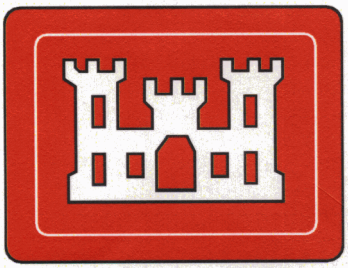
Final

ACTION PLAN
FOR THE
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

PREPARED FOR



U.S. ARMY CORPS OF ENGINEERS
NASHVILLE DISTRICT

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ACTION PLAN
FOR THE
RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO

Prepared for

U.S. Army Corps of Engineers
Nashville District
Nashville, Tennessee

Prepared by

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Under Contract DACA62-94-D-0029

March 1996

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

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

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ACRONYMS

AHP	Analytical Hierarchy Process
AOC	Area of Concern
AST	aboveground storage tank
CAPs	Corrective Action Plans
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CMSs	Corrective Measures Studies
COC	chemical of concern
DERP	Defense Environmental Restoration Program
DLA	Defense Logistics Agency
DoD	United States Department of Defense
DOE	United States Department of Energy
DQA	Data Quality Assessment
DQO	Data Quality Objective
DSERTS	Defense Sites Environmental Restoration Tracking System
EA	Environmental Assessment
EPA	United States Environmental Protection Agency
FS	Feasibility Study
FSHP	Facility-wide Safety and Health Plan
FSP	Field Sampling Plan
GPD/ft	gallons per day per foot
GPM	gallons per minute
HM	hazardous material(s)
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HRS	Hazard Ranking Score

IDW	Investigation-Derived Wastes
IOC	Industrial Operations Command
IRA	Interim Removal Action
IRP	Installation Restoration Program
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NFRAP	No Further Remedial Action Planned
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OB/OD	Open Burning/Open Detonation
OEPA	Ohio Environmental Protection Agency
PA	Preliminary Assessment
PAS	Preliminary Assessment Screening
PCB	polychlorinated biphenyl
PCOC	Potential Chemical of Concern
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
REC	Record of Environmental Consideration
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RMIS	Restoration Management Information System
ROE	Report of Excess
RRSE	Relative Risk Site Evaluation
RVAAP	Ravenna Army Ammunition Plant
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SI	Site Investigation
SWMU	Solid Waste management Unit
TNT	trinitrotoluene
TSCA	Toxic Substances Control Act
USACE	United States Army Corps of Engineers
USAEHA	United States Army Environmental Hygiene Agency
USATHAMA	United States Army Toxic and Hazardous Materials Agency
UST	underground storage tank

DEFINITIONS

Action Plan (AP)	An annual plan submitted by U.S. Army installations statusing current and future planned environmental activities at the installations.
Area of Concern (AOC)	Under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), a site where contamination is known or suspected to exist.
Ammatol	A mixture of ammonium nitrate and TNT.
Defense Environmental Restoration Program (DERP)	A program established by Congress in 1984 to evaluate and clean up contamination from past U.S. Department of Defense (DoD) activities (Title 10 U.S. Code 2701-2707 and 2810).
Facility-wide Sampling and Analysis Plan (SAP)	A submittal document comprised of the Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP); used to define all aspects of sampling and analytical work expected to be common to an installation. Not implementable without an investigation-specific SAP Addendum.
Facility	All contiguous land and structures, other appurtenances, and improvements within the boundaries of a property or parcels.
Facility-wide	A term used to reference all land and structures comprising a facility.
Feasibility Study (FS)	Based on data collected during the remedial investigation, options for final cleanup actions are developed and evaluated in the FS. The FS is divided into two phases: (1) an initial screening of alternatives, followed by (2) the detailed analysis of alternatives. The detailed analysis considers, among other things, cost-effectiveness, short- and long-term effectiveness, and the overall protection of human health and the environment.
Installation	A military facility or base.
Interim Remedial Action (IRA)	An early response action that is identified and implemented at any time during the study or design phase. IRAs are limited in scope, and they address only areas or media for which a final remedy will be developed by the remedial investigation (RI)/FS process. An IRA should be consistent with the final remedy for a site.
Investigation-Specific Sampling and Analysis Plan (SAP) Addendum	A submittal document comprised of the FSP and QAPP; used to define specific aspects of sampling and analytical work during the investigation of one or more AOCs. Tiered under the Facility-wide SAP and not implementable without the Facility-wide SAP.

No Further Action (NFA)	A no further action decision is a decision to close out a site from further response action. Such decisions can be made at different points in the process if data indicate that risks are within acceptable levels.
Pink Water	Waste water colored pink as a result of the photochemical reaction of TNT in water.
Phase I Remedial Investigation	Performed if the Preliminary Assessment (PA) recommends further investigation. Phase I investigations typically collect waste and environmental samples to determine the hazardous substances present at a site and whether they are being released to the environment.
Phase II Remedial Investigation (RI)	A field investigation that is more extensive than a Phase I RI. Its purpose is to characterize the nature and extent of contamination at a site. The Phase II RI also assesses the risks posed by on-site contamination to human health and the environment.
Preliminary Assessment (PA)	A limited-scope investigation designed to distinguish between sites that pose little or no threat to human health and the environment and sites that require further investigation. The PA is based on installation record searches, visual site inspections, and interviews of site personnel.
Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA)	The first step in the RCRA corrective action process. The RFA acts as a screen, first identifying and then eliminating solid waste management units (SWMUs), environmental media, or entire facilities from further consideration for corrective action. RFAs are performed as part of the RCRA permitting process.
Relative Risk	The grouping of sites or AOCs in the DERP into High, Medium, and Low categories based on an evaluation of site information using three key factors: the contaminant hazard factor, the migration pathway factor, and the receptor factor.
Remedial Action (RA)	Involves the construction, operation, and implementation of the final cleanup remedy. Long-term RAs require continued monitoring, operation, and maintenance for a number of years.
Remedial Design (RD)	Involves the development of the actual design of the selected cleanup remedy, including preparation of all technical drawings and specifications needed to implement the cleanup action.
Removal Action	An action taken to respond to a release, or threat of a release, of hazardous substances, pollutants, or contaminants so as to prevent, minimize, or mitigate harm to human health or the environment. Such actions may be taken during any phase of the site cleanup.

Site	An area(s) of known or suspected release or source of contamination including all potentially affected media (soil, groundwater, surface water, sediment, air).
Solid Waste Management Unit (SWMU)	Under RCRA, a site where solid waste or wastelike material is known or suspected to exist.
Strategic and Critical Materials	A government phrase referring to substances/materials essential to the effective conduct of war.

ACTION PLAN
Ravenna Army Ammunition Plant
Ravenna, Ohio

1. INTRODUCTION

This Action Plan has been prepared for the Ravenna Army Ammunition Plant (RVAAP), Ravenna, Ohio, by Science Applications International Corporation (SAIC) under Contract DACA62-94-D-0029, Delivery Order D0-0009, with the U.S. Army Corps of Engineers (USACE), Nashville District. The purpose of this plan is to present an annual overview of the U.S. Department of Defense (DoD) Defense Environmental Restoration Program (DERP) activities at the RVAAP leading to strategic planning and funding prioritization for current and future DERP activities. The objectives of the Action Plan are to:

- identify the current regulatory status of all sites at RVAAP,
- present the approach to environmental restoration of sites at RVAAP based on the appropriate regulatory drivers,
- establish DERP annual funding priorities for Areas of Concern (AOCs) based on the highest probable threat to human health and the environment,
- present the technical approach for conducting Installation Restoration Program (IRP) activities at RVAAP,
- identify current and planned environmental restoration activities at RVAAP, and
- facilitate strategic planning of environmental activities at RVAAP through regulatory participation.

Strategic planning and funding for environmental restoration at RVAAP will be an ongoing process. The process will change and develop as more information is collected and the environmental conditions at RVAAP are better understood, and as interaction with the regulator agencies continues. In addition, environmental restoration activities at RVAAP will be accomplished using a time-phased approach based on available DoD funding resources. Therefore, the Action Plan must be revised annually to ensure that those AOCs with the highest probable threat to human health and the environment are addressed as a priority based on the most current information and input from the Ohio Environmental Protection Agency (OEPA) and the U.S. Environmental Protection Agency (EPA).

Under the DERP, Resource Conservation and Recovery Act (RCRA) and other regulated activities are funded separately from Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activities. CERCLA activities are funded under the IRP; consequently, actions at RCRA and other regulated sites are not possible using IRP funds. The current funding available for environmental restoration at RVAAP is through the IRP and, therefore, is only available for CERCLA activities. One of the primary objectives of this Action Plan is to prioritize AOCs for CERCLA actions and, therefore, this effort is funded under the IRP. Consequently, this version of the Action Plan addresses only CERCLA AOCs with regard to prioritization and technical approach.

This Action Plan presents a brief description and history of the installation along with previous past environmental activities conducted at the facility, identification and summary descriptions of all currently known sites at RVAAP, the current regulatory status and approach for addressing sites at RVAAP (1. Introduction); the prioritization methodology, and the current ranking of CERCLA AOCs based on this methodology and currently available information (2. Prioritization); a discussion of the IRP technical approach for characterizing CERCLA AOCs, including Data Quality Objectives (DQOs), analytical quality levels, and field procedures along with the current IRP status and schedule (3. IRP Approach, Status, and Schedule).

1.1 INSTALLATION DESCRIPTION AND HISTORY

RVAAP is located in northeastern Ohio within Portage and Trumbull Counties, approximately 4.8 kilometers (3 miles) east/northeast of the Town of Ravenna and approximately 1.61 kilometers (1 mile) northwest of the Town of Newton Falls. The installation consists of 21,419 acres (8668 hectares) contained in a 17.7-kilometers-long (11-mile-long), 5.63-kilometers-wide (3.5-mile-wide) tract bounded by State Route 5, and the CSX System Railroad on the south; State Route 534 on the east; the Garrettsville and Berry Roads on the west; and the CONRAIL Railroad on the north. The Michael J. Kirwan Reservoir is located south of the facility. The land use surrounding the installation is primarily farmland with sparse private residences.

RVAAP is a government-owned, contractor-operated U.S. Army Industrial Operations Command (IOC) facility. Currently, RVAAP is an inactive facility maintained by a contracted caretaker, Mason and Hanger-Silas Co., Inc. Table 1-1 presents the RVAAP Command Organization, IRP executing agencies, and lead regulatory agencies.

Table 1-1. RVAAP Organizational Responsibilities

Command Organization
Major Command: U.S. Army Industrial Operations Command, Deputy Chief of Staff for Environmental Quality Major Subordinate Command: U.S. Army Armament, Munitions, and Chemical Command, Environmental Quality Directorate Installation: RVAAP, Commander's Representative Installation Modified Caretaker: Mason & Hanger-Silas Mason Co., Inc.
IRP Executing Agency
USACE, Nashville District
Regulatory Agencies
Ohio Environmental Protection Agency (OEPA) U.S. Environmental Protection Agency (EPA)

Over the years, RVAAP handled and stored strategic and critical materials for various government agencies and received, stored, maintained, transported, and demilitarized military ammunition and explosive items. RVAAP maintained the capabilities to load, assemble, and pack military ammunition;

however, these operations are inactive. As part of the RVAAP mission, the inactive facilities were maintained in a standby status by keeping equipment in a condition to permit resumption of production within the prescribed time limitations. U.S. Army Defense Logistics Agency (DLA) ore stockpiles (monozite and manganese) existed at RVAAP; however, according to correspondence from the U.S. Nuclear Regulatory Commission (1995), there is no residual radiological contamination of concern from these stockpiles. There is no known evidence of indicating processing or production of radiological materials at RVAAP.

A brief overview of the history of RVAAP is provided in chronological order to provide a summary of the facilities' history.

Date	Description of Activity/Facility Status
1940	10,117.5 hectares (25,000 acres) purchased by U.S. Government. Began construction of the plant.
Sep 1940	Operated by Atlas Powder Company.
Dec 1941 to Jan 1942	Facility completed and operations began at Load Lines 1, 2, 3, & 4. Primary mission was depot storage and ammunition loading. Divided installation into two separate units: Portage Ordnance Depot - depot storage of munitions and components and Ravenna Ordnance Plant - loading ammunition.
Nov 1945	Redesignated as the Ravenna Arsenal.
1945	Turned over to Ordnance Department.
1946 to 1949	Silas Mason Co. operated the ammonium nitrate line for the production of ammonium nitrate fertilizer.
1950	Plant placed on standby status. Operations limited to renovation, demilitarization, and normal maintenance of equipment and stored ammunition and components.
Apr 1951	Ravenna Arsenal, Inc. contracted to run facility. Subsidiary of Firestone Tire & Rubber.
Jul 1954	Plum Brook Ordnance Works, Sandusky, Ohio and the Keystone Ordnance Works of Meadville, Pennsylvania were made satellites of Ravenna.
Aug 1957	All at-plant production ended.
Oct 1957	The installation was placed on standby status.
Mar 1958	Plum Brook Ordnance Works ceased to be under the jurisdiction of Ravenna.
Jul 1959	Keystone Ordnance Works was transferred to the General Services Administration.
Oct 1960	Began rehabilitation work to replace facilities in the ammonium nitrate line for the processing and explosive melt-out of bombs.
Jan 1961	Began operations of the processing and explosive melt-out of bombs. First operation of this type in the ammunition industry.
Jul 1961	Plant again deactivated.

