FY2007

RADFORD ARMY AMMUNITION PLANT

Army Defense Environmental Restoration Program

Installation Action Plan

Printed 19 October 2007

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Statement of Purpose

The purpose of the Installation Action Plan (IAP) is to outline the total multi- year Cleanup Program for an installation. The plan identifies environmental cleanup requirements at each site or area of concern, and proposes a comprehensive, installation- wide approach, with associated costs and schedules, to conduct investigations and necessary remedial actions.

In an effort to coordinate planning information between the restoration manager, US Army Environmental Command (USAEC), Radford Army Ammunition Plant (RAAP), executing agencies, and regulatory agencies, an IAP was completed. The IAP is used to track requirements, schedules and tentative budgets for all Army installation cleanup programs.

All site- specific funding and schedule information has been prepared according to projected overall Army funding levels and is, therefore, subject to change.

The following persons contributed to the formulation and completion of this Installation Action Plan for RADFORD ARMY AMMUNITION PLANT during a planning workshop/book update held on 27- 28 March 2007:

Virginia Department of Environmental Quality (VDEQ)
ATK for Radford Army Ammunition Plant
USEPA Region III
ATK for Radford Army Ammunition Plant
Engineering and Environment, Inc. for USAEC
Radford Army Ammunition Plant
US Army Environmental Command
USACE - Baltimore District
Engineering and Environment, Inc. for USAEC
ATK for Radford Army Ammunition Plant
USACE - Baltimore District

Acronyms

AAP	Army Ammunition Plant
AMC	US Army Materiel Command
AOC	Area of Concern
AST	Aboveground Storage Tank
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CMS	Corrective Measures Study
COC	Contaminants of Concern
CORA	Corrective Action Permit
CTC	Cost- to- Complete
cy	cubic yards
DA	Department of Army
DD	Decision Document
DNT	Dinitrotoluene
DoD	Department of Defense
EPA	Environmental Protection Agency
ER	Emergency Removal
ER,A	Environmental Restoration, Army
FLFA	Former Lead Furnace Area
FRA	Final Remedial Action
FY	Fiscal Year
GW	Groundwater
HBN	Health- Based Numbers
HHRA	Human Health Risk Assessment
HWMU	Hazardous Waste Management Unit
IAP	Installation Action Plan
IRA	Interim Remedial Action
IRP	Installation Restoration Program
K	thousand
LTM	Long- Term Management
MC	Munitions Constituents
MEC	Munitions and Explosives of Concern
MMA	Main Manufacturing Area
MMRP	Military Munitions Response Program
MNA	Monitored Natural Attenuation
MRSPP	Munitions Response Site Prioritization Protocol
N/A	Not Applicable
NFA	No Further Action
NRV	New River Valley
PBC	Performance- Based Contract
RA	Remedial Action
RAAP	Radford Army Ammunition Plant
RC	Response Complete
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation

Acronyms

RIP	Remedy- in- Place
ROD	Record of Decision
SI	Site Inspection
SLERA	Screening Level Ecological Risk Assessment
SSP	Site Screening Process
SWMU	Solid Waste Management Unit
TCE	Trichloroethylene
TCLP	Toxicity Characteristic Leachate Procedure
TNT	Trinitrolouene
TPH	Total Petroleum Hydrocarbons
USACE	US Army Corps of Engineers
USACHPPM	US Army Center for Health Promotion and Preventive Medicine
USAEC	US Army Environmental Command
USATHAMA	US Army Toxic and Hazardous Materials Agency (currently called USAEC)
USEPA	US Environmental Protection Agency
VA	Virginia
VDEQ	Virginia Department of Environmental Quality
VI	Verification Investigation

Acronym Conversion Table

CERCLA		RCRA
Preliminary Assessment(PA)	=	RCRA Facility Assessment(RFA)
Site Inspection(SI)	=	Confirmation Sampling(CS)
Remedial Investigation/Feasiblity Study(RI/FS)	=	RCRA Facility Investigation/Corrective Measures Study(RFI/CMS)
Remedial Design(RD)	=	Design(DES)
Remedial Action (Correction)(RA(C))	=	Corrective Measures Implementation (Construction)(CMI(C))
Remedial Action (Operation)(RA(O))	=	Corrective Measures Implementation (Operation)(CMI(O))
Long Term Management(LTM)	=	Long Term Management(LTM)
Interim Remedial Action(IRA)	=	Interim Measure(IM)

CERCLA		RCRA Underground Storage Tank (UST) Site Phase Terms
Preliminary Assessment(PA)	=	Initial Site Characterization(ISC)
Remedial Investigation(RI)	=	Investigation(INV)
Feasibility Study(FS)	=	Corrective Action Plan(CAP)
Remedial Design(RD)	=	Design(DES)
Remedial Action (Construction)(RA(C))	=	Implementation (Construction)(IMP(C))
Remedial Action (Operation)(RA(O))	=	Implementation (Operations)(IMP(O))
Long Term Management(LTM)	=	Long Term Management(LTM)
Interim Remedial Action(IRA)	=	Interim Remedial Action(IRA)

Site Alias List

AEDB- R Site ID to Alias List

AEDB- R #	Alias
PBC @ Radford	PBC site
RAAP- 001	SWMU 51
RAAP- 002	SWMU 71
RAAP- 003	SWMU 69
RAAP- 005	SWMU 13
RAAP- 009	SWMU 40
RAAP- 010	S35,37,38
RAAP- 011	SWMU 41
RAAP- 013	SWMU 49
RAAP- 014	SWMU 54
RAAP- 016	SWMU 39
RAAP- 018	SWMU 48
RAAP- 021	SWMU 46
RAAP- 022	SWMU 57
RAAP- 023	SWMU 43
RAAP- 024	SWMU 45
RAAP- 025	SWMU 50
RAAP- 026	SWMU 31
RAAP- 028	SWMU 59
RAAP- 031	AOC A
RAAP- 033	SWMU 68
RAAP- 037	AOC P
RAAP- 038	AOC O
RAAP- 039	HWMU 16
RAAP- 040	FLFA
RAAP- 041	HWMU #4
RAAP- 042	HWMU #5
RAAP- 043	HWMU #7
RAAP- 044	NRU
RAAP- 047	RAAP- 047
RFAAP- 001- R- 01	

Installation Information

Installation Locale

Installation Size (Acreage): 6900
City: Radford
County: Pulaski and Montgomery Counties
State: Virginia
Other Locale Information

Radford Army Ammunition Plant (RAAP) is located in the western part of Virginia, approximately 40 miles west of Roanoke. RAAP consists of two locations in mountainous terrain. The New River flows through the main manufacturing area (MMA). The New River unit (NRU) is located approximately six miles from the MMA near Dublin, VA. Land usage surrounding the MMA and NRU is primarily agricultural with some residential and industrial use

Installation Mission

The RAAP primary mission is the manufacturing of propellants. Since 1968, RAAP has also produced trinitrotoluene (TNT) on an intermittent basis.

Lead Organization

Army Materiel Command (AMC)

Lead Executing Agencies for Installation

Investigation Phase Executing Agency: Radford Army Ammunition Plant and US Army Corps of Engineers (USACE), Baltimore District
Remedial Design/Action Phase Executing Agency: The US Army Corps of Engineers (USACE), Baltimore Districts as well as some IRAs conducted through Radford Army Ammunition Plant

Regulator Participation

Federal	US Environmental Protection Agency (USEPA), Region III (RCRA and Office of Superfund)
State	Virginia Department of Environmental Quality (VDEQ), Federal Facilities Restoration Program

National Priorities List (NPL) Status

No NPL Sites have been identified

Installation Restoration Advisory Board (RAB)/Technical Review Committee (TRC)/Technical Assistance for Public Participation (TAPP) Status

RAB established 199807

Installation Program Summaries

IRP

Primary Contaminants of Concern: Explosives, Metals, Perchlorate, Pesticides, Polychlorinated Biphenyls, Semi-volatiles, Volatiles

Affected Media of Concern: Groundwater, Other (Sludge), Sediment, Soil, Surface Water

Estimated Date for Remedy- In- Place (RIP)/Response Complete (RC): 201309/201509

Prior Funding: $33,740.0 K

Current Requirements: $4,687.0 K

Future Requirements: $38,168.0 K

MMRP

Primary Contaminants of Concern: Munitions constituents

Affected Media of Concern: Soil

Estimated Date for Remedy- In- Place (RIP)/Response Complete (RC): 201709/201709

Prior Funding: $.0 K

Current Requirements: $116.1 K

Future Requirements: $627.0 K

Cleanup Program Summary

Installation Historic Activity

Radford Army Ammunition Plant (RAAP) is located in the mountains of southwest Virginia in Pulaski and Montgomery Counties. RAAP consists of two noncontiguous areas: Main Manufacturing Area (MMA) and New River Unit (NRU). The MMA is located approximately five miles northeast of the city of Radford, Virginia which is approximately ten miles west of Blacksburg and 47 miles southwest of Roanoke. The New River Unit is located about six miles west of the MMA, near the town of Dublin.

RAAP lies in one of a series of narrow valleys typical of the eastern range of the Appalachian Mountains. Oriented in a northeast- southwest direction, the valley is approximately 25 miles long, eight miles in width at southeast end and narrowing to two miles in the northeast end. RAAP lies along the New River in the relatively narrow northeastern corner of the valley. The New River divides RAAP into two areas. The Horseshoe Area (which is part of the Main Manufacturing Area) exists within a meander of the New River.

The RAAP primary mission, the manufacturing of propellants, began in 1941 and continues today. Since 1968, RAAP has also produced TNT on an intermittent basis. The working population at RAAP varies greatly with mission requirements.

Installation Program Cleanup Progress

IRP

Prior Year Progress: The following were submitted to EPA & VDEQ:

- SWMU 31 Final RFI Report
- SWMUs 13,37,38,46,57,68,69,75,76,AOCs A,F,Q Draft Revised SSP Report
- Draft Work Plan addendum- SWMUs 48,49,50, 59,41,43,AOCs O,P,FLFA
- Draft Closeout Report- Bldg 4343

Future Plan of Action: Complete SSP Report: SWMU 46, 57, 68, 69 & AOC F

Complete RFI/CMS: SWMUs 54, 40/71, 45, 31, 41

Implement PBC: SWMUs 51, 41, 49, 39, 48, 59, 59, 43, AOC O, Former Pb Furnace Area, AOC P.

Contract and implement PBC: New River Unit.

MMRP

Prior Year Progress: Site Inspection is underway.

Future Plan of Action: SI to be completed in FY08.

