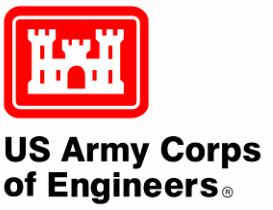
Final

Proposed Plan
for Soil, Sediment, and Surface Water
at RVAAP-38 NACA Test Area

Former Ravenna Army Ammunition Plant
Portage and Trumbull Counties, Ohio

Contract No. W912QR-15-C-0046

Prepared for:



U.S. Army Corps of Engineers
Louisville District

Prepared by:

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March 22, 2019

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None.

14. ABSTRACT

This Proposed Plan for NACA Test Area presents to the public the physical characteristics, geology, and hydrogeology of NACA Test Area; compiles historical and newly acquired environmental data; summarizes nature and extent of contamination in soil; evaluates contaminant fate and transport; provides human health and ecological risk assessments; and presents a preferred alternative to meet the remedial action objective at this AOC. To achieve an Unrestricted (Residential) Land Use for soil, sediment, and surface water, this plan presents the preferred alternative of “Alternative 3: Ex-situ Thermal Treatment of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted (Residential) Land Use".

15. SUBJECT TERMS

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Ohio Environmental Protection Agency

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

April 29, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859098

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

Subject: Final PP for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area

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 Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area," dated March 22, 2019. It was prepared by Leidos.

Ohio EPA has no comments on the "Final Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area." Based on the information contained in the Final Proposed Plan (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 NACA Test Area recommending preferred Alternative 3: Ex-Situ Thermal Treatment of Soil at Areas 1, 2, and 3 and Well Pit Removal - Attain Unrestricted (Residential) Land Use.

If you have any questions concerning this letter, please contact Vanessa Steigerwald Dick at (330) 963-1219.

Sincerely,

Melisa Witherspoon, Chief
Division of Environmental Response and Revitalization

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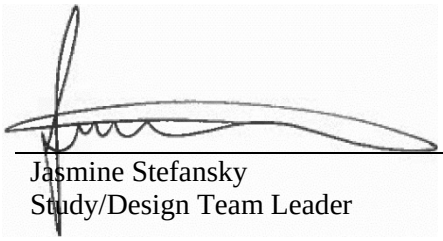
CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Leidos has completed the Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area at the Former Ravenna Army Ammunition Plant, Portage and Trumbull Counties, Ohio. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of data quality objectives; technical assumptions; methods, procedures, and materials to be used; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing United States Army Corps of Engineers (USACE) policy. In addition, an independent verification was performed to ensure all applicable changes were made per regulatory and Army comments



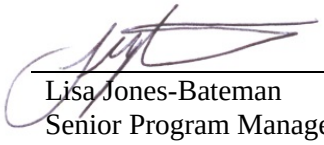
Jasmine Stefansky
Study/Design Team Leader

March 22, 2019
Date

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

March 22, 2019
Date

Significant concerns and explanation of the resolutions are documented within the project file. As noted above, all concerns resulting from independent technical review of the project have been considered.



Lisa Jones-Bateman
Senior Program Manager

March 22, 2019
Date

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Prepared for:
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DOCUMENT DISTRIBUTION
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ARNG = Army National Guard.
I&E = Installations & Environment.
NEDO = Northeast District Office.
OHARNG = Ohio Army National Guard.
Ohio EPA = Ohio Environmental Protection Agency.
REIMS = Ravenna Environmental Information Management System.
SWDO = Southwest District Office.
USACE = U.S. Army Corps of Engineers.

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LIST OF ACRONYMS

AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
Army	U.S. Department of the Army
ARNG	Army National Guard
bgs	Below Ground Surface
BHC	delta-Hexachlorocyclohexane
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CJAG	Camp James A. Garfield Joint Military Training Center
CMCOC	Contaminant Migration Chemical of Concern
CMCOPC	Contaminant Migration Chemical of Potential Concern
COC	Chemical of Concern
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CUG	Cleanup Goal
DERP	Defense Environmental Restoration Program
DNT	Dinitrotoluene
ERA	Ecological Risk Assessment
EU	Exposure Unit
FS	Feasibility Study
FWCUG	Facility-wide Cleanup Goal
HHRA	Human Health Risk Assessment
HQ	Hazard Quotient
IRP	Installation Restoration Program
NACA	National Advisory Committee for Aeronautics
OHARNG	Ohio Army National Guard
Ohio EPA	Ohio Environmental Protection Agency
PAH	Polycyclic Aromatic Hydrocarbon
PBA08	2008 Performance-based Acquisition
PCB	Polychlorinated Biphenyl
PP	Proposed Plan
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
RVAAP	Ravenna Army Ammunition Plant
SVOC	Semi-volatile Organic Compound
TNT	2,4,6-Trinitrotoluene
TR	Target Risk
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

This Proposed Plan (PP) presents the conclusions and recommendations for soil, sediment, and surface water within the National Advisory Committee for Aeronautics (NACA) Test Area area of concern (AOC) at the former Ravenna Army Ammunition Plant (RVAAP).

The former RVAAP is now known as Camp James A. Garfield Joint Military Training Center (CJAG) and is located in Portage and Trumbull counties, Ohio (Figure 1). NACA Test Area is designated as AOC RVAAP-38.

The Army National Guard (ARNG), in coordination with the Ohio Environmental Protection Agency (Ohio EPA), issues this PP to provide the public with necessary information to comment on selecting an appropriate response action. The remedy will be selected for NACA Test Area after all comments submitted during the 30-day public comment period are considered. Therefore, the public is encouraged to review and comment on all alternatives presented in this PP.

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

This PP summarizes information that can be found in detail in the *Phase II Remedial Investigation and Feasibility Study Report for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area* (Leidos 2018), herein referred to at the NACA Test Area RI/FS Report. The Administrative Record File, containing information used in selecting the remedy, is available for public review.

ARNG's preferred alternative at NACA Test Area is Alternative 3: Ex situ Thermal Treatment of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted

Public Comment Period:
July 29, 2019 to August 27, 2019

Public Meeting:
The Army National Guard will hold an open house and public meeting to present the conclusions and additional details presented in the *Phase II Remedial Investigation and Feasibility Study Report for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area* (Leidos 2018). Oral and written comments also will be accepted at the meeting. The open house and public meeting are scheduled for 6:00PM, August 15, 2019, at the Shearer Community Center, 9355 Newton Falls Road, Ravenna, Ohio 44266.

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

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

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

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

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

Online
http://www.rvaap.org/

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

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

(Residential) Land Use. ARNG encourages the public to review the background documents to gain a more comprehensive understanding of the AOC, activities that have been conducted to date, and the rationale for the preferred alternative.

2.0 SITE BACKGROUND

2.1 Facility Description and Background

The former RVAAP, now known as CJAG, located in northeastern Ohio within Portage and Trumbull counties, is approximately 3 miles east/northeast of the city of Ravenna and 1 mile north/northwest of the city of Newton Falls (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; Garrett, McCormick, and Berry Roads to the west; the Norfolk Southern Railroad to the north; and State Route 534 to the east. In addition, the facility is surrounded by the communities of Windham, Garrettsville, Charlestown, and Wayland. The facility is federal property, which has had multiple accountability transfers amongst multiple Army agencies, making the property ownership and transfer history complex. The most recent administrative accountability transfer occurred in September 2013 when the remaining acreage (not previously transferred) was transferred to the U.S. Property and Fiscal Officer for Ohio and subsequently licensed to the Ohio Army National Guard (OHARNG) for use as a military training site (Camp James A. Garfield).

2.2 NACA Test Area Background

NACA Test Area was designed and used by NACA from 1947–1953 to simulate a take-off accident in which an airplane fails to become airborne and strikes an embankment, which results in rupturing of the fuel tanks (NACA 1952). Figure 3 presents a 1952 aerial photograph depicting the engineered infrastructure such as the crash strip runway, observation towers, fuel and storage shacks, crash barrier, and access roads.

Crash tests were performed on 17 excess military airplanes provided by the U.S. Air Force to develop explosion-proof fuel tanks and fuel for airplanes. NACA used 4 Curtiss C-46 Commando and 13 Fairchild C-82 Packet airplanes to conduct the tests. Photographs 1 and 2 present the C-46 and C-82 while staged at NACA Test Area.

To conduct the tests, airplanes were fueled at the western portion of the site and then propelled under their own power down a 1,700 ft approach runway (or crash strip). The airplanes were crashed into a crash barrier at 80–105 miles per hour. Photograph 3 presents the constructed crash barrier, and Photograph 4 presents a C-82 1 second after impact with the crash barrier. During the tests, high-speed films were made to study fuel spillage, generation of ignition sources, flame front progression, and toxic gas generation, among other parameters.

Combustible liquids involved in testing activities included 100/130 octane aviation fuels, low-volatility fuel, flame retardants, lubricating oil, coolant compounds, hydraulic fluids, alcohol, and brake fluid. Each plane carried approximately 1,050 gallons of gasoline or low-volatility fuel (NACA 1953). Following airplane impact with the crash barrier, fluids were generally observed to disperse in a fan-shaped pattern beginning at the crash barrier and extending out in front of the airplane up to 400 ft into the Crash Area.

Airplanes that were significantly damaged during testing were stripped of instrumentation and salvageable parts. It appears that some airplanes were moved to the northeast portion of the site after crash tests. Debris has been observed recently protruding from the soil in this area.

Since 1969, OHARNG has used NACA Test Area for training. The area is currently designated as Training Area 29 and is used as part of the land navigation course and for

helicopter "touch and go" training for hasty landing zones.

2.3 Potential Contaminants

The *Phase I Remedial Investigation Report for the NACA Test Area* (Leidos 2001) (herein referred to at the Phase I Remedial Investigation [RI] Report) established anticipated primary chemicals of potential concern (COPCs), including metals, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs). These chemical groups are associated with burned or partly combusted fuels, deicing compounds, lubricants, hydraulic fluids, and fire extinguishing agents (specifically bromochloromethane).