Nov 1961	Installation was divided into the Ravenna Ordnance Plant and an industrial section. Entire facility was designated as the Ravenna Army Ammunition Plant.
May 1968	RVAAP reactivated in support of the Southeast Asian Conflict for loading, assembling, and packing munitions on three load lines and two component lines.
1971	Operations ceased at Load Lines 1, 2, 3, & 4.
Aug 1972 to Mar 1974	Deactivated major load lines and component lines to demilitarization of the M71A1 90MM projectile.
Oct 1982	Physics International Company (subsidiary of Rockcor, Inc.) purchased Ravenna Arsenal, Inc. from Firestone.
Jun 1985	Rockcor, Inc. was purchased by Olin Corporation.
1992	The RVAAP mission was discontinued, placing the installation on the "Inactive Maintained" status.
Mar 1993	Transfer of RVAAP from "Inactive Maintained" to "Inactive Modified-Caretaker" Status.
Sep 1993	RVAAP was placed in Modified-Caretaker Status.
Sep 1993	A Report of Excess (ROE) determined the load lines and associated real estate as excess to the U.S. Army. The excess area, includes approximately 4,957 acres (2006 hectares) and 362 buildings in Load Lines 1-12 (excluding 7 and 11), Area 4, and Area 8.
Oct 1993	Mason & Hanger-Silas Mason Co., Inc. took over as the installation's contractor Modified Caretaker.

1.2 CONTAMINATION ASSESSMENT

During the last 30 years there have been multiple environmental-related investigations conducted at the RVAAP. A brief summary of these investigations is provided below.

Date	Description of Investigation
1978	U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) conducted an Installation Assessment of RVAAP and concluded that no migration of contamination to groundwater had occurred at the installation (USATHAMA 1978).
1982	Reassessment by USATHAMA also concluded that no migration of contamination to groundwater had occurred (USATHAMA 1982).
1988	U.S. Army Environmental Hygiene Agency (USAEHA) conducted a groundwater contamination survey and an evaluation of Solid Waste Management Units (SWMUs). Twenty-nine potentially contaminated SWMUs were identified. Further investigation was recommended for 15 of the 29 SWMUs to determine if contaminants had migrated from these units (USAEHA 1988).

1989 EPA contracted Jacobs Engineering to perform a RCRA Facility Assessment (RFA) - Preliminary Review/Visual Site Inspection (USEPA 1989). The report identified 31 SWMUs, 13 of which were recommended for no further action (NFA). These 31 SWMUs are listed as sites in the Restoration Management Information System (RMIS).

1992 USAEHA conducted a hydrogeologic study of the Open Burning/Open Detonation (OB/OD) areas as part of a response to a Notice of Deficiency issued by OEPA regarding the installation's RCRA Part B permit application. Minor amounts of contamination were reported at these areas.

1994 USAEHA performed a Preliminary Assessment Screening (PAS) of the Boundary Load Line areas at RVAAP, and provided a Statement of Findings to support a Record of Environmental Consideration (REC) along with recommendations for additional activities at these sites.

1995 USACE began developing Site Management Plans (Preliminary Assessment, Facility-wide Sampling and Analysis Plan, and Facility Safety and Health Plan) for the purpose of characterizing priority AOCs in accordance with CERCLA under the IRP.

1996 USACE finalization of Site Management Plans and Phase I Remedial Investigation (RI) of high priority CERCLA AOCs.

1.3 SITE IDENTIFICATION

Thirty-eight sites have currently been identified at RVAAP. These sites have been assigned a Defense Sites Environmental Restoration Tracking System (DSERTS) designation number and are currently tracked under the DSERTS system. Table 1-2 is a comprehensive listing of all currently known sites at RVAAP.

Table 1-2. Listing of Sites at RVAAP

DSERTS Site Number	Site Name
RVAAP-01	Ramsdell Quarry Landfill
RVAAP-02	Erie Burning Ground
RVAAP-03	Demolition Area #1
RVAAP-04	Demolition Area #2
RVAAP-05	Winklepeck Burning Grounds
RVAAP-06	C Block Quarry
RVAAP-07	Building 1601 Hazardous Waste Storage
RVAAP-08	Load Line 1 and Dilution/Settling Pond
RVAAP-09	Load Line 2 and Dilution/Settling Pond
RVAAP-10	Load Line 3 and Dilution/Settling Pond
RVAAP-11	Load Line 4 and Dilution/Settling Pond

Table 1-2. (continued)

DSERTS Site Number	Site Name
RVAAP-12	Load Line 12 and Dilution/Settling Pond
RVAAP-13	Building 1200 Dilution/Settling Pond
RVAAP-14	Load Line 6 Evaporation Unit
RVAAP-15	Load Line 6 Treatment Plant
RVAAP-16	Quarry Landfill
RVAAP-17	Deactivation Furnace
RVAAP-18	Load Line 12 Pink Wastewater Treatment
RVAAP-19	Landfill North of Winklepeck Burning Grounds
RVAAP-20	Sand Creek Sewage Treatment Plant
RVAAP-21	Depot Sewage Treatment Plant
RVAAP-22	George Road Sewage Treatment Plant
RVAAP-23	Unit Training Equipment Site Waste Oil Tank
RVAAP-24	Reserve Unit Maintenance Area Waste Oil Tank
RVAAP-25	Building 1034 Motor Pool AST
RVAAP-26	Fuse and Booster Area Settling Tanks
RVAAP-27	Building 854 PCB Storage
RVAAP-28	Mustard Agent Burial Site
RVAAP-29	Upper and Lower Cobbs Pond
RVAAP-30	Load Line 7 Pink Wastewater Treatment
RVAAP-31	ORE Pile Retention Pond
RVAAP-32	40 & 60 MM Firing Range
RVAAP-33	Firestone Test Facility
RVAAP-34	Sand Creek Disposal Road Landfill
RVAAP-35	Building 1037 - Laundry Waste Water Tank
RVAAP-36	Pistol Range
RVAAP-37	Pesticide Building S-4452
RVAAP-38	NACA Test Area

1.3.1 Site Descriptions

A brief summary description of each site is provided in this section. Figure 1-1 identifies the location of each site.

RVAAP-01 Ramsdell Quarry Landfill

- 4-hectare (10-acre) unlined landfill in the bottom of an abandoned quarry.
- 1946 to 1950 - used as a surface burning area to thermally treat waste explosives from LL1 and napalm bombs.
- 1976 - nonhazardous solid waste landfill.
- 1978 - permitted by the State of Ohio as a sanitary landfill.
- 1989 - landfill operations ceased.
- 1990 - State of Ohio solid waste closure.
- High potential for release to groundwater due to nonliner.
- 5 groundwater monitoring wells installed around landfill perimeter.
- 5 wells monitored on regular basis as part of the closure requirements for the landfill.
- Contaminants of concern (COCs) are TNT, Comp B, napalm, gasoline, acid dip liquor, sulfuric acid, shell casings, chromic acid, sodium ortho-silicate, chromic acid and alkali, aluminum chloride. Volume unknown.
- Media are soils and groundwater.
- Long-term monitoring postclosure for 30 years.
- Wells sampled since 4Q CY91 for explosives, organics, and metals.

RVAAP-02 Erie Burning Grounds

- 14-hectare (35-acre) site used to thermally treat munitions by OB on the ground surface believed to be located in low-lying marshy area.
- Operated from 1941 to 1951.
- Ash residue left on site.
- COCs are Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), trinitrotoluene (TNT), and heavy metals. Propellant waste volumes estimates are as high as 1 million pounds.
- No contaminants (RDX, TNT) detected in 5 soil borings; not certain borings were placed in correct location.
- No observed discolored water, odors, or stress to flora and fauna.
- Media of Concern are soils, surface water, and groundwater.
- Potential release to surrounding soils, surface water, and groundwater.

RVAAP-03 Demolition Area #1

- 0.6-hectare (1.5-acre) site used to thermally treat munitions by OB/OD.
- Consists of a 0.3- to 0.46-meter (1- to 1.5-foot) berm surrounding a grassed area about 0.4- to 0.6-hectares (1- to 1.5-acres) in size; unit is unlined.
- Operations took place on the ground.
- COCs are metal munitions and explosives.
- Visual inspection noted strains at surface and stressed vegetation.
- Media of Concern are soils and groundwater.

N 576,250

E 2,388,250

E 2,327,500

N 546,500

OHIO STATE PLANE (NAD83)

0 2000 4000 8000

SCALE: 1" = 4000'

LEGEND OF SITES:

1 ..... RAMSDELL QUARRY LANDFILL
2 ..... ERIE BURNING GROUNDS
3 ..... DEMOLITIONS AREA #1
4 ..... **DEMOLITIONS 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 QUARRY LANDFILL/FORMER
16 ..... 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**
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 BUILDING S–44S2
38 ..... NACA TEST AREA

US Army Corps of Engineers Nashville District

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
NASHVILLE, TENNESSEE

RAVENNA ARMY AMMUNITION PLANT
RAVENNA, OHIO
FACILITY MAP

DRAWN BY:	REV. NO./DATE:	CAD FILE:
R. BEELER	REV. F/05–14–01	95021/DWGS/19111X17

Fig. 1-1. RVAAP Site Locations

RVAAP-04 Demolition Area #2

- 8-hectare (20-acre) site used to detonate large-caliber munitions and "off-spec" bulk explosives.
- Former RCRA interim status for the treatment of explosives by OD.
- Operations took place from 1948 to 1986.
- Backhoe dug pits to a minimum 1.2-meter (4-foot) depth.
- After detonation, metal parts are picked up and removed from the site.
- COCs are white phosphorous, explosives, heavy metals, unexploded ordnance, and bombs.
- 1984 study revealed soil samples were contaminated with explosives.
- Visual inspection revealed wastes eroding toward Sand Creek and one area devoid of vegetation.
- 4 groundwater monitoring wells installed as part of the study.
- 4 wells sampled on a quarterly basis for explosives, volatile organic compounds, and metals.
- The results from December 1995 sampling indicated no explosives or organics present above detection limits with very low concentrations of site-related metals.

RVAAP-05 Winklepeck Burning Grounds

- 81 hectares (200 acres) of total burning area.
- 1941 to 1980, OB of munitions in pits, pads, and on the roads within the 81-hectare (200-acre) area.
- Ash abandoned on site.
- Wastes treated included RDX, antimony sulfide, Comp B, lead azide, TNT, propellant, black powder, waste oils, sludge from the load lines, domestic wastes, and small amounts of laboratory chemicals.
- After 1980, burns of explosives, propellants, and explosive-contaminated materials conducted in raised refractory-lined trays within a 6-hectare (15-acre) area.
- COCs are explosives, metals, and waste oils.
- Media of Concern are soils, surface water, and groundwater; stream runs through unit.
- Visual inspection revealed ponding in trenches and stressed/absent vegetation in some areas.
- Buried glacial valley is suspected underlying this area.
- One acre is closed under RCRA, remaining 80.5 hectares (199 acres) are CERCLA.

RVAAP-06 C Block Quarry

- 0.1 hectare (0.3-acre) abandoned borrow pit.
- Used as a disposal area for annealing process wastes during 1950s.
- Liquid wastes were dumped on the ground in the bottom of the pit.
- Now heavily forested with trees 0.3 meter (1 foot) in diameter or larger.
- Current ponded water in quarry.
- Waste COCs include chromium, lead, mercury, sulfuric acid, and annealing process liquids.
- 1982 soil samples detected total chromium (13 mg/k). No TNT or RDX was detected.
- A soil investigation in 1986 reported no metals were detected above EP toxic limits; however, no details regarding this investigation are currently available.
- COC is metals.
- Visual inspection revealed no stress to flora/fauna.
- Medium of Concern is soils.

RVAAP-07 Building 1601 Hazardous Waste Storage

- RCRA storage area for solid ash residue and spent activated carbon.
- Building is a 6.1-meter by 6.7-meter (20- by 22-foot) concrete igloo.
- Wastes containerized in 209-liter (55-gallon) U.S. Department of Transportation drums.
- Little potential for contamination from operation of this unit.
- COC is metals. (Waste fly ash from demil activities and spent carbon from LL7 PWTF).
- Medium of Concern is soils.
- RCRA permitted.

RVAAP-08 Load Line 1 and Dilution/Settling Pond

- Operational from 1941 to 1971 - building washdown water and wastewater from the load line operations were collected in concrete sumps, pumped through sawdust filtration units, and discharged to open ditches to settling pond.
- Building washdown water from the melt-pour buildings was also swept through doorways onto the ground surrounding the buildings.
- Settling pond was an unlined earthen impoundment approximately 0.4 hectare (1 acre).
- Water from the impoundment was discharged to a surface stream that exited the installation.
- COCs are explosives (TNT, HMX, Comp B) and metals (lead, chromium, and arsenic).
- Media of Concern are soils, surface water, sediment, and groundwater.
- Verified release to surrounding surface water and groundwater. Soil sampling in ditch indicates TNT 30 μg/ml and RDX 11.6 μg/ml.
- Arsenic detected in nearby monitoring well (USEPA 1989).

