APPENDIX I

PBA08 Remedial Investigation Summary

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
bgs	Below Ground Surface
DoD	U.S. Department of Defense
DQO	Data Quality Objective
FWCUG	Facility-wide Cleanup Goal
FWSAP	*Facility-wide Sampling And Analysis Plan*
GPS	Global Positioning System
IDW	Investigation-derived Waste
ISM	Incremental Sampling Methodology
Ohio EPA	Ohio Environmental Protection Agency
PBA08 RI	Performance-based Acquisition 2008 Remedial Investigation
PBA08 SAP	Performance-based Acquisition 2008 Supplemental Investigation Sampling and Analysis Plan Addendum No. 1
QA	Quality Assurance
QC	Quality Control
RI	Remedial Investigation
RVAAP	Ravenna Army Ammunition Plant
SVOC	Semi-volatile Organic Compound
TestAmerica	TestAmerica Laboratories, Inc.
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

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I.0 REMEDIAL INVESTIGATION

This section presents the methods used for developing data quality objectives (DQOs), collecting field data, and managing analytical data and laboratory programs for the Performance-based Acquisition 2008 Remedial Investigation (PBA08 RI) at the Landfill North of Winklepeck Burning Grounds. The PBA08 RI was implemented in accordance with the Performance-based Acquisition 2008 Supplemental Investigation Sampling and Analysis Plan Addendum No. 1 (PBA08 SAP) to supplement historical data and complete the remedial investigation (RI) phase of the Comprehensive Environmental Response, Compensation, and Liability Act process. The results of the PBA08 RI sampling completed in 2010 are combined with the 2004 results of the Characterization of 14 areas of concern (AOCs) and the 1996 Phase I RI results to evaluate the nature and extent of contamination, assess potential future impacts to groundwater, conduct human health risk assessments and ecological risk assessments, and evaluate the need for remedial alternatives.

As part of the PBA08 RI DQOs, an initial screening approach was used to help focus the investigation on specific chemicals and areas to be further evaluated by assessing the nature and extent of contamination observed in historical samples (Section 3.2.2 of the PBA08 SAP). The screening approach presented in the PBA08 SAP compared sample results from previous investigations at the Landfill North of Winklepeck Burning Grounds to the most protective chemical-specific facility-wide cleanup goals (FWCUGs) at the 1E-06 cancer risk level and non-carcinogenic risk hazard quotient of 0.1, as presented in the Ravenna Army Ammunition Plant (RVAAP) Facility-wide Human Health Risk Assessors Manual (USACE 2005). The most protective FWCUGs are referred to as "screening criteria." Previous results were also compared to FWCUGs at the higher target risk of 1E-05 and hazard quotient of 1 to facilitate identification of potential source areas that may require additional sampling to refine the extent of contamination. Table I-1 lists the chemicals with detected concentrations that exceed screening criteria in historical soil samples.

Table I-1. Chemicals Detected at Concentrations above Screening Criteria in Previous Investigations

Surface Soil	Subsurface Soil	Sediment	Surface Water
Chromium Copper Thallium Benzo(a)pyrene	Thallium PCB-1254	Aluminum Chromium Thallium Benzo(a)pyrene	Manganese Thallium Benz(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthene Dibenz(a,h)anthracene Indeno(1,2,3-cd)pyrene

Note: This table was generated using data from the Characterization of 14 AOCs at the Ravenna Army Ammunition Plant (MKM 2007).
PCB = Polychlorinated biphenyl.

Representatives of the Army and Ohio Environmental Protection Agency (Ohio EPA) reviewed and approved the PBA08 RI sample locations and rationale as part of the approval process for the PBA08 SAP in January 2010.

The PBA08 RI was conducted from March through April 2010 and included collecting sediment, surface water, and surface soil using discrete and incremental sampling methodology (ISM) sampling techniques; subsurface soil samples were collected for geotechnical evaluation.

No groundwater samples were collected during the PBA08 RI, as the current condition of groundwater will be evaluated as an individual AOC for the entire facility (designated as RVAAP-66) and addressed in a separate RI Report. The following sections describe the rationale and sample collection methods for each component of the PBA08 RI field investigation.

I.1 SOIL CHARACTERIZATION

Soil samples were collected during the PBA08 RI to assess contaminant occurrence and distribution in surface and subsurface soil.

