Booster Quarry, evaluated in Group D.

The scope of this plan is to present the locations and specifications of the monitoring wells to be installed to support the FWGW FS. In addition, this report summarizes the fulfillment of collecting groundwater at RVAAP-71 Barn No. 5, as agreed to with Ohio EPA.

For the monitoring wells to be installed, this report:

- Identifies the location of the monitoring wells,
- Specifies depths, aquifers, and screened intervals for these monitoring wells, and
- Provides the sampling frequency and analytical parameter list upon sample collection.

The procedures to install and sample the monitoring wells will follow Appendix A of the *Remedial Investigation Work Plan for Groundwater and Environmental Investigation Services for RVAAP-66 Facility-Wide Groundwater* (TEC-Weston 2016). Permanent pumps will not be placed in the wells after well installation. The decision for continual sampling of these wells will be made during the annual review of the Facility-wide Groundwater Monitoring Program (FWGWMP) plan.

### **1.3 REPORT ORGANIZATION**

The following summarizes the components of the report and lists the appendices:

- Section 2.0 provides a description of FS monitoring wells.
- Section 3.0 provides a description of the temporary well at RVAAP-71 Barn No. 5 Petroleum Release.
- Section 4.0 presents the references.

## **2.0 FEASIBILITY STUDY MONITORING WELLS**

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The following subsections provide the rationale for new monitoring wells to be installed and sampled to support the FWGW FS. Table 2-1 summarized the monitoring wells. For each FS monitoring well, one round of sampling will be conducted that will then be used in the FS. Subsequent sampling of these wells will be determined as part of the annual review of the FWGWMP plan.

### **2.1 RVAAP-05 WINKLEPECK BURNING GROUNDS**

The FWGW RI Report identified 1,3,5-trinitro-1,3,5-triazine (RDX) in the Unconsolidated aquifer of Winklepeck Burning Grounds as a chemical requiring further evaluation in an FS for potential remediation. No chemicals of concern (COCs) in the Upper Sharon aquifer were identified as requiring evaluation in the FS. The current monitoring well network, presented in Figure 2-1, bounds the site both laterally and vertically. No additional wells are required to develop an FS for this site.

### **2.2 RVAAP-08 LOAD LINE 1**

The FWGW RI Report identified 1,3-dinitrobenzene (1,3-DNB); 2,4-dinitrotoluene (DNT); 2,6-DNT; and RDX in the Upper Sharon aquifer of Load Line 1 as chemicals requiring further evaluation in an FS for potential remediation. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS.

Figure 2-2 presents collected groundwater concentrations at Load Line 1 and nearby Load Line 2 for these chemicals from January 2007 to October 2020. Groundwater flow in the Upper Sharon aquifer at Load Line 1 is to the east in this area. To supplement the FS, four monitoring wells (two well pairs) will be installed east of Load Line 1.

Two nested well pairs will provide lateral and vertical migration potential in the localized direction of groundwater flow of the Unconsolidated and Upper Sharon aquifers (toward Criggy's Pond). One well pair will be installed along South Service Road, east of the center of Load Line 1, and one well pair will be installed west of Criggy's Pond, southeast of the center of Load Line 1. Each pair will have a well screened in the Unconsolidated aquifer to approximate depths of 15 to 30 feet below ground surface (bgs) and a shallow bedrock well screened across the observed water-bearing zone of the Upper Sharon aquifer to depths that may exceed 70 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

### **2.3 RVAAP-10 LOAD LINE 3**

The FWGW RI Report identified 2,4,6-trinitotoluene (TNT); 2,6-DNT; 4-amino-2,6-DNT; and RDX in Load Line 3 in the Upper Sharon aquifer as requiring evaluation in an FS for potential remediation. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS. This area was evaluated as part of Group G in the FWGW RI Report.

Figure 2-3 presents collected groundwater concentrations at Load Line 3 for these chemicals from January 2011 to October 2020. Groundwater flow in the Upper Sharon aquifer is to the west-southwest

in this area. To supplement the FS, one monitoring well will be installed west and one monitoring well will be installed southwest of the cluster of four wells at the center of Load Line 3 (LL3mw-237, LL3mw-238, LL3mw-239, and LL3mw-241). The two monitoring wells will be screened in shallow bedrock across the observed water-bearing zone of the Upper Sharon aquifer to depths that may exceed 25 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

#### **2.4 RVAAP-12 LOAD LINE 12**

The FWGW RI Report recommended that the area around LL12mw-185 and LL12mw-187 proceed to an FS for further evaluation to address the nitrate and ammonia contamination within the Unconsolidated aquifer. In addition, the FWGW RI Report recommended installing new wells to support this evaluation. This area was evaluated as part of Group E in the FWGW RI Report.

Figure 2-4 presents collected nitrate and ammonia groundwater concentrations at Load Line 12 from April 2017 to September 2020. To supplement the FS, two monitoring wells will be installed within the Unconsolidated aquifer, east of LL12mw-187 and LL12mw-185, along the perimeter of Load Line 12 will provide clarity to the localized groundwater flow and lateral migration potential of nitrate to the east. The monitoring wells will be installed to an approximate depth of 25 feet bgs. One round of sampling for nitrate and ammonia will be conducted that will then be used in the FS.

#### **2.5 RVAAP-16 FUZE AND BOOSTER QUARRY**

The FWGW RI Report identified 2,4-DNT; 2-amino-4,6-DNT; 4-amino-2,6-DNT; and TNT in FBQmw-174 in the Homewood aquifer as requiring evaluation in an FS for potential remediation. This well was assessed as part of Group D in the FWGW RI Report. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS.

Figure 2-5 presents concentrations at FBQmw-174 for these chemicals from May 2017 to October 2020. Groundwater flow in the Homewood aquifer is to the east in this area. To supplement the FS in this area, four monitoring wells (two nested well pairs) will be installed. Two nested well pairs will provide lateral and vertical migration potential in the localized direction of groundwater flow in both the Homewood and Upper Sharon aquifers. One well pair will be installed approximately 900 feet east of FBQmw-174, and one well pair will be installed approximately 500 feet southeast of FBQmw-174. Each pair will have a shallow bedrock well to approximate depths of 75 to 90 feet bgs and a deeper bedrock well to approximate depths of 140 to 155 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

**Table 2-1. Feasibility Study Monitoring Well Description and Purpose**

Location	Well ID	Targeted Aquifer	Elevations (amsl)		Well Screen (bottom)		Purpose
			Ground Surface	Top of Bedrock (estimated)	Feet bgs	Elevation (amsl)	
<b><i>RVAAP-08 Load Line 1</i></b>							
Northwest of LL1mw-064 (NESTED)	LL1mw-090	Unconsolidated	940	890	15	925	Unconsolidated extent eastward
	LL1mw-091	Upper Sharon, shallow	940	890	70	870	Upper Sharon extent eastward
West of Criggy's Pond (NESTED)	LL1mw-092	Unconsolidated	940	890	30	910	Unconsolidated extent to southeast
	LL1mw-093	Upper Sharon, shallow	940	890	70	870	Upper Sharon extent to southeast
<b><i>RVAAP-10 Load Line 3</i></b>							
West of cluster north of LL3mw-245	LL3mw-247	Upper Sharon, shallow	980	956	25	930	Upper Sharon extent westward
West of cluster east of LL3mw-245	LL3mw-248	Upper Sharon, shallow	980	956	25	930	Upper Sharon extent westward
<b><i>RVAAP-12 Load Line 12</i></b>							
Eastern border of LL12 North well	LL12mw-248	Unconsolidated	980	947	25	955	Unconsolidated extent eastward
Eastern border of LL12 South well	LL12mw-249	Unconsolidated	980	947	25	955	Unconsolidated extent eastward
<b><i>RVAAP-16 Fuze and Booster Quarry Ponds</i></b>							
Between FBQmw-174 and FWGmw-023 (NESTED)	FBQmw-178	Homewood, shallow	1180	1135	90	1090	In Homewood approximately 20 feet deeper than FBQmw-174
	FBQmw-179	Upper Sharon, deep	1180	1135	155	1025	Screened at water level in FWGmw-023 in April 2020
Southeast of FBQmw-174 (NESTED)	FBQmw-180	Homewood, shallow	1165	1135	75	1090	In Homewood approximately 20 feet deeper than FBQmw-174
	FBQmw-181	Upper Sharon, deep bedrock	1165	1135	140	1025	Screened at water level in FWGmw-023 in April 2020

