FINAL

# SAMPLING AND ANALYSIS PLAN ADDENDUM NO. 1

*FOR THE*

# PHASE II REMEDIAL INVESTIGATION OF ERIE BURNING GROUNDS AT THE RAVENNA ARMY AMMUNITION PLANT, RAVENNA, OHIO

*PREPARED FOR*

**US Army Corps of Engineers®**

LOUISVILLE DISTRICT
CONTRACT No. F44650-99-D-0007
DELIVERY ORDER CY10

October 2003

SAIC®

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**October 2003**

**Prepared for**

**U.S. Army Corps of Engineers**
**Louisville District**
**Contract No. F44650-99-D-0007**
**Delivery Order No. CY10**

**Prepared by**

**Science Applications International Corporation**
**151 Lafayette Drive**
**Oak Ridge, Tennessee 37830**

**SCIENCE APPLICATIONS INTERNATIONAL CORPORATION**

contributed to the preparation of this document and should not
be considered an eligible contractor for its review.

## CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW

Science Applications International Corporation (SAIC) has completed the Sampling and Analysis Plan Addendum No. 1 for the Phase II Remedial Investigation of Erie Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, 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 Corps policy.

W. Kevin Jago
Kevin Jago
Study/Design Team Leader

10-22-03
Date

Sally Absher
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Primary Author

10-22-03
Date

W. Kevin Jago
Kevin Jago
Independent Technical Review Team Leader

10-22-03
Date

Significant concerns and the explanation of the resolution are as follows:

> Reference comment response table appended to the back of the document. Incorporation of responses have been verified by the Independent Technical Review Team Leader.

As noted above, all concerns resulting from independent technical review of the project have been considered.

William P Kegley
Principal w/ A-E firm

10-22-03
Date

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**FINAL**

# Part I

# Field Sampling Plan Addendum No. 1 for the Phase II Remedial Investigation of Erie Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio

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# ABBREVIATIONS

| | |
|---|---|
| AOC | area of concern |
| bgs | below ground surface |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COPC | contaminant of potential concern |
| CSM | conceptual site model |
| DOT | U.S. Department of Transportation |
| DQO | Data Quality Objective |
| EBG | Erie Burning Grounds |
| EPA | U.S. Environmental Protection Agency |
| ERA | ecological risk assessment |
| FSA | field staging area |
| HHRA | human health risk assessment |
| IDW | investigation-derived waste |
| JMC | Joint Munitions Command |
| NTU | nephelometric turbidity unit |
| OAC | Ohio Administrative Code |
| Ohio EPA | Ohio Environmental Protection Agency |
| OE | ordnance and explosives |
| OVA | organic vapor analyzer |
| PCB | polychlorinated biphenyl |
| PID | photoionization detector |
| PPE | personal protection equipment |
| QAPP | Quality Assurance Project Plan |
| QA/QC | quality assurance/quality control |
| RCP | reinforced concrete pipe |
| RDX | hexahydro-1,3,5-trinitro-1,3,5-triazine |
| RI | Remedial Investigation |
| RRSE | Relative Risk Site Evaluation |
| RVAAP | Ravenna Army Ammunition Plant |
| SAP | Sampling and Analysis Plan |
| SRC | site-related contaminant |
| SVOC | semivolatile organic compound |
| TAL | Target Analyte List |
| TCLP | toxicity characteristic leaching procedure |
| TNT | 2,4,6-trinitrotoluene |
| USACE | U.S. Army Corps of Engineers |
| USCS | Unified Soil Classification System |
| UXO | unexploded ordnance |
| VOC | volatile organic compound |
| WBG | Winklepeck Burning Grounds |

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# 1.0 PROJECT DESCRIPTION

## 1.1 INTRODUCTION

The Phase II Remedial Investigation (RI) of Erie Burning Grounds (EBG) at the Ravenna Army Ammunition Plant (RVAAP), Ohio (Figure 1-1) will assess the impact of the area of concern (AOC) on the uppermost groundwater-producing zone in the immediate area, and includes limited surface soil, sediment, and surface water sampling, as indicated in Appendix A. The purpose of the sampling is to further delineate areas identified during the Phase I RI, and to support the performance of human health and ecological risk characterizations based on guidance established in the Facility-wide Ecological and Human Health Risk Assessment (HHRA) Work Plans.

This Phase II RI Sampling and Analysis Plan (SAP) Addendum for EBG at RVAAP has been prepared by Science Applications International Corporation under contract F44650-99-D-0007, Delivery Order No. CY10, with the U.S. Army Corps of Engineers (USACE), Louisville District. This SAP Addendum has been developed to tier under and supplement the *Facility-Wide Sampling and Analysis Plan for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001b). The Facility-wide SAP provides the base documentation, technical procedures, and investigative protocols for conducting RIs under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at RVAAP, whereas this SAP Addendum includes all of the sampling and analysis objectives, rationale, planned activities, and criteria specific to the Phase II RI at EBG. Consequently, the Phase II RI cannot be implemented without the guidance provided in both documents. Where appropriate, the SAP Addendum contains references to the Facility-wide SAP for standard procedures and protocols.

Both the Facility-wide SAP and this SAP Addendum have been developed following the USACE guidance document, *Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3, September 1994* (USACE 1994a), to collectively meet the requirements established by the Ohio Environmental Protection Agency (Ohio EPA), Northeast District, and the U.S. Environmental Protection Agency (EPA), Region V, for conducting CERCLA investigations.

## 1.2 ERIE BURNING GROUNDS HISTORY AND CONTAMINANTS

RVAAP is located in northeastern Ohio in Portage and Trumbull Counties and lies about 16 km (10 miles) east of Ravenna, Ohio (Figure 1-1). Operations at the facility date to 1940 and include the storage, handling, and packing of military ammunition and explosives. The facility encompasses 8,668 ha (21,419 acres) and is jointly operated by the U.S. Army Joint Munitions Command (JMC) and the National Guard Bureau. The current contractor for JMC is TolTest, Inc. The Ohio National Guard utilizes much of the facility for training purposes. Eventually, all of the facility is to be turned over to the National Guard Bureau. Presently, JMC controls two types of areas: environmental AOCs that require investigation and possibly remediation, and other areas utilized to store bulk explosives. A detailed history of process operations and waste disposal processes for each AOC at RVAAP (Figure 1-2) is presented in the *Preliminary Assessment for the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 1996b). The following is a summary of the history and related contaminants for EBG.

EBG (Figure 1-3), designated as AOC RVAAP-2, was in operation from 1941 to 1951. The Phase II RI characterization area covers approximately 14.2 ha (35 acres) and encompasses the known operational area of EBG. The burning grounds are situated on the northeastern corner of the facility. The site was

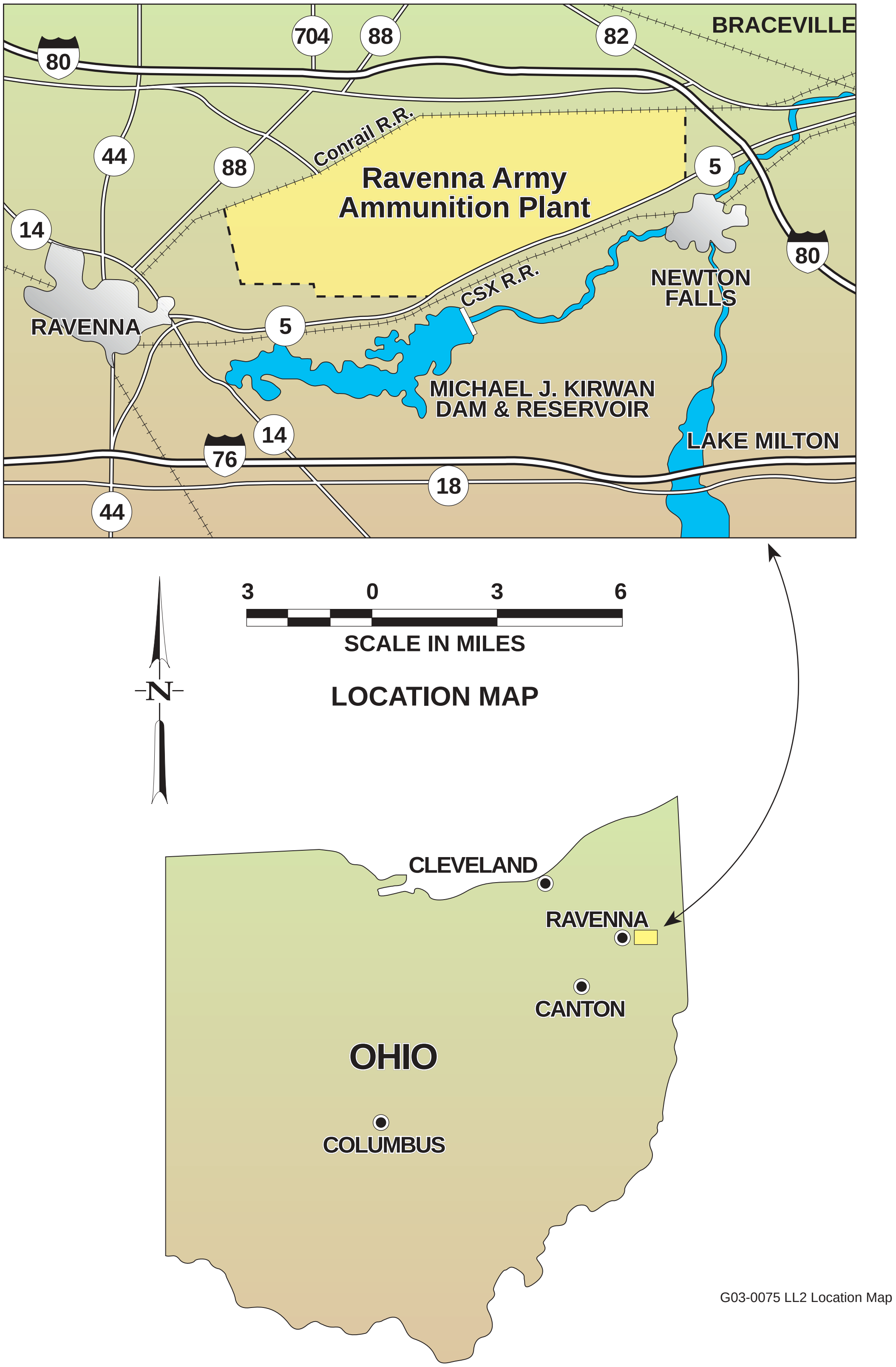
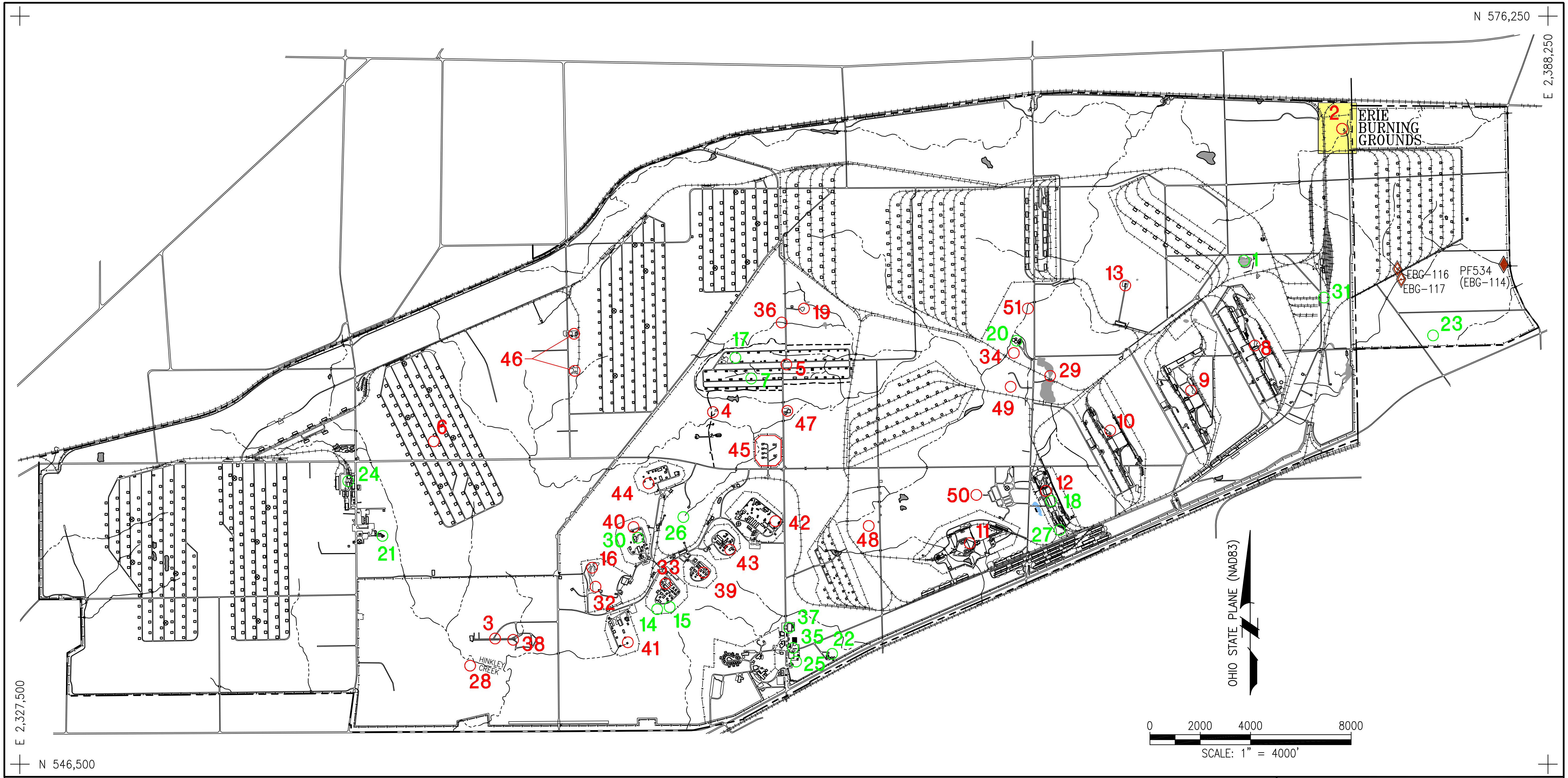


**Figure 1-1. General Location and Orientation of RVAAP**



## LEGEND OF SITES:

| | |
|---|---|
| 1 | RAMSDELL QUARRY LANDFILL |
| 2 | **ERIE BURNING GROUNDS** |
| 3 | DEMOLITION AREA #1 |
| 4 | DEMOLITION AREA #2 |
| 5 | WINKLEPECK BURNING GROUNDS |
| 6 | C BLOCK QUARRY |
| 7 | BLDG 1601 HAZARDOUS WASTE STORAGE |
| 8 | LOAD LINE 1 AND DILUTION/SETTLING POND |
| 9 | LOAD LINE 2 AND DILUTION/SETTLING POND |
| 10 | LOAD LINE 3 AND DILUTION/SETTLING POND |
| 11 | LOAD LINE 4 AND DILUTION/SETTLING POND |
| 12 | LOAD LINE 12 AND DILUTION/SETTLING POND |
| 13 | BLDG 1200 AND DILUTION/SETTLING POND |
| 14 | LOAD LINE 6, EVAPORATION UNIT |
| 15 | LOAD LINE 6, TREATMENT PLANT |
| 16 | QUARRY LANDFILL/FORMER FUZE & BOOSTER BURNING PITS |
| 17 | DEACTIVATION FURNACE |
| 18 | LOAD LINE 12 PINK WASTE WATER TREATMENT |
| 19 | LANDFILL NORTH OF WINKLEPECK BURNING GROUND |
| 20 | SAND CREEK SEWAGE TREATMENT PLANT |
| 21 | DEPOT SEWAGE TREATMENT PLANT |
| 22 | GEORGE ROAD SEWAGE TREATMENT PLANT |
| 23 | UNIT TRAINING SITE WASTE OIL TANK |
| 24 | RESERVE UNIT MAINTENANCE AREA WASTE OIL TANK |
| 25 | BLDG 1034 MOTOR POOL WASTE OIL TANK |
| 26 | FUZE BOOSTER AREA SETTLING TANKS |
| 27 | BLDG 854-PCB STORAGE |
| 28 | MUSTARD AGENT BURIAL SITE |
| 29 | UPPER AND LOWER COBBS POND COMPLEX |
| 30 | LOAD LINE 7 PINK WASTEWATER TREATMENT PLANT |
| 31 | ORE PILE RETENTION POND |
| 32 | 40 AND 60 MM FIRING RANGE |
| 33 | FIRESTONE TEST FACILITY |
| 34 | SAND CREEK DISPOSAL ROAD LANDFILL |
| 35 | 1037 BUILDING-LAUNDRY WASTEWATER SUMP |
| 36 | PISTOL RANGE |
| 37 | PESTICIDE STORAGE BUILDING T-4452 |
| 38 | NACA TEST AREA |
| 39 | LOAD LINE 5 / FUZE LINE 1 |
| 40 | LOAD LINE 7 / BOOSTER LINE 1 |
| 41 | LOAD LINE 8 / BOOSTER LINE 2 |
| 42 | LOAD LINE 9 / DETONATOR LINE |
| 43 | LOAD LINE 10 / PERCUSSION ELEMENT |
| 44 | LOAD LINE 11 / ARTILLERY PRIMER |
| 45 | WET STORAGE AREA |
| 46 | BUILDINGS F-15 AND F-16 |
| 47 | BUILDING T-5301 DECONTAMINATION |
| 48 | ANCHOR TEST AREA |
| 49 | CENTRAL BURN PITS |
| 50 | ATLAS SCRAP YARD |
| 51 | DUMP ALONG PARIS-WINDHAM ROAD |
| ○ | CERCLA |
| ○ | RCRA |
| ○ | OTHER REGULATORY |
| ◆ | SURFACE WATER QUALITY MONITORING STATION PF534 |
| ◇ | SAMPLING LOCATIONS EBG PHASE I RI DOWNSTREAM |

US Army Corps of Engineers
Louisville District

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

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
FACILITY MAP

| DRAWN BY: | REV. NO./DATE: | CAD FILE: |
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Figure 1-2. Ravenna Army Ammunition Plant Installation Map

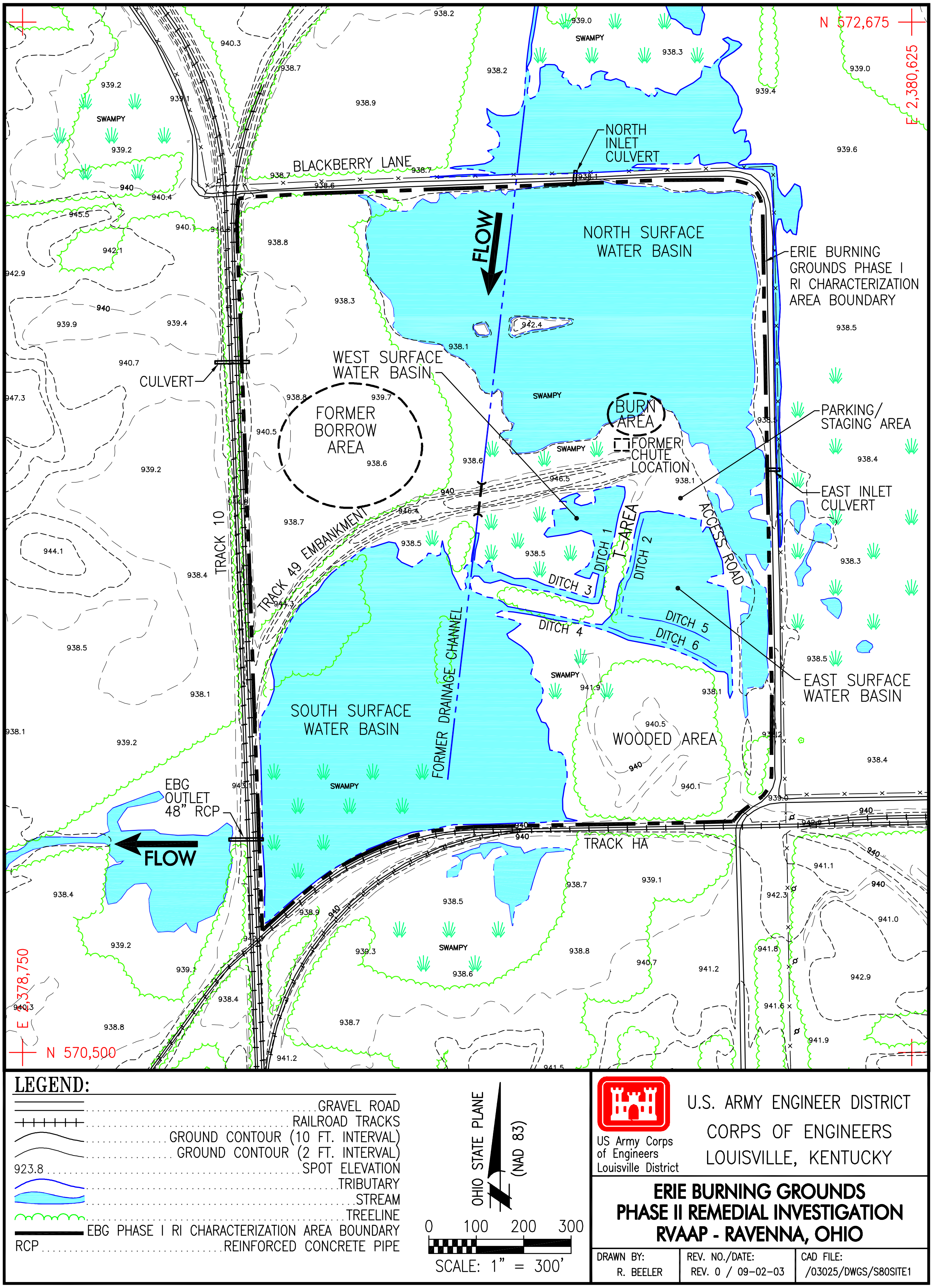

**Figure 1-3. Erie Burning Grounds Site Map**

used to conduct open burning of explosives and related materials. Prior to purchase by the Army in 1940, the site may have been used for brick manufacturing (Jacobs Engineering 1989). Bulk, obsolete, non-specification explosives, propellants, rags, and Army rail cars used for transporting explosives across the installation were treated at EBG.

