FINAL
Engineering Evaluation/Cost Analysis: CC RVAAP-78 Quarry Pond Surface Dump at Former Ravenna Army Ammunition Plant

Camp James A. Garfield
Portage and Trumbull Counties, Ohio

Project No. 118064-CC RVAAP-78

September 19, 2019

Prepared by:

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Prepared for:

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Portage and Trumbull Counties, Ohio

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14. ABSTRACT

This Engineering Evaluation/Cost Analysis (EE/CA) was prepared y the United States Army Corps of Engineers (USACE), Louisville District to identify and assess Alternatives to support the selection of appropriate remedial actions for the area of concern (AOC) Compliance Restoration Site under the Army Environmental Compliance-Related Cleanup Program, CC RVAAP-78 Quarry Pond Surface Dump at the former Ravenna Army Ammunition Plant (RVAAP). For this project Alternative 2 – Excavation and Off-site Disposal was selected. An evaluation of the potential chemicals of concern previously identified in the surface and subsurface soil was also assessed. Based on the results of the EE/CA, three Debris Piles that contain construction debris including asbestos-containing material (ACM) wastes; on subsurface soil in the Test Pit Area that contained ACM; and one subsurface soil sample under on the Debris Piles that had asbestos fibers int it are recommended for removal. Once the removal action is complete, the site will be a No Further Action (NFA) under CERCLA.

15. SUBJECT TERMS

EE/CA, asbestos removal, asbestos fibers, asbestos containing material, ACM, cost analysis, chemical evaluation, CC RVAAP-78 Quarry Pond Surface Dump, Compliance Restoration Sites, No Further Action, NFA, CERCLA, Unrestricted (Residential) Land Use

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Ohio Environmental Protection Agency

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

September 25, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859216

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

Subject: Review of Response to Comments, Final Engineering Evaluation/Cost Analysis for CC-RVAAP-78 Quarry Pond Surface Dump

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has reviewed the September 19, 2019 Engineering Evaluation/Cost Analysis for CC-RVAAP-78 Quarry Pond Surface Dump, received on September 20, 2019.

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
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STATEMENT OF INDEPENDENT TECHNICAL REVIEW

The United States Army Corps of Engineers has completed the Engineering Evaluation/Cost Analysis for the CC RVAAP-78 Quarry Pond Surface Dump 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 this project. During the independent technical review, compliance with established policy principals and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions, methods, procedures, and materials 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 the law and existing United States Army Corps of Engineers policy.

Reviewed/Approved by: _____ Date: 9/17/2019

Richard Kennard
Independent Technical Reviewer

Reviewed/Approved by: _____ Date: 9/18/2019

Nathaniel Peters, II
Independent Technical Reviewer

_____ Date: 9/18/2019

Angela L. Schmidt, MS, CET
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FINAL
Engineering Evaluation/Cost Analysis: CC RVAAP-78 Quarry Pond Surface Dump at Former Ravenna Army Ammunition Plant Camp James A. Garfield Portage and Trumbull Counties, Ohio

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Portage and Trumbull Counties, Ohio

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ARNG – Army National Guard
DERR – Division of Environmental Response and Revitalization
I&E – Installations and Environment
NEDO – Northeast District Office
OHARNG – Ohio Army National Guard
Ohio EPA = Ohio Environmental Protection Agency
SWDO = Southwest District Office
USACE = U.S. Army Corps of Engineers

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ACRONYMS AND ABBREVIATIONS

ACM	asbestos-containing material
AOC	Area of Concern
bgs	below ground surface
BSV	background screening value
CC	Army Environmental Compliance-Related Cleanup Program
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
C&DD	construction and demolition debris
CJAG	Camp James A. Garfield
CSM	conceptual site model
DERR	Division of Environmental Response and Revitalization
DGM	digital geophysical mapping
DOD	U.S. Department of Defense
DPT	direct-push technology
DU	Decision unit
EPA	U.S. Environmental Protection Agency
FS	feasibility study
FWSAP	Facility-Wide Sampling and Analysis Plan
FWCUG	facility-wide cleanup goal
ft	Feet (foot)
ft^2	Square feet (foot)
GPS	global positioning system
IRP	Installation Restoration Program
ISM	incremental sampling method
kg	kilogram
LDR	Land Disposal Restrictions
MDC	maximum detected concentration
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mm	millimeter
NESAP	National Emissions Standards for Hazardous Air Pollution
NGB	National Guard Bureau
OAC	Ohio Administrative Code
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PA	preliminary assessment
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PRG	Preliminary Remediation Goal
RA	removal action
RD	remedial design
RI	remedial investigation
ROD	record of decision

RSL	regional screening level
RVAAP	Former Ravenna Army Ammunition Plant
SAP	sampling and analysis plan
SLERA	screening level ecological risk assessment
SVOC	semivolatile organic compound
TBC	To Be Considered
USP&FO	United States Property and Fiscal Officer
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion & Preventative Medicine
USAEC	U.S. Army Environmental Command
VOC	volatile organic compound
yd^3	cubic yard

SECTION 1: INTRODUCTION

This Engineering Evaluation/Cost Analysis (EE/CA) was prepared by the United States Army Corps of Engineers (USACE), Louisville District to identify and assess Alternatives to support the selection of appropriate remedial actions for the area of concern (AOC), Compliance Restoration (CR) Site CC (Army Environmental Compliance-Related Cleanup Program) RVAAP-78 Quarry Pond Surface Dump at the former Ravenna Army Ammunition Plant (RVAAP). This AOC at the former RVAAP, now Camp James A. Garfield Joint Military Training Center (CJAG), is located in Portage and Trumbull counties, Ohio (**Figures 1-1 and 1-2**).

The CC RVAAP-78 AOC is in the south-central portion of the facility, northeast of the intersection between South Patrol Road and Greenleaf Road. The AOC consists of steeply inclined rocky slopes. The former dumping was completed at the bases of the rocky slopes. There were three main areas where debris was dumped that are called debris piles. The debris is sporadically spread across these piles. Most of the content of the debris piles is soil and not that of debris. The debris piles are located north, northwest, and northeast of the northern-most quarry pond within the adjacent Fuze and Booster Quarry Landfill/Ponds AOC (RVAAP-16). The dump areas called Debris Piles A and B are at the bases of steeply inclined rock slopes of the quarry. The third dump area is called Debris Pile C, is flatter and is adjacent to the northwest end of the northern-most pond within the AOC. Debris Piles consists of soil with construction debris, scrap metal, cultural debris, and asbestos-containing material (ACM) (e.g. transite type roofing, sheeting, etc.) spread on top of the soil.

The basis for this EE/CA was established in the 2011 Historical Records Review (HRR), the 2016 Site Inspection (SI) Report and the SI Addendum (USACE, 2018). The HRR indicated that there was a large amount of construction debris located between mainly Debris Pile A and Debris B (referred to herein as the Test Pit Area). The HRR also stated the construction debris area (Test Pit Area) possibly extended westward to the road along the east side of the northernmost pond on the adjacent AOC (RVAAP-16). The 2016 SI showed ACM was present in Debris Piles A and B, and one subsurface soil sample from Debris Pile C had 2% asbestos fibers. Construction debris and rubble were identified in Debris Pile C but no ACM was noted in the surface soil under the debris. The analytical results for surface soil in the 2016 SI showed samples had detections of various chemicals at concentrations greater than the Facility-wide Cleanup Goals (FWCUGs – see SAIC, 2010) for Unrestricted (Residential) Land Use as well as the observed presence of substantial amounts of transite and roofing materials in the debris that contains approximately 35% asbestos. The SI (USACE, 2016) concluded that additional remedial actions were warranted at the AOC to address the contamination (both chemical and ACM) in the three Debris Piles. The 2016 SI recommended that Debris Piles A, and B and potentially surface/subsurface soil at Debris Pile C be removed and disposed. No subsurface soil exists under Debris Pile A and Debris Pile B. Transite was observed in both Debris Piles A and B. Asbestos contents of 30 % and 40 % were detected in the transite samples from Debris Piles A and B, respectively, and the roofing sample from Debris Pile B had a result of 35 % asbestos. In the SI, all soil samples were analyzed for asbestos fibers. All the soil samples were non-detect or less than 1 percent asbestos, except

for sample C78SB-021M-0001-SO, one of the subsurface soil vertical ISM samples from Debris Pile C, which had a level of 2 percent asbestos fibers. The term ACM is used to refer to both building material with transite and other debris that contains asbestos while soil with asbestos is referred to as asbestos fibers. Following the SI, the SI Addendum was then completed to evaluate the areas surrounding the Debris Piles to determine if they contained contamination and also to see if there was contamination in the Test Pit Area. Since the SI already identified that a removal action was warranted to remove the three Debris Piles, the Debris Piles were not reassessed in the SI Addendum. The SI Addendum concluded that a No Further Action (NFA) decision was appropriate since neither chemical contamination nor asbestos contamination were found in the soil surrounding the three Debris Piles. Additionally, the SI Addendum showed that within the Test Pit Area, one Test Pit (Test Pit 5 – 78 TPA-TP5) sample contained ACM. The ACM was analyzed, and results indicated it contained 20 percent chrysotile. Test Pit 5 is located within the DU03 (DU around Debris Pile A) (**Figure 1-3**). It was recommended that the area around Test Pit 5 be included with the removal of the three Debris Piles. The SI Addendum Report essentially bounded the three Debris Piles to delineate the size of the Debris Piles.

This EE/CA streamlines the CERCLA process for the CC RVAAP-78 AOC, given the Army's decision to move forward to remove the asbestos and to re-evaluate the contaminated soil from the Debris Piles and the Test Pit Area, one Test Pit (Test Pit 5 – 78 TPA-TP5). The EE/CA allows the CERCLA process at the CC RVAAP-78 AOC to proceed in a defensible and cost-effective manner. Although the EE/CA is streamlined compared to a Feasibility Study (FS), the EE/CA process will ensure appropriate measures are taken to protect human health, the community, and the environment as done in an FS. Instead of completing an FS and going through the detailed Alternatives analysis and remedy selection, the Army has determined the most efficient and cost-effective way to complete the removal action is through the EE/CA process.

This EE/CA includes the following:

- Evaluation of two Alternatives –Evaluation of two Alternatives – No Action Alternative and Alternative 2 to excavate and dispose of Debris Piles A, B, and C; incidental removal of surface soil under Debris Piles A, B, and C where debris occurs; removal of debris and soil from Test Pit (Test Pit 5 – 78 TPA-TP5); and removal of subsurface soil in one location under Debris Pile C.

- As part of Alternative 2, results of chemicals from the Incremental Sample Methodology (ISM) surface soil samples from all three Debris Piles and subsurface soil samples from Debris Pile C from the 2016 SI were assessed to ensure that the soil does not contain concentrations of chemicals great enough to require further evaluation. This will also assist in determining the appropriate type of disposal in an approved landfill.

This report was prepared in accordance with CERLCA (42 U. S. Code 9601 et seq.) requirements to develop and evaluate removal action alternatives. Following CERLCA guidance, this EE/CA identifies removal action objectives (RmAOs), identifies potential

removal action alternatives, and evaluates alternatives against criteria identified in U. S. Environmental Protection Agency (USEPA) guidance documents *Use of Non-Time Critical Removal Authority in Superfund Response Actions* (USEPA, 2000) and *Guidance on Conducting Non-Time Critical Removal Actions under CERCLA* (USEPA, 1993).

This EE/CA was conducted under the United States (U.S.) Department of Defense (DOD) Installation Restoration Program (IRP). In addition, planning and performance of all elements of this work will be in accordance with the requirements of the Ohio Environmental Protection Agency (Ohio EPA) Director's Final Findings and Orders (DFFOs) dated June 10, 2004 (Ohio EPA, 2004). As stated in the guidelines, the USEPA has urged Superfund decision makers to broadly use the CERCLA removal authority to achieve quick, protective results at Superfund sites, consistent with legal requirements, including public participation. Most importantly, this EE/CA provides an efficient pathway to assess and evaluate two Alternatives at the CC RVAAP-78 AOC.

1.1 SCOPE AND PURPOSE

The primary purpose of this EE/CA is to evaluate a removal action of of Debris Piles A, B, and C; the subsurface soil at Debris Pile C around area sample C78SB-021M-0001-SO; and the ACM/soil from subsurface soil sample at the Test Pit 5 – 78 TPA-TP5 (in a location around Debris Pile A) at CC RVAAP-78 AOC . Following CERCLA guidance, this EE/CA identifies removal action objectives (RAOs), identifies potential removal action Alternatives, and evaluates Alternatives against criteria identified in USEPA's 1993 Guidance on Conducting Non-Time Critical Removal Actions under CERCLA. The final outcome of this EE/CA is to identify the most suitable Alternative that ensures the CC RVAAP-78 AOC meets the requirements for Unrestricted (Residential) Land Use.

1.2 REPORT ORGANIZATION

This report is organized as follows:

- Section 1 presents the introduction, scope and purpose, and report organization.
- Section 2 summarizes the facility description, site background and description, and previous investigations and results.
- Section 3 includes the evaluation of chemicals in soil.
- Section 4 summarizes the removal action objectives, cleanup goals, and volumes of soil requiring removal.
- Section 5 summarizes Applicable or Relevant and Appropriate Requirements.
- Section 6 includes the identification of Alternatives.
- Section 7 presents an evaluation of each Alternative.

- Section 8 presents a comparative analysis of the two Alternatives.
- Section 9 summarizes agency coordination and public involvement activities.
- Section 10 presents the Recommended Alternative.
- Section 11 provides references.
- Appendix A includes analytical data used in the evaluation of chemicals in soil.
- Appendix B identifies relevant Applicable or Relevant and Appropriate Requirements (ARARs).
- Appendix C presents information regarding the estimated costs.

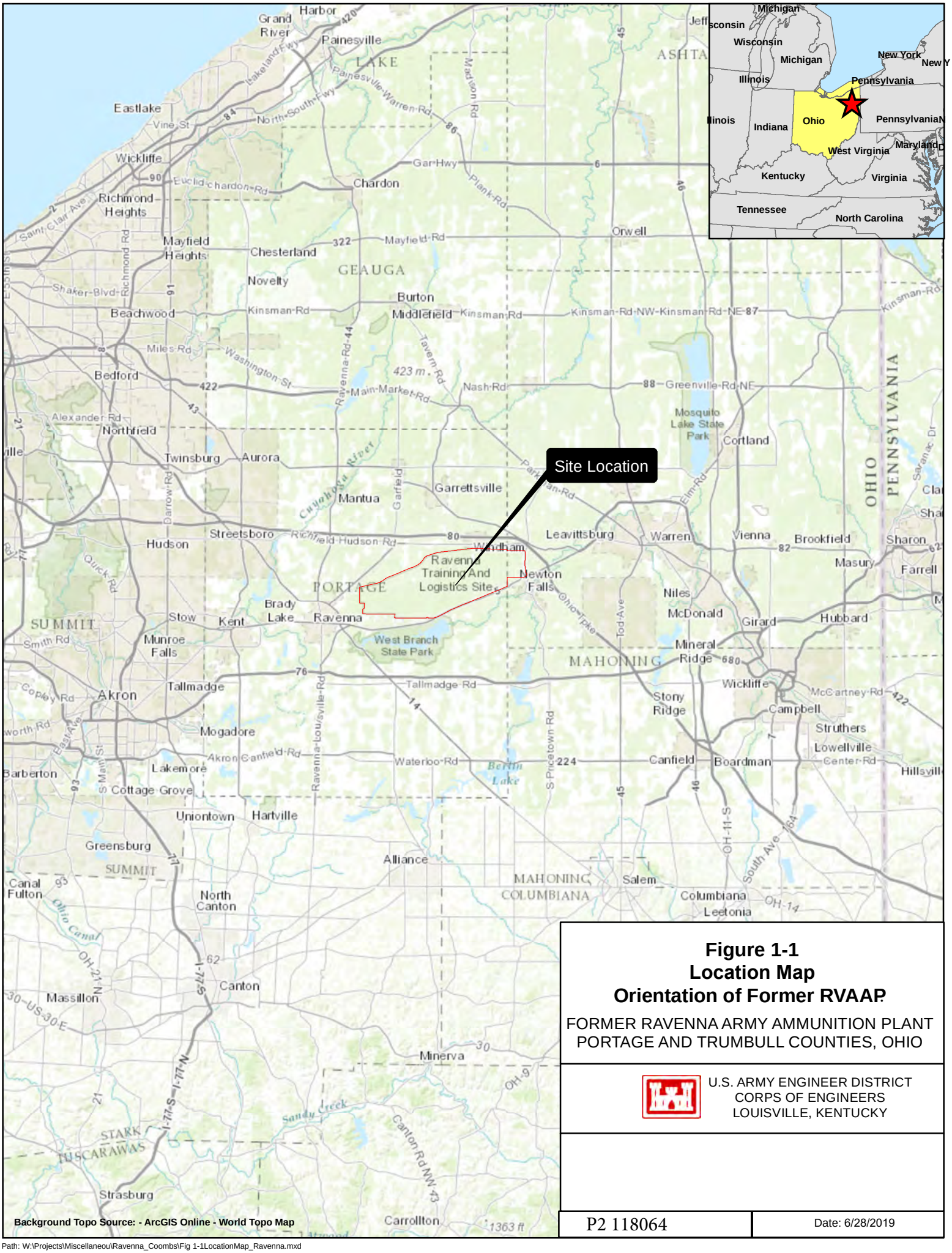

Figure 1-1
Location Map
Orientation of Former RVAAP

FORMER RAVENNA ARMY AMMUNITION PLANT
PORTAGE AND TRUMBULL COUNTIES, OHIO

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

P2 118064

Date: 6/28/2019

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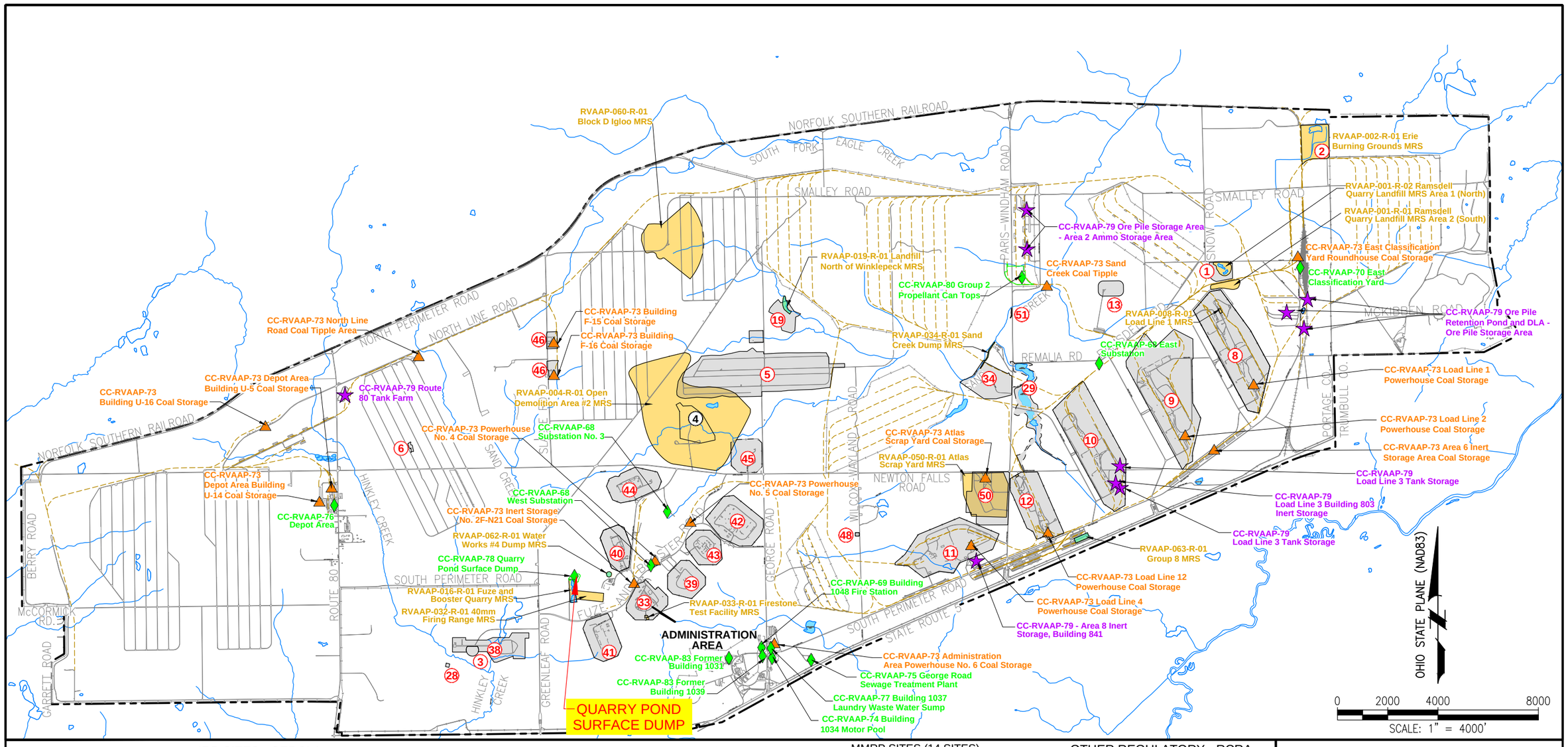


IRP SITES - CERCLA

- (1) RVAAP-01 ..... RAMSDELL QUARRY LANDFILL
- (3) RVAAP-03 ..... OPEN DEMOLITION AREA #1
- (5) RVAAP-05 ..... WINKLEPECK BURNING GROUNDS
- (6) RVAAP-06 ..... C BLOCK QUARRY
- (8) RVAAP-08 ..... LOAD LINE 1
- (9) RVAAP-09 ..... LOAD LINE 2
- (10) RVAAP-10 ..... LOAD LINE 3
- (11) RVAAP-11 ..... LOAD LINE 4
- (12) RVAAP-12 ..... LOAD LINE 12
- (13) RVAAP-13 ..... BLDG 1200 & DILUTION\SETTLING POND
- (19) RVAAP-19 ..... LANDFILL NORTH OF WINKLEPECK BURNING GROUNDS
- (28) RVAAP-28 ..... MUSTARD AGENT BURIAL SITE
- (29) RVAAP-29 ..... UPPER AND LOWER COBBS PONDS
- (33) RVAAP-33 ..... LOAD LINE 6
- (34) RVAAP-34 ..... SAND CREEK DISPOSAL ROAD LANDFILL
- (38) RVAAP-38 ..... NACA TEST AREA
- (39) RVAAP-39 ..... LOAD LINE 5
- (40) RVAAP-40 ..... LOAD LINE 7
- (41) RVAAP-41 ..... LOAD LINE 8
- (42) RVAAP-42 ..... LOAD LINE 9
- (43) RVAAP-43 ..... LOAD LINE 10
- (44) RVAAP-44 ..... LOAD LINE 11
- (45) RVAAP-45 ..... WET STORAGE AREA
- (46) RVAAP-46 ..... BUILDINGS F-15 AND F-16
- (48) RVAAP-48 ..... ANCHOR TEST AREA
- (50) RVAAP-50 ..... ATLAS SCRAP YARD
- (51) RVAAP-51 ... DUMP ALONG PARIS-WINDHAM ROAD
- RVAAP-66 ..... FACILITY-WIDE GROUNDWATER
- RVAAP-67 ..... FACILITY-WIDE SEWERS