Metals (such as cadmium and copper), explosives (such as 2,4,6-trinitrotoluene [TNT] and its associated degradation products), and propellants are not directly related to past operations. However, because of the proximity of Open Demolition Area #1, metals, explosives, and propellants also are considered potential contaminants, especially in the southern portion of the Crash Strip Area.

2.4 Remedial Investigations

NACA Test Area has been involved in numerous assessments and investigations conducted by the U.S. Department of the Army (Army). Assessments performed to initially evaluate site use, assess potential contamination, and help prioritize the site include the following:

- Installation Assessment (USATHAMA 1978);
- Preliminary Assessment for the Characterization of Areas of Contamination (USACE 1996);
- Relative Risk Site Evaluation (USACHPPM 1996); and
- Environmental Baseline Survey of Ravenna Army Ammunition Plant (Vista 1998).

The nature and extent of contamination, conceptual site model, fate and transport assessment, human health risk assessment (HHRA), and ecological risk assessment (ERA) are based on RIs conducted from 1999–2017. The following RIs have been conducted at NACA Test Area:

- 1999 Phase I RI (Leidos 2001),
- 2004/2005 Characterization of 14 AOCs (MKM 2007),
- 2010 Performance-based Acquisition (PBA08) RI, and
- 2017 Supplemental Investigation and Data Gap Analysis.

NACA Test Area data were aggregated to evaluate contaminant nature and extent and complete the HHRA and ERA. The initial basic aggregation of data was by environmental medium (e.g., soil, sediment, and surface water), site characteristics, operational data, and available maps. For each medium-specific aggregate, further aggregation or grouping of sample data was performed, usually by a certain area or common feature, such as a pond or ditch. The eight "functional areas" presented in the Phase I RI were modified as "spatial aggregates" in the NACA RI/FS Report (Leidos 2018). A summary of the sample aggregate names are presented in Table 1.

The following subsections further describe the RIs conducted at NACA Test Area. The soil, sediment, and surface water sample locations are presented in Figure 5.

2.4.1 1999 Phase I Remedial Investigation

In 1999, a Phase I RI was conducted at NACA Test Area, as summarized in the Phase I RI Report (Leidos 2001). The primary objectives of the investigation were to:

- Determine the potential types and sources of contamination using historical process information and previous sampling data to locate Phase I RI samples for soil, sediment, and surface water.

Table 1. NACA Test Area Sample Aggregate Names and Description

Phase II RI Aggregate Name	Media	Description and Notes
Former Crash Area	Soil	Combination of Phase I RI Functional Area 1: Crash Area and Functional Area 4: Ditches Flowing from the crash strip. The samples identified as surface soil/dry sediment for the ditches flowing from the Crash Area in the Phase I RI Report have been incorporated into the surrounding Former Crash Area spatial aggregate.
Former Plane Burial Area	Soil	Same as Phase I RI Functional Area 2: Plane Burial Area.
Former Plane Refueling/Crash Strip Area	Soil	Same as Phase I RI Functional Area 3: Plane Refueling/Crash Strip Area.
Wetland/Pond North of Former Crash Area	Sediment, Surface Water	Wetland/pond north of NACA Test Area.
Tributary to Hinkley Creek	Sediment, Surface Water	Tributary traversing through the middle of NACA Test Area.
Former Crash Area Well Pit	Soil	Same as Phase I RI Functional Area 5: Crash Area Well Pit. Media reclassified as surface soil, since this location is only intermittently wet.
Former Crash Area Reservoir	Sediment, Surface Water	Same as Phase I RI Functional Area 6: Crash Area Reservoir.
Off-AOC	Sediment, Surface Water	Evaluation of a drainage ditch sample collected during the Phase I RI upstream of NACA Test Area.

AOC = Area of concern.
NACA = National Advisory Committee on Aeronautics.
RI = Remedial investigation.

- Identify whether releases of contamination beyond the AOC boundary are occurring by collecting environmental samples (surface water and sediment) downstream from the AOC boundary within exit conveyances and using applicable historical information.
- Perform a screening risk evaluation to determine if additional investigation is warranted; the human health and ecological risk screening will be used to determine the potential magnitude of risk associated with any contamination detected.
- Provide preliminary recommendations for additional investigations and/or actions.

The field activities included the following:

- Collected 99 discrete surface soil (0–1 ft below ground surface [bgs]) samples,
- Collected 21 subsurface soil (1–3 and 3–5 ft bgs) samples,
- Collected 5 surface water samples,
- Collected 6 sediment samples,
- Collected 1 groundwater sample from a piezometer, and
- Surveyed sampling locations.

The Phase I RI recommended the following actions:

- Further investigate the surface water exposure unit (EU) to the confluence with Hinkley Creek,
- Investigate the northeastern quadrant to further characterize soil in the suspected plane burial area,
- Collect site-specific hydrogeologic data to determine the vertical and lateral extent of potential groundwater contamination in the unconsolidated zone,
- Perform chemical fate and transport modeling to identify contaminant migration potential,
- Complete a baseline HHRA for all environmental media, and
- Complete an ERA for all environmental media.

The Phase I RI identified site-related contamination in soil at NACA Test Area. Based on the human health and ecological screening risk evaluations, human health COPCs were identified for surface soil at NACA Test Area. Site conditions during the Phase I RI did not support a no further action decision.

Sample results and findings from the Phase I RI were included in the overall nature and extent of contamination evaluation, HHRA, and ERA that are summarized in the NACA Test Area RI/FS Report (Leidos 2018).

2.4.2 2004/2005 Characterization of 14 AOCs

From August 2004 through May 2005, well installation and groundwater sampling was conducted at NACA Test Area. During this investigation, seven trenches were excavated near monitoring wells, geotechnical soil samples were collected from monitoring well borings, monitoring wells NTAmw-107 to NTAmw-118 were installed and sampled, and slug testing was performed to assess the aquifer. Figure 5 presents the monitoring well locations at the site.

The Characterization of 14 AOCs Report stated that a full risk evaluation should be considered in the overall risk management decisions for the AOC.

Although groundwater will be addressed under the RVAAP Facility-wide Groundwater AOC (RVAAP-66) as a separate decision, groundwater concentrations were evaluated in the NACA RI/FS Report, since the selected remedy for soil, sediment, and surface water, must also be protective of groundwater.

2.4.3 2010 PBA08 Remedial Investigation

From February to April 2010, soil, sediment, and surface water samples were collected at NACA Test Area as part of the PBA08 RI.

Soil samples were collected to assess contaminant occurrence and distribution in soil. The PBA08 RI samples were designed to delineate the extent of areas previously identified as having the greatest likelihood of contamination (e.g., former crash and refueling areas).

A total of 15 surface soil samples were collected to further delineate or characterize surface soil. Twenty-six soil samples from eight soil borings were collected at locations where previous surface soil sampling results exceeded screening criteria and vertical delineation was warranted, where previous surface soil sampling results only slightly exceeded screening criteria to confirm that contaminant concentrations did not increase with depth, and at locations not previously sampled to fully characterize surface and subsurface soil.

Surface water and sediment samples were collected to characterize current conditions and assess potential exit pathways from the AOC. Three co-located surface water and sediment samples were collected during the PBA08 RI from the southern discharge point of the Wetland/Pond North of the Former Crash Area, the discharge point of the culvert outfall under the crash strip, and downstream from the AOC prior to the confluence of Hinkley Creek.

2.4.4 2017 Supplemental Investigation and Data Gap Analysis

In 2017, a supplemental investigation and data gap analysis were conducted at NACA Test Area. The primary scope and objectives of this supplemental investigation were to:

- Further investigate the area within NACA Test Area that was suspected for use as plane burial,
- Evaluate polycyclic aromatic hydrocarbon (PAH) chemicals of concern (COCs) beneath the concrete in the crash strip,
- Evaluate potential lead contamination in groundwater associated with the production well,
- Evaluate sediment in the Former Crash Area Reservoir, and

- Collect samples to define the extent of PAH contamination around historical sample locations NTA-083 and NTA-120 in the Former Plane Refueling and Storage Area.

2.4.4.1 Former Plane Burial Area Investigation

There has been speculation that airplanes were bulldozed and buried at the eastern end of the AOC within the sample aggregate identified at the Former Plane Burial Area. Additional subsurface investigation was performed to further assess the potential for buried debris and collect chemical data to determine if CERCLA risk resulted from this potential former burial activity.

A geophysical investigation was conducted to determine if and where materials may have been buried. During the geophysical investigation, metallic responses were observed across a large portion of the surveyed area; however, no large or symmetrical anomaly consistent with the shape and size of a C-46 airplane (76 ft long, 22 ft high, 108 ft wingspan) or the C-82 (77 ft long, 26 ft high, 106 ft wingspan) could be substantiated. It did not appear that a large effort to bury airplanes used in the crash tests conducted from 1947–1953 occurred. Rather, the investigation concluded that the area was used to stage airplanes after the crash tests were performed for evaluation and salvaging. Given the presence of small debris items on the ground surface, metallic anomalies identified during the geophysical survey, and identified wiring within one of the six soil borings, some debris remains at the site. This debris, however, is believed to be small pieces (e.g., wiring) from the airplanes deemed not salvageable.

Results of the geophysical investigation were used to determine the locations of soil sampling and analysis to conservatively assess chemical contamination and potential risk. Six soil borings were installed at locations with high metallic density to conservatively assess if chemical contamination is present within this area.

None of the chemicals in the subsurface soil samples were considered COPCs in this screening process. In addition, none of the polychlorinated biphenyls (PCBs) in surface soil were considered COPCs. The only chemicals that exceeded the screening level were aluminum, cadmium, chromium, copper, and benzo(a)pyrene in surface soil. However, all of the sample results were well below the Resident Receptor (Adult and Child) facility-wide cleanup goal (FWCUG) at a target hazard quotient (HQ) of 1 or target risk (TR) of 1E-05. Accordingly, it can be concluded that there is no unacceptable risk to human health in the Former Plane Burial Area.

2.4.4.2 Crash Strip Concrete Subsurface

Sample results from the 1999 Phase I RI and 2010 PBA08 RI indicated that there were high concentrations of PAHs in the two 6-ft-wide soil strips between the paved concrete runway and monorail strip. To assess if contamination was present beneath the pavement, eight core holes were installed in the 7-inch-thick concrete runway.

