

**Final
No Further Action Record of Decision for
RVAAP-033-R-01 Firestone Test Facility Munitions Response Site
Version 1.0**

**Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio**

**Contract No. W912DR-09-D-0005
Delivery Order No. 0002**

Prepared for:



**US Army Corps
of Engineers®
U.S. Army Corps of Engineers
Baltimore District
10 S. Howard Street, Room 7000
Baltimore, Maryland 21201**

Prepared by:

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150 Royall Street
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August 14, 2015

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The views, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy or decision, unless designated by other documentation.

14. ABSTRACT
This Record of Decision (ROD) provides the final remedy of No Further Action (NFA) that was selected for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site (MRS) at the former Ravenna Army Ammunition Plant under the Military Munitions Response Program (MMRP). The selection of the final remedy included a public meeting that was presented by the U.S. Army followed by a 30-day public comment period in accordance with its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulations 300). The recommendation of NFA at the MRS under the MMRP is protective of human health and the environment and meets the statutory requirements for cleanup standards established in Section 121 of CERCLA.

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Reset



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

September 21, 2015

**Re: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Approval
Remedial Response
Portage County
267000859209**

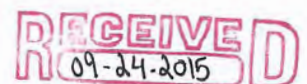
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Subject: Approval of the "Final No Further Action Record of Decision for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site, Version 1.0" Former Ravenna Army Ammunition Plant, Ravenna, Ohio: Dated August 14, 2015 (Work Activity No. 267-000859-209)

Dear Mr. Leeper:

Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the, "Final No Further Action Record of Decision for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site, Version 1.0" document dated August 14, 2015. This document received by Ohio EPA's NEDO on August 14, 2015, was prepared by CB&I Federal Services LLC.

The Military Munitions Response Program (MMRP) Remedial Investigation (RI) for the Firestone Test Facility munitions response site investigated the potential presence of munitions debris and munitions of explosives of concern within the defined portion of the Firestone Test Facility area. As there are no further comments or potential issues to address for the Firestone Test Facility munitions response site, Ohio EPA concurs with the remedy of no further action and has signed and dated the final record of decision for the Firestone Test Facility area of concern and will submit a signed copy for your records.



MR. MARK LEEPER, P.G., MBA
ARMY NATIONAL GUARD DIRECTORATE
SEPTEMBER 2, 2015
PAGE 2

If you have any questions or concerns, please do not hesitate to contact me at (614) 644-2896.

Sincerely,



Peter Whitehouse
Division Chief
Division of Environmental Response and Revitalization

PW:NCR/nvr

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CB&I—CB&I Federal Services LLC

Ohio EPA—Ohio Environmental Protection Agency

RVAAP—former Ravenna Army Ammunition Plant

USACE—United States Army Corps of Engineers

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Acronyms and Abbreviations

µg/L	micrograms per liter
AMEC	AMEC Earth and Environmental, Inc.
amsl	above mean sea level
AOC	Area of Concern
ARNG	U.S. Army National Guard
bgs	below ground surface
Camp Ravenna	Camp Ravenna Joint Military Training Center
CB&I	CB&I Federal Services LLC
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i>
cm/s	centimeters per second
COC	chemical of concern
COL	colonel
Community Relations Plan	<i>Community Relations Plan for the Ravenna Army Ammunition Plan Restoration Program in Portage and Trumbull Counties, Ohio</i>
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
Cr ⁺³	trivalent chromium
DERR	Division of Environmental Response and Revitalization
DFFO	<i>Director's Final Findings and Orders (DFFO) for RVAAP</i>
DGM	digital geophysical mapping
e ² M	engineering-environmental Management, Inc.
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
FWCUG	Facility-Wide Cleanup Goal
HA	Hazard Assessment
HHRA	human health risk assessment
HHRAM	<i>RVAAP's Facility-Wide Human Health Risk Assessor Manual</i>
IRP	Installation Restoration Program
ISM	incremental sampling methodology
MC	munitions constituents
MEC	munitions and/or explosives of concern
mg/kg	milligrams per kilogram
MKM	MKM Engineers, Inc.
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
NCP	<i>National Oil and Hazardous Substances Pollution Contingency Plan</i>
NFA	No Further Action
NFA Proposed Plan	<i>No Further Action Proposed Plan for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site</i>
OHARNG	Ohio Army National Guard

Acronyms and Abbreviations (continued)

Ohio EPA	Ohio Environmental Protection Agency
RAB	Restoration Advisory Board
RI	Remedial Investigation
RI Report	Final <i>Remedial Investigation for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site</i>
ROD	Record of Decision
RVAAP	former Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
Shaw	Shaw Environmental & Infrastructure, Inc.
SI	Site Inspection
SRC	site-related chemical
TNT	trinitrotoluene
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
Work Plan	Final <i>Work Plan for Military Munitions Response Program Remedial Investigation Environmental Services</i>

PART I: DECLARATION

A. Site Name and Location

This No Further Action (NFA) Record of Decision (ROD) addresses investigations conducted at RVAAP-033-R-01 Firestone Test Facility Munitions Response Site (MRS) under the Military Munitions Response Program (MMRP) at the former Ravenna Army Ammunition Plant (RVAAP), now known as the Camp Ravenna Joint Military Training Center (Camp Ravenna). Camp Ravenna is located in east-central Portage County and southwestern Trumbull County, Ohio, approximately 3 miles east-northeast of Ravenna and approximately 1 mile northeast of the city of Newton Falls (**Figure 1**). The Firestone Test Facility MRS is located at the south-central portion of Camp Ravenna within the boundaries of Load Line #6 (**Figure 2**). The United States (U.S.) Environmental Protection Agency (EPA) *Comprehensive Environmental Response, Compensation, and Liability Information System* Identifier for Camp Ravenna is OH5210020736.

B. Statement of Basis and Purpose

The U.S. Army National Guard (ARNG) is the lead agency and presents the decision that NFA is considered as the recommended alternative for the Firestone Test Facility MRS. NFA is selected in accordance with the requirements of the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) of 1980, as amended by the *Superfund Amendments and Reauthorization Act* of 1986 and the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP). The ARNG's decision is based on information contained in the Administrative Record file for the Firestone Test Facility MRS.