COMPLIANCE RESTORATION SITES (13 SITES)

- RVAAP-68 ..... ELECTRIC SUBSTATIONS (E,W,NO.3)
- RVAAP-69 ..... BUILDING 1048 – FIRE STATION
- RVAAP-70 ..... EAST CLASSIFICATION YARD
- RVAAP-72 ..... FACILITY-WIDE USTs
- RVAAP-73 ..... FACILITY-WIDE COAL STORAGE
- RVAAP-74 BUILDING 1034 MOTOR POOL HYDRAULIC LIFT
- RVAAP-75 .GEORGE ROAD SEWAGE TREATMENT PLANT
- RVAAP-76 ..... DEPOT AREA
- RVAAP-77 BUILDING 1037 LAUNDRY WASTE WATER SUMP
- RVAAP-78 ..... QUARRY POND SURFACE DUMP
- RVAAP-79 ..... DLA ORE STORAGE SITES
- RVAAP-80 ..... GROUP 2 PROPELLANT CAN TOPS
- RVAAP-83 ..... FORMER BUILDINGS 1031 AND 1039

MMRP SITES (14 SITES)

- RVAAP-001-R-02 ..... RAMSDELL QUARRY LANDFILL AREA 1 (NORTH)
- RVAAP-001-R-01 ..... RAMSDELL QUARRY LANDFILL AREA 2 (SOUTH)
- RVAAP-002-R-01 ..... ERIE BURNING GROUNDS MRS
- RVAAP-004-R-01 ..... OPEN DEMOLITION AREA #2 MRS
- RVAAP-008-R-01 ..... LOAD LINE 1 MRS
- RVAAP-016-R-01 ..... FUZE AND BOOSTER QUARRY MRS
- RVAAP-019-R-01 ..... LANDFILL NORTH OF WINKLEPECK MRS
- RVAAP-032-R-01 ..... 40MM FIRING RANGE MRS
- RVAAP-033-R-01 ..... FIRESTONE TEST FACILITY MRS
- RVAAP-034-R-01 ..... SAND CREEK DUMP MRS
- RVAAP-050-R-01 ..... ATLAS SCRAP YARD MRS
- RVAAP-060-R-01 ..... BLOCK D IGLOO MRS
- RVAAP-061-R-01 ..... BLOCK D IGLOO – TD MRS
- RVAAP-062-R-01 ..... WATER WORKS #4 DUMP MRS
- RVAAP-063-R-01 ..... GROUP 8 MRS

OTHER REGULATORY - RCRA

- (4) RVAAP-04 ..... OPEN DEMOLITION AREA #2

LEGEND:

- COMPLIANCE RESTORATION SITES – APPROVED
- DLA ORE STORAGE AREAS (7 SITES)
- COAL STORAGE AREAS (17 SITES)
- AOC SITES
- MMRP SITES
- OLD RAILROAD BED
- FENCELINE
- STREAM OR CREEK

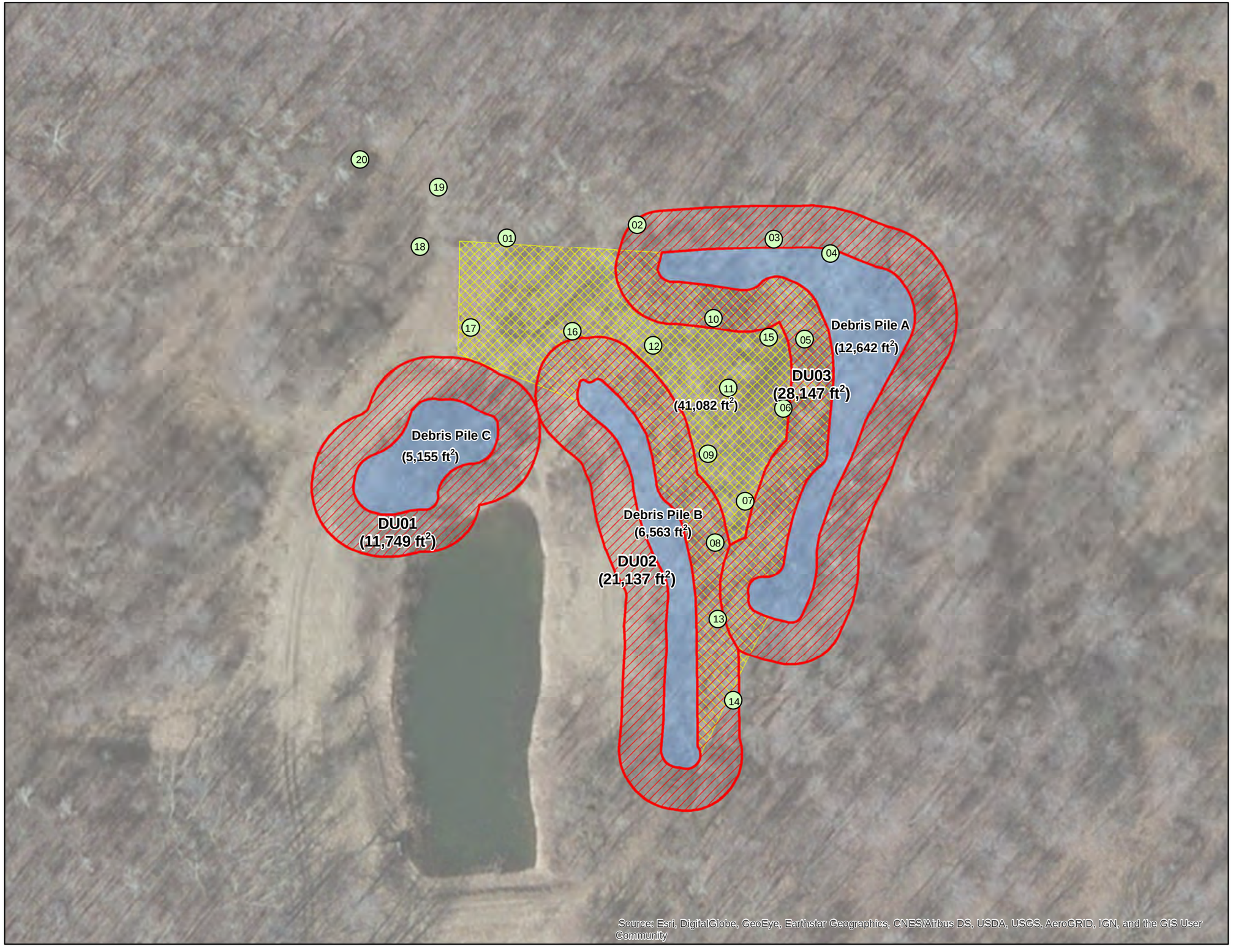
US Army Corps of Engineers Louisville District

leidos

FORMER RVAAP/CAMP JAMES A. GARFIELD PORTAGE & TRUMBULL COUNTIES, OHIO

DRAWN BY:	REV. NO./DATE:	CAD FILE: C:\08042\DWGS
P. HOLM	6/5/19	S87-QUARRYPONDDUMP

Figure 1-2. Former RVAAP Facility Map.



LEGEND

- Test Pit Location
- Test Pit Sample Location
- Decision Unit
- Debris Pile

NOTES & SOURCES

Map Source: ESRI World Imagery

Figure 1-3. Site Map of CC RVAAP-78 AOC.
(Quarry Pond Surface Dump)

FORMER RAVENNA ARMY AMMUNITION PLANT PORTAGE AND TRUMBULL COUNTIES, OHIO

0 40 80 Feet

N

FIGURE
1-3

SECTION 2: SITE DESCRIPTION AND HISTORY

2.1 GENERAL FACILITY

Camp James A. Garfield Joint Training Center (CJAG), former RVAAP, is located in northeastern Ohio within Portage and Trumbull counties, approximately 1.6 kilometers (km) (1 mile) northwest of the city of Newton Falls and 4.8 km (3 miles) east-northeast of the city of Ravenna (**Figure 1-1**). The installation is surrounded by several communities: Windham to the north; Garrettsville 1 mile to the northwest; Newton Falls 1 mile to the east; Charlestown to the southwest; and Wayland 3 miles southeast. The facility is a parcel of property approximately 17.7 km (11 miles) long and 5.6 km (3.5 miles) wide bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garret, McCormick, and Berry Roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east (**Figure 1-2**).

As of September 2013, administrative accountability of the entire 21,683-acre installation has been transferred to the United States Property and Fiscal Office (USP&FO) for Ohio. The installation has been licensed to the OHARNG for use as a military training site (CJAG). The RVAAP IRP involves cleanup of former production/operational areas throughout the facility related to operations that were conducted at the former RVAAP facility.

2.2 OPERATIONAL HISTORY AND MISSION OF THE FORMER RVAAP

The former RVAAP was constructed in 1940. Production at the former RVAAP began in December 1941, with the primary missions of depot storage and ammunition loading. The installation was divided into two separate units: the Portage Ordnance Depot and the Ravenna Ordnance Plant. The depot's primary mission was storage of munitions and components, while the mission of the ordnance plant was loading and packing major caliber artillery ammunition and the assembly of munitions-initiating components that included fuzes, boosters, and percussion elements. In August 1943, the installation was re-designated as the Ravenna Ordnance Center, and in November 1945, it was re-designated as the Ravenna Arsenal.

The plant was placed in standby status in 1950 and reactivated during the Korean Conflict to load and pack major caliber shells and components. All production ended in August 1957, and in October 1957 the installation again was placed in a standby condition. In October 1960 the ammonium nitrate line was renovated for demilitarization operations, which involved melting explosives out of bomb casings for subsequent recycling. These operations began in January 1961. In July 1961, the plant was deactivated again. In November 1961, the installation was divided into the Ravenna Ordnance Plant and an industrial section, with the entire Installation designated as the RVAAP.

In May 1968, loading, assembling, and packing munitions began on three load lines and two component lines to support the Southeast Asia conflict. These facilities were deactivated in August 1972. The destruction of M71A1 90-millimeter (mm) projectiles extended from June 1973 until March 1974. Demilitarization of various munitions was conducted from October 1982 through 1992.

Until 1993, the former RVAAP maintained the capability to load, assemble, and pack military ammunition. As part of the former RVAAP mission, the U.S. Army maintained inactive facilities in a standby status by keeping equipment in a condition to allow resuming production within prescribed limitations. In September 1993, the U.S. Army placed the former RVAAP in inactive caretaker status, which subsequently changed to modified caretaker status. The load lines and associated real estate were determined to be excess by the U.S. Army.

2.3 CURRENT STATUS

The facility is licensed to the OHARNG for use as a military training site, Camp James A. Garfield. The RVAAP restoration program (Installation Restoration Program – IRP) involves cleanup of former production/operational areas throughout the facility related to former activities conducted under the RVAAP. The Ohio EPA is the lead regulatory agency for the investigation and remediation conducted by the U.S. Army under the U.S. Department of Defense (DOD) IRP.

2.4 CC RVAAP-78 QUARRY POND SURFACE DUMP

This section presents a summary of the CC RVAAP-78 AOC history, previous RAs and investigations, and chemicals detected in environmental media at the AOC.

2.4.1 LOCATION AND SITE FEATURES

The CC RVAAP-78 AOC is in the south-central portion of the facility, northeast of the intersection between South Patrol Road and Greenleaf Road. The AOC consists of steeply inclined rocky slopes. The former dumping occurred at the bases of the rocky slopes. There are three main dump areas (debris piles) that are located north, northwest, and northeast of the northern-most quarry pond within the adjacent Fuze and Booster Quarry Landfill/Ponds AOC (RVAAP-16). Debris Piles A and B are at the bases of steeply inclined rock slopes of the quarry. The third dump area, Debris Pile C, is flatter and is adjacent to the northwest end of the northern-most pond within the AOC. Debris Piles consists of construction debris, scrap metal, cultural debris, and ACMs (e.g. transite, roofing, sheeting, etc.) on top of soil spread sporadically across each of the dump areas.

Debris Pile A is approximately 425 feet in length varying in surface width from 18 to 68 feet. A second, smaller dump area at the base of a steeply inclined rock slope, defined as Debris Pile B, is approximately 296 feet in length and 24 feet wide (**Figure 1-3**). Debris Pile C is located along the northwestern corner of the northern-most quarry pond area with the debris area being approximately 120 feet by 45 feet (**Figure 1-3**).

In addition to the Debris Piles, a small area where materials appeared to have been burned is located near where a rusted, 55-gallon drum was located within Debris Pile B. This drum was identified as Drum #1 in the SI and was properly removed and disposed as part of the 2016 SI. This area was called an “apparent burn area” in the SI although there was no evidence besides charred ground and lack of vegetation to support that it was an actual burn area. The topographic map of this area (**Figure 1-3**), shows the south end of Debris Pile A becoming one

continuous slope from Reference Point 9b of Debris Pile A to Reference Point 3 of Debris Pile B. A second rusted 55-gallon drum (Drum #2) was present within Debris Pile C and was also properly removed and disposed of during the SI investigations.

Based on the HRR, CC RVAAP-78 AOC appears to be a possible northern extension of the existing Fuze and Booster Quarry AOC (RVAAP-16), which operated from 1945 through 1993. Prior to 1976, the quarry was reportedly used for open burning and as a landfill. The debris from the burning/landfill was allegedly removed during pond construction during the 1970s. In 1998, the Fuze and Booster Quarry was expanded to include three other settling ponds to the west and two debris piles to the northeast. The CC RVAAP-78 AOC although part of RVAAP-16 was not assessed with the RVAAP-16 AOC. Therefore, the three Debris Piles were evaluated separately as the CC RVAAP-78 AOC. The history of use of the CC RVAAP-78 AOC is related to the RVAAP-16 usage and CC RVAAP-78 only represents three Debris Piles that resulted from former DOD activity at RVAAP-16 AOC. The HRR indicated there was possibly a large amount of construction debris located between mainly Debris Pile A and Debris B (referred to herein as the Test Pit Area). It was also noted in the HHR that the construction debris area (Test Pit Area) possibly extended westward to the road along the east side of the northernmost pond on the adjacent AOC (RVAAP-16).

The 2016 SI showed ACM was present in Debris Piles A and B, and one soil sample from Debris Pile C had 2% asbestos fibers. Construction debris and rubble were identified in Debris Pile C but no ACM was noted. The SI soil analytical results showed samples had detections of various chemicals at concentrations greater than the Facility-wide Cleanup Goals (FWCUGs) for Unrestricted (Residential) Land Use as well as the observed presence of substantial amounts of transite and roofing materials that contained approximately 35% asbestos. Accordingly, the SI recommended that an RI be completed to further evaluate the Nature and Extent of the chemicals in the Debris Piles and that additional sampling be conducted in the area between Debris Piles A and B and the east side of the northern-most pond to determine if any fill materials are present that contain contamination.

2.4.2 PREVIOUS INVESTIGATIONS AND INFORMATION

Several previous investigations and other activities have been conducted at the CC RVAAP-78 AOC.

2.4.2.1 Chronological Property Summary

The adjacent AOC (RVAAP-16 Fuze and Booster Quarry Landfill/Ponds) was used as an explosive-contaminated sawdust burning area for Load Lines 6 and 11 from 1945 to 1949. In 1976, settling ponds were constructed, separated by earthen dams, with flow control gates for treating the spent brine regenerant and sand filtration backwash water from the Water Works 3 treatment plant, which treated groundwater from facility production wells (1976-1993). The debris was removed from the quarry bottom and transferred to either Ramsdell Quarry Landfill or one of the burning grounds in 1976. Historical operational information indicated activity at that fuze, and booster assemblies, projectiles, residual ash, and sanitary wastes were burned or dumped in the quarry prior to pond construction. Aerial photographs from 1952 show CC

RVAAP-78 Quarry Pond Surface Dump. Aerial photographs from 1966, 1979, and 1981 show less vegetation in the area than what currently exists. Aerial photographs are provided in Appendix A of the 2016 SI.

2.4.2.2. Military Operations

During the HRR, no documented evidence of military operations being performed at CC RVAAP-78 Quarry Pond Surface Dump were identified.

2.4.2.3 Summary of Previous Investigations

The following reports were completed for this AOC:

- Final Historical Records Review Report for 2010 Preliminary Assessment Compliance Restoration Sites CC-RVAAP-78 Quarry Pond Surface Dump & CC-RVAAP-80 Group 2 Propellant Can Tops, prepared by Prudent Technologies Inc. (Prudent) (2011a).

- Final Revised Site Inspection for Compliance Restoration Site CC-RVAAP-78 Quarry Pond Surface Dump (USACE, 2016).

- Final Site Inspection Addendum Report, CC-RVAAP-78 Quarry Pond Surface Dump (USACE, 2018).

The HRR indicated that there was a large amount of construction debris located between mainly Debris Pile A and Debris B (referred to herein as the Test Pit Area). The HRR also noted the construction debris area (Test Pit Area) possibly extended westward to the road along the east side of the northernmost pond on the adjacent AOC (RVAAP-16).

Results from the SI showed ACM and construction debris in Debris Pile A and Debris Pile B, and asbestos fibers only in subsurface soil from Debris Pile C. The following chemicals were identified as potential contamination (based on the maximum value compared to stringent residential screening criteria) from each Debris Pile:

- Debris Pile A - Surface Soil **(Table 6-1 from the SI Addendum, Appendix A):**
    - Metals: thallium.
    - Explosives/Propellants: 1,3-dinitrobenzene (qualified as a U value - non-detect).
    - SVOCs: 2-methyl-4,6-dinitrophenol (qualified as a UJ value) and benzo(a)pyrene.
- Debris Pile B - Surface Soil **(Table 6-2 from the SI Addendum, Appendix A):**
    - Metals: arsenic, chromium, and manganese.
    - Explosives/Propellants: 2,4,6-trinitrolouene (qualified as a J value - estimated).
    - SVOCs: 2-methyl-4,6-dinitro.phenol (qualified as a UJ value); bis(2-chloroethyl) ether; benzo(a)pyrene; and hexachloro-cyclopentadiene.

  - PCBs: Aroclor 1254 value was 0.21 mg/kg and screening value is 0.21 mg/kg).
- Debris Pile C - Surface Soil **(Table 6-3 from the SI Addendum, Appendix A):**
  - Metals: arsenic, chromium, manganese, nickel, and thallium.
  - SVOCs: 2-methyl-4,6-dinitrophenol (qualified as a UJ value); benz(a)anthracene; benzo(a)pyrene; bis(2-chloroethyl)ether; and hexachlorocyclopentadiene.
- Debris Pile C - Subsurface Soil **(Table 6-4 from the SI Addendum, Appendix A):**
  - Metals: cadmium and manganese.
  - SVOCs: 2-methyl-4,6-dinitrophenol (qualified as a UJ value); benz(a)anthracene; benzo(a)pyrene; benzo(b)fluoroanthene; bis (2-chloroethyl)ether; dibenz(a,h) anthracene; N-nitroso-di-n-propylamine; and hexachloro-cyclopentadiene.
  - PCBs: Aroclor 1254.

Because asbestos and potential chemical contamination were found in Debris Piles A, B, and C, the SI recommended additional remedial actions such as proceeding to an RI for further investigation. The SI also included a recommendation for an additional investigation of the area between Debris Piles A and B and the road adjacent to the east side of the northern-most pond.

The SI Addendum was completed to define the size of the Debris Piles and evaluate the Test Pit Area. Decision Units (DUs) were established to surround each debris pile at a distance of 30 ft in all directions (30-ft perimeter ring around the debris piles) to help establish the extent of the contamination in each pile since the SI already confirmed that chemical contamination was present in all three Debris Piles, ACM in Debris Pile A and Debris Pile B, and asbestos fibers in the subsurface soil at one location under Debris Pile C **(Figure 1-3)**. The AOC was divided into three Decision Units (DUs) that surrounded the three debris piles and at an area between two of the debris piles referred to as the Test Pit Area. No contamination or asbestos were found in any of the three DUs surrounding the Debris Piles. Asbestos containing material was found only in Test Pit 5. The ACM was analyzed, and results indicated it contained 20 percent chrysotile. The SI Addendum recommended additional remedial actions at the AOC. It was recommended that removal action alternatives be evaluated in an EE/CA as the next phase in the CERCLA process.

Besides the 2016 SI and SI Addendum, no additional investigations specific to CC RVAAP-78 Quarry Pond Surface Dump have been completed. However, multiple investigations have been conducted at the adjacent AOC (RVAAP-16 Fuze and Booster Quarry Landfill/Ponds). Various environmental data for soil and groundwater have been collected at RVAAP-16. Those investigations include sample locations in the vicinity of, and in some cases within, CC RVAAP-78 Quarry Pond Surface Dump (SpecPro 2005).

2.4.2.4 Land Use and Ownership

The CC RVAAP-78 Quarry Pond Surface Dump is located on CJAG/former RVAAP which is a military training site. The facility is federally owned; administrative accountability for the

entire 21,683-acre facility was transferred to the United States Property and Fiscal Office for Ohio, and subsequently licensed to the OHARNG for use as a military training site.

SECTION 3: CHEMICAL EVALUATION OF SOIL

This Section presents the evaluation of the concentrations of chemicals in soil (CES) to assess whether chemicals that were identified as potential contamination in the soil in 2016 SI using the FWCUGs for the Resident Receptor for Unrestricted (Residential) Land Use need further evaluation. The representative receptor for this Land Use was the Resident Receptor (adult and child). Since the chemicals were only assessed in the SI to determine if they were contamination, the CES will reassess the concentration of these chemicals to determine if they are hazardous and require additional remedial actions. In addition, the FWCUGs have not been updated yet so the USEPA Residential Regional Screening Levels (RSLs) for soil were used as the primary decision criteria in the CES. The information gained in the CES will be used for the development of Remedial Action Objectives (RAOs) to ensure that the soil is remediated along with the ACM and the asbestos if needed. The surface soil at Debris Piles A, B, and C did not contain asbestos fibers but ACMs were noted in the debris at Debris Piles A and B. Asbestos fibers were detected in subsurface soil in one sample in Debris Pile C. There is no subsurface soil under Debris Piles A and B. The CES is necessary to evaluate the chemicals in the soil and not the debris. Since the SI showed that the soil (both surface and subsurface) in the three Debris Piles had some chemicals that exceeded residential standards, the soil was re-evaluated to ensure it is not hazardous or that concentrations are not great enough to be of concern. It is important to assess the soil since some of the surface soil under Debris Piles A, B, and C will be removed incidentally when the debris is removed. The subsurface soil, which is only underneath Debris Pile C, only will be removed from one location.

The CES is a re-evaluation of the chemicals identified as potential contamination in the 2016 SI for the Unrestricted (Residential) Land Use in surface soil at Debris Piles A and B, and the surface and subsurface soil below Debris Pile C. The CES will determine if additional actions such as soil removal may be required to address chemical contamination specifically in the soil. Asbestos containing materials in the debris and asbestos fibers identified in the subsurface soil under Debris Pile C are not included in the CES.