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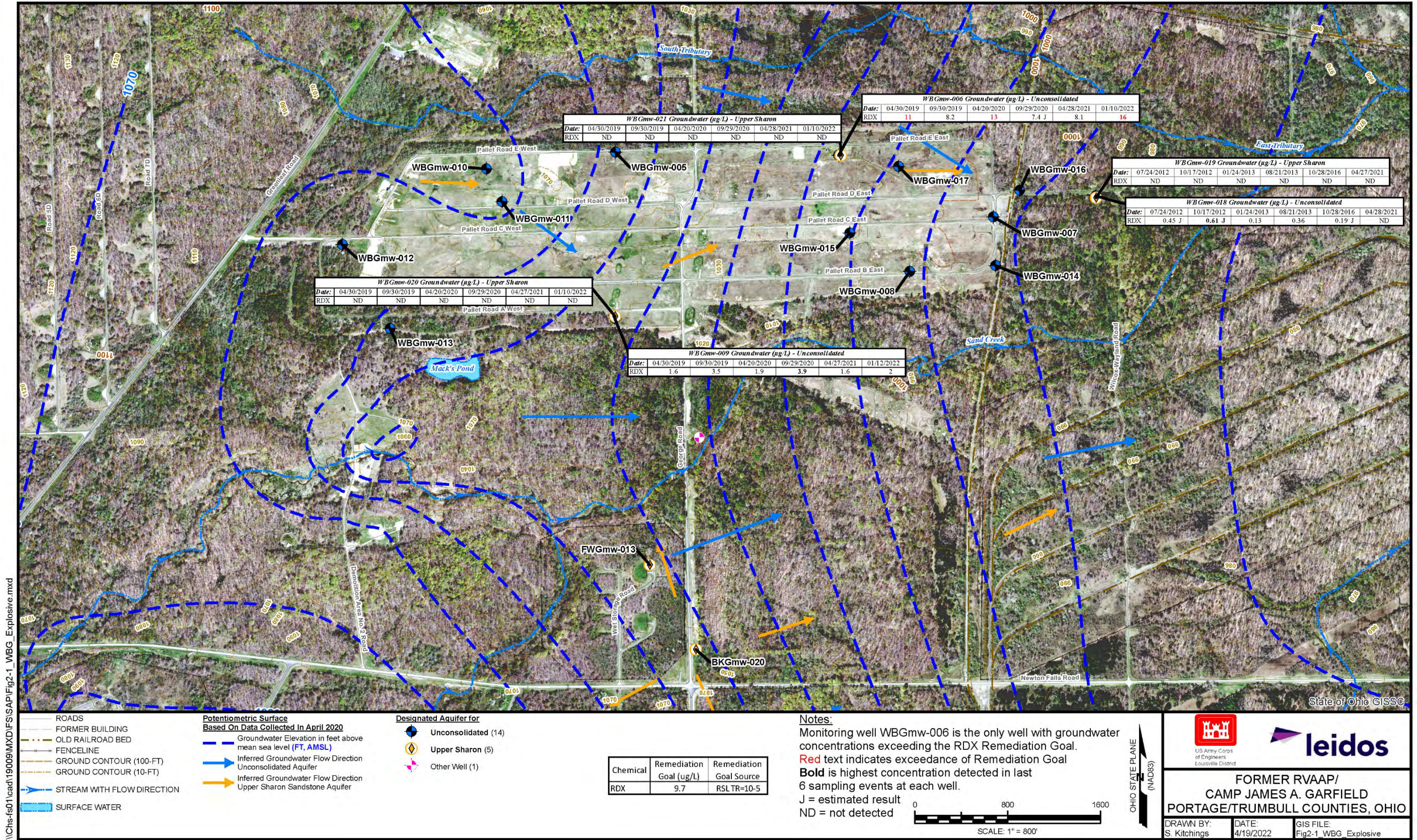


