Final

Feasibility Study for
Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard

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

September 23, 2019

Final

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Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard

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None.

14. ABSTRACT

This Feasibility Study for Atlas Scrap Yard defines areas requiring a remedial action, identifies the remedial action objectives and appropriate cleanup goals, screens remedial technologies, develops remedial alternatives, and performs a detailed evaluation of remedial alternatives to identify recommended alternatives. The recommended alternative for lead contamination within the Former Incinerator Area is FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use. The recommended alternative for PAH contamination within the Former Storage Area is FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use.

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Ohio Environmental Protection Agency

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

October 7, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Correspondence
Remedial Response
Portage County
ID # 267000859106

Mr. David Connolly
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 2204

Subject: Approval of Final Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office, Division of Environmental Response and Revitalization has reviewed the September 27, 2019 Final Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard.

Ohio EPA approves the document.

If you have any questions, please contact me at (330) 963-1170, or by email at ed.damato@epa.ohio.gov.

Sincerely,

Edward J. D'Amato
Site Coordinator
Division of Environmental Response and Revitalization

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CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Leidos has completed the Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard 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 (USACE) policy. In addition, an independent verification was performed to ensure all applicable changes were made per regulatory and Army comments.

September 23, 2019

Jed Thomas, P.E. — Date

Study/Design Team Leader, Main Author

September 23, 2019

Selvam Arunachalam, P.E. — Date

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.

September 23, 2019

Lisa Jones-Bateman, REM, PMP — Date

Senior Program Manager

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ARNG = Army National Guard.
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ACRONYMS AND ABBREVIATIONS

amsl	Above Mean Sea Level
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
Army	U.S. Department of the Army
ARNG	Army National Guard
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CJAG	Camp James A. Garfield
COC	Chemical of Concern
CUG	Cleanup Goal
DERR	Division of Environmental Response and Revitalization
DFFO	Director's Final Findings and Orders
DoD	U.S. Department of Defense
DQO	Data Quality Objective
ERA	Ecological Risk Assessment
FIA	Former Incinerator Area
FS	Feasibility Study
FSA	Former Storage Area
FWCUG	Facility-wide Cleanup Goal
GRA	General Response Action
HASP	Health and Safety Plan
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
ISM	Incremental Sampling Methodology
LDR	Land Disposal Restriction
LUC	Land Use Control
MRS	Munitions Response Site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operations and Maintenance
OAC	Ohio Administrative Code
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbon
PBA08	Performance-Based Acquisition 2008
PCB	Polychlorinated Biphenyl
PMP	Property Management Plan
PP	Proposed Plan
PPE	Personal Protective Equipment
RA	Remedial Action

ACRONYMS AND ABBREVIATIONS (continued)

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SVOC	Semi-Volatile Organic Compound
TCLP	Toxicity Characteristic Leaching Procedure
TR	Target Risk
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USP&FO	U.S. Property and Fiscal Officer
UTS	Universal Treatment Standards
VOC	Volatile Organic Compound
VEG©	Vapor Energy Generator

1.0 INTRODUCTION

This document has been prepared by Leidos under U.S. Army Corps of Engineers (USACE) Louisville District Contract Number W912QR-15-C-0046. This Feasibility Study (FS) addresses surface soil contamination identified at Atlas Scrap Yard within the former Ravenna Army Ammunition Plant (RVAAP) (now known as Camp James A. Garfield [CJAG] Joint Military Training Center) in Portage and Trumbull counties, Ohio (Figures 1-1 and 1-2). Atlas Scrap Yard is designated as area of concern (AOC) RVAAP-50.

This report has been prepared in accordance with the requirements of the Ohio Environmental Protection Agency (Ohio EPA) *Director's Final Findings and Orders* (DFFO) for RVAAP, dated June 10, 2004 (Ohio EPA 2004). This FS includes the following components:

- A summary of the operational history of the former RVAAP and Atlas Scrap Yard;
- A description of the environmental setting at CJAG and Atlas Scrap Yard;
- A summary of the conclusions for the Remedial Investigation (RI) and an assessment of the extent of contamination requiring a remedial action (RA) within the site;
- Identification of remedial action objectives (RAOs), cleanup goals (CUGs), and volume estimates for contaminated media;
- Identification of applicable or relevant and appropriate requirements (ARARs);
- Identification of general response actions (GRAs) and screening of a range of remedial technologies to reduce risk to human health and the environment from chemicals of concern (COCs) identified in the RI Report;
- Development of remedial alternatives and evaluation of alternatives against criteria specified by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); and
- Conclusions of the FS with a recommended alternative for each area containing COCs requiring an RA.

The recommended alternative will be submitted for public review and comment in a Proposed Plan (PP). Public comments will be considered in the final selection of a remedy, which will be documented in a Record of Decision (ROD).

1.1 PURPOSE

The purpose of this FS is to define areas requiring an RA, identify the RAOs and appropriate CUGs, screen remedial technologies, develop remedial alternatives to meet the RAOs and attain CUGs, and perform a detailed evaluation of remedial alternatives to identify recommended alternatives.

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) (herein referred to as the Technical Memorandum) 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 (U.S. Environmental Protection Agency [USEPA] Composite Worker).

If a site meets the standards for Unrestricted (Residential) Land Use, it can be used for all categories of Land Use at CJAG. Therefore, if an AOC meets the requirements for Unrestricted (Residential) Land Use, then the AOC is also considered to have met the requirements of the other Land Uses (i.e., Commercial/Industrial and Military Training), and the other Land Uses do not require evaluation.

The *Remedial Investigation Report for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard* (USACE 2017, herein referred to as the Atlas Scrap Yard RI Report) concluded that:

1. No further action was required for soil or sediment to protect groundwater;
2. No further action was required for soil or sediment to protect ecological resources or places; and
3. No subsurface soil, sediment, or surface water COCs were identified as requiring an RA to be protective of the Resident Receptor, Industrial Receptor, or National Guard Trainee.

However, the Atlas Scrap Yard RI Report identified human health COCs in surface soil requiring an RA for all three human receptors. The area currently designated as the Former Incinerator Area (FIA) had lead contamination in surface soil (0-1 ft below ground surface [bgs]) requiring remediation. In addition, the Atlas Scrap Yard RI Report identified polycyclic aromatic hydrocarbon (PAH) COCs requiring an RA, and this report will define the area of PAH COC contamination requiring an RA.

1.2 SCOPE

The scope of this FS is to screen technologies, develop remedial alternatives, and compare remedial alternatives for any COCs requiring an RA in soil, sediment, or surface water within Atlas Scrap Yard. The Atlas Scrap Yard RI Report did not identify COCs requiring an RA for subsurface soil, sediment, or surface water. However, surface soil (0-1 ft bgs) COCs requiring an RA were identified. This FS will identify and recommend remedial alternatives to address these COCs.

1.3 REPORT ORGANIZATION

This report is organized in accordance with Ohio EPA and USEPA CERCLA RI/FS guidance and applicable USACE guidance. The components of the report and a list of appendices are summarized below and include:

- Section 2.0 provides a description and history of the former RVAAP and Atlas Scrap Yard.
- Section 3.0 describes the environmental setting at CJAG and Atlas Scrap Yard.
- Section 4.0 presents and re-evaluates the COCs recommended for an RA in the Atlas Scrap Yard RI Report.
- Section 5.0 defines the RAOs for the chemicals and media of concern, presents the cleanup goals, and provides a volume estimate of surface soil requiring an RA.
- Section 6.0 summarizes potential federal and state chemical-, location-, and action-specific ARARs for potential RAs.
- Section 7.0 presents GRAs and the identification and screening of technology types and process options considered for possible use in an RA.
- Section 8.0 develops remedial alternatives for the lead-contaminated surface soil and provides detailed and comparative analyses of viable remedial alternatives.
- Section 9.0 develops remedial alternatives for the PAH-contaminated surface soil and provides detailed and comparative analyses of viable remedial alternatives.
- Section 10.0 presents the conclusions of the FS and the recommended remedial alternative.
- Section 11.0 summarizes the framework for conducting the necessary agency and public involvement activities.
- Section 12.0 provides a list of references used to develop this report.
- Appendices:
    - Appendix A. PAH COC Surface Soil (0-1 ft bgs) Concentrations and Screening.
    - Appendix B. Detailed Cost Estimates.
    - Appendix C. Ohio EPA Comments.

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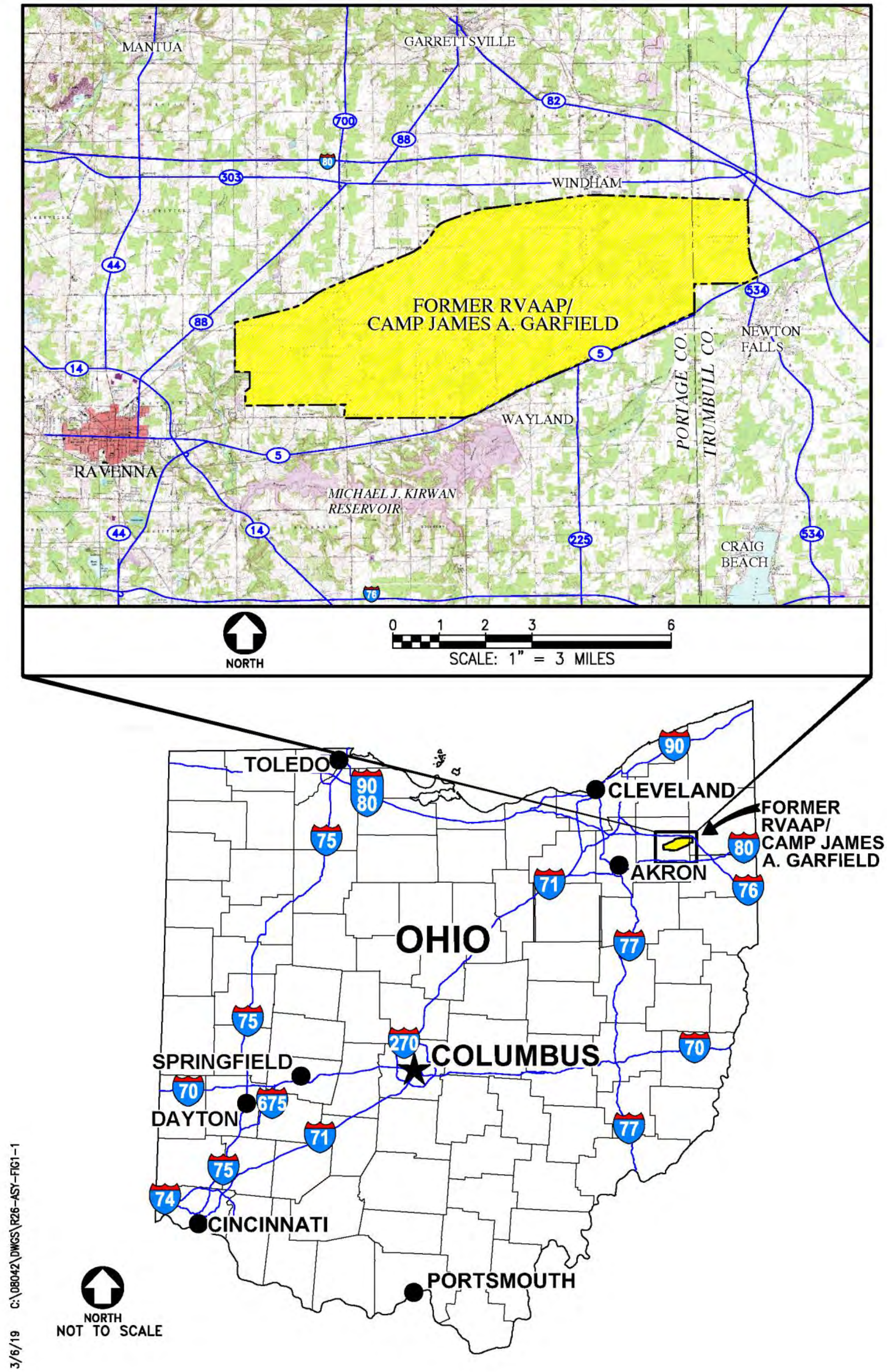

Figure 1-1. General Location and Orientation of Camp James A. Garfield

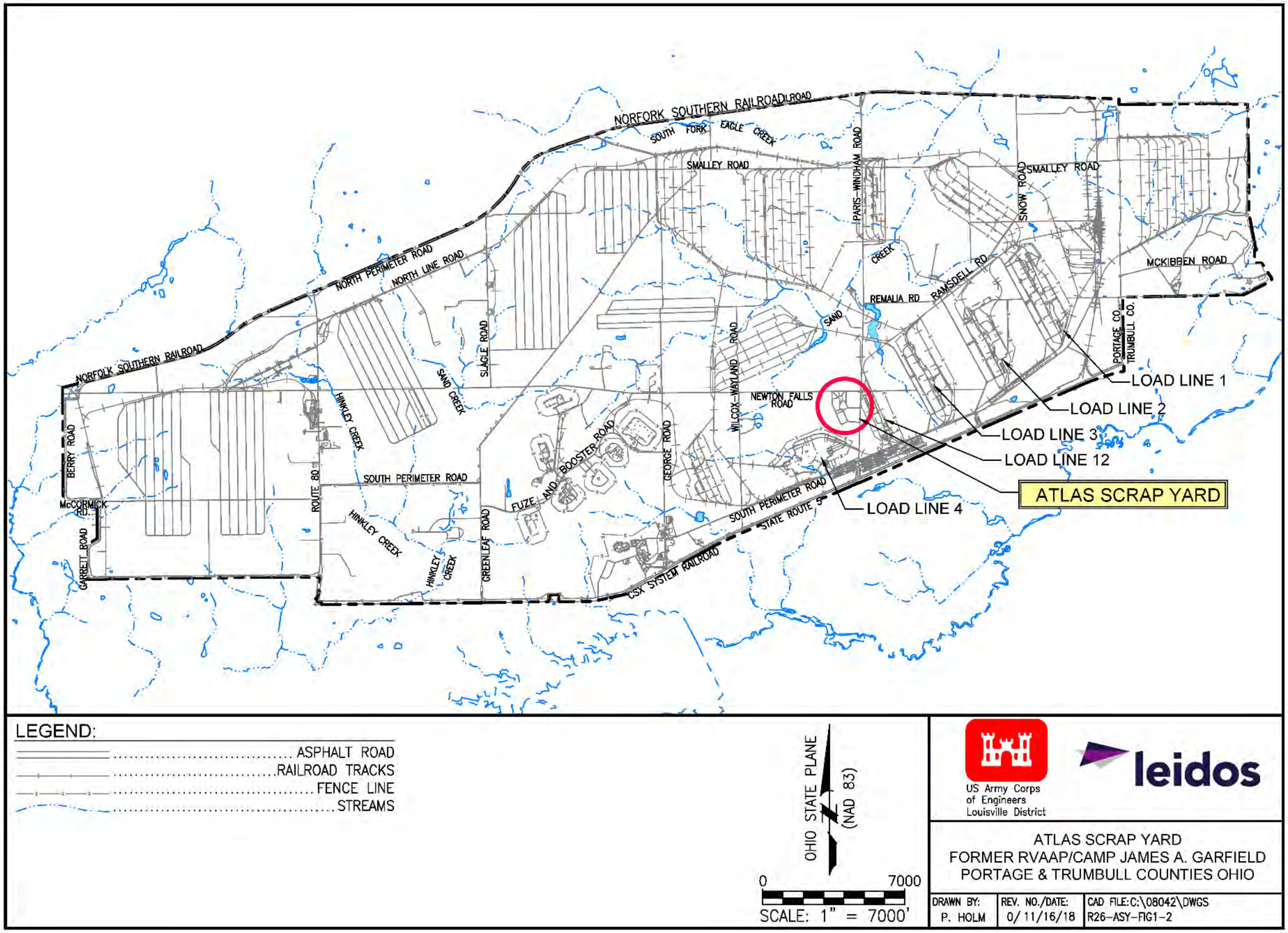

Figure 1-2. Location of Atlas Scrap Yard within Camp James A. Garfield

2.0 BACKGROUND

This section provides the background information of the facility and Atlas Scrap Yard.

2.1 FACILITY-WIDE BACKGROUND INFORMATION

2.1.1 General Facility Description

The former RVAAP, now known as 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 (Figure 1-1). 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).

2.1.2 Demography and Land Use

CJAG occupies east-central Portage County and southwestern Trumbull County. Census projections for 2010 indicated the populations of Portage and Trumbull counties are 161,419 and 210,312, respectively. Population centers closest to CJAG are Ravenna, with a population of 11,724, and Newton Falls, with a population of 4,795.

The facility is located in a rural area and is not close to any major industrial or developed areas. Approximately 55% of Portage County, in which the majority of CJAG is located, consists of either woodland or farmland acreage. The closest major recreational area, the Michael J. Kirwan Reservoir (also known as West Branch Reservoir), is located adjacent to the western half of CJAG, south of State Route 5.

CJAG is federally owned and is licensed to OHARNG for use as a military training site. Restoration activities at CJAG are managed by the Army National Guard (ARNG) and OHARNG. Training and related activities at CJAG include field operations and bivouac training, convoy training, maintaining equipment, C-130 aircraft drop zone operations, helicopter operations, and storing heavy equipment.

2.2 ATLAS SCRAP YARD BACKGROUND INFORMATION

Atlas Scrap Yard, formally known as the construction camp, is approximately 73 acres and is located in the southeastern portion of CJAG (Figure 1-2). There is no fence around Atlas Scrap Yard as a perimeter boundary; however, the site boundary is marked by Seibert stakes. Atlas Scrap Yard is bordered by Newton Falls Road to the north and Paris-Windham Road to the east (Figure 2-1). Load Line 4 is to the south of Atlas Scrap Yard. The interior of Atlas Scrap Yard is currently vegetated with shrub/scrub vegetation in unpaved areas and is forested around its perimeter.

Atlas Scrap Yard has served several operational functions over the history of the former RVAAP, but the site was never used for munitions production activities. From 1940–1945, Atlas Scrap Yard operated as a construction camp to house workers and their families during construction of the facility. By the end of World War II, the majority of buildings and structures at Atlas Scrap Yard were demolished or relocated to other areas of the facility.

Following World War II through the 1950s, four additional storage structures were constructed in the north central storage and stockpiling area. These new structures, along with the pre-World War II structures that remained, were used to support roads and grounds maintenance activities. After the Vietnam War, the north-central portion of Atlas Scrap Yard was utilized as a stockpile storage area for bulk material, including gravel, railroad ballasts, sand, culvert pipe, railroad ties, and telephone poles.

Two specific areas of interest are focused on in this FS: the FIA and the Former Storage Area (FSA). The following sections present a description of these areas, and these areas are depicted in Figure 2-1.

2.2.1 Former Incinerator Area

The southern portion of Atlas Scrap Yard currently contains a structure of a formerly used incinerator. The former incinerator consists of a 12 ft long by 8 ft wide primary chamber that is empty. Attached to the primary chamber is a 3 ft long by 4 ft wide by 14 ft high chimney. Photographs 2-1 through 2-3 depict the former incinerator, and Figure 2-2 presents a historical design drawing of the incinerator with current photographs. The outside structure associated with the former incinerator is still present, but other components associated with the incinerator have been razed.

As discussed later in this report, the surface soil (0-1 ft bgs) in the area of the former incinerator was determined to have lead contamination requiring an RA. The area containing this contaminated surface soil is designated as the FIA.

2.2.2 Former Storage Area

The northcentral portion of Atlas Scrap Yard is designated as the FSA. After the Vietnam War, this area was utilized as a stockpile storage area for bulk material, including gravel, railroad ballasts, sand, culvert pipe, railroad ties, and telephone poles. Sometime between 2000 and 2002, railroad ties and timbers were placed in the FSA.

Photograph 2-1. Front View of Former Incinerator

Photograph 2-2. Side View of Former Incinerator

Photograph 2-3. Inside Primary Chamber of Former Incinerator

A crushed slag parking area is located in the north-central portion of Atlas Scrap Yard. The source of slag at Atlas Scrap Yard is not known. However, records indicate that an inestimable amount of aggregate could have come from the plant that processed furnace slag in Youngstown, Ohio (Pfingsten 2009). Coal, used for building process heat, was piled in several areas of Atlas Scrap Yard, including the north central stockpiling area (USACE 2011). The central-east portion of Atlas Scrap Yard was a staging area for salvaged ammunition boxes from demilitarized Vietnam War munitions.

In early 2017, activities were conducted to remove the railroad ties and timbers, as well as stockpiled concrete and asphalt. These activities included sampling the waste material and subsequent determination that the waste streams are considered non-hazardous. Approximately 1,160 tons of stockpiled rail ties and telephone poles were loaded into semitractor dump trailers and hauled for disposal at American Waste Management in Warren, Ohio. In addition, approximately 1,655 tons of stockpiled concrete and asphalt were live loaded into semitractor dump trailers for recycling at Acme Company in North Jackson, Ohio (ERT 2017).

After debris removal, the contractor compacted and graded disturbed areas with existing, on-site material to promote positive drainage and eliminate potential pooling of water. Due to the site conditions underlying the stockpiled rail ties, a series of low areas (each approximately 20 ft by 20 ft by 2 ft) were not graded for proper storm water drainage. Since the site required a future assessment for an RA (as per the scope of this FS), additional fill material was not brought to the site to support positive drainage.

As discussed later in this report, the surface soil (0-1 ft bgs) in the FSA was determined to have PAH contamination requiring an RA.

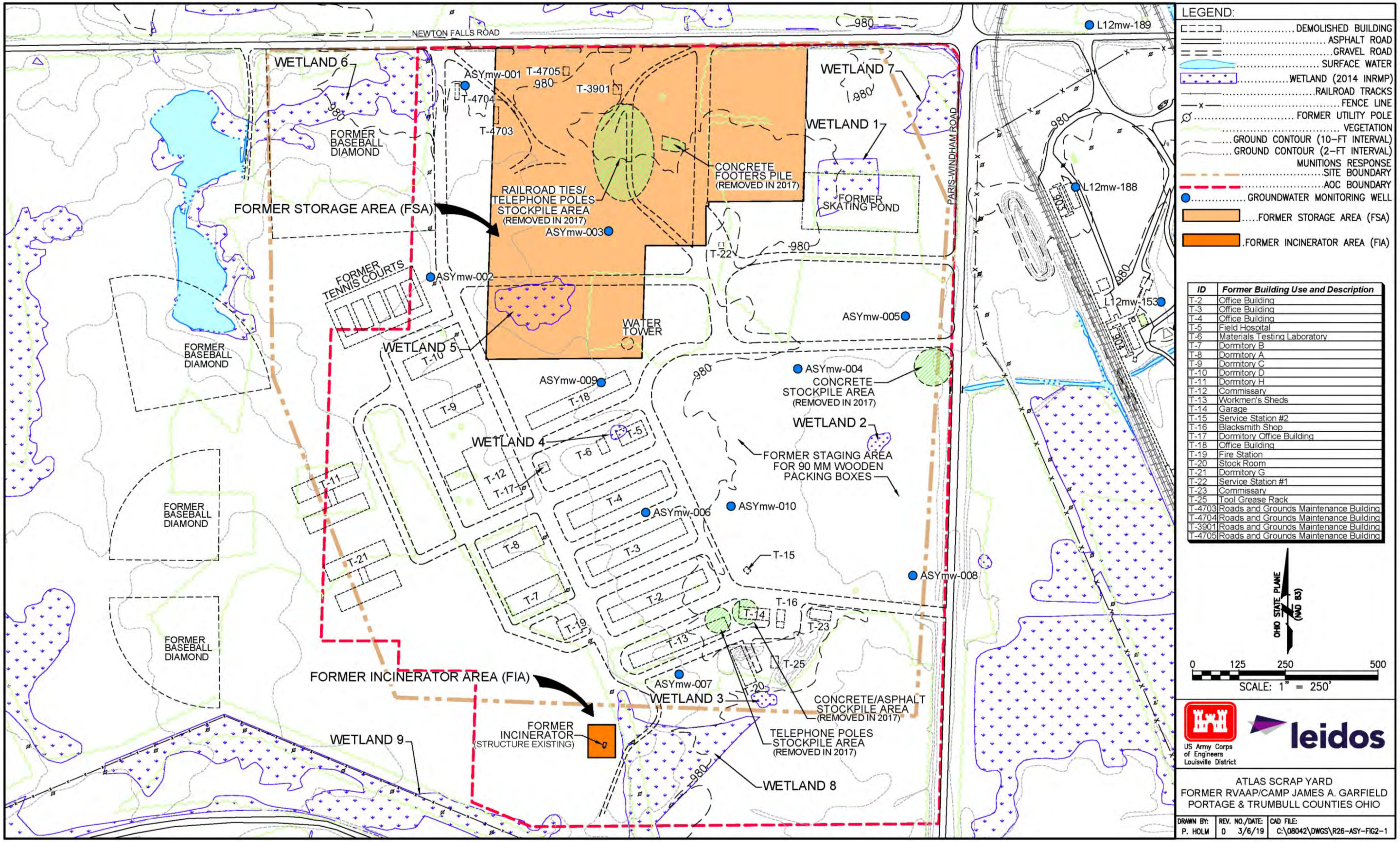

Figure 2-1. Atlas Scrap Yard Site Features

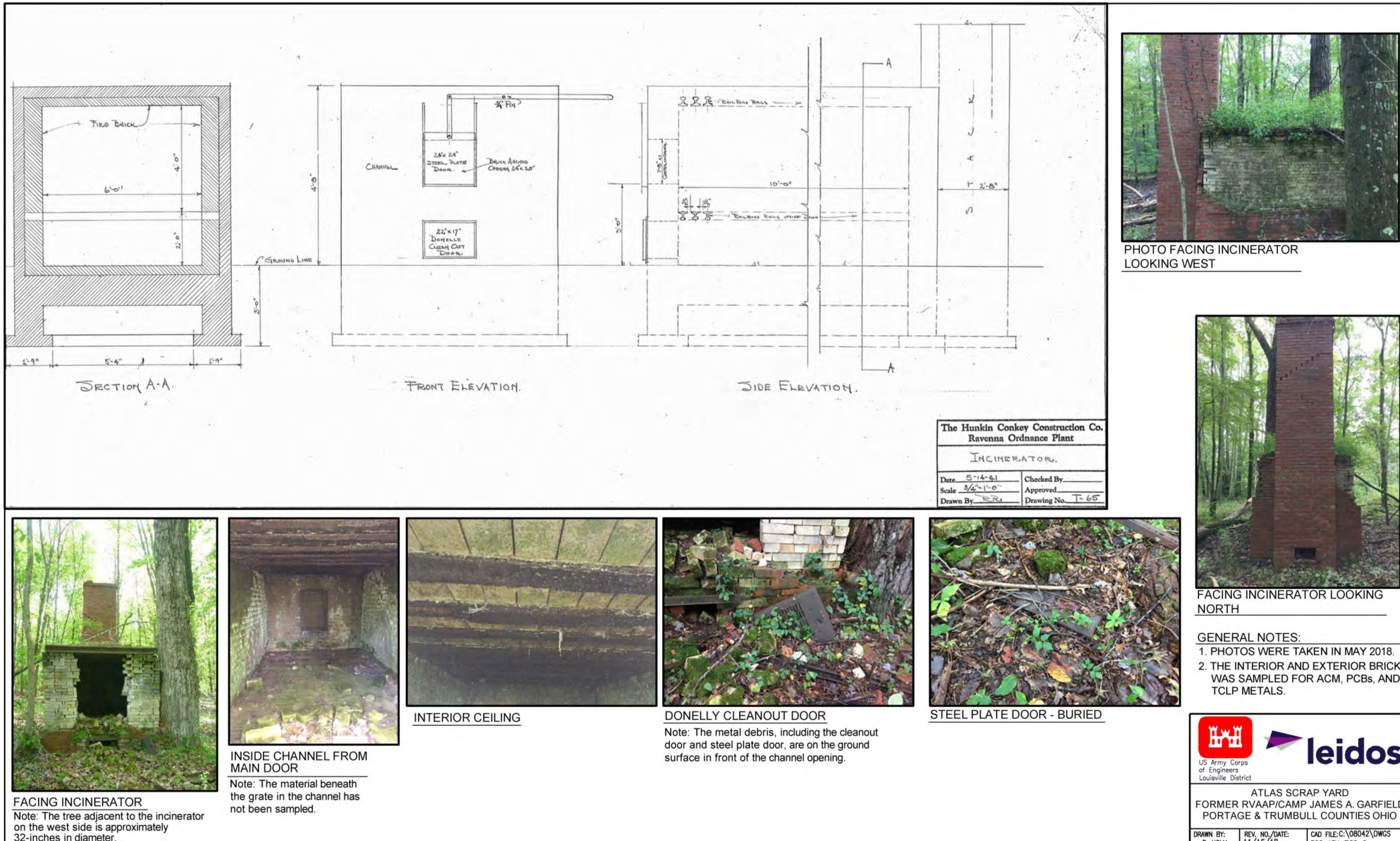

Figure 2-2. Incinerator Design Drawing

3.0 ENVIRONMENTAL SETTING

This section describes the facility and site physical features pertinent to addressing surface soil (0-1 ft bgs) contamination within Atlas Scrap Yard.

3.1 CAMP JAMES A. GARFIELD PHYSIOGRAPHIC SETTING

CJAG is located within the southern New York section of the Appalachian Plateaus physiographic province (USGS 1968). This province is characterized by elevated uplands underlain primarily by Mississippian-age and Pennsylvanian-age bedrock units that are horizontal or gently dipping. The province is also characterized by its rolling topography with incised streams having dendritic drainage patterns. The southern New York section has been modified by glaciation, which rounded ridges, filled major valleys, and blanketed many areas with glacially derived unconsolidated deposits (e.g., sand, gravel, and finer-grained outwash deposits). As a result of glacial activity in this section, old stream drainage patterns were disrupted in many locales, and extensive wetland areas developed.

3.2 ATLAS SCRAP YARD SURFACE FEATURES AND TOPOGRAPHY

Atlas Scrap Yard is a 73-acre AOC located southwest of the intersection of Newton Falls Road and Paris-Windham Road, north of Load Line 4, in the southeastern portion of CJAG. All buildings and structures have been demolished, with the exception of the brick structure associated with the former incinerator and the slab for former Building T-3901. In early 2017, approximately 1,160 tons of stockpiled rail ties and telephone poles and 1,655 tons of stockpiled concrete and asphalt were removed from Atlas Scrap Yard.

Remaining features at Atlas Scrap Yard include several one-lane gravel/slag access roads that enter Atlas Scrap Yard from the north and east, a crushed slag parking area is located in the north-central portion of Atlas Scrap Yard, and small construction drainage ditches that border the access roads.

Topographic relief at Atlas Scrap Yard is low, with a topographic high in the northwestern portion of the site that slopes downward to the topographic low in the central-eastern boundary. There was no available documentation of fill or soil brought onto Atlas Scrap Yard during building demolition. Ground elevations within Atlas Scrap Yard range from approximately 976–986 ft above mean sea level (amsl). Surface water follows topographic relief and drains into roadside ditches along the eastern portion of Atlas Scrap Yard (Figure 3-1).

3.3 SOIL AND GEOLOGY

3.3.1 Regional Geology

The regional geology at CJAG consists of horizontal to gently dipping bedrock strata of Mississippian and Pennsylvanian age overlain by varying thicknesses of unconsolidated glacial deposits. The bedrock and unconsolidated geology at CJAG and the geology specific to Atlas Scrap Yard are presented in the following subsections.

3.3.2 Soil and Glacial Deposits

Bedrock at CJAG is overlain by deposits of the Wisconsin-aged Lavery Till in the western portion of the facility and the younger Hiram Till and associated outwash deposits in the eastern two-thirds of the facility (Figure 3-2). Unconsolidated glacial deposits vary considerably in their character and thickness across CJAG, from zero in some of the eastern portions of the facility to an estimated 150 ft in the south-central portion.

Thin coverings of glacial material have been completely removed as a consequence of human activities at locations such as Ramsdell Quarry. Bedrock is present at or near the ground surface in locations such as at Load Line 1 and the Erie Burning Grounds (USACE 2001). Where this glacial material is still present, the distribution and character indicate their origin as ground moraine. These tills consist of laterally discontinuous assemblages of yellow-brown, brown, and gray silty clays to clayey silts, with sand and rock fragments. Lacustrine sediment from bodies of glacial-age standing water also has been encountered in the form of deposits of uniform light gray silt greater than 50-ft thick in some areas (USACE 2001).

Soil at CJAG is generally derived from the Wisconsin-age silty clay glacial till. Distributions of soil types are discussed and mapped in the *Soil Survey of Portage County, Ohio* (USDA 1978), which describes soil as nearly level to gently sloping and poor to moderately well drained. Much of the native soil at CJAG was disturbed during construction activities in former production and operational areas of the facility.

The Sharon Member of the Pennsylvanian Pottsville Formation is the primary bedrock beneath CJAG. In the western half of the facility, the upper members of the Pottsville Formation, including the Connoquenessing Sandstone (also known as the Massillon Sandstone), Mercer Shale, and uppermost Homewood Sandstone, have been found. The regional dip of the Pottsville Formation measured in the west portion of CJAG is from 5–11.5 ft per mile to the south.

3.3.3 Geologic Setting of Atlas Scrap Yard

The bedrock formation underlying the unconsolidated deposits at Atlas Scrap Yard, as inferred from existing geologic data, is the Pennsylvanian age Pottsville Formation, Sharon Sandstone Member (Figure 3-3). When encountered, bedrock was observed at Atlas Scrap Yard at 20–29 ft bgs during monitoring well installation activities as part of the 2004 Characterization of 14 AOCs (MKM 2007). The sandstone unit of the Sharon Member (informally referred to as the Sharon Conglomerate) is a highly porous, loosely cemented, permeable, cross-bedded, frequently fractured and weathered orthoquartzite sandstone, which is locally conglomeritic. The Sharon Conglomerate exhibits locally occurring thin shale lenses in the upper portion of the unit. Upper members of the Pottsville Formation are not present at Atlas Scrap Yard. Bedrock was not encountered in any of the 21 soil or geotechnical borings installed to a maximum depth of 13 ft bgs during the 2010 Performance-Based Acquisition 2008 (PBA08) RI (USACE 2017).

Atlas Scrap Yard is located within Hiram Till glacial deposits. The two soil types observed at Atlas Scrap Yard are the Mahoning silt loam (2–6% slopes) and the Trumbull silt loam (0–2% slopes). 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. The Mahoning silt loam has low permeability, with rapid runoff and seasonal wetness, and is present primarily in the central 60% of the site (USDA 2010). The Trumbull silt loam covers the remaining 40% of the AOC and is poorly drained soil formed in silty clay till, generally where bedrock is greater than 6 ft bgs. The Trumbull silt loam is typically formed in depressions with a moderate water capacity with groundwater existing near ground surface (USDA 2010).

As observed in PBA08 RI soil borings, the composition of unconsolidated deposits at Atlas Scrap Yard generally consist of yellowish-brown to gray, medium dense, silty clay tills with trace gravel, with sand content generally increasing with depth. Groundwater, when encountered, ranged from 8.45–13 ft bgs within a fine- to medium-grained sand in the PBA08 RI soil borings.

Geotechnical analyses conducted during the Characterization of 14 AOCs classify samples collected from ASYmw-001 at 4–6 ft bgs, ASYmw-003 at 6–8 ft bgs, and ASYmw-007 at 8–10 ft bgs as brown, lean clay with sand and trace gravel (MKM 2007).

3.4 ATLAS SCRAP YARD SURFACE WATER

Surface water drainage generally follows the topography of Atlas Scrap Yard and occurs as intermittent storm water runoff flowing into natural and constructed drainage ditches or conveyances along Newton Falls Road on the north side of Atlas Scrap Yard and along Paris-Windham Road on the eastern side of the production area (Figure 3-1). Surface water flowing in ditches or other drainage features is the primary migration pathway for contamination to leave Atlas Scrap Yard. Surface water exits from the eastern portion of Atlas Scrap Yard to Load Line 12. Once in Load Line 12, surface drainage flows north, eventually draining to Cobbs Ponds approximately 1,500 ft northeast of Atlas Scrap Yard.

During the PBA08 RI in 2010, stagnant surface water was observed in the drainage ditch parallel to Paris-Windham Road. The intermittent storm water runoff could not drain from this conveyance due to beaver dams obstructing flow downstream.

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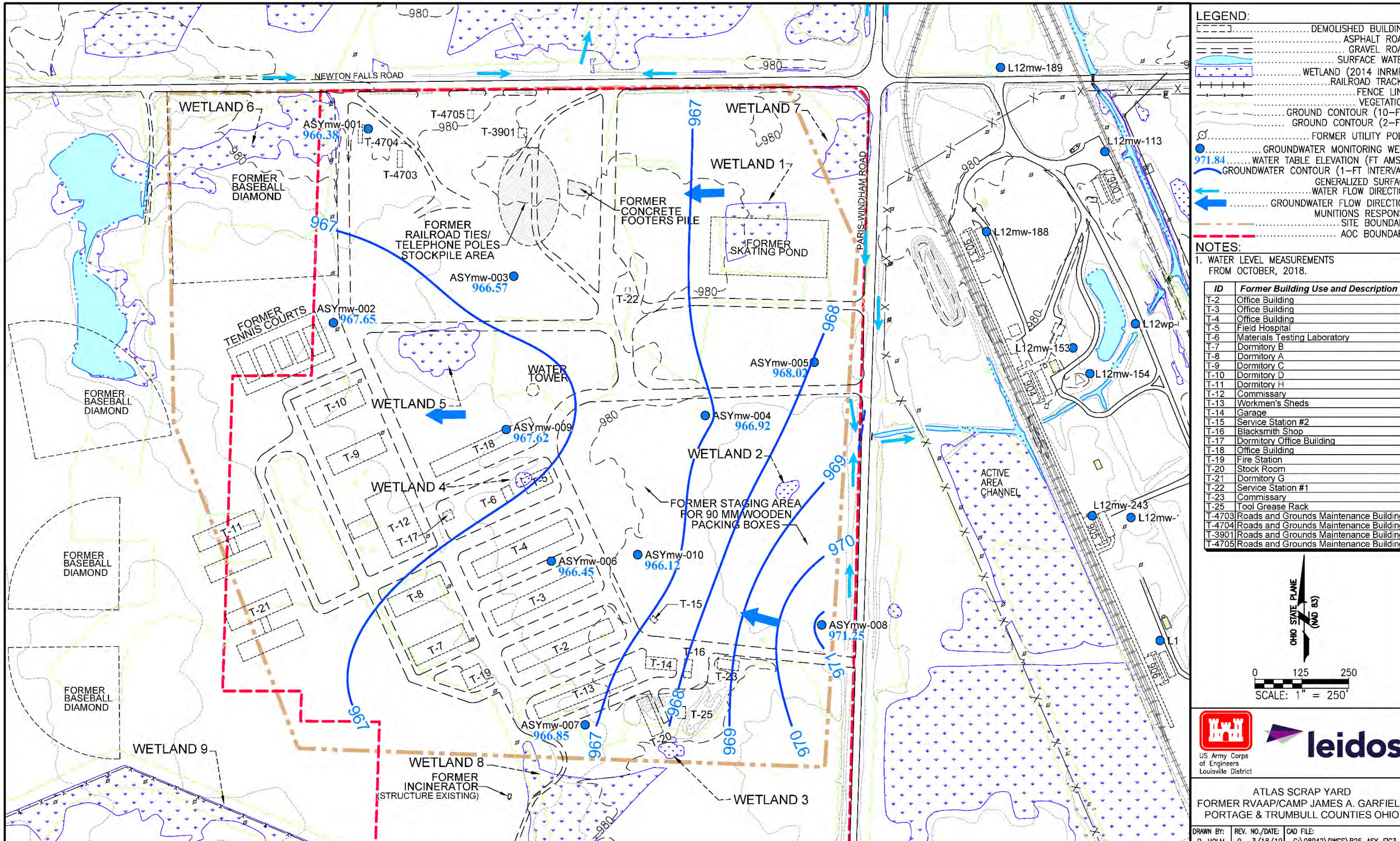

Figure 3-1. Topography, Groundwater Flow, and Surface Water Flow at Atlas Scrap Yard

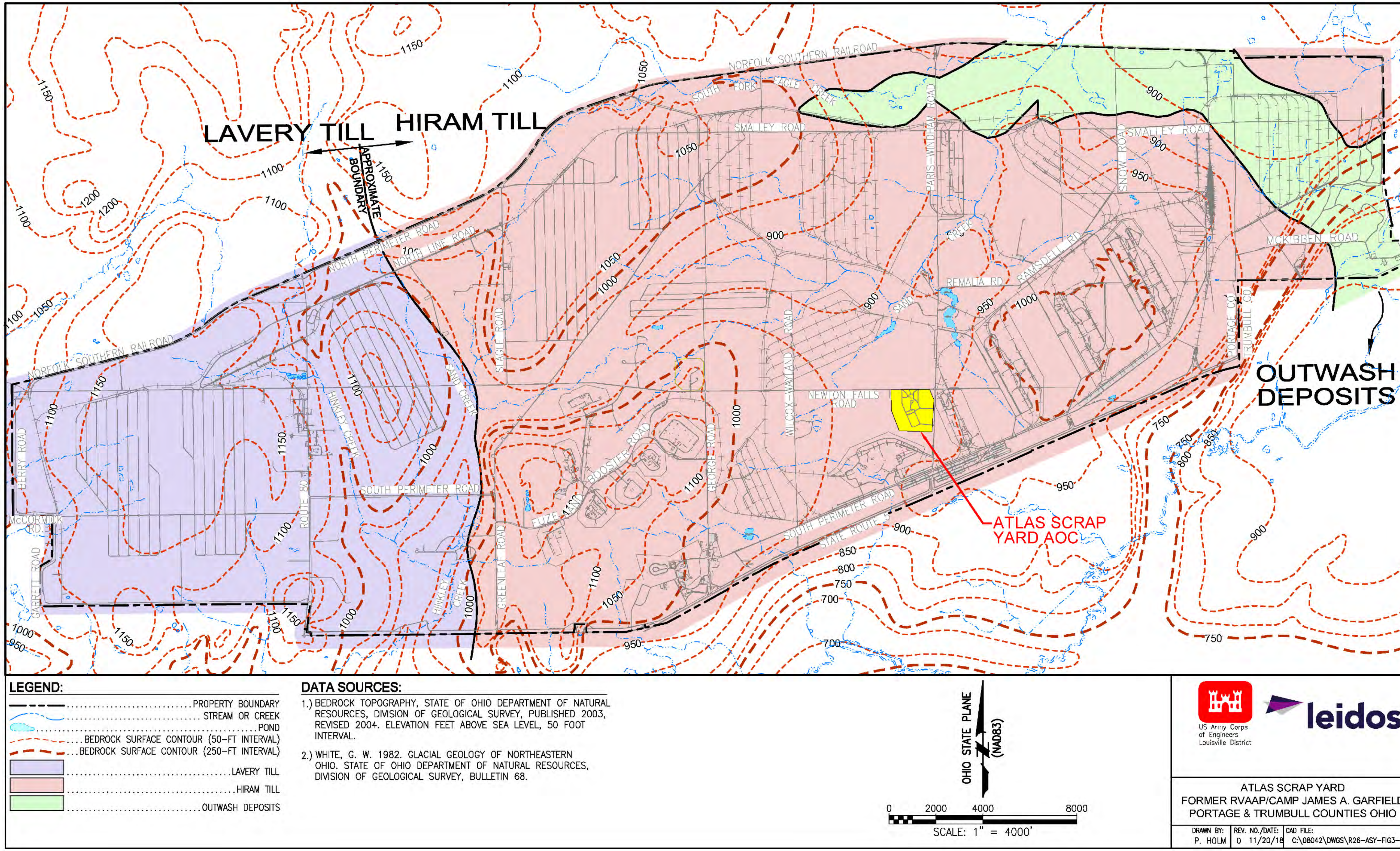

Figure 3-2. Geologic Map of Unconsolidated Deposits on Camp James A. Garfield

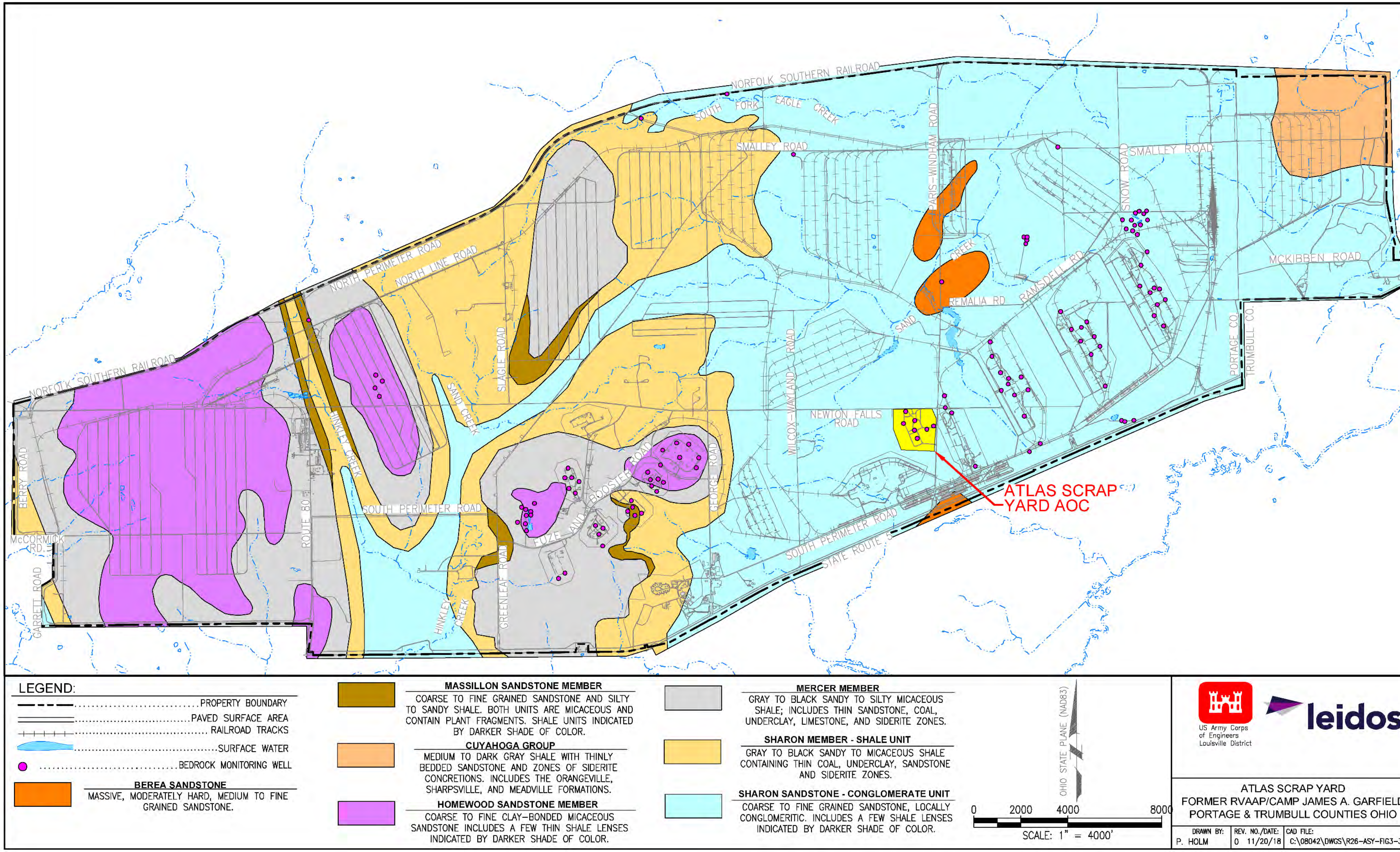

Figure 3-3. Geologic Bedrock Map and Stratigraphic Description of Units on Camp James A. Garfield

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4.0 NATURE AND EXTENT OF CONTAMINATION

Atlas Scrap Yard has been part of numerous investigations to adequately characterize the site, including the 2004 Characterization of 14 AOCs, 2010 PBA08 RI, and 2011 Supplemental Sampling. These investigations are summarized in the Atlas Scrap Yard RI Report.