3.1 ASSESSMENT PROCESS

The chemicals that were identified as potential contamination in surface soil at each of the Debris Piles were re-assessed in this CES. Additional evaluation was completed to address the chemicals identified as potential contamination in subsurface soil under Debris Pile C. The evaluation process completed in the CES involved the following:

- Re-evaluate each chemical to compare the maximum concentration detected, to background concentrations for metals. A Weight-of-Evidence (WOE) was completed for each metal that was considered contamination in the 2016 SI. Various lines of evidence such as frequency of detection, distribution of chemicals, location, etc. were used.

- Compare results to current US EPA RSLs.

- Determine if the maximum concentration of the chemical is great enough that it needs to be remediated. The Debris Piles and this AOC in general is in a very steep area and does not contain subsurface soil so it is not relatable to an exposure area for each of the Decision Units (DUs). Since there is ACM across the surface soil at Debris Piles A and B and these are planned to be removed, the previously evaluated chemicals identified as potential contamination were evaluated for non-carcinogenic effects using the Hazard Quotient (HQ) and cancer risks using the Target Cancer Risk (TCR – excess cancer risk level) to determine if the soil was hazardous. Since the FWCUGs were use during the SI, an additional comparison to the current USEPA RSLs was determined.

Surface soil is defined as to 0 to 1-foot interval below ground surface (bgs). Subsurface soil for Unrestricted (Residential) Land Use is defined as the 1- to 13-foot interval. An exposure point concentration (EPC) was the maximum detected concentration (MDC) for each chemical since the samples were ISM. The depth of the surface soil at Debris Piles A and B varies across the Piles but is not deeper than 1 foot at any location. Debris Pile C does have subsurface soil since the depth to bedrock is greater than one foot.

Surface soil **Tables 6-1, 6-2, 6-3** and subsurface soil **Table 6-4** at Debris Piles from the 2016 SI are presented in **Appendix A**. **Tables 3-1, 3-2,** and **3-3** presents the maximum detected concentrations of chemicals in surface soil that were identified in the SI at Debris Pile A, Debris Pile B, and Debris Pile C respectively. **Table 3-4** presents the maximum detected concentrations of chemicals identified as potential contamination in subsurface soil in the SI at Debris Pile C. **Figure 3-1** shows the location of the three Debris Piles and the Test Pit Area sample locations for surface soil. **Figure 3-2** shows the subsurface soil boring locations at Debris Pile C and the surface soil locations at Debris Piles A, B, and C.

3.2 EVALUATION OF POTENTIAL CONTAMINATION IDENTIFIED IN SURFACE SOIL IN THE 2016 SI

Surface Soil

To evaluate if the potential contamination identified in the 2016 SI, the maximum detected values of each of the chemicals that exceeded the Unrestricted (Residential) Land Use criteria were compared to the Resident Receptor's USEPA RSLs using the 1 X 10^{-5} ELCR or HQ = 1.0 to determine if there were any chemicals that would need removal. The FWCUGs are currently under revision. In order to ensure that the most current values are used, this CES rescreened the values using the most recent USEPA RSLs. Application of the FWCUGs and the USEPA RSLs is described in the Position Paper (USACE, 2012); *USACE's Facility-Wide Human Health Risk Assessment Manual* (HHRAM - USACE, 2005b) and in the 2014 Risk Assessment Tech Memorandum (NGB, 2014).

The following chemicals were identified as potential contamination in the surface soil at Debris Pile A in the 2016 SI: thallium; 1,3-dinitrobenzene; 1,3,5 trinitrobenzene; 2,4,6-trinitrobenzene; 2-methyl-4,6-dinitrophenol dinitro-o-cresol 4,6; and benzo(a)pyrene. A comparison to the USEPA Residential RSL for each of these chemicals shows that all the maximum detected concentrations are less than the Residential USEPA RSLs (**Table 3-1**).

The following chemicals were identified as potential contamination in Debris Pile B in the 2016 SI: arsenic; chromium; manganese; 2-methyl-4,6-dinitrophenol; benzo(a)pyrene; bBis(2-chloroethyl)ether; and Aroclor 1254. The maximum concentration of arsenic and chromium were determined to be similar to their respective background concentrations (Table 3-2). The maximum concentrations of remainder of the chemicals detected in Debris Pile B that were determined to be potential contamination in the SI, were less than their individual Residential USEPA RSLs (**Table 3-2**).

The following chemicals were identified as potential contamination in the surface soil at Debris Pile C in the 2016 SI: chromium; manganese; nickel; thallium; 2-methyl-4,6-dinitrophenol; benz(a) anthracene; benzo(a)pyrene; bis(2-chloroethyl)ether; and hexachlorocyclopentadiene. The maximum concentration of chromium was determined to be similar to the background concentration (**Table 3-3**). The maximum concentrations of the remainder of chemicals in surface soil in Debris Pile C that were determined to be potential contamination in the SI, were less than their individual Residential USEPA RSLs except for benzo(a)pyrene (Table 3-3). The USEPA RSL for benzo(a)pyrene is 1.1 mg/kg and the maximum concentration of benzo(a)pyrene in surface soil in Debris Pile C was 1.4 mg/kg. Since the concentration of benzo(a)pyrene is very similar to the USEPA RSL concentration, the 1.4 mg/kg concentration does not represent a hazard. In addition, the maximum concentration of benzo(a)pyrene in the surface soil ISM sample around the three Debris Piles was 0.53 mg/kg as shown in the 2018 SI Addendum. This indicates that the concentration of benzo(a)pyrene is much less than the USEPA RSL in the area surrounding Debris Pile C and would therefore be considered limited and insignificant.

The following chemicals were identified as potential contamination in subsurface soil at Debris Pile C in the 2016 SI: cadmium; benz(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene, bis(2-chloroethyl)ether; dibenz(a,h)anthracene; hexachlorocyclopentadiene; indeno(1,2,3-cd)pyrene; and N-nitroso-di-n-propylamine. The maximum concentration of the chemicals in subsurface soil in Debris Pile C that were determined to be potential contamination in the SI, were less than their individual Residential USEPA RSLs (**Table 3-4).**

This CES demonstrates that the maximum concentrations of chemicals detected in the surface soil at Debris Piles A and B, and the surface soil/ subsurface soil at Debris Pile C were not great enough to be of concern and do not require removal. The CES showed that none of the chemicals detected and identified as potential contamination in the SI need to be remediated or removed to achieve Unrestricted (Residential) Land Use.

Table 3-1. Evaluation of surface soil under Debris Pile A using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile A Maximum Detect Surface Soil	Background Criteria- Surface Soil	Residential RSLs (HQ=1.0,1 X 10^{-5})	Resident Child FWCUGs (HQ=1.0,1 X 10^{-5})	Resident Adult FWCUGs (HQ=1.0,1 X $10^{-5)}$	FWCUG Type	Needs further evaluation
Thallium	mg/kg	0.1*J*	0.78**	11.6				No
1,3-Dinitrobenzene	mg/kg	0.99*U*	NA	63				No
1,3,5 Trinitrobenzene	mg/kg	3.9	NA	22,200				No
2,4,6-Trinitrobenzene	mg/kg	3.90	NA	none	36.5	211.0	nc	No
2-Methyl-4,6-dinitrophenol Dinitro-o-cresol, 4,6	mg/kg	0.82 UJ	NA	51				No
Benzo(a)pyrene	mg/kg	0.24	NA	1.1				No

*value derived from RSL of a surrogate
ca = carcinogenic
nc=Non-carcinogenic
RSL=USEPA Regional Screening Levels
Res. = Residential

Table 3-2. Evaluation of surface soil under Debris Pile B using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile B Maximum Detect Surface Soil	Background Criteria-Surface Soil	Residential RSLs (HQ=1.0,1 X 10^{-5})	Resident Child FWCUGs (HQ=1.0,1 X 10^{-5})	Resident Adult FWCUGs (HQ=1.0,1 X 10^{-5})	FWCUG Type	Needs further evaluation
Arsenic	mg/kg	27	15.4/21.4	similar to background				No
Chromium	mg/kg	23	17/27.20	similar to background				No
Manganese	mg/kg	500	1450	less than background				No
2,4,6-Trinitrobenzene	mg/kg	5.8 J	0	none	36.5	211.0	nc	No
2-Methyl-4,6-dinitrophenol	mg/kg	0.82 UJ	0	1300				No
Benzo(a)pyrene	mg/kg	0.068 U	0	1.1				No
Bis(2-chloroethyl)ether	mg/kg	1 U	0	230				No
Aroclor 1254	mg/kg	0.21	0	2.4				No

*value derived from RSL of a surrogate
ca = carcinogenic
nc=Non-carcinogenic
RSL=USEPA Regional Screening Levels
Res. = Residential

Table 3-3. Evaluation of surface soil under Debris Pile C using the maximum concentration detected per analyte.

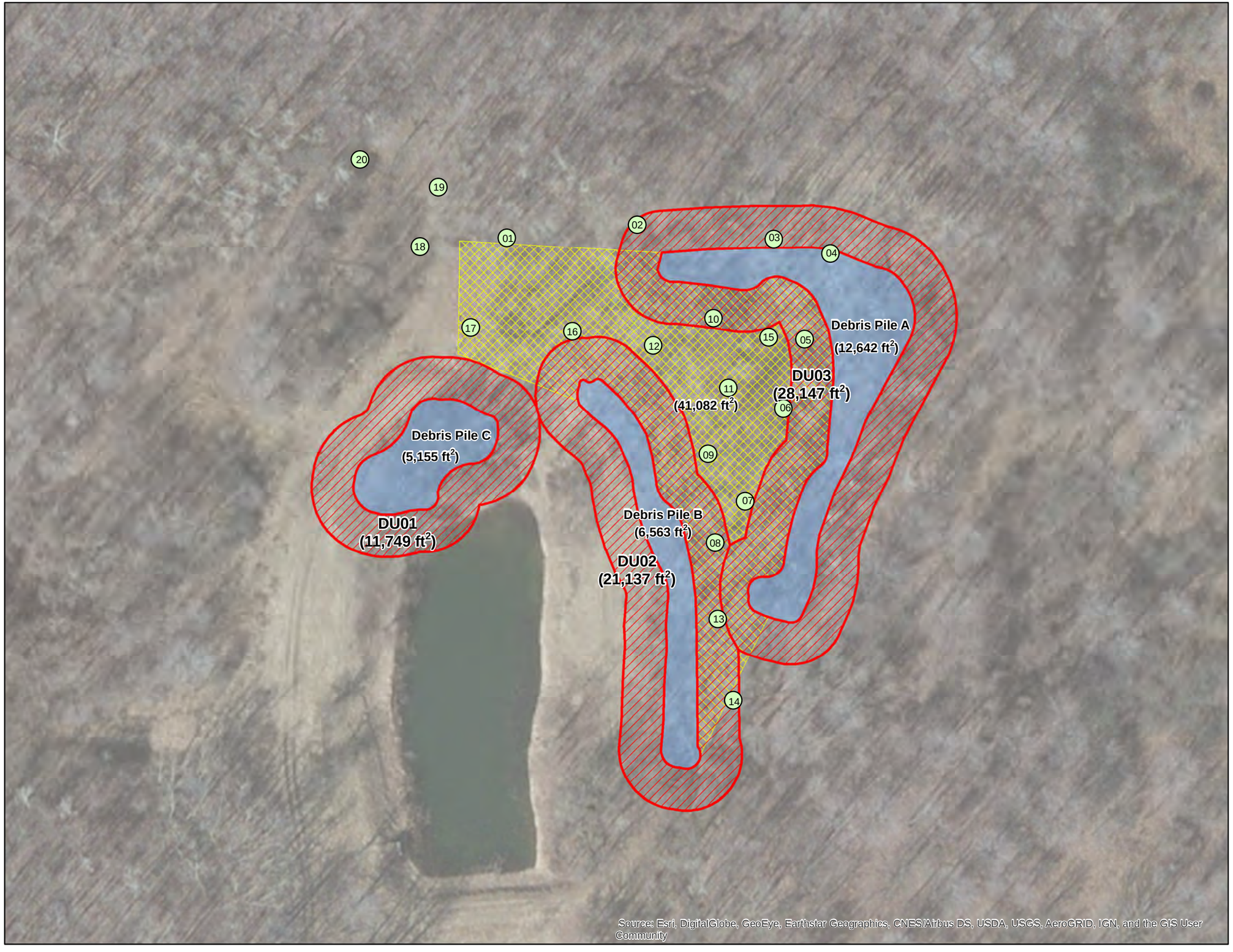
Analyte	Units	Debris Pile C Maximum Detect Surface	Background Criteria-Surface Soil	Residential RSLs (HQ=1.0,1 X 10^{-5})	Resident Child FWCUGs (HQ=1.0,1 X 10^{-5})	Resident Adult FWCUGs (HQ=1.0,1 X 10^{-5})	FWCUG Type	Needs further evaluation
Chromium	mg/kg	21	17/27.20					No
Manganese	mg/kg	640	13.4	1800				No
Nickel	mg/kg	1,200	0.61	6700				No
Thallium	mg/kg	0.15 J	1.2	11.6				No
2-Methyl-4,6-dinitrophenol	mg/kg	0.82 UJ	0	1300				No
Benz(a)anthracene	mg/kg	1.7	0	11				No
Benzo(a)pyrene	mg/kg	1.4	0	1.1				Yes
Bis(2-chloroethyl)ether	mg/kg	1 U	0	2.3				No
Hexachlorocyclopentadiene	mg/kg	3.4 U	0	18				No

ca=carcinogenic
na=Non-carcinogenic
RSL=USEPA Regional Screening Levels
Res. = Residential

Table 3-4. Evaluation of subsurface soil under Debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Subsurface Soil	Background Criteria-Subsurface Soil	Residential RSL (HQ=.1,10E^{-5})	Resident Child FWCUGs (HQ=1.0,1 X 10^{-5})	Resident Adult FWCUGs (HQ=1.0,1 X 10$^{-5)}$	FWCUG Type	Needs further evaluation
Cadmium	mg/kg	9	0	710				No
Benz(a)anthracene	mg/kg	0.71	0	11				No
Benzo(a)pyrene	mg/kg	0.62	0	1.1				No
Benzo(b)fluoranthene	mg/kg	0.87	0	11				No
Bis(2-chloroethyl)ether	mg/kg	1	0	2.3				No
Dibenz(a,h)anthracene	mg/kg	0.068	0	1.1				No
Hexachlorocyclopentadiene	mg/kg	3.4	0	18				No
Indeno(1,2,3-cd)pyrene	mg/kg	0.37	0	11				No
N-Nitroso-di-n-propylamine	mg/kg	0.51	0	0.78				No

ca=carcinogenic
na=Non-carcinogenic
Res. = Residential
RSL = USEPA Regional Screening Level



LEGEND

- Test Pit Location
- Test Pit Sample Location
- Decision Unit
- Debris Pile
- Test Pit Area

NOTES & SOURCES

Map Source: ESRI World Imagery

Figure 3-1. Location of the three Debris Piles and the test pit area sample locations.

(Quarry Pond Surface Dump)

FORMER RAVENNA ARMY AMMUNITION PLANT PORTAGE AND TRUMBULL COUNTIES, OHIO

0 40 80 Feet

N

FIGURE

3-1

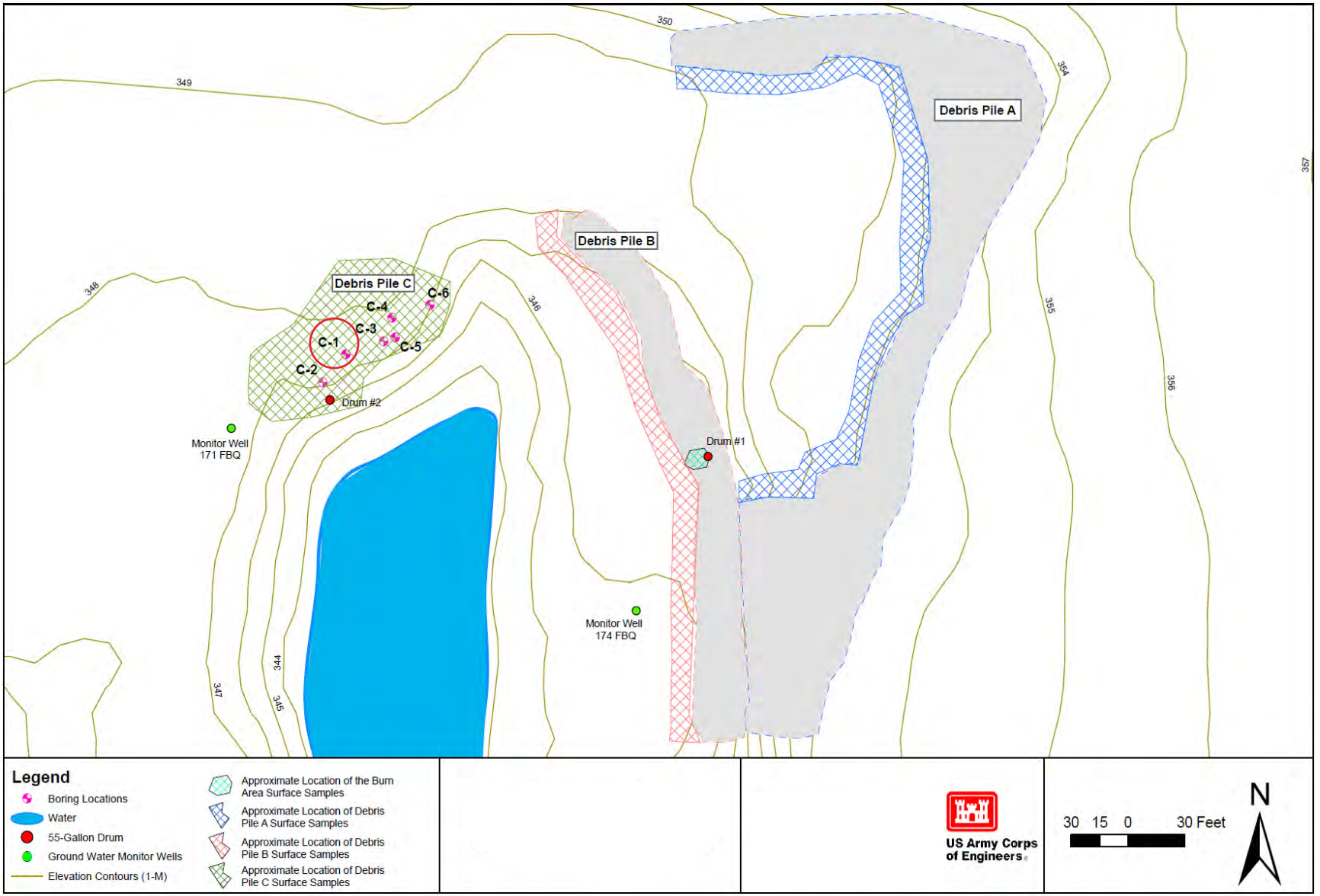


Figure 3-2. Locations of subsurface soil borings at Debris Pile C. Sample location C78SB-021M-001-SO is shown as Soil Boring C-1 in Debris Pile C.

SECTION 4: REMOVAL ACTION OBJECTIVES, CLEANUP GOALS, AND VOLUME CALCULATIONS

The scope, objectives, cleanup goals, and estimates of volume of debris and soil requiring remediation are presented in this section.

4.1 SCOPE AND PURPOSE

The CC RVAAP-78 AOC was characterized in the SI (USACE, 2016) and the SI Addendum (USACE, 2018). Surface soil samples at all three Debris Piles and subsurface soil samples (borings) (only at Debris Pile C), were collected during the SI field activities to identify potential contamination (chemical, ACM, and asbestos in the soil) in the soil beneath the Debris Piles and surrounding areas. The SI Addendum assessed the areas immediately surrounding each of the Debris Piles and the Test Pit Area. The recommended path forward was to proceed to an EE/CA to move the site forward in the CERCLA process. Ultimately, the goal of the remedy selection process is "to select remedies that are protective of human health and the environment, maintain protection over time, and minimize untreated waste.

The purpose of this EE/CA is to evaluate remedial alternatives to address the following:

- Removal of the three Debris Piles A, B, and C (which would eliminate the ACM).
- Incidental removal of surface soil under Debris Piles A, B, and C.
- Removal of ACM at Test Pit Area 05 and incidental soil.
- Removal of subsurface soil at sample location C78SB-021M-0001-SO (shown in the 2016 SI to contain asbestos fibers) in subsurface soil under Debris Pile C.

The determination whether or not there are chemicals in the soil associated with the Debris Piles and was assessed in Section 3 in the CES. All maximum concentrations of chemicals identified as potential contamination were less than that of their respective Residential Criteria except for benzo(a)pyrene in the surface soil under Debris Pile C. The maximum concentration of benzo(a)pyrene was 1.4 mg/kg while the Residential Criteria is 1.1 mg/kg. Since the area around Debris Pile C as reported in the SI Addendum USACE, 2018) had a concentration of 0.53 mg/kg of benzo(a)pyrene and the concentration in the Debris Pile C is similar to the Residential Criteria, benzo(a)pyrene was also eliminated from additional analysis in this EE/CA.

4.2 REMOVAL ACTION OBJECTIVES

The main objective for the EE/CA is to evaluate the removal action Alternatives for the CC RVAAP-78 AOC. Following CERCLA guidance, this EE/CA identifies removal action objectives, identifies potential removal action Alternatives, and evaluates Alternatives against

criteria identified in U.S. Environmental Protection Agency (USEPA) Guidance for *Conducting Non-Time Critical Removal Actions under CERCLA* (USEPA, 1993).

Since there are no chemicals with concentrations great enough to require remediation, the Removal Action Objectives (RAOs) only address debris/ACM and asbestos fibers in soil at one subsurface soil location. The RAOs are to remove Debris Piles A, B, and C (for debris/ACM) and incidental surface soil; to remove ACM/debris and incidental soil at Test Pit Area 05; and to remove subsurface soil (containing asbestos fibers) at sample location C78SB-021M-0001-SO under Debris Pile C. This will prevent potential contact with ACM or asbestos and to alleviate concerns of potential dispersal of asbestos fibers into the atmosphere.

Once asbestos is addressed, the AOC will meet the Unrestricted (Residential) Land Use requirements. The removal action will prevent Resident Receptors from contacting ACM and debris in Debris Piles A, B, C; ACM in Test Pit Area 05, and asbestos fibers in the subsurface soil location C78SB-021M-0001-SO (1 to 5 feet bgs) under Debris Pile C. The Test Pit 05 is within the area surrounding Debris Pile A. The RAOs specify requirements that the selected Alternative must fulfill to protect human health and the environment from contaminants and to meet the evaluation criteria

4.3 REMOVAL ACTION CLEANUP GOALS

The removal action cleanup goal represents the media (surface soil and subsurface soil) and chemical-specific criteria below which remedial action is not required. The goal of the removal action for the surface soil is to remove all ACM and asbestos-contaminated soil and does not include any chemicals. No cleanup goal has been developed for ACM and asbestos *per se.* The USEPA and other agencies have set some basic values (goals) but these are highly dependent upon the type of ACM, exposure factors, receptor activities, etc.