The Ohio Environmental Protection Agency (Ohio EPA), the lead regulatory agency, as per the *Director's Final Findings and Orders (DFFO) for RVAAP* (DFFO; Ohio EPA, 2004), reviewed and concurred with the *No Further Action Proposed Plan for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site* (NFA Proposed Plan; CB&I Federal Services [CB&I], 2015). The NFA Proposed Plan presented the ARNG's preliminary recommendations concerning how best to address the Firestone Test Facility MRS where no munitions and/or explosives of concern (MEC) were found that had the potential to originate from historical activities associated with manufacturing, storing, transporting, testing, training, and/or disposal that occurred at the facility. The NFA decision under the MMRP at this MRS satisfies the requirements of the DFFO (Ohio EPA, 2004).

C. Description of the Selected Remedy

NFA under CERCLA is necessary for the Firestone Test Facility MRS under the MMRP. No evidence of MEC was found at the MRS during the Remedial Investigation (RI) field work

that was conducted under the MMRP. The MRS was further evaluated for munitions constituents (MC) at locations specified in the Final *Work Plan for Military Munitions Response Program Remedial Investigation Environmental Services* (Work Plan; Shaw Environmental & Infrastructure, Inc. [Shaw], 2011), and no chemicals of concern (COCs) or chemicals of potential ecological concern (COPECs) that presented potential risks to human or environmental receptors, respectively, were found. The MRS is collocated with a designated Installation Response Program (IRP) Area of Concern (AOC), Load Line #6. COCs identified in the environmental media at the collocated AOC, if any, have either already been addressed or will continue to be addressed under future CERCLA decisions to be carried out under the IRP.

D. Statutory Determination

No MEC were encountered at the Firestone Test Facility MRS, and there are no explosive hazards or sources for MC. The recommendation of NFA at the MRS under the MMRP is protective of human health and the environment and meets the statutory requirements for cleanup standards established in Section 121 of CERCLA.

E. Authorizing Signature

Approved by:



HALLET BRAZELTON, JR.
Acting Chief,
I&E, Army National Guard

11/12/19
Date

PART II: DECISION SUMMARY

A. Site Name, Location, and Description

Camp Ravenna, formerly known as the RVAAP, is located in northeastern Ohio within Portage and Trumbull Counties and is approximately 3 miles east-northeast of the City of Ravenna and 1 mile west-northwest of the City of Newton Falls. The facility is federally owned and 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; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Newton Falls, Charlestown, and Wayland (**Figure 1**).

Camp Ravenna was formerly utilized as a load, assemble, and pack facility. Administrative control of the 21,683-acre facility has been transferred to the U.S. Property and Fiscal Officer for Ohio in a series of transfers with the last one taking place in September 2013. The property is licensed to the Ohio Army National Guard (OHARNG) for use as a military training site, Camp Ravenna. When the RVAAP was operational, Camp Ravenna did not exist and the entire 21,683-acre parcel was a federal government-owned, contractor-operated, industrial facility. The RVAAP restoration program involves cleanup of former production areas across the facility related to former operations under the RVAAP.

The Firestone Test Facility is 0.41 acres in size and is located on the southwest side of the Load Line #6 Fuze and Booster AOC. Load Line #6 is located at the south-central portion of Camp Ravenna (**Figure 2**). The MRS is currently undeveloped, vacant land with no improvements (CB&I, 2014). **Figure 3** presents the current MRS boundaries and cultural features that remain near the Firestone Test Facility MRS.

B. Site History

The RVAAP was constructed between 1940 and 1941 for depot storage and ammunition assembly/loading. During operations as an ammunition plant, the RVAAP was a government-owned and contractor-operated industrial facility. Industrial operations at the facility 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 (mixture of TNT and Research Department Explosive) into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls were cleaned with water and steam. Following cleaning, the “pink water” waste water, 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 were used to manufacture fuzes, primers, and boosters. From 1946 to 1949, Load Line 12 was used to produce ammonium nitrate for explosives and fertilizers prior to use as a weapons demilitarization facility.

In 1950, the facility was placed in standby status and operations were limited to renovation, demilitarization, and normal maintenance of equipment, along with storage of munitions. Production activities were resumed from July 1954 to October 1957 and again from May 1968 to August 1972. In addition to production missions, various demilitarization activities were conducted at facilities constructed at Load Lines 1, 2, 3, and 12. Demilitarization activities included disassembly of munitions and explosives melt-out and recovery operations using hot water and steam processes. Periodic demilitarization of various munitions continued through 1992.

In addition to production and demilitarization activities at the load lines, other facilities at the RVAAP include MRSs that were used for the burning, demolition, and testing of munitions. These burning and demolition grounds consist of large parcels of open space or abandoned quarries. Other AOCs present at the facility include landfills, an aircraft fuel tank testing area, and various general industrial support and maintenance facilities (Science Applications International Corporation [SAIC], 2011).

The Firestone Test Facility was an approximately 1-acre area that consisted of three buildings, a test pond, and a suspected test range. Two of the buildings were used as a test chamber for tube-launched, optically-tracked, wire-guided missiles and Dragon missiles, while shaped charges were tested under water at the test pond. Due to the classified nature of the research that was conducted at the Firestone Test Facility, there is little available information regarding the activities that occurred or how the tests were conducted (SAIC, 1996). The tests that were conducted were reportedly contained, which limited any release of MEC (engineering-environmental Management, Inc. [e²M], 2007). A third, smaller building was located adjacent to the former test pond that was used for testing shaped charges. The building, which measured 10 feet high and 10 feet square, was constructed of reinforced concrete and fitted with steel plates, and was surrounded by a barricade constructed of railroad ties. All three buildings have been removed, and the areas have been cleared of surface construction debris. Some buried construction debris is evident in the area around the former test pond due to mounded areas with rebar protruding through the ground surface. The MRS is currently 0.41 acres and is the location of the former building and area around the former test pond.

B.1 e²M 2007 Site Investigation

Field investigations have been ongoing at the Firestone Test Facility under the MMRP since 2007 when the Site Inspection (SI) was conducted by e²M. No MEC were found at the MRS during the SI field activities; however, various subsurface anomalies were detected that were not verified during the SI. Surface soil samples for MC associated with munitions that may have been tested at the MRS were not collected around the former test chambers or test pond during the SI, as chemical contamination in this area was being investigated under the IRP.

One surface sample was collected during the SI field work using the incremental sampling methodology (ISM). The samples was collected at the suspected test range area at the northeast boundary of Load Line #6 that is no longer considered part of the MRS. The sample was analyzed for Target Analyte List metals using EPA Method SW846 6010C and for explosives and propellants using EPA Method 8330B. No results for MC in the soil sample exceeded the EPA Preliminary Remediation Goals, which were the screening criteria at the time of the SI.