The Atlas Scrap Yard RI Report concluded that enough samples were collected to adequately characterize the site to complete the RI and proceed to an FS. The Atlas Scrap Yard RI Report presented the nature and extent of contamination, assessed potential contaminants that may pose a future threat to groundwater, and conducted a human health risk assessment (HHRA) and ecological risk assessment (ERA).

The Atlas Scrap Yard RI Report provided the following conclusions:

1. No further action was required for soil or sediment to protect groundwater;
2. No further action was required for soil or sediment to protect ecological resources or places;
3. No subsurface soil, sediment, or surface water COCs were identified as requiring an RA to be protective of the Resident Receptor, Industrial Receptor, or National Guard Trainee.
4. The FIA had concentrations of lead in surface soil (0-1 ft bgs) requiring evaluation in an FS.
5. Atlas Scrap Yard had concentrations of the PAHs benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene in surface soil (0-1 ft bgs) requiring evaluation in an FS.

The following subsections provide details and updates regarding the identified locations and COCs requiring an RA.

4.1 LEAD AT THE FORMER INCINERATOR AREA

The Atlas Scrap Yard RI Report identified lead in surface soil (0-1 ft bgs) as a COC requiring an RA in one general area located in the proximity of the former incinerator located at the site. The surface soil concentrations for lead were 1,200 mg/kg at ASYss-019M and 3,570J mg/kg at ASYsb-064. These concentrations exceed the Resident Receptor facility-wide cleanup goal (FWCUG) (400 mg/kg), Industrial Receptor regional screening level (RSL) (800 mg/kg), and National Guard Trainee FWCUG (800 mg/kg).

Results and the estimated extent of contamination are shown in Figure 4-1. This contaminated area is currently designated as the FIA. No other locations at Atlas Scrap Yard require remediation for lead.

4.2 POLYCYCLIC AROMATIC HYDROCARBONS

The Atlas Scrap Yard RI Report identified PAHs in surface soil (0-1ft bgs) as requiring an RA at Atlas Scrap Yard. The executive summary within the Atlas Scrap Yard RI Report divided Atlas Scrap Yard into Area 1, Area 2, and Area 3 based on PAH COC concentrations relative to screening levels (Resident Receptor FWCUGs) available at that time.

Since the submittal of the Atlas Scrap Yard RI Report, USEPA updated the cancer slope factors for the carcinogenic PAHs using more recent toxicity studies. These updated values are utilized in the June 2017 USEPA RSLs. The Resident Receptor FWCUGs and the USEPA Resident Soil RSLs at a target risk (TR) of 1E-05 for the PAH COCs, updated in June 2017, are presented in Table 4-1.

The following subsections present historical investigations conducted to assess PAHs at Atlas Scrap Yard and reassesses results based on the updated USEPA RSLs. To support this assessment, Figure 4-2 highlights surface soil locations areas sampled during the Characterization of 14 AOCs and 2010 PBA08 RI that had PAH COC exceedances of the 2017 USEPA Resident Soil RSL at TR of 1E-05. Figure 4-3 presents the surface soil sampling scheme implemented during the 2011 Supplemental Sampling. This figure also shows some of the features, such as the railroad ties and concrete footers, that were staged within this area. As discussed in Section 2.2.2, these features were removed in 2017. Figure 4-4 highlights the surface soil locations sampled during the 2011 Supplemental Sampling that had PAH COC exceedances of the 2017 USEPA Resident Soil RSL at TR of 1E-05.

4.2.1 2004 Characterization of 14 AOCs

The 2004 Characterization of 14 AOCs data quality objectives (DQOs) were to collect and provide sufficient, high-quality data for all applicable media such that future actions (i.e., HHRAs and ERAs) can be efficiently planned and accomplished at each AOC. Data generated by the characterization activities were to be used to determine if residual contaminants remain at the AOCs; if contaminants impact soil, sediment, surface water, or groundwater; if a need for more extensive risk assessments exists; and if RAs are appropriate. Results of this characterization are presented in the *Characterization of 14 AOCs at the Ravenna Army Ammunition Plant* (MKM 2007).

Four incremental sampling methodology (ISM) sample locations were analyzed for PAHs during the Characterization of 14 AOCs. These sample locations are presented in Table 4-2. The one location (ASYss-004) that had an exceedance of the 2017 USEPA Resident Soil RSL at TR of 1E-05 is highlighted in Figure 4-2.

4.2.2 2010 PBA Remedial Investigation

The PBA08 RI was implemented by collecting discrete surface soil and subsurface soil samples and ISM surface soil samples. The results of the PBA08 RI sampling, combined with the results of the Characterization of 14 AOCs, were used to evaluate the nature and extent of contamination, assess potential future impacts to groundwater, conduct HHRAs and ERAs, and evaluate the need for remedial alternatives.

As part of the 2010 PBA08 RI, a source area investigation was conducted to assess contaminant occurrence and distribution in surface soil. The PBA08 RI samples were designed to delineate extent of areas previously identified as having the greatest likelihood of contamination (e.g., adjacent to buildings or within sediment accumulation areas such as ditches). Nineteen ISM samples were collected around former ISM sample areas to delineate locations where chemicals were detected above FWCUGs (hazard quotient [HQ] of 1, TR of 1E-05) and to further define the lateral extent of contamination. These sample locations are presented in Table 4-3.

In addition, 18 large grid ISM samples (samples ASYss-086M through ASYss-103M) were collected to complete characterization of Atlas Scrap Yard. Grid ISM sample locations ranged from 3.1–4.2 acres in extent, encompassing the entirety of Atlas Scrap Yard. The individual large grid ISM samples included all areas within the grid boundary, including other sample locations that may overlap with the large ISM samples. These grid samples were collected to provide characterization of the entire AOC. These sample locations are presented in Table 4-4.

The 2010 PBA08 RI sample locations that had an exceedance of the 2017 USEPA Resident Soil RSL at TR of 1E-05 are highlighted in Figure 4-2.

4.2.3 2011 Supplemental Sampling

In April 2011, a Supplemental Sampling event was conducted to refine PAH COC contamination within the FSA. Three features were targeted during the 2011 Supplemental Sampling:

1. The debris piles, including railroad tie, concrete debris, and other rubble piles.
2. The parking areas made up of slag and asphalt gravel west of the railroad tie pile.
3. The ditch alongside the access road entering Atlas Scrap Yard from Newton Falls Road.

The debris piles (railroad ties, concrete debris, and other rubble piles) were considered for additional evaluation to determine if they were the sources of contamination observed in the 2010 large grid samples ASYss-089M and ASYss-088M. The objective of the 2011 Supplemental Sampling was to collect ISM samples at varying distances to the piles to better define the horizontal extent of contamination. ISM samples from areas 5 and 10 ft wide were collected immediately adjacent to and around the piles.

The parking areas made up of slag and asphalt gravel have been maintained to sustain vehicle or machine traffic at the FSA and are currently covered with gravel and wood chips. These areas were initially sampled in 2010 as ASYss-089M and ASYss-088M. In 2011, these two grid samples were subdivided into ASYss-116M, ASYss-117M, ASYss-118M, and ASYss-119M for sampling based on the current location of the parking/staging area. The ditch alongside the access road that enters Atlas Scrap Yard from Newton Falls Road was originally included in the 2010 grid sample ASYss-093M and was resampled in 2011 as locations ASYss-123M and ASYss-126M.

The 2011 Supplemental Sampling sample locations are presented in Table 4-5. The sample scheme with photographs is presented in Figure 4-3, and the sample locations that had an exceedance of the 2017 USEPA Resident Soil RSL at TR of 1E-05 are highlighted in Figure 4-4.

4.2.4 Extent of PAH Contamination Requiring a Remedial Action

Numerous sample locations had exceedances of the 2017 USEPA Resident Soil RSL at TR of 1E-05 within Atlas Scrap Yard. These areas are presented in Figures 4-2 and 4-4. Appendix A contains a comparison of Characterization of 14 AOCs, 2010 PBA08 RI, and 2011 Supplemental Sampling sample results against the 2017 USEPA Resident Soil RSLs.

The area containing a large majority of the exceedances is in the FSA. Three sample locations outside of the FSA (ASYss-069M, ASYss-071M, and ASYss-101M) exceeded the benzo(a)pyrene 2017 USEPA Resident Soil RSLs. These three sample locations do not require an RA to be protective of the Resident Receptor based on the weight-of-evidence presented below:

- ASYss-069M
  - The concentrations for benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene were below the USEPA Resident Soil RSL at TR of 1E-05.
  - The concentration of benzo(a)pyrene (1.7 mg/kg) was only slightly greater than the USEPA Resident Soil RSL of 1.1 mg/kg.
  - A soil boring (ASYsb-059) was collected from within the ISM sample ASYss-069M. The surface soil (0-1 ft bgs) concentrations for all five PAHs at ASYsb-059 were below the USEPA Resident Soil RSLs. In addition, there were no detections of the five PAHs in the subsurface soil samples (1-13 ft bgs) from ASYsb-059.
  - Sample location ASYss-069M was collected within the larger ISM sample ASYss-091M. The surface soil (0-1 ft bgs) concentrations for all five PAHs at ASYss-091M were below the USEPA Resident Soil RSLs.
- ASYss-071M
  - The concentrations for benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene were below the USEPA Resident Soil RSL at TR of 1E-05.
  - A large portion of this sample location was within the southern access road within Atlas Scrap Yard, which likely contributed to the elevated benzo(a)pyrene concentration.
  - Sample location ASYss-071M was collected within the larger ISM sample ASYss-096M. The surface soil (0-1 ft bgs) concentrations for all five PAHs at ASYss-096M were below the USEPA Resident Soil RSLs.
- ASYss-101M
  - The concentrations for benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene were below the USEPA Resident Soil RSL at TR of 1E-05.
  - The concentration of benzo(a)pyrene (1.4 mg/kg) was only slightly greater than the USEPA Resident Soil RSL of 1.1 mg/kg.
  - This sample location is immediately adjacent to Paris-Windham Road and contained the southern access road within Atlas Scrap Yard. These features likely contributed to the elevated benzo(a)pyrene concentration.

The FSA is the final area requiring an RA for PAHs within Atlas Scrap Yard. The requirements to achieve different land use scenarios are presented in Figures 4-5 and 4-6.

Only one sample location (ASYss-126M) within the FSA had an exceedance of the Industrial Receptor PAH CUG. Benzo(a)pyrene was detected at a concentration of 50J mg/kg at this sample location, compared to the Industrial Receptor CUG of 21 mg/kg. Figure 4-5 depicts this sample location

(ASYss-126M) requiring remediation to attain Commercial/Industrial Land Use. Figure 4-6 shows that the entirety of the FSA requires remediation to attain Unrestricted (Residential) Land Use.

4.3 DATA GAP SAMPLING

In addition, to address a data gap identified in the Atlas Scrap Yard RI Report, ARNG will collect a surface soil (0-1 ft bgs) sample at the location of the former Building T-4704 Roads and Grounds Maintenance Building for polychlorinated biphenyls (PCBs). This location is depicted in Figure 4-7.

PCBs were not previously collected from this location. Although documented releases of PCBs have not occurred at this location and the previous use of this building is not well documented, additional sampling to assess if the previous use of the building contributed PCB contamination to soil is warranted.

4.4 FINAL AREAS REQUIRING A REMEDIAL ACTION

Figure 4-7 presents the final areas within Atlas Scrap Yard requiring an RA. These areas are described below:

- The FIA to address the lead-contaminated soil in the vicinity of the former incinerator, and
- The FSA to address PAH-contaminated soil.

In the event that the PCB sampling at the location of the former Building T-4704 Roads and Grounds Maintenance indicates an RA or removal action is required, ARNG will conduct such actions. These potential activities are not included in the remedial alternative development in this FS.

The remainder of Atlas Scrap Yard requires no further action for surface soil. As discussed previously, subsurface soil, sediment, and surface water in the entirety of Atlas Scrap Yard requires no further action.

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Table 4-1. Resident Receptor FWCUGs and USEPA RSLs (June 2017) for PAH COCs

Chemical of Concern	Concentrations (mg/kg) Screening Levels (TR of 1E-05) Resident Receptor FWCUG	USEPA Resident Soil RSL (June 2017)
Benz(a)anthracene	2.21	11
Benzo(a)pyrene	0.221	1.1
Benzo(b)fluoranthene	2.21	11
Benzo(b)fluoranthene	22.1	110
Dibenz(a,h)anthracene	0.221	1.1

Table 4-2. Characterization of 14 AOCs – Samples Analyzed for PAH COCs

Sample Location	Sample Depth (ft bgs)	Potential Sources or Areas for Investigation	PAH COCs Exceed 2017 USEPA Resident Soil RSL at TR of 1E-05?
ASYss-004M	0.0–0.5	Concrete Rubble	Yes – Benzo(a)pyrene only
ASYss-011M	0.0–1.0	Former Staging Area of 90mm Wooden Packing Boxes	No
ASYss-015M	0.0–1.0	Building T-13 – Workmen's Sheds	No
ASYss-027M	0.0–1.0	Perimeter Drainage Ditches Along Site Roadway	No

Table 4-3. 2010 PBA08 RI – Source Area ISM Samples Analyzed for PAH COCs

Sample Location	Sample Depth (ft bgs)	Characterization of 14 AOCs ISM Sample – Targeted Area	PAH COCs Exceed 2017 USEPA Resident Soil RSL at TR of 1E-05?
ASYss-069M	0.0–1.0	ASYss-013M (Building T-19 Fire Station, Equipment Storage)	Yes
ASYss-070M	0.0–1.0	ASYss-019M (Incinerator)	No
ASYss-071M	0.0–1.0	ASYss-015M through -018M (Workmen's Sheds, Shops, and Equipment Storage Buildings)	Yes
ASYss-072M	0.0–1.0	ASYss-006M (Water Tower)	No
ASYss-073M	0.0–1.0	ASYss-004M (Concrete Rubble)	Yes
ASYss-074M	0.0–1.0	ASYss-004M (Concrete Rubble)	Yes
ASYss-075M	0.0–1.0	ASYss-004M (Concrete Rubble)	Yes
ASYss-076M	0.0–1.0	ASYss-004M (Concrete Rubble)	Yes
ASYss-077M	0.0–1.0	ASYss-003M (Railroad Ties)	Yes
ASYss-078M	0.0–1.0	ASYss-003M (Railroad Ties)	Yes
ASYss-079M	0.0–1.0	ASYss-003M (Railroad Ties)	Yes
ASYss-080M	0.0–1.0	ASYss-003M (Railroad Ties)	Yes
ASYss-081M	0.0–1.0	ASYss-001M (Reinforced Concrete Pipes)	No
ASYss-082M	0.0–1.0	ASYss-001M (Reinforced Concrete Pipes)	No
ASYss-083M	0.0–1.0	ASYss-001M (Reinforced Concrete Pipes)	No
ASYss-084M	0.0–1.0	ASYss-001M (Reinforced Concrete Pipes)	No
ASYss-085M	0.0–1.0	ASYss-001M (Reinforced Concrete Pipes)	No

Table 4-4. 2010 PBA08 RI – Large Area ISM Samples Analyzed for PAH COCs

PBA08 RI Location	Sample Depth (ft bgs)	PAH COCs Exceed 2017 USEPA Resident Soil RSL at TR of 1E-05?
ASYss-086M	0.0–1.0	No
ASYss-087M	0.0–1.0	No
ASYss-088M	0.0–1.0	Yes
ASYss-089M	0.0–1.0	Yes
ASYss-090M	0.0–1.0	No
ASYss-091M	0.0–1.0	No
ASYss-092M	0.0–1.0	No
ASYss-093M	0.0–1.0	Yes
ASYss-094M	0.0–1.0	No
ASYss-095M	0.0–1.0	No
ASYss-096M	0.0–1.0	No
ASYss-097M	0.0–1.0	No
ASYss-098M	0.0–1.0	No
ASYss-099M	0.0–1.0	No
ASYss-100M	0.0–1.0	No
ASYss-101M	0.0–1.0	Yes
ASYss-102M	0.0–1.0	No
ASYss-103M	0.0–1.0	No

Table 4-5. 2011 Supplemental Sampling – Source Area ISM Samples Analyzed for PAH COCs

PBA08 RI Location	Sample Depth (ft bgs)	Targeted Area	PAH COCs Exceed 2017 USEPA Resident Soil RSL at TR of 1E-05?
ASYss-111M	0.0–1.0	ASYss-003M (Railroad Ties)	Yes
ASYss-112M	0.0–1.0	ASYss-003M (Railroad Ties)	No
ASYss-113M	0.0–1.0	ASYss-003M (Railroad Ties)	No
ASYss-114M	0.0–1.0	ASYss-004M (Concrete Rubble)	Yes
ASYss-115M	0.0–1.0	Identified Pile North of Railroad Ties	No
ASYss-116M	0.0–1.0	Parking Area Proximate to ASYss-002M	Yes
ASYss-117M	0.0–1.0	Parking Area Proximate to ASYss-002M	Yes
ASYss-118M	0.0–1.0	Parking Area Proximate to ASYss-002M	Yes
ASYss-119M	0.0–1.0	Parking Area Proximate to ASYss-002M	Yes
ASYss-120M	0.0–1.0	Parking Area Proximate to ASYss-004M	Yes
ASYss-121M	0.0–1.0	Large ISM Sample ASYss-088M	Yes
ASYss-122M	0.0–1.0	ASYss-003M (Railroad Ties)	Yes
ASYss-123M	0.0–1.0	Roadside Drainage Ditch Within Active Storage Area	Yes
ASYss-124M	0.0–1.0	Large ISM Sample ASYss-089M	Yes
ASYss-125M	0.0–1.0	Large ISM Sample ASYss-093M	No
ASYss-126M	0.0–1.0	Roadside Drainage Ditch Within Active Storage Area	Yes

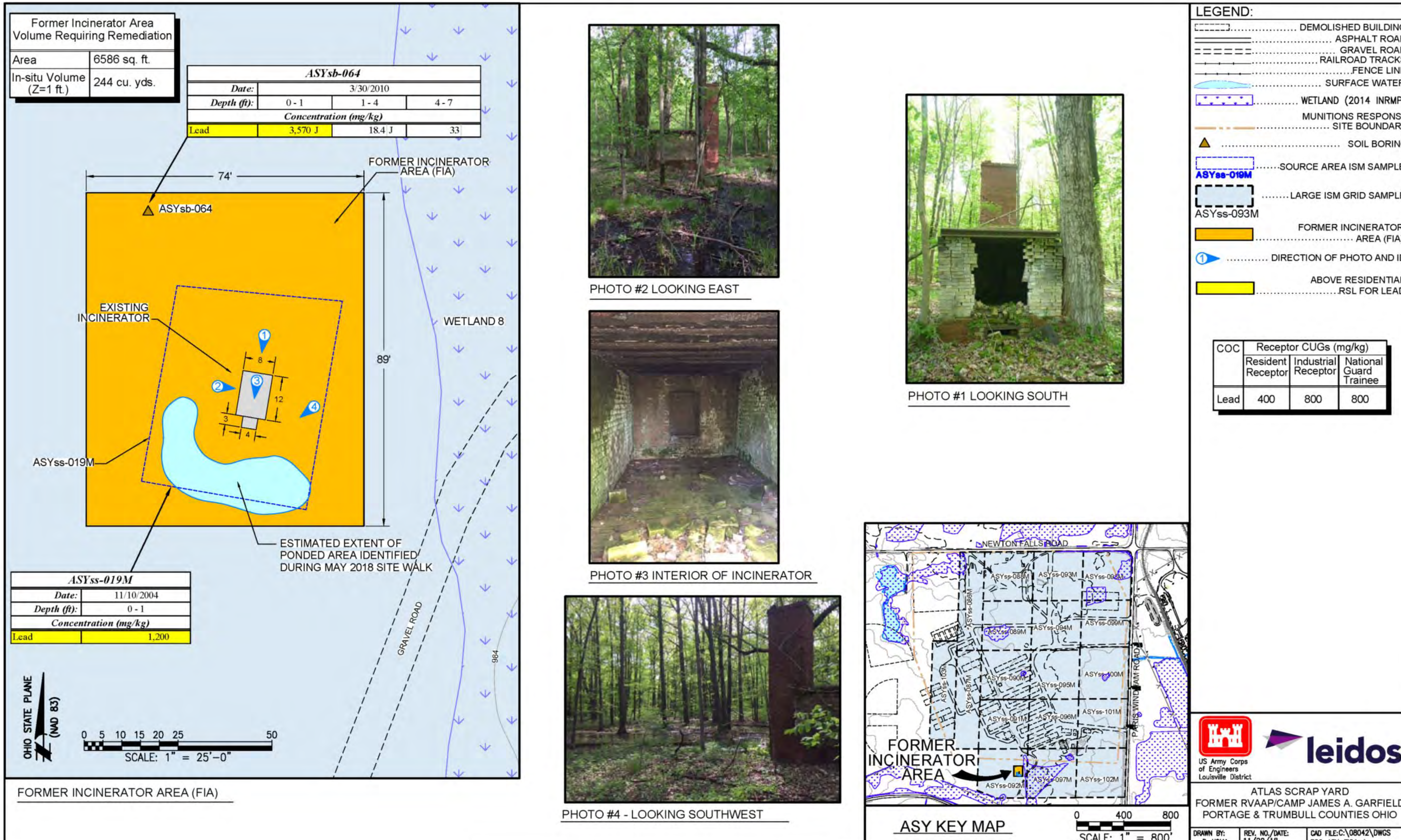


Figure 4-1. Former Incinerator Area – Area Requiring a Remedial Action for Lead

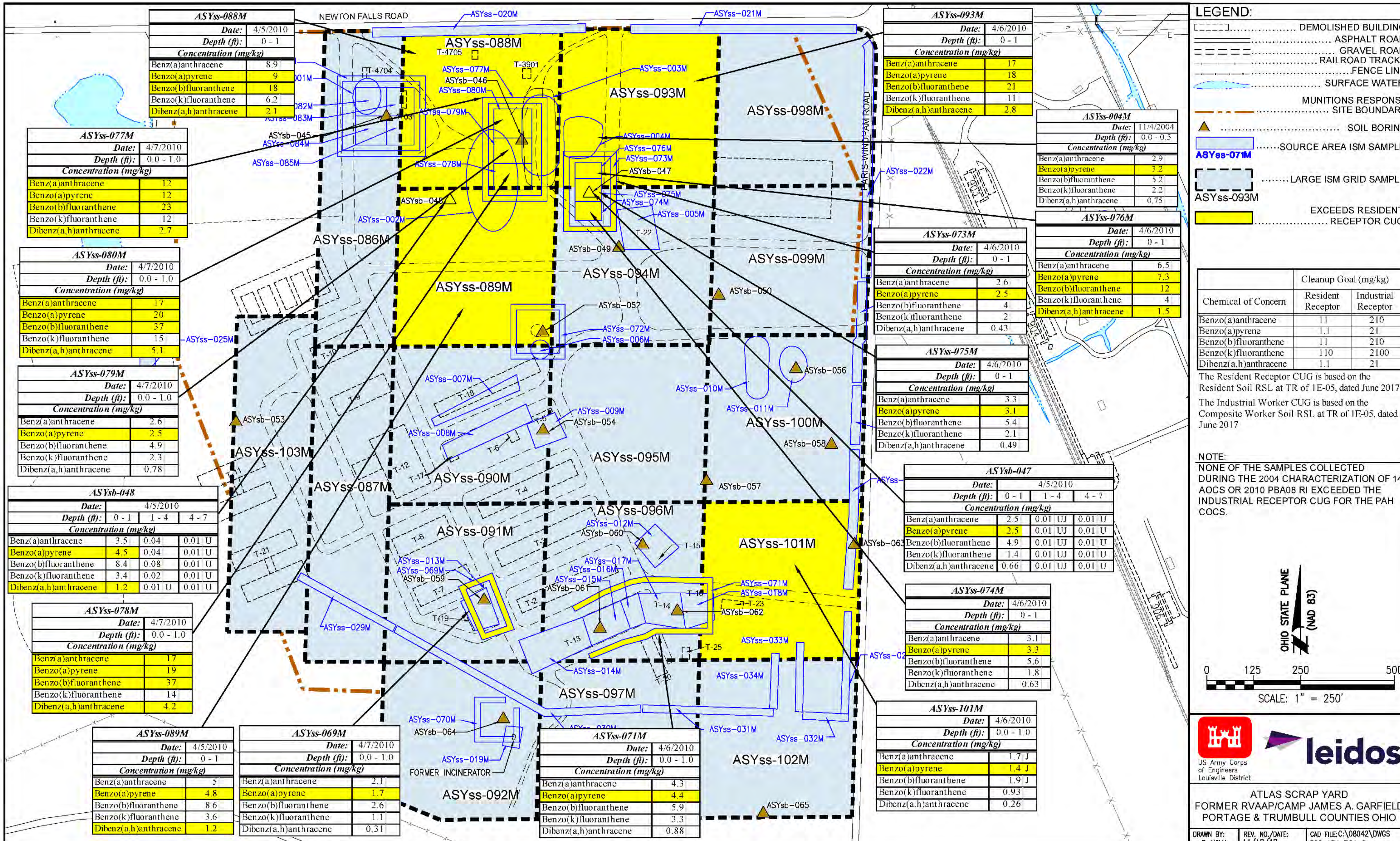


Figure 4-2. Characterization of 14 AOCs and 2010 PBA08 RI – PAH Sample Results

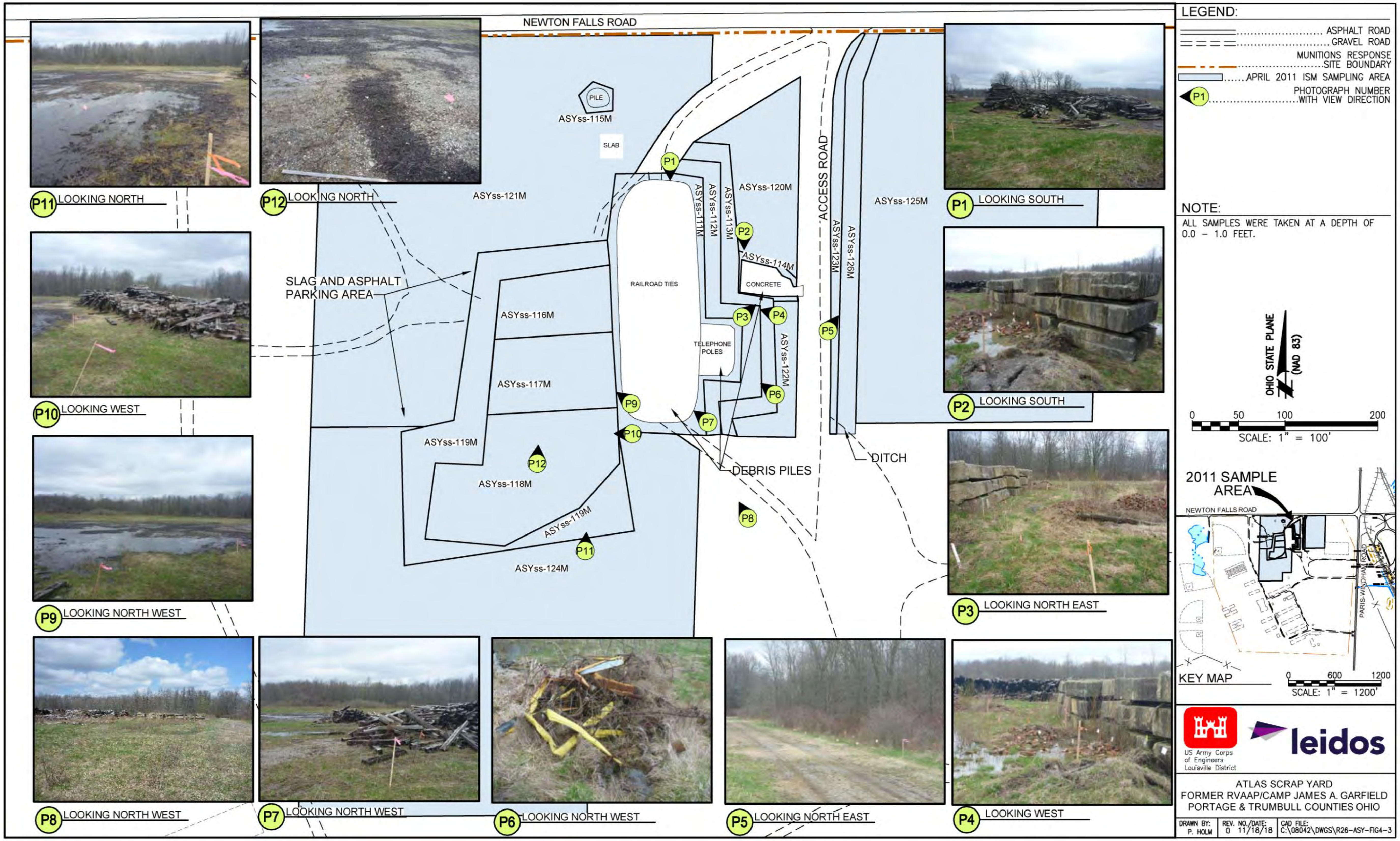
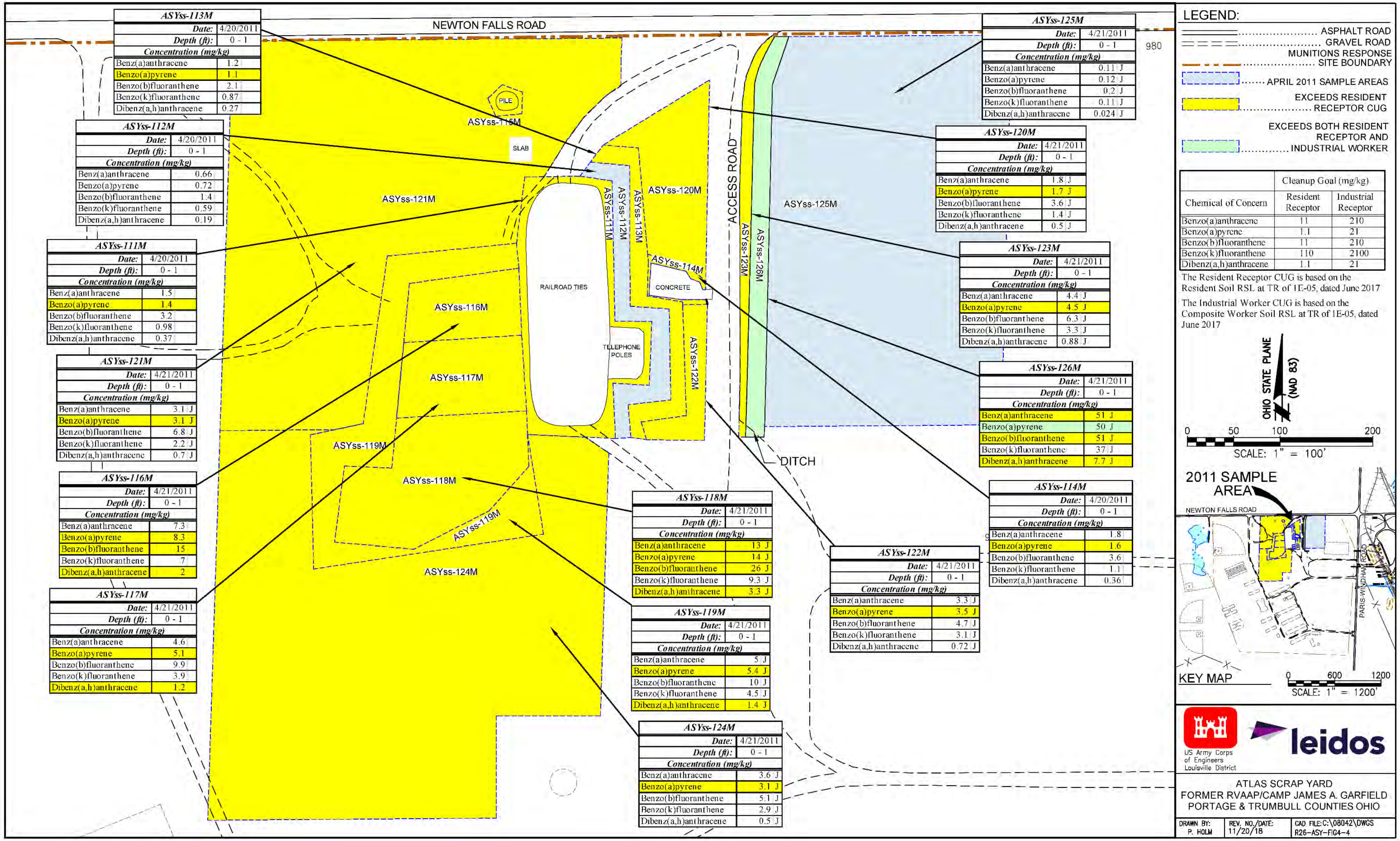


Figure 4-3. 2011 Supplemental Sampling – Sample Scheme



Chemical of Concern	Cleanup Goal (mg/kg) Resident Receptor	Industrial Receptor
Benzo(a)anthracene	11	210
Benzo(a)pyrene	1.1	21
Benzo(b)fluoranthene	11	210
Benzo(k)fluoranthene	110	2100
Dibenz(a,h)anthracene	1.1	21

ASYss-113M	
Date:	4/20/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	1.2
Benzo(a)pyrene	1.1
Benzo(b)fluoranthene	2.1
Benzo(k)fluoranthene	0.87
Dibenz(a,h)anthracene	0.27

ASYss-112M	
Date:	4/20/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	0.66
Benzo(a)pyrene	0.72
Benzo(b)fluoranthene	1.4
Benzo(k)fluoranthene	0.59
Dibenz(a,h)anthracene	0.19

ASYss-111M	
Date:	4/20/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	1.5
Benzo(a)pyrene	1.4
Benzo(b)fluoranthene	3.2
Benzo(k)fluoranthene	0.98
Dibenz(a,h)anthracene	0.37

ASYss-121M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	3.1 J
Benzo(a)pyrene	3.1 J
Benzo(b)fluoranthene	6.8 J
Benzo(k)fluoranthene	2.2 J
Dibenz(a,h)anthracene	0.7 J

ASYss-116M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	7.3
Benzo(a)pyrene	8.3
Benzo(b)fluoranthene	15
Benzo(k)fluoranthene	7
Dibenz(a,h)anthracene	2

ASYss-117M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	4.6
Benzo(a)pyrene	5.1
Benzo(b)fluoranthene	9.9
Benzo(k)fluoranthene	3.9
Dibenz(a,h)anthracene	1.2

ASYss-118M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	13 J
Benzo(a)pyrene	14 J
Benzo(b)fluoranthene	26 J
Benzo(k)fluoranthene	9.3 J
Dibenz(a,h)anthracene	3.3 J

ASYss-119M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	5 J
Benzo(a)pyrene	5.4 J
Benzo(b)fluoranthene	10 J
Benzo(k)fluoranthene	4.5 J
Dibenz(a,h)anthracene	1.4 J

ASYss-124M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	3.6 J
Benzo(a)pyrene	3.1 J
Benzo(b)fluoranthene	5.1 J
Benzo(k)fluoranthene	2.9 J
Dibenz(a,h)anthracene	0.5 J

ASYss-125M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	0.11 J
Benzo(a)pyrene	0.12 J
Benzo(b)fluoranthene	0.2 J
Benzo(k)fluoranthene	0.11 J
Dibenz(a,h)anthracene	0.024 J

ASYss-120M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	1.8 J
Benzo(a)pyrene	1.7 J
Benzo(b)fluoranthene	3.6 J
Benzo(k)fluoranthene	1.4 J
Dibenz(a,h)anthracene	0.5 J

ASYss-123M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	4.4 J
Benzo(a)pyrene	4.5 J
Benzo(b)fluoranthene	6.3 J
Benzo(k)fluoranthene	3.3 J
Dibenz(a,h)anthracene	0.88 J

ASYss-126M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	51 J
Benzo(a)pyrene	50 J
Benzo(b)fluoranthene	51 J
Benzo(k)fluoranthene	37 J
Dibenz(a,h)anthracene	7.7 J

ASYss-114M	
Date:	4/20/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	1.8
Benzo(a)pyrene	1.6
Benzo(b)fluoranthene	3.6
Benzo(k)fluoranthene	1.1
Dibenz(a,h)anthracene	0.36

ASYss-122M	
Date:	4/21/2011
Depth (ft):	0 - 1
Concentration (mg/kg)	
Benz(a)anthracene	3.3 J
Benzo(a)pyrene	3.5 J
Benzo(b)fluoranthene	4.7 J
Benzo(k)fluoranthene	3.1 J
Dibenz(a,h)anthracene	0.72 J