Aerial photos of the site from the 1940s and 1950s depict open boxcars staged at the end of the rail spur, known as Track 49. Presumably, materials were either tipped out of the cars on either side of the embankment to be burned, or entire boxcars were ignited on the track to destroy their contents. Evidence of activity in the aerial photos is indicated at the northeastern terminus of the rail spur, where it meets the gravel approach road. Engineering drawings dated 1941 show a waste chute on the north side of Track 49 approximately 200 ft from the terminus; the chute leads to a designated burning area on the drawings. Three pairs of trenches, now approximately 4 ft deep, were dug at EBG, perhaps to collect water and to serve as containment barriers for fires set with waste explosives placed in the "T-Area" between the trenches. These ditches were connected to the original creek channel that flowed through the approximate center of the site, about 300 ft west of the T-Area. A borrow area between Track 10 and Track 49 may potentially have been used for disposal by open burning. Unspecified large metal items were also treated to remove explosive residues. Metal items were salvaged and processed as scrap (Jacobs Engineering 1989). Ash residues from open burning remained on the site.

The principal sources of contaminants are the ash residues derived from the burning of trinitrotoluene (TNT), hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), and propellants. These residues potentially contain small amounts of explosives and heavy metals. Estimates of the quantities of wastes disposed by burning at EBG have reached as high as one million lbs (Jacobs Engineering 1989), but it is unknown if this figure is accurate.

Current conditions at EBG differ greatly from those during its active life. The area became a wetland in the early 1990s as a consequence of the plugging of a culvert and beaver damming of small streams that drained the burning grounds. Four main surface water basins now occupy the lowlands at the site. The largest surface water basin north of Track 49 (see Figure 1-3) has periodically drained on its own. The current depth of the water in the pond reaches a maximum of 5 ft within the former drainage channel, but is generally less than 1 ft in most areas. Wetlands extend to the north and east beyond EBG. Surface water within EBG is connected to these adjacent wetlands by a number of culverts beneath Blackberry Lane along the east and north border of the site. Surface water flow is from the north into EBG with drainage from the site to the southwest through a 48-in. diameter, reinforced concrete pipe (RCP) beneath Track 10. Also, culverts beneath Blackberry Lane along the southeastern portion of the site may direct flow from the west into EBG.

The areas that remain above water (Figure 1-3) include: (1) the railroad embankment and track, (2) the gravel access road, (3) a portion of the elevated T-area between the two pairs of parallel trenches, (4) the portion of the site northwest of the soil borrow area, and (5) a wooded area adjacent to the T-Area near the southeast corner of EBG. Dense brush vegetation now covers the portions of the site that are not submerged.

## 1.3 SUMMARY OF EXISTING DATA

Four previous investigations have been conducted: (1) Soil and Sediment Analyses, RVAAP (Mogul Corporation 1982); (2) Water Quality Surveillance Program (USATHAMA 1980-1992); (3) Relative Risk Site Evaluation (RRSE) (USACHPPM 1996); and (4) Phase I RI of EBG (SAIC 2001).

The 1982 investigation by Mogul Corporation included soil sampling at five locations within EBG, followed by analyses for the explosives TNT and RDX. Samples from EBG had non-detectable quantities of these analytes.

The Water Quality Surveillance Program was conducted at nine sampling locations throughout RVAAP. Of the sample locations, the one of interest to this study was a Parshall flume located near the eastern boundary of the installation, adjacent to Route 534 (station PF 534). All surface water drainage that exits EBG discharges off the installation through this sampling point. However, the station includes drainage from a large area in addition to EBG. Copper, chromium, hexavalent chromium, lead, zinc, TNT, and RDX were monitored annually in surface water. Cadmium was added to the annual list of metal analytes between 1988 and 1992. Indicator parameters such as pH, temperature, specific conductance, dissolved oxygen, oil and grease, total suspended solids, fecal coliform, and biochemical oxygen demand were monitored quarterly. Total organic carbon, total Kjehldal nitrogen, nitrate, nitrite, and phosphorus were evaluated semi-annually. Samples collected and analyzed from station PF 534 between 1980 and 1992 had no detectable quantities of explosives, with the exception of a November 5, 1987 sample (RDX at 64 µg/L) that was subsequently re-analyzed with a result of <0.25 µg/L. Low concentrations of zinc and copper were occasionally detected. Hexavalent chromium was detected on one occasion in 1985.

The RRSE performed for EBG was limited to the evaluation of surface water and sediment. Two samples each of surface water and sediment were analyzed for explosives and metals. For surface water, only lead exceeded the RRSE standard criteria, and the contaminant hazard factor was determined to be "moderate." However, a potential migration pathway was identified and a potential receptor point (recreational users with no site controls) was identified. On this basis, the surface water/human endpoint was assessed as a "high" relative risk. For sediment, concentrations of arsenic, barium, chromium, copper, and zinc were detectable, but maximum concentrations were well below the RRSE standard criteria. Accordingly, the contaminant hazard factor was determined to be "minimal." However, a migration pathway (surface water) and potential receptor (recreational user) were identified. Thus, the sediment/human endpoint was assessed as a "moderate" relative risk.

The Phase I RI results indicate levels of explosive, organic, and inorganic constituents above human health and ecological risk evaluation screening levels in soil, sediment, and surface water. A total of 59 surface soil samples, 42 subsurface soil samples, 86 sediment samples, and 18 surface water samples were collected and analyzed for the Phase I RI. This RI did not include an assessment of the AOC groundwater. Full results are contained in the RVAAP EBG Final Phase I RI Report (SAIC 2001). Based on the human health and ecological screening risk evaluations, contaminants of potential concern (COPCs) were identified for soil, sediment, and surface water within EBG. Based on the current and near future use and site conditions, the likelihood of exposure of human receptors to contaminants within EBG is low. A majority of the site is wetland, and site observations indicate that terrestrial and aquatic ecological receptors are present. Therefore, current site conditions do not support a "no further action" decision. Additional characterization and a baseline human health and ecological risk assessment (ERA) were recommended under the auspices of a Phase II RI.

## 1.4 SPECIFIC SAMPLING AND ANALYSIS PROBLEMS

Heavy understory plant growth at EBG will require extensive clearing by hand in some areas. It is not known whether ordnance and explosives (OE) is present on the site; however, OE avoidance will be performed prior to and during the sampling effort (see Appendix B). Sediment and surface water sampling within the four surface water basins presents specific issues regarding transport of materials and visual reconnaissance and avoidance for OE. Sampling within these basins will require the use of waders and personal flotation devices. A small boat will be required for transport of sampling equipment and supplies. Clearance and avoidance for OE within the surface water basins will rely primarily on instrumentation. In addition, the shallow water now covering the former burning areas presents difficulty in visually locating sampling points relative to locations showing evidence of historical activity or potentially contaminated areas.

# 2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The EBG Phase II project organization and responsibilities are presented in Figure 2-1. The functional responsibilities of all key personnel except the Field Logistics and Investigation –Derived Waste (IDW) Coordinator are described in Chapter 2.0 of the Facility-wide SAP and, therefore, are not presented here. Figure 2-1 shows the Project Organization Chart for the Phase II RI of EBG. Table 2-1 presents the baseline project schedule.

The Field Logistics and IDW Coordinator will coordinate with the Field Operations Manager and Sample Manager to coordinate logistics such as supplies, rentals, deliveries, and sample packaging and shipping. This position will also have specific responsibilities for labeling, tracking, and coordinating the staging and disposal of all IDW generated under the project. This position will also conduct an IDW management quality assurance (QA) and compliance review at the conclusion of each field project to ensure all containers are accounted for and properly staged pending characterization and disposal. The Field Logistics and IDW Coordinator will work, in conjunction with the Project Manager and the SAIC Compliance Officer, to prepare IDW characterization reports and to ensure proper disposition of IDW upon receipt of characterization results.

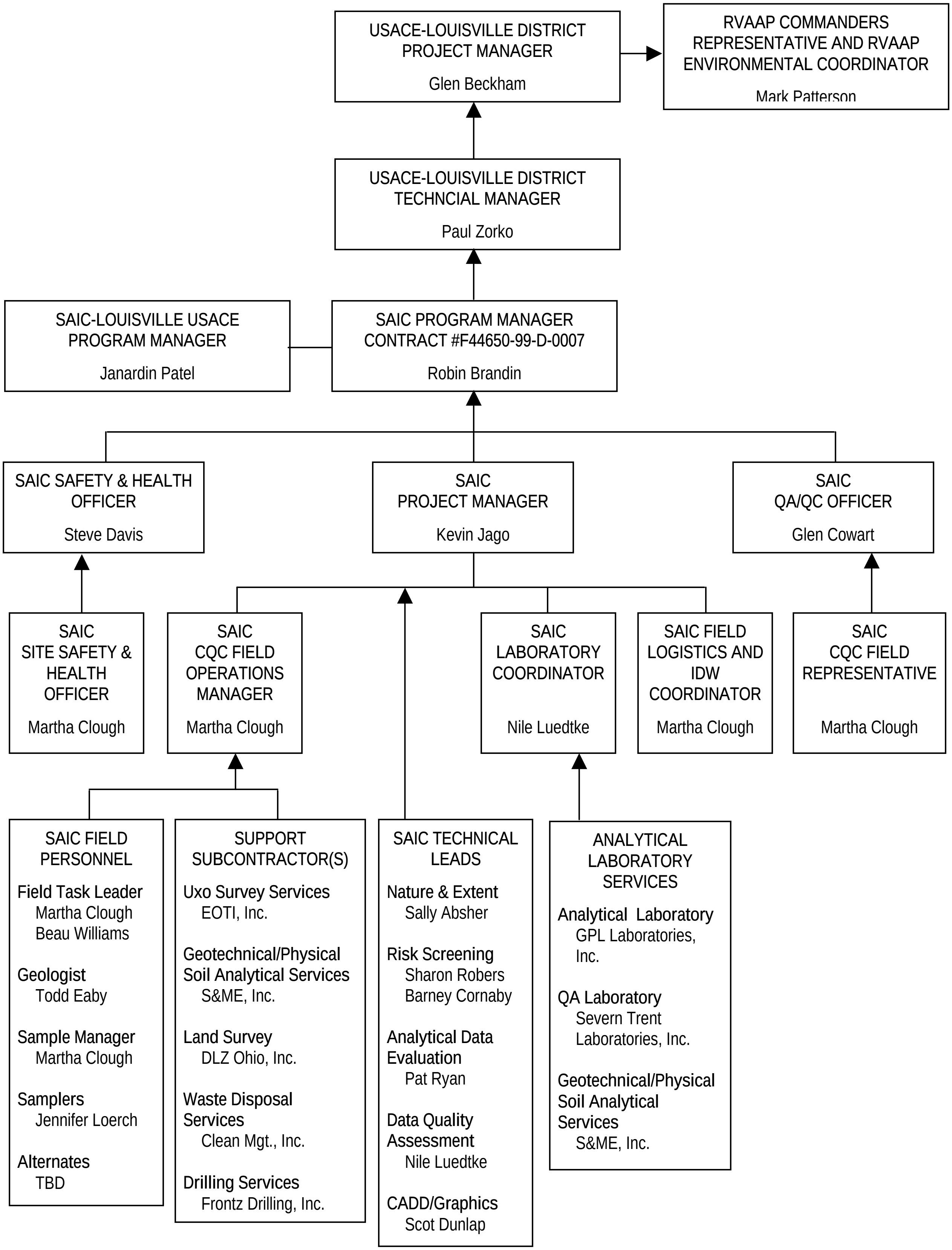

**Figure 2-1. Project Organization Chart for the Phase II RI for Erie Burning Grounds**

**Table 2-1. Project Schedule for the EBG Phase II RI**

| APPROXIMATE MILESTONE SCHEDULE | | |
|---|---|---|
| **Deliverable/Milestone** | **SOW Section** | **Calendar Days Following Notice to Proceed** |
| Submit Draft RI Work Plan Addenda | 2.2 through 2.5 | 39 |
| Submit Provisional Draft Work Plan Comment Response Tables | 2.6 | 56 |
| Work Plan Meeting | 2.6 | 75 |
| Submit Work Plan Meeting Minutes | 2.6 | 83 |
| Submit Final Work Plan Addenda | 2.7 | 90 |
| Receive Approval of Final Work Plan Addenda | 2.7 | 97 |
| Mobilization Phase | 4.0 | 97 to 104 |
| Field Investigation Phase | 4.2 and 4.3 | 106 to 148 |
| Submit Survey Report | 4.4 | 187 |
| Submit OE Avoidance Report | 5.0 | 176 |
| Draft IDW Report | 6.0 | 187 |
| Final IDW Report | 6.0 | 215 |
| IDW Disposal | 6.0 | 222 |
| Analytical Investigation Phase | 7.0 | 125 to 257 |
| Baseline Risk Assessments | 8.0 | 257 to 297 |
| Submit Preliminary Draft Phase II RI Report | 9.0 | 350 |
| Submit Provisional Preliminary Draft Phase II RI Report Comment Response Tables | 10.0 | 390 |
| Draft RI Report Comment Resolution Meeting | 10.0 | 390 to 392 |
| Submit Draft RI Report Comment Resolution Meeting Minutes | 10.0 | 404 |
| Submit Draft Phase II RI Reports | 11.0 | 445 |
| Submit Provisional Draft Phase II RI Report Comment Response Tables | 12.0 | 500 |
| Final RI Report Comment Resolution Meeting | 12.0 | 505 |
| Submit Final RI Report Comment Resolution Meeting Minutes | 12.0 | 519 |
| Submit Final Phase II RI Reports | 13.0 | 580 |
| Submit GIS Deliverable | 14.0 | TBD |

GIS = Geographical Information Services.
IDW = investigation-derived waste.
NA = not applicable.
OE = ordnance and explosives.
RI = remedial investigation.
SOW = statement of work.
TBD = to be determined.

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# 3.0 SCOPE AND OBJECTIVES

## 3.1 PHASE II REMEDIAL INVESTIAGION SCOPE AND OBJECTIVES

The primary objectives of the Phase II RI of EBG will be to assess the impact of the AOC on the uppermost groundwater-producing zone in the immediate area; to conduct limited surface soil, sediment, and surface water sampling to further delineate areas identified during the Phase I RI; and the performance of human health and ecological risk characterizations based on guidance established in the Facility-wide Ecological and Human Health Assessment Work Plans.

Additional objectives of the Phase II RI for EBG include modifications and revisions, where necessary, to the following elements of the Phase I effort:

- conceptual site model (CSM) refinement;
- modifications/revisions to the facility physical characteristics;
- assessment of the data gaps with respect to sources and extent of soil, sediment, and surface water contamination identified during the Phase I RI; and
- recommendations for additional assessment to address data gaps from the Phase II RI (if applicable).

Investigation-specific objectives have been developed using the data quality objective (DQO) approach presented in the Facility-wide SAP. Project-specific sampling objectives are presented for each environmental medium in Chapter 4.0 of this SAP Addendum.

## 3.2 PHASE II REMEDIAL INVESTIGATION DATA QUALITY OBJECTIVES

The project DQO is to provide sufficient high-quality data to address the primary project objectives identified in Section 3.1.

### 3.2.1 Conceptual Site Model

The CSM was developed during the Phase I RI for the AOC and is presented in the RVAAP EBG Final Phase I RI Report (SAIC 2001). This CSM will require modification based on groundwater information to be collected during the proposed Phase II investigation.

### 3.2.2 Problem Definition

Open burning of explosives wastes and munitions on the ground surface has contaminated surface and subsurface soils, surface water, and sediment as a result of leaching and storm runoff processes and accumulation of contaminants within low-lying areas. Additionally, contaminants may have migrated to groundwater via leaching of soils or infiltration of surface water.

### 3.2.3 Remedial Action Objectives

See Section 3.2.3 of the Facility-wide SAP.

### 3.2.4 Identify Decisions

See Section 3.2.4 of the Facility-wide SAP.

### 3.2.5 Define the Study Boundaries

The investigation area boundary for EBG is presented in Figure 1-3. This boundary was established to encompass all known or reported historical burning operations, adjacent support areas, and potential surface water and groundwater exit pathways.

### 3.2.6 Identify Decision Rules

See Section 3.2.6 of the Facility-wide SAP.

### 3.2.7 Identify Inputs to the Decision

See Section 3.2.7 of the Facility-wide SAP.

### 3.2.8 Specify Limits on Decision Error

See Section 3.2.8 of the Facility-wide SAP.

### 3.2.9 Sample Design

The sample design for the Phase II RI of EBG is described in detail in Chapter 4.0 of this SAP Addendum. The sampling design will attempt to define the extent of residual contamination identified during Phase I, and shall aim at providing sufficient information to address the primary objectives detailed in Section 3.1.

## 3.3 DATA EVALUATION METHODS

The methods for identifying AOC-related chemicals are described in the following sections. The data evaluation methods are consistent with those established for the Phase I RI of EBG (USACE 2001a). The general process for identifying AOC-related chemicals involves initial data reduction; defining data aggregates; data quality assessment; and screening of data against statistical, background, and weight-of-evidence criteria. Analytical results are reported by the laboratory in electronic form and loaded into a database. Site data are extracted from the database so that only one result is used for each station and depth sampled. Quality control (QC) data such as sample splits and duplicates and laboratory re-analyses and dilutions will not be included in the determination of contaminant nature and extent or in the risk evaluation. Samples rejected in the validation process also will be excluded. If it is found that a significant number of samples are rejected, the entire data set will be evaluated to determine if a representative data set exists without the rejected data. The percentage of rejected data will be presented in the data quality assessment section of the Phase I RI report.

### 3.3.1 Determination of AOC Chemical Background

The Phase I RI will not require determination of a separate AOC-specific chemical background. Analytical results from the Phase I RI will be screened against final facility-wide background values for RVAAP in the *Phase II RI Report for the Winklepeck Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001a). These facility-wide background criteria and the processes used to generate them are currently under review by USACE and Ohio EPA. The final criteria, as presented in the final Phase II RI Report, will be used in this study at EBG. This screening step will be used to determine if detected metals and other potential anthropogenic compounds (such as polynuclear aromatic hydrocarbons) are site related or naturally occurring.