The 1 percent threshold for asbestos-contain materials was first used in the 1973 National Emissions Standards for Hazardous Air Pollutants (NESHAP), where the intent of the threshold was:

> *…to ban the use of materials which contain significant quantities of asbestos, but to allow the use of materials which would: (1) contain trace amounts of asbestos which occur in numerous natural substances, and (2) include very small quantities of asbestos (less than 1 percent) added to enhance the material's effectiveness. (38 FR 8821).*

All subsequent EPA regulations and the Asbestos Hazardous Emergency Response Act Statute included this 1 percent threshold. In the 1990 NESHAP revisions, EPA retained the threshold, stating that it was related to the phase contrast microscopy (PCM) analytical method detection limits. The Occupational Safety and Health Administration (OSHA) Standards also defined an asbestos-containing material as a material containing more than 1 percent of asbestos (29 CFR Part 1910.1001 and 29 CFR Part 910.134). The 1 percent threshold in regulations does not necessarily mean that this threshold does not pose an unreasonable risk to human health. However, it is important to note that the 1 percent threshold concept was related to the limit of detection for the analytical methods available at the time and to EPA's prioritization of resources

on materials containing higher percentages of asbestos. Normally, cleanup goals would be developed by computing the concentration of asbestos in soil that corresponds to an excess cancer risk of 1 X 10^{-4}. However, such a computation is not possible at present because of the high variability in the relationship between asbestos in soil and asbestos in air. Even if the computations were possible, the ability to measure asbestos in surface and subsurface soil is presently limited by the available technologies and methods. Non-cancer risks from inhalation of asbestos fibers from ACM have also been recognized, but there is no current methodology to quantify non-cancer risks for asbestos. For these reasons, cleanup goals for asbestos have not been established for soils. Since this EE/CA is based on complete removal of ACM and the soil that contains asbestos, a threshold or cleanup value for asbestos is not required. The removal action will ensure that all asbestos –contaminated soil and the ACM is completely removed. This approach will allow the site to meet Unrestricted (Residential) Land Use criteria without evaluating site-specific parameters and developing a cleanup goal for the ACM or asbestos contaminated soil.

4.4 VOLUMES OF SOIL REQUIRING REMOVAL

Table 4-1 presents the calculations and values used to estimate the amount of debris/ACM and soil that needs to be properly excavated and disposed off-site. A total volume of 2,773 cubic yards (yds^3) was estimated. **Figures 3-1 and 3-2** show the locations of the three Debris Piles; the ISM samples taken around the three Piles in the SI Addendum; the sample location C78SB-021M-0001-SO (*SB 1) in Debris Pile C; and the location of Test Pit 05.

Table 4-1. Estimated Volumes of Debris, Surface Soil and Subsurface Soil Requiring Removal at CC RVAAP-78.

Location	Average Length (ft)	Average Width (ft)	Depth (ft)	Volume (ft^3)	Volume (yd^3)
Debris Pile A	425	43	1.5	27,413	1,015
Debris Pile A – Surface Soil	425	43	0.6 (bgs)[a]	10,965	610[b]
Test Pit 5 – Subsurface Soil	10	10	1 - 2 (bgs)	200	11.1[b]
Debris Pile B	296	24	1.5	10,656	395
Debris Pile B – Surface Soil	296	24	0.6 (bgs)	4,260	240[b]
Debris Pile C	120	45	1.5	8,100	300
Debris Pile C – Surface Soil	120	45	0.6 (bgs)	3,240	180[b]
C78SB-021M-0001-SO	10	10	1 - 5 (bgs)	400	22.2[b]
			Total	**65,234**	**2,773**

Notes:
[a] bgs = below ground surface
[b] includes 25% constructability factor and 20% swell factor.
ft^3 = cubic feet.
ft = feet.
yd^3 = cubic yard.

SECTION 5: APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or relevant and appropriate requirements (ARARs) are described in this section.

5.1 INTRODUCTION

The identification and evaluation of ARARs is an integral part of complying with CERCLA and SARA. As defined in the National Contingency Plan (NCP), applicable requirements are "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site" (40 Code of Federal Regulations [CFR] 300.5 [1995]). Requirements under Federal or state law may be either applicable or relevant and appropriate to CERCLA cleanup actions, but not both. In the latter case, requirements must be both relevant and appropriate to be ARARs. The Federal regulation must be selected when both a Federal and state ARARs are available or when two potential ARARs address the same issue (even if a state has authorization to administer the Federal program), unless the state has promulgated a more stringent requirement. "More stringent" also includes those state laws or programs that have no Federal counterpart because "they add to the Federal law requirements that are specific to the environmental conditions in the State" (USEPA, 1989).

All CERCLA onsite remedial response actions must comply only with the substantive requirements of a regulation and not the administrative requirements (CERCLA § 121[e]). This position has been reaffirmed in the NCP (55 Federal Register [FR] 8756, March 8, 1990). Substantive requirements pertain directly to the actions or conditions at a site, and administrative requirements facilitate their implementation. Certain administrative requirements should be observed if they are useful in determining cleanup standards at the site (55 FR 8757, March 8, 1990). Offsite actions, on the other hand, are subject to the full requirements of the applicable standards or regulations, including all administrative and procedural regulations.

Although remedial actions for AOCs at National Priorities List sites must comply only with the substantive requirements of federal or state environmental regulations, the Ohio Revised Code does not provide a similar permit waiver for actions conducted under the Ohio EPA Remedial Response Program Policy. The Ohio EPA's Division of Emergency and Remedial Response (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 resulting in the potential negation of all provided exemptions within the DFFO in the event non-compliant activities are identified.

The selection of ARARs is dependent on the hazardous substances at a site, the physical site characteristics and geographic location. The actions selected as remedy, and are addressed by chemical-, location-, and action-specific ARARs, respectively, as described below:

- Chemical-specific---Chemical-specific requirements define acceptable exposure levels for specific hazardous substances and, therefore, may be used as a basis for establishing preliminary remediation goals (PRGs) and cleanup levels for chemicals of concern or those requiring remediation in the designated media. Chemical-specific ARARs and to-be-considered (TBC) criteria also are used to determine treatment and disposal requirements for removal actions. In the event a chemical has more than one requirement, the more stringent of the two requirements is used. There are no known promulgated Federal chemical-specific cleanup standards for soil. The TBC guidance pertaining to the cleanup objectives for soil include the USEPA RSLs) (USEPA, 2018). There are no chemicals that need the remediated at CC RVAAP-78 AOC. The chemical-specific ARARs would not be applicable to debris/ACM or asbestos fibers in soil.

- Location-specific---Location-specific ARARs set restrictions on the types of removal actions that can be performed based on the physical characteristics of the site or its immediate surroundings. In determining the use of the location specific ARARs for selection of remedial actions at CERCLA sites, the jurisdictional prerequisites of each regulation must be investigated. Alternative removal actions may be restricted or precluded based on Federal and state laws for hazardous waste facilities or proximity to faults, floodplains, caves, salt-dome formations, salt-bed formations, underground mines, wetlands, wilderness areas, wildlife refuges, wildlife resources, and scenic rivers. None of the previous listed physical characteristics pertain to CC RVAAP 78 AOC or its immediate surroundings; therefore, no location specific ARARs pertain to this site.

- Action-specific---Action-specific ARARs are technology-based requirements that set controls or restrictions on the design, implementation, and performance levels of removal activities related to the management of hazardous substances, pollutants, or contaminants. Potential action specific ARARs are presented in **Appendix B.** If no remedial action was selected under the CERCLA process, compliance with action specific ARARs would not be required.

In accordance with the NCP (40 Code of Federal Regulations [CFR] 300.415(j)) on-site removal actions conducted under CERCLA are required to meet ARARs "to the extent practicable, considering the exigencies of the situation." Shipments of contaminated soils and dry sediments will comply with Federal, State, and local rules, laws and regulations. In addition to the identified applicable and relevant or appropriate requirements (ARARs) for the selected action, the Army will comply with requirements applicable to off-site actions, such as Resource Conservation and Recovery Act (RCRA) hazardous waste transportation requirements under Ohio Administrative Code (OAC) 3745-52-20 to OAC 3745-52-33, and offsite treatment prior to land disposal as required by RCRA's land disposal restrictions under OAC 3745-270, including alternative land disposal restriction treatment standards for contaminated soil under OAC 3745-270-49.

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 contaminants of concern that will remain at the AOC. In addition, CERCLA Section 121(d)(1) directs that remedial actions 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. Accordingly, any chemical-, action-, or location-specific requirements will be ARARs to the extent that they ensure the degree of cleanup will be protective of human health and the environment under the circumstances presented by the release. An evaluation of the regulatory requirements has shown there are no chemical specific ARARs for the chemicals identified in various media at the AOC.

In summary, chemical-, action-, or location-specific requirements will be ARARs to the extent that they establish standards protective of human health and the environment for chemicals that will remain on site after the remedial action and ensure protection of site works and the environment during remedy implementation. Requirements identified as chemical-specific ARARs must ensure a degree of cleanup that is protective of human health and the environment under the circumstances presented by the release.

5.2 POTENTIAL CHEMICAL-SPECIFIC ARARS

A review of the regulations indicated there are no potential chemical specific ARARs for any of the alternatives being considered in this EE/CA. No regulations were identified that included specific chemical concentrations or requirements that would be a potential ARAR to drive the remedial action process. No chemical-specific ARARs are included in this EE/CA since there is no chemical contamination requiring removal action at the CC RVAAP-78 AOC.

5.3 POTENTIAL ACTION-SPECIFIC ARARS

Implementing an excavation and disposal alternative triggers potential ARARs associated with land disturbance and emission controls. The OAC 3745-15-07 requires that nuisance air pollution emissions be controlled. This includes controlling potential fugitive dust from excavation activities. In addition, any construction (i.e., soil disturbance activities that would encompass over 1 acre) would trigger the storm water requirements found at 40 CFR Part 450. These requirements mandate that erosion and sedimentation control measures be designed and implemented to control erosion and sediment runoff.

Because debris containing ACM was historically disposed at the AOC, the requirement to control visible emissions has been identified as a potential ARAR for all alternatives. The requirements found at OAC 3745-20-07(A) specify that no visible emissions may be allowed from inactive asbestos disposal sites. The potential emissions from CC RVAAP 78 are currently controlled due to: (1) existing vegetation; (2) the fact that the soil is not disturbed; and (3) the AOC not being utilized for training activities. In addition, the soil around where the ACM was identified did not contain asbestos fibers.

Because excavation would include generating and managing contaminated media, RCRA requirements would be considered potential ARARs for this activity. The RCRA requirements mandate that a generator must determine whether a material is (or contains in the case of

environmental media) 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.

These requirements include how hazardous waste is stored, treated, transported, and disposed. The RCRA requirements are generally not considered to be chemical-specific ARARs because they do not relate directly to the degree of cleanup or to specific chemicals. In addition to the substantive requirements associated with managing and storing material that is also RCRA hazardous waste (or found to contain such waste), some RCRA requirements prescribe standards for disposing hazardous material and prohibiting disposal of specific chemicals until they are treated to a specified level or by a specific treatment technology and minimum technical requirements for land disposal units.

The Ohio Administrative Code (OAC) 3745-20 contains regulations for controlling asbestos emissions from demolition and renovation projects. Ohio's regulations are consistent with U.S. EPA's National Emission Standards for Hazardous Air Pollutants (NESHAP) regarding asbestos. The regulations require that State of Ohio licensed asbestos abatement contractors do several things, such as provide a notification, conduct thorough inspections to determine the presence of asbestos, follow specific work practices, and ensure proper disposal of asbestos-containing material.

Shipments of contaminated soils will comply with federal, state, and local rules, laws and regulations. In addition to the identified ARARs for the selected action, the Army will comply with requirements applicable to off-site actions, such as Resource Conservation and Recovery Act (RCRA) hazardous waste transportation requirements under OAC 3745-52-20 to OAC 3745-52-33.

In the event solid waste material 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 solid waste within the state of Ohio. The OAC Section 3745-27-05 requirements would be potential ARARs for disposing non-hazardous contaminated waste material generated during excavation and subsequent disposal at an off-site location. Potential action specific ARARs for the CC RVAAP 78 AOC are provided in **Appendix B.**

5.4 POTENTIAL LOCATION-SPECIFIC ARARS

Location-specific requirements include those established for potential remedial activities conducted within wetlands, within a floodplain area, or with respect to threatened and endangered species. Generally, for wetlands and floodplains, rules require alternatives to remedial activity within the sensitive area be pursued; 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 further 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 the sensitive areas (i.e., ecological areas or areas that include cultural resources and/or sites of historical/archeological significance) 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 control of further release that ensures protection of human health and the environment. No potential location-specific ARARs were identified for the CC RVAAP-78 AOC.

In addition to the requirements identified as ARARs, any action taken by the federal government must be conducted in accordance with requirements established under the National Environmental Policy Act, Endangered Species Act, National Historic Preservation Act, and federal and state wetlands and floodplains construction and placement of material 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.

SECTION 6: IDENTIFICATION OF ALTERNATIVES

This section describes the removal action Alternatives developed for the CC RVAAP-78 AOC and the individual analysis of each.

6.1 INTRODUCTION

Remedial Removal Action Alternatives should assure adequate protection of human health and the environment, achieve RAOs, meet ARARs, and if applicable, permanently and significantly reduce the volume, toxicity, and/or mobility of contaminants.

The two Alternatives considered in this EE/CA are:

- Alternative 1 – No Action
- Alternative 2 – Excavation and Off-site Disposal.

6.2 ALTERNATIVE 1: NO ACTION

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

6.3 ALTERNATIVE 2: EXCAVATION AND OFF-SITE DISPOSAL

Alternative 2 consists of excavation with off-site disposal of debris and comingled soil at Debris Piles A, B and C; removal of ACM and soil at Test Pit 5; and excavation and disposal of subsurface soil at C78SB-021M-0001-SO (1 to 5 feet bgs) to attain Unrestricted (Residential) Land Use. Other types of remedial actions will not allow Unrestricted (Residential) Land Use. No technology exists that can render the ACM or asbestos fibers in soil safe if it is left in place.

This remedial alternative requires coordinating remediation activities with Ohio EPA, OHARNG, and the 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 remedial action is relatively short and will not include an O&M period, as an Unrestricted (Residential) Land Use scenario will be achieved. Components of this remedial alternative include:

- Waste characterization sampling,
- Remedial Design (RD),
- Soil excavation and off-site disposal of debris and comingled soil at Debris Piles A, B, C and Test Pit Area 05; and excavation and disposal of subsurface soil at C78SB-021M-0001-SO (1 to 5 feet bgs);
- Confirmation sampling for asbestos fibers in the remaining soil around C78SB-021M-0001-SO (1 to 5 feet bgs): and

- Restoration.

Excavating Debris Piles A, B, and C Test Pit 05; and the subsurface soil at C78SB-021M-0001-SO will allow the CC RVAAP-78 AOC to meet Unrestricted (Residential) Land Use. See **Figures 3-1 and 3-2** for sample locations. These locations were identified in the 2016 SI and the 2018 SI Addendum. The potential contamination identified in the documents was assessed in Section 3 (CES) of this EE/CA. No chemicals were identified in the soil that require remedial actions.

6.3.1 REMOVAL ACTION WORK PLAN

An RD or Removal Action Work Plan will be developed prior to initiating removal actions. The RD will include an outline of construction requirements; site preparation activities (e.g., staging and equipment storage areas, truck routes, and storm water controls); the extent of soil removal; the sequence of excavation activities; decontamination; and segregation, transportation, and disposal of the waste. Erosion controls and health and safety controls to prevent exposure to asbestos will be developed as part of the RD to ensure protection of remediation workers and the environment. Waste characterization and confirmation sampling will be completed in accordance with disposal facility requirements. In addition to these planning activities, the estimated CO_2 emissions will be calculated, and a detailed review will be acquired prior to full-scale implementation.

6.3.2 EXCAVATION, REMOVAL, AND DISPOSAL

Prior to any ground disturbance, erosion control material such as silt fences and straw bales will be installed to minimize sediment runoff from the excavation area. 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 detailed in a site-specific health and safety plan. An Ohio EPA Notification of Renovation and Demolition (based on NESHAPS standard) will also be required because of the potential for asbestos air emissions. The Notification requirement applies to abatement/removal of asbestos or ACMs in soil.

To achieve a scenario in which the AOC is protective for Unrestricted (Residential) Land Use under CERCLA, soil will be removed from the proposed excavation locations stated above and shown on **Figure 3-1. Figure 3-2** shows all the sample locations that will be excavated for offsite disposal. Approximately 2,583 yds^3 will be removed from the excavation sites for disposal.

The excavated soil will be directly loaded onto trucks for off-site disposal at a licensed, permitted asbestos disposal facility. For cost estimation purposes, it is assumed that some of the surface soil beneath Debris Piles A, B, and C and at Test Pit Area 05 will be removed incidentally during the removal action. All debris at these three Piles and Test Pit Area 05 will be removed to ensure that all debris and ACM is removed. Additionally, these piles were assumed to average to be 1.5 feet tall. It is likely that this is an overestimate since the piles vary in depth and the surface soil varies. Once removed, all of the waste/soil will be disposed as asbestos waste per this EE/CA.

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

Soil will be hauled by truck to a licensed, permitted asbestos disposal facility. All trucks will be inspected and covered with tarps prior to exiting the CC RVAAP-78 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.

Excavated soil will be disposed at an existing off-site facility licensed and permitted to accept the characterized asbestos waste stream. The selection of an appropriate facility considers the type of waste, location, transportation options, and cost. Waste streams with different constituents and/or characteristics may be generated. Disposal cost savings can be made possible by utilizing specific disposal facilities for different waste streams, but all excavated soil is expected to be considered to contain asbestos.

6.3.3 DEBRIS AND SOIL HANDLING

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. The volumes of debris/ACM and soil is provided in Section 4.4 of this EE/CA.

6.3.4 CONFIRMATION SAMPLING AND SITE RESTORATION

Upon completing the excavation, confirmation samples will be taken to verify the removal action was successful and all asbestos contamination was removed. The disturbed areas will be backfilled with clean fill (from an approved and tested source). After the area is backfilled and graded, workers will apply a seed mixture (as approved by OHARNG) and mulch. Restored areas will be inspected and monitored consistent with best management practices.

SECTION 7: ANALYSIS OF ALTERNATIVES

7.1 EVALUATION CRITERIA

Section 300.430(e) of the NCP lists nine criteria by which each remedial Alternative must be assessed. The acceptability and performance of each Alternative against the criteria are evaluated individually so that relative strengths and weaknesses can be identified. However, in an EE/CA a streamlined version of evaluation criteria is considered. Each Alternative is evaluated using the short- and long-term aspects of three broad criteria: effectiveness, implementability, and cost. Additionally, each of the three broad criteria have sub-criteria that are also considered under each criterion. Consistent with the Guidance for Conducting Non-Time Critical Removal Actions under CERCLA EPA/540-R-93-057 (USEPA, 1993), the two Alternatives were evaluated against the following three broad criteria and associated sub-criteria:

- Effectiveness:
    - Overall protection of human health and the environment:
    - Complies with ARARS,
    - Long-term effectiveness and permanence,
    - Reduction of toxicity, mobility, or volume through treatment, and
    - Short-term effectiveness.

- Implementability:
    - Technical Feasibility,
    - Administrative Feasibility,
    - Availability of services and materials,
    - State (support agency) acceptance, and
    - Community acceptance.

- Cost:
    - Capital costs (including present worth and post removal site control), and
    - No operation and maintenance costs and fees are needed.

7.1.1 EFFECTIVENESS CRITERIA

The USEPA defines effectiveness of an Alternative as the ability to meet the objectives within the scope of the removal action. The criteria that determines the level of effectiveness is the overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, or volume; and short-term effectiveness.

7.1.1.1 Overall Protection of Human Health and the Environment

One measure of effectiveness is how well the overall protection of human health (community) and the environment are met by the Alternative. Each Alternative must be evaluated to determine how it achieves and maintains protection of human health and the environment.

7.1.1.2 Compliance with Applicable or Relevant and Appropriate Requirements

Compliance with ARARs addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and state environmental statutes and/or provide grounds for invoking a waiver. Compliance with ARARs is required to the extent possible based on the urgency of the situation and the scope of the action contemplated (40 CFR 1300.415(j)). Each Alternative must be evaluated against the ARARs presented in **Appendix B**. On-site response actions must comply with the substantive requirements that may be an ARAR, where practical.

7.1.1.3 Long-term Effectiveness and Permanence

Long-term effectiveness and permanence is an evaluation of the magnitude of residual risk (risk remaining after implementation of the Alternative) and the adequacy and reliability of controls used to manage the remaining waste (untreated waste and treatment residuals) over the long term once the cleanup goals have been met. Alternatives that provide the highest degree of long-term effectiveness and permanence leave little or no untreated waste at the site, make long-term maintenance and monitoring unnecessary, and minimize the need for land use controls.

7.1.1.4 Reduction of Toxicity, Mobility, or Volume

Reduction of toxicity, mobility, or volume through soil removal is an evaluation of the ability of the Alternative to reduce the toxicity, mobility, or volume of the waste. The evaluation involves an assessment of the amount of hazardous material removed, the degree of reduction in toxicity, mobility, or volume, and the type and quantities of residuals remaining after removal. Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies that may be employed in a remedy

7.1.1.5 Short-term Effectiveness

Short-term effectiveness addresses the protection of workers and the community during the removal action, the environmental effects of implementing the action, and the time required to achieve media-specific cleanup goals. This criterion accounts for potential threats to workers (e.g., fugitive dust and transportation of hazardous materials), the environment (e.g., potential spills and releases), and reliability of mitigation measures. Short-term Effectiveness refers to the speed with which the remedy achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

7.1.2 IMPLEMENTABILITY CRITERIA

Implementability addresses the technical and administrative feasibility of implementing an Alternative, the availability of various services and materials required during implementation, and the state and community acceptance. Implementability is a measure of whether a course of action Alternative can be physically and administratively implemented, such as the ability to construct, excavate, or demolish. It is also a measure of the availability of the services and materials needed to implement the Alternative. Other considerations regarding Implementability include state agency and community acceptance of a given Alternative.

7.1.2.1 Technical Feasibility

Technical feasibility assesses the reliability of the technology and operational difficulties and the environmental conditions of construction/removal implementation. It also addresses the ability to perform the removal in the allotted amount of time. Technical feasibility may also take into consideration the potential need and ease of future removal actions.

7.1.2.2 Administrative Feasibility

The administrative feasibility criterion assesses the coordination of all aspects involved with the removal action, addressing concerns from regulatory agencies, and adherence to non-environmental laws.

7.1.2.3 Availability of Services and Materials

The availability of services and materials to implement the removal actions is evaluated. The evaluation includes an assessment of the availability of materials, availability of contractors and specialists, and the availability of off-site treatment, storage, and disposal of excavated material.

7.1.2.4 State and Community Acceptance

State acceptance considers that all comments received from agencies of the State of Ohio are addressed and the EE/CA is accepted. The primary state agency supporting this investigation is the Ohio EPA. Community acceptance considers comments made by the community, including stakeholders, on the Alternatives being considered during the public comment period. Comments will be accepted from the community on the EE/CA and the preferred remedy presented in an Action Memorandum.