RVAAP-09 Load Line 2 and Dilution/Settling Pond

- Operational from 1941 to 1971 - building washdown water and wastewater from the load line operations were collected in concrete sumps, pumped through sawdust filtration units, and discharged to open ditches to settling pond.
- Building washdown water from the melt-pour buildings was also swept through doorways onto the ground surrounding the buildings.
- Settling pond was an unlined triangular-shaped pond approximately 0.8 hectare (2 acres) in size and 1.8- to 2.4-m (6- to 8-feet) deep.
- COCs are explosives (TNT, HMX, Comp B) and metals (lead, chromium, and arsenic).
- Media of Concern are soils, surface water, sediment, and groundwater.
- High potential for release to surrounding surface water and groundwater.
- Discharge from pond flowed to Sand Creek and eventually off the installation.
- TNT and RDX detected in sediment samples.

RVAAP-10 Load Line 3 and Dilution/Settling Pond

- Operational from 1941 to 1971 - building washdown water and wastewater from the load line operations were collected in concrete sumps, pumped through sawdust filtration units, and discharged to the settling pond.
- Building washdown water from the melt-pour buildings was also swept through doorways onto the ground surrounding the buildings.
- COCs are explosives (TNT, Comp B, HMX) and metals (lead, chromium, and arsenic).

- Media of Concern are soils, surface water, sediment, and groundwater.
- High potential for release to surrounding surface water and groundwater.
- RDX detected in sediment in Upper Cobbs Pond and drainage ditch (1.16 μg/ml).

RVAAP-11 Load Line 4 and Dilution/Settling Pond

- Operational from 1941 to 1971 - building washdown water and wastewater from the load line operations were collected in concrete sumps, pumped through sawdust filtration units, and discharged to the settling pond.
- Building washdown water from the melt-pour buildings was also swept through doorways onto the ground surrounding the buildings.
- Settling pond was an unlined triangular-shaped pond approximately 0.8 hectare (2 acres) in size and 1.8- to 2.4-meters (6- to 8-feet).
- Water from the settling pond was discharged to a surface stream that quickly exits the installation.
- COCs are explosives (TNT, RDX, and Comp B) and metals (chromium, lead, and arsenic).
- Media of Concern are soil, sediment, surface water, and groundwater.
- High potential for release to surrounding soils, sediment, surface water, and groundwater.
- Sediment samples indicate RDX at a concentration of 0.54 μg/ml and TNT at 0.17 μg/ml.

RVAAP-12 Load Line 12 and Dilution/Settling Pond

- Operational from 1951-57, 1981-83, and 1989-93 - building washdown water and wastewater from the bomb melt-out facility operations were collected in a house gutter system and flowed through a piping system to two stainless steel tanks.
- First tank was for settling and the second tank was for filtration.
- Before 1980 - water leaked under the building and ponded.
- Building 904 washdown water was swept through doorways onto the ground surrounding the buildings.
- After 1981 - water was treated in the Load Line 12 wastewater treatment system (RVAAP 18).
- TNT, HMX, Comp B, chromium, lead, mercury, and Ammatol.
- Media of Concern are soils, surface water, sediment, and groundwater.
- Sediment samples detected RDX at a concentration of 1.16 μg/ml and TNT at 0.17 μg/ml in Upper Cobbs Pond.
- Stressed vegetation and red stained soil noted during visual inspection.

RVAAP-13 Building 1200 Dilution/Settling Pond

- Operational from 1941 to 1971 - ammunition was demilitarized at this building by steaming munitions rounds.
- Steam decontamination generated pink water that drained to manmade ditch.
- Ditch discharged to a 0.2-hectare (0.5-acre) sedimentation pond, and the overflow from this pond discharged to Eagle Creek.
- COCs are explosive compounds and heavy metals (lead, chromium, TNT, HMX, Comp B, and mercury).
- Media of Concern are soils, surface water, sediment, and groundwater.
- High potential for release to surrounding soils, surface water, and groundwater.
- No analytical data available
- No visual stress to vegetation.

RVAAP-14 Load Line 6 Evaporation Unit

- Operational from 1981 to 1987 - load line tenant operations generated washdown water and wastewater that were discharged into a 5.5- by 4.3- by 1.2-meters (18- by 14- by 4-foot) concrete tank.
- 1985 - hairline cracks were observed in the concrete tank. Tank was lined with PVC as a remedial action.
- 1989 - tank was cleaned of explosive residue as a part of closure.
- COCs are TNT, RDX, and Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX).
- Soil samples in 1989 indicated TNT and RDX at 200 ppm (adjacent to evaporator unit). TNT and RDX at 100 ppm (beneath unit).
- Depth to groundwater ~6.8 meters (6 feet).
- Media of concern are soil and groundwater.

RVAAP-15 Load Line 6 Treatment Plant

- 1987 - active operation by tenant, closed in 1993.
- Unit consisted of dual-activated carbon units for filtration of pink water generated from load line operations.
- Waste water treatment system discharges under a National Pollutant Discharge Elimination System (NPDES)-permitted discharge to the RVAAP sanitary sewer system.
- COCs are TNT, RDX, and HMX.
- NPDES permit allows maximum discharge of .14 ppm TNT, RDX, and HMS.
- Medium of Concern is soils.
- RFA/RFI 1383#RVAP03289.
- NFA recommended in RFA (USEPA 1989).

RVAAP-16 Quarry Landfill

- 1945-1993 - active operations by tenant; closed in 1993.
- Consists of three elongated ponds situated end to end in an abandoned rock quarry.
- Ponds are 4.6- by 6.1-meters (15- to 20-feet) deep and are separated by earthen berms.
- Since 1976, spent brine regenerate and sand filtration backwash water from one of the RVAAP drinking water treatment plants has been discharged to the pond; regulated by NPDES.
- Prior to 1976, the quarry was used for OB and as a landfill.
- Lands adjacent to the quarry were used as an impact area to test 40MM projectiles and to incinerate/deactivate fuse and booster components.
- COCs include sodium chloride, calcium chloride, manganese, iron, TNT, HMX, RDX, and heavy metals.
- Media of Concern are surface water, sediment, and groundwater.
- Potential for release to surrounding surface water and groundwater.
- No surface water drainage out of quarry.
- No analytical data available.
- No observed stress to vegetation.

RVAAP-17 Deactivation Furnace

- No. 2 oil-fired horizontal rotary retort furnace used for the deactivation of small munitions items.

- Operated from 1960 to 1983.
- COC is metals.
- Medium of Concern is soil.
- Soil sampling of perimeter of unit to identify potential contamination from air emissions was recommended.

RVAAP-18 Load Line 12 Pink Wastewater Treatment

- Dual-mode activated carbon filters for treatment of explosive-contaminated wastewater.
- Operated from 1982-1983, 1984-1985.
- Wastewater discharge is regulated under NPDES-permitted discharge system.
- COCs include explosive compounds.
- Low potential for release to surface water or groundwater because wastes are contained within two carbon units within concrete-floored building.
- Media of Concern are soils and groundwater.
- NPDES permit allows maximum concentration of TNT discharged 0.14 ppm.

RVAAP-19 Landfill North of Winklepeck Burning Grounds

- 10-acre unlined landfill site used for general plant refuse, including sanitary wastes, possibly explosive wastes and ash residue.
- Operated from 1969 to 1976.
- High potential for releases of contaminants to soils, sediment, surface water, and groundwater since wastes were disposed of in unlined trenches and site drains to Sand Creek.
- COCs are explosives and metals (munitions waste).
- Media of Concern are soils, sediment, surface water, and groundwater.
- Visible waste seen during site walkover.
- Vegetation absent in some places.
- No analytical data available.

RVAAP-20 Sand Creek Sewage Treatment Plant

- Inactive domestic sewage treatment plant regulated under an NPDES discharge permit.
- Intermittently operational from 1969-1978, 1981-1983, and 1983-1993.
- Unit is a domestic sewage treatment plant so there is a low potential for release of potential contaminants to soil and groundwater.
- Media of Concern are soils and groundwater.
- Land spreading of dried sludge, accepted only domestic sewage.

RVAAP-21 Depot Sewage Treatment Plant

- Operated from 1941-1993 - domestic sewage treatment plant regulated under an NPDES discharge permit.
- Closed in FY 93 in accordance with EPA requirements; closure in accordance with EPA standards.
- Unit is a domestic sewage treatment plant, so there is a low potential for releases to the soil and groundwater.
- Media of Concern are soils and groundwater.

- RFA/RFI 1383#RVAP03289.
- Sludge hauled to the George Road Sewage Treatment Plant.

RVAAP-22 George Road Sewage Treatment Plant

- Inactive domestic sewage treatment plant regulated under an NPDES discharge permit.
- Closed in FY 93 in accordance with EPA requirements; closure in accordance with EPA standards.
- Unit is a domestic sewage treatment plant so there is a low potential for release of hazardous materials.
- Media of Concern are soils and groundwater.
- Land spreading of dried sludge.

RVAAP-23 Unit Training Equipment Site Waste Oil Tank

- Inactive since 1988 - Waste oil underground storage tank (UST) used by a tenant organization.
- Tank and adjacent soil reportedly removed in 1989. No record of regulatory involvement.
- No information is available regarding the removal of the tank and contaminated soil.
- COC is waste oil.
- Medium of Concern is soil underlying the tank.
- Soil staining noted during visual inspection.
- No analytical data are available.

RVAAP-24 Reserve Unit Maintenance Area Waste Oil Tank

- Operational from 1983-1993 - waste oil aboveground storage tank (AST) for vehicle maintenance located at Depot Area; Bldg. U4 used by a tenant organization.
- 1993 - tank emptied.
- Tank observed to be in good condition.
- COCs include waste oil, petroleum, and metals.
- Potential for release of contaminants to the surrounding soils and groundwater. Unit is located in sandy/silty kent till.
- Media of Concern are soils and groundwater.
- No soil staining observed.
- No analytical data are available.

RVAAP-25 Building 1034 Motor Pool AST

- Operational from 1974-1993 - AST for waste oil from vehicle maintenance operations.
- Contents emptied in FY 93 and remains inactive.
- COCs are waste oil, petroleum, and metals.
- Media of Concern are soils and groundwater.
- Low potential for release of contaminants to the surrounding soils and groundwater.

RVAAP-26 Fuse and Booster Area Settling Tanks

- 182 hectares (450 acres) and includes five component load lines (numbers 5, 7, 9, 10, and 11).
- Lines used for the manufacture of fuses, boosters, primers, detonators, and percussion elements from 1941 through 1971.

- Includes 14 concrete USTs and 1 concrete AST used for settling basins for explosive-contaminated waste water.
- 1971 - tanks were emptied, cleaned, and covered.
- COCs are explosives, TNT, RDX, lead, mercury, and unknown compounds.
- 1981 - installed shallow monitoring wells around the perimeter of the fuse and booster area (USEPA 1989).
- Monitoring wells not installed in association with individual tanks.
- Sampling of wells did not detect heavy metals in the groundwater but were not analyzed for explosives.
- Wells destroyed by frost heave.
- Potential for releases to the soils and groundwater from these tanks.
- Media of Concern are soils and groundwater.

RVAAP-27 Building 854 PCB Storage

- 15.2- by 15.2-meter (250- by 50-foot) area with a wooden frame building used for the storage of PCB-contaminated materials.
- PCB items stored within secondary containment pans on the concrete floor of the building, confined to a 32.9- by 6.4-meter (108- by 21-foot) section along the north and south wall of the building.
- Used from 1983.
- All transformers removed.
- Low potential for releases to the environment.
- COC is PCB.
- Medium of Concern is soil.

RVAAP-28 Mustard Agent Burial Site

- Possible mustard agent burial site approximately 4.6 by 5.5 by 5.5 meters (15 by 18 by 18 feet).
- Mustard agent may have been disposed of in barrels and buried on site, reportedly before 1969.
- The Army excavated the area and found one 208.2-liter drum (55-gallon) and 7 cans. No mustard agent was recovered.
- Potential for release of contaminants to soils and groundwater.
- COC is mustard agent.
- Media of Concern are soils and groundwater.

RVAAP-29 Upper and Lower Cobbs Pond

- Consists of two unlined ponds that received discharges from Load Line 3 and Load Line 12 explosive wastewater treatment systems from 1941 through 1971.
- Upper Cobbs is approximately 2 hectares (5 acres) in size; Lower Cobbs is approximately 3 to 4 acres (1.2 to 1.6 hectares) in size.
- COCs include TNT, RDX, HMX, Comp B, lead, chromium, mercury, and aluminum chloride.
- RDX (1.16 μg/ml) and TNT (0.17 μg/ml) detected in sediment in Upper Cobbs Pond.
- Documented fish kill in 1966.
- Confirmed releases to surface water and sediment.
- High potential for releases to groundwater.
- Media of Concern are soils, surface water, sediment, and groundwater.

RVAAP-30 Load Line 7 Pink Wastewater Treatment

- Dual-mode activated carbon pink wastewater treatment unit used by a tenant organization.
- Operated from 1989 to 1993.
- Wastewater discharge is regulated under NPDES-permitted discharge system.
- COCs include TNT, RDX, and HMX. Maximum allowable concentrations .14 ppm HMX, RDX, and TNT.
- Low potential for releases of contaminants from this unit.
- Media of Concern are soils and groundwater.

