Final

Record of Decision
for Soil, Sediment, and Surface Water
at RVAAP-45 Wet Storage Area

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-15-C-0046

Prepared for:

U.S. Army Corps of Engineers
Louisville District

Prepared by:

Leidos
8866 Commons Boulevard, Suite 201
Twinsburg, Ohio 44087

February 22, 2019

Final

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None.

14. ABSTRACT

This Record of Decision for Wet Storage Area presents the physical characteristics, geology, and hydrogeology of Wet Storage Area. This decision document summarizes nature and extent of contamination in soil, sediment, and surface water; contaminant fate and transport; and human health and ecological risk assessments. Remedial alternatives were developed and assessed, resulting in the selection of Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use as the remedial alternative. This information was presented to the public, and all public input was considered during the selection of the final remedy for soil, surface water, and sediment at Wet Storage Area in this ROD.

15. SUBJECT TERMS

record of decision, proposed plan, land use, chemicals of concern, remediation

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Ohio Environmental Protection Agency

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

March 28, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859127

Mr. David Connolly
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 22204

Subject: Final Record of Decision (ROD) for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the "Final Record of Decision for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area," dated February 22, 2019. It was prepared by Leidos.

Ohio EPA has no comments on the "Final Record of Decision for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area." Based on the information contained in the Final ROD document, other investigation documents and reports, and Ohio EPA's oversight participation during the investigation, Ohio EPA concurs with the Final ROD document for Wet Storage Area recommending soil remediation to attain unrestricted (residential) land use.

If you have any questions concerning this letter, please contact Megan Oravec at (330) 963-1168.

Sincerely,

James Sferra, Chief
Division of Environmental Response and Revitalization

JS/MO/sc

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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Leidos has completed the Record of Decision for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing U.S. Army Corps of Engineers policy. In addition, an independent verification was performed to ensure all applicable changes were made per regulatory and Army comments.

Sarika Johnson — February 22, 2019

Sarika Johnson
Study/Design Team Leader

Jed Thomas, P.E. — February 22, 2019

Jed Thomas, P.E.
Independent Technical Review Team Leader

Significant concerns and the explanation of the resolution are documented within the project file. As noted above, all concerns resulting from independent technical review of the project have been considered.

Lisa Jones-Bateman — February 22, 2019

Lisa Jones-Bateman
Senior Program Manager

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ARNG = Army National Guard.
I&E = Installations & Environment.
NEDO = Northeast District Office.
OHARNG = Ohio Army National Guard.
Ohio EPA = Ohio Environmental Protection Agency.
REIMS = Ravenna Environmental Information Management System.
SWDO = Southwest District Office.
USACE = U.S. Army Corps of Engineers.

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ACRONYMS AND ABBREVIATIONS

amsl	Above Mean Sea Level
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirements
Army	U.S. Department of the Army
ARNG	Army National Guard
AT123D	Analytical Transient 1-, 2-, and 3-Dimensional
bgs	Below Ground Surface
btoc	Below Top of Casing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CJAG	Camp James A. Garfield
CMCOC	Contaminant Migration Chemical of Concern
CMCOPC	Contaminant Migration Chemical of Potential Concern
COC	Chemical of Concern
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CUG	Cleanup Goal
DFFO	Director's Final Findings and Orders
ERA	Ecological Risk Assessment
FS	Feasibility Study
FWCUG	Facility-wide Cleanup Goal
FWGWMP	Facility-wide Groundwater Monitoring Program
HHRA	Human Health Risk Assessment
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	Hazard Quotient
IRP	Installation Restoration Program
ISM	Incremental Sampling Method
LUC	Land Use Control
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbon
PBA08 RI	2008 Performance-based Acquisition Remedial Investigation
PCB	Polychlorinated Biphenyl
RAO	Remedial Action Objective
RD	Remedial Design
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SEMS	Superfund Enterprise Management System

SL	Screening Level
SRC	Site-related Contaminant
SVOC	Semi-volatile Organic Compound
TNT	2,4,6-Trinitrotoluene
TR	Target Risk
USEPA	U.S. Environmental Protection Agency
USP&FO	U.S. Property and Fiscal Officer
VEG©	Vapor Energy Generation
VOC	Volatile Organic Compound

PART I: THE DECLARATION

A SITE NAME AND LOCATION

This Record of Decision (ROD) addresses soil, sediment, and surface water contaminants at Wet Storage Area. Wet Storage Area is designated as area of concern (AOC) RVAAP-45 within the former Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio (Figures 1 and 2).

The former RVAAP, now known as Camp James A. Garfield (CJAG), located in northeastern Ohio within Portage and Trumbull counties, is approximately 3 miles east/northeast of the city of Ravenna and 1 mile north/northwest of the city of Newton Falls. The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad to the south; Garrett, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland. The facility is federal property, which has had multiple accountability transfers amongst multiple Army agencies, making the property ownership and transfer history complex. The most recent administrative accountability transfer occurred in September 2013 when the remaining acreage (not previously transferred) was transferred to the U.S. Property and Fiscal Officer for Ohio (USP&FO) and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp James A. Garfield).

Wet Storage Area is a 36-acre fenced AOC located directly northwest of the intersection of George Road and Newton Falls Road near the geographic center of CJAG. The Superfund Enterprise Management System (SEMS) Identifier for RVAAP is OH5210020736.

B STATEMENT OF BASIS AND PURPOSE

The Army National Guard (ARNG) is the lead agency and has chosen the selected remedy for Wet Storage Area 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 the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record file for the AOC.

The Ohio Environmental Protection Agency (Ohio EPA), the supporting state regulatory agency, concurred with the *Remedial Investigation/Feasibility Study Report for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area* (USACE 2017; herein referred to as the Wet Storage Area Remedial Investigation/Feasibility Study [RI/FS] Report) and *Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area* (USACE 2018; herein referred to as the Wet Storage Area Proposed Plan).

The Director's Final Findings and Orders (DFFO) was issued to the U.S. Department of the Army (Army) on June 10, 2004 (Ohio EPA 2004). The objective of the DFFO was for the Army and Ohio EPA to "contribute to the protection of public health, safety, and welfare and the environment from

the disposal, discharge, or release of contaminants at or from the site, through implementation of a CERCLA-based environmental remediation program. This program will include the development by respondent of an RI/FS for each AOC or appropriate group of AOCs at the site, and upon completion and publication of a Proposed Plan and ROD or other appropriate document for each AOC or appropriate group of AOCs, the design, construction, operation, and maintenance of the selected remedy as set forth in the ROD or other appropriate document for each AOC or appropriate group of AOCs."

The RI/FS Report evaluated contaminated soil, sediment, and surface water at Wet Storage Area. No chemicals of concern (COCs) requiring remediation were identified for sediment or surface water; however, COCs requiring remediation were identified in soil. The Wet Storage Area RI/FS Report provided an evaluation of remedial alternatives for soil. Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use was the recommended alternative.

The decision to conduct a remedial action to address contamination at Wet Storage Area satisfies the requirements of the DFFO, as the Army and Ohio EPA have completed the CERCLA RI/FS phase of investigation at Wet Storage Area. ARNG is publishing this ROD to select a remedy for this site that is protective of human health and the environment. Part II, Section M explains how the selected remedy is protective of human health and the environment and that the selected remedy satisfies the statutory requirements of CERCLA Section 121 and the NCP.

C ASSESSMENT OF SITE

The response action selected in this ROD is necessary to protect public health, welfare, or the environment from actual or threatened releases of contaminants in soil at Wet Storage Area.

D DESCRIPTION OF THE SELECTED REMEDY

The potential future uses for Wet Storage Area are Military Training Land Use or Commercial/Industrial Land Use. The Representative Receptors corresponding to these potential future uses are the National Guard Trainee and Industrial Receptor, respectively. Although residential use is not anticipated at the former RVAAP or at this AOC, an Unrestricted (Residential) Land Use scenario was evaluated.

The nature and extent of potentially impacted media has been sufficiently characterized, the fate and transport modeling did not identify soil contaminant migration chemicals of concern (CMCOCs) impacting groundwater, and no ecological risk was identified. However, the human health risk assessment (HHRA) in the Wet Storage Area RI/FS Report (USACE 2017) identified surface soil (0–1 ft below ground surface [bgs]) COCs requiring remediation.

The HHRA within the Wet Storage Area RI/FS Report (USACE 2017) identified five polycyclic aromatic hydrocarbons (PAHs) (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) as surface soil COCs to be carried forward for potential remediation at locations WSAss-004M, WSAsb-028, and WSAsb-024 in the area of the

former igloos (WS-1 and WS-2) for Unrestricted (Residential) Land Use. The HHRA evaluated risk using Resident Receptor facility-wide cleanup goals (FWCUGs) and the June 2015 U.S. Environmental Protection Agency (USEPA) regional screening levels (RSLs).

Since the development and approval of the Wet Storage Area RI/FS Report, USEPA released updated RSLs in June 2017. Four of the five PAH COCs (benz[a]anthracene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) had maximum concentrations lower than the June 2017 USEPA Resident Soil RSLs. These PAHs were eliminated as COCs requiring remediation; however, benzo(a)pyrene continues to be identified as a COC requiring remediation. This updated assessment was presented to the public in the Wet Storage Area Proposed Plan (USACE 2018).

The locations requiring remediation for benzo(a)pyrene are described below:

- Benzo(a)pyrene at sample locations WSAss-004M and WSAsb-028 is a COC that requires remediation. The area containing these two samples locations is identified as WSA Area 1.
- Benzo(a)pyrene at sample location WSAsb-024 is a COC that requires remediation. The area containing this sample location is identified as WSA Area 2.

Remedial alternatives for surface soil at Wet Storage Area were developed and evaluated in the Wet Storage Area RI/FS Report (USACE 2017). The remedial alternatives are as follows:

- Alternative 1: No Action,
- Alternative 2: Excavation and Off-site Disposal – Attain Unrestricted (Residential) Land Use, and
- Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use.

The selected remedy for Wet Storage Area is Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use. This alternative involves thermally treating benzo(a)pyrene in surface soil at WSA Area 1 and WSA Area 2.

The selected remedy was chosen because it is protective for all receptors (Resident Receptor, Industrial Receptor, and National Guard Trainee), is cost effective, and can be performed in a timely manner. The activities associated with Alternative 3 Are summarized below:

- An estimated 70 yd^3 (in situ) of contaminated soil from WSA Area 1 and WSA Area 2 at 0-1 ft bgs will undergo thermal treatment to remove the COC (benzo[a]pyrene).
- Confirmation sampling will be conducted to determine whether cleanup goals (CUGs) have been attained.
- Successfully remediated areas will be graded and backfilled with clean soil and seeded.

The selected remedy will achieve a requisite level of protectiveness for the AOC. The cost for the selected remedy is estimated to be $134,587. The Army will not be required to develop and implement land use controls (LUCs) and five-year reviews, as this remedy attains Unrestricted (Residential) Land Use.

In the event that a thermal treatment system is not available on site at the former RVAAP, Alternative 2 would be readily available for implementation. Excavation and off-site disposal alternatives have been implemented multiple times during restoration efforts at the former RVAAP. As with Alternative 3, Alternative 2 is effective in the long term and attains Unrestricted (Residential) Land Use.

E STATUTORY DETERMINATIONS

The selected remedy protects human health and the environment, complies with federal and state laws and regulations that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions to the maximum extent practicable. The selected remedy satisfies the statutory preference for treatment, as a thermal treatment technology is the selected remedy for addressing soil contaminated with benzo(a)pyrene at WSA Area 1 and WSA Area 2.

Because the selected remedy will not result in hazardous substances, pollutants, or contaminants remaining on site above levels that allow for Unrestricted (Residential) Land Use, five-year reviews will not be required for this remedial action.

F DATA CERTIFICATION CHECKLIST

Table 1 provides the location of key remedy selection information contained in Part II, Decision Summary. Additional information can be found in the Administrative Record file for Wet Storage Area.

Table 1. ROD Data Certification Checklist

ROD Data Checklist Item	ROD Section
COCs and their respective concentrations	II.G.1
Baseline risk represented by the COCs	II.G
CUGs established for COCs and the basis for these goals	II.H
How source materials constituting principal threats are addressed	II.K
Current and reasonably anticipated future Land Use assumptions used in the baseline risk assessment and ROD	II.F
Suitable potential Land Uses, following the selected remedy	II.L.4
Estimated capital and the total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	II.L.3
Key factor(s) that led to selecting the remedy	II.L.1

COC = Chemical of concern.
CUG = Cleanup goal.
ROD = Record of Decision.

G AUTHORIZING SIGNATURE AND APPROVAL

William M. Myer
COL, GS
I&E, Army National Guard

5 June 2019
Date

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PART II: DECISION SUMMARY

A SITE NAME, LOCATION, AND DESCRIPTION

When the RVAAP Installation Restoration Program (IRP) began in 1989, RVAAP (SEMS Identification Number OH5210020736) was identified as a 21,419-acre installation. In 2002 and 2003, OHARNG surveyed the property and the total acreage was found to be 21,683 acres. The RVAAP IRP encompasses investigation and cleanup of past activities over the entire 21,683-acre former RVAAP.

As of September 2013, administrative accountability for the entire acreage of the facility has been transferred to the USP&FO for Ohio and subsequently licensed to OHARNG for use as a military training site. ARNG is the lead agency for any remediation, decisions, and applicable cleanup at Wet Storage Area. These activities are being funded and conducted under the IRP. Ohio EPA is the supporting state regulatory agency.

CJAG is located in northeastern Ohio within Portage and Trumbull counties, approximately 4.8 km (3 miles) east-northeast of the city of Ravenna and approximately 1.6 km (1 mile) northwest of the city of Newton Falls. References in this document to RVAAP relate to previous activities at the facility as related to former munitions production activities or to activities being conducted under the restoration/cleanup program.

CJAG is a parcel of property approximately 17.7 km (11 miles) long and 5.6 km (3.5 miles) wide, bounded by State Route 5 and the CSX System Railroad on the south; Garrett, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east (see Figures 1 and 2). CJAG is surrounded by several communities: Windham 11.2 km (7 miles) to the north, Garrettsville 9.6 km (6 miles) to the north, Newton Falls 1.6 km (1 mile) to the southeast, Charlestown 3.6 km (6 miles) to the southwest, and Wayland 4.8 km (3 miles) to the south.

Wet Storage Area is a 36-acre fenced AOC located directly northwest of the intersection of George Road and Newton Falls Road near the geographic center of CJAG (Figure 2). Most of the buildings at the AOC were demolished and removed in 2003 and 2004. Remaining features at Wet Storage Area include two storage igloos (WS-3 and WS-3A), access roads that enter the AOC from the south, and a fence that is not currently maintained (Figure 3). Small construction drainage ditches border the access roads near the igloo locations. The AOC is forested with the exception of those areas, consisting of access roads and the former and extant igloos.