7.1.3 COST CRITERIA

Cost analyses provide an estimate of the dollar cost of each Alternative. This analysis includes an estimate of the capital cost in dollars, annual operation and maintenance (O&M) cost (if applicable) and indicates the period of time to complete the proposed action. Details and assumptions used in developing cost estimates for each of the Alternatives presented in this EE/CA are provided in **Appendix C**. Cost figures (provided in **Appendix C**) were obtained from readily available sources (e.g., Means Site Work Costs Data, vendors, local suppliers, and

experience at other sites) and were used to estimate costs for the Alternatives for comparison and estimating purposes. These cost estimates should not be considered the actual cost of designing and implementing a remedial action, but rather relative costs among the Alternatives using consistent assumptions and estimating methods.

7.2 EVALUATION OF ALTERNATIVES

The two Alternatives evaluated for CC RVAAP-78 are described in Section 6. These Alternatives are as follows: Alternative 1: No Action and Alternative 2 – Excavation with Off-site Disposal.

The following sections analyze each removal action alternative using the criteria described in Section 7.1. This analysis will provide the advantages and disadvantages of each alternative.

7.2.1 ALTERNATIVE 1 – NO ACTION

This Alternative would involve no further CERCLA response action at the CC RVAAP-78 AOC. There would be no overall protection of human health and the environment. Removal goals would not be achieved, and this Alternative provides for no long-term effectiveness and permanence. This alternative has no removal or treatment; therefore, there is no reduction in toxicity, mobility, or volume.

7.2.1.1 Effectiveness of Alternative 1

No additional removal actions would be taken at the CC RVAAP-78 AOC under this Alternative. This Alternative would not provide additional protection of human health and the environment; compliance with ARARs; long- or short-term effectiveness; or reduction of toxicity, mobility, or volume. Under this Alternative, contaminated soil would remain in place at the AOC. This Alternative would not provide for overall protection of human health and the environment. Removal goals would not be achieved, and this Alternative provides for no long-term effectiveness and permanence. This Alternative has no removal or treatment so there is no reduction in toxicity, mobility, or volume. Under this Alternative, Five-Year Reviews would not be conducted as stated in CERCLA 121(c).

7.2.1.2 Implementability of Alternative 1

The No Action Alternative would be technically and administratively feasible and would require no services or materials to be implemented. No actions are proposed under this Alternative. However, it is unlikely that the State of Ohio and the Community would accept no action to occur as contaminated soil would remain on the Site.

7.2.1.3 Cost of Alternative 1

The present value cost to complete Alternative 1 is zero. There is no capital cost associated with No Action Alternative.

7.2.1.4 Outcome

The No Action Alternative will not be further evaluated or considered because it fails the effectiveness and implementability criteria.

7.2.2 ALTERNATIVE 2 – EXCAVATION WITH OFF-SITE DISPOSAL

Alternative 2 consists of excavating three Debris Piles and Test Pit 05 to remove debris/ACM and asbestos fibers in subsurface soil at C78SB-021M-0001-SO (Soil Boring 1 under Debris Pile C) - CC RVAAP-78 C to meet Unrestricted (Residential) Land

7.2.2.1 Effectiveness of Alternative 2

Alternative 2 will remove debris/ACM and soil containing asbestos fibers from the AOC. Excavating and removing asbestos contamination would result in a permanent reduction in risks at the CC RVAAP-78 AOC and achieve Unrestricted (Residential) Land Use. The contaminated soil would be removed and placed in a licensed asbestos disposal facility. As a result, long-term management and CERCLA five-year reviews would not be required.

This Alternative will reduce the toxicity, mobility, and volume of ACM/asbestos fibers since the level of toxicity from inhaling asbestos fibers would diminish.

During implementation, risks will be mitigated through use of proper controls such requiring workers to follow a health and safety plan and wear appropriate personal protective equipment to minimize exposures during site activities. Implementing mitigation measures such as erosion and dust control during construction would be included in Alternative 2. Other controls such as inspecting vehicles transporting soils before and after use and limiting the distance waste is transported in vehicles would be considered.

7.2.2.2 Implementability of Alternative 2

This alternative is implementable. Coordination would be required between removal action planners and OHARNG to minimize disruptions and/or impacts to OHARNG operations. Excavation and truck transport of soil are conventional construction activities. Resources such as standard excavation and construction equipment would be used and are readily available. Soil borrow sites and permitted waste disposal facilities are available within a reasonable distance.

Soil treatment activities will be coordinated with Camp James A. Garfield and OHARNG to minimize alterations and/or impacts to OHARNG proceedings. The RD will identify access routes to the AOC 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 Alternative 2.

7.2.2.3 Cost of Alternative 2

The present value cost to complete Alternative 2 is approximately $518,200 (in base year 2019 dollars). Costs include implementing the removal, off-site disposal, confirmation sampling, and site restoration. See **Appendix C** for a detailed description of Alternative 2 costs.

7.2.2.4 Outcome

Alternative 2 would be an effective method of removing and disposing debris/ACM and asbestos contaminated soil at the CC RVAAP-78 AOC. Excavation and off-site disposal are conventional technologies which can be readily implemented. This Alternative would reduce risks (hazards) from potential exposure to asbestos and once implemented, the CC RVAAP-78 AOC would meet Unrestricted (Residential) Land Use.

SECTION 8: COMPARATIVE ANALYSIS OF ALTERNATIVES

The comparative analysis is used to assess the performance of each Alternative with respect to effectiveness, implementability, and costs. This analysis also identifies the advantages and disadvantages of the Alternatives relative to one another with respect to the evaluation criteria.

The comparative analysis for the two Alternatives in this EE/CA is presented in **Table 9**. Based on the analysis, there are major differences between Alternative 1 and Alternative 2 regarding effectiveness, implementability, and costs.

Table 8-1. Comparative Analysis of Alternative for the EE/CA at the CC RVAAP-78 AOC.

Alternative	Evaluation Criteria		
	Effectiveness	Implementability	Costs
Alternative 1: No Action	Fails to meet this criteria. The primary component of this criteria is the overall protection of human health and the environment which this Alternative does not meet.	Implementable	$0
Alternative 2: Excavation with Off-site Disposal	Effective Overall	Readily Implementable	$518,200

As presented in **Table 8-1**, the No Action Alternative will not meet effectiveness evaluation criteria although there are no costs.

Alternative 2: Excavation and Off-site Disposal meets all of the requirements under the effectiveness evaluation criteria. This Alternative meets all evaluation criteria and has an estimated cost of $518,200.

SECTION 9: AGENCY COORDINATION AND PUBLIC INVOLVEMENT

The Army is the lead agency under the Defense Environmental Restoration Program responsible for achieving remedy of media at this AOC. This section provides a review of actions that have been conducted and that are planned to ensure Regulatory Agencies and the Public have been provided with appropriate opportunities to stay informed of the progress of the removal actions and to provide meaningful input on the planning effort as well as the final selection of a remedy.

9.1 STATE ACCEPTANCE

State acceptance considers comments received from agencies of the State of Ohio on the actions being considered. For the process of achieving the remedy at this AOC, Ohio EPA is the lead regulatory agency. This EE/CA has been prepared in consultation with Ohio EPA. Ohio EPA provided input during the ongoing investigation and report development process to ensure the action ultimately selected meets the needs of the State of Ohio and fulfills the requirements of the DFFO (Ohio EPA 2004).

The Draft and Final EE/CA will be submitted for review and comment as required under the DFFOs. After the Army has responded to Ohio EPA's comments and the Agency approves the decision and selected Alternative, the EE/CA will be finalized and published for public review and comment as described in the following.

9.2 COMMUNITY ACCEPTANCE

Community acceptance considers comments provided by the community on the actions being considered. Under CERCLA 42 U.S.C. 9617(a) early, constant, and responsive community relations is emphasized. The Army has prepared a Community Relations Plan for the Ravenna Army Ammunition Plant Restoration Program (Vista 2019) 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.

Community involvement is a necessary part of the CERCLA process and the DFFOs. The NCP requires that a public notice describing the EE/CA and announcing a public comment period be published in a major local newspaper.

The Army will notify the local newspaper to announce the availability of the Final EE/CA for public review. A public comment period of 30 days will commence following release of the EE/CA report to provide the public appropriate opportunities for involvement in site-related decisions. The Army will respond to comments received during the public comment period. These comments will be considered in the final selection of an Alternative for the CC RVAAP-78 AOC.

The CERCLA 42 U.S.C. 9617(a) requires that an Administrative Record be established "at or near the facility at issue." Relevant documents regarding the RVAAP Restoration Program 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 (CJAG) Joint Military Training Center
Environmental Office
1438 State Route 534 SW
Newton Falls Ohio 44444
(614) 336-6136

Note: Access is restricted to CJAG but may 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

The RVAAP Restoration Program has an online resource for restoration news and information. This website can be viewed at www.rvaap.org.

SECTION 10: RECOMMENDED REMOVAL ACTION ALTERNATIVE

This section presents the recommended Alternative for the CC RVAAP-78 AOC.

Alternative 2 - Excavation with Off-site Disposal to attain Unrestricted (Residential) Land Use is the recommended action for the CC RVAAP-78 AOC. The asbestos -contaminated soil and debris at the AOC will be removed from the AOC at the former RVAAP facility, hauled to a licensed, permitted asbestos disposal facility, and appropriately disposed. The removal areas will be sampled and restored with clean fill material and seeded.

No long-term monitoring or five-year reviews would be required under CERCLA since Unrestricted (Residential) Land Use will be achieved. Any solid waste identified during excavation will be removed and properly disposed. Approximately 2,773 yds^3 of debris/ACM (including soil estimated to be removed incidentally with the three Debris Piles, Test Pit 05, and the one subsurface soil sample under Debris Pile C) will be removed from the AOC for off-site disposal. This removal will be conducted as an NTCRA and will achieve quick, protective results at the AOC and was determined to be cost effective (estimated $518,200). **Figure 6-1** provides the locations of the areas that require removal. **Appendix C** includes breakdown of the costs and other information used to make this estimate.

SECTION 11: REFERENCES

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APPENDIX A: Data considered for the Evaluation of Chemicals in Soil

Table 6-1. Screening results for the determination of potential contamination in surface soil from debris Pile A using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile A Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSLs (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Inorganics										
Aluminum	mg/kg	5830	17,700	No	Less BG		7,380	52932	nc	Not an SRC
Antimony	mg/kg	2.40	0.96	Yes	> BG		2.82	13.60	nc	No
Arsenic	mg/kg	8.40	15.4	No	Less BG		0.524	0.43	ca	Not an SRC
Barium	mg/kg	82	88.4	No	Less BG		1,413	8,966	nc	Not an SRC
Beryllium	mg/kg	0.64	0.88	No	Less BG	16			nc	Not an SRC
Cadmium	mg/kg	0.57J	0	Yes	>BG		6.41	22.30	nc	No
Calcium	mg/kg	3900	15,800	No	Ess. Nutrient					Ess. Nutrient
Chromium	mg/kg	28	17	Yes	> BG		8,147	19.7	nc	No
Cobalt	mg/kg	8.20	0.47	Yes	>BG		131	803	nc	No
Copper	mg/kg	37.20	0.85	Yes	>BG		311	2714	nc	No
Iron	mg/kg	35000	964	Yes	Ess. Nutrient		2,313	19,010	nc	Ess. Nutrient
Lead	mg/kg	145	0.32	Yes	>BG		400		nc	No
Magnesium	mg/kg	1600	95.6	Yes	Ess. Nutrient	2.3				Ess. Nutrient
Manganese	mg/kg	650	13.4	Yes	>BG		293	1,482	nc	Yes
Mercury	mg/kg	.064J	0.0057	Yes	>BG		2.27	16.50	nc	No
Nickel	mg/kg	25	0.61	Yes	>BG		155	1346	nc	No
Potassium	mg/kg	733		Yes	Ess. Nutrient					Ess. Nutrient
Selenium	mg/kg	0.91	0.15	Yes	>BG	39			nc	No
Silver	mg/kg	.15J	0.045	Yes	>BG		38.6	324.00	nc	No
Sodium	mg/kg	18J		Yes	Ess. Nutrient					Ess. Nutrient
Thallium	mg/kg	.1J	1.2	No	<BG		0.612	4.76	nc	No
Vanadium	mg/kg	12.90	5.3	Yes	>BG		44.9	156	nc	No
Zinc	mg/kg	150	62	Yes	>BG		2,321	19,659	nc	No
Organics										
Explosives/Propellants										
1,3,5-Trinitrobenzene	mg/kg	.13J	0	Yes			225	1528	nc	No
1,3-Dinitrobenzene	mg/kg	.99U	0	Yes			0.765	5.94	nc	Yes
2,4,6-Trinitrobenzene	mg/kg	3.90	0	Yes			3.65	21.10	nc	Yes
2,4-Dinitrotoluene	mg/kg	.039J	0	Yes			1.1	0.75	ca	No
2,6-Dinitrotoluene	mg/kg	.099U	0	Yes			1.1	0.77	ca	No
2-Amino-4,6-Dinitrotoluene	mg/kg	0.44	0	Yes			1.54	12.60		No
2-Nitrotoluene	mg/kg	.09U	0	Yes			3.88	6.03	ca	No
3-Nitrotoluene	mg/kg	.11U	0	Yes		25			nc	No
4-Amino-2,6-Dinitrotoluene	mg/kg	0.74	0	Yes			1.54	12.80		No

Table 6-1. Screening results for the determination of potential contamination in surface soil from debris Pile A using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile A Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSLs (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
4-Nitrotoluene	mg/kg	.1U	0	Yes			52.5	81.60	ca	No
HMX	mg/kg	.12U	0	Yes			359	1909	nc	No
Nitrobenzene	mg/kg	.1U	0	Yes		2			nc	No
Nitrocellulose	mg/kg	4J	0	Yes		190,000,000			nm	No
Nitroglycerin	mg/kg	.5U	0	Yes			52.5	81.60	ca	No
Nitroguanidine	mg/kg	.12J	0	Yes		630			nc	No
RDX	mg/kg	.14U	0	Yes			8.03	163	ca	No
Tetryl	mg/kg	.09U	0	Yes		16			n	No
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	5.8			nc	No
1,2-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	180			nc	No
1,3-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	180*			nc	No
1,4-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	2.6			ca	No
2,4,5-Trichlorophenol	mg/kg	1.5 U	0	Yes	Det. Organic	630			nc	No
2,4,6-Trichlorophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	6.3			nc	No
2,4-Dichlorophenol	mg/kg	1.5 U	0	Yes	Det. Organic	19			nc	No
2,4-Dimethylphenol	mg/kg	1.5 U	0	Yes	Det. Organic	130			nc	No
2,4-Dinitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	13			nc	No
2-Chloronaphthalene	mg/kg	0.51 U	0	Yes	Det. Organic	480			nc	No
2-Chlorophenol	mg/kg	0.51 U	0	Yes	Det. Organic	39			nc	No
2-Methyl-4,6-dinitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	0.51			nc	Yes
2-Methylnaphthalene	mg/kg	0.068 U	0	Yes	Det. Organic		30.6	238	nc	No
2-Methylphenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	320			nc	No
2-Nitrophenol	mg/kg	0.51 U	0	Yes	Det. Organic		61.2*	476*		No
3,3'-Dichlorobenzidine	mg/kg	0.82 UJ	0	Yes	Det. Organic	1.2			ca	No
4-Bromophenyl phenyl ether	mg/kg	0.51 U	0	Yes	Det. Organic	0.68*				No
4-Chloro-3-methylphenol	mg/kg	1.5 U	0	Yes	Det. Organic	630			nc	No
4-Chlorophenyl phenyl ether	mg/kg	.51U	0	Yes	Det. Organic	0.68*				No
3 & 4-Methylphenol	mg/kg	1.5U	0	Yes	Det. Organic	31			nc	No
4-Nitrophenol	mg/kg	082U	0	Yes	Det. Organic		61.2	476		No
Acenaphthene	mg/kg	0.05	0	Yes	Det. Organic	360			nc	No
Acenaphthylene	mg/kg	0.01	0	Yes	Det. Organic	360*			nc	No
Anthracene	mg/kg	0.12	0	Yes	Det. Organic	1800	---	---	nc	No
Benz(a)anthracene	mg/kg	0.28	0	Yes	Det. Organic	16	0.65	0.22	ca	No
Benzo(a)pyrene	mg/kg	0.24	0	Yes	Det. Organic		0.065	0.02	ca	Yes
Benzo(b)fluoranthene	mg/kg	0.41	0	Yes	Det. Organic		0.65	0.22	ca	No
Benzo(g,h,i)perylene	mg/kg	0.13	0	Yes	Det. Organic	1.6			ca	No

Table 6-1. Screening results for the determination of potential contamination in surface soil from debris Pile A using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile A Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSLs (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Benzo(k)fluoranthene	mg/kg	0.14	0	Yes	Det. Organic	1.6	6.5	2.21	ca	No
Benzoic Acid	mg/kg	6.70	0	Yes	Det. Organic	25000			nc	No
Bis(2-chloroethoxy)methane	mg/kg	1U	0	Yes	Det. Organic	23	23	178	nc	No
Bis(2-chloroethyl)ether	mg/kg	1U	0	Yes	Det. Organic	0.23			ca	No
Bis(2-chloroisopropyl) ether	mg/kg	1U	0	Yes	Det. Organic	310			nc	No
Bis(2-ethylhexyl)phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	39			ca	No
Butyl benzyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	290			nc	No
Cabazole	mg/kg	.51U	0	Yes	Det. Organic		44.6	69.40	ca	No
Chrysene	mg/kg	0.31	0	Yes	Det. Organic	16	65.0	22.10	ca	No
Di-n-butyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	630			nc	No
Di-n-octyphthalate	mg/kg	0.51 U	0	Yes	Det. Organic	63			nc	No
Dibenz(a,h)anthracene	mg/kg	0.03	0	Yes	Det. Organic	160	0.065	0.02	ca	No
Dibenzofuran	mg/kg	.034J	0	Yes	Det. Organic		15.3	119	nc	No
Diethyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	5100			nc	No
Dimethyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	5100			nc	No
Fluoranthene	mg/kg	0.72	0	Yes	Det. Organic		163	276	nc	No
Fluorene	mg/kg	0.06	0	Yes	Det. Organic		243	737	nc	No
Hexachlorobenzene	mg/kg	.068U	0	Yes	Det. Organic	0.21			ca	No
Hexachlorobutadiene	mg/kg	.51U	0	Yes	Det. Organic	1.2			nc	No
Hexachlorocyclopentadiene	mg/kg	3.4U	0	Yes	Det. Organic	0.18			nc	No
Hexachloroethane	mg/kg	.51U	0	Yes	Det. Organic	1.8			nc	No
Indeno(1,2,3-cd)pyrene	mg/kg	0.12	0	Yes	Det. Organic		0.65	0.22	ca	No
Isophorone	mg/kg	0.51 U	0	Yes	Det. Organic	570			ca	No
N-Nitroso-di-n-propylamine	mg/kg	0.51 U	0	Yes	Det. Organic		0.12	0.13	ca	Yes
N-Nitrosodiphenylamine	mg/kg	.028UJ	0	Yes	Det. Organic	110			ca	No
Naphthalene	mg/kg	0.04	0	Yes	Det. Organic		122	368	ca	No
Pentachlorophenol	mg/kg	.82UJ	0	Yes	Det. Organic		4.91	2.12	ca	No
Phenanthrene	mg/kg	0.50	0	Yes	Det. Organic	360*			nc	no
Phenol	mg/kg	0.12	0	Yes	Det. Organic	1900			nc	No
Pyrene	mg/kg	0.54	0	Yes	Det. Organic		122	207.00	nc	No
Pesticides/Herbicides										
4,4'-DDD	mg/kg	0.02U	0	Yes	Det. Organic	2.3			ca	No
4,4'-DDE	mg/kg	0.017UJ	0	Yes	Det. Organic		3	4.08	ca	No
4,4'-DDT	mg/kg	0.02UJ	0	Yes	Det. Organic	1.9			ca	No
Aldrin	mg/kg	0.041U	0	Yes	Det. Organic		0.053	0.08	ca	No
Dieldrin	mg/kg	0.017U	0	Yes	Det. Organic		0.056	0.09	ca	No
Endosulfan I	mg/kg	0.017U	0	Yes	Det. Organic	47			nc	No

Table 6-1. Screening results for the determination of potential contamination in surface soil from debris Pile A using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile A Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSLs (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Endosulfan II	mg/kg	0.025U	0	Yes	Det. Organic	47*			nc	No
Endosulfan Sulfate	mg/kg	0.031U	0	Yes	Det. Organic	47*			nc	No
Endrin	mg/kg	0.017U	0	Yes	Det. Organic		1.12	1.77	nc	No
Endrin Aldehyde	mg/kg	0.031UJ	0	Yes	Det. Organic	1.9			nc	No
Endrin Ketone	mg/kg	0.02U	0	Yes	Det. Organic	1.9			nc	No
Heptachlor	mg/kg	.036U	0	Yes	Det. Organic	0.13	0.198	0.31	ca	No
Heptachlor Epoxide	mg/kg	.025U	0	Yes	Det. Organic	0.07	0.098	0.15	ca	No
Lindane	mg/kg	.025U	0	Yes	Det. Organic	0.57			ca	No
Methoxychlor	mg/kg	0.051UJ	0	Yes	Det. Organic	32			nc	No
Toxaphene	mg/kg	.68U	0	Yes	Det. Organic	0.49			ca	No
alpha-BHC	mg/kg	0.025U	0	Yes	Det. Organic	0.086			ca	No
alpha-Chlordane	mg/kg	0.031U	0	Yes	Det. Organic	1.7			ca	No
beta-BHC	mg/kg	.036U	0	Yes	Det. Organic	1.7	0.496	0.77	ca	No
delta-BHC	mg/kg	.041U	0	Yes	Det. Organic	1.7				No
gamma-Chlordane	mg/kg	.017UJ	0	Yes	Det. Organic	1.7	---	---	ca	No
Polychlorinated Biphenyls										
Aroclor 1016	mg/kg	0.33U	0	Yes	Det. Organic		0.349	0.20	nc	No
Aroclor 1221	mg/kg	0.25U	0	Yes	Det. Organic	0.20			ca	No
Aroclor 1232	mg/kg	0.23U	0	Yes	Det. Organic	0.17			ca	No
Aroclor 1242	mg/kg	0.2U	0	Yes	Det. Organic	0.23			ca	No
Aroclor 1248	mg/kg	0.28U	0	Yes	Det. Organic		0.349	0.20	ca	No
Aroclor 1254	mg/kg	0.55U	0	Yes	Det. Organic		0.349	0.20	nc	No
Aroclor 1260	mg/kg	0.28U	0	Yes	Det. Organic		0.349	0.20	ca	No
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	0.02UJ	0	Yes	Det. Organic	810			nc	No
1,1,2,2-Tetrachloroethane	mg/kg	0.024UJ	0	Yes	Det. Organic	0.6			ca	No
1,1,2-Trichloroethane	mg/kg	0.024UJ	0	Yes	Det. Organic	0.15			nc	No
1,1-Dichloroethene	mg/kg	0.024UJ	0	Yes	Det. Organic	23			nc	No
1,1-Dichloroethane	mg/kg	0.024UJ	0	Yes	Det. Organic	3.6			ca	No
1,2,-Dichloroethane	mg/kg	0.024UJ	0	Yes	Det. Organic	0.46			ca	No
1,2-Dichloroethane	mg/kg	0.024UJ	0	Yes	Det. Organic	16			nc	No
1,2,-Dichloropropane	mg/kg	0.48U	0	Yes	Det. Organic	1.0			ca	No
2-Butanone	mg/kg	0.0096UJ	0	Yes	Det. Organic	2700			nc	No
2-Hexanone	mg/kg	0.096UJ	0	Yes	Det. Organic	20			nc	No
4-Methyl-2-pentanone	mg/kg	0.048UJ	0	Yes	Det. Organic	3300			nc	No
Acetone	mg/kg	0.19UJ	0	Yes	Det. Organic	6100			nc	No
Benzene	mg/kg	0.024UJ	0	Yes	Det. Organic	1.2			ca	No