Samples from the 0–1 and 1–4 ft bgs intervals at sample locations were collected beneath the concrete runway and analyzed for benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)-anthracene, and indeno(1,2,3-cd)pyrene, and the results were screened against the lowest FWCUG for the Resident Receptor (Adult and Child) at a target HQ of 0.1 or TR of 1E-06, as presented in the FWCUG Report.

None of the PAH concentrations in the 0–1 ft bgs interval beneath the concrete runway exceeded the lowest FWCUG for the Resident Receptor (Adult and Child) at a target HQ of 0.1 or TR of 1E-06. Benzo(a)pyrene in the 1–4 ft bgs interval beneath the concrete runway was identified as a COPC; however, the benzo(a)pyrene maximum concentration of 0.029 mg/kg was below the FWCUG for the Resident Receptor (Adult and Child) at a target HQ of 1 or TR of 1E-05 and well below the 2017 U.S. Environmental Protection Agency (USEPA) Resident Receptor regional

screening level (RSL) of 1.1 mg/kg at a TR of 1E-05.

As a result, it was concluded that the soil beneath the concrete crash strip does not pose a risk to human health, and no further action is needed.

2.4.4.3 Groundwater in Production Well

The Phase I RI sampling indicated there was a high concentration of lead in soil within the Former Crash Area Well Pit. To assess potential contamination in groundwater, one filtered and one unfiltered groundwater sample were collected from the production well and analyzed for lead. Neither sample had detectable concentrations of lead. Consequently, it was concluded that the contaminated soil in the Former Crash Area Well Pit is not impacting groundwater.

2.4.4.4 Sediment in Former Crash Area Reservoir

Three sediment samples were collected from the Former Crash Area Reservoir and were analyzed for metals, SVOCs, explosives, propellants, VOCs, PCBs, and pesticides. None of the SVOCs, explosives, propellants, VOCs, and PCBs exceeded the screening criteria. The only chemicals to exceed screening criteria were aluminum, chromium, cobalt, and delta-hexachlorocyclohexane (BHC). However, the maximum concentrations of these chemicals were well below the Resident Receptor FWCUG at HQ of 1 or TR of 1E-05. Given these results, it was confirmed that no unacceptable human health risk is associated with the Former Crash Area Reservoir.

2.4.4.5 Surface Soil at Locations NTA-083 and NTA-120

Results from historical surface soil (0–1 ft bgs) samples at locations NTA-083 and NTA-102 in the Former Plane Refueling and Storage Area had PAH concentrations exceeding screening levels. To further evaluate these historical surface soil sample results, 11 discrete surface soil samples (0–1 ft bgs) from a sampling grid at and around historical samples NTA-083 and NTA-120 were collected. The samples were analyzed for benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene.

The concentrations were screened against the 2017 USEPA RSLs at a TR of 1E-05. Significant exceedances were in surface soil (0–1 ft bgs) at the eastern sample locations NTA-166, NTA-169, and NTA-172. These three sample locations are recommended for remediation in the feasibility study (FS) from 0–1 ft bgs. This recommendation includes additional delineation and confirmation sampling as part of the remedial alternative to further refine extent and confirm contaminant removal.

3.0 SITE CHARACTERISTICS

The NACA Test Area AOC is approximately 47 acres and is located west of Greenleaf Road at the southern end of Demolition Road in the southwestern portion of the facility (Figure 2).

Most of the engineered structures used during the plane simulation tests (e.g., crash barrier, observation towers, fuel and storage shacks, storage sheds) were demolished and removed. Remaining features include a concrete pad immediately west of the crash strip, the crash strip shown on Photograph 5, a small man-made reservoir southeast of the former crash barrier, and an out-of-service production water well with associated Well Pit shown on Photograph 6.

Current site features, groundwater flow direction, and surface water flow direction are presented in Figure 4. The site is forested around the perimeter and grassy in the interior (except for the concrete areas). The grass is occasionally mowed.

The site has low topographic relief, with most of the relief occurring at the east end of the site. Surface water drainage generally flows toward Hinkley Creek. A tributary to Hinkley Creek runs through the center of the

site near the east end of the crash strip. In addition to the intermittent storm water runoff in tributaries and overland, several large planning and jurisdictional wetlands and a 40- by 45-ft reservoir located southeast of the former crash barrier exist within the AOC boundary, which may receive overland surface water flow.

Silt loam, sand, and clay rich silt tills overlie the Sharon Conglomerate bedrock at NACA Test Area. Bedrock (Sharon Sandstone member) was not encountered at depths less than 30 ft bgs. Groundwater was encountered from 2.5–23 ft bgs in unconsolidated borings and several small, saturated sand seams from 3–5.2 ft bgs were observed in soil borings. Groundwater elevations ranged from 1,067.38–1,090.10 ft above mean sea level, flowing southwest toward Hinkley Creek.

4.0 SCOPE AND ROLE OF RESPONSE ACTION AND LAND USE

ARNG, in coordination with Ohio EPA, is implementing the Installation Restoration program (IRP) with the overall program strategy of addressing the principal environmental threats at each site posing a risk to applicable receptors. This PP addresses soil, sediment, and surface water. The response action for these media at NACA Test Area is being conducted to meet this overall program strategy. Groundwater will be addressed under the RVAAP Facility-wide Groundwater AOC (RVAAP-66) as a separate decision. However, the selected remedy for soil and sediment at NACA Test Area also must be protective of groundwater.

The potential future uses for NACA Test Area are Military Training Land Use or Commercial/Industrial Land Use. Although residential use is not anticipated at CJAG or NACA Test Area, Unrestricted (Residential) Land Use was evaluated in accordance with Defense Environmental Restoration Program (DERP) Manual 4715.20 (DoD 2012) in order to make appropriate risk management decisions.

Resident Receptor (Adult and Child) FWCUGs were used to conduct an Unrestricted (Residential) Land Use evaluation. Sites that meet the standards for Unrestricted (Residential) Land Use are also considered protective for Military Training and Commercial Industrial Land Uses.

No prior removal actions have been conducted at this site, and early or interim actions are not planned. The proposed response actions at NACA Test Area will be implemented under the authority of and in accordance with the requirements of the Ohio EPA Director's Final Findings and Orders, dated June 10, 2004 (Ohio EPA 2004).

5.0 SUMMARY OF SITE RISKS

The results of the 1999 Phase I RI, 2010 PBA08 RI, and 2017 Supplemental Investigation were used to evaluate the nature and extent of contamination, assess potential future impacts to groundwater, conduct HHRAs and ERAs, and evaluate the need for remedial alternatives.

In total, 147 surface soil samples, 68 subsurface soil samples, 12 sediment samples, and 13 surface water samples have been collected to characterize NACA Test Area. In addition, a geophysical survey was conducted at the Former Plane Burial Area sample aggregate to assess the previous usage in this area.

As of 2017, more than 100 groundwater samples have been collected within NACA Test Area. Although groundwater will be addressed under the RVAAP Facility-wide Groundwater AOC (RVAAP-66) as a separate decision, the information was evaluated in the NACA RI/FS Report, since the selected remedy for soil, sediment, and surface water also must be protective of groundwater.

5.1 Human Health Risk Assessment

The HHRA identified COCs and conducted a risk management analysis to determine if COCs pose unacceptable risk to the Resident

Receptor. FWCUGs were used to evaluate Unrestricted (Residential) Land Use. Sites that meet the standards for Unrestricted (Residential) Land Use are considered protective for other Land Uses at CJAG, including Military Training and Commercial/Industrial Land Use. If an unacceptable risk was identified for the Resident Receptor, the risk to the National Guard Trainee and Industrial Receptor was evaluated.

Media of concern at NACA Test Area are surface soil, subsurface soil, surface water, and sediment. Soil data associated with NACA Test Area were aggregated into surface and subsurface soil in each of three EUs (Former Plane Refueling/Crash Strip Area, Former Crash Area, and Former Plane Burial Area) and one potential hotspot (Former Crash Area Well Pit). Surface water and sediment data associated with NACA Test Area were aggregated into three EUs (Wetland/Pond North of Former Crash Area, Tributary to Hinkley Creek, and Former Crash Area Reservoir [sediment only]).

Table 2 summarizes whether unacceptable risk to human health at the NACA Test Area EUs exists, and Figure 6 presents the locations of identified COCs requiring remediation. No COCs were identified for any receptor at any EU in subsurface soil, sediment, or surface water. In addition, no COCs were identified for any receptor for surface soil in the Former Plane Burial Area. Table 3 presents the human health COCs requiring remediation at NACA Test Area. Lead was identified as a COC in surface soil to be carried forward for remediation at the Former Crash Area Well Pit. Lead within the Former Crash Area Well Pit is likely attributable to lead-based paint on the metal cover and/or former equipment and piping that used to be in the pit. The elevated concentration of lead (13,200 mg/kg) in the Well Pit represents a hotspot of lead contamination.

The PAHs benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were identified as COCs to be carried forward for potential remediation at the Former Plane Refueling/Crash Strip Area EU for Unrestricted (Residential) Land Use. Activities in this area (i.e., fueling, crashing, and burning airplanes) were a potential source of PAHs.

Benzo(a)pyrene was identified as a COC to be carried forward for remediation at the Former Crash Area for Unrestricted (Residential) Land Use. Concentrations of benzo(a)pyrene at NTA-026 (located directly east of the crash strip where the crash strip terminated at a former crash barrier structure) may be associated with site activities from use of the crash strip.

Table 2. Summary of the Presence of Unacceptable Risk at NACA Test Area EUs

Exposure Unit	Media	Unacceptable Risk to Resident Receptor?	Unacceptable Risk to Industrial Receptor and National Guard Trainee?
Former Crash Area	Soil	Yes	None
Former Plane Burial Area	Soil	None	None
Former Plane Refueling/Crash Strip Area	Soil	Yes	None
Wetland/Pond North of Former Crash Area	Sediment, Surface Water	None	None
Tributary to Hinkley Creek	Sediment, Surface Water	None	None
Former Crash Area Well Pit	Soil	Yes	Yes
Former Crash Area Reservoir	Sediment, Surface Water	None	None
Off-AOC	Sediment, Surface Water	None	None

Risk in soil was only in surface soil (0–1 ft bgs). The Phase II RI Report concluded there was no risk in subsurface soil (1–13 ft bgs) at any EU for any receptor.