Following the SI field work, it was concluded that there was a potential for MEC around the perimeter and bottom of the former test pond and adjacent to the former shaped charge test chamber building. It was recommended that the MRS be reduced from 0.91 acres to 0.41 acres to include these areas for further characterization to address the MEC concerns. Due to the lack of detected MC in the open area located outside of the MRS and that sampling investigations at the remaining portions of the MRS were being conducted under the IRP, additional characterization of MC at the MRS was not recommended following the SI field work (e²M, 2008).

B.2 CB&I 2011 Remedial Investigation

Between May and August 2011, CB&I conducted the field work for the RI under the MMRP at the Firestone Test Facility MRS. The purpose of the RI was to determine whether the Firestone Test Facility MRS warranted further response action pursuant to CERCLA and the NCP. More specifically, the RI was intended to determine the nature and extent of MEC and MC and to subsequently identify the potential hazards and risks posed to likely human and ecological receptors by MEC and MC.

The activities included a full-coverage digital geophysical mapping (DGM) survey at accessible areas, an intrusive investigation of subsurface anomalies, and an underwater tactile investigation within the former test pond. Sampling was conducted in environmental media at the MRS to verify that there was no MC present that represented risks to potential receptors. The sampling was conducted regardless of the recommendation in the SI phase that additional characterization for MC was not warranted.

The full-coverage DGM survey was conducted at the MRS during the RI field work to identify potential subsurface areas of MEC. No MEC were identified on the ground surface during the DGM survey or in the subsurface at anomaly locations that were selected for intrusive investigation (CB&I, 2014).

An underwater tactile investigation was performed at the former shaped charge test pond during the RI field work to examine for potential MEC items buried within the pond sediment. No MEC were found during the underwater investigation (CB&I, 2014).

Characterization for MC at the MRS during the RI included the evaluation of wet sediment samples that were collected from the former test pond, one surface soil sample that was collected from around the former test pond, and one surface water sample that was collected within the former test pond. The wet sediment samples were discrete (grab) samples along the edge of the pond, and the surface soil sample was collected using ISM. The surface water sample was a grab sample collected at the center depth (6 to 7 feet) of the pond.

The locations for the surface soil and sediment samples were specified in the Work Plan (Shaw, 2011). The soil and sediment samples were analyzed for the following metals: aluminum, antimony, barium, cadmium, chromium (total and hexavalent), copper, iron, lead, mercury, strontium, and zinc using EPA Methods SW846 6010C/7471A/7196A; explosives by EPA Method SW846 8330B; nitrocellulose by EPA Method SW846 9056; total organic carbon by the Lloyd Kahn Method; and pH by EPA Method SW846 9045D.

The surface water sample was analyzed for the following metals: aluminum, antimony, barium, cadmium, calcium, total chromium, copper, iron, lead, magnesium, manganese, mercury, strontium, and zinc; explosives; and propellants by the aforementioned EPA SW846 methods. The surface water sample was also analyzed for polychlorinated biphenyls using EPA Method SW846 8082A, pesticides using EPA Method SW846 8081B, semivolatile organic compounds using EPA Method SW846 8270C, and volatile organic compounds using EPA Method SW846 8260B.

The MC sample results were evaluated using the RVAAP data screening process presented in the *Final Facility-Wide Human Health Cleanup Goals for the Ravenna Army Ammunition Plant* (SAIC, 2010) that provides guidance for performing a statistical analysis of the results and as well as a comparison of the results against established facility-wide background value (inorganics only). The site-related chemicals (SRCs) that were retained for evaluation in the risk assessments included the following inorganics that exhibited concentrations above the applicable background levels: copper at an estimated concentration (i.e., "J" flagged) of 56.7 milligrams per kilogram (mg/kg) and cadmium at 0.25 mg/kg in surface soil; aluminum at 14,700 mg/kg, antimony at estimated concentrations of 0.72 and 0.98 mg/kg, cadmium at

concentrations of 0.16 and 0.21 mg/kg, copper at concentrations of 34.3 and 50 mg/kg, and lead at 48.2 mg/kg in sediment; and chromium at an estimated concentration of 1.3 micrograms per liter ($\mu\text{g/L}$), copper at 10.8 $\mu\text{g/L}$, lead at an estimated concentration of 2.8 $\mu\text{g/L}$, and strontium at 42.5 $\mu\text{g/L}$ in surface water (CB&I, 2014). The detected concentrations were considered to be low and were all below the applicable risk screening levels. Further discussions of human and ecological risks are provided in more detail in Section G.

C. Highlights of Community Participation

Using the RVAAP community relations program, the ARNG and the Ohio EPA have interacted with the public through news releases, public meetings, reading materials, direct mailing, an internet website, and receiving and responding to public comments. Specific items of the community relations program include the following:

- **Restoration Advisory Board (RAB):** The U.S. Army established the RAB in 1996 to promote community involvement in the U.S. Department of Defense environmental cleanup activities and to allow the public to review and discuss the progress with decision makers. RAB meetings are typically held every 4 months, except during the summer months, and are open to the public.
- **RVAAP Community Relations Plan:** The Final *Community Relations Plan for the Ravenna Army Ammunition Plan Restoration Program in Portage and Trumbull Counties, Ohio* (Community Relations Plan; U.S. Army Corps of Engineers [USACE], 2015) was prepared to establish processes to keep the public informed of activities being conducted as part of the RVAAP restoration program.
- **RVAAP Internet Website:** The U.S. Army established an internet website in 2004 for the RVAAP restoration program. This internet website is accessible to the public at www.rvaap.org.

In accordance with Section 117(a) of CERCLA and Section 300.430(f)(2) of the NCP, the ARNG released the NFA Proposed Plan for the Firestone Test Facility MRS (CB&I, 2015) to the public in May 2015. The NFA Proposed Plan and other project-related documents were made available to the public in the Administrative Record maintained at Camp Ravenna and in the two Information Repositories at Reed Memorial Library in Ravenna, Ohio and Newton Falls Public Library in Newton Falls, Ohio. The notice of availability for the NFA Proposed Plan was sent to the following media outlets: radio stations, television stations, and newspapers (*Newton Falls Press*, *Youngstown Vindicator*, *Warren Tribune-Chronicle*, *Akron Beacon Journal*, and *Ravenna Record Courier*), as specified in the Community Relations

Plan (USACE, 2015). The notice of availability initiated the 30-day public comment period beginning May 27, 2015, and ending June 26, 2015.