Figure 2-1. RVAAP-05 Winklepeck Burning Grounds – COC Groundwater Concentrations

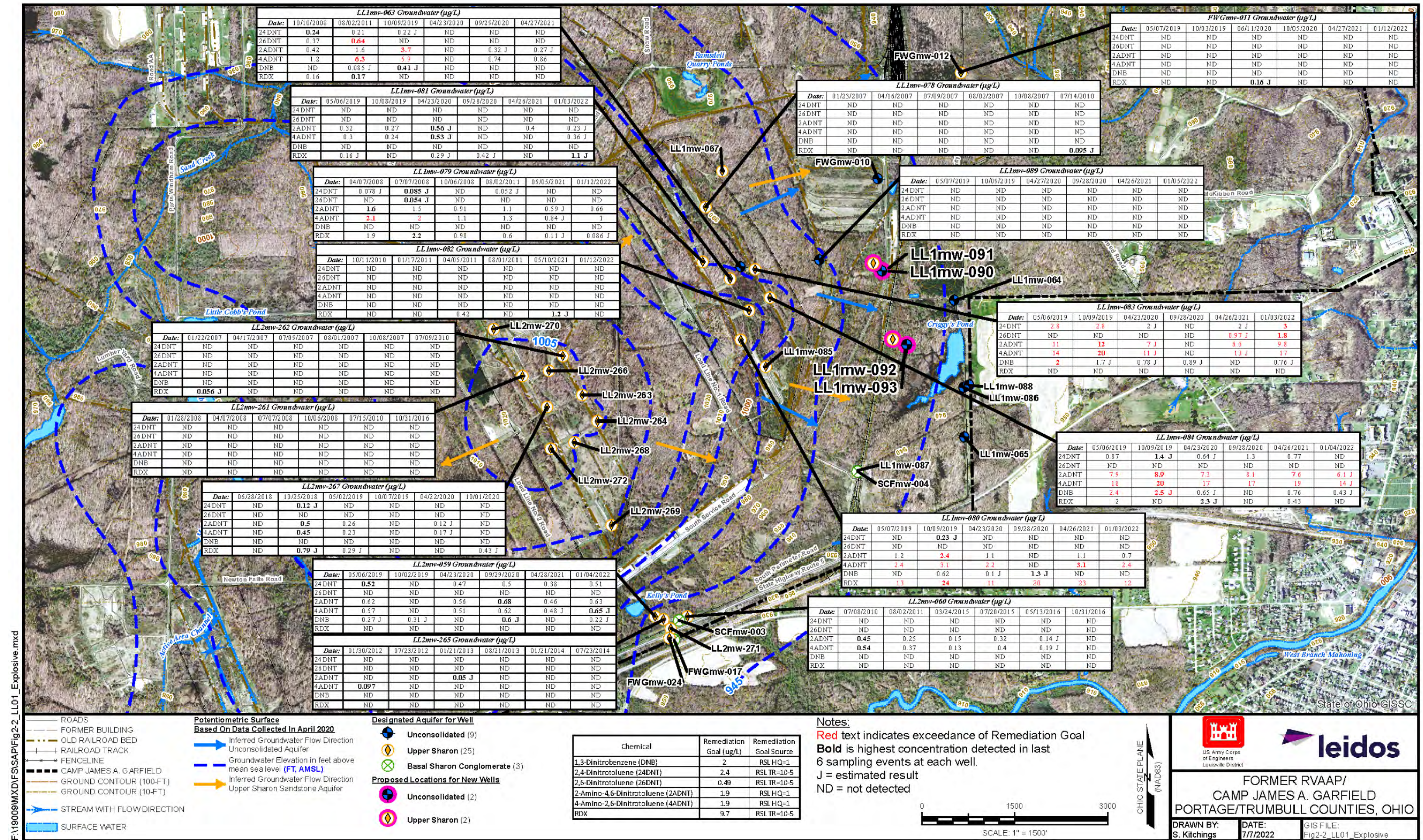


Figure 2-2. RVAAP-08 Load Line 1 Feasibility Study Well Locations

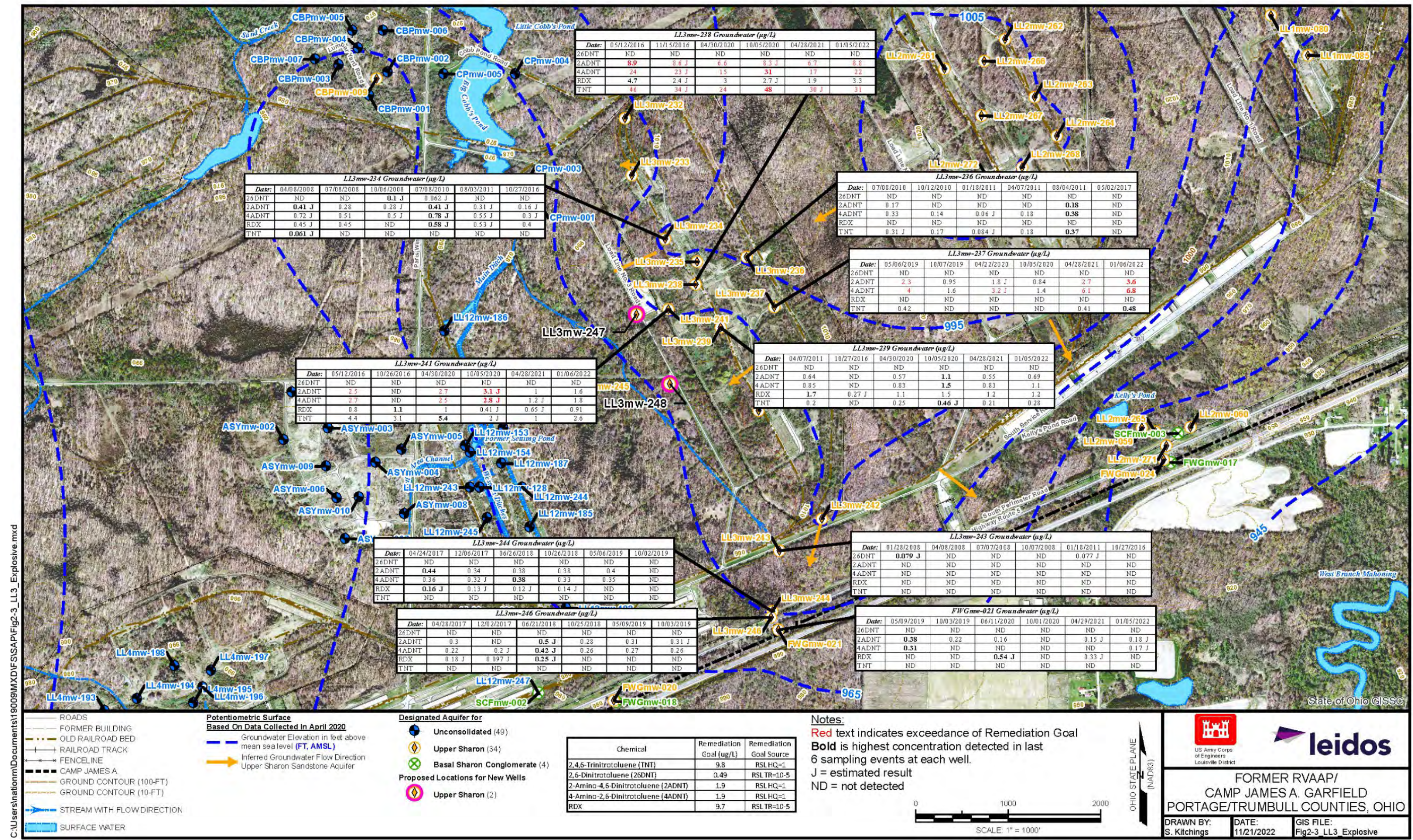
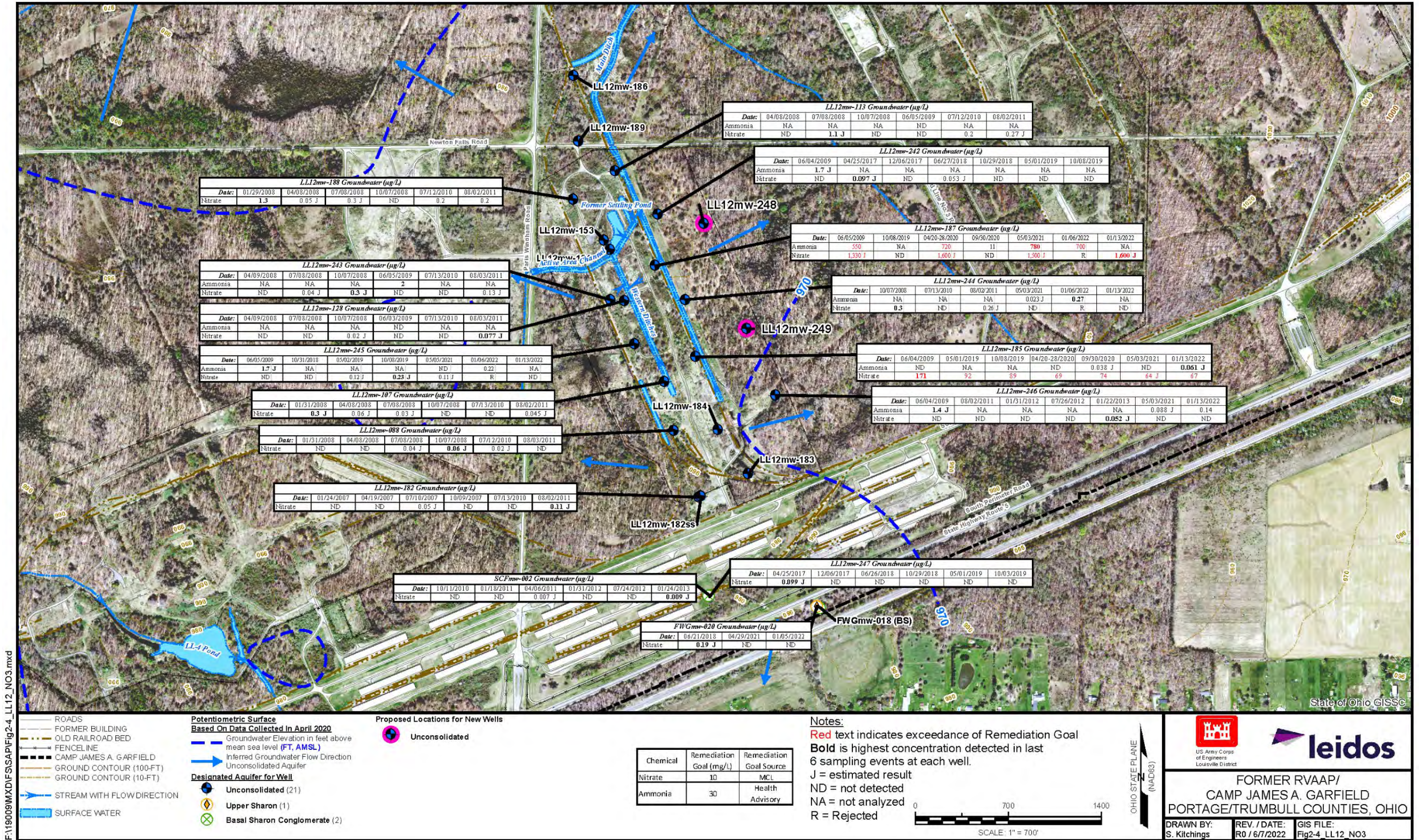


Figure 2-3. RVAAP-10 Load Line 3 Feasibility Study Well Locations



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Figure 2-4. RVAAP-12 Load Line 12 Feasibility Study Well Locations