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IRP Summary

Installation Total Army Environmental Database- Restoration (AEDB- R) Sites/RC Sites: 47/19

Installation Site Types with Future and/or Underway Phases

1 Above Ground Storage Tank
(RAAP- 033)
2 Burn Area
(RAAP- 002, RAAP- 005)
1 Chemical Disposal
(RAAP- 039)
1 Contaminated Ground Water
(RAAP- 047)
1 Contaminated Soil Piles
(RAAP- 040)
1 Drainage Ditch
(RAAP- 031)
13 Landfill
(PBC @ Radford, RAAP- 001, RAAP- 009, RAAP- 011, RAAP- 013, RAAP- 014, RAAP- 016, RAAP- 018, RAAP- 021, RAAP- 023, RAAP- 024, RAAP- 025, RAAP- 028)
1 Spill Site Area
(RAAP- 038)
2 Storage Area
(RAAP- 037, RAAP- 044)
7 Surface Impoundment/Lagoon
(RAAP- 003, RAAP- 010, RAAP- 022, RAAP- 026, RAAP- 041, RAAP- 042, RAAP- 043)

Most Widespread Contaminants of Concern

Explosives, Metals, Perchlorate, Pesticides, Polychlorinated Biphenyls, Semi- volatiles, Volatiles

Media of Concern

Groundwater, Other (Sludge), Sediment, Soil, Surface Water

Completed Remedial Actions (Interim Remedial Actions/ Final Remedial Actions (IRA/FRA))

Site ID	Site Name	Action	Remedy	FY	Cost
RAAP- 041	SURFACE IMPOUNDMENT #4 (HWMU #4)	FRA	REMOVAL	1988	TBD
RAAP- 014	PROPELLANT BURNING ASH DISPOSAL (S54)	IRA	REMOVAL	2000	$2,205.3 K
RAAP- 045	FORMERCADMIUM PLATING FACILTY(BLDG 4343)	FRA	REMOVAL	2007	TBD

Total Environmental Restoration, Army (ER,A) Funding

Prior Funding: $33,740.0 K
Current Requirements: $4,687.0 K
Future Requirements: $38,168.0 K

Duration of IRP

Date of IRP Inception: 198409
Estimated Date for Remedy- In- Place (RIP)/Response Complete (RC): 201309/201509
Date of IRP completion including Long Term Management (LTM): 203909

IRP Contamination Assessment

Contamination Assessment Overview

In a RCRA Facility Assessment completed by USEPA in 1987, 98 Solid Waste Management Units (SWMUs) were identified. The initial requirements for the corrective action process were specified in a RCRA permit issued by USEPA in 1989. The permit which governs corrective action was re- issued in October 2000. The first phase of investigations at the SWMUs was completed in October 1992 under the 1989 permit. Various investigations and actions have since been completed and submitted to the USEPA and the Commonwealth of Virginia. USEPA and the Commonwealth of Virginia are currently reviewing results of these investigations. In some cases SWMUs are grouped together based on similar histories or proximity.

The October 2000 Corrective Action Permit is the USEPA Region III enforceable document to manage the Radford AAP IRP and specific ER,A eligible sites. Radford AAP has separate permits issued by the Commonwealth of Virginia that manage operations pertaining to RCRA Subpart C, D and X. Similarly, the post- closure care permits are the enforceable documents issued by the Commonwealth of Virginia to manage the Radford AAP IRP and specific ER,A eligible sites.

The primary contaminants of concern at RAAP include metals and explosives. Groundwater within the RAAP boundaries has been impacted. Groundwater is believed to eventually discharge to the New River. Current data does not suggest that off- post groundwater has been impacted. Regional efforts are underway to delineate the occurrence and flow of groundwater. The efforts are complicated due to the presence of karst geology (highly fractured and channelized limestone). Due to the nature of the karst geology, source removal (clean closure) is the preferred alternative when an action may be required.

Cleanup Exit Strategy

RAAP in consultation with USEPA and VDEQ will investigate sites so as to assess what action, if any, is required to achieve response complete. It is anticipated that the remaining sites will fall into three broad categories: no further action, source removal, or waste in place with LTM.

IRP Previous Studies

	Title	Author	Date
1992			
	Verification Investigation Report	Dames and Moore	OCT- 1992
	RCRA Facility Investigation Report	Dames and Moore	OCT- 1992
1994			
	SWMU 69 Closure Report	Dames & Moore	AUG- 1994
1995			
	Final Community Relations Plan	Radford Army Ammunition Plant	SEP- 1995
1996			
	RCRA Facility Investigation for Solid Waste Management Units 17, 31, 48, 54	Parsons Engineering and Science, Inc.	JAN- 1996
1997			
	New River and Tributaries Study, Radford Army Ammunition Plant	Parsons Engineering Science, Inc.	DEC- 1997
1998			
	Site Management Plan	ICF Kaiser Engineers, Inc.	MAY- 1998
	Closure Documentation for Solid Waste Management Unit 10, Biological Treatment Plant Equalization Basin	Radford Army Ammunition Plant	DEC- 1998
	Closure Report for the Eastern Lagoon of SWMU 8	Radford Army Ammunition Plant	DEC- 1998
1999			
	RCRA Facility Investigation Report for SWMUs 31, 39, 48, 49, & 58	ICF Kaiser	JAN- 1999
	Work Plan Addendum 8: RI/FS for the Northern and Western Burning Grounds (at the NRU) and RFI for Building 4343	ICF Kaiser	JUN- 1999
	Work Plan Addendum 009: RFI Activities at Solid Waste Management Units 31, 48, and 49 and Horseshoe Area Groundwater Study	The IT Group	NOV- 1999
2000			
	Work Plan Addendum 010: Background Study	Radford Army Ammunition Plant	AUG- 2000
	Final Work Plan Addendum 11: Soil Sampling and Reporting SWMU 6	Radford Army Ammunition Plant	NOV- 2000
2001			
	Final SWMU 6 Sampling Results Report	Radford Army Ammunition Plant	MAY- 2001
2002			
	Final Work Plan Addendum 009: SWMU 31 and Horseshoe Area Groundwater Study	Radford Army Ammunition Plant	SEP- 2002
	Final Work Plan Addendum 012: SWMUs 39, 48, 49, 50, 58, 59, AOC- FLFA, AOC- Building 4343, New River Unit	Radford Army Ammunition Plant	SEP- 2002
	Final Master Work Plan	Radford Army Ammunition Plant	SEP- 2002
	Final Work Plan Addendum 13 RFI at SWMU 54	Radford Army Ammunition Plant	SEP- 2002
	Final Work Plan Addendum 14 RFI at SWMU 40/71	Radford Army Ammunition Plant	SEP- 2002
	Final SWMU 6 Decision Document	Radford Army Ammunition	OCT- 2002

IRP Previous Studies

	Title	Author	Date
2002			
		Plant	
2003			
	Final Work Plan Addendum 16, Site Screening Process fro SWMUs 13, 37, 38, 46, 57, 68, 69, 75, 76, and AOCs A, F, Q	Radford Army Ammunition Plant	MAR- 2003
	Final Work Plan Addendum 17 SWMU 51 RCRA Facility Investigation	Radford Army Ammunition Plant	DEC- 2003
	Final Work Plan Addendum 18, RCRA Facility Investigation at SWMU 41	Radford Army Ammunition Plant	DEC- 2003
	Final SWMU 58 RCRA Facility Investigation Report	Radford Army Ammunition Plant	DEC- 2003
2004			
	Final Soil Sampling Report, SWMU 8 and 36	Radford Army Ammunition Plant	JAN- 2004
	Final Building 4343 RCRA Facility Investigation/Corrective Measures Study Report	Radford Army Ammunition Plant	FEB- 2004
	Final Work Plan Addendum 17 SWMU 51 RCRA Facility Investigation	Radford Army Ammunition Plant	FEB- 2004
	Final New River Unit Additional Characterization: Work Instructions	Radford Army Ammunition Plant	MAY- 2004
	Final SWMU 54 Additional Characterization: Work Instructions	Radford Army Ammunition Plant	JUL- 2004
	Final SWMU 58 Decision Document –No Further Action	Radford Army Ammunition Plant	AUG- 2004
	Final SWMU 39 RCRA Facility Investigation/Corrective Measures Study Report	Radford Army Ammunition Plant	OCT- 2004
2005			
	Final SWMU 39 RCRA Facility Investigation/Corrective Measures Study Report	Radford Army Ammunition Plant	JUN- 2005
	Final No Further Action Decision Documents for SWMUs 8 and 36	Radford Army Ammunition Plant	JUL- 2005
2006			
	Final Sampling Plan Site Screening Process for SWMUs 13, 37, 38, 46, 57, 68, 69, and AOCs A, F, Q January 2006	Radford AAP, URS Corp	JAN- 2006
	Final Sampling Plan (email) in re Site Screening Process for SWMUs 13, 37, 38, 46 57, 68, 69 and AOCs A, F, Q	Radford Army Ammunition Plant	JAN- 2006
	Radford AAP Installation Action Plan, 2006	US Army	MAY- 2006
	Final Building 4343 Interim Measures Work Plan, October 2006	Radford AAP, Shaw	OCT- 2006
2007			
	Final RFI Report SWMU 31	Shaw Environmental	JAN- 2007
	Radford Army Ammunition Plant, Site Screening Process Report for Solid Waste Management Units 13, 37, 38, 46, 57, 68, 69 and Areas of Concern A, F, Q Final	URS	MAY- 2007
	Closure Evaluation for Hazardous Waste Management Unit 4 (HWMU #4)- Interim Status, Radford Army Ammunition Plant, EPA ID VA 1210020730	ATK letter 07- 815- 129 dated 28 June 2007	JUN- 2007

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Installation Restoration Program

Site Descriptions

PBC @ Radford
PBC site
Alias: PBC site

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Phases	Start	End
RFA	199909	200101
CMI(C)	200609	200905
LTM	200906	203809

RIP Date: N/A

RC Date: 200905

SITE DESCRIPTION

This PBC site was created to track the funding for the PBC that was awarded in September 2006. The following sites are under this PBC: RAAP- 001, 011, 013, 016, 018, 023, 025, 028, 037, 038, and 040. Please refer to the individual site descriptions for each site.

CLEANUP/EXIT STRATEGY

Please refer to the individual cleanup strategies for each site.

RAAP- 001
TNT WASTE ACID NEUTRALIZATION PITS(S51)
Alias: SWMU 51

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Explosives, Metals, Semi- volatiles, Volatiles

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200207	200801
DES	200709	200802
CMI(C)	200709	200802

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 51 is located on a plateau in the southeastern section of the Horseshoe Area and consists of one unlined trench, approximately 20 feet wide by 200 feet long. An estimated 10 tons of red water ash was reportedly disposed of in the trench from 1968- 1972. Additionally, the trench was used for disposal of TNT neutralization sludge from the treatment of red water in the 1970s. The pits were backfilled and revegetated.

A RCRA Facility Investigation (Dames & Moore 1992) evaluated groundwater and soil samples and a Corrective Measures Study (CMS) was recommended. The soil and groundwater concentrations of COCs exceeded health based numbers (HBNs) in the 1989 RCRA Corrective Action Permit (CORA) and could indicate risk under an industrial worker scenario.

The soil samples for the site screening process, a quantitative human health risk assessment (HHRA), and a screening- level ecological risk assessment (SLERA) were collected in FY04.

Collect GW/SO for SVOCs, VOCs and explosives to support a quantitative human health risk assessment. Due to the nature of the karst geology, source removal is recommended. LTM performed for 5 years. SWMUs 28 and 52 are in the same vicinity. During the May 2006 IAP workshop, it was understood by DA reps that this site would not be RIP/RC by FY07. In Sep 2006, a PBC was awarded with RIP of Sep 2009.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater. Source removal (clean closure) is anticipated.

