Draft

Proposed Plan
for Soil, Sediment, and Surface Water
at RVAAP Load Lines 1, 2, 3, 4, and 12

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-15-C-0046

Prepared for:

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Prepared by:

leidos

Leidos
8866 Commons Boulevard, Suite 201
Twinsburg, Ohio 44087

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Vasu Peterson, P.E., PMP
Sarika Johnson

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Leidos
8866 Commons Boulevard
Suite 201
Twinsburg, Ohio 44087

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USACE - Louisville District
U.S. Army Corps of Engineers
600 Martin Luther King Jr., Place
PO Box 59
Louisville, Kentucky 40202-0059

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14. ABSTRACT

This Proposed Plan for Load Lines 1 through 4 and 12 presents to the public the physical characteristics, geology, and hydrogeology of the five AOCs. This plan summarizes nature and extent of contamination in soil, sediment, and surface water; contaminant fate and transport; and human health and ecological risk assessments. These evaluations indicate there are chemicals of concern (COCs) that pose unacceptable risk. Therefore, this plan presents Alternative 3: Commercial/Industrial Land Use – Ex-situ Thermal Treatment of Soil and Administrative LUCs as the preferred alternative to the public with respect to soil, sediment, and surface water.

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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Leidos has completed the Draft Proposed Plan for Soil, Sediment, and Surface Water at Load Lines 1, 2, 3, 4, and 12 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 United States Army Corps of Engineers (USACE) policy.

Vasu Peterson, P.E., PMP
Study/Design Team Leader

July 24, 2018
Date

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

July 24, 2018
Date

Significant concerns and the explanation of the resolution are as follows:

Internal Leidos Independent Technical Review comments are recorded on a Document Review Record per Leidos standard operating procedure ESE A3.1 Document Review. This Document Review Record is maintained in the project file. Changes to the report addressing the comments have been verified by the Study/Design Team Leader. As noted above, all concerns resulting from independent technical review of the project have been considered.

Lisa Jones-Bateman
Senior Program Manager

July 24, 2018
Date

PLACEHOLDER FOR:

Documentation of Ohio EPA Concurrence of Final Document

(Documentation to be provided once concurrence is issued.)

Draft

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Name/Organization	Number of Printed Copies	Number of Electronic Copies
Susan Netzley-Watkins, Ohio EPA-NEDO	1	3
Mark Johnson, Ohio EPA-NEDO	Email transmittal letter only	
Bob Princic, Ohio EPA-NEDO	Email transmittal letter only	
Tom Schneider, Ohio EPA-SWDO	Email transmittal letter only	
David Connolly, ARNG-ILE Cleanup	0	1
Katie Tait, OHARNG, Camp Ravenna Kevin Sedlak, ARNG, Camp Ravenna	Email transmittal letter only	
Craig Coombs, USACE – Louisville District	Email transmittal letter only	
Nathaniel Peters II, USACE – Louisville District	1	1
Admin Records Manager – Camp Ravenna	2	2
Pat Ryan, Leidos-REIMS	0	1
Jed Thomas, Leidos	1	1
Vasu Peterson, Leidos	1	1
Leidos Contract Document Management System	0	1

ARNG = Army National Guard.
ILE = Installation, Logistics, and 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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LIST OF ACRONYMS

amsl	Above Mean Sea Level
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
Army	U.S. Department of the Army
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CMCOC	Contaminant Migration Chemical of Concern
COC	Chemical of Concern
COEC	Chemical of Ecological Concern
COI	Chemical of Interest
DERP	Defense Environmental Restoration Program
DNT	Dinitrotoluene
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ESV	Ecological Screening Value
FFS	Focused Feasibility Study
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
IROD	Interim Record of Decision
ISM	Incremental Sampling Methodology
LUC	Land Use Control
MCL	Maximum Contaminant Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PP	Proposed Plan
RAO	Remedial Action Objective
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RGO	Remedial Goal Option
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SARA	Superfund Amendments and Reauthorization Act
SOR	Sum-of-Ratios
SRC	Site-related Contaminant
TNT	2,4,6-Trinitrotoluene
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

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1.0 INTRODUCTION

This Proposed Plan (PP) presents the conclusions and recommendations for soil, sediment, and surface water within areas of concern (AOCs) at Load Lines 1, 2, 3, and 4 and soil at Load Line 12 at the former Ravenna Army Ammunition Plant (RVAAP). The former RVAAP is now known as Camp Ravenna Joint Military Training Center (herein referred to as Camp Ravenna) and is located in Portage and Trumbull counties, Ohio (Figure 1). (Note that all figures are presented at the end of this PP.) The load lines addressed in this PP are designated as follows:

Load Line	AOC Designation
Load Line 1	RVAAP-08
Load Line 2	RVAAP-09
Load Line 3	RVAAP-10
Load Line 4	RVAAP-11
Load Line 12	RVAAP-12

The U.S. Department of the Army (Army), in coordination with the Ohio Environmental Protection Agency (Ohio EPA), issues this PP to provide the public with information necessary to comment on the selection of an appropriate response action. The remedy will be selected after all comments submitted during the 30-day public comment period are considered. Therefore, the public is encouraged to review and comment on alternatives presented in this PP.

The Army is issuing this PP as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and Section 300.430(f) (2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 *Code of Federal Regulations* 300). Selecting and implementing a remedy will also be consistent with the requirements of the Ohio EPA *Director's Final Findings and Orders*, dated June 10, 2004 (Ohio EPA 2004).

Public Comment Period:
Month DD, YYYY to Month DD, YYYY

Public Meeting:
The Army will hold an open house and public meeting to present the conclusions and additional details presented in the *Feasibility Study Addendum for Soil, Sediment, and Surface Water at RVAAP Load Lines 1, 2, 3, 4, and 12* (USACE 2017a). Oral and written comments will also be accepted at the meeting. The open house and public meeting are scheduled for ____PM, Month DD, YYYY, at the Shearer Community Center, 9355 Newton Falls Road, Ravenna, Ohio 44266.

Information Repositories:
Information used in selecting the remedy is available for public review at the following locations:

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266
(330) 296-2827

Hours of operation:
9AM-9PM Monday-Thursday
9AM-6PM Friday
9AM-5PM Saturday
1PM-5PM Sunday

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444
(330) 872-1282

Hours of operation:
9AM-8PM Monday-Thursday
9AM-5PM Friday and Saturday

Online
http://www.rvaap.org/

The **Administrative Record File**, containing information used in selecting the remedy, is available for public review at the following location:

Camp Ravenna Joint Military Training Center (former Ravenna Army Ammunition Plant)
Environmental Office
1438 State Route 534 SW
Newton Falls, Ohio 44444
(614) 336-6136
Note: Access is restricted to Camp Ravenna, but the file can be obtained or viewed with prior notice to Camp Ravenna.

This PP summarizes information that is provided in detail in the *Feasibility Study Addendum for Soil, Sediment, and Surface Water at RVAAP Load Lines 1, 2, 3, 4, and 12*

(USACE 2017a) and other documents contained in the Administrative Record file for these AOCs.

The *Interim Record of Decision for the Remediation of Soil at Load Lines 1 through 4* (USACE 2007) and the *Record of Decision for Soil and Dry Sediment at RVAAP-12 Load Line 12* (USACE 2009) selected remedial actions to achieve protection established for the National Guard Trainee. Subsequent to these actions, the Army completed multiple investigations to identify the extent of residual contamination, as discussed in Section 3.1. This PP addresses residual contamination in soil, sediment, and surface water at Load Lines 1, 2, 3, and 4 and residual contamination in soil at Load Line 12. Sediment and surface water at Load Line 12 are being addressed separately and are presented to the public in the *Proposed Plan for Wet Sediment and Surface Water at RVAAP-12 Load Line 12* (USACE 2017b). In addition, the updated risk assessments for protection of the planned future land use are summarized in this PP.

The Army's preferred alternative at these load lines is Commercial/Industrial Land Use – Ex-situ Thermal Treatment of Soil and Administrative Land Use Controls (LUCs). The Army encourages the public to review the site background documents to gain a more comprehensive understanding of the AOCs, activities that have been conducted to date, and the rationale for the preferred alternatives.

2.0 RVAAP DESCRIPTION AND BACKGROUND

The facility, consisting of 21,683 acres, is federally owned and 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 (Figure 1). The facility, previously known as RVAAP, was formerly used as a load, assemble, and pack facility for munitions production. As of September 2013, administrative accountability for the entire acreage of the facility has been transferred to the U.S. Property and Fiscal Officer for Ohio and subsequently licensed to the Ohio Army National Guard for use as a military training site (Camp Ravenna). 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.

2.1 Load Lines 1 Through 4 and 12 Site Descriptions and Background

Industrial operations at the former RVAAP consisted of 12 munitions-assembly facilities referred to as "load lines." Figure 2 depicts locations of the five load lines presented in this PP. The site description and background for Load Lines 1through 4 and 12 are described as follows:

Load Line 1 – From 1941 through 1945, Load Line 1 was used to melt and load 2,4,6-trinitrotoluene (TNT) and Composition B into large-caliber shells and bombs. From 1947 to 1949, demilitarization projects occurred at Load Line 1. In 1949, the TNT washout plant and debanding equipment were moved from Load Line 1 to Load Line 12. From 1950 to 1952, Load Line 1 reclaimed cartridge bases for reuse. Sulfuric acid, sodium orthosilicate, chromic acid, and alkali were used in the annealing process. From 1961 to 1967, Load Line 1 was the site of munitions rehabilitation activities and the demilitarization of 90mm projectiles; activities included dismantling, replacing components, and repainting mines. In 1965 and 1966, Load Line 1 was used for demilitarizing propellant charges and cartridges. In 1973 and 1974, demilitarization operations on 90mm cartridges occurred at the load line. Load Line 1 was rehabilitated in 1951 to remove and replace soil contaminated with accumulated explosives and to remove and replace wastewater lines. All buildings and structures at Load Line 1 have been demolished.

Load Line 1 is located in the southeastern portion of the facility (Figure 3). The load line is characterized by moderately subdued

topography and ground surface elevations range from approximately 1,016 to 975 ft above mean sea level (amsl). Effluent and runoff from the main production area exited through ditches and storm sewers to discharge points along the perimeter of the load line. Wash-down water and wastewater from the load line operations were discharged to the unlined settling ponds, Charlie's Pond and Criggy's Pond. Water from the settling ponds was discharged to a surface stream (Sand Creek) that exited the installation. A thin layer of silty loam overlies sandstone bedrock at Load Line 1. Thickness of the sandstone bedrock exceeds 40 ft. Depths to groundwater range from 19 to 35 ft below ground surface (bgs), with the exception of one well in the southwestern portion of the AOC (approximately 10 ft bgs) (EQM 2010). The typical hydraulic gradient at the AOC is 2.35×10^{-5} to 7.3×10^{-4} cm/s.

Load Line 2 – From 1941 through 1945, Load Line 2 was used to melt and load TNT and Composition B into large-caliber shells and bombs. Demilitarization projects also occurred at Load Line 2 from 1947 through 1949 when a washout plant was installed. From 1950 to 1952, Load Line 2 reclaimed cartridge bases using an annealing process for reuse. During the entirety of its operational history, Load Line 2 produced about 10 million munitions, and approximately 1.8 million kg (4 million lb) of TNT were salvaged during demilitarization activities. In 1951, Load Line 2 was rehabilitated, including the removal of explosive accumulations. All buildings and structures at Load Line 2 have been demolished.

Load Line 2 is located in the southeastern portion of the facility (Figure 4). The AOC is characterized by moderately subdued topography and ground surface elevations range from approximately 990 to 1,010 ft amsl. However, topography decreases sharply to the south of the AOC, in the direction of Kelly's Pond. The primary surface water conveyance at Load Line 2 drains to the south and ultimately discharges into Kelly's Pond; water from the pond is discharged to Sand Creek. Surface water flows through a series of manmade ditches and the majority of surface water runoff is to the south. Flow in the ditches is intermittent and driven primarily by storm events. Soil at the AOC exhibits seasonal wetness, rapid runoff, and low permeability. During site investigations, bedrock was encountered at depths ranging from 4 to 16 ft. Groundwater depths range from approximately 5 to 14.7 ft bgs (EQM 2010). Hydraulic conductivities ranged from 1.04×10^{-2} to 7.43 ft/day.

Load Line 3 – Load Line 3 was primarily used to melt bulk explosives and load Composition B into large-caliber shells and bombs. During its operational history from 1941to 1945, Load Line 3 produced approximately 6.5 million munitions. Demilitarization activities were conducted between 1951 and 1957, during which time approximately 228,000 munitions were processed at the load line. During the operation of Load Line 3, bulk TNT and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) were offloaded at Buildings EA-6 and EA-6A for screening and preparation before being transported to melt pour Buildings EA-4 and EA-4A for processing and loading into shells. Bulk explosive carrier washout activities were conducted at Building EB-25. All buildings and structures at Load Line 3 have been demolished.

Load Line 3 is located in the southeastern portion of the facility (Figure 5). The load line is characterized by sloping topography on a reworked sandstone bedrock surface. Elevations vary from approximately 980 to 1,020 ft amsl. Ditches comprise the primary surface water conveyance at Load Line 3, which, ultimately, drain into Cobbs Pond. Poorly drained, silty clay loam or clay loam is formed over glacial till where bedrock is generally greater than 6 ft. Runoff is typically medium to rapid, and the soil is seasonally wet. Groundwater depths range from approximately 8 to 27 ft bgs (EQM 2010). Hydraulic conductivity ranged from 1.86×10^{-3} to 8.36×101 ft/day.