Figure 4-4. 2011 Supplemental Sampling – PAH Sample Results

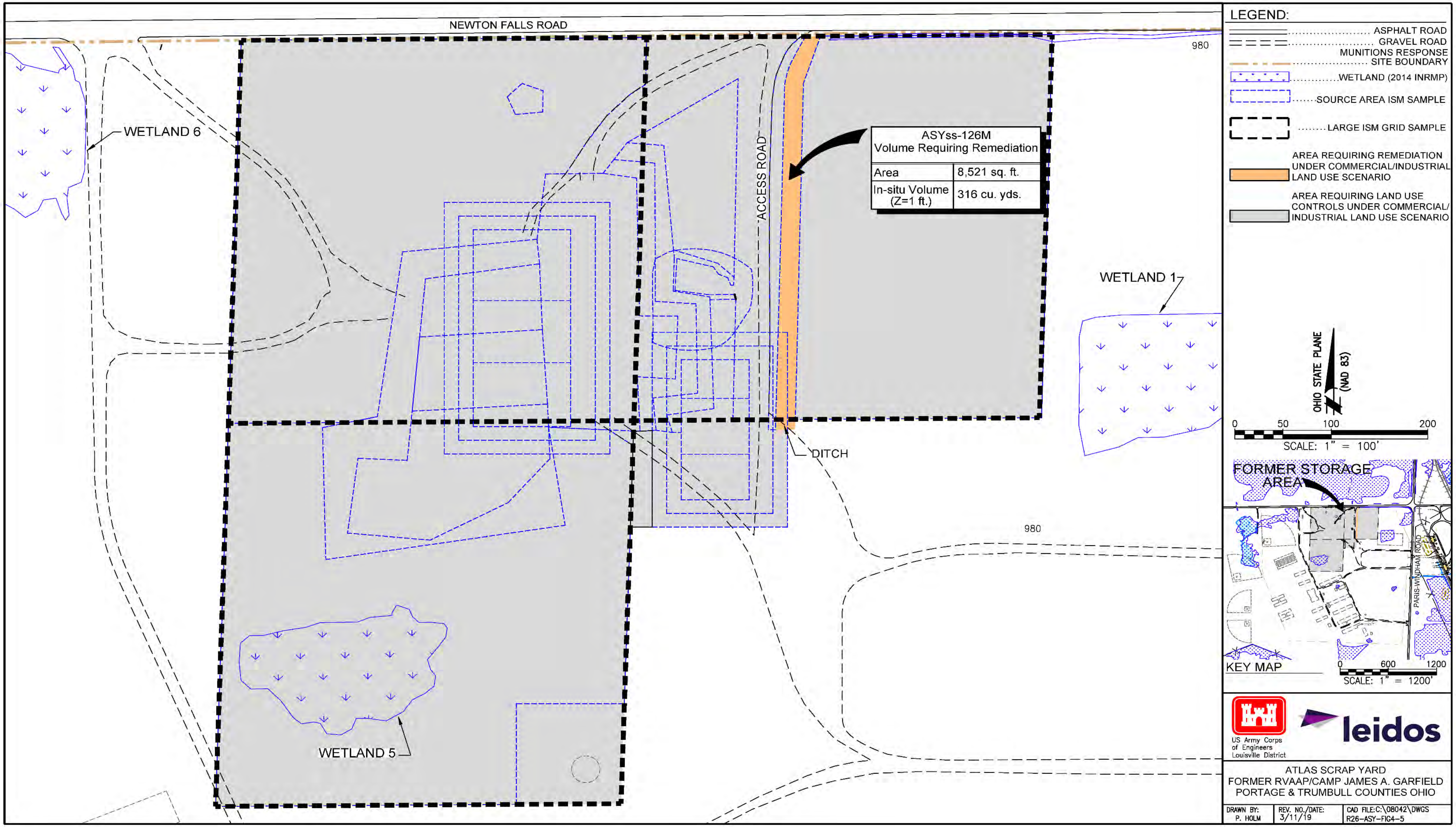


Figure 4-5. Former Storage Area – Area Requiring a Remedial Action for PAHs to Attain Commercial/Industrial Land Use

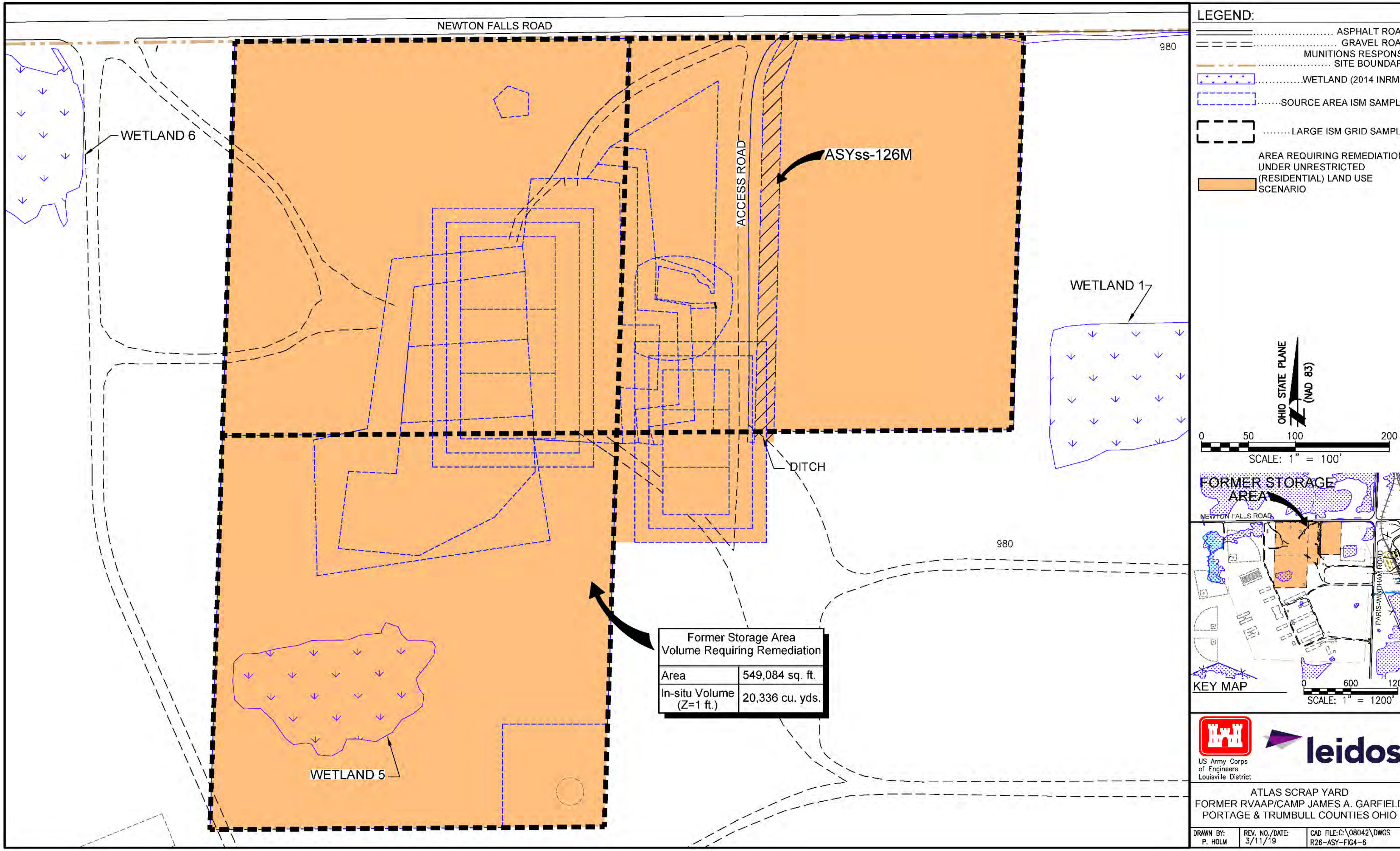
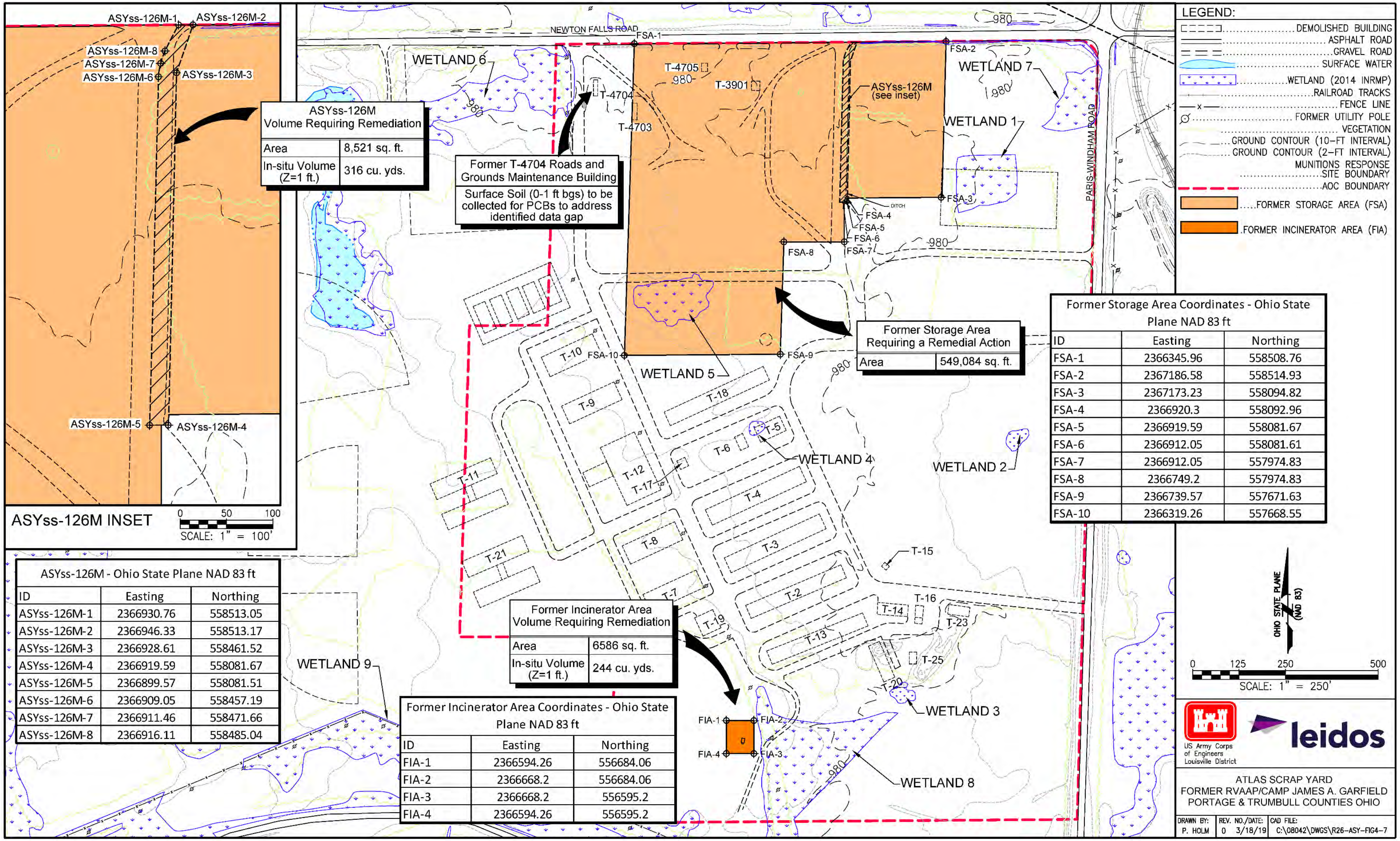


Figure 4-6. Former Storage Area – Area Requiring a Remedial Action for PAHs to Attain Unrestricted (Residential) Land Use



ASYss-126M Volume Requiring Remediation	
Area	8,521 sq. ft.
In-situ Volume (Z=1 ft.)	316 cu. yds.

Former Storage Area Requiring a Remedial Action	
Area	549,084 sq. ft.

Former Incinerator Area Volume Requiring Remediation	
Area	6586 sq. ft.
In-situ Volume (Z=1 ft.)	244 cu. yds.

ASYss-126M - Ohio State Plane NAD 83 ft

ID	Easting	Northing
ASYss-126M-1	2366930.76	558513.05
ASYss-126M-2	2366946.33	558513.17
ASYss-126M-3	2366928.61	558461.52
ASYss-126M-4	2366919.59	558081.67
ASYss-126M-5	2366899.57	558081.51
ASYss-126M-6	2366909.05	558457.19
ASYss-126M-7	2366911.46	558471.66
ASYss-126M-8	2366916.11	558485.04

Former Storage Area Coordinates - Ohio State Plane NAD 83 ft

ID	Easting	Northing
FSA-1	2366345.96	558508.76
FSA-2	2367186.58	558514.93
FSA-3	2367173.23	558094.82
FSA-4	2366920.3	558092.96
FSA-5	2366919.59	558081.67
FSA-6	2366912.05	558081.61
FSA-7	2366912.05	557974.83
FSA-8	2366749.2	557974.83
FSA-9	2366739.57	557671.63
FSA-10	2366319.26	557668.55

Former Incinerator Area Coordinates - Ohio State Plane NAD 83 ft

ID	Easting	Northing
FIA-1	2366594.26	556684.06
FIA-2	2366668.2	556684.06
FIA-3	2366668.2	556595.2
FIA-4	2366594.26	556595.2

Figure 4-7. Areas Requiring a Remedial Action at Atlas Scrap Yard

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5.0 REMEDIAL ACTION OBJECTIVES, CLEANUP GOALS, AND VOLUME CALCULATIONS

This section presents the RAOs, appropriate CUGs for RAs, and volume estimates of surface soil (0-1 ft bgs) requiring an RA to attain specific Land Use scenarios. The RAOs are in accordance with National Oil and Hazardous Substances Pollution Contingency Plan (NCP) and CERCLA RI/FS guidance, which specify receptors and desired exposure levels. CUGs establish acceptable exposure levels to be protective of human health while considering potential Land Uses and provide the basis for screening, evaluating, and selecting a remedial alternative. This section also presents the location and estimated volume of surface soil requiring remediation to attain a specific Land Use scenario.

5.1 FUTURE USE

The potential future uses for Atlas Scrap Yard 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.

Although residential use is not anticipated at the former RVAAP or at Atlas Scrap Yard, Unrestricted (Residential) Land Use was evaluated. The Resident Receptor is the representative receptor for Unrestricted (Residential) Land Use. If a site is protective of the Resident Receptor, it is considered protective of all potential RVAAP receptors, as established in the Technical Memorandum (ARNG 2014).

5.2 REMEDIAL ACTION CLEANUP GOALS

5.2.1 Lead at the Former Incinerator

Lead is a COC requiring an RA to be protective for the Resident Receptor, Industrial Receptor, and National Guard Trainee at the FIA. The surface soil concentrations of lead were 1,200 mg/kg at ASYss-019M and 3,570J mg/kg at ASYsb-064. These concentrations exceed the Resident Receptor FWCUG (400 mg/kg), Composite Worker RSL (800 mg/kg), and National Guard Trainee FWCUG (800 mg/kg). No other locations at Atlas Scrap Yard require an RA for lead.

No other COCs requiring an RA were identified in the FIA. Consequently, remediating this area to a lead concentration below the Resident Receptor CUG (400 mg/kg) would result in the entirety of the FIA being allowed for Unrestricted (Residential) Land Use.

5.2.2 PAHs in the Former Storage Area

This FS uses the 2017 USEPA Resident Soil RSLs as the PAH CUGs for the Resident Receptor and the 2017 USEPA Composite Worker RSLs as the PAH CUGs for the Industrial Receptor. Table 5-1 presents the PAH CUGs for Atlas Scrap Yard used in this FS.

5.3 VOLUME CALCULATIONS OF MEDIA REQUIRING A REMEDIAL ACTION

Figure 4-7 presents the estimated extent of contamination requiring an RA at the FIA and FSA. The volumes presented in this section are estimates. In the event that confirmation samples determine the initial extent of the remedial area still exceed the CUGs, the remedial area will be adjusted during the Remedial Design (RD)/RA phase.

5.3.1 Former Incinerator Area

The Atlas Scrap Yard RI Report identified lead in surface soil (0-1 ft bgs) as a COC requiring an RA in one general area located around surface soil samples ASYss-019M and ASYsb-064 to be protective of the Resident Receptor, Industrial Receptor, and National Guard Trainee.

This is the area currently containing the structure of a former incinerator used at Atlas Scrap Yard. This contaminated area is depicted in Figures 4-1 and Figure 4-7 and is designated at the FIA, and Table 5-2 presents the volume estimate of the FIA. No other locations at Atlas Scrap Yard require remediation for lead.

5.3.2 Former Storage Area

To be protective of the Resident Receptor, the entirety of the FSA requires an RA. Table 5-3 presents the volume estimate of the area requiring an RA to be protective of the Resident Receptor within the FSA.

Only one sample location (ASYss-126M) within the FSA had an exceedance of the Industrial Receptor PAH CUG. Benzo(a)pyrene was detected at a concentration of 50J mg/kg at this sample location, compared to the Industrial Receptor CUG of 21 mg/kg. All other PAH COCs at this sample location were at concentrations below their respective Industrial Receptor CUG. Table 5-4 presents the volume estimate of ASYss-126M, requiring an RA to be protective of the Industrial Receptor.

5.4 REMEDIAL ACTION OBJECTIVE

The RAO for Atlas Scrap Yard is as follows:

- Prevent Resident Receptor exposure to 1) surface soil (0-1 ft bgs) with concentrations of lead above 400 mg/kg at the FIA, and 2) surface soil (0-1 ft bgs) with concentrations of benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene above CUGs at the FSA.

Table 5-1. Feasibility Study PAH CUGs

Chemical of Concern	Concentration (mg/kg) Maximum Surface Soil Concentration	Resident Receptor	Industrial Receptor
Benz(a)anthracene	51J	11	210
Benzo(a)pyrene	50J	1.1	21
Benzo(b)fluoranthene	56J	11	210
Benzo(k)fluoranthene	37J	110	2100
Dibenz(a,h)anthracene	7.7J	1.1	21

The Resident Receptor CUG is based on the USEPA Resident Soil RSL at TR of 1E-05, dated June 2017.
The Industrial Receptor CUG is based on the USEPA Composite Worker Soil RSL at TR of 1E-05, dated June 2017.

Table 5-2. Estimated Volume Requiring a Remedial Action at the Former Incinerator Area to Attain Unrestricted (Residential) Land Use

Remedial Area	Media	Treatment Interval (ft bgs)	Surface Area (ft^2)	In Situ Volume (ft^3)	In Situ Volume (yd^3)	In Situ with Constructability[1] Volume (ft^3)	In Situ with Constructability[1] Volume (yd^3)	Ex Situ[1,2] Volume (ft^3)	Ex Situ[1,2] Volume (yd^3)
Former Incinerator Area	Surface Soil	0-1	6,586	6,586	244	8,233	305	9,879	366
Incinerator and Chimney	Brick and Steel	NA	108	980	37	980	37	1,634	62

[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.
NA = Not Applicable.
yd^3 = Cubic Yards.

Table 5-3. Estimated Volume Requiring a Remedial Action at the Former Storage Area to Attain Unrestricted (Residential) Land Use

Remedial Area	Media	Treatment Interval (ft bgs)	Surface Area (ft^2)	In Situ Volume (ft^3)	In Situ Volume (yd^3)	In Situ with Constructability[1] Volume (ft^3)	In Situ with Constructability[1] Volume (yd^3)	Ex Situ[1,2] Volume (ft^3)	Ex Situ[1,2] Volume (yd^3)
Former Storage Area	Surface Soil	0-1	549,084	549,084	20,336	686,355	25,421	823,626	30,505

[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 5-4. Estimated Volume Requiring a Remedial Action at ASYss-126M

Remedial Area	Media	Treatment Interval (ft bgs)	Surface Area (ft^2)	In Situ Volume (ft^3)	In Situ Volume (yd^3)	In Situ with Constructability[1] Volume (ft^3)	In Situ with Constructability[1] Volume (yd^3)	Ex Situ[1,2] Volume (ft^3)	Ex Situ[1,2] Volume (yd^3)
ASYss-126M	Surface Soil	0-1	8,521	8,521	316	10,651	394	12,782	473

[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.

6.0 Applicable or Relevant and Appropriate Requirements

6.1 INTRODUCTION

CERCLA Section 121 specifies that RAs must comply with requirements or standards under federal or more stringent state environmental laws that are "applicable or relevant and appropriate to the hazardous substances or particular circumstances at the AOC." In interpreting ARARs, it is inherently assumed that human health and the environment will be protected. This section summarizes potential federal and state chemical-, location-, and action-specific ARARs for potential RAs at the AOC.

ARARs include federal and state regulations designed to protect the environment. Applicable requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, RA, location, or other circumstance at a CERCLA site" (40 Code of Federal Regulations [CFR] 300.5). USEPA stated in the NCP that applicable requirements are those requirements that would apply if the response action were not taken under CERCLA.

Relevant and appropriate requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting law that, while not applicable to a hazardous substance, pollutant, contaminant, RA, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site such that their use is well suited to the particular site" (40 CFR 300.5).

In the absence of federal- or state-promulgated regulations, many criteria, advisories, guidance values, and proposed standards exist that are not legally binding, but may serve as useful guidance for setting protective cleanup levels. These are not potential ARARs but are to-be-considered guidance (40 CFR 300.400(g)(13)).

CERCLA on-site remedial response actions must only comply with the substantive requirements of a regulation and not the administrative requirements. The definitions of "applicable" and "relevant and appropriate" require that the federal or state requirements be substantive (i.e., cleanup standards, standards of control, and other substantive requirements, criteria, or limitations [40 CFR §300.5]). Substantive is further defined in USEPA guidance as "those requirements that pertain directly to actions in the environment" (USEPA 1988a). Administrative requirements are not considered ARARs and are described as those mechanisms of laws or regulations that facilitate implementation of the substantive requirements or methods or procedures by which substantive requirements are made effective. Certain administrative requirements should be observed if they are useful in determining cleanup standards at the site (Federal Register, Volume 55, page 8666). Off-site actions, on the other hand, are subject to the full requirements of the applicable standards or regulations, including all administrative and procedural requirements.

Ohio EPA's Division of Environmental Response and Revitalization (DERR) Policy DERR-00-RR-034 states "it has been DERR's policy to require responsible parties to acquire and comply with all necessary permits, including the substantive and administrative requirements." However, a DFFO was entered into on June 10, 2004, that provided certain exemptions from the Ohio Administrative Code (OAC) administrative requirements and required groundwater monitoring and remediation at RVAAP to be performed under the CERCLA process. The DFFO includes provisions for compliance that may result in the potential negation of all provided exemptions within the DFFO in the event non-compliant activities are identified.

6.2 POTENTIAL ARARs

USEPA classifies ARARs as chemical-, action-, and location-specific to provide guidance for identifying and complying with ARARs (USEPA 1988a):

- Chemical-specific ARARs are health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, allow numerical values to be established. These values establish the acceptable amount or concentration of a chemical that may be found in or discharged to the ambient environment.
- Action-specific ARARs are rules, such as performance-, design-, or other activity-based rules that place requirements or limitations on actions.
- Location-specific ARARs are rules that place restrictions on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations.

As explained in the following paragraph, rules from each of these categories are ARARs only to the extent that they relate to the degree of cleanup.

CERCLA Section 121 governs cleanup standards at CERCLA sites. ARARs originate in the subsection of CERCLA that specifies the degree of cleanup at each AOC: CERCLA Section 121(d). In Section 121(d)(2), CERCLA expressly directs that ARARs are to address specific COCs at each AOC, specifying the level of protection to be attained by any chemicals remaining at the AOC. CERCLA Section 121(d)(2) provides that, with respect to hazardous substances, pollutants, or contaminants remaining on site after completing an RA, an ARAR is:

> "Any standard, requirement, criteria, or limitation under any Federal environmental law … or any promulgated standard, requirement, criteria, or limitation under a State environmental or facility siting law that is more stringent than any Federal standard, requirement, criteria, or limitation."

CERCLA Section 121(d)(2) further states that the RA must attain a level of control established in rules determined to be ARARs.

In some cases, most ARARs will be chemical-specific. Action- or location-specific requirements will be ARARs to the extent that they establish standards addressing COCs that will remain at the AOC. In addition, CERCLA Section 121(d)(1) directs that RAs taken to achieve a degree of cleanup that is protective of human health and the environment are to be relevant and appropriate under the circumstances presented by the release. An evaluation of the regulatory requirements has shown no chemical-specific ARARs exist for the chemicals identified in various media at the AOC.

6.2.1 Potential Chemical-Specific ARARs

A review of the regulations indicated no potential chemical-specific ARARs exist for any of the COCs.

6.2.2 Potential Action-Specific ARARs

Potential excavation and disposal of contaminated environmental media at the AOC will trigger potential ARARs associated with land disturbance and emission controls. OAC 3745-15-07 requires that nuisance air pollution emissions be controlled. This includes controlling potential fugitive dust from soil handling excavation activities. In addition, any construction (e.g., soil disturbance activities that would encompass more than 1 acre) would trigger the storm water requirements found in 40 CFR Part 450. These requirements mandate that erosion and sedimentation control measures be designed and implemented to control erosion and sediment runoff.

Because excavation would include generating and managing contaminated media, including potentially characteristically hazardous waste, Resource Conservation and Recovery Act (RCRA) requirements would be considered potential ARARs for this activity. RCRA requirements mandate that a generator must determine whether a material is (or contains in the case of environmental media) a hazardous waste under OAC 3745-52-11. If a material is determined to be or contain a listed hazardous waste or exhibits a hazardous waste characteristic, additional management requirements under RCRA must be followed as an ARAR under CERCLA.

In addition to the substantive requirements associated with managing and storing material RCRA hazardous waste (or found to contain such waste), they prescribe standards for disposing of hazardous material. These requirements include land disposal restrictions (LDRs) prohibiting disposal of specific chemicals until they are treated to a specified level, or by a specific treatment technology.

USEPA cautions that LDRs should not be used to determine site-specific cleanup levels for soil (USEPA 2002). The purpose of LDRs is to require appropriate treatment of RCRA hazardous waste that is to be disposed of to minimize short- and long-term threats to human health or the environment based upon available technology. Performing treatment to meet LDR standards is different from the CERCLA approach to remediation, which analyzes risk and then develops soil cleanup standards based on the risk present, and may result in soil cleanup levels that are different from those of a risk-based approach. Nevertheless, if RCRA hazardous waste is generated from the CERCLA action and is disposed of on site, the material must meet the standards established in the LDRs.

In order for LDRs to be triggered as potential ARARs, RCRA hazardous waste must be present. This requires that soil contains contaminants derived from RCRA-listed waste or exhibit a characteristic of RCRA hazardous waste and that soil is managed in a way that "generates" hazardous waste. One exception to generation when managing wastes during remediation is the AOC approach. Specified management of wastes within USEPA's AOC policy does not generate hazardous waste.

If soil is managed in a manner that generates hazardous waste, such as removing it to an aboveground container and then redepositing the soil within the land unit for disposal, then LDRs become potential ARARs. Potential LDR ARARs in Ohio are variances from treatment standards in OAC Section 3745-270-44; LDR standards for contaminated debris in OAC Section 3745-270-45, Universal Treatment Standards (UTS) in OAC Section 3745-270-48; and Alternative Standards for Contaminated Soil in OAC Section 3745-270-49. Only the alternative soil treatment standards are explained in this document.

Ohio has adopted the alternative soil treatment standards promulgated by USEPA in its Phase IV LDR rule, effective August 1998. Under the alternative soil treatment standards, 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, subject to item three 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 Toxicity Characteristic Leaching Procedure [TCLP]), or 90% reduction in total constituent concentrations (when a metal removal treatment technology is used), subject to item three below.
3. When treating any constituent subject to 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."
4. USEPA and Ohio EPA RCRA regulations provide a site-specific variance from the soil treatment standards for contaminated soil. If approved, alternative risk-based LDR treatment standards can be applied that minimize 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 soil treatment standards.

If soil is found to be contaminated but not a RCRA hazardous waste, management and disposal of this material would be subject to the requirements associated with managing and disposing of solid waste within the State of Ohio. Potential action-specific ARARs are listed in Table 6-1.

6.2.3 Potential Location-Specific ARARs

Location requirements include, but are not limited to, those established for potential remedial activities conducted within wetlands, within a floodplain area, or with respect to federal- or state-listed species. Generally, for wetlands and floodplains, alternatives are required to be developed to conduct remedial activities within the sensitive area; if that is not feasible, adverse effects from any actions taken within the sensitive area must be mitigated to the extent possible. These requirements do not relate to specific chemicals, nor do they change the degree of cleanup in the sense of protecting human health or the environment from the effects of harmful substances. Rather, their purpose is to protect sensitive areas to the extent possible. Under CERCLA Section 121(d), relevance and appropriateness are related to the circumstances presented by the release of hazardous substances, with the goal of attaining a degree of cleanup and controlling further releases to ensure the protection of human health and the environment.

Within or near the areas requiring an RA, wetlands have been identified; however, permits and notifications are not required. Nationwide Permit 38 states "Activities undertaken entirely on a CERCLA site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act." Any disturbed area within a wetland will be restored with CJAG's "emergent marsh" seed mixture.

Any action taken by the federal government must be conducted in accordance with the requirements established under the National Environmental Policy Act, Endangered Species Act, National Historic Preservation Act, Native American Graves Protection and Repatriation Act, state burial laws, and federal and state wetlands and floodplains construction and placement of materials considerations, even though these laws and rules do not establish standards, requirements, limitations, or criteria relating to the degree of cleanup for chemicals remaining on site at the close of the response actions.

Table 6-1. 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 endangers the health, safety, or welfare of the public or causes 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 more than 1 acre must design and implement erosion and runoff controls.
Generation of contaminated soil or debris 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 6-1. Potential Action-Specific ARARs (continued)

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
Special rules regarding wastes that exhibit a characteristic OAC Section 3745-270-07	These rules specify the requirements of generators, treaters, and disposal facilities to test hazardous waste, as well as specify the tracking and record keeping requirements.	This rule would be applicable, as the contaminated soil will undergo waste characterization sampling prior to any off-site disposal. Using the "Rule of 20," total sample results for lead in the Former Incinerator Area indicate that the soil may exceed regulatory levels under 40 CFR 261.24.	The Army will determine if the waste has to be treated prior to being disposed of. If the contaminated soil does not meet the treatment standards, with the initial shipment of waste to each treatment or storage facility, the Army shall send a one-time written notice to each treatment or storage facility receiving the waste, as presented in Table 1 of 3745-270-07A. If the contaminated soil meets the treatment standard at the original point of generation: with the initial shipment of waste to each treatment, storage, or disposal facility, the Army shall send a one-time written notice to each treatment, storage, or disposal facility receiving the waste, and place a copy in the generator's files.
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 of 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.

Table 6-1. Potential Action-Specific ARARs (continued)

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
			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."
Soil/debris contaminated with RCRA hazardous waste – variance OAC Section 3745-270-44	The Ohio EPA Director will recognize a variance approved by 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.

Table 6-1. Potential Action-Specific ARARs (continued)

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
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 or Relevant and Appropriate Requirement.
CFR = Code of Federal Regulations.
LDR = Land Disposal Restriction.
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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7.0 TECHNOLOGY TYPES AND PROCESS OPTIONS

This section identifies and describes the GRAs that may be implemented to achieve CUGs. In addition, this section summarizes the remedial technologies and process options available to remediate COCs in soil identified in Section 4.0.

The procedure for identifying and screening potential remedial technologies followed the method established in the USEPA guidance document, *Guidance for Conducting Remedial Investigation/Feasibility Studies Under CERCLA* (USEPA 1988b). This guidance document provides the framework for identifying and screening all available remedial technologies with the most appropriate technologies available based on the COCs and site characteristics (e.g., soil type).

7.1 GENERAL RESPONSE ACTION

GRAs are actions that may be implemented to satisfy RAOs. These actions may be individual or a combination of responses. The following GRAs are applicable to Atlas Scrap Yard and are defined in greater detail for lead in surface soil (0-1 ft bgs) at the FIA and PAHs in surface soil (0-1 ft bgs) at the FSA:

- No action,
- Institutional controls,
- Containment,
- Removal, and
- Treatment.

7.1.1 No Action

The no action GRA is evaluated as the baseline to which other remedial alternatives are compared. No action may be an appropriate alternative if no unacceptable risk is present at the site. This GRA provides a baseline against which to compare other more proactive alternatives. In this alternative, no action is taken at the site to reduce any risk to human health or the environment. Any existing actions, such as restrictions or monitoring, are discontinued.

7.1.2 Institutional Controls

Institutional controls include engineering measures (i.e., fencing and warning signs) and non-engineering measures, such as administrative or legal controls, used to prevent or limit exposure to hazardous substances. Institutional controls do not reduce contaminant mobility, volume, or toxicity.

If institutional controls are selected as a component of a remedial alternative, the effectiveness of the remedy must undergo 5-year reviews. The primary goal of the 5-year reviews is to evaluate the implementation and performance of the remedy to determine if the remedy is or will be protective of human health and the environment. The 5-year reviews are discontinued when the remedy achieves CUGs for Unrestricted (Residential) Land Use.

7.1.3 Containment

Containment technologies are often used to prevent, or significantly reduce, the migration of contaminants in soil or sediment. In general, containment is performed when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards, technical impracticality, and/or unrealistic cost.

The main advantage of containment methods is that they can prevent further migration of contaminant plumes by minimizing infiltration and leaching. Containment requires periodic inspections for leaks and ponding of liquids, and periodic sampling to confirm the integrity of the containment system.

Common types of containment technologies include capping (e.g., clay cap, multi-layered cap that includes clay and synthetic liners, or an asphalt or concrete cap) and soil covers.

7.1.4 Removal

Removing contaminated media from the site reduces or eliminates the potential for long-term human and environmental exposure to chemicals exceeding concentrations determined to be protective for a given Land Use. Removing soil may be combined with pre-treatment prior to off-site disposal, or soil may be shipped without pre-treatment.

Disposal and handling, after removal, involve the final and permanent placement of waste material in a manner protective of human health and the environment. The impacted media is disposed of on site in an engineered facility or off site in a permitted or licensed facility such as a regulated landfill. Similarly, concentrated waste resulting from treatment processes is disposed of on site in a permanent disposal cell or off site in an approved disposal facility.

Transportation is accomplished utilizing various methods, including truck, railcar, and/or barge.

7.1.5 Treatment

Treatment is conducted either in situ or ex situ to reduce contaminant concentrations to acceptable levels. Common types of treatment include biological, chemical, physical, and thermal. Biological treatment involves using microbes to degrade contaminants. Chemical treatment processes add chemicals to react with contaminants to reduce their toxicity or mobility. Physical processes involve either physically binding the contaminants to reduce mobility or the potential for exposure (e.g., encapsulation), or extracting the contaminant(s) from a medium to reduce volumes. Thermal treatment, such as incineration, uses high temperatures to volatilize, decompose, or melt contaminants. For soil treated by ex situ methods, the treatment may allow soil to be placed back into the excavation, or soil may be treated to reduce the chemical concentration or stabilize the soil prior to off-site disposal.

7.2 INITIAL SCREENING OF TREATMENT TECHNOLOGIES

Table 7-1 summarizes the remedial technologies and process options available for treating the lead-contaminated surface soil (0-1 ft bgs) at the FIA. Table 7-2 summarizes the remedial technologies and process options available for PAH-contaminated surface soil (0-1 ft bgs) at the FSA.

The initial screening focuses on technology types capable of remediating the applicable COCs and evaluates the implementability of the technology. If treatment technologies are evaluated and retained as potentially viable treatment options, the retained technology will undergo a more detailed evaluation described in Section 7.3.

7.3 DETAILED SCREENING OF TECHNOLOGIES

The RA technologies retained from the initial screening process are evaluated against criteria of effectiveness, implementability, and cost (three of the NCP balancing criteria). The rationale for either retaining or eliminating treatment options for lead-contaminated soil at the FIA is presented and summarized in Table 7-3, and the rationale for either retaining or eliminating treatment options for PAH-contaminated soil at the FSA is presented and summarized in Table 7-4. The remedial options retained from the detailed screening process used to develop the remedial alternatives are presented in Sections 8.0 and 9.0.

7.3.1 Effectiveness

The effectiveness criterion assesses the ability of a remedial technology to protect human health and the environment by reducing the toxicity, mobility, or volume of contaminants. Each technology is evaluated for its ability to achieve RAOs, potential impacts to human health and the environment during construction and implementation, and overall reliability of the technology.

7.3.2 Implementability

Each process option/technology is evaluated for implementability in terms of technical feasibility; administrative feasibility; and availability of the necessary material, equipment, and work force. The assessment considers each technology's short- and long-term implementability. Short-term implementability considers constructability of the remedial technology, near-term reliability, the ability to obtain necessary approvals with other agencies, and the likelihood of obtaining a favorable community response. Long-term implementability evaluates the ease of undertaking additional RAs (if necessary), monitoring the effectiveness of the remedy, and operation and maintenance (O&M).

7.3.3 Cost

The cost criterion evaluates each remedial process in terms of relative capital and O&M costs. Costs for each technology are rated qualitatively, on the basis of engineering judgment, in terms of cost effectiveness. Therefore, a low-cost remedial technology is rated as highly cost effective, while a costly technology is evaluated as being of low cost effectiveness.

7.4 ALTERNATIVE ANALYSIS

The following subsections describe the remedial alternative development, detailed analysis, and comparative analysis for the FIA and FSA that are presented in Sections 8.0 and 9.0, respectively.

7.4.1 Development of Remedial Alternatives

After the initial and detailed technology screening process, remedial alternatives for the FIA and FSA are developed and presented in Sections 8.0 and 9.0, respectively. The developed remedial alternatives will be composed of implementable and cost-effective technology types and process options that address the surface soil (0-1 ft bgs) PAH COCs.

7.4.2 Detailed Analysis of Alternatives

After development of remedial alternatives, a detailed analysis is performed to provide stakeholders ample information to identify and select an appropriate remedy for each area requiring an RA. These alternatives are evaluated with respect to the nine comparative analysis criteria. These criteria are further described, as outlined by CERCLA, in Table 7-5. 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 ARARs.

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

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

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

1. State acceptance.
2. Community acceptance.

7.4.3 Comparative Analysis of Remedial Alternatives

The comparative analysis will be performed to directly compare the developed remedial alternatives to one another with respect to CERCLA evaluation criteria.

Table 7-1. Initial Screening of Technologies for Lead at the Former Incinerator Area

General Response Actions	Technology Type	Process Options	Description	Screening Results
No Action	None	None	No action is taken. Current LUCs, access restrictions, and monitoring programs will be discontinued. No remedial technologies are implemented to reduce hazards to potential human or ecological receptors.	Retained. Required under NCP to be carried through CERCLA analysis.
Institutional Controls	Access Restrictions	LUCs with CERCLA 5-Year Reviews	Implement LUCs to restrict access and Land Use. LUCs will be administered and enforced as part of the Property Management Plan and reviewed in CERCLA 5-year reviews. Five-year reviews include reviewing sampling and monitoring plans and results of monitoring activities, conducting interviews and inspections, and reviewing site status.	Not retained. The area requiring an RA exceeds the cleanup goals for Military Training and Commercial/Industrial Land Use. Some form of remediation is required to meet one of these Land Uses. In addition, remediating this area will attain Unrestricted (Residential) Land Use, which will then not require institutional controls.
		Fencing	Place fencing around areas of contamination (at a minimum) to restrict access and exposure to contamination left in place.	
Containment	Capping	Native Soil/Sediment	Uses native soil or sediment to cover contamination and reduce migration by wind and water erosion.	Not retained. Using a cap, liner, or asphalt/concrete in areas with contamination will inhibit active use of the site for Military Training or Commercial/Industrial Land Uses.
		Clay	Clay layers are used to cover contamination and eliminate prevent exposure. Installing clay cap to will limit water infiltration. Susceptible to weathering effects (e.g., cracking).	
		Synthetic Liner	A synthetic liner is used to cover contamination and prevent exposure. Synthetic material is used to limit water infiltration, which is not as susceptible to cracking as clay.	
		Multi-Layered	Multiple layers of different soil types used to limit water infiltration, which is not as susceptible to cracking as clay.	
		Asphalt/Concrete	Asphalt or concrete layers are used to cover contamination and prevent exposure. Additionally, this technology limits water infiltration; however, it is susceptible to cracking if not properly maintained.	
Removal	Bulk Removal	Excavation and Off-Site Disposal	Contaminated material is removed and transported to permitted off-site treatment and disposal facilities.	Retained.

Table 7-1. Initial Screening of Technologies for Lead at the Former Incinerator Area (continued)

General Response Actions	Technology Type	Process Options	Description	Screening Results
Treatment	In Situ Biological Treatment	Bioventing	Oxygen is delivered to contaminated unsaturated soil by forced air movement (either extraction or injection of air) to increase oxygen concentrations and stimulate biodegradation.	Not retained. This technology is not effective for inorganic chemicals.
		Enhanced Bioremediation	Adds oxygen and nutrients to aid indigenous or inoculated micro-organisms (e.g., fungi, bacteria, and other microbes) degrade (metabolize) organic contaminants found in soil and/or groundwater, converting them to innocuous end products.	Not retained. This technology is not effective for inorganic chemicals.
		Phytoremediation	Uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment.	Retained.
	In Situ Physical/Chemical Treatment	Chemical Oxidation	Chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. The oxidizing agents most commonly used are ozone, hydrogen peroxide, hypochlorites, chlorine, and chlorine dioxide.	Not retained. This technology is not effective for inorganic chemicals.
		Electrokinetic Separation	Removes inorganic chemicals and organic contaminants from low permeability soil, mud, sludge, and marine dredging. Electrokinetic remediation uses electrochemical and electrokinetic processes to desorb, and then remove, inorganic chemicals and polar organic chemicals.	Not retained. Extended use of electrokinetics system can also cause acidic conditions around the electrodes, sometimes reacting with contaminants.
		Soil Flushing	Water, or water containing an additive to enhance contaminant solubility, is applied to soil or injected into groundwater to raise the water table into the contaminated soil zone. Contaminants are leached into the groundwater, which is then extracted and treated.	Not retained. Washing the contaminant beyond the capture zone and the introduction of surfactants to the subsurface is a programmatic concern given the risk of introducing contaminants and surfactants to the groundwater media at the site.
		Soil Vapor Extraction	Vacuum is applied through extraction wells to create a pressure/concentration gradient that induces gas-phase volatiles to be removed from soil through extraction wells. This technology is also known as in situ soil venting, in situ volatilization, enhanced volatilization, or soil vacuum extraction.	Not retained. This technology is not effective for inorganic chemicals.

Table 7-1. Initial Screening of Technologies for Lead at the Former Incinerator Area (continued)

General Response Actions	Technology Type	Process Options	Description	Screening Results
Treatment	In Situ Thermal Treatment	Solidification/ Stabilization	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).	Not retained. Given that the contaminated soil is stabilized and the lead will effectively remain in the soil, there will be minimal reduction in potential risk to human health.
		Thermal Treatment	Steam/hot air injection or electrical resistance/electromagnetic/fiber optic/radio frequency heating is used to increase the volatilization rate of semi-volatiles and facilitate extraction.	Not retained. This technology is not effective for inorganic chemicals.
	Ex Situ Biological Treatment	Biopiles	Excavated soil is mixed with soil amendments and placed in aboveground enclosures. It is an aerated static pile composting process in which compost is formed into piles and aerated with blowers or vacuum pumps.	Not retained. This technology is not effective for inorganic chemicals.
		Landfarming	Contaminated soil, sediment, or sludge is excavated, applied into lined beds, and periodically turned over or tilled to aerate the waste.	Not retained. This technology is not effective for inorganic chemicals.
		Slurry Phase Biological Treatment	Aqueous slurry is created by combining soil, sediment, or sludge with water and other additives. The slurry is mixed to keep solids suspended and microorganisms in contact with the soil contaminants. Upon completing the process, the slurry is dewatered, and the treated soil is disposed of.	Not retained. This technology is not effective for inorganic chemicals.
	Ex Situ Physical/Chemical Treatment	Chemical Extraction	Waste-contaminated soil and extractant are mixed in an extractor, thereby dissolving the contaminants. The extracted solution is then placed in a separator, where the contaminants and extractant are separated for treatment and further use.	Retained.
		Chemical Reduction/ Oxidation	Reduction/oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.	Not retained. This technology is not effective for lead in soil.
		Soil Washing	Contaminants sorbed onto fine soil particles are separated from bulk soil in an aqueous-based system on the basis of particle size. The wash water may be augmented with a basic leaching agent, surfactant, pH adjustment, or chelating agent to help remove organic chemicals and heavy metals.	Retained.