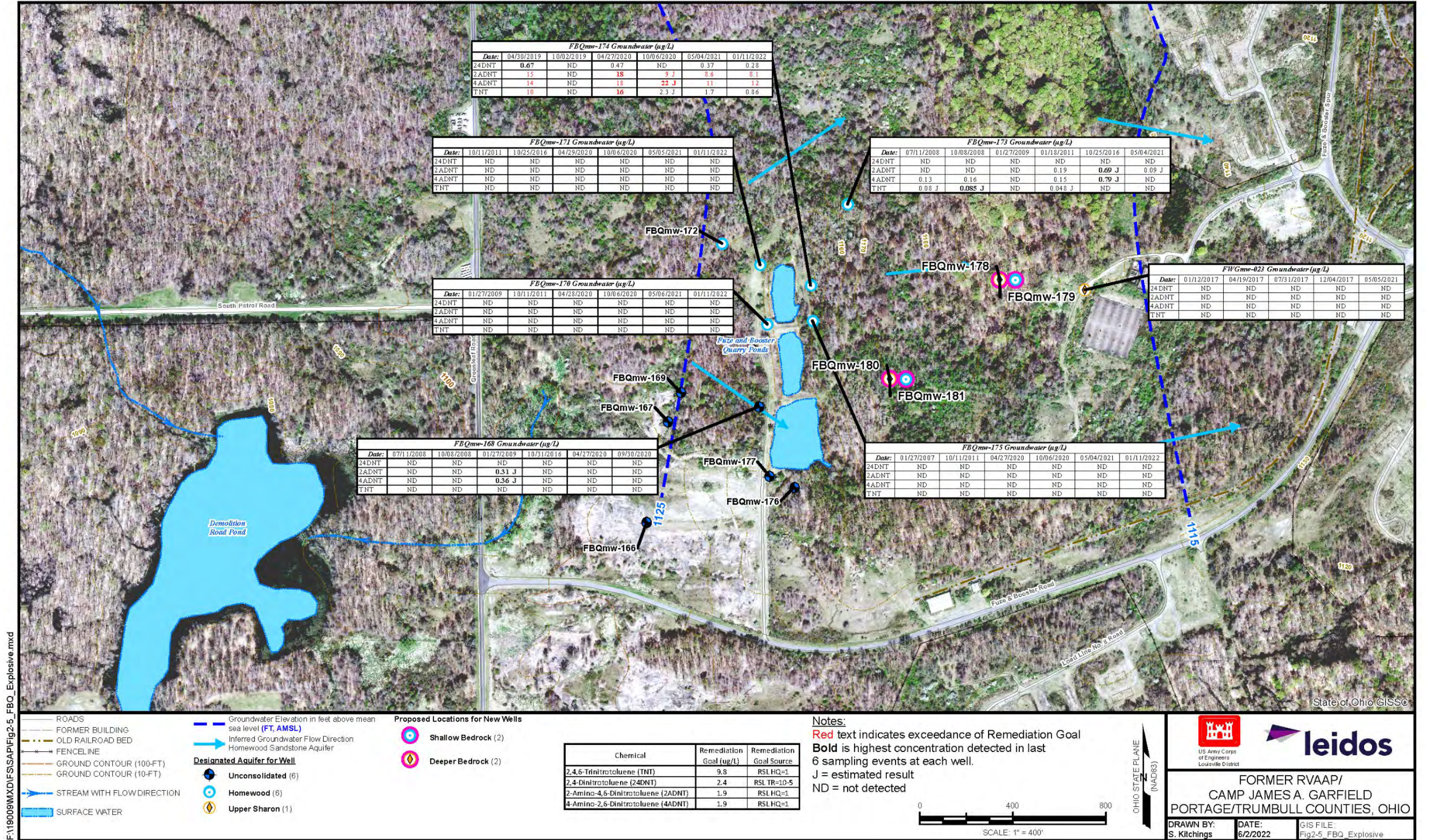


Figure 2-5. RVAAP-16 Fuze and Booster Quarry Feasibility Study Well Locations

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### **3.0 RVAAP-71 BARN NO. 5 PETROLEUM RELEASE**

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The CC RVAAP-71 Barn No. 5 Petroleum Release AOC is approximately 0.6 acres, including the footprint of Barn No. 5 and the land between the barn and fence line in the western portion of the facility (south of the National Advisory Committee for Aeronautics [NACA] Test Area and Open Demolition Area #1). The site was identified based on a historical gasoline release documented in a 1964 letter written by a former RVAAP Security Manager. The 1964 pipeline break caused a consequent release of an estimated 20 barrels of gasoline at the AOC. A Site Inspection (SI) was conducted in 2013 that included the sampling of subsurface soil to 13 feet bgs. The results of the SI indicated that No Further Action was required at this site. Figure 3-1 presents the Site and Release Area, as originally presented in the *Site Inspection Report for CC RVAAP-71 Barn No. 5 Petroleum Release* (ECC 2015).

This site was evaluated as part of Group B within the FWGW RI Report (Leidos 2022). The human health risk assessment (HHRA) and ecological risk assessment (ERA) associated with Group B groundwater concluded that there was no risk requiring an action, and Group B does not require further evaluation.

Although there is no documented evidence of impact from former and/or current military operations at this site, it was agreed with Ohio EPA to install a temporary well south of the location of the former pipeline. The temporary well will be installed in the Unconsolidated aquifer for a one-time groundwater sample collection for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), lead, and total petroleum hydrocarbon (TPH) diesel-range organics (DRO)/gasoline-range organics (GRO) analyses.

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ECC GIS Server: D:\Other\GIS\Reverna\MapDocuments\HRR\HRR\_Fig2-3\_CC71\_Boundaries.mxd

**Legend**

- Fence Line
- Road
- Facility Property Line
- Creek and Stream
- Flow Direction
- ✕ Post No. 6
- Pipeline (Approx)
- Pipeline Easement (Approx)
- CC-RVAAP-71 Site Area (Approx)
- Suspected Release Area
- Former Barn No. 5 Footprint

0 40 80  
 Feet  
 1 inch = 80 feet

**NOTES & SOURCES**  
 Map Coordinates: WGS 84, UTM Zone 17N in Meters  
 Base map data from SAIC. Aerial photograph from USGS.



U.S. ARMY ENGINEER DISTRICT  
 CORPS OF ENGINEERS  
 LOUISVILLE, KENTUCKY

**Figure 2-3**  
**CC-RVAAP-71**  
**Barn No.5 Petroleum Release**  
**Site and Release Areas**  
 RVAAP/CAMP RAVENNA  
 RAVENNA, OHIO

Figure 3-1. RVAAP-71 Barn No. 5 Petroleum Release – Site and Release Areas (Source: ECC 2012, Figure 2-3)

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## **4.0 FIELD PREPARATION ACTIVITIES**

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Prior to well installation activities, the monitoring well locations will be staked and the access routes will be marked. The final locations of the wells and access routes will be reviewed by the Ohio Army National Guard (OHARNG), and changes will be implemented as per this review. Considerations for the final placement of wells and access routes are provided in the following subsections.

### **4.1 WETLANDS DELINEATION AND STREAM MANAGEMENT AVOIDANCE**

To ensure wetlands are avoided during well installation activities, the wetlands biologist will perform a site visit of the proposed well installation locations and temporary access routes. If wetlands are observed during the review, access routes and well locations will be altered.

An initial review of the wetlands using wetland survey data from 2014 and 2018 indicates the following:

- Load Line 1: The nested pairs LL1mw-090/091 and LL1mw-092/093 are located outside known wetland areas. Installing and accessing these wells will not impact any known wetlands.
- Load Line 3: LL3mw-247 is near existing wetlands, and the site walk by the wetlands biologist will ensure that access to the wells and the location of the wells do not impact wetlands. LL3mw-248 is located on the southwestern side of the intersection of Newton Falls Road and Load Line No. 3 Road where no wetlands were identified.
- Load Line 12: LL12mw-248 and LL12mw-249 are not located within a wetland but are in proximity to wetlands. The site walk by the wetlands biologist will ensure that access to the wells and the location of the wells do not impact wetlands.
- Fuze and Booster Quarry: The nested pairs FBQmw-178/179 and FBQmw-180/181 are located outside known wetland areas.

It is not anticipated that a stream or ditch will be crossed to access these locations. Crane mats will be used if a stream or ditch must be temporarily crossed to access a well location.

### **4.2 VEGETATION REMOVAL AND MANAGEMENT**

Vegetation will be cleared, as necessary, to gain access to the monitoring well locations. Clearing may be performed along access routes and at the well location. A review of the well installation sites indicates the following:

- Load Line 1: The nested pair LL1mw-090/191 is adjacent to South Service Road. Vegetation removal is assumed to be minimal (primarily brush, possibly small trees). The nested pair LL1mw-092/093 is located adjacent to an older access road. Vegetation removal is assumed to be minimal (primarily brush, possibly small trees).
- Load Line 3: LL3mw-247 is located north of Old Newton Falls Road in an open area. Vegetation removal is assumed to be minimal (primarily brush, possibly small trees). LL3mw-248 is located

on the southwestern side of the intersection of Newton Falls Road and Load Line No. 3 Road. Vegetation removal is assumed to be minimal (primarily brush, possible small trees).

- Load Line 12: LL12mw-248 and LL12mw-249 are both located in wooded areas. The wooded area should be sufficiently open to avoid large trees. Vegetation removal is assumed to be minimal (primarily brush, possible small trees).
- Fuze and Booster Quarry: The nested pair FBQmw-178/179 is in a wooded area that is sufficiently open to avoid large trees. Vegetation removal is assumed to be minimal (primarily brush, possible small trees). The nested pair FBQmw-180/181 is located off an access road from the quarry ponds. Vegetation removal is assumed to be minimal (primarily brush, possible small trees).

All clearing activities will be performed to minimize erosion and sedimentation. Trees greater than 3 inches in diameter will attempt to be avoided. If unavoidable, the trees will be marked, reviewed by OHARNG, and cut between October 1 and March 31.