AOC = Area of concern. EU = Exposure unit.
bgs = Below ground surface. RI = Remedial investigation.

Table 3. COCs for Remediation and Cleanup Goals

Media	Chemical of Concern	Cleanup Goal (mg/kg) Unrestricted (Residential) Land Use (Resident Receptor)
Former Plane Refueling/Crash Strip Area (Areas 1 and 2)		
Surface Soil (0–1 ft bgs)	Benz(a)anthracene	11
	Benzo(a)pyrene	1.1
	Benzo(b)fluoranthene	11
	Dibenz(a,h)anthracene	1.1
	Indeno(1,2,3-cd)pyrene	11
Former Crash Area (Area 3)		
Surface Soil (0–1 ft bgs)	Benzo(a)pyrene	1.1
Former Crash Area Well Pit		
Soil	Lead	400

Benz(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene are not COCs for potential remediation in the Former Crash Area (Area 3). The maximum detected concentrations are below the Resident Receptor RSL.

Lead is also a COC for the Industrial Receptor and National Guard Trainee. However, given that the media and location is to be remediated are the same as that of the Resident Receptor, it is assumed that remediation of the Former Crash Area Well Pit will meet the Resident Receptor cleanup goal.

No subsurface soil, sediment, or surface water COCs require remediation for Unrestricted (Residential) Land Use at NACA Test Area.

No COCs were detected in the following EUs within NACA Test Area: Former Plane Burial Area, Tributary to Hinkley Creek, Wetland/Pond North of the Former Crash Area, Former Crash Area Reservoir, and Off-AOC.

AOC = Area of concern.
bgs = Below ground surface.
COC = Chemical of concern.
EU = Exposure unit.
ft = Feet.
mg/kg = Milligrams per kilogram.
NA = Not applicable. The COC does not require remediation for the receptor within the specified EU.
NACA = National Advisory Committee for Aeronautics.
RSL = Regional screening level.

5.2 Ecological Risk Assessment

The ecological habitat at NACA Test Area consists of 47 acres of mostly shrubland, field, and forest. Wetland/pond areas are located north of the Former Crash Area. Water generally flows southwest through the wetlands into the tributary to Hinkley Creek. The size of the habitat is large enough to completely support cover and food for small birds and mammals that typically require approximately 1 acre of habitat (USEPA 1993). The terrestrial vegetation provides a habitat for birds, mammals, insects, and other organisms.

The northern long-eared bat (*Myotis septentrionalis*; federally threatened) exists at CJAG. No other federally listed species or critical habitats are on the facility. NACA Test Area has not had a site-specific survey for federal- or state-listed species. However, surveys have been conducted throughout the facility and have not identified state-listed, federally listed, threatened, or endangered species at NACA Test Area (OHARNG 2014).

The Level I Scoping ERA presents important ecological resources on or near the AOC and evaluates the potential for current contamination to impact ecological resources. Ecological resources at NACA Test Area were compared to the list of important ecological places and resources (Leidos 2018). Chemical contamination is present in surface soil, sediment, and surface water at NACA Test Area. This contamination was identified using historical and PBA08 RI data. Dry, early-successional, herbaceous field (dominant vegetation type); seasonally flooded herbaceous alliance; and dry and semi-permanently flooded shrublands and four types of forest were observed on the 47-acre AOC. Important and significant ecological resources are found at the AOC. Specifically, wetlands and surface water (i.e., pond, streams) are present and near contamination. Per the *Guidance for Conducting Ecological Risk Assessments*

(Ohio EPA 2008), this ERA was continued to a Level II Screening ERA.

The Level II Screening ERA evaluated soil, sediment, and surface water chemicals of potential ecological concern (COPECs). Twenty-eight integrated COPECs were detected in soil, six were detected in sediment, and two were detected in surface water. However, no integrated COPECs are of ecological concern requiring remediation or further evaluation. Consequently, the Level II Screening ERA for NACA Test Area concludes with a recommendation that no further action is necessary to be protective of important ecological receptors.

5.3 Impacts to Groundwater

Using results from the 1999 Phase I RI and 2010 PBA08 RI, contaminant fate and transport modeling was performed to assess the potential for site-related contaminants and COPCs to leach from surface soil, subsurface soil, and sediment sources at NACA Test Area and impact groundwater beneath the sources and downgradient receptor locations. Modeling results were included in the decision-making process to determine whether performing remedial actions may be necessary to protect groundwater resources. No primary contaminant sources are located on the AOC, but secondary sources, such as contaminated soil, exist.

Antimony; arsenic; barium; cadmium; cobalt; copper; dibenzofuran; manganese; naphthalene; selenium; thallium; 2,4-dinitrotoluene (DNT); TNT; and naphthalene in soil were predicted to exceed the screening criteria in groundwater beneath the source area. However, except for naphthalene and 2,4-DNT from the Former Plane Refueling/Crash Strip Area, none of these constituents were predicted to exceed the screening criteria in groundwater at the downgradient receptor location.

The qualitative assessment concluded that no contaminant migration chemicals of concern (CMCOCs) were present in soil and sediment that may impact the groundwater beneath the source or at the downstream receptor location.

After the 2017 Supplemental Investigation took place, contaminant fate and transport were re-evaluated. The majority of samples from this investigation had lower detected values. Cadmium, copper, and aluminum had higher maximum concentrations in soil versus the previous investigations; however, they were detected only in the 0–1 ft bgs interval. This created a larger leaching zone, and travel time to groundwater would be greater than 1,000 years. Thus, these constituents were eliminated based on the travel time screen. Aluminum and cobalt in sediment have higher detected values than previous investigations. However, because these constituents were not detected in the previously collected surface water samples, they were eliminated from the list of CMCOPCs.

Thus, the results of fate and transport analysis concluded that no further action is required of soil and sediment at NACA Test Area for the protection of groundwater.

6.0 REMEDIAL ACTION OBJECTIVE

The RI for NACA Test Area concluded that no unacceptable risk to the Resident Receptor exists from subsurface soil, sediment, and surface water within any EUs. The EUs with surface soil requiring remediation are at the Former Crash Area, Former Plane Refueling/Crash Strip Area, and Former Crash Area Well Pit.

Benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and lead are COCs requiring remediation at the Former Plane Refueling/Crash Strip Area, Former Crash Area (benzo[a]pyrene only), and Former Crash Area Well Pit (lead only).

The remedial action objective (RAO) for NACA Test Area is as follows:

- Prevent (1) Industrial Receptor, National Guard Trainee, and Resident Receptor exposure to lead in soil above the cleanup

goal (CUG) at the Former Crash Area Well Pit and (2) Resident Receptor exposure to surface soil (0–1 ft bgs) with concentrations of benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene above CUGs in the Former Plane Refueling/Crash Strip Area and Former Crash Area.

The volume estimates of soil requiring remediation for Unrestricted (Residential) Land Use (assuming a soil depth of 1 ft bgs) are presented in Table 4 and Figure 6.

The Former Crash Area Well Pit is concrete-walled, is 3.8 ft long, 3.8 ft wide, 3.5 ft deep, and, based on field observations, contains approximately 0.15 yd^3 (4 ft^3) of contaminated soil.

The Former Plane Refueling/Crash Strip Area (Area 1) contaminated soil is within the two 6-ft-wide soil strips between the paved concrete runway and monorail strip. The eastern lateral extent of contamination is estimated to be half the distance between the sample with a Resident Receptor RSL exceedance (NTA-090) and an adjacent sample without an exceedance (NTAsb-122). The western lateral extent of contamination is bound by the concrete pad immediately west of sample location NTA-088. The vertical extent of contamination is assumed to be 1 ft bgs, as concentrations at depths below 1 ft bgs were below the Resident Receptor RSL.

The Former Plane Refueling Area (Area 2) contaminated soil is at 2017 Supplemental Investigation sample locations NTA-166, NTA-169, and NTA-172, near the former plane storage area. The vertical extent of contamination is assumed to be 1 ft bgs, based on historical samples collected near this location.

The Former Crash Area (Area 3) contaminated soil is at the east end of the crash strip. The lateral extent of contamination was estimated to be half the distance between the sample with Resident Receptor RSL exceedances (NTA-026) and adjacent samples without exceedances.

7.0 SUMMARY OF ALTERNATIVES

Remedial technologies and process options were screened to identify potential remedial alternatives that can achieve the RAO. These remedial alternatives are presented below. Area 1 refers to the Crash Strip Area, Area 2 refers to the Former Plane Refueling Area, and Area 3 refers to the Former Crash Area.

Table 4. Estimated Volume Requiring Remediation for Unrestricted (Residential) Land Use

Areas Requiring Remediation	Media	Treatment Interval	Surface Area	In situ		In situ with Constructability[1]		Ex situ[1,2]	
		(ft bgs)	(ft^2)	Volume (ft^3)	Volume (yd^3)	Volume (ft^3)	Volume (yd^3)	Volume (ft^3)	Volume (yd^3)
Area 1	Surface Soil	0-1	8,590	8,590	320	10,730	400	12,880	480
Area 2	Surface Soil	0-1	4,130	4,130	150	5,170	190	6,200	230
Area 3	Surface Soil	0-1	10,000	10,000	370	12,500	460	15,000	560
SUBTOTALS			22,720	22,720	840	28,400	1,050	34,080	1,270
Well Pit	Soil	VOLUME ESTIMATE BASED ON FIELD OBSERVATIONS						4	0.1
TOTAL								34,084	1,270

[1]Constructability factor accounts for over excavation, sloping of sidewalls, and addresses limitations of removal equipment. The in situ volume is increased by 25% for a constructability factor.
[2]Includes 20% swell factor.
bgs = Below ground surface.
ft = Feet.
ft^2 = Square feet.
ft^3 = Cubic feet.
yd^3 = Cubic yards.

