Final
Proposed Plan for
RVAAP-063-R-01 Group 8 Munitions Response Site
Version 2.0

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912DR-15-D-0016
Delivery Order No. 0001

Prepared for:

US Army Corps
of Engineers®

U.S. Army Corps of Engineers
Baltimore District
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Baltimore, Maryland 21201

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January 27, 2020

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14. ABSTRACT
The U.S. Department of the Army (U.S. Army) is presenting this Proposed Plan to involve the public in the remedy selection process for the former Ravenna Army Ammunition Plant, RVAAP 063-R-01 Group 8 MRS, located within located in Portage and Trumbull Counties, Ohio. This Proposed Plan presents the U.S. Army's preliminary recommendations for the preferred alternative of munitions constituents contaminated soil removal of the contaminated soil at the MRS. This alternative is presented for public consideration as the alternative that meets the threshold criteria and provides protection for receptors.

15. SUBJECT TERMS

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Ohio Environmental Protection Agency

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

February 21, 2020

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859246

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

Subject: Final Proposed Plan for RVAAP-063-R-01 Group 8 Munitions Response Site Version 2.0

Dear Mr. Connolly:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the "Final Proposed Plan for RVAAP-063-R-01 Group 8 Munitions Response Site Version 2.0," dated January 27, 2020. It was prepared by HydroGeoLogic, Inc.

Ohio EPA has no comments on the Final Proposed Plan (PP). Based on the information contained in the Final PP document, other investigation documents and reports, and Ohio EPA's oversight participation during the investigation, Ohio EPA concurs with the Final PP document for the RVAAP-063-R-01 Group 8 Munitions Response Site recommending the removal of munitions constituent contaminated soil.

If you have any questions concerning this letter, please contact Nicholas Roope at (330) 963-1235.

Sincerely,

Melisa Witherspoon
Chief
Division of Environmental Response and Revitalization

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CONTRACTOR'S STATEMENT OF INDEPENDENT TECHNICAL REVIEW

HydroGeoLogic, Inc., has completed the *Final Proposed Plan for RVAAP-063-R-01 Group 8 Munitions Response Site, Version 2.0,* at the former Ravenna Army Ammunition Plant in Portage and Trumbull Counties, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy, principles, and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures and materials to be used; the appropriateness of data used, and level of data obtained; and reasonableness of the results, including whether the product meets customer's needs consistent with law and existing United States Army Corps of Engineers policy.

Prepared/Approved by: Janardan Patel Date: January 27, 2020

Janardan Patel
Program Manager
HydroGeoLogic, Inc.

Reviewed/Approved by: Kimberly Vaughn Date: January 27, 2020

Kimberly Vaughn
Project Manager
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RVAAP-063-R-01 Group 8
Munitions Response Site, Version 2.0

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ARNG – Army National Guard
COR – Contracting Officer's Representative
IED – Installation and Environmental Division
OHARNG – Ohio Army National Guard
RVAAP – Former Ravenna Army Ammunition Plant
USACE – United States Army Corps of Engineers

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
ARAR	applicable or relevant and appropriate requirement
Army	U.S. Department of the Army
ARNG	Army National Guard
ASR	*Archives Search Report for the Ravenna Army Ammunition Plant*
bgs	below ground surface
CB&I	CB&I Federal Services LLC
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	Code of Federal Regulations
CJAG	Camp James A. Garfield Joint Military Training Center
COC	contaminants of concern
COPEC	chemicals of potential ecological concern
CTT	Closed, Transferring, and Transferred
DA	U.S. Department of the Army
DERP	Defense Environmental Restoration Program
DFFO	*Director's Final Findings and Orders for RVAAP*
DGM	digital geophysical mapping
DoD	U.S. Department of Defense
e^2M	engineering-environmental Management, Inc.
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
FWCUG	Facility-Wide Human Health Cleanup Goals
HGL	HydroGeoLogic, Inc.
HE	high explosive
HRR	*Final Military Munitions Response Program Historical Records Review*
HHRA	Human Health Risk Assessment
ISM	Incremental Sampling Methodology
LUC	land-use control
MC	munitions constituents
MD	munitions debris
MDAS	material documented as safe
MEC	munitions and explosives of concern
mg/kg	milligrams per kilogram
mm	millimeter
MMRP	Military Munitions Response Program
MPPEH	munitions potentially presenting an explosive hazard
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
NCP	*National Oil and Hazardous Substances Pollution Contingency Plan*
NPDES	National Pollutant Discharge Elimination System
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PCB	polychlorinated biphenyl
PRG	Preliminary Remediation Goals
RAO	remedial action objective
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Levels

RVAAP	Ravenna Army Ammunition Plant
SI	Site Inspection
TBC	To-Be Considered
TNT	2,4,6-Trinitrotoluene
TSCA	Toxic Substances Control Act
USACE	U.S. Army Corps of Engineers
USP&FO	U.S. Property and Fiscal Officer for Ohio
UU/UE	unlimited use/unrestricted exposure
UXO	unexploded ordnance

1.0 INTRODUCTION

The Army National Guard (ARNG) is presenting this **Proposed Plan*** to involve the public in the **alternative selection process** for the RVAAP-063-R-01 Group 8 **Munitions Response Site** (MRS) at the former Ravenna Army Ammunition Plant (RVAAP). The former RVAAP is in Portage and Trumbull Counties, Ohio, as shown on **Figure 1**. The former RVAAP is now known as Camp James A. Garfield Joint Military Training Center (CJAG). CJAG was previously known as Camp Ravenna Joint Military Training Center and is referred to as "Camp Ravenna" in some historical reports. The location of the MRS relative to the former RVAAP is shown on **Figure 2**.

The Army National Guard, in consultation with the Ohio Environmental Protection Agency (Ohio EPA), is the lead agency for investigating, reporting, making **remedial decisions**, and taking **remedial actions** at the former RVAAP. This Proposed Plan presents the ARNG's preliminary recommendations concerning how best to address **U.S. Department of Defense** (DoD) **military munitions** that are suspected to be present on the ground surface and in the subsurface at the Group 8 MRS. The various alternatives evaluated to address the **munitions constituent** (MC) contamination and the ARNG's rationale for recommending the stated **Preferred Alternative** are included in this Proposed Plan.

The ARNG is issuing this Proposed Plan to address its public participation responsibilities under Section 117(a) of the ***Comprehensive Environmental Response, Compensation, and Liability Act of 1980*** (CERCLA), as amended by the ***Superfund Amendments and Reauthorization Act of 1986*** and Section 300.430(f)(2) of the ***National Oil and Hazardous Substances Pollution Contingency Plan*** or **National Contingency Plan** (NCP) (40 Code of Federal Regulations [CFR] 300). Implementation of the selected alternative at the MRS will comply with the requirements of the *Director's Final Findings and Orders (DFFO) for RVAAP* (Ohio EPA, 2004).

This Proposed Plan summarizes information that can be found in the *Final Remedial Investigation Report for RVAAP-063-R-01 Group 8 MRS* (Final **Remedial Investigation** [RI] Report; CB&I Federal Services LLC [CB&I], 2015) and the *Final Feasibility Study for RVAAP-063-R-01 Group 8 Munitions Response Site, Version 1.0* (**Feasibility Study** [FS]) (HydroGeoLogic, Inc. [HGL], 2019). The ARNG encourages the public to review these documents to better understand the history of the MRS, activities that have been conducted there, and determinations that have been made for the MRS under the **Military Munitions Response Program** (MMRP).

This Proposed Plan includes a change to the approach for Alternative 3 that was evaluated in the Feasibility Study. The alternative has been revised to include removal of soils to a depth of 0.5 ft below ground surface (bgs) in additional areas GR8SS-003M and GR8SS-001M. Adding the excavation of soils from these additional areas is a more protective approach for the MRS. Additional details for the added excavation areas and the revised costs are included in Section 7.3 of this Proposed Plan.

The ARNG, in consultation with the Ohio EPA, will review and consider all comments on this Proposed Plan received during the 30-day public comment period. The public is encouraged to review and comment on all recommendations presented in this Proposed Plan.

2.0 SITE BACKGROUND

This section summarizes the history of the Former RVAAP and the Group 8 MRS.

* Terminology used in this Proposed Plan is defined in the Glossary found at the back of this document.

Public Comment Period:

March 4, 2020 to April 4, 2020

Public Meeting:

The ARNG will hold an open house/public meeting to explain the Proposed Plan. Oral and written comments on the document will be accepted at the meeting. The open house/public meeting is scheduled for 6:00 p.m. on March 11, 2020, at the Shearer Community Center (Paris Township Hall) at 9355 Newton Falls Road, Ravenna, Ohio 44266.

Information Repositories:

Information used in selecting the Preferred Alternative is available online at **www.rvaap.org** and at the following locations:

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

Hours of Operation:
9 a.m.–9 p.m., Monday–Thursday
9 a.m.–6 p.m., Friday
9 a.m.–5 p.m., Saturday
1 p.m.–5 p.m., Sunday

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

Hours of Operation:
9 a.m.–8 p.m., Monday–Thursday
9 a.m.–5 p.m., Friday and Saturday

The **Administrative Record** File, which includes the information used to select the Preferred Alternative, is available for review at the following location:

Camp James A. Garfield Joint Military Training Center
Environmental Office
1438 State Route 534 SW
Newton Falls, Ohio 44444
(614) 336-6136

Note: Access to CJAG is restricted but an appointment to review the Administrative Record File can be scheduled.

2.1 Facility History

The former RVAAP (Federal Facility ID No. OH213820736), now known as CJAG, located in northeastern Ohio within Portage and Trumbull Counties, is approximately 3 miles east-northeast of the city of Ravenna and 1 mile north-northwest of the city of Newton Falls (Figures 1 and 2). The facility is approximately 11 miles long and 3.5 miles wide. The facility is bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX system railroad to the south; Garret, McCormick, and Berry Roads to the west; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Newton Falls, Charlestown, and Wayland. The facility is federal property, which has had multiple accountability transfers amongst multiple Army agencies, making the property ownership and transfer history complex. The most recent administrative accountability transfer occurred in September 2013 when the remaining acreage (not previously transferred) was transferred to the U.S. Property and Fiscal Officer for Ohio (USP&FO) and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp James A. Garfield).

Administrative control of the 21,683-acre facility has been transferred to the United States Property and Fiscal Officer for Ohio USP&FO and subsequently licensed to the (OHARNG) for use as a military training site known as CJAG. The restoration program for the facility involves the remediation of areas affected by past activities of the former RVAAP.

The former RVAAP was constructed in 1940 and 1941 for assembly, loading, and **depot storage** of ammunition. While serving as an ammunition plant, the former RVAAP was a U.S. Government-owned and contractor-operated industrial facility. The ammunition plant consisted of 12 munitions assembly facilities, referred to as "load lines." Load Lines 1 through 4 were used to melt and load **2,4,6-Trinitrotoluene** (TNT) and Composition B (a mixture of TNT and **Research Department Explosive)** into **large-caliber shells** and bombs.

Operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls were cleaned with water and steam. After cleaning, the "pink water" wastewater, which contained TNT and Composition B, was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport to **earthen settling ponds**. Load Lines 5 through 11 manufactured **fuzes**, **primers**, and **boosters**. From 1946 to 1949, Load Line 12 produced **ammonium nitrate** for explosives and fertilizers and was later used as a **weapons demilitarization facility**.

In 1950, the facility was placed in standby status, and operations were limited to **renovation, demilitarization**, normal maintenance of equipment, and storage of munitions. **Production** activities resumed from July 1954 to October 1957 and again from May 1968 to August 1972. Demilitarization and production activities were conducted at Load Lines 1, 2, 3, and 12. Demilitarization activities included disassembling munitions and melting out and recovering explosives using hot water and steam processes. These activities continued through 1992.

Other areas at the former RVAAP were used for burning, demolishing, and testing munitions. These burning and demolition grounds consisted of large, open areas and abandoned quarries. Other **Areas of Concern** (AOCs) at the former RVAAP include a landfill, an aircraft fuel tank testing area, and various industrial support and maintenance facilities.

2.2 MRS Background and History

The Group 8 MRS covers 2.65 acres within the former RVAAP. The MRS is located between Buildings 846 and 849 and lies southeast of Load Line #12 and just north of the southern facility boundary. The Group 8 MRS (formerly known as Area Between Building 846 and 849) was used to burn construction debris and rubbish for an unknown period of time. Before designation as an MRS, this area between Building 846 and 849 was used as a staging area for military vehicles. There are no records available documenting the disposal of munitions at the MRS; however, previous discoveries of **munitions and explosives of concern** (MEC) and **munitions debris** (MD) indicated munitions may have been disposed of at the Group 8 MRS.

