UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION III

STATEMENT OF BASIS
RADFORD ARMY AMMUNITION PLANT

EPA ID NO. VA1210020730

RADFORD, VIRGINIA

May 2014

CONCURRENCES

SYMBOL <	3LC20	3LC20	3LC00	3RC43	3RC43	3RC40		
SURNAME <	Weissbart	Pizarro	Armstead	Hodges	Briggs-Stoutteville	Ajl		
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List of Acronyms

µg/L.....micrograms per liter
ADAF.....Age-Dependent Adjustment Factor
ASTM.....American Society for Testing and Materials
ATSDR .....Agency for Toxic Substances and Disease Registry
AUF.....Area Use Factor
BAF.....Bioaccumulation Factor
BCF.....Bioconcentration Factor
bgs .....below ground surface
BTAG.....Biological Technical Assistance Group
CCA .....Copper Chromated Arsenate
CCME .....Canadian Council of Ministers of the Environment
CDI.....Chronic Daily Intake
CERCLA.....Comprehensive Environmental Response, Compensation, and Liability Act
cm.....centimeters
CNS.....Central Nervous System
COI.....Contaminant of Interest
COPC.....Chemical of Potential Concern
COPEC.....Chemical of Potential Ecological Concern
Cr(III).....Trivalent Chromium
Cr(VI).....Hexavalent Chromium
CSEM.....Conceptual Site Exposure Model
CSF .....Cancer Slope Factor
CSM.....Conceptual Site Model
CT .....Carbon Tetrachloride
DA.....dose absorbed per unit area per event
DCA.....Dichloroethane
DCE.....Dichloroethene
DNB.....Dinitrobenzene
DNT .....Dinitrotoluene
DO.....Dissolved Oxygen
DQO.....Data Quality Objective
EcoSSL .....Ecological Soil Screening Level
EEQ.....Environmental Effects Quotient
EPC.....Exposure Point Concentration
EPD.....Effective Prediction Domain
ERAGS .....Ecological Risk Assessment Guidance for Superfund
FA .....fraction absorbed dose
FOD.....Frequency of Detection
ft msl .....feet above mean sea level
ft .....foot/feet
g/dL.....grams per deciliter
GI .....Gastrointestinal
GPS .....Global Positioning System
HEAST.....Health Effects Assessment Summary Tables
HHRA.....Human Health Risk Assessment
HI .....Hazard Index
HQ.....Hazard Quotient
HSA.....Horseshoe Area

IEUBK .....Integrated Exposure Uptake Biokinetic
IRIS .....Integrated Risk Information System
i-SL .....Industrial Screening Level
LOAEL .....Lowest-Observed-Adverse-Effect Level
MCL.....Maximum Contaminant Level
MDC .....Maximum Detected Concentration
MDL.....Method Detection Limit
mg/day.....milligrams per day
mg/kg .....milligrams per kilogram
mg/L.....milligrams per liter
mm Hg .....millimeters mercury
MNA.....Monitored Natural Attenuation
MOA.....Mode of Action
mV.....millivolts
MW.....Molecular Weight(s)
MWP.....Master Work Plan
NIBC.....Not Important Bioaccumulative Constituents
NOAEL.....No-Observed-Adverse-Effect Level
ORNL.....Oak Ridge National Laboratory
ORP.....Oxidation-Reduction Potential
OSWER.....Office of Solid Waste and Emergency Response
PAH.....Polynuclear Aromatic Hydrocarbon
PCB.....Polychlorinated Biphenyl
PCE.....Tetrachloroethene
PCP .....Pentachlorophenol
PEF.....Particulate Emission Factor
PPRTV.....Provisional Peer Reviewed Toxicity Value
PRG.....Preliminary Remedial Goal
QA.....Quality Assurance
QC.....Quality Control
RAGS.....Risk Assessment Guidance for Superfund
RBCA.....Risk-Based Corrective Action
RCRA.....Resource Conservation and Recovery Act
RDA.....Recommended Daily Allowance
RFA.....RCRA Facility Assessment
RFAAP.....Radford Army Ammunition Plant
RfD.....Risk Reference Dose
RFI .....RCRA Facility Investigation
RG.....Remedial Goal
RSL .....Regional Screening Level
r-SL .....Residential Screening Level
RTE.....Rare, Threatened, or Endangered
Shaw.....Shaw Environmental, Inc.
SL.....Screening Level
SLERA.....Screening Level Ecological Risk Assessment
SMDP.....Scientific/Management Decision Point
SSL.....Soil Screening Level
SVOC.....Semivolatile Organic Compound
SWMU.....Solid Waste Management Unit

SSL.....Soil Screening Level
SVOC.....Semivolatile Organic Compound
SWMU.....Solid Waste Management Unit
TAL.....Target Analyte List
TCE.....Trichloroethene
TCL.....Target Compound List
TCLP.....Toxicity Characteristic Leachate Procedure
TE.....Toxicity Equivalents
TEF .....Toxicity Equivalent Factor
TNT.....Trinitrotoluene
TOC.....Total Organic Carbon
TOX .....Total Organic Halides
TPH.....Total Petroleum Hydrocarbons
TRV.....Toxicity Reference Value
tw-SL.....Tap Water Screening Level
UCL.....Upper Confidence Limit
UF .....Uncertainty Factor
USAEC .....U.S. Army Environmental Command
USATHAMA.U.S. Army Toxic and Hazardous Materials Agency
USEPA.....U.S. Environmental Protection Agency
UTL.....Upper Tolerance Limit
VDEQ .....Virginia Department of Environmental Quality
VI .....Verification Investigation
VOC.....Volatile Organic Compound
VRP.....Voluntary Remediation Program
WHO.....World Health Organization
XRF..... X-ray Fluorescence

I. Introduction

The United States Environmental Protection Agency (EPA) has prepared this Statement of Basis (SB) to solicit public comment on its proposed remedies for three Corrective Action Units (CAU or Unit): Solid Waste Management Unit (SWMU) 54, the Army Small Arms Range (ARSAR) and SWMUs 48 and 49, at the Radford Army Ammunition Plant, located in Radford, Virginia (RFAAP or Facility).

This SB summarizes the process that EPA and RFAAP developed and evaluated under RFAAP's Resource Conservation and Recovery Act (RCRA) Corrective Action Permit issued by the EPA in October 2000, pursuant to Section 3004(u) of the, 42 U.S.C. Section 6925 (2000 Permit).

This SB explains EPA's rationale for recommending the proposed remedies. This SB also summarizes information that can be found in the work plans and reports submitted by RFAAP to EPA and the Virginia Department of Environmental Quality (VDEQ) during the RCRA Facility Investigation (RFI) and Corrective Measures Study (CMS) processes. To gain a more comprehensive understanding of the RCRA activities that have been conducted at the Facility, EPA encourages the public to review these documents, which are found on the RFAAP online repository and EPA Region 3, discussed in Section VIII.

The Facility is subject to EPA's Corrective Action program under the Solid Waste Disposal Act, as amended, commonly referred to as the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. Section 6901, et seq. The Corrective Action program requires that facilities subject to certain provisions of RCRA investigate and address releases of hazardous waste and hazardous constituents, usually in the form of soil or groundwater contamination, that have occurred at or from their properties.

EPA is providing a 30-day public comment period on this SB. EPA may modify its proposed remedies based on comments received during this period. EPA will announce its selection of a final remedy for SWMU 54, SWMUs 48 & 49, and ARSAR in a Final Decision and Response to Comments (Final Decision) after the public comment period has ended.