7.1 Alternative 1: No Action

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

7.2 Alternative 2: Excavation and Off-site Disposal of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted (Residential) Land Use

Alternative 2 will achieve Unrestricted (Residential) Land Use at NACA Test Area by removing the Well Pit and excavating surface soil (0–1 ft bgs) from Areas 1, 2, and 3 that exceeds Resident Receptor CUGs.

This alternative assumes the soil within the Well Pit will be completely removed. The Well Pit lid will be properly disposed of, and the former production well will be plugged and abandoned. Once the well is abandoned, Well Pit concrete structures will be removed.

To achieve a scenario in which the AOC is protective for Unrestricted (Residential) Land Use, this alternative consists of excavation and off-site disposal of surface soil from Areas 1, 2, and 3. Pre-excavation delineation sampling will be conducted in Areas 2 and 3. The assumed extent of the excavation in these areas is depicted in Figure 6. The estimated total disposal volume (i.e., ex situ) is approximately 1,270 yd^3.

Soil will be removed using conventional construction equipment such as backhoes, bulldozers, front-end loaders, and scrapers. Oversized debris will be crushed or otherwise processed to meet disposal facility requirements. Excavated soil will be hauled by truck to a licensed and permitted disposal facility. The vertical limit of the excavation is 1 ft bgs, and the horizontal limits of the excavation will be defined by the pre-excavation samples collected.

Upon completing the excavation in Area 1, five confirmatory samples will be collected from the floor and sidewalls of the excavation and analyzed for PAH COCs to ensure successful removal of contaminated soils. One confirmation sample will be collected from the footprint of the removed Well Pit and analyzed for lead. Confirmation samples are not required at Areas 2 and 3, as the delineation sampling will define the vertical and horizontal extents of soil removal.

Upon completing soil excavation and well abandonment, all disturbed and excavated areas will be backfilled with clean soil and graded to meet neighboring contours. The backfill soil will come from a clean source that was previously sampled and approved for use by Ohio EPA. After the area is backfilled and graded, workers will apply a seed mixture (as approved by OHARNG) and mulch. Restored areas will be inspected and monitored as required in the storm water best management practices established in the remedial design.

7.3 Alternative 3: Ex Situ Thermal Treatment of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted (Residential) Land Use

This alternative involves two remedial technologies: (1) excavation and off-site disposal of soil from the Well Pit in the Former Crash Area; and (2) ex situ thermal treatment, such as the VEG© treatment, for surface soil at Areas 1, 2, and 3. Implementing these remedial technologies will attain Unrestricted (Residential) Land Use.

The Well Pit will be removed and abandoned, as described in Alternative 2.

Delineation/pre-excavation confirmation sampling will be conducted to confirm the limits of soil excavation from Areas 2 and 3. Confirmation sampling will be completed at Area 1. Soil samples will be analyzed for

COCs until the lateral and horizontal extents of contamination are established by soil samples as having concentrations below the remedial CUG. When the delineation sampling is complete, the vertical and horizontal extents of soil removal will be defined.

Once the vertical and horizontal extents are defined, soil will undergo ex situ thermal treatment. The treatment system will be pre-heated to the optimal treatment temperature based on results of past bench- and pilot-scale tests. While the system is being heated, soil will be excavated using conventional construction equipment such as backhoes, bulldozers, front-end loaders, and scrapers and will be stockpiled immediately adjacent to the treatment system into approximately 50-yd^3 (ex situ) piles. Once the treatment system is at the optimal treatment temperature, contaminated soil will be fed directly into the fully enclosed, pre-heated chamber and exposed to steam to serve as the heat source for the thermal treatment. While emissions are contained within the system, PAHs are removed from the soil.

Soil samples will be collected from stockpiles of treated soil. Confirmation samples will not be required at Areas 2 and 3, as the pre-excavation delineation sampling will define the vertical and horizontal extents of soil removal. Five confirmatory soil samples are required at Area 1 to ensure PAH contamination has been removed. Once the laboratory analysis determines COC concentrations are below the remedial CUG, the treated soil will be placed back into the excavated area and graded to meet neighboring contours. Topsoil will be added prior to seeding and mulching.

8.0 EVALUATION OF ALTERNATIVES

A comparative analysis was performed for the three alternatives in order to provide a direct comparison to one another with respect to common criteria. Table 5 provides a comparative analysis of the alternatives conducted.

Table 5. Comparative Analysis of Remedial Alternatives

NCP Evaluation Criteria	Alternative 1: No Action	Alternative 2: Excavation and Off-site Disposal of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted (Residential) Land Use	Alternative 3: Ex situ Thermal Treatment of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted (Residential) Land Use
Threshold Criteria	***Result***	***Result***	***Result***
1. Overall Protectiveness of Human Health and the Environment	Not protective	Protective	Protective
2. Compliance with ARARs	Not compliant	Compliant	Compliant
Balancing Criteria	***Score***	***Score***	***Score***
3. Long-term Effectiveness and Permanence	Not applicable	1	2
4. Reduction of Toxicity, Mobility, or Volume through Treatment	Not applicable	1	2
5. Short-term Effectiveness	Not applicable	1	2
6. Implementability	Not applicable	2	1
7. Cost	Not applicable ($0)	2 ($408,592)	3 ($293,769)
Balancing Criteria Score	*Not applicable*	*7*	*10*

Any alternative considered "not protective" for overall protectiveness of human health and the environment or "not compliant" for compliance with ARARs, it is not eligible for selection as the recommended alternative. Therefore, that alternative is not scored as part of the balancing criteria evaluation.

Scoring for the balancing criteria is on a 3=most favorable, 1=least favorable basis. 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.

Alternative 1 was determined not to be protective of human health. No further action is required for protection of ecological resources. Potential Applicable or Relevant and Appropriate Requirements (ARARs) are not applicable for Alternative 1, since no actions would be implemented. Alternative 1 was not eligible for selection.

For the remaining alternatives, the balancing criteria (i.e., long-term effectiveness and permanence; reduction of contaminant toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost) were used to select a recommended alternative among the alternatives that would satisfy the threshold criteria. The remaining alternatives were scored among one another for each of the balancing criteria and a total score was generated.

If an on-site thermal treatment system is available at CJAG, Alternative 3 scores the highest and is the recommended alternative. Alternative 3 is effective in the long term and will attain Unrestricted (Residential) Land Use. In addition, Alternative 3 is a green and highly sustainable alternative. The thermal treatment associated with Alternative 3 minimizes secondary waste generation and reduces the carbon footprint as would otherwise be incurred with Alternative 2 through the transportation of waste to an off-site landfill and transportation of backfill material to the site. In addition, on-site thermal treatment results in reduced toxicity, mobility, and volume of contamination. In comparison, Alternative 2 only reduces mobility through placement of contaminated soil in an engineered landfill and no treatment is included in waste management.

In the event that a thermal treatment system is not available on site at the facility, Alternative 2 would be readily available for implementation. Excavation and off-site disposal alternatives have been implemented multiple times during restoration efforts at the former RVAAP. As with Alternative 3, Alternative 2 is effective in the long term and attains Unrestricted (Residential) Land Use. Alternative 2 reduces the mobility of contaminants by placing contamination in a licensed, engineered landfill. The cost of Alternative 3 ($293,769) is the lower of the two active response actions. The lower cost is attributable to the reduced soil volume requiring transportation and disposal to an off-site landfill and procurement of backfill material associated with Alternative 2. Neither Alternative 2 nor Alternative 3 require 5-year reviews in accordance with the NCP, as implementing the alternative results in attaining Unrestricted (Residential) Land Use.

9.0 PREFERRED ALTERNATIVE

The recommended alternative for NACA Test Area is Alternative 3: Ex situ Thermal Treatment of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted (Residential) Land Use if an on-site thermal treatment system is available at CJAG. Alternative 3 meets the requirements for overall protectiveness and is compliant with ARARs, thereby satisfying the threshold criteria. The balancing criteria (short- and long-term effectiveness; reduction of contaminant toxicity, mobility, or volume through treatment; ease of implementation; and cost) are also favorable for Alternative 3. Long-term protection of human health is provided by the treatment of soil to below CUGs and permanent, given there is no residual risk and no requirement for administrative land use controls. Alternative 3 reduces the toxicity, mobility, and volume of contamination through thermal treatment.

In addition, the thermal treatment associated with Alternative 3 is a green and highly sustainable technology that minimizes secondary waste generation and reduces the carbon footprint. Short-term effectiveness is achieved with implementation of expedited remediation efforts and proper soil handling techniques posing minimal impacts to the environment. Risks to site workers during soil excavation and treatment would be mitigated through appropriate health and safety practices addressed in the health and safety plan. The preferred alternative is also easily implementable, assuming the on-site availability of the thermal treatment system. At the lowest estimated cost, Alternative 3 has

no operations and maintenance costs and does not require 5-year reviews, as implementing the alternative results in attaining Unrestricted (Residential) Land Use.

This recommendation is not a final decision. ARNG, in coordination with Ohio EPA, will select the remedy for NACA Test Area after reviewing and considering all comments submitted during the 30-day public comment period. Comments received from the public on this PP will be considered in preparing a Record of Decision (ROD) to document the final remedy. The ROD will also include a responsiveness summary addressing comments received on the PP.

10.0 COMMUNITY PARTICIPATION

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

The comment period extends from July 29, 2019 to August 27, 2019. This period includes a public meeting at which ARNG will present this PP and accept oral and written comments.

10.1 Public Comment Period

The 30-day comment period is from July 29, 2019 to August 27, 2019, 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 PP.

ARNG and Ohio EPA will consider all public comments before selecting a remedy. During the comment period, the public is encouraged to review documents pertinent to NACA Test Area.

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

10.2 Written Comments

If the public would like to comment in writing on this PP or other relevant issues, please deliver comments to ARNG at the public meeting or mail written comments (postmarked no later than August 27, 2019).