Load Line 4 – Load Line 4 operated from 1941 to 1945 to produce 91,970 projectiles and bombs and again from 1951 to 1957 to produce 1,269,262 mines. Load Line 4 was used to melt and load TNT into large-caliber shells, bombs, and antitank mines. During its operational history, Load Line 4 produced about 1.2 million munitions. All buildings and structures at Load Line 4 have been demolished.

Load Line 4 is located in the south central portion of the facility (Figure 6). The topography is subdued on a glacial till surface. Elevations vary from approximately 980 to 1,000 ft amsl. A perennial stream crosses the AOC from northwest to southeast and flows into the large settling pond, which discharges to a surface stream that exits the facility at a point south of the load line. Poorly drained, silty clay loam or clay loam is formed over glacial till where bedrock is generally greater than 6 ft. Runoff is typically medium to rapid, and the soil is seasonally wet. Groundwater depths range from approximately 3.4 to 15.8 ft bgs (EQM 2010). Hydraulic conductivities range from 8.23 to 1.15×10^{-1} ft/day.

Load Line 12 – Load line 12 is a 76-acre former ammonium nitrate manufacturing facility that was operational from 1941 to 1946. From 1941 to 1943, explosive-grade ammonium nitrate was manufactured. Munitions renovation and demilitarization operations were performed after 1943. Load Line 12 was leased by the Silas Mason Company from 1946 to 1950 to manufacture fertilizer-grade ammonium nitrate. To improve the quality of TNT recovered from demilitarization operations, washout operations were converted to a steam melt-out process in the late 1950s. A pinkwater treatment plant located near Building 904 was operational from 1981 to 2000. From 1965 to 1967, Hercules Alcor, Inc. leased Building FF-19 to produce aluminum chloride. From 1969 to 1971, Load Line 12 produced M54 primers in support of the Southeast Asian conflict. Demolition of buildings occurred between 1973 and 2000. In 1999, approximately 1,500 ft^3 of soil were removed as part of an explosives composting pilot study.

Load Line 12 is located in the south central portion of the facility (Figure 7). The topography is moderately subdued on a reworked sandstone bedrock surface. Elevations vary from approximately 970 to 987 ft amsl. The primary north-south drainage feature (Main Ditch) flows north until its intersection with the Active Area Channel, the primary surface water conveyance. Poorly drained, silty clay loam or clay loam is formed over glacial till where bedrock is generally greater than 6 ft. Runoff is typically medium to rapid, and the soil is seasonally wet. Depth to groundwater ranges from 3.25 to 18.21 ft below top of casing. The average hydraulic conductivity is 5.64E-05 cm/s for the monitoring wells at Load Line 12 (USACE 2004d, MKM 2007).

2.2 Potential Contaminants

The 1978 Installation Assessment identified the major contaminants of the former RVAAP to be 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). Load Lines 1 through 4 were used to melt and load TNT and Composition B into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls were cleaned with water and steam. Following cleaning, the wastewater, containing TNT and Composition B, was known as "pinkwater" for its characteristic color. Pinkwater was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport to earthen settling ponds. From 1946 to 1949, Load Line 12 was used to produce ammonium nitrate for explosives and fertilizers prior to use as a weapons demilitarization facility.

In summary, potential contaminants at the load lines include explosives and inorganic chemicals (e.g., metals) along with other

contaminants related to ancillary activities, including volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs) from on-site transformers, and polycyclic aromatic hydrocarbons (PAHs).

3.0 PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

Since 1978, Load Lines 1 through 4 and 12 have been the subject of multiple investigations and/or assessments leading to CERCLA decisions and remedial actions at the AOCs. The Preliminary Assessment conducted in 1996 concluded that all five AOCs were high-priority AOCs requiring future environmental investigations (USACE 1996). Subsequently, Phase I Remedial Investigations (RIs) were conducted for each AOC, and recommendations included additional investigations in a Phase II RI. Based on the results of the human health risk assessment (HHRA) and ecological risk assessment (ERA) in the Phase II RIs, each site was recommended for further evaluation in a Feasibility Study (FS).

A Focused Feasibility Study (FFS) was developed for Load Lines 1 through 4 (Shaw 2005) and recommended excavation with off-site disposal as an interim remedy to address chemicals of concern (COCs) in soil that exceeded human health Facility-wide Cleanup Goals (FWCUGs) established for the National Guard Trainee. Removal of approximately 1,752 tons of hazardous and 9,484 tons of non-hazardous contaminated soil occurred at Load Lines 1 through 4 from August to November 2007 to achieve Military Training Land Use. The buildings also were removed in 2007; however, removal of the floor slabs and associated foundation walls was not completed until 2009.

At Load Line 12, building demolition and slab removal occurred from 1998 to 2000. The *Feasibility Study for Load Line 12 (RVAAP-12)* (USACE 2010) concluded that remediation of contaminated dry sediment in the Main Ditch would attain Military Training Land Use for soil and dry sediment. Removal of 1,181 tons of contaminated sediment from the Main Ditch was completed in 2010 (USACE 2010a).

3.1 Post-Remediation Sampling

After the removal actions were completed to achieve Military Training Land Use, the Army conducted multiple sampling events to assess if additional remedial actions are necessary to achieve potential future Commercial/Industrial Land Use or Unrestricted (Residential) Land Use.

In 2009 and 2010, the U.S. Army Corps of Engineers (USACE) collected surface and subsurface soil incremental sampling methodology (ISM) samples at Load Lines 1 through 4 to characterize deeper subsurface soil beneath the former building slabs that was not previously investigated via subsurface soil ISM techniques. Based on the sampling results, sub slab soil was removed at Load Lines 1 through 3 in 2010.

In 2011 and 2012, additional characterization sampling was completed at Load Lines 1 through 4 and 12 to guide future remedial and administrative measures. Surface and subsurface ISM samples were collected at Load Lines 1 through 4; only surface ISM samples were collected at Load Line 12.

In 2016, additional surface water and sediment sampling was conducted to address data gaps at Load Lines 1 through 3. Sediment sampling was conducted at Load Line 1; surface water and sediment sampling was conducted at Load Lines 2 and 3.

3.2 Investigation Results for Soil, Sediment, and Surface Water

The FS Addendum summarized all data collected since remedial activities occurred, provided updated risk assessments, and evaluated the Resident Receptor (Adult and Child) and the Industrial Receptor (U.S Environmental protection Agency [USEPA] Composite Worker) to be protective of full-time occupational exposures, including Military Training Land Use.

The chemicals of interest (COIs) for exposure of Resident Receptors (Adult and Child) to soil, sediment, and surface water at Load Lines 1 through 4 and soil at Load Line 12 are described in the following paragraphs. The Phase II RIs completed for each of the five AOCs presented the results of human health screening evaluations that identified COCs exceeding residential screening criteria. These COCs were compiled for each medium under investigation in this FS Addendum and identified as COIs. Following screening, constituents exceeding criteria were developed in the FS as COIs for data gap analysis and determination of further action.

Load Line 1 – Load Line 1 COIs were developed from the chemicals identified as exceeding residential risk in the Phase II RI Report (USACE 2003a) and *Supplemental Baseline Human Health Risk Assessment for Load Line 1 Alternative Receptors* (USACE 2004a). Load Line 1 COIs for exposure of Resident Receptors (Adult and Child) to soil, sediment, and surface water include four metals, four explosives, one PCB, one pesticide, and five PAHs.

Load Line 2 – Load Line 2 COIs were developed from the chemicals identified as exceeding residential risk targets in the Phase II RI (USACE 2004b). Load Line 2 COIs for exposure of Resident Receptors (Adult and Child) to soil, sediment, and surface water include nine metals, three explosives, two PCBs, one pesticide, and five PAHs.

Load Line 3 – Load Line 3 COIs were developed from the chemicals identified as exceeding residential risk in the Phase II RI (USACE 2004c). Load Line 3 COIs for exposure of Resident Receptors (Adult and Child) to soil, sediment, and surface water include eight metals, four explosives, two PCBs, four pesticides, and five PAHs (PAHs evaluated for soil only).

Load Line 4 – Load Line 4 COIs were developed from the chemicals identified as exceeding residential risk targets in the Phase II RI (USACE 2004d). Load Line 4 COIs for exposure of Resident Receptors (Adult and Child) to soil, sediment, and surface water include five metals, two PCBs, and five PAHs.

Load Line 12 – Load Line 12 COIs were developed from the chemicals identified as exceeding residential risk targets in the Phase II RI (USACE 2004e). Load Line 12 COIs for exposure of Resident Receptors (Adult and Child) to soil include one metal, three explosives, one PCB, one pesticide, and five PAHs.

3.3 Impacts to Groundwater

The potential for soil and sediment contaminants to impact groundwater was evaluated in a fate and transport evaluation. The details of the fate and transport analysis identifying constituents that may leach from soil (defined as soil leaching COIs) and impact groundwater beneath the source and at a nearest downgradient receptor location are presented in the FS Addendum (USACE 2017a). The soil leaching COI and all of the site-related contaminants (SRCs) identified in the sediment at the AOCs were evaluated through the stepwise fate and transport evaluation that included leachate modeling in the unsaturated zone using the SESOIL model and lateral transport modeling in the saturated zone using the AT123D model.

If the predicted maximum leachate concentration of a COI was lower than the screening criteria, the chemical was eliminated from further evaluation using AT123D modeling. For the remaining COIs, maximum concentrations predicted by AT123D in groundwater directly below the source areas and at the downgradient receptor locations were compared to applicable RVAAP background concentrations, as well as RVAAP FWCUGs for the Resident Receptor Adult, maximum contaminant levels (MCLs), and regional screening levels (RSLs). Modeling results were included in the decision-making process to determine whether performing remedial actions may be necessary to protect groundwater resources.

A qualitative assessment of the sample results was performed and the limitations and assumptions of the models were considered to identify if constituents are present in soil and sediment at these AOCs that may impact the groundwater. This qualitative assessment concluded that other than RDX from Load Line 1, no other constituents were present in soil and sediment that may impact the groundwater beneath their respective sources or at the downstream receptor locations. Therefore, no further action is required of soil and sediment at Load Lines 2 through 4 and 12 for the protection of groundwater. For Load Line 1, RDX contamination in surface and subsurface soil could potentially impact the groundwater beneath the site; therefore, a remedial action is required for the surface and subsurface soil at Load Line 1 for the protection of groundwater.

Additional groundwater evaluation will occur under the Facility-wide Groundwater Monitoring Program (FWGWMP).

4.0 LAND USE AND ROLE OF RESPONSE ACTION

The potential future uses for Load Lines 1 through 4 and 12 are Military Training Land Use or Commercial/Industrial Land Use. Although residential use is not anticipated at the former RVAAP or at these AOCs, Unrestricted (Residential) Land Use was evaluated in this FS in accordance with Defense Environmental Restoration Program (DERP) Manual 4715.20 (DoD 2012) in order to make appropriate risk management decisions.

Military Training Land Use describes potential exposure for military and civilian personnel that will train or work on any AOC or munitions response site within the former RVAAP/Camp Ravenna. This land use is characterized by activities that are necessary to properly train soldiers and operate/maintain a training base as defined by the Army. Commercial/Industrial Land Use represents receptors who work full time at the former RVAAP/Camp Ravenna AOCs and is characterized by activities consistent with full-time employees or career military personnel who are expected to work daily at the facility over their career. Activities can include work that will be conducted in office buildings, schools, maintenance buildings, and manufacturing facilities. Activities will also include outdoor work that will be conducted by full-time personnel to maintain military training lands. Commercial/Industrial Land Use will provide protectiveness for the National Guard Trainee. Unrestricted (Residential) Land Use is considered protective for, and may be applied to, all categories of land use on the former RVAAP/Camp Ravenna, without further restriction.

Groundwater will be addressed under the RVAAP Facility-wide Groundwater AOC (RVAAP-66) as a separate decision. However, the selected remedy for soil at Load Lines 1 through 4 and 12 must also be protective of groundwater.

5.0 SUMMARY OF HUMAN AND ECOLOGICAL RISKS

5.1 Human Health Risk Assessment

Using information defined by the land uses, an HHRA was performed at each AOC 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 for the Resident Receptor (Adult and Child) were surface soil (0 to 1 ft bgs), subsurface soil (1 to 13 ft bgs), sediment, and surface water at Load Lines 1 through 4 and surface soil (0 to 1 ft bgs) and subsurface soil (1 to 13 ft bgs) at Load Line 12.

The methodology of comparing COI exposure concentrations to remedial goal options (RGOs) and determining COCs generally follows guidance presented in the *Position Paper for Human Health Cleanup Goals* (USACE 2012) and Technical Memorandum

(ARNG 2014) and includes calculating a sum-of-ratios (SOR) for all non-carcinogenic and carcinogenic COIs. The reported concentration in each discrete or ISM sample was compared to RGOs (i.e., the exposure point concentration [EPC] is the concentration in each individual sample). COIs are identified as COCs for a given receptor if:

1. The EPC exceeds the most stringent RGO for either the 1E-05 target cancer risk or the 1 target hazard quotient (HQ); or
2. The SOR for all carcinogens or non-carcinogens that may affect the same organ is greater than 1; chemicals contributing at least 5 percent to an SOR greater than 1 are also considered COCs.