I.1.1 Surface Soil Sampling Rationale and Methods

Since ISM was used to evaluate surface soil [0–1 ft below ground surface (bgs)] as part of the Characterization of 14 AOCs, ISM was also used for surface soil sampling during the PBA08 RI. Samples were collected at LNWBG to assess contaminant occurrence and distribution in surface soil. Each ISM result was evaluated separately against the screening criteria for each chemical analyzed. Surface soil sampling to define the lateral extent of contamination was conducted according to the decision rules approved in the PBA08 SAP. All PBA08 RI surface soil samples were collected using ISM or discrete sampling techniques.

Ten ISM samples were collected around historical ISM sample areas to further delineate surface soil above historical screening criteria and to completely characterize the site. Two ISM samples in the southern portion of the surface soil sample set (LNWss-078M and LNWss-079M) were observed to contain mounds with estimated dimensions of 3–4 ft bgs in height and 10–18 ft in diameter (Figure I-1). In addition, one ISM sample (LNWss-070M) was collected to assess nature and extent of the Characterization of 14 AOCs sample (LNWss-042M) collected as a contingency sample in the area of the former barn.

One ISM surface soil sample (10% of the total number of ISM surface soil samples collected) was analyzed for RVAAP full-suite analytes. References to the "RVAAP full-suite analytes" generally include analyses of target analyte list metals, explosives, propellants (nitrocellulose and nitroguanidine), semi-volatile organic compounds, volatile organic compounds (VOCs), polychlorinated biphenyls, and pesticides. If an ISM sample was analyzed for RVAAP full-suite analytes, all parameters except VOCs were collected and analyzed as part of the ISM sample process, and the VOCs were analyzed from a discrete soil sample collected from within the ISM sample area. Nitroglycerin was analyzed under U.S. Environmental Protection Agency (USEPA) Method 8330 and was reported as an explosive chemical. Table I-2 presents the specific rationale for each surface soil sample collected for the PBA08 RI.

All surface soil samples were collected from 0–1 ft bgs in accordance with the bucket hand auger method described in Section 4.5.2.1.1 of the Facility-wide Sampling and Analysis Plan (USACE 2001a) (herein referred to as the FWSAP). An updated version of the FWSAP was developed in February 2011 and approved by Ohio EPA; however, the PBA08 RI was implemented prior to approval of this updated version.

For the PBA08 RI, the corners of each of the designated ISM sampling areas were located using a digital global positioning system (GPS) and were marked using wooden stakes. Sampling crews selected aliquot locations by walking over the entire ISM sampling area and marking the requisite number of points using flagging. At least 30 aliquots were collected for each ISM sample. Aliquot locations were randomly selected in the field and were not predetermined using a grid.

Approximately equal sample volume aliquots were collected from a depth of 0–1 ft bgs using a decontaminated ⅝-inch-diameter push probe. A soil description was completed for each ISM sample and is included in Appendix A.

All aliquots collected from a given ISM sample area were combined in a labeled container for transport to the laboratory in accordance with the PBA08 SAP. At the laboratory, each sample was air-dried, sieved, and ground for specified non-volatile chemical analyses.

Quality control (QC) field duplicate and quality assurance (QA) split samples were collected from ISM sample areas at a 50% frequency (one sample). The QC field duplicate samples were submitted to the laboratory as "blind" and were used to determine whether the field sampling technique was reproducible, and as an indicator of sample heterogeneity. The QA split samples were sent to a U.S. Army Corps of Engineers (USACE) QA laboratory for independent analysis and evaluation of analytical results obtained by the primary laboratory.

QA/QC samples were collected as replicate ISM samples requiring three separate ISM samples from the same sample area. The QA/QC samples were collected from a set of 30 aliquot locations that were positioned adjacent to the location used for the initial ISM sample. Aliquots for QA/QC samples were collected in separate stainless steel bowls and placed into separate labeled containers.

ISM was not utilized for samples collected for VOC analysis because the air drying, mixing, and sieving of aliquots required by the method could result in the loss of VOCs from the sample. For ISM sample areas designated for VOC analysis, one discrete sample was collected from a depth of 0–1 ft bgs within the ISM sample area using the bucket hand auger method described in the PBA08 SAP. The specific location of the discrete sample was randomly chosen. Soil portions designated for VOC analyses were not homogenized in the field but were placed directly in the sample container and compacted to zero headspace.