POINT OF CONTACT FOR WRITTEN COMMENTS

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

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

10.3 Public Meeting

ARNG will hold an open house and public meeting on this PP on August 15, 2019, at 6:00PM, in the Shearer Community Center, 9355 Newton Falls Road Ravenna, Ohio 44266 to accept comments.

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

10.4 Review of Public Comments

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.

The responsiveness summary, a document that summarizes ARNG's responses to comments received during the public comment period, will be included in the ROD. ARNG's final choice of action will be documented in the ROD.

The ROD will be added to the RVAAP Restoration Program Administrative Record and Information Repositories.

ADMINISTRATIVE RECORD FILE

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

Note: Access is restricted to Camp James A. Garfield, but the file can be obtained or viewed with prior notice.

INFORMATION REPOSITORIES

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

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

Newton Falls Public Library
204 South Canal Street
Newton Falls, Ohio 44444
(330) 872-1282
Hours of operation:
9AM-8PM Monday-Thursday
9AM-5PM Friday and Saturday

Online
http://www.rvaap.org/

GLOSSARY OF TERMS

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

Applicable or Relevant and Appropriate Requirements (ARAR): a promulgated federal or more stringent state law or regulation; aimed at protecting human health and the environment during the cleanup at a site; and that has been evaluated and found to be legally applicable or relevant for the site.

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

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

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

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

Feasibility Study: a CERCLA document that reviews and evaluates multiple remedial technologies under consideration at a site. It also identifies the preferred remedial action alternative.

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

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

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

Remedial Action Objective (RAO): medium-specific goal for protecting human health and the environment that specifies contaminants, media of interest, and cleanup goals.

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.

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

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

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

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

REFERENCES

DoD (U.S. Department of Defense) 2012. *Defense Environmental Restoration Program (DERP) Management Manual*. Number 4715.20. March 2012.

Leidos 2001. *Phase I Remedial Investigation Report for the NACA Test Area at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. December 2001.

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MKM (MKM Engineers) 2007. *Final Characterization of 14 AOCs at Ravenna Army Ammunition Plant*. March 2007.

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OHARNG (Ohio Army National Guard) 2014. *Integrated Natural Resources Management Plan at the Camp Ravenna Joint Military Training Center, Portage and Trumbull Counties, Ohio.* December 2014.

Ohio EPA (Ohio Environmental Protection Agency) 2004. *Director's Final Findings and Orders for the Ravenna Army Ammunition Plant*. June 2004.

Ohio EPA 2008. *Guidance for Conducting Ecological Risk Assessments*. Division of Emergency and Remedial Response. April 2008.

USACE (U.S. Army Corps of Engineers) 1996. *Preliminary Assessment for the Characterization of Areas of Contamination at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. February 1996.

USACHPPM (U.S. Army Center for Health Promotion and Preventive Medicine) 1996. *Relative Risk Site Evaluation at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. Hazardous and Medical Waste Study No. 37-EF-5360-97. November 1996.

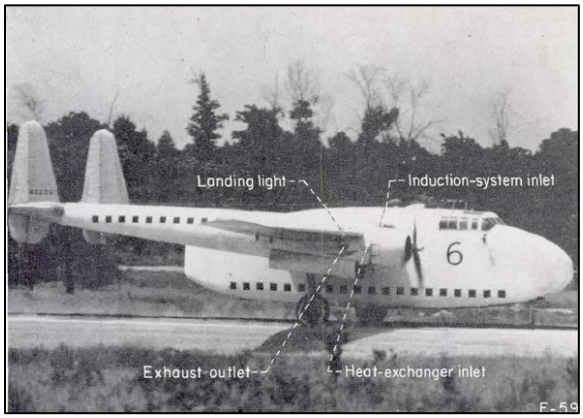
USATHAMA (U.S. Army Toxic and Hazardous Materials Agency) 1978. *Installation Assessment of Ravenna Army Ammunition Plant*, Records Evaluation Report No. 132. November 1978.

USEPA (U.S. Environmental Protection Agency) 1993. *Wildlife Exposure Factors Handbook*. Office of Research and Development, Washington, D.C., Volume 1 of 2. December 1993.

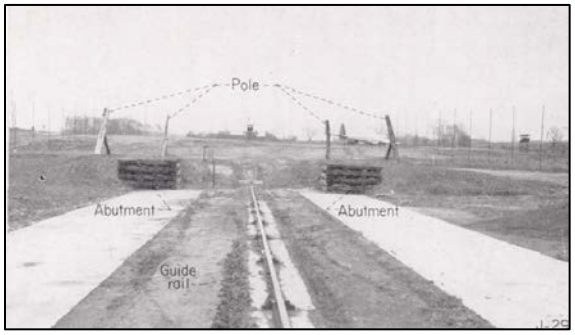
Vista (Vista Technologies) 1998. *Environmental Baseline Survey of the Ravenna Army Ammunition Plant*. September 1998.

PHOTOGRAPHS

Photograph 1. C-46 Airplane Used at NACA Test Area (NACA 1953, Figure 1)



Photograph 2. C-82 Airplane Used at NACA Test Area (NACA 1953, Figure 2)



Photograph 3. Constructed Crash Barrier at East End of Crash Strip (NACA 1953, Figure 4a)

Photograph 4. C-82 1-Second After Initial Impact with Crash Barrier Airplane Used at NACA Test Area (NACA 1953, Figure 41b)

Photograph 5. Current Photograph of Crash Strip (Facing East from Concrete Pad)