### 3.3.2 Definition of Aggregates

Data collected from EBG will be aggregated by environmental media (groundwater, surface water, soil, and sediment). Groundwater for the AOC will be evaluated as one spatial aggregate, unless compelling hydrologic data are obtained during the Phase II RI to suggest that further subdivisions be made. For soil, sediment, and surface water, Phase I and Phase II will be aggregated together where appropriate. Soil data will be aggregated by depth interval [surface soils from 0 to 1 ft below ground surface (bgs)] and subsurface soil from 1 to 3 ft bgs. Data will be evaluated on an AOC-wide scale. Summary statistics (i.e., minimum detect, maximum detect, frequency of detection, mean detect, and 95% upper confidence limit) will be developed for the entire EBG data set. Source areas ("hot spots") will be identified spatially from the soil and sediment data. Evaluation of the spatial distribution of surface water contaminants will remain on an AOC-wide scale and include factors such as proximity to sources and flow patterns within EBG. Focused discussions of any identified source areas and contamination at surface water exit points will be developed in the nature and extent assessment and the risk evaluation.

### 3.3.3 Data Screening

Data screening prior to the risk evaluation will consist of four steps: (1) data quality assessment, (2) frequency of detection screen, (3) background screening, and (4) screening of essential human nutrients. These screens will be used to identify site-related contaminants (SRCs). Those constituents identified as SRCs will then be screened in the risk evaluation. The application of these screens to the Phase I RI risk evaluation is presented in Section 3.4.

- A detailed assessment of the quality of the Phase I RI analytical results will take place. Data that are rejected as a result of the data quality assessment will not be evaluated further in the screening process.

- Each chemical for each environmental medium (aggregate) will be evaluated to determine its frequency of detection. Chemicals that are never detected will be eliminated as SRCs. For sample aggregations with greater than 20 samples and a frequency of detection of less than 5%, a weight-of-evidence approach will be used to determine if the chemical is an SRC. The magnitudes and locations (clustering) of the detects will be evaluated. If the detected results show no clustering and concentrations are not substantially elevated relative to the detection limit, they will be considered spurious and the chemical eliminated as an SRC.

- For each inorganic constituent passing the frequency of detection screen, concentrations will be screened against available naturally occurring background levels. If the maximum concentration of a constituent exceeds the background value, the constituent will be considered as an SRC. These background levels are presented in the *Phase II RI Report for the Winklepeck Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio* (USACE 2001a). Note that in the event a constituent was never detected in the background data set, its background level is assigned as zero. This process ensures that any detected concentrations at the EBG for a particular constituent in a particular medium cannot be eliminated simply because the chemical was never detected in background. All detected organic compounds will be considered as SRCs, evaluated in nature and extent, and screened using the risk evaluation.

- Chemicals that are considered as essential nutrients (calcium, chloride, iodine, iron, magnesium, potassium, phosphorous, and sodium) will not be evaluated as SRCs, unless grossly elevated relative to background. These chemicals are an integral part of the country's food supply, and are often added to foods as supplements; thus, these constituents are not generally addressed as contaminants (EPA 1989 and 1995). Data on essential elements, however, will be used to evaluate the subsurface geochemistry.

## 3.4 HUMAN HEALTH RISK ASSESSMENT

An HHRA will be conducted in accordance with the most current draft version of the RVAAP Facility-wide Human Health Risk Assessment Work Plan (USACE 2003a). The HHRA will further screen all constituents identified as SRCs using the process described in Section 3.3 above. COPCs will first be identified by screening of SRCs against EPA Region IX preliminary remediation goals. Subsequently, risks and chemical hazards for identified COPCs will be evaluated for land use/exposure scenarios specific to EBG. The assumed future land use for EBG, for purposes of the risk evaluation, will be Restricted Access. The area will be closed to all normal training and administrative activities. It may contain hazardous contamination, unexploded ordnance (UXO), other hazards to human health and safety, protected cultural or historical sites, and/or protected environmentally sensitive areas. Surveying; sampling and other essential security, safety, natural resources management; and other directed activities may be conducted here only after authorized personnel have been properly briefed on potential hazards/sensitive areas. Individuals unfamiliar with the hazards/restrictions will be escorted by authorized personnel at all times while in the restricted area. One AOC-wide exposure unit for surface soil (0 to 1 ft), subsurface soil (>1 ft) if deemed necessary, sediment, surface water, and groundwater will be evaluated. Subsurface soil will not be evaluated because the Maintenance Worker scenario does not include exposure to this medium, per the draft Facility-wide Risk Assessment Work Plan. Surface water, sediment, and groundwater media will not be included in the quantitative HHRA because the Maintenance Worker scenario does not include exposure to this medium.

## 3.5 OHIO LEVEL II ECOLOGICAL RISK ASSESSMENT

An Ohio ERA Guidance Levels II and III risk assessment will be conducted in accordance with the protocols prescribed by the State of Ohio ERA Guidance and the guidance specified in the RVAAP Facility-wide Ecological Risk Assessment Work Plan (USACE 2003b). Ohio Level I habitat descriptions will not be conducted. It is acknowledged that habitat does exist for this area as evidenced by the previous visits that have taken place to date. Rather, a habitat description will be conducted in the Level II assessment, which will consist of information about terrestrial, aquatic, and sensitive habitats, including lists of species of ecological receptors and threatened and endangered organisms that were provided in the ecological resources description of the Load Line 1 and 12 RI reports. One terrestrial exposure unit will be defined and evaluated. Additionally, one aquatic exposure unit will be evaluated for sediment and surface water. Among the surface water screening criteria will be the Water Quality Criteria in OAC 3745. Groundwater will not be evaluated as part of the ERA. Despite the initial appearance that surface water conveyances, vegetation patterns, and disturbance history at EBG are different from those observed at the Winklepeck Burning Grounds (WBG) reference site, the plant protection levels from WBG will be extrapolated as ecological screening values at EBG. Also, means (per Step 5 of Figure III of the RVAAP Facility-wide Ecological Risk Assessment Work Plan) for chemicals will be collocated with vegetation measurements for all pads (Table 9-6 in the March 2003 version of the Biological Field-Truthing Effort at WBG). The Level II risk assessment will result in a number of hazard quotients for a number of ecological receptors, which may be used in making future risk management decisions for EBG (i.e., no further action needed, further investigation needed to clarify an issue, or some form of remedial action).

# 4.0 FIELD ACTIVITIES

## 4.1 GROUNDWATER

### 4.1.1 Rationale

Hydrogeologic and analytical data are non-existent for groundwater at EBG. Accordingly, eight monitoring wells will be installed to assess groundwater impacts and potential migration pathways (Figure 4-1). Groundwater characterization efforts include the installation of monitoring wells to provide data on general hydrogeologic characteristics and groundwater flow patterns. Monitoring wells will also be specifically installed in the vicinity of known surface soil and sediment contamination to evaluate whether contaminants are leaching to groundwater. Monitoring wells are also planned along the boundaries of EBG to determine whether groundwater and potential contaminant transport is occurring off of the AOC.

#### 4.1.1.1 Monitoring well locations and installation

All monitoring wells will be installed using conventional drilling techniques (hollow-stem auger and air rotary drilling, as required) as described in Section 4.1.2.1. The maximum depth of each shallow monitoring well is expected to be ~9.1 m (30 ft) bgs or less. The screened intervals for the wells will be installed so that the water table is within the screened interval where possible. In the unconsolidated zone where the water table is less than a depth of 6.1 m (20 ft), which is the minimum depth required to set a complete well with a 3.05-m (10-ft) screen per USACE specifications, the screened interval will be placed at the minimum feasible depth (from 3.05 to 6.1 m (10 to 20 ft).

Where bedrock is encountered prior to intercepting the water table or at depths less than the minimum required to set a well, a decision whether to complete the well in bedrock will be made in conjunction with Ohio EPA, RVAAP, and USACE. At locations where the water table lies within the bedrock interval, the screen and filter pack will be set entirely within the bedrock interval [minimum screen interval from about 4.0 to 7 m (13 to 23 ft)].

One round of contemporaneous water level measurements will be performed on the same day for all wells at EBG following development and prior to sampling. Water level measurements will also be collected from the wells at the time they are sampled. Groundwater samples will be collected from each of the eight new monitoring wells. The individual sample identification and the required chemical analyses are provided in Chapter 5.0.

#### 4.1.1.2 Sample collection for field and laboratory analysis

All monitoring wells will be field screened for volatile organic compounds (VOCs) prior to sample collection using a hand-held photoionization detector (PID) or flame ionization detector organic vapor analyzer (OVA). Screening will be accomplished by monitoring the headspace vapors at the top of the riser pipe. Field measurements of pH, temperature, specific conductance, turbidity, and dissolved oxygen will be recorded for each groundwater sample. No samples will be collected for additional headspace analysis. One round of AOC-specific, contemporaneous water level measurements will be performed on the same day for all wells at EBG following development and prior to sampling. Water level measurements will also be collected immediately prior to sampling of each well.

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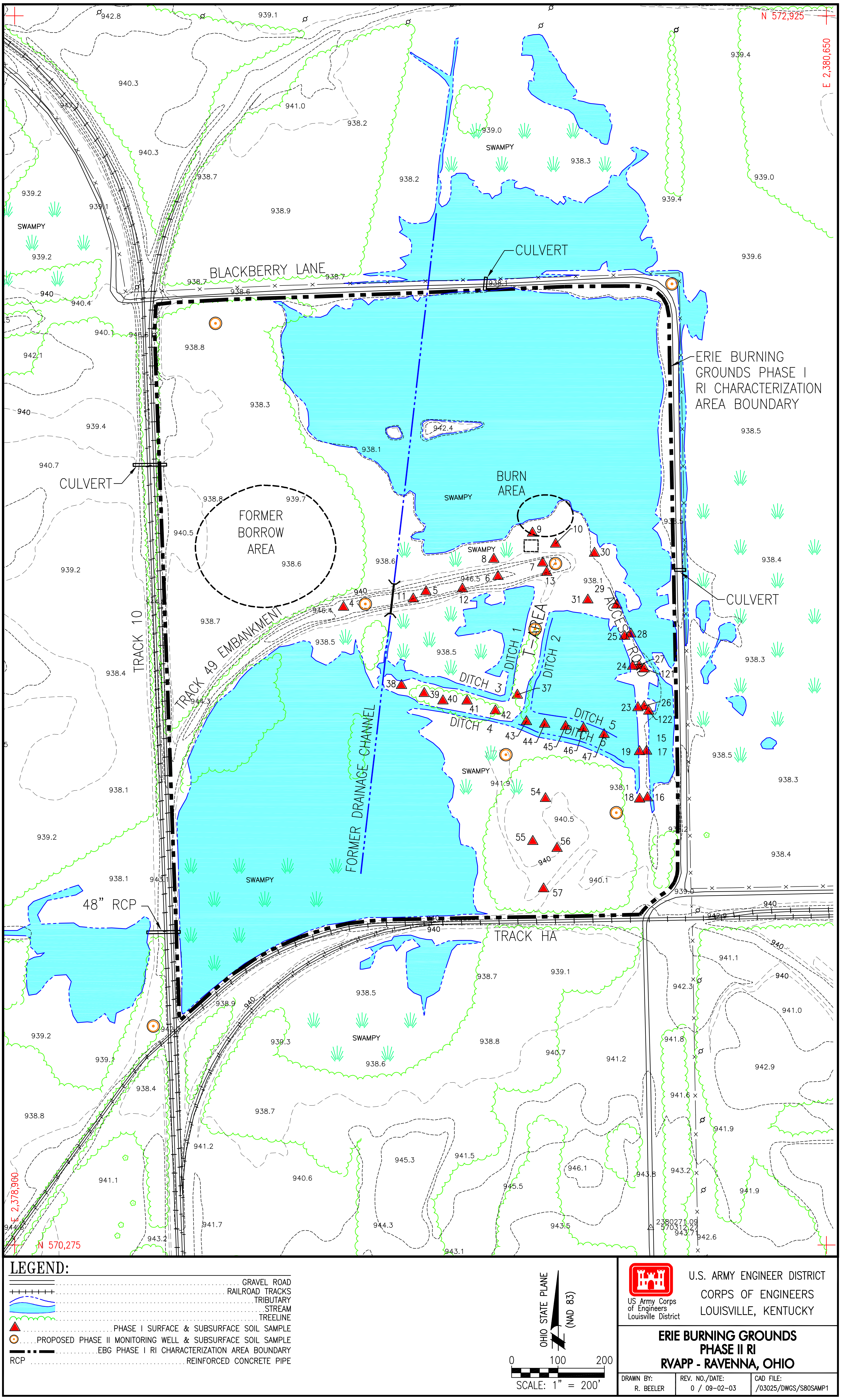

Figure 4-1. Proposed Groundwater Monitoring Well Locations, EGB Phase II RI

An unfiltered groundwater sample will be collected from each monitoring well and submitted for laboratory analysis of explosives, propellants, cyanide, semivolatile organic compounds (SVOCs), VOCs, pesticides, and polyvinyl chlorides (PCBs). An ample volume of water will be collected so that filtered Target Analyte List (TAL) metals can be analyzed. Unfiltered samples for TAL metals will not be analyzed. Filtering will be performed in the field according to Section 4.3.5 of the Facility-wide SAP.

#### 4.1.1.3 Quality assurance/quality control, and blank samples and frequency

QC duplicates, USACE quality assurance (QA) split groundwater samples, equipment rinsate samples, and matrix spike/matrix spike duplicates will be collected during the Phase II RI. Duplicates and QA splits will be selected randomly (from the same locations, whenever possible) and analyzed for the same parameters as the environmental samples. Duplicate and QA split samples will be collected at a frequency of 10% of environmental samples. Equipment rinsate samples will also be collected at a frequency of 10% of groundwater samples. Matrix spike/matrix spike duplicates will be collected at a rate of 5% of total samples per media. Trip blanks, which originate in the laboratory, will accompany shipment of all VOC groundwater samples and will be analyzed for VOCs only.

One source blank will be collected from the potable water source, which will be used for all potable wash and rinse water for equipment decontamination during the Phase II RI. One source blank will also be collected from the deionized/distilled (ASTM Type I) water source used. The source blanks will be analyzed for the full suite of analyses.

### 4.1.2 Monitoring Well Installation

In general, monitoring wells to be installed during the Phase II RI will be 2.0-in., Schedule 40 polyvinyl chloride wells with standard above-grade completions. Specifications for drilling, installation, completion, and development of monitoring wells are contained in the following subsections.

#### 4.1.2.1 Drilling methods and equipment

***Equipment Condition and Cleaning***

Requirements for the condition and cleaning of equipment used for well installation are described in Section 4.3.2.1.1 of the Facility-wide SAP. These requirements, as applicable, will be employed for equipment used to install monitoring wells in the Phase II RI.

***Drilling Methods***

Conventional drilling techniques (hollow-stem auger and air rotary) will be used to install monitoring wells, as described in Section 4.3.2.1.2 of the Facility-wide SAP. It is anticipated that the third drilling scenario described under Section 4.3.2.1.3 will be applicable for the installation of the monitoring wells to be drilled into bedrock (i.e., hollow stem auger and continuous sampling to bedrock with coring and subsequent reaming using air rotary with no surface casing). In the event that unconsolidated materials are found to be prone to collapse, the second drilling scenario (i.e., use of temporary surface casing) will be employed.

The fourth drilling scenario would be applicable to wells that monitor only the unconsolidated interval. Where depth to the water table is great enough, monitoring well boreholes will be drilled to sufficient depth to install the bottom of a 3-m (10-ft) well screen approximately 2.1 m (7 ft) below the current water table elevation. If the water table lies at too shallow a depth to place a screen across it and complete a well per specifications, then the borehole will be advanced to the minimum required depth of 6.1 m (20 ft) and the well completed. As noted previously, it is anticipated that the depth to the water table will range from 1.52 m (5 ft) to 9.1 m (30 ft) bgs at EBG, based on existing information.

For all groundwater monitoring wells that penetrate bedrock, NQ-size coring shall be performed for the bedrock interval prior to reaming the borehole to a diameter of at least 15.2 cm (6 in.) using air-rotary equipment with an oil-free (filtered) air source. The purpose of coring is to evaluate bedrock stratigraphy and the degree and nature of weathering and fracturing in bedrock. All rock cores will be stored in wooden boxes in such a manner as to preserve their relative positions by depth. Intervals of lost core shall be noted in the core sequence with wooden or Styrofoam blocks. Boxes will be marked on the outside to provide the boring number, cored interval, and box number, if there are multiple boxes. All cores collected will be documented (including photographing the core after it has been properly placed and labeled in the core boxes) and stored at RVAAP in accordance with *Ohio EPA Technical Guidance for Hydrogeologic Investigations and Groundwater Monitoring* (Ohio EPA 1995) and *EM-1110-1-4000, Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites* (USACE 1994b).

#### 4.1.2.2 Materials

***Casing/Screen***

The casing and screen materials for monitoring wells were presented in Section 4.3.2.2.1 of the Facility-wide SAP.

***Filter Pack, Bentonite, and Grout***

The filter pack, bentonite, and grout materials for monitoring wells were presented in Section 4.3.2.2.2 of the Facility-wide SAP.

***Surface Completion***

All wells will be constructed as above-ground installations, as described in Section 4.3.2.2.3 of the Facility-wide SAP.

***Water Source***

Potable water from a commercial source will be used during this investigation for monitoring well and decontamination purposes. The collection and evaluation of the source water sample will follow Section 4.3.2.2.4 of the Facility-wide SAP.

***Delivery, Storage, and Handling of Materials***

All monitoring well construction materials will be delivered, stored, and handled following Section 4.3.2.2.5 of the Facility-wide SAP.

#### 4.1.2.3 Installation

All monitoring well installation will be in accordance with the procedures for above-ground installations, as presented in Section 4.3.2.3 of the Facility-wide SAP. Unconsolidated surficial material in each location will be drilled using a 10.8-cm (4.25-in.) inside diameter hollow-stem auger having an outside diameter of at least 16.5 cm (6.25 in.). Soil samples will be collected continuously from the surface to bedrock refusal or borehole termination using a split-barrel sampler for geologic logging. If bedrock is encountered before borehole termination, the bedrock interval in a borehole will be drilled using air rotary with an NQ-size coring device, as described above. Following coring, rock drilling will continue with a tricone roller bit.

#### 4.1.2.4 Documentation

***Logs and Well Installation Diagrams***

***Boring Logs.*** Boring logs will be completed for all monitoring well boreholes following Section 4.3.2.4.1.1 of the Facility-wide SAP. Visually determined Unified Soil Classification System (USCS) of each soil sample taken will be recorded on each boring log.

***Well Construction Diagrams.*** All monitoring well activities will be documented according to the procedures presented in Section 4.3.2.4.1.2 of the Facility-wide SAP.

#### 4.1.2.5 Well abandonment

Any monitoring wells or boreholes abandoned during the Phase II RI will be abandoned according to the procedures presented in Section 4.3.2.5 of the Facility-wide SAP.

#### 4.1.2.6 Water level measurement

Water level measurements will follow the procedure presented in Section 4.3.2.6 of the Facility wide SAP.

#### 4.1.2.7 Well development

Development of monitoring wells will be accomplished with a pump following Section 4.3.2.3.11 of the Facility-wide SAP. Pumps may be replaced with bottom-filling bailers where well size or slow recharge rates restrict pump usage. Development will proceed until the criteria specified in the Facility-wide SAP are met.

- Turbidity readings of 5 nephelometric turbidity units (NTUs) or less are attained. If values of 5 NTUs or less cannot be attained, development will continue until the water is clear to the unaided eye or the maximum development time has expired (48 hrs).

- The sediment thickness remaining in the well is less than 1% of the screen length or <30 mm (0.1 ft) for a 3.05-m (10-ft) screen.

- A minimum of five times the standing water volume in the well has been purged (to include the well screen and casing plus saturated annulus, assuming 30% porosity).

- Indicator parameters (pH, temperature, and specific conductance) have stabilized to ±10% over three successive well volumes.

If potable water is added to the boring to aid drilling of the well or to control heaving sands, five times the volume of any water added will be removed during development. If development to the criteria specified above cannot be achieved due to site conditions, such as slow recharge or persistent turbidity, then the Architectural and Engineering Field Operations Manager, Ohio EPA, and the USACE Technical Manager or other field representative will be consulted to determine the appropriate course of action. For each monitoring well developed during the Phase II RI, a record will be prepared to include the information specified in Section 4.3.2.4.2 of the Facility-wide SAP.

