FINAL

Site Inspection Report for the Chopawamsic Troop Training Site

DERP FUDS Project Number: **C03VA019401**

Prepared Under: **Contract No. W912DY-04-D-0017**
Task Order # 00170001

Prepared for:

U.S. Army Engineering and Support Center, Huntsville
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September 2007

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ALION
SCIENCE AND TECHNOLOGY

9/13/07
Roger Azar — Date
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9/13/07
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Alion Corporate Quality Management Reviewer

September 2007

CONTRACTOR STATEMENT OF AUTHORSHIP AND INDEPENDENT TECHNICAL REVIEW

Alion Science and Technology Corporation has prepared this Site Inspection Report for Chopawamsic Troop Training Site, Formerly Used Defense Site (FUDS), Project No. C03VA019401. An independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Programmatic Work Plan. During the independent technical review, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of assumptions; methods, procedures, and material used in analyses; the appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with existing Corps policy. In accordance with Corps requirements, significant authors to this report are presented below.

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Significant concerns and explanation of the resolutions are documented within the project file.

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LIST OF ACRONYMS AND ABBREVIATIONS

Alion	Alion Science and Technology Corporation
ASR	Archive Search Report
CENAB	Corps of Engineers North Atlantic Baltimore
CENAO	Corps of Engineers North Atlantic Norfolk
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Chemical of Potential Concern
COPEC	Chemical of Potential Ecological Concern
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DMM	Discarded Military Munitions
DNT	Dinitrotoluene
DoA	Department of the Army
DoD	Department of Defense
DQI	Data Quality Indicator
DQO	Data Quality Objective
EA	EA Engineering, Science, and Technology, Inc.
ECOSSLs	Ecological Soil Screening Levels
EDS	Environmental Data Services
EOD	Explosive Ordnance Disposal
EPA	U.S. Environmental Protection Agency
°F	Degrees Fahrenheit
FEMA	Federal Emergency Management Agency
ft	Foot or Feet
FUDS	Formerly Used Defense Site(s)
GPL	GPL Laboratories, LLLP
gpm	Gallon Per Minute
GPS	Global Positioning System

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

HMX	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine
HQ	Hazard Quotient
HRS	Hazard Ranking System
HTRW	Hazardous, Toxic, and Radioactive Waste
INPR	Inventory Project Report
LCS	Laboratory Control Spike
m	Meter(s)
MC	Munitions Constituents
MD	Munitions Debris
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
mg/kg	Milligrams Per Kilogram
mm	Millimeters
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosive Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	No Department of Defense Action Indicated
NG	Nitroglycerin
NPS	National Park Service
NTCRA	Non-Time Critical Removal Action
OB/OD	Open Burn/Open Detonation
OEW	Ordnance and Explosive Waste
OSS	Office of Strategic Service
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, and Sensitivity

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

PETN	Pentaerythrite Tetranitrate
PWFP	Prince William Forest Park
PWP	Programmatic Work Plan
QA/QC	Quality Assurance/Quality Control
QSM	Quality Systems Manual
RAC	Risk Assessment Code
RDX	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine
RI/FS	Remedial Investigation/Feasibility Study
RBC	Risk-Based Concentration
RL	Reporting Limit
RPD	Relative Percent Difference
SI	Site Inspection
SLERA	Screening Level Ecological Risk Assessment
SS-WP	Final Site-Specific Work Plan Addendum
T&E	Threatened and Endangered
TCRA	Time Critical Removal Action
Tetryl	2,4,6-Trinitrophenyl-n-methylnitramine
TNT	Trinitrotoluene
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USAESCH	U. S. Army Engineering and Support Center, Huntsville
USC	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U. S. Geological Survey
UXO	Unexploded Ordnance
VADEQ	Virginia Department of Environmental Quality

GLOSSARY OF TERMS

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)—Also known as "Superfund," this congressionally enacted legislation provides the methodology for the removal of hazardous substances resultant from past / former operations. Response actions must be performed in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (USACE 2003).

Discarded Military Munitions (DMM)—Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of, consistent with applicable environmental laws and regulations (10 USC2710(e)(2)).

Explosive Ordnance Disposal (EOD)—The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded ordnance and of other munitions that have become an imposing danger, for example, by damage or deterioration (DoA 2005).

Explosives Safety—A condition where operational capability and readiness, people, property, and the environment are protected from the unacceptable effects or risks of potential mishaps involving military munitions (DoA 2005).

Formerly Used Defense Site (FUDS)—Locations that were owned by, leased to, or otherwise possessed by the Department of Defense (DoD) are considered FUDS. A FUDS is eligible for the Military Munitions Response Program if the release occurred prior to October 17, 1986; the property was transferred from DoD control prior to October 17, 1986; and the property or project meets other FUDS eligibility criteria. The FUDS Program focuses on compliance and cleanup efforts at FUDS (USACE 2004b).

Material Potentially Presenting an Explosive Hazard (MPPEH)—Material potentially containing explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris); or material potentially containing a high enough concentration of explosives such that the material presents an explosive hazard (e.g., equipment, drainage systems, holding tanks, piping, or ventilation ducts that were associated with munitions production, demilitarization or disposal operations). Excluded from MPPEH are munitions within DoD's established munitions management system and other hazardous items that may present explosion hazards (e.g., gasoline cans, compressed gas cylinders) that are not munitions and are not intended for use as munitions (DoA 2005).

GLOSSARY OF TERMS

Military Munitions—Military munitions means all ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives, and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges; and devices and components thereof. The term does not include wholly inert items; improvised explosive devices; and nuclear weapons, nuclear devices, and nuclear components, other then nonnuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 USC 2011 et seq.) have been completed (10 U.S.C 101(e)(4)(A) through (C)).

Munitions and Explosives of Concern (MEC)— This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks means: (A) Unexploded ordnance (UXO), as defined in 10 USC 101(e)(5); (B) Discarded military munitions (DMM), as defined in 10 USC 2710(e)(2); or (C) Munitions constituents (e.g., TNT, RDX), as defined in 10 USC 2710(e)(3), present in high enough concentrations to pose an explosive hazard (10 USC 2710(e)(2)).

Munitions Constituents (MC)—Any materials originating from unexploded ordnance (UXO), discarded military munitions (DMM), or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 USC 2710(e)(3)).

Munitions Debris (MD)—Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal (10 USC 2710(e)(2)).

Munitions Response Area (MRA) —Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. Examples include former ranges and munitions burial areas. A munitions response area is comprised of one or more munitions response sites (32 CFR 179.3).

Munitions Response Site (MRS) —A discrete location within an MRA that is known to require a munitions response (32 CFR 179.3).

GLOSSARY OF TERMS

Munitions Response Site Prioritization Protocol (MRSPP) — The MRSPP was published as a rule on October 5, 2005. This rule implements the requirement established in section 311(b) of the National Defense Authorization Act for Fiscal Year 2002 for the Department to assign a relative priority for munitions responses to each location (hereinafter MRS) in the Department's inventory of defense sites known or suspected of containing unexploded ordnance (UXO), discarded military munitions (DMM), or munitions constituents (MC). The DoD adopted the MRSPP under the authority of 10 USC 2710(b). Provisions of 10 U.S.C. 2710(b) require that the DOD assign to each defense site in the inventory a relative priority for response activities based on the overall conditions at each location taking into consideration various factors related to safety and environmental hazards (710 FR 58016).

Non-Time Critical Removal Action (NTCRA)—Actions initiated in response to a release or threat of a release that poses a risk to human health or the environment where more than six months planning time is available (USACE 2000).

Range—A designated land or water area that is set aside, managed, and used for range activities of the DoD. The term includes firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, electronic scoring sites, buffer zones with restricted access and exclusionary areas. The term also includes airspace areas designated for military use in accordance with regulations and procedures prescribed by the Administrator of the Federal Aviation Administration (10 USC 101(e)(1)(A) and (B)).

Range Activities—Research, development, testing, and evaluation of military munitions, other ordnance, and weapons systems; and the training of members of the armed forces in the use and handling of military munitions, other ordnance, and weapons systems (10 USC 101(e)(2)(A) and (B)).

Risk Assessment Code (RAC) - An expression of the risk associated with a hazard. The RAC combines the hazard severity and accident probability into a single Arabic number on a scale from 1 to 5, with 1 being the greatest risk and 5 the lowest risk. The RAC is used to prioritize response actions (USACE 2004a).

Time Critical Removal Action (TCRA)—Removal actions conducted to respond to an imminent danger posed by the release or threat of a release, where cleanup or stabilization actions must be initiated within six months to reduce risk to public health or the environment (USACE 2000).

Unexploded Ordnance (UXO)—Military munitions that (A) have been primed, fused, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (C) remain unexploded whether by malfunction, design, or any other cause (10 U.S.C 101(e)(5)(A) through (C)).

EXECUTIVE SUMMARY

ES.1 Under contract with the United States Army Corps of Engineers (USACE), Alion Science and Technology Corporation (Alion) has prepared the following Site Inspection (SI) Report to document SI activities and findings for the Chopawamsic Troop Training Site Formerly Used Defense Site (FUDS), Property No. C03VA0194. The Department of Defense (DoD) has established the Military Munitions Response Program (MMRP) under the Defense Environmental Restoration Program (DERP) to address potential munitions and explosives of concern (MEC) and munitions constituents (MC) remaining at FUDS. This SI is being completed under MMRP Project No. C03VA019401 to addresses potential MMRP hazards remaining at the Chopawamsic Troop Training Site FUDS.

ES.2 **SI Objectives and Scope**. The primary objective of the MMRP SI is to determine whether or not the FUDS project warrants further response action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The SI collects the minimum amount of information necessary to make this determination as well as it (i) determines the potential need for a removal action; (ii) collects or develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize the hazardous substance release for effective and rapid initiation of the Remedial Investigation/Feasibility Study (RI/FS). An additional objective of the MMRP SI is to collect additional data necessary to evaluate munitions response sites (MRSs) using the Munitions Response Site Prioritization Protocol.

ES.3 The scope of the SI is restricted to the evaluation of the presence of munitions and explosives of concern (MEC) or munitions constituents (MC) related to historical use of the FUDS prior to transfer. Potential releases of hazardous, toxic, and radioactive waste (HTRW) are not within the scope.

ES.4 **Chopawamsic Troop Training Site**. The Chopawamsic Troop Training Site was a World War II era installation occupied by the Army from 1942 to 1945 under a special use permit from the National Park Service (NPS). The 11,011.23-acre site was used for the training of counter intelligence agents of the Office of Strategic Service. This NPS-owned land is managed as the Prince William Forest Park (PWFP) and is open to the public for unrestricted recreational and educational pursuits year-round.

ES.5 **Technical Project Planning.** The SI approach was developed in concert with stakeholders through the USACE's technical project planning (TPP) framework, which was applied at the initial TPP meeting on 10 January 2006. Stakeholders agreed to the SI approach, as presented and modified during the TPP meeting and as finalized in the site-specific work plan (SS-WP).

ES.6 USACE programmatic range documents (including the Supplemental Archive Search Report [ASR] and the DERP Fiscal Year 2005 Annual Report to Congress (DoD 2005) identified four ranges at the FUDS. These four ranges, also referred to as MRSs, include: MRS 1 – Open Burn/Open Detonation (OB/OD) No. 3; MRS 2 – Fragmentation Grenade Range; MRS 3 – Range Complex No. 1; and MRS 4 – Range Complex No. 2. Range Complex No. 1/MRS 3 includes six subranges (i.e., Mortar Range No. 01, Mortar Range No. 02, Rifle Range No. 01, Machine Gun Range No. 01, Rocket Range, and an OB/OD Range). Range Complex No. 2/MRS 4 includes five subranges (i.e., Rifle Range No. 02, Pistol Range, Night Firing Course, Machine Gun Range No. 02, and OB/OD No. 02).

ES.7 **Qualitative Site Reconnaissance and MEC Assessment.** SI field activities, including site reconnaissance and MC sampling, were performed during two separate mobilizations in August and November 2006. A qualitative site reconnaissance of the FUDS was performed using visual observations and analog geophysics. The field sampling approach presented included meandering reconnaissance in and around sampling locations to identify ranges, target areas, MEC, munitions debris (MD), or other areas of interest (areas containing possible bomb craters, backstops, or other areas containing distressed vegetation). The qualitative site reconnaissance covered approximately 144 acres of the FUDS property. Evidence of past DoD use, including MD and remnants of targets/craters, was documented throughout the target areas associated with MRSs 1, 3, and 4. Subsurface anomalies possibly attributable to MEC or MD also were noted in all the MRSs.

ES.8 A qualitative MEC screening level risk assessment was conducted based on the SI qualitative reconnaissance, as well as historical data documented in the Inventory Project Report (INPR), Archives Search Report (ASR), and the ASR Supplement. Historical documentation and interviews performed as part of the SI indicate that a variety of conventional munitions were used at the FUDS property including small arms, live hand grenades, live ground rockets, blasting caps, and high explosive mortars. Previous finds at the FUDS property have included mortars and rockets in MRS 1 and MRS 3 indicating the range fans as drawn may not be accurate. MD items (40–millimeter illuminator rounds and spent bullets) were observed in MRS 3 and MRS 4 during the August 2006 SI site activities and numerous subsurface anomalies were recorded throughout MRSs 1, 2, 3, and 4. Evidence of munitions use (craters, training targets), suspect MEC/MD, and subsurface anomalies have been identified within each MRS. The potential risk posed by MEC, assessed through three risk factors (i.e., presence of MEC source, accessibility or pathway presence, and potential receptor contact), indicated low to moderate risk for each of the four MRSs.

ES.9 **MC Sampling and Risk Screening.** A total of 62 surface soil, 11 sediment, 11 surface water, and 7 groundwater samples were collected (which includes three background samples for surface soil, two background samples for surface water, and two background samples for sediment). Munitions-related MC were identified then aggregated for all four MRS given the overlap in MRS boundaries. These munition-related MC used to support analysis of results and risk screening include seven explosives (Trinitrotoluene [TNT], Hexahydro-1,3,5-Trinitro-1,3,5-Triazine [RDX], 2,4,6-Trinitrophenyl-n-methylnitramine [tetryl], Pentaerythrite Tetranitrate [PETN], Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine [HMX], Nitroglycerin [NG], and dinitrotoluene [DNT]), 11 metals (aluminum, antimony, barium, chromium, copper, iron, magnesium, lead, nickel, strontium, and zinc), and perchlorate (groundwater only). Only two analytes associated with the munitions (lead and copper in MRS 4) exceeded human health screening criteria in surface soil. A screening level ecological risk assessment (SLERA) was required given the former FUDS is located in an area regulated by the Virginia Coastal Zone Management Program, contains wetlands habitats, and is within PWFP. The SLERA identified various combinations of antimony, barium, copper, lead, nickel, and zinc as exceeding screening criteria in MRSs 1, 2, 3, and 4. However, when compared to background concentrations, antimony and barium concentrations reported above their respective screening values were not considered significant in most of the sample locations.