The HHRA identified COCs and conducted risk management analysis to determine if COCs pose unacceptable risk to the Industrial and Resident Receptors. If there is no unacceptable risk to the Industrial or Resident Receptor, it can be concluded that no further action is required from a human health perspective. The results of the HHRA by Load Line are provided below:

Load Line 1

The COCs recommended for remediation by media and land use were as follows:

Unrestricted (Residential) Land Use –

- Soil
  - metals (lead and antimony)
  - explosives (TNT and RDX)
  - PCB-1254
  - PAHs
- No COCs in sediment or surface water

Commercial/Industrial Land Use –

- Soil
  - metals (lead and antimony)
  - explosives (TNT and RDX)
  - PCB-1254
- No COCs in sediment or surface water

Load Line 2

Unrestricted (Residential) Land Use –

- Soil
  - metals (lead and antimony)
  - explosives (TNT and 2,4-DNT)
  - PCBs (PCB-1254 and PCB-1260)
  - PAHs
- Sediment – PAHs (in Kelly's Pond)
- No COCs in surface water

Commercial/Industrial Land Use –

- Soil – TNT
- No COCs in sediment or surface water

Load Line 3

Unrestricted (Residential) Land Use –

- Soil
  - lead
  - TNT
  - PCBs (PCB-1254 and PCB-1260)
  - PAHs
- No COCs in sediment or surface water

Commercial/Industrial Land Use –

- Soil
  - TNT
  - PCBs (PCB-1254 and PCB-1260)
  - PAHs
- No COCs in sediment or surface water

Load Line 4

Unrestricted (Residential) Land Use –

- Soil
  - lead
  - PCBs (PCB-1254 and PCB-1260)
  - PAHs
- No COCs in sediment or surface water

Commercial/Industrial Land Use –

- Soil
  - lead
  - PCB-1260
  - PAHs
- No COCs in sediment or surface water

Load Line 12

Unrestricted (Residential) Land Use –

- Soil
  - explosives (2,6-DNT [dinitrotoluene], TNT, and RDX)
  - PCB-1260
  - PAHs

Commercial/Industrial Land Use –

- Soil
  - explosives (2,6-DNT and TNT)
  - PCB-1260
  - PAHs.

5.2 Ecological Risk Assessment

Soil was evaluated for ecological risk for all five load lines (Load Lines 1 through 4 and 12) during the initial RI/FSs. As concluded in the Interim Record of Decision (IROD) at Load Lines 1 through 4 (USACE 2007) and the Final Record of Decision (ROD) at Load Line 12 (USACE 2009), remediation to meet human health cleanup goals will reduce overall contaminant concentrations and ecological risk. As a result, ecological cleanup goals were not required to achieve remedial action objectives (RAOs).

To reassess the potential ecological risk at Load Lines 1 through 4, the FS Addendum included an ERA for surface water and sediment in accordance with the Level I Scoping ERA and Level II Screening ERA outlined in the *Guidance for Conducting Ecological Risk Assessments* (Ohio EPA 2008) with specific application of components from other ecological risk guidance such as *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA 1997).

An updated ERA was not conducted for Load Line 12 in the FS Addendum. Based on conclusions documented in the Load Line 12 ROD (USACE 2009), additional ecological risk evaluation in soil was not required at Load Line 12. The ERA for surface water and sediment at Load Line 12 is presented in the *Phase III Remedial Investigation Report for Wet Sediment and Surface Water at RVAAP-12 Load Line 12* (USACE 2017c) and summarized in the *Proposed Plan for Wet Sediment and Surface Water at RVAAP-12 Load Line 12* (USACE 2017b).

A Level I ERA was conducted for Load Lines 1 through 4 to determine the presence/absence of important ecological places and resources and the presence of contamination. Perennial surface water in streams and/or ponds and wetlands are important ecological resources at these four load lines and chemical contamination is present based on the historical ERAs. Because there is contamination and important/significant ecological resources at each of the load lines, the ERAs continued to a Level II Screening ERA.

The Level II Screening ERA identified procedures to determine integrated COIs for each load line and defined habitats/environmental setting, suspected contaminants, and possible exposure pathways. Technical and refinement factors were then used to refine the integrated COIs from the Level II Screening ERA. The factors included use of mean exposure concentrations, discussion of approved ecological screening values (ESVs), and other topics. This type of assessment is Step 3A in the ERA process (USEPA 1997). Step 3A refined the list of integrated COIs to determine if: (1) there are chemicals of ecological concern (COECs) requiring further evaluation in Level III or remediation to protect ecological receptors, or (2) integrated COIs can be eliminated from further consideration. This evaluation is an important part of Level II and is adapted from USEPA Step 3A, outlined in the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA 1997) and *Risk Assessment Handbook Volume II: Environmental Evaluation* (USACE 2010b).

For Load Lines 1 through 4, the evaluation in Step 3A showed there is no further evaluation necessary for integrated COIs and there is no

ecological concern requiring remediation. Consequently, the ERAs for Load Lines 1 through 4 concluded with Level II that no further action is necessary to be protective of important ecological resources.

6.0 REMEDIAL INVESTIGATION CONCLUSIONS

Based on the investigation results, Load Lines 1 through 4 and 12 have been adequately characterized and the nature and extent of the contamination has been defined. The ERA concluded that no further action is necessary to be protective of important ecological resources and no further action is recommended from the ecological risk perspective. Extensive investigations of each load line concluded that a portion of each load line did not require further action to attain Unrestricted (Residential) Land Use. Limited areas of surface and subsurface soil at each load line were identified as posing unacceptable risk to the Industrial Receptor and/or Resident Receptor.

From a fate and transport perspective, a qualitative assessment of the sample results and considerations of the limitations and assumptions of the models were performed to identify if any contaminant migration chemicals of concern (CMCOCs) are present in soil and sediment at these AOCs that may impact the groundwater beneath their respective source or at the downstream receptor locations. This qualitative assessment concluded that for Load Line 1, RDX contamination in surface and subsurface soil could potentially impact the groundwater beneath the site.

As a result, an FS was developed to establish remedial alternatives to address human health risk and protection of groundwater.

7.0 REMEDIAL ACTION OBJECTIVE

The RAO for Load Lines 1 through 4 and 12 is as follows: Reduce risk from COCs in surface and subsurface soil and sediment to acceptable levels (RGOs) for the likely future land use (i.e., Industrial and/or Military Training) that are protective of human health at Load Lines 1 through 4 and 12.

Table 1 presents the COCs and RGOs. (Note that all tables are presented at the end of this PP.) RGOs are cleanup goals that establish acceptable exposure levels to be protective of human health while considering potential land uses. The soil volume estimates summarized for Load Lines 1 through 4 and 12 to meet RAOs are presented in Tables 2 and 3. The purpose of the FS, discussed below, was to evaluate a defined selection of alternatives that best achieves the RAO.

In addition to the RAO RGOs, applicable or relevant and appropriate requirements (ARARs) were developed to be applied during the evaluation of FS alternatives.

8.0 SUMMARY OF FEASIBILITY STUDY ALTERNATIVES

Remedial technologies and process options were screened to identify potential remedial alternatives that can achieve the RAO. The remedial alternatives developed are presented in the following subsections.

8.1 Alternative 1: No Action

The No Action Alternative must be evaluated under the NCP and provides the baseline against which other remedial alternatives are compared. This alternative assumes all current actions (e.g., access restrictions and environmental monitoring) are discontinued and that no future actions will take place to protect human receptors or the environment. Consequently, COCs at the AOC are not removed or treated.

8.2 Alternative 2: Commercial/Industrial Land Use – Excavation and Off-site Disposal of Soil and Administrative LUCs

Alternative 2 will achieve Commercial/ Industrial Land Use by implementing excavation and off-site disposal of

contaminated soil from each load line. The excavated soil will be transported to an off-site permitted disposal facility. Approximately 5,839 cubic yards of soil will require removal and disposal from the five load lines. Excavations will be backfilled with approved, clean soil. Disturbed areas will be restored to grade and re-vegetated using an Ohio Army National Guard (OHARNG)-approved seed mixture and mulched. Upon removing the contaminated soil, no LUCs will be required for Commercial/Industrial Land Use. However, some contaminated soil will be left in place, preventing Unrestricted (Residential) Land Use. Consequently, LUCs are put in place to restrict use of this AOC (i.e., no residential use).

8.3 Alternative 3: Commercial/Industrial Land Use – Ex-situ Thermal Treatment of Soil and Administrative LUCs

This alternative utilizes a combination of ex-situ thermal treatment and excavation with off-site disposal to achieve Commercial/ Industrial Land Use. Implementation of Alternative 3 will result in thermal treatment of 5,683 cubic yards of soil and excavation and off-site disposal of approximately 156 cubic yards of metals-impacted soil from Load Lines 1 through 4 and 12.

Soil anticipated for treatment will be excavated and placed into a thermal treatment system to remove COCs from soil. Once the treated soil is sampled and confirmed to be below RGOs, the treated soil will be placed back into the excavated area. Both disturbed areas will be restored to grade, using approved clean backfill, as necessary; re-vegetated using an OHARNG-approved seed mixture; and mulched. Upon removing the contaminated soil, no LUCs will be required for Commercial/Industrial Land Use. However, some contaminated soil will be left in place, preventing Unrestricted (Residential) Land Use. Consequently, LUCs are put in place to restrict use of this AOC (i.e., no residential use).

8.4 Alternative 4: Unrestricted (Residential) Land Use – Excavation and Off-site Disposal of Soil/Sediment

Alternative 4 will achieve Unrestricted (Residential) Land Use by implementing excavation and off-site disposal of contaminated soil from each load line. Approximately 31,448 cubic yards of excavated soil will be transported to an off-site permitted disposal facility. Excavations will be backfilled with approved, clean soil. Disturbed areas will be restored to grade and re-vegetated using an OHARNG-approved seed mixture and mulched. Upon removing the contaminated soil, no LUCs or 5-year reviews pursuant to CERCLA will be required because this alternative attains a level of protection for Unrestricted (Residential) Land Use.

8.5 Alternative 5: Unrestricted (Residential) Land Use – Ex-situ Thermal Treatment of Soil/Sediment

This alternative utilizes a combination of ex-situ thermal treatment for soil and sediment and excavation with off-site disposal of soil to achieve Unrestricted (Residential) Land Use. Upon removing and treating the contaminated soil and sediment, no additional controls will be required for any receptor. Implementation of Alternative 5 will result in thermal treatment of 30,121 cubic yards of soil and sediment and excavation and off-site disposal of approximately 1,327 cubic yards of metals-impacted soil from Load Lines 1 through 4 and 12.

Soil will be excavated and placed into a thermal treatment system to remove COCs from soil. Once the treated soil is sampled and confirmed to be below RGOs, the treated soil will be placed back into the excavated area. Both disturbed areas will be restored to grade, using approved clean backfill, as necessary; re-vegetated using an OHARNG-approved seed mixture; and mulched. No LUCs or 5-year reviews pursuant to CERCLA will be required because this alternative attains a level of protection for Unrestricted (Residential) Land Use.

9.0 EVALUATION OF ALTERNATIVES

A comparative analysis was performed for all five alternatives in order to provide a direct comparison to one another with respect to common criteria. Table 4 provides a comparative analysis of the alternatives conducted. Alternative 1 was determined not to be protective of human health and is not compliant with ARARs. In addition, Alternative 1 did not meet the RAO to prevent Resident Receptor exposure to surface soil (0 to 1 ft bgs). Therefore, Alternative 1 was not eligible for selection.

For the remaining four alternatives, the balancing criteria (short- and long-term effectiveness; reduction of contaminant toxicity, mobility, or volume through treatment; ease of implementation; and cost) were used to select a recommended alternative among the alternatives that satisfies the threshold criteria.

10.0 PREFERRED ALTERNATIVE

The recommended alternative for Load Lines 1 through 4 and 12 is Alternative 3: Commercial/Industrial Land Use – Ex-situ Thermal Treatment of Soil and Administrative LUCs. Alternative 3 had the highest score in the balancing criteria analysis. Alternative 3 meets the threshold and primary balancing criteria and is protective of the Industrial and National Guard Trainee Receptors by thermally treating explosives-, PCB-, and PAH-contaminated soil and disposing of the metals-impacted soil off-site at a licensed, engineered landfill.

The estimated cost of Alternative 3 is $1,649,093, making it the most cost-effective alternative. In addition, Alternative 3 is a green and highly sustainable alternative for on-site treatment and implements a treatment alternative to reduce the toxicity, mobility, and volume of contamination. In the event that a thermal treatment system is not on-site at the former RVAAP, Alternative 2: Commercial/Industrial Land Use – Excavation and Off-site Disposal of Soil and Administrative LUCs is readily available and considered for implementation by the Army.

Figures 8 through 12 present the proposed extent of soil requiring remediation for each load line under the recommended alternative. This recommendation is not a final decision. The Army, in coordination with Ohio EPA, will select the remedy for Load Lines 1 through 4 and 12 after reviewing and considering all comments submitted during the 30-day public comment period. Comments received from the public on this PP will be considered in preparing a ROD to document the final remedy. The ROD will also include a responsiveness summary addressing comments received on the PP.

11.0 COMMUNITY PARTICIPATION

Public participation is an important component of the remedy selection. The Army, in coordination with Ohio EPA, is soliciting input from the community on the preferred alternative.

11.1 Public Comment Period

The 30-day comment period is from Month DD, YYYY to Month DD, YYYY, and provides an opportunity for public involvement in the decision-making process for the proposed action. This period includes a public meeting at which the Army will present this PP.