RVAAP-31 ORE Pile Retention Pond

- Small unlined pond constructed to prevent potentially contaminated surface runoff from strategic manganese ore piles from entering receiving streams.
- Constructed in the mid-1950s.
- COCs include manganese, RDX, and TNT.
- Potential for release of contaminants to soils, sediment, groundwater, and surface water.
- Media of Concern are soils, sediment, surface water, and groundwater.
- Soil characterization indicates RDX and TNT. RDX was detected at 1.16 μg/ml in pond water.

RVAAP-32 40 & 60 MM Firing Range

- Reported by former workers at RVAAP to have been a test firing range for munitions.
- Dates of operation 1940s through 1950s.
- No file documentation currently exists, recently identified AOC.
- Possible COCs are metals.
- Media of concern are unknown.

RVAAP-33 Firestone Test Facility

- This area also known as Load Line 6
- Reported by former workers at RVAAP to have been a security classified experimental test facility for munitions. Shape charges constructed and tested for DoD.
- Site consists of a pond (underwater test chamber) and several buildings.
- Dates of operation not known.
- No file documentation currently exists, recently identified AOC.
- Possible COCs are lead azide, TNT, Comp B, and other unknown explosives.
- Media of concern are soils, surface water, sediment, and groundwater.

RVAAP-34 Sand Creek Disposal Road Landfill

- Reported by former workers at RVAAP to have been a construction landfill for concrete, wood, asbestos debris, and fluorescent light tubes.
- Dates of operation not known.
- No file documentation currently exists, recently identified AOC.
- Possible COCs are asbestos and metals.
- Located adjacent to surface water stream.
- Media of concern are soil, surface water, sediment, and groundwater.

RVAAP-35 Building 1037 - Laundry Waste Water Tank

- A concrete sump used as a settling tank for RVAAP laundry facilities.
- Dates of operation not known.
- Possible COCs are explosives and metals.
- No file documentation exists, recently identified AOC.
- Media of concern are soil and groundwater.

RVAAP-36 Pistol Range

- 106.7 by 45.7 meter area (350 by 150 foot) along Sand Creek.
- Used by installation security force for pistol qualification.
- Bullets were fired across the creek into opposite embankment.
- COC is lead.
- No file documentation exists, recently identified AOC.
- Media of concern are soil and surface water.

RVAAP-37 Pesticide Building S-4452

- A 12.2 by 6.1 meter (40 by 20 foot) wooden structure with a crawl space.
- Mixing area is a 6.1 by 3.6 meter (20 by 12 foot) gravel area outside building.
- In use from 1970s until 1993.
- An empty can with chlorinate residue and hand sprayer found in crawl space.
- COCs are synthetic organic compounds.
- No file documentation exists, recently identified AOC.
- Media of concern are soil and groundwater.

RVAAP-38 NACA Test Area

- Approximately 12.4 acre (5 hectare) site used as an aircraft test area.
- NACA tried to develop explosion proof fuel tanks and/or explosion proof fuel.
- Planes were rammed into a wall using a conveyor and examined after impact.
- COCs are petroleum hydrocarbons and possibly other unknown constituents.
- Media of concern are soil, surface water, sediment, and groundwater.

1.3.2 REGULATORY STATUS

Table 1-3 presents the current grouping of sites at RVAAP based on the current regulatory status of each site. Twenty-four sites are regulated under CERCLA and are referred to as AOCs consistent with CERCLA terminology, while four sites are regulated under RCRA and are referred to as SWMUs consistent with RCRA terminology. Two sites (RVAAP-04 and RVAAP-05) have discrete areas regulated under CERCLA and RCRA. The CERCLA part of these sites is referred to as AOCs, while the RCRA part is considered a SWMU. Ten sites regulated under other regulations (OEPA Division of Solid and Infectious Waste, TSCA, and NPDES) are also referred to as AOCs. This terminology (AOC or SWMU) will be used henceforth in referencing sites at RVAAP.

Table 1-3. Regulatory Grouping of Sites at RVAAP

CERCLA - Areas of Concern
RVAAP-02 Erie Burning Ground
RVAAP-03 Demolition Area #1
RVAAP-04 Demolition Area #2 (Non-RCRA permitted Areas Only)*
RVAAP-05 Winklepeck Burning Grounds (Non-RCRA permitted Areas Only)*
RVAAP-06 C Block Quarry
RVAAP-08 Load Line 1 and Dilution/Settling Pond
RVAAP-09 Load Line 2 and Dilution/Settling Pond
RVAAP-10 Load Line 3 and Dilution/Settling Pond
RVAAP-11 Load Line 4 and Dilution/Settling Pond
RVAAP-12 Load Line 12 and Dilution/Settling Pond
RVAAP-13 Building 1200 Dilution/Settling Pond
RVAAP-14 Load Line 6 Evaporation Unit
RVAAP-16 Quarry Landfill
RVAAP-19 Landfill North of Winklepeck Burning Grounds
RVAAP-23 Unit Training Equipment Site Waste Oil Tank
RVAAP-24 Reserve Unit Maintenance Area Waste Oil Tank
RVAAP-26 Fuse and Booster Area Settling Tanks
RVAAP-28 Mustard Agent Burial Site
RVAAP-29 Upper and Lower Cobbs Pond
RVAAP-32 40 & 60 MM Firing Range
RVAAP-33 Firestone Test Facility
RVAAP-34 Sand Creek Disposal Road Landfill
RVAAP-35 Building 1037 - Laundry Waste Water Tank
RVAAP-36 Pistol Range
RVAAP-37 Pesticide Building S-4452
RVAAP-38 NACA Test Area

Table 1-3. (continued)

RCRA - Solid Waste Management Units
RVAAP-04 Demolition Area #2 (Permitted Area Only)*
RVAAP-05 Winklepeck Burning Grounds (Permitted Area Only)*
RVAAP-07 Building 1601 Hazardous Waste Storage
RVAAP-17 Deactivation Furnace
Other Regulations - Areas of Concern
RVAAP-01 Ramsdell Quarry Landfill (OEPA Division of Solid and Infectious Waste)
RVAAP-15 Load Line 6 Treatment Plant (NPDES)
RVAAP-18 Load Line 12 Pink Wastewater Treatment Plant (NPDES)
RVAAP-20 Sand Creek Sewage Treatment Plant (NPDES)
RVAAP-21 Depot Sewage Treatment Plant (NPDES)
RVAAP-22 George Road Sewage Treatment Plant (NPDES)
RVAAP-25 Building 1034 Motor Pool AST (Undefined)
RVAAP-27 Building 854 PCB Storage (TSCA)
RVAAP-30 Load Line 7 Pink Wastewater Treatment Plant (NPDES)
RVAAP-31 Ore Pile Retention Pond (NPDES)

*Site has both RCRA- and CERCLA-designated areas.

1.4 REGULATORY APPROACH

The approach to addressing environmental conditions at RVAAP is regulatory-based following the framework established by the primary regulatory driver (CERCLA, RCRA, TSCA, etc.). DoD has developed programs and funding mechanisms for conducting environmental activities based on the regulatory status of sites. Consequently, the sites at RVAAP are grouped (Table 1-3) into three regulatory categories (CERCLA, RCRA, and other regulations) for funding considerations. The following sections present an overview of the current approach for each of the regulatory groupings at RVAAP.

Under the DERP, RCRA and other regulated activities are funded separately from CERCLA activities. CERCLA activities are funded under the IRP; consequently, actions at RCRA SWMUs and other regulated AOCs are not possible using IRP funds. The current funding available for environmental restoration at RVAAP is through the IRP, and, therefore, is only available for CERCLA activities. One of the primary objectives of this Action Plan is to prioritize AOCs for CERCLA actions, and, therefore, this effort is funded under the IRP. Consequently, this version of the Action Plan will not address RCRA

(or other regulated sites) in the subsequent sections addressing prioritization (Section 2) and technical approach (Section 3).

1.4.1 CERCLA

RVAAP has not formally been assigned a Hazard Ranking Score (HRS) by EPA or OEPA, and it is not currently on the National Priorities List (NPL) of high-priority CERCLA sites. However, both the OEPA and EPA have stated that a preliminary scoring of the facility, performed by their agencies, suggests that the RVAAP HRS score is >28.5, qualifying it as an NPL high-priority site. Twenty-six AOCs are currently regulated under CERCLA at RVAAP. Table 1-3 lists the AOCs at RVAAP being addressed in accordance with CERCLA.

Environmental restoration activities for the 26 AOCs at RVAAP are being conducted following the prescribed CERCLA approach for Superfund sites under the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Figure 1-2 graphically depicts the approach to implementing the CERCLA process at RVAAP under the guides of the IRP. Initially, a facility-wide Preliminary Assessment (PA) has been developed to identify all potential environmental sites at RVAAP. This investigation is based on a facility records search, site surveys, and interviews with current and former facility personnel. Using the results of the PA, the Action Plan includes a prioritization (Section 2) of the AOCs, based on the potential threat to human health and the environment, in order to determine a relative ranking for funding environmental restoration activities under the IRP. Based on this relative ranking, AOCs exhibiting the greatest potential threat to human health and the environment will be investigated on a priority basis to characterize environmental conditions. The investigation of all AOCs at RVAAP will be accomplished on a priority basis due to funding limitations. High priority AOCs will be addressed as a first order followed by medium and low priority AOCs as funding becomes available.

The investigation of AOCs at RVAAP will be accomplished using facility-wide work plans, to the extent practical, to stream-line the investigative process by reducing costs associated with redundant work plan information and compressing work plan development schedules. The facility-wide work plans consist of a Facility-wide Sampling and Analysis Plan (SAP) and a Facility-wide Safety and Health Plan (FSHP). The facility-wide plans are generic in nature in that they address work plan elements that are expected to be common to the investigation of multiple AOCs. AOC-specific investigations will be tiered under these facility-wide work plans, to the extent practical, and investigation-specific work plan addenda will be developed for each AOC investigation. Investigation-specific addenda will contain the necessary project-specific information for conducting an investigation of a specific, or group of AOCs when used in conjunction with the facility-wide work plans.

The investigative approach at RVAAP is consistent with the CERCLA process; however, DoD terminology is used in reference to the investigative steps for consistency with the IRP. Phase I RIs will be conducted at AOCs on a priority basis. The primary objective of the Phase I RI is to collect environmental samples to confirm if contamination is present and is being released to the environment, and determine the nature of the potential chemicals of concern (PCOCs). The Phase I RI is consistent with the CERCLA requirements for a Site Investigation (SI). Based on the results of the Phase I RI, AOCs will either be investigated further during a Phase II RI or NFA will be required and documented with a No Further Remedial Action Planned (NFRAP) to this effect. The primary objective of the Phase II RI is to characterize the nature and extent of contamination at an AOC and assess the risk posed to