The ARNG held a public meeting on June 3, 2015, at the Newton Falls Community Center, 52 East Quarry Street, Newton Falls, Ohio 44444, to present the NFA Proposed Plan to the public. At this meeting, representatives of the U.S. Army provided information and answered questions about the results of the MMRP-related investigations at the Firestone Test Facility MRS. A transcript of the public meeting is available to the public and has been included in the Administrative Record. Responses to the verbal and written comments received at this meeting and during the public comment period are included in the Responsiveness Summary, which is Part III of this ROD. The ARNG considered the public's input from the public meeting on the NFA Proposed Plan in selecting NFA under the MMRP at the Firestone Test Facility MRS.

D. Scope and Role of Response Action

Load Line #6, inclusive of the Firestone Test Facility MRS, is federal property, which is licensed to the OHARNG for use as a military training site. The purpose of the RI field work was to evaluate for the presence of MEC and MC associated with the historical activities at the MRS in support of the intended future use. This NFA ROD addresses surface soil, wet sediment, and surface water at the MRS where the release of MEC and MC associated with the historical testing of shaped charges may have occurred. The selected remedy at any MRS must also be protective of groundwater, which is monitored under the facility-wide groundwater monitoring program and in accordance with the DFFO (Ohio EPA, 2004).

Due to former operations and the fact that the site is still being investigated under the IRP, the potential exists for non-MMRP COCs or other non-munitions-related hazards to be present at the Firestone Test Facility MRS. Response actions associated with non-MMRP-related hazards will be addressed under the IRP and are not included in this NFA ROD.

E. Summary of Site Characteristics

Characteristics, nature and extent of contamination, and the conceptual site model for the Firestone Test Facility MRS are based on the various assessments, investigations, and/or removal actions that were conducted at the MRS.

E.1 Topography/Physiography

This section presents the discussion of the topography and physiography characteristics at Camp Ravenna and the Firestone Test Facility MRS. Camp Ravenna, in general, is located within the Southern New York section of the Appalachian Plateaus physiographic province. Rolling topography containing incised streams and dendritic drainage patterns are prevalent

in the province. Rounded ridges, filled major valleys, and areas covered with glacially derived unconsolidated deposits were the product of glaciation in the Southern New York section. In addition, bogs, kettle lakes, and kames are evidence of past glacial activity in the province; however, none are located at the MRS. Old stream drainage patterns were disturbed and wetlands were created within the province as a result of past glacial activity (e²M, 2008).

The topography at the Firestone Test Facility MRS is relatively flat to gently sloping towards the natural drainage channel to the east and adjacent to the MRS. The ground surface elevation at the MRS is approximately 1,115 feet above mean seal level (amsl). Natural drainage at the MRS is towards the drainage ditch that runs along the eastern boundary of the MRS or the former man-made test pond (CB&I, 2014).

E.2 Soils and Geology

This section presents the discussion of the soils and geology characteristics at Camp Ravenna and at the Firestone Test Facility MRS. Based on regional geology, the facility consists of Mississippian- and Pennsylvanian-age bedrock strata, which dips to the south at approximately 5 to 10 feet per mile. The bedrock is overlain by unconsolidated glacial deposits of varying thickness.

Bedrock is overlain by deposits of Wisconsin-age Lavery Till and Hiram Till in the western and eastern portions of the facility, respectively. The thickness of the glacial deposits varies throughout the facility, ranging from ground surface in parts of the eastern portion of the facility to an estimated 150 feet in the south-central portion of the facility.

Bedrock is present near the ground surface in many locations at Camp Ravenna, particularly at the east end of the facility. Where glacial deposits are still present, their distribution and character are indicative of ground moraine origin. Laterally discontinuous groupings of yellow-brown, brown, and gray silty clays to clayey silts, with sand and rock fragments are present. Glacial-age standing-water-body deposits may be present at the facility, in the form of uniform light gray silt deposits over 50 feet thick. At approximately 200 feet below ground surface (bgs), the Mississippian Cuyahoga Group is present throughout most of the facility. In the northeastern corner of the facility, the Meadville Shale Member of the Cuyahoga Group is present close to the surface. The Meadville Shale Member of the Cuyahoga Group is blue-gray silty shale characterized by alternating thin beds of sandstone and siltstone.

The Sharon Member of the Pennsylvanian Pottsville Formation unconformably overlies the Meadville Shale Member of the Mississippian Cuyahoga Group. A relief of as much as 200 feet exists in Portage County, which can be seen in the Sharon Member thickness variations. The Sharon Member is made up of shale and a conglomerate.

The Sharon Member conglomerate unit is identified as highly porous, permeable, cross-bedded, frequently fractured, and weathered quartzite sandstone, which is locally conglomeratic and has an average thickness of 100 feet. A thickness of as much as 250 feet exists in the Sharon Conglomerate where it was deposited in a broad channel cut into Mississippian rocks. In marginal areas of the channel, the conglomerate unit may thin out to approximately 20 feet, or in places, it may be missing owing to nondeposition on the uplands of the early Pennsylvanian erosional surface. Thin shale lenses occur intermittently within the upper part of the conglomerate unit.

The Sharon Member shale unit is identified as a light to dark gray fissile shale, which overlies the conglomerate in some locations; however, it has been eroded throughout the majority of the facility. The Sharon Member outcrops in many locations in the eastern half of the facility.

The remaining members of the Pottsville Formation overlie the Sharon Member in the western portion of the facility. Due to erosion and because the land surface is above the level of deposition, the Pottsville Formation is not found in the eastern half of the facility.

The Connoquenessing Sandstone Member, which is sporadic, relatively thin-channel sandstone comprised of gray to white, coarse-grained quartz with a higher percentage of feldspar and clay than the Sharon Conglomerate, unconformably overlies the Sharon Member. The Mercer Member, which is found above the Connoquenessing Sandstone Member, consists of silty to carbonaceous shale with many thin and discontinuous lenses of sandstone in its upper part. The Homewood Sandstone Member unconformably overlies the Mercer Member and consists of the uppermost unit of the Pottsville Formation. The Homewood Sandstone Member ranges from well-sorted, coarse-grained, white quartz sandstone to a tan, poorly sorted, clay-bonded, micaceous, medium- to fine-grained sandstone. The Homewood Sandstone Member occurs as a caprock on bedrock highs in the subsurface (MKM Engineers, Inc. [MKM], 2007).