All public comments will be considered by the Army and Ohio EPA before selecting a remedy. During the comment period, the public is encouraged to review documents pertinent to Load Lines 1 through 4 and 12.

This information is available at the Information Repositories and online at www.rvaap.org. To obtain further information, contact Kathryn Tait of the Camp Ravenna Environmental Office at kathryn.s.tait.nfg@mail.mil.

11.2 Written Comments

If the public would like to comment in writing on this PP or other relevant issues, please deliver comments to the Army at the public meeting or mail written comments (postmarked no later than Month DD, YYYY).

11.3 Public Meeting

The Army will hold an open house and public meeting on this PP on Month DD, YYYY, at ___PM, in the Shearer Community Center, 9355 Newton Falls Road Ravenna, Ohio 44266 to accept comments.

This meeting will provide an opportunity for the public to comment on the proposed action. Comments made at the meeting will be transcribed.

POINT OF CONTACT FOR WRITTEN COMMENTS

Mailing Address:
Camp Ravenna Joint Military Training Center
Environmental Office
Attn: Kathryn Tait
1438 State Route 534 SW
Newton Falls, Ohio 44444

Email Address:
kathryn.s.tait.nfg@mail.mil

11.4 Army Review of Public Comments

The Army will review the public's comments as part of the process in reaching a final decision for the most appropriate action to be taken.

The Responsiveness Summary, a document that summarizes the Army's responses to comments received during the public comment period, will be included in the ROD. The Army's final choice of action will be documented in the ROD. The ROD will be added to the RVAAP Restoration Program Administrative Record and Information Repositories.

INFORMATION REPOSITORIES

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266
(330) 296-2827

Hours of operation:
9AM-9PM Monday-Thursday
9AM-6PM Friday
9AM-5PM Saturday
1PM-5PM Sunday

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444
(330) 872-1282

Hours of operation:
9AM-8PM Monday-Thursday
9AM-5PM Friday and Saturday

Online
http://www.rvaap.org/

ADMINISTRATIVE RECORD FILE

Camp Ravenna Joint Military Training Center (former Ravenna Army Ammunition Plant)
Environmental Office
1438 State Route 534 SW
Newton Falls, Ohio 44444
(614) 336-6136
Note: Access is restricted to Camp Ravenna, but the file can be obtained or viewed with prior notice to Camp Ravenna.

GLOSSARY OF TERMS

Administrative Record: a collection of documents, typically reports and correspondence, generated during site investigation and remedial activities. Information in the Administrative Record represents the information used to select the preferred alternative.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): a Federal law passed in 1980, commonly referred to as the Superfund Program. It provides liability, compensation, cleanup, and emergency response in connection with the cleanup of inactive hazardous substance release sites that endanger public health or the environment.

Contaminant Migration Chemical of Concern (CMCOC): a chemical substance specific to an area of concern that potentially poses significant potential to leach to groundwater at a concentration above human health risks goals. CMCOCs are typically further evaluated for remedial action.

Chemical of Concern (COC): a chemical substance specific to an area of concern that potentially poses significant human health or ecological risks. COCs are typically further evaluated for remedial action.

Chemical of Ecological Concern (COEC): a chemical substance specific to an area of concern that potentially poses ecological risks and requires further evaluation in the RI. COECs are typically not evaluated for remedial action.

Ecological Receptor: a plant, animal, or habitat exposed to an adverse condition.

Exposure Point Concentration (EPC): in accordance with the *RVAAP Facility-wide Human Health Risk Assessors Manual – Amendment 1* (USACE 2005), the EPC is the calculated 95 percent upper confidence limit of the mean concentration of a chemical or the maximum detected concentration of a chemical, whichever value is lowest.

Human Receptor: a hypothetical person, based on current or potential future land use, who may be exposed to an adverse condition. For example, the National Guard Trainee is considered the hypothetical person when evaluating Military Training Land Use at the former RVAAP.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP): the set of regulations that implement CERCLA and address responses to hazardous substances and pollutants or contaminants.

Record of Decision (ROD): a signed legal record that describes the cleanup action or remedy selected for a site, the basis for selecting that remedy, public comments, and responses to comments.

Remedial Goal Options (RGOs): RGOs are cleanup concentrations for soil, sediment, and surface water that establish acceptable exposure levels to be protective of human health while considering potential land uses.

Remedial Investigation (RI): CERCLA investigation that involves sampling environmental media, such as air, soil, and water, to determine the nature and extent of contamination and to calculate human health and environmental risks that result from the contamination.

Responsiveness Summary: a section of the ROD that documents and responds to written and oral comments received from the public about the PP.

Risk Assessment: an evaluation that determines potential harmful effects, or lack thereof, posed to human health and the environment due to exposure to chemicals found at a CERCLA site.

Sum-of-Ratio (SOR): to adjust for multiple chemicals, divide the standard for each COC by the number of COCs. The adjusted value

can then be compared to the single chemical value, and each ratio summed. If the summed ratios are less than one, the applicable standards are met. If summed ratios exceed one, the applicable standards are not met.

Target Risk: the Ohio Environmental Protection Agency (2009) identifies 1E-05 as a target for cancer risk for carcinogens and an acceptable target hazard quotient of 1 for non-carcinogens.

Unrestricted (Residential) Land Use: defined for the former RVAAP restoration that is considered protective for all three land uses at Camp Ravenna. If an AOC meets the requirements for Unrestricted (Residential) Land Use, then the AOC can also be used for Military Training and Commercial/Industrial purposes.

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EQM (Environmental Quality Management, Inc.) 2010. Facility-wide Groundwater Monitoring Program Report on the January 2010 Sampling Event, Ravenna Army Ammunition Plant, Ravenna, Ohio. July.

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USACE 2004c. *Phase II Remedial Investigation Report for Load Line 3 at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. July.

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USACE 2010b. *Risk Assessment Handbook Volume II: Environmental Evaluation*. December 2010.

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USACE 2017a. *Final Feasibility Study Addendum for Soil, Sediment, and Surface Water at RVAAP Load Lines 1, 2, 3, 4, and 12.* June.

USACE 2017b. *Final Proposed Plan for Wet Sediment and Surface Water at RVAAP-12 Load Line 12, Former Ravenna Army Ammunition Plant Portage and Trumbull Counties, Ohio.* November.

USACE 2017c. *Phase III Remedial Investigation Report for Wet Sediment and Surface Water at RVAAP-12 Load Line 12 Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio.* February.

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TABLES

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Table 1. Remedial Goal Options

Media	Chemical of Concern	Cleanup Goals (mg/kg)	
		Industrial RGO	Residential RGO
Load Line 1			
Soil	Antimony	470	31
	Lead	800	400
	TNT	510	36
	RDX	280	61
	Benz(a)anthracene	29	1.6
	Benzo(a)pyrene	2.9	0.16
	Benzo(b)fluoranthene	29	1.6
	PCB-1254	9.7	1.2
Load Line 2			
Soil	Antimony	N/A	31
	Lead	N/A	400
	TNT	510	36
	2,4-DNT	N/A	17
	Benz(a)anthracene	N/A	1.6
	Benzo(a)pyrene	N/A	0.16
	Benzo(b)fluoranthene	N/A	1.6
	Dibenz(a,h)anthracene	N/A	0.16
	PCB-1254	N/A	1.2
Sediment*	Benz(a)anthracene	N/A	1.6
	Benzo(a)pyrene	N/A	0.16
	Benzo(b)fluoranthene	N/A	1.6
	Dibenz(a,h)anthracene	N/A	0.16
	Indeno(1,2,3-cd)pyrene	N/A	1.6
Load Line 3			
Soil	Lead	N/A	400
	TNT	510	36
	Benz(a)anthracene	29	1.6
	Benzo(a)pyrene	2.9	0.16
	Benzo(b)fluoranthene	29	1.6
	Dibenz(a,h)anthracene	2.9	0.16
	Indeno(1,2,3-cd)pyrene	N/A	1.6
	PCB-1254	9.7	1.2
	PCB-1260	N/A	2.4
Load Line 4			
Soil	Lead	800	400
	Benz(a)anthracene	29	1.6
	Benzo(a)pyrene	2.9	0.16
	Benzo(b)fluoranthene	29	1.6
	Dibenz(a,h)anthracene	2.9	0.16
	Indeno(1,2,3-cd)pyrene	N/A	1.6
	PCB-1254	N/A	1.2
	PCB-1260	9.9	2.4

Table 1. Remedial Goal Options (continued)

Media	Chemical of Concern	Cleanup Goals (mg/kg)	
		Industrial RGO	Residential RGO
Load Line 12			
Soil	TNT	510	36
	2,6-DNT	15	3.6
	RDX	N/A	61
	Benz(a)anthracene	29	1.6
	Benzo(a)pyrene	2.9	0.16
	Benzo(b)fluoranthene	29	1.6
	Dibenz(a,h)anthracene	2.9	0.16
	Indeno(1,2,3-cd)pyrene	N/A	1.6

*Residential RGOs are the same for soil and sediment, resulting in a very conservative evaluation of sediment.

DNT = Dinitrotoluene.
mg/kg = Milligrams per Kilogram.
N/A = Not applicable. The chemical of concern does not require remediation for the receptor within the specified AOC.
PCB = Polychlorinated Biphenyl.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
RGO = Remedial Goal Option.
TNT = 2,4,6-Trinitrotoluene.

Table 2. Estimated Volume Requiring Remediation for Commercial/Industrial Land Use

Commercial/Industrial						
			In-situ		Ex-situ	
Remediation Area	Area (ft^2)	Impacted Interval (ft bgs)	Volume (yd^3)	Volume with Constructability[a] (yd^3)	Volume[b] (yd^3)	Weight (tons)
Load Line 1	11,815	varies (max depth = 5 ft bgs)	1,491	1,864	2,236	2,795
Load Line 2	400	0-2	30	37	46	56
Load Line 3	25,056	varies (max depth = 6 ft bgs)	1,649	2,062	2,474	3,093
Load Line 4	5,994	varies (max depth = 7 ft bgs)	474	592	710	888
Load Line 12	2,633	varies (max depth = 4.5 ft bgs)	248	310	372	465
Total	**45,898**		**3,892**	**4,865**	**5,839**	**7,297**

[a] Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in-situ volume is increased by 25% for a constructability factor.
[b] Includes 20% swell factor.

bgs = Below Ground Surface.
ft^2 = Square Feet.
ft = Feet.
yd^3 = Cubic Yards.

Table 3. Estimated Volume Requiring Remediation for Unrestricted (Residential) Land Use

Unrestricted (Residential)						
			In-situ		Ex-situ	
Remediation Area	**Area (ft^2)**	**Impacted Interval (ft bgs)**	**Volume (yd^3)**	**Volume with Constructability[a] (yd^3)**	**Volume[b] (yd^3)**	**Weight (tons)**
Load Line 1	49,017	varies (max depth = 8 ft bgs)	4,584	5,730	6,876	8,595
Load Line 2 soil	31,616	varies (max depth = 6 ft bgs)	1,972	2,465	3,081	3,698
Load Line 2 sediment	53,027	0-1	1,966	2,457	3,071	3,686
Load Line 3	69,435	varies (max depth = 7 ft bgs)	8,865	11,082	13,298	16,622
Load Line 4	31,337	varies (max depth = 7 ft bgs)	2,940	3,674	4,409	5,512
Load Line 12	4,233	varies (max depth = 4.5 ft bgs)	475	593	712	890
Total	**238,665**		**20,802**	**26,001**	**31,448**	**39,003**

[a] Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in-situ volume is increased by 25% for a constructability factor.
[b] Includes 20% swell factor.

bgs = Below Ground Surface.
ft = Feet.
ft^2 = Square Feet.
yd^3 = Cubic Yards.

Table 4. Summary of Comparative Analysis of Remedial Alternatives for Load Lines 1 Through 4 and 12

NCP Evaluation Criteria	Alternative 1: No Action	Alternative 2: Commercial/Industrial Land Use – Excavation and Off-site Disposal of Soil and Administrative LUCs	Alternative 3: Commercial/Industrial Land Use – Ex-situ Thermal Treatment of Soil and Administrative LUCs	Alternative 4: Unrestricted (Residential) Land Use – Excavation and Off-site Disposal of Soil/Sediment	Alternative 5: Unrestricted (Residential) Land Use – Ex-situ Thermal Treatment of Soil/Sediment
Threshold Criteria	***Result***	***Result***	***Result***	***Result***	***Result***
1. Overall Protectiveness of Human Health and the Environment	Not protective	Protective	Protective	Protective	Protective
2. Compliance with ARARs	Not compliant	Compliant	Compliant	Compliant	Compliant
Balancing Criteria	***Score***	***Score***	***Score***	***Score***	***Score***
3. Long-term Effectiveness and Permanence	Not applicable	2	2	3	3
4. Reduction of Toxicity, Mobility, or Volume through Treatment	Not applicable	1	2	1	3
5. Short-term Effectiveness	Not applicable	2	3	1	2
6. Implementability	Not applicable	3	3	2	2
7. Cost	Not applicable ($0)	3 $2,011,655	3 $1,649,093	1 $6,990,292	1 $4,702,011
Balancing Criteria Score	*Not applicable*	*11*	*13*	*8*	*11*

Any alternative 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. Therefore, that alternative is not ranked as part of the balancing criteria evaluation.

Scoring for the balancing criteria is as follows: Most favorable = 3, 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.
LUC = Land Use Control.
NCP = National Contingency Plan.