### 4.1.3 Field Measurement Procedures and Criteria

All field measurement procedures and criteria will follow Section 4.3.3 of the Facility-wide SAP. All monitoring wells will be field screened for VOCs using a PID or OVA during groundwater sample collection. Screening will be accomplished by monitoring the headspace vapors at the top of the riser pipe.

### 4.1.4 Sampling Methods for Groundwater

Groundwater sampling from monitoring wells will follow the procedures for low-flow (micropurge) sampling presented in Section 4.3.4.2 of the Facility-wide SAP. Where micropurging cannot be accomplished for any reason, then purging and sampling of all monitoring wells installed during the Phase II RI will be conducted in accordance with conventional procedures discussed in Section 4.3.4.1 of the Facility-wide SAP.

#### 4.1.4.1 Filtration

Per Section 4.3.5 of the Facility-wide SAP, filtered groundwater samples only for dissolved TAL metals will be collected. Under the micropurge method, filtered samples will be collected using 0.45-µm disposable in-line pore filter attached to the return line of the pump. If conventional purging and sampling is required, filtration will be performed by using a negative pressure, hand-operated vacuum pump and collection flask and a disposable 0.45-µm pore size filter assembly. In the case of either method, filters will be replaced as they become restricted by solids buildup as well as between sample collection sites.

### 4.1.5 Sample Containers and Preservation Techniques

Requirements for sample containers and preservation techniques for groundwater samples are presented in Section 4.3.6 of the Facility-wide SAP.

### 4.1.6 Field Quality Control Sampling Procedures

QA/QC samples for monitoring well groundwater sampling activities will include QC duplicates and QA split groundwater samples, equipment rinsates, matrix spike/matrix spike duplicates, and trip blanks, as described in Section 4.1.1.3 above. Split samples will be submitted to the following USACE contract laboratory for independent analyses: Severn Trent Laboratories, North Canton, Ohio.

### 4.1.7 Decontamination Procedures

Decontamination of equipment associated with groundwater sampling will be in accordance with the procedure presented in Section 4.3.8 of the Facility-wide SAP. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

### 4.1.8 In-Situ Permeability Testing

A slug test will be performed in each of the monitoring wells installed as part of the Phase II RI to determine the hydraulic conductivity of the geologic material surrounding each well. The slug test method involves lowering or raising the static water level in a well bore by the removal or insertion of a cylinder (slug) of known volume. The return of the water level to a pre-test static level is then measured over time.

The change in water level over time is plotted on a logarithmic scale to determine hydraulic conductivity (K). K is a function of the formation permeability and the fluid in the formation and is influenced by well construction.

At a minimum, a slug insert (falling head) test will be used for this investigation. A rising head test will also be performed following the falling head test to obtain a corresponding K value for comparative purposes. If possible, the slug test will be performed in such a manner as to prevent the water level in the well from dropping below the top of the screened interval when the slug is removed. All tests will be performed after the groundwater has been sampled, as described in Section 4.1.4, and will be contingent upon a monitoring well containing sufficient water to allow testing.

Slug tests will only be initiated after the well has recovered from groundwater sampling, or after a minimum of 12 hrs has elapsed since sampling. A pressure transducer will be inserted into the well and the water level allowed to equilibrate to static conditions, or until at least 6 hrs have elapsed. A slug that displaces 0.3 m (1 ft) of water will be inserted to provide an adequate response for the analysis. Prior to the start of the test, plastic sheeting will be placed around the well in a manner to minimize water contact with the ground surface. The static water level will be measured with an electronic water level indicator and recorded to the nearest 0.003 m (0.01 ft) below top of casing. The total depth of the well will be measured with an electronic water level indicator and recorded to the nearest 0.003 m (0.01 ft) below top of casing. These measurements will be used to calculate the water column height in the well. Use of the electronic water level meter will follow procedures outlined in Section 4.3.3.1 of the Facility-wide SAP.

For the rising head test, the slug will be withdrawn quickly from the well without surging. The time of the test will begin as soon as the slug leaves the water column. Water level measurements will be recorded continuously during the test with a pressure transducer and data logger programmed to make measurements to within 0.003 m (0.01 ft) and record them on a logarithmic scale. Water level change will be recorded for a period of 6 hrs or until the well re-equilibrates to 90% of the pre-test water level, whichever occurs first.

The test data will be evaluated by the Bouwer and Rice method (1976, 1989) or the Cooper et al. method (1967). If the test geometry is not conducive to analysis to either of these two methods, an alternate method will be used subject to RVAAP team approval (USACE and Ohio EPA).

### 4.1.9 Ordnance and Explosive Avoidance

An OE Avoidance Plan in accordance with EP 75-1-2, prepared by the OE support subcontractor, is contained in Appendix B. Upon approval of the OE Avoidance Plan by the USACE Unexploded Ordnance Mandatory Center of Excellence, it will be presented as part of the initial project safety briefing. OE support staff will be present during all field operations. The OE Team Leader will train all field personnel to recognize and stay away from propellants and OE. Safety briefings for OE will also be provided to all site personnel and site visitors.

All sample locations and access routes into the locations will be cleared for potential OE prior to entry. The OE Team Leader will clearly mark the boundaries of the cleared soil sampling locations and access routes. If surface OE is encountered, the approach path will be diverted away from the OE, the area clearly marked, and the OE Team Leader notified immediately. In the event OE is encountered, notification will be made to the RVAAP Environmental Coordinator along with a map showing the exact location of the item. No item shall be moved without RVAAP approval. In any area where surface metallic OE is encountered, a magnetometer will be used to ensure that no subsurface OE exists within the approach path. Prior to collection of the surface soil sample [0 to 0.3 m (0 to 1 ft) bgs], the OE team will verify that the location is anomaly free using a magnetometer. If anomaly-free routes and sample locations cannot be identified, the OE Center of Excellence will be notified and the level of UXO support reassessed.

Where subsurface soil sampling or drilling is to be conducted [0.3 to 0.9 m (1 to 3 ft) bgs], the auger will be withdrawn at the top of the subsurface interval [0.3 m (1 ft) bgs] and the magnetometer lowered into the borehole to screen for subsurface magnetic anomalies. Should special circumstances dictate that the borehole be deepened beyond 0.9 m (3 ft) bgs, then a magnetometer reading will be taken at the top of each subsequent 0.6-m (2-ft) interval prior to augering. This process will be repeated to a depth of 3.05 m (10 ft) or to the top of the bedrock, whichever occurs first. Magnetometer equipment will be decontaminated between borings, or, in the case of hand-held magnetometers, a plastic sleeve may be used and replaced between borings.

## 4.2 SUBSURFACE SOILS

### 4.2.1 Rationale

Subsurface soil samples will be obtained from monitoring well borings for the purposes of geotechnical classification only. No additional subsurface soil samples for the purposes of laboratory analysis are planned. For any new wells that are set with the screened interval in overburden, a pair of undisturbed samples (Shelby tube) will be obtained near the midpoint of the screened interval and subjected to detailed geotechnical analysis to include: USCS Classification, Atterberg Limits, bulk density, porosity, and Total Organic Carbon.

#### 4.2.1.1 Subsurface soil sample locations

Subsurface soil samples will be collected from planned monitoring well boring locations, as shown on Figure 4-1. The final sample locations will be marked in the field based on site conditions, access considerations, visual survey of the area, and OE considerations.

### 4.2.2 Sampling Procedures

#### 4.2.2.1 Sampling for geotechnical analysis

Undisturbed subsurface soil samples will be collected from monitoring well borings using a thin-walled (Shelby) tube sampler during hollow-stem auger drilling. Shelby tube sampling will proceed as discussed in Section 4.4.2.4.1 of the Facility-wide SAP.

#### 4.2.2.2 Decontamination procedures

The decontamination procedure for subsurface soil sampling activities presented in Section 4.4.2.8 of the Facility-wide SAP will be followed. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

## 4.3 SURFACE SOILS AND SEDIMENT

### 4.3.1 Rationale

Surface soil samples from 0.0 to 0.3 m (0 to 1 ft) will be collected during the Phase II RI at EBG to (1) further define contaminant nature and extent of surface soil contamination; and (2) investigate potential source areas not sampled during Phase I. The soil-sampling program will employ biased sampling (targeted to known hot spots) to characterize suspected source areas and contaminant accumulation points. As set forth in the RVAAP Installation Action Plan, there will be a total of 15 surface soil samples obtained during this Phase II investigation. In an effort to validate recent multi-increment sampling techniques recently presented to the RVAAP Environmental Working Group, a total of 5 of the 15 surface soil samples will be collected using this technique. Multi-increment samples will be collected from 30 random locations within each of the sampling areas, allowed to air dry, passed through a No. 10 sieve, and prepared for shipping to the contract laboratory. The multi-increment sampling procedure is described in detail in Section 4.3.2.2. The surface soil samples and associated analytical suites are provided in Chapter 5.0.

The sampling program also incorporates collection of sediments from drainage ditches and catch basins from confirmed and suspected source areas and exit pathways (streams and ditches) in order to assess the potential for contaminant migration via leaching or erosion from surface soil to surface water and sediment. As set forth in the RVAAP Installation Action Plan, there will be a total of 12 sediment samples (0 to 0.5 in.) obtained during the EBG Phase II RI. The sediment samples and the associated analytical suites are provided in Chapter 5.0.

In an effort to validate recent multi-increment sampling techniques recently presented to the RVAAP Environmental Working Group, a total of 6 of the 12 samples referenced above will be collected using this technique. These six samples will be collected from two areas, each to be sampled three times for the purpose of comparative analysis. These two areas will be located within the north and south basins, respectively. General methodology for collecting these samples is similar to that described for surface soil multi-increment samples, and is detailed in Section 4.3.2.2.

#### 4.3.1.1 Surface soil sample locations

Ten discrete surface soil samples and five multi-incremental samples will be collected from within the EBG boundary. The planned locations of these samples are shown on Figure 4-2. The final sample locations will be marked in the field based on site conditions, access considerations, visual survey of the area, and OE considerations. The 10 discrete surface soil locations are as follows:

- Two surface soil samples will be collected from the monitoring well borings to be installed in the northwest quadrant of the EBG site,
- One sample is planned adjacent to the northern culvert along Track 10,
- Two samples are planned in the southeast wooded area in the vicinity of Ditch 4, and
- Five discrete samples are planned along the Track 49 Embankment.

Multi-increment samples will be collected from areas approximately 200 by 200 ft, as described in Section 4.3.2. The actual location of these sampling areas will be refined in the field, depending on accessibility, site conditions, etc., but the general areas of interest are indicated by the cross hatched pattern on Figure 4-2, and include areas in:

- the area around Ditch 3,
- the area at the east end of Track 49 (near the former burn area),

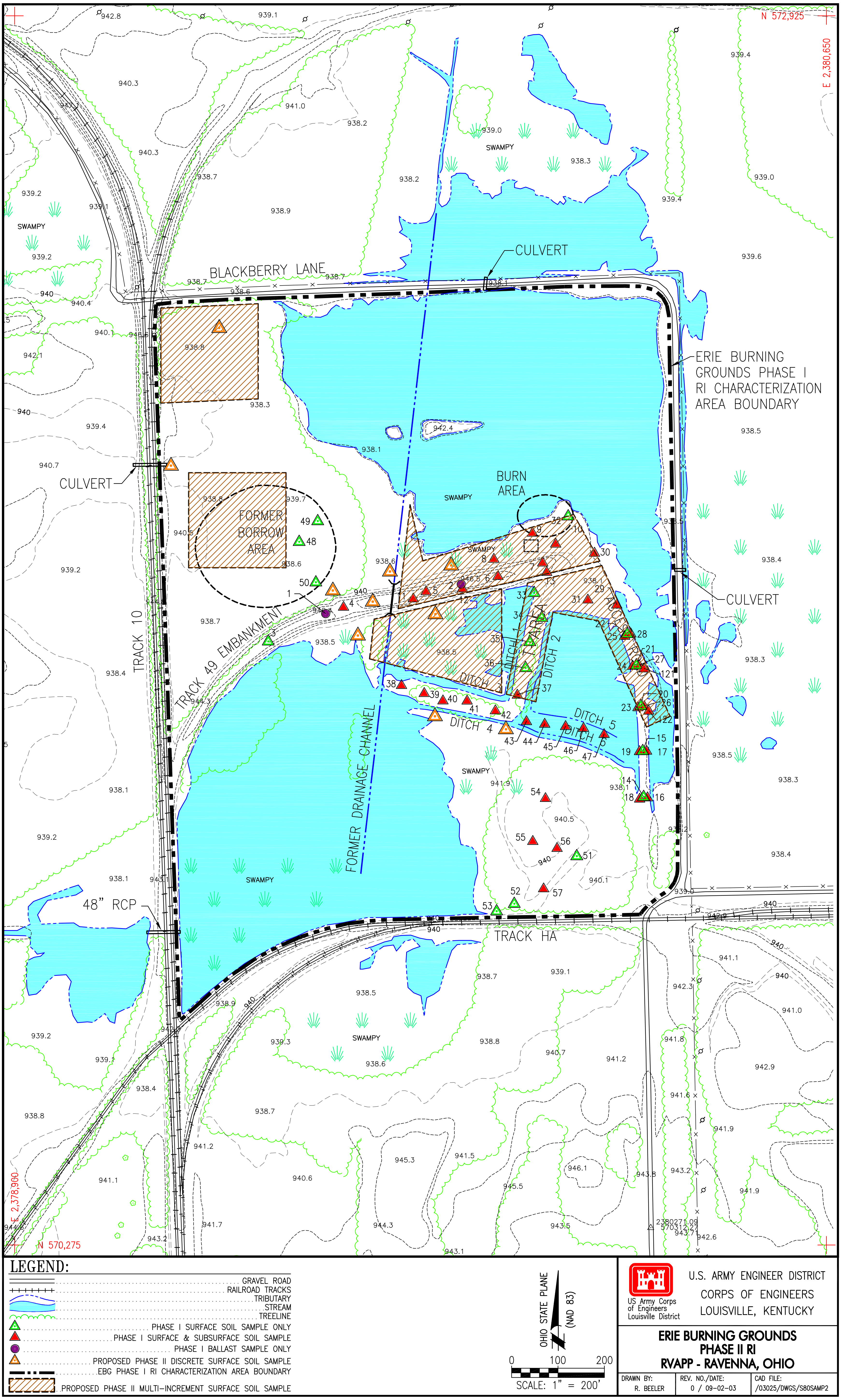

Figure 4-2. Existing and Proposed Surface Soil Sampling Locations, EBG Phase II RI

- the northern end of the Access Road, and
- two multi-increment sampling areas in the northwest quadrant in the vicinity of the new groundwater wells and in the area of the former borrow area.

#### 4.3.1.2 Sediment sampling locations

Sediments will be sampled from streams and ponds in order to (1) assess the potential for contaminant migration via erosion to surface water and sediment; (2) evaluate potential contaminant accumulation areas, such as sedimentation basins and runoff collection points, to evaluate if residual contamination exists and if these areas could act as secondary sources for contamination; and (3) evaluate potential contaminant exit pathways from the AOCs.

Sediment samples in the EBG Phase II RI are all subaqueous sediment from streams and ponds. The collection methods for this type of samples are discussed in Sections 4.3.2.1 (discrete samples) and 4.3.2.2 (multi-increment samples). Subaqueous sediment samples from streams and ponds will be sampled from 0.0- to 0.15-m (0.0- to 0.5-ft) depth intervals using a stainless-steel scoop, sediment core sampler, or remote device (Eckman sampler), as appropriate.

Six discrete and six multi-increment samples are planned for the Phase II RI of EBG. The planned locations for four of the discrete sediment samples and the multi-increment sampling areas are shown on Figure 4-3. Two of the sediment samples are being held as contingency samples, and the location of these samples will be determined once the field investigation is underway. The locations of the known discrete sediment samples include:

- the north side of the culvert at Blackberry Lane, opposite Phase I sediment/surface water location 112;
- the eastern exit of the culvert opposite Phase I sediment/surface water location 115 on the eastern side of the burning grounds;
- two samples from within the creek channel at the exit of the 48-in. RCP; and
- two contingency samples to be determined.

Multi-increment sample areas, as mentioned above, will be located within the north and south basins. The actual location of these areas will be determined in the field based on accessibility and site conditions at the time of the Phase II field investigation.

#### 4.3.1.3 Soil and sediment sampling requirements

***Composite Samples for Explosives and Propellants***

All surface soil and dry ditch sediment samples [from 0 to 0.3 m (0 to 1 ft)] to be analyzed for field explosives and propellants will be composite samples derived from three subsamples collected from about 0.9 m (3 ft) from one another in a roughly equilateral triangle pattern following protocols in Section 4.5.2.5 of the Facility-wide SAP.

***Discrete Soil and Dry Sediment Samples***

Samples for all analyses other than explosives or propellants will be discrete samples in accordance with Section 4.5.2.1 of the Facility-wide SAP.

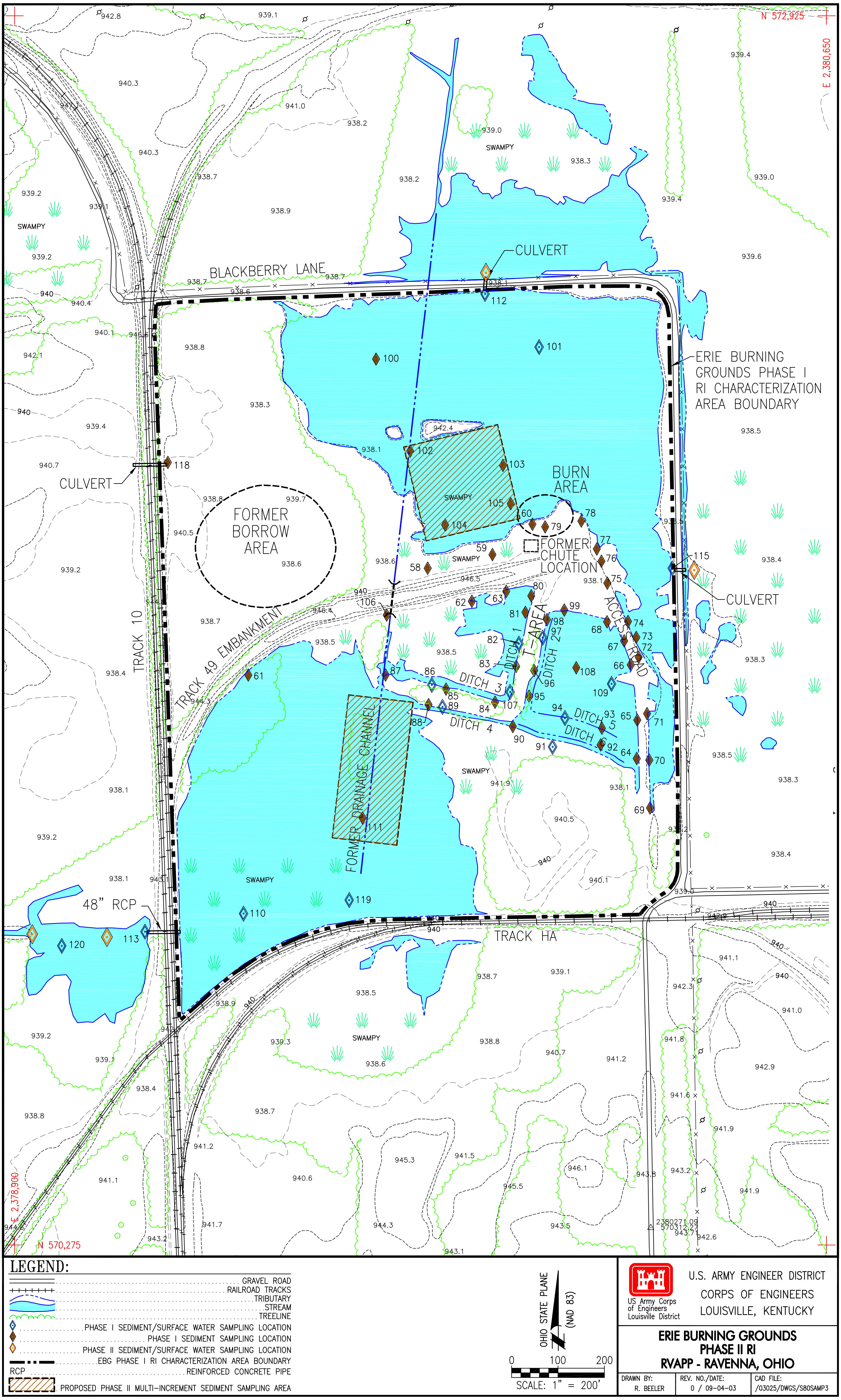

Figure 4-3. Existing and Proposed Sediment/Surface Water Locations, EBG Phase II RI

***Subaqueous Sediment***

Discrete sediment samples may be collected using a stainless steel trowel or scoop, hand auger, sediment--coring device, or remote sampler (where necessary), per Section 4.3.2.2. In ditches and flowing streams, sediment samples will be collected from downstream locations first and moving upstream relative to overall flow patterns. Sediment samples will not be collected from areas exhibiting turbid or rapid flow. Where sediment and surface water stations are co-located, surface water samples will be collected first. Samples for VOC analyses will be collected first, immediately upon extraction of the requisite sample volume. The remainder of the sample volume will be placed in a decontaminated, stainless steel bowl and homogenized. Sample aliquots for specified non-volatile constituent analyses and geotechnical analyses will be collected from the homogenized material.