Table 6-1. Screening results for the determination of potential contamination in surface soil from debris Pile A using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile A Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSLs (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Bromodichloromethane	mg/kg	0.024UJ	0	Yes	Det. Organic	0.29			ca	No
Bromoform	mg/kg	0.024UJ	0	Yes	Det. Organic	19			ca	No
Bromomethane	mg/kg	0.024UJ	0	Yes	Det. Organic	0.68			nc	No
Carbon Disulfide	mg/kg	0.048UJ	0	Yes	Det. Organic	77			nc	No
Carbon Tetrachloride	mg/kg	0.024UJ	0	Yes	Det. Organic	0.65			ca	No
Chlorobenzene	mg/kg	0.0096UJ	0	Yes	Det. Organic	28			nc	No
Chloroethane	mg/kg	0.0096UJ	0	Yes	Det. Organic	1400			nc	No
Chloroform	mg/kg	0.096UJ	0	Yes	Det. Organic	0.32			ca	No
Chloromethane	mg/kg	0.024UJ	0	Yes	Det. Organic	11			nc	No
Dibromochloromethane	mg/kg	0.024UJ	0	Yes	Det. Organic	8.3			ca	No
Ethylbenzene	mg/kg	0.24U	0	Yes	Det. Organic	5.8			nc	No
Xylene (total)	mg/kg	.48U	0	Yes	Det. Organic	58			nc	No
Methylene Chloride	mg/kg	0.17UJ	0	Yes	Det. Organic	35			nc	No
Styrene	mg/kg	0.0096UJ	0	Yes	Det. Organic	600			nc	No
Tetrachloroethene	mg/kg	0.024UJ	0	Yes	Det. Organic	8.1			nc	No
Toluene	mg/kg	0.024UJ	0	Yes	Det. Organic	490			nc	No
Trichloroethene	mg/kg	0.024UJ	0	Yes	Det. Organic	0.41			nc	No
Vinyl Chloride	mg/kg	0.024UJ	0	Yes	Det. Organic	0.059			ca	No
cis-1,3-Dichloropropene	mg/kg	0.024UJ	0	Yes	Det. Organic	1.8			ca	No
trans-1,3-Dichloropropene	mg/kg	0.024UJ	0	Yes	Det. Organic	1.8			ca	No

*value derived from RSL of a surrogate
ca=carcinogenic
HMX=Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
na=Non-carcinogenic
PCB=Polychlorinated biphenyl
RSL=USEPA Regional Screening Levels
RDX=Hexahydro-1,3,5-trinitro-1,3,5-triazine
Res. = Residential

Chemical	Surrogate
acenphthylene	acenapthene
4-bromophenyl phenyl ether	4-bromophenyl ether
di-methyl ohthalate	diethyl phthalate
1,2 dichlorobenzene	1,3 dochorobenzene
2-nitrophenol	4-nitrophenol

Table 6-2. Screening results for the determination of Contamination in surface soil from Debris Pile B using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile B Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Inorganics										
Aluminum	mg/kg	5,000	17,700	No	< BG		7,380	52932.00	nc	Not an SRC
Antimony	mg/kg	2.3	0.96	Yes	>BG		2.82	13.60	nc	No
Arsenic	mg/kg	27	15.4	Yes	>BG		0.524	0.43	ca	Yes
Barium	mg/kg	150	88.4	Yes	>BG		1,413	8,966	nc	No
Beryllium	mg/kg	0.98	0.88	Yes	>BG	16			nc	No
Cadmium	mg/kg	0.73 U	0	Yes	>BG		6.41	22.30	nc	No
Calcium	mg/kg	2,300	15,800	Ess. Nutrient						Ess. Nutrient
Chromium	mg/kg	23	17	Yes	>BG		8,147	19.70	nc	Yes
Cobalt	mg/kg	7.4	0.47	Yes	>BG		131	803.00	nc	No
Copper	mg/kg	36	0.85	Yes	>BG		311	2714.00	nc	No
Iron	mg/kg	31,000	964	Ess. Nutrient			2,313	19,010	nc	Ess. Nutrient
Lead	mg/kg	230	0.32	Yes	>BG		400	---	nc	No
Magnesium	mg/kg	1,500	95.6	Ess. Nutrient						Ess. Nutrient
Manganese	mg/kg	500	13.4	Yes	>BG		293	1,482	nc	Yes
Mercury	mg/kg	0.23	0.0057	Yes	>BG		2.27	16.50	nc	No
Nickel	mg/kg	22	0.61	Yes	>BG		155	1346.00	nc	No
Potassium	mg/kg	680		Ess. Nutrient						Ess. Nutrient
Selenium	mg/kg	4	0.15	Yes	>BG	39			nc	No
Silver	mg/kg	0.33 J	0.045	Yes	>BG		38.6	324.00	nc	No
Sodium	mg/kg	64 J		Ess. Nutrient						Ess. Nutrient
Thallium	mg/kg	1.1	1.2	No	< BG		0.612	4.76	nc	No
Vanadium	mg/kg	13	5.3	Yes	>BG		44.9	156.00	nc	No
Zinc	mg/kg	230	62	Yes	>BG		2,321	19,659	nc	No
Organics										
Explosives/Propellants										
1,3,5-Trinitrobenzene	mg/kg	0.3 J+	0	Yes	Det. Organic		225	1528.00	nc	No
1,3-Dinitrobenzene	mg/kg	0.1 U	0	Yes	Det. Organic		0.765	5.94	nc	No
2,4,6-Trinitrobenzene	mg/kg	5.8 J	0	Yes	Det. Organic		3.65	21.10	nc	Yes
2,4-Dinitrotoluene	mg/kg	0.07 J	0	Yes	Det. Organic		1.1	0.75	ca	No
2,6-Dinitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		1.1	0.77	ca	No
2-Amino-4,6-Dinitrotoluene	mg/kg	1 J+	0	Yes	Det. Organic		1.54	12.60		No
2-Nitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		3.88	6.03	ca	No
3-Nitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic	25			nc	No
4-Amino-2,6-Dinitrotoluene	mg/kg	1.1 J+	0	Yes	Det. Organic		1.54	12.80		No

Table 6-2. Screening results for the determination of Contamination in surface soil from Debris Pile B using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile B Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
4-Nitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		52.5	81.60	ca	No
HMX	mg/kg	0.1 U	0	Yes	Det. Organic		359	1909.00	nc	No
Nitrobenzene	mg/kg	0.1 U	0	Yes	Det. Organic	2			nc	No
Nitrocellulose	mg/kg	3 J	0	Yes	Det. Organic	190,000,000			nm	No
Nitroglycerin	mg/kg	0.25 U	0	Yes	Det. Organic		52.5	81.60	ca	No
Nitroguanidine	mg/kg	0.039 U	0	Yes	Det. Organic	630			nc	No
RDX	mg/kg	0.1 U	0	Yes	Det. Organic		8.03	163.00	ca	No
Tetryl	mg/kg	0.1 U	0	Yes	Det. Organic	16			n	No
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	5.8			nc	No
1,2-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	180			nc	No
1,3-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	180*			nc	No
1,4-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	2.6			ca	No
2,4,5-Trichlorophenol	mg/kg	1.5 U	0	Yes	Det. Organic	630			nc	No
2,+A53:G1044,6-Trichlorophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	6.3			nc	No
2,4-Dichlorophenol	mg/kg	1.5 U	0	Yes	Det. Organic	19			nc	No
2,4-Dimethylphenol	mg/kg	1.5 U	0	Yes	Det. Organic	130			nc	No
2,4-Dinitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	13			nc	No
2-Chloronaphthalene	mg/kg	0.51 U	0	Yes	Det. Organic	480			nc	No
2-Chlorophenol	mg/kg	0.51 U	0	Yes	Det. Organic	39			nc	No
2-Methyl-4,6-dinitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	0.51			nc	Yes
2-Methylnaphthalene	mg/kg	0.068 U	0	Yes	Det. Organic		30.6	238	nc	No
2-Methylphenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	320			nc	No
2-Nitrophenol	mg/kg	0.51 U	0	Yes	Det. Organic		61.2*	476*		No
3,3'-Dichlorobenzidine	mg/kg	0.82 UJ	0	Yes	Det. Organic	1.2			ca	No
4-Bromophenyl phenyl ether	mg/kg	0.51 U	0	Yes	Det. Organic	0.68*			ca	No
4-Chloro-3-methylphenol	mg/kg	1.5 U	0	Yes	Det. Organic	630			nc	No
4-Chlorophenyl phenyl ether	mg/kg	0.51 U	0	Yes	Det. Organic	0.68*				No
3 & 4-Methylphenol	mg/kg	4.1 U	0	Yes	Det. Organic	31			nc	No
4-Nitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic		61.2	476		No
Acenaphthene	mg/kg	0.068 U	0	Yes	Det. Organic	360			nc	No
Acenaphthylene	mg/kg	0.068 U	0	Yes	Det. Organic	360*			nc	No
Anthracene	mg/kg	0.068 U	0	Yes	Det. Organic	1800			nc	No
Benz(a)anthracene	mg/kg	0.068 U	0	Yes	Det. Organic		0.65	0.22	ca	No
Benzo(a)pyrene	mg/kg	0.068 U	0	Yes	Det. Organic		0.065	0.02	ca	Yes
Benzo(b)fluoranthene	mg/kg	0.068 U	0	Yes	Det. Organic		0.65	0.22	ca	No
Benzo(g,h,i)perylene	mg/kg	0.068 U	0	Yes	Det. Organic	1.6			ca	No

Table 6-2. Screening results for the determination of Contamination in surface soil from Debris Pile B using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile B Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Benzo(k)fluoranthene	mg/kg	0.068 U	0	Yes	Det. Organic		6.5	2.21	ca	No
Benzoic Acid	mg/kg	6.7 U	0	Yes	Det. Organic	25000			nc	No
Bis(2-chloroethoxy)methane	mg/kg	1 U	0	Yes	Det. Organic		23	178	nc	No
Bis(2-chloroethyl)ether	mg/kg	1 U	0	Yes	Det. Organic	0.23			ca	Yes
Bis(2-chloroisopropyl) ether	mg/kg	1 U	0	Yes	Det. Organic	310			nc	No
Bis(2-ethylhexyl)phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	39			ca	No
Butyl benzyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	290			nc	No
Cabazole	mg/kg	0.51 U	0	Yes	Det. Organic		44.6	69.40	ca	No
Chrysene	mg/kg	0.068 U	0	Yes	Det. Organic	16	65.0	22.10	ca	No
Di-n-butyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	630			nc	No
Di-n-octyphthalate	mg/kg	0.51 U	0	Yes	Det. Organic	63			nc	No
Dibenz(a,h)anthracene	mg/kg	0.068 U	0	Yes	Det. Organic	Pesticides/Herbicides,	0.065	0.02	ca	No
Dibenzofuran	mg/kg	0.51 U	0	Yes	Det. Organic		15.3	119	nc	No
Diethyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	5100			nc	No
Dimethyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	5100			nc	No
Fluoranthene	mg/kg	0.087 J-	0	Yes	Det. Organic		163	276	nc	No
Fluorene	mg/kg	0.068 U	0	Yes	Det. Organic		243	737	nc	No
Hexachlorobenzene	mg/kg	0.068 U	0	Yes	Det. Organic	0.21			ca	No
Hexachlorobutadiene	mg/kg	0.51 U	0	Yes	Det. Organic	1.2			nc	No
Hexachlorocyclopentadiene	mg/kg	3.4 U	0	Yes	Det. Organic	0.18			nc	Yes
Hexachloroethane	mg/kg	0.51 U	0	Yes	Det. Organic	1.8			nc	No
Indeno(1,2,3-cd)pyrene	mg/kg	0.068 U	0	Yes	Det. Organic		0.65	0.22	ca	No
Isophorone	mg/kg	0.51 U	0	Yes	Det. Organic	570			ca	No
N-Nitroso-di-n-propylamine	mg/kg	0.51 U	0	Yes	Det. Organic		0.12	0.13	ca	No
N-Nitrosodiphenylamine	mg/kg	0.51 U	0	Yes	Det. Organic	110			ca	No
Naphthalene	mg/kg	0.068 U	0	Yes	Det. Organic		122	368	ca	No
Pentachlorophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic		4.91	2.12	ca	No
Phenanthrene	mg/kg	0.1 J-	0	Yes	Det. Organic	360*			nc	No
Phenol	mg/kg	0.51 U	0	Yes	Det. Organic	1900			nc	No
Pyrene	mg/kg	0.057 J	0	Yes	Det. Organic		122	207.00	nc	No
Pesticides/Herbicides										
4,4'-DDD	mg/kg	0.01 U	0	Yes	Det. Organic	2.3			ca	No
4,4'-DDE	mg/kg	0.005 J	0	Yes	Det. Organic		3	4.08	ca	No
4,4'-DDT	mg/kg	0.0081 J	0	Yes	Det. Organic	1.9			ca	No
Aldrin	mg/kg	0.02 U	0	Yes	Det. Organic		0.053	0.08	ca	No
Dieldrin	mg/kg	0.0042 J	0	Yes	Det. Organic		0.056	0.09	ca	No
Endosulfan I	mg/kg	0.0086 U	0	Yes	Det. Organic	47	for Endosulfan		nc	No

Table 6-2. Screening results for the determination of Contamination in surface soil from Debris Pile B using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile B Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Endosulfan II	mg/kg	0.013 U	0	Yes	Det. Organic	47	""		nc	No
Endosulfan Sulfate	mg/kg	0.015 U	0	Yes	Det. Organic	47	""		nc	No
Endrin	mg/kg	0.0068 U	0	Yes	Det. Organic		1.12	1.77	nc	No
Endrin Aldehyde	mg/kg	0.015 U	0	Yes	Det. Organic	1.9	---	---	nc	No
Endrin Ketone	mg/kg	0.01 U	0	Yes	Det. Organic	1.9			nc	No
Heptachlor	mg/kg	0.018 U	0	Yes	Det. Organic	0.13	0.198	0.31	ca	No
Heptachlor Epoxide	mg/kg	0.013 U	0	Yes	Det. Organic	0.07	0.098	0.15	ca	No
Lindane	mg/kg	0.013 U	0	Yes	Det. Organic	0.57			ca	No
Methoxychlor	mg/kg	0.025 U	0	Yes	Det. Organic	32			nc	No
Toxaphene	mg/kg	0.34 U	0	Yes	Det. Organic	0.49			ca	No
alpha-BHC	mg/kg	0.013 U	0	Yes	Det. Organic	0.086			ca	No
alpha-Chlordane	mg/kg	0.015 U	0	Yes	Det. Organic	1.7	---	---	ca	No
beta-BHC	mg/kg	0.009 J	0	Yes	Det. Organic		0.496	0.77	ca	No
delta-BHC	mg/kg	0.02 U	0	Yes	Det. Organic	1.7			ca	No
gamma-Chlordane	mg/kg	0.0086 U	0	Yes	Det. Organic	1.7	---	---	ca	No
Polychlorinated Biphenyls										
Aroclor 1016	mg/kg	0.066 U	0	Yes	Det. Organic		0.349	0.20	nc	No
Aroclor 1221	mg/kg	0.051 U	0	Yes	Det. Organic	0.20			ca	No
Aroclor 1232	mg/kg	0.046 U	0	Yes	Det. Organic	0.17			ca	No
Aroclor 1242	mg/kg	0.040 U	0	Yes	Det. Organic	0.23			ca	No
Aroclor 1248	mg/kg	0.056 U	0	Yes	Det. Organic		0.349	0.20	ca	No
Aroclor 1254	mg/kg	0.21	0	Yes	Det. Organic		0.349	0.20	nc	Yes
Aroclor 1260	mg/kg	0.056 U	0	Yes	Det. Organic		0.349	0.20	ca	No
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	0.02 UJ	0	Yes	Det. Organic	810			nc	No
1,1,2,2-Tetrachloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.6			ca	No
1,1,2-Trichloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.15			nc	No
1,1-Dichloroethene	mg/kg	0.024 UJ	0	Yes	Det. Organic	23			nc	No
1,1-Dichloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	3.6			ca	No
1,2,-Dichloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.46			ca	No
1,2-Dichloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	16	most stringent		nc	No
1,2,-Dichloropropane	mg/kg	0.0096 UJ	0	Yes	Det. Organic	1.0			ca	No
2-Butanone	mg/kg	0.096 UJ	0	Yes	Det. Organic	2700			nc	No
2-Hexanone	mg/kg	0.048 UJ	0	Yes	Det. Organic	20			nc	No
4-Methyl-2-pentanone	mg/kg	0.096 UJ	0	Yes	Det. Organic	3300			nc	No
Acetone	mg/kg	0.19 UJ	0	Yes	Det. Organic	6100			nc	No
Benzene	mg/kg	0.024 UJ	0	Yes	Det. Organic	1.2			ca	No

Table 6-2. Screening results for the determination of Contamination in surface soil from Debris Pile B using the maximum concentration detected per analyte.

Analyte	Units	Debris Pile B Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Bromodichloromethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.29			ca	No
Bromoform	mg/kg	0.024 UJ	0	Yes	Det. Organic	19			ca	No
Bromomethane	mg/kg	0.048 UJ	0	Yes	Det. Organic	0.68			nc	No
Carbon Disulfide	mg/kg	0.024 UJ	0	Yes	Det. Organic	77			nc	No
Carbon Tetrachloride	mg/kg	0.0096 UJ	0	Yes	Det. Organic	0.65			ca	No
Chlorobenzene	mg/kg	0.0096 UJ	0	Yes	Det. Organic	28			nc	No
Chloroethane	mg/kg	0.096 UJ	0	Yes	Det. Organic	1400			nc	No
Chloroform	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.32			ca	No
Chloromethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	11			nc	No
Dibromochloromethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	8.3			ca	No
Ethylbenzene	mg/kg	0.24 UJ	0	Yes	Det. Organic	5.8			nc	No
Xylene (total)	mg/kg	0.48 U	0	Yes	Det. Organic	58			nc	No
Methylene Chloride	mg/kg	0.14 UJ	0	Yes	Det. Organic	35			nc	No
Styrene	mg/kg	0.0096 UJ	0	Yes	Det. Organic	600			nc	No
Tetrachloroethene	mg/kg	0.024 UJ	0	Yes	Det. Organic	8.1			nc	No
Toluene	mg/kg	0.024 UJ	0	Yes	Det. Organic	490			nc	No
Trichloroethene	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.41			nc	No
Vinyl Chloride	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.059			ca	No
cis-1,3-Dichloropropene	mg/kg	0.0096 UJ	0	Yes	Det. Organic	1.8			ca	No
trans-1,3-Dichloropropene	mg/kg	0.024 UJ	0	Yes	Det. Organic	1.8			ca	No

*value derived from RSL of a surrogate
ca=carcinogenic
HMX=Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
na=Non-carcinogenic
PCB=Polychlorinated biphenyl
RSL=USEPA Regional Screening Levels
RDX=Hexahydro-1,3,5-trinitro-1,3,5-triazine
Res. = Residential

Chemical	Surrogate
acenphthylene	acenapthene
4-bromophenyl phenyl ether	4-bromophenyl ether
di-methyl ohthalate	diethyl phthalate
1,2 dichlorobenzene	1,3 dochorobenzene
2-nitrophenol	4-nitrophenol

Table 6-3. Screening results for the determination of Contamination in surface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Inorganics										
Aluminum	mg/kg	12,000	17,700	No	< BG		7,380	52932.00	nc	Not an SRC
Antimony	mg/kg	1.8 U	0.96	Yes	>BG		2.82	13.60	nc	No
Arsenic	mg/kg	12	15.4	No	>BG		0.524	0.43	ca	Yes
Barium	mg/kg	77	88.4	No	<BG		1,413	8,966	nc	Not an SRC
Beryllium	mg/kg	0.78	0.88	No	<BG	16			nc	Not an SRC
Cadmium	mg/kg	0.41	0	Yes	>BG		6.41	22.30	nc	No
Calcium	mg/kg	4,900	15,800		Ess. Nutrient					Ess. Nutrient
Chromium	mg/kg	21	17	Yes	>BG		8,147	19.70	nc	Yes
Cobalt	mg/kg	9.8	0.47	Yes	>BG		131	803.00	nc	No
Copper	mg/kg	15	0.85	Yes	>BG		311	2714.00	nc	No
Iron	mg/kg	22,000	964		Ess. Nutrient		2,313	19,010	nc	Ess. Nutrient
Lead	mg/kg	21	0.32	Yes	>BG		400	---	nc	No
Magnesium	mg/kg	2,600	95.6		Ess. Nutrient					Ess. Nutrient
Manganese	mg/kg	640	13.4	Yes	>BG		293	1,482	nc	Yes
Mercury	mg/kg	0.045 J	0.0057	Yes	>BG		2.27	16.50	nc	No
Nickel	mg/kg	1,200	0.61	Yes	>BG		155	1346.00	nc	Yes
Potassium	mg/kg	1			Ess. Nutrient					Ess. Nutrient
Selenium	mg/kg	1.2	0.15	Yes	>BG	39			nc	No
Silver	mg/kg	0.014 J	0.045	Yes	>BG		38.6	324.00	nc	No
Sodium	mg/kg	36 J			Ess. Nutrient					Ess. Nutrient
Thallium	mg/kg	0.15 J	1.2	No	< BG		0.612	4.76	nc	No
Vanadium	mg/kg	19	5.3	Yes	>BG		44.9	156.00	nc	No
Zinc	mg/kg	110	62	Yes	>BG		2,321	19,659	nc	No
Organics										
Explosives/Propellants										
1,3,5-Trinitrobenzene	mg/kg	0.1 U	0	Yes	Det. Organic		225	1528.00	nc	No
1,3-Dinitrobenzene	mg/kg	0.1 U	0	Yes	Det. Organic		0.765	5.94	nc	No
2,4,6-Trinitrobenzene	mg/kg	0.25 UJ	0	Yes	Det. Organic		3.65	21.10	nc	No
2,4-Dinitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		1.1	0.75	ca	No
2,6-Dinitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		1.1	0.77	ca	No
2-Amino-4,6-Dinitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		1.54	12.60		No