B SITE HISTORY AND ENFORCEMENT ACTIVITIES

RVAAP was constructed in 1940 and 1941 for depot storage and ammunition assembly/loading and placed on standby status in 1950. Production activities resumed from 1954–1957 and 1968–1972. Demilitarization activities, including disassembly of munitions and explosives melt-out and recovery, continued until 1992.

In June 2004, the DFFO was issued to the Army. The objective of the DFFO was for the Army and Ohio EPA to "contribute to the protection of public health, safety, and welfare and the environment from the disposal, discharge, or release of contaminants at or from the site, through implementation of a CERCLA-based environmental remediation program. This program will include the development by respondent of an RI/FS for each AOC or appropriate group of AOCs at the site, and upon completion and publication of a Proposed Plan and ROD or other appropriate document for each AOC or appropriate group of AOCs, the design, construction, operation, and maintenance of the selected remedy as set forth in the ROD or other appropriate document for each AOC or appropriate group of AOCs."

From 1941–1945, Wet Storage Area was used to store highly explosive, shock-sensitive primary explosives, including lead azide, mercury fulminate, tetryl (USACHPPM 1998), and potentially nitroguanidine (USACE 2017). During storage activities, explosive material was containerized and covered with water within drums that were stored separately in six storage igloos at the AOC. All six igloos were earth-covered, and the floors, walls, and ceilings were constructed of reinforced concrete. The four westernmost igloos were constructed with a conductive lead floor liner in order to dissipate static electricity. Historical drawings indicate igloo WS-3A was later used as a Command Post and as an air raid shelter. Remnant infrastructure within the eastern part of Wet Storage Area consists of igloos WS-3 and WS-3A.

There is no documentation indicating any spills occurred at the AOC. No historical information exists to indicate a fuel storage tank was present at Wet Storage Area; however, Building PS-7 was a generator house, which likely used diesel fuel. As of August 2016, Building PS-7 is not present (no documentation of its removal exists).

Four storage igloos (WS-1, WS-1A, WS-2, and WS-2A), including slabs and foundations, were removed in 2003–2004. After demolition, the earthen mounds were re-graded to ensure positive drainage and seeded and mulched. Final site restoration operations were completed at the igloos in July 2004 (MKM 2005).

C COMMUNITY PARTICIPATION

Using the RVAAP community relations program, the Army and Ohio EPA have interacted with the public through public notices, public meetings, reading materials, direct mailings, an internet website, and receiving and responding to public comments.

Specific items in the community relations program include the following:

- **Restoration Advisory Board –** The Army established a Restoration Advisory Board in 1996 to promote community involvement in U.S. Department of Defense environmental cleanup activities and allow the public to review and discuss the progress with decision makers. Board meetings are generally held 2–3 times per year and are open to the public.
- **Community Relations Plan –** The *Community Relations Plan* (Vista 2017) is maintained to establish processes to keep the public informed of activities at RVAAP. The plan is available in the Administrative Record at CJAG.
- **Internet Website –** The Army established an internet website in 2004 for RVAAP. It is accessible to the public at www.rvaap.org.

In accordance with CERCLA Section 117(a) and NCP Section 300.430(f)(2), the Army released the Wet Storage Area Proposed Plan (USACE 2018) to the public on June 6, 2018. The Proposed Plan and other project-related documents were made available to the public in the Administrative Record maintained at CJAG and in the Information Repositories at Reed Memorial Library in Ravenna, Ohio, and Newton Falls Public Library in Newton Falls, Ohio. A notice of availability for the Proposed Plan was sent to radio stations, television stations, and newspapers (e.g., *Warren Tribune-Chronicle* and *Ravenna Record Courier*), as specified in the Community Relations Plan. The notice of availability initiated the 30-day public comment period beginning June 6, 2018 and ending July 6, 2018.

The Army held a public meeting on June 21, 2018 at the Shearer Community Center, 9355 Newton Falls Road, Ravenna, Ohio 44266 to present the Proposed Plan. At this meeting, representatives of the Army provided information and were available to answer any questions. A transcript of the public meeting is available to the public and has been included in the Administrative Record. Responses to any comments received at this meeting and during the public notification period are included in the Responsiveness Summary, which is Part III of this ROD.

The Army considered public input from the public meeting on the Proposed Plan when selecting the remedy.

D SCOPE AND ROLE OF RESPONSE ACTIONS

The overall program goal of the IRP at the former RVAAP is to clean up previously contaminated lands to reduce contamination to concentrations that are not anticipated to cause risks to human health or the environment. No IRP cleanup activities have been performed at Wet Storage Area to date.

This ROD addresses soil, sediment, and surface water. The potential future Land Uses for Wet Storage Area are Military Training Land Use or Commercial/Industrial Land Use, which are consistent with the intended future Land Uses for CJAG. No COCs require remediation for sediment or surface water at Wet Storage Area; however, benzo(a)pyrene was identified as a COC requiring remediation in soil. The soil contamination present at Wet Storage Area poses a potential risk to human health because the benzo(a)pyrene concentrations exceeded the CUG for the Resident Receptor for Unrestricted (Residential) Land Use.

Implementing the remedy described in this ROD will address potential risk through thermal treatment of contaminated soil. The selected remedy described in the ROD is consistent with, and protective for, the intended future use (Military Training or Commercial/Industrial) at the AOC. Other media (e.g., groundwater) and AOCs at CJAG will be managed as separate actions or decisions by the Army and will be considered under separate RODs.

Potential impacts to groundwater from soil and sediment (e.g., contaminant leaching) were evaluated in the Wet Storage Area RI/FS Report (USACE 2017), as protectiveness to groundwater was included in the fate and transport analysis. However, groundwater will be evaluated as an individual AOC for the entire facility (designated as RVAAP-66) under the Facility-wide Groundwater Monitoring Program (FWGWMP).

E SITE CHARACTERISTICS

This section presents site characteristics, nature and extent of contamination, and the conceptual site model for Wet Storage Area. These characteristics and findings are based on investigations conducted from 1978–2010 and are further summarized in the Wet Storage Area RI/FS Report (USACE 2017).

E.1 Physical Characteristics

This section describes the topography/physiology, geology, hydrogeology, and ecological characteristics of CJAG and Wet Storage Area that were key factors in identifying the potential contaminant transport pathways, receptor populations, and exposure scenarios to evaluate human health and ecological risks.

E.1.1 Topography/Physiography

The topography of CJAG is gently undulating with an overall decrease in ground elevation from a topographic high of approximately 1,220 ft above mean sea level (amsl) in the far western portion of the facility to low areas at approximately 930 ft amsl in the far eastern portion. Wet Storage Area is located on a topographic high relative to adjacent streams. Ground elevations range from approximately 1,028–1,077 ft amsl (Figure 4). The former operations area of the AOC is generally flat to gently sloping. The extent of Wet Storage Area is defined by a fence line surrounding the entire AOC. The terrain west of the razed igloos falls steeply toward the unnamed tributary to Sand Creek.

E.1.2 Geology

The primary soil types found at Wet Storage Area are the Mahoning silt loam (2–6% slopes), which covers approximately 90% of the AOC, and the Ellsworth silt loam (6–12% slopes) along the western and northern edges of the AOC as soil slopes to the creek. The Mahoning silt loam is a gently sloping, poorly drained soil formed in silty clay loam or clay loam glacial till, generally where bedrock is greater than 6 ft bgs. Mahoning silt loam has low permeability with rapid runoff and seasonal wetness. The Ellsworth series consists of gently sloping to steep slopes of soil located

adjacent to drainageways formed in silty clay loam and silty clay glacial till. The Ellsworth silt loam is moderately well drained, with rapid runoff and potential for severe erosion (USDA 2010).

As shown in Figure 5, Wet Storage Area is located within Hiram Till glacial deposits. At Wet Storage Area, unconsolidated zone characteristics may vary due to site disturbances, including demolition and re-grading.

As shown in Figure 6, the bedrock formation underlying the unconsolidated deposits at Wet Storage Area, as inferred from existing geologic data, is the Pennsylvanian-age Pottsville Formation, Sharon Shale Member. During the 2008 Performance-based Acquisition Remedial Investigation (PBA08 RI), weathered bedrock was encountered at 23.3 ft bgs in the western portion of the AOC. However, Sharon Shale was encountered in shallower soil at 11 ft bgs and Sharon Sandstone was encountered at 29.4 ft bgs during the 2012 installation of monitoring well FWGmw-013 in the northeastern portion of the AOC (EQM 2012).

E.1.3 Hydrogeology

During the PBA08 RI, the nearest monitoring well was BKGmw-020, located approximately 100 ft from the east Wet Storage Area fence line and on the opposite side of George Road from Wet Storage Area (Figure 4). Well gauging data collected at this well during the January 2010 facility-wide groundwater sampling event indicated a water level at 20.14 ft below top of casing (btoc) (EQM 2010). Monitoring well BKGmw-020 is completed in bedrock to a depth of 30.7 ft bgs (1,034.30 ft amsl). The generalized regional groundwater flow direction in the vicinity of Wet Storage Area is toward Sand Creek to the north, based on the results of facility-wide groundwater monitoring.

However, an additional monitoring well (FWGmw-013) was installed near storage igloo WS-3 within Wet Storage Area under the FWGWMP in 2012 (Figure 4). This monitoring well was completed to 34.5 ft bgs (1058.97 ft amsl) and screened in the Sharon Sandstone to monitor groundwater in the bedrock (EQM 2015). Initial depth to groundwater was 17.05 ft btoc (1041.92 ft amsl). The groundwater elevation for FWGmw-013 was 16.18 ft btoc (1043.33 ft amsl) in May 2014 (EQM 2015) and 17.31 ft btoc (1042.20 ft amsl) in July 2015 (TEC-WESTON 2016).

E.1.4 Ecology

The ecological habitat at Wet Storage Area consists of 36 acres of mostly shrubland and forest, and the size of the habitat is large enough to completely support cover and food for small birds and mammals that typically require approximately 1 acre (USEPA 1993) (Figure 7). The terrestrial vegetation provides a habitat for birds, mammals, insects, and other organisms.

A wetland delineation conducted in 2006 identified 26 wetlands of varying sizes and quality on the AOC (OHARNG 2006). Most jurisdictional wetlands are associated with drainage ditches/natural conveyances. A wetland complex consisting of approximately 1.2 acres of high quality, Category 3 wetlands exists on the floodplain of the unnamed tributary to Sand Creek within the western portion of the AOC. Perennial surface water features exist in the fenced AOC boundary in the form of the

unnamed tributary to Sand Creek. Intermittent surface water also flows in small drainage ditches bordering the roads and features within the AOC.

The northern long-eared bat (*Myotis septentrionalis*; federally threatened) exists at CJAG. No other federally listed species or critical habitats exist on CJAG. Wet Storage Area has not had a site-specific survey for federally or state-listed species. However, surveys have been conducted throughout the facility and have not identified state-listed, federally listed, threatened, or endangered species at the AOC (OHARNG 2014).

E.2 Site Investigations

In 1978, the U.S. Army Toxic and Hazardous Materials Agency conducted an Installation Assessment of RVAAP to review the potential for contaminant releases at multiple former operations areas, as documented in *Installation Assessment of Ravenna Army Ammunition Plant* (USATHAMA 1978). This assessment indicated historical operations may have utilized lead azide or lead styphnate, which are primary explosives. The 1978 Installation Assessment identified the major contaminants of the former RVAAP to be 2,4,6-trinitrotoluene (TNT); composition B (a combination of TNT and hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX]); sulfates; nitrates; lead styphnate; and lead azide (USATHAMA 1978). Additional site-specific contaminants include mercury fulminate; tetryl; octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX); nitroglycerine; nitrocellulose; nitroguanidine (as identified in USACE 2015); and heavy metals (lead, chromium, mercury, and arsenic) from other secondary explosive storage activities. PAHs from potential diesel fuel use at the Generator House (Building PS-7) and polychlorinated biphenyls (PCBs) from the on-site transformer are also considered site-specific contaminants. The evaluation of historical chemical contamination is not limited to these chemicals; rather, this evaluation is expanded to include all eligible chemical data that are available.

Since 1978, Wet Storage Area has been included in various historical assessments and investigations conducted at the former RVAAP. The following environmental investigations have been completed for Wet Storage Area:

- Installation Assessment of Ravenna Army Ammunition Plant (USATHAMA 1978),
- Relative Risk Site Evaluation for Newly Added Sites (USACHPPM 1998),
- Characterization of 14 AOCs (MKM 2007), and
- 2010 PBA08 RI (USACE 2017).

The results of the 2004 Characterization of 14 AOCs (MKM 2007) and 2010 PBA08 RI (USACE 2017) sampling were used to evaluate the nature and extent of contamination, examine contaminant fate and transport, conduct risk assessments, and evaluate potential remedial alternatives, as summarized in the Wet Storage Area RI/FS Report (USACE 2016).

E.3 Nature and Extent of Contamination

Data from the 2004 Characterization of 14 AOCs (MKM 2007) and 2010 PBA08 RI (USACE 2017) effectively characterized the nature and extent of contamination at the AOC. Figure 8 presents the RI sample locations. To support the evaluation of nature and extent of contamination, site-related contaminant (SRC) concentrations were compared to screening levels (SLs) corresponding to the lowest FWCUG for the Resident Receptor (Adult and Child) and National Guard Trainee at a target hazard quotient (HQ) of 0.1 or target risk (TR) of 1E-06, as presented in the *Facility-wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2010).

Based on previous information and the summary below, it can be concluded that the vertical and horizontal extent of contamination is defined, and no further sampling is needed to evaluate Wet Storage Area.

E.3.1 Surface Soil

The predominant SRCs in surface soil at Wet Storage Area were inorganic chemicals and semi-volatile organic compounds (SVOCs). Fourteen inorganic chemicals were identified as SRCs in surface soil. The maximum concentrations for inorganic SRCs were not concentrated in any one location, and two incremental sampling method (ISM) samples with the most maximum detections for surface soil were WSAss-002M and WSAss-033M. The highest density of samples with inorganic chemicals above background concentrations was located in the vicinity of the former igloos in the northwestern portion of Wet Storage Area. Aluminum, arsenic, and cobalt concentrations exceeded their respective SLs and were considered chemicals of potential concern (COPCs); however, only arsenic concentrations at nine ISM locations exceeded the respective Resident Receptor (Adult and Child) at a TR of 1E-05, HQ of 1. The arsenic exceedance does not appear to be concentrated in any particular area of the AOC.