EPA will make a decision after considering all comments received during the comment period, consistent with applicable RCRA requirements and regulations. If the decision is substantially unchanged from the one proposed, EPA will issue a Final Decision and inform all persons who submitted written comments or requested notice of EPA's final determination. If the Final Decision is significantly different from the one proposed, EPA will issue a public notice explaining the new decision and will reopen the comment period. In the Response to Comments section attached to the Final Decision, EPA will respond in writing to each comment received.

Information on the Corrective Action program as well as a fact sheet for the Facility can be found by navigating http://www.epa.gov/reg3wcmd/correctiveaction.htm.

II. Facility Background

A. Installation Location

RFAAP is located in the mountains of southwest Virginia in Pulaski and Montgomery Counties and it consists of two non-contiguous areas: the Main Manufacturing Area (MMA) and the 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 NRU is located about six miles west of the MMA, near the town of Dublin, and is not covered under the 2000 Permit. The two CAUs described in this SB are located in the MMA (Figure 1).

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

RFAAP began manufacturing propellants in 1941 and continues that work today. RFAAP has also produced 2,4,6-trinitrotoluene (TNT) on an intermittent basis.

B. Environmental Investigation/Contamination Assessment Overview

Various investigations and actions have been completed and reports have been submitted to the EPA and the VDEQ since 1989 when EPA issued Corrective Action Permit, No. VA1210020730, to the Facility. On October 31, 2000, the Corrective Action Permit was reissued (2000 Permit) and included the requirements to investigate approximately 80 CAUs. The 2000 Permit currently governs corrective action at the Facility.

The RFAAP has separate permits issued by the Commonwealth of Virginia (the Commonwealth) to manage operations pertaining to RCRA Subpart C, D and X. Additionally, the Commonwealth regulates four closed RCRA Hazardous Waste Management Units via a Post-Closure Care Permit.

The primary contaminants of concern at RFAAP include metals and explosives. Groundwater under the Facility has been impacted. RFAAP attempted to delineate the occurrence and flow of the groundwater, however, such efforts were complicated by the presence of karst geology (highly fractured and channelized limestone). Based on RFAAP's delineation efforts, it appears that the groundwater under the Facility eventually discharges to the New River. Current data do not suggest that off-site groundwater has been impacted.

EPA previously issued a Final Decision in April 2012 for the majority of CAUs at the Facility. Of the three types of CAUs in the April 2012 Final Decision were a large number of CAUs that had no environmental releases. A smaller number of CAUs were investigated for potential impacts to media (typically soils and/or groundwater) and no risks to human health or the environment were identified. The third category of Units investigated was a much smaller number where environmental releases were identified; those units have already been remediated.

EPA determined that the two CAUs described below in Section III of this SB had

releases to soil and/or groundwater that exceeded EPA Regional Screening Levels (RSLs) criteria. RSLs for groundwater were based on drinking water standards, the Maximum Contaminant Limits (MCLs) promulgated at 40 C.F.R. Part 141 pursuant to Section 1412 of the Safe Drinking Water Act, 42 U.S.C. Section 300g-1. If no MCL exists for a contaminant, the RSL was based on risk based tapwater levels. The RSLs for soil contaminants were based on both residential and industrial use scenarios.

III. Summary Of Environmental Investigations And Interim Measures

A. SWMU 54

1. Unit Description

SWMU 54 is located within the easternmost portion of the Horseshoe Area at RFAAP. SWMU 54 consists of two non-contiguous disposal areas; Area A is an approximate 0.58-acre triangular shaped area in the southern portion of SWMU 54 and Area B is an approximate 1.09-acre area in the northern portion of SWMU 54. SWMU 54 is currently undeveloped. The RFAAP Installation security fence is located along the northern and eastern boundaries of SWMU 54. SWMU 54 is situated on a gently sloping terrace ranging from approximately 1,716 to 1,696 feet (ft) mean sea level (msl) from east to west, respectively. The SWMU is positioned within the 100-year floodplain on a terrace feature of the New River. East of SWMU 54, the ground surface slopes steeply towards the New River whose elevation is approximately 1,676 ft msl.

SWMU 54 was reportedly used as a disposal area in the late 1970s for ash from propellant burning activities located at the Waste Propellant Burning Grounds. The propellant ash consisted of a residue resulting from the burning of waste explosives, propellants, and laboratory waste.

2. RFI/CMS

Data obtained from initial site investigations were used to identify Facility boundaries and characteristics, and identify chemicals of potential concern (COPCs). In 1992, the Environmental Photographic Interpretation Center provided aerial photographic analysis of SWMU 54, under the direction of the EPA. Also in 1992, a RCRA Verification Investigation (VI) was conducted at the Facility to identify the ash disposal at Area A. As a follow-up to the 1992 VI, a RFI was completed in 1996, as part of a multiple Unit investigation to "define the extent of ash and the limits of soil contamination." In 1998, a Supplemental RFI and a CMS was conducted to investigate a flat grassy area ringed by mature pine trees northwest of Area A. This area was defined as Area B within SWMU 54.

In 2008 an RFI/CMS was conducted at both Areas A and B to confirm the effectiveness of a previous hotspot removal as well as evaluate and assess current conditions and provide recommendations regarding potential corrective measure requirements. Direct push soil borings with chemical sampling were used to: characterize the nature and extent of constituents in soil at SWMU 54; identify the lateral and vertical extent of any waste material present; and characterize soil lithology and depth to groundwater and bedrock. Additionally, monitoring wells were installed at the SWMU and groundwater samples were collected and analyzed.

The nature and extent assessment indicated that the main concern is the fill material and grossly-contaminated soil directly below the material. Areas A and B were evaluated separately

for the soil and groundwater nature and extent assessments given the 200-ft separation between the areas, their topographic cross-gradient position, the lack of mobility of the chemicals in soil, and observed distributions of chemicals.

The main parameters of concern in Area A soil are lead, 2,4,6-trinitrotoluene (TNT), dinitrotoulene (DNT), RDX, amino DNTs, nitroglycerine (NG), heptachlor epoxide, and dioxins/furans. The main parameters of concern in groundwater at Area A are the previously listed explosives and perchlorate. The lateral extent of explosives and perchlorate in groundwater extends from Area A eastward to the area of the New River. Sampling of the groundwater/surface water interface (sediment pore water) and surface water of the New River did not indicate detectable impacts to sediment pore water or surface water from COPCs in groundwater.

COPCs in Area B soils consist of lead, DNT, amino DNT, NG, RDX, dieldrin, Aroclor 1254, heptachlor epoxide, and dioxins/furans. No COPCs were identified for Area B Groundwater.

In 2008, a Human Health Risk Assessment (HHRA) concluded that unacceptable risks to potential future residential and industrial receptors were associated with the COPCs. Because the RFI demonstrated that contamination was present at concentrations associated with unacceptable human health risks, the CMS identified soil excavation at Areas A and B, combined with off-site disposal, and monitored natural attenuation (MNA) of groundwater.

3. Interim Measures – Soil Excavation and Off-site Disposal

Based on the results from the 2008 HHRA, EPA determined that elevated levels of COPCs detected in the soil hot spot areas could potentially leach from soil to groundwater at levels of concern. Because the RFI demonstrated that contamination is present at concentrations associated with unacceptable human health risks, soil Remedial Goals (RG) based on leaching criteria were developed and used at SWMU 54 to confirm that all constituents have been removed to levels that are safe for human health and the environment (Table below).