The soils identified at the facility are generally derived from the Wisconsin-age silty clay glacial till. The majority of native soil at the facility has been reworked or removed during construction activities (MKM, 2007). The major soil types found at the facility are silt or clay loams, ranging in permeability from 6.0×10^{-7} to 1.4×10^{-3} centimeters per second (cm/s) (U.S. Department of Agriculture [USDA] et al., 1978).

The Firestone Test Facility MRS is located over the Mercer Member, and the bedrock elevation is approximately 1,100 feet amsl (MKM, 2007). The estimated depth to bedrock at the MRS is between 13 and 20 feet bgs (SAIC, 2011).

The soil type at the Firestone Test Facility MRS is the Mahoning silt loam with 0 to 2 percent slope (SAIC, 2011). The Mahoning silt loam is characterized with medium to rapid runoff, severe seasonal wetness, and slow permeability. The average permeability of the Mahoning silt loam is 9.1×10^{-5} cm/s (USDA et al., 1978).

E.3 Hydrology and Hydrogeology

This section presents the discussion of the hydrology and hydrogeology characteristics at Camp Ravenna and the Firestone Test Facility MRS. The facility is located within the Ohio River Basin. The major surface stream at the facility is the west branch of the Mahoning River, which flows adjacent to the western end of the facility, generally from north to south, before flowing into the Michael J. Kirwan Reservoir. After leaving the reservoir, the west branch joins the Mahoning River east of the facility.

Surface water features within Camp Ravenna include a variety of streams, lakes, ponds, floodplains, and wetlands. Numerous streams drain the facility, including approximately 19 miles of perennial streams. The combined stream length at the facility is 212 linear miles (AMEC Earth and Environmental, Inc. [AMEC], 2008).

Three primary watercourses drain Camp Ravenna: (1) the south fork of Eagle Creek, (2) Sand Creek, and (3) Hinkley Creek. Eagle Creek and its tributaries, including Sand Creek, are designated as State Resource Waters. With this designation, the stream and its tributaries fall under the state's antidegradation policy. These waters are protected from any action that would degrade the existing water quality.

Approximately 153 acres of ponds are found on the facility. Most of the ponds were created by beaver activity or small man-made dams and embankments. Some were constructed within natural drainage ways to function as settling ponds for effluent or runoff (AMEC, 2008). Due the size and configuration of the former test pond at the Firestone Test Facility MRS, it was likely man-made to support the historical testing of shaped charges.

A planning-level survey (i.e., desktop review of wetlands data and resources [National Wetlands Inventory maps, aeriels, etc.]) for wetlands was conducted for the entire facility, including the MRS, and no wetlands have been identified at the Firestone Test Facility MRS. Wetlands located within the facility include seasonally saturated wetlands, wet fields, and forested wetlands. Sand and gravel aquifers are present within the buried-valley and outwash deposits in Portage County. In general, the aquifer is too thin and localized to provide large quantities of water; however, yields are sufficient for residential water supplies. Wells located on the facility were primarily located within the sandstone facies of the Sharon Member (MKM, 2007).

No bogs, kettle lakes, or kames have been identified as being present within the MRS (AMEC, 2008). Perennial surface water at the Firestone Test Facility MRS is limited to the former test pond, which was historically utilized for testing of shaped charges.

Surface water at the northern and eastern portions of the MRS flows to the drainage ditch that runs along the eastern boundary of the MRS. Surface water at the southeast portion of the MRS enters the man-made former test pond or the drainage ditch.

The estimated groundwater flow direction at the MRS is to the east-southeast approximately 5 feet bgs in primarily sandy silt (MKM, 2007). Potentiometric data indicate the groundwater table occurs within the unconsolidated formation throughout the AOC that is collocated with the MRS (Environmental Quality Management, Inc., 2012).

E.4 Ecology

This section presents the discussion of the ecological habitats and receptors at Camp Ravenna and at the Firestone Test Facility MRS. Camp Ravenna has a diverse range of vegetation and habitat resources. Habitats present within the facility include large tracts of closed-canopy hardwood forest, scrub/shrub open areas, grasslands, wetlands, and open-water ponds and lakes. Vegetation at the facility can be grouped into three categories: (1) herb dominated, (2) shrub dominated, and (3) tree dominated. Tree-dominated areas are most abundant, covering approximately 13,000 acres of the facility. Shrub vegetation covers approximately 4,200 acres. A plant species survey identified 18 vegetation communities on the facility. The facility has seven forest formations, four shrub formations, eight herbaceous formations, and one nonvegetated formation (AMEC, 2008).

Vegetation at the MRS has been influenced by man-made improvements associated with the former use of the MRS as a test area for shaped charges, and the vegetation community present at the Firestone Test Facility MRS is categorized as “other land” (AMEC, 2008). This category presumably refers to highly disturbed areas that do not support any particular plant community. Vegetation associated with aquatic and semiaquatic conditions (i.e., cattails) are present at the edges of the former test pond.

Biological inventories have not occurred specifically within the MRS boundary, although no confirmed sightings of federal- or state-listed species have been reported. Although there is the potential for federal, state-listed, or rare species to be within the MRS boundary, the potential is unlikely due to the minimal size of the MRS (Camp Ravenna, 2010).

E.5 Nature and Extent of Contamination

The determination of the nature and extent of contamination at the Firestone Test Facility MRS is based on the data collected during the RI field work under the MMRP and presented

in the Final *Remedial Investigation for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site* (RI Report; CB&I, 2014). Under the MMRP, the evaluation for nature and extent of contamination is inclusive of MEC and MC that may be present at an MRS. The presence of MEC and MC are known to be present at other MRSs at Camp Ravenna; however, those media and MRSs are being addressed separately from the Firestone Test Facility MRS included in this NFA ROD.

As outlined in the RI Report (CB&I, 2014), no evidence of MEC was found at the MRS. The MRS was further evaluated for MC at locations specified in the Work Plan (Shaw, 2011), and no COCs or COPECs that presented potential risks to human or environmental receptors, respectively, were found.

E.6 Contaminant Fate and Transport

The fate and transport analysis for the Firestone Test Facility MRS in the RI Report concluded that there were no MEC that justified concerns for explosive hazards. Since no MEC were found during the RI field activities at the MRS, there is no sources of potential release of MC and a fate and transport analysis for MC at the MRS was not required (CB&I, 2014).