RAAP- 002
FLASH BURN PARTS AREA(S71)
Alias: SWMU 71

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals, Semi- volatiles

Media of Concern: Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200507	200908

RIP Date: N/A

RC Date: 200908

SITE DESCRIPTION

SWMU 71 consists of an open, hard- packed gravel area approximately 25 feet wide by 50 feet long. The SWMU was used from 1962 to 1982 to flash- burn metal process pipes contaminated with propellant. The pipes were then reused or sold for scrap.

A RCRA Verification Investigation (VI) (Dames & Moore 1992) detected metals and total petroleum hydrocarbons (TPH) from soil samples which led to a Supplementary VI (Dames & Moore 1994). A dye- trace study (Engineering- Science 1993) indicated a nearby karst conduit to the New River. However, it is believed that this site does not affect groundwater.

This site and SWMU 40 (RAAP- 009) are combined for the initial RFI. Based on the 2000 RCRA CORA permit, additional soil investigations are required. Soil samples were collected in FY03 to confirm previous investigative results and provide additional data to support a quantitative HHRA and SLERA. The RFI was submitted VDEQ and USEPA for review in FY04. There were several comment review cycles in FY05. It was agreed amongst stakeholders that additional sampling was needed to address soil and groundwater data gaps. Additional sampling was procured in FY06.

CLEANUP/EXIT STRATEGY

RAAP is in the process of implementing this additional effort. The RFI/CMS report is to be revised to address site- specific groundwater as part of the site conceptual model.

No further action is anticipated beyond the RFI/CMS.

RAAP- 003
POND BY CR ACID TREATMENT TANKS(S69)
Alias: SWMU 69

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Sediment, Soil

Phases	Start	End
RFA	198409	198410
CS	198410	198412
RFI/CMS	199007	200809

RIP Date: N/A

RC Date: 200809

SITE DESCRIPTION

SWMU 69 was an unlined settling pond that received SWMU 68 neutralized wastewater from rocket encasement cleaning activities. Before 1974, runoff consisted of neutralized chromic acid (pH=8.6), which had been treated with sulfuric acid, sodium metabisulfate, and calcium lime. After 1974 up to the time operations ceased, Oakite 33, an acidic rust stripper consisting of phosphoric acid and butyl cellosolve mixture, was used to clean rocket encasements. Oakite 33 was adjusted to a pH of 5.0 with soda ash before discharge to SWMU 69.

A Verification Investigation (VI) (Dames & Moore 1992) performed a qualitative human health risk assessment. The VI recommended interim corrective measures to remove all accumulated pond water, pond sediments, and adversely impacted surficial soil. Impacted soils and sediments were removed as indicated by confirmatory samples (Dames & Moore 1994). The Closure Report was submitted to the regulators in August 1994.

Site- screening sampling was performed in FY04. The report was submitted in FY04. There were several comment review cycles in FY05. A revised report was submitted in Jan 2007.

CLEANUP/EXIT STRATEGY

SWMU 69 is included in the Site Screening Process (SSP) report with other sites. NFA is anticipated for SWMU 69. Closeout documentation IAW CORA will be prepared.

RAAP- 005
WASTE PROPELLANT BURNING GROUND (S13)
Alias: SWMU 13

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Explosives, Metals, Perchlorate, Semi- volatiles, Volatiles

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200505	200810
DES	200809	200905
CMI(C)	200810	201108

RIP Date: N/A

RC Date: 201108

SITE DESCRIPTION

SWMU 13, approximately 20 acres in size, is located in the southeast section of the Horseshoe Area on the northern bank of the New River within the 100- year floodplain. The SWMU has been used for the burning of waste explosives, propellants, and laboratory wastes (propellant and explosive residues, samples, and analytical residues) since manufacturing operations began at RAAP in 1941. Until 1985, burning was conducted on the soil. From that time burning is performed in pans.

A RCRA Facility Investigation (Dames & Moore 1992) evaluated groundwater quality and potential soil contamination for explosives, VOCs, SVOCs, and heavy metals.

The concentrations of COCs exceeded health- based numbers (HBNs) in the 1989 RCRA Corrective Action Permit (CORA) and could indicate risk under an industrial worker scenario.

Site- screening sampling was performed in FY04. The site screening effort has identified off- site migration associated with activities before 1986. A RFI/CMS was procured in FY05. Also, a permit was issued in FY05 by the VDEQ governing burning operations at the Open Burning Ground. A GW and soil monitoring program is part of the permit.

CLEANUP/EXIT STRATEGY

The RFI/CMS and soil cleanup will address the area outside of the permitted unit from the fence to the river (~30 to 50'). It is anticipated that the soil cleanup will be hot spot removal with off- site disposal.

The RFI/CMS report will be submitted in FY08.

RAAP- 009
LANDFILL NITRO AREA (S40)
Alias: SWMU 40

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Soil, Surface Water

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200105	200908

RIP Date: N/A

RC Date: 200908

SITE DESCRIPTION

SWMU 40 was reportedly used as a sanitary landfill, approximately 1.5 acres, in the 1970s and early 1980s for the disposal of uncontaminated paper, municipal refuse, cement, and rubber tires. It is not known whether hazardous wastes or wastes containing hazardous constituents were ever disposed of in the landfill. Between 1991 and 1992, a fenced enclosure for asbestos storage was constructed over the northeast corner of this SWMU. The unit was strictly an area fill, and the unit was covered with soil and grass.

A RCRA Verification Investigation (Dames & Moore 1992) attempted to install four monitoring wells, which could not be sampled as the four borings were dry. A dye- trace study was conducted in the adjacent area (Engineering- Science 1993 and 1994) to identify groundwater flow paths in the south- central section of the Main Manufacturing Area. However, it is believed that this site does not affect groundwater. This site and SWMU 71 (RAAP- 02) are combined for the RFI. A contract to perform a RFI/CMS was procured in FY01. Field investigations were completed in FY03. Soil samples were collected to confirm previous investigative results and provide additional data to support a quantitative HHRA and SLERA. A portion (20 cy) of the IDM was determined to be hazardous waste (lead) and was stabilized and disposed of in a permitted treatment storage and disposal facility.

The RFI was submitted VDEQ and USEPA for review in FY04. There were several comment review cycles in FY05. It was agreed amongst stakeholders that additional sampling was needed to address soil and groundwater data gaps. Additional sampling was procured in FY06.

CLEANUP/EXIT STRATEGY

RAAP is in the process of implementing this additional effort. The RFI/CMS report is to be revised to address site- specific groundwater as part of the site conceptual model. No further action is anticipated beyond the completion of the RFI/CMS.

RAAP- 010
CASO4 TRMT/DISP (8,9,35,36,37,38,Q)
Alias: S35,37,38

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals, Pesticides, Polychlorinated Biphenyls, Volatiles

Media of Concern: Other (Sludge), Soil

Phases	Start	End
RFA	198409	198410
CS	198410	198412
RFI/CMS	199201	200805
DES	200806	200810
CMI(C)	200809	200912

RIP Date: N/A

RC Date: 200912

SITE DESCRIPTION

SWMU 8 consisted of two unlined, below- grade earthen lagoons located in the northeast section of the MMA along the south bank of the New River. The lagoons were designed to neutralize acidic wastewater from the Acidic Wastewater Treatment Plant with hydrated lime. The supernatant is discharged to the New River via Outfall 007.In 1998 the Eastern Lagoon was closed and replaced with a concrete tank.The closure documentation was submitted to EPA Region III and VDEQ in 1999 demonstrating no further action is required. In 2005 the Western Lagoon was replaced with a concrete tank. Sludge was dredged from the lagoons and was placed in the adjacent unlined drying beds (SWMU 36). In 2006 concrete drying beds were constructed within the SWMU 36 area. In 2004 a RFI report (non ER,A funded) that encompassed both SWMUs 8 and 36 contained a recommendation for NFA and was approved by USEPA and DEQ.

SWMU 9 consists of two unlined, below- grade earthen lagoons located in the northwest section of the MMA operated similar to SWMU 8. The supernatant is discharged to the New River via Outfall 005. As operations as a sludge settling lagoon ceased in 1993 it is ineligible for ER,A. Sludge was dredged from the lagoons and was placed in the adjacent drying beds then to SWMU 29 (1982 to 1991). In 1987, a RCRA Facility Assessment was conducted by the USEPA that included a preliminary data review, evaluation, and visual site inspection. A VI was performed in 1992.

SWMU 35 is an unlined Calcium Sulfate Drying Bed 160 feet by 80 feet with approximately 8 feet of sediment remaining in the basin. The SWMU is located along the New River in the northeast section of the Main Manufacturing Area. Calcium sulfate sludge was dredged from SWMU 8 prior to 1980 and pumped into SWMU 35. RAAP reported that sediment from SWMU 10 was also deposited in SWMU 35 during the early 1980s. A RCRA Verification Investigation (VI) and a Supplemental VI were performed that included groundwater sampling. Explosives and metals in soil, groundwater, surface water and sediment exceeded HBNs as per the 1989 RCRA CORA permit.

SWMU 37 is an unlined drying bed approximately 100 feet long, 80 feet wide, and eight feet deep located in the northwest section of the MMA. The SWMU is immediately southwest of and adjacent to SWMU 9 and received calcium sulfate sludge. Beds have been inactive since the 1980s. A RCRA Verification Investigation (VI) (Dames & Moore 1992) included the collection of one composite sludge sample to determine whether concentrations exceeded permit levels for VOCs, SVOCs, and TCLP metals. Although VOCs and SVOCs were detected, reported results were below 1989 RCRA CORA permit levels.

SWMU 38 is an unlined drying bed approximately 225 feet long, 40 feet wide, and 8 feet deep located in the northwest section of the Main Manufacturing Area. The drying bed received calcium sulfate sludge and, when it reached capacity, the overflow was pumped to Area Q via pipes that ran through a depression in the berm surrounding the drying bed. Beds have been inactive since the 1980s. A RCRA VI (Dames & Moore 1992) included the collection of one composite sludge sample to determine whether concentrations exceeded permit specifications for VOCs, SVOCs, and TCLP metals. The limited data indicates no exceedences of 1989 RCRA CORA permit HBNs.

Area Q is an abandoned lagoon located in the northwest section of the MMA. This site is less than a quarter of an acre. Area Q is immediately northwest and adjacent to SWMU 38 and was reported to be used as a sludge drying bed when SWMU 38 reached capacity. Sludge was pumped from SWMU 38 to Area Q via pipes that ran through a depression in the berm surrounding the

drying bed.

A site- screening report was submitted in FY04 for multiple sites including SWMUs 35, 37, 38 and AOC Q. There were several comment review cycles in FY05. The revised report was submitted in Jan 2007.

CLEANUP/EXIT STRATEGY

SWMU 35, 37, 38 and Area Q: Based on the SSP report, these sites will go to RFI. These sites contain identical wastes and are in close proximity. Source removal is anticipated.

Based on the SSP report, Area Q will go to RFI combined with SWMUs 35, 37 and 38. These sites contain identical wastes and are in close proximity.

This site is being considered for a PBC in FY07.