Table 7-1. Initial Screening of Technologies for Lead at the Former Incinerator Area (continued)

General Response Actions	Technology Type	Process Options	Description	Screening Results
Treatment	Ex Situ Thermal Treatment	Solidification/ Stabilization	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).	Retained.
		Hot Gas Decontamination	The process involves raising the temperature of the contaminated equipment or material for a specified period of time. The gas effluent from the material is treated in an afterburner system to destroy all volatilized contaminants.	Not retained. This technology is not effective for inorganic chemicals.
		Incineration	High temperatures, 870–1,200°C (1,600–2,200°F), are used to combust (in the presence of oxygen) organic constituents in hazardous waste.	Not retained. This technology is not effective for inorganic chemicals.
		Pyrolysis	Chemical decomposition is induced in organic material by heat in the absence of oxygen. Organic material is transformed into gaseous components and a solid residue (coke) containing fixed carbon and ash.	Not retained. This technology is not effective for inorganic chemicals.
		Thermal Treatment	Waste is heated in a mobile thermal treatment system to volatilize organic contaminants. The vapor emissions are treated using air filters, and the treated vapor is reused as an energy source for the operation of the thermal treatment system.	Not retained. This technology is not effective for inorganic chemicals.

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
LUC = Land Use Control.
NCP = National Contingency Plan.
RA = Remedial Action.

Table 7-2. Initial Screening of Technologies for PAHs at the Former Storage Area

General Response Actions	Technology Type	Process Options	Description	Screening Results
No Action	None	None	No action is taken. Current LUCs, access restrictions, and monitoring programs will be discontinued. No remedial technologies are implemented to reduce hazards to potential human or ecological receptors.	Retained. Required under NCP to be carried through CERCLA analysis.
Institutional Controls	Access Restrictions	LUCs with CERCLA 5-Year Reviews	Implement LUCs to restrict access and Land Use. LUCs will be administered and enforced as part of the Property Management Plan and reviewed in CERCLA 5-year reviews. Five-year reviews include reviewing sampling and monitoring plans and results of monitoring activities, conducting interviews and inspections, and reviewing site status.	Retained. ARNG may consider remediation at ASYss-126M to Industrial Receptor CUGs. Since Unrestricted (Residential) Land Use will not be attained in this scenario, LUCs would be required for the remainder of the FSA.
		Fencing	Place fencing around areas of contamination (at a minimum) to restrict access and exposure to contamination left in place.	Not retained. Fencing will inhibit active use of the site for Military Training or Commercial/Industrial Land Uses.
Containment	Capping	Native Soil/Sediment	Uses native soil or sediment to cover contamination and reduce migration by wind and water erosion.	Not retained. Using a cap, liner, or asphalt/concrete in areas with contamination will inhibit active use of the site for Military Training or Commercial/Industrial Land Uses.
		Clay	Clay layers are used to cover contamination and eliminate prevent exposure. Installing clay cap to will limit water infiltration. Susceptible to weathering effects (e.g., cracking).	
		Synthetic Liner	A synthetic liner is used to cover contamination and prevent exposure. Synthetic material is used to limit water infiltration, which is not as susceptible to cracking as clay.	
		Multi-Layered	Multiple layers of different soil types used to limit water infiltration, which is not as susceptible to cracking as clay.	
		Asphalt/Concrete	Asphalt or concrete layers are used to cover contamination and prevent exposure. Additionally, this technology limits water infiltration; however, it is susceptible to cracking if not properly maintained.	

Table 7-2. Initial Screening of Technologies for PAHs at the Former Storage Area (continued)

General Response Actions	Technology Type	Process Options	Description	Screening Results
Removal	Bulk Removal	Excavation and Off-Site Disposal	Contaminated material is removed and transported to permitted off-site treatment and disposal facilities.	Retained.
Treatment	In Situ Biological Treatment	Bioventing	Oxygen is delivered to contaminated unsaturated soil by forced air movement (either extraction or injection of air) to increase oxygen concentrations and stimulate biodegradation.	Not retained. Although the technology successfully remediates organic chemicals, this technology may not be successful in addressing surface soil.
		Enhanced Bioremediation	Adds oxygen and nutrients to aid indigenous or inoculated micro-organisms (e.g., fungi, bacteria, and other microbes) degrade (metabolize) organic contaminants found in soil and/or groundwater, converting them to innocuous end products.	Retained.
		Phytoremediation	Uses plants to remove, transfer, stabilize, and destroy contaminants in soil and sediment.	Retained.
	In Situ Physical/Chemical Treatment	Chemical Oxidation	Chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. The oxidizing agents most commonly used are ozone, hydrogen peroxide, hypochlorites, chlorine, and chlorine dioxide.	Not retained. The technology is not very effective for high molecular weight PAHs in soil.
		Electrokinetic Separation	Removes inorganic chemicals and organic contaminants from low permeability soil, mud, sludge, and marine dredging. Electrokinetic remediation uses electrochemical and electrokinetic processes to desorb, and then remove, inorganic chemicals and polar organic chemicals.	Not retained. The targeted contaminants for electrokinetics are heavy metals and polar organics. Technology is not effective for non-polar organics (e.g., PAHs).
		Soil Flushing	Water, or water containing an additive to enhance contaminant solubility, is applied to soil or injected into groundwater to raise the water table into the contaminated soil zone. Contaminants are leached into the groundwater, which is then extracted and treated.	Not retained. The soil permeability at the site is not conducive for effective soil flushing contaminant removal.

Table 7-2. Initial Screening of Technologies for PAHs at the Former Storage Area (continued)

General Response Actions	Technology Type	Process Options	Description	Screening Results
		Soil Vapor Extraction	Vacuum is applied through extraction wells to create a pressure/concentration gradient that induces gas-phase volatiles to be removed from soil through extraction wells. This technology is also known as in situ soil venting, in situ volatilization, enhanced volatilization, or soil vacuum extraction.	Not retained. Technology focuses on remediating media contaminated with VOCs and some fuels. Not applicable for contaminants with low volatilization (e.g., metals, PAHs).
		Solidification/ Stabilization	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).	Not retained. This technology has limited effectiveness for PAHs.
	In Situ Thermal Treatment	Thermal Treatment	Steam/hot air injection or electrical resistance/ electromagnetic/fiber optic/radio frequency heating is used to increase the volatilization rate of semi-volatiles and facilitate extraction.	Not retained. High moisture content while soil is in situ has a reduced permeability to air, hindering the operation.
	Ex Situ Biological Treatment	Biopiles	Excavated soil is mixed with soil amendments and placed in aboveground enclosures. It is an aerated static pile composting process in which compost is formed into piles and aerated with blowers or vacuum pumps.	Retained.
		Landfarming	Contaminated soil, sediment, or sludge is excavated, applied into lined beds, and periodically turned over or tilled to aerate the waste.	Not retained. Technology focuses on remediating media contaminated with volatile petroleum hydrocarbons. Not applicable for PAHs, as volatility is limited. Also, there is a chance of contaminant movement to previously non-contaminated areas of the site.

Table 7-2. Initial Screening of Technologies for PAHs at the Former Storage Area (continued)

General Response Actions	Technology Type	Process Options	Description	Screening Results
		Slurry Phase Biological Treatment	Aqueous slurry is created by combining soil, sediment, or sludge with water and other additives. The slurry is mixed to keep solids suspended and microorganisms in contact with the soil contaminants. Upon completing the process, the slurry is dewatered, and the treated soil is disposed of.	Not retained. Due to the estimated quantities of soil requiring remediation to attain Commercial/Industrial Land Use, development, and the need for construction of a treatment area to dewater the slurry, this is not a practical technology.
	Ex Situ Physical/Chemical Treatment	Chemical Extraction	Waste-contaminated soil and extractant are mixed in an extractor, thereby dissolving the contaminants. The extracted solution is then placed in a separator, where the contaminants and extractant are separated for treatment and further use.	Not retained. Technology focuses on remediating media contaminated with PCBs, VOCs, halogenated solvents, and petroleum waste. Although the technology is considered suitable for PAHs, clay content (similar to site soil) reduces treatment efficiency.
		Chemical Reduction/ Oxidation	Reduction/oxidation chemically converts hazardous contaminants to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.	Not retained. The target contaminant group for this technology is inorganics. It has low effectiveness for high molecular weight PAHs.
		Soil Washing	Contaminants sorbed onto fine soil particles are separated from bulk soil in an aqueous-based system on the basis of particle size. The wash water may be augmented with a basic leaching agent, surfactant, pH adjustment, or chelating agent to help remove organic chemicals and heavy metals.	Retained.

Table 7-2. Initial Screening of Technologies for PAHs at the Former Storage Area (continued)

General Response Actions	Technology Type	Process Options	Description	Screening Results
		Solidification/ Stabilization	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization).	Not retained. This technology has limited effectiveness for PAHs.
	Ex Situ Thermal Treatment	Hot Gas Decontamination	The process involves raising the temperature of the contaminated equipment or material for a specified period of time. The gas effluent from the material is treated in an afterburner system to destroy all volatilized contaminants.	Not retained. The technology is specific to addressing contaminated equipment or material, as opposed to contaminated soil.
		Incineration	High temperatures, 870–1,200°C (1,600–2,200°F), are used to combust (in the presence of oxygen) organic constituents in hazardous waste.	Retained.
		Pyrolysis	Chemical decomposition is induced in organic material by heat in the absence of oxygen. Organic material is transformed into gaseous components and a solid residue (coke) containing fixed carbon and ash.	Retained.
		Thermal Treatment	Waste is heated in a mobile thermal treatment system to volatilize organic contaminants. The vapor emissions are treated using air filters, and the treated vapor is reused as an energy source for the operation of the thermal treatment system.	Retained.

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
CUG = Cleanup Goal.
FSA = Former Storage Area.
LUC = Land Use Control.
NCP = National Contingency Plan.
PAH = Polycyclic Aromatic Hydrocarbon.
PCB = Polychlorinated Biphenyl.
VOC = Volatile Organic Compound.

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Table 7-3. Detailed Screening of Technologies for Lead at the Former Incinerator Area

General Response Actions	Technology Type	Process Options	Effectiveness	Implementability	Cost	Screening Comments
No Action	None	None	Not effective. Exposure to contaminants left in place goes unsupervised and uncontrolled.	Easy to implement. No activities are implemented.	No cost. No activities driving cost.	Retained. Required by CERCLA.
Removal	Bulk Removal	Excavation and Off-Site Disposal	Effective. Once the contaminated soil is removed to achieve goals of a specific receptor, contaminant exposure to human health and the environment are eliminated for that receptor.	Moderately easy to implement. Technology has been implemented at the former RVAAP in the past. Equipment for implementation is readily available and disposal facilities are available within a reasonable distance.	Moderate cost.	Retained.
Treatment	In Situ Biological Treatment	Phytoremediation	Moderate to low effectiveness. Phytoremediation can be designed to address lead constituents; however, effectiveness is limited. The time required for phytoremediation to reduce lead concentrations in the soil may extend beyond desirable schedule for OHARNG to start using the site. Phytoremediation usually takes more than one growing season. This technology is currently at the demonstration stage and not widely recognized by regulators. Additionally, concentrations can be hazardous to plants and may be mobilized into groundwater or bioaccumulated in animals.	Easy to implement. Implementation of the technology is not equipment or energy intensive. However, the lead-contaminated area is heavily forested, which may prevent effective establishment of a plant community.	Moderate cost. The cost effectiveness increases as the remedial footprint increases. The area requiring an RA is small; therefore, there is not optimal cost effectiveness.	Not retained. The time required for phytoremediation to reduce lead concentrations in soil to below CUGs is not practical given the desired OHARNG schedule to begin using the site.
	Ex Situ Physical/ Chemical Treatment	Chemical Extraction	Moderate to low effectiveness. Inorganics are a main contaminant group for chemical extraction via acid extraction; however, any residual acid in treated soil would need to be neutralized.	Not easy to implement. Chemical extraction requires the use of specialized equipment that is not readily available.	High cost. Capital costs can be high, and the technology is more economical for larger sites.	Not retained. The volume of soil requiring an RA does not result in cost efficiency for this technology. The technology is not easy to implement, as extractors are not readily available.
		Soil Washing	Moderate effectiveness. Soil washing is more effective at reducing soil with high concentrations of contaminants (e.g., hazardous waste levels). Only a moderate reduction in concentration is required to achieve CUGs.	Not easy to implement. Treatability study may be required to demonstrate effectiveness, as complex waste mixtures (e.g., metals with organics) make formulating washing fluid difficult. Implementing a treatability study is not practical given the time constraints to transfer the site to NGB. An additional treatment step of washing the solvent (potentially a hazardous waste) will be required.	High cost. Soil washing is cost effective with high soil volumes. However, a relatively low volume of soil requires remediation.	Not retained. The quantity of soil requiring an RA does not result in cost efficiency for this technology.
		Solidification/ Stabilization	Effective. Lead-contaminated soil has been solidified and stabilized effectively in the past.	Implementable. This technology has vendors and services available for implementation.	Moderate cost.	Retained.

ARNG = Army National Guard.
CUG = Cleanup Goal.
OHARNG = Ohio Army National Guard.
RVAAP = Ravenna Army Ammunition Plant.

Table 7-4. Detailed Screening of Technologies for PAHs at the Former Storage Area

General Response Actions	Technology Type	Process Options	Effectiveness	Implementability	Cost	Screening Comments
No Action	None	None	Not effective. Exposure to contaminants left in place goes unsupervised and uncontrolled.	Easy to implement. No activities are implemented.	No cost. No activities driving cost.	Retained. Required by CERCLA.
Institutional Controls	Access Restrictions	LUCs with CERCLA 5-Year Reviews	Effective. Restricting exposure to contaminants is accomplished through training of people accessing the site. Enforcement comes from a Property Management Plan.	Easy to implement. LUCs and administrative controls currently take place at the former RVAAP. Most access to facility is by trained National Guardsmen. A facility fence deters trespassers. Five-year reviews are conducted at other AOCs.	Moderate cost.	Retained.
Removal	Bulk Removal	Excavation and Off-Site Disposal	Effective. Once the contaminated soil is removed to achieve goals of a specific Receptor, contaminant exposure to human health and the environment are eliminated for that receptor.	Moderately easy to implement. Technology has been implemented at the former RVAAP in the past. Equipment for implementation is readily available and disposal facilities are available within a reasonable distance.	Moderate cost.	Retained.
Treatment	In Situ Biological Treatment	Enhanced Bioremediation	Moderate effectiveness. Requires application and mixing of amendments in Situ for treatment.	Requires moderate effort for implementation. Long treatment times are required for reducing the high molecular weight PAH concentrations to below CUGs. These treatment times may extend beyond desirable schedule for OHARNG to start using the site.	Moderate cost.	Not retained. The time required for enhanced bioremediation to reduce PAH concentrations in soil to below CUGs is not practical given the desired OHARNG schedule to begin using the site.
		Phytoremediation	Moderate to low effectiveness. Phytoremediation can be designed to address PAH constituents; however, effectiveness is limited.	Easy to implement. Implementation of the technology is not equipment or energy intensive.	Moderate cost. The cost effectiveness increases as the remedial footprint increases.	Not retained. The time required for phytoremediation to reduce PAH concentrations in soil to below CUGs is not practical given the desired OHARNG schedule to begin using the site.
	Ex Situ Biological Treatment	Biopiles	Moderate to low effectiveness. Biopiles are generally applied to VOCs and fuel hydrocarbons. The effectiveness of this technology decreases when applied to PAHs.	Moderate to low implementability. The time required for implementing biopiles (including a treatability study) may extend beyond desirable schedule for the OHARNG to start using the site.	Moderate cost relative to anticipated soil quantity.	Not retained. Technology is not very effective for PAHs. Additionally, the time required for biopile treatment (including a treatability study) may extend beyond desirable schedule for the OHARNG to start using the site.
	Ex Situ Physical/ Chemical Treatment	Soil Washing	Moderate effectiveness. Soil washing is more effective at reducing soil with high concentrations of contaminants (e.g., hazardous waste levels). Only a moderate reduction in concentration is required to achieve CUGs.	Not easy to implement. Treatability study may be required to demonstrate effectiveness, as complex waste mixtures (e.g., metals with organics) make formulating washing fluid difficult. Implementing a treatability study is not practical given the time constraints to transfer the AOC to NGB. An additional treatment step of washing the solvent (potentially a hazardous waste) will be required. The technology has difficultly removing organics adsorbed onto clay-size particles.	High cost. Soil washing is cost effective with high soil volumes. However, a relatively low volume of soil requires remediation to attain Commercial/Industrial Land Use.	Not retained. A treatability study may be required to demonstrate effectiveness, as complex waste mixtures (e.g., metals with organics) make formulating washing fluid difficult. Implementing a treatability study is not practical given the time constraints to transfer the site to NGB.

Table 7-4. Detailed Screening of Technologies for PAHs at the Former Storage Area (continued)

General Response Actions	Technology Type	Process Options	Effectiveness	Implementability	Cost	Screening Comments
	Ex Situ Thermal Treatment	Incineration	Effective. PAHs are a main contaminant group for incineration.	Not easy to implement. Incineration uses combustors, fluidized beds, or kilns to combust the chemicals in soil. These are not readily available, nor would obtaining and installing the equipment be appropriate for a small removal quantity.	High cost. Incineration uses combustors, fluidized beds, or kilns to remediate the chemicals in soil. These are generally put in place for remediating large soil volumes and are not cost effective for the smaller volumes of soil requiring an RA.	Not retained. The technology is not easy to implement, as combustors, fluidized beds, or kilns are not readily available. There would be high cost relative to implementing incineration for the relatively small removal volume.
		Pyrolysis	Effective. PAHs are a main contaminant group for pyrolysis.	Not easy to implement. Pyrolysis uses kilns or furnaces to serve as a heating chamber for the contaminated soil. These are not readily available, nor would obtaining and installing a kiln or furnace be appropriate for a small removal quantity.	High cost. Pyrolysis includes a rotary kiln or fluidized bed furnace. These are generally put in place for remediating large soil volumes and are not cost effective for the smaller volumes of soil requiring an RA.	Not retained. The technology is not easy to implement, as kilns or furnaces are not readily available. There would be high cost relative to implementing pyrolysis for the relatively small removal volume.
		Thermal Treatment	Effective. Soil PAH concentrations can be reduced to low levels meeting unrestricted use criteria. It is a green and sustainable technology that minimizes secondary waste generation and reduces carbon footprint. Thermal treatment is not effective for inorganics such as lead.	Not easy to implement. However, the mobile treatment system is not as complex as the incineration or pyrolysis technology and can be easily mobilized on site.	High cost if mobilization is required for such a small quantity. Thermal treatment is cost-effective with high soil volumes; however, a relatively low volume of soil requires remediation. Cost can be considered low if an on-site treatment system is readily available.	Retained. The volume of soil requiring an RA does not result in cost efficiency for this technology. However, if a treatment system is readily available, this alternative can be feasible.

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act.
CUG = Cleanup Goal.
LUC = Land Use Control.
NGB = National Guard Bureau.
OHARNG = Ohio Army National Guard.
PAH = Polycyclic Aromatic Hydrocarbon.
RA = Remedial Action.
RVAAP = Ravenna Army Ammunition Plant.

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Table 7-5. 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 ARARs – 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 RI Report, FS, and PP.

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8.0 DEVELOPMENT, ANALYSIS, AND COMPARISON OF ALTERNATIVES – FORMER INCINERATOR AREA

As discussed in Section 4.1, the surface soil (0-1 ft bgs) samples collected within the designated FIA had lead concentrations of 1,200 mg/kg at ASYss-019M and 3,570J mg/kg at ASYsb-064. Both these results exceed the Resident Receptor CUG (400 mg/kg), Industrial Receptor CUG (800 mg/kg), and National Guard Trainee CUG (800 mg/kg). It is anticipated that implementation of any remedial alternative to address lead in surface soil will result in the area having concentrations below the Resident Receptor CUG. If the FIA surface soil is remediated such that the lead concentration is below the Resident Receptor CUG, the FIA will attain Unrestricted (Residential) Land Use.

8.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES

This section describes the remedial alternatives developed and retained from the initial and detailed technology screening process for the lead-contaminated soil within the FIA. The retained remedial alternatives are composed of implementable and cost-effective technology types and process options.

The retained remedial alternatives are:

- FIA Alternative 1: No Action.
- FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.
- FIA Alternative 3: Excavation and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.

A detailed description of each remedial alternative is provided in the following sections. These alternatives are developed assuming that the contaminated soil at the FIA would be characteristically hazardous. Given the large quantity of contaminated soil and considerations regarding generation of hazardous waste, an alternative to dispose of the soil as characteristically hazardous soil without treatment is not developed.

8.1.1 FIA Alternative 1: No Action

The no action alternative is required for evaluation under the NCP. This alternative is the baseline to which other remedial alternatives are compared. This alternative assumes all current actions (e.g., access restrictions and environmental monitoring) will be discontinued and no future actions will take place to protect human receptors or the environment. COCs at the FIA will not be removed or treated.

8.1.2 FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use

This alternative would include the removal, stabilization, and off-site disposal of surface soil containing lead at concentrations above the Resident Receptor CUG (400 mg/kg) to achieve Unrestricted (Residential) Land Use. The assumed extent of the excavation is presented in Figures 4-1 and 4-7. Implementation of FIA Alternative 2 would comprise excavation, stabilization, and off-site disposal of approximately 366 cubic yards of contaminated soil. The volume of contaminated soil being removed is presented in Table 5-2.

This remedial alternative will require coordinating remediation activities with Ohio EPA, OHARNG, and ARNG. Coordinating with stakeholders during implementation of the excavation will minimize health and safety risks to on-site personnel and potential disruptions of CJAG activities. Components of this remedial alternative include:

- Demolition and removal of the remaining structure of the former incinerator;
- Delineation/pre-excavation confirmation sampling;
- Waste characterization sampling;
- RD;
- Soil excavation, stabilization, and off-site disposal;
- Confirmation sampling of the excavation footprint; and
- Restoration.

8.1.2.1 <u>Demolition and Removal of Former Incinerator</u>

The former incinerator is within the area containing lead-contaminated soil. The former incinerator was used at the time Atlas Scrap Yard functioned as a construction camp. The outside structure associated with the former incinerator is still present, but other components associated with the incinerator have been razed.

The incinerator consists of a 12 ft long by 8 ft wide primary chamber that is empty. Attached to the primary chamber is a 3 ft long by 4 ft wide by 14 ft high chimney. Photographs depicting this former incinerator are shown in Figure 4-1.

As part of this remedial alternative, this incinerator will be demolished and removed, including the brick walls and mortar and railroad rails used in the ceiling and floor. An estimated 76 tons of material are assumed to be associated with this former incinerator.

In September 2018, OHARNG collected samples of the red brick, white brick, and grout from within the former incinerator for laboratory analysis of TCLP metals, PCBs, and asbestos. The TCLP and PCB results were below regulatory limits, and asbestos was not detected in the sampled material.

Other material within the incinerator, such as ash and brick within the primary chamber, will be segregated during demolition activities and sampled for additional waste characterization prior to disposal. For cost estimating purposes within this FS, it is assumed that the material associated with the incinerator can be disposed of as nonhazardous waste.

8.1.2.2 Delineation/Pre-Excavation Confirmation Sampling

To coincide with and support development of the RD, delineation/pre-excavation confirmation sampling will be conducted to confirm the limits of soil excavation. The extent of the area sampled will be, at a minimum, the area depicted as the FIA in Figure 4-1. This will also include the footprint of the demolished former incinerator. The delineation/pre-excavation sampling plan will be implemented with the intent of adequately defining the extent of soil requiring removal.

A delineation/pre-excavation confirmation sampling plan will be presented to ARNG and Ohio EPA for approval. This plan will present a scheme of discrete soil sample locations within the FIA to be analyzed for lead.

8.1.2.3 Waste Characterization Sampling

Using the "Rule of 20," which provides an estimate of TCLP concentrations based on total concentrations, this FS assumes the area requiring an RA at the FIA will require the soil to be disposed of as hazardous waste, unless otherwise tested or treated. The TCLP regulatory limits for disposing of lead-contaminated soil as hazardous waste is 5 mg/L. The concentrations of lead in the FIA indicate the soil may exceed this regulatory limit and would require disposal as hazardous waste unless treated. This alternative includes waste characterization sampling to verify this assumption; however, for purposes of this FS, it is assumed that the soil in the FIA would be considered characteristically hazardous waste.

Waste characterization samples will be collected from the FIA. The waste characterization samples will be collected as ISM samples from the areas undergoing this remedy to provide data to properly profile the waste and determine if it is characteristically non-hazardous or hazardous. Each ISM sample analysis may include, but is not limited to, TCLP metals, TCLP semi-volatile organic compounds (SVOCs), TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs.

8.1.2.4 Remedial Design

An RD will be developed prior to initiating RAs. The RD will contain the laboratory results of the delineation sampling and waste characterization sampling. Using the waste characterization results, a waste analysis plan will be included in the RD to describe the procedures the Army will carry out to comply with the treatment standards prior to disposal.

In addition, the RD will contain results from the most recent wetland delineation. In the event that wetlands will be disturbed during RA activities, the RD will provide requirements for wetland restoration and address any necessary notifications and permitting required.

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

8.1.2.5 <u>Soil Excavation, Stabilization, and Off-Site Disposal</u>

Prior to any ground disturbance, the excavation area will be surveyed and demarcated by stakes. Erosion control material, such as silt fences and straw bales, will be installed to minimize sediment runoff. Dust generation will be minimized during excavation activities by keeping equipment movement areas and excavation areas misted with water. The health and safety of remediation workers, on-site CJAG employees, and the general public will be covered in a site-specific Health and Safety Plan (HASP).

Soil removal will be accomplished using conventional construction equipment, such as backhoes, bulldozers, front-end loaders, and scrapers. Oversize debris will be crushed or otherwise processed to meet disposal facility requirements.

Soil will be transferred to a mixing area, where the stabilization agent will be added to the soil. The soil and stabilizing agent will be mixed in this area until a homogeneous mixture is achieved. Upon completion of the mixing phase, soil samples will be collected and undergo TCLP analysis.

Once the soil samples indicate the stabilized soil is considered non-hazardous, the Army will send a one-time written notice to the treatment, storage, or disposal facility receiving the waste, and place a copy in the generator's files. The notice will include the information in column B of Table 1 of OAC 3745-270-07A, this rule, and the following certification statement, signed by an authorized representative:

> "I certify under penalty of law that I personally have examined and am familiar with the waste, through analysis and testing or through knowledge of the waste, to support this certification that the waste complies with the treatment standards specified in rules 3745-270-40 to 3745-270-49 of the Administrative Code. I believe that the information I submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine and imprisonment."

The treated soil will be hauled by truck to a licensed and permitted disposal facility. All trucks will be inspected prior to exiting the AOC. Appropriate waste manifests will accompany each waste shipment. Only regulated and licensed transporters and vehicles will be used. All trucks will travel pre-designated routes within CJAG.

8.1.2.6 Confirmation Sampling of Excavation Footprint

Upon completing the excavation at the FIA, confirmatory ISM samples will be collected from the excavation floor and sidewalls to ensure contaminated soil has been successfully removed. ISM samples collected for confirmation will include 30 to 50 aliquots per sample and be collected in duplicate to achieve DQOs. The confirmatory soil samples will be analyzed for lead. The laboratory results will be compared to the Resident Receptor CUG (400 mg/kg), and additional excavation and soil stabilization will be conducted if the Resident Receptor CUG is not met. Once the laboratory analysis determines the lead concentration is below the Resident Receptor CUG, the FIA will meet requirements for Unrestricted (Residential) Land Use.

8.1.2.7 Restoration

Upon completing soil excavation, all disturbed and excavated areas will be backfilled with clean soil and graded to meet neighboring contours. The backfill soil will come from a clean source that was previously sampled and approved for use by Ohio EPA. Given that the contaminated soil is stabilized and the lead effectively remains in the soil, the treated soil will not be placed back in the excavation footprint. It is the ARNG's preference to bring in clean, new backfill.

After the area is backfilled and graded, workers will apply a seed mixture (as approved by OHARNG) and mulch. This includes using the CJAG's "emergent marsh" seed mixture in areas previously identified as wetlands. Restored areas will be inspected and monitored as required in the storm water best management practices established in the RD.

8.1.3 FIA Alternative 3: Excavation and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use

This alternative would include the removal and off-site disposal of surface soil containing lead at concentrations above the Resident Receptor CUG (400 mg/kg) to achieve Unrestricted (Residential) Land Use. The assumed extent of the excavation is presented in Figures 4-1 and 4-7. Implementation of FIA Alternative 3 would comprise excavation and off-site disposal of approximately 366 cubic yards of contaminated soil. The volume of contaminated soil being removed is presented in Table 5-2.

This remedial alternative will require coordinating remediation activities with Ohio EPA, OHARNG, and ARNG. Coordinating with stakeholders during implementation of the excavation will minimize health and safety risks to on-site personnel and potential disruptions of CJAG activities. Components of this remedial alternative include:

- Demolition and removal of the remaining structure of the former incinerator,
- Delineation/pre-excavation confirmation sampling,
- Waste characterization sampling,
- RD,
- Soil excavation and off-site disposal,

- Confirmation sampling of the excavation footprint, and
- Restoration.

8.1.3.1 Demolition and Removal of Former Incinerator

The former incinerator is within the area containing lead-contaminated soil. The former incinerator was used at the time Atlas Scrap Yard functioned as a construction camp. The outside structure associated with the former incinerator is still present, but other components associated with the incinerator have been razed.

The incinerator consists of a 12 ft long by 8 ft wide primary chamber that is empty. Attached to the primary chamber is a 3 ft long by 4 ft wide by 14 ft high chimney. Photographs depicting this former incinerator are shown in Figure 4-1.

As part of this remedial alternative, this incinerator will be demolished and removed, including the brick walls and mortar and railroad ties used in the ceiling and floor. An estimated 76 tons of material are assumed to be associated with this former incinerator.

In September 2018, OHARNG collected samples of the red brick, white brick, and grout from within the former incinerator for laboratory analysis of TCLP metals, PCBs, and asbestos. The TCLP and PCB results were below regulatory limits, and asbestos was not detected in the sampled material.

Other material within the incinerator such as ash brick within the primary chamber will be segregated during demolition activities and sampled for additional waste characterization prior to disposal. For cost estimating purposes within this FS, it is assumed that the material associated with the incinerator can be disposed of as nonhazardous waste.

8.1.3.2 Delineation/Pre-Excavation Confirmation Sampling

To coincide with and support development of the RD, delineation/pre-excavation confirmation sampling will be conducted to confirm the limits of soil excavation. The extent of the area sampled will be, at a minimum, the area depicted as the FIA in Figure 4-1. This will also include the footprint of the demolished former incinerator. The delineation/pre-excavation sampling plan will be implemented with the intent of adequately defining the extent of soil requiring removal.

A delineation/pre-excavation confirmation sampling plan will be presented to ARNG and Ohio EPA for approval. This plan will present a scheme of discrete soil sample locations within the FIA to be analyzed for lead.

8.1.3.3 Waste Characterization Sampling

Using the "Rule of 20," which provides an estimate of TCLP concentrations based on total concentrations, this FS assumes the area requiring an RA at the FIA will require the soil to be disposed of as hazardous waste, unless otherwise tested or treated. The TCLP regulatory limits for disposing of lead-contaminated soil as hazardous waste is 5 mg/L. The concentrations of lead in the FIA indicate the soil may exceed this regulatory limit and would require disposal as hazardous waste unless treated. This alternative includes waste characterization sampling to verify this assumption; however, for purposes of this FS, it is assumed that the soil in the FIA would be considered characteristically hazardous waste.

Waste characterization samples will be collected from the FIA. The waste characterization samples will be collected as ISM samples from the areas undergoing this remedy to provide data to properly profile the waste and determine if it is characteristically non-hazardous or hazardous. Each ISM sample analysis may include, but is not limited to, TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs.

8.1.3.4 Remedial Design

An RD will be developed prior to initiating RAs. The RD will contain the laboratory results of the delineation sampling and waste characterization sampling. Using the waste characterization results, a waste analysis plan will be included in the RD to describe the procedures the Army will carry out to comply with the treatment standards prior to disposal.

In addition, the RD will contain results from the most recent wetland delineation. In the event that wetlands will be disturbed during RA activities, the RD will provide requirements for wetland restoration and address any necessary notifications and permitting required.

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

8.1.3.5 Soil Excavation and Off-Site Disposal

Prior to any ground disturbance, the excavation area will be surveyed and demarcated by stakes. Erosion control material, such as silt fences and straw bales, will be installed to minimize sediment runoff. Dust generation will be minimized during excavation activities by keeping equipment movement areas and excavation areas misted with water. The health and safety of remediation workers, on-site CJAG employees, and the general public will be covered in a site-specific HASP.

Soil removal will be accomplished using conventional construction equipment, such as backhoes, bulldozers, front-end loaders, and scrapers. Oversize debris will be crushed or otherwise processed to meet disposal facility requirements. If the contaminated soil does not meet the treatment standards, with the initial shipment of waste to each treatment or storage facility, the Army will send a one-time written notice to each treatment or storage facility receiving the waste, as presented in Table 1 of 3745-270-07A.

The excavated soil will be hauled by truck to a licensed and permitted disposal facility to accept hazardous waste. All trucks will be inspected prior to exiting the AOC. Appropriate waste manifests will accompany each waste shipment. Only regulated and licensed transporters and vehicles will be used. All trucks will travel pre-designated routes within CJAG.

8.1.3.6 Confirmation Sampling of Excavation Footprint

Upon completing the excavation at the FIA, confirmatory ISM samples will be collected from the excavation floor and sidewalls to ensure contaminated soil has been successfully removed. ISM samples collected for confirmation will include 30 to 50 aliquots per sample and be collected in duplicate to achieve DQOs. The confirmatory soil samples will be analyzed for lead. The laboratory results will be compared to the Resident Receptor CUG (400 mg/kg), and additional excavation and soil stabilization will be conducted if the Resident Receptor CUG is not met. Once the laboratory analysis determines the lead concentration is below the Resident Receptor CUG, the FIA will meet requirements for Unrestricted (Residential) Land Use.

8.1.3.7 Restoration

Upon completing soil excavation, all disturbed and excavated areas will be backfilled with clean soil and graded to meet neighboring contours. The backfill soil will come from a clean source that was previously sampled and approved for use by Ohio EPA.

After the area is backfilled and graded, workers will apply a seed mixture (as approved by OHARNG) and mulch. This includes using CJAG's "emergent marsh" seed mixture in areas previously identified as wetlands. Restored areas will be inspected and monitored as required in the storm water best management practices established in the RD.

8.2 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This section presents a detailed analysis of the viable remedial alternatives retained and developed throughout the technology screening process. A detailed analysis of each alternative against the threshold and balancing criteria is contained in the following sections. The detailed analysis further defines each alternative (if necessary), compares the alternatives against one another, and presents considerations common to the alternatives.

As presented in Section 8.1, the following remedial alternatives were retained for Atlas Scrap Yard:

- FIA Alternative 1: No Action.
- FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the Former Incinerator Area – Attain Unrestricted (Residential) Land Use.
- FIA Alternative 3: Excavation and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.

8.2.1 FIA Alternative 1: No Action

This alternative involves no RAs to prevent exposure to soil containing the COCs. The NCP requires that the no action alternative be evaluated to establish a baseline for comparison with other alternatives, especially in terms of cost and protection to human health and the environment.

8.2.1.1 Overall Protection of Human Health and the Environment

The no action alternative would not provide any protection because no RAs would be implemented to prevent the potential exposure to soil COCs.

8.2.1.2 Compliance with ARARs

Potential ARARs for remediating soil at Atlas Scrap Yard are presented in Section 6.0. Because no action would be taken to address the contamination, FIA Alternative 1 would not meet any ARARs and is considered not compliant.

8.2.1.3 Long-Term Effectiveness and Permanence

This alternative does not provide long-term effectiveness and permanence. There would be no reduction in the potential for exposure because no RA would be implemented, and there is no concern about the adequacy and reliability of controls because none would be applied.

8.2.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

FIA Alternative 1 will not reduce the toxicity, mobility, or volume of COCs. This alternative will not remove or treat soil with concentrations of COCs above CUGs.

8.2.1.5 Short-Term Effectiveness

FIA Alternative 1 will have no additional short-term health risks to the community, remediation workers, or the environment. This remedial alternative will offer no short-term benefits or progress to achieve the RAO.

8.2.1.6 Implementability

Since it does not change the existing condition at the FIA, this alternative will not require any additional effort to implement.

8.2.1.7 Cost

The present value cost to complete FIA Alternative 1 is $0. No capital and O&M costs are associated with this alternative.

8.2.2 FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use

FIA Alternative 2 will achieve Unrestricted (Residential) Land Use by implementing excavation, stabilization, and off-site disposal of lead-contaminated soil from the FIA. The excavated soil will be stabilized to non-hazardous criteria and transported to an off-site permitted disposal facility. Upon the stabilization and removal of the contaminated soil, no land use controls (LUCs) will be required for Unrestricted (Residential) Land Use.

8.2.2.1 Overall Protection of Human Health and the Environment

This alternative would provide adequate protection of human health and the environment through the stabilization and removal of lead-contaminated soil above the Resident Receptor CUG. Following the implementation of this alternative, the unacceptable human health risks associated with the Resident Receptor would be eliminated. Removing the lead-contaminated soil from the FIA, as described in the remedial alternative, results in the FIA being protective of human health for Unrestricted (Residential) Land Use.

8.2.2.2 Compliance with ARARs

No identified chemical-specific ARARs exist for FIA Alternative 2. FIA Alternative 2 would meet requirements of location-specific ARARs by conducting a wetland delineation and restore and disturbed wetland with CJAG's "emergent marsh" seed mixture. FIA Alternative 2 would meet requirements of action-specific ARARs for excavating soil presented in Section 6.0. Those requirements identified as ARARs deal primarily with characterizing, managing, and disposing of contaminated soil generated from excavation. Disturbing the soil will also trigger ARARs for controlling fugitive dust emissions and potentially erosion control measures.

8.2.2.3 Long-Term Effectiveness and Permanence

This alternative would provide a high degree of long-term effectiveness and permanence. Soil from the FIA will be excavated, stabilized, and transported to an off-site disposal facility to result in Unrestricted (Residential) Land Use, thereby mitigating risks to human health and the environment. Consequently, LUCs are not required after removal activities are complete. No CERCLA 5-year reviews or O&M sampling are required.

8.2.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

FIA Alternative 2 will involve on-site treatment of soil at the FIA. This alternative will reduce the toxicity and mobility of lead through treatment.

8.2.2.5 Short-Term Effectiveness

Potential short-term worker and community exposures associated with FIA Alternative 2 will exist. Short-term impact to on-site workers from safety hazards associated with the soil removal process would be mitigated and addressed in a HASP.

The community near the excavation area and along the route to the disposal facility may be exposed during removal and transportation activities, if needed. Environmental risks to the community would be minimal due primarily to the transportation of contaminated soil on public roads. Proper soil handling techniques would be implemented to prevent or minimize adverse environmental impacts due to soil erosion or soil transport.

8.2.2.6 Implementability

FIA Alternative 2 is technically and administratively feasible. Excavation is a commonly used remedial technology for addressing contaminated soil and, therefore, services and materials required for this alternative are readily available. In addition, stabilization agents are common and successfully used to address lead-contaminated soil. Multiple off-site disposal facilities will be available to accept generated waste. Resources (e.g., equipment, material, trained personnel) to implement this alternative will be readily available. All services and materials required for the implementation of this alternative are readily available.

8.2.2.7 Cost

The present value cost to complete FIA Alternative 2 is approximately $235,655 (in base year 2018 dollars). Appendix B provides a detailed description of FIA Alternative 2 costs.

8.2.3 FIA Alternative 3: Excavation and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use

FIA Alternative 3 will achieve Unrestricted (Residential) Land Use by implementing excavation and off-site disposal of lead-contaminated soil from the FIA. The excavated soil will be transported to an off-site disposal facility permitted to accept hazardous waste. Upon removal of the contaminated soil, no LUCs will be required for Unrestricted (Residential) Land Use.

8.2.3.1 Overall Protection of Human Health and the Environment

This alternative would provide adequate protection of human health and the environment through the removal of lead-contaminated soil above the Resident Receptor CUG. Following the implementation of this alternative, the unacceptable human health risks associated with the Resident Receptor would be eliminated. Removing the lead-contaminated soil from the FIA, as described in the remedial alternative, results in the FIA being protective of human health for Unrestricted (Residential) Land Use.

8.2.3.2 Compliance with ARARs

No identified chemical-specific ARARs exist for FIA Alternative 3. FIA Alternative 3 would meet requirements of location-specific ARARs by conducting a wetland delineation and restore and disturbed wetland with CJAG's "emergent marsh" seed mixture. FIA Alternative 3 would meet requirements of action-specific ARARs for excavating soil presented in Section 6.0. Those requirements identified as ARARs deal primarily with characterizing, managing, and disposing of contaminated soil generated from excavation. Disturbing the soil will also trigger ARARs for controlling fugitive dust emissions and potentially erosion control measures.

8.2.3.3 Long-Term Effectiveness and Permanence

This alternative would provide a high degree of long-term effectiveness and permanence. Soil from the FIA will be excavated and transported to an off-site disposal facility to result in Unrestricted (Residential) Land Use, thereby mitigating risks to human health and the environment. Consequently, LUCs are not required after removal activities are complete. No CERCLA 5-year reviews or O&M sampling are required.

8.2.3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

FIA Alternative 3 does not involve on-site treatment of soil at the FIA. This alternative does not reduce the toxicity and mobility of lead through treatment.

8.2.3.5 Short-Term Effectiveness

Potential short-term worker and community exposures associated with FIA Alternative 3 will exist. Short-term impact to on-site workers from safety hazards associated with the soil removal process would be mitigated and addressed in a HASP.

The community near the excavation area and along the route to the disposal facility may be exposed during removal and transportation activities, if needed. Environmental risks to the community would be minimal due primarily to the transportation of contaminated soil on public roads. Proper soil handling techniques would be implemented to prevent or minimize adverse environmental impacts due to soil erosion or soil transport.

8.2.3.6 Implementability

FIA Alternative 3 is technically and administratively feasible. Excavation is a commonly used remedial technology for addressing contaminated soil and, therefore, services and materials required for this alternative are readily available. Resources (e.g., equipment, material, trained personnel) to implement this alternative will be readily available. All services and materials required for the implementation of this alternative are readily available.

8.2.3.7 Cost

The present value cost to complete FIA Alternative 3 is approximately $372,578 (in base year 2018 dollars). Appendix B provides a detailed description of FIA Alternative 3 costs.

8.3 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

FIA Alternative 1 is not protective of human health and is not compliant with ARARs. In addition, FIA Alternative 1 does not meet the RAO to prevent Resident Receptor exposure to surface soil (0-1 ft bgs) with concentrations of lead above 400 mg/kg at the FIA. Therefore, FIA 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 satisfies the threshold criteria. The remaining alternatives are scored amongst one another for each of the balancing criteria and a total score is generated. This score is presented in Table 8-1.

FIA Alternative 2 scores the highest and is the recommended alternative. Both FIA Alternative 2 and FIA Alternative 3 are effective in the long term, as the contaminants will be removed from the site. FIA Alternative 2 is a green and highly sustainable alternative for on-site treatment and stabilization of the lead-contaminated soil, and this alternative reduces the mobility of the contaminants that will be disposed of in an off-site facility. FIA Alternative 2 is technically and administratively feasible, as excavation and stabilization agents are common and successfully used to address lead-contaminated soil. Multiple off-site disposal facilities will be available to accept generated waste. With the lower costs and rationale provided above, FIA Alternative 2 is the recommended alternative for the FIA.