Investigative reports summarized MEC discovered on the ground surface by OHARNG personnel in the past and during the 2007 **Site Inspection** (SI) field activities (engineering-environmental Management, Inc. [e^2M], 2008) and recommended the MRS proceed to the RI phase. The RI investigation; however, did not confirm the previously reported presence of MEC at the MRS and identified MD only. As described in Section 2.3, below, the SI recommended the MRS proceed to the RI phase due to MEC identified historically at the MRS. However, the findings in the RI phase are inconsistent with the historical findings as documented in the SI. The items documented in the SI are inconsistent with the types of MDAS recovered during the RI intrusive investigation. No additional MEC items have been recovered since the identification of the two confirmed MEC items in 1996 and the T-bar fuzes described in the 2007 SI. Only MDAS (which does not pose an explosive hazard) was recovered during the RI. The post-RI conclusion for the MRS is an incomplete exposure pathway for explosive hazards. Therefore, no further action is recommended for MEC and as a result, the FS and this Proposed Plan address only the risks posed due to MC-related contamination present at the MRS.

The MRS is currently unimproved grassy land characterized by gravel/dirt roads that pass though the center, along the northern border, and in the eastern corner of the MRS. A drainage ditch runs along the southern border of the MRS. There are no permanent surface water features within the MRS, and it is not located within a floodplain.

2.3 MRS Historical Investigations

The following investigations and reports have been completed for the Group 8 MRS under the MMRP:

- *Final* ***Archives Search Report*** *for Ravenna Army Ammunition Plant* (ASR); (U.S. Army Corps of Engineers [USACE], 2004)
- *Final Military Munitions Response Program* ***Historical Records Review*** (HRR); (e^2M, 2007)
- *Final* ***Site Inspection*** *Report, Ravenna Army Ammunition Plant, Ohio* (Final SI Report); (e^2M, 2008)
- Final RI Report (CB&I, 2015)
- Final Feasibility Study (HGL, 2019)

A summary of the site-specific MMRP investigations conducted for the Group 8 MRS are presented in the following sections.

2.3.1 Archives Search Report

In 2004, the USACE conducted an archives search under the Defense Environmental Restoration Program (DERP) as a historical records search, interview process and site visit for the presence of MEC at the facility. The USACE prepared the *Final Archives Search Report* (ASR) and therein identified 12 AOCs and 4 additional locations with the potential for containing MEC. The Group 8 MRS was not identified as one of the original sites that contained MEC as part of the 2004 ASR.

2.3.2 Historical Records Review

The HRR described the Group 8 MRS as the 2.65-acre "Area Between Buildings 846 and 849" and documented the requested name change to the Group 8 MRS. At the time of the HRR records research, the OHARNG was using the area as a vehicle staging area. Historical activities at the MRS included burning construction debris and rubbish. The time frame for these activities is not known.

In 1996, MEC was found at the MRS, in the form of a single antipersonnel **fragmentation bomb** containing high explosives (HE). MD was found in the form of a demilitarized (i.e. cut in half) 175mm projectile. The antipersonnel fragmentation bomb with HE was removed and detonated at Open Demolition Area #2. The 175mm projectile (determined to be MD) was also removed from the MRS and was taken to Building 1501.

2.3.3 Site Inspection

In 2007, the ARNG completed an MMRP SI at CJAG that included the Group 8 MRS. **Magnetometer** and metal detector assisted **unexploded ordnance** (UXO) surveys were conducted during the SI field activities over 100 percent of the MRS. Two unidentifiable T-bar fuzes were found partially buried in the southwest portion of the MRS and were determined at that time to be munitions potentially presenting an explosive hazard (MPPEH). Because the scope of the SI did not include any intrusive work or handling/disposal of MPPEH, the fuzes were left in place during the inspection. However, the items were not found during the subsequent RI, and their final disposition is unknown. Because they were not inspected by UXO qualified personnel, it is conservatively assumed the fuzes contained explosive material and meet the definition of MEC. MD items identified during the SI field activities included metal fragments from casings and projectiles, burster tubes, and fragments of fuzes. Most of the MD items found had most likely been pressed into the surface soils by the heavy equipment and vehicles that had been stored at the MRS before the SI. **Figure 3** shows the locations of the SI survey lines and the T-bar fuzes found during the SI field activities.

In addition to the MPPEH and MD, a significant amount of non-munitions related debris consisting of metal trash, fence materials, and wood scraps were found in the general areas where the MPPEH and MD were found. No MPPEH or other debris was identified on the ground surface at the northeast portion of the MRS during the SI.

Five surface soil samples were collected at the MRS during the SI field activities using **Incremental Sampling Methodology** (ISM). The samples were analyzed for explosives, propellants, and target analyte list metals.

Lead and thallium were detected in all five samples above the facility screening criteria for **background values** and one-tenth of the U.S. Environmental Protection (EPA) residential soil **Preliminary Remediation Goals** (PRGs).

Thallium was dismissed as an MC as it was non-munitions related. Antimony, arsenic, aluminum, cadmium, copper, iron, lead, and manganese were detected in at least one sample at concentrations greater than the facility screening criteria and were considered MC.

Explosives and propellants were detected at estimated concentrations (i.e., below the method detection limit); however, no concentrations exceeded one-tenth of the PRGs.

2.4 Remedial Investigation

Between October 31, 2011, and November 14, 2011, CB&I performed a digital geophysical mapping (DGM) investigation to identify potential subsurface areas of MEC at the Group 8 MRS. Full coverage DGM data were collected on 2.563 acres at the Group 8 MRS. Data were acquired in all accessible areas of the MRS on line spacing of approximately 2.5 feet. The area surveyed equates to nearly 97 percent coverage over the 2.65-acre MRS. The remaining 0.087 acres could not be investigated because of trees, utility poles, and barbed wire fence.

A total of 264 anomalies were **reacquired** during the intrusive investigation in 14 trenches within the three areas of high **anomaly** density. From these intrusive investigations, 359 individual items of MPPEH that weighed approximately 1,418 pounds were recovered from a maximum depth of 4 feet below ground surface (bgs). The **UXO-qualified personnel** documented that all these items were safe and classified them as material documented as safe (MDAS). The locations of the items and other debris are shown in **Figure 4**. The MDAS was debris that came from the following munitions: M397 series 40-millimeter (mm) HE grenades, M49 series 60mm mortars, 20mm projectiles, M72 series 75mm projectiles, M557 series fuzes, 175mm projectiles, HE anti-tank warheads, and assorted fuzes (CB&I, 2015). The MDAS items were solid and/or inert and did not pose an explosive safety hazard.

The MDAS identified during the RI was not consistent with the historically identified MDAS from the HRR and SI. The explosive hazards were re-evaluated during preparation of the Feasibility Study (see Section 2.5, below).

Sampling for MC-related contamination was conducted during the RI field work. Four samples were collected using ISM from sampling units of the same size for the entire MRS at depths between 0 and 0.5 feet bgs. The locations of the surface soil samples are shown on **Figure 5**. Additional samples were proposed in areas with concentrated MD and three additional ISM soil samples were collected from the bottom of three trenches, at depths of 4 to 4.5 feet bgs where the buried MD was encountered during the intrusive investigation activities. The trench samples were evaluated/considered as subsurface samples in the human health and ecological risk assessments.

Concentrations of cadmium, iron, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, Aroclor-1254, and Aroclor-1260 were detected in the surface soil samples and were carried forward for evaluation in the **Human Health Risk Assessment (HHRA)**. The following ten chemicals of potential ecological concern (COPECs) were recommended for evaluation under the Level III Baseline **Ecological Risk Assessment** evaluation after the Level II Screening in the RI: antimony, cadmium, copper, lead, mercury, zinc, bis(2-ethylhexly)phthalate, di-n-butyl phthalate, Aroclor-1254, and Aroclor-1260.The RI Report concluded that no contaminants in subsurface soil were present at concentrations that pose a risk to either human or ecological receptors.

Based on the historical discoveries of MEC, the MRS was assigned a **Munitions Response Site Prioritization Protocol** (MRSPP) priority of 4 during the RI. A Priority 1 MRS contains the highest potential hazard, while a Priority 8 MRS contains the lowest potential hazard.

2.5 Feasibility Study

An FS was prepared for the Group 8 MRS by the ARNG in 2019. The FS evaluated possible alternatives in detail and provided a comparative analysis of those alternatives, based on criteria outlined in the NCP. The FS identified three

possible alternatives to address the MC contamination at the Group 8 MRS. The alternatives consisted of 1) No Action, 2) **Land Use Controls** (LUCs), and 3) MC-Contaminated Soil Removal (to achieve use of land for **unlimited use/unrestricted exposure** (UU/UE)). The FS also developed the **Remedial Action Objectives** (RAOs) based on the potential for MC-related contamination at the Group 8 MRS (HGL, 2019).

The FS included a Risk Management Evaluation based on the previously collected data. The 2015 RI used the Facility-Wide Human Health Cleanup Goals (FWCUGs) (SAIC, 2010) in the risk assessment prepared at that time. However, the EPA Regional Screening Levels (RSLs) can be used to reflect current toxicity information and exposure assumptions. The Risk Management Evaluation performed in the FS was completed to re-assess the contaminants of concern (COCs) using the RSLs, which are protective of the Resident Receptor. The COCs identified for the Resident Receptor in the RI report were re-evaluated with respect to the current Residential Soil RSLs. The FS concluded that **cadmium** in surface soil at the location of sample GR8SS-004M-0001-SO poses a risk to the theoretical future Resident Receptor (Adult and Child). Soil contaminants do not pose a risk to the **Industrial Receptor**, who is the representative receptor under current site use. Additional detail summarizing the MC contamination present at the MRS is summarized in Section 3.3.2 and shown on **Figure 6**.

The Risk Management Evaluation also re-assessed the ecological risk that was presented in the RI. Because the habitat quality is poor, few birds and mammals would forage for food on the MRS. The RI overestimated the food and soil ingestion rates and potential exposure to animals. The FS concluded that it is unlikely that site contaminants pose a risk to wildlife communities.

As described in Sections 2.3.2, 2.3.3., and 2.4 above, the MEC items found in 1996 and 2007 were not consistent with the types of MDAS identified during the RI. No MEC has otherwise been reported since 2007 at the Group 8 MRS and the RI concluded with a 99 percent confidence level that no MEC are present. Only MDAS (which does not pose an explosive hazard) was recovered during the RI. The MRS has an incomplete exposure pathway for explosive hazards and no further action was recommended for MEC. Therefore, the MEC **exposure pathway** was re-evaluated during the FS phase and no explosive hazard is anticipated at the Group 8 MRS. The MEC exposure pathway is considered incomplete.

The MRSPP priority was also re-evaluated during the FS phase. The project team determined that the MEC items identified historically (during the site inspection) are not representative of the **explosive hazards** present at the MRS, as demonstrated by the findings during the RI fieldwork and the conclusions of the RI. As a result, the MRSPP was revised and the Group 8 MRS was assigned a score of 5 during the FS phase.

3.0 SITE CHARACTERISTICS

The characteristics for the MRS discussed in this section are based on the munitions response actions that have been completed by the ARNG for the MRS.

3.1 Physical Characteristics and Land Use

The MRS is 2.65 acres of vacant, grassy land located between Buildings 846 and 849 at the Former RVAAP. The MRS is located on federal property with administrative accountability assigned to the USP&FO for Ohio. The MRS is managed by the Army National Guard (ARNG) and the OHARNG.

The current land use activities at the MRS are **maintenance**, **natural resource management, environmental sampling,** and providing access to the road network to access adjacent buildings. Future land use at the MRS will be continuation of current use and potential **military training**.

Most native soil at the facility has been reworked or removed during construction. The Group 8 MRS is located over the Sharon Member conglomerate unit. The bedrock elevation is approximately 975 above mean sea

level. Major soil types found in the MRS are silt or clay loams, ranging in permeability from 6.0 $\times 10^{-7}$ to 1.4 $\times 10^{-3}$ centimeters per second (U.S. Department of Agriculture et al., 1978). The soil type at the MRS is the Mahoning-Urban land complex. The **frost line** for northeast Ohio extends to approximately 30 inches bgs.

Topography across the MRS is relatively flat and open. There are no natural streams or ponds located within the MRS and the MRS is not within a flood plain. No bogs, kettle lakes, or kames are present at the MRS. Surface water drainage at the Group 8 MRS generally flows into drainage ditches along the roadside where it eventually infiltrates the soil. No **wetlands** were identified within the MRS boundary (HGL, 2019).

Biological inventories have not occurred within the MRS and no confirmed sightings of **state-listed species of concern** have been reported; however, there is the potential for state-listed or **rare species** to be within the MRS boundary. The Northern long-eared bat is a **federally threatened species** that was identified at the CJAG and now must be considered during project and construction activities.