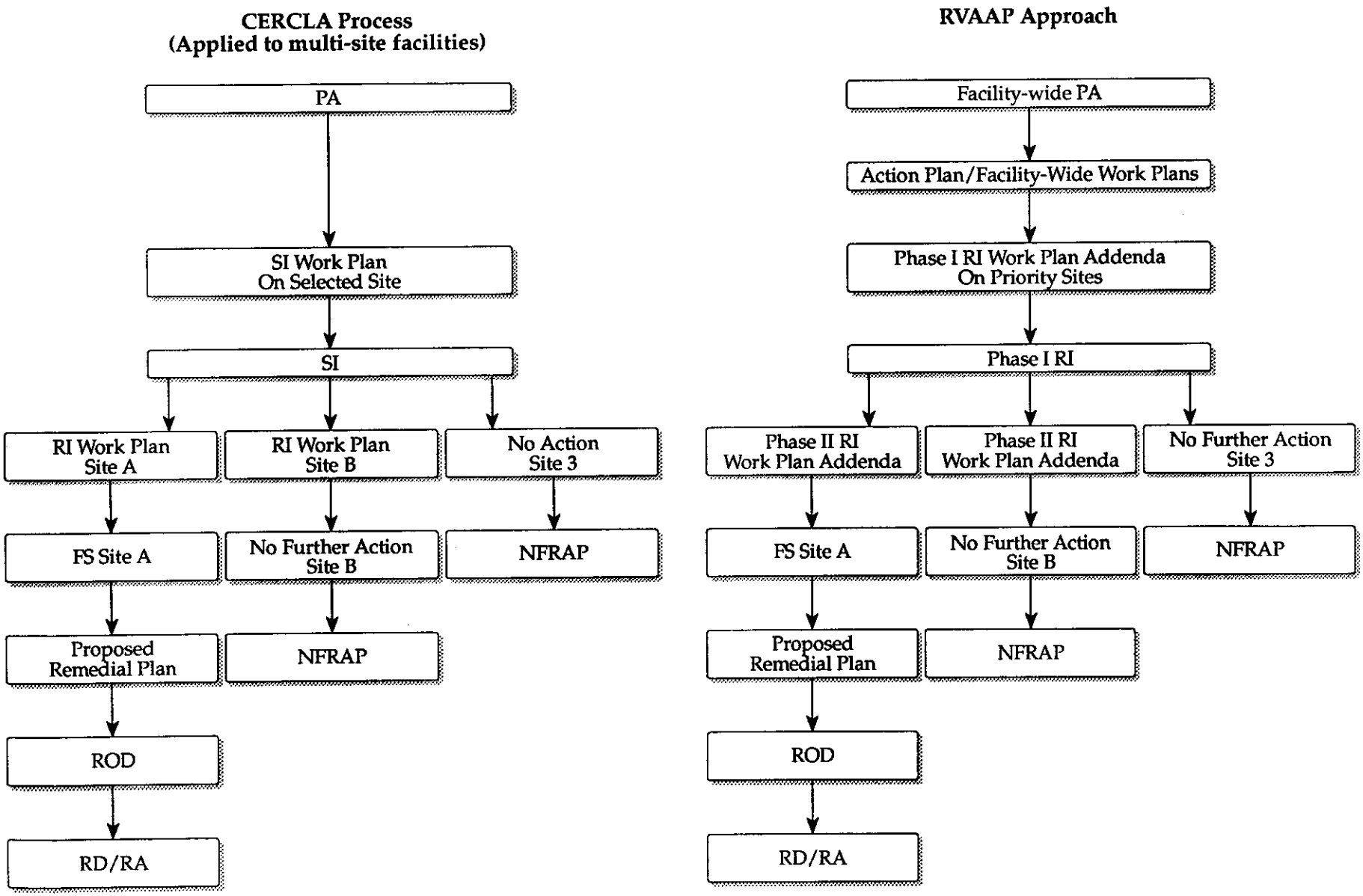

Figure 1-2. Approach to Implementing CERCLA Process at RVAAP

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human health and the environment. The Phase II RI is consistent with the CERCLA requirements for an RI. Based on the results of the Phase II RI, AOCs will either be evaluated for remedial options during a Feasibility Study (FS) or No Further Action will be required and documented with a NFRAP. After an FS is completed for an AOC, a Proposed Remedial Plan will be developed followed by a Record of Decision prior to Remedial Design (RD)/Remedial Action (RA) and a post-remedial report documenting clean-up. At any point during this process if conditions (i.e., a release or threat of a release or unacceptable risk to human health and the environment) are encountered that warrant an early remedial action, an Interim Removal Action (IRA) or Removal Action may be implemented.

A key component for implementing a successful approach to environmental restoration of AOCs at RVAAP under CERCLA is continual involvement in the process by regulatory agencies (OEPA and EPA). Consequently, the planned approach to implementing CERCLA at RVAAP includes provisions throughout the process for regulatory agency involvement through the review and approval process of work plans, reports, and decision documents.

1.4.2 RCRA

Four SWMUs are currently regulated under RCRA at RVAAP (Table 1-3). Separate portions of two SWMUs (RVAAP-04 and RVAAP-05) are also regulated under CERCLA. The approach to addressing SWMUs at RVAAP will follow the framework established by the State of Ohio regulations and OEPA policies for implementing RCRA. At RVAAP, this approach may entail additional RCRA permitting of active operating facilities and/or RFAs, RCRA Facility Investigations (RFIs), Corrective Measures Studies (CMSs), Corrective Action Plans (CAPs), Closure Plans, Post Closure Reports, and long-term monitoring of inactive SWMUs. The approach to implementing RCRA actions at RVAAP will be based on maintaining compliance.

RVAAP has previously submitted a Closure Plan for the Deactivation Furnace (RVAAP-17), and a RCRA Part B permit application covering the approximately .6 hectares (approximately 1.5 acres) used for open detonation at the Demolition Area No. 2 (RVAAP-04), approximately .4 hectares (approximately 1 acre) used for open burning at the Winklepeck Burning Grounds (RVAAP-05), and the Building 1601 Hazardous Waste Storage (RVAAP-17). The Part B application was withdrawn in 1994 and OEPA issued proposed Findings and Orders to RVAAP requiring the submittal of a Closure Plan for the areas previously covered in the Part B application. Final resolution of these RCRA activities has not presently occurred. Appendix A presents a chronology of RCRA Closure Plan events at RVAAP.

1.4.3 Other Regulations

Ten AOCs at RVAAP are currently regulated under other State and Federal regulations (Table 1-3). These include AOCs regulated by the OEPA Division of Solid and Infectious Waste, NPDES permits, and Toxic Substances Control Act (TSCA). The approach to addressing AOCs in this category will follow the framework established by the appropriate State and/or Federal regulation and permit requirements.

1.5 CURRENT ENVIRONMENTAL INVESTIGATIONS

Current CERCLA environmental restoration activities at RVAAP are focused on priority AOCs under the IRP. RCRA and other regulatory actions are also ongoing at RVAAP but are not addressed here

because this Action Plan is focused on CERCLA AOCs under the IRP. Current IRP activities include: (1) completion of a facility-wide PA, (2) completion of facility-wide management plans for performing CERCLA investigations, and (3) preparation of investigation-specific work plan addenda for conducting a Phase I RI of 11 high-priority AOCs. The facility-wide PA was prepared following CERCLA guidance and contains a composite listing of all currently known sites at RVAAP based on the combined results of previous assessment documents, facility records reviews, and former employee interviews. Facility-wide management plans currently being finalized include a Facility-wide SAP and an FSHP for the purpose of conducting CERCLA investigations of AOCs at RVAAP. Phase 1 RI work plan addenda are also being finalized to investigate the 11 high-priority AOCs (Section 2) at RVAAP but their completion is pending finalization of the facility-wide work plans. The schedule for IRP activities is presented in Section 3.3.

2. PRIORITIZATION

During the early stages of implementing CERCLA at Ravenna, efforts will be on-going to prioritize and score the individual AOCs to determine the order that AOCs are investigated and remediated. This section describes an effort to identify the first—or highest priority—AOCs at the RVAAP based on available data and information. Only those sites identified in Section 1 as CERCLA AOCs are evaluated and prioritized in this section for action under the IRP.

The DoD has developed a prioritization method for the DERP called the Relative Risk Site Evaluation (RRSE) method. However, the method requires three primary types of data be available for each AOC, data that are not available for most of the RVAAP AOCs:

- the contaminant hazard (e.g., chemical concentrations detected at the AOC greater than concentrations estimated to cause negative health effects);
- the potential for contaminant migration away from the source; and
- potential receptors.

The primary requirement for ranking an AOC using this method is the availability of reliable chemical concentration data for each of three environmental media: groundwater, surface water/sediment, and soil, as indicated in Figure 2.1. Because these data are not available for many of the RVAAP AOCs, the RRSE cannot be used for the first attempt to prioritize AOCs. Instead, a prioritization technique that can make use of semi-quantitative and qualitative inputs will be used. As additional data are collected over time, the DoD and other stakeholders will use the RRSE to prioritize RVAAP AOCs for DERP funding.

2.1 PRIORITIZATION METHODOLOGY

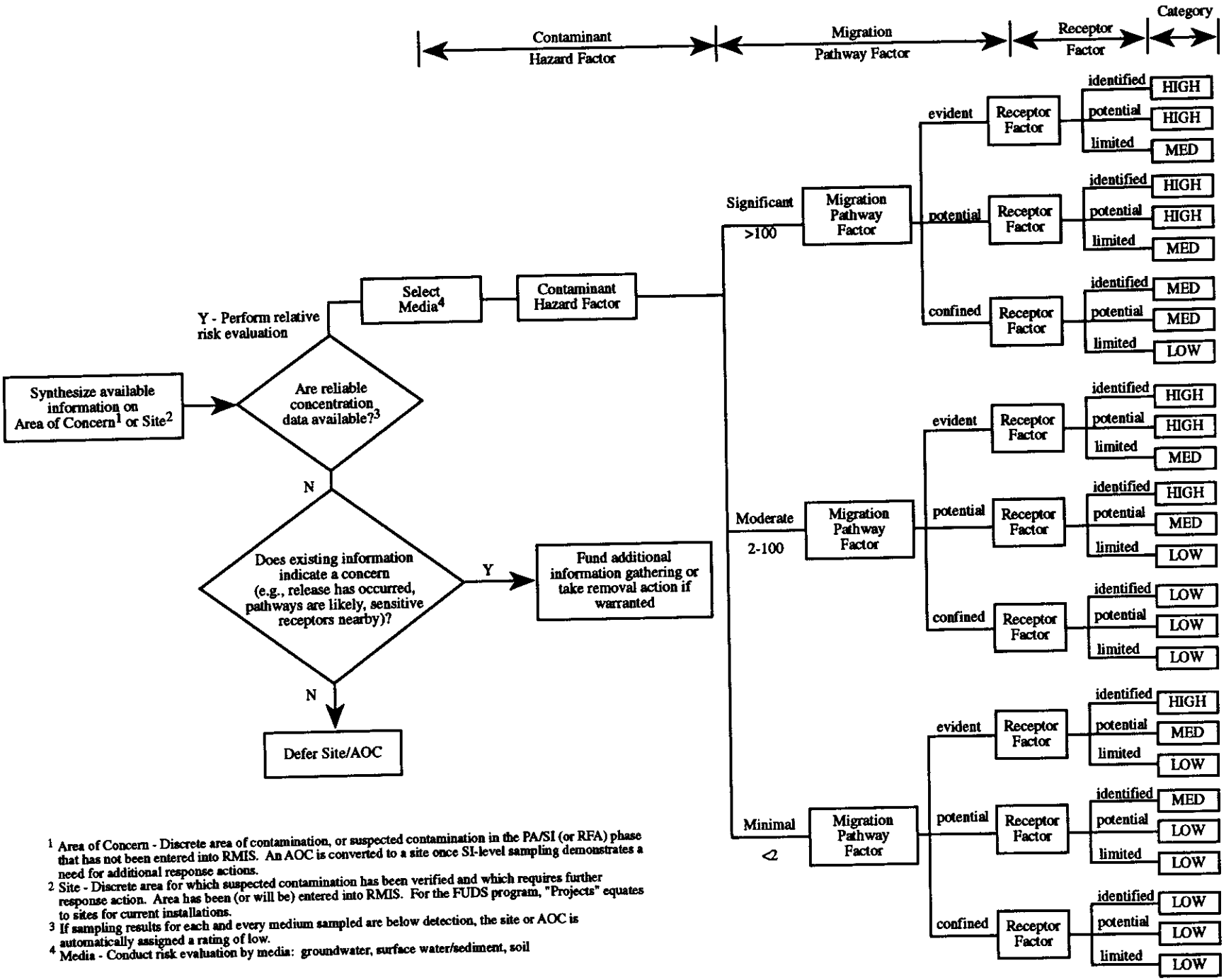
Three primary criteria are being used to identify priority AOCs at RVAAP:

- Is the AOC contributing to contaminant releases off site via surface water?
- Is the AOC contributing to contaminant releases off site via groundwater?
- Is there potential that the AOC is contributing to risk to human health and the environment?

Several methods are available for using these criteria to systematically rank AOCs. The method chosen is a modification of the Analytical Hierarchy Process (AHP) developed by Saaty (Saaty 1980). The AHP is a simple tool that allows users to define the prioritization criteria (listed above) and is flexible enough to accommodate semi-quantitative and qualitative inputs. The AHP has been successfully implemented on several U.S. Department of Energy (DOE) prioritization projects (Richter Pack 1987) including one in southern Ohio and a number of other projects (Golden et al. 1990).

Ranking the AOCs requires the following steps:

(1) identify the prioritization criteria (listed above);



[1] Area of Concern - Discrete area of contamination, or suspected contamination in the PA/SI (or RFA) phase that has not been entered into RMIS. An AOC is converted to a site once SI-level sampling demonstrates a need for additional response actions.
[2] Site - Discrete area for which suspected contamination has been verified and which requires further response action. Area has been (or will be) entered into RMIS. For the FUDS program, "Projects" equates to sites for current installations.
[3] If sampling results for each and every medium sampled are below detection, the site or AOC is automatically assigned a rating of low.
[4] Media - Conduct risk evaluation by media: groundwater, surface water/sediment, soil

Figure 2-1. Relative Risk Site Evaluation Framework: Decision Flowchart
(*Source*: DoD 1994)

(2) determine weighting factors for each criterion (For this ranking exercise, it is assumed that the criteria are equally weighted);

(3) compile data and information on each AOC; and

(4) synthesize input data to rank AOCs. The data synthesis for the RVAAP prioritization is described below.

Available data were compiled for each AOC being addressed under CERCLA (RCRA and NPDES sites are not included in the prioritization exercise). These data were derived primarily from the facility-wide PA (USACE 1996), which summarized available historical data on the AOCs and identified seven additional AOCs. The data and information generally included process information, site walkover observations, information on the surrounding surface water and groundwater conditions, and in some cases, limited contaminant characterization data. A summary of the surface water/groundwater hydrologic conditions at the RVAAP site is presented in Appendix B, "Site Conceptual Model". In developing the site conceptual model, it became obvious that although regional groundwater conditions have been studied in the past, information on specific groundwater conditions underlying many of the RVAAP AOCs is not available.

