

**Draft**

**Site Characterization and Focused Feasibility Study Work Plan for the  
Dump along Paris-Windham Road (RVAAP-51)**

**Ravenna Army Ammunition Plant  
8451 State Route 5  
Ravenna, Ohio 44266**

**December 4, 2009**

**Contract No. W912QR0-08-D-008  
Delivery Order No. 0014**

**Prepared for:**



**US Army Corps  
of Engineers®**

**United States Army Corps of Engineers  
Louisville District  
600 Martin Luther King, Jr. Place  
Louisville, Kentucky 40202**

**Prepared by:**



**SAIC Engineering of Ohio, Inc.  
8866 Commons Boulevard, Suite 201  
Twinsburg, Ohio 44087**

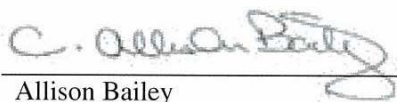
## **DISCLAIMER STATEMENT**

This report is a work prepared for the United States Government by Science Applications International Corporation. In no event shall either the United States Government or Science Applications International Corporation have any responsibility of liability for any consequences of any, use, misuse, inability to use, or reliance on the information contained herein, nor does either warrant or otherwise represent in any way the accuracy, adequacy, efficacy, or applicability of the contents hereof.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
<small>The public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing the burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</small> <b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b>					
1. REPORT DATE (DD-MM-YYYY) 04-12-2009		2. REPORT TYPE Technical		3. DATES COVERED (From - To) December 2009	
4. TITLE AND SUBTITLE Draft Site Characterization and Focused Feasibility Study Work Plan for the RVAAP-51 Dump Along Paris-Windham Road Ravenna Army Ammunition Plant Ravenna, Ohio			5a. CONTRACT NUMBER Contract No. W912QR0-08-D-0008		
			5b. GRANT NUMBER NA		
			5c. PROGRAM ELEMENT NUMBER NA		
			5d. PROJECT NUMBER Delivery Order 0014		
6. AUTHOR(S) C. Allison Bailey			5e. TASK NUMBER NA		
			5f. WORK UNIT NUMBER NA		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Science Applications International Corporation 151 Lafayette Drive Oak Ridge, Tennessee 37831			8. PERFORMING ORGANIZATION REPORT NUMBER 1526.20091204.001		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) USACE - Louisville District U.S. Army Corps of Engineers, Louisville District 600 Martin Luther King Jr. Place P.O. Box 50 Louisville, Kentucky 40202-0059			10. SPONSOR/MONITOR'S ACRONYM(S) CELRL-ED-EE		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S) NA		
12. DISTRIBUTION/AVAILABILITY STATEMENT Reference Distribution Page					
13. SUPPLEMENTARY NOTES None					
14. ABSTRACT This Work Plan presents historical data for the Dump Along Paris-Windham Road and outlines the planned approach to prepare a Site Characterization and Focused Feasibility Study Report.					
15. SUBJECT TERMS Work Plan, Feasibility Study, remediation					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES 41	19a. NAME OF RESPONSIBLE PERSON NA
a. REPORT NA	b. ABSTRACT NA	c. THIS PAGE NA			19b. TELEPHONE NUMBER (Include area code) NA

### CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW


Science Applications International Corporation (SAIC) has completed the Draft Site Characterization and Focused Feasibility Study Work Plan for the Dump along Paris-Windham Road (RVAAP-51) 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 USACE policy.



Allison Bailey  
Study/Design Team Leader

12/01/09

Date



Kevin Jago, P.G.  
Independent Technical Review Team Leader

12/01/09

Date

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

Internal SAIC Independent Technical Review comments are recorded on a Document Review Record per SAIC quality assurance procedure QAAP 3.1. This Document Review Record is maintained in the project file. Changes to the report addressing the comments have been verified by the Study/Design Team Leader. As noted above, all concerns resulting from independent technical review of the project have been considered.



Scott Armstrong  
Principal w/ A-E firm

Dec. 02, 2009

Date

**Draft**

**Site Characterization and Focused Feasibility Study Work Plan for the  
Dump along Paris-Windham Road (RVAAP-51)**

Volume One – Main Report and Attachment  
Version 1.0

Ravenna Army Ammunition Plant  
8451 State Route 5  
Ravenna, Ohio 44266

Contract No. W912QR0-08-D-008  
Delivery Order No. 0014

**Prepared For:**

U.S. Army Corps of Engineers  
600 Martin Luther King, Jr. Place  
Louisville, Kentucky 40202

**Prepared By:**

SAIC Engineering of Ohio, Inc.  
8866 Commons Boulevard, Suite 201  
Twinsburg, Ohio 44087

December 4, 2009

**DOCUMENT DISTRIBUTION**  
**for the**  
**Draft**  
**Site Characterization and Focused Feasibility Study Work Plan for the Dump along Paris-**  
**Windham Road (RVAAP-51)**  
**Ravenna Army Ammunition Plant**  
**Ravenna, Ohio**

<b>Name/Organization</b>	<b>Number of Printed Copies</b>	<b>Number of Electronic Copies</b>
Todd Fisher, Ohio EPA-NEDO	1	1
Eileen Mohr, Ohio EPA-NEDO	1	1
Bonnie Buthker, Ohio EPA-SWDO	1	1
Katie Elgin, OHARNG	1	1
Kim Harriz, NGB	0	1
Mark Patterson, RVAAP Facility Manager	2	2
Mark Krivansky, USAEC	0	1
Joan Cullen, USACE – Louisville District	1	1
Nathaniel Peters, USACE – Louisville District	1	1
Angela Schmidt, USACE – Louisville District	1	1
Mark Nichter, USACE – Louisville District	1	1
Kevin Jago, SAIC	1	1
Allison Bailey, SAIC	1	1
REIMS	0	1
SAIC Project File W912QR-05-F-0033	1	1
SAIC Central Records Facility	0	1

Ohio EPA-NEDO = Ohio Environmental Protection Agency-Northeast District Office  
Ohio EPA-SWDO = Ohio Environmental Protection Agency-Southwest District Office  
OHARNG = Ohio Army National Guard  
NGB = National Guard Bureau  
REIMS = Ravenna Environmental Information Management System  
RVAAP = Ravenna Army Ammunition Plant  
SAIC = Science Applications International Corporation  
USACE = United States Army Corps of Engineers  
USAEC = United States Army Environmental Command

# TABLE OF CONTENTS

1		
2		
3	LIST OF TABLES .....	ii
4	LIST OF FIGURES .....	ii
5	LIST OF PHOTOGRAPHS .....	ii
6	ACRONYMS AND ABBREVIATIONS .....	iii
7	<b>1.0 INTRODUCTION .....</b>	<b>1-1</b>
8	1.1 OBJECTIVES .....	1-1
9	1.2 REGULATORY STATUS .....	1-1
10	<b>2.0 SCOPE .....</b>	<b>2-1</b>
11	2.1 WORK PLAN APPROACH .....	2-1
12	2.2 KEY ASSUMPTIONS .....	2-1
13	<b>3.0 BACKGROUND INFORMATION .....</b>	<b>3-1</b>
14	3.1 FACILITY BACKGROUND INFORMATION .....	3-1
15	3.2 RVAAP-51 DUMP ALONG PARIS-WINDHAM ROAD BACKGROUND AND	
16	DESCRIPTION .....	3-2
17	3.3 PREVIOUS INVESTIGATIONS AND ACTIVITIES .....	3-2
18	3.3.1 Relative Risk Site Evaluation .....	3-2
19	3.3.2 RD/RA Activities .....	3-3
20	<b>4.0 DATA SUMMARY .....</b>	<b>4-1</b>
21	4.1 RD/RA DATA SUMMARY .....	4-1
22	<b>5.0 CONCEPTUAL SITE MODEL .....</b>	<b>5-1</b>
23	5.1 PRIMARY SOURCE AND MIGRATION PATHWAY .....	5-1
24	5.2 SECONDARY SOURCES .....	5-1
25	5.3 POTENTIAL RECEPTORS .....	5-1
26	<b>6.0 RISK EVALUATION METHODS .....</b>	<b>6-1</b>
27	6.1 HUMAN HEALTH RISK MANAGEMENT EVALUATION .....	6-1
28	6.1.1 Identification of Representative Site-Specific Receptors .....	6-1
29	6.1.2 Identification of Constituents of Concern .....	6-2
30	6.1.3 Identify Cleanup Goals for the Focused Feasibility Study .....	6-3
31	6.1.4 Nature and Extent .....	6-4
32	6.2 ECOLOGICAL RISK EVALUATION AND WEIGHT-OF-EVIDENCE .....	6-4
33	<b>7.0 SUMMARY .....</b>	<b>7-1</b>
34	<b>8.0 SCHEDULE .....</b>	<b>8-1</b>
35	<b>9.0 REFERENCES .....</b>	<b>9-1</b>