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Table 8-1. Comparative Analysis of Former Incinerator Area Remedial Alternatives

NCP Evaluation Criteria	FSA Alternative 1: No Action	FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use	FIA Alternative 3: Excavation and Off-Site Disposal of Surface Soil at the FIA – 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	2	1
4. Reduction of Toxicity, Mobility, or Volume Through Treatment	Not applicable	2	1
5. Short-Term Effectiveness	Not applicable	2	1
6. Implementability	Not applicable	1	2
7. Cost	Not applicable ($0)	2 ($235,655)	1 ($372,578)
Balancing Criteria Score	*Not applicable*	*9*	*6*

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.

FIA = Former Incinerator Area.

FSA = Former Storage Area.

NCP = National Contingency Plan.

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9.0 DEVELOPMENT, ANALYSIS, AND COMPARISON OF ALTERNATIVES – FORMER STORAGE AREA

As discussed in Section 4.2, the FSA surface soil (0-1 ft bgs) has widespread PAH COC exceedances of the Resident Receptor CUG. These PAH COCs consist of benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene. If the FSA surface soil is remediated such that these PAH COCs are below the Resident Receptor CUGs, the FSA will attain Unrestricted (Residential) Land Use.

The benzo(a)pyrene concentration at ISM sample location ASYss-126M was 50J mg/kg, which exceeded the Resident Receptor CUG (1.1 mg/kg), Industrial Receptor CUG (21 mg/kg), and National Guard Trainee CUG (4.77 mg/kg). While the FSA had multiple sample locations with PAH COCs exceeding the Resident Receptor CUGs, ASYss-126M was the only sample location with a PAH COC that exceeded the Industrial Receptor and National Guard Trainee CUGs. If ASYss-126M is remediated such that the benzo(a)pyrene is below the Industrial Receptor CUG (21 mg/kg), the FSA will attain Commercial/Industrial Land Use.

9.1 DEVELOPMENT OF REMEDIAL ALTERNATIVES

This section describes the remedial alternatives for the FSA developed and retained from the initial and detailed technology screening process. The retained remedial alternatives are composed of implementable and cost-effective technology types and process options that address the surface soil (0-1 ft bgs) PAH COCs.

The retained remedial alternatives are:

- FSA Alternative 1: No Action.
- FSA Alternative 2: Excavation and Off-Site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use.
- FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use.
- FSA Alternative 4: Excavation and Off-Site Disposal of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use.
- FSA Alternative 5: Ex Situ Thermal Treatment of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use.

A detailed description of each remedial alternative is provided in the following sections.

9.1.1 FSA Alternative 1: No Action

The no action alternative is required for evaluation under the NCP. This alternative is the baseline to which other remedial alternatives are compared. This alternative assumes all current actions (e.g., access restrictions and environmental monitoring) will be discontinued and no future actions will take place to protect human receptors or the environment. PAH COCs at the FSA will not be removed or treated.

9.1.2 FSA Alternative 2: Excavation and Off-Site Disposal of ASYss-126M – Attain Commercial/Industrial Land Use

This alternative includes the removal and off-site disposal of surface soil containing PAH COCs at concentrations above the Industrial Receptor CUGs to achieve Commercial/Industrial Land Use. The extent of the excavation is sample area for ASYss-126M, as presented in Figure 4-5. Implementation of FSA Alternative 2 would result in excavation and off-site disposal of approximately 473 cubic yards of surface soil (0-1 ft bgs). The volume of soil being removed from each area in presented in Table 5-4.

Under this alternative, PAH COCs will remain on site that exceed the Resident Receptor CUG; therefore, this alternative also will rely on LUCs to prevent Resident Receptor exposure to contaminants in surface soil (0-1 ft bgs) in those areas. It will be the ARNG/OHARNG's responsibility to implement, inspect, maintain, and enforce LUCs at the former RVAAP. This remedial alternative requires coordinating remediation activities with Ohio EPA, OHARNG, and ARNG. Coordinating with stakeholders during implementation of the excavation minimizes health and safety risks to on-site personnel and potential disruptions of CJAG activities. Components of this remedial alternative include:

- Waste characterization sampling,
- RD,
- Soil excavation and off-site disposal,
- Confirmation sampling,
- Restoration,
- LUC RD, and
- Five-year reviews.

9.1.2.1 Waste Characterization Sampling

Waste characterization samples will be collected from ASYss-126M prior to removal. The waste characterization samples will be collected to provide data to properly profile the waste and determine if it is characteristically non-hazardous or hazardous. Each ISM sample analysis may include (but is not limited to) TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs.

9.1.2.2 Remedial Design

An RD will be developed prior to initiating RAs. The RD will contain the laboratory results of the waste characterization sampling. In addition, the RD will contain results from the most recent wetland delineation. In the event that wetlands will be disturbed during RA activities, the RD will provide requirements for wetland restoration and address any necessary notifications and permitting required.

This RD will 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. Engineering and administrative controls (e.g., erosion controls, health and safety controls) will be developed during the active construction period to ensure remediation workers and the environment are protected.

9.1.2.3 Soil Excavation and Disposal

Prior to any ground disturbance, the excavation area at ASYss-126M will be surveyed and demarcated by stakes. Erosion control material, such as silt fences and straw bales, will be installed to minimize sediment runoff. Dust generation will be minimized during excavation activities by keeping equipment movement areas and excavation areas misted with water. The health and safety of remediation workers, on-site CJAG employees, and the general public will be covered in a site-specific HASP.

Soil removal will be accomplished using conventional construction equipment, such as backhoes, bulldozers, front-end loaders, and scrapers. Oversize debris will be crushed or otherwise processed to meet disposal facility requirements. Excavated soil will be segregated if certain areas have different soil characteristics. The soil will be hauled by truck to a licensed and permitted disposal facility. All trucks will be inspected prior to exiting Atlas Scrap Yard. Appropriate waste manifests will accompany each waste shipment. Only regulated and licensed transporters and vehicles will be used. All trucks will travel pre-designated routes within CJAG.

9.1.2.4 Confirmation Sampling

Upon completing the surface soil excavation at ASYss-126M, confirmatory ISM samples will be collected from the excavation floor and sidewalls to ensure contaminated soil has been successfully removed. ISM samples collected for confirmation will include 30 to 50 aliquots per sample and be collected in duplicate to achieve DQOs. The confirmatory soil samples will be analyzed for benzo(a)pyrene. The laboratory results will be compared to the Industrial Receptor CUG for benzo(a)pyrene (21 mg/kg), and additional excavation will be conducted if the confirmation samples exceeds this CUG. Once the laboratory analysis determines the benzo(a)pyrene concentration of the final excavation is below the Industrial Receptor CUG, the FSA will meet requirements for Commercial/Industrial Land Use.

9.1.2.5 Restoration

Upon completing soil excavation, all disturbed and excavated areas will be backfilled with clean soil and graded to meet neighboring contours. The backfill soil will come from a clean source that was previously sampled and approved for use by Ohio EPA. After the area is backfilled and graded, workers will apply a seed mixture (as approved by OHARNG) and mulch. This includes using CJAG's "emergent marsh" seed mixture in areas previously identified as wetlands. Restored areas will be inspected and monitored as required in the storm water best management practices established in the RD.

9.1.2.6 Land Use Control Remedial Design

PAH COCs will remain on site above the Resident Receptor CUGs in the FSA; therefore, this alternative will also rely on LUCs to prevent Resident Receptor exposure to PAH COCs in the FSA. As an attachment to the Remedial Action Completion Report, a LUC RD will be developed to present the site's Land Use, activities, RAOs, and LUC requirements for the FSA. The LUC requirements will include annual inspections and CERCLA 5-year reviews.

This information will be presented in an attachment to the Property Management Plan (PMP). The PMP identifies LUCs and restrictions for specific AOCs/munitions response sites (MRSs) within the former RVAAP. The procedures within the PMP are intended to comply with the U.S. Department of Defense (DoD) Manual, Defense Environmental Restoration Program Management, Number 4715.20, March 9, 2012 (DoD Office of the Under Secretary of Defense for Acquisition, Technology and Logistics), and Ohio Revised Code 5913.10.

9.1.2.7 Five-Year Reviews

CERCLA Section 121(c) 5-year reviews will be conducted for the FSA to assess the effectiveness of the LUCs and whether a need to modify the LUCs exists. ARNG/OHARNG will verify whether the LUCs continue to be properly documented and maintained. Each review of the remedy will evaluate whether Land Use has changed. If the risk levels have changed since initial LUC implementation, LUC modifications will be considered, which may include a change in monitoring frequency. A 5-year review report will be submitted.

9.1.3 FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use

This alternative would utilize ex situ thermal treatment for surface soil (0-1 ft bgs) at ASYss-126M to reduce the benzo(a)pyrene concentration to below the Industrial Receptor CUG (21 mg/kg). Implementing this remedial technology will attain Commercial/Industrial Land Use. Implementation of FSA Alternative 3 would result in thermal treatment of 473 cubic yards of soil.

Under this alternative, PAH COCs will remain on site that exceed the Resident Receptor CUG; therefore, this alternative also will rely on LUCs to prevent Resident Receptor exposure to contaminants in surface soil (0-1 ft bgs) in those areas. ARNG/OHARNG will be responsible for implementing, inspecting, maintaining, and enforcing LUCs at the former RVAAP. This remedial alternative requires coordinating remediation activities with Ohio EPA, OHARNG, and ARNG. Coordinating with stakeholders during implementation of the excavation minimizes health and safety risks to on-site personnel and potential disruptions of CJAG activities. Components of this remedial alternative include:

- RD,
- Thermal treatment of soil,
- Confirmation sampling,

- Restoration,
- LUC RD, and
- Five-year reviews.

9.1.3.1 Remedial Design

An RD will be developed prior to initiating RAs. The RD will contain results from the most recent wetland delineation. In the event that wetlands will be disturbed during RA activities, the RD will provide requirements for wetland restoration and address any necessary notifications and permitting required.

This RD will 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. Engineering and administrative controls (e.g., erosion controls, health and safety controls) will be developed during the active construction period to ensure remediation workers and the environment are protected. In addition to the RD elements discussed for FSA Alternative 2, design will include details of the thermal desorption system.

9.1.3.2 Thermal Treatment of Soil

The contaminated soil at ASYss-126M will undergo ex situ thermal treatment. The treatment system, such as the Vapor Energy Generator (VEG©) treatment system, will be pre-heated to the optimal treatment temperature based on results of past bench- and pilot-scale tests previously conducted using the VEG© system at the former RVAAP. While the system is being heated, soil will be excavated using conventional construction equipment, such as backhoes, bulldozers, front-end loaders, and scrapers, and will be stockpiled immediately adjacent to the treatment system into approximately 50-yd^3 piles.

Once the treatment system is at the optimal treatment temperature, contaminated soil will be fed directly into the fully enclosed, preheated chamber by being placed onto a conveyor. Steam at 1,300°F is fed into the renewal/treatment chamber, where it serves as the heat source for thermal treatment of soils. As the soil moves through the system via a rotational auger, the soil contaminants will be desorbed at specified temperatures and residence times and will be passed as vapors into the box head space within the enclosed chamber.

The PAH vapors will then be subject to a patented filter/scrubber system to remove the acidic gases (i.e., nitrous oxides, sulfur oxides, hydrogen chloride) and carbon dioxide components, using an engineered mixture of sodium hydroxide, lime, zero valent iron, steam, and water within a slender packed column. Induced vapors from the contaminated soils will be routed through this filtration system, allowing for full treatment of acidic gases, SVOC vapors, and conversion of any remaining vapors into a synthetic gas. This synthetic gas will be used as a renewable source of fuel to replace the propane used initially to generate steam and to continue operating the VEG© treatment system.

Relying on this fully enclosed looping system, no emissions to the atmosphere have occurred, and the limited carbon dioxide generated through the process may be further reduced (by some 90% to levels below background) using the water-lime component of the patented filtration process. After treatment, the soil will be stockpiled into approximately 50-yd^3 stockpiles on tarp and covered with plastic sheeting.

9.1.3.3 **Confirmation Sampling**

Confirmatory ISM samples will be collected from the excavation floor and sidewalls to ensure contaminated soil has been successfully removed. ISM samples collected for confirmation will include 30 to 50 aliquots per sample and be collected in duplicate to achieve DQOs. The confirmatory soil samples will be analyzed for benzo(a)pyrene. The laboratory results will be compared to the Industrial Receptor CUG for benzo(a)pyrene (21 mg/kg), and additional excavation will be conducted if the confirmation samples exceeds this CUG.

Upon completing the thermal treatment of soil, soil samples will be collected from the individual stockpiles to ensure contaminated soils have been successfully treated to PAH concentrations below the CUGs. The confirmatory soil samples will be analyzed for benzo(a)pyrene. The laboratory results will be compared to the Industrial Receptor CUG for benzo(a)pyrene (21 mg/kg). Once the laboratory analysis determines that benzo(a)pyrene concentration in the stockpiles is below the Industrial Receptor CUG, the treated soil will be used for backfill and site restoration. Should confirmation samples indicate that benzo(a)pyrene in the surface soil is not sufficiently treated, the soil will be rerun through the thermal treatment system, likely at a higher temperature, until the target post-treatment levels are reached.

Once the laboratory analysis determines the benzo(a)pyrene concentration of the thermally treated soil and the final excavation footprint are below the Industrial Receptor CUG, the FSA will meet requirements for Commercial/Industrial Land Use.

9.1.3.4 **Restoration**

Upon confirming that the treated soil is below the Industrial Receptor CUG for benzo(a)pyrene, all treated soil will 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 will be placed on the treated soil. After the area is backfilled and graded, workers will apply a seed mixture (as approved by OHARNG) and mulch. This includes using CJAG's "emergent marsh" seed mixture in areas previously identified as wetlands. Restored areas will be inspected and monitored as required in the storm water best management practices established in the RD.

9.1.3.5 **Land Use Control Remedial Design**

PAH COCs will remain on site above the Resident Receptor CUGs in the FSA; therefore, this alternative will also rely on LUCs to prevent Resident Receptor exposure to COCs in the FSA. A LUC

RD will be developed to present the site's Land Use, activities, RAOs, and LUC requirements for the FSA. The LUC requirements will include annual inspections and CERCLA 5-year reviews.

This information will be presented in an attachment to the PMP. The PMP identifies LUCs and restrictions for specific AOCs/MRSs within the former RVAAP. The procedures within the PMP are intended to comply with the DoD Manual, Defense Environmental Restoration Program Management, Number 4715.20, March 9, 2012 (DoD Office of the Under Secretary of Defense for Acquisition, Technology and Logistics), and Ohio Revised Code 5913.10.

9.1.3.6 Five-Year Reviews

CERCLA Section 121(c) 5-year reviews will be conducted for the FSA to assess the effectiveness of the LUCs and whether a need to modify the LUCs exists. ARNG/OHARNG will verify whether the LUCs continue to be properly documented and maintained. Each review of the remedy will evaluate whether Land Use has changed. If the risk levels have changed since initial LUC implementation, LUC modifications will be considered, which may include a change in monitoring frequency. A 5-year review report will be submitted.

9.1.4 FSA Alternative 4: Excavation and Off-Site Disposal of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use

This alternative includes the removal and off-site disposal of surface soil (0-1 ft bgs) within the FSA containing COCs at concentrations above the Residential CUGs. This alternative will achieve Unrestricted (Residential) Land Use; therefore, LUCs will not be required for any receptor upon completion of the excavation and disposal activities. The assumed extent of the excavation is the entirety of the FSA, as presented in Figure 4-6. Implementation of FSA Alternative 4 would result in excavation and off-site disposal of approximately 30,505 cubic yards of soil. The volume of soil being removed from each area in presented in Table 5-3.

This remedial alternative will require coordinating remediation activities with Ohio EPA, OHARNG, and ARNG. Coordinating with stakeholders during implementation of the excavation will minimize health and safety risks to on-site personnel and potential disruptions of CJAG activities. The time period to complete this RA is relatively short and will not require long-term management of the FSA associated with LUCs because the Unrestricted (Residential) Land Use scenario will be achieved. Components of this remedial alternative include:

- Delineation/pre-excavation confirmation sampling,
- Waste characterization sampling,
- RD,
- Soil excavation and off-site disposal,
- Confirmation sampling, and
- Restoration.

9.1.4.1 Delineation Sampling

To coincide with and support development of the RD, delineation/pre-excavation confirmation sampling will be conducted to confirm the limits of the soil requiring excavation/treatment. The delineation/pre-excavation sampling plan will be implemented with the intent of adequately defining the extent of soil requiring excavation/treatment.

A delineation/pre-excavation confirmation sampling plan will be presented to the ARNG and Ohio EPA for approval. This plan will present a scheme of discrete soil sample locations within the FSA to be analyzed for PAH COCs.

9.1.4.2 Waste Characterization Sampling

Waste characterization samples will be collected from the FSA prior to removal. The waste characterization samples will be collected to provide data to properly profile the waste and determine if it is characteristically non-hazardous or hazardous. Each ISM sample analysis may include, but is not limited to, TCLP metals, TCLP SVOCs, TCLP pesticides, TCLP herbicides, reactive cyanide, reactive sulfide, and PCBs.

9.1.4.3 Remedial Design

An RD will be developed prior to initiating RAs. The RD will contain the laboratory results of the delineation sampling and waste characterization sampling. In addition, the RD will contain results from the most recent wetland delineation. In the event that wetlands will be disturbed during RA activities, the RD will provide requirements for wetland restoration and address any necessary notifications and permitting required.

This RD will 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. Engineering and administrative controls (e.g., erosion controls, health and safety controls) will be developed during the active construction period to ensure remediation workers and the environment are protected.

9.1.4.4 Soil Excavation and Disposal

Prior to any ground disturbance, the excavation area will be surveyed and demarcated by stakes. Erosion control material, such as silt fences and straw bales, will be installed to minimize sediment runoff. Dust generation will be minimized during excavation activities by keeping equipment movement areas and excavation areas misted with water. The health and safety of remediation workers, on-site CJAG employees, and the general public will be covered in a site-specific HASP.

Soil removal will be accomplished using conventional construction equipment, such as backhoes, bulldozers, front-end loaders, and scrapers. Oversize debris will be crushed or otherwise processed to meet disposal facility requirements. Excavated soil will be segregated if certain areas have different soil characteristics. The soil will be hauled by truck to a licensed and permitted disposal facility. All trucks will be inspected prior to exiting Atlas Scrap Yard. Appropriate waste manifests will accompany each waste shipment. Only regulated and licensed transporters and vehicles will be used. All trucks will travel pre-designated routes within CJAG.

9.1.4.5 Confirmation Sampling

Upon completing the surface soil excavation at the FSA, confirmatory ISM samples will be collected from the excavation floor and sidewalls to ensure contaminated soil has been successfully removed. ISM samples collected for confirmation will include 30 to 50 aliquots per sample and be collected in duplicate to achieve DQOs. The confirmatory soil samples will be analyzed for the PAH COCs. The laboratory results will be compared to the Resident Receptor CUGs, and additional excavation will be conducted if the confirmation sample exceeds this CUG. Once the laboratory analysis determines the PAH COC concentrations of the final excavation are below the Resident Receptor CUG, the FSA will meet requirements for Unrestricted (Residential) Land Use.

9.1.4.6 Restoration

Workers will apply a seed mixture (as approved by OHARNG) and mulch. This includes using CJAG's "emergent marsh" seed mixture in areas previously identified as wetlands. Restored areas will be inspected and monitored as required in the storm water best management practices established in the RD.

9.1.5 FSA Alternative 5: Ex Situ Thermal Treatment of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use

This alternative would utilize ex situ thermal treatment at the FSA to reduce PAH concentrations in soil to below Residential CUGs. Implementing this remedial technology will attain Unrestricted (Residential) Land Use. LUCs will not be required for any receptor upon completion of the remediation. The evaluation of this alternative assumes that a mobile thermal treatment system is already on site and readily available for use. The assumed extent of the excavation for the FSA is presented in Figure 4-6. Implementation of FSA Alternative 5 would result in thermal treatment of 30,505 cubic yards of soil. The volume of soil being treated from the FSA is presented in Table 5-3.

This remedial alternative will require coordinating remediation activities with Ohio EPA, OHARNG, and ARNG. Coordinating with stakeholders during implementation of the excavation will minimize health and safety risks to on-site personnel and potential disruptions of CJAG activities. The time period to complete this RA is relatively short and will not require long-term management of the FSA associated with LUCs because Unrestricted (Residential) Land Use scenario will be achieved. Components of this remedial alternative include:

- Delineation/pre-excavation confirmation sampling,
- RD,

- Thermal treatment of soil,
- Confirmation sampling, and
- Restoration.

The delineation/pre-excavation confirmation sampling, waste characterization sampling, RD, soil excavation and off-site disposal, confirmation sampling, and site restoration are anticipated to occur as described in FSA Alternative 3.

9.1.5.1 Delineation Sampling

To coincide with and support development of the RD, delineation/pre-excavation confirmation sampling will be conducted to confirm the limits of the soil requiring excavation/treatment. The delineation/pre-excavation sampling plan will be implemented with the intent of adequately defining the extent of soil requiring excavation/treatment.

A delineation/pre-excavation confirmation sampling plan will be presented to the ARNG and Ohio EPA for approval. This plan will present a scheme of discrete soil sample locations within the FSA to be analyzed for PAHs.

9.1.5.2 Remedial Design

An RD will be developed prior to initiating RAs. The RD will contain the laboratory results of the delineation sampling. In addition, the RD will contain results from the most recent wetland delineation. In the event that wetlands will be disturbed during RA activities, the RD will provide requirements for wetland restoration and address any necessary notifications and permitting required.

This RD will 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. Engineering and administrative controls (e.g., erosion controls, health and safety controls) will be developed during the active construction period to ensure remediation workers and the environment are protected. In addition, the RD will include details of the thermal desorption system.

9.1.5.3 Thermal Treatment of Soil

The contaminated soil at the FSA will undergo ex situ thermal treatment. The treatment system, such as the VEG© treatment system, will be pre-heated to the optimal treatment temperature based on results of past bench- and pilot-scale tests previously conducted using the VEG© system at the former RVAAP. While the system is being heated, soil will be excavated using conventional construction equipment, such as backhoes, bulldozers, front-end loaders, and scrapers, and will be stockpiled immediately adjacent to the treatment system into approximately 50-yd^3 piles.

Once the treatment system is at the optimal treatment temperature, contaminated soil will be fed directly into the fully enclosed, preheated chamber by being placed onto a conveyor. Steam at 1,300°F is fed into the renewal/treatment chamber, where it serves as the heat source for thermal treatment of soils. As the soil moves through the system via a rotational auger, the soil contaminants will be desorbed at specified temperatures and residence times and will be passed as vapors into the box head space within the enclosed chamber.

The PAH vapors will then be subject to a patented filter/scrubber system to remove the acidic gases (i.e., nitrous oxides, sulfur oxides, hydrogen chloride) and carbon dioxide components, using an engineered mixture of sodium hydroxide, lime, zero valent iron, steam, and water within a slender packed column. Induced vapors from the contaminated soils will be routed through this filtration system, allowing for full treatment of acidic gases, SVOC vapors, and conversion of any remaining vapors into a synthetic gas. This synthetic gas will be used as a renewable source of fuel to replace the propane used initially to generate steam and to continue operating the VEG© treatment system.

Relying on this fully enclosed looping system, no emissions to the atmosphere occur, and the limited carbon dioxide generated through the process may be further reduced (by some 90% to levels below background) using the water-lime component of the patented filtration process. After treatment, the soil will be stockpiled into approximately 50-yd^3 stockpiles on tarp and covered with plastic sheeting.

9.1.5.4 Confirmation Sampling

Confirmatory ISM samples will be collected from the excavation floors and sidewalls to ensure contaminated soil has been successfully removed. ISM samples collected for confirmation will include 30 to 50 aliquots per sample and be collected in duplicate to achieve DQOs. The confirmatory soil samples will be analyzed for the PAH COCs. The laboratory results will be compared to the Resident Receptor CUGs, and additional excavation will be conducted if the confirmation samples exceed these CUGs.

Upon completing the thermal treatment of soil, soil samples will be collected from the individual stockpiles to ensure contaminated soils have been successfully treated to PAH concentrations below the CUGs. The confirmatory soil samples will be analyzed for the PAH COCs. The laboratory results will be compared to the Resident Receptor CUGs. Once the laboratory analysis determines that the PAH COCs are below the Resident Receptor CUG, the treated soil will be used for backfill and site restoration. Should confirmation samples indicate that any contaminants are not sufficiently treated, those soils will be rerun through the thermal treatment system, likely at a higher temperature, until the target post-treatment levels are reached.

Once the laboratory analysis determines the PAH COC concentrations of the thermally treated soil and the final excavation footprint are below the Resident Receptor CUGs, the FSA will meet requirements for Unrestricted (Residential) Land Use.

9.1.5.5 Restoration

Upon confirming that the treated soil is below Resident Receptor CUGs, all treated soil will 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 will be placed on the treated soil. After the area is backfilled and graded, workers will apply a seed mixture (as approved by OHARNG) and mulch. This includes using CJAG's "emergent marsh" seed mixture in areas previously identified as wetlands. Restored areas will be inspected and monitored as required in the storm water best management practices established in the RD.

9.2 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

This section presents a detailed analysis of the viable remedial alternatives retained and developed throughout the technology screening process. A detailed analysis of each alternative against the threshold and balancing criteria is contained in the following sections. The detailed analysis further defines each alternative (if necessary), compares the alternatives against one another, and presents considerations common to the alternatives.

As presented in Section 9.1, the following remedial alternatives were retained for Atlas Scrap Yard:

- FSA Alternative 1: No Action.
- FSA Alternative 2: Excavation and Off-Site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use.
- FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use.
- FSA Alternative 4: Excavation and Off-Site Disposal of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use.
- FSA Alternative 5: Ex Situ Thermal Treatment of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use.

9.2.1 FSA Alternative 1: No Action

This alternative involves no RAs to prevent exposure to soil containing the PAH COCs. The NCP requires that the no action alternative be evaluated to establish a baseline for comparison with other alternatives, especially in terms of cost and protection to human health and the environment.

9.2.1.1 <u>Overall Protection of Human Health and the Environment</u>

The no action alternative would not provide any protection because no RAs would be implemented to prevent the potential exposure to soil PAH COCs.

9.2.1.2 <u>Compliance with ARARs</u>

Potential ARARs for remediating soil at Atlas Scrap Yard are presented in Section 6.0. Because no action would be taken to address the contamination, FSA Alternative 1 would not meet any ARARs and is considered not compliant.

9.2.1.3 Long-Term Effectiveness and Permanence

This alternative does not provide long-term effectiveness and permanence. There would be no reduction in the potential for exposure because no RA would be implemented, and there is no concern about the adequacy and reliability of controls because none would be applied.

9.2.1.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

FSA Alternative 1 will not reduce the toxicity, mobility, or volume of COCs. This alternative will not remove or treat soil with concentrations of COCs above CUGs.

9.2.1.5 Short-Term Effectiveness

FSA Alternative 1 will have no additional short-term health risks to the community, remediation workers, or the environment. This remedial alternative will offer no short-term benefits or progress to achieve the RAO.

9.2.1.6 Implementability

Since it does not change the existing condition at the FSA, this alternative will not require any additional effort to implement.

9.2.1.7 Cost

The present value cost to complete FSA Alternative 1 is $0. No capital and O&M costs are associated with this alternative.

9.2.2 FSA Alternative 2: Excavation and Off-Site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use

FSA Alternative 2 will achieve Commercial/Industrial Land Use by implementing excavation and off-site disposal of contaminated soil from ASYss-126M. The excavated soil will be transported to an off-site permitted disposal facility. PAH-contaminated soil will remain at the FSA exceeding the Resident Receptor CUG, thus not allowing Unrestricted (Residential) Land Use. Consequently, LUCs are put in place to restrict use of the FSA (i.e., no residential use).

9.2.2.1 Overall Protection of Human Health and the Environment

This alternative would provide adequate protection of human health and the environment through the removal of contaminated soil above Industrial Receptor CUGs. Following the implementation of this alternative, the human health risks associated with the Industrial Receptor would be removed from the FSA. The administrative LUCs would be protective of human health and the environment by restricting residential use.

9.2.2.2 Compliance with ARARs

No identified chemical-specific ARARs for FSA Alternative 2 exist. FSA Alternative 2 would meet requirements of location-specific ARARs by conducting a wetland delineation and restore and disturbed wetland with CJAG's "emergent marsh" seed mixture. FSA Alternative 2 would meet requirements of action-specific ARARs for excavating soil presented in Section 6.0. Those requirements identified as ARARs deal primarily with characterizing, managing, and disposing of contaminated soil generated from excavation. Disturbing the soil will also trigger ARARs for controlling fugitive dust emissions and potentially erosion control measures.

9.2.2.3 Long-Term Effectiveness and Permanence

This alternative would provide a high degree of long-term effectiveness and permanence for the Industrial Receptor because unacceptable risks from soil with COCs above Industrial Receptor CUGs would be eliminated. Resident Receptor exposure to surface soil containing PAH COCs would be mitigated through administrative controls on soil use at the site. Long-term effectiveness and permanence would be achieved by effectively enforcing the LUCs.

Because Unrestricted (Residential) Land Use is not achieved, 5-year reviews would be conducted. These reviews would review Land Use to ensure effectiveness over the long term.

9.2.2.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Since this alternative does not involve treatment, no reduction in toxicity, mobility, or volume would occur through treatment. However, the contaminated soil and landfill waste would be removed from the site, resulting in a reduction in toxicity, mobility, or volume of contaminants at the FSA.

9.2.2.5 Short-Term Effectiveness

Potential short-term worker and community exposures associated with FSA Alternative 2 exist. Short-term impact to on-site workers from safety hazards associated with the soil removal process would be mitigated and addressed in a HASP.

The community near the excavation area and along the route to the disposal facility may be exposed during removal and transportation activities. Environmental risks to the community would be minimal due primarily to the transportation of contaminated soil on public roads. Proper soil handling techniques would be implemented to prevent or minimize adverse environmental impacts due to soil erosion or soil transport.

9.2.2.6 Implementability

FSA Alternative 2 is technically and administratively feasible. Excavation is a commonly used remedial technology for addressing contaminated soil and, therefore, services and materials required for this alternative are readily available. Multiple off-site disposal facilities will be available to accept generated waste. Resources (e.g., equipment, material, trained personnel) to implement this alternative will be readily available.

Administrative controls likely would require working with state and local jurisdictions to establish land use restrictions. All services and materials required for the implementation of this alternative are readily available.

9.2.2.7 Cost

The present value cost to complete FSA Alternative 2 is approximately $294,389 (in base year 2018 dollars). Appendix B provides a detailed description of FSA Alternative 2 costs.

9.2.3 FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use

Under this alternative, contaminated soil at ASYss-126M will undergo ex situ thermal treatment to achieve Commercial/Industrial Land Use. Upon treating the contaminated soil that exceeds the Industrial Receptor CUG, contaminated soil will remain that will not allow for Unrestricted (Residential) Land Use; consequently, LUCs will be put in place to restrict access and use of the FSA.

9.2.3.1 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment. Ex situ thermal treatment at ASYss-126M would reduce the COC concentrations to below the Industrial Receptor CUG for benzo(a)pyrene. These remedial activities will result in the FSA being protective of human health for the Industrial Receptor. The administrative LUCs would be protective of human health and the environment by restricting residential use.

9.2.3.2 Compliance with ARARs

No identified chemical-specific ARARs for FSA Alternative 3 exist. FSA Alternative 3 would meet requirements of location-specific ARARs by conducting a wetland delineation and restore and disturbed wetland with CJAG's "emergent marsh" seed mixture. This alternative will also meet the action-specific ARARs. Those requirements identified as action-specific ARARs deal primarily with characterizing, managing, and treating contaminated soil generated from excavation. Disturbing the soil will also trigger ARARs for controlling fugitive dust emissions and potentially may trigger ARARs for erosion-control measures. Potential ARARs for excavating soil are presented in Section 6.0.

9.2.3.3 Long-Term Effectiveness and Permanence

Ex situ thermal treatment at ASYss-126M would reduce contaminant concentrations in soil to below the Industrial Receptor CUGs. The implementation of these technologies would eliminate risks to the Industrial Receptor. Therefore, this alternative would be effective in the long term because COCs would be permanently reduced to below the Industrial Receptor CUGs. Exposure of Resident Receptor to soil containing COCs would be mitigated through administrative controls on soil use at the site. Long-term effectiveness and permanence would be achieved by effectively enforcing LUCs. Because Unrestricted (Residential) Land Use is not achieved, 5-year reviews would be conducted. These reviews would evaluate the LUCs to ensure effectiveness.

9.2.3.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

FSA Alternative 3 will involve on-site treatment of soil at ASYss-126M. This alternative will reduce the toxicity, mobility, and volume of COCs through treatment.

9.2.3.5 Short-Term Effectiveness

Workers may be exposed during excavation activities, stockpiling soil, and loading soil into the treatment system with FSA Alternative 3. A HASP that identifies appropriate personal protective equipment (PPE) for workers will minimize and/or eliminate exposures.

Mitigation measures during excavation, such as erosion and dust control, will minimize/eliminate potential short-term impacts. Soil treatment will occur in a fully enclosed chamber, thus minimizing worker exposure to heat from the treatment process or resulting vapors. Treating the soil and restoring the FSA is estimated to be completed in less than 1 year. Upon completing the excavation, treatment, and site restoration activities, the FSA would be released for Commercial/Industrial Land Use.

9.2.3.6 Implementability

FSA Alternative 3 will be implementable after using historical bench-scale tests to establish optimal treatment temperature and residence times; developing an RD that is approved by stakeholders; and completing all appropriate coordination with local, state, and federal agencies. Excavating soil, constructing temporary roads, and waste handling are conventional, straightforward construction techniques and methods.

Soil treatment activities will be coordinated with CJAG and ARNG/OHARNG to minimize alterations and/or impacts to OHARNG proceedings. The RD will identify access routes to the site for heavy equipment and steps to minimize potential hazards to on-site personnel. Developing the RD; implementing and enforcing LUCs; and coordinating with local, state, and federal agencies will increase the implementation difficulty of FSA Alternative 3.

9.2.3.7 Cost

The present value cost to complete FSA Alternative 3 is approximately $224,194 (in base year 2018 dollars) and based on use of VEG© technology. Appendix B provides a detailed description of FSA Alternative 3 costs.

This cost assumes an existing thermal treatment system is on site and ready for mobilization. The mobilization cost in that scenario is an estimated $1,000. If no treatment system is on site and readily available, the mobilization cost may increase by $24,000, thus increasing the estimated cost of FSA Alternative 3 to $248,194 (in base year 2018 dollars).

9.2.4 FSA Alternative 4: Excavation and Off-Site Disposal of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use

FSA Alternative 4 will achieve Unrestricted (Residential) Land Use by implementing excavation and off-site disposal of PAH-contaminated soil from the FSA. The excavated soil will be transported to an off-site permitted disposal facility. Upon removing the contaminated soil, no LUCs will be required for any receptor.

9.2.4.1 Overall Protection of Human Health and the Environment

This alternative would provide adequate protection of human health and the environment through the removal of contaminated soil above the Resident Receptor CUGs. Following the implementation of this alternative, the unacceptable risks associated with Resident Receptor would be eliminated. Removing the PAH-contaminated soil from the FSA, as described in the remedial alternative, results in the FSA being protective of human health for Unrestricted (Residential) Land Use.

9.2.4.2 Compliance with ARARs

No identified chemical-specific ARARs for FSA Alternative 4 exist. FSA Alternative 4 would meet requirements of location-specific ARARs by conducting a wetland delineation and restore and disturbed wetland with CJAG's "emergent marsh" seed mixture. FSA Alternative 4 would meet requirements of action-specific ARARs for excavating soil presented in Section 6.0. Those requirements identified as ARARs deal primarily with characterizing, managing, and disposing of contaminated soil generated from excavation. Disturbing the soil will also trigger ARARs for controlling fugitive dust emissions and potentially erosion control measures.

9.2.4.3 Long-Term Effectiveness and Permanence

This alternative would provide a high degree of long-term effectiveness and permanence. Soil from the FSA will be excavated and transported to an off-site disposal facility to result in Unrestricted (Residential) Land Use, thereby mitigating risks to human health and the environment. Consequently, LUCs are not required after removal activities are complete. No CERCLA 5-year reviews or O&M sampling are required.

9.2.4.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

Since this alternative does not involve treatment, no reduction in toxicity, mobility, or volume would occur through treatment. However, the contaminated soil would be removed from the site, resulting in a reduction in toxicity, mobility, or volume of contaminants at the FSA.

9.2.4.5 Short-Term Effectiveness

Potential short-term worker and community exposures associated with FSA Alternative 4 exist. Short-term impact to on-site workers from safety hazards associated with the soil removal process would be mitigated and addressed in a HASP.

The community near the excavation area and along the route to the disposal facility may be exposed during removal and transportation activities. Environmental risks to the community would be minimal due primarily to the transportation of contaminated soil on public roads. Proper soil handling techniques would be implemented to prevent or minimize adverse environmental impacts due to soil erosion or soil transport.

9.2.4.6 Implementability

FSA Alternative 4 is technically and administratively feasible. Excavation is a commonly used remedial technology for addressing contaminated soil and, therefore, services and materials required for this alternative are readily available. Multiple off-site disposal facilities will be available to accept generated waste. Resources (e.g., equipment, material, trained personnel) to implement this alternative will be readily available.

Administrative controls likely would require working with state and local jurisdictions to establish land use restrictions. All services and materials required for the implementation of this alternative are readily available.

9.2.4.7 Cost

The present value cost to complete FSA Alternative 4 is approximately $4,496,580 (in base year 2018 dollars). Appendix B provides a detailed description of FSA Alternative 4 costs.

9.2.5 FSA Alternative 5: Ex Situ Thermal Treatment of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use

Under this alternative, PAH-contaminated soil at the FSA will undergo ex situ thermal treatment to achieve Unrestricted (Residential) Land Use. Upon treating the contaminated soil, no additional controls will be required for any receptor.

9.2.5.1 Overall Protection of Human Health and the Environment

This alternative would be protective of human health and the environment. Ex situ treatment at the FSA would reduce the PAH COC concentrations to below the Resident Receptor CUGs. These remedial activities will result in the FSA being protective of human health for the Resident Receptor.

9.2.5.2 Compliance with ARARs

No identified chemical- or location-specific ARARs for FSA Alternative 5 exist. FSA Alternative 5 would meet requirements of location-specific ARARs by conducting a wetland delineation and restore and disturbed wetland with CJAG's "emergent marsh" seed mixture. There are action-specific ARARs for this alternative. Those action-specific ARARs deal primarily with characterizing, managing, and treating contaminated soil generated from excavation. Disturbing the soil will also trigger ARARs for controlling fugitive dust emissions and potentially may trigger ARARs for erosion-control measures. Potential ARARs for excavating soil are presented in Section 6.0.

9.2.5.3 Long-Term Effectiveness and Permanence

Ex situ thermal treatment at the FSA would reduce contaminant concentrations in soil to below Resident Receptor CUGs. The implementation of these technologies would eliminate unacceptable risks to the Resident Receptor. Therefore, this alternative would be effective in the long term because PAH COCs would be permanently removed from the soil at the FSA. Consequently, LUCs will not be required when removal activities are complete. No CERCLA 5-year reviews or O&M sampling will be required.

9.2.5.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

FSA Alternative 5 will involve on-site treatment of soil at the FSA. This alternative will reduce the toxicity, mobility, and volume of COCs through treatment.

9.2.5.5 Short-Term Effectiveness

Workers may be exposed during excavation activities, stockpiling soil, and loading soil into the treatment system with FSA Alternative 5. A HASP that identifies appropriate PPE for workers will minimize and/or eliminate exposures.

Mitigation measures during excavation, such as erosion and dust control, will minimize/eliminate potential short-term impacts. Soil treatment will occur in a fully enclosed chamber, thus minimizing worker exposure to heat from the treatment process or resulting vapors. Treating the soil and restoring the FSA is estimated to be completed in less than 1 year. Upon completing the excavation, treatment, and site restoration activities, the FSA would be released for Unrestricted (Residential) Land Use.

9.2.5.6 Implementability

The implementability of FSA Alternative 5 is predicated on commercial availability of the mobile thermal treatment system given the limited number of systems in operation. Once on site, the treatment system can efficiently mobilize from within the former RVAAP. FSA Alternative 5 will be implementable after using historical bench-scale tests to establish optimal treatment temperature and residence times; developing an RD that is approved by stakeholders; and completing all appropriate coordination with local, state, and federal agencies. Excavating soil, constructing temporary roads, and waste handling are conventional, straightforward construction techniques and methods.

Soil treatment activities will be coordinated with CJAG and ARNG/OHARNG to minimize alterations and/or impacts to OHARNG proceedings. The RD will identify access routes to the site for heavy equipment and steps to minimize potential hazards to on-site personnel. Developing the RD and coordinating with local, state, and federal agencies will increase the implementation difficulty of FSA Alternative 5.

9.2.5.7 Cost

The present value cost to complete FSA Alternative 5 is approximately $2,718,988 (in base year 2018 dollars) and based on use of VEG© technology. Appendix B provides a detailed description of FSA Alternative 5 costs.

This cost assumes an existing thermal treatment system is on site and ready for mobilization. The mobilization cost in that scenario is an estimated $1,000. If no treatment system is on site and readily available, the mobilization cost may increase by $24,000, thus increasing the estimated cost of FSA Alternative 5 to $2,742,988 (in base year 2018 dollars).

9.3 COMPARATIVE ANALYSIS OF REMEDIAL ALTERNATIVES

FSA Alternative 1 is not protective of human health and is not compliant with ARARs. In addition, FSA Alternative 1 does not meet the RAO to prevent Resident Receptor exposure to surface soil (0-1 ft bgs) with concentrations of benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene above CUGs at the FSA. Therefore, FSA 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 satisfies the threshold criteria. The remaining alternatives are scored amongst one another for each of the balancing criteria and a total score is generated. This score is presented in Table 9-1.

If an on-site thermal treatment system is available at CJAG, FSA Alternative 3 scores the highest and is the recommended alternative. FSA Alternative 3 Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/ Industrial Land Use is effective in the long term through treatment of benzo(a)pyrene in soil and LUCs. In addition, FSA Alternative 3 is a green and highly sustainable alternative for on-site treatment and 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 for use at the former RVAAP, FSA Alternative 2: Excavation and Off-Site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use would be readily available.