Chemical of Interest	Area A - Soil RG (mg/kg)	Area B - Soil RG (mg/kg)
2,4,6-TNT	1.7	1.45
DNT Mixture	0.044 or Lab RL	0.037 or Lab RL
RDX	0.161	0.134
Perchlorate	--	--
Amino DNTs	1.095	0.912
Nitroglycerin	0.069 or Lab RL	0.057 or Lab RL
Heptachlor Epoxide	0.0047	0.0039
2,3,7,8-TCDD (TEQ)	7.89E-06	6.57E-06
Lead	--	400
Arocolor	--	0.25
Dieldrin	--	0.00446

An Interim Measures Completion Report was approved by EPA in July 2011. Approximately 870 tons of hazardous soil and 4921 tons of nonhazardous soil were removed from Area A and 2200 tons of hazardous soil and 2288 tons of nonhazardous soil were removed from Area B. All materials removed from the two areas were tested for hazardous wastes, and those materials that were determined to be hazardous were disposed of in a RCRA hazardous waste landfill. The areas were backfilled with general fill and the entire area was hydroseeded to finalize restoration.

Subsequent to excavation, confirmation samples indicated that the contaminated soil at Areas A and B was removed, and that the remaining on-site soil is at concentrations less than, or equal to the applicable RGs. The conservative soil-to-groundwater transfer RGs calculated are lower than both the industrial and residential RSLs, with the exception of Aroclor 1254 and 2,3,7,8-TCDD (TEQ). Aroclor 1254 was not detected above either RG level in the collected confirmation samples. The 2,3,7,8-TCDD (TEQ) exceeded the EPA RSL in only one of thirty-five samples collected.

4. Interim Measure - Groundwater Monitoring

Fourteen groundwater monitoring wells were sampled on a quarterly basis for two years at SWMU 54. Additionally, in the fourth and eighth quarters of monitoring, five pore water sample locations were monitored in the New River. Groundwater samples collected in the first eight quarters were analyzed for explosives, perchlorate, and MNA indicators. Sample results were compared to MCLs, tap water RSLs, and RGs to evaluate whether MNA is occurring. Based on contaminant concentrations and biological indicator parameters measured in groundwater, MNA processes are occurring at SWMU 54 and include biodegradation (for 2,4,6-TNT only), sorption, dilution, dispersion, and chemical stabilization. The data also suggest that MNA processes are affecting plume stability and decreasing nitroaromatic and perchlorate mass. Geochemical parameters indicate that groundwater conditions are generally aerobic, thereby supporting biological degradation of 2,4,6-TNT; however, conditions do not currently support biological degradation of 2,4-DNT, amino DNT, RDX, and perchlorate.

5. Current Conditions

Source removal efforts at SWMU 54 appear to have been effective in significantly lowering the Site-wide COPCs in groundwater. Eleven of fourteen monitoring well locations contained groundwater concentrations for 2,4,6-TNT, DNT mixture, RDX, and perchlorate below Facility RGs for eight consecutive quarters. Pore water samples in the New River have had no detections of explosives or perchlorate in 2 years of sampling. Explosives and perchlorate concentrations through eight quarters of groundwater sampling do not appear to indicate biodegradation. Based on the rapidly decreasing plume of elevated constituents and the generally declining concentrations Site-wide, active remediation is unnecessary at SWMU 54. However, the eighth quarter of sample collection reported a single elevated COPC at one monitoring location, warranting additional monitoring at some locations.

B. Army Small Arms Range (ARSAR)

1. Unit Description

The ARSAR is a munitions response site investigated under the Military Munitions Response Program. The ARSAR is an approximate 7.6-acre area located along the southeastern boundary of the MMA. Most of the unit is an open grass field with wooded areas located along the banks of Stroubles Creek, which is located along the southern portion of the unit. ARSAR is

divided into two areas consisting of the Firing Point/Berm Area and the Southeast Hillside Area. A target berm, which is approximately eight ft high and 270 ft long, is located along the southeastern portion of the Firing Point/Berm Area. The Southeast Hillside Area is a steep, rocky hillside thought to have been used as a backstop prior to the construction of the target berm. A fence is located at the top of the Southeast Hillside Area, which prevents access to the area.

ARSAR is located within a nearly level alluvial plain at an elevation of approximately 1,715 ft msl. The Southeast Hillside Area located across Stroubles Creek to the south, slopes steeply upward to an elevation greater than 1,950 ft msl. The ARSAR was a .30 caliber small arms firing range (former range) used by both the National Guard and the Army Reserve from approximately 1941 to 1968. The closed range consisted of an approximate 10-ft-high berm and four potential firing areas. The former range is now a grass field surrounded by a fence that is occasionally used as a helicopter landing pad and as a baseball field. The ARSAR was added to RFAAP's RCRA Corrective Action Permit on July 15, 2005.

2. Historical Investigations

A Historical Records Review Report (HRR) was completed in 2008 to support the Site Screening Process (SSP). The HRR utilized historical records, interviews with on-site personnel, aerial photography, existing Unit maps, and environmental restoration documents to provide information used to identify, verify, and establish physical limits and potential for Munitions and Explosives of Concern (MEC) and Munitions Constituents (MC) at the ARSAR. The HRR concluded that MEC is not a concern at this unit. The HRR did indicate that MC in the form of lead in the target berm and potential explosives residues at the firing points was likely at the ARSAR.

The SSP was completed in October 2008 to assess the presence or absence of MEC and MC remaining from former activities at ARSAR. Field sampling activities were developed to investigate MC as MEC was not expected at the ARSAR. Sampling was conducted using a visual inspection of the target berm and southeast hillside, followed by a sweep for potential bullet fragments using a metal detector. Target responses that occurred were limited to the berm. Additionally, a shovel was used to dig into the surface soil at the target response locations to investigate whether bullet fragments were present at these locations. Fragments were identified at several locations within the berm at depths of approximately 2 to 4 inches, however there were no recordable metal detector responses for the Southeast Hillside Area.

Sample results indicated that elevated antimony and lead concentrations were detected in the target berm. Elevated arsenic levels were detected within the Southeast Hillside Area. Based on the results of the SSP evaluation, further action for MC was recommended at the ARSAR. No further action was recommended for MEC at this unit.

3. RFI/IM

In 2011, a RFI was performed to characterize potential contamination and an IM was performed to remove soil contamination identified in the SSP. The SSP data set indicated that lead and antimony were the COPCs in the target berm. The IM was performed to address these constituents detected at elevated concentrations in the berm soil.

The soils at the ARSAR firing range floor and potential firing points were not sampled during previous investigations. Analytical data was collected in 2011. X-Ray Diffraction (XRF)

screening indicated that lead concentrations in the firing range floor were below the 400 mg/kg RG designated for the ARSAR. Laboratory confirmation samples from nine XRF screening samples verified that: 1) XRF screening results for lead were all below the r-RG; and, 2) three PAHs [benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene], one PCB (PCB-1254), and two metals (arsenic and iron) were detected at concentrations above soil RSLs, however these detections were isolated and not considered to be related to past site use.

XRF and laboratory confirmation data indicate that elevated concentrations of lead were predominantly encountered in a focused area of the Southeast Hillside approximately 10 ft above Stroubles Creek. Although no bullet fragments were discovered along the hillside during sampling activities, the distribution of lead at this height and area along the hillside indicate that errant shots from the firing range most likely flew just over the top of the target berm and lodged into the surface of the hillside.

Data from surface water samples indicate that three VOCs (acetone, chloromethane, and toluene), one SVOC (di-n-butylphthalate), one pesticide (methoxychlor), and perchlorate were detected in the samples, however detected concentrations were well below applicable RSLs and are not a concern in surface water at the Facility. Three metals (aluminum, iron, and manganese) were detected at concentrations exceeding applicable RSLs, however the three detected metals are ubiquitous in surface water samples collected throughout RFAAP.

Data from sediment samples indicated that three PAHs [benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene] were the only analytes detected in sediment samples above applicable RSLs and the concentrations were marginally greater than their respective r-SLs and all were well below i-SLs. EPA has determined that the presence of these PAHs is related to the deteriorating asphalt roads and parking lots immediately adjacent to the site.