Table I-2. PBA08 RI Surface Soil Samples and Rationales

PBA08 RI Station	Targeted Area	Purpose	Analyses Performed				
			Metals	Explosives	VOCs	Pesticides/ PCBs	SVOC
LNWss-070M	Former Barn, previously sample LNWss-042M	Delineate lateral extent of previously identified contamination	Y	Y	N	N	Y
LNWss-071M	Bottom of slope along East Tributary	Characterize area not previously sampled	Y	Y	N	N	Y
LNWss-072M	Bottom of slope along East Tributary, in area of identified geophysical anomalies.	Characterize area not previously sampled	Y	Y	N	N	Y
		QA/QC	Y	Y	N	N	Y
			Y	Y	N	N	Y
LNWss-073M	Northern portion AOI.	Characterize area not previously sampled	Y	Y	N	N	Y
LNWss-074M	North-central portion of AOI.	Characterize area not previously sampled	Y	Y	N	N	Y
LNWss-075M	Central portion of AOI, in area of identified geophysical anomalies.	Characterize area not previously sampled	Y	Y	N	N	Y
LNWss-076M	East-central portion of AOI, in area of identified geophysical anomalies.	Characterize area not previously sampled	Y	Y	N	N	Y
LNWss-077M	East-central portion of AOI.	Characterize area not previously sampled. Analyzed for RVAAP full-suite analytes	Y	Y	Y	Y	Y
LNWss-078M	Southern portion of AOI, in area of identified geophysical anomalies.	Characterize area not previously sampled	Y	Y	N	N	Y
LNWss-079M	Southern portion of AOI.	Characterize area not previously sampled	Y	Y	N	N	Y

AOI = Area of investigation.
bgs = Below ground surface.
ft = Feet.
PBA08 RI = Performance-based Acquisition 2008 Remedial Investigation.
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RVAAP = Ravenna Army Ammunition Plant.
SVOC = Semi-volatile organic compound.
VOC = Volatile organic compound.

In addition to the ISM surface soil samples, three discrete chromium speciation samples were collected to evaluate the potential contribution of hexavalent chromium to the total chromium concentrations in soil. Samples from 0–1 ft bgs were collected in accordance with the bucket hand auger method described in Section 4.5.2.1.1 of the FWSAP. An updated version of the FWSAP was developed in February 2011 and approved by Ohio EPA; however, the PBA08 RI was implemented prior to approval of this updated version. Two samples were collected from areas previously identified as having elevated total chromium concentrations. One sample was collected from an area previously identified as having total chromium concentrations near background levels. Field duplicate samples were not collected for chromium speciation. A sample log including soil description was completed for each sample, and all logs are included in Appendix A.

After the discrete samples were collected, excess soil was designated as investigation-derived waste (IDW) and placed in lined, labeled 55-gal drums that were sealed after use and staged at Building 1036. IDW management practices for all media are discussed in Appendix F. Hand auger borings were backfilled to ground surface with dry bentonite chips and hydrated with the project-approved potable water.

I.1.2 Subsurface Soil Sampling Rationale and Methods

Subsurface soil samples for chemical characterization were not collected during the PBA08 RI; however, two samples were collected for geotechnical evaluation. Table I-3 presents the specific rationale for each geotechnical sample collected for the PBA08 RI.

Two geotechnical samples were collected from one boring location to provide soil data for fate and transport modeling. A pilot boring was installed with a Geoprobe at sample location LNWsb-087 to a depth of 24 ft bgs to allow for lithological characterization of the soil and determine the appropriate geotechnical sample intervals (Appendix A). The geotechnical sample location was offset from the pilot boring and drilled with hollow stem auger attachments. Geotechnical samples were collected beneath the hollow stem augers directly into the Shelby tube. Undisturbed Shelby tube samples were collected from 4–5.5 and 12–13.5 ft bgs, directly above the only moist zones observed in the pilot boring. The Shelby tubes were sealed with wax, capped, and submitted for laboratory geotechnical analysis for porosity, bulk density, moisture content, total organic carbon, grain size fraction analysis, and permeability. Laboratory analytical results for geotechnical samples are presented in Appendix D. QA/QC samples were not collected for geotechnical samples.

After samples were collected, excess soil was designated as IDW and placed in lined, labeled 55-gal drums that were sealed after use and staged at Building 1036. IDW management practices for all media are discussed in Appendix F. Borings were backfilled to ground surface with dry bentonite chips while hydrating with the project-approved potable water.