FIGURES

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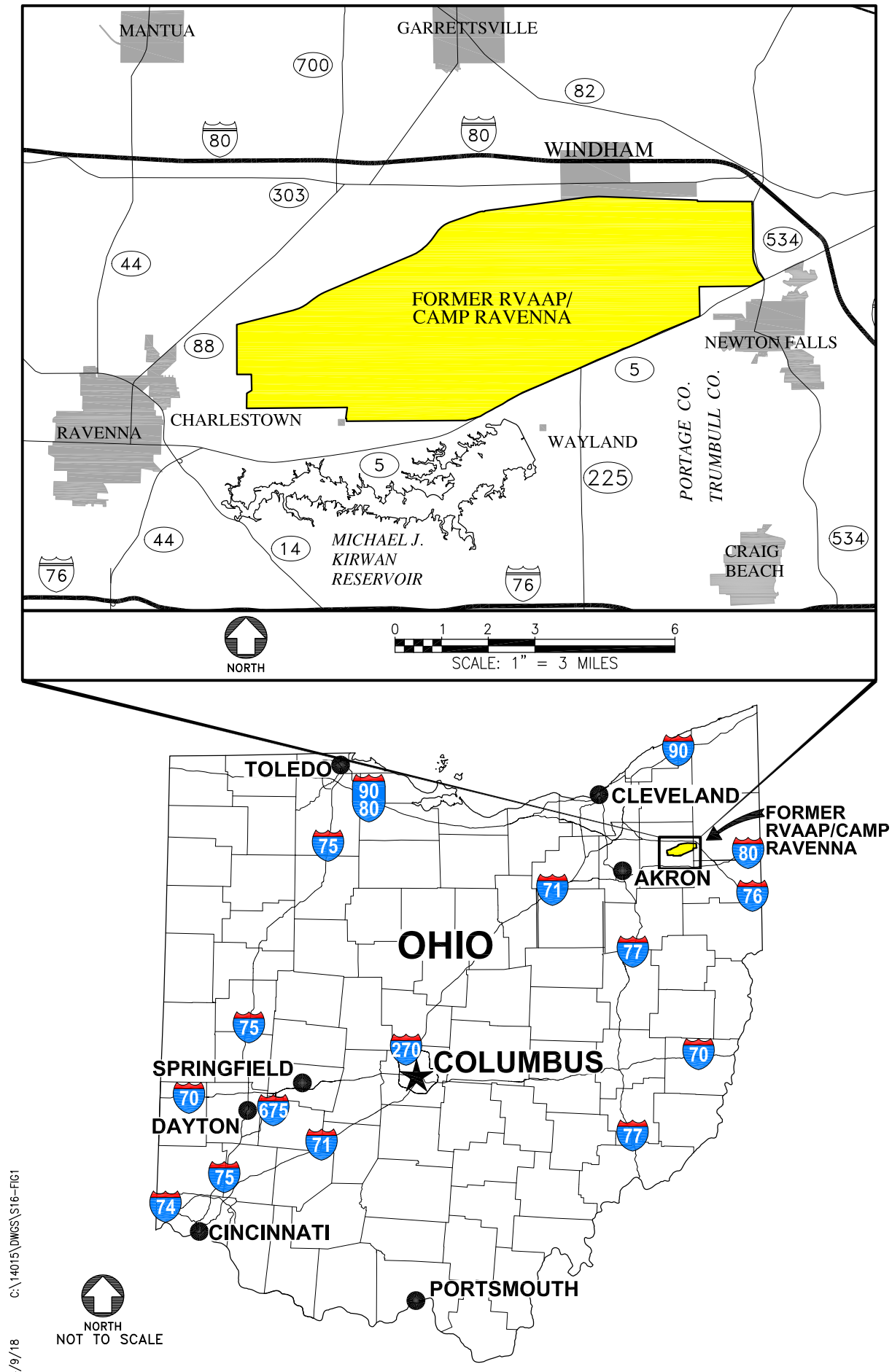


Figure 1. General Location and Orientation of Camp Ravenna

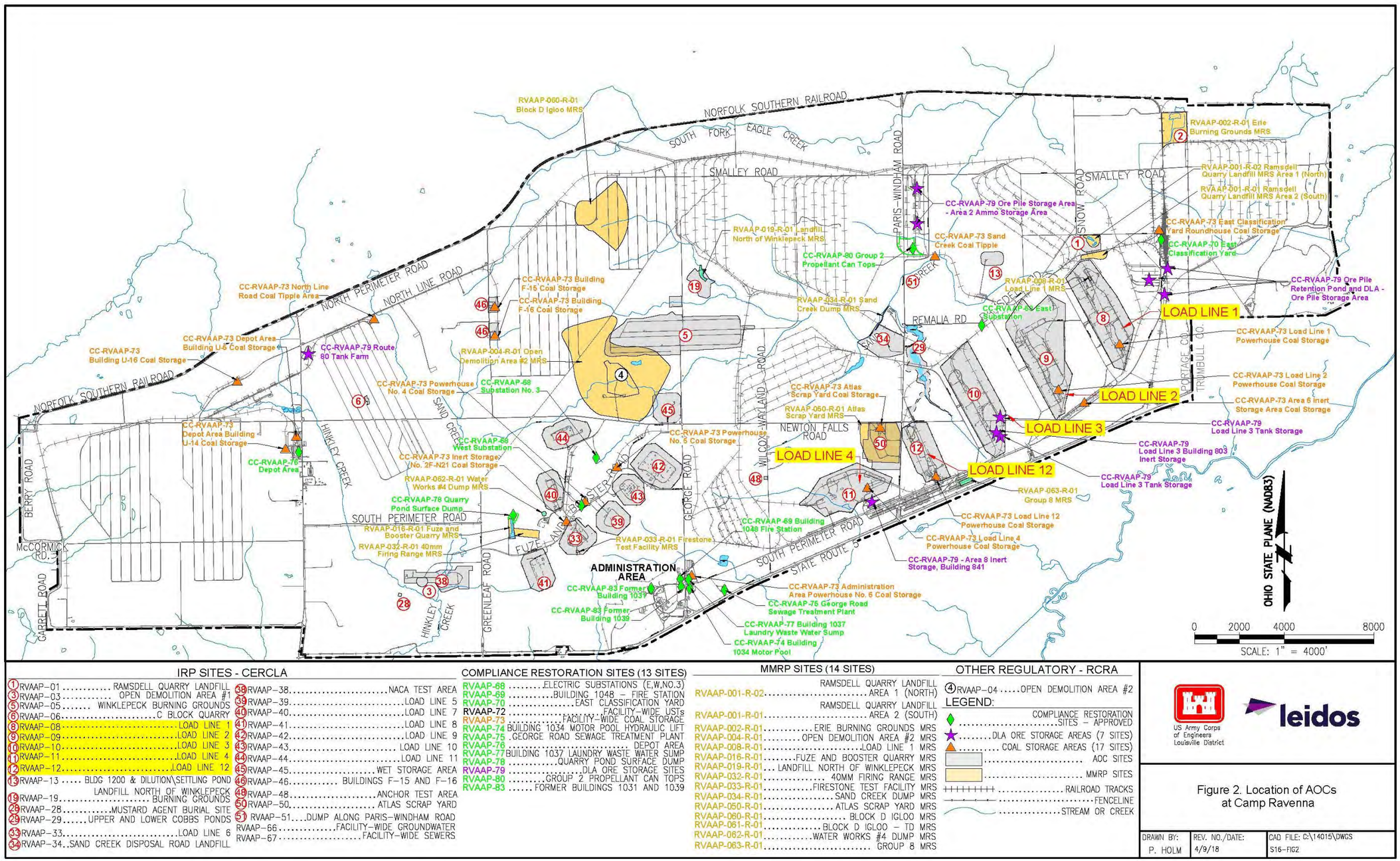
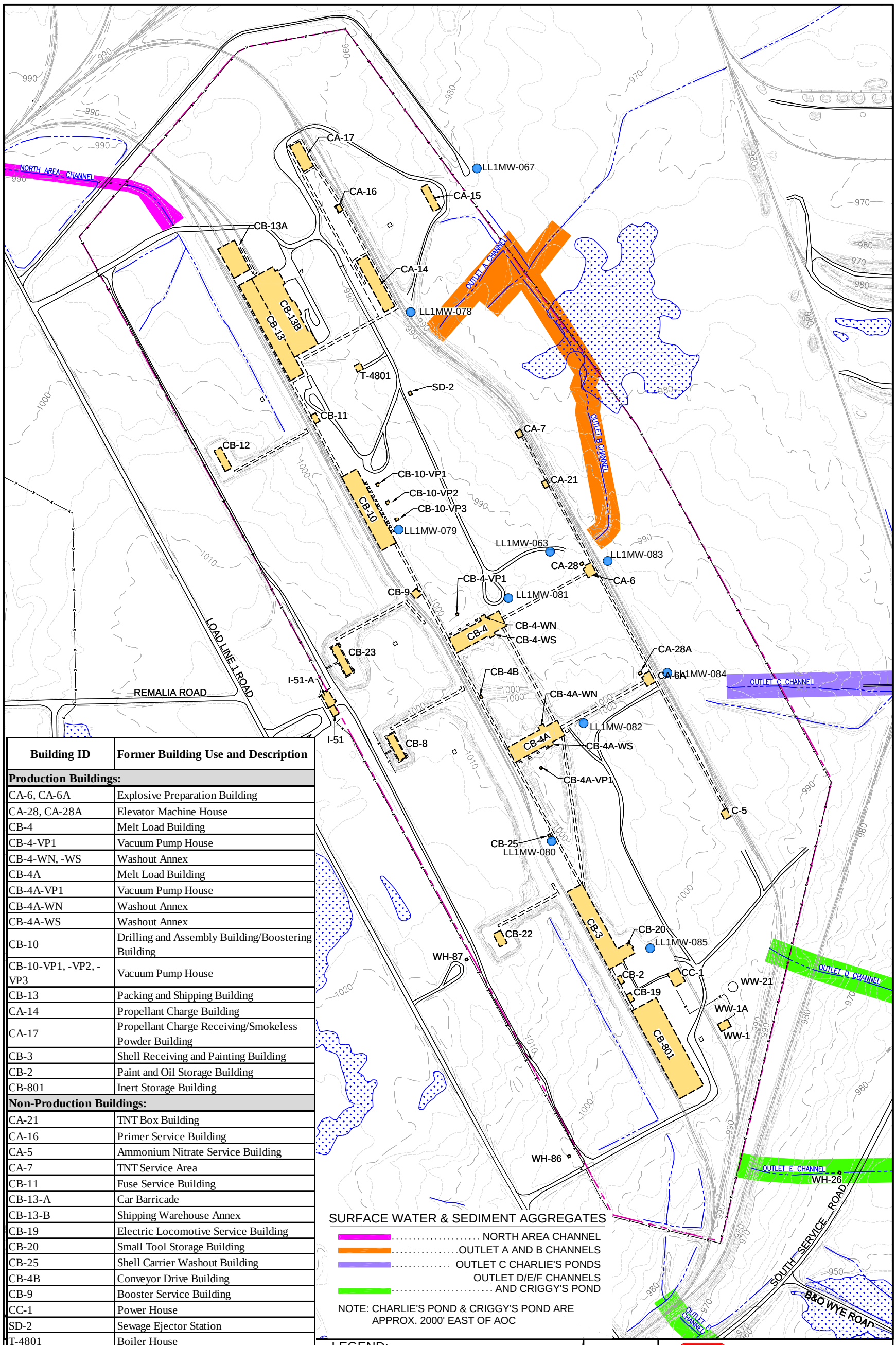


Figure 2. Location of AOCs at Camp Ravenna



Building ID	Former Building Use and Description
Production Buildings:	
CA-6, CA-6A	Explosive Preparation Building
CA-28, CA-28A	Elevator Machine House
CB-4	Melt Load Building
CB-4-VP1	Vacuum Pump House
CB-4-WN, -WS	Washout Annex
CB-4A	Melt Load Building
CB-4A-VP1	Vacuum Pump House
CB-4A-WN	Washout Annex
CB-4A-WS	Washout Annex
CB-10	Drilling and Assembly Building/Boostering Building
CB-10-VP1, -VP2, -VP3	Vacuum Pump House
CB-13	Packing and Shipping Building
CA-14	Propellant Charge Building
CA-17	Propellant Charge Receiving/Smokeless Powder Building
CB-3	Shell Receiving and Painting Building
CB-2	Paint and Oil Storage Building
CB-801	Inert Storage Building
Non-Production Buildings:	
CA-21	TNT Box Building
CA-16	Primer Service Building
CA-5	Ammonium Nitrate Service Building
CA-7	TNT Service Area
CB-11	Fuse Service Building
CB-13-A	Car Barricade
CB-13-B	Shipping Warehouse Annex
CB-19	Electric Locomotive Service Building
CB-20	Small Tool Storage Building
CB-25	Shell Carrier Washout Building
CB-4B	Conveyor Drive Building
CB-9	Booster Service Building
CC-1	Power House
SD-2	Sewage Ejector Station
T-4801	Boiler House
WH-26,-86, -87	Well House (Note: WH-25,-27,-88 are SE of AOC)
WW-1	Pump and Filter Station
WW-1A	Filtered Water Reservoir
WW-21	Elevated Water Tank
I-51	Clock Alley
I-51-A	Load Line Office
CB-8,-12,-15,-22, -23	Change Houses