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17

**LIST OF FIGURES**

Figure 3-1. Location of Dump Along Paris-Windham Road within RVAAP/Camp Ravenna .....3-5

Figure 3-2. Sample Location Map.....3-7

Figure 5-1. Preliminary Conceptual Site Model for Dump Along Paris-Windham Road  
(RVAAP-51) .....5-2

Figure 8-1. Project Schedule .....8-3

**LIST OF PHOTOGRAPHS**

Photograph 3-1. Debris Removal Activities Near Grid #4 and Grid #5, April 2003 .....3-8

Photograph 3-2. Installation of Two-foot Soil Backfill Cover During Restoration Activities,  
November 2003 .....3-8

Photograph 3-3. Site Conditions at the Completion of Site Restoration Activities,  
November 2003 .....3-9

Photograph 3-4. Southern Portion of the AOC Near the Drainage Swale, August 2009 .....3-9

## ACRONYMS AND ABBREVIATIONS

1		
2		
3	ACM	Asbestos-Containing Material
4	AOC	Area of Concern
5	C&D	Construction and Demolition
6	Camp Ravenna	Camp Ravenna Joint Military Training Center
7	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
8	COC	Constituent of Concern
9	COPC	Constituent of Potential Concern
10	CSM	Conceptual Site Model
11	CUG	Cleanup Goal
12	DFFO	Director's Final Findings and Orders
13	EPC	Exposure Point Concentration
14	FFS	Focused Feasibility Study
15	FWHHRAM	Facility-Wide Human Health Risk Assessor Manual
16	HQ	Hazard Quotient
17	IRP	Installation Restoration Program
18	MI	Multi-Increment
19	NGB	National Guard Bureau
20	OHARNG	Ohio Army National Guard
21	Ohio EPA	Ohio Environmental Protection Agency
22	PCB	Polychlorinated Biphenyl
23	PRG	Preliminary Remediation Goal
24	RA	Removal Action
25	RAO	Remedial Action Objective
26	RD	Remedial Design
27	RRSE	Relative Risk Site Evaluation
28	RVAAP	Ravenna Army Ammunition Plant
29	SAIC	Science Applications International Corporation
30	SC	Site Characterization
31	SDZ	Surface Danger Zone
32	SVOC	Semi-Volatile Organic Compound
33	T&E	Threatened and Endangered
34	TAL	Target Analyte List
35	TNT	2,4,6-trinitrotoluene
36	UCL	Upper Confidence Limit
37	USACE	U.S. Army Corps of Engineers
38	USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
39	USEPA	U.S. Environmental Protection Agency
40	VOC	Volatile Organic Compound
41	WOE	Weight-of-Evidence
42	WP	Work Plan

**THIS PAGE INTENTIONALLY LEFT BLANK.**

## 1.0 INTRODUCTION

---

Science Applications International Corporation (SAIC) has been contracted by the U.S. Army Corps of Engineers (USACE), Louisville District to provide environmental services to perform a Site Characterization and Focused Feasibility Study (SC/FFS) for the Dump Along Paris-Windham Road (RVAAP-51) at the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio. This work is being conducted under Contract W912QR0-08-D-0008, Delivery Order 0014 issued by the USACE, Louisville District on June 16, 2009. In addition, planning and performance of all elements of this work will be in accordance with the requirements of the Director's Final Findings and Orders (DFFO) dated June 10, 2004 (Ohio EPA 2004).

### 1.1 OBJECTIVES

A Remedial Design/Removal Action (RD/RA) was conducted in 2003 to remove unconsolidated surface debris and some subsurface debris, including asbestos-containing material (ACM) (transite), from the Dump Along Paris-Windham Road (MKM 2004). Completion of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process is required in order to obtain a final remedy for soil and dry sediment. Assessment of the adequacy of existing site characterization data, evaluation of human health and ecological risks, and determination of the need for additional remedial actions are necessary to proceed with the CERCLA process. The RD/RA did not evaluate the nature and extent of contamination and did not identify constituents of potential concern (COPCs) or constituents of concern (COCs) for risk evaluation. Therefore, the SC/FFS will complete these tasks and evaluate remedial alternatives in accordance with the CERCLA process.

The objective of this project is to perform a SC/FFS for the Dump Along Paris-Windham Road utilizing existing analytical data, human health and ecological risk assessment information, and remedy evaluation to achieve the Remedial Action Objective (RAO) consistent with the Ohio Army National Guard's (OHARNG) proposed use of the property.

### 1.2 REGULATORY STATUS

The 2003 RD/RA included excavation of contaminated soil and transite, and a protective soil and vegetation cover was placed over the excavated portions of the area of concern (AOC). Based on results of the RD/RA confirmatory sampling effort (MKM 2004), several semi-volatile organic compounds (SVOCs), aluminum, arsenic, and manganese were found to be present above U.S. Environmental Protection Agency (USEPA) Region 9 Residential Preliminary Remediation Goals (PRGs) or RVAAP facility-wide background values within the AOC limits and in dry sediment in a drainage swale at the base of the dump toe slope within the neighboring Sand Creek floodplain. Additionally, in order to avoid potentially undermining the structure of Paris-Windham Road, residual small fragments of transite were left in place along the slope of the southern half of the AOC. These fragments were subsequently covered in place during restoration operations. The RD/RA

1 recommended a risk assessment be performed using existing data to verify RD/RA activities were  
2 sufficient enough to allow for regulatory site close out (MKM 2004).

3  
4 In accordance with CERCLA, a residential receptor will be addressed in the risk evaluation as a  
5 comparative baseline to other likely future land use scenarios and risk receptors (Section 6.1).  
6 However, a remedial alternative based on residential land use will not be evaluated in the FFS due to  
7 the following factors:

- 8  
9 • A portion of the AOC is located within a floodplain, which precludes residential land use;
- 10 • The physical characteristics of the majority of the AOC (e.g., approximately 45-degree slope  
11 in the AOC) preclude residential construction; and
- 12 • The location of Paris-Windham Road immediately adjacent to the AOC and wastes remaining  
13 in place preclude residential land use.

## 2.0 SCOPE

---

### 2.1 WORK PLAN APPROACH

This Work Plan (WP) presents the existing RD/RA data and provides a conceptual site model (CSM) incorporating site characteristics, the most likely foreseeable future land use, and evaluation of potential human and ecological receptors and exposure pathways. This WP further provides the framework and methodologies that will be used in the SC/FFS to:

1. Evaluate existing data to identify COPCs and COCs;
2. Identify remedial action objectives based on projected land use and exposure assumptions;
3. Conduct risk management evaluation and determine the need for any additional remedial actions; and
4. Evaluate and recommend a remedial alternative.