ES.10 **Recommendations**. Based on the findings of this SI, an RI/FS is recommended to address MEC/MC concerns at the FUDS (Table ES-1). Given the previous findings (MEC associated with MRS 3 being found in MRS 1) and the location of the MRSs as designated, the potential exists that additional MEC from MRS 3 may be found in MRS 1, 2, and 4. Due to the apparent overlap associated with the range fans in MRS 3, the MEC RI/FS recommendation applies to each of the four MRSs. An RI/FS is also recommended for MC in MRSs 1, 2, 3, and 4. Neither a time critical removal action (TCRA) nor a non-TCRA (NTCRA) is recommended for any of the MRSs. The boundary and acreage associated with each MRS in the Supplemental ASR should be revised to address natural topography and overlap from adjacent MRSs. The INPR should be amended to include the land located in the MRS range fans beyond the FUDS boundary for investigation and delineation during the RI/FS. Finally, in the DERP Annual

Report to Congress Fiscal 2006, MMRP Site Inventory website, the name of this site is spelled incorrectly (Chopawamic). The FUDS property name should be corrected (Chopawamsic).

Table ES-1 Summary of Site Recommendations for Chopawamsic Troop training Site

(FUDS Project No. C03VA019401)

MRS	Recommendation	Basis for Recommendation	
		MEC	**MC**
MRS 1 (OB/OD No. 3)	Remedial Investigation/ Feasibility Study Additional studies should focus on MEC and MC. TCRA/NTCRA not recommended	MEC Assessment: Low to moderate risk Past finds of MEC/MD/ MPPEH[1] area overlaps other MRSs	Risk Screening Assessment: : Potential risks to ecological receptors ***Surface Soil***-Metal exceedances for ecological receptors (antimony, copper, lead, nickel, and zinc) ***Surface Water*** –Metal exceedances for ecological receptors (barium)
MRS 2 (Fragmentation Grenade Range)	Remedial Investigation/ Feasibility Study Additional studies should focus on MEC and MC. TCRA/NTCRA not recommended	Past finds of MEC/MD/MPPEH[1] area overlaps other MRSs MEC Assessment: Low to moderate risk	Risk Screening Assessment: Potential risks to ecological receptors ***Surface Soil***- Metal exceedances for ecological receptors (copper, lead, and zinc)
MRS 3 (Complex No. 1)	Remedial Investigation/ Feasibility Study Additional studies should focus on MEC and MC. TCRA/NTCRA not recommended	MEC Assessment: Moderate risk Past finds of MEC/MD area overlaps other MRSs	Potential risks to ecological receptors ***Surface Soil***-Metal exceedances for ecological receptors (copper, lead, and zinc)
MRS 4 (Complex No. 2)	Remedial Investigation/ Feasibility Study Additional studies should focus on MEC and MC. TCRA/NTCRA not recommended	MEC Assessment: Low to moderate risk Past finds of MEC/MD/MPPEH[1] area overlaps other MRSs	Risk Screening Assessment: Potential risks to human health and ecological receptors ***Surface Soil***-Metal exceedances for human (lead and copper) and ecological receptors (barium, copper, lead, and zinc)
General	1) The FUDS property name DERP Annual Report to Congress Fiscal 2006, MMRP Site Inventory website, should be corrected from Chopawamic to Chopawamsic. 2) The boundary and acreage associated with each MRS in the Supplemental ASR should be revised to address natural topography and overlap from adjacent MRSs. The INPR should be amended to include the land located in the MRS range fans beyond the FUDS boundary for investigation and delineation during the RI/FS.		

1: where MMPEH is used, the historic documents did not definitively identify the items DERP - Defense Environmental Restoration Program FUDS – Formerly Used Defense Site MC-munitions constituents MEC-munitions and explosives of concern	MPPEH - Material Potentially Presenting an Explosive Hazard MRS-Munitions Response Site NTCRA - Non-Time Critical Removal Action OB/OD – Open Burn/Open Detonation RI/FS - Remedial Investigation/Feasibility Study TCRA - Time Critical Removal Action

1. INTRODUCTION

1.0.1 This report documents the findings of the Military Munitions Response Program (MMRP) Site Inspection (SI) performed at the Chopawamsic Troop Training Site Formerly Used Defense Site (FUDS) located in Prince William County, Virginia, MMRP Project No. C03VA019401. Alion Science and Technology Corporation (Alion), along with its subcontractors [EA Engineering, Science, and Technology, Inc. (EA), Environmental Data Services (EDS), and GPL Laboratories, LLLP (GPL)], prepared this report under contract to the U. S. Army Engineering and Support Center, Huntsville (USAESCH). This work is being performed in accordance with Contract No. W912DY-04-D-0017, Task Order 00170001 for FUDS in the Northeast Region of the Continental United States. The Corps of Engineers North Atlantic Baltimore (CENAB) is working with USAESCH and its contractor, Alion, on the completion of this project in accordance with the SI performance work statement (see Appendix A).

1.0.2 The technical approach to this SI is based on the *Programmatic Work Plan for Formerly Used Defense Sites (FUDS) Military Munitions Response Program (MMRP) Site Inspections at Multiple Sites the Northeast Region* (PWP) (Alion 2005) and the *Final Site-Specific Work Plan Addendum to the MMRP Programmatic Work Plan for the Site Inspection of the Chopawamsic Troop Training Site* (SS-WP) (Alion 2006b).

1.1 Project Authorization

1.1.1 The Department of Defense (DoD) has established the MMRP to address DoD sites suspected of containing munitions and explosives of concern (MEC) or munitions constituents (MC). Under the MMRP, the U.S. Army Corps of Engineers (USACE) is conducting environmental response activities at FUDS for the Army, DoD's Executive Agent for the FUDS program.

1.1.2 Pursuant to USACE's Engineer Regulation 200-3-1 (USACE, 10 May 2004) and the Management Guidance for the Defense Environmental Response Program (DERP) (Office of the Deputy Under Secretary of Defense [Installations and Environment], September 2001), USACE is conducting FUDS response activities in accordance with the DERP statute (10 USC 2701 et seq.), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC §9601 et seq.), Executive Orders 12580 and 13016, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR Part 300). As such, USACE is conducting SIs, as set forth in the NCP, to evaluate hazardous substance releases or threatened releases from eligible FUDS.

1.1.3 While not all MEC/MC constitute CERCLA hazardous substances, pollutants or contaminants, the DERP statute provides DoD the authority to respond to releases of MEC/MC, and DoD policy states that such responses shall be conducted in accordance with CERCLA and the NCP.

1.2 Project Scope and Objectives

1.2.1 The primary objective of the MMRP SI is to determine whether or not the FUDS project warrants further response action under CERCLA. The SI collects the minimum amount of information necessary to make this determination as well as it (i) determines the potential need for a removal action; (ii) collects or develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (EPA); and (iii) collects data, as appropriate, to characterize the hazardous substance release for effective and rapid initiation of the Remedial Investigation/Feasibility Study (RI/FS). An additional objective of the MMRP SI is to collect additional data necessary to evaluate munitions response sites (MRSs) using the Munitions Response Site Prioritization Protocol (MRSPP).

1.2.2 The scope of the SI is restricted to the evaluation of the presence of MEC or MC related to historical use of this FUDS prior to transfer through records review, qualitative site reconnaissance to assess MEC presence/absence, and sampling where MC might be expected based on the conceptual site model (CSM). Evaluation of potential releases of hazardous, toxic, and radioactive waste (HTRW) is not within the scope of this SI.

1.3 Project Location

1.3.1 The Chopawamsic Troop Training Site is located about 50 miles east of the Blue Ridge Mountains and 35 miles west of Chesapeake Bay in Prince William County, Virginia. The North American Datum 83 North coordinates for the FUDS property are Universal Transverse Mercator X and Y (meters) 292395 and 4272101, respectively. The Chopawamsic Troop Training Site falls under the geographical jurisdiction of Corps of Engineers North Atlantic Norfolk (CENAO). The SI for the Chopawamsic Troop Training Site is being completed under DERP FUDS Project No. C03VA019401 which addresses MMRP hazards at the FUDS.

1.4 Munitions Response Site Prioritization Protocol

1.4.1 This SI Report includes draft MRSPP rankings that apply to each of the four designated MRSs identified in this report (Appendix K). The MRSPP scoring will be updated by USACE on an annual basis to incorporate new information.

2. SITE DESCRIPTION

2.1 Site Description and History

2.1.1 In 1942, a special use permit was granted by the National Park Service (NPS) to the War Department allowing exclusive use of 11,011.23-acres and its park facilities. From 1942 to 1945, the Office of Strategic Service (OSS), the forerunner of the Central Intelligence Agency, used Chopawamsic Troop Training Site. During this 3-year period, cabins, administration buildings, recreation buildings, and latrines were built on the FUDS property (USACE 1996).

2.1.2 Training areas that were created included 10 target ranges and 3 demolition areas (USACE 1996). The Chopawamsic Troop Training Site was divided into “Areas” or “Camps” and the historical documentation uses these terms to describe the various locations of the ranges, magazines, etc. (USACE 1996). No historical maps were included in the Archive Search Report (ASR) to indicate the location and extent of the “Areas” or “Camps.” In 1946, the special use permit for the 11,011.23 acres associated with the Chopawamsic Troop Training Site was terminated by the War Department.

2.2 MRS Identification and Munitions Information

2.2.1 USACE programmatic range documents (including the Supplemental Archive Search Report [ASR] and the DERP Fiscal Year 2005 Annual Report to Congress) identified four ranges at the Chopawamsic Troop Training Site FUDS (USACE 2004b, DoD 2005). These ranges are documented in Table 2-1 and shown in Figure 2-1. Two of the ranges, Range Complex No. 1 and Range Complex No. 2, include six and five subranges, respectively. Following USACE guidance for the SI, the ranges on the FUDS property have been designated as four MRSs: MRS 1 – Open Burn/Open Detonation (OB/OD) No. 3; MRS 2 – Fragmentation Grenade Range; MRS 3 – Range Complex No. 1; and MRS 4 – Range Complex No. 2. Range Complex No. 1/MRS 3 includes six subranges (i.e., Mortar Range No. 01, Mortar Range No. 02, Rifle Range No. 01, Machine Gun Range No. 01, Rocket Range, and an OB/OD Range). Range Complex No. 2/MRS 4 includes five subranges (i.e., Rifle Range No. 02, Pistol Range, Night Firing Course, Machine Gun Range No. 02, and OB/OD No. 02).

2.2.2 Different nomenclature was used during the ASR to describe these ranges. The ASR nomenclature has been included in Table 2-2 and is summarized as follows: MRS 1 includes multiple training areas identified in the ASR as C-Demolition Range, D-Demolition Range, E-Demolition Range, and H-Demolition Range. MRS 2 includes one Range identified in the ASR as area F-Fragmentation Grenade Range. MRS 3 includes multiple training areas identified in the ASR as area B-Rifle, Machine Gun, Mortar, and Rocket Firing Range and area I-Mortar Range. MRS 4 contains multiple training areas identified in the ASR as area A-Rifle Range, and area G-Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range. Munitions associated with these MRSs are summarized on Table 2-2. ASR and Supplemental ASR terminology is used interchangeably throughout the document (USACE 1996, USACE 2004b)

2.2.3 As Figures 2-1 and 2-2 indicate, MRS 1 fully encompasses MRS 2 and MRS 4 and it also overlaps MRS 3. In addition, MRS 2 overlaps MRS 4. Some of the acreage associated with MRSs 1 and 3 extends beyond the FUDS boundary. DERP management guidance and USACE guidance have limited SI activities to FUDS eligible properties; therefore, the acreage outside the FUDS boundary underlying the range fans associated with MRS 1 and MRS 3 (as shown on Figure 2-1) was not addressed during the SI. The SI recommendations concerning MC/MEC apply only to the FUDS eligible portions of the four designated MRSs (USACE 2007).

2.3 Physical Setting

2.3.0.1 The following sections provide a physical description of the FUDS property with respect to relief, vegetation, and climate as well as the local demographic and land uses.

2.3.1 Topography and Vegetation

2.3.1.1 The Chopawamsic Troop Training Site is located in the Piedmont Province and the Coastal Plain Province. The topography is undulating with narrow ridge tops and steep-sided valleys. The trend of the valleys and ridges is northwest-southeast (U.S. Geological Survey [USGS] 1984). Erosion by streams created a local topographic relief of 100 to 200 feet (ft) between drainage divides and stream bottoms. Land surface in the Piedmont ranges from 300 to 600 ft above sea level along the eastern border near the Fall Line between the provinces to more than 1,500 ft near the escarpment of the Blue Ridge (USACE 1996). The Chopawamsic Troop Training Site is a predominantly forested area consisting of mature trees. There are wetlands lying along some stretches of Quantico Creek and South Fork Run. Dense vegetation is present within some forested areas.

2.3.2 Climate

2.3.2.1 The area encompassing the FUDS is characterized by warm and humid summers, and winters are cold, but not severe. The average summer temperatures are in the upper 80s (°F) and the winter temperatures are in the upper 20s (°F). The average winter snowfall is about 18 inches per year (USACE 1996).

2.3.3 Local Demographics

2.3.3.1 There are approximately 60 parcels of private land inside the Chopawamsic Troop Training Site FUDS boundary on the south side of the FUDS property, north of Joplin Road/Route 619. Quantico Marine Corps Base is located south and west of the FUDS property. There are residential and commercial properties along the northern boundary of the FUDS property and Interstate 95 borders the FUDS property on the east. The west bank of the Potomac River is approximately 4 miles east of the FUDS property (Prince William County, Virginia 2007).

2.3.3.2 Prince William County has a population of 280,813 and a population density of 831 persons per square mile (U.S. Census Bureau 2000). Populated areas within 1 mile of the FUDS property include Dumfries and Triangle to the east and southeast, respectively. There are 4,937 people residing in the town of Dumfries and 5,500 people residing in Triangle. Montclair is a residential community surrounding a man-made lake and golf course located less than 1 mile north of the FUDS. There are 15,728 people residing in Montclair (U.S. Census Bureau 2000). There are 6,571 people residing in Quantico Station, which is located approximately 4 miles southeast of the FUDS boundary. Demographic information for the Quantico Marine Corps Base (immediately south and west of the FUDS) is not available. Forest Park High School (grades 9-12) is approximately 0.1 miles north of the boundary of the Chopawamsic Troop Training Site FUDS at 15721 Forest Park Drive, Woodbridge, Virginia 22193. Approximately 2,400 students attend the high school (Forest Park High School 2006). Montclair KinderCare day care is located less than 0.1 miles north of the boundary of the Chopawamsic Troop Training Site FUDS at 4381 Kevin Walker Dr, Dumfries, Virginia 22025. Approximately 30 children attend the day care (Montclair KinderCare 2007).