RAAP- 011
RED WATER ASH BURIAL GROUND(S41)
Alias: SWMU 41

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Explosives, Metals, Semi- volatiles

Media of Concern: Groundwater, Soil, Surface Water

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200207	200812
DES	200707	200812
CMI(C)	200707	200812

RIP Date: N/A

RC Date: 200812

SITE DESCRIPTION

SWMU 41 is located in the MMA and consists of two non- contiguous disposal areas for red water ash. The northern area consisted of an unlined lagoon approximately 50 feet by 70 feet, which was backfilled. The southern area consisted of a clay-lined disposal area approximately 100 feet by 150 feet. Prior to the construction of the red water treatment plant, red water was concentrated by evaporation and burned in four rotary kilns located in the TNT manufacturing area. The ash produced from these kilns was disposed of in SWMU 41 from 1967 to 1971.

A RCRA VI (Dames & Moore 1992) included the collection and analysis of groundwater samples near the landfill, ash and soil samples from the lagoon north of the landfill, and a surface water sample from Stroubles Creek.

Data from the VI indicate explosives and metals in soil and SVOCs and metals in groundwater above 1989 RCRA CORA permit HBNs. The soil samples for the site screening process, a quantitative HHRA, and a SLERA were collected in FY04.

In Sep 2006, a PBC was awarded with RIP of Sep 2009.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater.

Repairs to the existing cap are anticipated for the southern area. A request for NFA is anticipated for the northern area.

RAAP- 013
RED WATER ASH BURIAL #2 (S49)
Alias: SWMU 49

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Explosives, Metals, Semi- volatiles, Volatiles

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199712	200807
DES	200707	200809
CMI(C)	200707	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 49 is approximately 75 feet by 50 feet and is located in the Horseshoe Area, contiguous with SWMUs 48, 50 and 59. The four SWMUs were classified together during the 1980s because no distinction could be made between the areas by visual observation. SWMU 48 was later divided into an upper and a lower disposal area, and SWMU 49 was determined to be the part of the SWMU 48 lower disposal unit. SWMU 49 reportedly received 10 tons of redwater ash during its active life.

A RCRA VI (Dames & Moore 1992) and a RCRA Facility Investigation (RFI) (Parsons Engineering- Science 1996) were conducted to determine the impacts to groundwater quality and soil. A draft RFI (ICF Kaiser 1999) included the verification of previous RFI results. Metals, VOCs and SVOCs were detected above 1989 RCRA CORA permit HBNs.

The RFI sampling was completed in FY02. In Sep 2006, a PBC was awarded with RIP of Sep 2009 at SWMUs 49, 48, 50 and 59, which are in proximity to each other.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater.

Due to the contiguous nature of RAAP- 013 (SWMU 49), - 018 (SWMU 48), - 025 (SWMU 50), and - 028 (SWMU 59) local groundwater issues may be best addressed under a MNA/LTM plan for RAAP- 013 (SWMU 49) and - 018 (SWMU 48), as these two sites are thought to be the likely source areas.

No further action is anticipated for soil at RAAP- 013 (SWMU 49). MNA/LTM is anticipated for groundwater at and in the vicinity of RAAP- 013 (SWMU 49) and - 018 (SWMU 48).

RAAP- 014
PROPELLANT BURNING ASH DISPOSAL (S54)
Alias: SWMU 54

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Explosives, Metals, Perchlorate, Volatiles

Media of Concern: Groundwater, Sediment, Soil, Surface Water

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199601	200808
DES	200809	200811
IRA	199808	200001
CMI(C)	200809	200906
LTM	200907	201508

RIP Date: N/A

RC Date: 200906

SITE DESCRIPTION

SWMU 54 is an inactive disposal area situated on approximately 5 acres within the easternmost section of the Horseshoe Area. The SWMU was used during the 1970s for disposal of the Propellant Burning Ground (SWMU 13) ash.

A RCRA VI (Dames & Moore 1992), a RCRA Facility Investigation (Parsons Engineering- Science 1996) and a Supplemental RFI (ICF Kaiser 1997) were conducted. Soil and groundwater samples were taken in these efforts. Soil data indicates the presence of metals; VOCs and explosives in exceedence of 1989 RCRA CORA permit HBNs.

An interim removal action (Parallax 1999) was performed to remove "hot spots" associated with lead.

A contract to perform a RFI/CMS was procured in FY01. Clean closeout will mitigate long- term monitoring and long- term operation liability. RFI sampling was conducted in FY03 through FY06. More sampling is needed per March 29- 30, 2006 meeting among RAAP, USAEC, USACE, USACHPPM, VDEQ and USEPA. Additional sampling was procured in FY06.

CLEANUP/EXIT STRATEGY

RAAP is in the process of implementing this additional sampling. The SWMU 54 RFI/CMS report is on hold pending the collection of additional data. Final source identification/removal is anticipated.

RAAP- 016
WASTEWATER PONDS FROM PROP INCINER(S39)
Alias: SWMU 39

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199802	200512
DES	200707	200805
CMI(C)	200707	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 39 consists of two unlined earthen ponds, approx. two acres total, located in the north- central section of the Horseshoe Area, adjacent to and associated with SWMU 14 (Hazardous Waste Incinerator). The settling ponds were excavated approximately six to 8 feet into the natural grade. These ponds received overflow from the former incinerator spray pond. Caustic was reportedly added to neutralize the water. Sludges are believed to remain in the former ponds.

A RCRA VI (Dames & Moore 1992) and a Supplemental VI (Dames & Moore 1994) installed and sampled three monitoring wells near the ponds. Metals exceeding 1989 RCRA CORA permit HBNs were detected in the soil and groundwater.

A draft RFI was submitted in 1999 (ICF Kaiser). The RFI/CMS was submitted in FY04. This document was subsequently reviewed, revised and approved by EPA on 6 June 2005 and by VDEQ on 9 December 2004. An internal Army Decision Document was prepared and submitted by RAAP on 17 August 2005. In Sep 2006, a PBC was awarded with RC of Sep 2009 at SWMU 39.

CLEANUP/EXIT STRATEGY

Effort will be directed to implement the remedy in the approved RFI/CMS. Contaminated soil removal is expected.

RAAP- 018
OILY WATER BURIAL AREA (S48)
Alias: SWMU 48

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Explosives, Metals

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198409	198410
CS	198410	198412
RFI/CMS	199712	200807
DES	200707	200809
CMI(C)	200707	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

This unit is contiguous to SWMU 49 (Red Water Ash Disposal Area), SWMU 50 (Calcium Sulfate Disposal Area) and SWMU 59 (Bottom Ash Pile). It is estimated that 200,000 gallons or more of oil- contaminated wastewater were disposed in unlined trenches at this unit prior to off- plant used oil recycling.

A RCRA Verification Investigation (Dames & Moore 1992) and a RCRA Facility Investigation (RFI) (Parsons Engineering- Science 1996) was conducted to evaluate potential groundwater contamination. Four monitoring wells were installed and sampled. Soil data from the VI indicated the presence of metals and explosives above 1989 RCRA CORA permit HBNs. Groundwater data from the VI indicated the presence of chlorinated solvents and metals above 1989 RCRA CORA permit HBNs.

A draft RFI was submitted in 1999 (ICF Kaiser). Soil data from the RFI indicated the presence of metals above 1989 RCRA CORA permit HBNs. The RFI sampling was completed in FY02. In Sep 2006 a PBC was awarded with RIP of Sep 2009 at SWMUs 49, 48, 50 and 59, which are in proximity to each other.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater.

Due to the contiguous nature of RAAP- 013 (SWMU 49), - 018 (SWMU 48), - 025 (SWMU 50), and - 028 (SWMU 59), local groundwater issues may be best addressed under a MNA/LTM plan for RAAP- 013 (SWMU 49) and - 018 (SWMU 48), as these two sites are thought to be the likely source areas.

Land use control is anticipated for soil at RAAP- 018 (SWMU 48). MNA/LTM is anticipated for groundwater at and in the vicinity of RAAP- 013 (SWMU 49) and - 018 (SWMU 48).

RAAP- 021
PROPELLANT BURIAL (S46)
Alias: SWMU 46

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Contaminants of Concern: Explosives, Metals

Media of Concern: Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199201	200803

RIP Date: N/A

RC Date: 200803

SITE DESCRIPTION

The reported location of SWMU 46 is a small depression with no outward drainage. Approximately one ton of propellants and propellant- contaminated soil were reportedly disposed of at this location because of a railroad derailment in the 1950s (USATHAMA 1976). The actual size of the Waste Propellant Disposal Area is not known. During a March 1990 facility visit, a broken- off sign identifying buried explosive waste was found in a low area between the railroad tracks and the driveway leading to Building 456.

A RCRA VI (Dames & Moore 1992) collected one surface water and one sediment sample, and no contaminants of concern were detected against HBNs. In 1997, USACHPPM conducted further studies by collecting five subsurface (five to nine feet) soil samples. Samples were analyzed for SVOCs, explosives, total metals and nitrite/nitrates. No exceedences were detected. Direct- push groundwater sampling was attempted but groundwater was not encountered.

Site- screening sampling was performed in FY04. The report was submitted in FY04. There were several comment review cycles in FY05. The revised report was submitted in Jan 2007.

CLEANUP/EXIT STRATEGY

SWMU 46 is included in the Site Screening Process (SSP) report with other sites. NFA is anticipated for SWMU 46. Closeout documentation will be funded and prepared for this site and RAAP- 006 (Area F) IAW CORA.

RAAP- 022
POND BY BLDGS 4931 & 4928 (S57)
Alias: SWMU 57

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Contaminants of Concern: Metals

Media of Concern: Sediment

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199201	200806

RIP Date: N/A

RC Date: 200806

SITE DESCRIPTION

SWMU 57 is designated as an acid settling pond that supported the Nike program and is located in the western section of the Horseshoe Area. SWMU 57 is approximately 30 feet in diameter, surrounded by a gravel berm, and is enclosed by a perimeter fence. The pond is connected to a maintenance shop (Building 4931) by an underground pipe. A similar practice occurred at Building 4343 (RAAP- 045), where subsequent investigations found metal concentrations above action levels.

A RCRA VI (Dames & Moore 1992) collected one surface water and one sediment sample. No contaminants of concern were detected against HBNs. The VI never received regulatory approval.

Site- screening sampling was performed in FY04 to comply with the 2000 RCRA CORA. The report was submitted in FY04. There were several comment review cycles in FY05. The revised report was submitted in Jan 2007.

CLEANUP/EXIT STRATEGY

Based on the SSP report, this site will go to RFI thus the RFI effort will follow and build upon the SSP. NFA is anticipated. Closeout documentation is to be prepared IAW CORA.

RAAP- 023
SANITARY LANDFILL NO.2 (S43)
Alias: SWMU 43

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Contaminants of Concern: Metals

Media of Concern: Groundwater, Sediment, Surface Water

Phases	Start	End
RFA	198409	198410
CS	198410	198412
RFI/CMS	200610	200909
LTM	200910	203909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 43 is a closed, unlined sanitary landfill, approximately two acres, located immediately adjacent to the New River in the northeast section of the RAAP MMA that operated from 1958 to 1969. The exact boundaries of the unit have not been determined because of the unavailability of a site plan or documents. Site was regraded in accordance with VI recommendation. A RCRA VI (Dames & Moore 1992) installed six groundwater monitoring wells. Groundwater and surface water data indicates the presence of metals and VOCs which did not exceed 1989 RCRA CORA permit HBNs.

In Sep 2006, a PBC was awarded to produce a RFI/CMS by Sep 2009.