NOTE: ALL ABOVE GROUND STRUCTURES ARE DEMOLISHED

Figure 3. Load Line 1 AOC Features

Building ID	Former Building Use and Description
Production Buildings:	
DA-6, -6A	Explosive Preparation Building
DB-10	Drilling and Assembly Building
DB-10-VP1, -VP2	Vacuum Pump House
DB-13	Packing and Shipping Building
DB-13A	Shell Storage Building/Assembling and Shipping Building
DB-13B	Shipping Warehouse Annex
DB-25	Shell Carrier Washout Building
DB-26	Radiographic Building
DB-27, -27A	Cyclic Heat Building No. 2, No. 1
DB-27B	Boiler Plant
DB-27C	Shipping Building
DB-3	Shell Receiving and Painting Building
DB-4	Melt Load Building and SPCC
DB-4A	Melt Loading Building
DB-4-A-VP1	Vacuum Pump House
DB-4A-WN, -WS	Washout Annex
DB-4-VP1	Vacuum Pump House
DB-4-WN, -WS	Washout Annex
DB-802	Inert Storage Building
DB-9, -9A	Booster Service Building
DA-28, -28A	Elevator Machine House
Non-Production Buildings:	
DC-1	Power House No. 2
CTank1, Tank2	Concrete Settling Tank
WST-1, -2	Wooden Settling Tank
DB-2	Paint and Oil Storage Building
DA-5	Ammonium Nitrate Service Building
DA-7	TNT Service Building
DB-11	Fuse Service Building
DB-19	Electric Locomotive Service Building
DB-20A	Metrology Laboratory/Line Office
DB-8, -8A, -22	Change House
DA-21	TNT Box Building
DB-29	Elevator Machine House
2-51	Clock Alley
2-51A	Load Line Office
950-D	Gate House

NOTE: ALL ABOVE GROUND STRUCTURES ARE DEMOLISHED

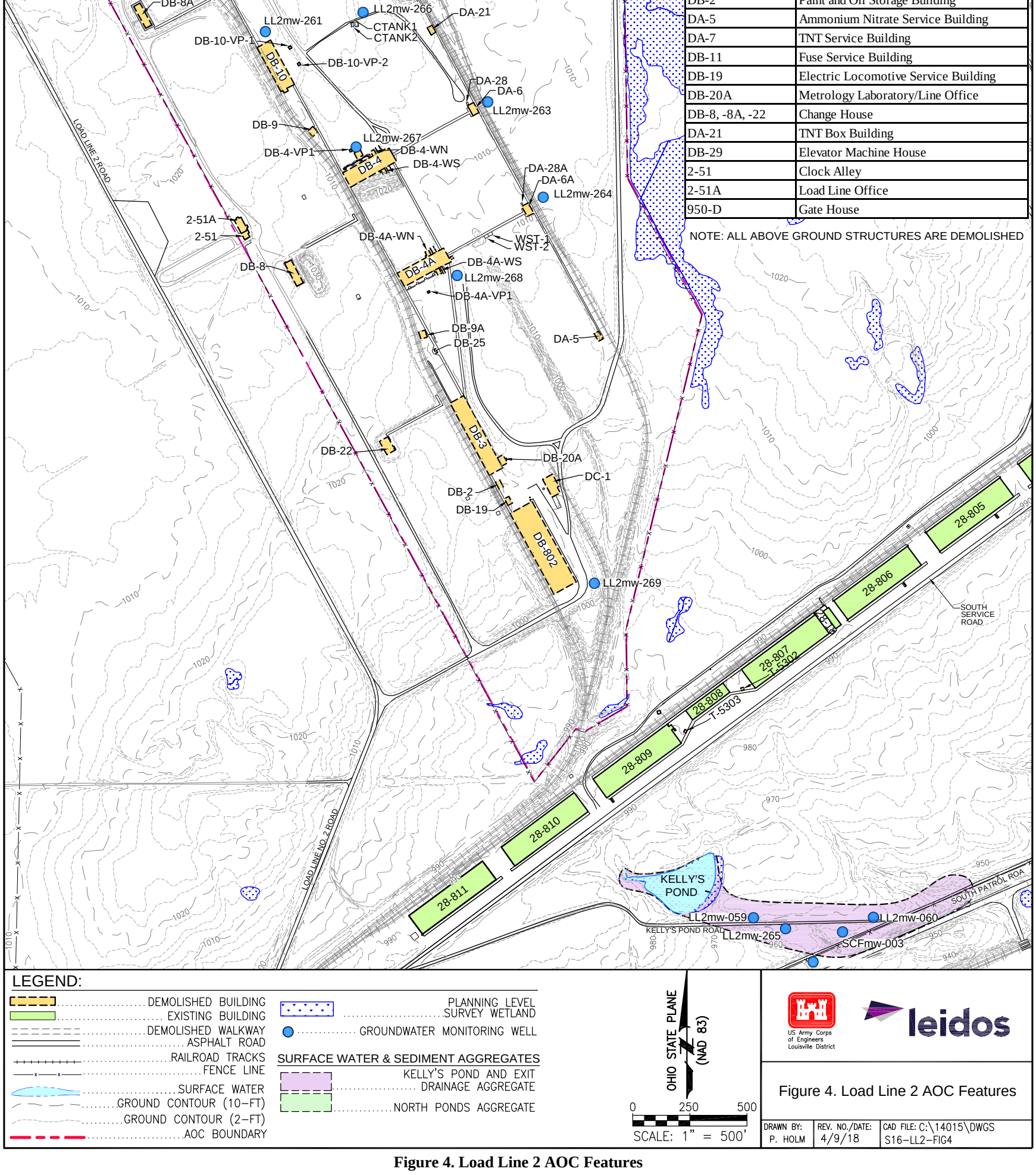


Figure 4. Load Line 2 AOC Features

Building ID	Former Building Use and Description
Production Buildings:	
EA-6, -6A	Explosive Preparation Building
EA-28, -28A	Elevator Machine House
EB-4, -4A	Melt Load Building
EB-4A-WN, -WS EB-4-WN, -WS	Washout Annex
EB-4-VP1, EB-4A-VP1 EB-10-VP1, -VP2	Vacuum Pump House
EB-10	Drilling and Assembly Building
EB-10A	Radiographic Building
EB-13	Packing and Shipping Building
EB-13A	Shell Storage Building/Assembling and Shipping Building
EB-13B	Shipping Warehouse Annex
EB-25	Shell Carrier Washout Building
Non-Production Buildings:	
EA-7	TNT Service Building
EB-11	Fuse Service Building
EB-19	Electric Locomotive Service Building
EB-2	Paint and Oil Storage Building
EB-3	Shell Receiving and Painting Building
EB-803	Inert Storage Building
EB-9, -9A	Service Building
LL3-CST-1, CST-2	Concrete Settling Tanks
EA-21	TNT Box Building
EA-5	AN Service Building
EB-22, -8, -8A	Change House
3-51A	Load Line Office
3-51	Clock Alley
EB-20	Line Office

NOTE: ALL ABOVE GROUND STRUCTURES ARE DEMOLISHED

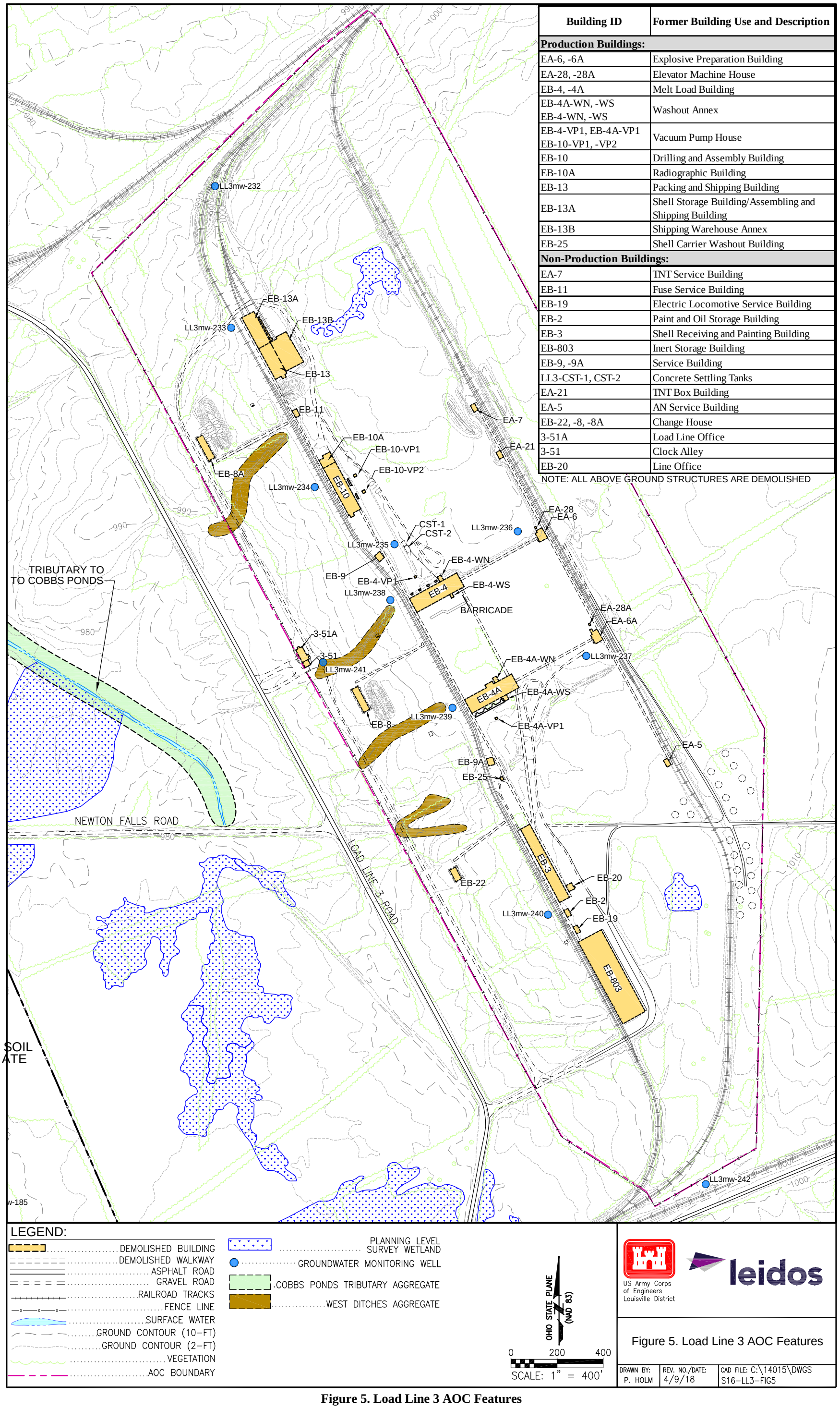


Figure 5. Load Line 3 AOC Features

Building ID	Former Building Use and Description
Production Buildings:	
G-11	Magazine/AN Service Building
G-12, -12A	Explosive Cooling Building
G-13	Funnel Removal and Face Off
G-13A	X-Ray
G-15	Explosive Prep Building/TNT Screening Building
G-16	TNT Receiving
G-18	Paint Storage/Component Service Building
G-19	Packing and Shipping Building
G-19A	Shipping Building
G-8	Melt Pour Building
Non-Production Buildings:	
CC-1	Construction Camp Fire House
CC-2	Hunkin Conkey Construction
CC-3	Workmen's Sheds
CC-4	Garage
CC-5	Stock Rooms
CC-6	Communications Unit
G-2	Paint Storage
G-3	Shell Preparation and Painting Building
G-4	Power House No. 7
G-5	Line Office
G-6, -6A	Change House
G-7	Booster Service Building
SD-5	Sewage Ejector Station
T-5201	Guard Post
G-20	Gate House
WW-23	Elevated Water Tank
G-9	Explosive Screening Building
G-1	Material Receiving/Inert Storage Warehouse
G-1A	Material Receiving/Truck Repair Shop
G-14	Booster Service Building
G-17	Supplementary Charges Magazine