Table I-3. PBA08 RI Subsurface Soil Rationale and Analyses

PBA08 RI Location	Comments/Rationale	Sample Type	Depth (ft bgs)	Analyses Performed				
				Metals	Explosives	VOCs	Pesticides/ PCBs	SVOC
LNWsb-087	Geotechnical	Discrete	4–5.5	N	N	N	N	N
		Discrete	12–13.5	N	N	N	N	N

bgs = Below ground surface.
ft = Feet.
PBA08 RI = Performance-based Acquisition 2008 Remedial Investigation.
PCB = Polychlorinated biphenyl.
SVOC = Semi-volatile organic compound.
VOC = Volatile organic compound.

I.2 SURFACE WATER AND SEDIMENT CHARACTERIZATION

Surface water and sediment samples were collected to characterize current conditions and assess potential entrance and exit pathways from the AOC (Figure I-2). Four co-located surface water and sediment samples were collected during the PBA08 RI.

I.2.1 Surface Water and Sediment Sampling Methods

The surface water grab samples were collected by the handheld bottle method in accordance with Section 4.3 of the PBA08 SAP and analyzed for RVAAP full-suite analytes. Water quality parameters for temperature, pH, conductivity, dissolved oxygen, and turbidity were collected using calibrated water quality meters (Hanna Instrument Models 9828 and 98703). A surface water and sediment sample collection sheet was completed for each sample location and is included in Appendix A.

The sediment samples were collected in accordance with Section 4.2 of the PBA08 SAP. The samples consisted of a multi-aliquot composite with 10 aliquots selected randomly within a 5 ft radius of the identified sample location. Each aliquot was collected by means of a stainless steel push probe or Ponar sediment sampler lowered from the side of a boat to a maximum depth of 0.5 ft bgs. The aliquots were homogenized in a stainless steel bowl and transferred to the appropriate labeled sample container. Three composite sediment samples were analyzed for target analyte list metals, explosives, and semi-volatile organic compounds. The remaining composite sediment sample was analyzed for RVAAP full-suite analytes. For VOC analysis, one discrete sample was collected from 0–0.5 ft bgs within the 5 ft sampling radius and placed directly in the appropriate, labeled sample container. No QC field duplicate or QA split sediment samples were collected.

I.2.2 Surface Water and Sediment Sampling Rationale

Surface water and sediment samples were collected to characterize current conditions and assess potential exit pathways from the site (Figure I-1). Three co-located surface water and sediment samples were collected during the PBA08 RI from the East Tributary. One sample location (LNWsd/sw-083) was upstream of the site, one sample location (LNWsd/sw-084) was immediately adjacent to the site, and one sample location (LNWsd/sw-085) was downstream of the site. In addition, one co-located surface water and sediment sample location (LNWsd/sw-086) was immediately downgradient of the site in the South Tributary. Table I-4 presents the specific rationale for the surface water and sediment samples collected for the PBA08 RI.

Table I-4. PBA08 RI Surface Water and Sediment Samples and Rationales

PBA08 RI Location	Targeted Area	Comments/Rationale	Sample Type	Depth (ft bgs)	Analyses Performed				
					Metals	Explosives	VOCs	Pesticides/ PCBs	SVOC
LNWsd-083	East Tributary	Characterize current upstream of AOI. Sediment analyzed for RVAAP full-suite analytes.	Composite	0–0.5	Y	Y	Y	Y	Y
LNWsw-083			Grab	NA	Y	Y	Y	Y	Y
LNWsd-084	East Tributary	Characterize current conditions of wetland east of the AOI.	Composite	0–0.5	Y	Y	N	N	Y
LNWsw-084			Grab	NA	Y	Y	Y	Y	Y
LNWsd-085	East Tributary	Downstream of AOI.	Composite	0–0.5	Y	Y	N	N	Y
LNWsw-085			Grab	NA	Y	Y	Y	Y	Y
LNWsd-086	South Tributary	Characterize current conditions of wetland south of the AOI.	Composite	0–0.5	Y	Y	N	N	Y
LNWsw-086			Grab	NA	Y	Y	Y	Y	Y

AOC = Area of concern.
bgs = Below ground surface.
ft = Feet.
NA = Not applicable.
PBA08 RI = Performance-based Acquisition 2008 Remedial Investigation.
PCB = Polychlorinated biphenyl.
RVAAP = Ravenna Army Ammunition Plant.
SVOC= Semi-volatile organic compound.
VOC = Volatile organic compound.