The WP scope and key assumptions are presented in Section 2.0. A summary of the background information for the AOC is provided in Section 3.0. The historical data are summarized along with the RD/RA screening results in Section 4.0. Section 5.0 provides a CSM. The human health and ecological risk evaluation methodologies that will be used to assess AOC conditions are provided in Section 6.0. Section 7.0 provides a summary along with a proposed outline for the SC/FFS. The project schedule is provided in Section 8.0.

### 2.2 KEY ASSUMPTIONS

Key assumptions used in the development of this WP and for the preparation of the SC/FFS include the following:

- The SC/FFS will evaluate all potential exposure pathways identified in the CSM. Groundwater data does not exist for the vicinity of the AOC. Therefore, groundwater will be excluded as a potential exposure pathway, and will be addressed by the U.S. Army under a future decision for the RVAAP Facility-Wide Groundwater AOC (RVAAP-68).
- Sediment and surface water samples were collected from an intermittent drainage swale adjacent to the active dump area. Because this drainage is intermittent, sediment is considered dry and will be treated as surface soil in the risk evaluation included in the SC/FFS.
- Previously collected data at the conclusion of the RD/RA were of good quality; however, the data screening processes employed in the RD/RA (MKM 2004) were not in conformance with current RVAAP protocols. As described in Section 6.1, COPCs and COCs will be

1 developed in the SC/FFS Report using current data screening processes (e.g., frequency of  
2 detection and essential human nutrient data screens) and draft facility-wide cleanup goals  
3 (CUGs) following the processes outlined in the *Final U.S. Army Corps of Engineers Ravenna*  
4 *Army Ammunition Plant (RVAAP) Position Paper for the Application and Use of Facility-*  
5 *Wide Human Health Cleanup Goals, June 2009* (USACE 2009).

## 3.0 BACKGROUND INFORMATION

---

### 3.1 FACILITY BACKGROUND INFORMATION

When the RVAAP Installation Restoration Program (IRP) began in 1989, RVAAP was identified as a 21,419-acre installation. The property boundary was resurveyed by OHARNG over a 2-year period (2002 and 2003) and the total acreage of the property was found to be 21,683.289 acres.

As of February 2006, a total of 20,403 acres of the former 21,683-acre RVAAP has been transferred to the National Guard Bureau (NGB) and subsequently licensed to OHARNG for use as a military training site (Camp Ravenna Joint Military Training Center). These transferred portions are now referred to as Camp Ravenna. The current RVAAP consists of 1,280 acres in various parcels throughout Camp Ravenna.

Camp Ravenna is in northeastern Ohio within Portage and Trumbull Counties, approximately 4.8 km (3 miles) east-northeast of the City of Ravenna and approximately 1.6 km (1 mile) northwest of the City of Newton Falls. The RVAAP portions of the property are solely located within Portage County. Camp Ravenna/RVAAP is a parcel of property approximately 17.7 km (11 miles) long and 5.6 km (3.5 miles) wide bounded by State Route 5, the Michael J. Kirwan Reservoir, and the CSX System Railroad on the south; Garret, McCormick, and Berry roads on the west; the Norfolk Southern Railroad on the north; and State Route 534 on the east. Camp Ravenna is surrounded by several communities: Windham on the north; Garrettsville 9.6 km (6 miles) to the northwest; Newton Falls 1.6 km (1 mile) to the southeast; Charlestown to the southwest; and Wayland 4.8 km (3 miles) to the south.

The entire 21,683-acre parcel was an industrial facility that was government-owned, contractor-operated when the RVAAP was operational (Camp Ravenna did not exist at that time). The RVAAP IRP encompasses investigation and cleanup of past activities over the entire 21,683 acres of the former RVAAP. References to RVAAP in this document are considered to be inclusive of the historical extent of RVAAP, which is inclusive of the combined acreages of the current Camp Ravenna and RVAAP, unless otherwise specifically stated.

Industrial operations at the former RVAAP consisted of 12 munitions-assembly facilities referred to as "load lines." Load Lines 1 through 4 were used to melt and load 2,4,6-trinitrotoluene (TNT) and Composition B into large-caliber shells and bombs. The operations on the load lines produced explosive dust, spills, and vapors that collected on the floors and walls of each building. Periodically, the floors and walls were cleaned with water and steam. Following cleaning, the waste water, containing TNT and Composition B, was known as "pink water" for its characteristic color. Pink water was collected in concrete holding tanks, filtered, and pumped into unlined ditches for transport to earthen settling ponds. Load Lines 5 through 11 were used to manufacture fuzes, primers, and boosters. Potential contaminants in these load lines include lead compounds, mercury compounds,

1 and explosives. Load Line 12 was used from 1946 to 1949 to produce ammonium nitrate for  
2 explosives and fertilizers, and portions of the AOC were later used for weapons demilitarization.  
3 In 1950, the facility was placed on standby status and operations were limited to renovation,  
4 demilitarization, and normal maintenance of equipment, along with storage of munitions. Production  
5 activities were resumed from July 1954 to October 1957 and again from May 1968 to August 1972.  
6 In addition to production missions, various demilitarization activities were conducted at facilities  
7 constructed at Load Lines 1, 2, 3, and 12. Demilitarization activities included disassembly of  
8 munitions and explosives melt-out and recovery operations using hot water and steam processes.  
9 Periodic demilitarization of various munitions continued through 1992.

10  
11 In addition to production and demilitarization activities at the load lines, other facilities at RVAAP  
12 include AOCs that were used for the burning, demolition, and testing of munitions. These burning  
13 and demolition grounds consist of large parcels of open space or abandoned quarries. Potential  
14 contaminants at these AOCs include explosives, propellants, metals, and waste oils. Other types of  
15 AOCs present at RVAAP include landfills, an aircraft fuel tank testing facility, and various general  
16 industrial support and maintenance facilities.

### 17 18 **3.2 RVAAP-51 DUMP ALONG PARIS-WINDHAM ROAD BACKGROUND AND DESCRIPTION**

19  
20 The Dump Along Paris-Windham Road is located along a steep embankment on the west side of  
21 Paris-Windham Road in the east-central portion of the facility between the intersections of Paris-  
22 Windham Road and Remalia Road approximately 100 feet east of Sand Creek (Figure 3-1). The  
23 AOC was used as an open dump for a variety of miscellaneous construction and demolition (C&D)  
24 type materials including transite roofing and siding (ACM), lab bottles and drums, concrete, brick,  
25 glass, scrap metal, fencing, and wood debris. There are no records indicating the quantities of  
26 materials dumped at the AOC, or the dates of operation. The dump is approximately 400 feet long by  
27 20 feet wide and slopes east to west away from Paris-Windham Road. The slope face ranges from 40  
28 to 60 degrees from horizontal. There are no structures or dwellings on the AOC. Surface water  
29 runoff follows the topography and flows in a westerly direction, entering Sand Creek. The Sand  
30 Creek flood plain occupies the land between the dump and Sand Creek.

31  
32 Preliminary site assessments found the AOC overgrown with mature trees and ground-level  
33 vegetation. Large, co-mingled piles of surface debris were most evident in the southern portion of the  
34 AOC, while individual items and small debris piles scattered throughout the northern boundary.