All 21 SVOC SRCs were detected at 2004 ISM sample location WSAss-004M, located adjacent to one of the southwestern igloos. The maximum concentrations for all 21 of the SVOC SRCs were detected in this sample. Thirteen SVOCs were detected at WSAss-036M, which delineates the area containing WSAss-004M, at concentrations typically two orders of magnitude lower than those at WSAss-004M. Five of the six PAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene)) that exceeded their SLs at WSAss-004M were detected at concentrations greater than their respective Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1.

Benzo(a)pyrene also exceeded the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1 at discrete PBA08 RI sample locations WSAsb-022, WSAsb-024, WSAsb-027, and WSAsb-028. Benz(a)anthracene, benzo(b)fluoranthene, and dibenz(a,h)anthracene also exceeded the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1 at discrete PBA08 RI sample locations WSAsb-024 and WSAsb-028.

An explosive (3-nitrotoluene), propellant (nitrocellulose), and five pesticides (4,4′-dichlorodiphenyldichloroethylene; endosulfan sulfate; endrin; alpha-chlordane; and beta-hexachlorocyclohexane) were identified as SRCs in the surface soil at Wet Storage Area. None of the detected concentrations exceeded their respective SLs. Volatile organic compounds (VOCs) and PCBs were not detected in the surface soil.

E.3.2 Subsurface Soil

Four inorganic chemicals (arsenic, cadmium, cobalt, and silver) were identified as SRCs, although no spatial or vertical trend is apparent for the distribution of inorganic chemicals in subsurface soil, and concentrations only marginally exceeded their applicable background concentrations. Seventeen SVOCs were identified as SRCs, with soil boring location WSAsb-024 (located adjacent to one of the former igloos in the northwestern portion of the AOC) containing the greatest number and highest concentrations of SVOCs. Benzo(a)pyrene was detected in the 1–4 ft bgs interval at WSAsb-024 at a concentration that exceeded its respective SL of 0.022 mg/kg; thus, benzo(a)pyrene was identified as a COPC. The benzo(a)pyrene concentration was detected below the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1. No SVOCs were detected from the 4–7 or 7–13 ft bgs intervals at WSAsb-024. The majority of SVOC SRCs were PAHs, which also were identified as SRCs in surface soil.

One VOC (toluene) and one pesticide (4,4′-dichlorodiphenyltrichloroethane) were identified as SRCs, although they occurred at low, estimated concentrations in different depth intervals of soil boring WSAsb-028. Explosives, propellants, and PCBs were not detected in the subsurface soil.

E.3.3 Sediment and Surface Water

The greatest number and highest concentrations of identified SRCs in sediment samples were detected in the most upstream location within the unnamed tributary to the west of Wet Storage Area. The predominant SRCs in sediment were inorganic chemicals and PAHs. SRC concentrations generally followed a clear longitudinal trend, exhibiting decreasing numbers and concentrations with downstream distance. However, location WSAsd-037, which exhibits the highest concentrations and greatest number of PAH and inorganic detections, is in a location that is upstream relative to potential surface water contributions from Wet Storage Area; therefore, it is not influenced by runoff from the AOC. Two of the inorganic chemicals (antimony and manganese) were not identified as SRCs in surface soil at Wet Storage Area and occurred in sediment at upstream location WSAsd-037 at concentrations twice or greater than the maximum concentrations observed in surface soil at the AOC. Manganese concentrations at WSAsd-037 exceeded the Resident Receptor (Adult and Child) FWCUG at a TR of 1E-05, HQ of 1. One VOC (2-butanone) was detected in sediment sample WSAsd-037 upstream of the AOC. Chloromethane and the pesticide dieldrin were detected in sediment in one historical sample in Sand Creek, downstream from the AOC. Explosives, propellants, pesticides, and PCBs were not detected in sediment samples at Wet Storage Area.

Surface water at Wet Storage Area is present within the unnamed tributary on the western side of the AOC, which then enters into Sand Creek to the north. Within the former operational area at Wet

Storage Area, surface water only occurs as storm water runoff either overland or within discontinuous ditch lines immediately adjacent to intra-AOC access roads. While five inorganic SRCs were identified in surface water, these inorganic chemicals did not have established background concentrations, and all detections were at concentrations below laboratory screening criteria. Explosives, propellants, SVOCs, pesticides, and PCBs were not detected in surface water samples at Wet Storage Area. Nitrocellulose, bis(2-ethylhexyl)phthalate, acetone, carbon disulfide, and chloroform were each detected once at locations outside the AOC.

E.4 Conceptual Site Model

Conceptual site model elements are discussed in this section, including primary and secondary contaminant sources and release mechanisms, contaminant migration pathways and discharge or exit points, and potential human receptors and ecological resources.

E.4.1 Primary and Secondary Contaminant Sources and Release Mechanisms

No primary contaminant sources (e.g., operational facilities or retention basins) remain at Wet Storage Area. All previously stored materials were removed as of 1945. Four igloos with lead-lined floors along the western side of the AOC were demolished in 2004. Two igloos (concrete floored) on the eastern side of the AOC (WS-3 and WS-3A) remain intact; one was refurbished for administrative use. Remnant contamination in soil is considered a secondary source of contamination.

Sample locations WSAss-004M, WSAsb-028, and WSAsb-024 had PAH concentrations greater than their respective Resident Receptor FWCUGs at a TR of 1E-05, HQ of 1. These samples were located near the entrance to igloos WS-1 and WS-2. None of the detected PAH concentrations in subsurface soil were above the Resident Receptor FWCUG at a TR of 1E-05, HQ of 1.

Sites where explosives were identified as potential contaminants from previous use were thoroughly evaluated, including around former process buildings and across the AOC as a whole. Explosives were not detected above SLs in any of the environmental media sampled (i.e., surface soil, subsurface soil, sediment, and surface water).

Small drainage ditches within the AOC convey storm water runoff on an intermittent basis. No perennial drainage conveyances exist within the AOC; however, an unnamed tributary to Sand Creek lies approximately 100 ft to the west and Sand Creek lies approximately 400 ft to the north. None of the detected chemical concentrations in sediment or surface water were above the Resident Receptor FWCUG at a TR of 1E-05, HQ of 1.

The primary mechanisms for release of contaminants from secondary sources at the AOC are:

- Eroding soil matrices with sorbed chemicals and mobilization in overland surface water storm runoff during heavy rainfall conditions,
- Dissolving soluble chemicals and transport in perennial surface water conveyances and intermittent surface water runoff,

- Re-suspending contaminated sediment during periods of high flow with downstream transport within the surface water system, and
- Leaching contaminants to groundwater.

E.4.2 Contaminant Migration Pathways and Exit Points

The potential for soil and sediment contaminants to impact groundwater was evaluated in the fate and transport evaluation presented in the Wet Storage Area RI/FS Report (USACE 2017). Contaminants in surface soil may migrate to surface water via drainage ditches in the dissolved phase following a storm event or as particulates in storm water runoff.

Maximum SRC concentrations identified in surface and subsurface soil were evaluated using a series of generic screening steps to identify initial contaminant migration chemicals of potential concern (CMCOPCs). These CMCOPCs for soil were further evaluated using the Seasonal Soil Compartment model to predict leaching concentrations and identify final CMCOPCs based on RVAAP facility-wide background criteria and the lowest risk-based screening criteria among USEPA maximum contaminant levels, USEPA tap water RSLs, or RVAAP groundwater FWCUGs for the Resident Receptor Adult. Final CMCOPCs were evaluated using the Analytical Transient 1-, 2-, and 3-Dimensional (AT123D) model to predict groundwater mixing concentrations beneath source areas and concentrations at the nearest downgradient groundwater receptor to the AOC (e.g., stream). Maximum SRC concentrations in sediment were evaluated using an analytical solution to identify final CMCOPCs for evaluation using the AT123D model. The AT123D modeling results were evaluated with respect to AOC groundwater monitoring data, as well as model limitations and assumptions, to identify chemicals to be retained as CMCOCs.

Conclusions of the soil and sediment screening, leachate modeling, and groundwater modeling are as follows:

- Arsenic and naphthalene in soil were predicted to exceed the screening criteria in groundwater beneath the source area; however, none of these constituents were predicted to exceed screening criteria at the downgradient receptor location.
- Manganese, benz(a)anthracene, benzo(b)fluoranthene, and naphthalene in sediment were predicted to exceed the screening criteria in groundwater beneath the source area; however, none of these constituents were predicted to exceed screening criteria at the downgradient receptor location.

A qualitative assessment of the sample results was performed, and the limitations and assumptions of the models were considered to identify if any CMCOCs are present in soil at Wet Storage Area that may potentially impact groundwater. This qualitative assessment concluded that no CMCOCs were present in soil and sediment that may impact the groundwater beneath the source or at the downstream receptor location. No further action is required of soil and sediment at Wet Storage Area for the protection of groundwater. Groundwater will be further evaluated under the FWGWMP.

E.4.3 Potential Human Receptors and Ecological Resources

In February 2014, the Army and Ohio EPA amended the risk assessment process to address changes in the RVAAP restoration program. The *Final Technical Memorandum: Land Uses and Revised Risk Assessment Process for the RVAAP Installation Restoration Program* (ARNG 2014) identified the following three Categorical Land Uses and Representative Receptors to be considered during the RI phase of the CERCLA process.

1. Unrestricted (Residential) Land Use – Resident Receptor (Adult and Child) (formerly called Resident Farmer).
2. Military Training Land Use – National Guard Trainee.
3. Commercial/Industrial Land Use – Industrial Receptor (USEPA Composite Worker).

An evaluation using Resident Receptor (Adult and Child) FWCUGs was used to provide an Unrestricted (Residential) Land Use evaluation. If a site meets the standards for Unrestricted (Residential) Land Use, it can be used for all categories of Land Use at CJAG. The receptor is assumed to be exposed to surface soil from 0–1 ft bgs and subsurface soil from 1–13 ft bgs.

CJAG has a diverse range of vegetation and habitat resources. Habitats present within the facility include large tracts of closed-canopy hardwood forest, scrub/shrub open areas, grasslands, wetlands, open-water ponds and lakes, and semi-improved administration areas. An abundance of wildlife is present on the facility: 35 species of land mammals, 214 species of birds, 41 species of fish, and 34 species of amphibians and reptiles have been identified. The Ecological Risk Assessment (ERA) Level I presents important ecological resources on or near the AOC and evaluates the potential for current contamination to impact ecological resources. Chemical contamination is present in soil and sediment at Wet Storage Area, and important and significant ecological resources are found at the AOC. The Level II ERA and the factors in Step 3A showed no integrated chemicals of potential ecological concern (COPECs) that require remediation or further evaluation. Consequently, the Level II Screening ERA concluded that no further action is necessary to be protective of ecological resources.

F CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

Wet Storage Area is currently managed by ARNG/OHARNG. The AOC is not currently being utilized for training purposes. The potential future uses for Wet Storage Area are Military Training Land Use or Commercial/Industrial Land Use. The Resident Receptor was evaluated in the HHRA to assess an Unrestricted (Residential) Land Use scenario. This ROD discusses future Land Use as it pertains to soil, sediment, and surface water and how it impacts human health, the environment, and groundwater.

G SUMMARY OF SITE RISKS

The HHRA and ERA estimated risks to human receptors and ecological resources; identified exposure pathways; presented COCs and COPECs, if any; and provided a basis for remedial

decisions. This section of the ROD summarizes the results of the HHRA and ERA, which are presented in detail in the Wet Storage Area RI/FS Report (USACE 2017) and Wet Storage Area Proposed Plan (USACE 2018) located in the Administrative Record and Information Repositories.

G.1 Human Health Risk Assessment

An HHRA was performed to identify COCs and provide a risk management evaluation to determine if remediation is required under CERCLA based on potential risks to human receptors. The media evaluated in the HHRA were surface soil, subsurface soil, sediment, and surface water.

No COCs were identified for the Resident Receptor (Adult and Child) in subsurface soil, sediment, or surface water. Arsenic and five PAHs (benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) were identified as COCs for the Resident Receptor (Adult and Child) in surface soil.

Although arsenic slightly exceeded the subsurface soil background concentration at WSAss-020M, the other 21 ISM samples had concentrations less than the subsurface soil background concentration. Since arsenic was detected at naturally occurring concentrations at Wet Storage Area, it is not identified as a COC requiring remediation.

Four of the five PAH COCs (benz[a]anthracene, benzo[b]fluoranthene, dibenz[a,h]anthracene, and indeno[1,2,3-cd]pyrene) had maximum concentrations lower than the June 2017 USEPA Resident Soil RSLs (released after the finalization of the Wet Storage Area RI/FS Report), eliminating these four PAHs as COCs requiring remediation. The one remaining surface soil COC requiring remediation at Wet Storage Area is benzo(a)pyrene.

Benzo(a)pyrene at WSAsb-027 (0.3J mg/kg) slightly exceeded the Resident Receptor FWCUG (0.221 mg/kg). None of the other PAHs exceeded their respective Resident Receptor FWCUGs. As a result, the HHRA in the Wet Storage Area RI/FS Report (USACE 2017) determined this location does not require remediation. In addition, this concentration is below the June 2017 USEPA RSL for benzo(a)pyrene (1.1 mg/kg).

Benzo(a)pyrene at WSAsb-022 (1.1 mg/kg) also exceeded the Resident Receptor FWCUG. None of the other PAHs exceeded their respective Resident Receptor FWCUGs. WSAsb-022 was collected from the center of a ditch adjacent to ISM sample WSAss-034M, in which very low concentrations of benzo(a)pyrene (0.071 mg/kg) were detected. The HHRA in the Wet Storage Area RI/FS Report (USACE 2017) determined that this location does not require remediation. In addition, this concentration is equal to the June 2017 USEPA RSL for benzo(a)pyrene (1.1 mg/kg).

The locations to be remediated for benzo(a)pyrene are WSAss-004M, WSAsb-028, and WSAsb-024 in the area of the former igloos (WS-1 and WS-2). Figure 9 presents the concentrations of the sample results exceeding the remedial CUG of 1.1 mg/kg.

Soil boring WSAsb-028 was collected within the boundary of WSAss-004M. Benzo(a)pyrene was not detected in the 1–4 and 4–7 ft bgs samples from this boring. Accordingly, the soil depth requiring remediation to attain Unrestricted (Residential) Land Use is limited to 0–1 ft bgs. The horizontal boundary is considered the horizontal extent of WSAss-004M. The entire area to be remediated from these two sample locations is considered WSA Area 1.

Soil boring WSAsb-024 was collected within the boundary of WSAss-002M. Benzo(a)pyrene was not detected in the 1–4 and 4–7 ft bgs samples from this boring. Accordingly, the soil depth requiring remediation to attain Unrestricted (Residential) Land Use is limited to 0–1 ft bgs. WSAss-002M was not analyzed for PAHs in 2004. Therefore, to be conservative, the horizontal boundary is considered the horizontal extent of WSAss-002M. The entire area to be remediated from these two sample locations is considered WSA Area 2.