Table 9-1. Comparative Analysis of Former Storage Area Remedial Alternatives

NCP Evaluation Criteria	FSA Alternative 1: No Action	FSA Alternative 2: Excavation and Off-Site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use	FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use	FSA Alternative 4: Excavation and Off-Site Disposal of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use	FSA Alternative 5: Ex Situ Thermal Treatment of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use
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	1	2	4	3
4. Reduction of Toxicity, Mobility, or Volume Through Treatment	Not applicable	1	3	2	4
5. Short-Term Effectiveness	Not applicable	3	4	1	2
6. Implementability	Not applicable	4	3	2	1
7. Cost	Not applicable ($0)	3 ($294,389)	4 ($224,194)	1 ($4,496,580)	2 ($2,718,988)
Balancing Criteria Score	*Not applicable*	*12*	*16*	*10*	*12*

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 scored as part of the balancing criteria evaluation.
Scoring for the balancing criteria is as follows for applicable alternatives: Most favorable = 4, least favorable = 1. The alternative with the highest total balancing criteria score is considered the most feasible.
ARAR = Applicable or Relevant and Appropriate Requirement.
FSA = Former Storage Area.
NCP = National Contingency Plan.

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10.0 CONCLUSIONS AND RECOMMENDED ALTERNATIVE

10.1 CONCLUSIONS

The primary purposes of this FS is to define areas requiring an RA, identify the RAOs and appropriate CUGs, screen remedial technologies, develop remedial alternatives to meet the RAOs and attain CUGs, and perform a detailed evaluation of remedial alternatives to identify recommended alternatives for surface soil (0-1 ft bgs) COCs requiring an RA.

The Atlas Scrap Yard RI Report concluded remediation was not necessary for subsurface soil, sediment, or surface water for any receptor. Conclusions of the ERA indicate RAs are not needed to protect ecological receptors. Fate and transport modeling indicates soil remediation to protect groundwater is not warranted. RAs specific to groundwater media at Atlas Storage Yard will be evaluated in a separate report.

The RI concluded that concentrations of lead in surface soil (0-1 ft bgs) in the FIA required remediation to be protective of human health. In addition, a reassessment of PAH concentrations in surface soil (0-1 ft bgs) compared to USEPA Resident Soil RSLs concluded that surface soil (0-1 ft bgs) in the FSA require remediation to be protective of human health. All other areas within Atlas Scrap Yard are eligible for release of Unrestricted (Residential) Land Use without implementing any RA, as no COCs requiring an RA were identified.

This FS specified the RAO to prevent Resident Receptor exposure to 1) surface soil (0-1 ft bgs) with concentrations of lead above 400 mg/kg at the FIA, and 2) surface soil (0-1 ft bgs) with concentrations of benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and dibenz(a,h)anthracene above CUGs at the FSA.

Alternatives were developed and evaluated to determine the most feasible remedial alternatives to reduce risk from the surface soil COCs in the FIA and FSA to acceptable levels for the likely future land use (i.e., Commercial/Industrial and/or Military Training) that are protective of human health at Atlas Scrap Yard.

The following remedial alternatives were developed for the FIA:

- FIA Alternative 1: No Action.
- FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.
- FIA Alternative 3: Excavation and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.

The following remedial alternatives were developed for the FSA:

- FSA Alternative 1: No Action.
- FSA Alternative 2: Excavation and Off-Site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use.
- FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use.
- FSA Alternative 4: Excavation and Off-Site Disposal of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use.
- FSA Alternative 5: Ex Situ Thermal Treatment of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use.

These alternatives are applicable and are compared against one another to provide information of sufficient quality and quantity to justify the selection of a remedy. The following section provides the recommended alternative for Atlas Scrap Yard surface soil.

10.2 RECOMMENDED ALTERNATIVES

The recommended alternative for the FIA is FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use. FIA Alternative 2 is effective in the long term and will attain Unrestricted (Residential) Land Use. Excavation and off-site disposal alternatives have been implemented multiple times during restoration efforts at the former RVAAP. In addition, FIA Alternative 2 is a green and highly sustainable alternative for on-site treatment of soil and implements a treatment alternative to reduce the toxicity, mobility, and volume of contamination. FIA Alternative 2 is effective in the long term and attains Unrestricted (Residential) Land Use. FIA Alternative 2 reduces the mobility of contaminants by placing contamination in an engineered landfill. The estimated cost for FIA Alternative 2 is $235,655.

The recommended alternative for the FSA is FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use. FSA Alternative 3 is effective in the long term through treatment of benzo(a)pyrene in soil and LUCs. In addition, FSA Alternative 3 is a green and highly sustainable alternative for on-site treatment and reuse of soil and implements a treatment alternative to reduce the toxicity, mobility, and volume of contamination. The estimated cost for FSA Alternative 3 is $224,194, which includes an estimated $97,978 for LUCs. In the event that a thermal treatment system is not available for use at the former RVAAP, FSA Alternative 2: Excavation and Off-Site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use, would be readily available.

After implementation of the two recommended alternatives, the area designated as the Former Storage Area will require LUCs to ensure use is limited to Commercial/Industrial Land Use. This area is depicted in Figure 10-1. The remaining portions of Atlas Scrap Yard will attain Unrestricted (Residential) Land Use.

The next step in the CERCLA process is to prepare a PP to solicit public input on the remedial alternatives. The PP will present these alternatives with the preferred remedial alternative for Atlas Scrap Yard. Comments on the PP provided by state and federal agencies and the public will be presented in the Responsive Summary section of the Atlas Scrap Yard ROD. The ROD will provide a brief summary of the history, characteristics, and risks of Atlas Scrap Yard and will document the selected remedy.

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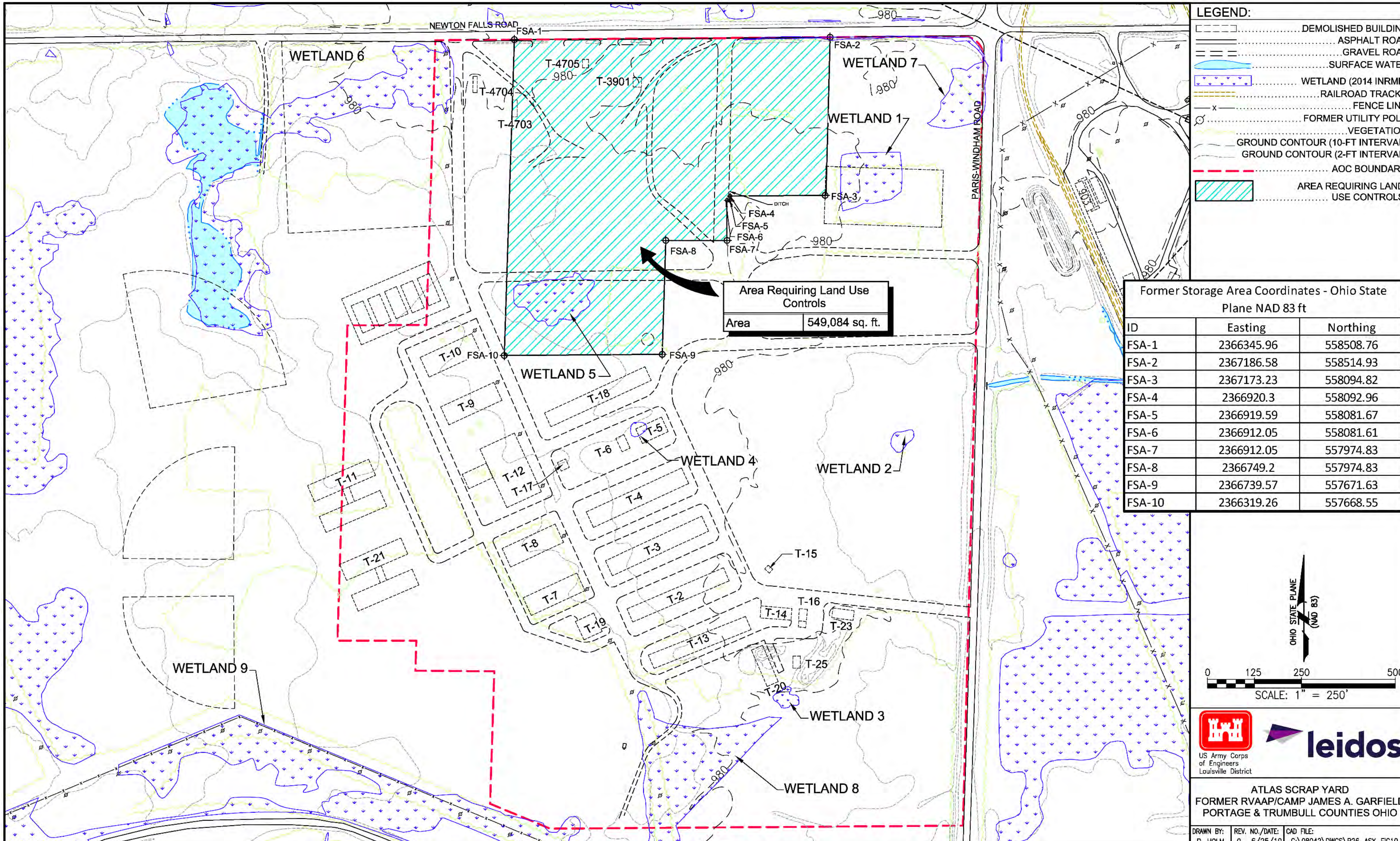

Former Storage Area Coordinates - Ohio State Plane NAD 83 ft

ID	Easting	Northing
FSA-1	2366345.96	558508.76
FSA-2	2367186.58	558514.93
FSA-3	2367173.23	558094.82
FSA-4	2366920.3	558092.96
FSA-5	2366919.59	558081.67
FSA-6	2366912.05	558081.61
FSA-7	2366912.05	557974.83
FSA-8	2366749.2	557974.83
FSA-9	2366739.57	557671.63
FSA-10	2366319.26	557668.55

Figure 10-1. Area Requiring Land Use Controls after Implementation of Recommended Alternative

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11.0 AGENCY COORDINATION AND PUBLIC INVOLVEMENT

ARNG is the lead agency responsible for executing the CERCLA process and ultimately completing an approved ROD for soil, sediment, and surface water at Atlas Scrap Yard. This section reviews actions that have been conducted and presents activities that are planned to ensure the regulatory agencies and members of the public have been provided with appropriate opportunities to stay informed of the progress of the Atlas Scrap Yard environmental investigation, restoration efforts, and final selection of a remedy.

Two of the nine NCP evaluation criteria are known as “modifying criteria”: state acceptance and community acceptance. These criteria provide a framework for obtaining the necessary agency coordination and public involvement in the remedy selection process.

11.1 STATE ACCEPTANCE

State acceptance considers comments received from agencies of the State of Ohio on the proposed remedial alternatives. Ohio EPA is the supporting state regulatory agency. This FS has been prepared in consultation with Ohio EPA.

Ohio EPA has provided input during the ongoing investigation and report development to ensure the remedy ultimately selected for Atlas Scrap Yard meets the needs of the State of Ohio and fulfills the requirements of the DFFO (Ohio EPA 2004). Ohio EPA provided comments on this FS and will provide comments on the subsequent PP and ROD. ARNG will obtain Ohio EPA concurrence prior to the final selection of the remedy for soil, sediment, and surface water at Atlas Scrap Yard.

11.2 COMMUNITY ACCEPTANCE

Community acceptance considers comments provided by community members. CERCLA 42 United States Code (U.S.C.) 9617(a) emphasizes early, constant, and responsive community relations. The *Community Relations Plan 2017 for the Ravenna Army Ammunition Plant Restoration Program* (Vista 2017) has been prepared to facilitate communication between the former RVAAP and the community surrounding CJAG during environmental investigations and potential RA. The plan was developed to ensure the public has convenient access to information regarding project progress. The community relations program interacts with the public through news releases, public meetings, public workshops, and Restoration Advisory Board meetings with local officials, interest groups, and the general public.

CERCLA 42 U.S.C. 9617(a) requires an Administrative Record to be established “at or near the facility at issue.” Relevant documents regarding the former RVAAP have been made available to the public for review and comment.

The Administrative Record for this project is available at the following location:

Camp James A. Garfield
Environmental Office
1438 State Route 534 SW
Newton Falls, Ohio 44444

Access to CJAG is restricted but can be obtained by contacting the environmental office at (614) 336-6136. In addition, an Information Repository of current information and final documents is available to any interested reader at the following libraries:

Reed Memorial Library
167 East Main Street
Ravenna, Ohio 44266

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444-1694

Additionally, RVAAP has an online resource for restoration news and information. This website is available at www.rvaap.org.

Comments will be received from the community upon issuing the RI Report, FS, and the PP. As required by the CERCLA regulatory process and the Community Relations Plan (Vista 2017), ARNG will hold a public meeting and request public comments on the PP for Atlas Scrap Yard. These comments will be considered prior to the final selection of a remedy. Responses to these comments will be addressed in the responsiveness summary of the ROD.

12.0 REFERENCES

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APPENDIX A

PAH COC Surface Soil (0-1 ft bgs) Results and Screening

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Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYsb-045	ASYsb-045-5660-SO	0.0-1.0	Benz(a)anthracene	0.04	11	No	210	No
ASYsb-045	ASYsb-045-5660-SO	0.0-1.0	Benzo(a)pyrene	0.046	1.1	No	21	No
ASYsb-045	ASYsb-045-5660-SO	0.0-1.0	Benzo(b)fluoranthene	0.092	11	No	210	No
ASYsb-045	ASYsb-045-5660-SO	0.0-1.0	Benzo(k)fluoranthene	0.035	110	No	2100	No
ASYsb-045	ASYsb-045-5660-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0088 U	1.1	No	21	No
ASYsb-046	ASYsb-046-5664-SO	0.0-1.0	Benz(a)anthracene	0.2	11	No	210	No
ASYsb-046	ASYsb-046-5664-SO	0.0-1.0	Benzo(a)pyrene	0.28	1.1	No	21	No
ASYsb-046	ASYsb-046-5664-SO	0.0-1.0	Benzo(b)fluoranthene	0.59	11	No	210	No
ASYsb-046	ASYsb-046-5664-SO	0.0-1.0	Benzo(k)fluoranthene	0.23	110	No	2100	No
ASYsb-046	ASYsb-046-5664-SO	0.0-1.0	Dibenz(a,h)anthracene	0.07	1.1	No	21	No
ASYsb-047	ASYsb-047-5668-SO	0.0-1.0	Benz(a)anthracene	2.5	11	No	210	No
ASYsb-047	**ASYsb-047-5668-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**2.5**	**1.1**	**Yes**	**21**	**No**
ASYsb-047	ASYsb-047-5668-SO	0.0-1.0	Benzo(b)fluoranthene	4.9	11	No	210	No
ASYsb-047	ASYsb-047-5668-SO	0.0-1.0	Benzo(k)fluoranthene	1.4	110	No	2100	No
ASYsb-047	ASYsb-047-5668-SO	0.0-1.0	Dibenz(a,h)anthracene	0.66	1.1	No	21	No
ASYsb-048	ASYsb-048-5672-SO	0.0-1.0	Benz(a)anthracene	3.5	11	No	210	No
ASYsb-048	**ASYsb-048-5672-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**4.5**	**1.1**	**Yes**	**21**	**No**
ASYsb-048	ASYsb-048-5672-SO	0.0-1.0	Benzo(b)fluoranthene	8.4	11	No	210	No
ASYsb-048	ASYsb-048-5672-SO	0.0-1.0	Benzo(k)fluoranthene	3.4	110	No	2100	No
ASYsb-048	**ASYsb-048-5672-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**1.2**	**1.1**	**Yes**	**21**	**No**
ASYsb-049	ASYsb-049-5676-SO	0.0-1.0	Benz(a)anthracene	0.23	11	No	210	No
ASYsb-049	ASYsb-049-5676-SO	0.0-1.0	Benzo(a)pyrene	0.24	1.1	No	21	No
ASYsb-049	ASYsb-049-5676-SO	0.0-1.0	Benzo(b)fluoranthene	0.36	11	No	210	No
ASYsb-049	ASYsb-049-5676-SO	0.0-1.0	Benzo(k)fluoranthene	0.13	110	No	2100	No
ASYsb-049	ASYsb-049-5676-SO	0.0-1.0	Dibenz(a,h)anthracene	0.042	1.1	No	21	No
ASYsb-050	ASYsb-050-5680-SO	0.0-1.0	Benz(a)anthracene	<0.0087 U	11	No	210	No
ASYsb-050	ASYsb-050-5680-SO	0.0-1.0	Benzo(a)pyrene	<0.0087 U	1.1	No	21	No
ASYsb-050	ASYsb-050-5680-SO	0.0-1.0	Benzo(b)fluoranthene	<0.0087 U	11	No	210	No
ASYsb-050	ASYsb-050-5680-SO	0.0-1.0	Benzo(k)fluoranthene	<0.0087 U	110	No	2100	No
ASYsb-050	ASYsb-050-5680-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0087 U	1.1	No	21	No
ASYsb-052	ASYsb-052-5688-SO	0.0-1.0	Benz(a)anthracene	0.031	11	No	210	No
ASYsb-052	ASYsb-052-5688-SO	0.0-1.0	Benzo(a)pyrene	0.034	1.1	No	21	No
ASYsb-052	ASYsb-052-5688-SO	0.0-1.0	Benzo(b)fluoranthene	0.055	11	No	210	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYsb-052	ASYsb-052-5688-SO	0.0-1.0	Benzo(k)fluoranthene	0.027	110	No	2100	No
ASYsb-052	ASYsb-052-5688-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0085 U	1.1	No	21	No
ASYsb-053	ASYsb-053-5692-SO	0.0-1.0	Benz(a)anthracene	0.024	11	No	210	No
ASYsb-053	ASYsb-053-5692-SO	0.0-1.0	Benzo(a)pyrene	0.028	1.1	No	21	No
ASYsb-053	ASYsb-053-5692-SO	0.0-1.0	Benzo(b)fluoranthene	0.042	11	No	210	No
ASYsb-053	ASYsb-053-5692-SO	0.0-1.0	Benzo(k)fluoranthene	0.017	110	No	2100	No
ASYsb-053	ASYsb-053-5692-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0091 U	1.1	No	21	No
ASYsb-054	ASYsb-054-5696-SO	0.0-1.0	Benz(a)anthracene	0.033 J	11	No	210	No
ASYsb-054	ASYsb-054-5696-SO	0.0-1.0	Benzo(a)pyrene	0.038 J	1.1	No	21	No
ASYsb-054	ASYsb-054-5696-SO	0.0-1.0	Benzo(b)fluoranthene	0.053 J	11	No	210	No
ASYsb-054	ASYsb-054-5696-SO	0.0-1.0	Benzo(k)fluoranthene	0.025 J	110	No	2100	No
ASYsb-054	ASYsb-054-5696-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.063 U	1.1	No	21	No
ASYsb-056	ASYsb-056-5702-SO	0.0-1.0	Benz(a)anthracene	0.084	11	No	210	No
ASYsb-056	ASYsb-056-5702-SO	0.0-1.0	Benzo(a)pyrene	0.11	1.1	No	21	No
ASYsb-056	ASYsb-056-5702-SO	0.0-1.0	Benzo(b)fluoranthene	0.14	11	No	210	No
ASYsb-056	ASYsb-056-5702-SO	0.0-1.0	Benzo(k)fluoranthene	0.04	110	No	2100	No
ASYsb-056	ASYsb-056-5702-SO	0.0-1.0	Dibenz(a,h)anthracene	0.021	1.1	No	21	No
ASYsb-057	ASYsb-057-5706-SO	0.0-1.0	Benz(a)anthracene	0.034 J	11	No	210	No
ASYsb-057	ASYsb-057-5706-SO	0.0-1.0	Benzo(a)pyrene	0.036 J	1.1	No	21	No
ASYsb-057	ASYsb-057-5706-SO	0.0-1.0	Benzo(b)fluoranthene	0.055 J	11	No	210	No
ASYsb-057	ASYsb-057-5706-SO	0.0-1.0	Benzo(k)fluoranthene	0.02 J	110	No	2100	No
ASYsb-057	ASYsb-057-5706-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0087 UJ	1.1	No	21	No
ASYsb-058	ASYsb-058-5710-SO	0.0-1.0	Benz(a)anthracene	0.011	11	No	210	No
ASYsb-058	ASYsb-058-5710-SO	0.0-1.0	Benzo(a)pyrene	<0.0087 U	1.1	No	21	No
ASYsb-058	ASYsb-058-5710-SO	0.0-1.0	Benzo(b)fluoranthene	0.016	11	No	210	No
ASYsb-058	ASYsb-058-5710-SO	0.0-1.0	Benzo(k)fluoranthene	<0.0087 U	110	No	2100	No
ASYsb-058	ASYsb-058-5710-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0087 U	1.1	No	21	No
ASYsb-059	ASYsb-059-5714-SO	0.0-1.0	Benz(a)anthracene	0.95	11	No	210	No
ASYsb-059	ASYsb-059-5714-SO	0.0-1.0	Benzo(a)pyrene	0.87	1.1	No	21	No
ASYsb-059	ASYsb-059-5714-SO	0.0-1.0	Benzo(b)fluoranthene	1.3	11	No	210	No
ASYsb-059	ASYsb-059-5714-SO	0.0-1.0	Benzo(k)fluoranthene	0.69	110	No	2100	No
ASYsb-059	ASYsb-059-5714-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.016 U	1.1	No	21	No
ASYsb-060	ASYsb-060-5718-SO	0.0-1.0	Benz(a)anthracene	<0.0092 U	11	No	210	No
ASYsb-060	ASYsb-060-5718-SO	0.0-1.0	Benzo(a)pyrene	<0.0092 U	1.1	No	21	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYsb-060	ASYsb-060-5718-SO	0.0-1.0	Benzo(b)fluoranthene	0.026	11	No	210	No
ASYsb-060	ASYsb-060-5718-SO	0.0-1.0	Benzo(k)fluoranthene	<0.0092 U	110	No	2100	No
ASYsb-060	ASYsb-060-5718-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0092 U	1.1	No	21	No
ASYsb-061	ASYsb-061-5722-SO	0.0-1.0	Benz(a)anthracene	<0.0094 U	11	No	210	No
ASYsb-061	ASYsb-061-5722-SO	0.0-1.0	Benzo(a)pyrene	<0.0094 U	1.1	No	21	No
ASYsb-061	ASYsb-061-5722-SO	0.0-1.0	Benzo(b)fluoranthene	<0.0094 U	11	No	210	No
ASYsb-061	ASYsb-061-5722-SO	0.0-1.0	Benzo(k)fluoranthene	<0.0094 U	110	No	2100	No
ASYsb-061	ASYsb-061-5722-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0094 U	1.1	No	21	No
ASYsb-062	ASYsb-062-5726-SO	0.0-1.0	Benz(a)anthracene	0.11	11	No	210	No
ASYsb-062	ASYsb-062-5726-SO	0.0-1.0	Benzo(a)pyrene	0.11	1.1	No	21	No
ASYsb-062	ASYsb-062-5726-SO	0.0-1.0	Benzo(b)fluoranthene	0.2	11	No	210	No
ASYsb-062	ASYsb-062-5726-SO	0.0-1.0	Benzo(k)fluoranthene	0.082	110	No	2100	No
ASYsb-062	ASYsb-062-5726-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.061 U	1.1	No	21	No
ASYsb-063	ASYsb-063-5730-SO	0.0-1.0	Benz(a)anthracene	0.24	11	No	210	No
ASYsb-063	ASYsb-063-5730-SO	0.0-1.0	Benzo(a)pyrene	0.27	1.1	No	21	No
ASYsb-063	ASYsb-063-5730-SO	0.0-1.0	Benzo(b)fluoranthene	0.44	11	No	210	No
ASYsb-063	ASYsb-063-5730-SO	0.0-1.0	Benzo(k)fluoranthene	0.14	110	No	2100	No
ASYsb-063	ASYsb-063-5730-SO	0.0-1.0	Dibenz(a,h)anthracene	0.046	1.1	No	21	No
ASYsb-064	ASYsb-064-5734-SO	0.0-1.0	Benz(a)anthracene	<0.011 U	11	No	210	No
ASYsb-064	ASYsb-064-5734-SO	0.0-1.0	Benzo(a)pyrene	0.019	1.1	No	21	No
ASYsb-064	ASYsb-064-5734-SO	0.0-1.0	Benzo(b)fluoranthene	0.052	11	No	210	No
ASYsb-064	ASYsb-064-5734-SO	0.0-1.0	Benzo(k)fluoranthene	<0.011 U	110	No	2100	No
ASYsb-064	ASYsb-064-5734-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.011 U	1.1	No	21	No
ASYsb-065	ASYsb-065-5738-SO	0.0-1.0	Benz(a)anthracene	0.065	11	No	210	No
ASYsb-065	ASYsb-065-5738-SO	0.0-1.0	Benzo(a)pyrene	0.073	1.1	No	21	No
ASYsb-065	ASYsb-065-5738-SO	0.0-1.0	Benzo(b)fluoranthene	0.12	11	No	210	No
ASYsb-065	ASYsb-065-5738-SO	0.0-1.0	Benzo(k)fluoranthene	0.043	110	No	2100	No
ASYsb-065	ASYsb-065-5738-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.012 U	1.1	No	21	No
ASYss-004M	ASYss-004M-SO	0.0-0.5	Benz(a)anthracene	2.9	11	No	210	No
ASYss-004M	**ASYss-004M-SO**	**0.0-0.5**	**Benzo(a)pyrene**	**3.2**	**1.1**	**Yes**	**21**	**No**
ASYss-004M	ASYss-004M-SO	0.0-0.5	Benzo(b)fluoranthene	5.2	11	No	210	No
ASYss-004M	ASYss-004M-SO	0.0-0.5	Benzo(k)fluoranthene	2.2	110	No	2100	No
ASYss-004M	ASYss-004M-SO	0.0-0.5	Dibenz(a,h)anthracene	0.75	1.1	No	21	No
ASYss-011M	ASYss-011M-SO	0.0-1.0	Benz(a)anthracene	0.073	11	No	210	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-011M	ASYss-011M-SO	0.0-1.0	Benzo(a)pyrene	0.1	1.1	No	21	No
ASYss-011M	ASYss-011M-SO	0.0-1.0	Benzo(b)fluoranthene	0.12	11	No	210	No
ASYss-011M	ASYss-011M-SO	0.0-1.0	Benzo(k)fluoranthene	0.079	110	No	2100	No
ASYss-011M	ASYss-011M-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.035 U	1.1	No	21	No
ASYss-015M	ASYss-015M-SO	0.0-1.0	Benz(a)anthracene	0.79 J	11	No	210	No
ASYss-015M	ASYss-015M-SO	0.0-1.0	Benzo(a)pyrene	1.1 J	1.1	No	21	No
ASYss-015M	ASYss-015M-SO	0.0-1.0	Benzo(b)fluoranthene	1.2 J	11	No	210	No
ASYss-015M	ASYss-015M-SO	0.0-1.0	Benzo(k)fluoranthene	0.64 J	110	No	2100	No
ASYss-015M	ASYss-015M-SO	0.0-1.0	Dibenz(a,h)anthracene	0.26 J	1.1	No	21	No
ASYss-027M	ASYss-027M-SO	0.0-1.0	Benz(a)anthracene	0.29	11	No	210	No
ASYss-027M	ASYss-027M-SO	0.0-1.0	Benzo(a)pyrene	0.32	1.1	No	21	No
ASYss-027M	ASYss-027M-SO	0.0-1.0	Benzo(b)fluoranthene	0.45	11	No	210	No
ASYss-027M	ASYss-027M-SO	0.0-1.0	Benzo(k)fluoranthene	0.16	110	No	2100	No
ASYss-027M	ASYss-027M-SO	0.0-1.0	Dibenz(a,h)anthracene	0.052	1.1	No	21	No
ASYss-069M	ASYss-069M-5743-SO	0.0-1.0	Benz(a)anthracene	2.1	11	No	210	No
ASYss-069M	**ASYss-069M-5743-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**1.7**	**1.1**	**Yes**	**21**	**No**
ASYss-069M	ASYss-069M-5743-SO	0.0-1.0	Benzo(b)fluoranthene	2.6	11	No	210	No
ASYss-069M	ASYss-069M-5743-SO	0.0-1.0	Benzo(k)fluoranthene	1.1	110	No	2100	No
ASYss-069M	ASYss-069M-5743-SO	0.0-1.0	Dibenz(a,h)anthracene	0.31	1.1	No	21	No
ASYss-070M	ASYss-070M-5744-SO	0.0-1.0	Benz(a)anthracene	0.015	11	No	210	No
ASYss-070M	ASYss-070M-5744-SO	0.0-1.0	Benzo(a)pyrene	0.015	1.1	No	21	No
ASYss-070M	ASYss-070M-5744-SO	0.0-1.0	Benzo(b)fluoranthene	0.035	11	No	210	No
ASYss-070M	ASYss-070M-5744-SO	0.0-1.0	Benzo(k)fluoranthene	0.013	110	No	2100	No
ASYss-070M	ASYss-070M-5744-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0068 U	1.1	No	21	No
ASYss-071M	ASYss-071M-5745-SO	0.0-1.0	Benz(a)anthracene	4.3	11	No	210	No
ASYss-071M	**ASYss-071M-5745-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**4.4**	**1.1**	**Yes**	**21**	**No**
ASYss-071M	ASYss-071M-5745-SO	0.0-1.0	Benzo(b)fluoranthene	5.9	11	No	210	No
ASYss-071M	ASYss-071M-5745-SO	0.0-1.0	Benzo(k)fluoranthene	3.3	110	No	2100	No
ASYss-071M	ASYss-071M-5745-SO	0.0-1.0	Dibenz(a,h)anthracene	0.88	1.1	No	21	No
ASYss-072M	ASYss-072M-5746-SO	0.0-1.0	Benz(a)anthracene	0.13	11	No	210	No
ASYss-072M	ASYss-072M-5746-SO	0.0-1.0	Benzo(a)pyrene	0.13 J	1.1	No	21	No
ASYss-072M	ASYss-072M-5746-SO	0.0-1.0	Benzo(b)fluoranthene	0.19	11	No	210	No
ASYss-072M	ASYss-072M-5746-SO	0.0-1.0	Benzo(k)fluoranthene	0.1	110	No	2100	No
ASYss-072M	ASYss-072M-5746-SO	0.0-1.0	Dibenz(a,h)anthracene	0.028	1.1	No	21	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-073M	ASYss-073M-5747-SO	0.0-1.0	Benz(a)anthracene	2.6	11	No	210	No
ASYss-073M	**ASYss-073M-5747-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**2.5**	**1.1**	**Yes**	**21**	**No**
ASYss-073M	ASYss-073M-5747-SO	0.0-1.0	Benzo(b)fluoranthene	4	11	No	210	No
ASYss-073M	ASYss-073M-5747-SO	0.0-1.0	Benzo(k)fluoranthene	2	110	No	2100	No
ASYss-073M	ASYss-073M-5747-SO	0.0-1.0	Dibenz(a,h)anthracene	0.43	1.1	No	21	No
ASYss-074M	ASYss-074M-5748-SO	0.0-1.0	Benz(a)anthracene	3.1	11	No	210	No
ASYss-074M	**ASYss-074M-5748-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**3.3**	**1.1**	**Yes**	**21**	**No**
ASYss-074M	ASYss-074M-5748-SO	0.0-1.0	Benzo(b)fluoranthene	5.6	11	No	210	No
ASYss-074M	ASYss-074M-5748-SO	0.0-1.0	Benzo(k)fluoranthene	1.8	110	No	2100	No
ASYss-074M	ASYss-074M-5748-SO	0.0-1.0	Dibenz(a,h)anthracene	0.63	1.1	No	21	No
ASYss-075M	ASYss-075M-5749-SO	0.0-1.0	Benz(a)anthracene	3.3	11	No	210	No
ASYss-075M	**ASYss-075M-5749-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**3.1**	**1.1**	**Yes**	**21**	**No**
ASYss-075M	ASYss-075M-5749-SO	0.0-1.0	Benzo(b)fluoranthene	5.4	11	No	210	No
ASYss-075M	ASYss-075M-5749-SO	0.0-1.0	Benzo(k)fluoranthene	2.1	110	No	2100	No
ASYss-075M	ASYss-075M-5749-SO	0.0-1.0	Dibenz(a,h)anthracene	0.49	1.1	No	21	No
ASYss-076M	ASYss-076M-5750-SO	0.0-1.0	Benz(a)anthracene	6.5	11	No	210	No
ASYss-076M	**ASYss-076M-5750-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**7.3**	**1.1**	**Yes**	**21**	**No**
ASYss-076M	**ASYss-076M-5750-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**12**	**11**	**Yes**	**210**	**No**
ASYss-076M	ASYss-076M-5750-SO	0.0-1.0	Benzo(k)fluoranthene	4	110	No	2100	No
ASYss-076M	**ASYss-076M-5750-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**1.5**	**1.1**	**Yes**	**21**	**No**
ASYss-077m	**ASYss-077M-5751-SO**	**0.0-1.0**	**Benz(a)anthracene**	**12**	**11**	**Yes**	**210**	**No**
ASYss-077m	**ASYss-077M-5751-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**12**	**1.1**	**Yes**	**21**	**No**
ASYss-077m	**ASYss-077M-5751-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**23**	**11**	**Yes**	**210**	**No**
ASYss-077m	ASYss-077M-5751-SO	0.0-1.0	Benzo(k)fluoranthene	12	110	No	2100	No
ASYss-077m	**ASYss-077M-5751-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**2.7**	**1.1**	**Yes**	**21**	**No**
ASYss-078M	**ASYss-078M-5752-SO**	**0.0-1.0**	**Benz(a)anthracene**	**17**	**11**	**Yes**	**210**	**No**
ASYss-078M	**ASYss-078M-5752-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**19**	**1.1**	**Yes**	**21**	**No**
ASYss-078M	**ASYss-078M-5752-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**37**	**11**	**Yes**	**210**	**No**
ASYss-078M	ASYss-078M-5752-SO	0.0-1.0	Benzo(k)fluoranthene	14	110	No	2100	No
ASYss-078M	**ASYss-078M-5752-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**4.2**	**1.1**	**Yes**	**21**	**No**
ASYss-079M	ASYss-079M-5753-SO	0.0-1.0	Benz(a)anthracene	2.6	11	No	210	No
ASYss-079M	**ASYss-079M-5753-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**2.5**	**1.1**	**Yes**	**21**	**No**
ASYss-079M	ASYss-079M-5753-SO	0.0-1.0	Benzo(b)fluoranthene	4.9	11	No	210	No
ASYss-079M	ASYss-079M-5753-SO	0.0-1.0	Benzo(k)fluoranthene	2.3	110	No	2100	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-079M	ASYss-079M-5753-SO	0.0-1.0	Dibenz(a,h)anthracene	0.78	1.1	No	21	No
ASYss-080M	**ASYss-080M-5754-SO**	**0.0-1.0**	**Benz(a)anthracene**	**17**	**11**	**Yes**	**210**	**No**
ASYss-080M	**ASYss-080M-5754-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**20**	**1.1**	**Yes**	**21**	**No**
ASYss-080M	**ASYss-080M-5754-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**37**	**11**	**Yes**	**210**	**No**
ASYss-080M	ASYss-080M-5754-SO	0.0-1.0	Benzo(k)fluoranthene	15	110	No	2100	No
ASYss-080M	**ASYss-080M-5754-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**5.1**	**1.1**	**Yes**	**21**	**No**
ASYss-081M	ASYss-081M-5755-SO	0.0-1.0	Benz(a)anthracene	0.49	11	No	210	No
ASYss-081M	ASYss-081M-5755-SO	0.0-1.0	Benzo(a)pyrene	0.51	1.1	No	21	No
ASYss-081M	ASYss-081M-5755-SO	0.0-1.0	Benzo(b)fluoranthene	0.89	11	No	210	No
ASYss-081M	ASYss-081M-5755-SO	0.0-1.0	Benzo(k)fluoranthene	0.36	110	No	2100	No
ASYss-081M	ASYss-081M-5755-SO	0.0-1.0	Dibenz(a,h)anthracene	0.11	1.1	No	21	No
ASYss-082M	ASYss-082M-5756-SO	0.0-1.0	Benz(a)anthracene	0.32	11	No	210	No
ASYss-082M	ASYss-082M-5756-SO	0.0-1.0	Benzo(a)pyrene	0.35	1.1	No	21	No
ASYss-082M	ASYss-082M-5756-SO	0.0-1.0	Benzo(b)fluoranthene	0.55	11	No	210	No
ASYss-082M	ASYss-082M-5756-SO	0.0-1.0	Benzo(k)fluoranthene	0.27	110	No	2100	No
ASYss-082M	ASYss-082M-5756-SO	0.0-1.0	Dibenz(a,h)anthracene	0.084	1.1	No	21	No
ASYss-083M	ASYss-083M-5757-SO	0.0-1.0	Benz(a)anthracene	0.98	11	No	210	No
ASYss-083M	ASYss-083M-5757-SO	0.0-1.0	Benzo(a)pyrene	0.87	1.1	No	21	No
ASYss-083M	ASYss-083M-5757-SO	0.0-1.0	Benzo(b)fluoranthene	1.3	11	No	210	No
ASYss-083M	ASYss-083M-5757-SO	0.0-1.0	Benzo(k)fluoranthene	0.58	110	No	2100	No
ASYss-083M	ASYss-083M-5757-SO	0.0-1.0	Dibenz(a,h)anthracene	0.15	1.1	No	21	No
ASYss-084M	ASYss-084M-5758-SO	0.0-1.0	Benz(a)anthracene	0.98	11	No	210	No
ASYss-084M	ASYss-084M-5758-SO	0.0-1.0	Benzo(a)pyrene	1.1	1.1	No	21	No
ASYss-084M	ASYss-084M-5758-SO	0.0-1.0	Benzo(b)fluoranthene	2.7	11	No	210	No
ASYss-084M	ASYss-084M-5758-SO	0.0-1.0	Benzo(k)fluoranthene	1.1	110	No	2100	No
ASYss-084M	ASYss-084M-5758-SO	0.0-1.0	Dibenz(a,h)anthracene	0.32	1.1	No	21	No
ASYss-085M	ASYss-085M-5759-SO	0.0-1.0	Benz(a)anthracene	0.63	11	No	210	No
ASYss-085M	ASYss-085M-5759-SO	0.0-1.0	Benzo(a)pyrene	0.58	1.1	No	21	No
ASYss-085M	ASYss-085M-5759-SO	0.0-1.0	Benzo(b)fluoranthene	1.6	11	No	210	No
ASYss-085M	ASYss-085M-5759-SO	0.0-1.0	Benzo(k)fluoranthene	0.74	110	No	2100	No
ASYss-085M	ASYss-085M-5759-SO	0.0-1.0	Dibenz(a,h)anthracene	0.2	1.1	No	21	No
ASYss-086M	ASYss-086M-5760-SO	0.0-1.0	Benz(a)anthracene	0.38	11	No	210	No
ASYss-086M	ASYss-086M-5760-SO	0.0-1.0	Benzo(a)pyrene	0.42	1.1	No	21	No
ASYss-086M	ASYss-086M-5760-SO	0.0-1.0	Benzo(b)fluoranthene	0.75	11	No	210	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-086M	ASYss-086M-5760-SO	0.0-1.0	Benzo(k)fluoranthene	0.33	110	No	2100	No
ASYss-086M	ASYss-086M-5760-SO	0.0-1.0	Dibenz(a,h)anthracene	0.12	1.1	No	21	No
ASYss-087M	ASYss-087M-5761-SO	0.0-1.0	Benz(a)anthracene	0.051	11	No	210	No
ASYss-087M	ASYss-087M-5761-SO	0.0-1.0	Benzo(a)pyrene	0.055	1.1	No	21	No
ASYss-087M	ASYss-087M-5761-SO	0.0-1.0	Benzo(b)fluoranthene	0.093	11	No	210	No
ASYss-087M	ASYss-087M-5761-SO	0.0-1.0	Benzo(k)fluoranthene	0.03	110	No	2100	No
ASYss-087M	ASYss-087M-5761-SO	0.0-1.0	Dibenz(a,h)anthracene	0.013	1.1	No	21	No
ASYss-088M	ASYss-088M-5756-SO	0.0-1.0	Benz(a)anthracene	8.9	11	No	210	No
ASYss-088M	**ASYss-088M-5756-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**9**	**1.1**	**Yes**	**21**	**No**
ASYss-088M	**ASYss-088M-5756-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**18**	**11**	**Yes**	**210**	**No**
ASYss-088M	ASYss-088M-5756-SO	0.0-1.0	Benzo(k)fluoranthene	6.2	110	No	2100	No
ASYss-088M	**ASYss-088M-5756-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**2.1**	**1.1**	**Yes**	**21**	**No**
ASYss-089M	ASYss-089M-5763-SO	0.0-1.0	Benz(a)anthracene	5	11	No	210	No
ASYss-089M	**ASYss-089M-5763-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**4.8**	**1.1**	**Yes**	**21**	**No**
ASYss-089M	ASYss-089M-5763-SO	0.0-1.0	Benzo(b)fluoranthene	8.6	11	No	210	No
ASYss-089M	ASYss-089M-5763-SO	0.0-1.0	Benzo(k)fluoranthene	3.6	110	No	2100	No
ASYss-089M	**ASYss-089M-5763-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**1.2**	**1.1**	**Yes**	**21**	**No**
ASYss-090M	ASYss-090M-5764-SO	0.0-1.0	Benz(a)anthracene	0.31	11	No	210	No
ASYss-090M	ASYss-090M-5764-SO	0.0-1.0	Benzo(a)pyrene	0.29	1.1	No	21	No
ASYss-090M	ASYss-090M-5764-SO	0.0-1.0	Benzo(b)fluoranthene	0.37	11	No	210	No
ASYss-090M	ASYss-090M-5764-SO	0.0-1.0	Benzo(k)fluoranthene	0.27	110	No	2100	No
ASYss-090M	ASYss-090M-5764-SO	0.0-1.0	Dibenz(a,h)anthracene	0.037	1.1	No	21	No
ASYss-091M	ASYss-091M-5765-SO	0.0-1.0	Benz(a)anthracene	0.16	11	No	210	No
ASYss-091M	ASYss-091M-5765-SO	0.0-1.0	Benzo(a)pyrene	0.17	1.1	No	21	No
ASYss-091M	ASYss-091M-5765-SO	0.0-1.0	Benzo(b)fluoranthene	0.27	11	No	210	No
ASYss-091M	ASYss-091M-5765-SO	0.0-1.0	Benzo(k)fluoranthene	0.13	110	No	2100	No
ASYss-091M	ASYss-091M-5765-SO	0.0-1.0	Dibenz(a,h)anthracene	0.025	1.1	No	21	No
ASYss-092M	ASYss-092M-5766-SO	0.0-1.0	Benz(a)anthracene	0.031	11	No	210	No
ASYss-092M	ASYss-092M-5766-SO	0.0-1.0	Benzo(a)pyrene	0.033	1.1	No	21	No
ASYss-092M	ASYss-092M-5766-SO	0.0-1.0	Benzo(b)fluoranthene	0.065	11	No	210	No
ASYss-092M	ASYss-092M-5766-SO	0.0-1.0	Benzo(k)fluoranthene	0.024	110	No	2100	No
ASYss-092M	ASYss-092M-5766-SO	0.0-1.0	Dibenz(a,h)anthracene	0.0078	1.1	No	21	No
ASYss-093M	**ASYss-093M-5767-SO**	**0.0-1.0**	**Benz(a)anthracene**	**17**	**11**	**Yes**	**210**	**No**
ASYss-093M	**ASYss-093M-5767-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**18**	**1.1**	**Yes**	**21**	**No**