### 35 36 **3.3 PREVIOUS INVESTIGATIONS AND ACTIVITIES**

#### 37 38 **3.3.1 Relative Risk Site Evaluation**

39  
40 The U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) conducted a  
41 Relative Risk Site Evaluation (RRSE) for Newly Added Sites at the RVAAP in 1998 (Hazardous and  
42 Medical Waste Study No. 37-EF-5360-99, 19-23 October 1998). From the 13 AOCs that were  
43 evaluated, five were classified as high priority AOCs. The Dump Along Paris-Windham Road

(RVAAP 51) was one of these five AOCs. The RRSE identified surface soil and sediments to be potential media for contaminant migration at the Dump Along Paris-Windham Road due to the lack of any physical barriers (e.g., fencing) and proximity to Sand Creek. Samples were collected and analyzed for SVOCs, explosives, and metals. The study found the AOC contained C&D debris, including ACM (transite siding) and inorganic contaminants. The RRSE identified potential human and ecological receptors for surface soil and sediment contamination and assumed complete exposure pathways because there were no access controls (e.g., fence) in place. As a result, the RRSE for this AOC was scored as "High."

### 3.3.2 RD/RA Activities

The 2003 RD/RA activities are summarized in the *Final Report for Remedial Design/Remedial Action at Paris-Windham Road Dump* (MKM 2004). The RD/RA was conducted in accordance with CERCLA to mitigate risk related to potential contact with exposed waste materials. The RD/RA was not intended to be a final remedy and, as noted in Section 1.2, the U.S. Army planned for future evaluation of the need for additional characterization and remedial actions under a SC/FFS and the completion of the CERCLA process.

On April 19, 2003, the RD/RA was initiated at the Dump Along Paris-Windham Road. Removal and confirmation sampling activities were concluded on April 28, 2003. Initial site preparation and mobilization activities included an ordnance and explosive survey. The RD/RA removal activities consisted of removing all existing unconsolidated surface debris, limited removal of subsurface debris, transportation and disposal of debris, performing confirmation sampling and site restoration (Photograph 3-1). A combined total of 300.66 tons of surface soil material and subsurface transite debris was removed from the AOC. During the surface debris removal operations, subsurface pockets and veins of buried transite debris were exposed at several different locations at the AOC. Although removal of subsurface debris was not included in the original RD/RA scope, the subsurface transite was removed. However, because removing the material may have potentially undermined Paris-Windham Road, small fragments of transite were left in place in the southern portion of the AOC.

Prior to site restoration, a total of 10 confirmation samples were collected within the limits of the AOC to evaluate the success of the RD/RA (Figure 3-2). Additionally, six co-located sediment/surface water samples were collected from a drainage swale at the base of the toe slope and within the neighboring floodplain to characterize impacts associated with runoff. Two contingency samples were later collected (September and October 2003) and analyzed. Sampling results are summarized in Section 4.0.

Following collection and review of confirmatory and contingency samples, the excavation area was restored to grade using a combination of clean, hard fill and approved soil backfill in November 2003. Approximately 480 tons of non-contaminated concrete demolition material of various sizes obtained from the approved stockpile at Load Line 6 was used to create a layer of clean, hard fill for stability, followed by approximately two feet (277 tons) of soil backfill material for cover (Photograph 3-2).

- 1 The area was seeded and mulched (Photograph 3-3). Site reconnaissance data from a walkover
- 2 conducted by SAIC in August 2009 shows extensive healthy re-vegetation of the area covered with
- 3 clean soil backfill material. A view of the current conditions is provided on Photograph 3-4.