3.2 Applicable or Relevant and Appropriate Requirements

Applicable or relevant and appropriate requirements (ARARs) are **promulgated, statutory,** and **regulatory** requirements that are substantive in nature, and must be met or waived during implementation of a remedial action, as required by the NCP. ARARs are identified based on MRS-specific factors such as contaminants present, location, physical features, and **remedial alternatives** being considered, and are subdivided into three categories (chemical-specific, action-specific, and location-specific). Remedial alternatives must either attain or formally waive each ARAR identified for the Group 8 MRS. As such, ARARs were considered in the development of the remedial alternatives. In addition to the promulgated statutory and regulatory requirements that comprise ARARs, non-promulgated advisories, guidance, or policies known as "**To Be Considered"** (TBCs) criteria were also evaluated for the MRS. The potential ARARs considered for remedial action at the MRS are summarized below:

- Erosion and Sediment Control Regulations (Ohio Administrative Code 1501.15-1-04) – State rule requiring that sediment and **erosion** controls be employed in areas of denudation and land disturbance. Describes management and conservation practices that will control wind or water erosion of the soil and minimize the degradation of water resources by soil and sediment; and
- Toxic Substances Control Act (TSCA) (40 CFR 761.61) – Describes the cleanup and disposal of remediation of waste specific to PCBs.

The potential TBCs considered for remedial action at the MRS are summarized below:

- EPA RSLs – Provides industrial and residential risk-based screening levels for soil; and
- FWCUGs for Former RVAAP – Provides residential risk-based screening levels for soil.

A detailed discussion of the potential ARARs and TBCs evaluated for the Group 8 MRS is presented in the FS (HGL, 2019).

3.3 Nature and Extent of Contamination

A summary of the nature and extent of contamination at the Group 8 MRS is presented in this section.

3.3.1 Munitions and Explosives of Concern

The previous SI report summarized MEC discovered in the past (e^2M, 2008) and recommended the MRS proceed to the RI phase. The RI did not confirm the presence of MEC at the MRS and identified MD only. The MD recovered during the RI was verified as MDAS. Items reported previously were not representative of munitions confirmed to be present at the MRS during the RI.

Because MEC is not present, interactions involving explosive hazards are not expected to

occur at the MRS and no explosive hazards exist at the Group 8 MRS. Therefore, the MEC exposure pathway is considered incomplete for all receptors.

3.3.2 MC-Related Contamination

Soil data at the MRS was collected for MC analysis during the RI. The data set consists of four surface soil ISM samples (collected from 0 to 0.5 feet bgs) and three subsurface soil ISM samples (collected from 4 to 4.5 feet bgs).

The ISM surface soil sampling units were created as four areas of equally probable anticipated use by potential receptors to evaluate the nature and extent of contamination associated with previous activities at the MRS. The surface soil sampling units were of four equal sizes to provide a representative comparison of various portions of the MRS.

The RI ecological risk assessment concluded that detected contaminants in surface soil had the potential to locally impact soil invertebrates, birds, and mammalian receptors even though the habitat quality of the site is low.

The RI HHRA concluded that detected contaminants in surface soil presented potential risks to the Resident Receptor (Adult and Child) that is evaluated for **Unrestricted (Residential) Land Use** (UU/UE) and risks to the National Guard Trainee, the Representative Receptor for the future land use of military training.

As summarized in Section 2.4, the FS included a risk management evaluation using the previously collected RI analytical results. The FS risk management evaluation concluded that cadmium in surface soil at GR8SS-004M-0001-SO poses a risk to the theoretical future Resident Receptor (Adult and Child). Following the FS, the Army National Guard and Ohio EPA agreed to include additional excavation to remove lead in surface soil at GR8SS-001M and GR8SS-003M to ensure maximum protectiveness is achieved to meet Unrestricted (Residential) Land Use). The concentrations of soil contaminants (COCs) do not pose risks to the Industrial Receptor, who is the Representative Receptor under current site use. Additionally, no ecological risks were identified. Therefore, this Proposed Plan recommends remediation of the lead and cadmium contamination in GR8SS-004M and the lead contamination in GR8SS-001M and GR8SS-003M (**Figure 6**) to eliminate potential risks to human health under Unrestricted (Residential) Land Use. Remediation of the lead and cadmium contamination in the Group 8 MRS will eliminate potential risks to human health under Unrestricted (Residential) Land Use.

4.0 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The overall remedial strategy for the Group 8 MRS reflects the interests of both the ARNG and the Ohio EPA in mitigating risk and protecting potential **human receptors** where residual hazards remain. In keeping with this strategy, a Preferred Alternative was developed for the MRS that addresses the remediation of MC-related contaminated soils. These materials constitute principle threat wastes at the MRS. Following completion of the response action, the ARNG anticipates being able to conclude its investigation and remediation of the Group 8 MRS. The property can be used for the anticipated land use and is protective of the **Industrial Receptor** and a theoretical future Resident Receptor.

The National Guard Trainee was identified as the representative receptor for the MRS in the RI. However, in accordance with the Technical Memorandum (ARNG, 2014), the human receptor that has the greatest opportunity for exposure to explosive hazards or MC at the MRS is the Industrial Receptor. To form the basis for identifying COCs in the FS, the Industrial Receptor was evaluated in conjunction with the theoretical future Resident Receptor (Adult and Child) for Unrestricted Land Use. Though there are no current plans for the MRS to change from an industrial land use to a residential land use, consideration of the theoretical future Resident Receptor is included.

5.0 SUMMARY OF SITE RISKS

Risks at the MRS were evaluated in terms of an exposure model that consists of a **source** of

contamination, a **receptor**, and **interaction** at the **exposure point**. Within this model, the source would consist of MC contamination in surface soils present at the Group 8 MRS at the location of samples, GR8SS-001M, GR8SS-003M, and GR8SS-004M. The representative receptors are the Industrial Receptor (a full-time employee or career military individual expected to work daily at the Former RVAAP) and a theoretical future Resident Receptor. The **exposure pathway** would be a means of interaction between the source and the receptor, such as a person directly contacting contaminated soil.

A qualitative HHRA was completed in the Final RI Report (CB&I, 2015) and a Risk Management Evaluation presented in the FS (HGL, 2019), using information from investigations completed at the MRS. The HHRA conducted during the RI identified the potential for cadmium in site soil to pose a risk to the theoretical future Resident Receptor at the Group 8 MRS. The Final RI Report (CB&I, 2015) also included an evaluation of COPECs in surface soil under Level II Screening and Level III Baseline evaluations. Given the conservatism of the analysis, the poor habitat quality at the site, and the relatively small area spanned by the site, it is unlikely that site contaminants pose a risk to wildlife communities.

The EPA residential soil RSL of 71 milligrams per kilogram (mg/kg) is identified as the preliminary remediation goal (PRG) for cadmium in surface soil for the Unrestricted (Residential) Land Use. The EPA residential soil RSL of 400 mg/kg is identified as the PRG for lead in surface soil for the Unrestricted (Residential) Land Use. Soil contaminants do not pose a risk to the Industrial Receptor, who is the representative receptor under current and anticipated future site use.

5.1 Receptors

A receptor is any human who comes into physical contact with potential munitions constituents and/or explosive hazards. The **human receptor** that has the greatest opportunity for exposure to a hazard at the MRS is the Industrial Receptor. The Industrial Receptor represents a full-time occupational receptor at the MRS whose activities are consistent with full-time employees or military personnel who are expected to work daily at CJAG over their career. The maximum depth that the Industrial Receptor is expected to access as part of their planned activities is 4 feet bgs (ARNG, 2014).

5.2 MEC Exposure Pathways

As summarized in Section 3.3.1, none of the munitions documented in the HRR and SI are consistent with the MDAS items found during the RI; no MEC has otherwise been reported since 2007; and the RI concluded with a 99 percent confidence level that no MEC are present. Therefore, no explosive hazard is anticipated at the Group 8 MRS and the MEC exposure pathway is considered incomplete.

5.3 MC-Related Contamination Exposure Pathways

An exposure pathway is the course a chemical or physical agent takes from a source to a receptor. Each MC pathway includes a source, interaction (release mechanisms, exposure media, and exposure routes), and a receptor. Exposure pathways identified for human interaction with MC contamination include potential exposure to surface soil by direct contact, subsequent incidental ingestion and/or dermal absorption, and inhalation of dust particles. The RI Report concluded that no contaminants in subsurface soil were present at concentrations that pose a risk to either human or ecological receptors.

The major exposure route for chemical toxicity from surface soil to the environmental receptors is ingestion (for terrestrial invertebrates and upper trophic level receptors). Minor exposure routes for surface soil include dermal contact and inhalation of fugitive dust.

Except for a small drainage ditch along the south side of the MRS, there are no significant surface water features where MC in surface soil could have migrated. Therefore, the MC exposure

pathways for all receptors at the MRS to the aquatic environments are considered incomplete, including surface water and sediment and accumulation into aquatic biota.

The soil conditions at the MRS are considered low to moderately permeable, and the depth to groundwater is approximately 15 to 20 feet, 11 feet below the maximum depth that MD was found. The detected concentrations of constituents are expected to remain in the top several inches of soil or in subsurface soils beneath concentrated areas of buried MD where they were deposited. Based on this rationale, it is not expected that the likely human and ecological receptors will come into contact with groundwater beneath the MRS and the groundwater exposure pathway is considered incomplete for all receptors.

Based on the HHRA completed in the Final RI Report (CB&I, 2015) and the Risk Management Evaluation presented in the FS (HGL, 2019), the soil contaminants do not pose a risk to the Industrial Receptor, who is the representative receptor under current and anticipated future site use. Though there are no current plans for the MRS to change from an industrial land use to a residential land use, consideration of the theoretical future Resident Receptor is included. Therefore, consideration of the unacceptable risk to Resident Receptors in surface soil is evaluated.

6.0 REMEDIAL ACTION OBJECTIVES

The RAOs were developed based on the hazards, receptors, and exposure pathways identified at the Group 8 MRS and the analysis of ARARs. The RAOs are:

- Prevent exposure of a Resident Receptor (Child and Adult) to lead and cadmium present in surface soil (0 to 0.5 feet bgs) at GR8SS-004M.
- Prevent exposure of a Resident Receptor (Child and Adult) to lead present in surface soil (0 to 0.5 feet bgs) at GR8SS-001M, GR8SS-003M and GR8SS-004M.

The EPA residential soil RSL of 71 mg/kg is identified as the PRG for cadmium in surface soil. The EPA residential soil RSL of 400 mg/kg is identified as the PRG for lead in surface soil for the theoretical future Resident Receptor. This will be protective of the current receptors by accomplishing remediation for the Resident Receptor (Adult and Child) under the theoretical future Unrestricted (Residential) Land Use.

7.0 SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives that were developed to address MC contamination at the Group 8 MRS were:

- No Action;
- LUCs; and
- MC-Contaminated Soil Removal.

Following the preliminary evaluation of the developed remedial alternatives, all three remedial alternatives were retained for further consideration in the detailed analysis in the FS and are described below. The individual components of the remedial alternatives that were developed are in **Table 1.**

7.1 No Action (Alternative 1)

The No Action alternative consists of continued use of the Group 8 MRS in its current condition with no action taken, including administrative, remedial, or other action to locate, remove, dispose, or prevent exposure to MC-contaminated soil at the MRS. Consideration of the No Action alternative is required by the NCP for **baseline** comparison with other alternatives. There are no costs associated with the No Action alternative. Five-Year Reviews would not be performed under this alternative.

7.2 Land Use Controls (Alternative 2)

Capital Cost:..... $20,445
Operation and Maintenance Cost:..... $77,608
Periodic Cost: $27,841
Present Worth Cost: $125,904
Five-Year Reviews: $94,175
Construction Time Frame: .....<1 year
Operation Time Frame:.....30 years

The LUCs alternative would not include any planned removal of MC-contaminated soil at the

MRS. It would instead restrict residential use through **educational controls** (annual LUC briefing) and **annual monitoring** (annual inspection events) that were developed through the **Institutional Analysis** in the FS Report (HGL, 2019), and as described below.

The alternative would consist of annual awareness training to notify authorized personnel of existing conditions, existing engineering controls, and MC risk mitigation procedures (i.e., Personal Protective Equipment, decontamination, etc.) at the MRS. Annual inspections would be conducted and the Property Management Plan Inspection Form would be completed to monitor the LUCs. Five-Year Reviews would be required to ensure the effectiveness of this alternative because it does not allow for UU/UE at the MRS.

Educational controls to be implemented would include different levels of general **awareness training** that would depend on the personnel and activities to be conducted at the MRS. Full time-employees at the facility would receive annual general awareness training to notify them of existing conditions, existing engineering controls, and proper procedures for MC risk mitigation.

Annual monitoring (i.e. inspections) would be conducted annually to ensure that the LUCs remain effective and protective of employees, training units, visitors, and contractors. **Five-Year Reviews** would be required to ensure the effectiveness of this alternative, because it does not allow for UU/UE at the MRS.