Photograph 6. Well Pit

FIGURES

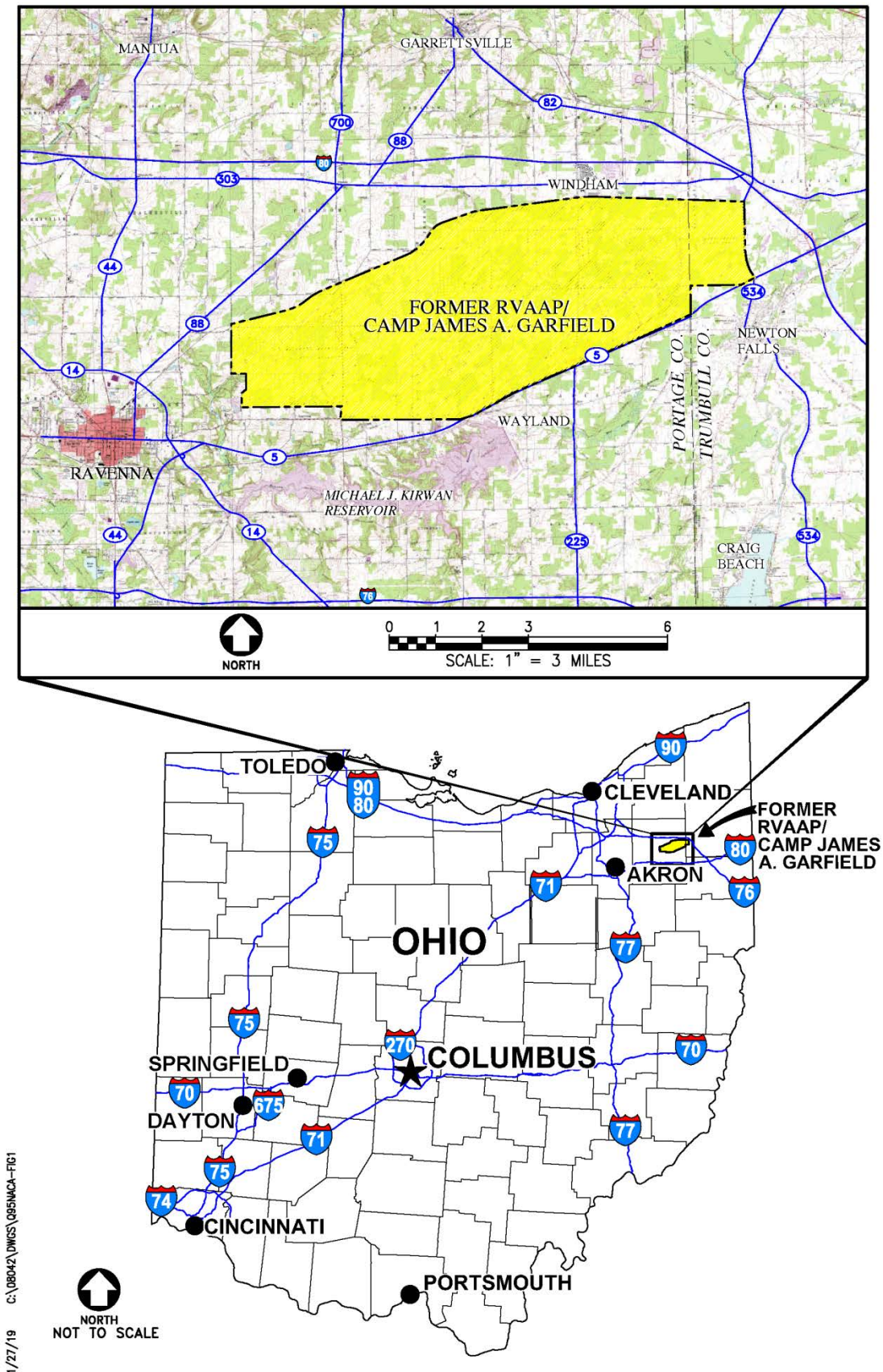


Figure 1. General Location and Orientation of Camp James A. Garfield

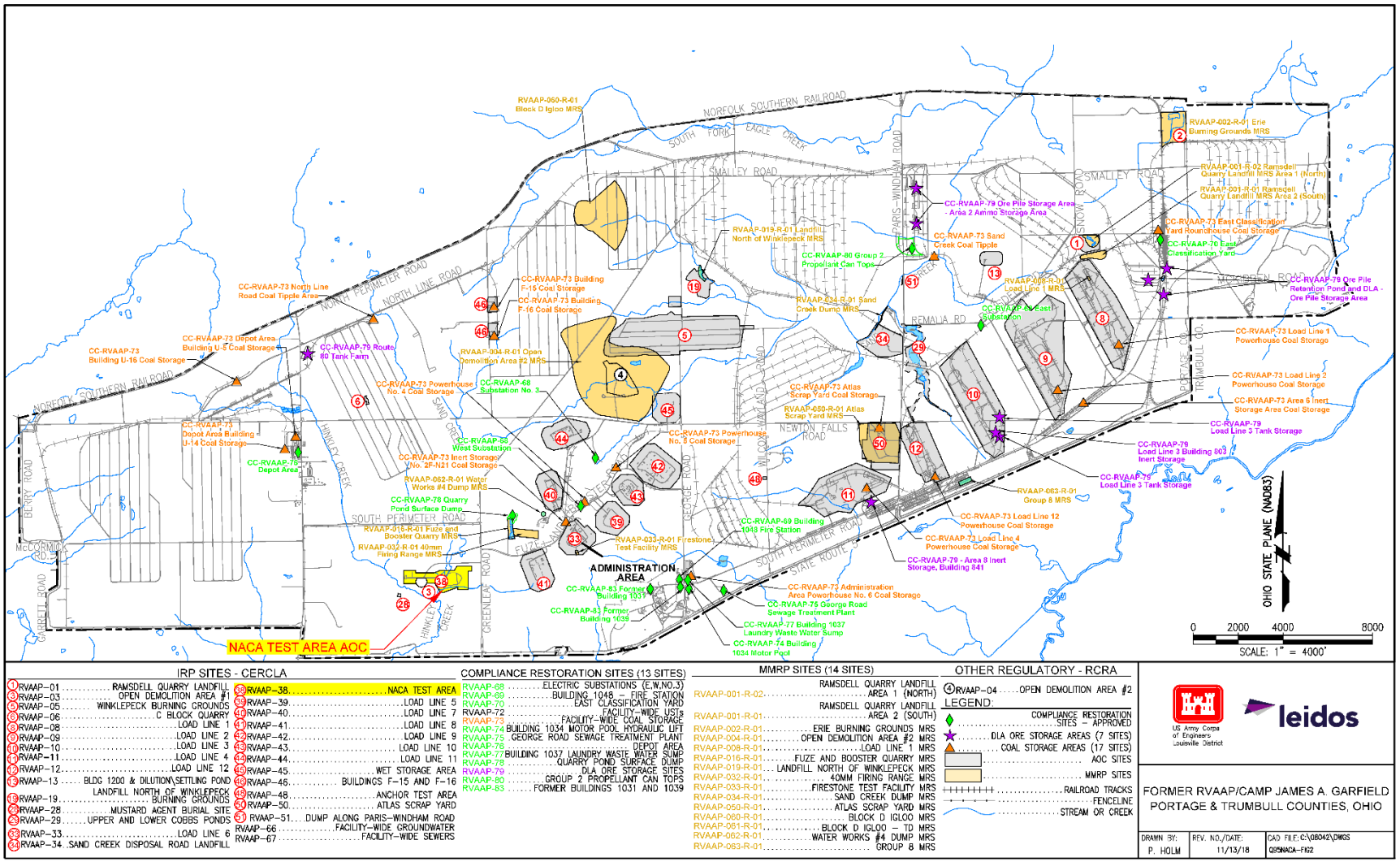


Figure 2. Location of NACA Test Area within Camp James A. Garfield

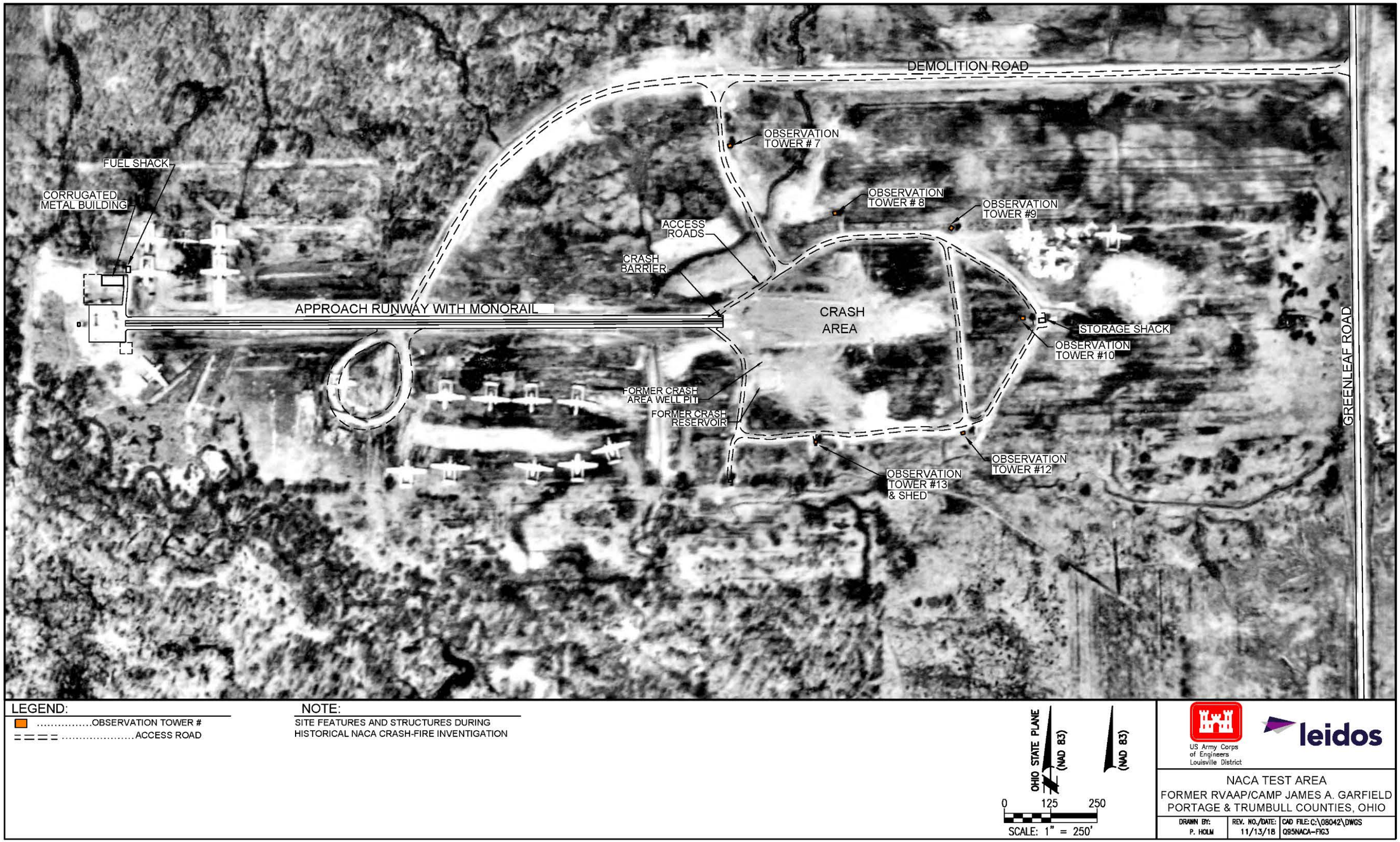


Figure 3. NACA Test Area – 1952 Aerial Photograph

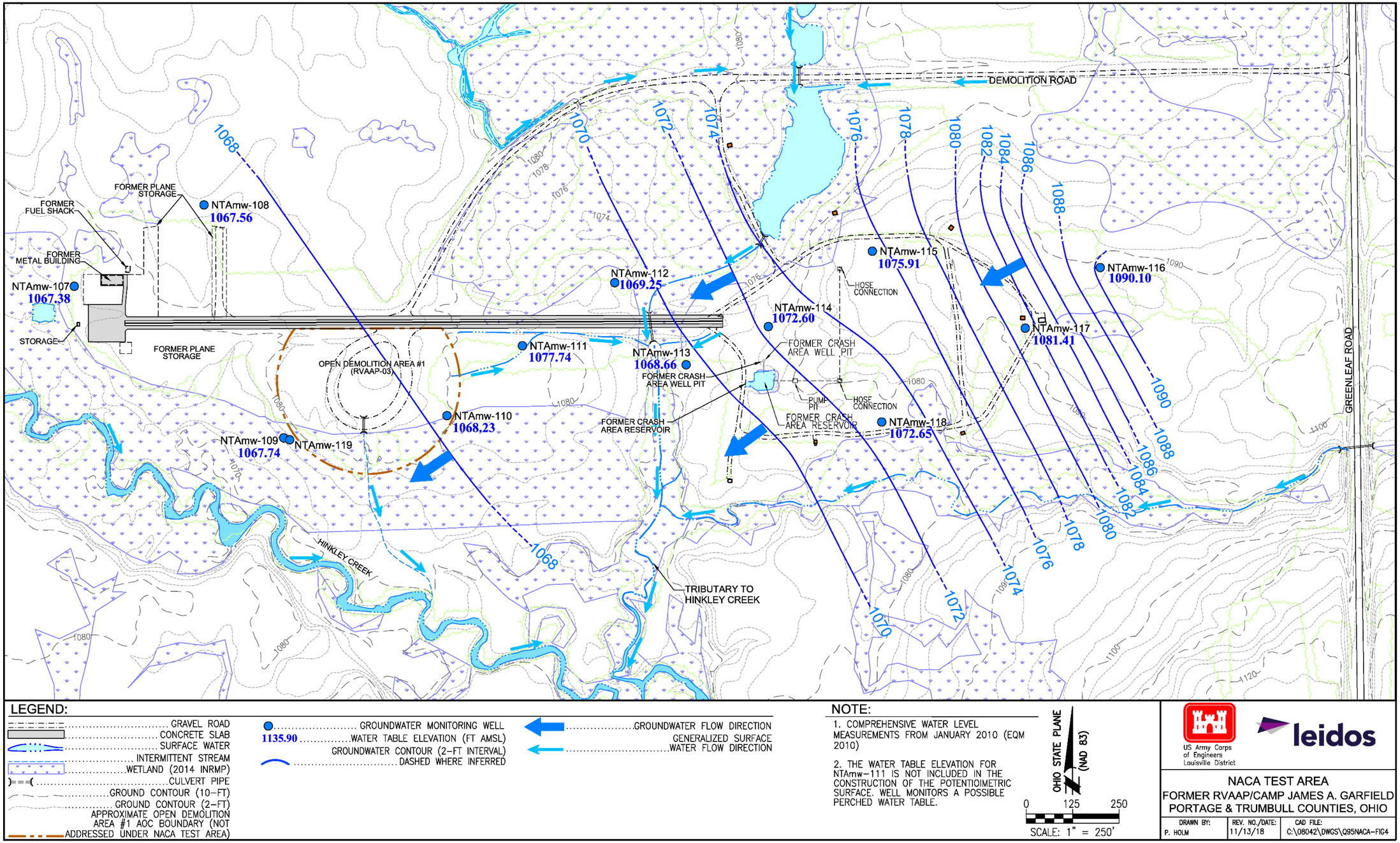


Figure 4. NACA Test Area – Current Site Features

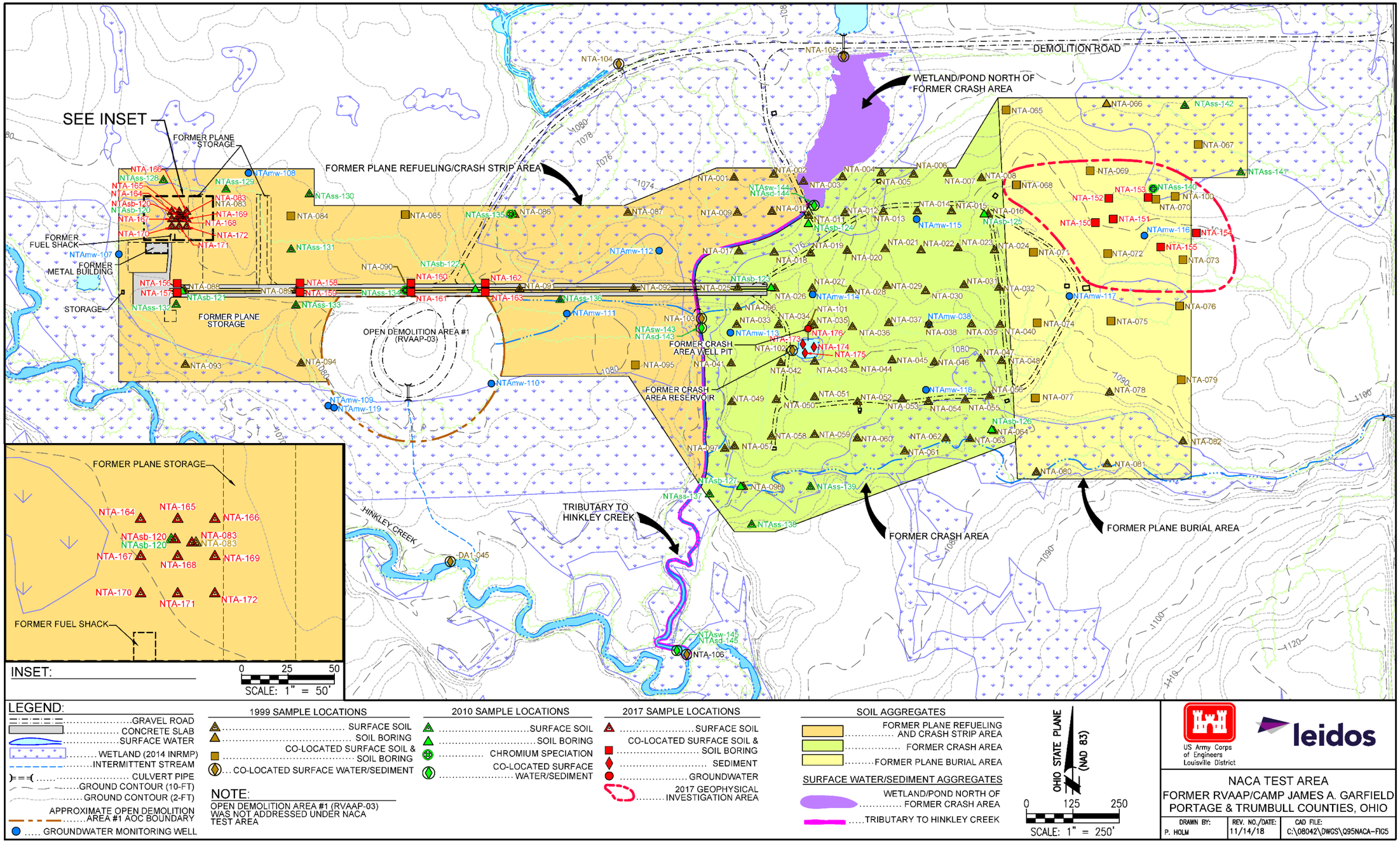


Figure 5. NACA Test Area – Remedial Investigation Sampling Locations

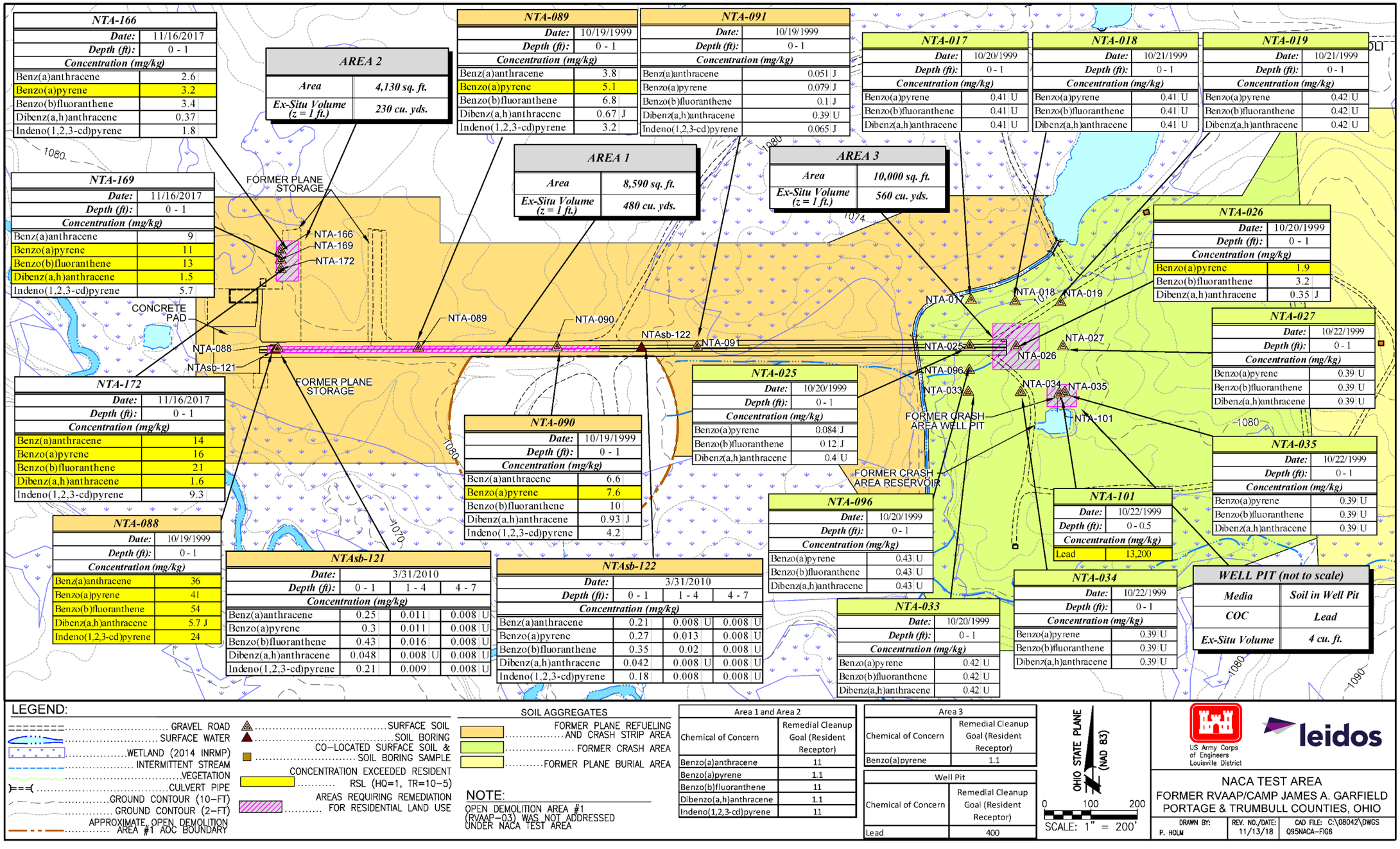


Figure 6. Estimated Extent of Soil Requiring Remediation

ATTACHMENT A

Ohio EPA Correspondence

Ohio Environmental Protection Agency

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

March 20, 2019

RE: US Army Ravenna Ammunition Plt RVAAP
Remediation Response
Project Records
Remedial Response
Portage County
ID # 267000859098

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

Subject: Draft Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area, Dated February 6, 2019

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 "Draft Proposed Plan for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area," dated February 6, 2019. This document was received by Ohio EPA, NEDO on February 11, 2019. It was prepared by Leidos.

This Draft Proposed Plan (PP) summarizes information found in the "Phase II Remedial Investigation and Feasibility Study Report for Soil, Sediment, and Surface Water at RVAAP-38 NACA Test Area July 2018." The Army National Guard's (ARNG) preferred alternative for NACA Test Area is *Alternative 3: Ex situ Thermal Treatment of Soil at Areas 1, 2, and 3 and Well Pit Removal – Attain Unrestricted (Residential) Land Use*, if an on-site thermal treatment system is available. Ohio EPA has no comments on the Draft PP and concurs with the preferred Alternative 3. Please submit the Final PP.

If you have any questions concerning this letter, please contact Vanessa Steigerwald Dick at (330) 963-1219.

Sincerely,

Vanessa Steigerwald Dick

RECEIVED
MAR 20 2019

Vanessa Steigerwald Dick
Environmental Scientist
Division of Environmental Response and Revitalization

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