The semi-quantitative information compiled for the prioritization was used to score the AOCs in relation to the three criteria. Scores of 1-9 were assigned, with 9 indicating a high potential for contaminant release or high potential for risk, 5 indicating a medium potential, and 1 indicating a low potential.

In general, an AOC received a high scoring if there was clear proof that a release had already occurred or if walkover survey information suggested a release had occurred or vegetation had been stressed. AOCs for which information suggests no release had occurred, or where process and site descriptions suggest the potential for a release of hazardous material is low, the AOC received a low scoring (e.g., a carbon treatment unit is in place, or the unit only received nonhazardous waste streams). Table 2-1 summarizes the rationale for scoring the AOCs.

To the extent possible, scores were assigned with available data or observations from visual inspections. In some cases, judgments had to be made about the potential for releases from a unit. These judgments are based primarily on the proximity of the unit to a surface water body or drainage, and whatever data are available on the hydrologic characteristics of the underlying groundwater.

2.2 PRELIMINARY PRIORITIZATION RESULTS

Table 2-2 presents the scores assigned to each of the units for each of the ranking criteria. The total score reflects the sum of the individual criteria scores. The final column of the table provides the justification for the scores.

AOCs with total scores greater than 20 are considered "High Priority AOCs". AOCs with scores between 10 and 20 are considered medium priority AOCs while AOCs scoring less than 10 are low priority. As noted in the facility-wide PA for the RVAAP (USACE 1996), AOCs that were recently identified do not have enough data to develop a prioritization score.

Table 2-1. Rationale for Scoring RVAAP Areas of Concern

Score	Interpretation	Evidence for Score
9	High potential for contaminant release to surrounding environment	1) Available analytical data indicate release of hazardous chemicals; 2) Walkover survey indicates visual evidence of release or stressed or absent vegetation; 3) Site geology indicates release may have occurred to groundwater but no nearby wells are available to confirm release; 4) Site has similar characteristics to other sites for which analytical data indicate release (e.g. load line ponds)
5	Medium potential for contaminant release to surrounding environment	No clear evidence that release has occurred but process information and site-specific geology/hydrology indicate the potential for a release to occur
1	Low potential for contaminant release to surrounding environment	1) Analytical evidence indicates that no release has occurred; 2) Process information or waste unit description suggests potential for release is low, e.g. there is proof of an engineered containment system or treatment system

Table 2-2. *Prioritization Score for RVAAP Areas of Concern*

Number	Name	Analytical Data?	Surface water release	Score	Ground water release	Score	Ecological Effect	Score	Total Score	Justification
RVAAP-2	Erie Burning Grounds	Y	L	1	L	1	L	1	3	No stress to flora/fauna; no detects in soil borings
RVAAP-3	Demolition Area #1	N	L	1	H	9	H	9	19	Berm prevents runoff; Hiram Till, gw 6 ft bgs; stressed vegetation
RVAAP-4	Demolition Area #2	Y	H	9	M	5	H	9	23	Waste eroding to stream; stressed vegetation; explosives detected in soil samples (1984); however, no detected contamination in groundwater samples (1995)
RVAAP-5	Winklepeck Burning Grounds	N	H	9	H	9	H	9	27	Waste oil released; intermittent drainage passes through unit; stressed/absent vegetation; overlies mouth of glacial valley
RVAAP-6	C Block Quarry	Y	L	1	L	1	L	1	3	No stress to flora/fauna; all sample results < EP tox limit; standing water in quarry
RVAAP-8	Load Line 1 Dilution Settling Pond	Y	H	9	H	9	M	5	23	Arsenic in wells; TNT, RDX in sediment; no observed stress to vegetation, no data on aquatic species or biota; score assumes uptake may occur
RVAAP-9	Load Line 2 Dilution Settling Pond	Y	H	9	H	9	H	9	27	TNT, RDX in sediment; no GW data; assume uptake by aquatic species
RVAAP-10	Load Line 3 Dilution Settling Pond	Y	H	9	H	9	H	9	27	RDX in sediment in Upper Cobbs Pond; no GW data; assume uptake by aquatic species

Table 2-2 (continued)

Number	Name	Analytical Data?	Surface water release	Score	Ground water release	Score	Ecological Effect	Score	Total Score	Justification
RVAAP-11	Load Line 4 Dilution Settling Pond	Y	H	9	H	9	H	9	27	TNT, RDX in sediment; discharge from pond quickly exists installation; no GW data; assume uptake by aquatic species
RVAAP-12	Load Line 12 Dilution Settling Pond	Y	H	9	H	9	H	9	27	TNT,RDX in sediment in Cobbs Pond; red stains on soil; stressed vegetation; GW 4 ft. bgs
RVAAP-13	Bldg 1200 Dilution/Settling Pond	N	H	9	H	9	H	9	27	No data; assumed to similar to load line ponds
RVAAP-14	Load Line 6 Evaporation Unit	Y	L	1	M	5	L	1	7	TNT and RDX in soil up to 200 ppm; GW 6 ft. bgs
RVAAP-16	Quarry Landfill/Pond		M	5	H	9	M	5	19	Direct interaction w/GW; no surface drainage; no observed stressed vegetation
RVAAP-19	Landfill North of Winklepeck Burning Grounds	N	H	9	H	9	H	9	27	Unlined trenches; feeds trib to Sand Creek.; absent vegetation; visable waste along creek
RVAAP-23	Unit Training Equipment Site Waste Oil Tank		L	1	M	5	L	1	7	20-year-old UST; removed in 1989 along with adjacent soil
RVAAP-24	Reserve Unit Maintenance Area Waste Oil Tank	N	L	1	H	9	L	1	11	Located in sandy Kent till; no observed soil stains; tank observed to be in good condition
RVAAP-26	Fuze & Booster Area Settling Tanks	Y	L	1	M	5	L	1	7	Wastes removed from tanks; remaining issue is residual in subsurface soils; no GW contaminants in area-wide wells
RVAAP-28	Mustard Agent Burial Site	N	L	1	L	1	L	1	3	Uncertainties about actual presence of waste source

Table 2-2 (continued)

Number	Name	Analytical Data?	Surface water release	Score	Ground water release	Score	Ecological Effect	Score	Total Score	Justification
RVAAP-29	Upper & Lower Cobbs Pond	Y	H	9	H	9	H	9	27	RDX in sediment; fish kill (1966); unlined pond
RVAAP-32	40 & 60 MM Firing Range	N	L	1	L	1	L	1	3	Uncertainties about source; little or no information available
RVAAP-33	Firestone Test Facility	N	M	5	M	5	M	5	15	Melt pour operations suggest wastewater generation. Assume pond used for effluent settling similar to other load lines; sparse information available
RVAAP-34	Sand Creek Disposal Road Landfill	N	M	5	L	1	L	1	7	Located adjacent to surface water stream; sparse information available
RVAAP-35	Building 1037 - Laundry Waste Water Tank	N	L	1	H	9	L	1	11	Below ground concrete sump/settling tank; TNT contaminated waste water; sparse information available
RVAAP-36	Pistol Range	N	M	5	L	1	L	1	7	Located adjacent to surface water stream; potential contaminant drainage to creek; sparse information available
RVAAP-37	Pesticide Bldg S-4452	N	L	1	M	5	L	1	7	Possible leaching to groundwater from chemical spills at gravel pad mixing area; chemicals stored in building in containment structure; sparse information available
RVAAP-38	NACA Test Area	N	L		M	5	L	1	7	Potential for leaching of fuels to groundwater; sparse information available

The prioritization results presented in Table 2-3 indicate that a set of AOCs appear to be of greater concern as potential sources of releases to the surrounding environment. This set includes the load line settling ponds and several of the large waste areas. AOCs with total scores greater than 20 are considered high priority and should be addressed first as characterization efforts begin at the RVAAP. AOCs with scores less than 20 (10–20 medium priority and 0–9 low priority) should be addressed in secondary characterization efforts after the high priority AOCs.

Table 2-3. Relative Priority Ranking of AOCs at RVAAP

Area of Concern		
Number	Name	AHP Score
HIGH PRIORITY SITES		
RVAAP-04	Demolition Area #2	23
RVAAP-05	Winklepeck Burning Grounds	27
RVAAP-08	Load Line 1 Dilution Settling Pond	27
RVAAP-09	Load Line 2 Dilution Settling Pond	27
RVAAP-10	Load Line 3 Dilution Settling Pond	27
RVAAP-11	Load Line 4 Dilution Settling Pond	27
RVAAP-12	Load Line 12 Dilution Settling Pond	27
RVAAP-13	Bldg. 1200 Dilution Settling Pond	27
RVAAP-19	Landfill North of Winklepeck Burning Ground	27
RVAAP-29	Upper and Lower Cobbs Pond	27
MEDIUM PRIORITY SITES		
RVAAP-2	Erie Buring Grounds	3
RVAAP-3	Demolition Area 1	19
RVAAP-6	C Block Quarry	11
RVAAP-14	Load Line 6 Evaporation Unit	15
RVAAP-16	Quarry Landfill/Former Fuse and Booster Buring Pits	19
RVAAP-23	Unit Training Equipment Site Waste Oil Tank	7
RVAAP-24	Waste Oil Tank	7
RVAAP-26	Fuse and Booster Area Settling Tanks	7
RVAAP-28	Mustard Agent Burial Site	3
RVAAP-32	40 & 60 MM Firing Range	3
RVAAP-33	Firestone Test Facility	15
RVAAP-34	Sand Creek Disposal Road Landfill	7
RVAAP-35	Building 1037-Laundry Waste Water Tank	11
RVAAP-36	Pistol Range	7
RVAAP-37	Pesticide Building 5-4452	7
RVAAP-38	NACA Test Area	7

3. IRP APPROACH, STATUS, AND SCHEDULE

3.1 TECHNICAL APPROACH

Facility-wide work plans (facility-wide SAP and FSHP) are currently being developed as a first-order activity to guide CERCLA investigative activities, to the extent practical, at all AOCs to be investigated at RVAAP. The facility-wide work plans are generic in nature in that they address specific work plan elements that are expected to be common to the investigation of AOCs. The objective of the facility-wide work plans is to reduce repetition and improve efficiency (schedule and cost) in developing AOC-specific work plans by addressing generic investigation activities common to all AOCs in a single work plan. Facility-wide work plans consist of an SAP and an FSHP. All AOC-specific investigations necessary at RVAAP will be tiered under these facility-wide work plans to the extent possible and AOC-specific addenda will be developed for each investigation to guide the specific investigation activities to meet the specific scope and objectives for each AOC.

The facility-wide SAP is the most critical work plan document with regard to performing CERCLA investigation of AOCs at RVAAP. The facility-wide SAP is being developed in accordance with the USACE guidance document *Requirements for the Preparation of Sampling Analysis Plans*, EM 200-1-3. September 1994, and to meet the requirements established by the OEPA and EPA Region V. The facility-wide SAP consists of two major elements: (1) Field Sampling Plan (FSP) and (2) Quality Assurance Project Plan (QAPP). The facility-wide FSP focuses on addressing anticipated field sampling activities, based on available information, and will document expected sampling methods and procedures, sample custody/documentation requirements, sample packaging and shipping requirements, management of Investigation-Derived Wastes (IDW), chemical quality control requirements, data chemical quality control reporting, and corrective actions. The facility-wide QAPP addresses quality assurance (QA)/quality control (QC) issues and will focus primarily on QA/QC procedures to be used in the collection and analysis of expected samples. The facility-wide QAPP documents sampling procedures, handling, custody, preservation; analytical holding times, procedures, equipment, calibration, preventive maintenance; laboratory QC and Data Quality Assessment (DQA) process; data review, verification, and validation; laboratory assessments; data precision, accuracy, completeness, sensitivity, representativeness, and compatibility; and reporting.

For each AOC-specific investigation (Phase I or Phase II RI), a SAP addendum will be developed and tiered under the facility-wide SAP. Each addendum will address the project-specific scope and objectives and sampling strategy and rationale, developed using the EPA DQO methodology, for the AOC being investigated. The SAP addendum will contain the specific sampling methods, locations, and frequencies for each media, and any new procedures or deviations from the facility-wide SAP along with specific IDW requirements. An addendum to the FSHP will also be developed for each investigation. These addenda will also be tiered under the facility-wide work plans and include specific requirements, new procedures, and deviations from the facility-wide plans.

3.1.1 DQOs

DQOs will be developed initially at a facility-wide level using EPA guidance to define the scope and objectives for the investigation of AOCs at RVAAP. DQOs will also be used to form the basis for data quality needs to support decisions to be made from an installation perspective. The facility-wide DQOs will be used as a paradigm in developing AOC-specific DQOs to ensure that each investigation will

contribute the data needed to achieve the facility-wide objectives. DQOs will be developed for AOC-specific investigation (Phase I or II RI) using EPA guidance and included in the FSP addenda to define specific scope and objectives, develop the sampling rationale and approach, and establish data quality needs to support decisions to be made using the data collected during each investigation.