F. Current and Potential Future Land Uses

Current activities at the Firestone Test Facility MRS include maintenance, environmental sampling, and natural resource management activities. Possible users associated with the current activities at the MRS include facility personnel, contractors, and potential trespassers (CB&I, 2014).

The OHARNG future use at the MRS is military training. The potential user for the future land use is the National Guard Trainee and the Engineering School Instructor (USACE, 2005).

G. Summary of Site Risks

The ISM surface soil and discrete sediment samples were collected at the Firestone Test Facility MRS to evaluate for the nature and extent of contamination associated with previous activities at the MRS and to determine whether or not there is unacceptable risk. The intent of the surface water sampling event was to evaluate options for investigating the former test pond sediment, which included approved and controlled discharge to the ground surface or manual diving operations. The results of the surface water sample were also used for the purposes of the RI to characterize the nature and extent of contamination of the surface water in the pond and to determine if there is any unacceptable risk associated with that medium at the MRS. The results from the RI field work, including the data results for MC, were used to

evaluate risk in terms of potential exposures associated with MEC and/or MC and evaluation of the potential transport pathways MEC and/or MC may take from a source to a receptor. Each pathway includes a source, activity, access, and receptor component with complete, potentially complete, or incomplete exposure pathways identified for each receptor.

Both a human health risk assessment (HHRA) and an ecological risk assessment (ERA) were performed to further evaluate the SRCs identified during the RI. The purpose of the HHRA was to evaluate whether site conditions may pose a risk to current or future human receptors. The ERA was conducted to evaluate the potential for adverse ecological effects to environmental receptors.

G.1 MEC Hazard Assessment

The Interim *Munitions and Explosives of Concern Hazard Assessment Methodology* (EPA, 2008) addresses human health and safety concerns associated with potential exposure to MEC at a MRS under a variety of site conditions, including various cleanup scenarios and land use assumptions. If an explosive hazard is identified, the MEC Hazard Assessment (HA) evaluation will include the information available for the MRS up to and including the RI field activities and provide a scoring summary for the current and future land use activities. If no explosive hazard is found at the MRS, then there is no need to calculate a MEC HA score since there are no human health safety concerns.

No MEC representing an explosive safety hazard at the Firestone Test Facility MRS were identified during RI field activities. Therefore, calculation of a MEC HA score was not warranted for the MRS and the MEC exposure pathways for all receptors at the MRS are incomplete.

G.2 Human Health Risk Assessment

The HHRA was prepared based on the RI data results using the streamlined approach to risk decision-making as described in the *Ravenna Army Ammunition Plant Final Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals* (USACE, 2012). The approach identifies chemicals of potential concern (COPCs) by comparing concentrations to background screening values, eliminating essential nutrients, and comparing site concentrations to the Facility-Wide Cleanup Goals (FWCUGs). The COCs are identified through additional screening of the COPCs by comparing site concentrations to specific FWCUGs and using a “Sum of Ratios” approach to account for cumulative effects.

The HHRA evaluates the intended Representative Receptor for the future land use at each of the MRSs where sampling for MC occurred during the RI field work. The Representative Receptor for the future land use, in conjunction with the evaluation of the Resident Receptor (Adult and Child) for Unrestricted Land Use, forms the basis for identifying COCs in the RI.

Evaluation for Unrestricted (Residential) Land Use is performed to assess for baseline conditions and the no action alternative under CERCLA, and as outlined in *RVAAP's Facility-Wide Human Health Risk Assessor Manual* (HHRAM; USACE, 2005). The facility has defined exposure scenarios for the identified receptors that are presented in the HHRAM (USACE, 2005).

The Firestone Test Facility MRS will be used for military training. The National Guard Trainee and the Engineering School Instructor were chosen as the Representative Receptors for this future land use (USACE, 2005).

Surface soil for the Resident Receptor (Adult and Child) is defined as 0 to 1 foot bgs, and surface soil for both the National Guard Trainee and the Engineer School Instructor is evaluated from 0 to 4 feet bgs. The facility-defined wet sediment exposure depth for the human receptors is 0 to 0.5 feet (6 inches) bgs and is consistent with the sample depth of the sediment samples that were collected during the RI field activities (SAIC, 2010).

Aluminum in sediment in the former test pond was the only SRC identified as a COPC during the first screening step. The COC evaluation of aluminum in sediment was performed and concluded that aluminum is not considered a COC and is not likely to pose risks to human receptors. In summation, none of the MC-related SRCs were determined to pose risks to likely human receptors, including the Resident Receptor (Adult and Child), and Unrestricted Land Use was achieved for MC at the Firestone Test Facility MRS. Therefore, the MC exposure pathways for all human receptors at the Firestone Test Facility MRS are incomplete.

Since the RI was initiated before the finalization of the ARNG's Technical Memorandum (ARNG, 2014), modifications to the HHRA specified in the technical memorandum were not required for the RI. Specifically, the RI still included an assessment of risks to a formerly used human health receptor (the Engineering School Instructor) and did not include the Commercial Industrial Land Use using the Industrial Receptor. Furthermore, evaluation for the Industrial Receptor is not required when the MC results for Unrestricted Land Use are achieved.

G.3 Ecological Risk Assessment

The ERA process at the facility includes characterizing the ecological communities in the vicinity of the MRS, determining the particular SRCs that are present, identifying pathways for receptor exposure, and estimating the magnitude of the likelihood of potential adverse effects to identified receptors. The ERA process is consistent with the process described in the EPA's *Ecological Risk Assessment Guidance for Superfund* (1997) and the Ohio EPA's *Ecological Risk Assessment Guidance Document* (2008) and also follows the facility Unified

Approach (USACE, 2011) to ERAs established at MRSs under environmental investigation at the facility. The environmental receptor species selected for evaluation in the ERAs for the MRSs where data were collected for the evaluation of MC were identified in the *RVAAP Facility-Wide Ecological Risk Assessment Work Plan* (USACE, 2003).

Several metals were identified as COPECs in surface soil, sediment, and surface water at the Firestone Test Facility MRS. Copper was present in all three media at slightly elevated concentrations, which suggests that it may be an actual MC related to the MRS's previous history as a test area for shaped charges. Antimony and cadmium were identified as COPECs in soil and sediment. Aluminum and lead were identified as COPECs in sediment only. Chromium, in its trivalent form (Cr^{+3}), was identified as a COPEC in surface soil only.