NOTE: ALL ABOVE GROUND STRUCTURES ARE DEMOLISHED

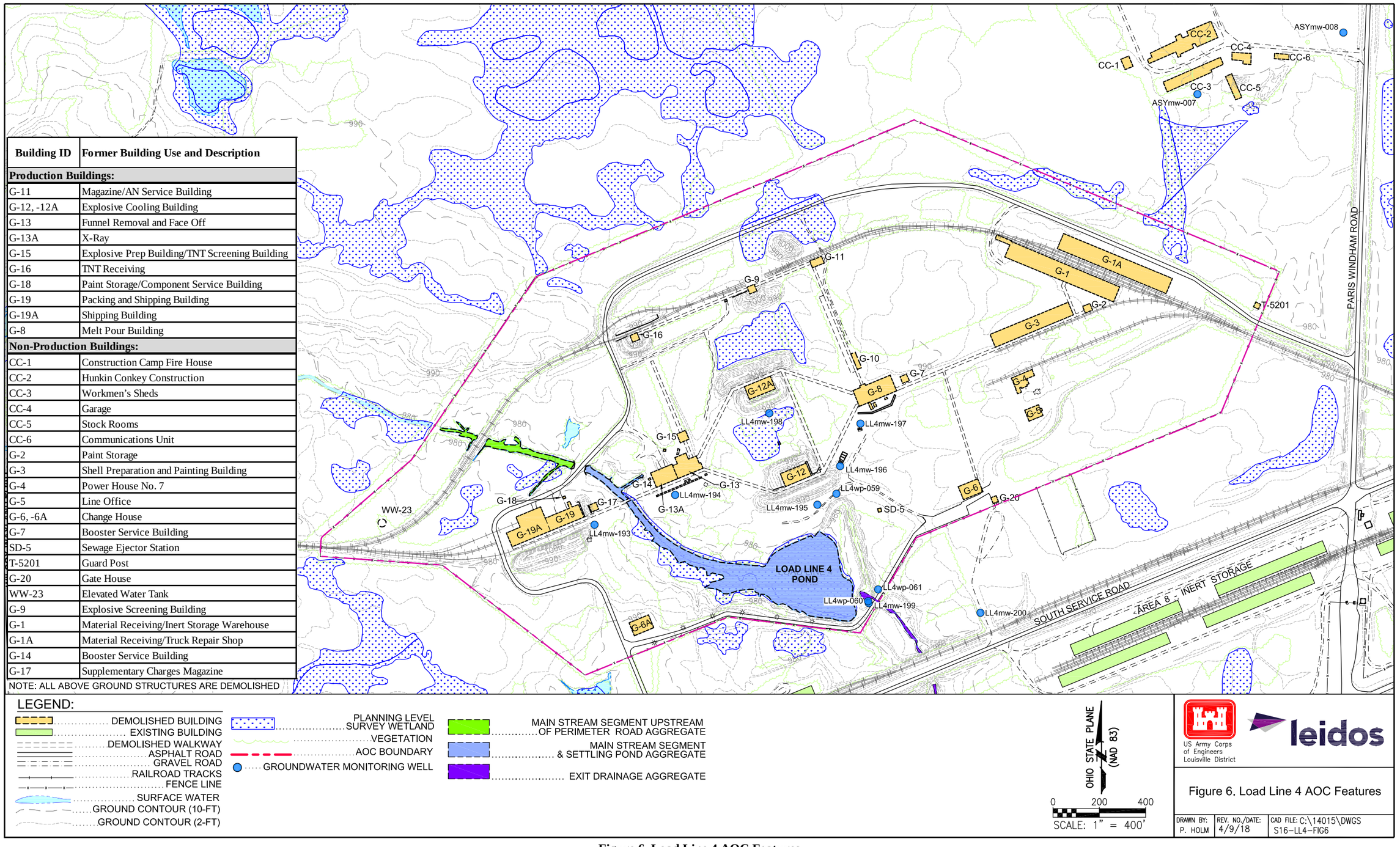
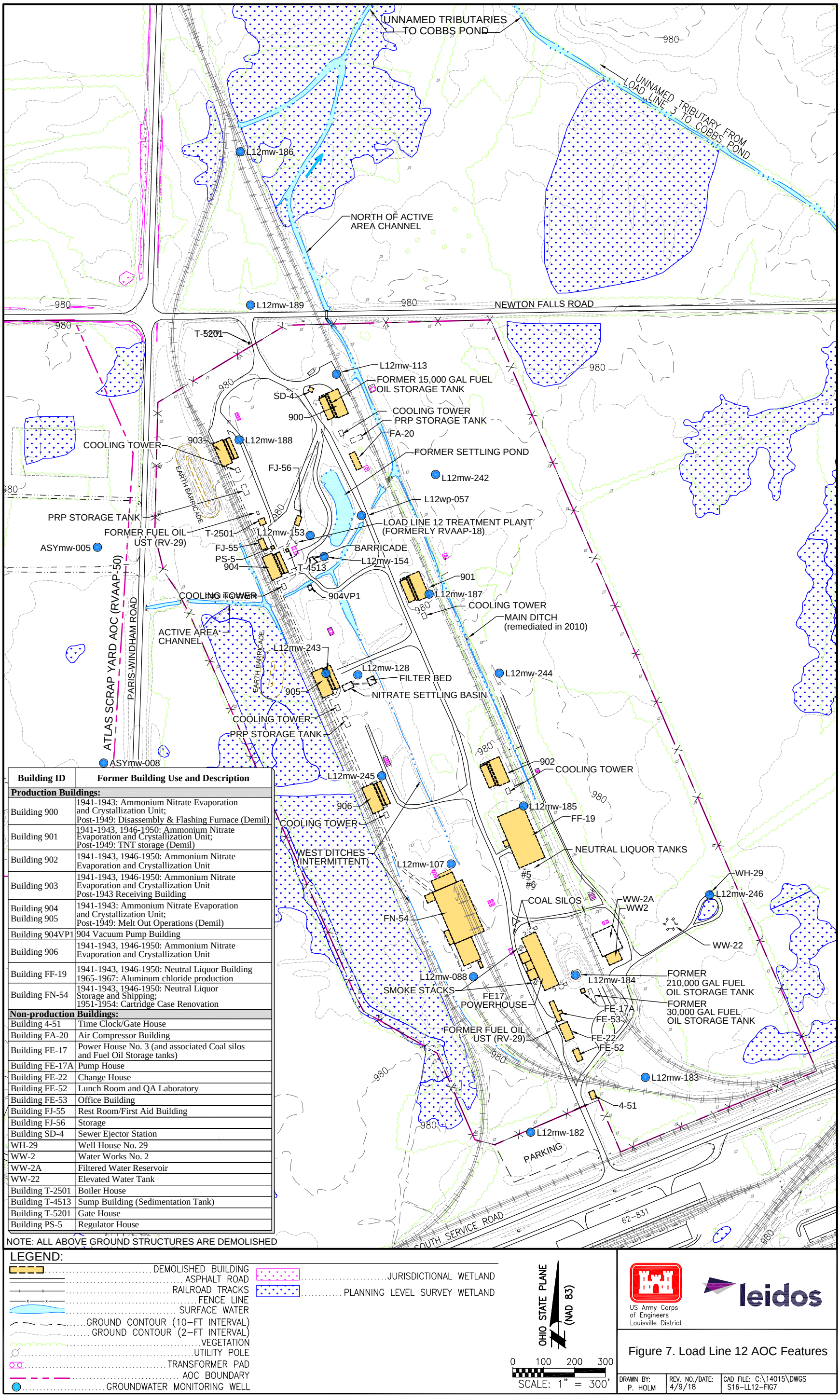


Figure 6. Load Line 4 AOC Features



Building ID	Former Building Use and Description
Production Buildings:	
Building 900	1941-1943: Ammonium Nitrate Evaporation and Crystallization Unit; Post-1949: Disassembly & Flashing Furnace (Demil)
Building 901	1941-1943, 1946-1950: Ammonium Nitrate Evaporation and Crystallization Unit; Post-1949: TNT storage (Demil)
Building 902	1941-1943, 1946-1950: Ammonium Nitrate Evaporation and Crystallization Unit
Building 903	1941-1943, 1946-1950: Ammonium Nitrate Evaporation and Crystallization Unit Post-1943 Receiving Building
Building 904 Building 905	1941-1943: Ammonium Nitrate Evaporation and Crystallization Unit; Post-1949: Melt Out Operations (Demil)
Building 904VP1	904 Vacuum Pump Building
Building 906	1941-1943, 1946-1950: Ammonium Nitrate Evaporation and Crystallization Unit
Building FF-19	1941-1943, 1946-1950: Neutral Liquor Building 1965-1967: Aluminum chloride production
Building FN-54	1941-1943, 1946-1950: Neutral Liquor Storage and Shipping; 1951-1954: Cartridge Case Renovation
Non-production Buildings:	
Building 4-51	Time Clock/Gate House
Building FA-20	Air Compressor Building
Building FE-17	Power House No. 3 (and associated Coal silos and Fuel Oil Storage tanks)
Building FE-17A	Pump House
Building FE-22	Change House
Building FE-52	Lunch Room and QA Laboratory
Building FE-53	Office Building
Building FJ-55	Rest Room/First Aid Building
Building FJ-56	Storage
Building SD-4	Sewer Ejector Station
WH-29	Well House No. 29
WW-2	Water Works No. 2
WW-2A	Filtered Water Reservoir
WW-22	Elevated Water Tank
Building T-2501	Boiler House
Building T-4513	Sump Building (Sedimentation Tank)
Building T-5201	Gate House
Building PS-5	Regulator House

NOTE: ALL ABOVE GROUND STRUCTURES ARE DEMOLISHED

LEGEND:
- DEMOLISHED BUILDING
- ASPHALT ROAD
- RAILROAD TRACKS
- FENCE LINE
- SURFACE WATER
- GROUND CONTOUR (10-FT INTERVAL)
- GROUND CONTOUR (2-FT INTERVAL)
- VEGETATION
- UTILITY POLE
- TRANSFORMER PAD
- AOC BOUNDARY
- GROUNDWATER MONITORING WELL
- JURISDICTIONAL WETLAND
- PLANNING LEVEL SURVEY WETLAND

OHIO STATE PLANE (NAD 83)
0 100 200 300
SCALE: 1" = 300'

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Figure 7. Load Line 12 AOC Features

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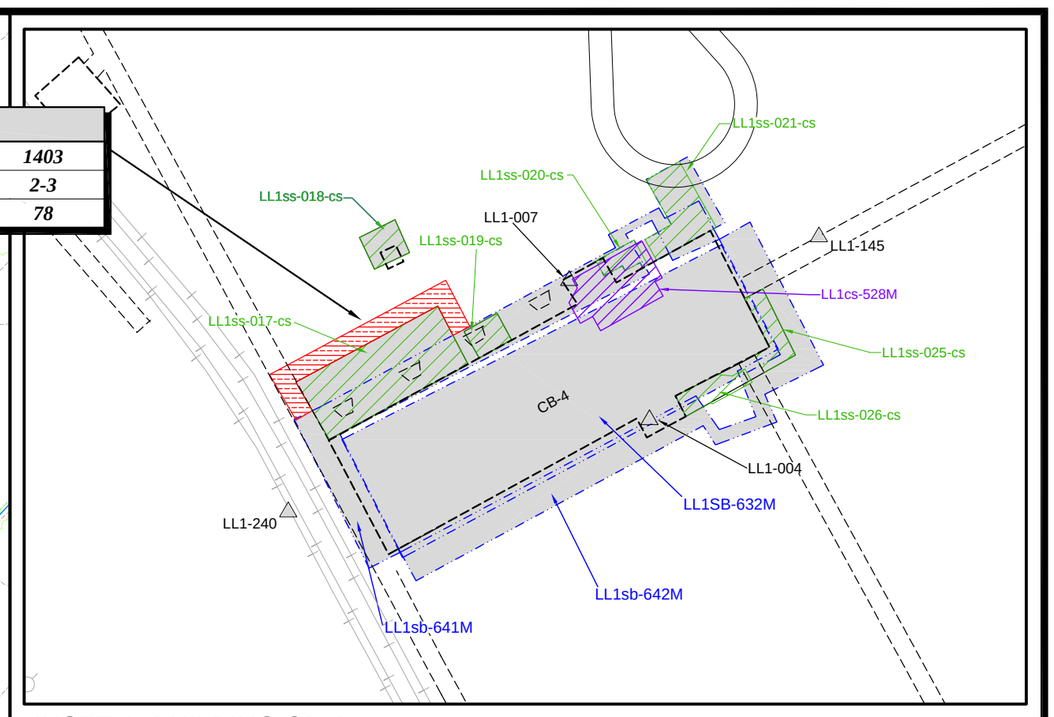
Figure 7. Load Line 12 AOC Features

Building CB-4	
Area (sq. ft.):	1403
Treatment Interval (ft. bgs):	2-3
Ex-Situ Volume (cy):	78

CB-13B (LL1-252)	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-1.5
Ex-Situ Volume (cy):	33



INSET A: BUILDING CB-4

SUBSURFACE SOIL SCREENING RESULTS

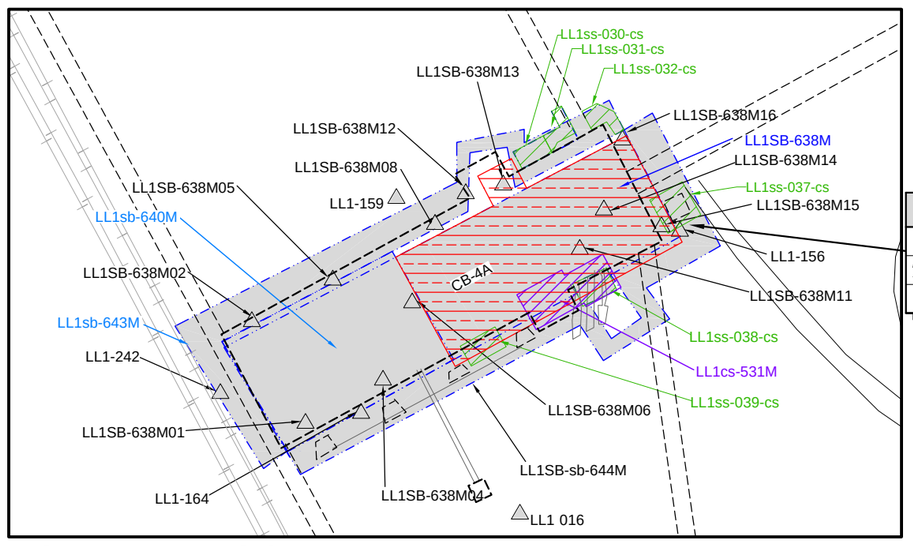
0 40 80
SCALE: 1" = 80'

SEE INSET A: BUILDING CB-4

SEE INSET B: BUILDING CB-4A

SEE INSET C: BUILDING CB-2

Building CB-4A	
Area (sq. ft.):	9212
Treatment Interval (ft. bgs):	1-5
Ex-Situ Volume (cy):	2047