Two direct-push downgradient groundwater samples were collected from temporary wells installed in the southwestern portion of the ARSAR. Groundwater sample data indicated that three PAHs [bis(2-ethylhexyl)phthalate, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene], one total metal (antimony), and perchlorate exceeded groundwater screening levels. EPA concluded that the isolated exceedances at concentrations marginally exceeding groundwater RSLs are not a concern in groundwater at the site.

4. Interim Measure – Soil Excavation and Offsite Disposal

An IM was completed within the target berm at the ARSAR to remove the antimony and lead source area, previously identified by the SSP. The objective of the IM was to reduce concentrations of antimony and lead in the berm below the r-RGs of 3.1 and 400 milligrams per kilogram (mg/kg), respectively. Approximately 1-2 ft of soil was removed from the berm face and direct loaded into dump trucks for off-site disposal. Soil was excavated from the berm face until XRF results demonstrated that lead and antimony concentrations were below the pre-established RGs. Laboratory confirmation samples confirmed the XRF screening results and demonstrated that the RGs for lead and antimony had been achieved for the target berm. Upon completion of the berm excavation, it was determined that a total of 147 tons, or approximately 105 cubic yards (CY), of impacted soil were removed from the firing range berm.

5. Current Condition

a. Firing Point/Berm Area

Based on past use of the ARSAR and the previous investigation, lead and antimony were identified as the main COPCs for the Firing Point/Berm Area of the ARSAR. Media samples collected from the Firing Point/Berm Area during the 2011 RFI/IM activities indicated that lead and antimony were not detected in soil, surface water, sediment, or groundwater at concentrations exceeding applicable SLs/RGs.

b. Southeast Hillside Area

Arsenic was reported at elevated levels in soil samples collected along the Southeast Hillside Area during the previous investigation and during the 2011 RFI. No source related to past use of this Area has been identified for arsenic. Elevated concentrations of arsenic detected in the Southeast Hillside Area soil are considered to be naturally occurring. Concentrations of lead are above the health protective criterion for hypothetical future residents in surface soil at the Southeast Hillside Area.

C. SWMUs 48 and 49

1. Unit Description

SWMUs 48 and 49 are combined into one study area (Study Area) which is located in the southeastern portion of the RFAAP Horseshoe Area, east of the main bridge over the New River. The two SWMUs are adjacent, with SWMU 48 located approximately 200 ft northwest of SWMU 49. SWMU 48 is approximately 380 ft long by 120 ft wide; whereas, SWMU 49 is 75 ft long by 83 ft wide. The SWMUs are situated on a bluff approximately 120 ft above and overlooking the New River.

The land surface in the Study Area gently slopes from approximately 1,830 ft msl on the north side of SWMU 48, to approximately 1,816 ft msl on the southeast side of SWMU 49. Based on topography, surface water runoff is expected to flow approximately 700 ft south to the New River. SWMU 48, the oily water burial area, consists of two sets of unlined trenches, one at the northern end of the SWMU and one at the southern end. SWMU 49, the red water ash burial no. 2, simply looked like an area of disturbed ground during its time of active use. The overall Study Area is grassy with wooded areas to the south, east, and west. A subsided area that coincides with the southern SWMU 48 trench provides the only evidence of its location. An east-west asphalt road, located at the northern edge of the Study Area, parallels SWMU 48 and provides access to the combined Study Area via a gravel and bottom ash covered dirt road that trends north-south in the middle of the Study Area.

SWMU 48, Oily Water Burial Area. Prior to waste oil being sent off-site for reclamation, approximately 200,000 gallons of oily wastewater removed from oil/water separators throughout RFAAP was reportedly disposed of in SWMU 48 in two unlined trenches. The results of environmental sampling indicate that the oily wastewater was likely disposed of in the area associated with SWMU 49. Conversely, sampling indicates that the red water ash associated with SWMU 49 was disposed in the SWMU 48 disposal trenches. Interpretations of aerial photographs indicate that activity first occurred at SWMU 48 in 1970. Documentation for disposal activities in the southern trench is currently unknown, but observations during soil boring and test pit activities during a 1998 RFI indicate a layer of fine black material occurring at approximately 6-7 ft bgs. Explosives compounds were detected in samples of this material.

SWMU 49, Red Water Ash Burial No. 2. SWMU 49 reportedly received 10 tons of red water ash during its active period. However, the results of environmental sampling indicate that

the red water ash was likely disposed of in the disposal trenches associated with SWMU 48. Conversely, sampling indicates that the oily wastewater associated with SWMU 48 was disposed of in the SWMU 49 area. Red water ash is a RCRA listed hazardous waste (K047) and is listed solely for reactivity. During the production and formulation of TNT, an alkaline, red-colored aqueous waste was generated (red water). This waste stream is composed of TNT purification filtrate, air pollution control scrubber effluent, washwater from cleaning of equipment and facilities, and washwater from product washdown operations. Red water was concentrated by evaporation, and the sludge was burned in rotary kilns located in the TNT manufacturing area. The ash from the burned red water sludge is known as red water ash. The location of SWMU 49 is defined in aerial photography by disturbed ground during the time of active disposal in the adjacent SWMUs 48 and 50. No signs of release were noted during an April 1987 visual site inspection performed during the RCRA Facility Assessment.

2. Historical Investigations

Six previous investigations have been conducted at SWMUs 48 and 49. In 1987, an RFA was performed to evaluate potential hazardous waste or hazardous constituent releases and implement corrective actions, as necessary; the results concluded the SWMUs were contiguous. In 1992, a VI including surface and subsurface soil sampling and a soil gas survey to characterize the nature and extent of contamination, was completed. The VI report concluded that COPCs, including explosive SVOC compounds (DNT-mix), were detected within SWMU 48 that were greater than health-based numbers.

RFI's were performed in 1996, 1998, 2002, and 2006 to further delineate the extent of contamination. The additional sampling conducted in 2002 and 2006 was to collect sufficient data to complete human health and ecological risk assessments. The investigations provide a comprehensive, long-term dataset that, in conjunction with current data, can be used to assess concentrations over time. The results of these investigations were never submitted as a "final" report.

3. RFI/CMS

An RFI was conducted at the Study Area in 2007. The investigation was performed in accordance with the 2007 Master Workplan Addendum 019 (MWP 019). MWP 019 was prepared to facilitate the investigation effort to comply with the requirements set forth in the 2000 Permit and was approved by the EPA and the VDEQ. During the development of MWP 019, a review of the historical data indicated that additional wells were needed to fully delineate constituents in groundwater. In addition, groundwater samples from previous investigations at the Study Area had not been analyzed for perchlorate or herbicides. Additional soil sampling at SWMU 49 was performed to provide additional data for a risk assessment. Soil at SWMU 48 was considered sufficiently characterized through the sampling performed in the previous investigations. 2007 RFI activities included the installation of four new monitoring wells and the collection and chemical analysis of groundwater samples from the new and existing wells in the area. Additional surface and subsurface soil samples were also collected from SWMU 49.

A supplemental data investigation was conducted in 2010 and consisted of the advancement of a series of test pits perpendicular to the trenches at SWMU 48 and subsurface soil sampling. Based on the discovery of bags containing an unknown clayey substance and the high concentrations of metals detected in the clayey substance, an IM was performed in 2011 and, impacted soil, the ash layer, and debris, including the clayey substance, were removed from the southern trench of SWMU 48 and disposed of off-site.