Given the conservativeness of the ERA and the low overall concentrations detected, the potential that exposure to the COPECs identified to adversely impact populations of environmental receptors at the Firestone Test Facility MRS was considered to be very low and not pose a concern to ecological receptors. No final COPECs were identified for any media, and no further investigation or action was considered necessary at the Firestone Test Facility MRS for ecological purposes. The exposure pathways for all environmental receptors at the Firestone Test Facility MRS are incomplete.

H. Documentation of No Significant Change

The NFA Proposed Plan for the Firestone Test Facility MRS (CB&I, 2015) was released for public comment in May 2015. The Proposed Plan recommends NFA under the MMRP for the MRS. After the public comment period, no significant changes regarding the recommended alternative, as originally identified in the NFA Proposed Plan, were necessary or appropriate.

PART III: RESPONSIVENESS SUMMARY FOR PUBLIC COMMENTS ON THE PROPOSED PLAN

A. Overview

In May 2015, the ARNG released the NFA Proposed Plan for the Firestone Test Facility MRS (CB&I, 2015) for public comment. A 30-day public comment period was held between May 27, 2015, and June 26, 2015. The ARNG hosted a public meeting on June 3, 2015, to present the preferred alternative and take questions and comments from the public for the record.

Based on comments received, the community voiced no objections to the NFA recommendation. All public input was considered during the selection of the final decision.

B. Summary of Public Comments and Agency Responses

No site-specific verbal comments were received during the public meeting, and no site-specific comments were received or submitted in writing during the 30-day public comment period. Written comments that included two general comments and one site-specific comment were received during the public meeting only. The transcript from the meeting was incorporated into the Administrative Record.

B.1 Oral Comments from Public Meeting

No oral questions or comments that were specific to the Firestone Test Facility MRS were received during the public meeting.

B.2 Written Comments from Public Meeting

The written comments received during the public meeting are grouped together in the following general topic categories: groundwater monitoring, projected future land use, and the potential for future exposures and safety risks. Each comment was reformatted, where appropriate, for presentation in this section. Each comment is followed by a response.

B.2.1 Groundwater Monitoring

Comment: How many groundwater monitoring wells exist on site at this time?

Response: There are a total of nine monitoring wells at Load Line #6, in which the Firestone Test Facility MRS is located. These wells were installed as part of the ongoing facility-wide groundwater monitoring program for the RVAAP. Three of the wells are installed in the unconsolidated overburden and the other six wells are installed in bedrock. The nearest well to the MRS is bedrock well LL6mw-007, which is located adjacent to the MRS along the Load Line #6 southern fence line boundary.

B.2.2 Projected Future Land Use

Comment: What is the projected future land use of the RVAAP if not classified?

Response: The facility will be used for military training. Due to residual contamination that may be left in place at some cleanup sites (landfills, asbestos in soil), some sites will be restricted and properly managed with land-use controls. These sites will not be used for military training.

B.2.3 Potential for Future Exposures and Safety Risks

Comment: Do the ongoing investigations protect all future exposures and safety risks for all future involvement on the RVAAP facility?

Response: Investigations of potential contamination are utilized to define nature and extent of contamination from past operations. If contamination is found, then risk assessments are completed to assess potential for future exposure to contamination and develop any remedial action alternatives that may be necessary to address the risk to future receptors. Ongoing cleanup activities, including investigations, are protective for all projected future exposures/uses at the facility. If the land use changes, additional investigative activities would be required to evaluate the new use to ensure protectiveness.

C. Technical and Legal Issues

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

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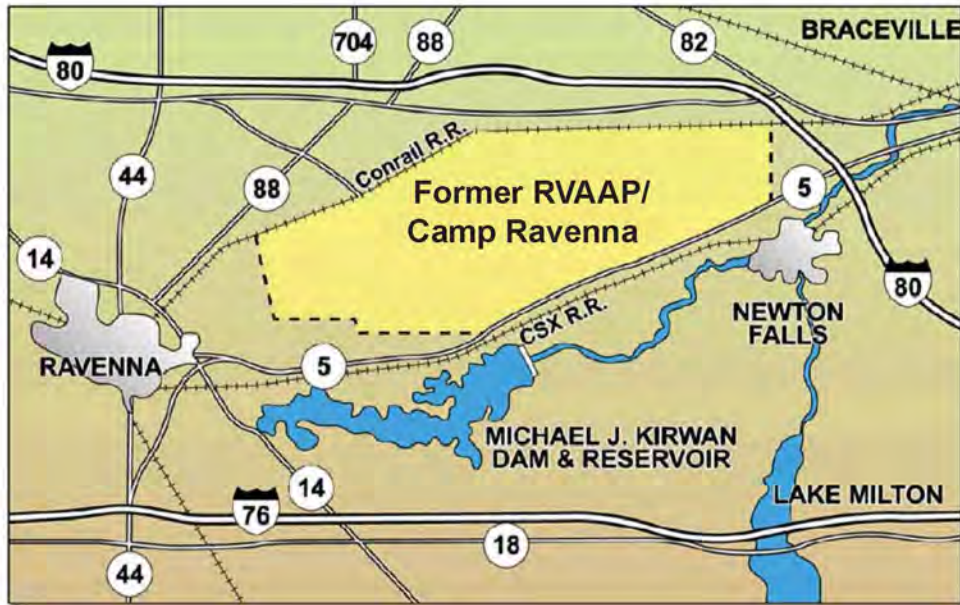
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FIGURES

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Note:
 The Scale is for the Upper Map Only
 Showing the Former RVAAP/Camp Ravenna Location