I.3 CHANGES FROM THE WORK PLAN

Changes to the PBA08 SAP are documented in the field change requests provided in Appendix B. Changes made in the field based on AOC-specific conditions are not documented on field change requests but on the field sampling logs (Appendix A). The only change made based on field conditions was to move the location of the geotechnical sample from a thickly wooded area to a more accessible location. New coordinates for this location can be found on the boring log.

I.4 ANALYTICAL PROGRAM OVERVIEW

The following sections describe the analytical program followed during the PBA08 RI.

I.4.1 Data Quality Objectives

Samples were collected and analyzed according to the FWSAP and the PBA08 SAP that were prepared in accordance with USACE and USEPA guidance. The FWSAP and PBA08 SAP outline the organization, objectives, intended data uses, and QA/QC activities to perform in order to achieve the desired DQOs for maintaining the defensibility of the data. Project DQOs were established in accordance with USEPA Region 5 guidance. Requirements for sample collection, handling, analysis criteria, target analytes, laboratory criteria, and data verification criteria for the RI are consistent with USEPA and U.S. Department of Defense (DoD) requirements. DQOs for this project include analytical precision, accuracy, representativeness, completeness, comparability, and sensitivity for the measurement data. Appendix C presents an assessment of the analytical program objectives.

I.4.2 Quality Assurance and Quality Control

Samples were properly packaged for shipment and transferred by courier to the laboratory for analysis. A signed chain-of-custody record (included in Appendix D) with sample numbers and locations was enclosed with each shipment. When transferring possession of samples, the individuals relinquishing and receiving the samples signed, dated, and noted the time on the record. All shipments were in compliance with applicable U.S. Department of Transportation regulations for environmental samples.

QA/QC samples for this project included field blanks, trip blanks, QC field duplicates, QA split samples, laboratory method blanks, laboratory control samples, laboratory duplicates, and matrix spike/matrix spike duplicate samples. Table I-5 presents a summary of QA/QC samples utilized during the PBA08 RI and how each sample type was used to support the quality of the analytical data. Evaluation of QA/QC samples and their contribution to documenting project data quality is provided in Appendix C.

Table I-5. Summary of PBA08 RI QA/QC Samples

Sample Type	Rationale
Field Blank	Analyzed to determine contamination in source material that may contribute to sample contamination.
Trip Blank	Analyzed to assess the potential for cross contamination of samples due to contaminant interference during sample shipment and storage.
Field Duplicate	Analyzed to determine sample heterogeneity and sampling methodology reproducibility.
Equipment Rinsate	Analyzed to assess the adequacy of the equipment decontamination processes for non-dedicated sampling equipment.
Laboratory Method Blanks	Analyzed to assess the contamination level in the laboratory preparation and analysis process.
Laboratory Duplicate Samples	Analyzed to assist in determining the analytical reproducibility and precision of the analysis for the samples of interest and provide information about the effect of the sample matrix on the measurement methodology.
Matrix Spike/Matrix Spike Duplicate	
Laboratory Control Sample	Analyzed to determine the accuracy and precision of the analytical method implemented by the laboratory and to monitor the laboratory's analytical process control.
QA Split	Analyzed to provide independent verification of the accuracy and precision of the principal analytical laboratory.

QA = Quality assurance.
QC = Quality control.
PBA08 RI = Performance-based Acquisition 2008 Remedial Investigation.

I.4.3 Field Analyses

No field laboratory analyses (i.e., field explosives testing) were conducted for the PBA08 RI. However, water quality parameters were recorded using water quality meters (Hanna Instrument Models 9828 and 98703) that were calibrated daily. Additionally, field screening for organic vapors was not used to guide sampling or analytical efforts. Organic vapors were monitored in the breathing zone during drilling for health and safety purposes at each subsurface soil boring location.

I.4.4 Laboratory Analyses

Samples collected during the PBA08 RI were analyzed by TestAmerica Laboratories, Inc. (TestAmerica) of North Canton, Ohio, and West Sacramento, California, as a subcontractor to White Water Associates, Inc., of Amasa, Michigan. Collected QA split samples were analyzed by USACE's contracted QA laboratory, RTI Laboratories, Inc., of Livonia, Michigan. TestAmerica and RTI Laboratories, Inc. are accredited by the DoD Environmental Laboratory Accreditation Program.