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-093M	**ASYss-093M-5767-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**21**	**11**	**Yes**	**210**	**No**
ASYss-093M	ASYss-093M-5767-SO	0.0-1.0	Benzo(k)fluoranthene	11	110	No	2100	No
ASYss-093M	**ASYss-093M-5767-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**2.8**	**1.1**	**Yes**	**21**	**No**
ASYss-094M	ASYss-094M-5768-SO	0.0-1.0	Benz(a)anthracene	0.11	11	No	210	No
ASYss-094M	ASYss-094M-5768-SO	0.0-1.0	Benzo(a)pyrene	0.078	1.1	No	21	No
ASYss-094M	ASYss-094M-5768-SO	0.0-1.0	Benzo(b)fluoranthene	0.17	11	No	210	No
ASYss-094M	ASYss-094M-5768-SO	0.0-1.0	Benzo(k)fluoranthene	0.06	110	No	2100	No
ASYss-094M	ASYss-094M-5768-SO	0.0-1.0	Dibenz(a,h)anthracene	<0.0068 U	1.1	No	21	No
ASYss-095M	ASYss-095M-5769-SO	0.0-1.0	Benz(a)anthracene	0.81	11	No	210	No
ASYss-095M	ASYss-095M-5769-SO	0.0-1.0	Benzo(a)pyrene	0.83	1.1	No	21	No
ASYss-095M	ASYss-095M-5769-SO	0.0-1.0	Benzo(b)fluoranthene	1.2	11	No	210	No
ASYss-095M	ASYss-095M-5769-SO	0.0-1.0	Benzo(k)fluoranthene	0.51	110	No	2100	No
ASYss-095M	ASYss-095M-5769-SO	0.0-1.0	Dibenz(a,h)anthracene	0.11	1.1	No	21	No
ASYss-096M	ASYss-096M-5770-SO	0.0-1.0	Benz(a)anthracene	0.21	11	No	210	No
ASYss-096M	ASYss-096M-5770-SO	0.0-1.0	Benzo(a)pyrene	0.22	1.1	No	21	No
ASYss-096M	ASYss-096M-5770-SO	0.0-1.0	Benzo(b)fluoranthene	0.35	11	No	210	No
ASYss-096M	ASYss-096M-5770-SO	0.0-1.0	Benzo(k)fluoranthene	0.13	110	No	2100	No
ASYss-096M	ASYss-096M-5770-SO	0.0-1.0	Dibenz(a,h)anthracene	0.046	1.1	No	21	No
ASYss-097M	ASYss-097M-5771-SO	0.0-1.0	Benz(a)anthracene	0.22	11	No	210	No
ASYss-097M	ASYss-097M-5771-SO	0.0-1.0	Benzo(a)pyrene	0.22	1.1	No	21	No
ASYss-097M	ASYss-097M-5771-SO	0.0-1.0	Benzo(b)fluoranthene	0.33	11	No	210	No
ASYss-097M	ASYss-097M-5771-SO	0.0-1.0	Benzo(k)fluoranthene	0.13	110	No	2100	No
ASYss-097M	ASYss-097M-5771-SO	0.0-1.0	Dibenz(a,h)anthracene	0.046 J	1.1	No	21	No
ASYss-098M	ASYss-098M-5772-SO	0.0-1.0	Benz(a)anthracene	0.31	11	No	210	No
ASYss-098M	ASYss-098M-5772-SO	0.0-1.0	Benzo(a)pyrene	0.34	1.1	No	21	No
ASYss-098M	ASYss-098M-5772-SO	0.0-1.0	Benzo(b)fluoranthene	0.52	11	No	210	No
ASYss-098M	ASYss-098M-5772-SO	0.0-1.0	Benzo(k)fluoranthene	0.23	110	No	2100	No
ASYss-098M	ASYss-098M-5772-SO	0.0-1.0	Dibenz(a,h)anthracene	0.062	1.1	No	21	No
ASYss-099M	ASYss-099M-5773-SO	0.0-1.0	Benz(a)anthracene	0.51	11	No	210	No
ASYss-099M	ASYss-099M-5773-SO	0.0-1.0	Benzo(a)pyrene	0.47	1.1	No	21	No
ASYss-099M	ASYss-099M-5773-SO	0.0-1.0	Benzo(b)fluoranthene	0.78	11	No	210	No
ASYss-099M	ASYss-099M-5773-SO	0.0-1.0	Benzo(k)fluoranthene	0.3	110	No	2100	No
ASYss-099M	ASYss-099M-5773-SO	0.0-1.0	Dibenz(a,h)anthracene	0.088	1.1	No	21	No
ASYss-100M	ASYss-100M-5774-SO	0.0-1.0	Benz(a)anthracene	0.4	11	No	210	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-100M	ASYss-100M-5774-SO	0.0-1.0	Benzo(a)pyrene	0.4	1.1	No	21	No
ASYss-100M	ASYss-100M-5774-SO	0.0-1.0	Benzo(b)fluoranthene	0.57	11	No	210	No
ASYss-100M	ASYss-100M-5774-SO	0.0-1.0	Benzo(k)fluoranthene	0.25	110	No	2100	No
ASYss-100M	ASYss-100M-5774-SO	0.0-1.0	Dibenz(a,h)anthracene	0.073	1.1	No	21	No
ASYss-101M	ASYss-101M-5775-SO	0.0-1.0	Benz(a)anthracene	1.7 J	11	No	210	No
ASYss-101M	**ASYss-101M-5775-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**1.4 J**	**1.1**	**Yes**	**21**	**No**
ASYss-101M	ASYss-101M-5775-SO	0.0-1.0	Benzo(b)fluoranthene	1.9 J	11	No	210	No
ASYss-101M	ASYss-101M-5775-SO	0.0-1.0	Benzo(k)fluoranthene	0.93	110	No	2100	No
ASYss-101M	ASYss-101M-5775-SO	0.0-1.0	Dibenz(a,h)anthracene	0.26	1.1	No	21	No
ASYss-102M	ASYss-102M-5776-SO	0.0-1.0	Benz(a)anthracene	0.25	11	No	210	No
ASYss-102M	ASYss-102M-5776-SO	0.0-1.0	Benzo(a)pyrene	0.24	1.1	No	21	No
ASYss-102M	ASYss-102M-5776-SO	0.0-1.0	Benzo(b)fluoranthene	0.38	11	No	210	No
ASYss-102M	ASYss-102M-5776-SO	0.0-1.0	Benzo(k)fluoranthene	0.14	110	No	2100	No
ASYss-102M	ASYss-102M-5776-SO	0.0-1.0	Dibenz(a,h)anthracene	0.035	1.1	No	21	No
ASYss-103M	ASYss-103M-5777-SO	0.0-1.0	Benz(a)anthracene	0.15	11	No	210	No
ASYss-103M	ASYss-103M-5777-SO	0.0-1.0	Benzo(a)pyrene	0.13	1.1	No	21	No
ASYss-103M	ASYss-103M-5777-SO	0.0-1.0	Benzo(b)fluoranthene	0.21	11	No	210	No
ASYss-103M	ASYss-103M-5777-SO	0.0-1.0	Benzo(k)fluoranthene	0.097	110	No	2100	No
ASYss-103M	ASYss-103M-5777-SO	0.0-1.0	Dibenz(a,h)anthracene	0.03	1.1	No	21	No
ASYss-111M	ASYss-111M-5835-SO	0.0-1.0	Benz(a)anthracene	1.5	11	No	210	No
ASYss-111M	**ASYss-111M-5835-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**1.4**	**1.1**	**Yes**	**21**	**No**
ASYss-111M	ASYss-111M-5835-SO	0.0-1.0	Benzo(b)fluoranthene	3.2	11	No	210	No
ASYss-111M	ASYss-111M-5835-SO	0.0-1.0	Benzo(k)fluoranthene	0.98	110	No	2100	No
ASYss-111M	ASYss-111M-5835-SO	0.0-1.0	Dibenz(a,h)anthracene	0.37	1.1	No	21	No
ASYss-112M	ASYss-112M-5836-SO	0.0-1.0	Benz(a)anthracene	0.66	11	No	210	No
ASYss-112M	ASYss-112M-5836-SO	0.0-1.0	Benzo(a)pyrene	0.72	1.1	No	21	No
ASYss-112M	ASYss-112M-5836-SO	0.0-1.0	Benzo(b)fluoranthene	1.4	11	No	210	No
ASYss-112M	ASYss-112M-5836-SO	0.0-1.0	Benzo(k)fluoranthene	0.59	110	No	2100	No
ASYss-112M	ASYss-112M-5836-SO	0.0-1.0	Dibenz(a,h)anthracene	0.19	1.1	No	21	No
ASYss-113M	ASYss-113M-5837-SO	0.0-1.0	Benz(a)anthracene	1.2	11	No	210	No
ASYss-113M	ASYss-113M-5837-SO	0.0-1.0	Benzo(a)pyrene	1.1	1.1	No	21	No
ASYss-113M	ASYss-113M-5837-SO	0.0-1.0	Benzo(b)fluoranthene	2.1	11	No	210	No
ASYss-113M	ASYss-113M-5837-SO	0.0-1.0	Benzo(k)fluoranthene	0.87	110	No	2100	No
ASYss-113M	ASYss-113M-5837-SO	0.0-1.0	Dibenz(a,h)anthracene	0.27	1.1	No	21	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-114M	ASYss-114M-5838-SO	0.0-1.0	Benz(a)anthracene	1.8	11	No	210	No
ASYss-114M	**ASYss-114M-5838-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**1.6**	**1.1**	**Yes**	**21**	**No**
ASYss-114M	ASYss-114M-5838-SO	0.0-1.0	Benzo(b)fluoranthene	3.6	11	No	210	No
ASYss-114M	ASYss-114M-5838-SO	0.0-1.0	Benzo(k)fluoranthene	1.1	110	No	2100	No
ASYss-114M	ASYss-114M-5838-SO	0.0-1.0	Dibenz(a,h)anthracene	0.36	1.1	No	21	No
ASYss-115M	ASYss-115M-5839-SO	0.0-1.0	Benz(a)anthracene	0.47	11	No	210	No
ASYss-115M	ASYss-115M-5839-SO	0.0-1.0	Benzo(a)pyrene	0.56	1.1	No	21	No
ASYss-115M	ASYss-115M-5839-SO	0.0-1.0	Benzo(b)fluoranthene	0.87	11	No	210	No
ASYss-115M	ASYss-115M-5839-SO	0.0-1.0	Benzo(k)fluoranthene	0.47	110	No	2100	No
ASYss-115M	ASYss-115M-5839-SO	0.0-1.0	Dibenz(a,h)anthracene	0.12	1.1	No	21	No
ASYss-116M	ASYss-116M-5840-SO	0.0-1.0	Benz(a)anthracene	7.3	11	No	210	No
ASYss-116M	**ASYss-116M-5840-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**8.3**	**1.1**	**Yes**	**21**	**No**
ASYss-116M	**ASYss-116M-5840-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**15**	**11**	**Yes**	**210**	**No**
ASYss-116M	ASYss-116M-5840-SO	0.0-1.0	Benzo(k)fluoranthene	7	110	No	2100	No
ASYss-116M	**ASYss-116M-5840-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**2**	**1.1**	**Yes**	**21**	**No**
ASYss-117M	ASYss-117M-5841-SO	0.0-1.0	Benz(a)anthracene	4.6	11	No	210	No
ASYss-117M	**ASYss-117M-5841-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**5.1**	**1.1**	**Yes**	**21**	**No**
ASYss-117M	ASYss-117M-5841-SO	0.0-1.0	Benzo(b)fluoranthene	9.9	11	No	210	No
ASYss-117M	ASYss-117M-5841-SO	0.0-1.0	Benzo(k)fluoranthene	3.9	110	No	2100	No
ASYss-117M	**ASYss-117M-5841-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**1.2**	**1.1**	**Yes**	**21**	**No**
ASYss-118M	**ASYss-118M-5842-SO**	**0.0-1.0**	**Benz(a)anthracene**	**13 J**	**11**	**Yes**	**210**	**No**
ASYss-118M	**ASYss-118M-5842-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**14 J**	**1.1**	**Yes**	**21**	**No**
ASYss-118M	**ASYss-118M-5842-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**26 J**	**11**	**Yes**	**210**	**No**
ASYss-118M	ASYss-118M-5842-SO	0.0-1.0	Benzo(k)fluoranthene	9.3 J	110	No	2100	No
ASYss-118M	**ASYss-118M-5842-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**3.3 J**	**1.1**	**Yes**	**21**	**No**
ASYss-119M	ASYss-119M-5843-SO	0.0-1.0	Benz(a)anthracene	5 J	11	No	210	No
ASYss-119M	**ASYss-119M-5843-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**5.4 J**	**1.1**	**Yes**	**21**	**No**
ASYss-119M	ASYss-119M-5843-SO	0.0-1.0	Benzo(b)fluoranthene	10 J	11	No	210	No
ASYss-119M	ASYss-119M-5843-SO	0.0-1.0	Benzo(k)fluoranthene	4.5 J	110	No	2100	No
ASYss-119M	**ASYss-119M-5843-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**1.4 J**	**1.1**	**Yes**	**21**	**No**
ASYss-120M	ASYss-120M-5844-SO	0.0-1.0	Benz(a)anthracene	1.8 J	11	No	210	No
ASYss-120M	**ASYss-120M-5844-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**1.7 J**	**1.1**	**Yes**	**21**	**No**
ASYss-120M	ASYss-120M-5844-SO	0.0-1.0	Benzo(b)fluoranthene	3.6 J	11	No	210	No
ASYss-120M	ASYss-120M-5844-SO	0.0-1.0	Benzo(k)fluoranthene	1.4 J	110	No	2100	No

Appendix A. PAH COC Surface Soil (0-1 ft bgs) Results and Screening (continued)

Station	Sample ID	Depth (ft)	COC	Result	Resident Receptor FS CUG	Exceed Resident Receptor CUG?	Industrial Worker FS CUG	Exceed Industrial Worker CUG?
ASYss-120M	ASYss-120M-5844-SO	0.0-1.0	Dibenz(a,h)anthracene	0.5 J	1.1	No	21	No
ASYss-121M	ASYss-121M-5845-SO	0.0-1.0	Benz(a)anthracene	3.1 J	11	No	210	No
ASYss-121M	**ASYss-121M-5845-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**3.1 J**	**1.1**	**Yes**	**21**	**No**
ASYss-121M	ASYss-121M-5845-SO	0.0-1.0	Benzo(b)fluoranthene	6.8 J	11	No	210	No
ASYss-121M	ASYss-121M-5845-SO	0.0-1.0	Benzo(k)fluoranthene	2.2 J	110	No	2100	No
ASYss-121M	ASYss-121M-5845-SO	0.0-1.0	Dibenz(a,h)anthracene	0.7 J	1.1	No	21	No
ASYss-122M	ASYss-122M-5846-SO	0.0-1.0	Benz(a)anthracene	3.3 J	11	No	210	No
ASYss-122M	**ASYss-122M-5846-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**3.5 J**	**1.1**	**Yes**	**21**	**No**
ASYss-122M	ASYss-122M-5846-SO	0.0-1.0	Benzo(b)fluoranthene	4.7 J	11	No	210	No
ASYss-122M	ASYss-122M-5846-SO	0.0-1.0	Benzo(k)fluoranthene	3.1 J	110	No	2100	No
ASYss-122M	ASYss-122M-5846-SO	0.0-1.0	Dibenz(a,h)anthracene	0.72 J	1.1	No	21	No
ASYss-123M	ASYss-123M-5847-SO	0.0-1.0	Benz(a)anthracene	4.4 J	11	No	210	No
ASYss-123M	**ASYss-123M-5847-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**4.5 J**	**1.1**	**Yes**	**21**	**No**
ASYss-123M	ASYss-123M-5847-SO	0.0-1.0	Benzo(b)fluoranthene	6.3 J	11	No	210	No
ASYss-123M	ASYss-123M-5847-SO	0.0-1.0	Benzo(k)fluoranthene	3.3 J	110	No	2100	No
ASYss-123M	ASYss-123M-5847-SO	0.0-1.0	Dibenz(a,h)anthracene	0.88 J	1.1	No	21	No
ASYss-124M	ASYss-124M-5848-SO	0.0-1.0	Benz(a)anthracene	3.6 J	11	No	210	No
ASYss-124M	**ASYss-124M-5848-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**3.1 J**	**1.1**	**Yes**	**21**	**No**
ASYss-124M	ASYss-124M-5848-SO	0.0-1.0	Benzo(b)fluoranthene	5.1 J	11	No	210	No
ASYss-124M	ASYss-124M-5848-SO	0.0-1.0	Benzo(k)fluoranthene	2.9 J	110	No	2100	No
ASYss-124M	ASYss-124M-5848-SO	0.0-1.0	Dibenz(a,h)anthracene	0.5 J	1.1	No	21	No
ASYss-125M	ASYss-125M-5849-SO	0.0-1.0	Benz(a)anthracene	0.11 J	11	No	210	No
ASYss-125M	ASYss-125M-5849-SO	0.0-1.0	Benzo(a)pyrene	0.12 J	1.1	No	21	No
ASYss-125M	ASYss-125M-5849-SO	0.0-1.0	Benzo(b)fluoranthene	0.2 J	11	No	210	No
ASYss-125M	ASYss-125M-5849-SO	0.0-1.0	Benzo(k)fluoranthene	0.11 J	110	No	2100	No
ASYss-125M	ASYss-125M-5849-SO	0.0-1.0	Dibenz(a,h)anthracene	0.024 J	1.1	No	21	No
ASYss-126M	**ASYss-126M-5850-SO**	**0.0-1.0**	**Benz(a)anthracene**	**51 J**	**11**	**Yes**	**210**	**No**
ASYss-126M	**ASYss-126M-5850-SO**	**0.0-1.0**	**Benzo(a)pyrene**	**50 J**	**1.1**	**Yes**	**21**	**Yes**
ASYss-126M	**ASYss-126M-5850-SO**	**0.0-1.0**	**Benzo(b)fluoranthene**	**51 J**	**11**	**Yes**	**210**	**No**
ASYss-126M	ASYss-126M-5850-SO	0.0-1.0	Benzo(k)fluoranthene	37 J	110	No	2100	No
ASYss-126M	**ASYss-126M-5850-SO**	**0.0-1.0**	**Dibenz(a,h)anthracene**	**7.7 J**	**1.1**	**Yes**	**21**	**No**

Bold = Sample results exceeded the FS Resident Receptor CUG.
Bold and gray highlight = Sample result exceeded the FS Industrial Worker CUG.

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APPENDIX B

Detailed Cost Estimates

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Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of Alternatives

RVAAP- Atlas Scrap Yard – Former Incinerator Area		Duration	Non Discounted Cost		
			Soil		
			Capital Cost	O&M Cost	Total
1	No Action	0	$0	$0	$0
2	Excavation, Stabilization, and Off-site Disposal of Surface Soil at the Former Incinerator Area – Attain Unrestricted (Residential) Land Use	<1 yr	$235,655	$0	$235,655
2	Excavation and Off-site Disposal of Surface Soil at the Former Incinerator Area - Attain Unrestricted (Residential) Land Use	<1 yr	$372,578	$0	$372,578

Notes:

1. The base year of comparison and cost data will be CY2018.

2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of AOC Areas and Volumes

Areas Requiring Remediation	Media	Treatment Interval (ft bgs)	Surface Area (ft2)	In Situ Volume (ft3)	In Situ Volume (yd3)	In situ with Constructability[1] Volume (ft3)	In situ with Constructability[1] Volume (yd3)	Ex situ[1,2] Volume (ft3)	Ex situ[1,2] Volume (yd3)
Former Incinerator Area	Surface Soil	0-1	6,586	6,586	244	8,233	305	9,879	366
Incinerator and Chimney	Brick and Steel	NA	108	980	37	980	37	1,634	62

[1] 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. This is not applicable to former incinerator.

[2] Includes 20% swell factor for soils and 66% for demolition debris.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 2 - Excavation, Stabilization, and Off-site Disposal of Surface Soil at the Former Incinerator Area – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Pre-excavation Delineation and Waste Characterization Sampling			
Samples	ea	18	Delineation sampling includes 8 sampling locations with 2 samples per location (0-1 ft bgs and 1-2 ft bgs) for 16 total samples analyzed for Lead. Waste characterization includes 2 composite samples TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter.
Sampling Labor	hrs	10	Assumes 1 sampling technician at 10 hours to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	18	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	944	Analyze samples for Lead (16 @ $14) and TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter (4 @ $360).
Site Work			
Site Area	sf	6,586	
Civil Survey	day	1.0	Survey AOC areas to document excavation area. RSMeans 017123131100.
Civil Survey	$/day	1,066	
As Built Drawings	hours	4	Develop plat map for incorporation into the Base Master Plan.
As Built Drawings	$/hr	80	
Clearing	acre	0.25	Assume trees/brush cleared, chipped, & left onsite.
Clearing	$/acre	4,897	RSMeans 022302000200. Clear & chip medium trees to 12" dia.
Demolish Former Incinerator	ls	1	Demolish Former Incinerator - The primary chamber is 12 ft long, 8 ft wide, and 7 ft high (672 cf). It has brick walls (two bricks thick) and mortar. There are railroad rails in mortar in both ceiling and floor. The chimney is 3 ft long, 4 ft wide, and 14 ft high (168 cf) and contains brick walls (2 bricks thick) and mortar. The floor is 12 ft long by 8 ft wide (96 sf) and made with brick (two bricks thick) and mortar. RSMeans 024113301200 and added 15% for footer wall and railroad rail removal.
Demolish Former Incinerator	$/ls	3,854	
Characterize Former Incinerator	ea	2	Samples collected of segregated material after demolition of former incinerator.
Characterize Former Incinerator	$/ea	1,129.00	Waste characterization includes composite samples TCLP VOCs, SVOCs, metals, RCRA Characteristics, and Paint Filter ($944). Collected onsite at time of demolition, no extra cost for truck or gas. One sampling technician at 2 hours and $75/hour to collect and ship sample. Sample materials at $35.
Sediment and Erosion Control	lf	300	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	$/lf	12.68	RSMeans 312514161000 & 250.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 2 - Excavation, Stabilization, and Off-site Disposal of Surface Soil at the Former Incinerator Area – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Soil Excavation			Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (In situ)	cy	305	
Soil Excavation Volume (Ex situ)	cy	366	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Volume to Weight Conversion	tons/cy	1.60	In situ soil conversion.
Soil Excavation Mass	tons	488	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	6,586	
Former Incinerator			Includes demolition of former incinerator. In situ volumes include no constructability factor.
Former Incinerator Volume (In situ)	cy	37	
Former Incinerator Volume (Ex situ)	cy	62	Includes former incinerator volume to be transported and disposed. Ex situ volumes include 66% swell factor.
Former Incinerator Mass	tons	76	Includes soil mass to be transported and disposed.
Mobilization/Demobilization	ls	8,000	Includes mob/demob of excavation equipment and preparing submittals.
Excavate Soils	day $/day	3 2,615.00	Includes 3/4 cy excavator, 1 O.E., 1 L.S. spotter, 1 L.S. to prep trucks/and misc. Reduced productivity by 33% for loading trucks, small/precise excavations, and security/S&H requirements. Assume trucks are direct loaded. Average 180 BCY/day based excavator productivity. Duration = 1.7 days for excavation and 1.3 days to blend soils and load soils/demolition debris. Assume 3 days. RSMeans Crew B12-F.
Standby Time	day $/day	3 671	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
Treat Lead Impacted Soils	tons	20	Portland Cement, type I/II, trucked in bulk, includes material only. Add 60% for delivery and upgrade to speciality product such as Enviroblend. Assumes 4% by weight required for treatment.
Treat Lead Impacted Soils	$/ton	276.80	
Nonhazardous Waste Transport and Offsite Disposal	tons $/ton	584 82.55	Includes transport and disposal of waste to American Landfill, Waynesburg, Ohio. Assumes a minimum of 22 tons/load. Based on Clean Harbors quote March 2019 and includes $716 per load for transportation and $50/ton disposal.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 2 - Excavation, Stabilization, and Off-site Disposal of Surface Soil at the Former Incinerator Area – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Confirmation Sampling			
Samples	ea	10	Includes 8 samples collected for confirmation and analyzed for Lead and 2 samples for TCLP analysis to confirm treated soil has been stabilized.
Sampling Labor	hrs	8	Assumes 1 sampling technician at 4 hours to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	10	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	832	Analyze samples for Lead (8 @ $14) and TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter (2 @ $360).
Restoration			Includes native soil backfill. Added 10 cy for former incinerator foundation backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	376	Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	$/cy	35.09	
Native Soil Backfill Certification	ea	1	One sample of native soil for RVAAP full suite analysis ($716). One sampling technician at 4 hours and $75/hour to collect and ship sample. Sample materials at $35. Truck rental at $90/day and gas at $20.
Native Soil Backfill Certification	$/ea	1,161	
Seeding, Vegetative Cover	MSF	15	Seeding with mulch and fertilizer. Assume 1/3 acre is revegetated for restored areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	$/MSF	107.07	
SWPPP Inspections	hrs	16	Assume 4 hrs per week for 4 weeks.
SWPPP Inspections	$/hr	80	
Plans and Reports			
Report	hrs	240	Includes Construction QC data and preparing report.
Technical Labor	$/hr	95	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 2 - Excavation, Stabilization, and Off-site Disposal of Surface Soil at the Former Incinerator Area – Attain Unrestricted (Residential) Land Use
Cost Estimate

CAPITAL COST	$235,655

Activity (unit)	Quantity	Unit Cost	Total
Pre-excavation Delineation and Waste Characterization Sampling			
Sampling Labor (hrs)	10	$75.00	$750
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	18	$35.00	$630
Sample Analysis (event)	1	$944.00	$944
Site Work			
Civil Survey (day)	1	$1,066.00	$1,066
As Built Drawings (hrs)	4	$80.00	$320
Clearing (acre)	0.25	$4,897.03	$1,224
Demolish Former Incinerator (ls)	1	$3,854.34	$3,854
Characterize Former Incinerator (ea)	2	$1,129.00	$2,258
Sediment and Erosion Control (lf)	300	$12.68	$3,803
Soil Excavation			
Mobilization/Demobilization (ls)	1	$8,000.00	$8,000
Excavate Soil (days)	3	$2,615.00	$7,845
Standby Time (day)	3	$671.00	$2,013
Treat Impacted Lead Soils (ton)	20	$276.80	$5,536
NonhazardousTransport and Offsite Disposal (ton)	584	$82.55	$48,207
Confirmation Sampling			
Sampling Labor (hrs)	8	$75.00	$600
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	10	$35.00	$350
Sample Analysis (event)	1	$832.00	$832
Restoration			
Native Soil Backfill (cy)	376	$35.09	$13,193
Native Soil Backfill Certification (ea)	1	$1,161.00	$1,161
Seeding, Vegetative Cover (MSF)	15	$107.07	$1,606
SWPPP Inspections (hrs)	16	$80.00	$1,280
Plans and Reports			
Corrective Action Completion Report (ea)	240	$95.00	$22,800
Subtotal			$128,493
Design		25%	$32,123
Office Overhead		5%	$6,425
Field Overhead		10%	$12,849
Subtotal			$179,890
Profit		6%	$10,793
Contingency		25%	$44,972
Total			$235,655

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 3 - Excavation and Off-site Disposal of Surface Soil at the Former Incinerator Area - Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Pre-excavation Delineation and Waste Characterization Sampling			
Samples	ea	18	Delineation sampling includes 8 sampling locations with 2 samples per location (0-1 ft bgs and 1-2 ft bgs) for 16 total samples analyzed for Lead. Waste characterization includes 2 composite samples TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter.
Sampling Labor	hrs	10	Assumes 1 sampling technician at 10 hours to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	18	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	944	Analyze samples for Lead (16 @ $14) and TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter (4 @ $360).
Site Work			
Site Area	sf	6,586	
Civil Survey	day	1.0	Survey AOC areas to document excavation area. RSMeans 017123131100.
Civil Survey	$/day	1,066	
As Built Drawings	hours	4	Develop plat map for incorporation into the Base Master Plan.
As Built Drawings	$/hr	80	
Clearing	acre	0.25	Assume trees/brush cleared, chipped, & left onsite.
Clearing	$/acre	4,897	RSMeans 022302000200. Clear & chip medium trees to 12" dia.
Demolish Former Incinerator	ls	1	Demolish Former Incinerator - The primary chamber is 12 ft long, 8 ft wide, and 7 ft high (672 cf). It has brick walls (two bricks thick) and mortar. There are railroad rails in mortar in both ceiling and floor. The chimney is 3 ft long, 4 ft wide, and 14 ft high (168 cf) and contains brick walls (2 bricks thick) and mortar. The floor is 12 ft long by 8 ft wide (96 sf) and made with brick (two bricks thick) and mortar. RSMeans 024113301200 and added 15% for footer wall and railroad rail removal.
Demolish Former Incinerator	$/ls	3,854	
Characterize Former Incinerator	ea	2	Samples collected of segregated material after demolition of former incinerator.
Characterize Former Incinerator	$/ea	1,129.00	Waste characterization includes composite samples TCLP VOCs, SVOCs, metals, RCRA Characteristics, and Paint Filter ($944). Collected onsite at time of demolition, no extra cost for truck or gas. One sampling technician at 2 hours and $75/hour to collect and ship sample. Sample materials at $35.
Sediment and Erosion Control	lf	300	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	$/lf	12.68	RSMeans 312514161000 & 250.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 3 - Excavation and Off-site Disposal of Surface Soil at the Former Incinerator Area - Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Soil Excavation			Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (In situ)	cy	305	
Soil Excavation Volume (Ex situ)	cy	366	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Volume to Weight Conversion	tons/cy	1.60	In situ soil conversion.
Soil Excavation Mass	tons	488	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	6,586	
Former Incinerator			Includes demolition of former incinerator. In situ volumes include no constructability factor.
Former Incinerator Volume (In situ)	cy	37	
Former Incinerator Volume (Ex situ)	cy	62	Includes former incinerator volume to be transported and disposed. Ex situ volumes include 66% swell factor.
Former Incinerator Mass	tons	76	Includes soil mass to be transported and disposed.
Mobilization/Demobilization	ls	8,000	Includes mob/demob of excavation equipment and preparing submittals.
Excavate Soils	day	2	Includes 3/4 cy excavator, 1 O.E., 1 L.S. spotter, 1 L.S. for misc. Reduced productivity by 33% for loading shipping containers, small/precise excavations, and security/S&H requirements. Assume shipping containers are direct loaded. Average 180 BCY/day based excavator productivity. Duration = 1.7 days. Based on RSMeans Cost Data.
	$/day	2,615.00	
Standby Time	day	3	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
	$/day	671	
Hazardous Waste	tons	564	Includes transport and disposal of waste to Clean Harbors Corunna Facility, Ontario, Canada. Assumes a minimum of 22 tons/load. Based on Clean Harbors quote March 2019 and includes $2235 per load for transportation and $145/ton disposal.
Transport and Offsite Disposal	$/ton	246.59	
Confirmation Sampling			
Samples	ea	10	Includes 8 samples collected for confirmation and analyzed for Lead and 2 samples for TCLP analysis to confirm treated soil has been stabilized.
Sampling Labor	hrs	8	Assumes 1 sampling technician at 4 hours to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	10	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	832	Analyze samples for Lead (8 @ $14) and TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter (2 @ $360).

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 3 - Excavation and Off-site Disposal of Surface Soil at the Former Incinerator Area - Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Restoration			Includes native soil backfill. Added 10 cy for former incinerator foundation backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	376	Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	$/cy	35.09	
Native Soil Backfill Certification	ea	1	One sample of native soil for RVAAP full suite analysis ($716). One sampling technician at 4 hours and $75/hour to collect and ship sample. Sample materials at $35. Truck rental at $90/day and gas at $20.
Native Soil Backfill Certification	$/ea	1,161	
Seeding, Vegetative Cover	MSF	15	Seeding with mulch and fertilizer. Assume 1/3 acre is revegetated for restored areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	$/MSF	107.07	
SWPPP Inspections	hrs	16	Assume 4 hrs per week for 4 weeks.
SWPPP Inspections	$/hr	80	
Plans and Reports			
Report	hrs	240	Includes Construction QC data and preparing report.
Technical Labor	$/hr	95	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Incinerator Area
Alternative 3 - Excavation and Off-site Disposal of Surface Soil at the Former Incinerator Area - Attain Unrestricted (Residential) Land Use
Cost Estimate

CAPITAL COST			**$372,578**

Activity (unit)	Quantity	Unit Cost	Total
Pre-excavation Delineation and Waste Characterization Sampling			
Sampling Labor (hrs)	10	$75.00	$750
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	18	$35.00	$630
Sample Analysis (event)	1	$944.00	$944
Site Work			
Civil Survey (day)	1	$1,066.00	$1,066
As Built Drawings (hrs)	4	$80.00	$320
Clearing (acre)	0.25	$4,897.03	$1,224
Demolish Former Incinerator (ls)	1	$3,854.34	$3,854
Characterize Former Incinerator (ea)	2	$1,129.00	$2,258
Sediment and Erosion Control (lf)	300	$12.68	$3,803
Soil Excavation			
Mobilization/Demobilization (ls)	1	$8,000.00	$8,000
Excavate Soil (days)	2	$2,615.00	$5,230
Standby Time (day)	3	$671.00	$2,013
NonhazardousTransport and Offsite Disposal (ton)	564	$246.59	$139,077
Confirmation Sampling			
Sampling Labor (hrs)	8	$75.00	$600
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	10	$35.00	$350
Sample Analysis (event)	1	$832.00	$832
Restoration			
Native Soil Backfill (cy)	376	$35.09	$13,193
Native Soil Backfill Certification (ea)	1	$1,161.00	$1,161
Seeding, Vegetative Cover (MSF)	15	$107.07	$1,606
SWPPP Inspections (hrs)	16	$80.00	$1,280
Plans and Reports			
Corrective Action Completion Report (ea)	240	$95.00	$22,800
Subtotal			$211,212
Design		25%	$52,803
Office Overhead		5%	$10,561
Field Overhead		10%	$21,121
Subtotal			$295,697
Profit		6%	$17,742
Contingency		20%	$59,139
Total			$372,578

Ravenna Atlas Scrap Yard Former Incinerator Area 4-7-19.xlsx

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of Alternatives

RVAAP- Atlas Scrap Yard – Former Storage Area		Duration	Non Discounted Cost		
			Soil		
			Capital Cost	O&M Cost	Total
1	No Action	0	$0	$0	$0
2	Excavation and Off-site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use	30 yr	$196,411	$97,978	$294,389
3	Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/ Industrial Land Use	30 yr	$126,216	$97,978	$224,194
4	Excavation and Off-site Disposal of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use	1 yr	$4,496,580	$0	$4,496,580
5	Ex Situ Thermal Treatment of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use	1 yr	$2,718,988	$0	$2,718,988

Notes:

1. The base year of comparison and cost data will be CY2018.

2. Costs were estimated for comparison purposes only and are believed to be accurate within a range of -30% to +50%. Use of these costs for other purposes, including but not limited to, budgetary or construction cost estimating is not appropriate.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio
Summary of AOC Areas and Volumes

Alternative	Remedial Area	Media	Treatment Interval (ft bgs)	Surface Area (ft^2)	In Situ Volume (ft^3)	In Situ Volume (yd^3)	In situ with Constructability[1] Volume (ft^3)	In situ with Constructability[1] Volume (yd^3)	Ex situ[1,2] Volume (ft^3)	Ex situ[1,2] Volume (yd^3)
Alts 2 and 3	ASYss-126M	Surface Soil	0-1	8,521	8,521	316	10,651	394	12,782	473
Alts 4 and 5	Former Storage Area	Surface Soil	0-1	549,084	549,084	20,336	686,355	25,421	823,626	30,505

[1] 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.

[2] Includes 20% swell factor

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 2 - Excavation and Off-site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Waste Characterization Sampling			
Samples	ea	2	Waste characterization includes 2 samples for TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter.
Sampling Labor	hrs	8	Assumes 1 sampling technician at 8 hours to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	2	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	720	Analyze samples TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter (2 @ $360).
Site Work			
Site Area	sf	8,521	
Civil Survey	day	1.0	Survey AOC areas to document excavation area. RSMeans 017123131100.
Civil Survey	$/day	1,066	
As Built Drawings	hours	4	Develop plat map for incorporation into the Base Master Plan.
As Built Drawings	$/hr	80	
Clearing	acre	0.20	Assume trees/brush cleared, chipped, & left onsite.
Clearing	$/acre	4,897	RSMeans 022302000200. Clear & chip medium trees to 12" dia.
Sediment and Erosion Control	lf	300	Includes silt fence and straw bales along down slope of excavation. RSMeans 312514161000 & 250.
Sediment and Erosion Control	$/lf	12.68	
Soil Excavation			Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (In situ)	cy	394	
Soil Excavation Volume (Ex situ)	cy	473	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Volume to Weight Conversion	tons/cy	1.60	In situ soil conversion.
Soil Excavation Mass	tons	630	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	8,521	
Mobilization/Demobilization	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
Excavate Soils	day	3	Includes 3/4 cy excavator, 1 O.E., 1 L.S. spotter, 1 L.S. to prep trucks/and misc. Reduced productivity by 50% for loading trucks, small/precise excavations, and security/S&H requirements. Assume trucks are direct loaded. Average 135 BCY/day based excavator productivity. Duration = 2.9 days. Based on RSMeans Cost Data.
	$/day	2,223.00	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 2 - Excavation and Off-site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Standby Time	day	3	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
	$/day	671	
Nonhazardous Waste	tons	630	Includes transport and disposal of waste to American Landfill, Waynesburg, Ohio. Assumes a minimum of 22 tons/load. Based on Clean Harbors quote March 2019 and includes $716 per load for transportation and $50/ton disposal.
Transport and Offsite Disposal	$/ton	82.55	
Confirmation Sampling			
Samples	ea	8	Includes 8 samples collected for confirmation and analyzed for PAHs.
Sampling Labor	hrs	8	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	8	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	840	Analyze samples for PAHs (8 @ $105).
Restoration			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	473	Includes 12-in lift of native fill assuming 20% swell. ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	$/cy	35.09	
Native Soil Backfill Certification	ea	1	One sample of native soil for RVAAP full suite analysis ($716). One sampling technician at 4 hours and $75/hour to collect and ship sample. Sample materials at $35. Truck rental at $90/day and gas at $20.
Native Soil Backfill Certification	$/ea	1,161	
Seeding, Vegetative Cover	MSF	15	Seeding with mulch and fertilizer. Assume 1/3 acre is revegetated for restored areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	$/MSF	107.07	
SWPPP Inspections	hrs	16	Assume 4 hrs per week for 4 weeks.
SWPPP Inspections	$/hr	80	
Plans and Reports			
Corrective Action Completion Report	hrs	160	Includes Construction QC data and preparing report.
Technical Labor	$/hr	95	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 2 - Excavation and Off-site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

O&M Cost (Years 0 to 30)			
Site Inspection and Maintenance	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually and complete checklist for incorporation into 5-year review.
Field Labor	$/hr	70	
CERCLA Reviews			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	$/event	8,200	Assume 80 hours/review @ $90/hr. Add $1,000 misc expenses.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 2 - Excavation and Off-site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use
Cost Estimate

CAPITAL COST **$196,411**

Activity (unit)	Quantity	Unit Cost	Total
Waste Characterization Sampling			
Sampling Labor (hrs)	8	$75.00	$600
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	2	$35.00	$70
Sample Analysis (event)	1	$720.00	$720
Site Work			
Civil Survey (day)	1	$1,066.00	$1,066
As Built Drawings (hrs)	4	$80.00	$320
Clearing (acre)	0.20	$4,897.03	$979
Sediment and Erosion Control (lf)	300	$12.68	$3,803
Soil Excavation			
Mobilization/Demobilization (ls)	1	$5,000.00	$5,000
Excavate Soil (days)	3	$2,223.00	$6,669
Standby Time (day)	3	$671.00	$2,013
NonhazardousTransport and Offsite Disposal (ton)	630	$82.55	$52,037
Confirmation Sampling			
Sampling Labor (hrs)	8	$75.00	$600
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	8	$35.00	$280
Sample Analysis (event)	1	$840.00	$840
Restoration			
Native Soil Backfill (cy)	473	$35.09	$16,597
Native Soil Backfill Certification (ea)	1	$1,161.00	$1,161
Seeding, Vegetative Cover (MSF)	15	$107.07	$1,606
SWPPP Inspections (hrs)	16	$80.00	$1,280
Plans and Reports			
Corrective Action Completion Report (ea)	160	$95.00	$15,200
Subtotal			$111,061
Design		20%	$22,212
Office Overhead		5%	$5,553
Field Overhead		10%	$11,106
Subtotal			$149,932
Profit		6%	$8,996
Contingency		25%	$37,483
Total			$196,411

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 2 - Excavation and Off-site Disposal of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use
Cost Estimate

OPERATION AND MAINTENANCE	$97,978

Activity (unit)	Quantity	Unit Cost	Total Cost
Site Inspection			
Site Inspection (ea)	30	$280	$8,400
CERCLA Reviews			
CERCLA 5-Year Reviews (ea)	6	$8,200	$49,200
Subtotal O&M			$57,600
Design		20%	$11,520
Office Overhead		5%	$2,880
Field Overhead		10%	$5,760
Subtotal			$77,760
Profit		6%	$4,666
Contingency		20%	$15,552
Total			$97,978

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost)	$294,389

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 3 - Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/ Industrial Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Site Work			
Site Area	sf	8,521	
Civil Survey	day	1.0	Survey AOC areas to document excavation area. RSMeans 017123131100.
Civil Survey	$/day	1,066	
As Built Drawings	hours	4	Develop plat map for incorporation into the Base Master Plan.
As Built Drawings	$/hr	80	
Clearing	acre	0.20	Assume trees/brush cleared, chipped, & left onsite.
Clearing	$/acre	4,897	RSMeans 022302000200. Clear & chip medium trees to 12" dia.
Sediment and Erosion Control	lf	300	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	$/lf	12.68	RSMeans 312514161000 & 250.
Soil Excavation			
Soil Excavation Volume (In situ)	cy	394	Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	473	Includes soil volume to be treated. Ex situ volumes include 20% swell factor.
Soil Excavation Surface Area	sf	8,521	
Mobilization/Demobilization	ls	5,000	Includes mob/demob of excavation equipment and preparing submittals.
Excavate Soils	day	3	Includes 3/4 cy excavator, 1 cy loader, 2 O.E., 1 L.S. spotter, 1 L.S. for misc. Reduced productivity by 25% for small/precise excavations and security/S&H requirements. Average 180 BCY/day based excavator productivity. Duration = 2.2 days. Based on RSMeans Cost Data.
	$/day	3,443.00	
Standby Time	day	3	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
	$/day	671	
Thermal Treatment of Contaminated Soil	cy	473	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	$/cy	42.64	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 3 - Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/ Industrial Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Confirmation Sampling			
Samples	ea	18	Includes 8 samples collected for confirmation and analyzed for PAHs. Includes 10 samples (one sample per treated 50 cy pile). Endpoint cost estimate of 10 samples is $1972.
Sampling Labor	hrs	16	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	18	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	2,812	Analyze samples for PAHs (8 @ $105) and treated soils ($1972).
Restoration			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	105	Quantity is based on 4-in of native soil over the removal area to facilitate vegetation growth. Pricing basis from ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	$/cy	35.09	
Native Soil Backfill Certification	ea	1	One sample of native soil for RVAAP full suite analysis ($716). One sampling technician at 4 hours and $75/hour to collect and ship sample. Sample materials at $35. Truck rental at $90/day and gas at $20.
Native Soil Backfill Certification	$/ea	1,161	
Seeding, Vegetative Cover	MSF	15	Seeding with mulch and fertilizer. Assume 1/3 acre is revegetated for restored areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	$/MSF	107.07	
SWPPP Inspections	hrs	16	Assume 4 hrs per week for 4 weeks.
SWPPP Inspections	$/hr	80	
Plans and Reports			
Corrective Action Completion Report	hrs	160	Includes Construction QC data and preparing report.
Technical Labor	$/hr	95	
O&M Cost (Years 0 to 30)			
Site Inspection and Maintenance	years	30	
Site Inspection	events	30	
Site Inspections	hrs	4	Inspect site annually and complete checklist for incorporation into 5-year review.
Field Labor	$/hr	70	
CERCLA Reviews			
CERCLA 5-Year Reviews	events	6	Assume 5 year reviews for 30 years.
CERCLA 5-Year Reviews	$/event	8,200	Assume 80 hours/review @ $90/hr. Add $1,000 misc expenses.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 3 - Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/ Industrial Land Use
Cost Estimate

CAPITAL COST			$126,216

Activity (unit)	Quantity	Unit Cost	Total
Site Work			
Civil Survey (day)	1	$1,066.00	$1,066
As Built Drawings (hrs)	4	$80.00	$320
Clearing (acre)	0.20	$4,897.03	$979
Sediment and Erosion Control (lf)	300	$12.68	$3,803
Soil Excavation and Treatment			
Mobilization/Demobilization (ls)	1	$5,000.00	$5,000
Excavate Soil (days)	3	$3,443.00	$10,329
Standby Time (day)	3	$671.00	$2,013
Thermal Treatment of Contaminated Soil (cy)	473	$42.64	$20,169
Confirmation Sampling			
Sampling Labor (hrs)	16	$75.00	$1,200
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	18	$35.00	$630
Sample Analysis (event)	1	$2,812.00	$2,812
Restoration			
Native Soil Backfill (cy)	105	$35.09	$3,691
Native Soil Backfill Certification (ea)	1	$1,161.00	$1,161
Seeding, Vegetative Cover (MSF)	15	$107.07	$1,606
SWPPP Inspections (hrs)	16	$80.00	$1,280
Plans and Reports			
Corrective Action Completion Report (ea)	160	$95.00	$15,200
Subtotal			$71,369
Design		20%	$14,274
Office Overhead		5%	$3,568
Field Overhead		10%	$7,137
Subtotal			$96,348
Profit		6%	$5,781
Contingency		25%	$24,087
Total			$126,216

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 3 - Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/ Industrial Land Use
Cost Estimate

OPERATION AND MAINTENANCE **$97,978**

Activity (unit)	Quantity	Unit Cost	Total Cost
Site Inspection			
Site Inspection (ea)	30	$280	$8,400
CERCLA Reviews			
CERCLA 5-Year Reviews (ea)	6	$8,200	$49,200
Subtotal O&M			$57,600
Design		20%	$11,520
Office Overhead		5%	$2,880
Field Overhead		10%	$5,760
Subtotal			$77,760
Profit		6%	$4,666
Contingency		20%	$15,552
Total			$97,978

TOTAL ALTERNATIVE CAPITAL AND O&M COST (Non Discounted Cost) **$224,194**

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 4 - Excavation and Off-site Disposal of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Waste Characterization Sampling			
Samples	ea	12	Waste characterization includes 12 samples for TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter.
Sampling Labor	hrs	10	Assumes 1 sampling technician at 10 hours to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	12	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	4,320	Analyze samples TCLP VOCs, SVOCs, Metals, RCRA Characteristics, and Paint Filter (12 @ $360).
Site Work			
Site Area	sf	549,084	
Civil Survey	day	2.0	Survey AOC areas to document excavation area. RSMeans 017123131100.
Civil Survey	$/day	1,066	
As Built Drawings	hours	8	Develop plat map for incorporation into the Base Master Plan.
As Built Drawings	$/hr	80	
Clearing	acre	0.50	Assume trees/brush cleared, chipped, & left onsite.
Clearing	$/acre	4,897	RSMeans 022302000200. Clear & chip medium trees to 12" dia.
Sediment and Erosion Control	lf	3,000	Includes silt fence and straw bales along down slope of excavation. RSMeans 312514161000 & 250.
Sediment and Erosion Control	$/lf	12.68	
Soil Excavation			
Soil Excavation Volume (In situ)	cy	25,421	Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (Ex situ)	cy	30,505	Includes soil volume to be transported and disposed. Ex situ volumes include 20% swell factor.
Volume to Weight Conversion	tons/cy	1.60	In situ soil conversion.
Soil Excavation Mass	tons	40,674	Includes soil mass to be transported and disposed.
Soil Excavation Surface Area	sf	549,084	
Mobilization/Demobilization	ls	10,000	Includes mob/demob of excavation equipment and preparing submittals. Assume two or more crews.
Excavate Soils	day	59	
	$/day	3,036.00	Includes 1.5 cy excavator, 1 O.E., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 20% for loading trucks, precise excavations, and security/S&H requirements. Assume trucks are direct loaded. Average 432 cy/day and 58.8 days for excavation. Assume 59 days. RSMeans Crew B12-F.