G.2 Ecological Risk Assessment

The ecological habitat at Wet Storage Area consists of 36 acres of mostly shrubland and forest, and the size of the habitat is large enough to completely support cover and food for small birds and mammals that typically require approximately 1 acre (USEPA 1993). The terrestrial vegetation provides a habitat for birds, mammals, insects, and other organisms.

A wetland delineation conducted in 2006 identified 26 wetlands of varying sizes and quality on the AOC (OHARNG 2006). Most jurisdictional wetlands are associated with drainage ditches/natural conveyances. A wetland complex consisting of approximately 1.2 acres of high quality, Category 3 wetlands exists on the floodplain of the unnamed tributary to Sand Creek within the western portion of the AOC. Perennial surface water features exist in the fenced AOC boundary in the form of the unnamed tributary to Sand Creek. Intermittent surface water also flows in small drainage ditches bordering the roads and features within the AOC.

The northern long-eared bat (*Myotis septentrionalis*; federally threatened) exists at CJAG. No other federally listed species or critical habitats exist on CJAG. Wet Storage Area has not had a site-specific survey for federally or state-listed species. However, surveys have been conducted throughout the facility and have not identified state-listed, federally listed, threatened, or endangered species at the AOC (OHARNG 2014).

The Level I Scoping ERA presents important ecological resources on or near the AOC and evaluates whether chemical contamination is present in the environment. Ecological resources at Wet Storage Area were compared to the list of important ecological places and resources (USACE 2017). Based on the 39 criteria defining important places and resources as identified by the Army and Ohio EPA, important and significant ecological resources exist at the AOC. Specifically, wetlands and surface water (unnamed tributary to Sand Creek) are present and near contamination. The ERA incorporates available data to identify integrated COPECs. Chemical contamination is present in surface soil. This contamination was identified using historical and PBA08 RI data. Per the *Guidance for Conducting Ecological Risk Assessments* (Ohio EPA 2008), this ERA was continued to a Level II Screening Level ERA.

The Level II ERA evaluated soil and sediment COPECs. Seventeen integrated COPECs were identified for soil. Four integrated COPECs were identified for sediment. No integrated COPECs require remediation or further evaluation. Consequently, the Level II Screening Level ERA for Wet Storage Area concludes with a recommendation that no further action is necessary to be protective of important ecological receptors.

H REMEDIAL ACTION OBJECTIVES

The remedial action objective (RAO) references CUGs and risk levels that are considered protective of human health under current and future use scenarios. The RAO for Wet Storage Area is to prevent Resident Receptor exposure to surface soil (0–1 ft bgs) with a benzo(a)pyrene concentration above the remedial CUG of 1.1 mg/kg at WSA Area 1 and WSA Area 2.

Figure 10 presents the estimated extent of surface soil (0–1 ft bgs) requiring remediation. Table 2 presents the COC and remedial CUG.

Table 2. Remedial CUG for Wet Storage Area

COC	Remedial CUG (mg/kg)
Benzo(a)pyrene	1.1

The remedial CUG is based on the 2017 U.S. Environmental Protection Agency Resident Soil Regional Screening Level at hazard quotient=1, target risk=1E-05.
COC = Chemical of concern.
CUG = Cleanup goal.
mg/kg = Milligrams per kilogram.

I DESCRIPTION OF ALTERNATIVES

The Wet Storage Area RI/FS Report (USACE 2017) developed and evaluated remedial alternatives for surface soil at Wet Storage Area. The remedial alternatives are listed below:

- Alternative 1: No Action,
- Alternative 2: Excavation and Off-site Disposal – Attain Unrestricted (Residential) Land Use, and
- Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use.

This section includes a description of various components of the remedial alternatives identified in the RI/FS Report, including soil treatment, removal, disposal, and handling.

I.1 Alternative 1: No Action

Alternative 1 provides no remedial action and is required under the NCP as a baseline for comparison with other remedial alternatives. Alternative 1 provides no additional protection to human health and the environment. Any current legal and administrative LUC mechanisms at the AOC would be discontinued. No future legal, administrative, or physical LUC mechanisms would be employed at the AOC. Environmental monitoring would not be performed, and five-year reviews would not be

conducted in accordance with CERCLA 121(c). In addition, no restrictions on Land Use would be pursued.

I.2 Alternative 2: Excavation and Off-site Disposal – Attain Unrestricted Land Use

Implementing surface soil removal (0–1 ft bgs) at WSA Area 1 and WSA Area 2 would attain Unrestricted (Residential) Land Use. The following subsections describe activities associated with this alternative.

I.2.1 Delineation and Waste Characterization Sampling

To coincide with and support development of a remedial design (RD), a delineation/pre-excavation sampling plan would be implemented with the intent of: 1) adequately defining the extent of soil requiring removal to support the direct loading of soil on to trucks for off-site disposal, and 2) minimizing the time required to implement the remedial action by eliminating the need for post-excavation confirmation sampling. In addition, waste characterization samples would be collected from the area requiring removal and off-site disposal to assess if soil is characteristically hazardous.

I.2.2 Remedial Design

An RD would be developed to outline site preparation activities (e.g., staging and equipment storage areas, truck routes, storm water controls); the extent of the excavation; sequence and description of excavation and site restoration activities; decontamination; and segregation, transportation, and disposal of various waste streams. Erosion and health and safety controls would be developed during the active construction period to ensure remediation workers and the environment are protected.

I.2.3 Soil Removal

To achieve a scenario in which the AOC is protective for Unrestricted (Residential) Land Use, soil would be removed from WSA Area 1 and WSA Area 2, which exceeded the CUG for benzo(a)pyrene, and would be hauled by truck to a licensed and permitted disposal facility.

I.2.4 Site Restoration

All disturbed and excavated areas would be backfilled with clean soil and graded to meet neighboring contours. The backfill soil would come from a clean source that was previously sampled and approved for use by Ohio EPA. To ensure adequate vegetation is established within the excavated area, a layer of topsoil from a clean source that was previously sampled and approved for use by Ohio EPA would be placed on the backfill soil.

After the areas are backfilled and graded, workers would apply a seed mixture (as approved by OHARNG) and mulch. Restored areas would be inspected and monitored as required in the storm water best management practices established in the RD.

I.3 Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use

Implementing ex situ thermal treatment, such as the Vapor Energy Generation© (VEG©) treatment, for surface soil (0–1 ft bgs) at WSA Area 1 and WSA Area 2 would attain Unrestricted (Residential) Land Use. The following subsections describe activities associated with this alternative.

I.3.1 Delineation and Waste Characterization Sampling

To coincide with and support development of an RD, a delineation/pre-excavation sampling plan would be implemented with the intent of: 1) adequately defining the extent of soil requiring treatment, and 2) minimizing the time required to implement the remedial action by eliminating the need for sampling within the excavation footprint. In addition, waste characterization samples would be collected from the area requiring removal and off-site disposal to assess if that soil is characteristically hazardous.

I.3.2 Remedial Design

An RD would be developed to outline preparation activities (e.g., staging and equipment storage areas, truck routes, storm water controls); the extent of the excavation; sequence and description of excavation and site restoration activities; confirmation sampling of soils to be returned to the excavation; decontamination; and segregation, transportation, and disposal of various waste streams. Erosion and health and safety controls would be developed during the active construction period to ensure remediation workers and the environment are protected.

I.3.3 Excavation and Soil Treatment

The soil contaminated with benzo(a)pyrene at WSA Area 1 and WSA Area 2 would undergo ex situ thermal treatment. Treated soil would be stockpiled and analyzed for benzo(a)pyrene. Once the laboratory analysis determines benzo(a)pyrene is below the CUG, the treated soil would be used for backfill and site restoration. Should confirmation samples indicate that any contaminants are not sufficiently treated, then those soils would be rerun through the treatment system, likely at a higher temperature, until the target post-treatment levels are reached.

I.3.4 Site Restoration

All treated soil would be placed back into the excavated area and graded to meet neighboring contours. To ensure adequate vegetation is established within the excavated area, a layer of topsoil from a clean source that was previously sampled and approved for use by Ohio EPA would be placed on the treated soil.

After the areas are backfilled and graded, workers would apply a seed mixture (as approved by OHARNG) and mulch. Restored areas would be inspected and monitored as required in the storm water best management practices established in the RD.

J COMPARATIVE ANALYSIS OF ALTERNATIVES

These alternatives were evaluated with respect to the nine comparative analysis criteria. These criteria are further described, as outlined by CERCLA, in Table 3. The nine criteria are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria as follows:

Threshold Criteria – Must be met for the alternative to be eligible for selection as a remedial option.

1. Overall protection of human health and the environment.
2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).

Primary Balancing Criteria – Used to weigh major trade-offs among alternatives.

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

Modifying Criteria – FS consideration to the extent that information was available. Evaluated fully after public comment period on the Proposed Plan.

8. State acceptance.
9. Community acceptance.

The following subsections discuss the comparative analysis of the alternatives developed for Wet Storage Area, and a scoring of these alternatives is presented in Table 4.

J.1 Overall Protection of Human Health and the Environment

Overall protection and compliance with ARARs are threshold criteria that must be met by any alternative to be eligible for selection. If any alternative is considered "not protective" for overall protectiveness of human health and the environment or "not compliant" for compliance with ARARs, it is not eligible for selection as the recommended alternative.

Alternative 1 is not protective of human health and is not compliant with ARARs. In addition, Alternative 1 does not meet the RAO to prevent Resident Receptor exposure to surface soil (0–1 ft bgs). The concentrations of benzo(a)pyrene are above the CUG at WSA Area 1 and WSA Area 2. Therefore, Alternative 1 is not eligible for selection.

For the remaining alternatives, the balancing criteria (short- and long-term effectiveness; reduction of contaminant toxicity, mobility, or volume through treatment; ease of implementation; and cost) are used to select a recommended alternative among the alternatives that satisfy the threshold criteria.
The remaining alternatives are ranked among one another for each of the balancing criteria and a total score is generated.

Alternative 3 scores the highest and is the recommended alternative. Alternative 3 is effective in the long term and will attain Unrestricted (Residential) Land Use. In addition, Alternative 3 is a green and highly sustainable alternative for on-site treatment and unrestricted reuse of soil and implements a treatment alternative to reduce the toxicity, mobility, and volume of contamination.

In the event that a thermal treatment system is not available on site at the former RVAAP, Alternative 2 is readily available for implementation. Excavation and off-site disposal alternatives have been implemented multiple times during restoration efforts at the former RVAAP. As with Alternative 3, Alternative 2 is effective in the long term and attains Unrestricted (Residential) Land Use. Alternative 2 reduces the mobility of contaminants by placing contamination in an engineered landfill.

Table 3. CERCLA Evaluation Criteria

Overall Protection of Human Health and the Environment – Considers whether or not an alternative provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
Compliance with Applicable or Relevant and Appropriate Requirements – Considers how a remedy will meet all the applicable or relevant and appropriate requirements of other federal and state environmental statutes and/or provide grounds for invoking a waiver.
Long-term Effectiveness and Permanence – Considers the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.
Reduction of Toxicity, Mobility, or Volume Through Treatment – Considers the anticipated performance of the treatment technologies that may be employed in a remedy.
Short-Term Effectiveness – Considers the speed with which the remedy achieves protection, as well as the potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.
Implementability – Considers the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.
Cost – Considers capital costs and operation and maintenance costs associated with the implementation of the alternative.
State Acceptance – Indicates whether the state concurs with, opposes, or has no comment on the preferred alternative.
Community Acceptance – Considers public input following a review of the public comments received on the Remedial Investigation/Feasibility Study Report and Proposed Plan.

Table 4. Summary of Comparative Analysis of Remedial Alternatives

NCP Evaluation Criteria	Alternative 1: No Action	Alternative 2: Excavation and Off-site Disposal – Attain Unrestricted (Residential) Land Use	Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use
Threshold Criteria	***Result***	***Result***	***Result***
1. Overall Protectiveness of Human Health and the Environment	Not protective	Protective	Protective
2. Compliance with ARARs	Not compliant	Compliant	Compliant
Balancing Criteria	***Score***	***Score***	***Score***
3. Long-term Effectiveness and Permanence	Not applicable	1	2
4. Reduction of Toxicity, Mobility, or Volume through Treatment	Not applicable	1	2
5. Short-term Effectiveness	Not applicable	1	2
6. Implementability	Not applicable	2	1
7. Cost	Not applicable ($0)	2 ($116,346)	1 ($134,587)
Balancing Criteria Score	*Not applicable*	*7*	*8*

Any alternative considered "not protective" for overall protectiveness of human health and the environment or "not compliant" for compliance with ARARs is not eligible for selection as the recommended alternative. Therefore, that alternative is not scored as part of the balancing criteria evaluation.

Scoring for the balancing criteria is as follows for applicable alternatives: Most favorable = 2, least favorable = 1. The alternative with the highest total balancing criteria score is considered the most feasible.

ARAR = Applicable or Relevant and Appropriate Requirement.

NCP = National Contingency Plan.

J.2 State Acceptance

State acceptance was evaluated formally after the public comment period on the Proposed Plan. Ohio EPA has expressed its support for Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use.

J.3 Community Acceptance

Community acceptance was evaluated formally after the public comment period. During the public meeting, the community voiced no objections to Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use, as indicated in Part III of this ROD, the Responsiveness Summary.

K PRINCIPAL THREAT WASTES

Principal threat wastes, as defined by USEPA in *A Guide to Principal Threat and Low Level Threat Wastes* (USEPA 1991), are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur.

Wastes that generally are considered to constitute principal threats include, but are not limited to:

- Liquids – wastes contained in drums, lagoons, or tanks, free product floating on or under groundwater.
- Mobile source material – surface soil or subsurface soil containing high concentrations of chemicals that are mobile due to wind entrainment, volatilization, surface runoff, or subsurface transport.
- Highly toxic source material – buried drummed non-liquid wastes, buried tanks containing non-liquid wastes, or soils containing significant concentrations of highly toxic materials.

USEPA guidance indicates where mobility and toxicity of source material combine to pose a potential risk of 10^{-3} or greater, generally treatment alternatives should be considered. Wet Storage Area does not contain source materials that are considered principal threat wastes, as described above, and no chemicals pose a risk of 10^{-3} or greater. As such, no remedies are required to address principal threat wastes at this AOC.

L SELECTED REMEDY

Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use is selected for implementation at the Wet Storage Area. This alternative also attains the requisite level of cleanup for Military Training Land Use and Commercial/Industrial Land Use.