CLEANUP/EXIT STRATEGY

RFI/CMS will be completed, followed by LTM.

RAAP- 024
LANDFILL NO.3 (S45)
Alias: SWMU 45

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Semi- volatiles

Media of Concern: Groundwater

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200503	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 45 is an inactive sanitary landfill, approximately 5 acres, located in the north- central section of the MMA that operated between 1957 and 1961. The unit was never operated as a permitted landfill. Paper and municipal refuse were the only materials reportedly disposed of in SWMU 45. Evidence of burning has been observed in the area.

A RCRA VI (Dames & Moore 1992) included monitoring well installation, a geophysical survey, and a baseline human health risk assessment.

SSP was procured in FY05. In late FY06, a geophysical delineation and groundwater assessment was procured as agreed among stakeholders.

CLEANUP/EXIT STRATEGY

A SSP will be conducted in accordance with the RCRA CORA 2000 Permit. NFA is anticipated based on initial SSP. If SSP is failed, a RFI will be required. Closeout documentation will be prepared IAW CORA.

RAAP- 025
CASO4 TREATMENT/DISPOSAL AREA (S50)
Alias: SWMU 50

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Contaminants of Concern: Explosives, Metals, Semi- volatiles, Volatiles

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199201	200807
DES	200707	200809
CMI(C)	200707	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 50 is an open area south of SWMU 48 approximately 300 feet long by 300 feet and is located within the Horseshoe Area. Until 1982, SWMU 50 was one of the major disposal areas at RAAP for sludge removed from the calcium sulfate drying beds (SWMUs 35, 36, 37, 38, and Area Q).

A RCRA VI (Dames & Moore 1992) collected two subsurface soil samples. Metals, VOCs and SVOCs were detected above 1989 RCRA CORA permit HBNs.

The RFI sampling was completed in FY02. In Sep 2006, a PBC was awarded with RIP of Sep 2009 at SWMUs 49, 48, 50 and 59, which are in proximity to each other.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater.

Due to the contiguous nature of RAAP- 013 (SWMU 49), - 018 (SWMU 48), - 025 (SWMU 50), and - 028 (SWMU 59), local groundwater issues may be best addressed under a MNA/LTM plan for RAAP- 013 (SWMU 49) and - 018 (SWMU 48), as these two sites are thought to be the likely source areas.

No further action is anticipated for soil and groundwater from RAAP- 025 (SWMU 50) and separate closeout documentation is to be submitted.

RAAP- 026
COAL ASH SETTLING LAGOONS (S31)
Alias: SWMU 31

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals, Semi- volatiles

Media of Concern: Soil, Surface Water

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199601	200804

RIP Date: N/A

RC Date: 200804

SITE DESCRIPTION

SWMU 31 consists of three unlined settling lagoons, approximately a total of 2.5 acres, located in the northwest section of the Horseshoe Area and received fly ash wastewater flow from Power House No. 2 when it was operating and filter backwash from the active potable water plant.

A RCRA VI (Dames & Moore 1992) and a RFI (Parsons Engineering- Science 1996) collected sludge, groundwater, and subsurface soil samples to determine the migration of metals from the lagoons. A draft RFI was submitted in 1999 (ICF Kaiser). A contract for additional RFI effort was procured in FY01. The RFI fieldwork was completed in summer 2002. The draft RFI report needs to be revised based on the March 29- 30, 2006 meeting among the stakeholders. The revised RFI report was submitted in Jan 2007.

CLEANUP/EXIT STRATEGY

The revised RFI report recommended CMS. This site is being considered for a PBC in FY07.

RAAP- 028
BOTTOM ASH PILE(S59)
Alias: SWMU 59

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Contaminants of Concern: Explosives, Metals

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199102	200802
DES	200707	200809
CMI(C)	200707	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 59, the Bottom Ash Pile, is located near SWMUs 48 and 50 in the Horseshoe Area of RAAP, approximately 3,400 feet east of the main bridge over the New River. Although there are currently no bottom ash accumulation piles, bottom ash has been spread within the immediate SWMU vicinity.

A RCRA VI (Dames & Moore 1992) collected soil samples. Soil data indicates metals in exceedence of 1989 RCRA CORA permit HBNs. Groundwater data indicates VOCs in exceedence of 1989 RCRA CORA permit HBNs.

The RFI sampling was completed in FY02. In Sep 2006 a PBC was awarded with RIP of Sep 2009 at SWMUs 49, 48, 50 and 59, which are in proximity to each other.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater.

Due to the contiguous nature of RAAP- 013 (SWMU 49), - 018 (SWMU 48), - 025 (SWMU 50), and - 028 (SWMU 59) local groundwater issues may be best addressed under a MNA/LTM plan for RAAP- 013 (SWMU 49)and - 018 (SWMU 48)as these two sites are thought to be the likely source areas.

No further action is anticipated for soil and groundwater from RAAP- 028 (SWMU 59) and separate closeout documentation is to be submitted.

RAAP- 031
AREA A NITROCELLULOSE RAINWTR DITCH
Alias: AOC A

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Contaminants of Concern: Metals

Media of Concern: Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199201	200811
DES	200812	200902
CMI(C)	200903	201003

RIP Date: N/A

RC Date: 201003

SITE DESCRIPTION

AOC A is located in the eastern portion of the MMA, near Building 1558. It was identified during the April 1987 Visual Site Inspection as a 1- foot- deep soil depression that received runoff from the A- Line (Visual Inspection Field Notes 1987).

Site- screening sampling was performed in FY04. The report was submitted in FY04. There were several comment review cycles in FY05. The revised SSP report was submitted in Jan 2007.

CLEANUP/EXIT STRATEGY

Based on the SSP report, Area A will go to RFI.

RAAP- 033
CHROMIC ACID TREATMENT TANKS (S68)
Alias: SWMU 68

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Soil

Phases	Start	End
RFA	198409	198410
CS	198410	198412
RFI/CMS	199201	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

SWMU 68 is located 100 feet northwest of SWMU 57 where the plateau of the Horseshoe Area begins sloping towards the New River. The unit previously contained two 4,000- gallon aboveground tanks, which were used to neutralize wastewater generated from the cleaning of rocket encasements (USEPA 1987). Neutralized wastewater was subsequently discharged to the finishing pond, previously located at SWMU 69.

A RCRA VI (Dames & Moore 1992) detected metals in surface soil samples above the 1989 RCRA CORA permit HBNs. A RFI (ICF Kaiser 1998) was conducted to evaluate potential subsurface contamination and included up gradient surface and subsurface soil samples to establish SWMU- specific background metals concentrations. The results of confirmation samples demonstrated that previous SWMU process- related activities had not adversely impacted subsurface conditions and associated contamination sources had been removed.

Site- screening sampling was performed in FY04. The report was submitted in FY04. There were several comment review cycles in FY05. The revised SSP report was submitted in Jan 2007.

CLEANUP/EXIT STRATEGY

SWMU 68 is included in the Site Screening Process (SSP) report with other sites. NFA is anticipated for SWMU 68. Closeout documentation will be prepared IAW CORA.

RAAP- 037
BATTERY STORAGE AREA (P)
Alias: AOC P

STATUS

Regulatory Driver: RCRA

RRSE: LOW

Contaminants of Concern: Explosives, Metals

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200610	200909
DES	200809	200912
CMI(C)	200908	201001

RIP Date: N/A

RC Date: 201001

SITE DESCRIPTION

The Spent Battery Storage Area (Area P) consists of an open lot several acres in size that was used for the storage of shredded scrap metal, decommissioned tanks, powder cans and batteries prior to off- post shipment. This area is approximately 50 feet by 200 feet long and is located within the former scrap metal salvage yard 600 feet west of the Biological Treatment Plant (SWMU 10).

A RCRA VI (Dames & Moore 1992) evaluated surface and subsurface soils within the SWMU to determine the impact of spent battery acid spillage. Data from the soil sampling indicates metals in exceedence of 1989 RCRA CORA permit HBNs.

In Sep 2006, a PBC was awarded to produce a RFI/CMS to cover all media of concern by Sep 2009.

CLEANUP/EXIT STRATEGY

Excavation, transportation and disposal of impacted soil are anticipated based on the 1992 RCRA verification investgation (VI).

RAAP- 038
UNDERGROUND FUEL OIL SPILL (O)
Alias: AOC O

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Semi- volatiles, Volatiles

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198409	198410
CS	198410	198410
RFI/CMS	200310	200807
DES	200707	200909
CMI(C)	200707	200909

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

Area O consists of one inactive 269,000- gallon fuel oil AST that is situated on a concrete base and surrounded by a concrete secondary containment system. The Underground Fuel Oil Spill was located in the east section of the MMA.

An Oil Audit was conducted by USACE in 1982 placed fuel leakage of an underground pipeline at approximately 3,000 gallons. In 1983, four monitoring wells were installed to characterize groundwater flow and quality at the site.

The RFI (Dames & Moore 1992) and a Phase II RFI (Dames & Moore 1994) collected groundwater samples at previously sampled wells. VOCs and SVOCs exceeded 1989 RCRA CORA permit HBNs.

In Sep 2006 a PBC was awarded with RIP of Sep 2009.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater.

MNA/LTM is anticipated for this site.

RAAP- 039
HAZARDOUS WASTE LANDFILL (HWMU16)
Alias: HWMU 16

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Explosives, Volatiles

Media of Concern: Groundwater

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200010	200210
LTM	200210	203309

RIP Date: N/A

RC Date: 200210

SITE DESCRIPTION

Hazardous waste management unit (HWMU) 16 is located in the Horseshoe Area of the plant between RAAP- 007 (SWMU 28, Permit 401) and RAAP- 029 (SWMU 52, Permit 401) and covers ~two acres. The site is a closed landfill (early 1980s) used for lab chemicals, burning ground, and incinerator residue.

Groundwater data indicates the presence of elevated concentrations of explosives and chlorinated solvents. There are indications that the groundwater contamination at HWMU 16 is migrating to the areas of SWMU 28 and 52.

A post- closure care permit requiring LTM was issued by VDEQ in October 2002.

CLEANUP/EXIT STRATEGY

Long- term management is planned for 30 years at this site. Wells will be sampled quarterly as required in the permit. Radford AAP is preparing a permit modification request to reduce LTM. The costs for GIS upgrades and to modify the RCRA CORA permit to close out sites are also included under this site.

RAAP- 040
FORMER LEAD FURNACE AREA
Alias: FLFA

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	199803	200909
IRA	200704	200806

RIP Date: N/A

RC Date: 200909

SITE DESCRIPTION

Former Lead Furnace area (FLFA) is located in the south- central portion of the MMA adjacent to SWMU 17A (Stage and Burn Area) and was operational during World War II. Typically, lead recovered during routine operations would be melted in the furnace and cast into ingots for salvage. It is not known precisely how long the lead furnace was in operation. The SWMU location has apparently been used for various activities and is listed in the RCRA Permit as a used oil and transfer location.

The FLFA was added to the VI of 1992 by USATHAMA after the discovery of solid lead slag in the soil during the removal of used oil tanks in SWMU 76. The VI included the sampling and analysis of subsurface soil in the vicinity of the FLFA, located within SWMU 17A. A RFI was conducted to verify VI results and included the sampling/removal of lead hot spots and the collection and analysis of subsurface soil samples. RFI sampling was completed in FY02.