7.3 MC-Contaminated Soil Removal (Alternative 3)

Capital Cost: *$747,187*
Operation and Maintenance Cost: *$0*
Periodic Cost: *$0*
Present Worth Cost: *$747,187*
Five-Year Reviews: *$0*
Construction Time Frame: ..... *~2 years*
Operation Time Frame: ..... *N/A*

The MC-Contaminated Soil Removal alternative would combine mechanical and manual excavation techniques to remove the contaminated soil to a depth of 0.5 feet bgs in the area of the MRS that exceeds the PRG for cadmium. Incidental to the surface soil removal, if any munitions debris is encountered, it will be segregated, inspected, and certified as MDAS before disposal. Under this alternative, all MC-contaminated soil exceeding the PRG would be removed, allowing for UU/UE at the MRS (although residential use is not anticipated).

Confirmation soil samples will be collected to confirm that the extent of MC-contaminated soil exceeding the remediation goal for cadmium is removed. The confirmation soil samples for laboratory analysis will be collected immediately below the 0.5 feet to confirm all MC contamination has been removed. Samples of stockpiled, excavated soils will be collected and analyzed to determine if the soil meets the definition of characteristic hazardous waste, pursuant to 40 CFR Part 261 using the Toxicity Characteristic Leaching Procedure for disposal. For MC-contaminated soil shown to meet non-hazardous disposal criteria, the soil will be transported to a non-hazardous landfill for proper disposal. The excavation locations within the MRS will be planned so that areas containing contaminants at potentially hazardous levels are managed separately. If characterization results indicate that excavated material is hazardous, it will be segregated from non-hazardous soils for proper off-site disposal.

After the initial excavation of the GR8SS-001M, GR8SS-003M and GR8SS-004M footprints has been conducted, confirmation samples (from 6-inches to 1-foot bgs) will be collected from the excavations to confirm that MC-contaminated soil to a depth of 6 inches has been excavated and removed. A minimum depth of 0.5-foot bgs will be excavated. The assumption that up to 2.0 feet bgs may be required to be excavated, based on the results of confirmation sampling, was used to establish the cost estimate. If indicated, localized areas may require further limited excavation to deeper than 6 inches after the confirmation sampling occurs. This additional excavation would be accomplished, and additional confirmation samples collected from

Table 1 Components of Remedial Alternatives

Remedial Alternative	Individual Components
No Action (Alternative 1)	• No components • Continued use of the MRS in its current condition with no removal action for MC-contaminated soil taken • No Five-Year Reviews
LUCs (Alternative 2)	• No planned physical removal action for MC-contaminated soil taken • **Engineering controls** (existing controls currently in place) • Educational **awareness training program** • Annual monitoring (i.e., inspections) • Five-Year Reviews • Achieves protection for the current site conditions for the Industrial Receptor with a Commercial/Industrial land use
MC-Contaminated Soil Removal (Alternative 3)	• Mechanical and manual **excavation** to remove MC-contaminated soil to a depth of 0.5 feet bgs minimum • Confirmation Soil Sampling • Site restoration activities (grading and installation of clean soil to backfill and level all excavated areas) • Attains UU/UE that is protective of all Receptors (the Industrial Receptor and the theoretical future Resident Receptor) with a theoretical future Residential Land Use • Attaining UU/UE is a CERCLA preference • No Five-Year Reviews

bgs denotes below ground surface
LUC denotes land use control
MC denotes munitions constituent
MRS denotes Munitions Response Site.

the new excavation to confirm the extent has been removed. Discrete confirmation samples will be collected at a density of 1 per 400 square feet of excavation floor. MC-Contaminated Soil Removal would be accomplished following additional sampling activities and laboratory analysis. Based on the RI recommendations, the estimated minimum contaminated soil volume is 1,603 cubic yards (excavation to 0.5 feet bgs), and the maximum contaminated soil volume is 4,008 cubic yards (excavation to 2 feet bgs, if required by confirmation laboratory soil sampling results). MC risks will be addressed through removal of confirmed MC-contaminated soil.

Additional site restoration activities will be conducted, including grading the site and installing confirmed clean soil to backfill and level all excavated areas. The excavated areas will be reseeded with native vegetation or gravel will be replaced to restore the existing roadway within the MRS.

8.0 EVALUATION OF ALTERNATIVES

The three remedial alternatives were evaluated with respect to the nine evaluation criteria outlined in the NCP [Section 300.430(f)] (**Table 2**). The nine criteria are categorized into three groups: Threshold Criteria, Primary Balancing Criteria, and Modifying Criteria. These criteria groups are as follows:

Threshold Criteria must be met for the alternative to be eligible for selection as a remedial option:

1. Overall protection of human health and the environment
2. Compliance with ARARs

Primary Balancing Criteria are used to weigh major trade-offs among alternatives:

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

Modifying Criteria may be considered to the extent that information is available during development of the FS but can be fully considered only after public comment on this Proposed Plan.

1. State acceptance
2. Community acceptance

Table 2 CERCLA Evaluation Criteria

Threshold Criteria
Overall Protection of Human Health and the Environment considers how well the alternative protects human health and the environment from the hazard at the MRS.
Compliance with ARARs considers if the alternative can be implemented in compliance with the ARARs and/or TBCs identified for the MRS.
Balancing Criteria
Long-term Effectiveness and Permanence considers how effective and permanent the alternative will be over time.
Reduction of Toxicity, Mobility, or Volume Through Treatment considers how well the alternative reduces the harmful effects of the hazard at the MRS.
Short-term Effectiveness considers how long it will take to complete the cleanup and follow-on work and if the community, workers at the MRS, and the environment can be kept safe during cleanup operations.
Implementability considers if the alternative can be practically and successfully implemented considering any technical and administrative issues that may need to be addressed.
Cost considers **capital costs**, **operation and maintenance costs**, and **periodic costs** associated with the implementation of the alternative using current prices.
Modifying Criteria
State Acceptance indicates whether the state regulator approves of the alternative.
Community Acceptance addresses whether the public approves of the alternative.

The comparative analysis evaluates the relative performance of the alternatives with respect to each of the nine criteria. Identifying the advantages and disadvantages of each alternative with respect to each other helps to identify the relative strengths of the preferred alternative. These strengths, combined with risk management decisions made by the ARNG and

Ohio EPA and input from the community, will serve as the basis for selecting the Preferred Alternative.

8.1 Comparative Analysis of Alternatives Threshold Criteria

Overall Protection of Human Health and the Environment - The No Action alternative would not involve any measures to limit exposures to MC-contaminated soil and would not be protective of human health. Thus, the No Action alternative does not meet this criterion. The MC-Contaminated Soil Removal (UU/UE) alternative provides the greatest level of overall protection to human health through the removal of MC-contaminated soil to 0.5 feet bgs at GR8SS-004M, GR8SS-001M, and GR8SS-003M. Alternative 2, LUCs, would not actively treat or remove MC at the MRS; however, it would isolate receptors from potential exposure to MC through behavior controls (i.e., awareness training, existing engineering controls, and risk mitigation procedures).

Compliance with ARARs - There are no ARARs associated with the No Action alternative that would restrict or modify implementation. No ARARs are triggered for the LUCs alternative (i.e., no location- or action-specific ARARs identified and all polychlorinated biphenyl (PCB) concentrations are less than the cleanup standard in the TSCA, which is the only chemical-specific ARAR). The MC-Contaminated Soil Removal alternative can be performed in a manner that complies with all chemical-specific and action-specific ARARs identified in Section 3.2. The soil sampling to be accomplished after the performance of the MC soil removal would verify that soil remaining at the MRS does not exceed the chemical-specific TBCs and chemical-specific ARARs. Some vegetation clearance (i.e., grubbing, brush removal) at the MRS is anticipated. Excavation of soil may potentially cause soil erosion; however, the site would be restored with clean backfill materials once the absence of MC contamination is confirmed. MC contamination excavation will disturb an area of 1.99 acres; therefore, best management practices for erosion control will be used and adherence to the Ohio General National Pollutant Discharge Elimination System (NPDES) Permit and Erosion and Sediment Control requirements will be required. The facility will comply with all NPDES permit requirements and erosion control requirements.

Balancing Criteria

Long-Term Effectiveness and Permanence - Alternative 1 (No Action) takes no action and therefore does not provide long-term effectiveness and permanence. There are different degrees of long-term effectiveness and permanence associated with Alternative 2 (LUCs) and Alternative 3 (MC-Contaminated Soil Removal).

Because Alternative 2 relies on LUCs, its effectiveness and permanence depend on maintaining the educational controls emplaced to modify behavior and conducting an annual inspection to evaluate the conditions at the MRS to ensure the LUCs are protective. An educational briefing on the use of Siebert stakes is conducted for full time employees as an interim control for the MRS, and the OHARNG/CJAG is willing to maintain educational controls and conduct annual inspections over the long term.

Because the MRS will remain under OHARNG/CJAG control, Alternative 2 is effective in the long term and permanent. However, MC-contaminated soils constituting a risk to potential future Residential Receptors would not be permanently removed under Alternative 2 in comparison to Alternative 3.

Alternative 3 would involve the removal of MC-contaminated soils to 0.5 feet bgs for MC constituting a risk to the theoretical future Residential Receptor. Confirmation soil samples would verify that all MC-contaminated soils were removed before site restoration. The magnitude of the chemical hazards would be eliminated under Alternative 3, and no residuals or untreated waste that would represent the potential for exposure to the Industrial Receptor would remain. As a result, Alternative 3 best achieves long-term effectiveness and permanence at the MRS.

Reduction of Toxicity, Mobility, and Volume Through Treatment – Alternative 1 takes no actions and does not provide reduction of toxicity, mobility, or volume through treatment of MC at the MRS. Alternative 2 provides no treatment or removal of MC-contaminated soils. Therefore, Alternative 2 does not satisfy the statutory preference for employing treatment as a principal element. Alternative 3 includes the removal of MC in soil that would result in a negligible probability of exposure for the Residential Receptor (i.e., allow for UU/UE). Therefore, the reduction of toxicity, mobility, and volume, through removal of MC at the MRS under Alternative 3 is greatest. Alternative 3 meets the statutory preference.

Short-Term Effectiveness – The No Action Alternative and the risk due to MC is unaltered in the short-term. No Action has no adverse short-term effects.

Under Alternative 2 (LUCs), no removal actions will be conducted at the MRS that eliminate any potential for worker exposure or short-term risks to facility employees beyond the baseline conditions. The LUCs to be implemented under Alternative 2 can be quickly established and will further reduce short-term risks by mitigating the potential for exposure to MC at the MRS through behavior controls. Therefore, the short-term effectiveness for Alternative 2 is considered acceptable.

The short-term effectiveness of Alternative 3 (MC-Contaminated Soil Removal) is affected by the handling, removal, and restoration activities associated with complete excavation of the MRS to a depth of 0.5 feet bgs. Soil disturbance is potentially significant, but short-term risks would be minimized by adherence to erosion control requirements. The short-term effectiveness of Alternative 3 is considered to be low in comparison to Alternatives 1 and 2; however, the short-term risk is considered acceptable because of the measures that will be taken to mitigate risks associated with exposure to chemical hazards.

Implementability - Although easy to technically implement, the No Action alternative would be the least administratively feasible to implement because the stakeholders are not likely to accept it as the Preferred Alternative. The LUCs alternative would be technically feasible to implement since there is no specialized equipment required and awareness training and annual inspections are already being conducted at CJAG. The LUCs alternative is administratively feasible to implement.

The MC-Contaminated Soil Removal would require specialized equipment and personnel to implement. However, the excavation of MC-contaminated soils at the MRS under Alternative 3 is implementable with appropriate planning and coordination, and the services and equipment are readily available.

Overall, the degree of implementability for the MC-Contaminated Soil Removal alternative involving the actual removal of MC-contaminated soil would be more complex than the No Action alternative and the LUCs alternative, which do not include any planned removal actions.

Cost - There are no costs associated with the No Action alternative.

The LUCs alternative has the lowest total **present worth** costs ($125,904) compared to the MC-Contaminated Soil Removal alternative ($747,187). Additionally, Five-Year Reviews would be required for the LUCs alternative since UU/UE is not attained. The present worth costs associated with the Five-Year Reviews over the 30-year performance period would be $94,175 for the LUCs alternative. Present worth costs are dollar amounts estimated using current prices for goods and services.

Modifying Criteria

Although remedial alternatives cannot be evaluated against modifying criteria at this time, available information is provided below.

State Acceptance - The Ohio EPA concurrence will be evaluated after the public comment period and will be described in the **Record of Decision** (ROD).

Community Acceptance - Community acceptance of the Preferred Alternative will be

evaluated after the public comment period ends and will be described in the ROD for the MRS.