L.1 Rationale for the Selected Remedy

The selected remedy meets the threshold criteria and provides the best overall balance of trade-offs in terms of the five balancing criteria:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, and volume;
- Short-term effectiveness;
- Implementability; and
- Cost.

The selected remedy is protective for the future use, is cost effective, and can be performed in a timely manner. Based on the available risk assessment information, the selected remedy will achieve the RAO, which prevents Resident Receptor exposure to surface soil (0–1 ft bgs) with concentrations above the benzo(a)pyrene CUG at WSA Area 1 and WSA Area 2.

Using engineering controls, personal protective equipment, erosion and sediment controls, proper waste handling practices, and monitoring will mitigate short-term effects during construction. The selected remedy addresses state and community concerns by removing and treating contaminated soil from the Wet Storage Area.

Alternative 3 is a green and highly sustainable alternative for on-site treatment and unrestricted reuse of soil contaminated with benzo(a)pyrene and implements a treatment alternative to reduce the toxicity, mobility, and volume of contamination.

L.2 Description of the Selected Remedy

Alternative 3 consists of thermally treating soil contaminated with benzo(a)pyrene at WSA Area 1 and WSA Area 2. This alternative is described in more detail in Section I.3.

L.3 Summary of the Estimated Remedy Costs

The cost to complete Alternative 3 is approximately $134,587 (in base year 2016 dollars). No operations and maintenance is required; therefore, no operations and maintenance costs are associated with this alternative. This cost assumes an existing thermal treatment system is on site and ready for mobilization.

This cost estimate is based on the best available information regarding the anticipated scope of the selected remedy. This is an order of magnitude engineering cost estimate that is expected to be within –30 to +50% of the actual project cost in accordance with USEPA guidance (USEPA 1988).

L.4 Expected Outcomes of the Selected Remedy

Table 2 provides the benzo(a)pyrene CUG to be achieved for soil at Wet Storage Area after the remedial activities are complete. Residual risks after implementing the selected remedy will be within the acceptable risk range for the future use and will meet the criteria for Unrestricted (Residential) Land Use. Removing contaminated soil will reduce the likelihood of contaminant migration to other environmental media, such as surface water or groundwater. Removing soil to attain the human health CUG will also reduce risks to ecological receptors.

No negative socioeconomic and community revitalization impacts are expected from this remedial action. Positive socioeconomic impacts are expected from removing soil exceeding the CUG because additional resources will be available for use by the OHARNG training mission.

M STATUTORY DETERMINATIONS

The selected remedy satisfies the statutory requirements of CERCLA Section 121 and the NCP, as described below.

M.1 Protection of Human Health and the Environment

Human exposure to benzo(a)pyrene will be eliminated to concentrations that are protective through treatment and off-site disposal of soil at Wet Storage Area. The selected remedy also protects environmental resources from potential exposure to COC-contaminated media. The selected remedy will attain the CUG listed in Table 2.

M.2 Compliance with ARARs

The selected remedy will comply with the action-specific ARARs listed in Attachment A.

M.3 Cost Effectiveness

The selected remedy meets the statutory requirement for a cost-effective remedy. Cost effectiveness is concerned with the reasonableness of the relationship between the effectiveness afforded by each alternative and its costs compared to other available options.

M.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The selected remedy represents the maximum extent to which permanent solutions are practicable for soil at the AOC. The selected remedy represents the best balance of trade-offs between the alternatives because it provides a permanent solution for contaminated media, is cost-effective, and eliminates the need for long-term LUCs respective to chemical contaminants in soil.

M.5 Preference for Treatment as a Principal Element

The selected remedy uses permanent solutions to the maximum extent practicable. The remedy satisfies the statutory preference for treatment.

M.6 Five-Year Review Requirements

Five-year reviews in compliance with CERCLA Section 121(c) and NCP Section 300.430(f)(4)(ii) will not be required.

N DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE OF PROPOSED PLAN

The Wet Storage Area Proposed Plan (USACE 2018) was released for public comment on June 6, 2018. Feedback received from the public during the public comment period and public meeting are presented in Part III of this ROD. The Proposed Plan identified Alternative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use as the recommended alternative for Wet Storage Area. No significant changes were necessary or appropriate following the conclusion of the public comment period.

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PART III: RESPONSIVENESS SUMMARY FOR PUBLIC COMMENTS ON THE ARMY PROPOSED PLAN FOR RVAAP-45 WET STORAGE AREA

A OVERVIEW

On June 6, 2018, the Army released the Wet Storage Area Proposed Plan (USACE 2018) for public comment. A 30-day public comment period was held from June 6, 2018 to July 6, 2018. The Army hosted a public meeting on June 21, 2018 to present the Proposed Plan and take questions and comments from the public for the record. The public comment period and public meeting also included Proposed Plans for Load Line 7, Load Line 9, Load Line 12, and Upper and Lower Cobbs Ponds.

For soil, surface water, and sediment at Wet Storage Area, the Army recommended Alterative 3: Ex Situ Thermal Treatment – Attain Unrestricted (Residential) Land Use. During the public meeting, Ohio EPA concurred with the recommendation of this alternative.

The community voiced no objections to this recommendation. All public input, including the oral and written comments provided, was considered during the selection of the final remedy for soil, surface water, and sediment at Wet Storage Area in this ROD.

B STAKEHOLDER ISSUES AND LEAD AGENCY RESPONSES

The following subsections summarize the oral and written comments provided during the public comment period and public meeting. ARNG's responses provided below are considered final upon approval of the Final ROD.

B.1 Oral Comments from Public Meeting

Comment 1: What impacts or what will occur when you excavate the contaminated soil? Is there any testing that is done to monitor airborne contaminants?
Response: Excavation of contaminated soil would include the use of engineering controls to mitigate risk from airborne contaminants to workers and the community. These controls include constant visual inspections to verify that excessive dust is not created in excavation or transport, wetting of the contaminated soil if dust is created, and ensuring the contaminated soil is covered when in the haul trucks prior to exiting the site.

If contaminated media are at concentrations that airborne particulates can pose unacceptable risk to workers or the community via an airborne pathway, the RD will specify that air monitoring equipment will be on site and continually monitored.

B.2 Written Comments

Comment 1: What happens to Sand Creek after the exit from the arsenal area into Windham?
Response: Sand Creek flows through the center of the former RVAAP (CJAG), generally in a northeast direction to its confluence with South Fork Eagle Creek. This confluence is just inside the CJAG perimeter fence. After the confluence, South Fork Eagle Creek exits CJAG between Windham Road and Snow Road and continues in a northerly direction for approximately 3 miles to its confluence with Eagle Creek.

C TECHNICAL AND LEGAL ISSUES

No technical or legal issues were raised during the public comment period.

PART IV: REFERENCES

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USACE 2017. *Remedial Investigation/Feasibility Study Report for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area, Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio.* February 2017.

USACE 2018. *Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area, Former Ravenna Ammunition Plant Portage and Trumbull Counties, Ohio*. February 2018.

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USATHAMA (U.S. Army Toxic and Hazardous Materials Agency) 1978. *Installation Assessment of Ravenna Army Ammunition Plant*, Records Evaluation Report No. 132. 1978.

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FIGURES

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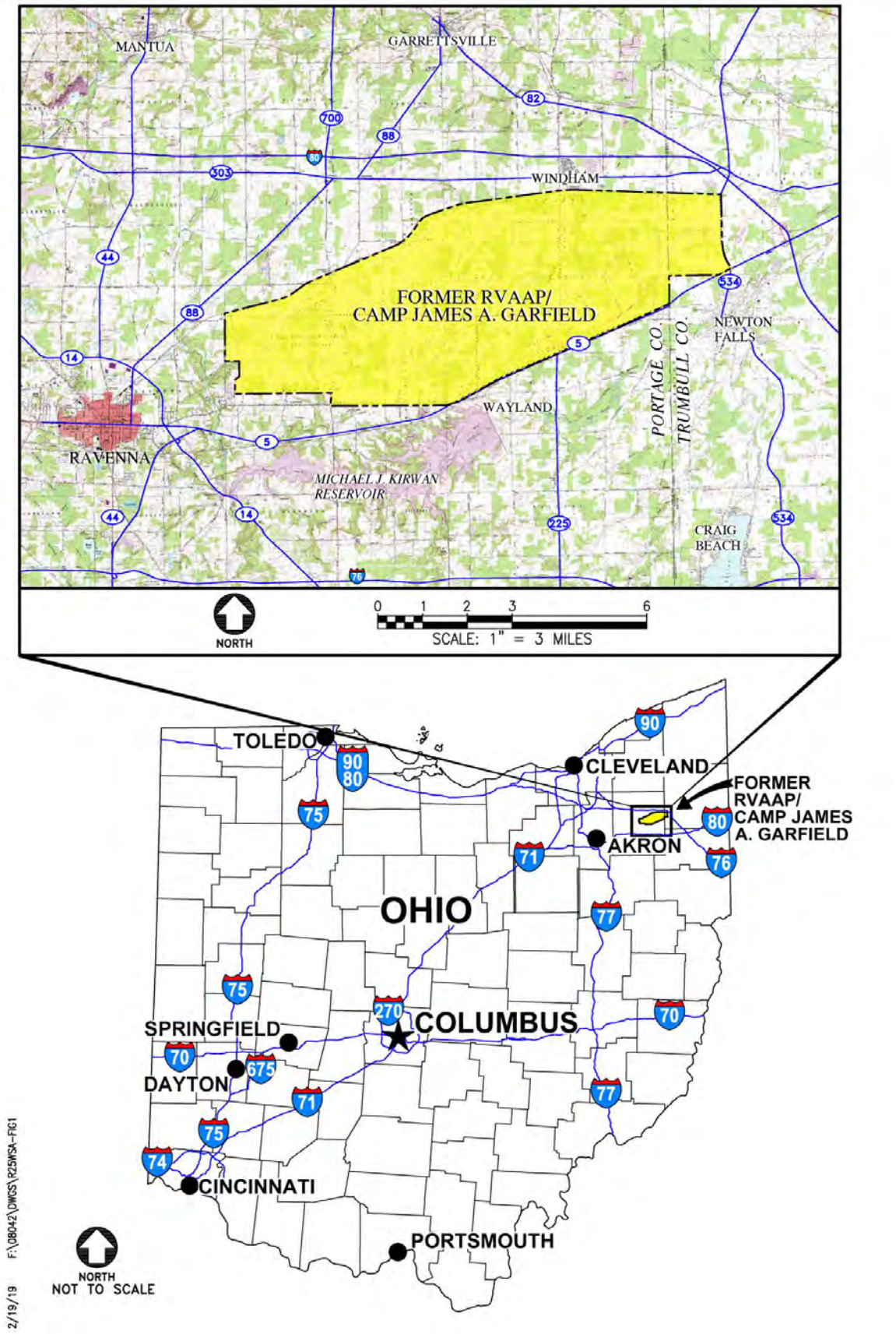