In Sep 2006, a PBC was awarded with RC for soil of Sep 2009. In addition, the PBC is to produce an RFI/CMS to address site-specific groundwater by Sep 2009.

CLEANUP/EXIT STRATEGY

Interim soil removal is expected. Completion of RFI/CMS for groundwater.

RAAP- 041
SURFACE IMPOUNDMENT #4 (HWMU #4)
Alias: HWMU #4

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	198701	198801
CMI(C)	198701	198801
LTM	199901	203309

RIP Date: N/A

RC Date: 198801

SITE DESCRIPTION

HWMU 4 is located in the eastern area of the MMA. It was a lined surface impoundment and was used as an equalization basin for acidic wastewaters.

The source (the impoundment and associated soils) was removed in 1988 in accordance with a VDEQ approved closure plan.

The site was clean- closed for soil by the VDEQ on August 2, 1996. Long- term groundwater monitoring and a post closure permit were required by the VDEQ. The clean closure report was submitted in March 21, 2000.

Per the May 2004 IAP workshop: Clean closure for GW is being pursued to negate the need for a state- mandated post- closure permit. LTM is required until relief is granted by the clean closure action AND follow- on GW data. In March 2007, RAAP resubmitted the March 2000 report.

On June 28, 2007, RAAP submitted a closure evaluation and requested clean closure for groundwater such that the post closure care period could be terminated. On August 14, 2007, the VDEQ concurred that clean closure for groundwater had been achieved and advised RAAP to discontinue remaining post closure activities.

It should be noted that well abandonment needs to occur.

CLEANUP/EXIT STRATEGY

Long- term management is planned for 30 years at this site. Wells will be sampled quarterly as required in the post- closure plan. Radford AAP will pursue with VDEQ the clean- closure for GW demonstration that was submitted in March 2000 and resubmitted in March 2007.

RAAP- 042
SURFACE IMPOUNDMENT #5 (HWMU #5)
Alias: HWMU #5

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200010	200210
LTM	200210	203309

RIP Date: N/A

RC Date: 200210

SITE DESCRIPTION

HWMU 5 is located in the middle of the MMA. It was a surface impoundment used for acidic wastewaters. Sludge was removed, but contaminated soil below the sludge layer was left in place. The lagoon was filled and capped. The presence of residual waste precludes clean- closure.

Groundwater monitoring has been performed for the past 15 years. DNT and TCE were recently detected. TCE exceeded Groundwater Protection Standards (GPS). Alternate source demonstration report for TCE was resubmitted to VDEQ in FY04.

In fall 2002, an investigative effort was completed for HWMUs 5 and 7. The subsequent draft Field Investigation Report and Risk Assessment for HWMUs 5 and 7 (DAA 2003) was submitted to VDEQ. This report is to facilitate elimination of LTM. A post-closure care permit requiring LTM was issued by VDEQ in Oct 2002.

Based on the 2003 data, an amended closure plan was submitted to VDEQ in February 2007.

CLEANUP/EXIT STRATEGY

Long- term management is planned for 30 years at this site. Wells will be sampled quarterly as required in the permit. LTM is required until relief is granted by the clean closure action and follow- on GW data. Radford AAP needs to submit a revised alternate source demonstration. Also a closure report will need to be submitted once/if DEQ approves the amended closure plan. Radford AAP is preparing a permit modification request to reduce LTM.

RAAP- 043
SURFACE IMPOUNDMENT #7 (HWMU #7)
Alias: HWMU #7

STATUS

Regulatory Driver: RCRA

RRSE: HIGH

Contaminants of Concern: Metals

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	198410	198412
CS	198410	198412
RFI/CMS	200010	200210
LTM	200210	203309

RIP Date: N/A

RC Date: 200210

SITE DESCRIPTION

HWMU 7 is located in the western section of the MMA along the New River. It was a surface impoundment used for acidic wastewaters. VDEQ issued a post- closure permit in 2001, which requires LTM.

In fall 2002, an investigative effort was completed for HWMUs 5 and 7. The subsequent draft Field Investigation Report and Risk Assessment for HWMUs 5 and 7 (DAA 2003) was submitted to VDEQ. This report is to facilitate elimination of LTM. A post-closure care permit requiring LTM was issued by VDEQ in Oct 2002.

In January 2007, an alternate source demonstration was submitted to VDEQ. Based on the 2003 data, an amended closure plan was submitted to DEQ in February 2007.

CLEANUP/EXIT STRATEGY

Long- term management is planned for 30 years at this site. Wells will be sampled quarterly as required in the permit. LTM is required until relief is granted by the clean closure action and follow- on GW data. Also a closure report will need to be submitted once/if DEQ approves the amended closure plan. Radford AAP is preparing a permit modification request to reduce LTM.

RAAP- 044
NEW RIVER UNIT
Alias: NRU

STATUS

Regulatory Driver: CERCLA

RRSE: HIGH

Contaminants of Concern: Metals, Polychlorinated Biphenyls

Media of Concern: Groundwater, Sediment, Soil, Surface Water

Phases	Start	End
PA	199705	199708
SI	199712	199806
RI/FS	199806	200909
RD	200908	200912
RA(C)	201001	201009

RIP Date: N/A

RC Date: 201009

SITE DESCRIPTION

The New River Unit (NRU) is located approximately 6 miles west of the RAAP MMA and consists of approximately 2,813 acres. Between 1940 and 1945, the NRU was used for the loading of propellants and igniter charges and the manufacturing of igniter charge bags. Between 1943 and 1945, operations were expanded to include an additional bag- loading line, rolled powder operations, flash- reducer loading lines, and black powder drying facilities. Production ended after World War II, and the plant was officially designated as part of the RAAP installation. Since 1947, approximately 1,000 acres in the western section of the plant have been sold or transferred for other uses.

There is conductive flooring in several buildings. The material is comprised of barium, copper, asbestos, and lead. It is exposed to the elements and is leaching to surrounding soil.

A Remedial Investigation sampling effort included the collection of surface soil, sludge, and water samples. Metals have been detected in exceedence of the 1989 RCRA CORA permit HBNs; however this site is not subject to any RCRA CORA permit. Six areas within the New River Unit are being investigated: the Bag Loading Area (BLA), the Igniter Assembly Area (IAA), Northern Burning Grounds (NBG), Western Burning Grounds (WBG), Rail Yard (RY), and the Building Debris Disposal Trench (BDDT). The RI fieldwork was completed in FY02. Effort from the Work Instructions was performed in FY04.

In an e- mail dated Feb 16, 2007, USAEC confirmed that the BLA and IAA are eligible for ER,A funding.

In FY06, USAEC decided to implement a PBC at NRU in FY07.

CLEANUP/EXIT STRATEGY

Effort will include groundwater as part of the site conceptual model. Excavation, transportation and disposal of contaminated soil are anticipated at the BLA, IAA, NBG, WBG, and BDDT. This site is being considered for PBC in FY07.

RAAP- 047
TCE Plume at BLDGS 1549,1041&1034
Alias: RAAP- 047

STATUS

Regulatory Driver: RCRA

RRSE: MEDIUM

Contaminants of Concern: Volatiles

Media of Concern: Groundwater, Soil

Phases	Start	End
RFA	200704	200704
CS	200704	200704
RFI/CMS	200712	200812
CMI(C)	200901	201309
CMI(O)	200910	201509

RIP Date: 201309

RC Date: 201509

SITE DESCRIPTION

From the 4/07 HWMU 5 (RAAP- 041) TCE Alternate Source Demonstration, Radford AAP identified BLDGS 1549, 1041,&1034 in the vicinity of HWMU- 5 that are sources of TCE detected in the ground water. Chlorinated solvents have historically been used at these building in the 1960- 1970 time period. Building 1549 is an Area Maintenance Shop located approximately 300 feet southeast of HWMU- 5 and was constructed on a filled sinkhole. The cleaning of equipment involved the use of Varsol and WD-40. Disposal of the used solvents consisted of pouring the solvents down the nearest floor drain. Building 1041 was formerly used as the Degreasing Shop. The building is located approximately 980 feet southeast of HWMU- 5. The building formerly contained a dip tank. The dip tank has been removed. Building 1034 formerly housed a facility nitrocellulose laboratory and currently houses the Electric and Refrigeration Shop. Building 1034 is located approx. 950 feet SE of HWMU- 5. DuPont Cleaning Solvent #49, one of the solvents commonly used in electric motor cleaning, contains PCE and was used at Building 1034. TCE is a daughter product of the degradation of PCE. No documentation of lab waste disposal practices is available. Surface drainage and geologic features generally would direct surface water and GW along with any contaminates from these buildings and into the GW monitorning network of HWMU 5 where TCE has been detected above the MCL.

CLEANUP/EXIT STRATEGY

An RFI/CMS effort is to be produced and will address site- specific groundwater. MNA/LTM is anticipated for this site.

Response Complete (No Further Action) Summary

Site ID	Site Name	NFA Date	Documentation
RAAP- 004	INERT LANDFILL NO3 (S74)	200009	Active Landfill - not eligible for ER,A
RAAP- 006	FORMER DRUM STORAGE AREA 9387- 2(F)	200009	Site Screening Process (SSP) pending approval by EPA
RAAP- 007	CLOSED SANITARY LANDFILL (S28)	200009	Handled under post closure care permit for RAAP- 039, HWMU 16
RAAP- 008	CASO4 TREATMENT/DISPOSAL AREA (S27)	200009	Site is active (VDEQ permit 353) - Not eligible for ER,A funding
RAAP- 012	ACID WASTEWATER LAGOON(S6)	200209	The Decision Document was approved by EPA on October 9, 2002 and by VDEQ on October 24, 2002
RAAP- 015	FLY ASH LANDFILL #1 (S26)	200009	Completed post- closure care under VDEQ permit 399. Not eligible for ER,A funding
RAAP- 017	ACTIVATED CARBON DISPOSAL AREA(S53)	200009	See RAAP- 007, S28. Not eligible for ER,A funding
RAAP- 019	INERT LANDFILL NO.1 (S32)	200009	Site closed under VDEQ permit 400. Not eligible for ER,A funding
RAAP- 020	FLY ASH LANDFILL #2 (S29)	200009	Site is active - VDEQ permit 353. Not eligible for ER,A funding
RAAP- 027	RUBBLE PILE(S58)	200405	VDEQ approved the RFI Report on August 5, 2003 and EPA approved it on May 24, 2004. A Decision Document was submitted to EPA and VDEQ on September 10, 2004. EPA approved DD on 16 December 2004.
RAAP- 029	CLOSED SANITARY LANDFILL (S52)	200009	Handled under post closure care permit for RAAP- 039, HWMU 16
RAAP- 030	AIR CURTAIN DESTRUCTOR & OPEN BURN (S17)	200009	VDEQ approve closure action for the Air Curtain Destructor on 12 Aug 2005. The Open Burn Pit is still active. Not eligible for ER,A funding
RAAP- 032	MOBILE USED OIL TANKS (S61,75,76)	200305	SWMU 61 not eligible for ER,A funding, as it no longer exists (trailer- mounted tank). SWMU 75: VDEQ letter of October 3, 1995 and EPA approval of Work Plan Addendum 16 on September 8, 2003; SWMU 76: VDEQ letter of August 28, 1992 and EPA approval of Work Plan Addendum 16 on September 8, 2003.
RAAP- 035	SEWAGE LINES	200205	Sewer system work plan, electronic data disk, line inspection and manhole reports 35 video tapes, etc. were submitted to EPA and VDEQ on 23 Jan 2003. Not eligible for ER,A funding
RAAP- 036	BIOPLANT BASIN (S10)	199812	Clean- closed for soils and GW is monitored according to post- closure permit for HWMUs 5, 7, 10, and 16. Not eligible for ER,A funding
RAAP- 045	FORMERCADMIUM PLATING FACILTY(BLDG 4343)	200709	
RFAAP- 046	MMA GROUNDWATER STUDY	200703	Cleanup strategy changed from site- wide to site- specific.