***Multi-increment Samples***

Surface soil and sediment samples under this classification will be collected using multi-increment techniques. Multi-increment samples are composite samples collected from multiple random points within each of the designated multi-increment sampling areas. The sample aliquots comprising the sample are collected at random. For soils or dry sediment, sample aliquots are collected using a small-diameter push tube. For subaqueous sediment in shallow water, sample aliquots are collected using a sediment core device or trowel; if water depths prohibit the use of a core device or trowel, then a remote sampling device may be used. A sufficient number of aliquots are collected to provide statistical confidence that the average concentration of a particular constituent within a designated area is represented by the composite sample. For an approximately 0.5-acre area (exposure unit), no less than 30 aliquots will be collected to provide the requisite statistical confidence (95%).

The entire volume of all aliquots is composited into a single sample, dried, sieved, splits obtained, and the splits ground finely for specified non-volatile constituent analyses. Sample collection, drying, sieving, and splitting are completed in the field. Sample grinding and analyses are conducted at the fixed-base laboratory. Volatile organic analyses are not conducted on samples collected using this technique.

#### 4.3.1.4 Sample collection for field and laboratory analysis

Field screening of surface soil and sediment samples for organic vapors will be performed using a PID, per Section 4.3.2.3; samples for headspace analyses will not be collected. Geotechnical logging, including estimates of USCS classification, will be performed at the time of sampling.

Sample aliquots for laboratory and geotechnical analyses will be collected as discussed in Section 4.3.1.3. Disturbed samples for geotechnical analyses will be collected at specified surface soil and sediment locations from homogenized soil mixtures.

#### 4.3.1.5 Field QC sampling procedures

Surface soil/sediment QA/QC samples will be collected during the EBG Phase II RI. QC duplicate and QA split soil samples will be collected at a frequency of 10% (1 per 10 environmental samples) for each matrix (soil and sediment). Matrix spike/matrix spike duplicate samples will be collected at a rate of 5% of total samples per media. Split samples will be submitted to the USACE contract laboratory for independent analysis, as noted in Section 4.1.1.3. Duplicate and split samples will be derived from the same sampling station, selected on a random basis, and submitted for the same analyses as the environmental samples. Two rinsate blanks will be collected for surface soil/sediment equipment per field cycle. Trip blanks will accompany all shipments containing VOCs. Chapters 5.0 and the Quality Assurance Project Plan (QAPP) addendum (Chapter 8.0) summarize QA/QC sampling requirements.

### 4.3.2 Sampling Procedures

#### 4.3.2.1 Sampling methods for soil/dry sediment

***Bucket Hand-Auger Method***

Surface soil and dry sediment samples will be collected with a bucket hand auger in accordance with Section 4.5.2.1.1 of the Facility-wide SAP.

***Trowel/Scoop Method***

A stainless steel trowel or scoop may be used, as presented in Section 4.5.2.1.2 of the Facility-wide SAP, to collect surface soil or dry sediment samples in soft, loose soil, if feasible. The protocol for compositing, homogenization, and discrete VOC sample collection will follow that described in Section 4.3.2.1.1 for bucket hand augers.

***Multi-increment Sampling***

Each of the five designated multi-increment soil sampling areas will be roughly marked in the field using flagging and/or wooden stakes. Sample aliquots will be randomly collected across the entire length and breadth of each area at a minimum of 30 points. Sampling points will be located using a "random walk" technique employed in the field; sample points will not be pre-located using a random grid. Each sample aliquot will be collected using a 53-cm (21-in.) long, 2.2-cm (0.875-in.) outside diameter, 1.7-cm (0.68-in.) inside diameter, stainless steel, soil probe. The soil probe collects a 25.4-cm (10-in.) soil core and may be either pushed or driven into the ground using a hammer attachment. In areas where a soil probe cannot be used (e.g., very rocky soil or hard pan), a hand auger, stainless steel scoop, or trowel may be used to sample from 0 to 0.3 m (0 to 12 in.). If a scoop or trowel is used, aliquots should be about the same volume.

The approximate boundaries of subaqueous sediment multi-increment sampling areas will be demarcated using stakes located along the edges of the wetland areas to the extent practicable. Sample aliquots will be collected from 0 to 15 cm (0 to 6 in.) using a decontaminated stainless steel scoop, trowel, or sediment core device where water depths allow (<30 cm or 1 ft) by wading. Where water depths are too deep to allow use of these types of sampling devices, a remote sampler (Eckmann clamshell sampler or equivalent) will be used while wading or from a small boat. The amount of organic detritus and free water in sediment samples will be minimized.

Sample aliquots will be composited in a large stainless steel container. Upon collection of the sample aliquots, the entire composited contents of each sample will be air dried and sieved using No. 4 and No. 10 brass sieves. Depending on the nature of sediment material collected, sieving may not be necessary. The sieved sample will be spread evenly on an aluminum or stainless steel tray and a minimum of 30 random aliquots collected until the requisite volume is attained for shipment to the contract laboratory. Upon receipt of the samples, the contract laboratory will grind and mix the samples to attain a high degree of homogeneity. Sample grinding will be accomplished using a conventional coffee grinder or food processor unit with removable blades for decontamination (stainless steel blades are preferred). The ground sample will be split for analysis by the primary and QA laboratories.

#### 4.3.2.2 Sampling methods for subaqueous sediments from streams and surface water basins

***Trowel/Scoop Method***

Sediment samples in locations where water depth does not exceed 15.2 cm (0.5 ft) will be collected with a stainless steel trowel or scoop following Section 4.5.2.2.1 of the Facility-wide SAP. At sample locations where VOC fractions are to be collected, the VOC containers will be filled immediately with the first sediment obtained. Sample containers for the remaining nonvolatile analytes will be filled, as described in Section 4.5.2.5 of the Facility-wide SAP.

***Hand Core Sampler Method***

A sediment core sampler will be used to collect sediment at locations where the depth of the surface water exceeds 15.2 cm (0.5 ft) or the sediment cannot be accessed directly with trowels and scoops. All samples collected with the sludge sampler will be obtained following the protocol in Section 4.5.2.2.2 of the Facility-wide SAP. Sediment will be placed into a stainless steel bowl as it is collected. At sample locations where VOC fractions are to be collected, the VOC containers will be filled immediately with the first sediment obtained. Sample containers for the remaining nonvolatile analytes will be filled as described in Section 4.5.2.5 of the Facility-wide SAP.

***Remote (Eckman) Sampler Method***

A remote sediment sampler may be used to collect sediment at locations where the depth of the surface water exceeds 15.2 cm (0.5 ft) or the sediment cannot be accessed directly with trowels and scoops. The remote sampler is a stainless steel clamshell device that is lowered to the sample point using a retrieval line or extension rods. The sampler is activated using a second line that closes the clamshell. Sediment will be placed into a stainless steel bowl as it is collected. At sample locations where VOC fractions are to be collected, the VOC containers will be filled immediately with the first sediment obtained. Sample containers for the remaining nonvolatile analytes will be filled as described in Section 4.5.2.5 of the Facility-wide SAP.

#### 4.3.2.3 Field Measurement Procedures and Criteria

***Organic Vapor Screening***

All field measurement procedures and criteria will follow Section 4.4.2.3 of the Facility-wide SAP, with the following exception. Headspace gases will not be screened in the field for organic vapors. Because there were no notable detections of VOCs during the Phase I RI soil sampling, organic vapor monitoring of headspace gases is not necessary during Phase II. All OVA readings will be noted in the field boring logs.

#### 4.3.2.4 Sampling for geotechnical analysis

Surface soil and sediment samples collected using the hand-auger, scoop, or sediment corer methods are classified as disturbed samples. Therefore, geotechnical analysis of samples collected using these methods will be limited. Sampling procedures for geotechnical analysis using the above sampling methods are presented in Section 4.5.2.4 of the Facility-wide SAP.

Geotechnical analysis will be limited to the six discrete sediment samples, and will include only grain size distribution and USCS classification. These samples will also be submitted for total organic carbon analyses.

#### 4.3.2.5 Sampling for chemical analysis

Procedures for sampling surface soil for chemical analyses are presented in Section 4.5.2.1 of the Facility-wide SAP. As indicated in Chapter 5.0, the following general criteria apply for chemical analyses of surface soil.

- All surface soil samples (discrete and multi-increment) will be analyzed for TAL metals and cyanide, explosives, and SVOCs.
- Three of the discrete samples will be submitted for propellant analyses.
- Two of the discrete surface soil samples collected will be submitted for VOC, pesticide, and PCB analyses.
- Multi-increment soil samples will not be analyzed for VOCs, pesticides, or PCBs.

As indicated in Chapter 5.0, the general criteria below apply for chemical analyses for subaqueous sediment samples. Procedures for sampling subaqueous sediment are presented in Section 4.5.2.2 of the Facility-wide SAP.

- All sediment samples (discrete and multi-increment) will be analyzed for explosives, TAL metals and cyanide, propellants, SVOCs, and pesticides/PCBs.
- Discrete sediment samples will also be analyzed for VOCs

The assumptions noted in the above general criteria result in maximum numbers of samples that are allowed to be collected and submitted for analysis at EBG. The maximum number of samples to be analyzed for each parameter group is provided in Table 4.1 in the EBG QAPP Addendum. Requirements for sample containers and preservation techniques for surface soil and sediment samples are presented in Section 4.4.2.6 of the Facility-wide SAP and in the QAPP addendum.

#### 4.3.2.6 Decontamination procedures

The decontamination procedure for surface soil and sediment sampling activities is presented in Section 4.4.2.8 of the Facility-wide SAP. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

#### 4.3.2.7 Sample container/preservation techniques

Sample container and preservation technique requirements will follow those prescribed in Table 4-1 in the EBG QAPP Addendum.

### 4.3.3 OE Avoidance

The protocol for OE avoidance for sampling activities is discussed in Section 4.2.3 and detailed in the OE Avoidance Plan (Appendix B). In addition to the protocol in Section 4.2.3, OE technicians will collect soil samples in areas known or suspected (i.e., red soil or raw product) to have explosives concentrations greater than 10% (100,000 mg/kg).

## 4.4 SURFACE WATER

### 4.4.1 Rationale

Water samples will be collected from drainage ditches, streams, and ponds, in order to (1) assess the potential for contaminant migration in surface water; (2) evaluate potential contaminant accumulation areas to evaluate if residual contamination is partitioning to water and if these features are acting as secondary sources for contamination to groundwater and surface water; and (3) evaluate potential contaminant exit pathways from the AOC. Samples of accumulated water will be co-located with selected sediment samples to determine if contaminants are partitioning from sediment or sludge and potentially contributing to shallow groundwater or surface water contamination.

As set forth in the RVAAP Installation Action Plan, there will be a total of eight surface water samples obtained during the EBG Phase II RI. Surface water samples will be co-located with the six discrete sediment samples described in Section 4.3.1.1. In addition to the two co-located contingency samples, an additional two contingency surface water samples are provided for. The individual samples and analytical suites associated with these samples are provided in Chapter 5.0.

#### 4.4.1.1 Surface water sample locations

Six of the eight surface water sample locations will be co-located with sediment sample locations described in Section 4.3.1.2. Four of the six are planned locations, and are shown on Figure 4-1. Two of the six are contingency locations, and an additional two surface water contingency samples are provided for. The four planned locations include

- the north side of the culvert at Blackberry Lane, opposite Phase I sediment/surface water location 112,

- the eastern exit of the culvert opposite Phase I sediment/surface water location 115 on the eastern side of the burning grounds, and

- two samples from within the creek channel at the exit of the 48-in. RCP.

All samples will be grab samples. Final locations will be determined in the field based on site conditions.

### 4.4.2 Sampling Procedures

All surface water sampling will be conducted as described in Section 4.6.2.1 of the Facility-wide SAP. The hand-held bottle method will be used to sample water in ditches and streams where water is flowing and in basins or ponds where access from the edge is feasible and safe. Section 4.6.2.1.1 of the Facility-wide SAP describes the procedure for sampling using the hand-held bottle method. All surface water sample collection will begin at the sampling point furthest downstream in the channel and proceed upstream to minimize the effects of sediment turbidity on surface water quality. The water sample will be collected prior to sediment samples at co-located sites.

For water sampling stations that are not readily or safely accessible (i.e., ponds), a dipper or pond sampler will be employed for sampling, per Section 4.6.2.1.2 of the Facility-wide SAP.

#### 4.4.2.1 Sampling methods for surface water–filtration

Surface water collected during the EBG Phase II RI at Load Lines 2, 3, and 4 will not be filtered prior to analysis.

#### 4.4.2.2 Field measurement procedures and criteria

Surface water field measurements to be performed during the Phase II RI will include determination of pH, conductivity, dissolved oxygen content, turbidity, and temperature. These measurements will be performed in the same manner as described in Section 4.3.3 of the Facility-wide SAP. All field measurements will be recorded in the sampling logbooks.

#### 4.4.2.3 Sampling for chemical analysis

All water samples collected from ponds, streams, and drainages will be submitted to the analytical laboratory for a full suite of analysis (explosives, propellants, TAL metals, cyanide, VOCs, SVOCs, pesticides, and PCBs), as indicated in Chapter 5.0.

#### 4.4.2.4 Sample containers and preservation techniques

Information regarding sample containers and preservation techniques for surface water samples collected for chemical analysis during the EBG Phase II RI is presented in the QAPP Addendum. All sample containers will be provided by the contracted laboratory, including pre-preserved containers for VOC samples.

#### 4.4.2.5 Field QC sampling procedures

Surface water QA/QC samples will be collected during the Phase II RI. QC duplicate samples will be collected at a frequency of 10% (1 per 10 environmental samples). QA split samples will be submitted to the USACE contract laboratory for independent analysis, as noted in Section 4.1.1.3. Split samples will be collected at a frequency of 10% (1 per 10 environmental samples). Duplicate and split samples will be selected based on a random basis and submitted for the same analyses as the environmental samples. Each set of duplicate and split samples will be collected from the same station. Matrix spike/matrix spike duplicate samples will be collected at a rate of 5% of total samples by media. One field blank or rinsate for surface water will be collected (frequency of 5%). The QAPP Addendum summarizes required QA/QC sampling.

#### 4.4.2.6 Decontamination procedures

Decontamination of any equipment used for collection of surface water samples during the Phase II RI will be conducted in the same manner as described for non-dedicated sampling equipment in Section 4.3.8 of the Facility-wide SAP. A final decontamination inspection of any equipment leaving RVAAP at the end of field activities will be conducted to ensure proper decontamination.

In addition to the surface water sampling equipment, field measurement instruments will also be decontaminated between sampling locations. Only those portions of each instrument that come into contact with potentially contaminated surface water will be decontaminated. This will be accomplished with a deionized-water rinse of the measurement probe and the collection cup.

## 4.5 SITE SURVEY

Following sampling and well installation activities, the horizontal coordinates of all sampling stations and monitoring wells will be determined to within 0.3 m (1 ft). The surface elevations of soil and sediment sampling stations will be determined to within 0.06 m (0.2 ft). For soil sampling stations, the ground elevations will be determined at the point of collection. For tributary surface water locations and sediment sampling stations that are not under water (i.e., adjacent to the water edge), the ground elevation at the water's edge at the collection point will be determined. For surface water locations within a stream or pond and for sediment sampling stations under water, the elevation of the water surface, depth to bottom, and elevation of the bottom will be determined. For groundwater monitoring wells, the horizontal and vertical coordinates will be determined in accordance with the current Facility-wide SAP, which requires 1.0-ft horizontal and 0.01-ft vertical accuracy.

All locations will be conveyed in Ohio State Plane Coordinates (NAD83). The vertical datum for all elevations will be 1929 National Geodetic Vertical Datum. All coordinates and elevations will be recorded on the boring logs upon receipt of quality assured survey results. In addition, electronic results will be provided to USACE and RVAAP in ASCII format.

# 5.0 SAMPLE CHAIN OF CUSTODY/DOCUMENTATION

## 5.1 FIELD LOGBOOK

All field logbook information will follow structures identified in Section 5.1 of the Facility-wide SAP.

## 5.2 PHOTOGRAPHS

Information regarding the documentation of photographs for the EBG Phase II RI is presented in Section 4.3.2.4.3 of the Facility-wide SAP. Representative photographs will be taken of the investigative measures during the Phase II RI and any significant observations that are made during the field effort. Photographs will be suitable for presentation in a public forum, as well as for documenting scientific information.

## 5.3 SAMPLE NUMBERING SYSTEM

The sample numbering system that will be used to identify samples collected during the EBG Phase II RI is explained in Section 5.3 of the Facility-wide SAP. The specific identifying information that will be used to implement this system during the Phase II RI is presented in Figure 5-1. Samples have already been collected at EBG under the Phase I RI; therefore, sample numbering will continue the sequence established in the previous investigation. Table 5-1 presents the baseline sample identification listing for the Phase II RI. Samples collected in addition to the baseline set will be identified sequentially by following the numbering system. If a sample in the baseline set is not collected or is reassigned to another location, a specific reason and notation will be given in the project field books.

## 5.4 SAMPLE DOCUMENTATION

All sample label, logbook, field record, and field form information will follow structures identified in Section 5.4 of the Facility-wide SAP.

## 5.5 DOCUMENTATION PROCEDURES

Documentation and tracking of samples and field information will follow the series of steps identified in Section 5.5 of the Facility-wide SAP.

## 5.6 CORRECTIONS TO DOCUMENTATION

Any corrections to documentation will follow guidance established in Section 5.6 of the Facility-wide SAP.

## 5.7 MONTHLY REPORTS

Monthly reports during implementation of the Phase II RI field investigation are not specified by contract. However, monthly reports for the EBG Phase II RI delivery order (in general) will be provided as a best management practice. The content of the reports will have content similar to that specified in Section 5.7 of the Facility-wide SAP.