Access routes to the well locations will be cleared using a brush cutter and other relevant above-grade vegetation removal equipment. A chainsaw or the equivalent will be used for the felling of trees. Stumps will remain in place. Felled trees will be chipped and dispersed at the site.

It is estimated that approximately 0.7 acres total will be disturbed to install the 12 monitoring wells. Best management practices will be implemented to control and minimize erosion. Following the completion of well installation activities, field personnel will grade the site for positive drainage and revegetate any disturbed areas using the OHARNG-approved seed mixture.

### **4.3 UTILITY CLEARANCE**

Some anticipated activities associated with the well drilling task will have the potential for exposing or contacting subsurface utilities. Leidos will prepare a map of the well locations and present it to the CJAG Directorate of Public Works Operations office for utility clearance.

## **5.0 INVESTIGATION-DERIVED WASTE**

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Liquid (decontamination fluids and purged groundwater) investigation-derived waste (IDW), soil IDW, and expendable sanitary waste will be generated during well installation activities. Each of the types of IDW will be contained separately. All IDW will be properly handled, labeled, characterized, and managed in accordance with Section 8.0 of the *Facility-wide Sampling and Analysis Plan for Environmental Investigations* (Leidos 2011) and CJAG Waste Management Guidelines.

Expendable sanitary waste will be not sampled for characterization purposes and will be disposed of as sanitary waste. Liquid IDW will be placed in drums and staged at the identified location within secondary containment structures. To avoid potential drum rupture due to freezing conditions, drums containing liquid will be filled only to 75 percent capacity. All liquid IDW will be stored inside Building 1036 or Building 1047 on the secondary containment pallets. Soil IDW will be staged at the southeastern end of the Building 1036 parking lot.

Characterization and classification of the soil and liquid IDW will be based on the IDW sample collection and analysis per the toxicity characteristic leaching procedure (TCLP). At the conclusion of field activities for the project, a letter report will be submitted to USACE and the Army National Guard (ARNG)/OHARNG documenting the characterization and classification of the wastes. Upon approval of the IDW classification report, all solid and liquid IDW will be removed from the site and properly transported and disposed of. All shipments of IDW offsite will be coordinated through the OHARNG restoration representative.

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## 6.0 REFERENCES

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- ECC (Environmental Chemical Corporation) 2012. *Historical Records Review Report for CC RVAAP-71 Barn No. 5 Petroleum Release and CC-RVAAP-83 Former Buildings 1031 and 1039*. May.
- ECC 2015. *Site Inspection Report for CC RVAAP-71 Barn No. 5 Petroleum Release*. February.
- Leidos 2011. *Facility-Wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant*. February.
- Leidos 2022. *Remedial Investigation Report for RVAAP-66 Facility-wide Groundwater*. February.
- TEC-Weston 2016. *Remedial Investigation Work Plan for Groundwater and Environmental Investigation Services for RVAAP-66 Facility-Wide Groundwater*. December.
- OHARNG (Ohio Army National Guard) 2014. *Integrated Natural Resources Management Plan (INRMP) at the Camp Ravenna Joint Military Training Center*. December.
- Ohio EPA (Ohio Environmental Protection Agency) 2004. *Director's Final Findings and Orders for the Ravenna Army Ammunition Plant*. June.

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**APPENDIX A**  
**OHIO EPA COMMENTS**

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Mike DeWine, Governor  
Jon Husted, Lt. Governor  
Laurie A. Stevenson, Director

November 7, 2022

**TRANSMITTED ELECTRONICALLY**

Mr. Kevin Sedlak  
Restoration Program Manager  
ARNG-ILE Clean Up  
Camp James A Garfield JTC  
1438 State Route 534 SW  
Newton Falls, OH 44444

RE: US Army Ammunition Plant RVAAP  
Remediation Response  
Approval  
Remedial Investigation  
Remedial Response  
Portage County  
ID#267000859036

**Subject: Response to Ohio EPA Comments on the "Draft RVAAP-66 Facility-wide Groundwater, Feasibility Study Monitoring Well Installation Plan" dated September 20, 2022**

Dear Mr. Sedlak:

The Ohio Environmental Protection Agency (Ohio EPA) has received and reviewed the "Response to Ohio EPA Comments on the "Draft RVAAP-66 Facility-wide Groundwater, Feasibility Study Monitoring Well Installation Plan" at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio (Camp James A. Garfield). This document was received at Ohio EPA's Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) via email on September 20, 2022. The response was prepared for the United States Army Corps of Engineers (USACE) on behalf of the National Guard Bureau by Leidos.

Based on our review of the Army National Guard's Response to Ohio EPA comments provided in your letter dated September 20, 2022, we find the responses generally acceptable, and the document can be finalized. Please be sure that all agreed-upon changes, additions, and clarifications are provided in the final document.

This letter is an official response from Ohio EPA that will be maintained as a public record. If you have any questions regarding this letter, you can reach me at [kevin.palombo@epa.ohio.gov](mailto:kevin.palombo@epa.ohio.gov) or at (330) 963-1292.

Sincerely,

A handwritten signature in black ink, appearing to read "Kevin M. Palombo".

Kevin M. Palombo, Environmental Specialist  
Division of Environmental Response and Revitalization

KP/cm

ec: Rebecca Shreffler, Chenega Tri-Services  
Katie Tait, OHARNG RTLS  
Steven Kvaal, USACE Louisville  
Nat Peters, USACE Louisville  
Bob Prinic, Ohio EPA, NEDO DERR  
Natalie Oryshkewych, Ohio EPA, NEDO DERR  
Liam McEvoy, Ohio EPA, NEDO DERR  
Thomas Schneider, Ohio EPA, SWDO DERR  
Carrie Rasik, Ohio EPA, CO DERR

RECEIVED  
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**NATIONAL GUARD BUREAU**  
111 SOUTH GEORGE MASON DRIVE  
ARLINGTON VA 22204-1373

September 20, 2022

Ohio Environmental Protection Agency  
DERR-NEDO  
Attn: Mr. Kevin Palombo  
2110 East Aurora Road  
Twinsburg, OH 44087-1924

Subject: Ravenna Army Ammunition Plant (RVAAP) Restoration Program, CJAG, Portage/Trumbull Counties, Ohio, RVAAP-66 Facility-Wide Groundwater, Responses to Ohio EPA Comments on the Draft Feasibility Study Monitoring Well Installation Plan for (Work Activity No. 267-000-859-036)

Dear Mr. Palombo:

The Army appreciates your time and comments on the Draft Feasibility Study Monitoring Well Installation Plan for Facility-wide Groundwater, comments dated September 7, 2022. Enclosed for your review are responses to your comments. Upon resolution of these comments, the Army will provide a Final version of the report for Ohio EPA concurrence.

These comment responses were prepared for the Army National Guard in support of the RVAAP restoration program. Please contact the undersigned at 614-336-6000, ext 2053 or [kevin.m.sedlak.ctr@army.mil](mailto:kevin.m.sedlak.ctr@army.mil) if there are issues or concerns with this submission.

Sincerely,

TAIT.KATHRYN.SE  
RENA.1289508275  
Digitally signed by  
TAIT.KATHRYN.SERENA.12895082  
75  
Date: 2022.09.20 13:54:26 -04'00'

**FOR** Kevin M. Sedlak  
RVAAP Restoration Program Manager  
Army National Guard Directorate

cc: Natalie Oryshkewych, Ohio EPA, NEDO  
Bob Princic, Ohio EPA, NEDO  
Liam McEvoy, Ohio EPA, NEDO  
Tom Schneider, Ohio EPA, SWDO  
Carrie Rasik, Ohio EPA, CO  
Katie Tait, OHARNG, Camp James A. Garfield  
Steve Kvaal, USACE Louisville  
Jay Trumble, USACE Louisville  
Vasu Peterson, Leidos  
Jed Thomas, Leidos

Subject: Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, Ohio, Feasibility Study Monitoring Well Installation Plan for Facility-Wide Groundwater (Work Activity No. 267-000-859-036)

## Comments

### **Ohio EPA Comment 1: RVAAP-05 WINKLEPECK BURNING GROUNDS (Group M in the FWGW RI Report)**

The FWGW RI Report identified 1,3,5-trinitro-1,3,5-triazine (RDX) in the Unconsolidated aquifer of Winklepeck Burning Grounds as a chemical requiring further evaluation in an FS for potential remediation. No chemicals of concern (COCs) in the Upper Sharon aquifer were identified as requiring evaluation in the FS. The current monitoring well network, presented in Figure 2-1 of the Draft FS Additional Well Install Plan 2022, bounds the site both laterally and vertically. No additional wells are required to develop an FS for this site.