8.2 Overall Evaluation

The presence of MC-contaminated soil in the MRS presents a potential hazard to the theoretical future Residential Receptor. The NCP statutory preference for reduction of toxicity, mobility, or volume through treatment is best achieved with Alternative 3, which would allow for UU/UE with a negligible probability of exposure for the theoretical future Residential Receptor. Removal of these soils will be protective of the National Guard Trainee (a potential future receptor) and the Industrial Receptor (the current receptor). There are no current plans for the MRS to change from an industrial land use to a residential land use; however, the unacceptable risk to the theoretical future Residential Receptor is considered. Based on the evaluation of the NCP criteria, Alternative 2 (LUCs), and Alternative 3 (Removal of MC-contaminated Soil), are effective and implementable (**Table 3**). The deciding factor in selecting a remedy will be the alternative that meets the RAOs and is technically and administratively implementable (HGL, 2019). Though soil contaminants do not pose a risk to the Industrial Receptor, who is the representative receptor under current site use; the cadmium in surface soil does pose an unacceptable risk to the theoretical future Resident Receptor (Adult and Child). Alternative 3 (removal of MC-contaminated soil) best achieves protection of both the industrial Receptor and the theoretical future Resident Receptor.

9.0 PREFERRED ALTERNATIVE

The removal of MC-contaminated soil alternative is the Preferred Alternative for the Group 8 MRS. The Preferred Alternative satisfies the RAOs for the Group 8 MRS by removing the MC contamination in surface soil at the MRS. Alternative 3 is a CERCLA preference since it allows for UU/UE, is protective of human health and the environment, is ARAR compliant, and provides the best combination of primary balancing attributes that allow for the anticipated future land use.

This recommendation is not a final decision. The ARNG, in coordination with Ohio EPA, will select the alternative for the Group 8 MRS after reviewing and considering all comments submitted during the 30-day public comment period.

9.1 Summary Statement

Based on the information currently available, the ARNG believes that the Preferred Alternative meets the threshold criteria and provides the best overall protection of the public. The ARNG expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA Section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be cost effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principle element, or explain why the preference for treatment will not be met.

10.0 COMMUNITY PARTICIPATION

Public participation is an important component of the alternative selection process. The ARNG, in coordination with the Ohio EPA, is soliciting input from the community on the Preferred Alternative. The comment period extends from March 4, 2020 to April 4, 2020. This period includes a public meeting at which the ARNG will present this Proposed Plan. The ARNG will accept oral and written comments on the Proposed Plan at this meeting.

Table 3 CERCLA Evaluation Criteria for Each Alternative

NCP Evaluation Criteria	Alternative 1: No Action	Alternative 2: Land Use Controls	Alternative 3: MC-Contaminated Soil Removal (Achieves UU/UE)
Threshold Criteria	***Result***	***Result***	***Result***
1. Overall Protection of Human Health and the Environment	Not protective	Not protective of the theoretical future Resident Receptor	Protective of all Receptors
2. Compliance with ARARs	Not compliant	Compliant	Compliant
Balancing Criteria	***Score***	***Score***	***Score***
3. Long-term Effectiveness and Permanence	Not applicable	1	2
4. Reduction of Toxicity, Mobility, or Volume through Treatment	Not applicable	1	2
5. Short-term Effectiveness	Not applicable	2	1
6. Implementability	Not applicable	2	1
7. Cost	Not applicable ($0)	2 ($125,904)	1 ($747,187)
Balancing Criteria Score	*Not applicable*	*Not scored*[1]	*7*
Modifying Criteria	***Result***		
8. State Acceptance	The Ohio EPA concurrence will be evaluated after the public comment period and will be described in the Record of Decision (ROD).		
9. Community Acceptance	Community acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the ROD.		

1-Any alternative considered "not protective" for overall protection of human health and the environment and "not compliant" for compliance with ARARs is not eligible for selection as the recommended alternative. Therefore, that alternative is not scored as part of the balancing criteria evaluation.
Scoring for the balancing criteria is as follows for applicable alternatives: most favorable = 2, least favorable = 1. The alternative with the highest total balancing criteria score is considered the most feasible.

ARAR = Applicable or relevant and appropriate requirement.
NCP = National Oil and Hazardous Substances Pollution Contingency Plan.
LUC = Land use control.

10.1 Public Comment Period

The 30-day comment period extends from March 4, 2020 to April 4, 2020 and provides an opportunity for public involvement in the decision-making process for the proposed action. The public is encouraged to review and comment on this Proposed Plan. All public comments will be considered by the ARNG and Ohio EPA before selecting an alternative. During the comment period, the public is also encouraged to review documents pertinent to the Group 8 MRS. This information is available at the **Information Repositories** and online at **www.rvaap.org**. To obtain further information, contact the CJAG Environmental Office.

10.2 Public Meeting

The ARNG will hold an open house and public meeting on this Proposed Plan on March 11, 2020, at the Shearer Community Center (Paris Township Hall) at 9355 Newton Falls Road, Ravenna, Ohio 44266. This meeting will provide an opportunity for the public to comment on the proposed action. Comments made at the meeting will be transcribed.

10.3 Written Comments

If a member of the public would like to provide comments, questions, or suggestions on this Proposed Plan or other relevant issues in writing, they should deliver the questions to the ARNG at the public meeting or mail them in hard copy (postmarked no later than March 4,

2020). The public can also submit comments, questions, or suggestions via email before the end of the comment period to the CJAG Environmental Office at **kathryn.s.tait.nfg@mail.mil**.

POINT OF CONTACT FOR WRITTEN COMMENTS

Ms. Kathryn Tait
CJAG Environmental Office
1438 State Route 534 SW
Newton Falls, Ohio 44444

10.4 Army Review of Public Comments

The ARNG will review the public's comments as part of the process in reaching a final decision for the most appropriate action to be taken. A **Responsiveness Summary**, a document that summarizes the ARNG's responses to comments received during the public comment period, will be included in the ROD. The ARNG's final choice of action will be documented in the ROD. The ROD will be added to the RVAAP Administrative Record and Information Repositories.

2,4,6-Trinitrotoluene (TNT): An explosive used in military shells, bombs, and grenades, in industrial uses, and in underwater blasting. TNT production in the U.S. occurs solely at military arsenals.

Administrative Control: Direction or exercise of authority over subordinate or other organizations in respect to administration and support, including organization of Service forces, control of resources and equipment, personnel management, unit logistics, individual and unit training, readiness, mobilization, demobilization, discipline, and other matters not included in the operational missions of the subordinate or other organizations.

Administrative Record: A collection of documents, typically reports and correspondence, generated during site investigation and remedial activities. Information in the Administrative Record is used to select the preferred remedy. It is available for public review at the Camp Ravenna Environmental Control Office; call (330) 872-8003 for an appointment.

Alternative Selection Process: A part of the CERCLA process, typically from the Proposed Plan through the ROD that involves public participation in identifying the preferred alternative. The final selection of the preferred alternative is made in the ROD after taking into consideration the recommendations in the Proposed Plan and any comments received from the public during the 30-day comment period.

Ammonium Nitrate: A chemical compound predominantly used in agriculture as a high-nitrogen fertilizer. Its other major use is as a component of explosive mixtures used in mining, quarrying, and civil construction.

Analog Magnetometer: An instrument that measures magnetism associated with metal items that contain iron (i.e., ferrous). A compass is a simple example of a magnetometer, one that measures the direction of a magnetic field. An analog magnetometer is less complex than a digital magnetometer and produces a sound or signal when metal items are encountered.

Awareness Training Program: Training implemented as an educational control at the facility to provide informational materials on DoD military munitions recognition, avoidance, and encounter protocols.

Annual monitoring: Inspections conducted on a yearly basis.

Anomaly: An item seen as a subsurface irregularity (i.e., deviates from expected subsurface items such as pipes, utility lines, etc.) after geophysical investigations.

Applicable or Relevant and Appropriate Requirements (ARARs): The federal and state requirements that a selected alternative will attain. These requirements may vary among sites and alternatives.

Archives Search Report (ASR): An initial historical records search for the presence of military munitions usage at the MRS.

Area of Concern (AOC): A term used by regulatory bodies to refer to environmentally sensitive or damaged areas.

Background Value: Concentrations of chemicals in environmental media in the immediate area of an environmentally impacted site. Background values can be naturally occurring (i.e., the concentration is not due to a release of chemicals from human activities), or anthropogenic (i.e., the presence of a chemical in the environment is due to human activities but is not the result of site-specific use or release of waste or products, or industrial activity).

Biological Inventory: An attempt to document and identify all biological species living in some defined area.

Booster: A sensitive explosive charge that acts as a bridge between a (relatively weak) conventional detonator and a low-sensitivity (but typically high-energy) explosive such as TNT. By itself, the initiating detonator would not deliver enough energy to set off the low-sensitivity charge. However, it detonates the primary charge (the booster), which then delivers an explosive shockwave sufficient to detonate the secondary, main, high-energy charge.

Cadmium: Cadmium is a metal that occurs naturally in the earth's crust. It is extracted during the production of metals such as copper, lead, and zinc. Exposure to cadmium by ingestion or inhalation can cause short-term or long-term health effects.

Capital Cost: This includes costs associated with construction, treatment equipment, site preparation, services, transportation, disposal, health and safety, installation and startup, administration, legal support, engineering, and design associated with remedial alternatives.

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

Demilitarization: The reduction of one or more types of weapons or weapons systems.

Department of Defense (DoD) Military Munitions: A munition or explosive deposited by DoD activities that may pose an explosive safety risk because it either did not function as designed, was discharged and/or abandoned, or is an explosive constituent. The term includes UXO, **discarded military munitions**, and MC-related contamination.

Depot Storage: A designated location for the storage of military supplies.

Digital Magnetometer: An instrument that measures magnetism associated with metal items that are iron-containing (i.e., ferrous). A compass is a simple example of a magnetometer that measures the direction of a magnetic field. A digital magnetometer is more complex than an analog magnetometer and can map and produce outputs of data of the metal items that are encountered.

Discarded Military Munitions: Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations.

Discrete Soil Sample: A single soil sample taken at a specific location.

Earthen Settling Pond: An earthen structure that uses sedimentation to remove settleable matter and turbidity from wastewater.

Ecological Receptor: A suite of wildlife species chosen to characterize the exposure scenarios for a particular representative habitat.

Ecological Risk Assessment: The process for evaluating how likely it is that the environment may be impacted as a result of exposure to one or more environmental stressors such as chemicals, land change, disease, invasive species and climate change.

Educational Controls: Programs geared toward notification of existing conditions, existing engineering controls, and potential hazards to visitors, facility personnel, contractors, and utility workers.

Engineering Controls: Physical structures that warn of hazards or prevent access to a site.

Environmental Sampling: The isolation and careful gathering of specimens of interest in a given environmental study.

Erosion: The action of surface processes (such as water flow or wind) that remove soil, rock, or dissolved material from one location on the Earth's crust, then transport it away to another location.

Excavation: The act of digging to removal soil or other earthen material.

Explosive Hazard: Any hazard containing an explosive component. Explosive hazards include UXO (including land mines), booby traps, improvised explosive devices, and bulk explosives.

Exposure Pathway: The means by which a person can interact with a hazard, such as encountering MC and/or MEC at the MRS. If a pathway is complete, then a person can encounter MC/MEC. If a pathway is incomplete, then a person cannot encounter MC/MEC. If a pathway is potentially complete, it is suspected that a person may be

able to contact MC/MEC, but it is not confirmed.

Exposure Point: Exposure to something dangerous (i.e., explosive and/or chemical hazard) that causes harm to a receptor.

Feasibility Study (FS): This CERCLA document reviews and evaluates multiple remedial technologies under consideration at the site. It also identifies the preferred remedial action alternative.

Federally-Threatened Species: Species for which a final rule has been published in the Federal Register to list the species as threatened. Species is legally protected by the Endangered Species Act.

Five-Year Review: Required by CERCLA or program policy when hazardous substances remain on site above levels that permit unrestricted use and unlimited exposure. Five-year reviews provide an opportunity to evaluate the implementation and performance of a remedy to determine whether it remains protective of human health and the environment. Reviews take place five years following the start of a CERCLA response action and are repeated every five years so long as future uses remain restricted.

Fragmentation Bomb: An aerial antipersonnel bomb that scatters shrapnel over a wide area upon explosion.

Frost Line: The maximum depth to which the groundwater in soil is expected to freeze.

Fuze: A device that detonates a munition's explosive material under specified conditions. In addition, a fuze has safety and arming mechanisms that protect users from premature or accidental detonation.

Historical Records Review (HRR): An in-depth review of historical documentation that identifies the types of activities previously conducted, the types of munitions used/stored, and historical finds and incidents associated with the MRS.