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 4 - Excavation and Off-site Disposal of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Standby Time	day $/day	3 892	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
Nonhazardous Waste Transport and Offsite Disposal	tons $/ton	40,674 82.55	Includes transport and disposal of waste to American Landfill, Waynesburg, Ohio. Assumes a minimum of 22 tons/load. Based on Clean Harbors quote March 2019 and includes $716 per load for transportation and $50/ton disposal.
Confirmation Sampling			
Samples	ea	64	Includes 64 samples collected for confirmation and analyzed for PAHs.
Sampling Labor	hrs	80	Assumes 1 sampling technician to collect and ship samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	920	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	64	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	6,720	Analyze samples for PAHs (64 @ $105).
Restoration			
Seeding, Vegetative Cover	MSF	484	Seeding with mulch and fertilizer. Assume 11 acres is revegetated for restored areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	$/MSF	107.07	
SWPPP Inspections	hrs	40	Assume 4 hrs per week for 10 weeks.
SWPPP Inspections	$/hr	80	
Plans and Reports			
Corrective Action Completion Report	hrs	240	Includes Construction QC data and preparing report.
Technical Labor	$/hr	95	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 4 - Excavation and Off-site Disposal of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use
Cost Estimate

CAPITAL COST **$4,496,580**

Activity (unit)	Quantity	Unit Cost	Total
Waste Characterization Sampling			
Sampling Labor (hrs)	10	$75.00	$750
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	12	$35.00	$420
Sample Analysis (event)	1	$4,320.00	$4,320
Site Work			
Civil Survey (day)	2	$1,066.00	$2,132
As Built Drawings (hrs)	8	$80.00	$640
Clearing (acre)	0.50	$4,897.03	$2,449
Sediment and Erosion Control (lf)	3,000	$12.68	$38,033
Soil Excavation			
Mobilization/Demobilization (ls)	1	$10,000.00	$10,000
Excavate Soil (days)	59	$3,036.00	$179,124
Standby Time (day)	3	$892.00	$2,676
Nonhazardous Transport and Offsite Disposal (ton)	40,674	$82.55	$3,357,421
Confirmation Sampling			
Sampling Labor (hrs)	80	$75.00	$6,000
Truck Rental / Gas (event)	1	$920.00	$920
Sample Materials (ea)	64	$35.00	$2,240
Sample Analysis (event)	1	$6,720.00	$6,720
Restoration			
Seeding, Vegetative Cover (MSF)	484	$107.07	$51,820
SWPPP Inspections (hrs)	40	$80.00	$3,200
Plans and Reports			
Corrective Action Completion Report (ea)	240	$95.00	$22,800
Subtotal			$3,691,774
Design		2%	$73,835
Office Overhead		1%	$36,918
Field Overhead		2%	$73,835
Subtotal			$3,876,362
Profit		6%	$232,582
Contingency		10%	$387,636
Total			$4,496,580

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 5 - Ex Situ Thermal Treatment of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Site Work			
Site Area	sf	549,084	
Civil Survey	day	2.0	Survey AOC areas to document excavation area. RSMeans 017123131100.
Civil Survey	$/day	1,066	
As Built Drawings	hours	8	Develop plat map for incorporation into the Base Master Plan.
As Built Drawings	$/hr	80	
Clearing	acre	0.50	Assume trees/brush cleared, chipped, & left onsite.
Clearing	$/acre	4,897	RSMeans 022302000200. Clear & chip medium trees to 12" dia.
Sediment and Erosion Control	lf	3,000	Includes silt fence and straw bales along down slope of excavation.
Sediment and Erosion Control	$/lf	12.68	RSMeans 312514161000 & 250.
Soil Excavation			Includes excavation of the AOC area based on the areas and depths presented in the summary table. In situ volumes include a 25% constructability factor.
Soil Excavation Volume (In situ)	cy	25,421	
Soil Excavation Volume (Ex situ)	cy	30,505	Includes soil volume to be treated. Ex situ volumes include 20% swell factor.
Soil Excavation Surface Area	sf	549,084	
Mobilization/Demobilization	ls	10,000	Includes mob/demob of excavation equipment and preparing submittals.
Excavate Soils	day	59	
	$/day	3,898.00	Includes 1.5 cy excavator, 2.25 cy loader, 2 O.E., 1 L.S. spotter, 1 L.S. for misc. Reduced productivity by 20% for precise excavations and security/S&H requirements. Average 432 cy/day and 58.8 days for excavation. Assume 59 days. RSMeans Crew B12-F.
Standby Time	day	3	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
	$/day	892	
Thermal Treatment of Contaminated Soil	cy	30,505	Source: Endpoint Technology cost estimate using Vapor Energy Generator (VEG) Soil Remediation.
	$/cy	42.64	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 5 - Ex Situ Thermal Treatment of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use
Key Parameters and Assumptions

Key Parameters and Assumptions:

Confirmation Sampling			
Samples	ea	675	Includes 64 samples collected for confirmation and analyzed for PAHs. Includes 611 samples (one sample per treated 50 cy pile). Endpoint cost estimate of 10 samples is $120,489.
Sampling Labor	hrs	80	Assumes 1 sampling technician to collect and ship PAH samples.
Sampling Labor	$/hr	75	
Truck Rental / Gas	$/event	110	1 truck x $90/day. Add $20 for gas.
Sample Materials	ea	64	Reference ECHOS 33 02 0401/0402 for ISM, processing, disposable sampling and decontamination materials.
Sample Materials	$/ea	35	
Analytical Cost	$/event	127,209	Analyze samples for PAHs (64 @ $105) and treated soils ($120,489).
Restoration			Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements.
Native Soil Backfill	cy	6,778	Quantity is based on 4-in of native soil over the removal area to facilitate vegetation growth. Pricing basis from ECHOS 17030423 and RSMeans 312323160040, Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, Includes delivery, spreading, and compaction.
Native Soil Backfill	$/cy	35.09	
Native Soil Backfill Certification	ea	1	One sample of native soil for RVAAP full suite analysis ($716). One sampling technician at 4 hours and $75/hour to collect and ship sample. Sample materials at $35. Truck rental at $90/day and gas at $20.
Native Soil Backfill Certification	$/ea	1,161	
Seeding, Vegetative Cover	MSF	484	Seeding with mulch and fertilizer. Assume 11 acres is revegetated for restored areas and equipment damage. RSMeans 329219142200.
Seeding, Vegetative Cover	$/MSF	107.07	
SWPPP Inspections	hrs	40	Assume 4 hrs per week for 10 weeks.
SWPPP Inspections	$/hr	80	
Plans and Reports			
Report	hrs	280	Includes Construction QC data and preparing report.
Technical Labor	$/hr	95	

Feasibility Study for RVAAP Atlas Scrap Yard – Former Storage Area
Alternative 5 - Ex Situ Thermal Treatment of Surface Soil at the Former Storage Area – Attain Unrestricted (Residential) Land Use
Cost Estimate

CAPITAL COST			$2,718,988
Activity (unit)	Quantity	Unit Cost	Total
Site Work			
Civil Survey (day)	2	$1,066.00	$2,132
As Built Drawings (hrs)	8	$80.00	$640
Clearing (acre)	0.50	$4,897.03	$2,449
Sediment and Erosion Control (lf)	3,000	$12.68	$38,033
Soil Excavation and Treatment			
Mobilization/Demobilization (ls)	1	$10,000.00	$10,000
Excavate Soil (days)	59	$3,898.00	$229,982
Standby Time (day)	3	$892.00	$2,676
Thermal Treatment of Contaminated Soil (cy)	30,505	$42.64	$1,300,733
Confirmation Sampling			
Sampling Labor (hrs)	80	$75.00	$6,000
Truck Rental / Gas (event)	1	$110.00	$110
Sample Materials (ea)	64	$35.00	$2,240
Sample Analysis (event)	1	$127,209.00	$127,209
Restoration			
Native Soil Backfill (cy)	6,778	$35.09	$237,832
Native Soil Backfill Certification (ea)	1	$1,161.00	$1,161
Seeding, Vegetative Cover (MSF)	484	$107.07	$51,820
SWPPP Inspections (hrs)	40	$80.00	$3,200
Plans and Reports			
Corrective Action Completion Report (ea)	280	$95.00	$26,600
Subtotal			$2,042,816
Design		4%	$81,713
Office Overhead		2%	$40,856
Field Overhead		4%	$81,713
Subtotal			$2,247,098
Profit		6%	$134,826
Contingency		15%	$337,065
Total			$2,718,988

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APPENDIX C

Ohio EPA Comments

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Ohio Environmental Protection Agency

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

September 10, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Correspondence
Remedial Response
Portage County
ID # 267000859106

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

Subject: Ohio EPA's Review of the Army's Response to Comments, Draft Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA) has reviewed the Army's August 13, 2018 response to Ohio EPA's July 30, 2019 comment letter on the Draft Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard.

All comments have been adequately addressed. Please submit the document in final form.

If you have any questions, please feel free to contact me at (330) 963-1170, or by email at ed.damato@epa.ohio.gov.

Sincerely,

Edward J. D'Amato
Site Coordinator
Division of Environmental Response and Revitalization

ED/sc

ec: David Connolly, ARNG
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
Craig Coombs, USACE Louisville
Nathaniel Peters, USACE Louisville
Rebecca Shreffler, Chenega Tri-Services, LLC
Natalie Oryshkewych, Ohio EPA, NEDO, DERR
Megan Oravec, Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
Tom Schneider, Ohio EPA, SWDO, DERR
Brian Tucker, Ohio EPA, CO, DERR

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SEP 10 2019

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

August 13, 2019

Ohio Environmental Protection Agency
DERR-NEDO
Attn: Mr. Edward D'Amato
2110 East Aurora Road
Twinsburg, OH 44087-1924

Subject: Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, RVAAP-50 Atlas Scrap Yard, Responses to Ohio Environmental Protection Agency (Ohio EPA) Comments dated July 30, 2019, Draft Feasibility Study (Work Activity No. 267-000-859-106)

References: Draft Atlas Scrap Yard Feasibility Study, April 11, 2019
Ohio EPA's Review of "Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard", June 5, 2019
Army Responses to Ohio EPA Comments, June 28, 2019
Ohio EPA's Review of the Army's Response to Comments, July 30, 2019

Dear Mr. D'Amato:

The Army appreciates your review of the Army's responses to Ohio EPA comments regarding the Draft Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard. As noted in the July 30, 2019 letter, responses to Ohio EPA Comments 1, 2, 4, 5, and 6 were adequately addressed. Enclosed for your review and concurrence is a response to your additional comments on Ohio EPA Comment 3. Upon resolution of Ohio EPA Comment 3, the Army will submit the Final version of this feasibility study.

The comment responses were prepared for the Army National Guard in support of the RVAAP restoration program. Please contact the undersigned at (703) 607-7589 or david.m.connolly8.civ@mail.mil if there are issues or concerns with this submission.

Sincerely,

Date: 2019.08.13 08:50:40 -04'00'

David Connolly
RVAAP Restoration Program Manager
Army National Guard Directorate

cc: Bob Princic, Ohio EPA, NEDO, DERR
Mark Johnson, Ohio EPA, NEDO, DERR
Thomas Schneider, Ohio EPA, SWDO, DERR
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
Craig Coombs, USACE Louisville
Nathaniel Peters, II, USACE Louisville
Jed Thomas, Leidos
Gail Harris, Vista Sciences Corporation
Rebecca Shreffler, Chenega

Subject: Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, RVAAP-50 Atlas Scrap Yard (Work Activity No. 267-000-859-106)

Ohio EPA Comment 3 (dated 6/5/19): Land Use Control

It was not clear in the draft document what areas of the AOC would potentially be restricted if LUCs are used as part of the remedy. If a use other than unrestricted land use is selected as part of a remedy, then the entire AOC area would be restricted to commercial/industrial use.

Comment 3 Action Item: Please clarify the revised document as discussed above.

Army Response (dated 6/28/19): Clarification. The Army's recommended alternatives are as follows, as presented in Section 10 of the FS:

- FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.

- FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use

After implementation of these two recommended alternatives, the only area requiring land use controls is the Former Storage Area. The other portions of Atlas Scrap Yard, including the entirety of the Former Incinerator Area, will not require land use controls and will attain Unrestricted (Residential) Land Use.

For clarity, the following paragraph has been added after the second paragraph of Section 10.2 Recommended Alternatives:

> "After implementation of the two recommended alternatives, the area designated as the Former Storage Area will require LUCs to ensure use is limited to Commercial/Industrial Land Use. This area is depicted in Figure 10-1. The remaining portions of Atlas Scrap Yard will attain Unrestricted (Residential) Land Use."

In addition, a new Figure 10-1 will be added to the FS to depict the area requiring Land Use Controls after implementation of the Army's recommended alternatives. This new figure is presented at the end of these responses. *(Presented in the letter dated 6/28/19).*

Ohio EPA Response (dated 7/30/19):

Please include a discussion of the process and cost of placing a land use restriction on a portion of the AOC, including the cost of annual inspections and maintenance.

For future sites/AOCs with soil polycyclic aromatic hydrocarbon contamination that require remediation, the Army may want to consider the use of mycoremediation (the use offungi to break down contaminants) or other bioremediation approaches as potential remedial alternatives. These technologies have become more reliable and can be very cost effective compared to other technologies.

Army Response: Clarification and agree. As noted above, implementation of the recommended alternative for the FSA (FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use) will require land use controls (LUCs) for the area designated as the Former Storage Area (FSA). The LUC requirements will include annual inspections and CERCLA 5-year reviews.

The process for placing land use restrictions on the FSA is to develop a Land Use Control Remedial Design (LUCRD) for Ohio EPA concurrence. Details specified in the LUCRD will be documented in the Property

Management Plan. The LUC requirements and details for this process are currently summarized in Sections 9.1.3.5 and 9.1.3.6 of the FS.

Appendix B.2 presents the cost components and total estimated cost for FSA Alternative 2. Within this appendix, key parameters and assumptions for the annual inspections and five-year reviews are presented, and the cost for these specific elements are calculated. These are presented in Pages B-15 and B-16 of Appendix B.2. (Please note that the final version of the FS will have page numbering on the cost estimate for ease of reference).

The second paragraph within Section 10.2 Recommended Alternatives has been revised as follows:

> "In addition, FSA Alternative 3 is a green and highly sustainable alternative for on-site treatment and reuse of soil and implements a treatment alternative to reduce the toxicity, mobility, and volume of contamination. The estimated cost for FSA Alternative 3 is $224,194, which includes an estimated $97,978 for LUCs."

Regarding future sites/AOCs with soil PAH contamination requiring remediation, the Army will consider the use of bioremediation (such as mycoremediation) approaches as potential remedial alternatives.

Ohio Environmental Protection Agency

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

July 30, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Correspondence
Remedial Response
Portage County
ID # 267000859106

Mr. David Connolly
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 2204

Subject: Ohio EPA's Review of the Army's Response to Comments, Draft "Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard"

Dear Mr. Connolly:

On June 28, 2019, the Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) received the Army National Guard's (Army) response to Ohio EPA's June 5, 2019 comment letter on the "Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard." The document was prepared for the United States Army Corps of Engineers (USACE) by Leidos.

All comments have been adequately addressed except for Comment 3 regarding Land Use Controls (LUCs). Below is Ohio EPA's original comment and the Army's response followed by Ohio EPA's current response:

3) Land Use Control

It was not clear in the draft document what portions of the Area of Concern (AOC) would potentially be restricted if LUCs are used as part of the remedy. If a use other than unrestricted land use is selected as part of a remedy, then the entire AOC area would be restricted to commercial/industrial use.

Action Item: Please clarify the revised document as discussed above.

Army Response: *Clarification. The Army's recommended alternatives are as follows, as presented in Section 10 of the [feasibility study] FS:*

- *FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.*
- *FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use*

After implementation of these two recommended alternatives, the only area requiring land use controls is the Former Storage Area. The other portions of Atlas Scrap Yard, including the entirety of the Former Incinerator Area, will not require land use controls and will attain Unrestricted (Residential) Land Use. For clarity, the following paragraph has been added after the second paragraph of Section 10.2

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Recommended Alternatives:

"After implementation of the two recommended alternatives, the area designated as the Former Storage Area will require LUCs to ensure use is limited to Commercial/Industrial Land Use. This area is depicted in Figure 10-1. The remaining portions of Atlas Scrap Yard will attain Unrestricted (Residential) Land Use."

In addition, a new Figure 10-1 will be added to the FS to depict the area requiring Land Use Controls after implementation of the Army's recommended alternatives. This new figure is presented at the end of these responses.

Ohio EPA Response: Please include a discussion of the process and cost of placing a land use restriction on a portion of the AOC, including the cost of annual inspections and maintenance.

For future sites/AOCs with soil polycyclic aromatic hydrocarbon contamination that require remediation, the Army may want to consider the use of mycoremediation (the use of fungi to break down contaminants) or other bioremediation approaches as potential remedial alternatives. These technologies have become more reliable and can be very cost effective compared to other technologies.

Please incorporate the response to the above comment into a revised draft FS. If you have any questions, please feel free to contact me at (330) 963-1170, or by email at ed.damato@epa.ohio.gov.

Sincerely,

Edward J. D'Amato
Site Coordinator
Division of Environmental Response and Revitalization

ED/sc

ec: David Connolly, ARNG
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
Craig Coombs, USACE Louisville
Nathaniel Peters, USACE Louisville
Rebecca Shreffler, Chenega Tri-Services, LLC
Mark S. Johnson Jr., Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
Tom Schneider, Ohio EPA, SWDO, DERR
Brian Tucker, Ohio EPA, CO, DERR

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

June 28, 2019

Ohio Environmental Protection Agency
DERR-NEDO
Attn: Mr. Edward D'Amato
2110 East Aurora Road
Twinsburg, OH 44087-1924

Subject: Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, RVAAP-50 Atlas Scrap Yard, Responses to Comments on the Draft Feasibility Study (Work Activity No. 267-000-859-106)

Dear Mr. D'Amato:

The Army appreciates your time and comments (dated June 5, 2019) on the Draft Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard. Enclosed for your review are responses to your comments. Upon resolution of these comments, the Army will provide a Final version of the feasibility study for Ohio EPA concurrence.

These comment responses were prepared for the Army National Guard in support of the RVAAP restoration program. Please contact the undersigned at (703) 607-7589 or david.m.connolly8.civ@mail.mil if there are issues or concerns with this submission.

Sincerely,

SEDLAK.KEVIN.MICHAEL.1254440171 Digitally signed by SEDLAK.KEVIN.MICHAEL.1254440171 Date: 2019.06.28 12:14:42 -04'00'

FOR David Connolly
RVAAP Restoration Program Manager
Army National Guard Directorate

cc: Bob Princic, Ohio EPA, NEDO, DERR
Mark Johnson, Ohio EPA, NEDO, DERR
Thomas Schneider, Ohio EPA, SWDO, DERR
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
Craig Coombs, USACE Louisville
Nathaniel Peters, II, USACE Louisville
Jed Thomas, Leidos
Gail Harris, Vista Sciences Corporation
Rebecca Shreffler, Chenega

Subject: Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, RVAAP-50 Atlas Scrap Yard (Work Activity No. 267-000-859-106)

Comments

<u>Ohio EPA Comment 1</u>: Section 4.2.4, Page 4-4, Extent of Polyaromatic Hydrocarbon (PAH) Contamination Requiring a Remedial Action (RA)

"Figure 4-5 depicts this sample location (ASYss-126M) requiring remediation to attain Commercial/Industrial land Use and the remainder of the FSA requiring land use controls (LUCs) to prevent Unrestricted (Residential) Land Use."

The sentence above in the document discusses areas requiring LUCs to meet commercial/industrial land use. Clarification is needed so it is understood that RA is needed as the identified areas do not meet unrestricted/residential clean-up goals (CUGs). It is premature at this stage of the Feasibility Study (FS) to suggest or identify possible remedial decisions. Furthermore, this text may also imply that the FS was not completely evaluated, and a remedy was selected before the appropriate evaluations.

Comment 1 Action Item: Revise text prior to identifying the preferred remedy as needing RA where LUCs were indicated.

Army Response: Agree. The text has been revised as below to indicate that only ASYss-126M requires remediation to attain Commercial/Industrial Land Use.

> "Only one sample location (ASYss-126M) within the FSA had an exceedance of the Industrial Receptor PAH CUG. Benzo(a)pyrene was detected at a concentration of 50J mg/kg at this sample location, compared to the Industrial Receptor CUG of 21 mg/kg. Figure 4-5 depicts this sample location (ASYss-126M) requiring remediation to attain Commercial/Industrial Land Use ~~and the remainder of the FSA requiring land use controls (LUCs) to prevent Unrestricted (Residential) Land Use~~. Figure 4-6 shows that the entirety of the FSA requires remediation to attain Unrestricted (Residential) Land Use."

The alternatives that require LUCs (FSA Alternative 2 and FSA Alternative 3) both state the following within the Land Use Control Remedial Design portion of the description of the remedial alternatives (Sections 9.1.2.6 and 9.1.3.5): "…alternative will also rely on LUCs to prevent Resident Receptor exposure to PAH COCs in the FSA."

<u>Ohio EPA Comment 2</u>: Preference for Unrestricted/Residential Use at all Areas of Concern (AOCs)

The preferred option for all AOCs is unrestricted land use. It is not clear why this preference for unrestricted land use was not identified and thoroughly discussed in the draft FS, as stated in the February 4, 2014 technical memorandum on land uses and risk assessment (http://www.rvaap.org/docs/pub/F TM LU FWCUG 40 00.pdf): "The preferred remedy is one that would meet Unrestricted Land Use (e.g. , residential)."

Unrestricted land use allows for the most flexibility and options for the property owners. The FS should be revised to include this information. The weighting of the alternatives should, in part, consider the preferred goal unrestricted land use. Provide this information in the next version of the draft FS as it may affect the identified preferred alternative.

Comment 2 Action Item: Please revise the FS to include the information from the 2014 technical memorandum and revise the weighting of alternatives as discussed above.

Army Response: Clarification.

The Feasibility Study evaluates three alternatives that achieve Unrestricted (Residential) Land Use, one alternative is associated with the Former Incinerator Area and two alternatives are associated with the Former Storage Area. The detailed description of these alternatives are presented in the following subsections:

- Section 8.1.2 FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use
- Section 9.1.4 FSA Alternative 4: Excavation and Off-Site Disposal of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use
- Section 9.1.5 FSA Alternative 5: Ex Situ Thermal Treatment of Surface Soil at the FSA – Attain Unrestricted (Residential) Land Use

A detailed analysis of remedial alternatives is presented in the FS to compare the alternatives against one another and present considerations common to the alternatives. A comparative analysis of each alternative is presented that scores the established balancing criteria amongst one another to identify the most feasible alternative.

While it is preferred to meet Unrestricted (Residential) Land Use for maximum flexibility and use of a site, the Army must evaluate and identify the most feasible alternative to achieve acceptable land uses.

For the Former Incinerator Area, the alternative that attains Unrestricted (Residential) Land Use is identified as the recommended alternative.

For the Former Storage Area, the Army, as the lead agency, is recommending Alternative 3, which attains Commercial/Industrial Land Use. Alternative 3 is estimated to cost approximately $5.3M less than Alternative 4 and approximately $2.5M less than Alternative 5. In addition, Alternative 3 scored higher when considering the implementability (i.e., the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution) and short-term effectiveness (i.e., 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).

As such, the Army is recommending no changes to the FSA recommended alternative.

<u>Ohio EPA Comment 3</u>: Land Use Control

It was not clear in the draft document what areas of the AOC would potentially be restricted if LUCs are used as part of the remedy. If a use other than unrestricted land use is selected as part of a remedy, then the entire AOC area would be restricted to commercial/industrial use.

Comment 3 Action Item: Please clarify the revised document as discussed above.

Army Response: Clarification. The Army's recommended alternatives are as follows, as presented in Section 10 of the FS:

- FIA Alternative 2: Excavation, Stabilization, and Off-Site Disposal of Surface Soil at the FIA – Attain Unrestricted (Residential) Land Use.

- FSA Alternative 3: Ex Situ Thermal Treatment of Surface Soil at ASYss-126M – Attain Commercial/Industrial Land Use

After implementation of these two recommended alternatives, the only area requiring land use controls is the Former Storage Area. The other portions of Atlas Scrap Yard, including the entirety of the Former Incinerator Area, will not require land use controls and will attain Unrestricted (Residential) Land Use.

For clarity, the following paragraph has been added after the second paragraph of Section 10.2 Recommended Alternatives:

> "After implementation of the two recommended alternatives, the area designated as the Former Storage Area will require LUCs to ensure use is limited to Commercial/Industrial Land Use. This area is depicted in Figure 10-1. The remaining portions of Atlas Scrap Yard will attain Unrestricted (Residential) Land Use."

In addition, a new Figure 10-1 will be added to the FS to depict the area requiring Land Use Controls after implementation of the Army's recommended alternatives. This new figure is presented at the end of these responses.

<u>Ohio EPA Comment 4</u>: Cost Modifications to Alternatives to Meet Unrestricted Land Use

Modifications to the removal or thermal treatment alternatives to meet unrestricted land use should be considered to reduce the estimated costs. One modification for soil removal (Alternative 4) is to not include replacement of soil/restoration. A one-foot excavation, off-site disposal and potential regrading of the area would lower total cost for the option. Also, transport costs and related costs should be reduced if the thermal treatment unit (Alternative 5) is being used at other AOCs for soil remediation.

Comment 4 Action Item: Please provide some discussion in the revised FS and possibly a range of potential costs for the four alternatives evaluated.

Army Response: Clarification. To fairly compare one alternative to another, only one cost estimate is provided per alternative. Per the CERCLA guidance, the cost estimate accuracy is targeted to be within +50% to -30%. In addition, slight refinements will not make up for the cost difference associated with the lead agency's current recommended alternative (FSA Alternative 3, cost of $224K) and alternatives that attain Unrestricted (Residential) Land Use (FSA Alternative 4, cost $5.59M and FSA Alternative 5, cost $2.72M)

Regarding the specific recommendations:

1) For purposes of this cost estimate, the Army agrees to remove the placement of Native Soil Backfill from the cost estimate. However, it should be noted that Atlas Scrap Yard is essentially flat and prone to poor drainage. In reality, regardless of which alternative is ultimately selected, the Army will require the remediation contractor to restore the site to near original grade to minimize excessive ponding of rain water. Section 9.1.4.6 Restoration (for FSA Alternative 4) has been revised as follows:

   "~~Upon completing soil excavation, all disturbed and excavated areas will be backfilled with clean soil and graded to meet neighboring contours. The backfill soil will come from a clean source that was previously sampled and approved for use by Ohio EPA. After the area is backfilled and graded,~~ Workers will apply a seed mixture (as approved by OHARNG) and mulch. This includes using CJAG's "emergent marsh" seed mixture in areas previously identified as wetlands. Restored areas will be inspected and monitored as required in the storm water best management practices established in the RD."

2) The Army accounted for savings with respect to mobilization of a thermal treatment system. The cost estimates associated with FSA Alternative 3 and FSA Alternative 5 assumed the treatment system will be onsite. However, beyond that, it is the Army's preference to evaluate each site individually. The Army is uncertain of the schedule and scope of the Atlas Scrap Yard Remedial Action compared to a site or sites that may be conducted at the same time.

Ohio EPA Comment 5: Company Profit in the Cost Section of an FS

Company profit is to be removed from all alternatives evaluated in this and future FS documents. This is especially important for fixed or performance-based projects where profits are not considered in the RA costs and therefore are not a genuine or defensible component of the detailed screening of the technologies.

Comment 5 Action Item: Please remove the discussion of company profit from the revised document.

Army Response: Clarification. Future contractors competitively bidding on the work will include profits in their cost proposals and final prices. This is true for fixed or performance-based projects. It is safe for the government to assume that the cost to execute these alternatives will include profit for the executing firm. USEPA guidance for developing and documenting remedial alternative cost estimates during the feasibility study in *A Guide to Developing and Documenting Cost Estimates During the Feasibility Study,* July 2000, states Capital and O&M costs include all labor, equipment, and material costs, including contractor markups such as overhead and profit (Section 3.1).

As the lead agency, the Army would like profits to be considered in the FS cost estimates.

Ohio EPA Comment 6: Annual Reporting Costs

Costs of annual monitoring and reporting appears to be undervalued. For example, annual reporting and monitoring should be estimated for a minimum of 50 years as the default 30-year period is not commensurate with the costs incurred as long as the property remains a restricted land use (perpetual costs). It would be informative to include a year at which the costs of the remedy that included monitoring and O&M would equal the costs of the least expensive alternative that meets an unrestricted land use.

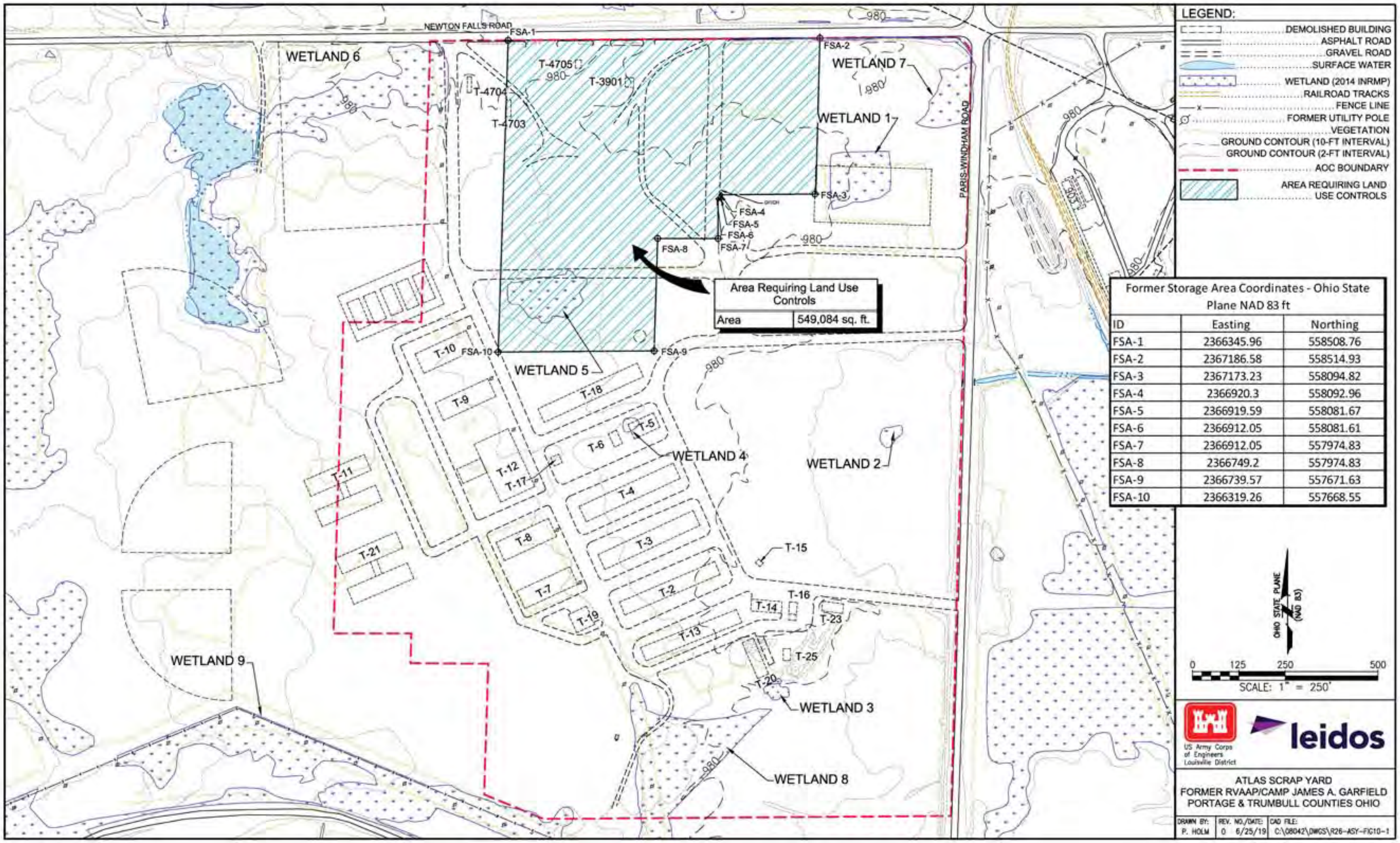
Comment 6 Action Item: Please revise the document to properly value the annual costs of monitoring and reporting.

Army Response: Clarification. The 30-year O&M period for sites that do not attain Unrestricted (Residential) Land Use has been utilized in many feasibility studies in the past.

The FS provides an estimated cost of $97,978 to conduct 30 years of O&M. Therefore, 60 years would be $195,956; 90 years $293,934, etc. This is significantly lower than the difference between the lead agency's recommended alternative (FSA Alternative 2, cost $224K) and the least expensive alternative that meets Unrestricted (Residential) Land Use (FSA Alternative 5, cost $2.72M).

Subject: Former Ravenna Army Ammunition Plant (RVAAP) Restoration Program, Portage/Trumbull Counties, RVAAP-50 Atlas Scrap Yard (Work Activity No. 267-000-859-106)

New Figure 10-1



Former Storage Area Coordinates - Ohio State Plane NAD 83 ft		
ID	Easting	Northing
FSA-1	2366345.96	558508.76
FSA-2	2367186.58	558514.93
FSA-3	2367173.23	558094.82
FSA-4	2366920.3	558092.96
FSA-5	2366919.59	558081.67
FSA-6	2366912.05	558081.61
FSA-7	2366912.05	557974.83
FSA-8	2366749.2	557974.83
FSA-9	2366739.57	557671.63
FSA-10	2366319.26	557668.55

Figure 10-1. Area Requiring Land Use Controls after Implementation of Recommended Alternatives

Ohio Environmental Protection Agency

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

June 5, 2019

RE: US Army Ravenna Ammunition PLT RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859106

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

Subject: Ohio EPA's Review of "Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard"

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA) has received and reviewed the April 11, 2019 "Feasibility Study for Soil, Sediment, and Surface Water at RVAAP-50 Atlas Scrap Yard," for the Ravenna Army Ammunition Plant (RVAAP), Portage and Trumbull Counties. The document was received at the Northeast District Office (NEDO) on April 11, 2019. Ohio EPA has the following comments:

1. **Section 4.2.4, Page 4-4, Extent of Polyaromatic Hydrocarbon (PAH) Contamination Requiring a Remedial Action (RA)**

   "Figure 4-5 depicts this sample location (ASYss-126M) requiring remediation to attain Commercial/Industrial land Use and the remainder of the FSA requiring land use controls (LUCs) to prevent Unrestricted (Residential) Land Use."

   The sentence above in the document discusses areas requiring LUCs to meet commercial/industrial land use. Clarification is needed so it is understood that RA is needed as the identified areas do not meet unrestricted/residential clean-up goals (CUGs). It is premature at this stage of the Feasibility Study (FS) to suggest or identify possible remedial decisions. Furthermore, this text may also imply that the FS was not completely evaluated, and a remedy was selected before the appropriate evaluations.

   Action Item: Revise text prior to identifying the preferred remedy as needing RA where LUCs were indicated.

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2. Preference for Unrestricted/Residential Use at all Areas of Concern (AOCs)

The preferred option for all AOCs is unrestricted land use. It is not clear why this preference for unrestricted land use was not identified and thoroughly discussed in the draft FS, as stated in the February 4, 2014 technical memorandum on land uses and risk assessment (http://www.rvaap.org/docs/pub/F_TM_LU_FWCUG_40_00.pdf): "*The preferred remedy is one that would meet Unrestricted Land Use (e.g., residential).*" Unrestricted land use allows for the most flexibility and options for the property owners. The FS should be revised to include this information. The weighting of the alternatives should, in part, consider the preferred goal unrestricted land use. Provide this information in the next version of the draft FS as it may affect the identified preferred alternative.

Action Item: Please revise the FS to include the information from the 2014 technical memorandum and revise the weighting of alternatives as discussed above.

3. Land Use Control

It was not clear in the draft document what areas of the AOC would potentially be restricted if LUCs are used as part of the remedy. If a use other than unrestricted land use is selected as part of a remedy, then the entire AOC area would be restricted to commercial/industrial use.

Action Item: Please clarify the revised document as discussed above.

4. Cost Modifications to Alternatives to Meet Unrestricted Land Use

Modifications to the removal or thermal treatment alternatives to meet unrestricted land use should be considered to reduce the estimated costs. One modification for soil removal (Alternative 4) is to not include replacement of soil/restoration. A one-foot excavation, off-site disposal and potential regrading of the area would lower total cost for the option. Also, transport costs and related costs should be reduced if the thermal treatment unit (Alternative 5) is being used at other AOCs for soil remediation.

Action Item: Please provide some discussion in the revised FS and possibly a range of potential costs for the four alternatives evaluated.

5. Company Profit in the Cost Section of an FS

Company profit is to be removed from all alternatives evaluated in this and future FS documents. This is especially important for fixed or performance-based projects where profits are not considered in the RA costs and therefore are not a genuine or defensible component of the detailed screening of the technologies.

Action Item: Please remove the discussion of company profit from the revised document.

6. Annual Reporting Costs

Costs of annual monitoring and reporting appears to be undervalued. For example, annual reporting and monitoring should be estimated for a minimum of 50 years as the default 30-year period is not commensurate with the costs incurred as long as the property remains a restricted land use (perpetual costs). It would be informative to include a year at which the costs of the remedy that included monitoring and O&M would equal the costs of the least expensive alternative that meets an unrestricted land use.

> **Action Item:** Please revise the document to properly value the annual costs of monitoring and reporting.

If you have any questions concerning the above, please feel free to contact me at (330) 963-1170, or by email at ed.damato@epa.ohio.gov.

Sincerely,

Edward D'Amato
Site Coordinator
Division of Environmental Response and Revitalization

ED/sc

ec: David Connolly, ARNG
Kevin Sedlak, ARNG, Camp James A. Garfield
Katie Tait, OHARNG, Camp James A. Garfield
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Nathaniel Peters, USACE Louisville
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