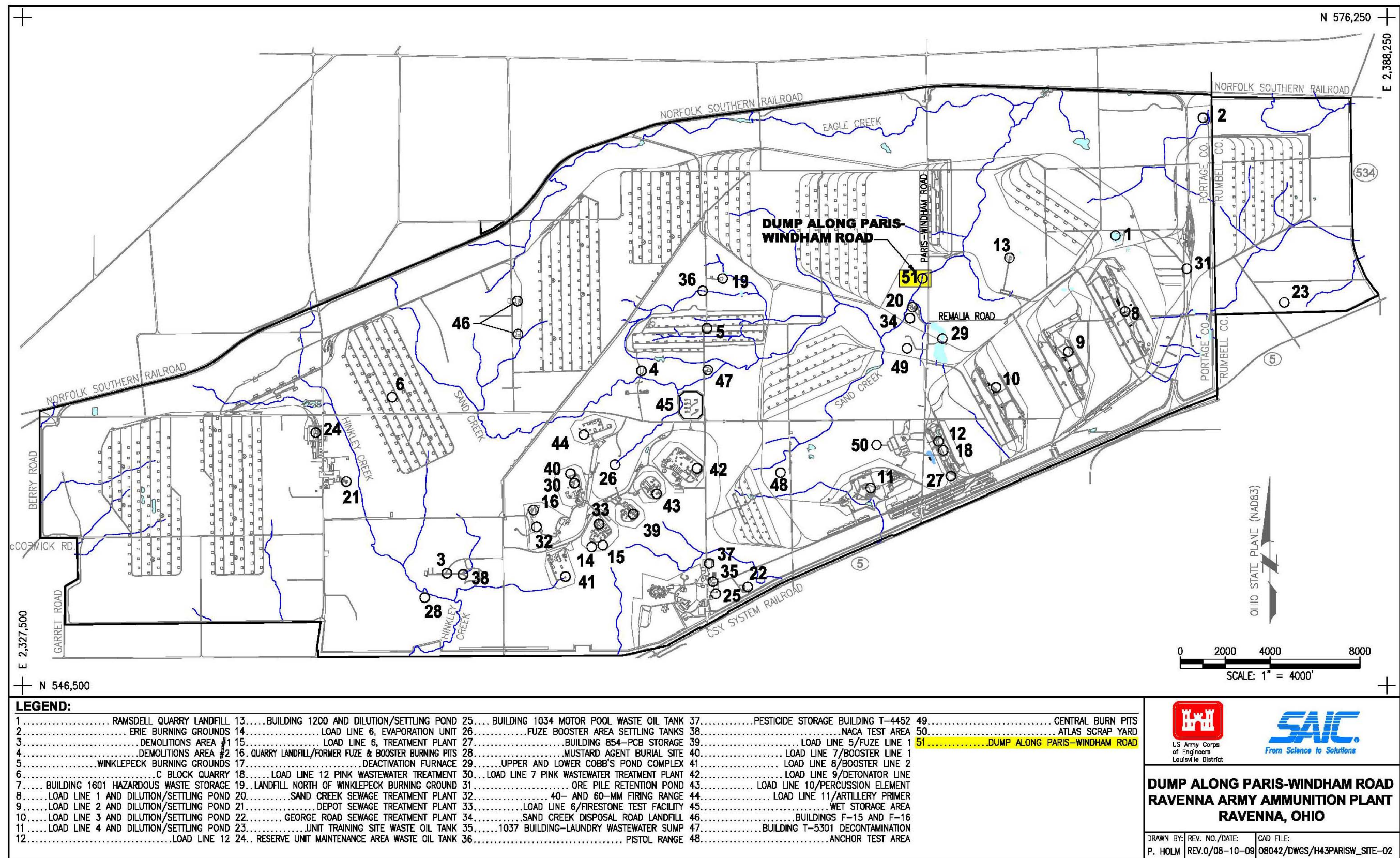


Figure 3-1. Location of Dump Along Paris-Windham Road within RVAAP/Camp Ravenna

**THIS PAGE INTENTIONALLY LEFT BLANK.**

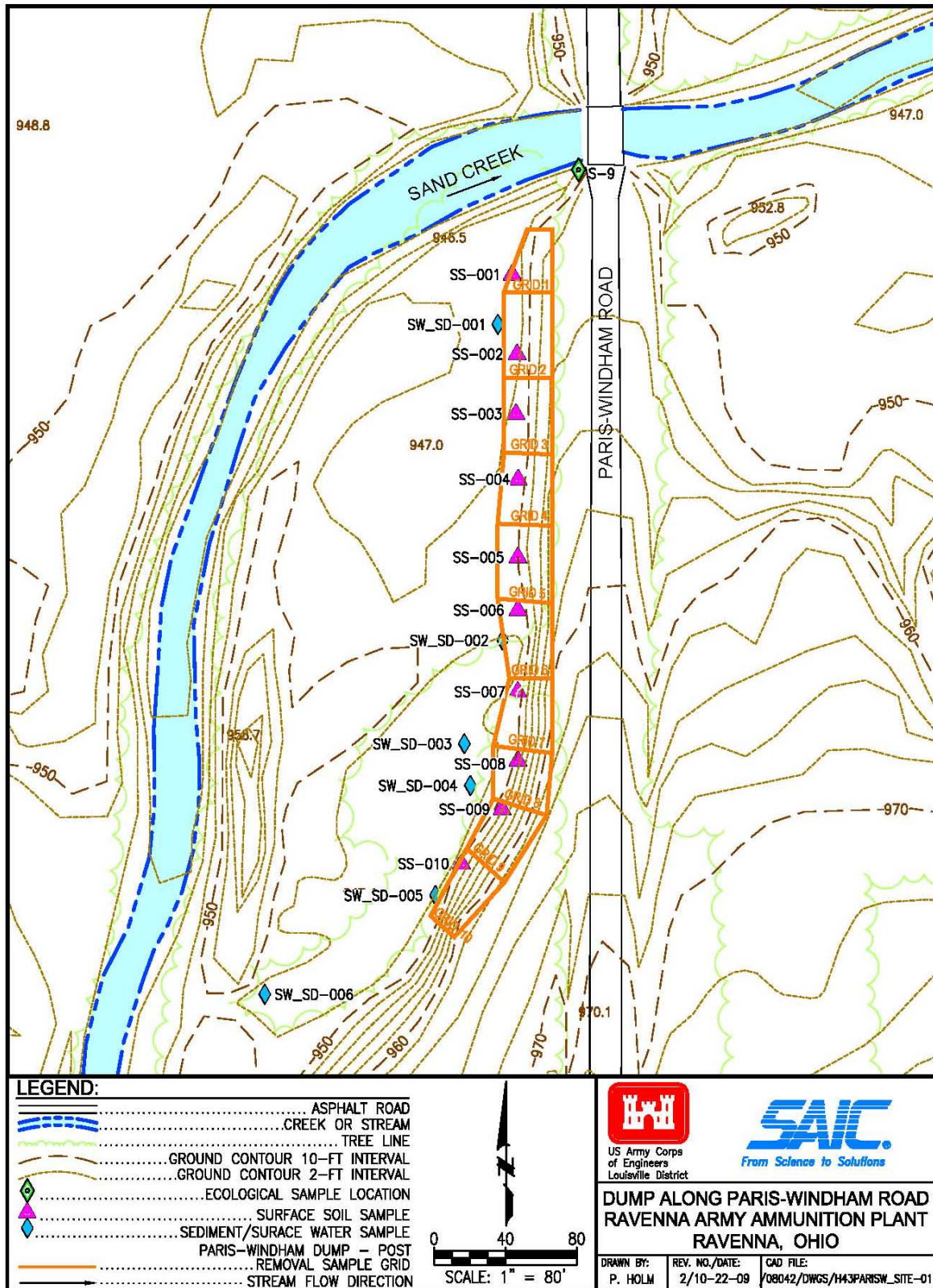


Figure 3-2. Sample Location Map



**Photograph 3-1. Debris Removal Activities Near Grid #4 and Grid #5,  
April 2003**



**Photograph 3-2. Installation of Two-foot Soil Backfill Cover During  
Restoration Activities, November 2003**



**Photograph 3-3. Site Conditions at the Completion of Site Restoration Activities, November 2003**



**Photograph 3-4. Southern Portion of the AOC Near the Drainage Swale, August 2009**

**THIS PAGE INTENTIONALLY LEFT BLANK.**

## 4.0 DATA SUMMARY

---

### 4.1 RD/RA DATA SUMMARY

Upon completion of the surface debris removal operations, and prior to application of the soil cover, confirmation and contingency samples were collected to evaluate the success of the RD/RA and provide data for future evaluation of a final remedy. The dump area was divided into 10 equally-sized grids to facilitate collection of discrete and multi-incremental soil samples (Figure 3-2).

Confirmation sampling activities included collecting one discrete shallow (0-1 ft) soil sample from each of the 10 grids measuring approximately 40 feet by 20 feet. Additionally, six confirmatory sediment and surface water samples were collected, one at each of the co-located sites. Five of these sites (SW\_SD 2 through 6) were located within the adjacent Sand Creek floodplain in an intermittent drainage swale between the dump and Sand Creek. One sample location (SW\_SD 1) was located on the north end of the AOC outside the waterway (Figure 3-2). The 2003 RD/RA did not differentiate whether the sediment samples were considered wet sediment or dry sediment. Therefore, conditions of the AOC were evaluated, inclusive of a field survey, and a determination of the sediment type (wet or dry per RVAAP standards) was performed as part of the CSM (Section 5.0).

Confirmation samples were analyzed for target analyte list (TAL) metals and asbestos. In addition, ten percent of the samples were analyzed for a full suite of parameters including explosives, SVOCs, cyanide, volatile organic compounds (VOCs), propellants, and pesticides/polychlorinated biphenyls (PCBs), and asbestos. Full-suite analyses were performed on samples collected from Grid 9 and sediment/surface water sampling location SW\_SD-004 (Figure 3-2).

The results indicated elevated concentrations (i.e., above 2001 USEPA Region 9 Residential PRGs) of arsenic in the soil, sediment and surface water. Elevated concentrations of SVOCs were also detected in the soil and sediment (Grid location 9 and sediment location 4). These constituents included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, indeno(1,2,3-cd) pyrene, and PCB-1254 at grid location 9. At sediment location SW\_SD-004, only benzo(a)pyrene was detected above PRGs. No SVOCs were detected above detection limits in the surface water sample. Asbestos fibers were not detected in any of the samples collected.

Based on the results, two contingency multi-increment (MI) samples were collected. On September 30, 2003, an MI sample at grid location 9 consisting of 10 random shallow soil aliquots was collected and analyzed for SVOCs only. A second contingency sample, collected on October 30, 2003 and consisting of 40 random (4 from each grid) shallow soil aliquots, was collected to evaluate the extent of the SVOC contamination over the entire AOC. The results of the contingency sampling effort verified that elevated levels of SVOCs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd) pyrene, and dibenzo(a,h)anthracene, were present in the soil.