Figure 1. General Location and Orientation of Camp James A. Garfield

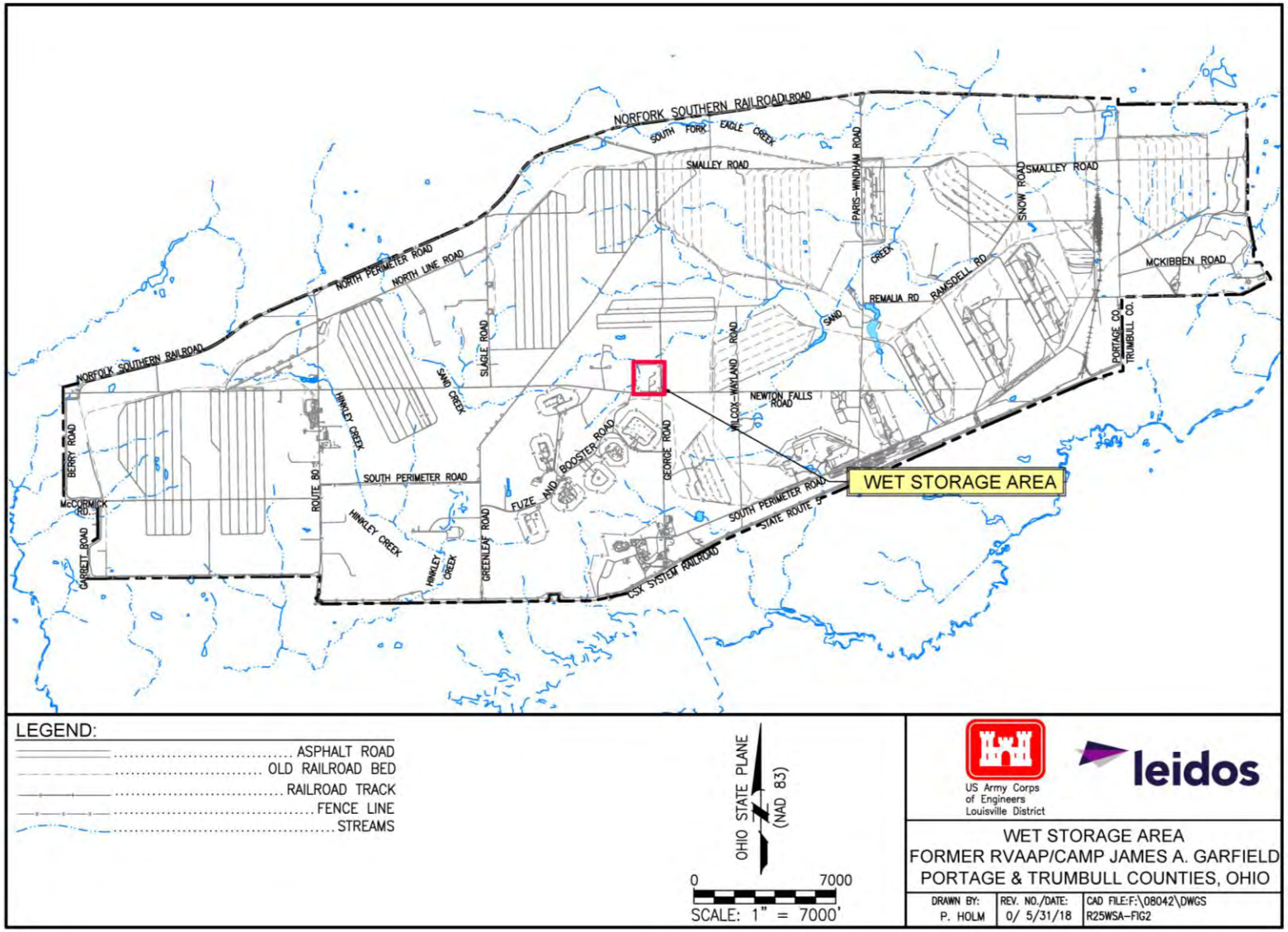

Figure 2. Camp James A. Garfield Installation Map

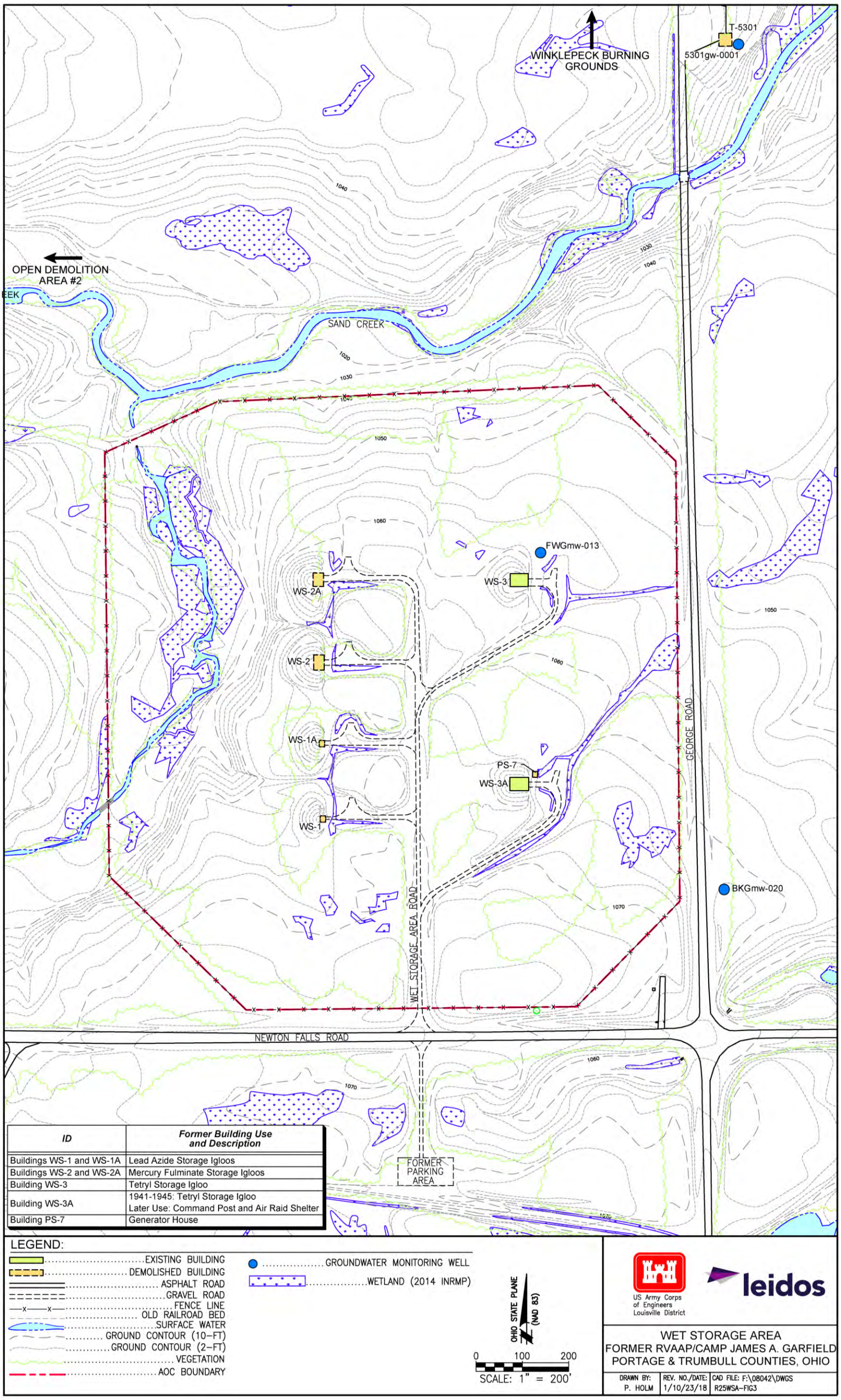

Figure 3. Wet Storage Area Site Features

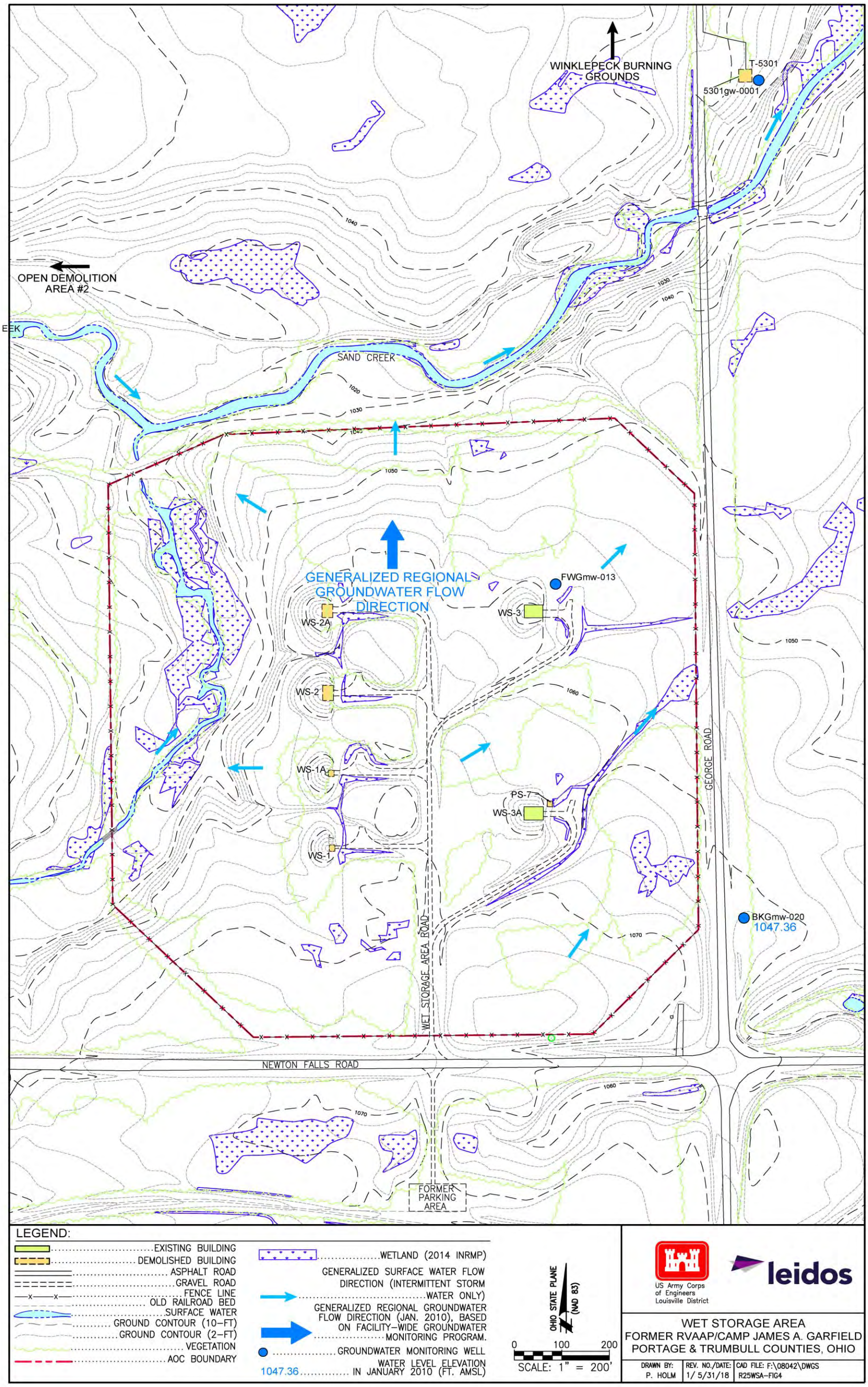

Figure 4. Topography, Groundwater Flow, and Surface Water Flow at Wet Storage Area

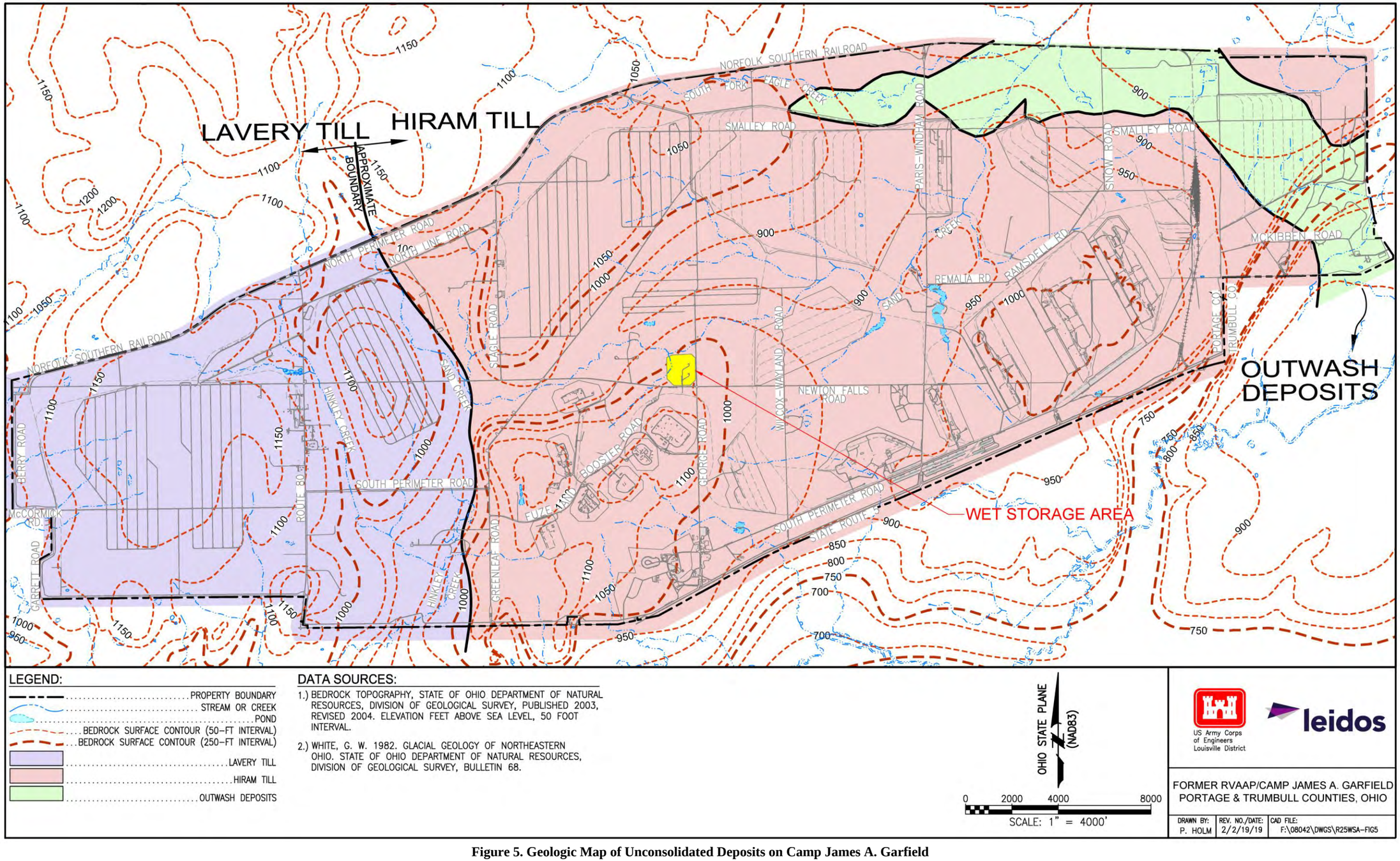

Figure 5. Geologic Map of Unconsolidated Deposits on Camp James A. Garfield

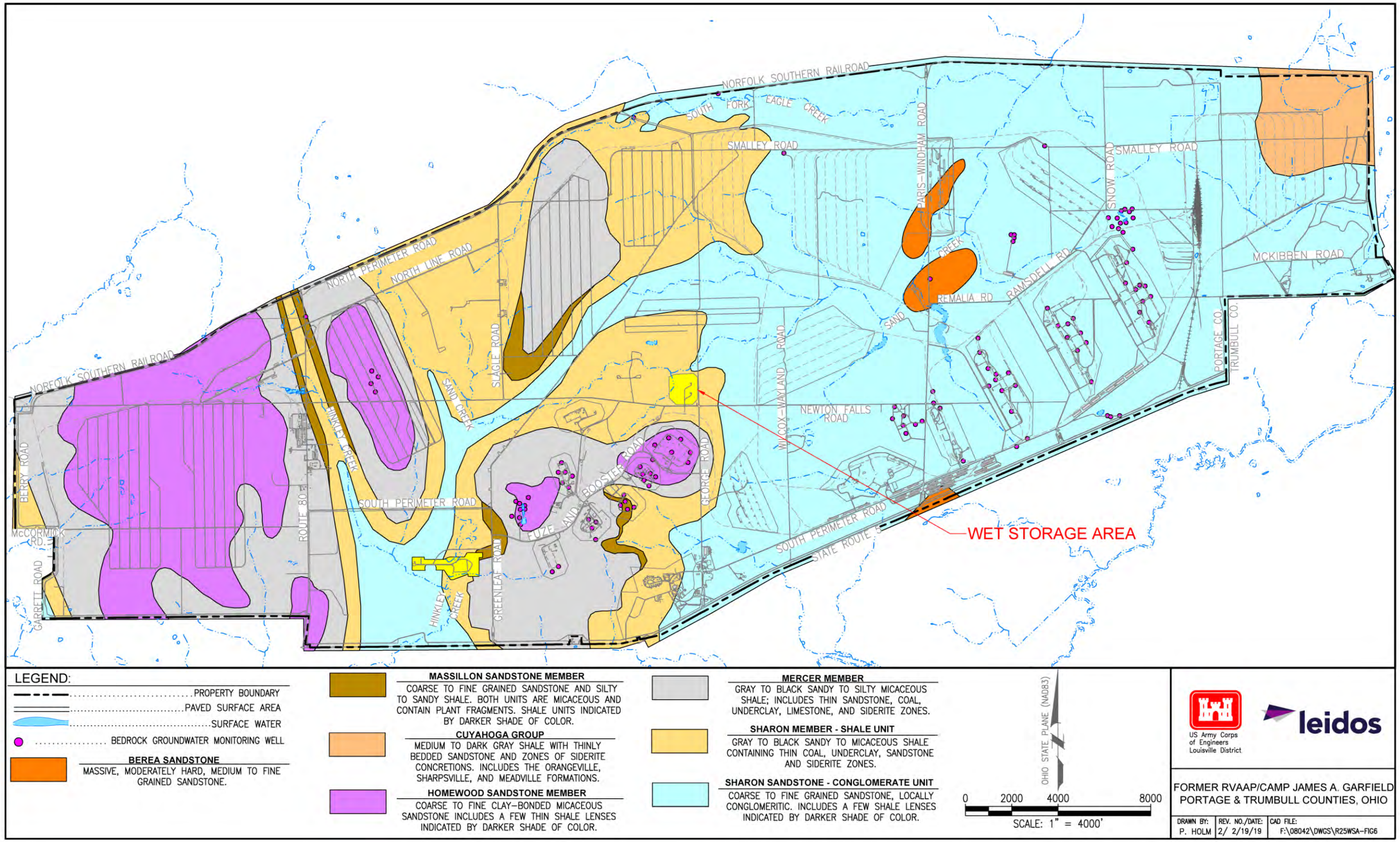

Figure 6. Geologic Bedrock Map and Stratigraphic Description of Units on Camp James A. Garfield