The 2007 RFI groundwater data indicated that further investigation was required to delineate the extent of chlorinated solvents in groundwater in the Study Area. To complete the RFI at the Study Area, a Supplemental RFI was performed in 2013 that included the installation of four additional groundwater monitoring wells to the south and east of SWMUs 48 and 49.

A comparison of groundwater constituent concentrations from the mid-1990s to 2013 indicates that the majority of the VOCs are no longer present in the sampled areas and have broken down through natural processes. Analysis of the groundwater data during this roughly 20-year period shows that concentrations of carbon tetrachloride (CT) and trichloroethene (TCE) plume have: 1) decreased overall, 2) decreased to 1 µg/L surrounding the center of the plume, and 3) decreased at least by one half in the center of the plume. The presence of daughter products, i.e., chloroform and cis-1,2-dichloroethene (DCE), in groundwater at the Study Area indicates that limited biological degradation of the chlorinated solvents is occurring.

4. Interim Measure – Excavation and Offsite Disposal

Based upon the findings from the 2010 Supplemental Data Investigation, an IM was performed in the southern portion of SWMU 48 in 2011 to mitigate the potential threats to human health and the environment that existed from the ash layer and/or grossly-contaminated soil under the ash layer, as well as to mitigate the threat for a potential release of contaminants from ash layer to groundwater. The interim measures included:

- Site Preparation;
- Locate test pits and waste excavation;
- Waste Characterization and Off Site Disposal;
- Confirmation sampling; and,
- Site Restoration.

An Interim Measures Completion Report was submitted in June 2012. Upon completion of the IM, a total of 3,393 tons of nonhazardous soil and 101.6 tons of hazardous soil were excavated from SWMU 48. All materials removed from the SWMU were tested for hazardous wastes, and those materials that were determined to be hazardous were disposed of in an appropriate RCRA hazardous waste landfill. The SWMU was backfilled with 3261 cubic yards of general fill and topsoil to return the area to pre-excavation grade. The entire area was hydroseeded to finalize site restoration. The excavation of contaminated soils reduced contaminant concentrations to below residential RSLs. Because the IMs undertaken meet EPA's corrective action objectives and are protective of human health and the environment, no further action is necessary for SWMU 48 soils.

5. Current Conditions

Soil constituents have been remediated to below residential standards at SWMU 48. Additionally, by the cleanup efforts at SWMU 48 achieving residential soil RGs the site is now suitable for unrestricted use.

The HHRA at SWMU 49 indicated that the total cancer risk exposures to surface soil and/or total soil was within or below the target risk range. For the future child resident, the total cancer risk associated with total soil (4E-05) was within the target risk range. Based on the findings from the HHRA, and a Screening Level Ecological Risk Assessment, SWMU 49 is also suitable for unrestricted use.

Groundwater at the Study Area has been investigated from the mid-1990s through 2013 and has been fully characterized and delineated. Groundwater currently exceeds the MCL for carbon tetrachloride and TCE.

IV. Corrective Action Objectives

EPA has identified the following Corrective Action Objectives for soils and groundwater at the Facility:

A. Soils

EPA has determined that EPA's RSL for residential soils for direct contact are protective of human health and the environment for individual contaminants. In areas where the residential RSLs have not been achieved, EPA's Corrective Action Objective for soils is to control exposure to those contaminated soils.

B. Groundwater

EPA's Corrective Action Objectives for contaminated groundwater at the Facility are to restore groundwater to drinking water standards; control exposure to the hazardous constituents remaining in the groundwater until such time that MCLs are achieved; protect the current existing receptors (the New River) from unacceptable concentrations from COC impacts; and ensure that all dissolved groundwater plumes are contained and will not migrate.

V. Proposed Remedy

EPA's proposed remedy consists of the following components:

A. Soils

1. SWMU 54

Source control measures for SWMU 54 were completed in 2010 through the excavation of contaminated soils. EPA proposes Corrective Action Complete Without Controls for soils at SWMU 54 because based on the available information, there are no unacceptable risks to human health and the environment from those soils. Soils at SWMU 54 are, therefore, subject to unlimited use.

2. ARSAR

Firing Point/Berm Area

EPA proposes Corrective Action Complete Without Controls for soils at the Firing Point/Berm Area because based on the available information, there are no unacceptable risks to human health and the environment from those soils. Soils at the Firing Point/Berm Area are, therefore, subject to unrestricted use.

Southeast Hillside Area

EPA proposes the implementation and maintenance of land use restrictions within the boundary of Southeast Hillside Area as shown on Figure 3. The objective of the restrictions is to prevent any future residential use of this Area. Although residential development of the Southeast Hillside Area is highly unlikely, the results of the lead evaluation indicate a need for future land use controls.

3. SWMUs 48 and 49

EPA has made a Corrective Action Complete Without Controls determination for soils at SWMUs 48 and 49 because based on the available information, there are no unacceptable risks to human health and the environment from those soils. Soils at SWMUs 48 and 49 are, therefore, subject to unrestricted use.

B. Groundwater

Since 2011, groundwater monitoring of SWMU 54 has demonstrated that groundwater quality continues to improve. All monitoring wells at the Unit show either non-detect levels for COPCs or decreasing trends. Monitored natural attenuation is proposed as the remedy to continue on a quarterly basis at three well locations in combination with groundwater use restrictions (see Section V.C., below). The Long Term Monitoring Program is described in more detail in the 2011 SWMU 40 Interim Measures Work Plan and subsequent revisions in the SWMU 54 Two Year Final Report. The monitoring will continue until RSLs are met.

Groundwater conditions for SWMUs 48 & 49 has been adequately characterized. In addition, in 2011 source control measures were completed at SWMUs 48 & 49 and EPA had determined that potential soil sources have been controlled. Therefore, the proposed remedy for groundwater consists of monitored natural attenuation until drinking water standards are met, and compliance with and maintenance of groundwater use restrictions (see Section V.C., below) at the Facility to prevent exposure to contaminants while levels remain above MCLs.

C. Land and Groundwater Use Restrictions

EPA is proposing the following land and groundwater use restrictions be implemented at the Facility:

a) The Southeast Hillside Area of the ARSAR shall not be used for residential purposes;
b) Groundwater at SWMUs 48, 49, and 54 shall not be used for any purpose, including, but not limited to, use as a potable water source, other than to conduct the maintenance and monitoring activities required by VADEQ and/or EPA;
c) The ARSAR and SWMUs 48,49, and 54 shall not be used in a way that will adversely affect or interfere with the integrity and protectiveness of the final remedies implemented at the Facility;
d) Any Owner of the Facility property or any portion thereof shall provide EPA and VADEQ with a "Certified, True and Correct Copy" of any instrument that conveys any interest in the Facility property or any portion thereof. Any such conveyance must provide for the continuation of the ICs until EPA, in consultation with VADEQ, determines the ICs are no longer necessary;

EPA proposes to implement the land and groundwater use restrictions through an enforceable mechanism which shall consist of a Permit. If an Environmental Covenant is implemented as part of the final remedy, it will be recorded in the chain of title for the Parcel property and, once recorded, will be enforceable against future land owners.

If EPA determines that additional maintenance and monitoring activities, institutional controls, or other corrective actions are necessary to protect human health or the environment, EPA has the authority to require and enforce such additional corrective actions through an enforceable mechanism which may include an order/permit or Environmental Covenant, provided any necessary public participation requirements are met.

VI. Evaluation of Proposed Remedy

This section provides a description of the criteria EPA used to evaluate the proposed remedy consistent with EPA guidance, "Corrective Action for Releases From Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule," 61 Federal Register 19431, May 1, 1996. The criteria are applied in two phases. In the first phase, EPA evaluates three decision threshold criteria as general goals. In the second phase, for those remedies which meet the threshold criteria, EPA then evaluates seven balancing criteria to determine which proposed remedy alternative provides the best relative combination of attributes.