**THIS PAGE INTENTIONALLY LEFT BLANK.**

## 5.0 CONCEPTUAL SITE MODEL

---

### 5.1 PRIMARY SOURCE AND MIGRATION PATHWAY

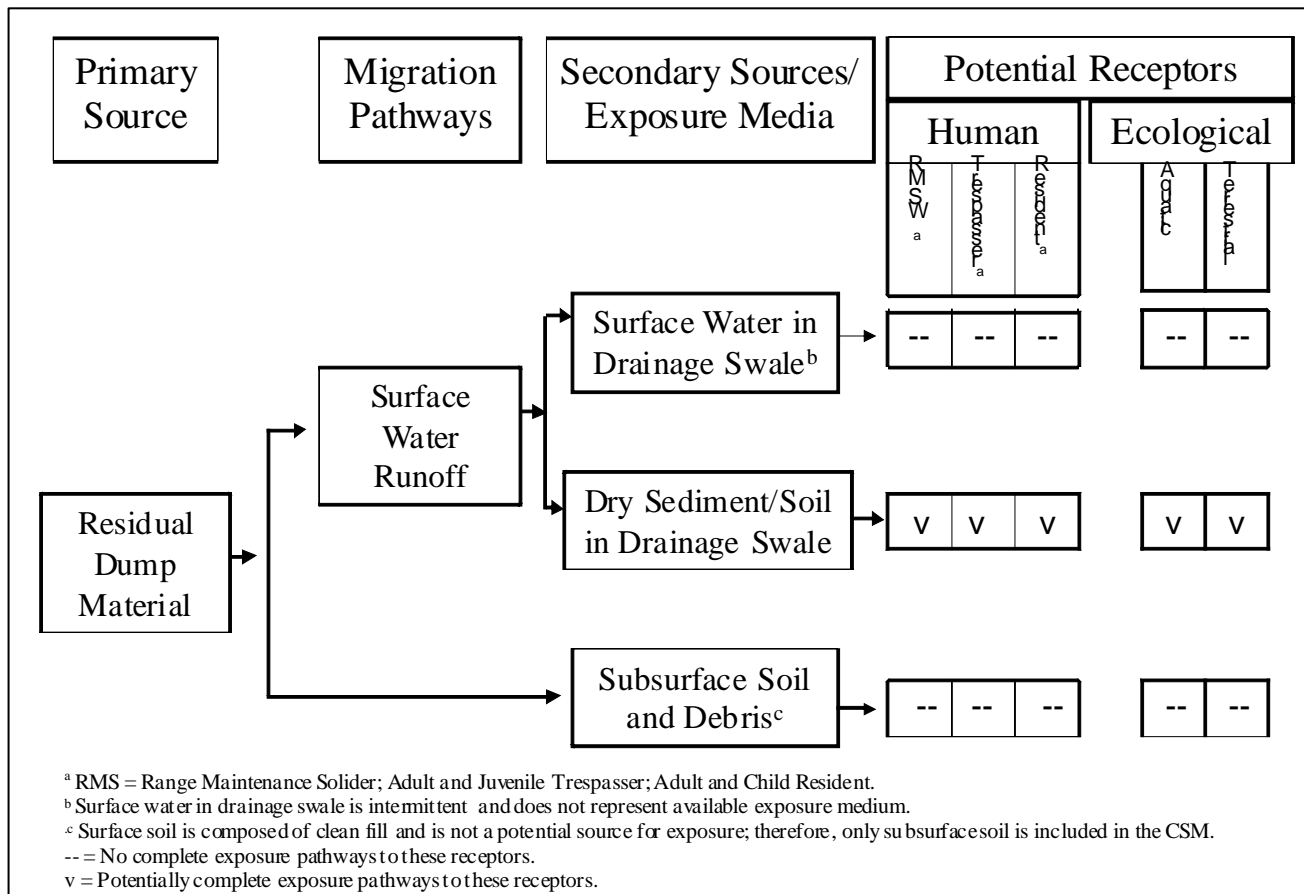
Figure 5-1 illustrates a preliminary CSM for the Dump Along Paris-Windham Road. The primary source of any contamination was the residual dump material. However, following the 2003 removal action, clean hard fill (i.e., non-contaminated concrete demolition material of various sizes obtained from the approved stockpile at Load Line 6) and a layer of Ohio Environmental Protection Agency (Ohio EPA)-approved clean soil backfill (obtained from Patrick Excavating on Route 5) were placed on top of the ten excavated grids, and the area was re-vegetated (Figures 3-4 and 3-5). The fill and cover included approximately 760 tons of material with a minimum thickness of 2 feet (MKM 2004). This area is about 30 feet wide by 400 feet long (approximately 0.3 acres) in size (Figure 3-2). Therefore, the primary migration pathway is surface water runoff.

### 5.2 SECONDARY SOURCES

A long, narrow drainage swale exists down slope of the gridded area where confirmatory surface water and sediment samples were taken in late April 2003. Based on the RD/RA report, clean backfill soil was not placed in the drainage swale following the removal action (Figure 3.2). The drainage swale is estimated to be 15 feet wide x 400 feet long (approximately 0.15 acres). In the swale, surface water only occurs during occasional storms or overflow conditions from nearby Sand Creek. During a walkover conducted by SAIC in August 2009, the sediment in the drainage swale had a high moisture content, but no standing water was observed. Sand Creek flows northward about 400 feet west of the gridded area and comes as close as 40 feet at the northern end of the AOC. Based on conditions of the AOC, sediment in the drainage swale is considered dry sediment because of the ephemeral surface water. Therefore, there are three secondary sources at the AOC (Figure 5-1): 1) surface water in the drainage swale; 2) dry sediment in the drainage swale; and 3) subsurface soil and debris under the layers of clean hard fill and soil back fill placed during the RD/RA.

### 5.3 POTENTIAL RECEPTORS

Potential human and ecological receptors have been identified for the Dump Along Paris-Windham Road, and these are shown on Figure 5-1 as part of the complete CSM. Human and ecological receptors and associated exposure pathways, are detailed in Section 6. Section 6.1 discusses the future land uses, exposure pathways, and the selection of representative human receptors included in the CSM. Section 6.2 discusses selection of representative ecological receptors and evaluation of ecological risk weight-of-evidence (WOE).



**Figure 5-1. Preliminary Conceptual Site Model for Dump Along Paris-Windham Road (RVAAP-51)**

## 6.0 RISK EVALUATION METHODS

---

This section of the WP is based on the CSM (Section 5.0) and describes the methods that will be used to prepare the human (Section 6.1) and the ecological (Section 6.2) risk evaluations in the SC/FFS.

### 6.1 HUMAN HEALTH RISK MANAGEMENT EVALUATION

The human health risk management evaluation in the SC/FFS will consist of the following three steps:

1. Evaluate representative site-specific receptors and exposure media;
2. Identify COCs using appropriate RVAAP risk-based, facility-wide CUGs and background values; and
3. Identify the specific facility-wide CUGs that are applicable for the FFS. Evaluate nature and extent of COCs.

#### 6.1.1 Identification of Representative Site-Specific Receptors

The following information was considered when identifying representative receptors for the Dump Along Paris-Windham Road that will be evaluated in the SC/FFS:

- This area is designated as the surface danger zone (SDZ) for a small arms range complex per the OHARNG Land-Use Summary Table (OHARNG 2008).
- No specific development project is identified for this AOC.
- Utilities are located on the east side of Paris-Windham Road due to the presence of transite on the west side of the road in this area.
- The area is not fenced and does not have any additional security beyond those in place for the entire facility.
- The dump area is small, and located on a steep slope starting at the berm to the west of Paris-Windham Road, with a flood plain at the bottom.