3.1.2 Analytical Data Quality Levels

Analytical data quality levels necessary to support the decisions to be made at RVAAP will be developed through application of the DQO process at the facility-wide level and for individual AOCs during specific investigations. The decisions to be made at RVAAP will be driven primarily by the expected future land use of the installation and the risks posed to potential future land users at the facility. In this early phase of evaluating the decisions to be made at RVAAP, future land uses for the facility are yet to be determined; therefore, analytical data quality levels can only be speculated because specific data needed to support the decisions are not yet identified. However, it is assumed that RVAAP will, in some form (industrial, recreational, or residential), be released to the general public in the future. Based on this scenario, a high level of data certainty and confidence will be needed to make decisions concerning transfer of the installation to the public and, therefore, will drive the need to collect a high level of data quality.

At a minimum, it is expected that confirmatory samples collected during AOC investigations will need to yield defensible analytical results to support risk-based decisions. Defensible data results will be achieved using EPA SW-846 analytical methods and Contract Laboratory Program (CLP) data deliverables for reporting analytical results. It is anticipated that analytical results will be verified and validated using the "Focused Level III" validation process. A Focused Level III validation process has been used successfully to ensure data adequacy (precision and accuracy) in support of the risk-based decisions. The Focused Level III validation process, simply stated, concentrates on validating the data against validation criteria that contribute the most, based on statistical analysis, to defining data quality, and eliminates from consideration the criteria that infrequently drive data qualification. The Focused Level III validation process begins with CLP summary data packages (formerly referred to as Level 3) and consists of data screening, range checking, auditing, verification, flagging, and quality evaluation according to the DQO requirements. The Focused Level III data validation criteria are presented in Table 3-1. Additional details regarding analytical data quality levels are presented in the facility-wide SAP.

The Focused Level III data validation process has been shown to provide data quality results equivalent to full-scale Level III validation at approximately one-half the cost at sites where it has been applied. Where higher data quality levels may be needed to support risk-based decisions, the Focused Level III validation process can be combined with a lessor percentage (e.g., 10%) of Level IV data validation to achieve higher-quality levels and further reduce data uncertainty while maintaining cost savings.

3.1.3 Field Procedures

Field operating procedures for conducting investigations at RVAAP will be developed in accordance with requirements established in the USACE guidance documents *Requirements for the Preparation of Sampling Analysis Plans*, EM 200-1-3, September 1994, and *Monitoring Well Design, Installation, and Documentation at Hazardous and/or Toxic Waste Sites*, EM 1110-1-4000, August 1994. Requirements for environmental sampling of various media are contained in EM 200-1-3 in Appendices C, E, and F, which provide general guidelines for environmental sampling strategies and instructions for sample collection (environmental and field QC), sample handling (preparation and shipping), field and sample

Table 3-1. Focused Level III Data Validation Criteria

Organics	Inorganics
Holding Times	Holding Times
Blanks	Blanks
Surrogate Recovery	Laboratory Control Sample
Internal Standards	Furnace Atomic Absorption
-	QC
Calibration	Calibration
Sample Reanalysis	-
Secondary Dilutions	-
Case Narrative	Case Narrative

documentation, and equipment decontamination. Requirements for monitoring well installation, including drilling, construction, development, purging/sampling, documentation, and abandonment, are contained in EM 1110-1-4000. In the event that field procedures are required beyond the scope of the USACE guidance documents, these will be developed to meet OEPA and EPA Region V requirements.

3.2 IRP STATUS

Table 3-2 presents a summary of the current status for each site at RVAAP.

3.3 IRP SCHEDULE

A long-range schedule has been developed on a phased approach for IRP work at RVAAP. Key IRP milestones and planned completion dates are shown in Table 3-3.

The current 1996 schedule for planned IRP work is presented as Figure 3.1.

Table 3-2. Summary Status of RVAAP Sites

DSERTS NO.	Current RRSE Rating[1]	AHP Priority Ranking	Completed Work Phase	Current Work Phase	Future Work Phase
RVAAP-01	2B	—	Solid Waste Closure	Monitoring	Monitoring
RVAAP-02	3B	Low	PA	—	Phase I RI
RVAAP-03	3B	Medium	PA	—	Phase I RI
RVAAP-04	1B	High	PA	Phase I RI/ Draft RCRA Closure Plan	Phase II RI/ RCRA Closure
RVAAP-05	1B	High	PA	Phase I RI/ Draft RCRA Closure Plan	Phase II RI/ RCRA Closure
RVAAP-06	3B	Low	PA	—	Phase I RI
RVAAP-07	3B	—	PA	Draft RCRA Closure Plan	RCRA Closure
RVAAP-08	2B	High	PA	Phase I RI	Phase II RI
RVAAP-09	3B	High	PA	Phase I RI	Phase II RI
RVAAP-10	1B	High	PA	Phase I RI	Phase II RI
RVAAP-11	3B	High	PA	Phase I RI	Phase II RI
RVAAP-12	3B	High	PA	Phase I RI	Phase II RI
RVAAP-13	3A	High	PA	Phase I RI	Phase II RI
RVAAP-14	—	Medium	PA	—	Phase I RI
RVAAP-15	3B	Medium	PA	—	Phase I RI
RVAAP-16	3B	Medium	PA	—	Phase I RI
RVAAP-17	1B	—	PA	Draft RCRA Closure Plan	RCRA Closure
RVAAP-18	3B	—	PA	Phase I RI	Phase II RI
RVAAP-19	3B	High	PA	Phase I RI	Phase II RI
RVAAP-20	—	—	PA	—	—
RVAAP-21	3B	—	PA	—	—
RVAAP-22	3B	—	PA	—	—
RVAAP-23	—	Medium	PA	—	Phase I RI
RVAAP-24	—	Medium	PA	—	Phase I RI
RVAAP-25	—	—	PA	—	—
RVAAP-26	3B	Low	PA	—	Phase I RI
RVAAP-27	3B	—	PA	—	—

Table 3-2 (continued)

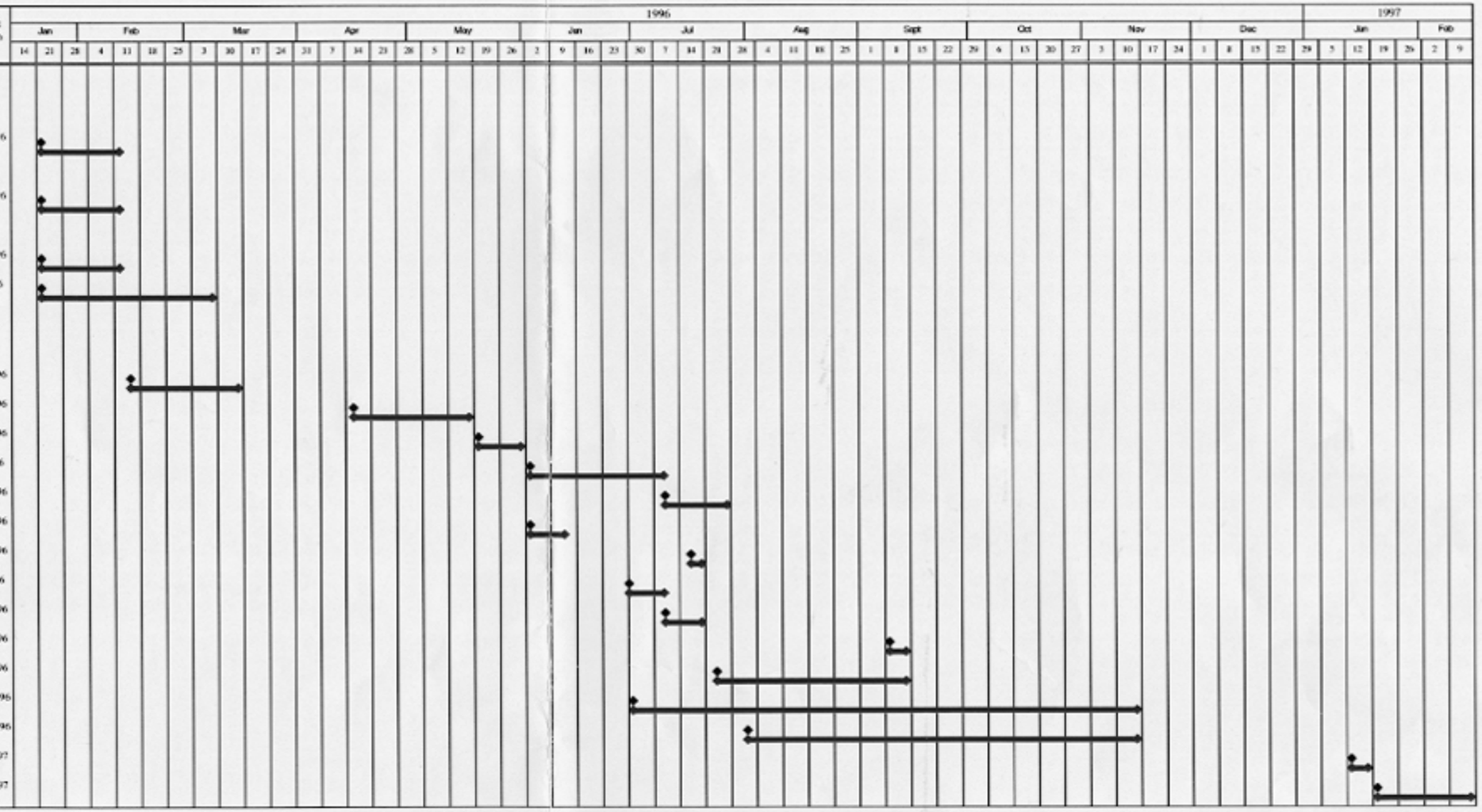
DSERTS NO.	Current RRSE Rating[1]	AHP Priority Ranking	Completed Work Phase	Current Work Phase	Future Work Phase
RVAAP-28	3B	Low	PA	PA	—
RVAAP-29	3B	High	PA	Phase I RI	Phase II RI
RVAAP-30	3B	—	PA	—	—
RVAAP-31	3A	—	PA	—	—
RVAAP-32	—	Low	PA	—	Phase I RI
RVAAP-33	—	Medium	PA	—	Phase I RI
RVAAP-34	-	Low	PA	—	Phase I RI
RVAAP-35	—	Medium	PA	—	Phase I RI
RVAAP-36	—	Low	PA	—	Phase I RI
RVAAP-37	—	Low	PA	—	Phase I RI
RVAAP-38	—	Low	PA	—	Phase I RI

[1]Current RRSE rating is an estimate based on suspected site conditions because data needed to perform the RRSE are not currently available. Data necessary for RRSE will be collected as a part of the Phase I RI for each site.

Table 3-3. IRP Milestones

IRP Phase	Scheduled Completion Date
Action Plan	February 1996
PA	February 1996
Phase I RI of High Priority AOCs	February 1997
Phase II RI/FS of High Priority AOCs	1997
Phase I RI of Medium/Low Priority AOCs	1997
Phase II RI of Medium/Low Priority AOCs	1998
Decision Document	March 2000
Remedial Design	September 2000
Remedial Actions	September 2005

Activity Name	Start Date	Target Finish Date
RAVENNA SITE MANAGEMENT PLANS (D-29-0009)		
Enhanced PA		
Final	1/22/96	2/12/96
Action Plan		
Final	1/22/96	2/12/96
Facility-wide Work Plans		
Final FSSHP	1/22/96	2/12/96
Final SAP	1/22/96	3/8/96
RAVENNA PHASE I RI (D-29- 0010) 0F 11 HIGH-PRIORITY AOLS		
Work Plan Addenda (SAP & SSHP)		
Draft	2/15/96	3/15/96
Final	4/16/96	5/17/96
Mobilization/training	5/20/96	5/31/96
Soil sampling	6/3/96	7/8/96
Sediment sampling	7/10/96	7/27/96
Geophysical surveys	6/3/96	6/12/96
Trenching	7/17/96	7/20/96
UXO support	6/30/96	7/9/96
Well point installation and sampling	7/10/96	7/20/96
Disposal of IDW	9/9/96	9/13/96
Surveying, mapping	7/24/96	9/13/96
Sample analysis, data assessment/validation, and reporting	7/1/96	11/15/96
Preparation and submission of draft RI report	8/1/96	11/15/96
Draft RI report meeting	1/13/97	1/17/97
Preparation of final RI report	1/20/97	2/14/97



95-037MS/021500

Figure 3-1. RVAAP 1996 Schedule for Planned IRP Work

4. REFERENCES

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APPENDIX A
CHRONOLOGY OF RVAAP RCRA CLOSURE PLAN EVENTS

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CHRONOLOGY OF RVAAP RCRA CLOSURE PLAN EVENTS

8 Nov 1988	RVAAP submitted a RCRA Part B Permit application to Ohio EPA for open burning/open detonation (OB/OD) treatment of hazardous waste.
22 June 1988	RVAAP submitted a revised RCRA Part B permit application.
30 July 1992	Director, Ohio EPA issued final findings and orders that exempted Ravenna from permitting requirements for OB/OD at RVAAP.
30 July 1992	Final findings and orders state exemption provided would be effective until hazardous waste facility board makes a final determination on RVAAP's Part B permit application.
11 April 1994	RVAAP withdrew RCRA Part B Permit.
14 April 1994	Ohio EPA and RVAAP representatives met to discuss RVAAP's permit withdrawal.
19 April 1994	RVAAP confirmed to Ohio EPA RVAAP's intention to withdraw its Part B permit and cease operation of OB/OD units.
15 May 1994	Submitted dates to Ohio EPA for submittal for an approvable closure plan on OB/OD/Bldg 1601 and deactivation furnace.
1 Sept 1994	Revised deactivation closure plan based on Ohio EPA comments.
31 Oct 1994	Revised deactivation closure plan based on Ohio EPA comments.
15 Jan 1995	Missed deadline with Ohio EPA responding to 19 NOVs on OB/OD/Bldg 1601 closure plans.
16 March 1995	Received proposed Admin findings and orders from Ohio EPA for closure plan for OB/OD/Bldg 1601.
1 May 1995	Sent Army revised Admin finding and orders to Ohio EPA.
8 9 May 1995	Meeting with Ohio EPA RCRA representatives. (1) Mutually decided to include deactivation furnace in Admin findings and order. (2) Ohio EPA wants reasonable schedule for the closure schedules for OB/OD/Bldg 1601/Deactivation furnace. (3) Informed them we had overhead citation for getting money, however, this option would take 6 8 months (too long). (4) Ohio EPA informed us they wanted RCRA schedules to benefit from CERCLA schedules.