Table 6-3. Screening results for the determination of Contamination in surface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
2-Nitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		3.88	6.03	ca	No
3-Nitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic	25			nc	No
4-Amino-2,6-Dinitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		1.54	12.80		No
4-Nitrotoluene	mg/kg	0.1 U	0	Yes	Det. Organic		52.5	81.60	ca	No
HMX	mg/kg	0.1 U	0	Yes	Det. Organic		359	1909.00	nc	No
Nitrobenzene	mg/kg	0.1 U	0	Yes	Det. Organic	2			nc	No
Nitrocellulose	mg/kg	0.99 J	0	Yes	Det. Organic	190,000,000			nm	No
Nitroglycerin	mg/kg	0.25 U	0	Yes	Det. Organic		52.5	81.60	ca	No
Nitroguanidine	mg/kg	0.04 U	0	Yes	Det. Organic	630			nc	No
RDX	mg/kg	0.1 U	0	Yes	Det. Organic		8.03	163.00	ca	No
Tetryl	mg/kg	0.1 U	0	Yes	Det. Organic	16			n	No
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	5.8			nc	No
1,2-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	180			nc	No
1,3-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	180*			nc	No
1,4-Dichlorobenzene	mg/kg	0.51 U	0	Yes	Det. Organic	2.6			ca	No
2,4,5-Trichlorophenol	mg/kg	1.5 U	0	Yes	Det. Organic	630			nc	No
2,4,6-Trichlorophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	6.3			nc	No
2,4-Dichlorophenol	mg/kg	1.5 U	0	Yes	Det. Organic	19			nc	No
2,4-Dimethylphenol	mg/kg	1.5 U	0	Yes	Det. Organic	130			nc	No
2,4-Dinitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	13			nc	No
2-Chloronaphthalene	mg/kg	0.51 U	0	Yes	Det. Organic	480			nc	No
2-Chlorophenol	mg/kg	0.51 U	0	Yes	Det. Organic	39			nc	No
2-Methyl-4,6-dinitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	0.51			nc	Yes
2-Methylnaphthalene	mg/kg	0.074	0	Yes	Det. Organic		30.6	238	nc	No
2-Methylphenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	320			nc	No
2-Nitrophenol	mg/kg	0.51 U	0	Yes	Det. Organic		61.2*	476*	nc	No
3,3'-Dichlorobenzidine	mg/kg	0.82 UJ	0	Yes	Det. Organic	1.2			ca	No
4-Bromophenyl phenyl ether	mg/kg	0.51 U	0	Yes	Det. Organic	0.68*			ca	No
4-Chloro-3-methylphenol	mg/kg	1.5 U	0	Yes	Det. Organic	630			nc	No
4-Chlorophenyl phenyl ether	mg/kg	0.51 U	0	Yes	Det. Organic	0.68*			ca	No
4-Methylphenol	mg/kg	4.1 U	0	Yes	Det. Organic	31			nc	No
4-Nitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic		61.2	476	nc	No
Acenaphthene	mg/kg	0.079	0	Yes	Det. Organic	360			nc	No
Acenaphthylene	mg/kg	0.27	0	Yes	Det. Organic	360*			nc	No
Anthracene	mg/kg	0.49	0	Yes	Det. Organic	1800	---	---	nc	No
Benz(a)anthracene	mg/kg	1.7	0	Yes	Det. Organic	16	0.65	0.22	ca	Yes

Table 6-3. Screening results for the determination of Contamination in surface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Benzo(a)pyrene	mg/kg	1.4	0	Yes	Det. Organic	0.016	0.065	0.02	ca	Yes
Benzo(b)fluoranthene	mg/kg	1.9	0	Yes	Det. Organic	0.16	0.65	0.22	ca	No
Benzo(g,h,i)perylene	mg/kg	0.8	0	Yes	Det. Organic	1.6			ca	No
Benzo(k)fluoranthene	mg/kg	1.1	0	Yes	Det. Organic	1.6	6.5	2.21	ca	No
Benzoic Acid	mg/kg	6.7 U	0	Yes	Det. Organic	25000			nc	No
Bis(2-chloroethoxy)methane	mg/kg	1 U	0	Yes	Det. Organic	23	23	178	nc	No
Bis(2-chloroethyl)ether	mg/kg	1 U	0	Yes	Det. Organic	0.23			ca	Yes
Bis(2-chloroisopropyl) ether	mg/kg	1 U	0	Yes	Det. Organic	310			nc	No
Bis(2-ethylhexyl)phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	39			ca	No
Butyl benzyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	290			nc	No
Carbazole	mg/kg	0.51 U	0	Yes	Det. Organic		44.6	69.40	ca	No
Chrysene	mg/kg	1.6	0	Yes	Det. Organic	16	65.0	22.10	ca	No
Di-n-butyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	630			nc	No
Di-n-octyphthalate	mg/kg	0.51 U	0	Yes	Det. Organic	63			nc	No
Dibenz(a,h)anthracene	mg/kg	0.068 U	0	Yes	Det. Organic	160	0.065	0.02	ca	No
Dibenzofuran	mg/kg	0.08 J	0	Yes	Det. Organic		15.3	119	nc	No
Diethyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	5100			nc	No
Dimethyl phthalate	mg/kg	0.51 U	0	Yes	Det. Organic	5100			nc	No
Fluoranthene	mg/kg	3.8 J-	0	Yes	Det. Organic		163	276	nc	No
Fluorene	mg/kg	0.12	0	Yes	Det. Organic		243	737	nc	No
Hexachlorobenzene	mg/kg	0.068 U	0	Yes	Det. Organic	0.21			ca	No
Hexachlorobutadiene	mg/kg	0.51 U	0	Yes	Det. Organic	1.2			nc	No
Hexachlorocyclopentadiene	mg/kg	3.4 U	0	Yes	Det. Organic	0.18			nc	Yes
Hexachloroethane	mg/kg	0.51 U	0	Yes	Det. Organic	1.8			nc	No
Indeno(1,2,3-cd)pyrene	mg/kg	0.78	0	Yes	Det. Organic		0.65	0.22	ca	No
Isophorone	mg/kg	0.51 U	0	Yes	Det. Organic	570			ca	No
N-Nitroso-di-n-propylamine	mg/kg	0.51 U	0	Yes	Det. Organic		0.12	0.13	ca	No
N-Nitrosodiphenylamine	mg/kg	0.51 U	0	Yes	Det. Organic	110			ca	No
Naphthalene	mg/kg	0.068	0	Yes	Det. Organic		122	368	ca	No
Pentachlorophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic		4.91	2.12	ca	No
Phenanthrene	mg/kg	1.4 J-	0	Yes	Det. Organic	360*			nc	No
Phenol	mg/kg	0.51 U	0	Yes	Det. Organic	1900			nc	No
Pyrene	mg/kg	2.6	0	Yes	Det. Organic		122	207.00	nc	No
Pesticides/Herbicides										
4,4'-DDD	mg/kg	0.02 U	0	Yes	Det. Organic	2.3			ca	No
4,4'-DDE	mg/kg	0.017 U	0	Yes	Det. Organic		3	4.08	ca	No
4,4'-DDT	mg/kg	0.02 U	0	Yes	Det. Organic	1.9			ca	No

Table 6-3. Screening results for the determination of Contamination in surface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Aldrin	mg/kg	0.041 U	0	Yes	Det. Organic		0.053	0.08	ca	No
Dieldrin	mg/kg	0.017 U	0	Yes	Det. Organic		0.056	0.09	ca	No
Endosulfan I	mg/kg	0.017 U	0	Yes	Det. Organic	47	for Endosulfan		nc	No
Endosulfan II	mg/kg	0.026 U	0	Yes	Det. Organic	47	""		nc	No
Endosulfan Sulfate	mg/kg	0.031 U	0	Yes	Det. Organic	47	""		nc	No
Endrin	mg/kg	0.017 U	0	Yes	Det. Organic		1.12	1.77	nc	No
Endrin Aldehyde	mg/kg	0.031 U	0	Yes	Det. Organic	1.9	---	---	nc	No
Endrin Ketone	mg/kg	0.02 U	0	Yes	Det. Organic	1.9			nc	No
Heptachlor	mg/kg	0.036 U	0	Yes	Det. Organic		0.198	0.31	ca	No
Heptachlor Epoxide	mg/kg	0.026 U	0	Yes	Det. Organic		0.098	0.15	ca	No
Lindane	mg/kg	0.026 U	0	Yes	Det. Organic	0.57			ca	No
Methoxychlor	mg/kg	0.051 U	0	Yes	Det. Organic	32			nc	No
Toxaphene	mg/kg	0.68 U	0	Yes	Det. Organic	0.49			ca	No
alpha-BHC	mg/kg	0.026 U	0	Yes	Det. Organic	0.086			ca	No
alpha-Chlordane	mg/kg	0.031 U	0	Yes	Det. Organic	1.7	---	---	ca	No
beta-BHC	mg/kg	0.036 U	0	Yes	Det. Organic		0.496	0.77	ca	No
delta-BHC	mg/kg	0.041 U	0	Yes	Det. Organic	1.7			ca	No
gamma-Chlordane	mg/kg	0.017 U	0	Yes	Det. Organic	1.7	---	---	ca	No
Polychlorinated Biphenyls										
Aroclor 1016	mg/kg	0.066 U	0	Yes	Det. Organic		0.349	0.20	nc	No
Aroclor 1221	mg/kg	0.051 U	0	Yes	Det. Organic	0.20			ca	No
Aroclor 1232	mg/kg	0.046 U	0	Yes	Det. Organic	0.17			ca	No
Aroclor 1242	mg/kg	0.041 U	0	Yes	Det. Organic	0.23			ca	No
Aroclor 1248	mg/kg	0.056 U	0	Yes	Det. Organic		0.349	0.20	ca	No
Aroclor 1254	mg/kg	0.056 U	0	Yes	Det. Organic		0.349	0.20	nc	No
Aroclor 1260	mg/kg	0.056 U	0	Yes	Det. Organic		0.349	0.20	ca	No
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	0.02 UJ	0	Yes	Det. Organic	810			nc	No
1,1,2,2-Tetrachloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.6			ca	No
1,1,2-Trichloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.15			nc	No
1,1-Dichloroethene	mg/kg	0.024 UJ	0	Yes	Det. Organic	23			nc	No
1,1-Dichloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	3.6			ca	No
1,2,-Dichloroethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.46			ca	No
1,2-Dichloroethene (total)	mg/kg	0.024 UJ	0	Yes	Det. Organic	16			nc	No
1,2,-Dichloropropane	mg/kg	0.0097 UJ	0	Yes	Det. Organic	1.0			ca	No
2-Butanone	mg/kg	0.097 UJ	0	Yes	Det. Organic	2700			nc	No
2-Hexanone	mg/kg	0.049 UJ	0	Yes	Det. Organic	20			nc	No

Table 6-3. Screening results for the determination of Contamination in surface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Surface	Background Criteria-Surface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
4-Methyl-2-pentanone	mg/kg	0.097 UJ	0	Yes	Det. Organic	3300			nc	No
Acetone	mg/kg	0.19 UJ	0	Yes	Det. Organic	6100			nc	No
Benzene	mg/kg	0.024 UJ	0	Yes	Det. Organic	1.2			ca	No
Bromodichloromethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.29			ca	No
Bromoform	mg/kg	0.024 UJ	0	Yes	Det. Organic	19			ca	No
Bromomethane	mg/kg	0.049 UJ	0	Yes	Det. Organic	0.68			nc	No
Carbon Disulfide	mg/kg	0.024 UJ	0	Yes	Det. Organic	77			nc	No
Carbon Tetrachloride	mg/kg	0.0097 UJ	0	Yes	Det. Organic	0.65			ca	No
Chlorobenzene	mg/kg	0.0097 UJ	0	Yes	Det. Organic	28			nc	No
Chloroethane	mg/kg	0.097 UJ	0	Yes	Det. Organic	1400			nc	No
Chloroform	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.32			ca	No
Chloromethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	11			nc	No
Dibromochloromethane	mg/kg	0.024 UJ	0	Yes	Det. Organic	8.3			ca	No
Ethylbenzene	mg/kg	0.24 U	0	Yes	Det. Organic	5.8			nc	No
Xylene (total)	mg/kg	0.49 U	0	Yes	Det. Organic	58			nc	No
Methylene Chloride	mg/kg	0.14 UJ	0	Yes	Det. Organic	35			nc	No
Styrene	mg/kg	0.0097 UJ	0	Yes	Det. Organic	600			nc	No
Tetrachloroethene	mg/kg	0.024 UJ	0	Yes	Det. Organic	8.1			nc	No
Toluene	mg/kg	0.024 UJ	0	Yes	Det. Organic	490			nc	No
Trichloroethene	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.41			nc	No
Vinyl Chloride	mg/kg	0.024 UJ	0	Yes	Det. Organic	0.059			ca	No
cis-1,3-Dichloropropene	mg/kg	0.0097 UJ	0	Yes	Det. Organic	1.8			ca	No
trans-1,3-Dichloropropene	mg/kg	0.024 UJ	0	Yes	Det. Organic	1.8			ca	No

*value derived from RSL of a surrogate
ca=carcinogenic
HMX=Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
na=Non-carcinogenic
PCB=Polychlorinated biphenyl
RSL=USEPA Regional Screening Levels
RDX=Hexahydro-1,3,5-trinitro-1,3,5-triazine
Res. = Residential

Chemical
acenphthylene
4-bromophenyl phenyl ether
di-methyl ohthalate
1,2 dichlorobenzene
2-nitrophenol

Surrogate
acenapthene
4-bromophenyl ether
diethyl phthalate
1,3 dochorobenzene
4-nitrophenol

Table 6-4. Screening results for the determination of potential contamination in subsurface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Subsurface	Background Criteria-Subsurface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Inorganics										
Aluminum	mg/kg	6,900	19,500	No	< BG		7,380	52932	nc	Not an SRC
Antimony	mg/kg	0.24	0.96	No	< BG		2.82	13.60	nc	Not an SRC
Arsenic	mg/kg	9.0	19.8	No	< BG		0.524	0.43	ca	Not an SRC
Barium	mg/kg	45.0	124	No	< BG		1,413	8,966	nc	Not an SRC
Beryllium	mg/kg	0.46	0.88	No	< BG	16			nc	Not an SRC
Cadmium	mg/kg	9	0	Yes	>BG		6.41	22.30	nc	Yes
Calcium	mg/kg	9,600	35,500	Ess. Nutrient						Ess. Nutrient
Chromium	mg/kg	13	27.2	No	<BG		8,147	19.70	nc	Not an SRC
Cobalt	mg/kg	7.70	23.2	No	<BG		131	803	nc	Not an SRC
Copper	mg/kg	11.00	32.3	No	<BG		311	2714	nc	Not an SRC
Iron	mg/kg	18,000	35,200	Ess. Nutrient			2,313	19,010	nc	Ess. Nutrient
Lead	mg/kg	13.00	19.1	No	<BG		400	---	nc	No
Magnesium	mg/kg	2,500.0	8,790	Ess. Nutrient						Ess. Nutrient
Manganese	mg/kg	340.0	3,030	No	>BG		293	1,482	nc	Yes
Mercury	mg/kg	0.0180	0.044	No	>BG		2.27	16.50	nc	No
Nickel	mg/kg	16.00	60.7	No	>BG		155	1346	nc	No
Potassium	mg/kg			Ess. Nutrient						Ess. Nutrient
Selenium	mg/kg	0.84	1.5	No	>BG	39			nc	No
Silver	mg/kg	0.088	0.0	Yes	>BG		38.6	324	nc	No
Sodium	mg/kg			Ess. Nutrient						Ess. Nutrient
Thallium	mg/kg	0.1	0.9	No	< BG		0.612	4.76	nc	Not an SRC
Vanadium	mg/kg	12.0	37.6	No	>BG		44.9	156	nc	Not an SRC
Zinc	mg/kg	100	93.3	Yes	>BG		2,321	19,659	nc	No
Organics										
Explosives/Propellants										
1,3,5-Trinitrobenzene	mg/kg	0.1	0	Yes	Det. Organic		225	1528	nc	No
1,3-Dinitrobenzene	mg/kg	0.1	0	Yes	Det. Organic		0.765	5.94	nc	No
2,4,6-Trinitrobenzene	mg/kg	0.1	0	Yes	Det. Organic		3.65	21.10	nc	No
2,4-Dinitrotoluene	mg/kg	0.1	0	Yes	Det. Organic		1.1	0.75	ca	No
2,6-Dinitrotoluene	mg/kg	0.1	0	Yes	Det. Organic		1.1	0.77	ca	No
2-Amino-4,6-Dinitrotoluene	mg/kg	0.1	0	Yes	Det. Organic		1.54	12.60		No
2-Nitrotoluene	mg/kg	0.1	0	Yes	Det. Organic		3.88	6.03	ca	No
3-Nitrotoluene	mg/kg	0.1	0	Yes	Det. Organic	25			nc	No
4-Amino-2,6-Dinitrotoluene	mg/kg	0.1	0	Yes	Det. Organic		1.54	12.80	nc	No
4-Nitrotoluene	mg/kg	0.1	0	Yes	Det. Organic		52.5	81.60	ca	No

Table 6-4. Screening results for the determination of potential contamination in subsurface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Subsurface	Background Criteria-Subsurface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
HMX	mg/kg	0.1	0	Yes	Det. Organic		359	1909	nc	No
Nitrobenzene	mg/kg	0.1	0	Yes	Det. Organic	2			nc	No
Nitrocellulose	mg/kg	1.8	0	Yes	Det. Organic	190,000,000			nm	No
Nitroglycerin	mg/kg	0.26	0	Yes	Det. Organic		52.5	81.60	ca	No
Nitroguanidine	mg/kg	0.04	0	Yes	Det. Organic	630			nc	No
RDX	mg/kg	0.1	0	Yes	Det. Organic		8.03	163.00	ca	No
Tetryl	mg/kg	0.1	0	Yes	Det. Organic	16			n	No
Semivolatile Organic Compounds										
1,2,4-Trichlorobenzene	mg/kg	0.51	0	Yes	Det. Organic	5.8			nc	No
1,2-Dichlorobenzene	mg/kg	0.51	0	Yes	Det. Organic	180			nc	No
1,3-Dichlorobenzene	mg/kg	0.51	0	Yes	Det. Organic	180*			nc	No
1,4-Dichlorobenzene	mg/kg	0.51	0	Yes	Det. Organic	2.6			ca	No
2,4,5-Trichlorophenol	mg/kg	1.5	0	Yes	Det. Organic	630			nc	No
2,4,6-Trichlorophenol	mg/kg	0.82	0	Yes	Det. Organic	6.3			nc	No
2,4-Dichlorophenol	mg/kg	1.5	0	Yes	Det. Organic	19			nc	No
2,4-Dimethylphenol	mg/kg	1.5	0	Yes	Det. Organic	130			nc	No
2,4-Dinitrophenol	mg/kg	0.82	0	Yes	Det. Organic	13			nc	No
2-Chloronaphthalene	mg/kg	0.51	0	Yes	Det. Organic	480			nc	No
2-Chlorophenol	mg/kg	0.51	0	Yes	Det. Organic	39			nc	No
2-Methyl-4,6-dinitrophenol	mg/kg	0.82 UJ	0	Yes	Det. Organic	0.51			nc	Yes
2-Methylnaphthalene	mg/kg	0.2	0	Yes	Det. Organic		30.6	238	nc	No
2-Methylphenol	mg/kg	0.82	0	Yes	Det. Organic	320			nc	No
2-Nitrophenol	mg/kg	0.51	0	Yes	Det. Organic		61.2*	476*		No
3,3'-Dichlorobenzidine	mg/kg	0.82	0	Yes	Det. Organic	1.2			ca	No
4-Bromophenyl phenyl ether	mg/kg	0.51	0	Yes	Det. Organic	0.68*			ca	No
4-Chloro-3-methylphenol	mg/kg	1.5	0	Yes	Det. Organic	630			nc	No
4-Chlorophenyl phenyl ether	mg/kg	0.51	0	Yes	Det. Organic	0.68*			ca	No
4-Methylphenol	mg/kg	4.1	0	Yes	Det. Organic	31			nc	No
4-Nitrophenol	mg/kg	0.82	0	Yes	Det. Organic		61.2	476		No
Acenaphthene	mg/kg	0.068	0	Yes	Det. Organic	360			nc	No
Acenaphthylene	mg/kg	0.068	0	Yes	Det. Organic	360*			nc	No
Anthracene	mg/kg	0.27	0	Yes	Det. Organic	1800	---	---	nc	No
Benz(a)anthracene	mg/kg	0.71	0	Yes	Det. Organic	16	0.65	0.22	ca	Yes
Benzo(a)pyrene	mg/kg	0.62	0	Yes	Det. Organic	0.016	0.065	0.02	ca	Yes
Benzo(b)fluoranthene	mg/kg	0.87	0	Yes	Det. Organic	0.16	0.65	0.22	ca	Yes
Benzo(g,h,i)perylene	mg/kg	0.42	0	Yes	Det. Organic	1.6			ca	No

Table 6-4. Screening results for the determination of potential contamination in subsurface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Subsurface	Background Criteria-Subsurface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Benzo(k)fluoranthene	mg/kg	0.37	0	Yes	Det. Organic	1.6	6.5	2.21	ca	No
Benzoic Acid	mg/kg	6.7	0	Yes	Det. Organic	25000			nc	No
Bis(2-chloroethoxy)methane	mg/kg	1	0	Yes	Det. Organic	23	23	178	nc	No
Bis(2-chloroethyl)ether	mg/kg	1	0	Yes	Det. Organic	0.23			ca	Yes
Bis(2-chloroisopropyl) ether	mg/kg	1	0	Yes	Det. Organic	310			nc	No
Bis(2-ethylhexyl)phthalate	mg/kg	0.51	0	Yes	Det. Organic	39			ca	No
Butyl benzyl phthalate	mg/kg	0.51	0	Yes	Det. Organic	290			nc	No
Carbazole	mg/kg	0.51	0	Yes	Det. Organic		44.6	69.40	ca	No
Chrysene	mg/kg	0.72	0	Yes	Det. Organic	16	65.0	22.10	ca	No
Di-n-butyl phthalate	mg/kg	0.51	0	Yes	Det. Organic	630			nc	No
Di-n-octyphthalate	mg/kg	0.51	0	Yes	Det. Organic	63			nc	No
Dibenz(a,h)anthracene	mg/kg	0.068	0	Yes	Det. Organic	160	0.065	0.02	ca	Yes
Dibenzofuran	mg/kg	0.51	0	Yes	Det. Organic		15.3	119	nc	No
Diethyl phthalate	mg/kg	0.51	0	Yes	Det. Organic	5100			nc	No
Dimethyl phthalate	mg/kg	0.51	0	Yes	Det. Organic	5100			nc	No
Fluoranthene	mg/kg	1.6	0	Yes	Det. Organic		163	276	nc	No
Fluorene	mg/kg	0.068	0	Yes	Det. Organic		243	737	nc	No
Hexachlorobenzene	mg/kg	0.068	0	Yes	Det. Organic	0.21			ca	No
Hexachlorobutadiene	mg/kg	0.51	0	Yes	Det. Organic	1.2			nc	No
Hexachlorocyclopentadiene	mg/kg	3.4	0	Yes	Det. Organic	0.18			nc	Yes
Hexachloroethane	mg/kg	0.51	0	Yes	Det. Organic	1.8			nc	No
Indeno(1,2,3-cd)pyrene	mg/kg	0.37	0	Yes	Det. Organic		0.65	0.22	ca	Yes
Isophorone	mg/kg	0.51	0	Yes	Det. Organic	570			ca	No
N-Nitroso-di-n-propylamine	mg/kg	0.51	0	Yes	Det. Organic		0.12	0.13	ca	Yes
N-Nitrosodiphenylamine	mg/kg	0.51	0	Yes	Det. Organic	110			ca	No
Naphthalene	mg/kg	0.13	0	Yes	Det. Organic		122	368	ca	No
Pentachlorophenol	mg/kg	0.82	0	Yes	Det. Organic		4.91	2.12	ca	No
Phenanthrene	mg/kg	0.71	0	Yes	Det. Organic	360*			nc	No
Phenol	mg/kg	0.51	0	Yes	Det. Organic	1900			nc	No
Pyrene	mg/kg	1.2	0	Yes	Det. Organic		122	207.00	nc	No
Pesticides/Herbicides										
4,4'-DDD	mg/kg	0.02	0	Yes	Det. Organic	2.3			ca	No
4,4'-DDE	mg/kg	0.017	0	Yes	Det. Organic		3	4.08	ca	No
4,4'-DDT	mg/kg	0.02	0	Yes	Det. Organic	1.9			ca	No
Aldrin	mg/kg	0.041	0	Yes	Det. Organic		0.053	0.08	ca	No
Dieldrin	mg/kg	0.017	0	Yes	Det. Organic		0.056	0.09	ca	No