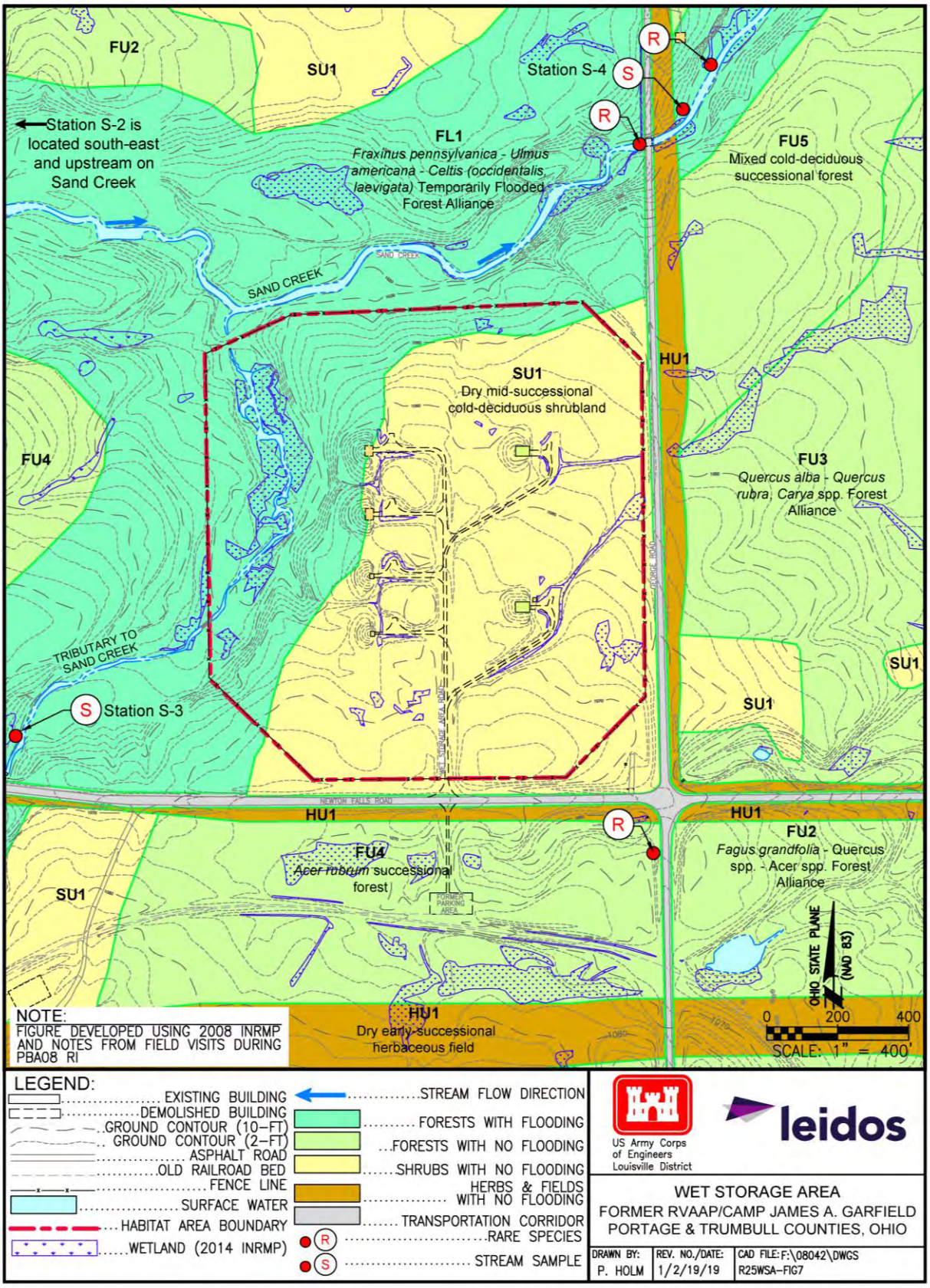

Figure 7. Natural Resources Inside and Near Habitat Area at Wet Storage Area

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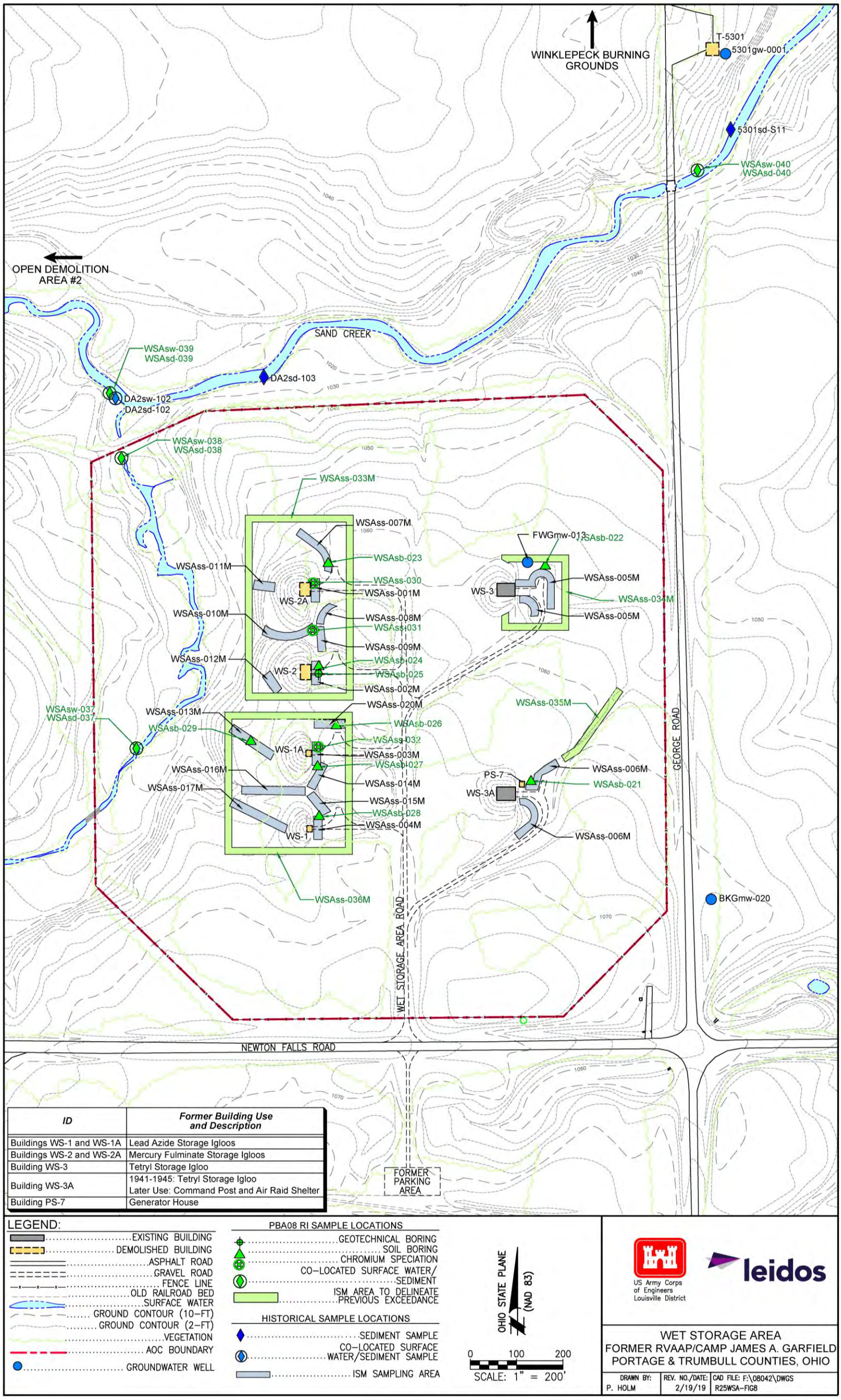


ID	Former Building Use and Description
Buildings WS-1 and WS-1A	Lead Azide Storage Igloos
Buildings WS-2 and WS-2A	Mercury Fulminate Storage Igloos
Building WS-3	Tetryl Storage Igloo
Building WS-3A	1941-1945: Tetryl Storage Igloo Later Use: Command Post and Air Raid Shelter
Building PS-7	Generator House

Figure 8. Wet Storage Area Sample Locations

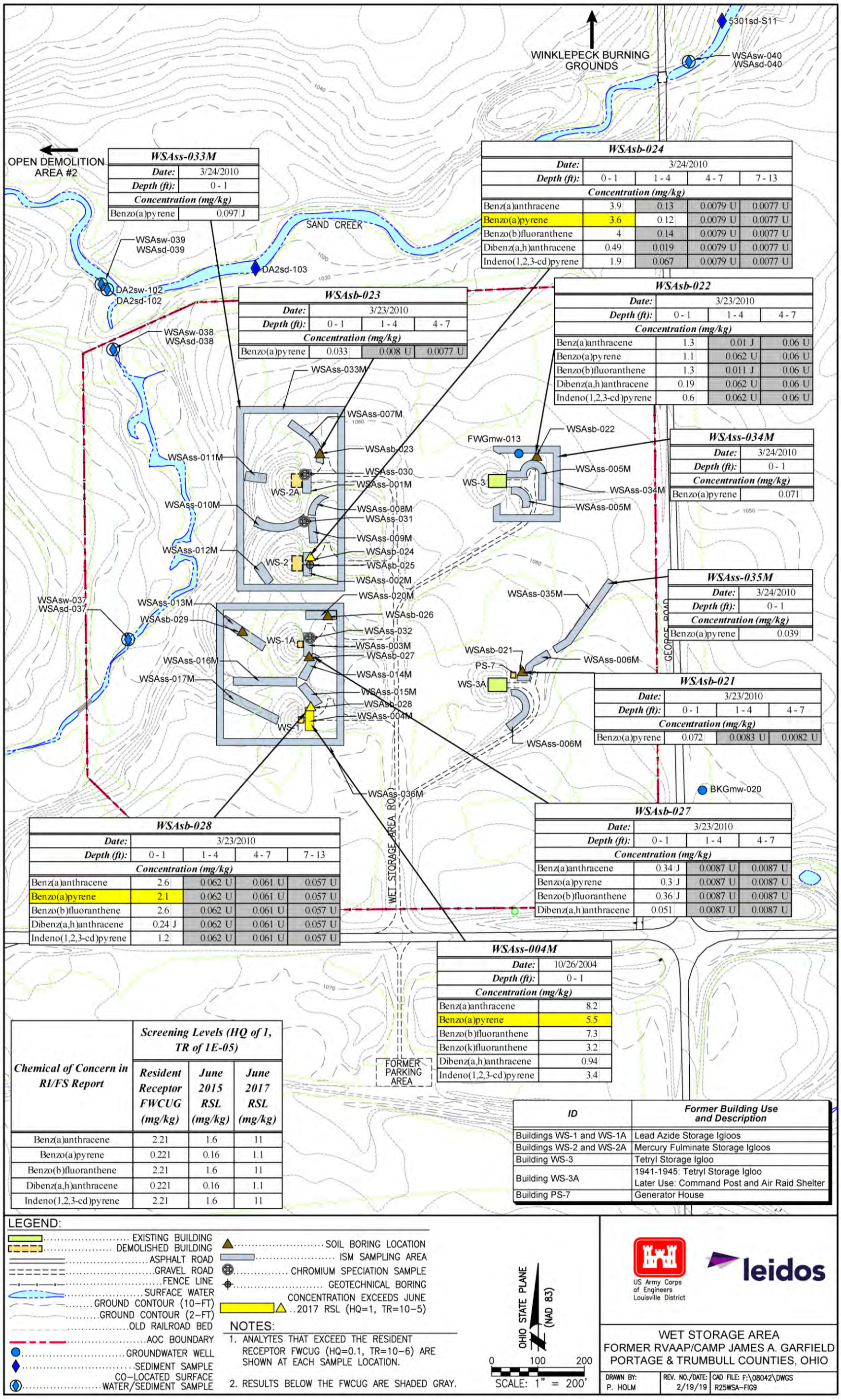
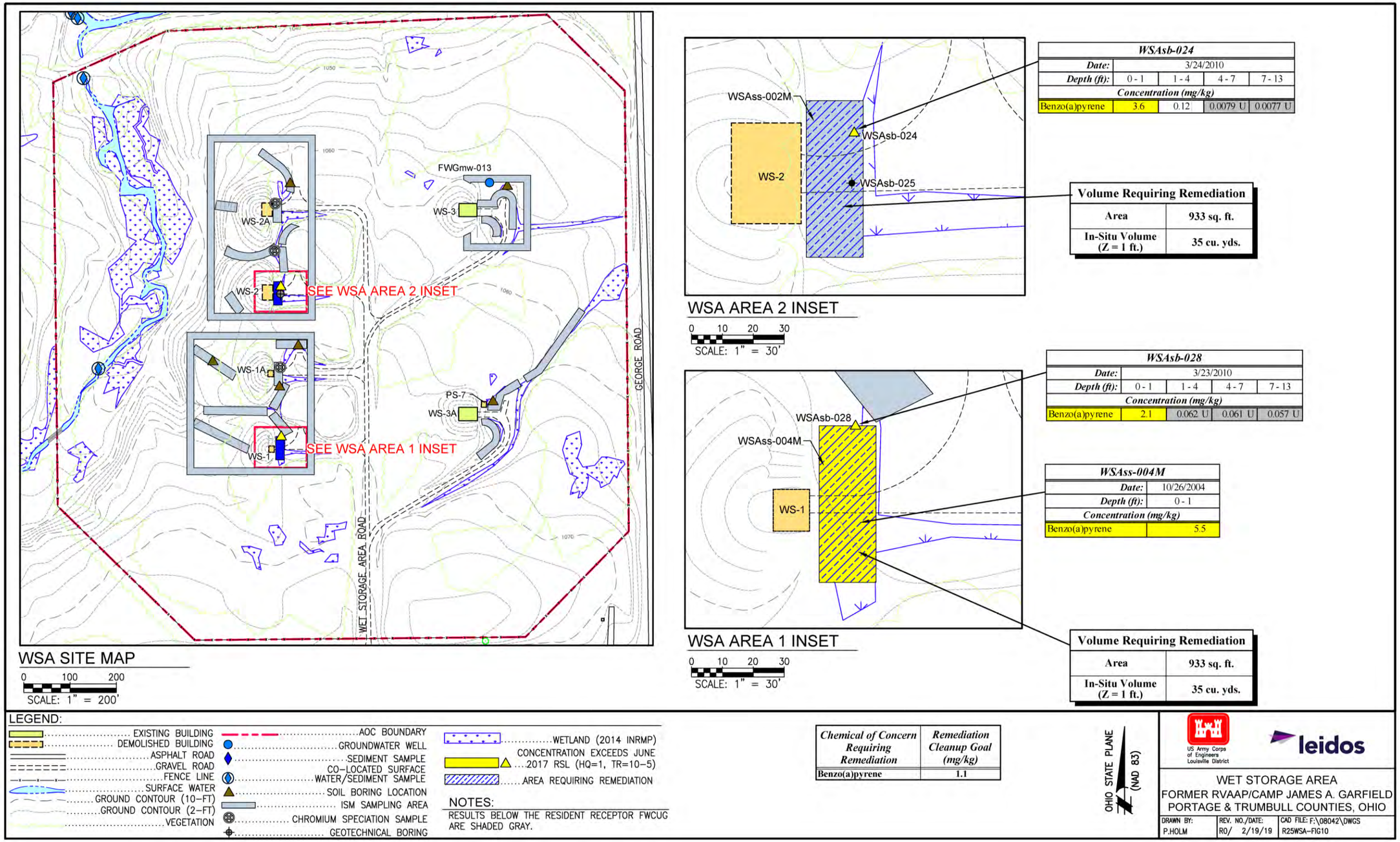