2.3.4 Current and Future Land Use

2.3.4.1 The former Chopawamsic Troop Training Site currently constitutes a portion of the Prince William Forest Park (PWFP), owned by the NPS, which serves as picnic and camping grounds as well as a national forest reserve. PWFP is open to the public for unrestricted recreational and educational pursuits year-round. Hiking and jogging trails meander through the park allowing access to areas not served by roads. PWFP will continue to be used for recreational, educational, and administrative purposes in the future (Alion 2006a and 2006b). There are areas inside the southern FUDS boundary (north of Joplin Road/Route 619) that are privately owned. Most of these parcels are used as private residences.

2.3.5 Geologic Setting

2.3.5.1 The Chopawamsic Troop Training Site sits on the Fall Line, the boundary between the Piedmont Province to the west and the Coastal Plain Province to the east. The western three-fourths of the FUDS property are in the Piedmont Province underlain by metamorphic rocks ranging in age from Precambrian and Early Cambrian to late Ordovician. The rocks include gneiss, greenstone, phyllite, schist, and slate. The rocks have been folded and faulted and dip nearly vertically. Outcrops are found along the streambed of South Fork Quantico Creek and some of its tributaries. Along the ridge tops and valley walls, the rocks are overlain by saprolite ranging in thickness from 5 to 150 ft. In the eastern third of the FUDS property, younger Coastal Plain sediments consisting of sand, clay, silt, and gravel of Cretaceous age overlie the saprolite and bedrock (USGS 1984).

2.3.5.2 The soils of the Chopawamsic Troop Training Site are composed mainly of silty sandy clay that becomes gradually more clayey and gravelly in the substratum. Slopes in this area range from 0 to 50 percent. Soil layers are thick (over 60 inches) except for a few areas of severe slope where the soil is only moderately thick (48 inches) (USACE 1996).

2.3.6 Hydrogeologic Setting

2.3.6.1 The water-table configuration at the Chopawamsic Troop Training Site reflects the local topography. The water table is highest beneath the ridges and the maximum depth to water also occurs below the ridges. The direction of groundwater flow is from higher altitudes beneath the ridges to lower altitudes in the valleys and generally follows the migration of surface water in an east/southeast direction (USGS 1984).

2.3.6.2 The maximum groundwater storage per volume of material occurs in the silts and clays of the Piedmont saprolite and Coastal Plain alluvium (USGS 1984). The permeability of the soil is moderate. In these areas, the porosity is about 35 to 55 percent near land surface but decreases with depth as the degree of weathering decreases. Porosity of the bedrock is only 0.01 to 2 percent. Because of the relatively high porosity and low to medium permeability of the regolith, recharge from precipitation is stored in the regolith and later reaches the underlying rocks through the fractures. The abundance of connected fractures within the bedrock directly affects the yield of wells in the Piedmont Province. Well yields are greater where wells intersect large or numerous fractures. Most wells within the Piedmont are less than 800 ft deep and commonly produce 5 to 35 gallons per minute (gpm), with some wells yielding as much as 1,800 gpm (USACE 1996).

2.3.6.3 Two surface water streams flow through the FUDS property: South Fork Quantico Creek and Quantico Creek (Figure 2-3). The streams flow in a southeasterly direction and their confluence is located on the eastern boundary of the FUDS property. After the confluence, Quantico Creek flows off-site into the Potomac River (USACE 1996). In addition to the aforementioned streams (South Fork Quantico Creek and Quantico Creek) which flow through the FUDS, there are also many small headwater streams that flow through the hilly terrain and into these two main branches. There is a small lake (formed because of the presence of a dam) on South Fork Quantico Creek on the west side of the FUDS property in the vicinity of H-Demolition Range (United States Department of Agriculture, Natural Resources Conservation Service, National Cartography and Geospatial Center 2000).

2.3.6.4 The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps for Prince William County in 1995 indicate that the majority of the Chopawamsic Troop Training Site is in Zone X, a designation that indicates the FUDS property is outside the 500-year floodplain (FEMA 1995a, 1995b, 1995c, 1995d, 1995e, and 1995f). However, some areas have been designated as special flood hazard areas inundated by the 100-year flood. South Fork Quantico Creek on the southwest side of the FUDS property has been designated Zone A, which indicates that no base flood elevations have been determined for this area (FEMA 1995c). The confluence of South Fork Quantico Creek and Quantico Creek and downstream of the confluence have been designated Zone AE, which indicates that base flood elevations have been determined for this area (FEMA 1995e and 1995f).

2.3.7 Area Water Supply/Groundwater Use

2.3.7.1 Drinking water populations within 4 miles of Chopawamsic Troop Training Site include the residents of Dumfries, Triangle, Montclair, and Dale City, Virginia. The total population of these cities/towns is 82,136 (United States Census Bureau 2000).

2.3.7.2 Prior to November 2005, eight wells and three springs located at PWFP supplied water to all areas of the park. In November 2005, PWFP connected to a municipal water supply provided by the Prince William County Service Authority and stopped drawing water from the wells and springs located at the park. The wells will be permanently abandoned/closed by NPS in the near future. Local residences located along the Route 619 corridor, south and west of PWFP, use well water as the main source of groundwater, although some may have been recently tied into municipal supplies (Liffert 2007). Areas north and east of PWFP within Prince William County are serviced by Prince William County Service Authority and Virginia-American Water Company, as shown in Figure 2-4; however, some residences in that area may still derive their water from private groundwater wells. People living outside the municipal service areas may derive their water from private groundwater wells or small community systems (Metropolitan Washington Council of Governments 2004). The Stafford County Utilities Department provides water and sewer service to the residents of Stafford County. The County has two reservoirs, 430 miles of water lines, and two sewage treatment plants (Stafford County Economic Development Authority 2006). A service area map for Stafford County was not available for review.

2.3.7.3 There are many groundwater well systems at and within 4 miles of PWFP. Private properties within the FUDS on the north side of Joplin Road/Route 619 are served by private wells, many of which are still in use. The wells shown on Figure 2-4 (within the FUDS boundary associated with the PWFP) are no longer in use. The Azalea Mobile Home Park system and Powerline Golf system (north of the FUDS property) are also not in use (Edelman 2007) as shown in Figure 2-4 and Table 2-3. The other groundwater well systems are still in use and a 1-mile fixed radius from the intake is determined to be the wellhead protection zone (Virginia Department of Health, Office of Drinking Water 2004). Details for these wells are provided on Table 2-3.

2.3.7.4 Surface water is not a source for drinking water to the FUDS, but there are surface water protection zones located to the north and south of the FUDS. Figure 2-4 indicates the surface water and source water protection zones (Virginia Department of Health, Office of Drinking Water 2005).

2.3.8 Sensitive Environments

2.3.8.0.1 The following subsections discuss the sensitive environments associated with the FUDS and the process used to determine the necessity for completing an ecological risk assessment at the FUDS.

2.3.8.1 Army Checklist for Important Ecological Places

2.3.8.1.1 In accordance with USACE HTRW Center of Expertise guidance, the Army Checklist for Important Ecological Places is completed to determine if a FUDS may require a screening level ecological risk assessment (SLERA) (USACE 2006, USACE 2007). Chopawamsic Troop Training Site is located in an area regulated by the Virginia Coastal Zone Management Program (authorized by the Coastal Zone management Act of 1972) (Public Law 92-583, 16 USC 1451-1456), contains wetland habitat, and is located within PWFP; therefore, the performance of a SLERA is required (USACE 2006b). The checklist is included as Table 2-4.

2.3.8.2 Wetlands

2.3.8.2.1 As shown in Figure 2-3, freshwater forested/shrub wetlands and freshwater emergent wetlands are located along various stretches of Quantico Creek on the northwest, north-central, and southeast portion of this site (United States Fish and Wildlife Service [USFWS] 2006).

2.3.8.3 Coastal Zones

2.3.8.3.1 The Chopawamsic Troop Training Site is located within the Virginia Commonwealth's designated coastal zone. Prior to completing field activities, the Virginia Department of Environmental Quality (VADEQ) was contacted to determine if SI activities would require the development and submission of a consistency determination for coordinated review by VADEQ.[1] VADEQ determined that the proposed actions would have no effect on Virginia's coastal water resources or uses and the SI activities would not require the development and submission of a consistency determination for coordinated review by VADEQ. However, any future remediation activities undertaken as a result of the SI findings would require VADEQ review to determine if a consistency determination is required (VADEQ 2005).

2.4 Previous Investigations for Munitions Constituents and Munitions and Explosives of Concern

2.4.0.1 A summary of historical investigations and discoveries of on site MC and MEC is provided in the following sections.

2.4.1 Restoration Survey

2.4.1.1 In 1945, USACE completed a restoration survey under the terms of the original DoD use permit. The USACE survey noted the following areas as being used by OSS training: Rifle Range; Rifle, Machine Gun, Mortar, and Rocket Firing Range; four Demolition Ranges; Fragmentation Grenade Range; Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range; and Mortar Range. The survey indicated that there were "duds" located on the two mortar ranges (assumed to be referring to MEC or material potentially presenting an explosive hazard [MPPEH]). The FUDS property was cleared of "all demolition, explosives, or other dangerous explosive or combustible materials of warfare" before NPS took possession of the land. Also included with the restoration survey was a letter from Headquarters, Dept # 6, 9800th TSU-CE, Bomb and Shell Disposal Team, Chopawamsic, Virginia, dated January 1946 and titled "Clearance of Range Land in Chopawamsic Park." The letter lists MEC usage areas; however, the referenced map was not available (USACE 1996).

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[1] VADEQ serves as the lead agency of a network of state agencies that administer state regulations and policies to protect and enhance coastal resources.

2.4.2 Prince William Forest Park, An Administrative History

2.4.2.1 *Prince William Forest Park, An Administrative History*, written in 1986 by Susan Cary Strickland of the History Division, NPS, Department of the Interior, Washington, D.C., provides a detailed account of the park's development. Included in this document is information on the military occupation of the park, site selection, early development, and growth (Strickland 1986).

2.4.3 Inventory Project Report

2.4.3.1 A 1992 INPR was prepared for the Chopawamsic Troop Training Site. The INPR discusses a removal action that occurred in 1985 when a mortar shell that was found in the roof of an existing structure was removed by an Army demolition team. The reported location of the mortar is shown in MRS 1 on Figure 2-5. The classification of the mortar (MEC versus MD) is unknown; therefore, the item has been referred to as MPPEH in the report. .No ordnance and explosive waste (OEW) was identified during the INPR site visit.[2] The INPR recommended a project to address OEW and a Risk Assessment Code (RAC) was assigned to the FUDS property. A RAC is the numerical value assigned to a site describing the hazard severity and the hazard probability. A RAC of 5 indicates no action is required while a RAC of 1 indicates an imminent hazard. Completion of the RAC procedures form resulted in a RAC of 3 for the FUDS property. However, CENAO presented a justification in the Findings and Determination of Eligibility to change the proposed OEW project to a RAC of 4 based on the size of the FUDS property and the limited troops using the facility (USACE 1992).

2.4.4 Archive Search Report

2.4.4.1 The 1996 ASR identified nine training areas/ranges at the FUDS that were the focus during the ASR field inspection. The training areas/ranges are designated with the following letters: A-Rifle Range; B-Rifle, Machine Gun, Mortar, and Rocket Firing Range; C-Demolition Range; D-Demolition Range; E-Demolition Range; F-Fragmentation Grenade Range; G-Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range; H-Demolition Range; and I-Mortar Range (USACE 1996). Figure 2-5 shows the locations of the training areas/ranges in relation to the designated MRSs/ranges.

2.4.4.2 During the ASR site visit, munitions debris (MD) was observed in two of the areas: .45-caliber rounds were embedded in target posts at the Night Firing Course, Pistol, Carbine, and Sub-machine Gun Range (G-Night Firing Course which corresponds to MRS 1 and MRS 4) and a portion of a 2.36-inch rocket body was found at the multi-use assault range (B-Rifle which corresponds to MRS 3). Also at B-Rifle, Machine Gun, Mortar, and Rocket Firing Range, the

[2] The OEW project category under DERP-FUDS has been replaced with MMRP.

field team found two trapezoidal concrete targets (one with a 20-millimeter [mm] gun barrel). The ASR states that prior to the ASR visit one 2.36-inch rocket body assumed to be MEC was found in Area B in January 1993 (this corresponds to MRS 3).[3] The locations of the findings are shown on Figure 2-5 (USACE 1996). Although MEC was found in only two of the areas that were inspected during the ASR site visit, the ASR states that there is a probability that MEC may exist at other training areas/ranges on the FUDS property. The FUDS property was assigned a RAC score of 3 indicating that further action should be taken (USACE 1996). The ASR supplement provides the general class of munitions used in each MRS. The information provided in the ASR Supplement was combined with the ASR information detailing specific munitions used at each site and used to generate Table 2-2, which lists the military munitions type and composition for the FUDS. The information is arranged by MRS; USACE technical documents, manuals, etc. were used to generate the list of MC for each of the munitions. As noted in Table 2-2, MC associated with primers and tracers were not included in the list of MC for the FUDS property as these constituents typically represent less than 1 and 5 percent, respectively, of the MC associated with the munitions.

2.4.5 Supplemental ASR

2.4.5.1 The Supplemental ASR, completed in 2004, divided the FUDS property into four ranges, as described in Section 2.2: OB/OD No. 3 (MRS 1), the Fragmentation Grenade Range (MRS 2), Range Complex No. 1 (MRS 3), and Range Complex No. 2 (MRS 4). The RAC scores in the Supplemental ASR range from 2 to 5 for the subranges (USACE 2004b); however, the overall RAC scores for each Range was 2 (individual RAC scores are provided in Table 2-1). The most influential factor in determining the RAC at this site is the type of conventional ordnance used in each area. The areas with a greater hazard severity typically used rockets, explosive projectiles, and/or detonators, blasting caps, fuzes, bursters, and boosters, and were given a RAC of 2. An area which used only small arms was given a RAC of 5. The Supplemental ASR provided details of the ranges, including information and descriptions concerning firing positions, range fans, and the most probable danger zones. This range information, along with the information provided in the ASR, was used to identify the most probable locations where MC could potentially be found (USACE 1996; 2004b).

2.5 Citizen Reports of Munitions and Explosives of Concern

2.5.1 At the technical project planning (TPP) meeting in January 2006, NPS personnel noted that a rocket was found in Taylor Farm Run in June 2005 (Alion 2006a and 2006b). The

[3] The ASR refers to both finds as UXO. The item found in 1993 was blown in place; therefore, both items are identified as MEC.

location of the rocket is shown on Figure 2-5. The status of the rocket (MEC versus MD) is not known, so it is referred to as MPPEH in this report. EOD reportedly removed the item.

2.6 Non-DoD Contamination/Regulatory Status

2.6.1 There is no evidence that activities occurring prior to or after DoD use of the land contributed to present day MEC/MD and MC findings.