Table 6-4. Screening results for the determination of potential contamination in subsurface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Subsurface	Background Criteria-Subsurface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Endosulfan I	mg/kg	0.017	0	Yes	Det. Organic	47	for Endosulfan		nc	No
Endosulfan II	mg/kg	0.025	0	Yes	Det. Organic	47	""		nc	No
Endosulfan Sulfate	mg/kg	0.03	0	Yes	Det. Organic	47	""		nc	No
Endrin	mg/kg	0.017	0	Yes	Det. Organic		1.12	1.77	nc	No
Endrin Aldehyde	mg/kg	0.03	0	Yes	Det. Organic	1.9	---	---	nc	No
Endrin Ketone	mg/kg	0.02	0	Yes	Det. Organic	1.9			nc	No
Heptachlor	mg/kg	0.035	0	Yes	Det. Organic	0.13	0.198	0.31	ca	No
Heptachlor Epoxide	mg/kg	0.025	0	Yes	Det. Organic	0.07	0.098	0.15	ca	No
Lindane	mg/kg	0.025	0	Yes	Det. Organic	0.57			ca	No
Methoxychlor	mg/kg	0.051	0	Yes	Det. Organic	32			nc	No
Toxaphene	mg/kg	0.68	0	Yes	Det. Organic	0.49			ca	No
alpha-BHC	mg/kg	0.025	0	Yes	Det. Organic	0.086			ca	No
alpha-Chlordane	mg/kg	0.03	0	Yes	Det. Organic	1.7	---	---	ca	No
beta-BHC	mg/kg	0.035	0	Yes	Det. Organic		0.496	0.77	ca	No
delta-BHC	mg/kg	0.041	0	Yes	Det. Organic	1.7			ca	No
gamma-Chlordane	mg/kg	0.017	0	Yes	Det. Organic	1.7	---	---	ca	No
Polychlorinated Biphenyls										
Aroclor 1016	mg/kg	0.066	0	Yes	Det. Organic		0.349	0.20	nc	No
Aroclor 1221	mg/kg	0.051	0	Yes	Det. Organic	0.20			ca	No
Aroclor 1232	mg/kg	0.046	0	Yes	Det. Organic	0.17			ca	No
Aroclor 1242	mg/kg	0.041	0	Yes	Det. Organic	0.23			ca	No
Aroclor 1248	mg/kg	0.056	0	Yes	Det. Organic	0.23	0.349	0.20	ca	No
Aroclor 1254	mg/kg	0.4	0	Yes	Det. Organic	0.12	0.349	0.20	nc	Yes
Aroclor 1260	mg/kg	0.056	0	Yes	Det. Organic	0.24	0.349	0.20	ca	No
Volatile Organic Compounds										
1,1,1-Trichloroethane	mg/kg	0.29	0	Yes	Det. Organic	810			nc	No
1,1,2,2-Tetrachloroethane	mg/kg	0.29	0	Yes	Det. Organic	0.6			ca	No
1,1,2-Trichloroethane	mg/kg	0.29	0	Yes	Det. Organic	0.15			nc	Yes
1,1-Dichloroethene	mg/kg	0.29	0	Yes	Det. Organic	23			nc	No
1,1-Dichloroethane	mg/kg	0.29	0	Yes	Det. Organic	3.6			ca	No
1,2,-Dichloroethane	mg/kg	0.29	0	Yes	Det. Organic	0.46			ca	No
1,2-Dichloroethene (total)	mg/kg	0.29	0	Yes	Det. Organic	16			nc	No
1,2,-Dichloropropane	mg/kg	0.29	0	Yes	Det. Organic	1.0			ca	No
2-Butanone	mg/kg	1.3	0	Yes	Det. Organic	2700			nc	No
2-Hexanone	mg/kg	1.3	0	Yes	Det. Organic	20			nc	No
4-Methyl-2-pentanone	mg/kg	1.2	0	Yes	Det. Organic	3300			nc	No

Table 6-4. Screening results for the determination of potential contamination in subsurface soil from debris Pile C using the maximum concentration detected per analyte.

Analyte	Units	Maximum Detect Subsurface	Background Criteria-Subsurface	Potential Contamination Yes or No	Rationale	Residential RSL (HQ=.1, TCR =1 X 10^{-6})	Resident Child FWCUGs (HQ=.1, TCR =1 X 10^{-6})	Resident Adult FWCUGs (HQ=.1, TCR =1 X 10^{-6})	FWCUG Type	Contamination Yes or No
Acetone	mg/kg	1.2	0	Yes	Det. Organic	6100			nc	No
Benzene	mg/kg	0.29	0	Yes	Det. Organic	1.2			ca	No
Bromodichloromethane	mg/kg	0.29	0	Yes	Det. Organic	0.29			ca	No
Bromoform	mg/kg	0.032	0	Yes	Det. Organic	19			ca	No
Bromomethane	mg/kg	0.29	0	Yes	Det. Organic	0.68			nc	No
Carbon Disulfide	mg/kg	0.29	0	Yes	Det. Organic	77			nc	No
Carbon Tetrachloride	mg/kg	0.29	0	Yes	Det. Organic	0.65			ca	No
Chlorobenzene	mg/kg	0.29	0	Yes	Det. Organic	28			nc	No
Chloroethane	mg/kg	0.29	0	Yes	Det. Organic	1400			nc	No
Chloroform	mg/kg	0.29	0	Yes	Det. Organic	0.32			ca	No
Chloromethane	mg/kg	0.29	0	Yes	Det. Organic	11			nc	No
Dibromochloromethane	mg/kg	0.032	0	Yes	Det. Organic	8.3			ca	No
Ethylbenzene	mg/kg	0.31	0	Yes	Det. Organic	5.8			nc	No
Xylene (total)	mg/kg	0.61	0	Yes	Det. Organic	58			nc	No
Methylene Chloride	mg/kg	0.27	0	Yes	Det. Organic	35			nc	No
Styrene	mg/kg	0.29	0	Yes	Det. Organic	600			nc	No
Tetrachloroethene	mg/kg	0.29	0	Yes	Det. Organic	8.1			nc	No
Toluene	mg/kg	0.29	0	Yes	Det. Organic	490			nc	No
Trichloroethene	mg/kg	0.29	0	Yes	Det. Organic	0.41			nc	No
Vinyl Chloride	mg/kg	0.29	0	Yes	Det. Organic	0.059			ca	No
cis-1,3-Dichloropropene	mg/kg	0.013	0	Yes	Det. Organic	1.8			ca	No
trans-1,3-Dichloropropene	mg/kg	0.032	0	Yes	Det. Organic	1.8			ca	No

*value derived from RSL of a surrogate
ca=carcinogenic
HMX=Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
na=Non-carcinogenic
PCB=Polychlorinated biphenyl
RSL=USEPA Regional Screening Levels
RDX=Hexahydro-1,3,5-trinitro-1,3,5-triazine
Res. = Residential

Chemical	Surrogate
acenphthylene	acenapthene
4-bromophenyl phenyl ether	4-bromophenyl ether
di-methyl ohthalate	diethyl phthalate
1,2 dichlorobenzene	1,3 dochorobenzene
2-nitrophenol	4-nitrophenol

APPENDIX B: Applicable or Relevant and Appropriate Requirements

Table B-1. Potential Action-specific ARARs

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
Prohibition of air pollution nuisances (e.g., fugitive dust) OAC Section 3745-15-07	These rules prohibit a release of nuisance air pollution that endanger health, safety, or welfare of the public or cause personal injury or property damage.	Applies to any activity that could result in the release of a nuisance air pollutant. This would include dust from excavation or waste management processes.	Any person undertaking an activity is prohibited from emitting nuisance air pollution.
Storm water requirements at construction sites 40 CFR Part 450	These rules require that storm water controls be employed at construction sites that exceed 1 acre.	Applies to any construction activity that exceeds 1 acre.	Persons undertaking construction activities (including grubbing and land clearing) at an AOC where the construction footprint is over 1 acre must design and implement erosion and runoff controls.
Presence of ACM in soil OAC 3745-20-07(A)(1-3)	These rules require emissions from inactive asbestos disposal sites be controlled.	Applies to any area considered an inactive asbestos disposal site.	No visible emissions from inactive asbestos disposal sites or the area must be covered as appropriate by use of a non-asbestos containing soil cover.
Notification of asbestos excavation or disturbance OAC 3745-20-07(D)	These rules require that the Ohio EPA Director must be notified 45 days prior to disturbance of an inactive asbestos disposal site.	Applies to any action that results in disturbance of asbestos at an inactive asbestos disposal site.	Each owner or operator of an inactive asbestos waste disposal site shall notify the director in writing 45 days prior to excavating, disturbing, or removing asbestos-containing waste material.
Off-site disposal of asbestos containing soil/debris OAC 3745-20-05	These rules require asbestos-containing waste to be managed to control emissions through wetting and packaging until disposal at an approved disposal facility.	Applies to asbestos containing waste or material requiring disposal at an approved off-site location	Waste and material containing asbestos must be managed in a manner to prevent emission and exposure through prescribed packaging, handling, and labeling requirements.
Generation of contaminated waste material (i.e., soil, sediment, 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 waste is considered characteristically hazardous.

Table B-1. Potential Action-specific ARARs

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
Management of contaminated waste material that is or contains a hazardous waste OAC Sections 3745-52-30 through 3745-52-34	These rules require that hazardous waste is properly packaged, labeled, marked, placarded, 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 that includes proper packaging, labeling, marking, and placarding in accordance with the specified regulations. This includes inspecting containers or container areas where hazardous waste is accumulated on site.
Acquisition and use of manifests for hazardous waste shipments to off-site treatment, storage, or disposal facilities OAC Sections 3745-52-20 through 3745-52-23	These rules require that a Uniform Hazardous Waste Manifest be used for any off-site shipment of hazardous waste.	Applies to any shipment of hazardous waste to an off-site facility for treatment, storage, or disposal.	Requires a generator who transports or offers for transportation hazardous waste for off-site treatment, storage, or disposal to prepare a uniform hazardous waste manifest.
Soil contaminated with RCRA hazardous waste OAC Section 3745-270-48 UTS OAC Section 3745-270-49 Soil	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. These rules are considered for ARAR status only upon generation of a RCRA hazardous waste. If any soil is determined to be RCRA hazardous and will be disposed of on site, this rule is potentially applicable to disposal of the soil. These rules may be relevant to the sewer sediment since the regulatory definition of soil includes soil mixtures with liquid (i.e., sediment).	All soil subject to treatment must be treated as follows: 1. For non-metals, treatment must achieve a 90% reduction in total constituent concentration (i.e., the primary constituent for which the waste is characteristically hazardous as well as for any organic or metal UHC), subject to three below. 2. For metals, carbon disulfide, cyclohexanone, and methanol, treatment must achieve a 90% reduction in constituent concentrations as measured in leachate from the treated media (tested according to the TCLP) or a 90% reduction in total constituent concentrations (when a metal removal treatment technology is used), subject to three below. 2. When treating any constituent subject to treatment 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 10 x UTS."

Table B-1. Potential Action-specific ARARs

Media and Citation	Description of Requirement	Potential ARAR Status	Standard
Debris Contaminated with RCRA Hazardous Waste OAC Section 3745-270-45	These rules prescribe conditions and standards for land disposal of debris contaminated with RCRA hazardous waste. Debris subject to this requirement for characteristic RCRA contamination that no longer exhibits the hazardous characteristic after treatment does not need to be disposed of as a hazardous waste. Debris contaminated with listed RCRA contamination remains subject to hazardous waste disposal requirements.	If RCRA hazardous debris is disposed of on site, these rules are potentially applicable to disposal of the debris.	Standards are extraction or destruction methods prescribed in OAC Section 3745-270-45. Treatment residues continue to be subject to RCRA hazardous waste requirements.
Soil/Debris Contaminated with RCRA Hazardous Waste – Variance OAC Section 3745-270-44	The Ohio EPA Director will recognize a variance approved by the USEPA from the alternative treatment standards for hazardous contaminated waste material.	Potentially applicable to RCRA hazardous waste material that is generated and placed back into a unit and that will be land disposed of on site.	Where the treatment standard is expressed as a concentration in a waste and the waste cannot be treated to the specific level, the generator may petition for a variance. A site-specific variance from the soil treatment standards can be used when treating concentrations of hazardous constituents greater higher than those specified in the soil treatment standards minimizes 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.
Solid waste material that is contaminated but not a hazardous waste for disposal. OAC Section 3745-27-05	Establishes standard for disposal of solid waste within the state of Ohio.	Potentially applicable to contaminated solid waste material disposed of offsite under state solid waste disposal requirements.	Establishes allowable methods of solid waste disposal and prohibits management by open burning or dumping.

AOC = Area of concern.
ARAR = Applicable or Relevant and Appropriate Requirements
CFR = Code of Federal Regulations.
LDR = Land disposal restrictions. OAC = Ohio Administrative Code.
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.

APPENDIX C: Estimated Cost Details

Engineering Evaluation/Cost Analysis (EE/CA) for CC RVAAP-78
Quarry Pond Surface Dump – Cost Components.
Government and Contractor Total Costs

Item	Units	Value	Notes
Capital Costs			
Contract Award			
Government Cost	each	$15,000	
Action Memorandum			
Government Cost	each	$17,040	
PMP/QCP/Work Plan/HASP			
Contractor Cost	each	$36,100	
Oversight and Project Management	each	$4,000	
Debris/Soil Removal			
Contractor Cost (includes 3 subtasks below)	4,440 cu.yds. TOTAL	$386,060	Includes confirmation sampling, waste characterization, excavation, trucking, disposal, backfill, and site restoration
Confirmation Sampling	2 samples		$782
Waste characterization sampling and analysis	6 samples		$2,226
Mobilization/Demobilization, Excavation, Loading, Transportation, Offsite disposal, Standby, and Site Restoration	4,440 cu.yds		$383,050
Oversight and Project Management	each	$25,000	
Completion Report			
Contractor Cost	each	$32,000	
Oversight and Project Management	each	$3,000	
	TOTAL	**$518,200**	

*Overall Total Includes Government Contract Award and Oversight

EE/CA for CC RVAAP-78 Quarry Pond Surface Dump,
Former Ravenna Army Ammunition Plant (RVAAP)
Summary of Contractor Costs for Alternatives
Contractor Only Total Costs

CC RVAAP-78 Alternatives		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 Debris Piles A, B and C; incidental soil under A, B, and C; Test Pit 5; and Sample C78SB-021M-0001-SO	<1 yr	$454,458	$0	$454,458

Notes:

1. The base year of comparison and cost data will be CY2019.

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.

EE/CA for CC RVAAP-78 Quarry Pond Surface Dump,
Former Ravenna Army Ammunition Plant (RVAAP)
Summary of Removal Areas and Volumes

Locations Requiring Remediation	Media	Treatment Interval	Surface Area	In Situ		In situ with Constructability1		Ex situ1,2	
		(ft bgs)	(ft2)	Volume (ft3)	Volume (yd3)	Volume (ft3)	Volume (yd3)	Volume (ft3)	Volume (yd3)
Debris Pile A	Debris	Above grade	18,275	27,413	1,015.3	27,413[3]	1,015.3[3]	27,413[4]	1,015[4]
Debris Pile A	Surface Soil	0 - 0.6	18,275	10,965	406	13,706	508	16,447	610
Test Pit 5	Subsurface Soil	1 - 2	100	200	7.4	250	9.3	300	11.1
Debris Pile B	Debris	Above grade	7,104	10,656	395	10,656[3]	395[3]	10,656[4]	395[4]
Debris Pile B	Surface Soil	0 – 0.6	7,104	4,262	158	5,328	197	6,394	240
Debris Pile C	Debris	Above grade	5,400	8,100	300	8,100	300	8,100	300[4]
Debris Pile C	Surface Soil	0 – 0.6	5,400	3,240	120	4,050	150	4,860	180
C78SB-021M-0001-SO	Subsurface Soil	1 - 5	100	400	14.8	500	18.5	600	22.2
TOTALS					**2,416**				**2,773**

[1] Typically a constructability factor of 25% is used to account for over excavation, sloping of sidewalls, and addresses limitations of removal equipment.

[2] Includes 20% swell factor to account for expansion during excavation.

[3] Constructability factor does not apply to above-grade debris.

[4] Swell factor does not apply to above-grade debris.

EE/CA for CC RVAAP-78 Quarry Pond Surface Dump
Alternative 2 – Removal and Off-site Disposal
Key Parameters and Assumptions

Key Parameters and Assumptions:

Item	Unit	Value	Notes
Capital Cost			
Waste Characterization Sampling			
Samples	ea	6	Waste characterization includes 5 composite samples for the following: TCLP metals, TCLP herbicides, TCLP pesticides, TCLP VOCs, TCLP SVOCs, pH, Asbestos, PCBs, Flashpoint, Total Cyanide, Total Sulfide. Assumes 1 sampling technician at 16 hours to collect and ship samples.
Sampling Labor	hrs	16	
Sampling Labor	$/hr	$85	
Truck Rental / Gas	$/event	$180	1 truck x $80/day. Add $20 for gas.
Sample Materials	ea	6	
Sample Materials	$/ea	$35	Analyze samples for Asbestos (6 @ 136) and TCLP Metals (6 @ $180), RCRA Characteristics (6 @ $160).
Analytical Cost	$/event	$476	
Excavation			
Excavation Volume (In situ)	cy	2,416	Includes soil volume to be transported and disposed.
Excavation Volume (Ex situ)	cy	2,773	Ex situ volumes include 20% swell factor.
Volume to Weight Conversion	tons/cy	1.60	
Excavation Mass	tons	4,440	Includes soil mass to be transported and disposed.
Excavation Surface Area	sf	31,000	

EE/CA for CC RVAAP-78 Quarry Pond Surface Dump
Alternative 2 – Removal and Off-site Disposal
Key Parameters and Assumptions

Key Parameters and Assumptions:

Mobilization/Demobilization	ls	1,500	Includes mob/de-mob of excavation equipment.
Excavate Soils	day $/day	13 $5,000	Includes 2 cy excavator, 1-22 cy off highway truck, 1 O.E., 3 T.D., 1 L.S. spotter, 2 L.S. to prep trucks/and misc. Reduced productivity by 33% for loading trucks, precise excavations, and security/S&H requirements. Assume trucks are direct loaded. Average 200 cy/day and 1 day.
Standby Time	day $/day	3 900	Assume 3 days equipment standby while analysis is being performed. Assume no additional hot spot excavation.
Nonhazardous Waste and ACM	tons	2773	Based on shipping waste to American Landfill, Waynesburg,
Transport and Offsite Disposal	$/ton	$65	Ohio (approximately 80 mi RT). Assumes a minimum of 22 tons /load. Rate includes $16.60/ton tax from Portage County.
Confirmation Sampling			
Samples	ea	2	Includes 2 ISM or composite samples for confirmation of (Asbestos fibers)
Sampling Labor	hrs	4	Assumes 1 sampling technician at 4 hours to collect and ship samples.
Sampling Labor	$/hr	$85	
Truck Rental / Gas	$/event	$100	1 truck x $80/day. Add $20 for gas.
Sample Materials	ea	$35	
Sample Materials	$/ea	$272	Analyze samples for Asbestos (2@136).
Analytical Cost	$/event		
Restoration			
Native Soil Backfill	cy	80	Includes native soil backfill. Assume productivity has been reduced by 25% to account for security and safety requirements. Includes 12-in lift of native fill assuming 20% swell. Unclassified Fill, 6" Lifts, offsite Source @ 20 miles, includes delivery, spreading, and compaction.
Native Soil Backfill	$/cy	$40	
Seeding, Vegetative Cover	MSF	55	Seeding with mulch and fertilizer. Assume 1.25 acre is revegetated for restored areas and equipment damage.
Seeding, Vegetative Cover	$/MSF	$110	
Plans and Reports			
PMP/QCP	hrs	60	Includes Construction QC data and preparing report.
Work Plan & HASP/APP	hrs	320	
Corrective Action Completion Report	hrs	340	
Technical Labor	$/hr	95	

EE/CA for CC RVAAP-78 Quarry Pond Surface Dump
Alternative 2 – Removal and Off-site Disposal
Cost Estimate **Contractor Only Total Costs*

CAPITAL COST

Activity (unit)	Quantity	Unit Cost	Total
Waste Characterization Sampling			
Sampling Labor (hrs) Truck	16	$85.00	$1,360
Rental / Gas (event)	1	$180.00	$180
Sample Materials (ea)	6	$35.00	$210
Sample Analysis (event)	1	$476.00	$476
Soil Excavation			
Mobilization/Demobilization (ls)	1	$1,500.00	$1,500
Excavate Soil (days)	13	$5000.00	$65,000
Standby Time (day)	3	$900.00	$2,700
NonhazardousTransport and Offsite Disposal (ton)	4,440	$65.00	$288,600
Confirmation Sampling			
Sampling Labor (hrs) Truck	4	$85.00	$340
Rental / Gas (event)	1	$100.00	$100
Sample Materials (ea)	2	$35.00	$70
Sample Analysis (event)	1	$272.00	$272
Restoration			
Native Soil Backfill (cy)	480	$40.00	$19,200
Seeding, Vegetative Cover (MSF)	55	$110.00	$6,050
Documents			
PMP/QCP	1	$5,700	$5,700
Work Plan & HASP/APP	1	$30,400	$30,400
Corrective Action Completion Report	1	$32,000	$32,000
Total for Alternate 2			**$454,458**