	(5) Ohio EPA indicated they had initiatives within 6-12 months in their state to make CERCLA and RCRA clean-up levels agree.
1 July 1995	Final negotiation with Ohio EPA on schedules for Admin findings and orders to include reasonable schedules on RCRA closure process for OB and OD, Bldg 1601 and deactivation furnace.

Source: U.S. Army Industrial Operational Command, December 1995.

APPENDIX B
SITE CONCEPTUAL MODEL

APPENDIX B
SITE CONCEPTUAL MODEL

B.1 SITE CONCEPTUAL MODEL

The site conceptual model is presented in Figure B-1 and is textually described below. The RVAAP installation lies in the glaciated Allegheny Plateau section of the Appalachian Plateau Physiographic Province. The installation is situated in an area characterized as a temperate climatic zone. The normal mean temperature for the year averages approximately 9.6°C (49.2°F). The average annual precipitation for the area is approximately 114.3 centimeters (45.7 inches).

B.1.1 Geology

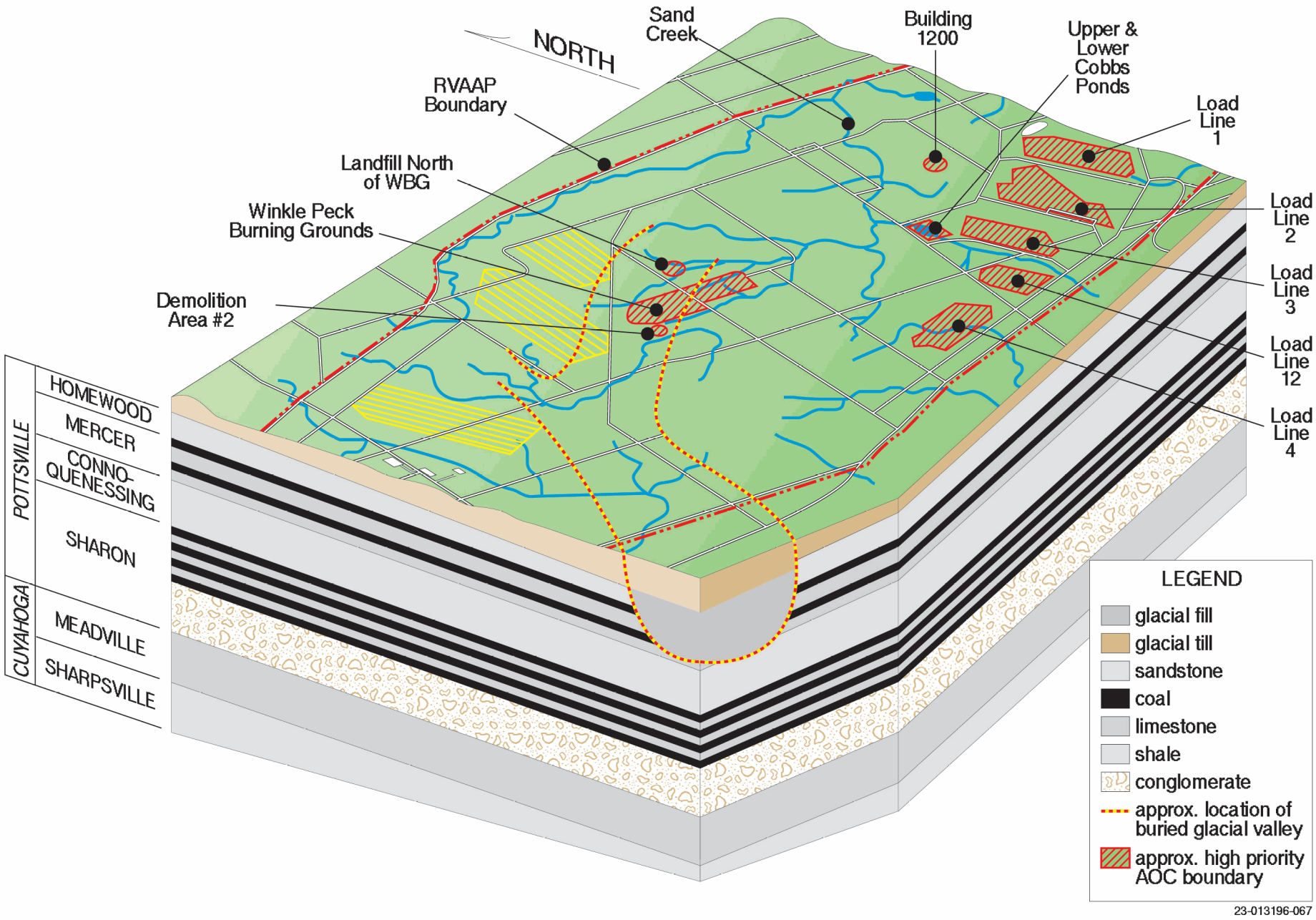
Unconsolidated Sediments

Glacial advances during the Pleistocene Epoch resulted in the deposition of a veneer of glacial till over the entire RVAAP installation. The Kent Till was deposited over the entire installation. This till consists mostly of sand and silt, and ranges in depth from 6.1 to 12.2 meters (20 to 40 feet) below the ground surface. The eastern two-thirds of the installation is underlain by the Hiram Till. The Hiram Till consists of 12% sand, 41% silt, and 47% illite and chlorite clay minerals, and ranges in depth from 1.5 to 4.6 meters (5 to 15 feet). The Hiram Till overlies thin beds of sandy outwash in the far northeastern corner of the installation.

A buried glacial valley, oriented in a southwest-northeast direction, is located in the central portion of the installation (Figure B-1). This valley is filled with glacial outwash consisting of poorly sorted clay, till, gravel, and silty sand. Depths of unconsolidated sediments in the valley range from 30.5 to 60.9 meters (100 to 200 feet). Based on the inferred location of the buried glacial at RVAAP, as determined from the Ohio Natural Resources Department (ODNR) geologic maps (Open File Report Nos. 204 and 205), eight environmental sites at RVAAP are located geographically in proximity to the subsurface location of the glacial valley. These sites are: Demolition Area #1 (RVAAP-03); Demolition Area #2 (RVAAP-04); Winklepeck Burning Grounds (RVAAP-05); Building 1601 Hazardous Waste Storage (RVAAP-07); Deactivation Furnace (RVAAP-17); Landfill North of Winklepeck Burning Grounds (RVAAP-19); Mustard Agent Burial Site (RVAAP-28); and Load Line 7 Pink Wastewater Treatment Plan (RVAAP-30).

Bedrock

The bedrock consists of Carboniferous age sedimentary rocks that lie stratigraphically beneath the glacial deposits of the Kent and Hiram Tills (Figure B-2). The oldest bedrock that outcrops within the installation is the Cuyahoga Group of the Mississippian Age. Three members comprise this group: (1) the Orangeville Shale, (2) the Sharpsville Sandstone, and (3) the Meadville Shale. The group as a whole outcrops in the far northeastern corner of the installation and consists of a blue-gray silty shale with interbedded sandstone. The dip of the Cuyahoga Group strata is between 1.5 to 3.1 meters (5 to 10 feet) per 2.62 kilometers (1 mile) to the south.



Preliminary Site Conceptual Model for RVAAP

System	Formation or Group	Member	Unit	Lithology	Thickness (in feet)
Pennsylvanian	Pottsville	Homewood	Sandstone		0 - 100
		Mercer	Tionesta Coal		0 - 90
			Upper Limestone		
			Bedford Coal		
			Lower Limestone		
			Middle Mercer Coal		
			Lower Mercer Coal		
		Connoquenessing	Sandstone		0 - 140
		Sharon	Quakertown Coal		0 - 90
			Sharon Coal		
			Conglomerate		0 - 250
Mississippian	Cuyahoga	Meadville	Shale		5 - 250
		Sharpesville	Sandstone		
		Orangeville	Shale		

Figure B-2. Generalized Geologic Column of RVAAP

The remainder of the installation is underlain by bedrock associated with the Pottsville Formation of the Pennsylvanian Age. This formation is divided into four members: (1) the Sharon, (2) the Connoquenessing Sandstone, (3) the Mercer, and (4) the Homewood Sandstone. The Sharon Member consists of a shale unit containing coal seams and a conglomerate unit. The Mercer Member consists of six interbedded coal and limestone units. The Connoquenessing and Homewood Members consist of coarse-grained crossbedded sandstones that contain discontinuous shale lenses. The dip of the Pottsville Formation strata is between 1.5 to 3.1 meters (5 to 10 feet) per 2.62 kilometer (1 mile) per mile to the south. However, the dip of the lower limestone unit of the Mercer Member is about 13.7 meters (45 feet) per 2.62 kilometers (1 mile) to the south.

B.1.2 Hydrogeology

Unconsolidated Sediments

The largest groundwater supplies within Portage County come from two buried valleys that underlie Franklin, Brimfield, and Suffield Townships, and Streetsboro, Shalersville, and Mantua Townships, respectively. The sand and gravel within these buried valleys are favorably situated to receive recharge from surface streams and surface infiltration. The water-bearing characteristics for the surficial sand and gravel aquifers in the vicinity of the RVAAP installation are poorly documented. Wells that penetrate these aquifers can yield up to 6080 liters per minute [1600 gallons per minute (GPM)]. However, yields from wells penetrating silty or clay materials are significantly lower.

Bedrock

The most important bedrock source of groundwater in the vicinity of the RVAAP installation is the sandstone/conglomerate aquifers of the Pottsville Formation. These aquifers, together with two other deeper Mississippian/Devonian sandstone aquifers, represent the most important bedrock sources of groundwater in Northeastern Ohio. Hydraulic conductivity values in Portage County for the Sharon Conglomerate and Connoquenessing and Homewood Sandstones are as follows: Sharon Conglomerate, 19 to 7600 liters per day per meter (LPD/m) [5 to 2000 gallons per day per foot (GPD/ft)]; Connoquenessing Sandstone, 19 to 1140 LPD/meters (5 to 300 GPD/feet); and Homewood Sandstone, 19 to 760 LPD/meters (5 to 200 GPD/feet).

B.1.3 Surface Water

The entire RVAAP installation is situated within the Ohio River Basin with the West Branch of the Mahoning River representing the major surface stream in the area. This stream flows by the west end of the installation, generally in a north-to-south direction, before flowing into the M.J. Kirwan Reservoir, which is located on the south side of the installation. The West Branch flows out of the reservoir along the southern boundary of the installation before joining the Mahoning River at the east side of the installation.

The western and northern portions of the RVAAP installation display low hills and a dendritic surface drainage pattern. The eastern and southern portions are characterized by an undulating to moderately level surface, with less dissection of the surface drainage pattern. The installation is marked with marshy areas and flowing and intermittent streams whose headwaters are located in the installation's hills. Three

primary water courses drain the installation: (1) the South Fork of Eagle Creek, (2) Sand Creek, and (3) Hinkley Creek. All of these water courses have many associated tributaries.

Sand Creek, with a drainage area of 36 square kilometers (13.9 square miles), flows in a generally northeast direction to its confluence with the South Fork of Eagle Creek. In turn, the South Fork of Eagle Creek flows in a northerly direction for 4.3 kilometers (2.7 miles) to its confluence with Eagle Creek. The drainage area of the South Fork of Eagle Creek is 67.9 square kilometers (26.2 square miles), including the area drained by Sand Creek. Hinkley Creek originates just southeast of the intersection between State Routes 88 and 303. Its drainage area is 28.5 square kilometers (11.0 square miles). This creek flows in a southerly direction through the installation to its confluence with the West Branch of the Mahoning River.

Approximately 21 ponds are scattered throughout the installation. Many were built within natural drainageways. Others are natural in origin, resulting from glacial action. All water bodies support an abundance of aquatic vegetation and are well stocked with fish. None of the ponds within the installation are used as water supply sources. Rather, the main water source for the RVAAP installation is a 19-million-liter (5.0-million-gallon) covered water storage reservoir that is replenished by five on-site groundwater wells that collectively produce 7.6 to 9.5 million liters (2.0 to 2.5 million gallons) of water per month.