Ohio EPA concurs with the further evaluation in an FS for potential remediation of 1,3,5- trinitro-1,3,5-triazine (RDX) in the Unconsolidated aquifer of Winklepeck Burning Grounds (around WBGmw-006 and WBGmw-009) as recommended above. Ohio EPA has previously concurred with the statement that “no additional wells are required to develop an FS for the site”, but requests clarification since previous United States Army Corps of Engineers (USACE) response was that “During the development and regulatory review of the FS, it will be determined if additional wells are needed to refine the conceptual site model and/or monitor contaminant migration.” (January 29, 2021, Responses to Comments on the Draft Remedial Investigation Report for RVAAP-66 Facility-wide Groundwater (January 2021 Draft RI RTC Letter)). Ohio EPA wants to clarify that additional wells, if warranted, will still be installed in the future.

Army Response: The conceptual site model (CSM) is in development for the FS to provide the most recent available data and remediation goals. As shown in Figure 2-1, there are several wells in the unconsolidated aquifer located downgradient of the COC exceedances as well as deeper wells in the Upper Sharon which will provide for a refined CSM in the FS. It is unlikely that additional wells will be required; however, this determination will be completed as part of the CERCLA process in subsequent decision documents.

### **Ohio EPA Comment 2: RVAAP-08 LOAD LINE 1 (Group H in the FWGW RI Report)**

The FWGW RI Report identified 1,3-dinitrobenzene (1,3-DNB); 2,4-dinitrotoluene (DNT); 2,6- DNT; and RDX in the Upper Sharon aquifer of Load Line 1 as chemicals requiring further evaluation in an FS for potential remediation. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS. Figure 2-2 of the Draft FS Additional Well Install Plan 2022 presents collected ground water concentrations at Load Line 1 and nearby Load Line 2 for these chemicals from January 2007 to October 2020. Ground water flow in the Upper Sharon aquifer at Load Line 1 is to the east in this area. To supplement the FS, four monitoring wells (two well pairs) will be installed east of Load Line 1. Two nested well pairs will provide lateral and vertical migration potential in the localized direction of ground water flow of the Unconsolidated and Upper Sharon aquifers (toward Criggy’s Pond). One well pair will be installed along South Service Road, east of the center of Load Line 1, and one well pair will be installed west of Criggy’s Pond, southeast of the center of Load Line 1. Each pair will have a well screened in the Unconsolidated aquifer to approximate depths of 15 to 30 feet below ground surface (bgs) and a shallow bedrock well screened in the Upper Sharon aquifer to approximate depths of 70 to 90 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

Subject: Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, Ohio, Feasibility Study Monitoring Well Installation Plan for Facility-Wide Groundwater (Work Activity No. 267-000-859-036)

Ohio EPA concurs with the proposed installation of four monitoring wells (two well pairs) to be installed east of Load Line 1 in order to supplement the FS and concurs with the proposed locations as denoted on Figure 2-2 of the Draft FS Additional Well Install Plan 2022. The proposed 15 to 30 feet below ground surface (bgs) well screen interval for the Unconsolidated aquifer wells appears acceptable, but further clarification is requested for the proposed Upper Sharon aquifer screening levels of approximately 70 to 90 feet bgs. Nearby Upper Sharon wells LL1mw-082, 83, and 84 are all approximately 40 feet in depth; please clarify why 70-90 feet depths will be appropriate for Upper Sharon wells.

**Army Response:**

In preliminary cross-sections developed for the FS, both ground elevation and the bedrock plane from Load Line 1 dips dramatically to the east and southeast. Furthermore, the unconsolidated aquifer is thicker to the east at Criggy's Pond. Thus, in order to capture the appropriate depth for groundwater in both the unconsolidated and Upper Sharon, the elevation of the wells must be determined by depth to bedrock rather than ground surface. At FW-011 and FW-012, bedrock was encountered at 920 ft amsl. At LL1mw-086 and LL1mw-088, bedrock was encountered at 860 ft amsl. Table 2-1 provides the ground elevation and rationale for depths in both feet below ground surface (bgs) and elevation above mean sea level (amsl). Actual depth to bedrock and well screen interval will be field determined but may occur at any depth between 920-860 ft amsl, therefore the new Upper Sharon wells will be screened within the shallow water bearing zone of the bedrock aquifer. The text in Section 2.2 will be revised as follows:

*One well pair will be installed along South Service Road, east of the center of Load Line 1, and one well pair will be installed west of Criggy's Pond, southeast of the center of Load Line 1. Each pair will have a well screened in the Unconsolidated aquifer to approximate depths of 15 to 30 feet below ground surface (bgs) and a shallow bedrock well screened across the observed water bearing zone of the Upper Sharon aquifer to depths that may exceed 70 feet bgs. approximate depths of 70-90 feet bgs.*

**Ohio EPA Comment 3: RVAAP-10 LOAD LINE 3 (Group G in the FWGW RI Report)**

The FWGW RI Report identified 2,4,6-trinitotoluene (TNT); 2,6-DNT; 4-amino-2,6-DNT; and RDX in Load Line 3 in the Upper Sharon aquifer as requiring evaluation in an FS for potential remediation. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS. This area was evaluated as part of Group G in the FWGW RI Report. Figure 2-3 of the Draft FS Additional Well Install Plan 2022 presents collected ground water concentrations at Load Line 3 for these chemicals from January 2011 to October 2020. Ground water flow in the Upper Sharon aquifer is to the west-southwest in this area. To supplement the FS, one monitoring well will be installed west and one monitoring well will be installed southwest of the cluster of four wells at the center of Load Line 3 (LL3mw-237, LL3mw-238, LL3mw-239, and LL3mw-241). The two monitoring wells will be screened in shallow bedrock to approximate depths of 50 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

Ohio EPA concurs with the proposed installation of two monitoring wells to be installed west and southwest of Load Line 3 in order to supplement the FS. Further clarification of the proposed locations as denoted on Figure 2-3 of the Draft FS Additional Well Install Plan 2022 is requested, as the current proposed location for LL3mw-247 appears to be over 1,000 feet west of LL3mw-241 and on the opposite side of a stream. To minimize any influence from this surface water feature, to be generally closer to the LL3 source area, and to provide better delineation and better modelling results for the FS, the proposed well location may be better suited further east closer to the Load Line 3 Road. LL3mw-248 could also be located further

Subject: Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, Ohio, Feasibility Study Monitoring Well Installation Plan for Facility-Wide Groundwater (Work Activity No. 267-000-859-036)

north and closer to the LL3 area. Further clarification is requested for the proposed Upper Sharon aquifer screening level to approximately 50 feet bgs. Nearby Upper Sharon wells LL3mw-237, LL3mw-238, LL3mw-239, and LL3mw-241 range from 20 to 35 feet in depth; please clarify why 50 feet depths will be appropriate for Upper Sharon wells.

Army Response: Agree. LL3-247 will be relocated closer to Load Line 3 and east of the surface water feature/stream. LL3-248 is suggested to remain as placed on Figure 2-3. There are slight variations in water levels seasonally, indicating groundwater flow from LL3mw-237 may flow slightly south in the direction of the proposed well location. Furthermore adequate coverage of the westerly flow direction and potential transport or attenuation is captured from data at mw-239 and mw-241. Actual depth to bedrock and well screen interval will be field determined but may occur at any depth between 980-955 ft amsl, therefore the new Upper Sharon wells will be screened within the shallow water bearing zone of the bedrock aquifer. Table 2-1 will be revised to reflect a more likely depth of 25 feet bgs. The text in Section 2.3 will be revised as follows:

*The two monitoring wells will be screened in shallow bedrock across the observed water bearing zone of the Upper Sharon aquifer to depths that may exceed to approximate depths of 50 25 feet bgs.*

#### **Ohio EPA Comment 4: RVAAP-12 LOAD LINE 12 (Group E in the FWGW RI Report)**

The FWGW RI Report recommended that the area around LL12mw-185 and LLmw-187 proceed to an FS for further evaluation to address the nitrate and ammonia contamination within the Unconsolidated aquifer. In addition, the FWGW RI Report recommended installing new wells to support this evaluation. This area was evaluated as part of Group E in the FWGW RI Report. Figure 2-4 of the Draft FS Additional Well Install Plan 2022 presents collected nitrate and ammonia ground water concentrations at Load Line 12 from April 2017 to September 2020. To supplement the FS, two monitoring wells will be installed within the Unconsolidated aquifer, east of LL12mw-187 and LL12mw-185, along the perimeter of Load Line 12 will provide clarity to the localized ground water flow and lateral migration potential of nitrate to the east. The monitoring wells will be installed to an approximate depth of 25 feet bgs. One round of sampling for nitrate and ammonia will be conducted that will then be used in the FS.