**U.S. ARMY
 CORPS OF ENGINEERS
 BALTIMORE DISTRICT**

MILITARY MUNITIONS RESPONSE PROGRAM

FORMER RVAAP/CAMP RAVENNA
 PORTAGE AND TRUMBULL COUNTIES, OHIO

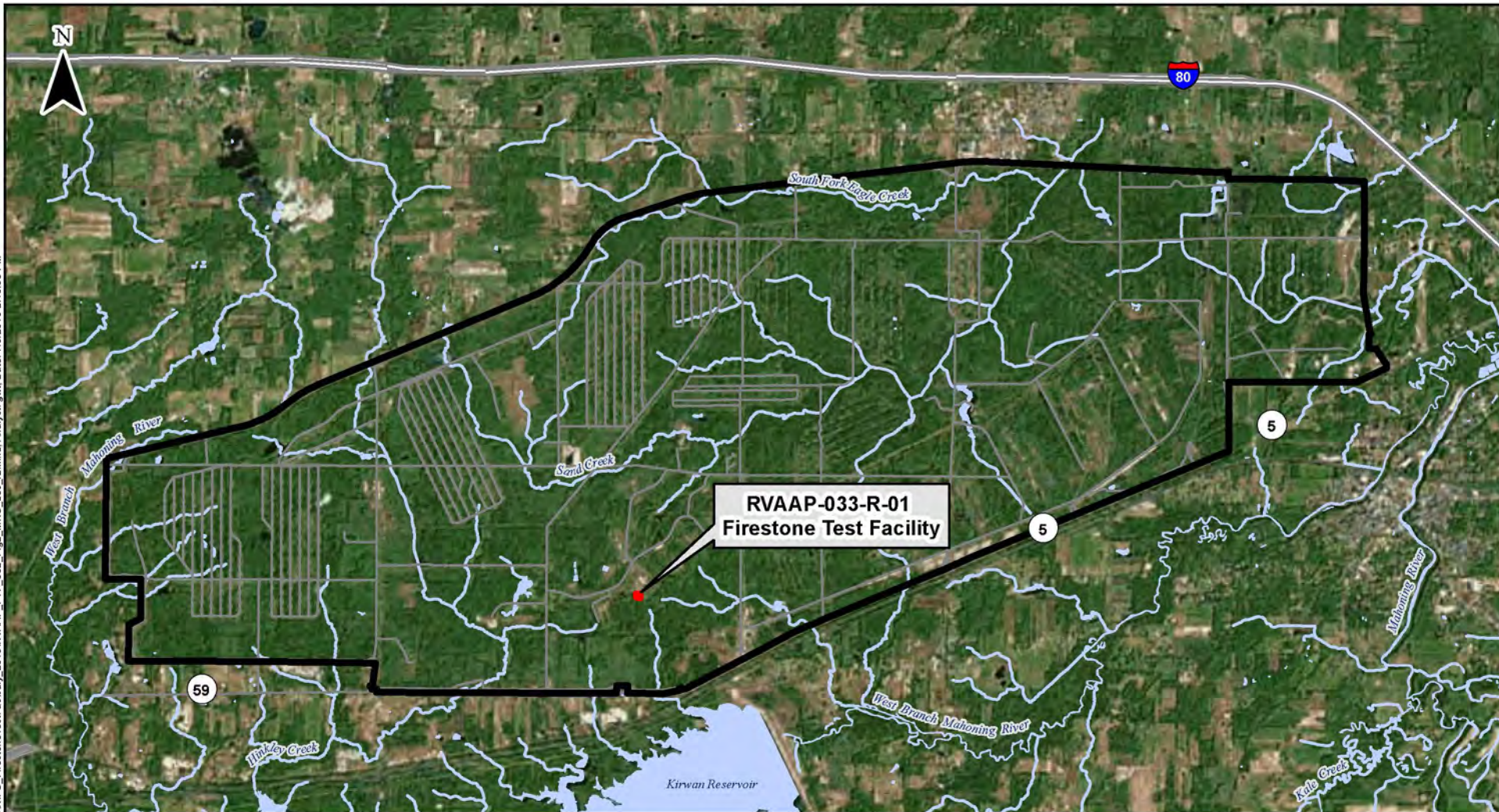





CB&I Federal Services LLC
 150 Royall Street
 Canton, MA 02021

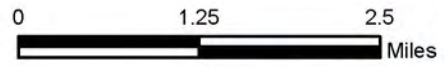
FIGURE 1 INSTALLATION LOCATION MAP

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-  Facility Boundary
-  MRS Boundary
-  Stream



PROJECTION: NAD83 UTM Zone 17N



**U.S. ARMY
CORPS OF ENGINEERS
BALTIMORE DISTRICT**

MILITARY MUNITIONS RESPONSE PROGRAM

FIRESTONE TEST FACILITY MRS
FORMER RVAAP/CAMP RAVENNA
PORTAGE AND TRUMBULL COUNTIES, OHIO



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150 Royall Street
Canton, MA 02021




FIGURE 2 MRS LOCATION MAP

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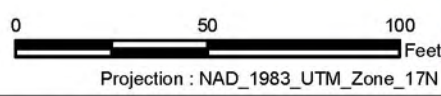
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

-  MRS Boundary
-  Fence Line
-  Direction of Drainage Channel Flow



	U.S. ARMY CORPS OF ENGINEERS BALTIMORE DISTRICT
	MILITARY MUNITIONS RESPONSE PROGRAM

FIRESTONE TEST FACILITY MRS
FORMER RVAAP/CAMP RAVENNA
PORTAGE AND TRUMBULL COUNTIES, OHIO



	CB&I Federal Services LLC 150 Royall Street Canton, MA 02021
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FIGURE 3 SITE FEATURES MAP

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OHIO EPA CORRESPONDENCE

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

July 27, 2015

Re: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Plans
Remedial Response
Portage County
267000859209

Mr. Mark Leeper, P.G., MBA
Army National Guard Directorate
Environmental Programs Division
ARNG-ILE-CR
111 South George Mason Drive
Arlington, VA 22204

Subject: Review of the "Draft No Further Action Record of Decision for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site Version 1.0," Former Ravenna Army Ammunition Plant, Ravenna, Ohio: Dated July 22, 2015 (Work Activity No. 267-000859-209)

Dear Mr. Leeper:

The Ohio Environmental Protection Agency (Ohio EPA), Northeast District Office (NEDO), Division of Environmental Response and Revitalization (DERR) has received and reviewed the "Draft No Further Action Record of Decision for RVAAP-033-R-01 Firestone Test Facility Munitions Response Site, Version 1.0" dated July 22, 2015. This document was received by Ohio EPA, NEDO on July 23, 2015. Ohio EPA has completed the review of the draft record of decision and has no further comments. Please submit the final copy of the document for approval.

If you have any questions or concerns, please do not hesitate to contact me at (330) 963-1235.

Sincerely,

Nicholas Roope
Site Coordinator
Division of Environmental Response and Revitalization

NCR/nvr

cc: Gregory F. Moore, USACE, Louisville District
Katie Tait/Kevin Sedlak, Camp Ravenna Environmental Office, Newton Falls
Haney/Harris, Camp Ravenna Environmental Office, Vista Sciences, Newton Falls

ec: Rod Beals, Ohio EPA, NEDO, DERR
Bob Princic, Ohio EPA, NEDO, DERR
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