**Sample Station Location Identification: XXXmm-NNN(n)-####-tt**

EBG = Area Designator

mm = Sample Location Type
mw = Groundwater Monitoring Well
so = Soil Boring/Subsurface Soil Sample Location
sw = Surface Water Sample Location
sd = Sediment Sample Location
ss = Surface Soil Sample Location

NNN = Sequential Sample Location Number
Unique, sequential number for each sample location beginning with Phase I RI stations and extending into any subsequent investigative phases (i.e., 001 – 999)

(n) = Special Identifier
Optional use (as needed) to identify special sample matrices or sample location characteristics
c = Stream or Drainage Channel Sample
p = Pond Sample
b = Railroad Ballast Sample

#### = Sequential Sample Identification Number
Unique, sequential number for each sample beginning with Phase I RI locations and extending into any subsequent investigative phases (i.e., 0001 – 9999)

tt = Sample Type
GW = Groundwater
GF = Groundwater, Filtered
SO = Soil Sample
SD = Sediment Sample
SW = Surface Water Sample
MI = Multi-increment
TB = Trip Blank
FB = Field Blank
ER = Equipment Rinsate

**Sample Identification: XXXmm-NNN(n)-####-tt**

**Figure 5-1. EBG Phase II RI Sample Identification System**

## Table 5-1. Baseline Sample Identification for the Erie Burning Grounds Phase II RI

| Facility/Area | Depth (ft) | Station | Sample ID | Exp | Prop[a] | TAL Metals | CN | Pest/PCB | VOCs[c] | Other[d] |
|---|---|---|---|---|---|---|---|---|---|---|
| Groundwater (eight wells) | | EBGmw-123 | EBGmw-123-0283-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes:USCS, AL, BD, P. TOC |
| | | EBGmw-124 | EBGmw-124-0284-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes:USCS, AL, BD, P. TOC |
| | | EBGmw-125 | EBGmw-125-0285-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes:USCS, AL, BD, P. TOC |
| | | EBGmw-126 | EBGmw-126-0286-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes:USCS, AL, BD, P. TOC |
| | | EBGmw-127 | EBGmw-127-0287-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes:USCS, AL, BD, P. TOC |
| | | EBGmw-128 | EBGmw-128-0288-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes: USCS, AL, BD, P. TOC |
| | | EBGmw-129 | EBGmw-129-0289-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes:USCS, AL, BD, P. TOC |
| | | EBGmw-130 | EBGmw-130-0290-GW | 1 | 1 | 1[b] | 1 | 1 | 1 | Two Shelby tubes:USCS, AL, BD, P. TOC |
| Discrete Surface Soil Locations (10) | 0 to 1 | EBG-131 | EBGss-131-0291-SO | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 0 to 1 | EBG-132 | EBGss-132-0292-SO | 1 | 1 | 1 | 1 | 1 | 1 | |
| | 0 to 1 | EBG-133 | EBGss-133-0293-SO | 1 | 1 | 1 | 1 | | | |
| | 0 to 1 | EBG-134 | EBGss-134-0294-SO | 1 | | 1 | 1 | | | |
| | 0 to 1 | EBG-135 | EBGss-135-0295-SO | 1 | | 1 | 1 | | | |
| | 0 to 1 | EBG-136 | EBGss-136-0296-SO | 1 | | 1 | 1 | | | |
| | 0 to 1 | EBG-137 | EBGss-137-0297-SO | 1 | | 1 | 1 | | | |
| | 0 to 1 | EBG-138 | EBGss-138-0298-SO | 1 | | 1 | 1 | | | |
| | 0 to 1 | EBG-139 | EBGss-139-0299-SO | 1 | | 1 | 1 | | | |
| | 0 to 1 | EBG-140 | EBGss-140-0300-SO | 1 | | 1 | 1 | | | |

## Table 5-1. Baseline Sample Identification for the Erie Burning Grounds Phase II RI (continued)

| Facility/Area | Depth (ft) | Station | Sample ID | Exp | Prop[a] | TAL Metals | CN | Pest/PCB | VOCs[c] | Other[d] |
|---|---|---|---|---|---|---|---|---|---|---|
| Multi-increment Surface Soil Locations (five) | 0 to 1 | EBG-141 | EBGss-141-0301-MI | 1 |  | 1 | 1 |  |  |  |
|  | 0 to 1 | EBG-142 | EBGss-142-0302-MI | 1 |  | 1 | 1 |  |  |  |
|  | 0 to 1 | EBG-143 | EBGss-143-0303-MI | 1 |  | 1 | 1 |  |  |  |
|  | 0 to 1 | EBG-144 | EBGss-144-0304-MI | 1 |  | 1 | 1 |  |  |  |
|  | 0 to 1 | EBG-145 | EBGss-145-0305-MI | 1 |  | 1 | 1 |  |  |  |
| Discrete Sediment Locations (six) | 0 to 0.5 | EBG-146 | EBGsd-146-0306-SD | 1 | 1 | 1 | 1 | 1 | 1 | TOC |
|  | 0 to 0.5 | EBG-147 | EBGsd-147-0307-SD | 1 | 1 | 1 | 1 | 1 | 1 | TOC |
|  | 0 to 0.5 | EBG-148 | EBGsd-148-0308-SD | 1 | 1 | 1 | 1 | 1 | 1 | TOC |
|  | 0 to 0.5 | EBG-149 | EBGsd-149-0309-SD | 1 | 1 | 1 | 1 | 1 | 1 | TOC |
|  | 0 to 0.5 | EBG-150 | EBGsd-150-0310-SD | 1 | 1 | 1 | 1 | 1 | 1 | TOC |
|  | 0 to 0.5 | EBG-151 | EBGsd-151-0311-SD | 1 | 1 | 1 | 1 | 1 | 1 | TOC |
| Multi-increment Sediment Locations (six) | 0 to 0.5 | EBG-152 | EBGsd-152-0312-MI | 1 | 1 | 1 | 1 | 1 |  |  |
|  | 0 to 0.5 | EBG-152 | EBGsd-152-0313-MI | 1 | 1 | 1 | 1 | 1 |  |  |
|  | 0 to 0.5 | EBG-152 | EBGsd-152-0314-MI | 1 | 1 | 1 | 1 | 1 |  |  |
|  | 0 to 0.5 | EBG-153 | EBGsd-153-0315-MI | 1 | 1 | 1 | 1 | 1 |  |  |
|  | 0 to 0.5 | EBG-153 | EBGsd-153-0316-MI | 1 | 1 | 1 | 1 | 1 |  |  |
|  | 0 to 0.5 | EBG-153 | EBGsd-153-0317-MI | 1 | 1 | 1 | 1 | 1 |  |  |
| Surface Water Locations (eight) |  | EBG-154 | EBGsw-154-0318-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |
|  |  | EBG-155 | EBGsw-155-0319-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |
|  |  | EBG-156 | EBGsw-156-0320-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |
|  |  | EBG-157 | EBGsw-157-0321-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |
|  |  | EBG-158 | EBGsw-158-0322-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |
|  |  | EBG-159 | EBGsw-159-0323-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |
|  |  | EBG-160 | EBGsw-160-0324-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |
|  |  | EBG-161 | EBGsw-161-0325-SW | 1 | 1 | 1 | 1 | 1 | 1 |  |

[a] Soil samples for propellant analyses will be selected based on field conditions/observations.

[b] Only filtered groundwater samples will be collected for TAL metals analyses. Sample identification numbers will end in -GF for these samples.

[c] Soil samples for VOC analyses will be selected based on field conditions/observations.

[d] Other analytes include specified TOC for discrete sediment samples. Undisturbed geotechnical samples will be collected from the unconsolidated interval of the installed groundwater monitoring wells.

## Table 5-1. Baseline Sample Identification for the Erie Burning Grounds Phase II RI (continued)

AL = Atterberg Limits.
BD = bulk density.
CN = cyanide.
EXP = explosives.
P = porosity.
PCB = polychlorinated biphenyl.
Prop = propellants (nitrocellulose, nitroglycerine, nitroguanidine).
SVOCs = semivolatile organic compound.
TAL = Target Analyte List.
TOC = total organic carbon.
USCS = Unified Soil Classification System.
VOC = volatile organic compound.

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# 6.0 SAMPLE PACKAGING AND SHIPPING REQUIREMENTS

Sample packaging and shipping shall generally follow Chapter 6.0 of the Facility-wide SAP. Because the analytical laboratory is located on the east coast, the samples will be shipped overnight following the packaging measures described in the Facility-wide SAP.

Coolers containing QA samples that are shipped to the USACE contract laboratory for independent analysis will be prepared and shipped in accordance with the Facility-wide SAP. On all shipments to all laboratories, a chain-of-custody form will be prepared for each cooler and the cooler number will be recorded on the chain-of-custody form.

Geotechnical samples do not require refrigeration or other preservation, and will be shipped to the contract laboratory at the conclusion of the sampling effort by conventional methods.

The addresses and points-of-contact for laboratories used for chemical and geotechnical analyses for this field effort are listed in Section 2.0 of the QAPP.

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# 7.0 INVESTIGATION-DERIVED WASTE

All investigation-derived waste (IDW), including auger cuttings, personal protective equipment (PPE), disposable sampling equipment, and decontamination fluids, will be properly handled, labeled, characterized, and managed in accordance with Chapter 7.0 of the Facility-wide SAP, federal and state of Ohio large-quantity generator requirements, and RVAAP's Installation Hazardous Waste Management Plan.

Seven types of IDW are anticipated, which will be contained separately. The types and estimated quantities for each include

- Soil and sediment from depths <1.8 m (6 ft), including residual surface and subsurface soil, following sample homogenization and residual dry sediment collection. An estimated two 55-gal drums of soil and sediment IDW are anticipated. Disposition shall be based on the laboratory analyses of these soil samples.

- Soil and rock cuttings from borehole installations >1.8 m (6 ft) to be contained in roll-off boxes. A single 10 CY roll-off box is anticipated. A representative composite sample from the roll-off box shall be subjected to full Toxicity Characteristic Leaching Procedure (TCLP) testing. Disposition of the roll-off box shall be based on the results of this analysis.

- Development and purge water from monitoring wells. An estimated 12 55-gal drums of groundwater IDW are anticipated. Analytical results of the ground water samples shall be used for waste characterization of these drums.

- Decontamination fluids, including those derived from decontamination of sampling equipment and drilling equipment. An estimated single 55-gal drum of decontamination fluid is anticipated from soil and sediment sampling equipment decontamination. A representative sample of the decontamination fluid will be subjected to full TCLP testing.

- An estimated 1,000 gallons of drill rig decontamination water and one 55-gal drum of decontamination pad sludge is anticipated. Two TCLP tests shall be provided, one for the sludge and one for a composite of the water tank, to characterize these materials.

- Expendables/solid wastes, including PPE and disposable sampling equipment. One 55-gal drum of expendable IDW is anticipated. All IDW shall be appropriately accounted for as soon as possible and prior to conclusion of the task order. Any shipment of IDW solid waste off-site shall comply with all appropriate federal and state laws.

## 7.1 INVESTIGATION-DERIVED WASTE COLLECTION AND CONTAINERIZATION

Indigenous solid IDW (soil and rock cuttings) generated from borehole installations >1.8 m (6 ft) in depth will be collected and contained in a lined roll-off box. This roll-off box will be staged in an approved field staging area (FSA).

Indigenous solid IDW (soil and sediment) from borehole installations < 1.8 m (6 ft) will be collected and contained in labeled U.S. Department of Transportation (DOT)-approved, open-top, 55-gal drums equipped with plastic drum liners and sealed with bung-top lids.

All liquid indigenous (groundwater) IDW generated from monitoring well installation, development, and purging will be segregated by sample station. All liquid indigenous IDW will be collected in labeled DOT-approved, 55-gal, closed-top drums.

All solid non-indigenous (expendable sampling equipment and trash) IDW will be segregated as non-contaminated and potentially contaminated material. Potentially contaminated and non-contaminated solid non-indigenous IDW will be identified in the field on the basis of visual inspection (e.g., soiled versus non-soiled), usage of the waste material (e.g., outer sampling gloves versus glove liners), and field screening of the material using available field instrumentation (e.g., OVA). All non-indigenous IDW will be contained in trash bags with potentially contaminated non-indigenous IDW being additionally contained in labeled DOT-approved, open-top, 55-gal drums equipped with plastic drum liners and sealed with bung-top lids.

All liquid non-indigenous (decontamination rinse water) IDW will be segregated by waste stream (e.g., soap and water/water rinses from methanol and hydrochloric acid rinses) and contained in labeled DOT-approved, 55-gal closed-top drums. All known potentially hazardous liquid non-indigenous IDW streams, such as methanol, hydrochloric acid rinses, and acetone waste from field laboratories, will be contained separately in labeled DOT-approved, closed-top, 55-gal drums.

## 7.2 WASTE CONTAINER LABELING

All IDW containers will be labeled prior to placing IDW in them. All IDW containers (drums and roll-off box) will be labeled in accordance with Section 7.2 of the Facility-wide SAP.

## 7.3 INVESTIGATION-DERIVED WASTE FIELD STAGING

An FSA will be designated at the beginning of field activities and approved by the RVAAP Environmental Coordinator. A roll-off box will be located at the designated FSA. A centralized FSA will be established for the staging of all drums of IDW. The FSA will be managed according to the requirements of Section 7.3 of the Facility-wide SAP.

Acetone residuals from the field colorimetry laboratory are known to be Resource Conservation and Recovery Act Hazardous Waste (D001) from process knowledge. This waste stream will be managed in accordance with the Ohio Administrative Code (OAC), Chapter 3745-55, Management of Hazardous Wastes [40 *Code of Federal Regulations* 264, Subparts I (containers)]. A satellite accumulation area will be established near the field laboratory in accordance with OAC 3745-52-34 (C)(1). An inventory and a location map of the waste will be given to RVAAP staff on a daily basis as waste is generated and updated on a daily basis if changes occur. When 55 gal of acetone residuals are accumulated, the drum must be transferred to a 90-day storage area within 3 days.

Daily inventories of IDW will be taken and provided to the RVAAP Environmental Coordinator by the designated IDW coordinator. A final inventory will be conducted prior to demobilization from the site and all IDW staged at the FSA, with the exception of the roll-off box. All liquid waste not transported off of the facility within 30 days following project completion will require secondary containment.

## 7.4 INVESTIGATION-DERIVED WASTE CHARACTERIZATION AND CLASSIFICATION FOR DISPOSAL

All indigenous IDW (soil, sediment, and groundwater) will be characterized for disposal on the basis of analytical results from environmental samples collected from each sampling station. Indigenous IDW contained in the roll-off box and non-indigenous IDW (decontamination fluids, laboratory residuals) except for PPE and expendable sampling equipment, will be characterized for disposal on the basis of composite samples collected from segregated waste stream storage containers. Composite waste samples will be submitted for laboratory analysis of full TCLP to characterize each waste stream for disposal. Procedures for composite waste sampling are presented in Sections 7.4.1 and 7.4.2 of the Facility-wide SAP. PPE and expendable sampling equipment will be managed in accordance with Section 7.4 of the Facility-wide SAP.

At the conclusion of field activities for the EBG Phase II RI, letter reports will be submitted to the USACE and RVAAP Environmental Coordinator documenting the characterization and classification of the wastes.

## 7.5 INVESTIGATION-DERIVED WASTE DISPOSAL

Upon approval of IDW classification reports, all solid and liquid IDW will be removed from the site and disposed of by a licensed waste disposal contractor in accordance with Section 7.5 of the Facility-wide SAP and all applicable state and federal rules, laws, and regulations. All shipments of IDW off-site will be coordinated through the RVAAP Environmental Coordinator.

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# APPENDIX A

# SAMPLING SUMMARY FOR ERIE BURNING GROUND PHASE I REMEDIAL INVESTIGATION

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**TABLE A-1. Sample Analytical Requirements - ERIE BURNING GROUNDS, PHASE II RI**

| MEDIA | NUMBER SAMPLES | SAMPLE DEPTH | Explosives Method 8330 | TAL Metals+CN Method 6010 | Propellants Method 8330 | VOC Method 8260 | SVOC Method 8270 | Pesticides/PCBs Method 8081/8082 | TOC Wakley/Black | Physical Caharacteristics | TCLP Full Suite |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Surface Soil** | | | | | | | | | | | |
| (discreet/multi-increment) | 10/5 | 0 to 1' | 10/5 | 10/5 | 3/0 | 2/0 | 10/5 | 2/0 | - | - | - |
| Duplicates (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| USACE QC Splits (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| Trip Blanks | 2 | | - | - | - | 1 | - | - | - | - | - |
| Equipment Blanks | 1 | | 1 | 1 | 1 | - | 1 | 1 | - | - | - |
| MS(5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| MSD (5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| **Subsurface Soil** | 8 | Samples obtained from well borings. | | | | | | | 8 | 8[1] | - |
| **Sediment** | | | | | | | | | | | |
| (discreet/multi-increment) | 6/6 | 0 to 0.5' | 6/6 | 6/6 | 6/6 | 6/0 | 6/6 | 6/6 | 6/0 | 6/0[2] | - |
| Duplicates (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| USACE QC Splits (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| Trip Blanks | 2 | | - | - | - | 2 | - | - | - | - | - |
| Equipment Blanks | 1 | | 1 | 1 | 1 | - | 1 | 1 | - | - | - |
| MS(5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| MSD (5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| **Surface Water** | 8 | N/A | 8 | 8 | 8 | 8 | 8 | 8 | | | - |
| Duplicates (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| USACE QC Splits (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| Trip Blanks | 7 | | - | - | - | 7 | - | - | - | - | - |
| MS(5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| MSD (5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| **Groundwater** | 8 | N/A | 8 | 8 | 8 | 8 | 8 | 8 | - | - | - |
| Duplicates (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| USACE QA Splits (10%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| Equipment Blanks | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| Trip Blanks | 6 | | - | - | - | 6 | - | - | - | - | - |
| MS(5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| MSD (5%) | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| **Source Water** | | | | | | | | | | | |
| ASTM Decon Water | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| Drilling Water | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - |
| **IDW** | | | | | | | | | | | |
| soils | 1 | | - | - | - | - | - | - | - | - | 1 |
| Well Purge/Sample water | N/A | | | | | | | | | | |
| Decon water | 2 | | - | - | - | - | - | - | - | - | 2 |
| **INVESTIGATION SAMPLES (D/M.I.)** | | | **34/11** | **34/11** | **27/6** | **26/0** | **34/11** | **26/6** | **14/0** | **14/0** | **3** |
| QC SAMPLES (AE) | | | 7 | 7 | 7 | 21 | 7 | 7 | 0 | - | - |
| QA SAMPLES (CORPS) | | | 4 | 4 | 4 | 4 | 4 | 4 | 0 | - | - |
| **TOTAL AE SAMPLES** | | | **54** | **54** | **40** | **47** | **54** | **39** | **14** | **14** | 3 |

1. Physical characteristics to be performed on soil samples from within the screened interval of the monitoring wells include: Bulk density, USCS Classification, Atterberg Limits and porosity.
TOC samples will also be obtained from the screened interval of the monitoring well.
2. Physical characteristics for sediment samples to include: Gradation, USCS Classification
Surface soils to be analyzed at the following frequencies: Explosives and metals=100%, Propellants 15%, VOCs=10%, SVOCs=100%, Pesticides/PCBs=10%.
Split and duplicate samples will be obtained on discreet samples only.
MS/MSD samples are not included in the "AE total sample" value.

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# APPENDIX B

# ORDNANCE AND EXPLOSIVES AVOIDANCE PLAN

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# Appendix B
# Site-Specific Operating Procedure For Ordnance and Explosives Avoidance for Erie Burning Grounds (RVAAP-02)
# Ravenna, OH

## B-1.0 INTRODUCTION

The purpose of this Site-Specific Operating Procedure (SSOP) is to establish general guidelines and procedures that assure protection of Science Applications International Corporation (SAIC) personnel, Explosive Ordnance Technologies Inc. (EOTI) personnel, and the public. This plan includes considerations unique to ordnance and explosives (OE) operations. EOTI is the unexploded ordnance (UXO) contractor and has consulted with SAIC on the development of this plan.

The objective of a SSOP is to provide supervisors and workers with the necessary information and guidance to maintain a safe and healthy work place environment. SAIC and EOTI view safety and accident prevention as the first priority and place the burden of responsibility on all employees, consultants, and contractor/subcontractor team members. A copy of this SSOP is available to all employees, subcontractors, and visitors. Prior to entering the work site, all supervisors and workers are required to read the SSOP and sign a log acknowledging that they understand the plan. Personnel who violate policies contained in the SSOP may be directed to leave the work site and, if appropriate, their employment may be terminated.

## B-2.0 GENERAL

EOTI will augment SAIC with UXO personnel to provide on-site UXO support during all well drilling and sampling activities at the referenced project site. During site investigation activities, components of explosives were previously encountered in these areas. The EOTI UXO team will not move, touch, or destroy any UXO encountered during this phase of the project. The UXO team will report all UXO to the SAIC Supervisor and U.S. Army Corps of Engineers (USACE) on-site safety representative. EOTI will safely locate and identify any potential ordnance and ordnance-related scrap hazards found in the work area.

## B-3.0 REFERENCES

EP 75-1-2 (20 November 2000) (Chapter 5) Unexploded Ordnance (UXO) Support During Hazardous, Toxic, and Radioactive Waste (HTRW) and Construction Activities.