Table 2-1. Range Inventory (USACE 2004)

Site Name	Range Name[2]	Subrange Name	RMIS Range Number	RAC Score	Acreage[1]
Chopawamsic Troop Training Site	OB/OD No. 03 (MRS 1)	N/A	C03VA019401M01	2	4,824.09
	Fragmentation Grenade Range (MRS 2)	N/A	C03VA019401R01	2	25
	Range Complex No. 01 (MRS 3)	Six Subranges – See Below	C03VA019401R02	2	3,106.9
		Mortar Range No. 01	C03VA019401R02-SR01	2	1,866
		Mortar Range No. 02	C03VA019401R02-SR02	2	1,866
		Rifle Range No. 01	C03VA019401R02-SR03	5	704.93
		Machine Gun Range No. 01	C03VA019401R02-SR04	5	2,161.41
		Rocket Range	C03VA019401R02-SR05	2	410
		OB/OD Range	C03VA019401R02-SR06	2	1,209.51
	Range Complex No. 02 (MRS 4)	Five Subranges – See Below	C03VA019401R03	2	340.4
		Rifle Range No. 02	C03VA019401R03-SR01	5	182.34
		Pistol Range	C03VA019401R03-SR02	5	76.87
		Night Firing Course	C03VA019401R03-SR03	5	99.93
		Machine Gun Range No. 02	C03VA019401R03-SR04	5	155.59
		OB/OD No. 02	C03VA019401R03-SR05	2	315.75

RMIS = Restoration Management Information System

1 – Acreage included in Range inventory. May include land outside FUDS Boundary. Subranges within range complexes overlap therefore acreage totals for subranges are greater than range complex numbers.

2- MRS designation completed by Alion.

RAC – Risk Assessment Code Score. The RAC allows a score of 1 to 5.

Table 2-2. Military Munitions Type and Composition (USACE 1996; USACE 2004)

Range ID (MRS)/ Subrange	Munitions ID	Munitions Type	Composition (Filler, Projectile, Body, Propellant, other) [1]	Associated MC Analysis
OB/OD No. 3 (MRS 1) / No Subrange [C-Demolition Range, D-Demolition Range, E-Demolition Range, H-Demolition Range, and 1-acre OB/OD Area]	DEMOLITION MATERIALS (CTT37) BLASTING CAPS(CTT39)	Demolition Materials	N/A Tetryl; TNT; RDX; HMX; PETN; etc. Container: Steel	Explosives: • TNT, RDX, Tetryl, PETN, HMX Metals: • No analysis
		M6 Electric Blasting Caps	Component type: Ignition Charge - Nitrocellulose, Potassium Chlorate, Lead salt of Dinitro Cresol. Filler: smokeless powder (Nitrocellulose and Diphenylamine [stabilizer])	Explosives: • No analysis Metals: • Lead Other: • Diphenylamine [stabilizer] (no analysis) • Nitrocellulose (no analysis)
		M7 Non-electric Blasting Caps	Component type: Ignition Charge - Lead styphnate, lead azide, RDX aluminum container Filler: smokeless powder (Nitrocellulose and Diphenylamine [stabilizer])	Explosives: • RDX Metals: • Aluminum • Lead Other: • Diphenylamine [stabilizer] (no analysis) • Nitrocellulose (no analysis)
Fragmentation Grenade Range (MRS 2)/ No Subrange [F-Fragmentation Grenade Range]	HAND GRENADES, LIVE(CTT03)	Live Mk II Hand Grenades (fragmentation) Fuze: M204A1, M204A2	Body: Cast iron Propellant: N/A Filler: Flaked or granular TNT; Amatol (TNT and ammonium nitrate), smokeless powder (Nitrocellulose and Diphenylamine [stabilizer]), Trojan Powder Detonator/Delay Column: barium chromate, lead azide, potassium perchlorate, nickel alloy, RDX and PETN	Explosives: • TNT • RDX • PETN Metals: • Barium • Chromium • Lead • Iron • Nickel Other: • Perchlorate • Diphenylamine (stabilizer - no analysis) • Nitrocellulose (no analysis)
Range Complex No. 1 (MRS 3)/ Mortar Range 1[B-Rifle]	MORTARS, HE(CTT22)	M43 81 mm High Explosive (HE) Fuze: M45.	Body: Forged steel. Propellant: Ballistite (nitrocellulose and NG) Filler: Black Powder , Carborundum 150 (practice)	Explosives: • TNT • NG Metals: • Iron
Range Complex No. 1				

Table 2-2. Military Munitions Type and Composition (USACE 1996; USACE 2004)

Range ID (MRS)/ Subrange	Munitions ID	Munitions Type	Composition (Filler, Projectile, Body, Propellant, other) [1]	Associated MC Analysis
(MRS 3)/ Mortar Range 2[I-Mortar Range]			Or TNT (for HE)	Other • Nitrocellulose (no analysis)
Range Complex No. 1 (MRS 3)/ Rifle Range 1 [B-Rifle]	SMALL ARMS(CTT01)	General Small Arms (0.50, 0.45, and 0.30 caliber rounds)	Projectile .50 cal: Lead, Antimony, cupro-nickel, and Soft Steel. Propellant - Single or Double-base powder (Nitrocellulose and nitroglycerine) or smokeless powder Nitrocellulose (91.18%), Dinitrotoluene (DNT) (7.0%), Diphenylamine (.87%), Potassium sulfate (.55%), Graphite (.4%). Filler: N/A. Projectile .30 cal: antimony, lead, and iron and potentially zinc. Propellant: Black Powder (Potassium Nitrate, Sulfur, and Charcoal), nitrocellulose, and nitroglycerine (NG). Filler: N/A. Projectile .45 cal: Lead antimony with gilding metal jacket or cupro-nickel metal jacket. Propellant: Black Powder (Potassium Nitrate, Sulfur, and Charcoal), nitrocellulose, and nitroglycerine (NG) or Dinitrotoluene, Nitrocellulose, Diphenylamine, Graphite. Filler: N/A.	Explosives: • NG • DNT Metals: • Antimony • Copper • Iron • Lead • Nickel • Zinc Other: • Nitrocellulose (no analysis)
Range Complex No. 1 (MRS 3)/ Machine Gun Range 1 [B-Rifle]				
Range Complex No. 1 (MRS 3)/ Rocket Range [B-Rifle]	GROUND ROCKETS, LIVE(CTT11)	M6A1 2.36 in. heat rocket Fuze: M400	Projectile: steel Propellant: Ballistite (NG and Nitrocellulose) Filler: Pentolite (PETN and TNT)	Explosives: • NG • TNT • PETN Metals: • Iron Other: • Nitrocellulose (no analysis)
Range Complex No. 1 (MRS 3)/ OB/OD 1 [4-acre and 20-acre OB/OD areas]	DEMOLITION MATERIALS (CTT37) BLASTING CAPS(CTT39)	Demolition materials	N/A Tetryl; TNT; RDX; HMX; PETN; etc. Container: Steel	Explosives: • TNT, RDX, Tetryl, PETN, HMX Metals: • No analysis
		M6 Electric Blasting Caps	Component type: Ignition Charge - Nitrocellulose, Potassium Chlorate, Lead salt of Dinitro Cresol.	Metals: • Lead Other:

Table 2-2. Military Munitions Type and Composition (USACE 1996; USACE 2004)

Range ID (MRS)/ Subrange	Munitions ID	Munitions Type	Composition (Filler, Projectile, Body, Propellant, other) [1]	Associated MC Analysis
			Filler: smokeless powder.	• Nitrocellulose (no analysis)
		M7 Non-electric Blasting Caps	Component type: Ignition Charge - Lead styphnate, lead azide, RDX Aluminum container Filler: smokeless powder (Nitrocellulose and Diphenylamine [stabilizer])	Explosives: • RDX Metals: • Lead • Aluminum Other: • Nitrocellulose (no analysis) • Diphenylamine [stabilizer] (no analysis)
Range Complex No. 2 (MRS 4) / Rifle Range 2 [A-Rifle Range]	SMALL ARMS(CTT01)	General Small Arms	Projectile .30 cal: antimony, lead, and iron and potentially zinc Propellant: Black Powder (Potassium Nitrate, Sulfur, and Charcoal), nitrocellulose, and nitroglycerine (NG). Filler: N/A	Explosives: • Nitroglycerine Metals: • Antimony • Lead • Zinc Other: • Nitrocellulose (no analysis)
Range Complex No. 2 (MRS 4)/ Pistol Range [G-Night Firing Course]	SMALL ARMS(CTT01)	General Small Arms (0.22 caliber and 0.45 caliber rounds)	Projectile 0.22 caliber – Lead antimony with copper alloy jacket. Propellant - Nitrocellulose, Dibutylphthalate, Diphenylamine, Nitroglycerin, Graphite. Filler: N/A. Projectile .45 cal: Lead antimony with gilding metal jacket or cupro-nickel metal jacket. Propellant: Black Powder (Potassium Nitrate, Sulfur, and Charcoal), nitrocellulose, and nitroglycerine (NG) or Dinitrotoluene, Nitrocellulose, Diphenylamine, Graphite. Filler: N/A.	Explosives: • Nitroglycerine • DNT Metals: • Antimony • Lead • Nickel • Copper Other: • Nitrocellulose (no analysis)
Range Complex No. 2 (MRS 4) / Night Firing Course [G-Night Firing Course]	SMALL ARMS(CTT01)	General Small Arms (0.50, 0.45, and 0.30 caliber rounds)	Projectile .50 cal: Lead, Antimony, cupro-nickel, and Soft Steel. Propellant - Single or Double-base powder (Nitrocellulose and nitroglycerine) or smokeless powder Nitrocellulose (91.18%), Dinitrotoluene (DNT) (7.0%), Diphenylamine (.87%), Potassium sulfate (.55%), Graphite (.4%). Filler: N/A.	Explosives: • Nitroglycerine • DNT Metals: • Antimony • Copper • Iron • Lead • Nickel • Zinc

Table 2-2. Military Munitions Type and Composition (USACE 1996; USACE 2004)

Range ID (MRS)/ Subrange	Munitions ID	Munitions Type	Composition (Filler, Projectile, Body, Propellant, other) [1]	Associated MC Analysis
			Projectile .30 cal: antimony, lead, and iron and potentially zinc. Propellant: Black Powder (Potassium Nitrate, Sulfur, and Charcoal), nitrocellulose, and nitroglycerine (NG). Filler: N/A. Projectile .45 cal: Lead antimony with gilding metal jacket or cupro-nickel metal jacket. Propellant: Black Powder (Potassium Nitrate, Sulfur, and Charcoal), nitrocellulose, and nitroglycerine (NG) or Dinitrotoluene, Nitrocellulose, Diphenylamine, Graphite. Filler: N/A.	
Range Complex No. 2 (MRS 4) / Night Firing Course [G-Night Firing Course]		Illumination/ night flares[2]	Illuminating projectile compositions: Sodium nitrate, magnesium, and Laminac A (binding agent). Trip flare compositions: aluminum, 69.5% barium nitrate, 5% sodium oxalate, and 4% sulfur. 30.4% magnesium, 26.6% sodium nitrate, 11% strontium nitrate, calcium carbonate. Reconnaissance and Landing Flare Composition – The illuminate in these flares consists of the following components: aluminum, magnesium, barium nitrate, sodium oxilate, sulfur.	Explosives: • Sodium nitrate (no analysis) Metals: • Aluminum • Barium • Magnesium • Strontium • Sulfur (no analysis)
Range Complex No. 2 (MRS 4) / Machine Gun Range 2 [G-Night Firing Course]	SMALL ARMS(CTT01)	General Small Arms – 0.50 and 0.30 caliber	Projectile: .50 cal: Lead, Antimony, cupro-nickel, and Soft Steel. Propellant - Single or Double-base powder (Nitrocellulose and nitroglycerine) or smokeless powder Nitrocellulose (91.18%), DNT (7.0%), Diphenylamine (.87%), Potassium sulfate (.55%), Graphite (.4%). Projectile .30 cal: antimony, lead, and iron and potentially zinc Propellant: Black Powder (Potassium Nitrate, Sulfur, and	Explosives: • Nitroglycerine • DNT Metals: • Antimony • Copper • Iron • Lead • Nickel • Zinc Other: • Nitrocellulose (no analysis)

Table 2-2. Military Munitions Type and Composition (USACE 1996; USACE 2004)

Range ID (MRS)/ Subrange	Munitions ID	Munitions Type	Composition (Filler, Projectile, Body, Propellant, other) [1]	Associated MC Analysis
			Charcoal), nitrocellulose, and nitroglycerine (NG). Filler: N/A	

[A-Rifle Range] – Denotes training areas/ranges identified in the ASR
(MRS) – Munitions Response Site designation
Amatol- A mixture of Ammonium Nitrate and TNT
AP=Armor Piercing
Mk=Mark
lb=pound(s)
TNT=trinitrotoluene
HE=High Explosive
RDX –Cyclotrimethylenetrinitramine, also called Cyclonite or Hexahydro-1,3,5-trinitro-1,3,5-triazine
Tetryl – Methyl-2,4,6-trinitrophenylnitramine
PETN – Pentaerythrite Tetranitrate
DNT - Dinitrotoluene

DNT=dinitrotoluene
in=inch(es)
BD=Base Detonating
PD=Point Detonating
HMX – Cyclotetramethylenetetranitramine also called homocyclonite or Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
CTT= Closed, transferred or transferring
N/A=Not Applicable
1- Small arms primer materials typically include tetracene, Potassium chlorate Lead thiocyanate, TNT, Antimony sulfide mercury fulminate, aluminum, antimony, barium, lead, and PETN and they represent less than 1% of the MC. Common small arms tracer materials include barium, magnesium, potassium perchlorate, strontium, and zinc which typically represent less than 5% of the MC. MC sampling typically focuses on primary constituents but will defer to decisions made during TPP.
2 – The ASR indicates night training took place. Specific munitions used were not identified. Common flares and associated MC identified for night firing activities

Table 2-3. Groundwater Wells Near Chopawamsic Troop Training Site

PWSID	Well Name	UTM NAD 83, Zone 18 North		Well Depth (ft)	Well Screened (ft)	Well Yield (gpm)	Aquifer/Notes
		Easting (m)	Northing (m)				
6153661[1]	Pine Grove Well 52-S-23	295464	4270580	210	-	13.6	Chopawamsic Formation of Paleozoic age
6153661[1]	Pine Grove Well 52-S-58	295423	4270685	-	-	-	Chopawamsic Formation of Paleozoic age
6153663[1]	Telegraph Well 52-S-24	295891	4270320	178	Open hole 155-178	14.3	Quantico Slate of Upper Ordovician age
6153665[1]	Maintenance Well 52-S-14	293627	4271181	206	-	15.0	Chopawamsic Formation of Paleozoic age
6153665[1]	Maintenance Spring 52-SS-1	293675	4270808	Spring	N/A	4.2	Sediments of Undifferentiated Cretaceous Age
6153662[1]	Turkey Run Well 52-S-18	293350	4273223	343	-	16.7	Wissahickon Schist of Paleozoic age
6153659[1]	Camp 2&5 Spring 51-SS-1	289420	4272710	Spring	N/A	16.5	Wissahickon Schist of Paleozoic age
6153659[1]	Camp 2&5 Spring 51-SS-2	289295	4272779	Spring	N/A	10.0	Wissahickon Schist of Paleozoic age
6153664[1]	Oak Ridge CG Well 51-S-5	289750	4275384	280	Open hole 152-280	10.3	Wissahickon Schist of Paleozoic age
6153474	Forest Greens Golf	294799	4269567	-	Open hole	-	Bedrock
6153925	Woodbine Baptist Church	287603	4283305	110	Open hole	-	Bedrock
6153020[1]	Azalea Mobile Home Park	289928	4278576	-	Open hole	-	Bedrock
6153315	Independent Hill Mini-Library	287105	4279368	-	Open hole	-	Bedrock
6153623[1]	Powerline Golf	301149	4277719	460	Open hole	2	Bedrock
6153765	Tim's River Shore Restaurant	302858	4271382	40	-	-	Unconsolidated Material
6179777	Spring Lake Motel	292884	4264684	-	-	-	-
N/A	CTT-O3-GW-00-03 (18049 Joplin Road)	293156	4270587	70	Owner did not know	Owner did not know	Carbon filter and chlorine added each month

Table 2-3. Groundwater Wells Near Chopawamsic Troop Training Site

PWSID	Well Name	UTM NAD 83, Zone 18 North		Well Depth (ft)	Well Screened (ft)	Well Yield (gpm)	Aquifer/Notes
		Easting (m)	Northing (m)				
N/A	CTT-O3-GW-00-04 (17937 Joplin Road)	291700	4271063	Requested	Requested	Requested	Requested

ID-identification
m-meter
ft-feet
gpm-gallons per minute
N/A-not applicable
Requested-information has been requested from the Virginia Department of Health

UTM-Universal Transverse Mercator
NAD-North American Datum
PWSID – public water system identification
-, information unknown/unavailable
1, no longer used as public water supply wells
Source - (USGS 1984; Virginia Department of Health, Office of Drinking Water 2005; Edelman 2007).