The SDZ is defined as the safety zone for the range based on the chance of a ricochet from the range. No impact from the range is anticipated in this area, and no range construction activities will be conducted in this area. Activity on the site will consist of occasional foot traffic associated with monitoring the SDZ, minor range maintenance activities (e.g., mowing and control of vegetation), and road maintenance (e.g., mowing along road berm, road surface repairs/patching). This land use is best represented by the Range Maintenance Solider receptor. Because this area does not have

1 elevated security measures, trespassers may visit the site. Therefore, representative receptors that will  
2 be evaluated in the SC/FFS are the Range Maintenance Soldier and Adult and Juvenile Trespassers.  
3 The National Guard Trainee is not considered an appropriate receptor for this area because the AOC  
4 is within the SDZ for a small arms range complex, and because it is a small area on a steep road berm.  
5 The topography of the area (i.e., steep slope and flood plain) preclude residential development;  
6 however, in addition to the site-specific receptors, a residential receptor will also be included as a  
7 comparative baseline in accordance with CERCLA and for evaluation of potential future unrestricted  
8 use. The Resident Farmer Adult and Child receptors developed specific to RVAAP will be evaluated  
9 as outlined in the Facility-Wide Human Health Risk Assessor Manual (FWHHRAM) Amendment 1  
10 (USACE 2005a). Application of these receptor scenarios to the Paris-Windham AOC is described in  
11 more detail as follows:

- 12  
13 • Range Maintenance Soldier – This receptor represents OHARNG personnel who may  
14 occasionally visit the site in connection with its status as part of the SDZ for the adjacent  
15 range, or for other routine or occasional monitoring of the area. This receptor is assumed to  
16 contact shallow surface soil (including dry sediment).
- 17 • Adult and Juvenile Trespassers – These receptors are assumed to contact shallow surface soil  
18 (including dry sediment).
- 19 • Resident Farmer (Adult and Child) – These receptors are generally assumed to contact  
20 shallow surface soil and subsurface soil. This AOC is located on a steep embankment, is  
21 bordered by a flood plain and a road, and is not suitable for residential use (e.g., a house  
22 cannot be built directly on the AOC). However, for evaluation of a residential scenario, it is  
23 assumed that a residence could be built across the road from the AOC with a yard that  
24 encompasses the road and hillside. Based on this scenario, the residential receptors are  
25 assumed to contact shallow surface soil (including dry sediment) only. Exposure to  
26 subsurface soil is not included because the foundation of a house would have to be located  
27 outside the AOC.

### 28 29 **6.1.2 Identification of Constituents of Concern**

30  
31 As part of the risk management evaluation in the SC/FFS, COCs will be defined by comparison of  
32 RD/RA sample results to RVAAP facility-wide CUGs as described in the USACE Position Paper on  
33 Human Health CUGs (USACE 2009). The facility-wide CUGs are established in the *Draft Facility-  
34 Wide Human Health Cleanup Goals Report for the RVAAP* (USACE 2008), herein referred to as the  
35 Draft CUG Report. The Draft CUG Report identified facility-wide CUGs by media for each  
36 chemical for various receptors and risk levels. The determination of COCs will consist of the  
37 following screening process:

- 38  
39 • Identify those shallow surface soil/dry sediment facility-wide CUGs that apply for Resident  
40 Farmer (Adult and Child) Receptors and the appropriate receptors for the Dump Along Paris-  
41 Windham Road (i.e., the Security Guard/Maintenance Worker and Juvenile and Adult

1 Trespasser) at a target cancer risk of 1.0E-05 and target hazard quotient (HQ) of 1.0 for all  
2 shallow surface soil/dry sediment COCs (including dry sediment).

3 • Include both cancer-based and noncancer-based facility-wide CUGs, and report critical effect  
4 and target organ for each of the non carcinogen-based, facility-wide CUGs.

5 • Compare the exposure point concentration (EPC) for each COPC to the appropriate facility-  
6 wide CUG. The EPC will be either the 95% upper confidence limit (UCL) of the mean, or the  
7 maximum value detected, depending upon whichever value is the lowest.

8 • For noncarcinogens, sum the ratios of the EPC to the facility-wide CUG for all chemicals that  
9 affect similar target organs.

10 • For carcinogens, sum the ratios of the EPC to the facility-wide CUG for all carcinogens.

11 Because the drainage swale (evaluated as shallow surface soil/dry sediment) is very small  
12 (approximately 0.15 acres), EPCs will be calculated for a single exposure unit using all of the  
13 sediment data previously collected. A constituent will be identified as a COC if one of the following  
14 occurs:

15  
16 1. The EPC exceeds the most stringent facility-wide CUG for the Resident Farmer (Adult and  
17 Child), or any of the OHARNG planned future use receptors (Security Guard/Maintenance  
18 Worker and Juvenile and Adult Trespasser); or

19 2. The constituent contributes significantly (i.e., a least 10%) to a Sum of Ratios greater than  
20 1.0.

21 It is assumed that the presence of concentrations at or less than the background value indicates the  
22 absence of contamination. Therefore, if the facility-wide, CUG-based screening criterion for an  
23 inorganic chemical is less than background, the background value will be used as the screening  
24 criterion. Because the Draft CUG Report includes facility-wide CUGs for all chemicals identified  
25 above 2001 EPA Region 9 PRGs in soil and sediment at the Dump Along Paris-Windham Road, no  
26 additional AOC-specific CUG development will be required. The draft facility-wide CUGs are  
27 subject to change as the Draft CUG Report is reviewed and finalized by RVAAP stakeholders.  
28 Therefore, revised or additional data comparisons for risk management decisions may be required at a  
29 later point in the CERCLA process.

30

### 31 **6.1.3 Identify Cleanup Goals for the Focused Feasibility Study**

32

33 In accordance with the Final USACE Position Paper for the application and use of facility-wide  
34 CUGs (USACE 2009), the facility-wide CUGs established in the Draft CUG Report are the  
35 remediation levels for the designated end user for any COCs identified for the Dump Along Paris-  
36 Windham Road unless there are additive effects to be considered. In some circumstances, there may  
37 be a risk management analysis approach [e.g., WOE] that may allow the COC to be re-assessed.

#### 6.1.4 Nature and Extent

The SC/FFS will include an evaluation of contaminant nature and extent based on existing data. The evaluation will assess the distribution of any identified COCs to determine where exceedances of facility-wide CUGs occur, and if those exceedances are clustered or isolated. This information will establish causal relationships and determine whether contaminant migration has occurred from source materials to other media (e.g., sediment in the drainage swale). The nature and extent evaluation will ultimately be considered in the risk management decisions for the appropriate final remedial response.

### 6.2 ECOLOGICAL RISK EVALUATION AND WEIGHT-OF-EVIDENCE

The ecological risk evaluation will consist of a WOE approach rather than a mathematical or quantitative risk assessment. As shown in the CSM (Figure 5-1) and as described in the human health assessment method (Section 6.1), only one exposure pathway is assumed to be open in this small area (0.3 acre).

The WOE assessment will only address potential chemical exposure from uncovered sediment or soil, and will consist of using four elements:

1. Facts about ecological resources [e.g., streams, wetlands and threatened and endangered (T & E)] species habitats will be assembled and noted.
2. The land use for human health assessment will be used in the ecological WOE.
3. Site characteristics such as slope, soil cover, and vegetative cover will be collected based on previously reported conditions (MKM 2004) and an August 2009 site reconnaissance by SAIC.
4. The likelihood of surface water conveyance of contaminants from the AOC to nearby habitats will be ascertained. One of the principal sources of information will be the *Facility-Wide Biological and Water Quality Study* (USACE 2005b).

Photographs of current site conditions and habitats will be taken to supplement photographs published in the MKM report (MKM 2004). This information, along with the WOE elements, will be used to reach a risk management decision about the ecological resources at the AOC.

## 7.0 SUMMARY

---

Based on results of the RD/RA confirmatory sampling effort, three metal compounds and several SVOCs were found to be present above screening criteria used at that time (background and 2001 USEPA Region 9 PRGs) in soil within the dump limits and in dry sediment in a drainage swale. In order to avoid potentially undermining the structure of Paris-Windham Road, residual small fragments of transite were left in place along the slope of the southern half of the AOC. These fragments were subsequently covered in place during site restoration operations. The RD/RA recommended that a risk assessment be performed using the existing data to verify that RD/RA activities were sufficient to allow for CERCLA remedy (MKM 2004).