Human Health Risk Assessment: The process used to estimate the nature and probability of adverse health effects in humans who may be exposed to hazards in contaminated environmental media, now or in the future.

Human Receptor: Any human individual or population that is presently or will potentially be exposed to, and adversely affected by, the release or migration of contaminants or exposure to potentially explosive hazards.

Incremental Sampling Methodology (ISM): A sample collection and processing approach having specific elements designed to control data that is variable due to non-continuous distribution of contaminants in environmental media. ISM sampling consist of collecting a sufficient number of discrete "increments" (typically 30 to 100) in an unbiased manner throughout a specified area, combining and variously processing the increments into a single larger sample, and incrementally separating out smaller samples (i.e., sub-samples) from the processed larger sample to obtain a representative aliquot (i.e., smaller sized sample) for analysis. Properly executed, the method provides unbiased, representative and reproducible estimates of the mean concentration of analytes for that sample area.

Industrial Receptor: A full-time occupational receptor at the MRS whose activities are consistent with full-time employees or career military personnel who are expected to work daily at the facility over their career.

Information Repositories: A collection of documents relating to a facility with investigations and response actions under CERCLA and/or a site's permitting activity or corrective action. It includes documents and information about site activities and general information about environmental regulations and CERCLA. The purpose of an Information Repository is to (1) ensure open and convenient public access to site-related documents and (2) better inform the public of the restoration process.

Institutional Analysis: An evaluation of the type(s) of use restrictions necessary at a site, potential LUCs that might be relied upon to implement the selected restrictions, potential parties who may be responsible for long-term LUC activities, criteria for terminating the LUCs, issues that might impact the effectiveness of the LUCs, estimated costs, and funding sources.

Interaction: Mutual or reciprocal action or influence.

Land Use Controls (LUCs): Used in CERCLA remedies to prevent or control exposures of potential receptors to contamination remaining in place at the site and to assure continued effectiveness of the response action. LUCs include access controls and monitoring.

Large-Caliber Shell: A missile fired from the muzzle of a gun or cannon. Projectiles above 7 inches in caliber are considered large-caliber.

Magnetometer: An instrument that measures magnetism associated with metal items that are iron-containing (i.e., ferrous). These can be either **digital magnetometers** or **analog magnetometers** and locate items by various means.

Maintenance: Actions necessary for retaining or restoring an area to the specified operable condition to achieve its maximum useful life.

Manual excavation: Excavation (digging) by individual persons using hand tools.

Munitions and Explosives of Concern (MEC): A munitions or explosive that may pose an explosive safety risk because it either did not function as designed, was discharged and/or abandoned, or is an explosive constituent. MEC includes UXO, discarded military munitions, and explosive constituents of munitions present in high enough concentrations to pose an explosive hazard.

Military Munitions Response Program: A U.S. Department of Defense program consisting of actions necessary to ensure protection of human health, welfare, and the environment from the hazards associated with DoD military munitions and MC-related contamination at locations impacted by historical military activities.

Military Training: The instruction of personnel to enhance their capacity to perform specific military functions and tasks.

Mobility: The ability to move or to be moved freely and easily.

Munitions Constituents (MC): Any material originating from UXO, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

Munitions Debris (MD): Remnants of military munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.

Munitions Response Site (MRS): Any area on a defense site that is known or suspected to contain DoD military munitions or MC-related contamination.

Munitions Response Site Prioritization Protocol: The methodology developed by the Army for prioritizing MRSs for response actions under the MMRP**.**

National Contingency Plan (NCP): The *National Oil and Hazardous Substances Pollution Contingency Plan*. CERCLA regulations that provide the federal government the authority to respond to the problems of abandoned or uncontrolled hazardous waste disposal sites and to certain incidents involving hazardous wastes (e.g., spills).

Natural Resource Management: Management of natural resources such as land, water, soil, plants and animals, with a particular focus on how management affects the quality of life for both present and future generations.

Operation and Maintenance Cost: Annual post-construction cost necessary to ensure the continued effectiveness of a remedial action.

Periodic Cost: Post-construction cost that occurs on an infrequent basis (i.e., not annually) and is necessary to ensure the continued effectiveness of a remedial action.

Preferred Alternative: The remedial response presented in the FS that meets the RAOs as identified in coordination by the ARNG and the Ohio EPA. The determination to make this alternative "final" is made after reviewing and considering all comments submitted during the 30-day public comment period.

Preliminary Remediation Goals: The Preliminary Remediation Goals (currently the

Regional Screening Levels) are developed by Environmental Protection Agency and provide a source of comparison values for residential and commercial/industrial exposures to soil, air, and drinking water. These standards are often used in the absence of established screening or cleanup goals for a site or facility.

Present Worth: Used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year. This allows the cost of the remedial alternatives to be compared on the basis of a single figure representing the amount of money that would be sufficient to cover capital and operation and maintenance costs associated with each remedial alternative over its life.

Primer: A primer, also known as a blasting cap, is a small, sensitive, primary explosive device generally used to detonate a larger, more powerful and less-sensitive secondary explosive such as TNT, dynamite, or plastic explosive. Primers come in a variety of types, including nonelectric caps, electric caps, and fuse caps.

Production: The action of making or manufacturing from components or raw materials.

Promulgated: legally enforceable federal and state requirements.

Proposed Plan: This CERCLA document provides the public with information necessary to participate in the selection of an alternative. It is designed to solicit public comment on a preferred alternative before a ROD is established.

Rare Species: A group of organisms that is uncommon or scarce. The designation may be applied to either plant or animal taxon and may be distinct from the term endangered or threatened species. Designation of a rare species may be made by an official body such as the federal government, state, or province.

Reacquire/reacquired: To come into possession or find again.

Receptor: See human receptor or ecological receptor.

Record of Decision (ROD): A legal record signed by the ARNG and Ohio EPA. It describes the cleanup action or alternative selected for a site, the basis for selecting those alternative, public comments, responses to comments, and the estimated cost of the alternative.

Regulatory: Serving or intending to control or maintain something.

Remedial Action: The actual construction or implementation phase of a CERCLA site cleanup that follows Remedial Design.

Remedial Alternative: A response action scenario identified and screened in the Feasibility Study. The alternatives identified may range from No Action to a response action that attains UU/UE.

Remedial Decision: A formal, written communication from the regulating authority that approves a site investigation, identifies the preferred alternative, and approves the remedial action, if any, at a site.

Remedial Action Objective (RAO): The phase of the CERCLA process when the selected remedy is in place and is operating, leading to the cleanup objective. It may include active remediation, monitoring, operation; optimization, and implementation and management/maintenance of LUCs for extended periods of time to reduce contaminants to site cleanup standards.

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

Renovation: The process of improving a broken, damaged, or outdated structure or piece of equipment.

Research Department Explosives: A hard, white crystalline solid, insoluble in water and only slightly soluble in some other solvents. Sensitive to percussion, its principal nonmilitary use is in blasting caps. It is often mixed with other substances to decrease its sensitivity.

Responsiveness Summary: A section of the ROD where the ARNG documents and responds to written and oral comments received from the public about the Proposed Plan.

Sedimentation: The tendency for particles in suspension to settle out of the fluid (i.e., storm water or standing water) in which they are entrained and come to rest against a barrier.

Site Inspection (SI): Part of the CERCLA evaluation process that is conducted following a Preliminary Assessment to further evaluate the extent to which a site presents a threat to human health or the environment.

Source: The location at the MRS where DoD military munitions and/or MC-related contamination is situated in the environment, or are expected to be found, and can come into contact with a receptor.

State-Listed Species of Concern: A species or subspecies that falls under the jurisdiction of the Ohio Department of Natural Resources and which might become threatened in Ohio under continued or increased stress.

Statutory: A written law that is regulated, permitted, or enacted by a legislative body.

Superfund: The U.S. Superfund Amendments and Reauthorization Act is an amendment and reauthorization of CERCLA, better known as the Superfund Act. Both CERCLA and SARA have the goals of identifying, remediating and preventing the release of hazardous substances to the environment.

To-Be Considered (TBC) Guidance: Federal and state environmental public health programs that develop criteria, advisories, guidance, and proposed standards that are not legally binding but may provide useful information or recommended procedures.

Toxicity: The degree to which a substance can damage an organism**.**

Unexploded Ordnance (UXO): Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; have been fired, dropped, launched, projected, or placed in such a manner as to constituent a hazard to operations, installations, personnel, or material; and remain unexploded either by malfunction, design, or any other cause.

UXO Qualified Personnel: Workers, typically with former Army or Navy explosive ordnance disposal backgrounds, that are specially trained to handle conventional and unconventional weapons for secured disposal.

Unlimited Use/Unrestricted Exposure (UU/UE): There are no restrictions placed on the potential future use of land or other natural resources.

Unrestricted (Residential) Land Use: Contaminated land that has been cleaned up to a standard that allows for residential housing, the most conservative land use as opposed to commercial or industrial, without any limitations.

Volume: The amount of space that a substance or object occupies.

Wetland: A land area that is saturated with water, either permanently or seasonally, such that it takes on the characteristics of a distinct ecosystem. The primary factor that distinguishes wetlands from other land forms or water bodies is the characteristic vegetation of aquatic plants, adapted to the unique hydric soil.

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FIGURES

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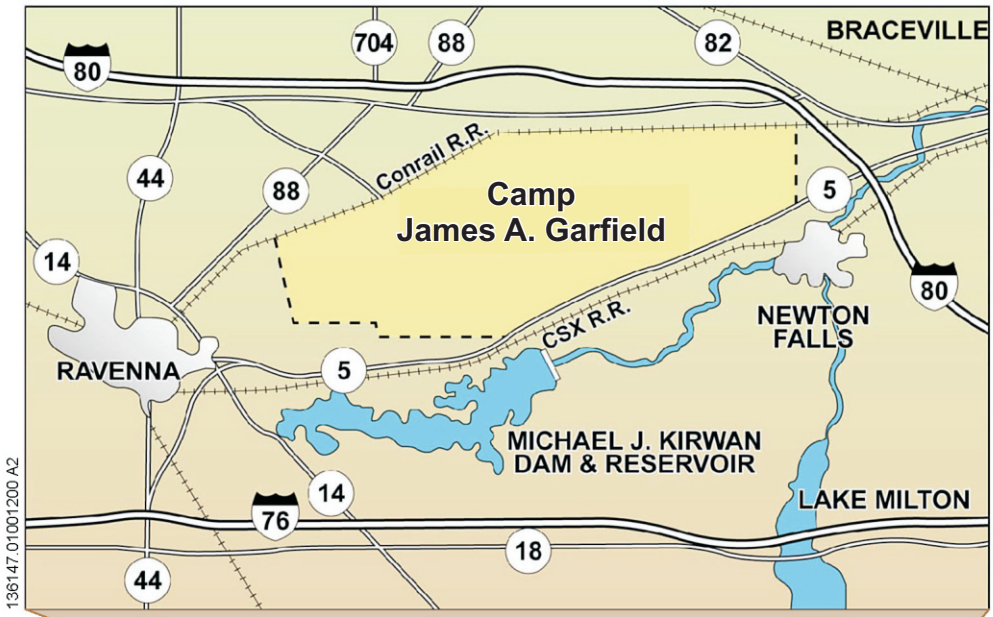

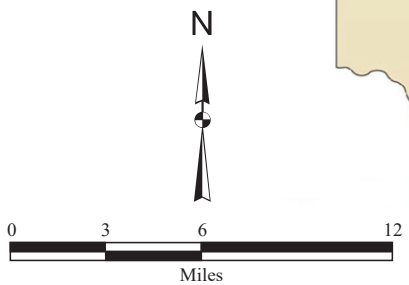

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3/21/2019 JG
Source: CB&I

Legend

Camp James A. Garfield

Note:
RVAAP=Ravenna Army Ammuntion Plant

Figure 1
Location Map
Camp James A. Garfield/
Former RVAAP
Portage and Trumbull
Counties, Ohio