All analytical procedures were completed in accordance with applicable professional standards, USEPA requirements, government regulations and guidelines, DoD Quality Systems Manual Version 3, USACE Louisville District analytical QA guidelines, and specific project goals and requirements. In addition to these standards, the analytical laboratories were required to strictly adhere to the requirements set forth in the FWSAP and PBA08 SAP so that conditions adverse to data quality would not arise. Project quantitation level goals for analytical methods were listed in the Quality Assurance Project Plan. These levels were achieved or exceeded throughout the analytical process,

with the exception of the pesticide analysis of one aqueous sample. These goals and exceptions are further discussed in Appendix C, Data Quality Control Summary Report. While some quantitation levels were elevated above FWCUGs, all method detection limits for undetected analytes remained below these levels. Preparation and analyses for chemical parameters were performed according to the methods listed in Table I-6. Additionally, soil geotechnical analysis for porosity, bulk density, moisture content, grain size fraction, and permeability were performed in compliance with American Society for Testing and Materials test methods.

Table I-6. Summary of PBA08 RI Sample Preparation and Analytical Procedures

Parameter	Soil and Sediment		Surface Water	
	Preparation	Analysis	Preparation	Analysis
Inorganic chemicals	SW-846 3050B	SW-846 6020	SW-846 3005A	SW-846 6020
Mercury	--	SW-846 7471A	--	SW-846 7470A
Explosives	--	SW-846 8330B	--	SW-846 8330B
SVOCs and PAHs	SW-846 3540C	SW-846 8270C	SW-846 3520C	SW-846 8270C
Propellants: Nitrocellulose Nitroguanidine	 -- SW-846 3550A	 353.2 Modified SW-846 8330M	 -- SW-846 3535	 353.2 Modified SW-846 8330M
VOCs	SW-846 5030B	SW-846 8260B	SW-846 5030B	SW-846 8260B
Pesticides	SW-846 3540C	SW-846 8081A	SW-846 3520C	SW-846 8081A
PCBs	SW-846 3540C	SW-846 8082	SW-846 3520C	SW-846 8082
Hexavalent Chromium	SW-846 3060A	SW-846 7196A	--	SW-846 7196A

PAH = Polycyclic aromatic hydrocarbon.
PCB = Polychlorinated biphenyl.
PBA08 RI = Performance-based Acquisition 2008 Remedial Investigation.
SVOC = Semi-volatile organic compound.
VOC = Volatile organic compound.
-- = Preparation steps included in analytical method.

Leidos is the custodian of project files and will maintain the contents of the files for this investigation, including all relevant records, reports, logs, field notebooks, photographs, subcontractor reports, correspondence, and sample custody forms. These files will remain in a secure area under the custody of the Leidos project manager until they are transferred to USACE Louisville District and the U.S. Department of the Army (Army) at the end of the Performance-based Acquisition 2008 project.

Analytical data reports from the project laboratory were forwarded to the USACE Louisville District laboratory data validation contractor for validation, review, and QA comparison. White Water Associates, Inc. and TestAmerica will retain all original raw data (hard copy and electronic copy) in a secure area under the custody of the laboratory project manager for a minimum of seven years.

I.4.5 Data Review, Verification, and Quality Assessment

Data were produced, reviewed, and reported by the laboratory in accordance with specifications in the PBA08 SAP, USACE Louisville District analytical QA guidelines, and the laboratory's QA manual.

TestAmerica performed in-house analytical data reduction under the direction of the laboratory project manager and QA officer. These individuals were responsible for assessing data quality and

informing Leidos and USACE of any data considered "unacceptable" or requiring caution by the data user in terms of its reliability.

Final reports were generated by the laboratory project manager. Data were then delivered to Leidos for verification. TestAmerica prepared and retained full analytical and QC documentation for the project in paper copy and electronic storage media (e.g., compact disk), as directed by the analytical methodologies employed. Laboratory reports included documentation verifying analytical holding time compliance.