Ohio EPA concurs with the proposed installation of two monitoring wells to be installed east of Load Line 12 in order to supplement the FS and concurs with the proposed locations as denoted on Figure 2-4 of the Draft FS Additional Well Install Plan 2022. The proposed 25 feet depth bgs for the Unconsolidated aquifer wells appears acceptable, with other nearby wells in the LL12 area installed between 24 and 32 feet bgs.

Army Response: Comment noted.

#### **Ohio EPA Comment 5: RVAAP-16 FUZE AND BOOSTER QUARRY (Group D in the FWGW RI Report)**

The FWGW RI Report identified 2,4-DNT; 2-amino-4,6-DNT; 4-amino-2,6-DNT; and TNT in FBQmw-174 in the Homewood aquifer as requiring evaluation in an FS for potential remediation. This well was assessed as part of Group D in the FWGW RI Report. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS. Figure 2-5 of the Draft FS Additional Well Install Plan 2022 presents concentrations at FBQmw-174 for these chemicals from May 2017 to October 2020. Ground water flow in the Homewood aquifer is to the east in this area. To supplement the FS in this area, four monitoring

Subject: Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, Ohio, Feasibility Study Monitoring Well Installation Plan for Facility-Wide Groundwater (Work Activity No. 267-000-859-036)

wells (two nested well pairs) will be installed. Two nested well pairs will provide lateral and vertical migration potential in the localized direction of ground water flow in both the Homewood and Upper Sharon aquifers. One well pair will be installed approximately 900 feet east of FBQmw-174, and one well pair will be installed approximately 500 feet southeast of FBQmw-174. Each pair will have a shallow bedrock well to approximate depths of 75 to 90 feet bgs and a deeper bedrock well to approximate depths of 140 to 155 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

Ohio EPA concurs with the proposed installation of four monitoring wells (two well pairs) to be installed in order to supplement the FS, specifically around FBQmw-174. Further discussion on the proposed locations as denoted on Figure 2-5 of the Draft FS Additional Well Install Plan 2022 is requested, as the current proposed location for FBQmw-178/179 being 900 feet east of FBQmw-174 may be too far to provide good delineation and modelling data. The preferred location may be further west closer to FBQmw-174 (i.e., within 200-300 feet), however that may be at the crest of the hill, so further discussion is warranted to logistically place this boring. Upon closer inspection of the potentiometric map of the area and bedrock mapping, the proposed FBQmw-180/181 to the east may be better located to the west of FBQmw-174 and FBQmw-170/171, since bedrock highs on Camp James A. Garfield (CJAG) typically exhibit radial flow patterns (that may not be apparent at the FBQ area since wells are not located far enough west to show ground water flow completely in that direction). The inferred/presumed eastern ground water flow may not be entirely correct in this area. Additionally, Homewood wells in the FBQ have been installed at depths ranging from 30-50 feet based on topographic surfaces, rather than the proposed 75-90 feet bgs (while this depth may be appropriate east of the FBQ area where the topography demonstrates higher elevations. Please clarify the proposed Upper Sharon deeper bedrock well approximate depths of 140 to 155 feet bgs, as the eastern FWGmw-023 well in the Upper Sharon is installed to a depth of 215 feet bgs.

#### Army Response:

The well pair FBQmw-178 and 179 were located to the east of FBQmw-174 to address the Ohio EPA comment noted in the RI that horizontal and vertical delineation to the east is warranted. As noted, the ideal location would have been 200-300 feet east of mw-174, however, this is the crest of the hill as observed in Ohio EPA comment above and likely potential exists for a localized radial flow pattern. The well pair FBQmw-180 and 181 was located to further address delineation to the southeast. The contamination at mw-174 is otherwise bound by the ponds to the west and wells to the north and south and groundwater elevation measured routinely in adjacent wells demonstrates groundwater flows toward FBQmw-173 and FBQmw-175, away from mw-174. Only flow gradients to the east and southeast are unknown.

The ground elevation at mw-174 occurs at 1135 ft amsl with slope rising steadily to an elevation of 1170 ft amsl within 200 feet. The slope to the east of the crest is more gradual and conducive to drilling. In preliminary cross-sections developed for the FS, the bedrock surface is relatively flat between FBQmw-174 and FWGmw-023 and regional groundwater in both the Unconsolidated and Upper Sharon flows to the east; representing the most likely contaminant migration pathway not previously determined.

Table 2-1 provides the ground elevation and rationale for depths in both feet bgs and elevation feet amsl. Actual depth to bedrock and well screen interval will be field determined based on observations of extracted soil and rock cores but may occur at depths ranging from 1090 1025 feet amsl.





Mike DeWine, Governor  
Jon Husted, Lt. Governor  
Laurie A. Stevenson, Director

RECEIVED September 7, 2022

September 7, 2022

**TRANSMITTED ELECTRONICALLY**

Mr. Kevin Sedlak  
Restoration Program Manager  
ARNG-ILE Clean Up  
Camp James A Garfield JTC  
1438 State Route 534 SW  
Newton Falls, OH 44444

RE: US Army Ammunition Plt RVAAP  
Remediation Response  
Approval  
Remedial Investigation  
Remedial Response  
Portage County  
ID#267000859036

**Subject: Ohio EPA Comments on the “Draft Feasibility Study Monitoring Well Installation Plan for RVAAP-66 Facility-wide Groundwater Former Ravenna Army Ammunition Plant” dated July 7, 2022**

Dear Mr. Sedlak:

The Ohio Environmental Protection Agency (Ohio EPA) has received and reviewed the “Draft Feasibility Study Monitoring Well Installation Plan for RVAAP-66 Facility-wide Groundwater Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio (Camp James A. Garfield). This document was received via email at Ohio EPA's Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) on July 7, 2022. The report was prepared for the United States Army Corps of Engineers on behalf of the National Guard Bureau by Leidos under Contract Number W912QR-16-D-0003. Comments on the document based on Ohio EPA review are provided below. Please provide responses to the enclosed comments in accordance with the Directors Findings and Orders.

**COMMENTS**

The Draft Feasibility Study Additional Well Install Plan 2022 provided rationale for new monitoring wells to be installed and sampled to support the Facility Wide Groundwater Feasibility Study (FWGW FS). Table 2-1 summarized the monitoring wells. For each Feasibility Study (FS) monitoring well, one round of sampling will be conducted that will then be used in the FS. The need for subsequent sampling of these wells will be determined as part of the annual review of the FWGWMP plan.

Ohio EPA compared these recommendations for additional FS work/additional monitoring well installs to those previously presented in the Draft FWGW Remedial Investigation (RI) Report from July 2020.

**Comment 1: RVAAP-05 WINKLEPECK BURNING GROUNDS (Group M in the FWGW RI Report)**

The FWGW RI Report identified 1,3,5-trinitro-1,3,5-triazine (RDX) in the Unconsolidated aquifer of Winklepeck Burning Grounds as a chemical requiring further evaluation in an FS for potential remediation. No chemicals of concern (COCs) in the Upper Sharon aquifer were identified as requiring evaluation in the FS. The current monitoring well network, presented in Figure 2-1 of the Draft FS Additional Well Install Plan 2022, bounds the site both laterally and vertically. No additional wells are required to develop an FS for this site.

Ohio EPA concurs with the further evaluation in an FS for potential remediation of 1,3,5-trinitro-1,3,5-triazine (RDX) in the Unconsolidated aquifer of Winklepeck Burning Grounds (around WBGmw-006 and WBGmw-009) as recommended above. Ohio EPA has previously concurred with the statement that “no additional wells are required to develop an FS for the site”, but requests clarification since previous United States Army Corps of Engineers (USACE) response was that “During the development and regulatory review of the FS, it will be determined if additional wells are needed to refine the conceptual site model and/or monitor contaminant migration.” (January 29, 2021, Responses to Comments on the Draft Remedial Investigation Report for RVAAP-66 Facility-wide Groundwater (January 2021 Draft RI RTC Letter)). Ohio EPA wants to clarify that additional wells, if warranted, will still be installed in the future.