Table 2-4 Army Checklist for Important Ecological Places

No.	Checklist Item	Yes	No	Comments
1.	Locally important ecological place identified by the Integrated Natural Resource Management Plan, BRAC Cleanup Plan or Redevelopment Plan, or other official land management plans.	X		The FUDS is part of the Prince William Forest Park (PWFP) managed by the National Park Service (NPS).
2.	Critical habitat for Federal designated endangered or threatened species. See No. 12 below.		X	
3.	Marine Sanctuary		X	
4.	National Park		X	
5.	Designated Federal Wilderness Area		X	
6.	Areas identified under the Coastal Zone Management Act	X		The PWFP is located within the Virginia Coastal Zone.
7.	Sensitive Areas identified under the National Estuary Program or Near Coastal Waters Program		X	
8.	Critical areas identified under the Clean Lakes Program		X	
9.	National Monument		X	
10.	National Seashore Recreational Area		X	
11.	National Lakeshore Recreational Area		X	
12.	Habitat known to be used by Federal designated or proposed endangered or threatened species		X	
13.	National preserve		X	
14.	National or State Wildlife Refuge		X	
15.	Unit of Coastal Barrier Resources System		X	
16.	Coastal Barrier (undeveloped)		X	
17.	Federal land designated for protection of natural ecosystems	X		The FUDS is part of the PWFP managed by the NPS.
18.	Administratively Proposed Federal Wilderness Area		X	
19.	Spawning areas critical for the maintenance of fish/shellfish species within river, lake, or coastal tidal waters		X	
20.	Migratory pathways and feeding areas critical for maintenance of anadromous fish species within river reaches or areas in lakes or coastal tidal waters in which fish spend extended periods of time		X	
21.	Terrestrial areas utilized for breeding by large or dense aggregations of animals		X	
22.	National river reach designated as Recreational		X	
23.	Habitat known to be used by state designated endangered or threatened species		X	

Table 2-4 Army Checklist for Important Ecological Places

No.	Checklist Item	Yes	No	Comments
24.	Habitat known to be used by species under review as to its Federal endangered or threatened status		X	
25.	Coastal Barrier (partially developed)		X	
26.	Federally designated Scenic or Wild River		X	
27.	State land designated for wildlife or game management		X	
28.	State-designated Scenic or Wild River		X	
29.	State-designated Natural Areas		X	
30.	Particular areas, relatively small in size, important to maintenance of unique biotic communities		X	
31.	State-designated areas for protection or maintenance of aquatic life		X	
32.	Wetlands	X		The PWFP contains designated wetlands.
33.	Fragile landscapes, land sensitive to degradation if vegetative habitat or cover diminishes		X	

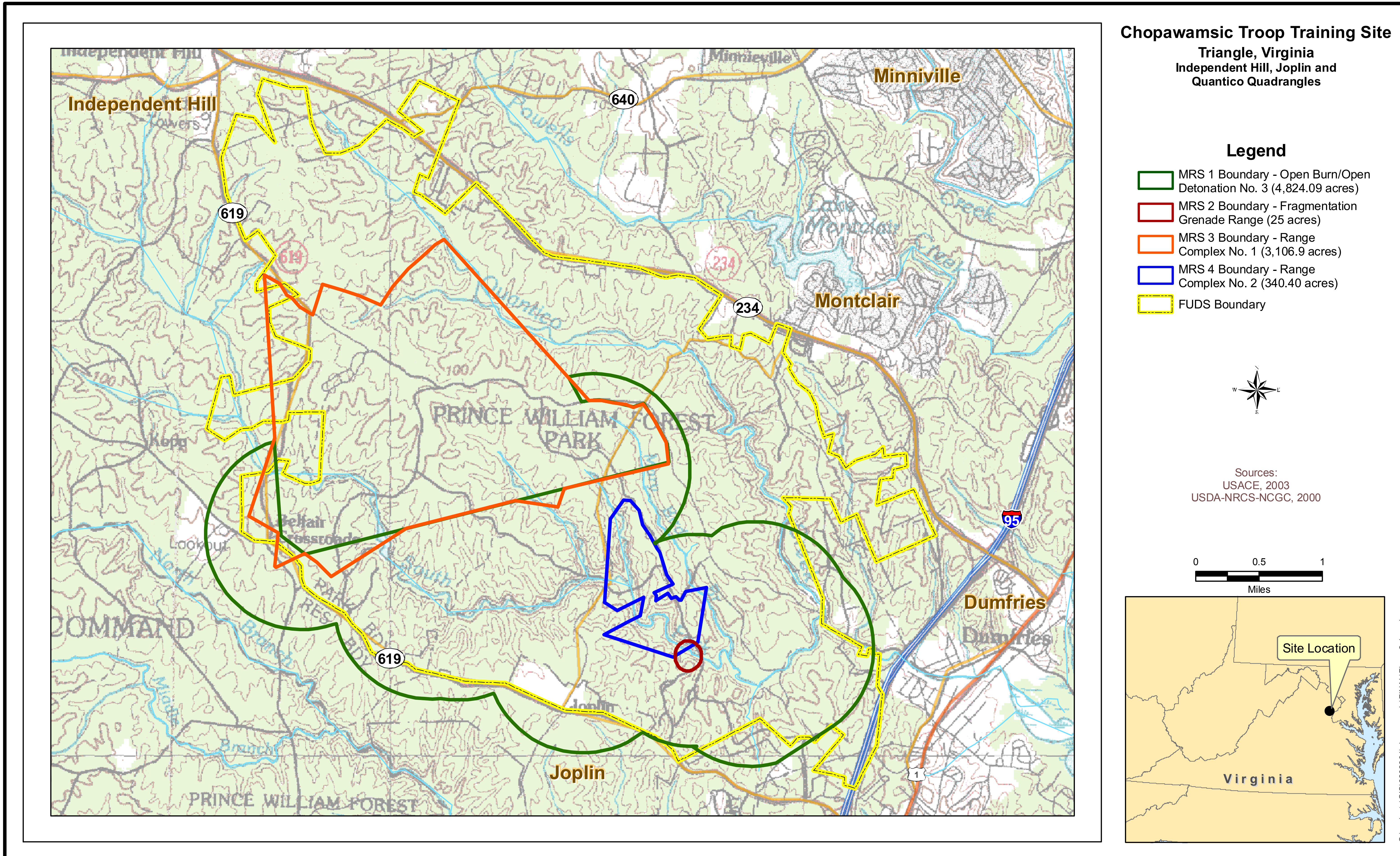

Figure 2-1. Munitions Response Sites for Chopawamsic Troop Training Site.

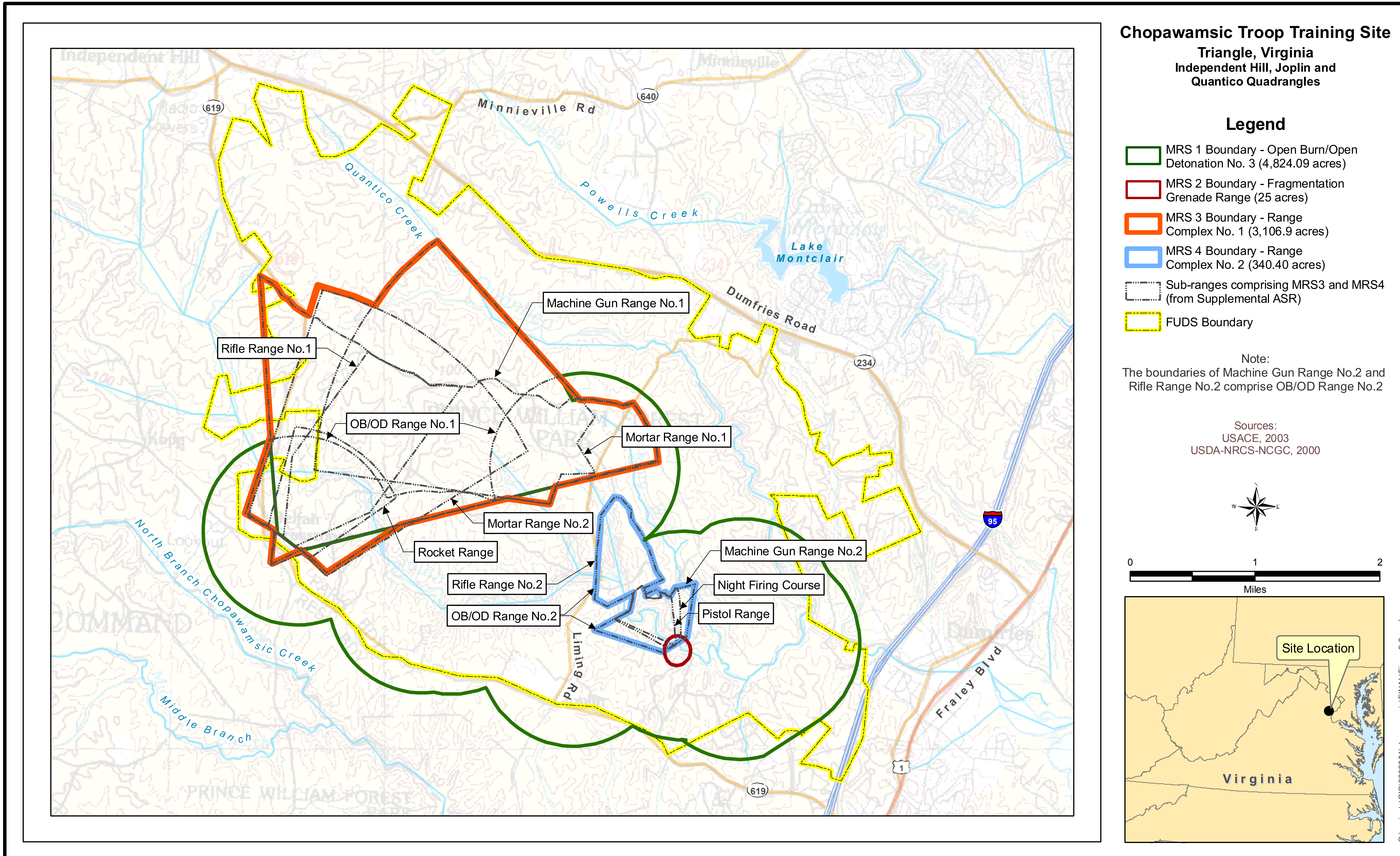

Figure 2-2. Range Overview/Layout.

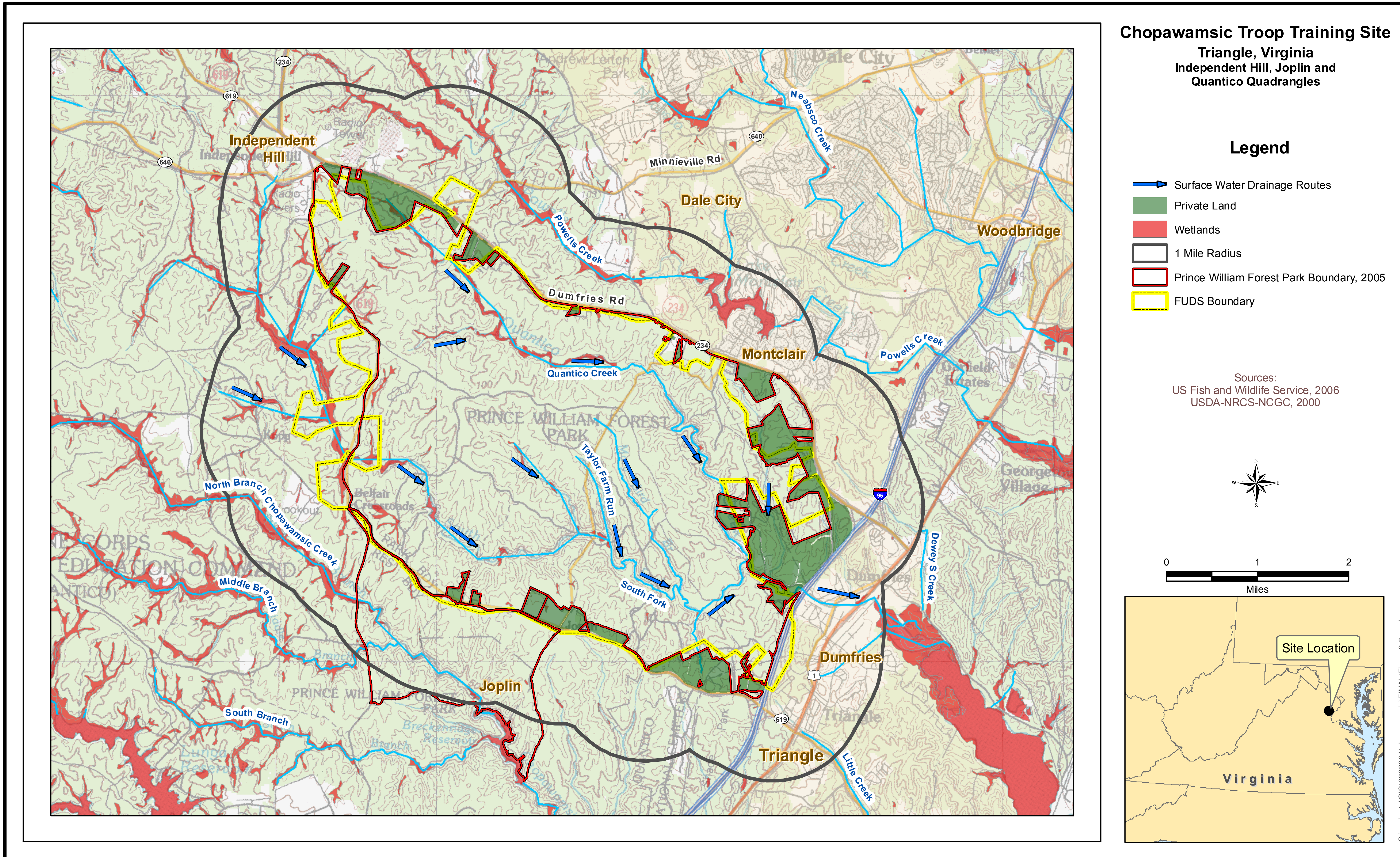

Figure 2-3. Site Location and Surroundings.