IRP Schedule

Date of IRP Inception: 198409

Past Phase Completion Milestones

1985

RFA (RAAP- 001 - TNT WASTE ACID NEUTRALIZATION PITS(S51), RAAP- 002 - FLASH BURN PARTS AREA(S71), RAAP- 003 - POND BY CR ACID TREATMENT TANKS(S69), RAAP- 004 - INERT LANDFILL NO3 (S74), RAAP- 005 - WASTE PROPELLANT BURNING GROUND (S13), RAAP- 006 - FORMER DRUM STORAGE AREA 9387- 2(F), RAAP- 007 - CLOSED SANITARY LANDFILL (S28), RAAP- 008 - CASO4 TREATMENT/DISPOSAL AREA (S27), RAAP- 009 - LANDFILL NITRO AREA (S40), RAAP- 010 - CASO4 TRMT/DISP (8,9,35,36,37,38,Q), RAAP- 011 - RED WATER ASH BURIAL GROUND(S41), RAAP- 012 - ACID WASTEWATER LAGOON(S6), RAAP- 013 - RED WATER ASH BURIAL #2 (S49), RAAP- 014 - PROPELLANT BURNING ASH DISPOSAL (S54), RAAP- 015 - FLY ASH LANDFILL #1 (S26), RAAP- 016 - WASTEWATER PONDS FROM PROP INCINER(S39), RAAP- 017 - ACTIVATED CARBON DISPOSAL AREA(S53), RAAP- 018 - OILY WATER BURIAL AREA (S48), RAAP- 019 - INERT LANDFILL NO.1 (S32), RAAP- 020 - FLY ASH LANDFILL #2 (S29), RAAP- 021 - PROPELLANT BURIAL (S46), RAAP- 022 - POND BY BLDGS 4931 & 4928 (S57), RAAP- 023 - SANITARY LANDFILL NO.2 (S43), RAAP- 024 - LANDFILL NO.3 (S45), RAAP- 025 - CASO4 TREATMENT/DISPOSAL AREA (S50), RAAP- 026 - COAL ASH SETTLING LAGOONS (S31), RAAP- 027 - RUBBLE PILE(S58), RAAP- 028 - BOTTOM ASH PILE(S59), RAAP- 029 - CLOSED SANITARY LANDFILL (S52), RAAP- 030 - AIR CURTAIN DESTRUCTOR & OPEN BURN (S17), RAAP- 031 - AREA A NITROCELLULOSE RAINWTR DITCH, RAAP- 033 - CHROMIC ACID TREATMENT TANKS (S68), RAAP- 035 - SEWAGE LINES, RAAP- 036 - BIOPLANT BASIN (S10), RAAP- 037 - BATTERY STORAGE AREA (P), RAAP- 038 - UNDERGROUND FUEL OIL SPILL (O), RAAP- 039 - HAZARDOUS WASTE LANDFILL (HWMU16), RAAP- 040 - FORMER LEAD FURNACE AREA, RAAP- 041 - SURFACE IMPOUNDMENT #4 (HWMU #4), RAAP- 042 - SURFACE IMPOUNDMENT #5 (HWMU #5), RAAP- 043 - SURFACE IMPOUNDMENT #7 (HWMU #7))

CS (RAAP- 001 - TNT WASTE ACID NEUTRALIZATION PITS(S51), RAAP- 002 - FLASH BURN PARTS AREA(S71), RAAP- 003 - POND BY CR ACID TREATMENT TANKS(S69), RAAP- 004 - INERT LANDFILL NO3 (S74), RAAP- 005 - WASTE PROPELLANT BURNING GROUND (S13), RAAP- 006 - FORMER DRUM STORAGE AREA 9387- 2(F), RAAP- 007 - CLOSED SANITARY LANDFILL (S28), RAAP- 008 - CASO4 TREATMENT/DISPOSAL AREA (S27), RAAP- 009 - LANDFILL NITRO AREA (S40), RAAP- 010 - CASO4 TRMT/DISP (8,9,35,36,37,38,Q), RAAP- 011 - RED WATER ASH BURIAL GROUND(S41), RAAP- 012 - ACID WASTEWATER LAGOON(S6), RAAP- 013 - RED WATER ASH BURIAL #2 (S49), RAAP- 014 - PROPELLANT BURNING ASH DISPOSAL (S54), RAAP- 015 - FLY ASH LANDFILL #1 (S26), RAAP- 016 - WASTEWATER PONDS FROM PROP INCINER(S39), RAAP- 017 - ACTIVATED CARBON DISPOSAL AREA(S53), RAAP- 018 - OILY WATER BURIAL AREA (S48), RAAP- 019 - INERT LANDFILL NO.1 (S32), RAAP- 020 - FLY ASH LANDFILL #2 (S29), RAAP- 021 - PROPELLANT BURIAL (S46), RAAP- 022 - POND BY BLDGS 4931 & 4928 (S57), RAAP- 023 - SANITARY LANDFILL NO.2 (S43), RAAP- 024 - LANDFILL NO.3 (S45), RAAP- 025 - CASO4 TREATMENT/DISPOSAL AREA (S50), RAAP- 026 - COAL ASH SETTLING LAGOONS (S31), RAAP- 027 - RUBBLE PILE(S58), RAAP- 028 - BOTTOM ASH PILE(S59), RAAP- 029 - CLOSED SANITARY LANDFILL (S52), RAAP- 030 - AIR CURTAIN DESTRUCTOR & OPEN BURN (S17), RAAP- 031 - AREA A NITROCELLULOSE RAINWTR DITCH, RAAP- 033 - CHROMIC ACID TREATMENT TANKS (S68), RAAP- 035 - SEWAGE LINES, RAAP- 036 - BIOPLANT BASIN (S10), RAAP- 037 - BATTERY STORAGE AREA (P), RAAP- 038 - UNDERGROUND FUEL OIL SPILL (O), RAAP- 039 - HAZARDOUS WASTE LANDFILL (HWMU16), RAAP- 040 - FORMER LEAD FURNACE AREA, RAAP- 041 - SURFACE IMPOUNDMENT #4 (HWMU #4), RAAP- 042 - SURFACE IMPOUNDMENT #5 (HWMU #5), RAAP- 043 - SURFACE IMPOUNDMENT #7 (HWMU #7))

1987

RFA (RAAP- 032 - MOBILE USED OIL TANKS (S61,75,76))

1988

RFI/CMS (RAAP- 041 - SURFACE IMPOUNDMENT #4 (HWMU #4))

RFA (RFAAP- 046 - MMA GROUNDWATER STUDY)

CMI(C) (RAAP- 041 - SURFACE IMPOUNDMENT #4 (HWMU #4))

1993

RFI/CMS (RAAP- 006 - FORMER DRUM STORAGE AREA 9387- 2(F))

1996	
RFA	(RAAP- 045 - FORMERCADMIUM PLATING FACILTY(BLDG 4343))
1997	
PA	(RAAP- 044 - NEW RIVER UNIT)
1998	
SI	(RAAP- 044 - NEW RIVER UNIT)
1999	
RFI/CMS	(RAAP- 036 - BIOPLANT BASIN (S10))
2000	
IRA	(RAAP- 014 - PROPELLANT BURNING ASH DISPOSAL (S54))
RFI/CMS	(RAAP- 004 - INERT LANDFILL NO3 (S74), RAAP- 007 - CLOSED SANITARY LANDFILL (S28), RAAP- 008 - CASO4 TREATMENT/DISPOSAL AREA (S27), RAAP- 015 - FLY ASH LANDFILL #1 (S26), RAAP- 017 - ACTIVATED CARBON DISPOSAL AREA(S53), RAAP- 019 - INERT LANDFILL NO.1 (S32), RAAP- 020 - FLY ASH LANDFILL #2 (S29), RAAP- 029 - CLOSED SANITARY LANDFILL (S52), RAAP- 030 - AIR CURTAIN DESTRUCTOR & OPEN BURN (S17))
2001	
RFA	(PBC @ Radford - PBC site)
2002	
RFI/CMS	(RAAP- 012 - ACID WASTEWATER LAGOON(S6), RAAP- 035 - SEWAGE LINES)
2003	
RFI/CMS	(RAAP- 039 - HAZARDOUS WASTE LANDFILL (HWMU16), RAAP- 042 - SURFACE IMPOUNDMENT #5 (HWMU #5), RAAP- 043 - SURFACE IMPOUNDMENT #7 (HWMU #7))
2004	
RFI/CMS	(RAAP- 027 - RUBBLE PILE(S58), RAAP- 045 - FORMERCADMIUM PLATING FACILTY(BLDG 4343))
2005	
DES	(RAAP- 045 - FORMERCADMIUM PLATING FACILTY(BLDG 4343))
2006	
RFI/CMS	(RAAP- 016 - WASTEWATER PONDS FROM PROP INCINER(S39))

Projected Phase Completion Milestones

See attached schedule

Projected Record of Decision (ROD)/Decision Document (DD) Approval Dates

To Be Determined

Final RA(C) Completion Date: 201309

NPL Deletion Date: N/A

Schedule for Next Five- Year Review: 2010

Estimated Completion Date of IRP at Installation (including LTM phase): 203909

RADFORD ARMY AMMUNITION PLANT IRP Schedule

= phase underway

SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
PBC @ Radford	PBC site	RFA						
		CMI(C)						
		LTM						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 001	TNT WASTE ACID NEUTRALIZATION PITS(S51)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 002	FLASH BURN PARTS AREA(S71)	RFA						
		CS						
		RFI/CMS						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 003	POND BY CR ACID TREATMENT TANKS(S69)	RFA						
		CS						
		RFI/CMS						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 005	WASTE PROPELLANT BURNING GROUND (S13)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 009	LANDFILL NITRO AREA (S40)	RFA						
		CS						
		RFI/CMS						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 010	CASO4 TRMT/DISP (8,9,35,36,37,38,Q)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 011	RED WATER ASH BURIAL GROUND(S41)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						

RADFORD ARMY AMMUNITION PLANT IRP Schedule

SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 013	RED WATER ASH BURIAL #2 (S49)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 014	PROPELLANT BURNING ASH DISPOSAL (S54)	RFA						
		CS						
		RFI/CMS						
		DES						
		IRA						
		CMI(C)						
		LTM						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 016	WASTEWATER PONDS FROM PROP INCINER(S39)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 018	OILY WATER BURIAL AREA (S48)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 021	PROPELLANT BURIAL (S46)	RFA						
		CS						
		RFI/CMS						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 022	POND BY BLDGS 4931 & 4928 (S57)	RFA						
		CS						
		RFI/CMS						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 023	SANITARY LANDFILL NO.2 (S43)	RFA						
		CS						
		RFI/CMS						
		LTM						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 024	LANDFILL NO.3 (S45)	RFA						
		CS						
		RFI/CMS						