**Comment 2: RVAAP-08 LOAD LINE 1 (Group H in the FWGW RI Report)**

The FWGW RI Report identified 1,3-dinitrobenzene (1,3-DNB); 2,4-dinitrotoluene (DNT); 2,6-DNT; and RDX in the Upper Sharon aquifer of Load Line 1 as chemicals requiring further evaluation in an FS for potential remediation. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS. Figure 2-2 of the Draft FS Additional Well Install Plan 2022 presents collected ground water concentrations at Load Line 1 and nearby Load Line 2 for these chemicals from January 2007 to October 2020. Ground water flow in the Upper Sharon aquifer at Load Line 1 is to the east in this area. To supplement the FS, four monitoring wells (two well pairs) will be installed east of Load Line 1. Two nested well pairs will provide lateral and vertical migration potential in the localized direction of ground water flow of the Unconsolidated and Upper Sharon aquifers (toward Criggy’s Pond). One well pair will be installed along South Service Road, east of the center of Load Line 1, and one well pair will be installed west of Criggy’s Pond, southeast of the center of Load Line 1. Each pair will have a well screened in the Unconsolidated aquifer to approximate depths of 15 to 30 feet below ground surface (bgs) and a shallow bedrock well screened in the Upper Sharon aquifer to approximate depths of 70 to 90 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

Ohio EPA concurs with the proposed installation of four monitoring wells (two well pairs) to be installed east of Load Line 1 in order to supplement the FS and concurs with the proposed locations as denoted on Figure 2-2 of the Draft FS Additional Well Install Plan 2022. The proposed 15 to 30 feet below ground surface (bgs) well screen interval for the Unconsolidated

aquifer wells appears acceptable, but further clarification is requested for the proposed Upper Sharon aquifer screening levels of approximately 70 to 90 feet bgs. Nearby Upper Sharon wells LL1mw-082, 83, and 84 are all approximately 40 feet in depth; please clarify why 70-90 feet depths will be appropriate for Upper Sharon wells.

**Comment 3: RVAAP-10 LOAD LINE 3 (Group G in the FWGW RI Report)**

The FWGW RI Report identified 2,4,6-trinitotoluene (TNT); 2,6-DNT; 4-amino-2,6-DNT; and RDX in Load Line 3 in the Upper Sharon aquifer as requiring evaluation in an FS for potential remediation. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS. This area was evaluated as part of Group G in the FWGW RI Report. Figure 2-3 of the Draft FS Additional Well Install Plan 2022 presents collected ground water concentrations at Load Line 3 for these chemicals from January 2011 to October 2020. Ground water flow in the Upper Sharon aquifer is to the west-southwest in this area. To supplement the FS, one monitoring well will be installed west and one monitoring well will be installed southwest of the cluster of four wells at the center of Load Line 3 (LL3mw-237, LL3mw-238, LL3mw-239, and LL3mw-241). The two monitoring wells will be screened in shallow bedrock to approximate depths of 50 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

Ohio EPA concurs with the proposed installation of two monitoring wells to be installed west and south-west of Load Line 3 in order to supplement the FS. Further clarification of the proposed locations as denoted on Figure 2-3 of the Draft FS Additional Well Install Plan 2022 is requested, as the current proposed location for LL3mw-247 appears to be over 1,000 feet west of LL3mw-241 and on the opposite side of a stream. To minimize any influence from this surface water feature, to be generally closer to the LL3 source area, and to provide better delineation and better modelling results for the FS, the proposed well location may be better suited further east closer to the Load Line 3 Road. LL3mw-248 could also be located further north and closer to the LL3 area. Further clarification is requested for the proposed Upper Sharon aquifer screening level to approximately 50 feet bgs. Nearby Upper Sharon wells LL3mw-237, LL3mw-238, LL3mw-239, and LL3mw-241 range from 20 to 35 feet in depth; please clarify why 50 feet depths will be appropriate for Upper Sharon wells.

**Comment 4: RVAAP-12 LOAD LINE 12 (Group E in the FWGW RI Report)**

The FWGW RI Report recommended that the area around LL12mw-185 and LLmw-187 proceed to an FS for further evaluation to address the nitrate and ammonia contamination within the Unconsolidated aquifer. In addition, the FWGW RI Report recommended installing new wells to support this evaluation. This area was evaluated as part of Group E in the FWGW RI Report. Figure 2-4 of the Draft FS Additional Well Install Plan 2022 presents collected nitrate and ammonia ground water concentrations at Load Line 12 from April 2017 to September 2020. To supplement the FS, two monitoring wells will be installed within the Unconsolidated aquifer, east of LL12mw-187 and LL12mw-185, along the perimeter of Load Line 12 will provide clarity to the localized ground water flow and lateral migration potential of nitrate to the east. The monitoring wells will be installed to an approximate depth of 25 feet

bgs. One round of sampling for nitrate and ammonia will be conducted that will then be used in the FS.

Ohio EPA concurs with the proposed installation of two monitoring wells to be installed east of Load Line 12 in order to supplement the FS and concurs with the proposed locations as denoted on Figure 2-4 of the Draft FS Additional Well Install Plan 2022. The proposed 25 feet depth bgs for the Unconsolidated aquifer wells appears acceptable, with other nearby wells in the LL12 area installed between 24 and 32 feet bgs.

**Comment 5: RVAAP-16 FUZE AND BOOSTER QUARRY (Group D in the FWGW RI Report)**

The FWGW RI Report identified 2,4-DNT; 2-amino-4,6-DNT; 4-amino-2,6-DNT; and TNT in FBQmw-174 in the Homewood aquifer as requiring evaluation in an FS for potential remediation. This well was assessed as part of Group D in the FWGW RI Report. No COCs in the Unconsolidated aquifer were identified as requiring evaluation in the FS. Figure 2-5 of the Draft FS Additional Well Install Plan 2022 presents concentrations at FBQmw-174 for these chemicals from May 2017 to October 2020. Ground water flow in the Homewood aquifer is to the east in this area. To supplement the FS in this area, four monitoring wells (two nested well pairs) will be installed. Two nested well pairs will provide lateral and vertical migration potential in the localized direction of ground water flow in both the Homewood and Upper Sharon aquifers. One well pair will be installed approximately 900 feet east of FBQmw-174, and one well pair will be installed approximately 500 feet southeast of FBQmw-174. Each pair will have a shallow bedrock well to approximate depths of 75 to 90 feet bgs and a deeper bedrock well to approximate depths of 140 to 155 feet bgs. One round of sampling for explosives will be conducted that will then be used in the FS.

Ohio EPA concurs with the proposed installation of four monitoring wells (two well pairs) to be installed in order to supplement the FS, specifically around FBQmw-174. Further discussion on the proposed locations as denoted on Figure 2-5 of the Draft FS Additional Well Install Plan 2022 is requested, as the current proposed location for FBQmw-178/179 being 900 feet east of FBQmw-174 may be too far to provide good delineation and modelling data. The preferred location may be further west closer to FBQmw-174 (i.e., within 200-300 feet), however that may be at the crest of the hill, so further discussion is warranted to logistically place this boring. Upon closer inspection of the potentiometric map of the area and bedrock mapping, the proposed FBQmw-180/181 to the east may be better located to the west of FBQmw-174 and FBQmw-170/171, since bedrock highs on Camp James A. Garfield (CJAG) typically exhibit radial flow patterns (that may not be apparent at the FBQ area since wells are not located far enough west to show ground water flow completely in that direction). The inferred/presumed eastern ground water flow may not be entirely correct in this area. Additionally, Homewood wells in the FBQ have been installed at depths ranging from 30-50 feet based on topographic surfaces, rather than the proposed 75-90 feet bgs (while this depth may be appropriate east of the FBQ area where the topography demonstrates higher elevations. Please clarify the proposed Upper Sharon deeper bedrock well approximate

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depths of 140 to 155 feet bgs, as the eastern FWGmw-023 well in the Upper Sharon is installed to a depth of 215 feet bgs.

This "Draft Feasibility Study Monitoring Well Installation Plan for RVAAP-66 Facility-wide Groundwater Former Ravenna Army Ammunition Plant" was reviewed by personnel from Ohio EPA. Additional information is necessary to approve the document.

This letter is an official response from Ohio EPA that will be maintained as a public record. If you have questions or would like to set up a meeting to discuss these comments, you can reach me at [kevin.palombo@epa.ohio.gov](mailto:kevin.palombo@epa.ohio.gov) or at (330) 963-1292.

Sincerely,



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