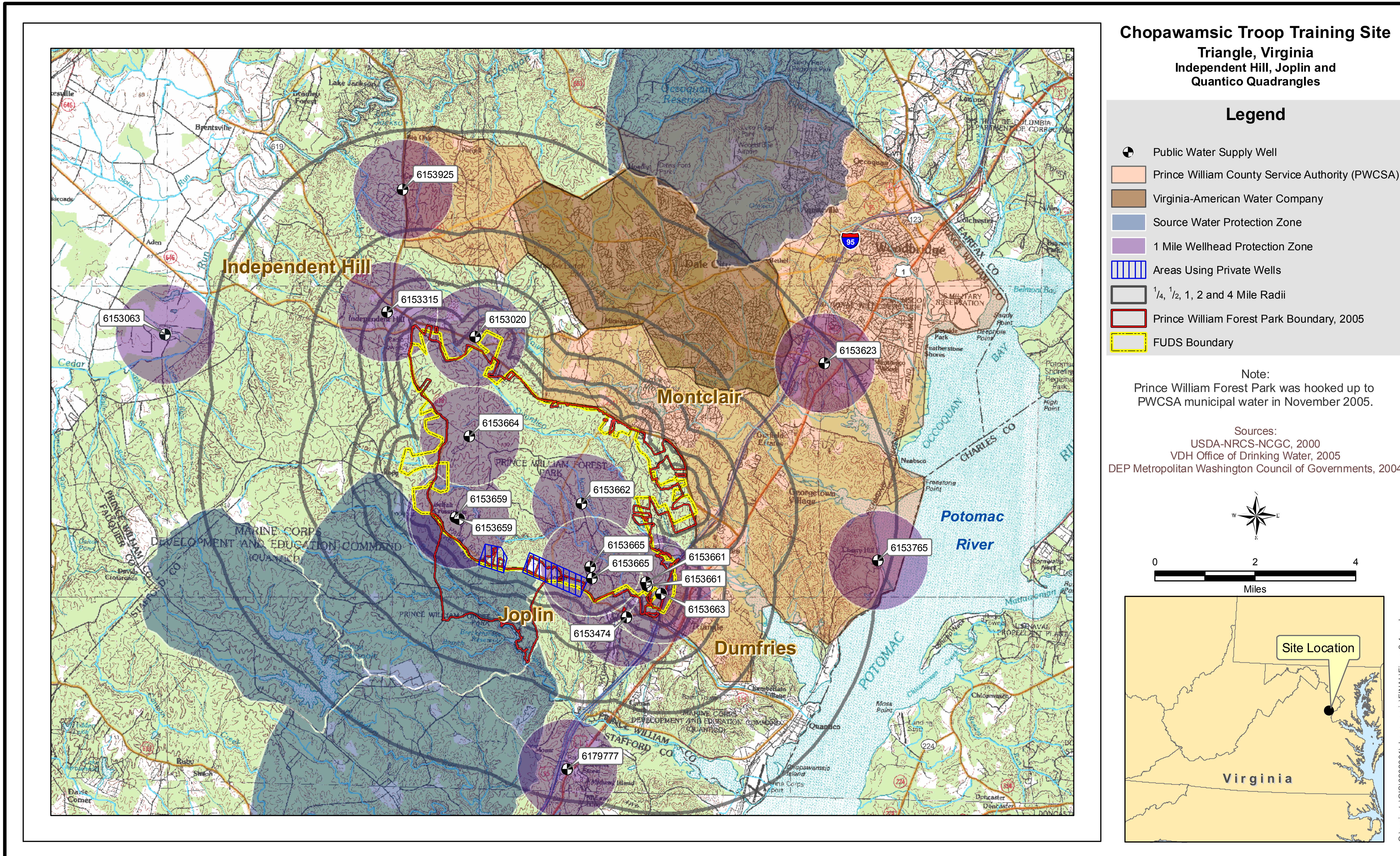

Figure 2-4. Wells, Wellhead Protection Areas, and Source Water Protection Zones.

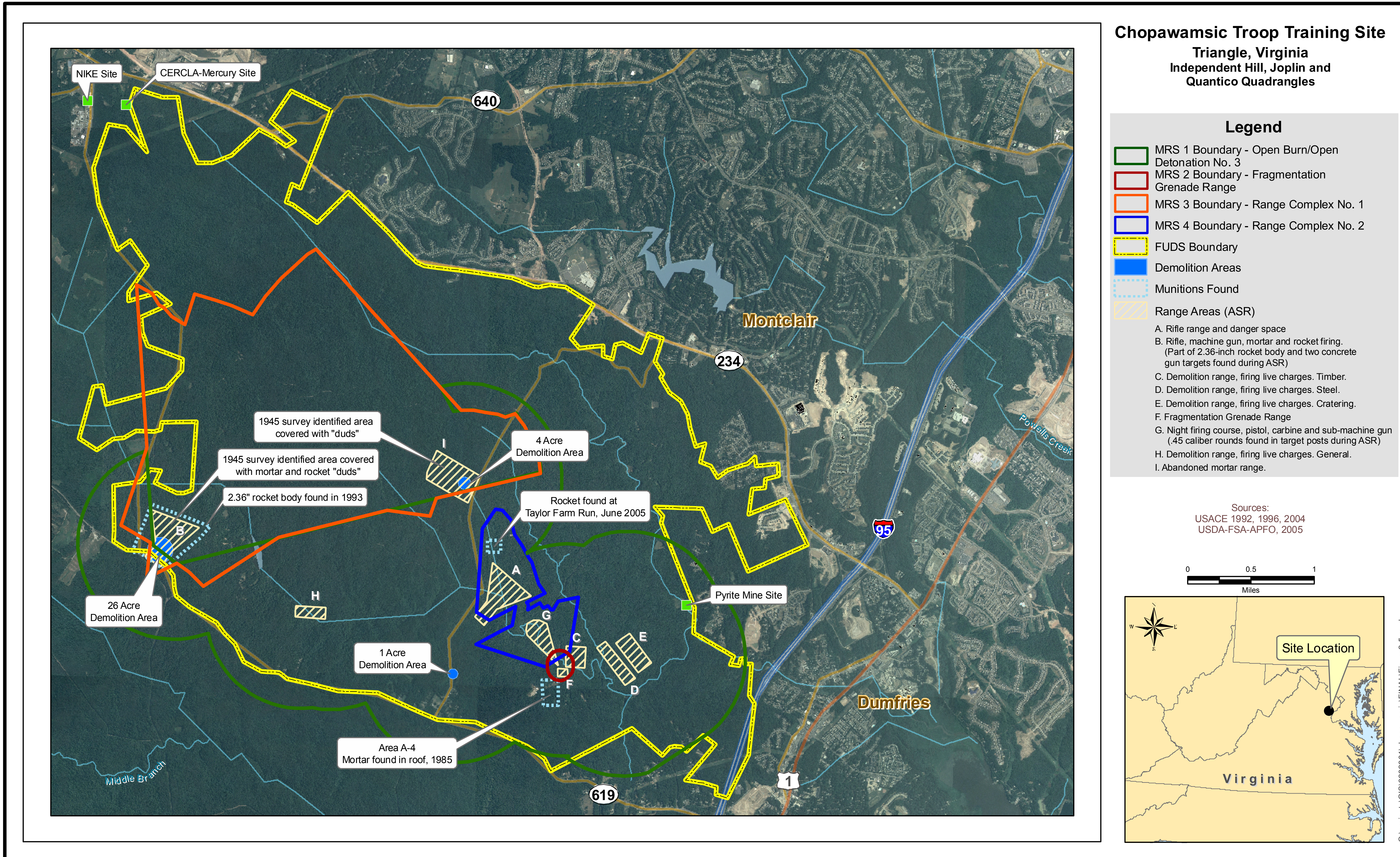

Figure 2-5. Areas Inspected During ASR Site Inspection, Munitions Found, and Environmental Impacts.

3. SITE INSPECTION ACTIVITIES

3.1 Technical Project Planning

3.1.1 The first TPP meeting for Chopawamsic Troop Training Site was conducted on 10 January 2006 at the Turkey Run Environmental Center at PWFP in Triangle, Virginia. The final TPP Memorandum documenting the meeting was issued in April 2006. Participants in the TPP meeting included representatives from USACE (CENAB and CENAO), PWFP (NPS), Quantico Marine Corps Base, VADEQ, and the Alion Team. During the first TPP meeting, the participants provided valuable information that guided SI activities. Six Data Quality Objectives (DQOs) were defined for this SI (Alion 2006a and 2006b). The TPP discussion involved a presentation of general decision rules for completing the SI objectives. These decision rules were summarized in the DQO worksheets and are summarized below.

3.1.2 DQO 1 – Determine the presence/absence of MEC. The basis for the MEC RI/FS recommendations is specified below:

- Historic data that indicates the presence of MEC or MD
- Visual evidence or anomalies classified as MEC, MD, or material potentially presenting an explosive hazard (MPPEH)
- One or more anomalies in a target area near historic or current MEC/MD finds or within an impact crater
- Physical evidence indicating the presence of MEC (e.g., distressed vegetation, stained soil, ground scarring, bomb craters, burial pits, etc.)

3.1.3 In each of these instances, all lines of evidence (e.g., historic data, field data, etc.) will be used to make a final decision for a No Department of Defense Action Indicated (NDAI) or RI/FS. If none of these scenarios occur above for MEC, then the recommendation for NDAI is a possible option.

3.1.4 DQO 2 – Eliminate from further consideration those releases that pose no significant threat to public health or the environment by collecting adequate samples to assess the presence or absence of MC at the FUDS property. The basis for the MC RI/FS recommendations is specified below:

- Maximum concentrations at the FUDS property exceed site-specific background levels.

- Maximum concentrations at the FUDS property exceed EPA Region 3 Risk-Based Concentrations (RBCs) based on current and future land use.
- Maximum concentrations at the FUDS property exceed EPA interim ecological risk screening values.
- Data reporting the presence or absence (less than detection limits) of analytes for which no screening criteria (decision limits: RBCs, etc.) are available will be used to support the weight-of- evidence evaluation of MC at the FUDS property.
- All lines of evidence, including secondary lines of evidence, such as historic data, field data, comparison to screening/cleanup criteria, will be used to make a final decision for an NDAI or RI/FS.

3.1.5 DQO 3 – Determine the potential need for an emergency response action and/or Time Critical Removal Action (TCRA) of MEC by collecting and analyzing data from previous investigations/reports, conducting site visits, and performing analog geophysical activities, as appropriate.[4] The basis for recommendations is specified below:

- A TCRA would be recommended if there is a complete pathway between source and receptor and if the MEC and the situation are viewed as an imminent danger posed by the release or threat of a release, where cleanup or stabilization actions must be initiated within six months to reduce risk to public health or the environment.
- A non-TCRA (NTCRA) would be recommended if a release or threat of release that poses a risk where more than six months planning time is available.

3.1.6 In each of these instances, all lines of evidence (e.g., historic data, field data, etc.) will be used to make a final decision for a TCRA or NTCRA.

3.1.7 DQO 4 – Collect data and complete related analyses to determine if an RI/FS is necessary.

- Refers to culmination of DQOs 1 and 2.

3.1.8 DQO 5 – Collect or develop additional data for the Environmental Protection Agency (EPA) to support the potential HRS scoring.

[4] MMRP Programmatic guidance has suggested the terminology "emergency response action" be replaced with TCRA and NTCRA. The DQO as written is what was presented in the SS-WP, but the decision criteria match the current guidance.

- Verification that data were collected in accordance with the Final SS-WP in the SI Report.

3.1.9 DQO 6 – Collect the additional data necessary to the complete the MRSPP.

- Completion of the MRSPP for each MRS with all available data and documentation of any data gaps for future annual MRSPP updates.

3.1.10 The TPP meeting participants concurred with the DQOs and the general technical approach for the planned SI activities discussed during the TPP (Alion 2006a) and as revised and subsequently documented in the Final SS-WP (Alion 2006b). In summary, these agreements were to inspect the cited areas of concern and conduct multimedia sampling in accordance with the Final SS-WP; and to complete the data assessment in accordance with the DQOs. Please refer to the Final TPP Memorandum (Alion 2006a), attached in Appendix B, for more specific details of the TPP meeting. As part of this SI Report, Alion evaluated the DQOs presented in the SS-WP and completed a DQO attainment verification worksheet to document completion of the DQOs (included in Appendix B).

3.2 Supplemental Records Review

3.2.0.1 State agencies were contacted regarding threatened and endangered (T&E) species and cultural and ecological resources at the FUDS property.

3.2.1 Threatened and Endangered Species

3.2.1.1 Several state and federal T&E species were identified as present in Prince William County, Virginia (USACE 1996). Updated information on T&E species information for this site has been provided by USFWS and the Virginia Department of Conservation and Recreation, Division of Natural Heritage (Alion 2006b). The Virginia Department of Conservation and Recreation, Division of Natural Heritage provided concurrence to SI sampling activities (Appendix L). No threatened or endangered species were noted during SI activities.

3.2.2 Cultural and Archaeological Resources

3.2.2.1 Archaeological surveys have been performed at multiple locations within the Chopawamsic Troop Training Site (Alion 2006b). Cultural and Archaeological areas were avoided during the SI.

3.3 Site Inspection Field Work

3.3.1 The SI field work included two separate sampling events: 14-18 August and 28-30 November 2006, each of which was conducted in accordance with the PWP (Alion 2005) and the Final SS-WP (Alion 2006b). A qualitative site reconnaissance for MEC and sample collection and analyses for MC was completed. A total of 144 acres were assessed through the qualitative reconnaissance. A total of 62 surface soil, 11 sediment, 11 surface water, and 7 groundwater samples were collected (which included background samples for soil, surface water, and sediment). In accordance with the SS-WP, surface soil samples were collected as composite samples (7-point wheel composite), and sediment, surface water and groundwater samples were collected as discrete samples.