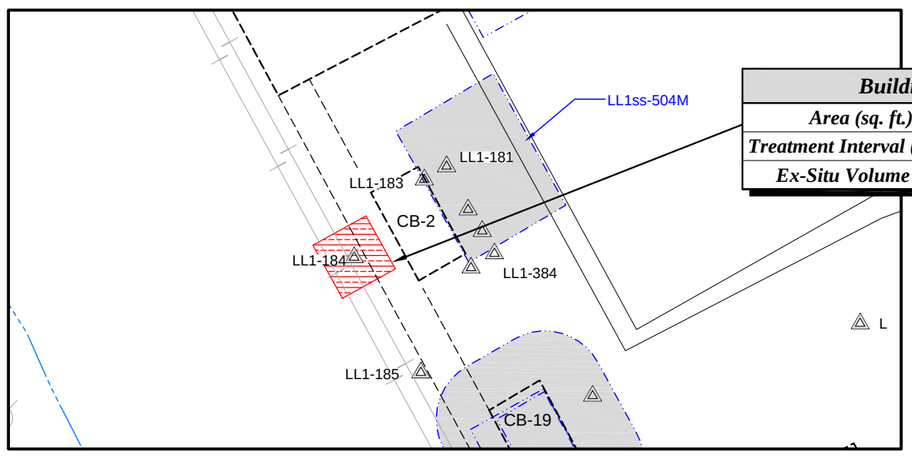


INSET B: BUILDING CB-4A

SUBSURFACE SOIL SCREENING RESULTS

0 40 80
SCALE: 1" = 80'

Building CB-2	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-2
Ex-Situ Volume (cy):	44



INSET C: BUILDING CB-2

SURFACE SOIL SCREENING RESULTS

0 25 50
SCALE: 1" = 50'

Outlet Channel D (LL1-049)	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-1.5
Ex-Situ Volume (cy):	33

LEGEND:

- DEMOLISHED BUILDING
- WALKWAY
- FENCE LINE
- FORMER RAILROAD
- SURFACE WATER
- GROUND CONTOUR (10-FT INTERVAL)
- GROUND CONTOUR (2-FT INTERVAL)
- VEGETATION
- AOC BOUNDARY
- LL1ss-030-cs — 2007 CONFIRMATION SAMPLE
- 2007 REMEDIATION AREAS
- 2010 REMEDIATION AREAS
- SURFACE SOIL DISCRETE SAMPLE
- SUBSURFACE SOIL DISCRETE SAMPLE
- LL1sb-642M — SOIL ISM
- GENERAL AREA OF REMEDIATION
- INDUSTRIAL REMEDIATION AREA

NOTE:

1. SAMPLE LOCATIONS SHOWN ONLY IN REMEDIATION AREAS

0 100 200 300
SCALE: 1" = 300'

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Figure 8. Load Line 1 Industrial Remediation Areas

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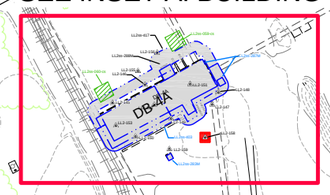
P. HOLM	7/19/18	S16-LL1-FIG8_R1

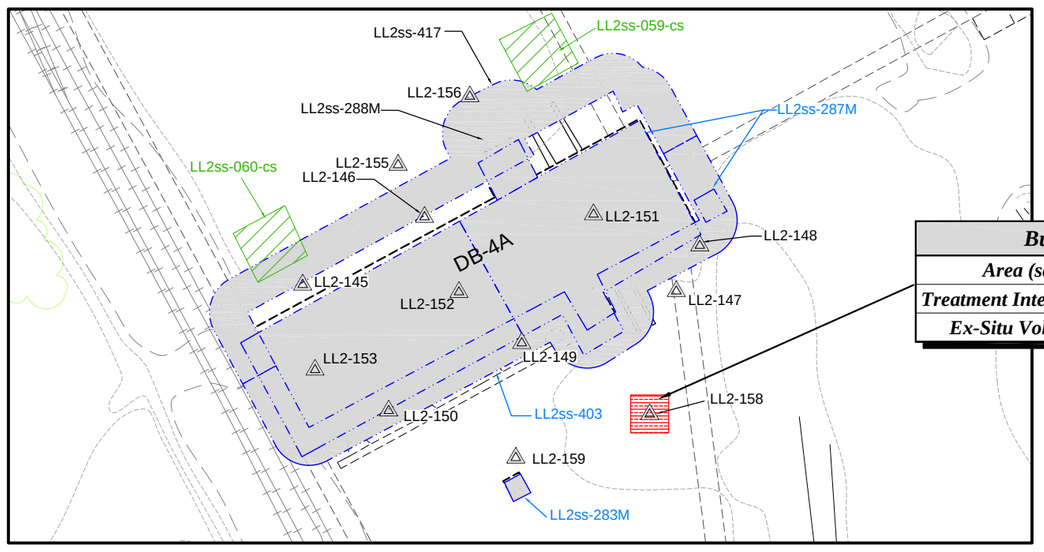
LOAD LINE 1 ROAD

LOAD LINE 2 ROAD

DB-27C
DB-27
DB-27B
DB-27A
DB-13A
DB-13B
DB-13
DB-26
DB-11
DB-8A
DB-10
DB-9
DB-4
3-51A
DB-8
DB-4A
DB-9A
DB-22
DB-3
DB-2
DB-19
DB-802
DA-7
DA-21
DA-6
DA-6A
DA-5
DB-20A
DC-1

SEE INSET A: BUILDING DB-4A





Building DB-4A	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-2
Ex-Situ Volume (cy):	46

INSET A: BUILDING DB-4A

SURFACE SOIL SCREENING RESULTS

0 25 50
SCALE: 1" = 50'

LEGEND:

- DEMOLISHED BUILDING
- WALKWAY
- FENCE LINE
- FORMER RAILROAD
- SURFACE WATER
- GROUND CONTOUR (10-FT INTERVAL)
- GROUND CONTOUR (2-FT INTERVAL)
- VEGETATION
- AOC BOUNDARY
- 2007 REMEDIATION AREAS
- LL2ss-060-cs — 2007 CONFIRMATION SAMPLE
- LL1sb-642M — SOIL ISM
- SURFACE SOIL DISCRETE SAMPLE
- GENERAL AREA OF REMEDIATION
- INDUSTRIAL REMEDIATION AREA

NOTE:

1. SAMPLE LOCATIONS SHOWN ONLY IN REMEDIATION AREAS

0 100 200 300
SCALE: 1" = 300'

OHIO STATE PLANE (NAD 83)

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Figure 9. Load Line 2 Industrial Remediation Areas

DRAWN BY:	REV. NO./DATE:	CAD FILE: C:\14015\DWGS
P. HOLM	7/19/18	S16-LL2-FIG9_R1

Building EB-10 (a)	
Area (sq. ft.):	9962
Treatment Interval (ft. bgs):	3-5
Ex-Situ Volume (cy):	1107

Building EB-10 (b)	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-2
Ex-Situ Volume (cy):	44

Building EA-7	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-1
Ex-Situ Volume (cy):	22

Building EA-6 (a)	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-1
Ex-Situ Volume (cy):	22

Building EA-6 (b)	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-1
Ex-Situ Volume (cy):	22

Building EA-6 (c)	
Area (sq. ft.):	4062
Treatment Interval (ft. bgs):	4.5 - 6
Ex-Situ Volume (cy):	339

Building EB-4	
Area (sq. ft.):	6996
Treatment Interval (ft. bgs):	1- 3
Ex-Situ Volume (cy):	777

Building EB-9A	
Area (sq. ft.):	1010
Treatment Interval (ft. bgs):	0 - 1
Ex-Situ Volume (cy):	56

Building EA-5 (LL3-056)	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	1-3
Ex-Situ Volume (cy):	44

West Perimeter	
Area (sq. ft.):	625
Treatment Interval (ft. bgs):	0 - 0.5
Ex-Situ Volume (cy):	17

Building EB-803	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-1
Ex-Situ Volume (cy):	22

LEGEND:

- DEMOLISHED BUILDING
- WALKWAY
- FENCE LINE
- FORMER RAILROAD
- SURFACE WATER
- GROUND CONTOUR (10-FT INTERVAL)
- GROUND CONTOUR (2-FT INTERVAL)
- VEGETATION
- AOC BOUNDARY
- LL3ss-027-cs ..... 2007 CONFIRMATION SAMPLE
- 2007 REMEDIATION AREAS
- 2010 REMEDIATION AREAS
- SURFACE SOIL DISCRETE SAMPLE
- SUBSURFACE SOIL DISCRETE SAMPLE
- LL3ss-027M ..... SOIL ISM
- GENERAL AREA OF REMEDIATION
- INDUSTRIAL REMEDIATION AREA

KEY MAP

NOTE:

1. SAMPLE LOCATIONS SHOWN ONLY IN REMEDIATION AREAS

OHIO STATE PLANE (NAD 83)

0 50 100 200

SCALE: 1" = 100'

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Figure 10. Load Line 3
Industrial Remediation Areas

DRAWN BY:	REV. NO./DATE:	CAD FILE: C:\14015\DWGS
P. HOLM	7/19/18	S16-LL3-FIG10_R1

Building G-16	
Area (sq. ft.):	0-1
Treatment Interval (ft. bgs):	400
Ex-Situ Volume (cy):	22

Former Water Tower	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-1
Ex-Situ Volume (cy):	22

Building G-8 (a)	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	1-7
Ex-Situ Volume (cy):	133

Building G-8 (b)	
Area (sq. ft.):	4794
Treatment Interval (ft. bgs):	3-5
Ex-Situ Volume (cy):	533

SEE INSET A

INSET A: BUILDING G-8

SUBSURFACE SOIL SCREENING RESULTS

SCALE: 1" = 80'

LEGEND:

- DEMOLISHED BUILDING
- WALKWAY
- FENCE LINE
- FORMER RAILROAD
- SURFACE WATER
- GROUND CONTOUR (10-FT INTERVAL)
- GROUND CONTOUR (2-FT INTERVAL)
- VEGETATION
- AOC BOUNDARY
- 2007 REMEDIATION AREAS
- LL4ss-111cs ..... 2007 CONFIRMATION SAMPLE
- SURFACE SOIL DISCRETE SAMPLE
- SUBSURFACE SOIL DISCRETE SAMPLE
- LL4ss-027M ..... SOIL ISM
- GENERAL AREA OF REMEDIATION
- INDUSTRIAL REMEDIATION AREA

NOTE:

1. SAMPLE LOCATIONS SHOWN ONLY IN REMEDIATION AREAS

OHIO STATE PLANE (NAD 83)

SCALE: 1" = 200'

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Figure 11. Load Line 4
Industrial Remediation Areas

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P. HOLM	7/19/18	S16-LL4-FIG11_R1

TEAM TRACK AREA EU

BUILDING 900 EU

BUILDING 903 EU

BUILDING 904 EU

BUILDING 906 EU

BUILDING FF-19 EU

BUILDING FN-54 EU

BUILDING FE-17 EU

BUILDING WW2 EU

SEE INSET A: ACTIVE AREA CHANNEL

SEE INSET B: BUILDING FF-19

T-5201

T-2501

T-4513

900

901

902

903

904

904VP1

905

906

SD-4

FA-20

FORMER SETTLING POND

EARTH BARRICADE

EARTH BARRICADE

PARIS WINDHAM ROAD

SOUTH SERVICE ROAD

ACTIVE AREA CHANNEL

FF-19

FN-54

FE17 POWERHOUSE

WH-29

WW-2A

WW2

WW-22

980

L12-146

L12-147

L12-143

L12-232

FJ-56

FJ-55

L12ss-303M

L12-060

L12-062

L12-068

L12-071

L12-086

L12-067

L12-080

L12ss-304M

L12-064

L12-059

L12ss-300M

Active Area Channel	
Area (sq. ft.):	400
Treatment Interval (ft. bgs):	0-2
Ex-Situ Volume (cy):	44

Building FF-19 (a)	
Area (sq. ft.):	625
Treatment Interval (ft. bgs):	0-1
Ex-Situ Volume (cy):	35

Building FF-19 (b)	
Area (sq. ft.):	625
Treatment Interval (ft. bgs):	0-4.5
Ex-Situ Volume (cy):	156

Building FF-19 (c)	
Area (sq. ft.):	983
Treatment Interval (ft. bgs):	0-2.5
Ex-Situ Volume (cy):	137

INSET A: ACTIVE AREA CHANNEL & BUILDING 904 EU
SURFACE SOIL SCREENING RESULTS

INSET B: BUILDING FF-19 EU
SURFACE SOIL SCREENING RESULTS

0 40 80
SCALE: 1" = 80'

LEGEND:

- FENCE LINE
- SURFACE WATER
- GROUND CONTOUR (10-FT INTERVAL)
- GROUND CONTOUR (2-FT INTERVAL)
- VEGETATION
- AOC BOUNDARY
- 2010 REMEDIATION AREA
- FACILITY-WIDE COAL STORAGE (CC-RVAAP-73)
- EXPOSURE UNIT (EU)
- SURFACE SOIL DISCRETE SAMPLE
- LLxss-027M ..... SOIL ISM
- GENERAL AREA OF REMEDIATION
- INDUSTRIAL REMEDIATION AREA

NOTE:

1. SAMPLE LOCATIONS SHOWN ONLY IN REMEDIATION AREAS

OHIO STATE PLANE (NAD 83)

0 100 200
SCALE: 1" = 200'

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Figure 12. Load Line 12 Industrial Remediation Areas

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