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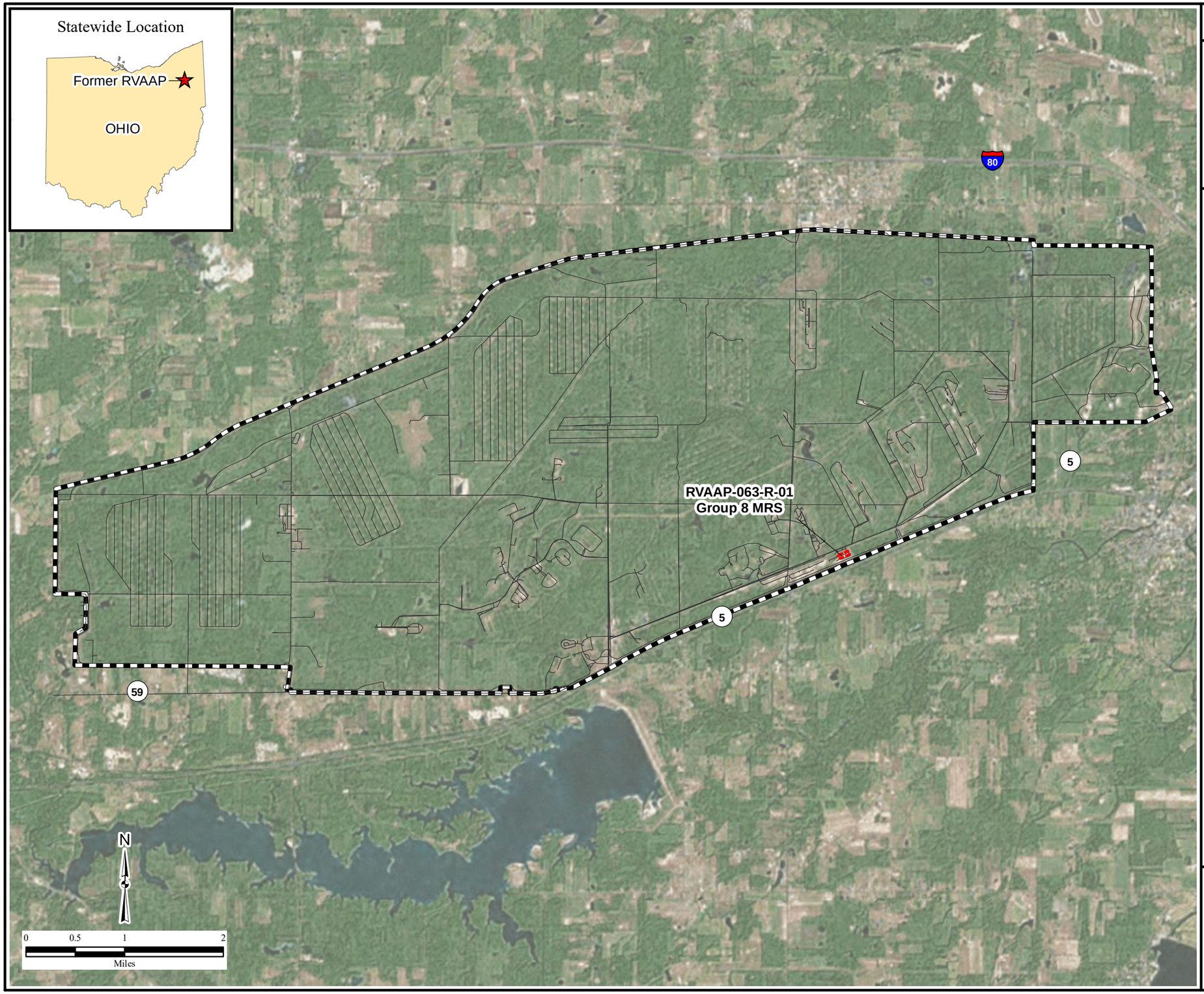
Figure 2
MRS Location
Group 8
Former RVAAP
Portage and Trumbull Counties, Ohio



Legend

- Road
- MRS
- Installation Boundary

Notes:
MRS=munitions response site
RVAAP=Ravenna Army Ammuntion Plant

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5/9/2017 JAR
Source: HGL,CB&I, USACE, e²M ArcGIS Online Imagery

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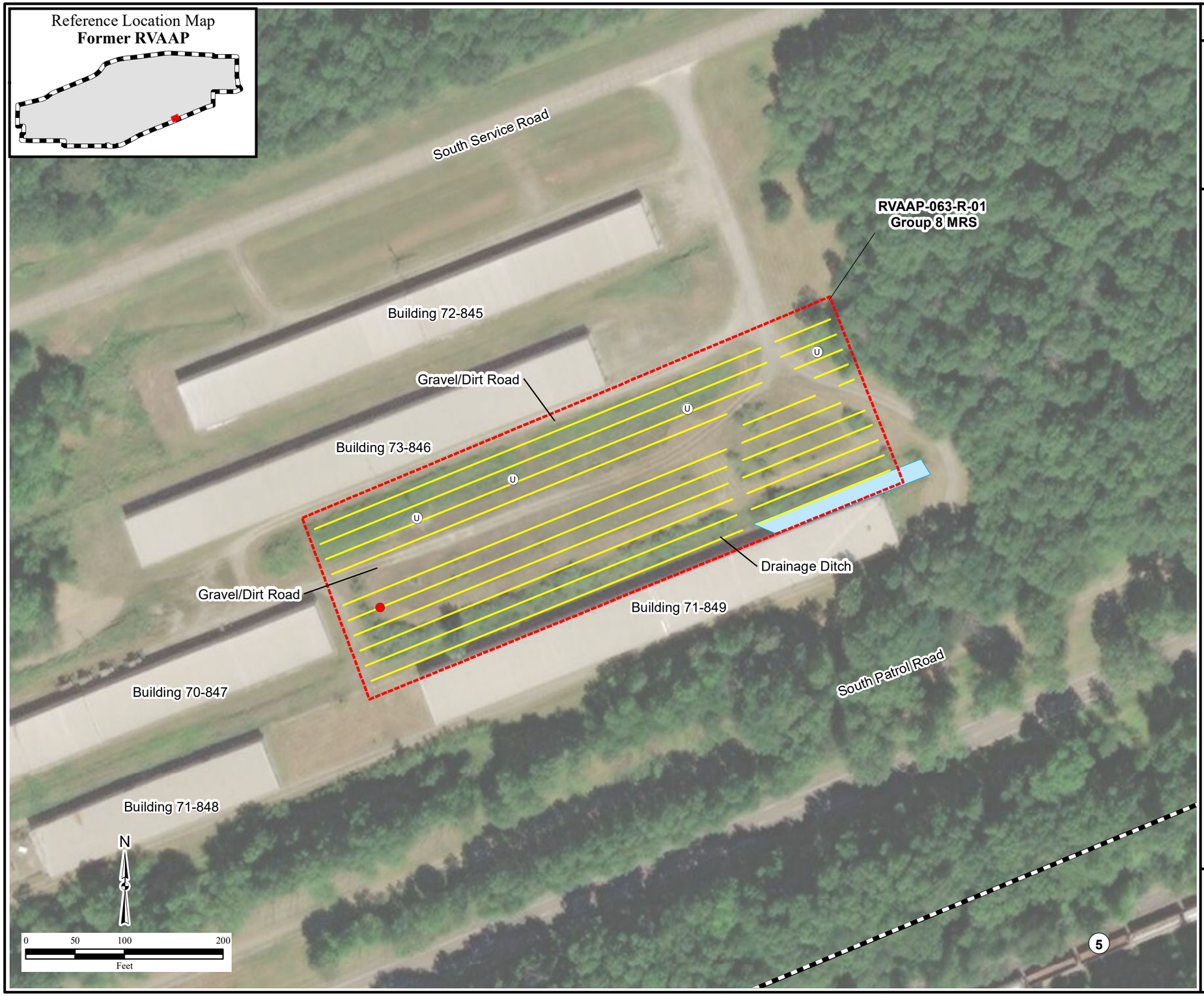
Figure 3
2008 Site Inspection Results
Group 8 MRS
Former RVAAP
Portage and Trumbull Counties, Ohio



Legend

- MPPEH (T-Bar Fuzes)
- Utility Pole
- Line Abreast Survey Area
- Standing Water
- MRS
- Installation Boundary

Notes:
MPPEH=material potentially presenting an explosive hazard
MRS=munitions response site
RVAAP=Ravenna Army Ammuntion Plant

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10/8/2019 JG
Source: HGL,CB&I, USACE, e²M
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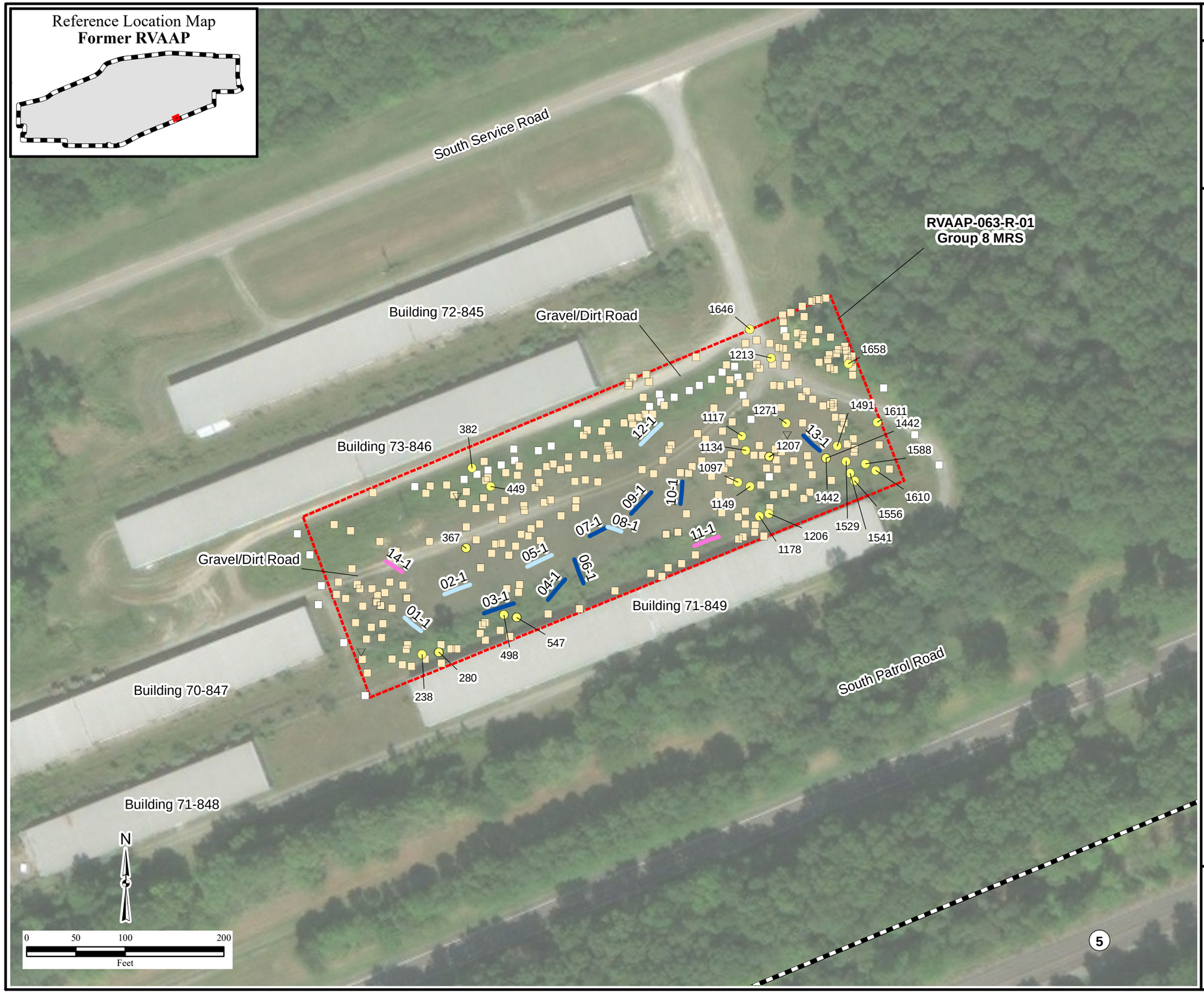
Figure 4
2015 Remedial Investigation Results
Group 8 MRS
Former RVAAP
Portage and Trumbull Counties, Ohio



Legend

Single Anomaly Results
- Control Point (QC)
- MDAS
- Other Debris
- Surface Metal

Trench Results
- MDAS Identified
- MDAS and Other Debris Identified
- Other Debris Identified

- MRS
- Installation Boundary

Notes:
MDAS=material documented as safe
MRS=munitions response site
QC=quality control
RVAAP=Ravenna Army Ammuntion Plant