3.3.2 MEC reconnaissance findings and MC sample results are discussed in Sections 4 and 5, respectively. As-collected sample locations, sample designations, and sampling rationale are summarized in Table 3-1. Sampling locations are depicted on Figures 3-1 through 3-6. Additional information pertaining to the field activities, including the field notes and forms, are included in Appendix D. Photograph locations and descriptions are presented in Appendix E.

3.4 Work Plan Deviations and Field Determinations

3.4.1 Deviations from the Final SS-WP (Alion 2006b) occurred, mostly with respect to the number of samples collected and the location of samples. The SS-WP included 76 surface soil samples, 10 groundwater samples (5 park wells and 5 private wells), 13 sediment samples, and 13 surface water samples (includes background samples for soil, surface water, and sediment).

3.4.2 During the August 2006 sampling event the Alion Team collected 51 surface soil samples, five groundwater samples (5 park wells), nine sediment samples, and nine surface water samples. However, during the FUDS property reconnaissance, the safety fans for several firing ranges were noted to extend well beyond the target areas; however, the topography at the FUDS property (very rugged terrain with hills surrounding low lying areas) did not fit with the range layouts designated in the ASR Supplement. It was further determined that some of the sample locations, based on the Supplemental ASR maps (USACE 1996), were outside the suspected impact areas. The Alion Team requested and received approval from USACE to relocate samples and reduce the sample numbers for the FUDS property (Appendix L). In addition, the right-of-entry for three parcels could not be obtained; therefore, three groundwater samples could not be collected. The November 2006 sampling event involved additional reconnaissance and the collection of 11 surface soil, two surface water, two sediment, and two groundwater samples.

3.4.3 Through both field events, a total of 62 surface soil, 11 sediment, 11 surface water, and 7 groundwater samples were collected (which included three background samples for surface soil, two background samples for surface water, and two background samples for sediment). Deviations to the SS-WP are documented in the DQO Verification Worksheet, included in Appendix B.

3.5 Site Inspection Laboratory Data Quality Indicators

3.5.1 This section summarizes the data quality assessment for the Chopawamsic Troop Training Site SI analytical data. Data were generated by GPL under the DoD Quality Systems Manual (QSM) Version IIII and validated by a third-party validator (EDS) using EPA Region III Data Validation Guidelines (Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses, April 1993, and Region III Modification to the National Functional Guidelines for Organic Data Review, September 1994). The data were also analyzed using the Automated Data Review (ADR) Version 8.1 based on the DoD QSM Version III guidelines, and these results are included in the EDMS database. The detailed GPL and EDS reports are contained in Appendix F and G, respectively, and the following text summarizes the findings. Data Quality Indicators (DQI's) include precision, accuracy, representativeness, completeness, comparability and sensitivity (PARCCS).

3.5.2 Precision is a measure of the reproducibility of repetitive measurements of the same process under similar conditions. Precision is determined by measuring the agreement among individual measurements of the same property, under similar conditions, and is calculated as an absolute value. The degree of agreement was expressed as the relative percent difference (RPD) between the separate measurements (usually matrix spike/matrix spike duplicate [MS/MSD] pairs) and the observed RPD compared to acceptable values. There were a few MS/MSD pairs that did not achieve acceptable values, and these samples were qualified appropriately (Appendix G). Field precision is measured by the comparison of field duplicate samples, which are also presented in Appendix G.

3.5.3 Accuracy is the degree of agreement of a measurement with an accepted reference or true value. Accuracy measures the bias or systematic error of the entire data collection process. To determine accuracy, a sample which has been spiked with a known concentration is analyzed by the laboratory as the MS, MSD, Laboratory Control Spike, Surrogate, and Blank Spikes. EDS assessed accuracy according to the Region III Data Validation Guidelines and assigned qualifiers as appropriate. No data were rejected based on accuracy.

3.5.4 Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is achieved through proper development of the field sampling program during the TPP and work plan development. Based on site conditions and concurrence with USACE, fewer samples were taken than planned (Section 3.4.2); however, the data actually collected were determined to be representative of the FUDS property and environmental conditions. USACE concurred with this determination at the time the sample numbers and locations were revised (Appendix L).

3.5.5 Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. Data are complete and valid if the data achieve all acceptance criteria including accuracy, precision, and any other criteria specified by the particular analytical method being used. A total of seven individual analyte measurements were rejected out of the total 4,103 analytical measurements taken for this site, a completeness of greater than 99 percent. All of the rejected measurements related to antimony in some soil and sediment with accuracy issues in the MS/MSD. The seven rejected data were for antimony, four in soil and three in sediment. Consequently, of the 82 solid matrices (11 sediment and 71 surface soil) the rejection rate was 7/82 or 9% (numbers include nine duplicates). The Chopawamsic Troop Training Site data meet the completeness DQI.

3.5.6 Comparability expresses the confidence with which one data set can be compared to another. There are no previous analyses of data at Chopawamsic Troop Training Site for comparison of reported concentrations from this project. However, the utilization of standard methods for sampling and analyses, as documented in the SS-WP, gives the assurance that the comparability DQI has been achieved.

3.5.7 Sensitivity is a measure of the screening criteria as they compare to detection limits[5]. If screening criteria exceed detection limits the certainty of "non-detected" data is called into question. The laboratory reported to the reporting limit (RL) for explosives, which represents the lowest concentration for which a standard was assessed; consequently, if screening values are greater than explosive detection limits, the DQI has been met. For metals, the laboratory report to the method detection limit, which represents the lowest concentration detectable above

[5] The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater then zero and is determined from analysis of a sample in a given matrix containing the analyte (Alion 2005). The method reporting limit (RL) is established at a factor of five to ten times the MDL for the majority of target analytes but no lower then three times the MDL for any target analyte (Alion 2005).

instrument noise. No calibration standards are analyzed between the MDL and RL; consequently, this adds uncertainty for non-detected metals. A discussion on data sensitivity is presented in Section 5.1.4, which will discuss any instances of uncertainty (e.g. a sensitivity discussion for NG is provided).

3.6 Second TPP meeting

3.6.1 A second TPP meeting was held on 21 August 2007 to discuss the finding, conclusions, and recommendations of the Draft Final SI Report, review the MRSPP, and confirm that the project objectives and DQOs have been achieved. A Memorandum of the second TPP can be found in Appendix B. The following decisions and action items were agreed upon at the second TPP meeting.

- Ms. Adriane James will request available handouts from the USACE Norfolk District Pubic Affairs Office to potentially include a FUDS facts sheet and MRSPP fact sheet for delivery to PWFP. *Note: Ms. James did provide the FUDS fact sheet to PWFP.*

- The Final SI Report will provide specific available information about munitions found during the site's history (e.g. Live, fuzed, etc.) *Note: The supplemental reports were reviewed and revisions were made to the text regarding the nature of munitions found during the site's history (MEC, MD, or MPPEH).*

- All comments on the report were due by Friday 7 September. The stakeholders were agreeable to providing comments by this date. *Note: All stakeholders provided comments or stated that they did not have any comments.*

- Though several stakeholders were still reviewing the Draft Final SI Report, the USACE, VDEQ, EPA, and PWFP agreed that a RI/FS was warranted at this time for MC and MEC at all MRSs at the Chopawamsic Troop Training Site. *Note: No action required.*

Table 3-1 Chopawamsic Sample Locations and Field Observations

Range Location (Munitions Response Site [MRS])	Sampling Identification	Coordinates (UTM,NAD83, ZONE 18, Meters [m])		Work Plan Rationale for Sampling Locations (Alion 2006b)	Comments
		Easting (m)	Northing (m)		
Background Samples	CTT-BG-SW-00-01	290432	4277104	Surface water upstream of ranges	None
	CTT-BG-SW-00-02	288471	4273772	Surface water upstream of ranges	None
	CTT-BG-SD-02-01	290432	4277104	Sediment upstream of ranges	None
	CTT-BG-SD-02-02	288471	4273772	Sediment upstream of ranges	None
	CTT-BG-SS-02-01	296453	4273885	Undisturbed Soil	None
	CTT-BG-SS-02-02	291133	4277344	Undisturbed Soil	None
	CTT-BG-SS-02-03	288881	4278740	Undisturbed Soil	None
OB/OD 3 (MRS 1)	CTT-O2-GW-00-01	293319	4273003	Former public supply well	Well #1 (#52-S-18)
	CTT-O3-GW-00-01	293596	4270962	Former public supply well	Well #1 (#52-S-14)
	CTT-O3-GW-00-02	293644	4270589	Former public supply well	Spring #1 (#52-SS-1)
	CTT-O3-GW-00-03	293156	4270587	Private well (outside tap)	18049 Joplin Road
	CTT-O3-GW-00-04	291700	4271063	Private well (outside tap)	17937 Joplin Road
	CTT-O1-SD-02-01	290044	4272647	Sediment in South Fork	Sandy, gravelly sediment-sampled just below dam
	CTT-O1-SD-02-03	290736	4272234	Sediment in South Fork	Sampled approximately 1 km below dam
	CTT-O1-SW-00-01	290044	4272647	Surface water in South Fork	Sampled just below dam
	CTT-O1-SW-00-03	290736	4272234	Surface water in South Fork	Sampled approximately 1 km below dam
	CTT-O3-SD-02-01	294997	4271314	Sediment in South Fork	Sampled upstream of bridge below D-Demolition Range
	CTT-O3-SD-02-02	295084	4271350	Sediment in South Fork	Sampled below E-Demolition Range
	CTT-O3-SW-00-01	294997	4271314	Surface water in South Fork	Sampled upstream of bridge below D-Demolition Range
	CTT-O3-SW-00-02	295084	4271350	Surface water in South Fork	Sampled below E-Demolition Range
	CTT-O3-SS-02-01	294634	4271850	E-Demolition Range-Find Ground scarring, munitions debris, cratering	Downgradient of multiple subsurface anomalies in mounded area

Table 3-1 Chopawamsic Sample Locations and Field Observations

Range Location (Munitions Response Site [MRS])	Sampling Identification	Coordinates (UTM,NAD83, ZONE 18, Meters [m])		Work Plan Rationale for Sampling Locations (Alion 2006b)	Comments
		Easting (m)	Northing (m)		
OB/OD 3-MRS 1 (continued)	CTT-O3-SS-02-02	294602	4271790	E-Demolition Range-Ground scarring, munitions debris, cratering	Sampled in and around depression (2x2x1 ft) and 40 mm illuminator round
	CTT-O3-SS-02-03	294699	4271743	E-Demolition Range-Ground scarring, munitions debris, cratering	Downgradient of subsurface anomaly, brown clayey silt
	CTT-O3-SS-02-04	294781	4271472	E-Demolition Range-Ground scarring, munitions debris, cratering	Downgradient of subsurface anomaly, brown clayey silt
	CTT-O3-SS-02-05	294573	4271341	D-Demolition Range-Ground scarring, munitions debris, steel	Downgradient of subsurface anomaly, gray clayey soil
	CTT-O3-SS-02-06	294361	4271596	D-Demolition Range-Ground scarring, munitions debris, steel	Downgradient of subsurface anomaly
	CTT-O3-SS-02-07	294612	4271782	E-Demolition Range-Ground scarring, munitions debris, cratering	Sampled downgradient of mounded area
	CTT-O3-SS-02-11	292401	4271434	1-acre OB/OD area (Liming Lane)-Ground scarring, munitions debris	Sampled downgradient of subsurface anomaly
	CTT-O3-SS-02-12	292434	4271386	1-acre OB/OD area (Liming Lane)-Ground scarring, munitions debris	Sampled downgradient of subsurface anomalies and surface cultural debris
	CTT-O3-SS-02-13	292433	4271432	1-acre OB/OD area (Liming Lane)-Ground scarring, munitions debris	Sampled at bottom of depression, downgradient of subsurface anomaly
	CTT-GR-SS-02-01	293558	4271289	Previous MEC finding-Mortar found in roof or evidence of Grenade Range	Sampled located near 3 small depressions-did not find building with mortar and no evidence of grenade range
	CTT-GR-SS-02-05	293643	4271112	Previous MEC finding-Mortar found in roof or evidence of Grenade Range	Sampled downgradient of concrete “bunker” -did not find building with mortar and no evidence of grenade range
	CTT-O2-SS-02-06	292471	4271952	Near magazine at Liming Lane	Magazine still intact-sampled outside door

Table 3-1 Chopawamsic Sample Locations and Field Observations

Range Location (Munitions Response Site [MRS])	Sampling Identification	Coordinates (UTM,NAD83, ZONE 18, Meters [m])		Work Plan Rationale for Sampling Locations (Alion 2006b)	Comments
		Easting (m)	Northing (m)		
OB/OD 3-MRS 1 (continued)	CTT-O1-SS-02-01	290453	4272083	H-Demolition Range-Ground scarring, munitions debris	Sampled downgradient of subsurface anomalies; dark brown clay soil
	CTT-O1-SS-02-03	290608	4272128	H-Demolition Range-Ground scarring, munitions debris	Sampled near CO2 cylinder, subsurface anomalies nearby
	CTT-PR-SS-02-01	294851	4273723	Expended bullets, backstop	Looking for Pistol Range as per NPS personnel. No obvious backstop found. No findings to note.
Fragmentation Grenade Range (MRS 2)	CTT-GR-SS-02-02	293733	4271332	F-Fragmentation Grenade Range-Ground scarring, grenade fragments, bullet casings	None
	CTT-GR-SS-02-03	293889	4271385	F-Fragmentation Grenade Range-Ground scarring, grenade fragments, bullet casings	Sampled located near depression
	CTT-GR-SS-02-04	293768	4271354	F-Fragmentation Grenade Range-Ground scarring, grenade fragments, bullet casings	Sampled downgradient of subsurface anomaly
Range Complex No. 1 (MRS 3)	CTT-M2-GW-00-01	289264	4272559	Former public supply well	Spring #2 (#51-SS-2)
	CTT-M2-GW-00-02	289388	4272490	Former public supply well	Spring #1 (#51-SS-1)
	CTT-M2-SD-02-01	289889	4273502	Sediment in South Fork	Upstream of Mawavi Road bridge
	CTT-M2-SW-00-01	289889	4273502	Surface water in South Fork	Upstream of Mawavi Road bridge
	CTT-RR-SD-02-01	289675	4273699	Sediment in South Fork	Tributary draining south into main branch
	CTT-RR-SW-00-01	289675	4273699	Surface water in South Fork	Tributary draining south into main branch
	CTT-M1-SS-02-01	292915	4273730	I-Mortar Range-Craters, ground scarring, mortar duds	Sampled downgradient of subsurface anomaly
	CTT-M1-SS-02-02	292573	4273655	I-Mortar Range-Craters, ground scarring, mortar duds	Sampled downgradient of 3 subsurface anomalies