EP 385-1-95-a (29 June 2001) Basic Safety Concepts and Considerations for Ordnance and Explosives Operations.

EM 385-1-1 Safety Requirements and Health Manual (3 September 1996).

## B-4.0 DEFINITIONS

a. **Ordnance and Explosive (OE).** Bombs and warheads, guided and ballistic missiles, artillery, rocket and mortar ammunition, small arms ammunition, anti-personnel and anti-tank mines, demolition charges, pyrotechnics, grenades, containerized and non-containerized explosives and propellants, military chemical agents, and all similar and related items or components explosive in nature or otherwise designed to cause damage to personnel or material. Soils with explosive constituents are considered to be OE if the concentration is sufficient to be reactive and present an imminent safety hazard.

b. **Unexploded Ordnance (UXO).** An item of explosive ordnance that has failed to function as designed or that has been abandoned, discarded, or improperly disposed of and is still capable of functioning and causing damage to personnel or material.

c. **Inert Ordnance.** An item that has functioned as designed, leaving an inert carrier. An item manufactured to serve a specific training purpose. Fragments from UXO.

d. **Explosive Ordnance Disposal (EOD) Personnel.** Active duty military EOD personnel.

e. **UXO Personnel.** Former EOD personnel employed by a contractor.

f. **Recovered Chemical Warfare Material (RCWM).** RCWM is defined as chemical agent material and/or associated equipment and surrounding contaminated media discovered either by chance or during deliberate real estate recovery/restoration operations that were previously disposed of as waste. RCWM is classified as hazardous waste by the Army and not within the scope of the Army Chemical Surety Program.

g. **Chemical Event.** Discovery of an actual or suspected chemical agent or container that may require emergency transportation or disposal.

## B-5.0 UNEXPLODED ORDNANCE TEAM COMPOSITION AND QUALIFICATIONS

The following UXO procedures are proposed for use at the Erie Burning Grounds [Ravenna Army Ammunition Plan (RVAAP) –02] site. Procedures used at the site will be followed until such time as the UXO Supervisor and the SAIC Supervisor deem the procedures unnecessary.

a. **UXO Team Leader.** The UXO Team Leader for this project is Mr. Wayne Lewallen. Mr. Lewallen is qualified for this position by virtue of training and experience. He has more than 20 years of military and civilian UXO experience. Mr. Lewallen is qualified for, and has served as, Senior UXO Supervisor, Site Safety Officer, and Quality Control Specialist. Mr. Lewallen has attained Master EOD Technician level. Duties and assignments include range clearance as a supervisor of multiple team operations and civilian UXO experience including performance as UXO Supervisor for OE removal operations.

b. **UXO Team Member.** The UXO Team Member for this project is Mr. Daryl Satko. Mr. -Satko is a graduate of the U.S. Naval Explosive Ordnance School. Mr. Satko is an Explosive Ordnance Disposal Technician with over 4 years of combined military and civilian experience.

## B-6.0 RESPONSIBILITIES AND AUTHORITY

The Team Leader is the technical lead for all OE operations and is assigned the following safety- and health-related responsibilities:

- Reports administratively to the SAIC Site Supervisor, coordinating schedule and support requirements through that individual;
- Overall coordination between operations and safety and health personnel;
- Reviewing and becoming familiar with the site-specific Sampling and Analysis and Site Safety and Health Plan Addenda for this project;
- Early detection and identification of potential problem areas, including safety and health matters; and
- Conduct and document UXO safety briefings for all site personnel and visitors.

## B-7.0 WORK AND SAFETY PLANS

UXO specialists are required to comply with the provisions of all SAIC Site-Specific Safety and Health Addenda for this project, applicable RVAAP policies and procedures, and all applicable federal, state, and local regulations. They report to their assigned UXO Supervisor for performing duties as members of functional teams. The UXO Team Leader will conduct UXO safety briefings for all site personnel and visitors.

## B-8.0 ACCESS ROUTES TO SAMPLING LOCATIONS

**a.** Prior to soil sampling and well drilling crews entering the site, EOTI will conduct a reconnaissance of the area for each of the proposed work locations. The reconnaissance will include locating a path for the sampling crews, vehicles, and equipment to the approach site. The approach path, at a minimum, will be twice the width of the widest vehicle (normally a minimum of 20 ft). No personnel will be allowed outside the paths. The following color scheme will be used during the investigation to demarcate access routes and distinguish surface UXO and subsurface anomalies. EOTI will clearly mark all boundaries of the surveyed approach path with pin flags or other suitable markers (green in color) to signify all clear and prevent personnel from straying into areas that have not been identified as part of the established path. Red pin flags and other red markers (as appropriate) will be used to designate surface UXO. Yellow pin flags or flagging will be used to identify subsurface anomalies or any other item of concern. No subsurface utilities are known to exist within the Erie Burning Grounds; however, in the event that a subsurface utility is discovered, the trace of the utility will be marked with blue flagging or paint to distinguish it from surveyed access routes, UXO, or magnetic anomalies.

**b.** If UXO is encountered on the surface, EOTI personnel will clearly mark the area with red pin flags or ribbon, and report the UXO to the SAIC on-site Field Operations Manager (FOM) and USACE technical representative. The SAIC FOM and/or the USACE technical representative will, in turn, notify the RVAAP Facility Representative, who will make the determination as to the appropriate response, including any necessary contacts with local law enforcement agencies or military EOD.

**c.** A magnetometer will be used to ensure there is no subsurface UXO within the approach path. If a magnetic anomaly is encountered, EOTI will divert the path around the anomaly. Only EOTI personnel will handle UXO and operate magnetometers.

**d.** It must be understood that during avoidance procedures, sample locations and access routes are not cleared. Locations and routes free of anomalies are identified and marked.

**e.** If anomaly-free routes and sample locations cannot be identified, the OE Center of Excellence must be notified and the level of UXO support reassessed.

## B-9.0 SOIL SAMPLE AND MONITORING WELL SITES

**a.** The EOTI UXO team will conduct a survey of proposed sampling and drilling locations prior to sampling or drilling activities. All identified surface UXO and subsurface anomalies will be marked and avoided. If surface UXO is encountered or subsurface anomalies identified, they will be marked in accordance with the flagging/color scheme noted in Paragraph B-8.0a and the investigation area will be relocated to avoid contact. Any discovered surface UXO may be assessed to determine its condition and whether reporting is required, as specified in Paragraph B-8.0b.

**b.** EOTI will clearly mark the boundaries of the site. Personnel will not go outside the cleared area. As a minimum, the cleared area will be a square, with a side dimension equal to twice the length of the largest vehicle or piece of equipment to be brought on-site.

**c.** EOTI will use a hand-held magnetometer to clear an area prior to subsurface soil sampling or well drilling operations commencing. At not more than a 2-ft depth, the magnetometer will be lowered into the hole. This procedure will be used to ensure that smaller items of UXO, undetectable from the surface, can be detected. If no magnetic anomalies are located, the procedure will be repeated at 2-ft intervals to the maximum depth required (10 ft or until bedrock is encountered, whichever is less).

**d.** The following personal protective clothing will be used by all EOTI personnel while on the site.

- Safety glasses or goggles, gloves, and safety boots.

NOTE: EOTI personnel will not wear steel-toed shoes or other ferrous items on their person because of their interference with the operation of magnetometer/ordnance locators.

**e.** The following ordnance locators will be used to support this operation:

- The Schonstedt Models GA-52 and GA-72 magnetic locators will be used for sweeping and subsurface range-clearance operations. These locators are designed to detect the magnetic field between two sensors spaced inside the locators 20 and 14 in. apart, respectively.

NOTE: The primary disadvantage of these locators is their inability to respond to nonmagnetic materials such as gold, silver, copper, brass, or aluminum, all of which can be found in certain types of military ordnance. Standard UXO safety precautions and techniques will be followed in support of this operation.

## B-10.0 RECOVERED CHEMICAL WARFARE MATERIALS

**a.** If suspected Recovered Chemical Warfare Material (RCWM) is located at any time, all work will cease immediately. Site workers will withdraw along cleared paths from the area containing the RCWM. The EOTI Team Leader will clearly mark the area containing the RCWM, and report the chemical event as specified in Figure B-1. EOTI UXO personnel will stand by in an upwind location until relieved by a government representative. The report of discovery of suspected RCWM will be made within 1 hr of the discovery. The point of contact (POC) will make the final determination as to the actual presence of RCWM.

**b.** If the POC confirms the presence of RCWM, the government person in charge will report the chemical event to the appropriate agencies.

**c.** When contacting the POC about suspect RCWM, EOTI will provide the information listed in Figure B-1. Contact with the POC will not be delayed due to lack of information. The suspect RCWM report will follow the format in Figure B-1.

| |
|---|
| 1. Date and local time of event |
| 2. Location |
| 3. Quantity and type of munition(s) or container(s) and chemical agents involved |
| 4. Description of what has happened |
| 5. Description of property damage |
| 6. Personnel casualties and/or injuries |
| 7. Whether medical services or facilities were required |
| 8. Assistance required |
| 9. Any other pertinent information |

**Figure B-1. Suspected RCWM Data Report**

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**FINAL**

# Part II

# Quality Assurance Project Plan
# Addendum No. 1
# for the
# Phase II Remedial Investigation of Erie Burning Grounds at the Ravenna Army Ammunition Plant, Ravenna, Ohio

**October 2003**

Prepared for

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# CONTENTS

# PART II – QUALITY ASSURANCE PROJECT PLAN ADDENDUM

# TABLES

# ACRONYMS

| | |
|---|---|
| COC | chain of custody |
| CX | Center of Expertise |
| EBG | Erie Burning Grounds |
| EPA | U.S. Environmental Protection Agency |
| FSP | Field Sampling Plan |
| GPL | GPL Laboratories |
| HTRW | Hazardous, Toxic, and Radioactive Waste |
| ICP | inductively coupled plasma |
| LCS | laboratory control sample |
| MRL | method reporting level |
| MS | matrix spike |
| MSD | matrix spike duplicate |
| QA | quality assurance |
| QAPP | Quality Assurance Project Plan |
| QC | quality control |
| RI | Remedial Investigation |
| SAIC | Science Applications International Corporation |
| SAP | Sampling and Analysis Plan |
| SOP | standard operating procedure |
| USACE | U.S. Army Corps of Engineers |

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# INTRODUCTION

This Quality Assurance Project Plan (QAPP) addendum addresses supplemental project-specific information in relation to the final Facility-wide QAPP for the Ravenna Army Ammunition Plant (RVAAP) (USACE 2001b). Each QAPP section is presented documenting adherence to the Facility-wide QAPP or stipulating project-specific addendum requirements.

Primary analytical direction for these projects will be obtained from the identified EPA SW-846 Methods; the USACE Shell for Analytical Chemistry Requirements Appendix I, EM200-1-3 (USACE 2001a); and the Louisville Chemistry Guideline, Rev. 5, Samir Mansy (USACE 2002).

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# 1.0 PROJECT DESCRIPTION

## 1.1 SITE HISTORY/BACKGROUND INFORMATION

This information is contained in Section 1.1 of the Field Sampling Plan (FSP) of the Erie Burning Grounds (EBG) Phase II Remedial Investigation (RI) Sampling and Analysis Plan (SAP) Addendum.

## 1.2 PAST DATA COLLECTION ACTIVITY/CURRENT STATUS

This information is contained in Section 1.2 of the FSP of the EBG Phase II RI SAP Addendum.

## 1.3 PROJECT OBJECTIVES AND SCOPE

This information is contained in Chapter 3.0 of the FSP of the EBG Phase II RI SAP Addendum.

## 1.4 SAMPLE NETWORK DESIGN AND RATIONALE

This information is contained in Chapter 4.0 of the FSP of the EBG Phase II RI SAP Addendum.

## 1.5 PARAMETERS TO BE TESTED AND FREQUENCY

Sample matrix types, analytical parameters, and analytical methods are discussed in Chapter 4.0 of the FSP of the EBG Phase II RI SAP Addendum. These sampling and analysis requirements are summarized in Table 1-1 of this Quality Assurance Project Plan (QAPP) Addendum, in conjunction with anticipated sample numbers, quality assurance (QA) sample frequencies, and field quality control (QC) sample frequencies.

## 1.6 PROJECT SCHEDULE

The EBG Phase II RI project schedule is discussed in Chapter 2.0 of the FSP of the SAP Addendum.

### Table 1-1. Sampling and Analytical Requirements for the Erie Burning Grounds Phase II RIs

| Parameter | Methods | Field Samples[a] | Field Duplicate Samples | Site Source Water[b] | Sampler Rinsates | Trip Blanks | Total A-E Samples | USACE QA Split Samples | USACE Trip Blanks |
|---|---|---|---|---|---|---|---|---|---|
| ***Surface Soils*** | | | | | | | | | |
| Volatile Organics, TCL | SW-846, 5030/8260B | 2/0 | 1 | - | 1 | - | 4/0 | 1 | - |
| Semivolatile Organics, TCL | SW-846, 3540/8270C | 10/5 | 1 | - | 1 | - | 12/5 | 1 | - |
| Pesticides, TCL | SW-846, 3540/8081A | 2/1 | 1 | - | 1 | - | 4/1 | 1 | - |
| PCBs, TCL | SW-846, 3540/8082 | 2/1 | 1 | - | 1 | - | 4/1 | 1 | - |
| Explosives | SW-846, 8330 | 10/5 | 1 | - | 1 | - | 12/5 | 1 | - |
| Propellants | SW-846, 8330/9056 | 3/1 | 1 | - | 1 | - | 5/1 | 1 | - |
| Metals, TAL | SW-846, 6010B/7471 | 10/5 | 1 | - | 1 | - | 12/5 | 1 | - |
| Cyanide | SW-846, 9011/9012A | 10/5 | 1 | - | 1 | - | 12/5 | 1 | - |
| ***Subsurface Soils*** | | | | | | | | | |
| TOC | Walkley/Black Method | 8 | - | - | - | - | 8 | - | - |
| Moisture Content | ASTM D2216 | 8 | - | - | - | - | 8 | - | - |
| Atterberg Limits | ASTM D4318 | 8 | - | - | - | - | 8 | - | - |
| USCS Classification | N/A | 8 | - | - | - | - | 8 | - | - |
| Bulk Density | ASTM D4531 | 8 | - | - | - | - | 8 | - | - |
| Porosity | EM1110-2-1906 | 8 | - | - | - | - | 8 | - | - |
| ***Sediments*** | | | | | | | | | |
| Volatile Organics, TCL | SW-846, 5030/8260B | 6/0 | 1 | - | 1 | - | 8/0 | 1 | - |
| Semivolatile Organics, TCL | SW-846, 3540/8270C | 6/6 | 1 | - | 1 | - | 8/2 | 1 | - |
| Pesticides, TCL | SW-846, 3540/8081A | 6/6 | 1 | - | 1 | - | 8/2 | 1 | - |
| PCBs, TCL | SW-846, 3540/8082 | 6/6 | 1 | - | 1 | - | 8/2 | 1 | - |
| Explosives | SW-846, 8330 | 6/6 | 1 | - | 1 | - | 8/2 | 1 | - |
| Propellants | SW-846, 8330/9056 | 6/6 | 1 | - | 1 | - | 8/2 | 1 | - |
| Metals, TAL | SW-846, 6010B/7471 | 6/6 | 1 | - | 1 | - | 8/2 | 1 | - |
| Cyanide | SW-846, 9011/9012A | 6/6 | 1 | - | 1 | - | 8/2 | 1 | - |
| TOC | Walkley/Black Method | 6/0 | - | - | - | - | 6/0 | - | - |
| Grain Size (sieve/hydrometer) | ASTM D422 | 6/0 | - | - | - | - | 6/0 | - | - |
| Moisture Content | ASTM D2216 | 6/0 | - | - | - | - | 6/0 | - | - |
| USCS Classification | ASTM D2487-92 | 6/0 | - | - | - | - | 6/0 | - | - |

### Table 1-1. Sampling and Analytical Requirements for the Erie Burning Grounds Phase II RI (continued)

| Parameter | Methods | Field Samples[a] | Field Duplicate Samples | Site Source Water[b] | Sampler Rinsates | Trip Blanks | Total A-E Samples | USACE QA Split Samples | USACE Trip Blanks |
|---|---|---|---|---|---|---|---|---|---|
| ***Groundwaters*** | | | | | | | | | |
| Volatile Organics, TCL | SW-846, 5030/8260B | 8 | 1 | - | 1 | 6 | 16 | 1 | 1 |
| Semivolatile Organics, TCL | SW-846, 3520/8270C | 8 | 1 | - | 1 | - | 10 | 1 | - |
| Pesticides, TCL | SW-846, 3520/8081A | 8 | 1 | - | 1 | - | 10 | 1 | - |
| PCBs, TCL | SW-846, 3520/8082 | 8 | 1 | - | 1 | - | 10 | 1 | - |
| Explosives | SW-846, 8330 | 8 | 1 | - | 1 | - | 10 | 1 | - |
| Propellants | SW-846, 8330/9056 | 8 | 1 | - | 1 | - | 10 | 1 | - |
| Metals (total), TAL | SW-846, 6010A/7470 | 8 | 1 | - | 1 | - | 10 | 1 | - |
| Cyanide | SW-846, 9012A | 8 | 1 | - | 1 | - | 10 | 1 | - |
| ***Surface Waters*** | | | | | | | | | |
| Volatile Organics, TCL | SW-846, 5030/8260B | 8 | 1 | 2 | - | 6 | 17 | 1 | 1 |
| Semivolatile Organics, TCL | SW-846, 3520/8270C | 8 | 1 | 2 | - | - | 11 | 1 | - |
| Pesticides, TCL | SW-846, 3520/8081A | 8 | 1 | 2 | - | - | 11 | 1 | - |
| PCBs, TCL | SW-846, 3520/8082 | 8 | 1 | 2 | - | - | 11 | 1 | - |
| Explosives | SW-846, 8330 | 8 | 1 | 2 | - | - | 11 | 1 | - |
| Propellants | SW-846, 8330/9056 | 8 | 1 | 2 | - | - | 11 | 1 | - |
| Metals (total), TAL | SW-846, 6010A/7470 | 8 | 1 | 2 | - | - | 11 | 1 | - |
| Cyanide | SW-846, 9012A | 8 | 1 | 2 | - | - | 11 | 1 | - |

[a] Surface soil and sediment samples are identified as x/y, where x = discreet samples and y = multi-increment samples.
[b] Source waters = one potable water source and one ASTM water supply lot for the project.
A-E = Architect-Engineer.
ASTM = American Society of Testing and Materials.
EM = Engineering Manual (USACE).
N/A = not applicable.
PCB = polychlorinated biphenyl.
QA = quality assurance.
RI = Remedial Investigation.
TAL = Target Analyte List.
TCL = Target Compound List.
TOC = total organic carbon.
USACE = U.S. Army Corps of Engineers.
USCS = Unified Soil Classification System.

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# 2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The functional project organization and responsibilities are described in Chapter 2.0 of the Facility-wide SAP and the EBG Phase II RI SAP Addendum.

Analytical support for this work has been assigned to GPL Laboratories, Inc (GPL). All analyses will be completed by GPL's Gaithersburg, Maryland facility. This laboratory is validated by the U.S. Army Corps of Engineers' (USACE's) Hazardous, Toxic, and Radioactive Waste (HTRW) Center of Expertise (CX), Omaha, Nebraska. GPL's QAPP, Version 7, May 2003, is available for review upon request. The laboratory's organizational structure, roles, and responsibilities are identified in Chapters 3.0 and 4.0 of the GPL-QAPP. Geotechnical determinations will be performed by S&ME, Inc., Louisville, Tennessee. Addresses and telephone numbers for each facility are as follows:

GPL Laboratories, Inc. – chemical analytical services:

202 Perry Parkway
Gaithersburg, MD 20877
Tel: (301) 926-6802
Fax: (301) 840-1209

S&ME, Inc. – soil and sediment geotechnical analyses:

1413 Topside Road
Louisville, TN 37777
Tel: (865) 970-0003
Fax: (865) 970-2312

Comprehensive data validation will be independently performed by the Louisville USACE-approved firm of Laboratory Data Consultants, Inc., 7750 El Camino Road, Suite 2L, Carlsbad, CA 92009. QA split samples will be submitted to the following USACE, Louisville District contract laboratory for independent analyses:

Severn Trent Laboratories, Inc.
4101 Shuffel Drive, NW
North Canton, OH 44720
Tel: (330) 497-9366

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# 3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

## 3.1 DATA QUALITY OBJECTIVES

Data quality objective summaries for this investigation will follow Tables 3-1 and 3-2 in the Facility-wide QAPP. All QC parameters stated in the specific U.S. Environmental Protection Agency (EPA) SW-846 methods will be adhered to for each chemical listed. The SW-846 method references found in the Facility-wide QAPP have been revised to the Update III methods (i.e., 8260A is now 8260B, 8270B is now 8270C, etc.). Laboratories are required to comply with all methods as written; recommendations are considered requirements. Concurrence with the USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3, 1 February 2001 and Louisville Chemistry Guideline, Rev. 5, June 2002, Samir Mansy is expected.