RADFORD ARMY AMMUNITION PLANT IRP Schedule

SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 025	CASO4 TREATMENT/DISPOSAL AREA (S50)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 026	COAL ASH SETTLING LAGOONS (S31)	RFA						
		CS						
		RFI/CMS						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 028	BOTTOM ASH PILE(S59)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 031	AREA A NITROCELLULOSE RAINWTR DITCH	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 033	CHROMIC ACID TREATMENT TANKS (S68)	RFA						
		CS						
		RFI/CMS						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 037	BATTERY STORAGE AREA (P)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 038	UNDERGROUND FUEL OIL SPILL (O)	RFA						
		CS						
		RFI/CMS						
		DES						
		CMI(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 039	HAZARDOUS WASTE LANDFILL (HWMU16)	RFA						
		CS						
		RFI/CMS						
		LTM						

RADFORD ARMY AMMUNITION PLANT IRP Schedule

SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 040	FORMER LEAD FURNACE AREA	RFA						
		CS						
		RFI/CMS						
		IRA						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 041	SURFACE IMPOUNDMENT #4 (HWMU #4)	RFA						
		CS						
		RFI/CMS						
		CMI(C)						
		LTM						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 042	SURFACE IMPOUNDMENT #5 (HWMU #5)	RFA						
		CS						
		RFI/CMS						
		LTM						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 043	SURFACE IMPOUNDMENT #7 (HWMU #7)	RFA						
		CS						
		RFI/CMS						
		LTM						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 044	NEW RIVER UNIT	PA						
		SI						
		RI/FS						
		RD						
		RA(C)						
SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RAAP- 047	TCE Plume at BLDGS 1549,1041&1034	RFA						
		CS						
		RFI/CMS						
		CMI(C)						
		CMI(O)						

IRP Costs

Total Funding through FY 2004: $23,592.0 K

Prior Funding

FY	Phase	Site ID	Obligations	FY Total
2005	LTM	RAAP- 023	$99.0 K	$2,676.0 K
		RAAP- 039	$99.0 K	
		RAAP- 041	$99.0 K	
		RAAP- 042	$99.0 K	
	RA(C)	RAAP- 045	$611.0 K	
	RI	RAAP- 002	$101.0 K	
		RAAP- 005	$297.0 K	
		RAAP- 009	$101.0 K	
		RAAP- 010	$70.0 K	
		RAAP- 021	$35.0 K	
		RAAP- 022	$388.0 K	
		RAAP- 024	$320.0 K	
		RFAAP- 046	$357.0 K	
2006	LTM	RAAP- 039	$90.0 K	$7,472.0 K
		RAAP- 041	$90.0 K	
		RAAP- 042	$90.0 K	
		RAAP- 043	$90.0 K	
	RA(C)	PBC	$6,271.0 K	
		RAAP- 045	$80.0 K	
	RI	RAAP- 005	$29.0 K	
		RAAP- 010	$122.0 K	
		RAAP- 016	$86.0 K	
		RAAP- 022	$260.0 K	
		RAAP- 031	$122.0 K	
		RAAP- 033	$122.0 K	
		RFAAP- 046	$20.0 K	

TOTAL PRIOR FUNDING: $33,740.0 K

Current Requirements

FY	Phase	Site ID	Requirements	FY Total
2007	LTM	RAAP- 039	$100.0 K	$4,687.0 K
		RAAP- 041	$100.0 K	
		RAAP- 042	$100.0 K	
		RAAP- 043	$100.0 K	
	RA(C)	PBC at Radford	$3,991.0 K	
	RI/FS	RAAP- 001	$20.0 K	
		RAAP- 002	$20.0 K	
		RAAP- 005	$3.0 K	
		RAAP- 010	$20.0 K	
		RAAP- 011	$5.0 K	
		RAAP- 013	$20.0 K	

IRP Costs

RAAP- 018	$22.0 K
RAAP- 022	$12.0 K
RAAP- 024	$20.0 K
RAAP- 025	$22.0 K
RAAP- 028	$17.0 K
RAAP- 031	$50.0 K
RAAP- 037	$15.0 K
RAAP- 038	$25.0 K
RAAP- 040	$25.0 K

TOTAL CURRENT REQUIREMENTS: $4,687.0 K

TOTAL FUTURE REQUIREMENTS: $38,168.0 K

TOTAL PROGRAM COST: $76,595.0 K

RADFORD ARMY AMMUNITION PLANT

Army Defense Environmental Restoration Program
Military Munitions Response Program

MMRP Summary

Installation Total Army Environmental Database- Restoration (AEDB- R) Sites/RC Sites: 1/0

Installation Site Types with Future and/or Underway Phases

1 Small Arms Range

(RFAAP- 001- R- 01)

Most Widespread Contaminants of Concern

Munitions constituents

Media of Concern

Soil

Completed Remedial Actions (Interim Remedial Actions/ Final Remedial Actions (IRA/FRA))

Site ID	Site Name	Action	Remedy	FY	Cost
N/A					

Total Environmental Restoration, Army (ER,A) Funding

Prior Funding: $.0 K

Current Requirements: $116.1 K

Future Requirements: $627.0 K

Duration of MMRP

Date of MMRP Inception: 200202

Estimated Date for Remedy- In- Place (RIP)/Response Complete (RC): 201709/201709

Date of MMRP completion including Long Term Management (LTM): 201709

MMRP Contamination Assessment

Contamination Assessment Overview

The Phase 3 Army Range Inventory was completed at Radford Army Ammunition Plant in May 2003. The inventory identified one site as eligible for the MMRP. The Phase 3 Inventory serves as the preliminary assessment under CERCLA. A site inspection was initiated in October 2006.

Cleanup Exit Strategy

The installation plans to complete the SI in 2008 and execute follow- on phases/actions as required.

MMRP Previous Studies

Title	Author	Date
2002		
US Army Closed, Transferred and Transferring Range/Site Inventory for Radford Army Ammunition Plant, Virginia	Malcolm Pirnie, Inc.	NOV- 2002

RADFORD ARMY AMMUNITION PLANT

Military Munitions Response Program

Site Descriptions

RFAAP- 001- R- 01
ARMY RESERVE SMALL ARMS RANGE
Alias: None

STATUS

Regulatory Driver: CERCLA

MRSPP Score: Evaluation pending

Contaminants of Concern: Munitions constituents

Media of Concern: Soil

Phases	Start	End
PA	200202	200305
SI	200703	200809
RI/FS	201010	201109
RD	201510	201609
RA(C)	201610	201709

RIP Date: N/A

RC Date: 201709

SITE DESCRIPTION

The closed Army Reserve Small Arms Range occupied approximately 3 acres. It was used for small arms training from approximately 1941 to 1967. The closed range is located along the southeastern boundary of RAAP. A berm (approximately 200 feet long by 10 feet high) is still present and indicates that the direction of fire was southeast. The berm is adjacent to a stream, which forms the installation boundary. This range likely contained 10- 15 stations. The "Radford Ordnance Works Historic Investigation" states that 155,375 rounds of ammunition were "expended in the pistol range by the RAAP police department from October 1941 to October 1945." The local rifle club from 1946- 1967 may have also used the range.

The former small arms range is not within the secure limited manufacturing area, but public access is restricted. The former range is currently a grass field surrounded by an unlocked fence. The field was once used as a baseball field and was accessible to the public up until the late 1960s.

CLEANUP/EXIT STRATEGY

Army and DoD experience indicates that contamination on small arms ranges is primarily lead in soils and that remediation of these sites would primarily consist of excavation, off- site transportation, stabilization, and disposal. No MEC components would be expected at small arms ranges; therefore, they are not included in the estimate. Although the types of small arms ranges and patterns of contamination can vary, assumptions for this CTC estimate were based on the characteristics of a typical pistol and/or rifle MMRP range.

The RA selected for small arms ranges is the excavation of lead- contaminated soil with transportation and disposal at an off- site facility with stabilization. Soil excavation volumes are based on site size.

Response Complete (No Further Action) Summary

Site ID	Site Name	NFA Date	Documentation

There are no NFA sites

MMRP Schedule

Date of MMRP Inception: 200202

Past Phase Completion Milestones

2003

PA (RFAAP- 001- R- 01 - ARMY RESERVE SMALL ARMS RANGE)

Projected Phase Completion Milestones

See attached schedule

Projected Record of Decision (ROD)/Decision Document (DD) Approval Dates

To Be Determined

Final RA(C) Completion Date: 201709

NPL Deletion Date: N/A

Schedule for Next Five- Year Review: 2010

Estimated Completion Date of MMRP at Installation (including LTM phase): 201709

RADFORD ARMY AMMUNITION PLANT MMRP Schedule

= phase underway

SITE ID	SITE NAME	PHASE	FY08	FY09	FY10	FY11	FY12	FY13+
RFAAP- 001- R-01	ARMY RESERVE SMALL ARMS RANGE	PA						
		SI						
		RI/FS						
		RD						
		RA(C)						

MMRP Costs

Total Funding through FY 2004: $.0 K

Prior Funding

FY	Phase	Site ID	Obligations	FY Total

TOTAL PRIOR FUNDING: $.0 K

Current Requirements

FY	Phase	Site ID	Requirements	FY Total
2007	SI	RFAAP- 001- R- 01	$116.1 K	$116.1 K

TOTAL CURRENT REQUIREMENTS: $116.1 K

TOTAL FUTURE REQUIREMENTS: $627.0 K

TOTAL PROGRAM COST: $743.1 K

Community Involvement

Technical Review Committee (TRC): None

Restoration Advisory Board (RAB): RAB established 199807

RAB Adjournment Date: N/A
RAB Adjournment Reason: None

Additional Community Involvement Information

The surrounding community for Radford AAP included the counties of Montgomery (2004 Pop. 83,959), Pulaski (2004 Pop. 35,152), Floyd (2004 Pop. 14,464), Giles (2004 Pop. 16,989) and the City of Radford (Pop. 15,940).

In February 1995 and January 1998, we conducted surveys to determine if enough community interest existed to sustain a Restoration Advisory Board. A Community Involvement Plan was finalized in September 1995.

February 1995 and January 1998, RAAP with the assistance of the US Army Environmental Center conducted community interviews with residents of the surrounding counties and city, and placed two newspaper advertisements soliciting community members to volunteer for RAB positions. In June 1998, RAAP held a public meeting to share information about the RAAP cleanup program and about forming a RAB. August 1998, RAAP held first RAB- style meeting in which the Community Co- chair person was selected. In September 1999, an information repository was established at the Montgomery Floyd Regional Library, Christiansburg Branch consistent with RAB recommendation.

RAB activities to date have included quarterly meetings with regulators present, plant tours, and project and program status briefings.

RAAP is committed to involving the public in the restoration program and will do all we can to make it a success.

Administrative Record is located at

the Christiansburg Library as CDs and online

Information Repository is located at

the Christiansburg Library as CDs and online

Current Technical Assistance for Public Participation (TAPP): N/A

TAPP Title: N/A

Potential TAPP: N/A