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Source: HGL,CB&I, USACE, e²M
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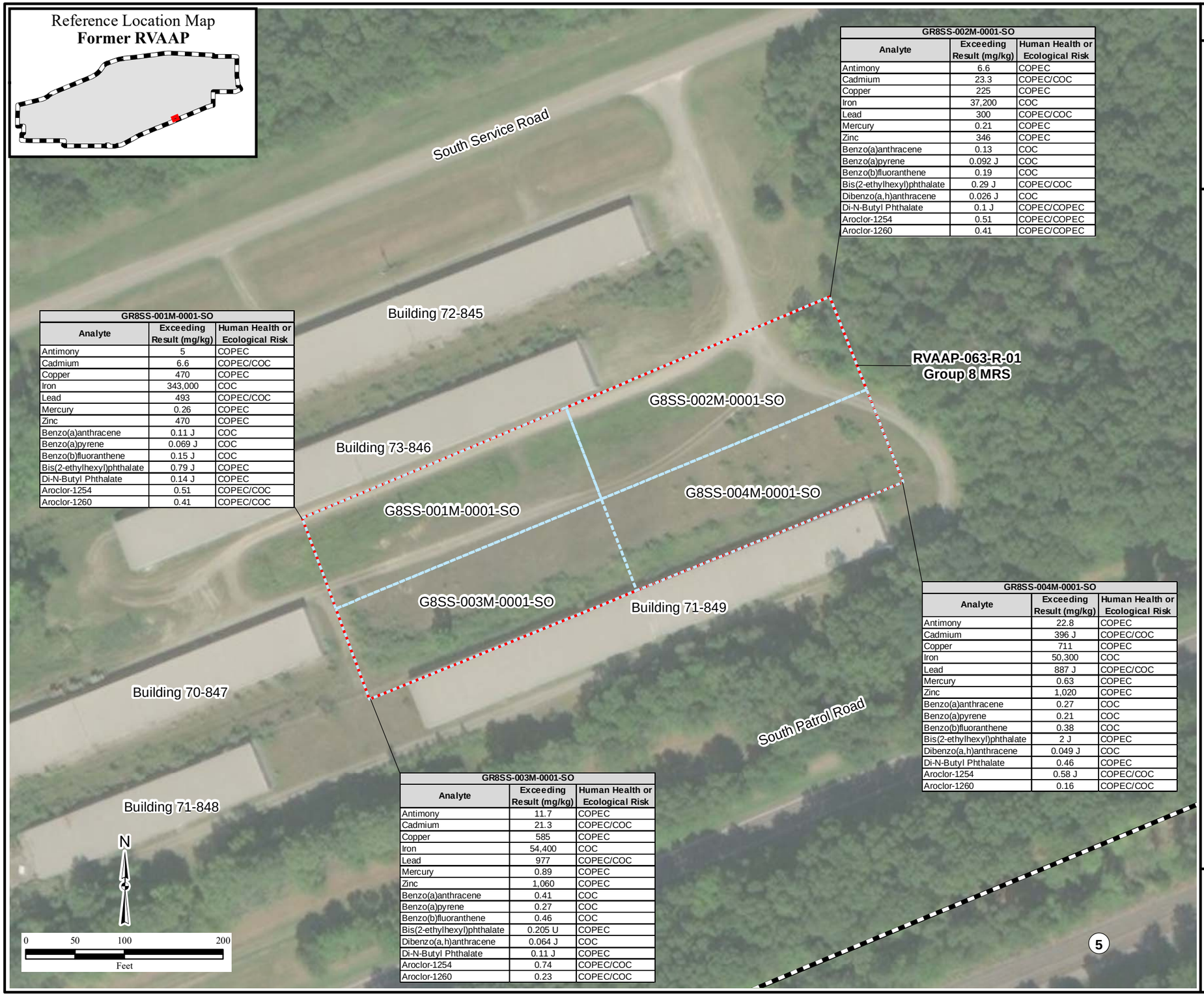
Figure 5
2015 Remedial Investigation
Delineated MC Contamination
Surface Soil Only
Former RVAAP
Portage and Trumbull Counties, Ohio



GR8SS-001M-0001-SO		
Analyte	**Exceeding Result (mg/kg)**	**Human Health or Ecological Risk**
Antimony	5	COPEC
Cadmium	6.6	COPEC/COC
Copper	470	COPEC
Iron	343,000	COC
Lead	493	COPEC/COC
Mercury	0.26	COPEC
Zinc	470	COPEC
Benzo(a)anthracene	0.11 J	COC
Benzo(a)pyrene	0.069 J	COC
Benzo(b)fluoranthene	0.15 J	COC
Bis(2-ethylhexyl)phthalate	0.79 J	COPEC
Di-N-Butyl Phthalate	0.14 J	COPEC
Aroclor-1254	0.51	COPEC/COC
Aroclor-1260	0.41	COPEC/COC

GR8SS-002M-0001-SO		
Analyte	**Exceeding Result (mg/kg)**	**Human Health or Ecological Risk**
Antimony	6.6	COPEC
Cadmium	23.3	COPEC/COC
Copper	225	COPEC
Iron	37,200	COC
Lead	300	COPEC/COC
Mercury	0.21	COPEC
Zinc	346	COPEC
Benzo(a)anthracene	0.13	COC
Benzo(a)pyrene	0.092 J	COC
Benzo(b)fluoranthene	0.19	COC
Bis(2-ethylhexyl)phthalate	0.29 J	COPEC/COC
Dibenzo(a,h)anthracene	0.026 J	COC
Di-N-Butyl Phthalate	0.1 J	COPEC/COPEC
Aroclor-1254	0.51	COPEC/COPEC
Aroclor-1260	0.41	COPEC/COPEC

GR8SS-003M-0001-SO		
Analyte	**Exceeding Result (mg/kg)**	**Human Health or Ecological Risk**
Antimony	11.7	COPEC
Cadmium	21.3	COPEC/COC
Copper	585	COPEC
Iron	54,400	COC
Lead	977	COPEC/COC
Mercury	0.89	COPEC
Zinc	1,060	COPEC
Benzo(a)anthracene	0.41	COC
Benzo(a)pyrene	0.27	COC
Benzo(b)fluoranthene	0.46	COC
Bis(2-ethylhexyl)phthalate	0.205 U	COPEC
Dibenzo(a,h)anthracene	0.064 J	COC
Di-N-Butyl Phthalate	0.11 J	COPEC
Aroclor-1254	0.74	COPEC/COC
Aroclor-1260	0.23	COPEC/COC

GR8SS-004M-0001-SO		
Analyte	**Exceeding Result (mg/kg)**	**Human Health or Ecological Risk**
Antimony	22.8	COPEC
Cadmium	396 J	COPEC/COC
Copper	711	COPEC
Iron	50,300	COC
Lead	887 J	COPEC/COC
Mercury	0.63	COPEC
Zinc	1,020	COPEC
Benzo(a)anthracene	0.27	COC
Benzo(a)pyrene	0.21	COC
Benzo(b)fluoranthene	0.38	COC
Bis(2-ethylhexyl)phthalate	2 J	COPEC
Dibenzo(a,h)anthracene	0.049 J	COC
Di-N-Butyl Phthalate	0.46	COPEC
Aroclor-1254	0.58 J	COPEC/COC
Aroclor-1260	0.16	COPEC/COC

Legend

- Surface ISM Soil Sample Area
- MRS
- Installation Boundary

HHRA COCs - Surface Soil Only
Resident Receptor
Aroclor-1254
Aroclor-1260
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Cadmium
Dibenzo(a,h)anthracene
Iron
Lead
National Guard Trainee
Cadmium
Lead
ERA COPECs - Surface Soil Only
Antimony
Aroclor-1254
Aroclor-1260
Bis(2-ethylhexyl)phthalate
Cadmium
Copper
Di-N-Butyl Phthalate
Lead
Mercury
Zinc

Notes:
Surface soil defined as 0 ft bgs to 0.5 ft bgs.

COC=Chemical of Concern
COPEC=Chemical of Potential Ecological Concern
ERA=Ecological Risk Assessment
ft bgs=feet below ground surface
HHRA=Human Health Risk Assessment
ISM=incremental sampling method
J=estimated value
MC=munitions constituent
mg/kg=milligrams per kilogram
MRS=munitions response site
RVAAP=Ravenna Army Ammuntion Plant
U=undetected

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2/8/2019 TH
Source: HGL,CB&I, USACE, e²M
ArcGIS Online Imagery

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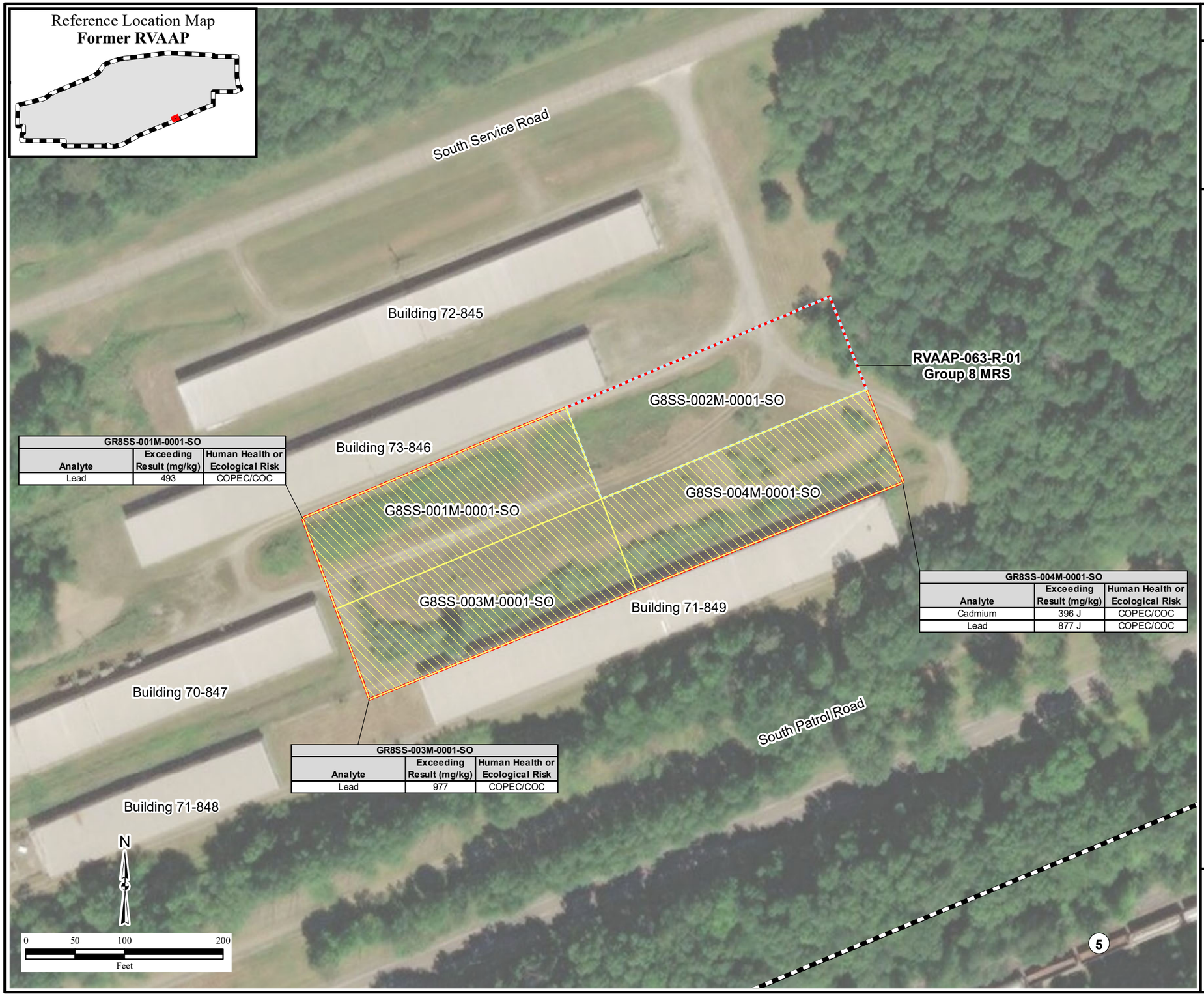
Figure 6
2019 Feasibility Study
Risk Management Evaluation
Delineated MC Contamination
Former RVAAP
Portage and Trumbull Counties, Ohio



Legend

- Excavation Area
- Surface ISM Soil Sample Area
- MRS
- Installation Boundary

HHRA COCs - Surface Soil Only
Resident Receptor
Aroclor-1254
Aroclor-1260
Benzo(a)anthracene
Benzo(a)pyrene
Benzo(b)fluoranthene
Cadmium
Dibenzo(a,h)anthracene
Iron
Lead
National Guard Trainee
Cadmium
Lead
ERA COPECs - Surface Soil Only
Antimony
Aroclor-1254
Aroclor-1260
Bis(2-ethylhexyl)phthalate
Cadmium
Copper
Di-N-Butyl Phthalate
Lead
Mercury
Zinc
No habitat present onsite

Notes:
Surface soil defined as 0 ft bgs to 0.5 ft bgs.

COC=Chemical of Concern
COPEC=Chemical of Potential Ecological Concern
ERA=Ecological Risk Assessment
ft bgs=feet below ground surface
HHRA=Human Health Risk Assessment
ISM=incremental sampling method
J=estimated value
MC=munitions constituent
mg/kg=milligrams per kilogram
MRS=munitions response site
RVAAP=Ravenna Army Ammuntion Plant

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10/8/2019 JG
Source: HGL,CB&I, USACE, e²M
ArcGIS Online Imagery

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