## 3.2 LEVEL OF QUALITY CONTROL EFFORT

QC efforts will follow Section 3.2 of the Facility-wide QAPP. Field QC measurements will include field source water blanks, trip blanks, field duplicates, and equipment rinsate blanks. Laboratory QC measurements will include method blanks, laboratory control samples (LCSs), laboratory duplicates, and matrix spike/matrix spike duplicate (MS/MSD) samples. LCS measurements will include the standard mid-level analyte concentration, plus a QC/method reporting level (MRL) low-level concentration, per the Louisville Chemistry Guideline. It is recognized that the laboratory will routinely perform and monitor the QC/MRL; however, guidance check limits will be utilized, as advisory and corrective action will not be required for individual analyte variances.

## 3.3 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSIS

Program accuracy, precision, and sensitivity goals identified in Section 3.3 and Tables 3-1 through 3-9 of the Facility-wide QAPP will be imposed for this investigation. In addition, the Louisville Chemistry Guideline (USACE 2002) identifies analytical method quality objectives related to individual method QC protocol. Current GPL-generated analytical method control limits have been submitted to the USACE, Louisville District Chemistry group for review. Upon acceptance, these QC limits will be imposed during analytical runs. If these internal QC operational limits are not acceptable to the USACE, Louisville District, the laboratory will impose the Louisville Chemistry Guideline control limits. Due to the instability of hexachlorocyclopentadiene analysis, this compound’s performance will be monitored but will not precipitate method corrective action procedures.

Program and project reporting levels are identified in Tables 3-1 through 3-9 of the Facility-wide QAPP. Laboratories will make all reasonable attempts to meet these levels for each individual sample analysis. When samples require dilution, both the minimum dilution and quantified dilution must be reported. GPL will screen all samples to determine optimum dilution ranges. Dilution runs will be performed to quantitate high target analyte concentrations within the upper half of the calibration range, thus reducing the degree of dilution as much as possible. In addition, a five times less diluted run will then be performed to report other target analyte reporting levels as low as possible without destroying analytical detectors and instrumentation. If there are matrix interferences, non-target analyte, or high target analyte concentrations that preclude analysis of an undiluted sample, the laboratory project manager will contact Science Applications International Corporation (SAIC) and USACE, Louisville District, forward analytical and chromatographic information from diluted runs, and obtain direction on how to proceed.

## 3.4 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Completeness, representativeness, and comparability goals identified in Section 3.4 and Tables 3-1 and 3-2 of the Facility-wide QAPP will be imposed for this investigation.

# 4.0 SAMPLING PROCEDURES

Sampling procedures are discussed in Chapter 4.0 of the Facility-wide SAP and SAP Addendum for the EBG Phase II RI.

Table 4-1 summarizes sample container, preservation, and holding time requirements for the soil, sediment, and water matrices for this investigation. The number of containers required is estimated in this table.

As noted in the Facility-wide QAPP, additional sample volumes will be provided, when necessary, for the express purpose of performing associated laboratory QC (MS/MSD). These laboratory QC samples will be designated by the field and identified for the laboratory on respective chain of custody (COC) documentation.

## Table 4-1. Container Requirements for Water, Soil, and Sediment Samples for the Erie Burning Grounds Phase II RI at RVAAP[a]

| Analyte Group | Approx. No. of Containers incl. Field QC | Container | Minimum Sample Size | Preservative | Holding Time |
|---|---|---|---|---|---|
| ***Groundwater and Surface Water*** | | | | | |
| VOCs | 120 | Three, 40-mL glass vials with Teflon®-lined septum (no headspace) | 80 mL | HCl to pH <2<br>Cool, 4°C | 14 d |
| SVOCs | 50 | Two, 1-L amber glass bottles with Teflon®-lined lid | 1000 mL | Cool, 4°C | 7 d (extraction)<br>40 d (analysis) |
| Pesticide Compounds | 50 | Two, 1-L amber glass bottles with Teflon®-lined lid | 1000 mL | Cool, 4°C | 7 d (extraction)<br>40 d (analysis) |
| PCB Compounds | 50 | Two, 1-L amber glass bottles with Teflon®-lined lid | 1000 mL | Cool, 4°C | 7 d (extraction)<br>40 d (analysis) |
| Explosive Compounds | 50 | Two, 1-L amber glass bottles with Teflon®-lined lid | 1000 mL | Cool, 4°C | 7 d (extraction)<br>40 d (analysis) |
| Propellant Compounds | 25 | One, 1-L amber glass bottles with Teflon®-lined lid | 1000 mL | Cool, 4°C | 7 d (extraction)<br>40 d (analysis) |
| Metals (total) | 25 | 1-L polybottle | 500 mL | $HNO_3$ to pH <2<br>Cool, 4°C | 180 d |
| Cyanide | 25 | 1-L polybottle | 500 mL | NaOH to pH >12<br>Cool, 4°C | 14 d |
| ***Soils and Sediments*** | | | | | |
| VOCs | 15 | One 2-oz. glass jar with Teflon®-lined cap (no headspace) | 20 grams | Cool, 4°C | 14 d |
| SVOCs | 30 | One 8-oz. wide-mouth glass jar with Teflon®-lined cap | 100 grams | Cool, 4°C | 14 days (extraction)<br>40 days (analysis) |
| Pesticide Compounds | - | One 8-oz. wide-mouth glass jar with Teflon®-lined cap or use same container as SVOC, where possible | 100 grams | Cool, 4°C | 14 days (extraction)<br>40 days (analysis) |
| PCB Compounds | - | One 8-oz. wide-mouth glass jar with Teflon®-lined cap or use same container as Metals, where possible | 100 grams | Cool, 4°C | 14 days (extraction)<br>40 days (analysis) |
| Explosive Compounds | 30 | One 4-oz. glass jar with Teflon®-lined cap | 100 grams | Cool, 4°C | 14 days (extraction)<br>40 days (analysis) |
| Propellant Compounds | 20 | One 4-oz. glass jar with Teflon®-lined cap | 100 grams | Cool, 4°C | 14 days (extraction)<br>40 days (analysis) |
| Metals | 30 | One 8-oz. wide-mouth glass jar with Teflon®-lined cap | 50 grams | Cool, 4°C | 180 d |
| Cyanide | - | Use same container as metals | 25 grams | Cool, 4°C | 14 d |
| Total Organic Carbon | 15 | One 4-oz. glass jar with Teflon®-lined cap | 10 grams | Cool, 4°C | 28 d |
| Geotechnical Parameters | 8 | Shelby Tube or 32-oz/ wide-mouth container | 1000 grams | None | None |

[a] One sample will be tripled in volume for the laboratory to perform appropriate laboratory QC analysis.
PCB = polychlorinated biphenyl.
QC = quality control.
RI = Remedial Investigation.
RVAAP = Ravenna Army Ammunition Plant.
SVOC = semivolatile organic compound.
VOC = volatile organic compound.

# 5.0 SAMPLE CUSTODY

## 5.1 FIELD CHAIN-OF-CUSTODY PROCEDURES

Sample handling, packaging, and shipment procedures will follow those identified in Section 5.1 of the Facility-wide QAPP.

## 5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

Laboratory COC will follow handling and custody procedures identified in Section 6.3 of the GPL-QAPP.

## 5.3 FINAL EVIDENCE FILES CUSTODY PROCEDURES

Custody of evidence files will follow those criteria defined in Section 5.3 of the Facility-wide QAPP.

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# 6.0 CALIBRATION PROCEDURES AND FREQUENCY

## 6.1 FIELD INSTRUMENTS/EQUIPMENT

Field instruments and equipment calibrations will follow those identified in Section 6.1 of the Facility-wide QAPP.

## 6.2 LABORATORY INSTRUMENTS

Calibration of laboratory equipment will follow procedures identified in Section 6.5 of the GPL-QAPP, GPL laboratory-specific standard operating procedures (SOPs), and corporate and facility-specific operating procedures.

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# 7.0 ANALYTICAL PROCEDURES

## 7.1 LABORATORY ANALYSIS

Analytical methods, parameters, and quantitation or detection limits are those listed in Tables 3-3 through 3-9 of the Facility-wide QAPP.

The GPL-QAPP will be followed during the analysis of these samples. The following laboratory SOPs will implement the defined EPA methods.

- SOP No. H.8, version 8, January 2003, Acid Digestion of Aqueous EP, and TCLP Extracts and Waste, etc. 3010A.
- SOP No. H21, version 3, August 2002, Acid Digestion of Soil, Sludge, Sediment, and other Solid Waste Samples for ICP by SW846 Method 3050B.
- SOP No. H.11, version 11, February 2003, Trace ICP Quantitation for HSL Metals plus Boron, Molybdenum, Silicon, Strontium, Titanium and Tin According to Method 6010B.
- SOP No. H.31, version 1, January 2003, Trace ICP Quantitation for HSL Metals plus Boron, Molybdenum, Silicon, Strontium, Titanium and Tin According to Method 6020.
- SOP No. H.12, version 12, April 2003, Cold Vapor Analysis for Mercury in Accordance with SW846 Methods 7470A and 7471A.
- SOP No. M.5, version 12, February 2003, Volatile Organics – 8260B.
- SOP No. N.5, version 3, September 2002, Soil Extraction for Pesticide/PCB Compounds by Method 3540C (Soxhlet Extraction).
- SOP No. N.21, version 1, March 2001, Soil Extraction for Semivolatile Organics by Method 3540C (Soxhlet Extraction).
- SOP No. N.24, version 2, July 2002, Soil Extraction for Explosives by Method 3540C (Soxhlet Extraction).
- SOP No. N.6, version 7, September 2002, Method 3520C, Continuous Liquid-Liquid Extraction for Pesticide/PCB Compounds.
- SOP No. N.11, version 7, October 2002, Method 3520C, Continuous Liquid-Liquid Extraction for Semivolatile Organics.
- SOP No. N.34, version 1, February 2003, Method 3520C, Continuous Liquid-Liquid Extraction for Explosive Organics.
- SOP No. P.5, version 10, February 2003, SOP for SW846 Method 8270C, GC/MS Analysis of Semivolatile Organics.

- SOP No. Q.6, version 7, October 2002, SOP for Method 8081A, Organochlorine Pesticides.
- SOP No. Q.7, version 4, November 2001, SOP for Method 8082, Arochlor and PCB Congeners.
- SOP No. S.1, version 15, February 2003, HPLC Analysis of Nitroaromatic and Nitramine Explosive Residues in Water, Soil, and Sediment Samples (8330).
- SOP No. S.4, version 3, March 2003, HPLC Analysis of Nitroquanidine in Water and Soil Samples.
- SOP No. S.7, version 4, December 2002, HPLC Analysis of Nitroglycerine in Water and Soil Samples (8332).
- SOP No. J.28, version 7, December 2002, Nitrocellulose.
- SOP No. J.44, version 4, April 2003, Cyanide, (automatic colorimetric with off-line distillation) by Method 9012A.

GPL facilities will at all times maintain a safe and contaminant free environment for the analysis of samples. The laboratories will demonstrate, through instrument blanks, holding blanks, and analytical method blanks, that the laboratory environment and procedures will not and do not impact analytical results.

GPL facilities will also implement all reasonable procedures to maintain project reporting levels for all sample analyses. Where contaminant and sample matrix analytical interferences impact the laboratory's ability to obtain project reporting levels, the laboratory will institute sample clean-up processes, minimize dilutions, adjust instrument operational parameters, or propose alternative analytical methods or procedures. Elevated reporting levels will be kept to a minimum throughout the execution of this work. When samples require dilution, both the minimum dilution and quantified dilution must be reported. GPL will screen all samples to determine optimum dilution ranges. Dilution runs will be performed to quantitate high target analyte concentrations within the upper half of the calibration range, thus reducing the degree of dilution as much as possible. In addition, a five times less diluted run will then be performed to report other target analyte reporting levels as low as possible without destroying analytical detectors and instrumentation. If there are matrix interferences, non-target analyte, or high target analyte concentrations that preclude analysis of an undiluted sample, the laboratory project manager will contact SAIC and USACE, Louisville District, forward analytical and chromatographic information from diluted runs, and obtain direction on how to proceed.

## 7.2 FIELD SCREENING ANALYTICAL PROTOCOLS

Procedures for field analysis are identified in Chapter 6.0 of the Facility-wide SAP and in Chapter 4.0 of the FSP of this SAP Addendum. Only screening of samples for organic vapors using a photoionization detector will be conducted. Headspace analysis will not be conducted.

# 8.0 INTERNAL QUALITY CONTROL CHECKS

## 8.1 FIELD SAMPLE COLLECTION

Field QC sample types, numbers, and frequencies are identified in Chapters 4.0 and 5.0 of the FSP of this SAP Addendum. In general, field duplicates will be collected at a frequency of 10%. Field equipment rinsates will be collected at a frequency of 10% for water samples, while one soil/sediment equipment rinsate samples will be collected per field cycle. This will constitute a process check for the effectiveness of the decontamination procedure. Two site source water samples (one potable water source and one deionized water source) will be collected for the combined field effort. Volatile organic trip blanks will accompany all shipments containing volatile organic water samples.

## 8.2 FIELD MEASUREMENT

Refer to Chapter 4.0 of the FSP of this SAP Addendum for details regarding these measurements.

## 8.3 LABORATORY ANALYSIS

Analytical QC procedures will follow those identified in the referenced EPA methodologies. These will include method blanks, LCS, MS, MSD, laboratory duplicate analysis, calibration standards, internal standards, surrogate standards, and calibration check standards.

GPL facilities will conform to the GPL-QAPP and implement their established SOPs to perform the various analytical methods required by the project. QC frequencies will follow those identified in Section 8.3 of the Facility-wide QAPP.

Analyses will also be consistent with direction provided by the USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3, 1 February 2001 and the Louisville Chemistry Guideline, Rev. 5 June 2002, Samir Mansy. The following are clarifications to this guidance relative to this project:

- The QC/MDL check will be performed quarterly, until criteria can be established. After performance criteria are determined, the frequency of this QC check may be reduced to biannually or annually per instrument.

- Analytical method blanks will be considered clean as long as analyte concentrations are below reporting levels. Corrective actions will be performed for any analyte detected above the established method reporting level. Any analytes detected between the method detection limit and the MRL will be flagged appropriately.

- LCSs will contain all project target compounds; however, for organic methods, only the SW-846 subset of system monitoring compounds will be used to monitor method performance and initiate analytical method corrective actions.

- For methods that have multi-responders (i.e., archlors and pesticides) within the same analytical process, the laboratory will not include all analytes within the matrix spiking mixture. A representative analyte will be employed for the MS evaluation.

- Inductively coupled plasma initial calibration curves will be confirmed through the analysis of a blank and three standards, and this documentation will be reported as part of the analytical data package.

- ICP serial dilution will be performed on a per batch basis. If the serial dilution falls outside acceptance criteria, a post-digestion spike analyses will be performed.

- Sediment samples having moisture levels that preclude soxlet extraction processes will be extracted by sonication methods.

# 9.0 DATA REDUCTION, VALIDATION, AND REPORTING

## 9.1 DATA REDUCTION

Sample collection and field measurements will follow the established protocols defined in the Facility-wide QAPP, Facility-wide SAP, and this SAP Addendum. Laboratory data reduction will follow GPL-QAPP, Chapter 7.0 guidance and will conform to general direction provided by the Facility-wide QAPP; the USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3, February 2001; and the Louisville Chemistry Guideline, Rev. 5 June 2002, Samir Mansy.

## 9.2 DATA VERIFICATION/VALIDATION

Project data verification and validation will follow direction provided in the Facility-wide QAPP Section 9.2 and diagramed in Figure 9-1. Protocol for analytical data verification and validation has been updated to the following references:

- USACE Louisville Chemistry Guideline, Rev. 5, June 2002.
- USACE Shell for Analytical Chemistry Requirements, Appendix I EM200-1-3, 1 February 2001.
- Environmental Data Assurance Guideline, USACE Louisville, May 2000.
- EPA National Functional Guidelines for Organic Data Review, EPA-540/R-99/008, October 1999.
- EPA National Functional Guidelines for Inorganic Data Review, EPA-540/R-94/013, February 1994.

All data will be reviewed and verified by SAIC according to the Facility-wide QAPP.

Validation of 10% of the data will follow the direction provided in the Facility-wide QAPP and the Louisville Chemistry Guideline, Rev.5 June 2002, Samir Mansy. An independent data validation subcontractor qualified by USACE, Louisville District will perform this data validation.

## 9.3 DATA REPORTING

Analytical data reports will follow the direction provided in the Facility-wide QAPP.

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# 10.0 PERFORMANCE AND SYSTEM AUDITS

## 10.1 FIELD AUDITS

A minimum of one field surveillance for the investigation will be performed by the SAIC QA Officer and/or the SAIC Field Team Leader. This audit will encompass the sampling of groundwater, surface water, soil, and sediment from the wells, ditches, ponds, and land areas. Surveillances will follow SAIC QAAP No. 18.3.

USACE, EPA Region 5, or Ohio EPA audits may be conducted at the discretion of the respective agency.

## 10.2 LABORATORY AUDITS

Routine USACE HTRW CX on-site laboratory audits may be conducted by USACE, while audits by EPA Region 5 or Ohio EPA may be conducted at the discretion of the respective agency.

Internal performance and systems audits will be conducted by GPL's QA staff, as defined in the GPL-QAPP, Sections 9.2 and 9.3.

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# 11.0 PREVENTIVE MAINTENANCE PROCEDURES

## 11.1 FIELD INSTRUMENTS AND EQUIPMENT

Maintenance of all field analytical and sampling equipment will follow direction provided in Section 11.1 of the Facility-wide QAPP.

## 11.2 LABORATORY INSTRUMENTS

Routine and preventive maintenance for all laboratory instruments and equipment will follow the direction of Section 5.3 of the GPL-QAPP.

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# 12.0 SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

## 12.1 FIELD MEASUREMENTS DATA

Field data will be assessed as outlined in Section 12.1 of the Facility-wide QAPP.

## 12.2 LABORATORY DATA

Laboratory data will be assessed as outlined in Section 12.2 of the Facility-wide QAPP.

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# 13.0 CORRECTIVE ACTIONS

## 13.1 SAMPLE COLLECTION/FIELD MEASUREMENTS

Field activity corrective action protocol will follow directions provided in Section 13.1 of the Facility-wide QAPP.

## 13.2 LABORATORY ANALYSES

Laboratory activity corrective action protocol will follow directions provided in Section 13.2 of the Facility-wide QAPP and Section 9.5 of the GPL-QAPP.

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# 14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Procedures and reports will follow the protocol identified in Chapter 14.0 of the Facility-wide QAPP and those directed by Chapter 9.0 of the GPL-QAPP.

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# 15.0 REFERENCES

USACE (U.S. Army Corps of Engineers) 2001a. Requirements for the Preparation of Sampling and Analysis Plans, EM200-1-3, Appendix I, *Shell for Analytical Chemistry Requirements*, February.

USACE (U.S. Army Corps of Engineers) 2001b. *Facility-wide Sampling and Analysis Plan for Environmental Investigations at the Ravenna Army Ammunition Plant, Ravenna, Ohio*, DACA62-00-D-0001, Delivery Order CY02, Final, March.

USACE (U.S. Army Corps of Engineers) 2002. *Louisville Chemistry Guideline (LCG),* Samir A. Mansey, Environmental Chemistry Branch, Rev. 5, June.

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