Figure 9. PAH Exceedances of Resident Receptor FWCUGs in Soil



WSAsb-024				
Date:	3/24/2010			
Depth (ft):	0 - 1	1 - 4	4 - 7	7 - 13
Concentration (mg/kg)				
Benzo(a)pyrene	3.6	0.12	0.0079 U	0.0077 U

Volume Requiring Remediation	
Area	933 sq. ft.
In-Situ Volume (Z = 1 ft.)	35 cu. yds.

WSAsb-028				
Date:	3/23/2010			
Depth (ft):	0 - 1	1 - 4	4 - 7	7 - 13
Concentration (mg/kg)				
Benzo(a)pyrene	2.1	0.062 U	0.061 U	0.057 U

WSAss-004M	
Date:	10/26/2004
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benzo(a)pyrene	5.5

Volume Requiring Remediation	
Area	933 sq. ft.
In-Situ Volume (Z = 1 ft.)	35 cu. yds.

Chemical of Concern Requiring Remediation	Remediation Cleanup Goal (mg/kg)
Benzo(a)pyrene	1.1

Figure 10. Estimated Extent of Soil Requiring Remediation

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APPENDIX A

Applicable or Relevant and Appropriate Requirements (ARARs)

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Table A–1. Potential Action-Specific ARARs

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
Prohibition of air pollution nuisances (e.g., fugitive dust) OAC Section 3745-15-07	These rules prohibit a release of nuisance air pollution that endanger the health, safety, or welfare of the public or cause personal injury or property damage.	Applies to any activity that could result in the release of a nuisance air pollutant. This would include dust from excavation or soil management processes.	Any person undertaking an activity is prohibited from emitting nuisance air pollution.
Storm water requirements at construction sites 40 CFR Part 450	These rules require that storm water controls be employed at construction sites that exceed 1 acre.	Applies to any construction activity that exceeds 1 acre.	Persons undertaking construction activities (including grubbing and land clearing) at an AOC where the construction footprint is over 1 acre must design and implement erosion and runoff controls.
Hazardous Waste Determination OAC Section 3745-52-11	These rules require that a generator determine whether a material generated is a hazardous waste.	Applies to any material that is or contains a solid waste. Must be characterized to determine whether the material is or contains a hazardous waste.	Any person that generates a waste as defined must use prescribed methods to determine if the waste is considered characteristically hazardous using the prescribed methods.
Management of contaminated soil or debris that is or contains a hazardous waste OAC Sections 3745-52-30 through 3745-52-34	These rules require that hazardous waste be properly packaged, labeled, marked, and accumulated on site pending on-site or off-site disposal.	Applies to any hazardous waste or media containing a hazardous waste that is generated from on-site activities.	All hazardous waste must be accumulated in a compliant manner. This includes proper marking, labeling, and packaging such waste in accordance with the specified regulations. Containers or container areas will be inspected where hazardous waste is accumulated on site.

Table A-1. Potential Action-Specific ARARs (continued)

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
Soil contaminated with RCRA hazardous waste OAC Section 3745-270-49 OAC Section 3745-270-48 UTS	These rules prohibit land disposal of RCRA hazardous waste subject to them, unless the waste is treated to meet certain standards that are protective of human health and the environment. Standards for treating hazardous waste-contaminated soil prior to disposal are set forth in the two cited rules. Using the greater of either technology-based standards or UTS is prescribed.	LDRs apply only to RCRA hazardous waste. This rule is considered for ARAR status only upon generating a RCRA hazardous waste. If any soil is determined to be hazardous under RCRA and if it will be disposed on site, this rule is potentially applicable to disposal of the soil.	All soil subject to treatment must be treated as follows: 1) For non-metals except carbon disulfide, cyclohexanone, and methanol, treatment must achieve 90% reduction in total constituent concentration (primary constituent for which the waste is characteristically hazardous as well as for any organic or inorganic UHC), subject to item 3 below. 2) For metals and carbon disulfide, cyclohexanone, and methanol, treatment must achieve 90% reduction in constituent concentrations as measured in leachate from the treated media (tested according to the TCLP) or 90% reduction in total constituent concentrations (when a metal removal treatment technology is used), subject to item 3 below. 3) When treating any constituent subject to achieve a 90% reduction standard would result in a concentration less than 10 times the UTS for that constituent, treatment to achieve constituent concentrations less than 10 times the UTS is not required. This is commonly referred to as "90% capped by 10xUTS."

Table A-1. Potential Action-Specific ARARs (continued)

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
Soil/debris contaminated with RCRA hazardous waste – variance OAC Section 3745-270-44	The Ohio EPA Director will recognize a variance approved by the USEPA from the alternative treatment standards for hazardous contaminated soil or for hazardous debris.	Potentially applicable to RCRA hazardous soil or debris that is generated and placed back into a unit and that will be disposed of on site.	A site-specific variance from the soil treatment standards that can be used when treating concentrations of hazardous constituents higher than those specified in the soil treatment standards, minimizing short- and long-term threats to human health and the environment. In this way, on a case-by-case basis, risk-based LDR treatment standards approved through a variance process could supersede the soil treatment standards.
Treatment of hazardous waste in a miscellaneous treatment unit OAC Section 3745-57-91	These standards address the management and treatment of hazardous wastes when such activities do not fall under the descriptions or prerequisites of other hazardous waste units covered in the regulations.	Potentially applicable to the thermal treatment of RCRA hazardous waste	Unit must be located, designed, constructed, operated and maintained, and closed in a manner that will ensure protection of human health and the environment. Protection of human health and the environment includes, but is not limited to: prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering the factors listed in OAC Section 3745-57-91.

AOC = Area of concern.
ARAR = Applicable and Relevant or Appropriate Requirements.
CFR = Code of Federal Regulations.
LDR = Land disposal restrictions.
OAC = Ohio Administrative Code.
Ohio EPA = Ohio Environmental Protection Agency.
RCRA = Resource Conservation and Recovery Act
TCLP = Toxicity characteristic leaching procedure.
UHC = Underlying hazardous constituent.
USEPA = U.S. Environmental Protection Agency.
UTS = Universal Treatment Standard.

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APPENDIX B

Affidavits

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Affidavit of Publication, Tribune Chronicle, June 6, 2018

NOTICE OF DOCUMENT AVAILABILITY
Proposed Plans for Load Line 7, Load Line 9, Load Line 12, Wet Storage Area and Upper and Lower Cobbs Ponds at the Former Ravenna Army Ammunition Plant (RVAAP)

The Proposed Plans for Load Line 7, Load Line 12, and Upper and Lower Cobbs Ponds each present a recommendation of No Further Action and provide the rationale for this recommendation. The Proposed Plans for Load Line 9 and Wet Storage Area present the preferred alternative, Ex-situ Thermal Treatment. These Proposed Plans are now available for public review for 30 days from June 6, 2018 to July 6, 2018.

The Proposed Plans are available at:

Newton Falls Public Library	Reed Memorial Library
204 South Canal Street	167 East Main Street
Newton Falls, Ohio 44444	Ravenna, Ohio 44266

The Proposed Plans are also available at www.rvaap.org

Please join us for an OPEN HOUSE and PUBLIC MEETING.

The Army will host an informational open house and a public meeting to explain the recommendations in the Proposed Plans. Oral and written comments will be accepted at the meeting. Written comments may be mailed to the Camp Ravenna Environmental Office, 1438 State Route 534 SW, Newton Falls, OH 44444. Comments will be accepted during the public comment period from June 6, 2018 to July 6, 2018.

The public meeting is scheduled for:	at:
Thursday, June 21, 2018	Shearer Community Center
6:00 pm Open House	(Paris Township Hall)
6:30 pm Public Meeting	9355 Newton Falls Road
	Ravenna, OH 44266

For more information or if you need special accommodations to attend, please contact Katie Tait at 614-336-6136.
#157-1T-June 6, 2018 #3674

PROOF OF PUBLICATION

STATE OF OHIO
TRUMBULL COUNTY SS. PAMELA EAZOR

BEING DULY SWORN, UPON OATH STATES THAT SHE IS AN AUTHORIZED REPRESENTATIVE OF THE TRIBUNE CHRONICLE, (A DIVISION OF EASTERN OHIO NEWSPAPERS INC) A DAILY NEWSPAPER PRINTED IN THE CITY OF WARREN, COUNTY OF TRUMBULL, STATE OF OHIO AND OF GENERAL CIRCULATION IN THE CITY OF WARREN, TRUMBULL COUNTY, OHIO AND IS INDEPENDENT IN POLITICS.

THAT THE ATTACHED ADVERTISEMENT WAS PUBLISHED IN THE TRIBUNE CHRONICLE EVERY WEDNESDAY FOR (1) ONE CONSECUTIVE WEEKS AND THAT THE FIRST INSERTION WAS ON WEDNESDAY THE 6th DAY OF JUNE 2018.

Pamela Eazor

SWORN TO BEFORE ME AND SUBSCRIBED IN MY PRESENCE ON THIS 6th DAY OF JUNE 2018

Constance A. Pacek
NOTARY PUBLIC

NOTARY PUBLIC STATE OF OHIO

CONSTANCE A. PACEK
Notary Public, State of Ohio
My Commission Expires
March 7, 2021

ADVERTISING COST $ 283.32

Affidavit of Publication, Record Courier, June 6, 2018

~~3119393~~
3119393

Proof of Publication
Record Publishing Company
1050 W. Main Street,
Kent, OH 44240
Phone (330) 541-9400
Fax (330) 673-6363

I, [illegible] being first duly sworn depose and say that I am Advertising Clerk of
Record Publishing Company

30 Record-Courier a newspaper printed and published in the city of Kent, and of General circulation in the County of Portage, State of Ohio, and personal knowledge of the facts herein stated and that the notice hereto annexed was Published in said newspapers for 1 insertions on the same day of the week from and after the 6th day of June, 2018 and that the fees charged are legal.

Name of Account: Leidos
Ad Number: 12454540
No. of Lines: 28

Day(s) Published: 06/06.
Printers Fee: $115.20

Sworn to and subscribed before this 6th day of June, 2018.

Elizabeth McDaniel
Notary Public
Commission Expires June 19, 2021

Notice of Document Availability

Proposed Plans for Load Line 7, Load Line 9, Load Line 12, Wet Storage Area and Upper and Lower Cobbs Ponds at the Former Ravenna Army Ammunition Plant (RVAAP)

The Proposed Plans for Load Line 7, Load Line 12, and Upper and Lower Cobbs Ponds each present a recommendation of No Further Action and provide the rationale for this recommendation. The Proposed Plans for Load Line 9 and Wet Storage Area present the preferred alternative, Ex-situ Thermal Treatment. These Proposed Plans are now available for public review for 30 days from June 6, 2018 to July 6, 2018.

The Proposed Plans are available at:

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266

The Proposed Plans are also available at: www.rvaap.org

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6:30 pm Public Meeting	Ravenna, OH 44266

For more information or if you need special accommodations to attend, please contact Katie Tait at 614-336-6136.

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APPENDIX C

Ohio EPA Correspondence

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Ohio Environmental Protection Agency

John R. Kasich, Governor
Mary Taylor, Lt. Governor
Craig W. Butler, Director

January 10, 2019

Mr. David Connolly
Army National Guard Directorate
Environmental Programs Division
ARNGD-ILE -CR
111 South George Mason Drive
Arlington, VA 22204

Re: US Army Ammunition PLT RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
267000859127

Subject: Ravenna Army Ammunition Plant, Portage/Trumbull Counties. "Draft Record of Decision for Soil, Sediment, and Surface Water at RVAAP-45, Wet Storage Area," Dated November 29, 2018.

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA) has received and reviewed the Draft Record of Decision for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area for the Ravenna Army Ammunition Plant (RVAAP), Portage/Trumbull Counties. This document is dated and was received at Ohio EPA, Northeast District Office (NEDO) on November 29, 2018.

Ohio EPA has no comments on the Draft Record of Decision for Soil, Sediment, and Surface Water at RVAAP-45 Wet Storage Area. Please forward the final version of the ROD to Ohio EPA for review.

If you have any questions, please contact me at megan.oravec@epa.ohio.gov or at (330) 963-1168.

Sincerely,

Megan Oravec

Megan Oravec, Site Coordinator
Division of Environmental Response and Revitalization

MO/nvp

ec: Bob Princic, Ohio EPA, NEDO DERR
Mark Johnson, Ohio EPA, NEDO DERR
Tom Schneider, Ohio EPA, SWDO DERR
Bill Damschroder, Ohio EPA, Legal
Nat Peters, USACE
Katie Tait/Kevin Sedlak, OHARNG RTLS
Craig Coombs, USACE
Rebecca Shreffler, Chenega
David Connolly, ARNG
Jed Thomas, Leidos

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