A. Threshold Criteria

1. Protect Human Health and the Environment - This criterion is met without additional remedial actions with respect to current risk. The Facility property is industrial use, there is no current potable use of groundwater, and contaminated groundwater is stable and not affecting potential receptors. The proposed remedy will continue to protect human health and the environment from exposure to contamination, including future risks. Land and groundwater use restrictions will prohibit future uses that would pose an unacceptable risk through the use of a permit or an environmental covenant which will be enforceable against future land owners.

2. Achieve Media Cleanup Objectives - EPA's proposed remedy meets the cleanup objectives appropriate for the expected current and reasonably anticipated future industrial land use. The groundwater cleanup standards are MCLs. Groundwater does not currently meet MCLs, however, there are no on-site receptors for groundwater and the proposed remedy provides that uses of groundwater at SWMUs with groundwater in excess of MCLs are to be prohibited other than maintenance and monitoring activities. The activity use restriction will eliminate future unacceptable exposures to both soil at the Southeast Hillside Area and groundwater.

3. Control the Source of Releases - In its RCRA Corrective Action proposed remedies, EPA seeks to eliminate or reduce further releases of hazardous wastes or hazardous constituents that may pose a threat to human health and the environment. Controlling the sources of contamination relates to the ability of the proposed remedy to reduce or eliminate, to the maximum extent practicable, further releases. Wherever possible and practical at RFAAP, excavation and off-site disposal of contaminated soil was completed as an IM thereby remediating the sources of releases. At the Southeast Hillside of the ARSAR where contamination is left in place, sampling has confirmed that no releases have occurred and controls will be in place to prevent residential use at this unit.

B. Balancing/Evaluation Criteria

1. Long-Term Reliability and Effectiveness - The proposed remedy of MNA and land and groundwater use restrictions will maintain protection of human health and the environment over time by eliminating exposure to the hazardous constituents remaining in groundwater until no longer necessary. The long term effectiveness is high, as land and groundwater use restrictions are readily implementable and easily maintained.

2. **Reduction of Toxicity, Mobility, or Volume of Waste** - Natural degradation processes will reduce the toxicity and volume of contaminants in groundwater over time. Excavation of soil containing COCs in excess of RGs and r-SL has reduced the volume of waste by disposal offsite.

3. **Short-Term Effectiveness** - EPA's proposed remedy does not involve any additional activities, such as construction or excavation that would pose short-term risks to workers, residents, and the environment. The Facility is enclosed by fencing, which restricts access. Groundwater is not used for any purposes other than monitoring or maintenance. Groundwater discharge to the River has been shown not to occur; therefore the proposed remedy's short-term effectiveness is high.

4. **Implementability** - EPA's proposed remedy is readily implementable. The remedy will be implemented using existing monitoring wells. EPA proposes that the use restrictions be implemented through an enforceable mechanism such as a Permit and/or an Environmental Covenant pursuant to the Virginia Uniform Environmental Covenants Act.

5. **Cost** - The majority of the capital costs for the proposed remedy have been incurred previously: monitoring well installation; excavation and disposal; soil cover and regrading. Additional costs associated with implementation of use restrictions, and groundwater monitoring and reporting are minimal. Based on EPA's best professional judgment, the proposed remedy is cost effective for the Facility.

6. **Community Acceptance** - RFAAP currently meets with a Restoration Advisory Board to foster an open dialogue, an exchange of ideas, better understanding and cooperation with the surrounding community regarding safety, and environmental protection programs. Ultimately, community acceptance of EPA's proposed remedy will be evaluated based on comments received during the public comment period and will be described in the Final Decision and Response to Comments.

7. **State/Support Agency Acceptance** - VADEQ has reviewed and concurred with the proposed remedy. Furthermore, VADEQ has provided input and been involved throughout the investigation process.

VII. Environmental Indicators

Under the Government Performance and Results Act (GPRA), EPA has set national goals to address RCRA corrective action facilities. Under GPRA, EPA evaluates two key environmental clean-up indicators for each facility: (1) Current Human Exposures Under Control and (2) Migration of Contaminated Groundwater Under Control. The Facility met these indicators on July 17, 2012, and June 3, 2011, respectively. The environmental indicators are available at http://www.epa.gov/reg3wcmd/ca/va/webpages/va1210020730.html.

VIII. Public Participation

RFAAP routinely conducts Restoration Advisory Board (RAB) meetings in accordance with the Facility Installation Restoration Program. The investigations and associated remedial actions at the Facility have been presented and discussed at these meetings. The RAB meetings are advertised in the local newspaper and open to the public.

Written comments on this SB will be accepted during the 30-day public comment period. The public comment period will last 30 calendar days from the date that notice of the start of the comment period is published in a local newspaper. Comments may be submitted by mail, email, or phone to Mr. Erich Weissbart at the address listed below.

A public hearing will be held upon request. Requests for a public hearing should be made to Mr. Erich Weissbart of the EPA Region III Office (contact info below). A hearing will not be scheduled unless one is requested.

The public is encouraged to review the Administrative Record and to comment on the proposed remedy presented in this document. This SB provides only a summary description of the investigations and activities performed at the Facility. EPA encourages the public to review the documents in the Administrative Record in order to gain a more comprehensive understanding of the activities that have been conducted at the site and the proposals under consideration. The Administrative Record contains all the information considered by EPA for the proposed remedy presented in this SB. The Administrative Record is available to the public for review and can be found at the following locations:

U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103
Contact: Mr. Erich Weissbart (3LC20)
Phone: (410) 305-2779
Email: weissbart.erich@epa.gov

and

http://www.radfordaapirp.org/inforepo/online-index.htm

and at:

Montgomery-Floyd Regional Library
Christiansburg Branch
125 Sheltman Road
Christiansburg, VA 24073
Phone: (540) 382-6965

Signature: John Armstead

Date: 6.4.14

John Armstead, Director
Land and Chemicals Division
USEPA, Region III

Attachment 1	Administrative Record File Index of Documents
Figure 1	Site Map
Figure 2	SWMU 54 Site Map
Figure 3	Army Reserve Small Arms Range Site Map
Figure 4	SWMU 48 and SWMU 49 Site Map

Attachment 1

Radford Army Arsenal
Radford, Virginia
Statement of Basis
Administrative Record File
Index of Documents

1. Permit: USEPA Permit for Corrective Action and Waste Minimization, Radford Army Ammunition Plant, October 31, 2000.

2. Workplan: *RAAP Master Workplan Addendum 19 Report,* prepared by Shaw Environmental, July 2007.

3. Workplan: *RAAP ARSAR RFI Interim Measures Workplan*, prepared by Shaw Environmental, March 2011.

4. Workplan: *RAAP SWMU 54 Monitored Natural Attenuation Interim Measures Workplan*, prepared by Shaw Environmental, April 2011.

5. Letter from Erich Weissbart, EPA, to P.W. Holt, Environmental Manager, Alliant Techsystems Inc., dated 11 April 2011, approving SWMU 54 IM Completion Report.

6. Letter from Erich Weissbart, EPA, to P.W. Holt, Environmental Manager, Alliant Techsystems Inc., dated 11 April 2011, approving SWMU 54 MNA IM Workplan.

7. Letter from Erich Weissbart, EPA, to P.W. Holt, Environmental Manager, Alliant Techsystems Inc., dated 11 April 2011, approving ARSAR RFI IM Workplan.

8. Letter from Erich Weissbart, EPA, to P.W. Holt, Environmental Manager, Alliant Techsystems Inc., dated 20 July 2011, approving SWMU 48 IM Workplan.