After evaluation of the CSM (Section 5.0), it was determined that the only potential open exposure pathway for both human and ecological receptors is dry sediment within the drainage swale. Surface soil within the AOC is not a potential source of exposure because, following the 2003 removal action, clean hard fill for stability and a layer of clean soil backfill material were placed on top of the ten excavated grids (approximately 760 tons of material to a depth of 2 feet) and the area was re-vegetated (MKM 2004). Transite should not be considered further as it is not exposed and the surface soil/subsurface soil pathway has been determined to be incomplete. Furthermore, asbestos was not detected in any of the sampling results.

Human health and ecological risk management evaluation in the SC/FFS will be completed as described in this WP. If no human health COCs are identified in the SC/FFS and the ecological WOE indicates no actions are needed to protect ecological resources, the SC/FFS will recommend no further action at the AOC. If COCs are identified for remediation, the SC/FFS will screen appropriate remedial process options for shallow surface soil/dry sediment and remedial alternatives will be developed and evaluated in accordance with CERCLA guidance. Based on the remedial alternative evaluation, a recommended alternative for soil and dry sediment will be made in the FFS. The SC/FFS will compare concentrations of COPCs to USEPA Generic Soil Screening Levels to determine if any chemicals may have a potential to leach to groundwater, and will make recommendations as needed for further consideration under a future groundwater action.

The proposed outline for the SC/FFS is as follows:

- Executive Summary
- Section 1.0: Introduction
- Section 2.0: Background Information
- Section 3.0: Occurrence and Distribution of Contamination
- Section 4.0: Human Health Risk Evaluation and Ecological Weight-of-Evidence
- Section 5.0: Remedial Action Objectives
- Section 6.0: Applicable or Relevant And Appropriate Requirements
- Section 7.0: Technology Types and Process Options
- Section 8.0: Development of Remedial Alternatives

- 1       • Section 9.0: Analysis of Remedial Alternatives
- 2       • Section 10.0: Agency Coordination and Public Section Involvement
- 3       • Section 11.0: Conclusions
- 4       • Section 12.0: References

## 1    **8.0 SCHEDULE**

---

- 2    The anticipated schedule for the completion of the SC/FFS for the Dump Along Paris-Windham Road  
3    (RVAAP-51) is provided on Figure 8-1.

**THIS PAGE INTENTIONALLY LEFT BLANK.**

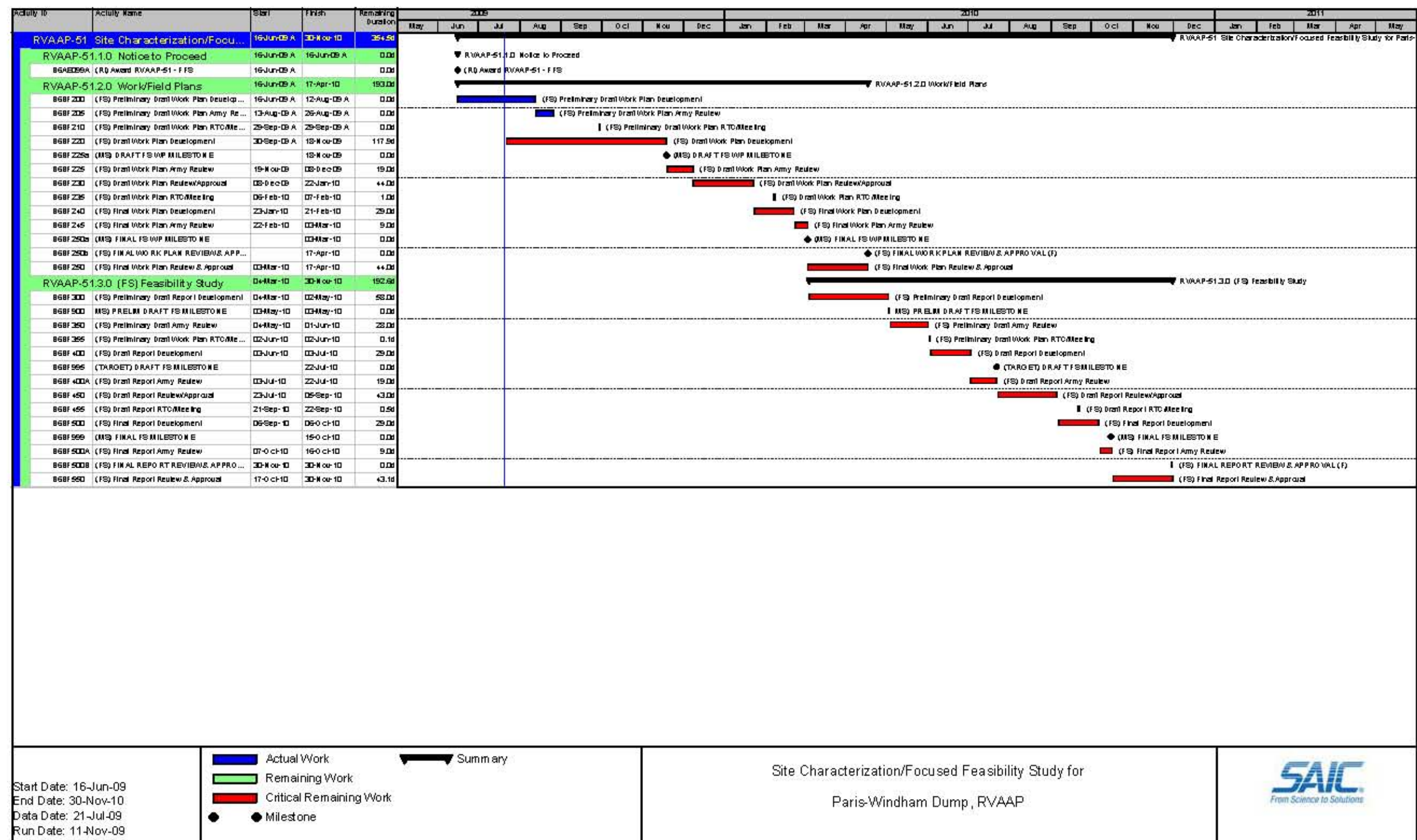


Figure 8-1. Project Schedule

**THIS PAGE INTENTIONALLY LEFT BLANK.**

## 9.0 REFERENCES

---

- MKM (MKM Engineers, Inc.) 2004. *Final Report for Remedial Design/Removal Action Plan for Paris-Windham Road Dump*. March 2004.
- Ohio Army National Guard (OHARNG) 2008. Land Use Summary Table, personal communication from Katie Elgin OHARNG. August 14, 2009.
- Ohio EPA (Ohio Environmental Protection Agency) 2004. *Director's Final Findings and Orders in the matter of U.S. Department of the Army, Ravenna Army Ammunition Plant*. June 2004.
- USACE (United States Army Corps of Engineers) 2005a. *Ravenna Army Ammunition Plant Facility-wide Human Health Risk Assessor Manual, Amendment 1*, U.S. Army Corps of Engineers, Louisville District, 01 November 2005.
- USACE (United States Army Corps of Engineers) 2005b. *Facility-wide Biological and Water Quality Study 2003 at the Ravenna Army Ammunition Plant*. November 2005.
- USACE 2008. *Draft Facility-Wide Human Health Cleanup Goals Report for the Ravenna Army Ammunition Plant, Ravenna, Ohio*. September 2008.
- USACE 2009. *Final United States Army Corps of Engineers Ravenna Army Ammunition Plant (RVAAP) Position Paper for the Application and Use of Facility-Wide Human Health Cleanup Goals*. June 2009.
- U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) 1998. *Relative Risk Site Evaluation for Newly Added Sites at the Ravenna Army Ammunition Plant, Ravenna, Ohio*. Hazardous and Medical Waste Study No. 37-EF-5360-99. October 1998.

**THIS PAGE INTENTIONALLY LEFT BLANK.**