Leidos performed a systematic process utilizing automated data review software for data verification to ensure the precision and accuracy of the analytical data were adequate for their intended use. The automated data review outlier reports are included as Attachment 1 to Appendix C. This verification also attempted to minimize the potential of using false-positive or false-negative results in the decision-making process (i.e., to ensure accurate identification of detected versus non-detected chemicals). This approach was consistent with the DQOs for the project and with the analytical methods used for determining chemicals of concern and calculating risk. "Definitive data" were reported consistent with the deliverables identified in the project sampling and analysis plan. These definitive data were then verified through the review process outlined in the project sampling and analysis plan and presented in Appendix C. During the review process, 16 non-detectable semi-volatile organic analytes were rejected for surface water sample LNWSW-086-5279-SW due to very poor surrogate recoveries. Additional results were qualified as estimated; indicating accuracy, precision, or sensitivity was less than desired but adequate for their intended use. The completeness goal for analytical data is 90%, as defined in Tables 3-1 and 3-2 of the Facility-wide Quality Assurance Project Plan. The project achieved this goal by collecting all samples presented in the PBA08 SAP and producing usable results for 99.1% of all samples performed. In addition to the Leidos data review, a 10% validation of all data was performed by USACE to evaluate data usability.

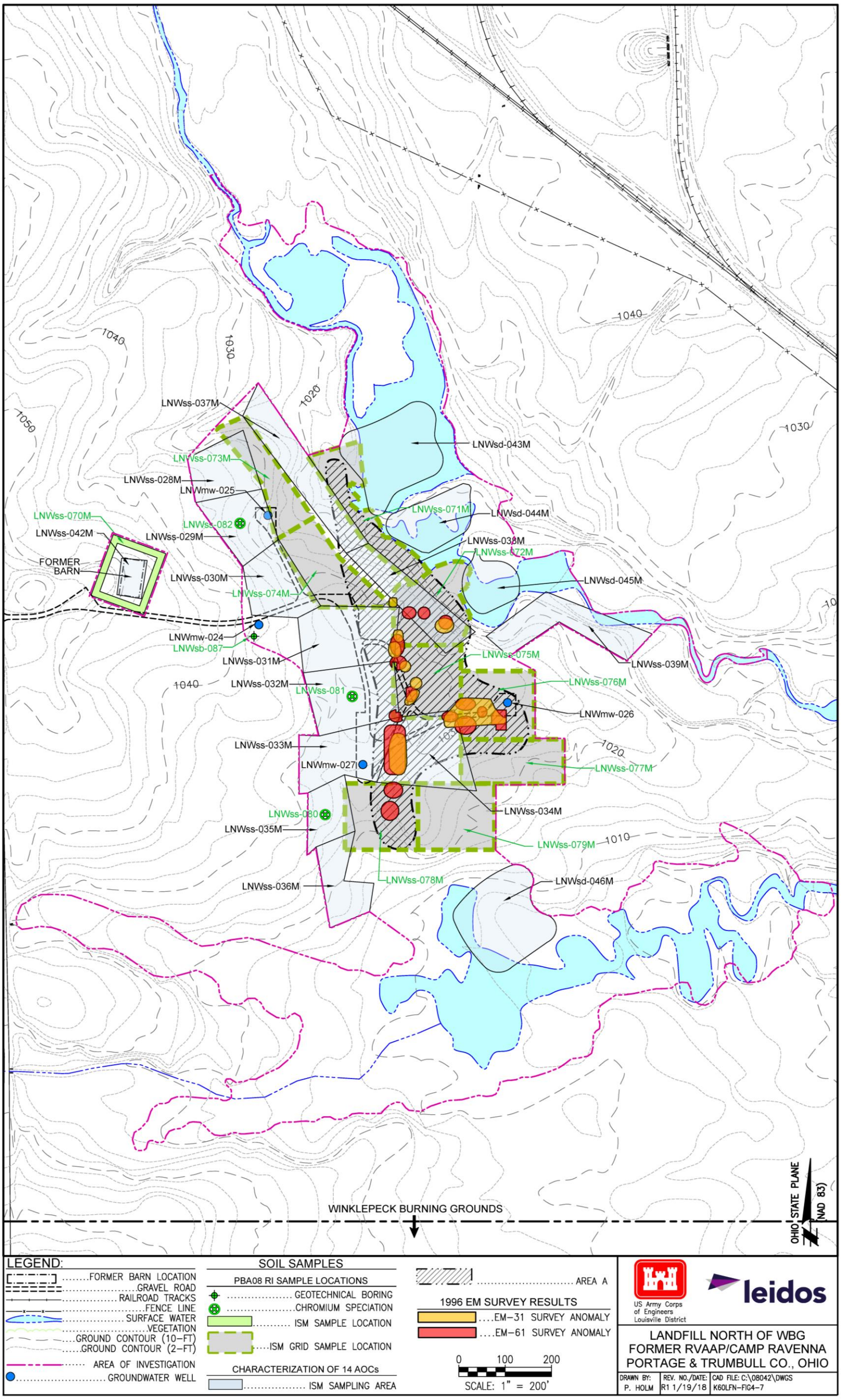

Figure I-1. PBA08 RI Soil Locations

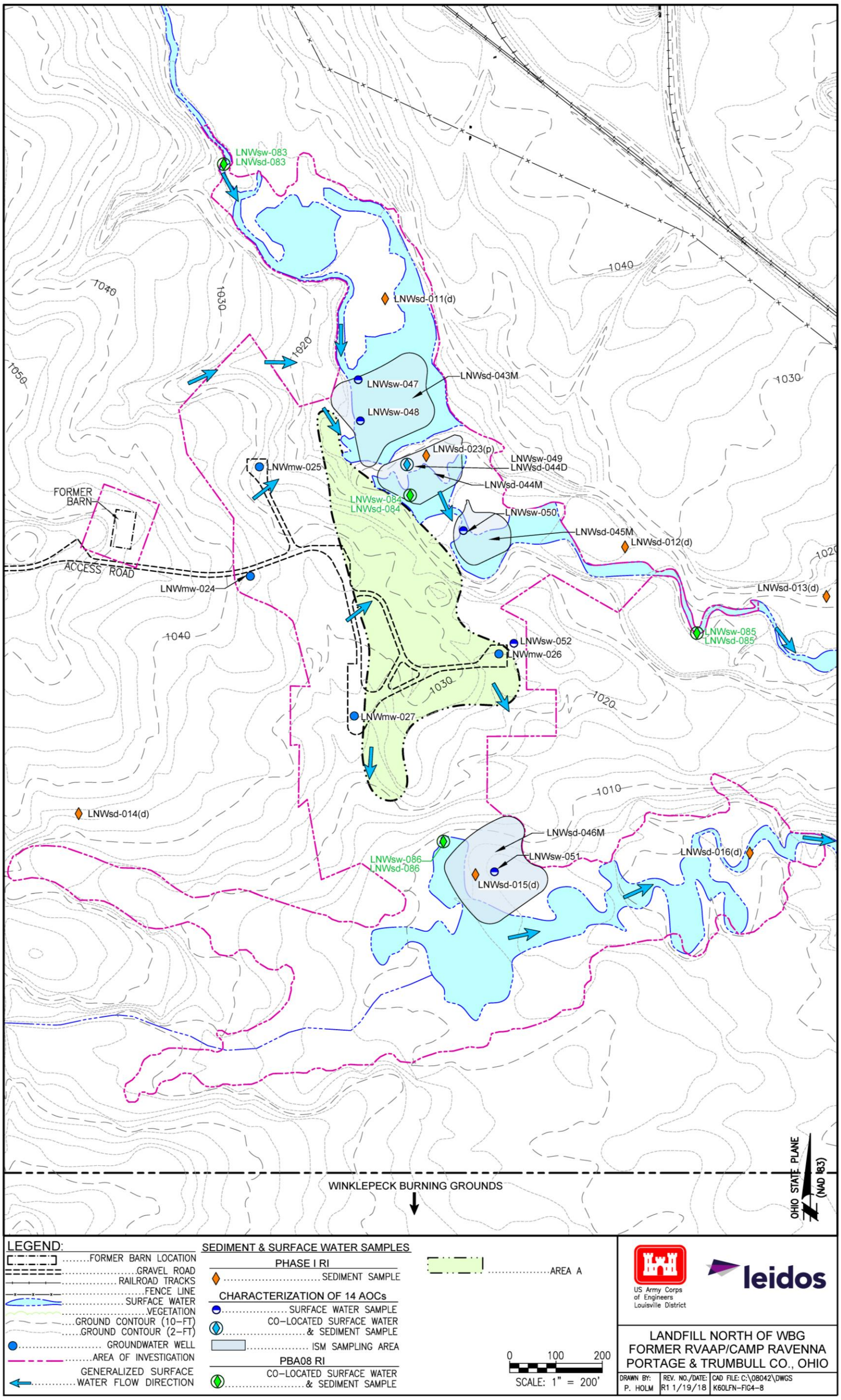

Figure I-2. PBA08 RI Sediment and Surface Water Locations

REFERENCES

USACE (U.S. Army Corps of Engineers) 2001. *Facility-wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. March 2001.

USACE 2005. *RVAAP Facility-wide Human Health Risk Assessors Manual – Amendment 1*. December 2005.

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