9. Letter from Erich Weissbart, EPA, to Jay Stewart, Environmental Manager, BAE Systems Ordnance, dated 20 August 2013, approving SWMU 54 MNA IM Year One Report.

10. Letter from Erich Weissbart, EPA, to Jay Stewart, Environmental Manager, BAE Systems Ordnance, dated 23 December 2013, approving SWMU 54 MNA IM Two Year Sampling Report.

11. Letter from Erich Weissbart, EPA, to Bob Winstead, Environmental Manager, BAE Systems Ordnance, dated 14 January 2014, approving ARSAR RFI IM Completion Report.

12. Report: *RAAP SWMU 54 RFI/CMS Report*, prepared by URS, September 2008.

13. Report: *RAAP SWMU 54 Interim Measures Completion Report*, prepared by Shaw Environmental, April 2011.

14. Report: *RAAP SWMU 48 Interim Measures Completion Report*, prepared by Shaw Environmental, June 2012.

15. Report: *RAAP SWMU 54 Monitored Natural Attenuation Interim Year One Report*, prepared by Shaw Environmental, February 2013.

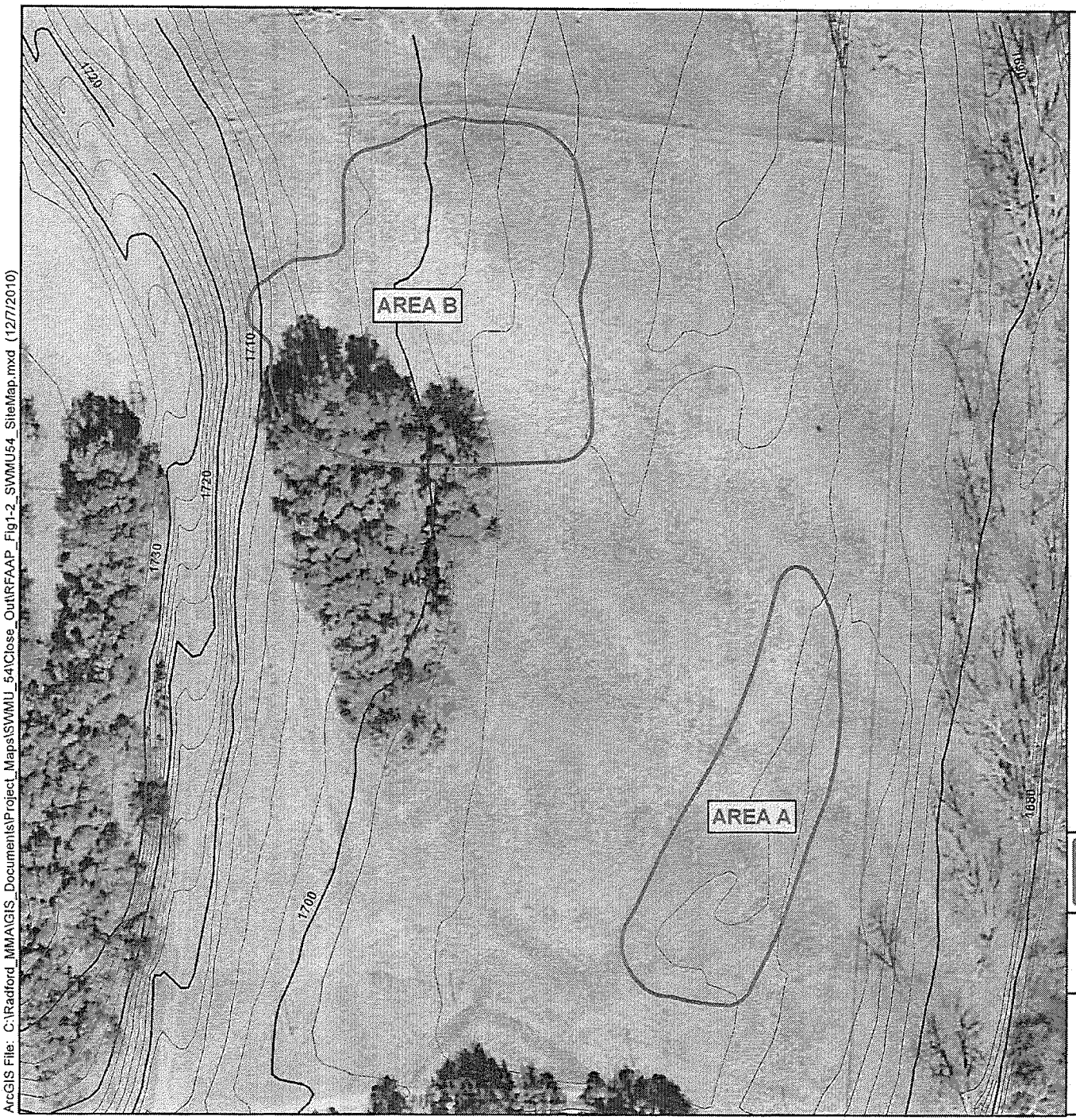
16. Report: *RAAP ARSAR RFI IM Completion Report*, prepared by Shaw Environmental, November 2013.

17. Report: *RAAP SWMU 54 Monitored Natural Attenuation Interim Year Two Report*, prepared by Shaw Environmental, December 2013.

18. Report: *RAAP SWMUs 48 and 49 RCRA Facility Investigation Report*, prepared by Shaw Environmental, January 2014.

Figures

Radford Army Ammunition Plant
Installation Restoration Program Sites



ArcGIS File: C:\Radford_MMA\GIS_Documents\Project_Maps\SWMU_54\Close_Out\RFAAP_Fig1-2_SWMU54_SiteMap.mxd (12/7/2010)

LEGEND

10 ft Contour Line

SWMU 54 Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.
2) Samples were collected in April/May 2009.

N

Scale:

0 50 100 200 Feet

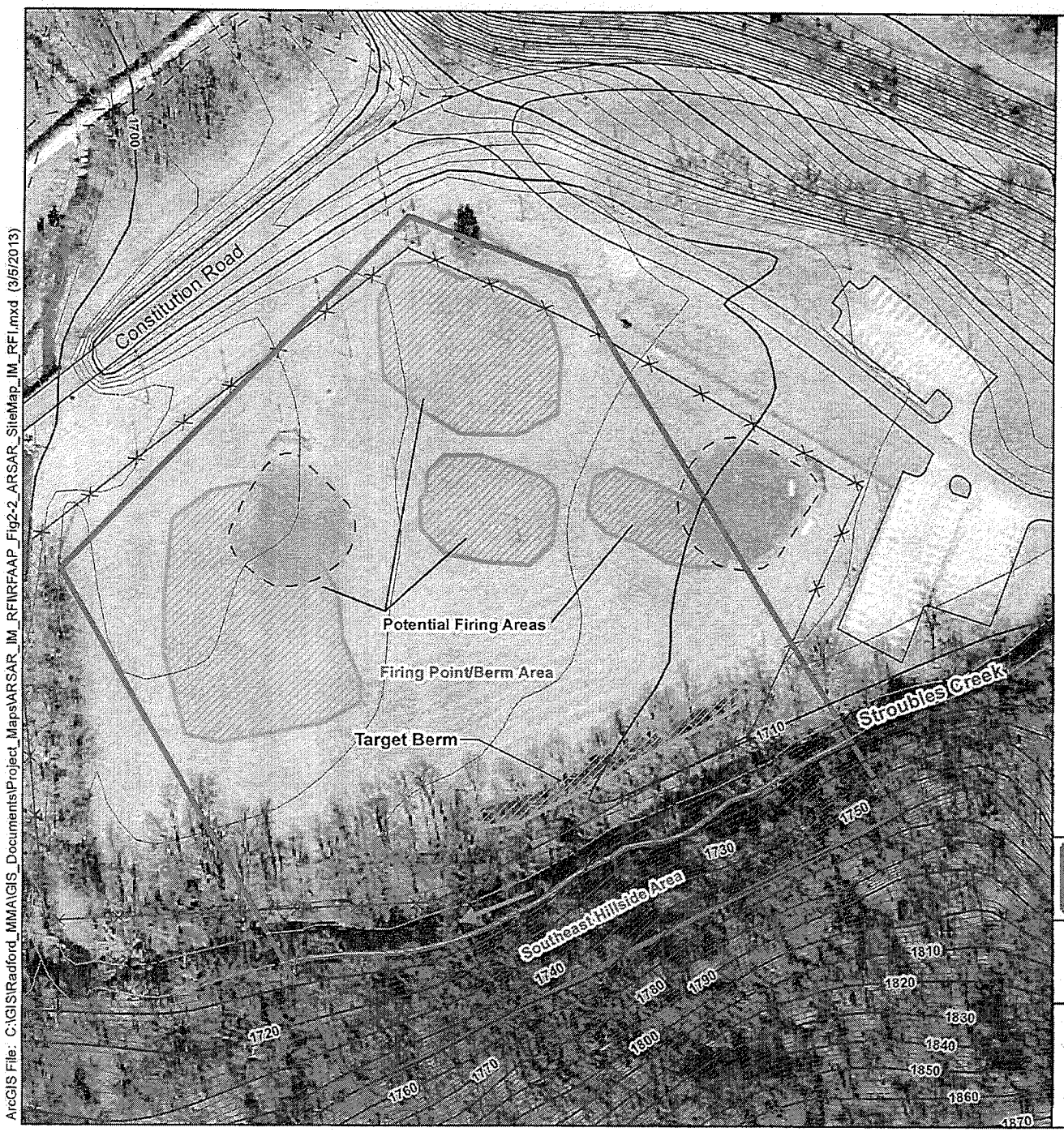
U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

FIGURE 1-2

SWMU 54 Site Map

Radford Army Ammunition Plant,
Radford, VA



ArcGIS File: C:\GIS\Radford_MMA\GIS_Documents\Project_Maps\ARSAR_IM_RFI\RFAAP_Fig2-2_ARSAR_SiteMap_IM_RFI.mxd (3/5/2013)

LEGEND

- 2 ft Contour Line
- 10 ft Contour Line
- Water Feature
- Surface Water Flow Direction
- Dirt Road
- Paved Road
- Fence Line
- MRS Boundary
- Historic Feature

Notes:

1) Aerial photo, dated 2005, was obtained from Montgomery County Planning, VA Planning & GIS Services.
2) Historic features and MRS boundary were obtained from Final Site Screening Process Report (URS, 2009).

N

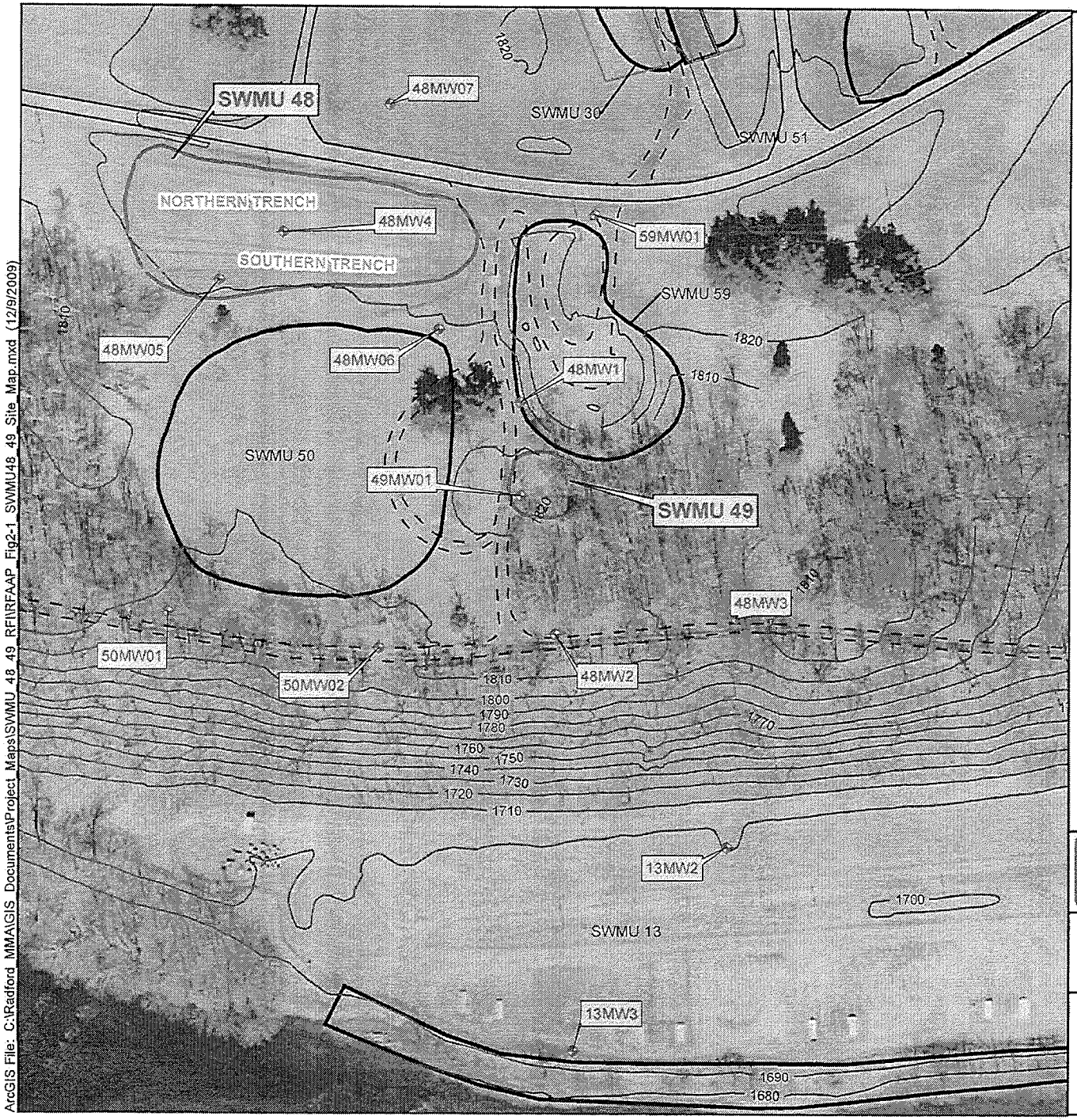
Scale:

0 65 130 260 Feet

U.S. Army Corps of Engineers

Shaw Environmental, Inc.
(A CB&I Company)

FIGURE 2-2
Army Reserve Small Arms Range
Site Map
Radford Army Ammunition Plant,
Radford, VA



LEGEND

- Monitoring Well
- Dirt Road
- Paved Road
- Fence
- 10 ft Contour Line
- Trench Boundary
- SWMU 48 and SWMU 49 Boundaries
- Other SWMU Boundary

Notes:
1) Aerial photo, dated 2005, was obtained from Montgomery County, VA Planning & GIS Services.

N

Scale:
0 75 150 300 Feet

U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

FIGURE 2-1
SWMU 48 and SWMU 49 Site Map
Radford Army Ammunition Plant,
Radford, VA

ArcGIS File: C:\Radford_MMA\GIS_Documents\Project_Maps\SWMU_48_49_RFI\RFAAP_Fig2-1_SWMU48_49_Site_Map.mxd (12/9/2009)