Table 3-1 Chopawamsic Sample Locations and Field Observations

Range Location (Munitions Response Site [MRS])	Sampling Identification	Coordinates (UTM,NAD83, ZONE 18, Meters [m])		Work Plan Rationale for Sampling Locations (Alion 2006b)	Comments
		Easting (m)	Northing (m)		
Range Complex No. 1 (MRS 3) (continued)	CTT-M1-SS-02-03	292610	4273800	I-Mortar Range-Craters, ground scarring, mortar duds	None
	CTT-M1-SS-02-04	292344	4273941	I-Mortar Range-Craters, ground scarring, mortar duds	Sampled downgradient of subsurface anomalies
	CTT-M1-SS-02-05	292346	4273721	I-Mortar Range-Craters, ground scarring, mortar duds	Sampled at rim of 8x8x4 ft depression-subsurface anomalies in and around
	CTT-M1-SS-02-07	292333	4274084	I-Mortar Range-Craters, ground scarring, mortar duds	Slightly wooded area, loamy soil
	CTT-M1-SS-02-08	292349	4273879	I-Mortar Range-Craters, ground scarring, mortar duds	Sampled downgradient of subsurface anomaly
	CTT-M1-SS-02-09	292603	4273758	I-Mortar Range-Craters, ground scarring, mortar duds	Loamy and sandy soil
	CTT-M2-SS-02-01	288818	4272840	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Area littered with surface scrap metal
	CTT-M2-SS-02-02	288707	4272909	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Red/brown sandy silt, some organics
	CTT-M2-SS-02-03	288607	4272987	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Light brown sandy silt
	CTT-M2-SS-02-04	288936	4272579	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Red clayey silt
	CTT-M2-SS-02-05	288897	4272875	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Next to Gun Mount B
	CTT-M2-SS-02-06	288880	4272903	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Next to Gun Mount A

Table 3-1 Chopawamsic Sample Locations and Field Observations

Range Location (Munitions Response Site [MRS])	Sampling Identification	Coordinates (UTM,NAD83, ZONE 18, Meters [m])		Work Plan Rationale for Sampling Locations (Alion 2006b)	Comments
		Easting (m)	Northing (m)		
Range Complex No .1 (MRS 3) (continued)	CTT-R1-SS-02-01	289169	4273134	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Lightly wooded area, sandy loamy soil
	CTT-R1-SS-02-02	289012	4273214	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Many fallen trees around the area
	CTT-R1-SS-02-03	289134	4273318	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Slightly sloped terrain, moderately wooded
	CTT-R1-SS-02-04	289239	4273253	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Dense, loamy soil
	CTT-RR-SS-02-01	289114	4273066	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Slightly sloped terrain
	CTT-RR-SS-02-02	289000	4273031	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Fallen trees seen in the area
	CTT-RR-SS-02-03	288793	4273228	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Slightly sloped terrain, moderately wooded
	CTT-RR-SS-02-04	289001	4272822	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Sampled at edge of depression (2x2x1 ft), anomaly at bottom of depression, red/brown silty clayey soil
	CTT-RR-SS-02-05	288881	4272942	B-Rifle-Craters, ground scarring, mortar and rocket duds, bullet casings	Downgradient of subsurface anomalies and posts, red/brown silty sandy soil
Range Complex No. 2 (MRS 4)	CTT-R2-SD-02-01	292943	4272480	Sediment in South Fork	None
	CTT-R2-SW-00-01	292943	4272480	Surface water in South Fork	None

Table 3-1 Chopawamsic Sample Locations and Field Observations

Range Location (Munitions Response Site [MRS])	Sampling Identification	Coordinates (UTM,NAD83, ZONE 18, Meters [m])		Work Plan Rationale for Sampling Locations (Alion 2006b)	Comments
		Easting (m)	Northing (m)		
Range Complex No. 2 (MRS 4) (continued)	CTT-PR-SD-02-01	293691	4271602	Sediment in South Fork	Sandy silty sediment
	CTT-PR-SD-02-02	293556	4271901	Sediment in South Fork	Gravelly sediment
	CTT-PR-SW-00-01	293691	4271602	Surface water in South Fork	None
	CTT-PR-SW-00-02	293556	4271901	Surface water in South Fork	None
	CTT-G2-SS-02-01	293786	4272116	G-Night Firing Course- Bullet casings, backstop, targets	Light brown silty soil
	CTT-R2-SS-02-01	292846	4272362	A-Rifle Range- Bullet casings, backstop, targets	Moved near a crater
	CTT-R2-SS-02-02	292708	4272182	A-Rifle Range- Bullet casings, backstop, targets	Moved near a crater
	CTT-G2-SS-02-02	293791	4271980	G-Night Firing Course- Bullet casings, backstop, targets	Medium brown silt with some sand- downgradient of potential target post and subsurface anomalies
	CTT-G2-SS-02-03	293369	4271614	G-Night Firing Course- Bullet casings, backstop, targets	None
	CTT-G2-SS-02-04	293137	4271696	G-Night Firing Course- Bullet casings, backstop, targets	sampled near semi-dry creek bed
	CTT-PR-SS-02-02	293596	4271667	G-Night Firing Course- Bullet casings, backstop, targets	Medium brown sandy loam with leaf cover
	CTT-PR-SS-02-03	293342	4272135	G-Night Firing Course- Bullet casings, backstop, targets	None
	CTT-O2-SS-02-03	292986	4272973	A-Rifle Range- Bullet casings, backstop, targets	Sloping terrain north of streambed-north of A-Rifle Range
	CTT-O2-SS-02-05	293018	4272155	A-Rifle Range- Bullet casings, backstop, targets	Potential natural backstop-sample collected in side of hill/backstop
	CTT-NF-SS-02-01	293343	4272035	G-Night Firing Course- Bullet casings, backstop, targets	Sampled in depression in hill (6x4x1.5 ft) overlooking stream

Table 3-1 Chopawamsic Sample Locations and Field Observations

Range Location (Munitions Response Site [MRS])	Sampling Identification	Coordinates (UTM,NAD83, ZONE 18, Meters [m])		Work Plan Rationale for Sampling Locations (Alion 2006b)	Comments
		Easting (m)	Northing (m)		
	CTT-NF-SS-02-02	293580	4271995	G-Night Firing Course-Bullet casings, backstop, targets	None
Range Complex No. 2 (MRS 4) (continued)	CTT-NF-SS-02-03	293623	4271809	G-Night Firing Course-Bullet casings, backstop, targets	Light brown sandy silt-leaf covered
	CTT-NF-SS-02-04	293753	4271484	G-Night Firing Course-Bullet casings, backstop, targets	Posts from potential target area
	CTT-O3-SS-02-08	293963	4271654	C-Demolition Range-Ground scarring, munitions debris, timber	Medium brown sandy silt and organics
	CTT-O3-SS-02-09	294029	4271590	C-Demolition Range-Ground scarring, munitions debris, timber	Sample taken in a depression (7x7x3.5 ft)
	CTT-O3-SS-02-10	293990	4271596	C-Demolition Range-Ground scarring, munitions debris, timber	Red/brown silty clay

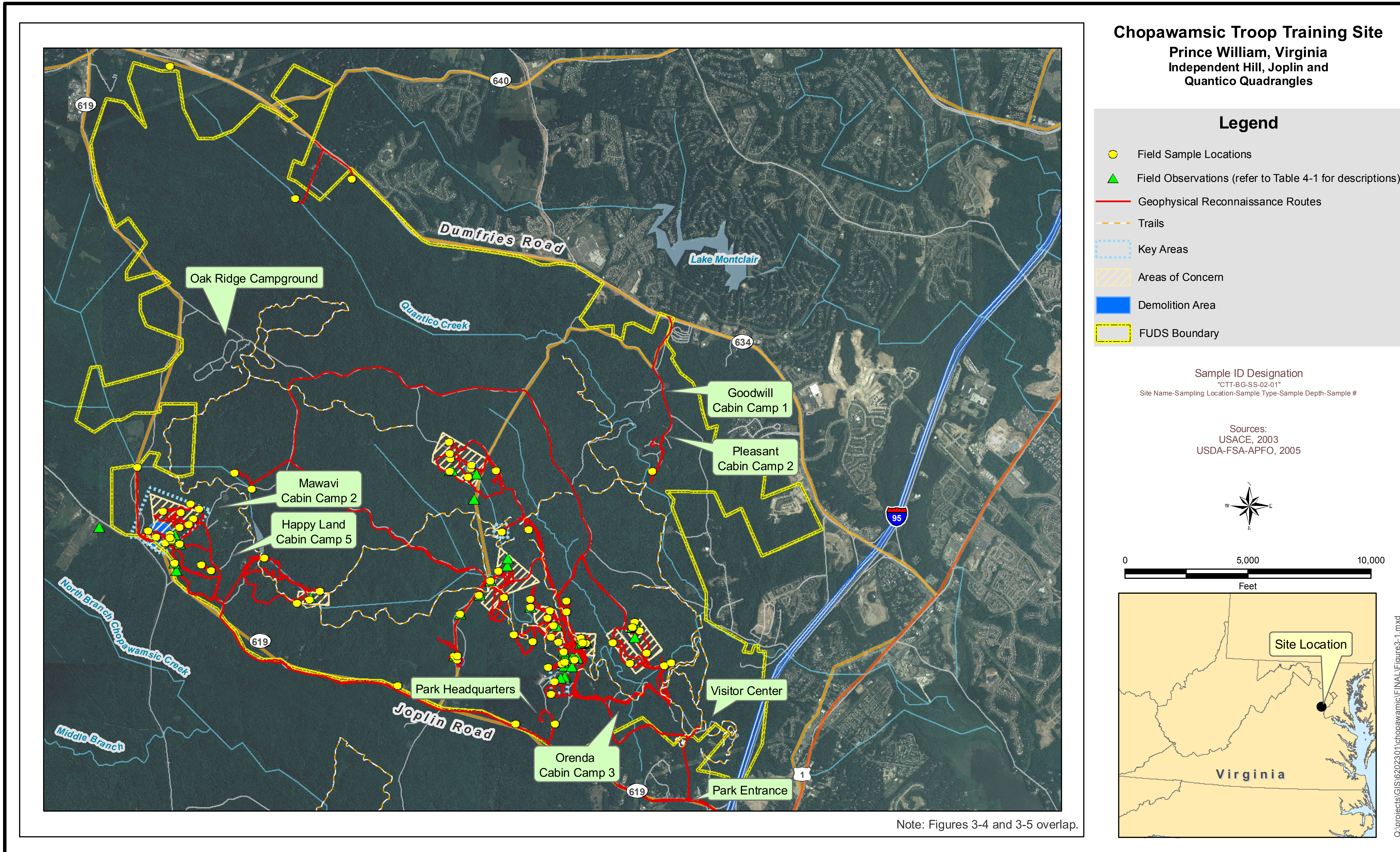

Figure 3-1. Sample Locations and Geophysical Site Reconnaissance Findings.

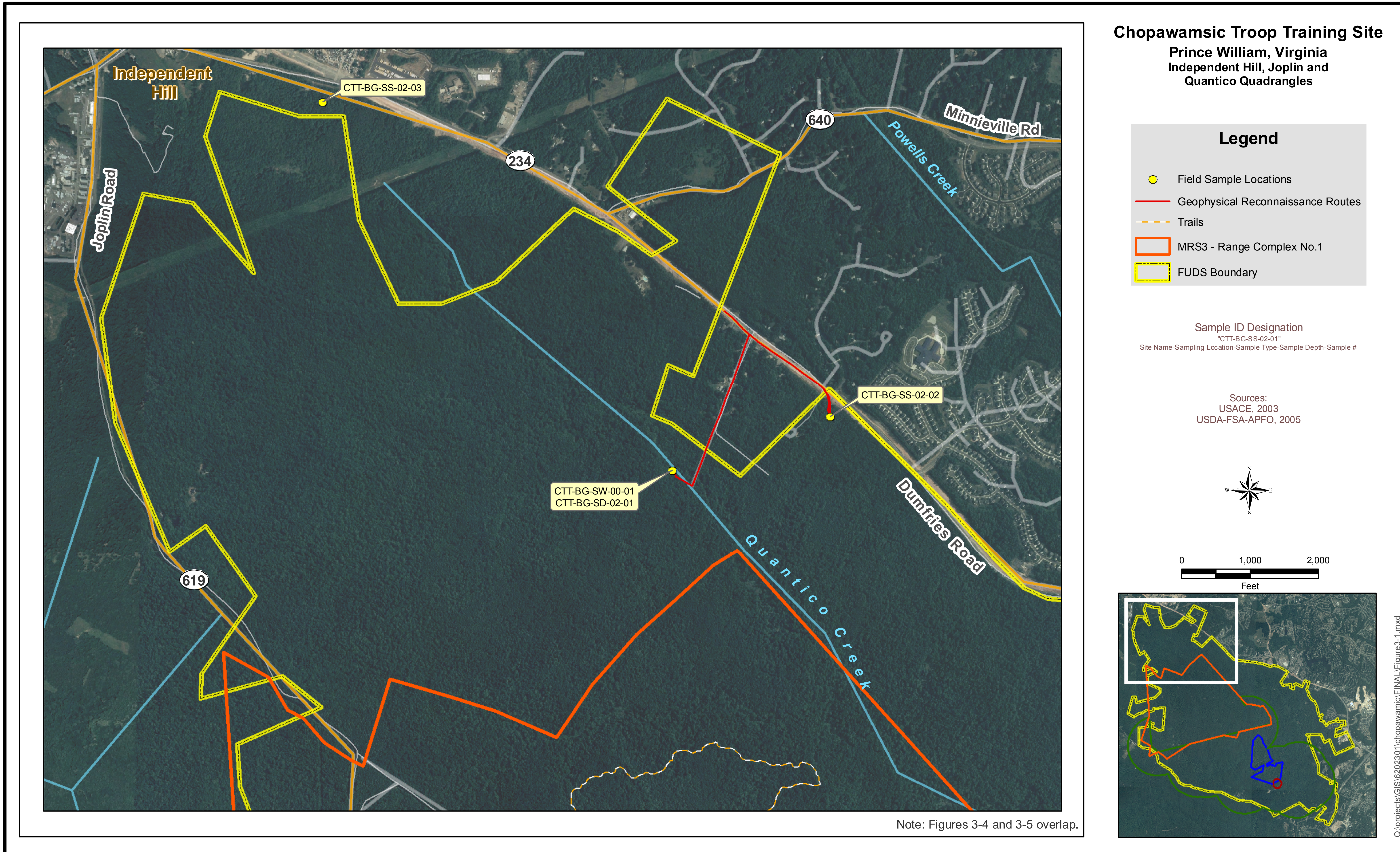

Figure 3-2. Sample Locations and Geophysical Site Reconnaissance Findings (Northwest).

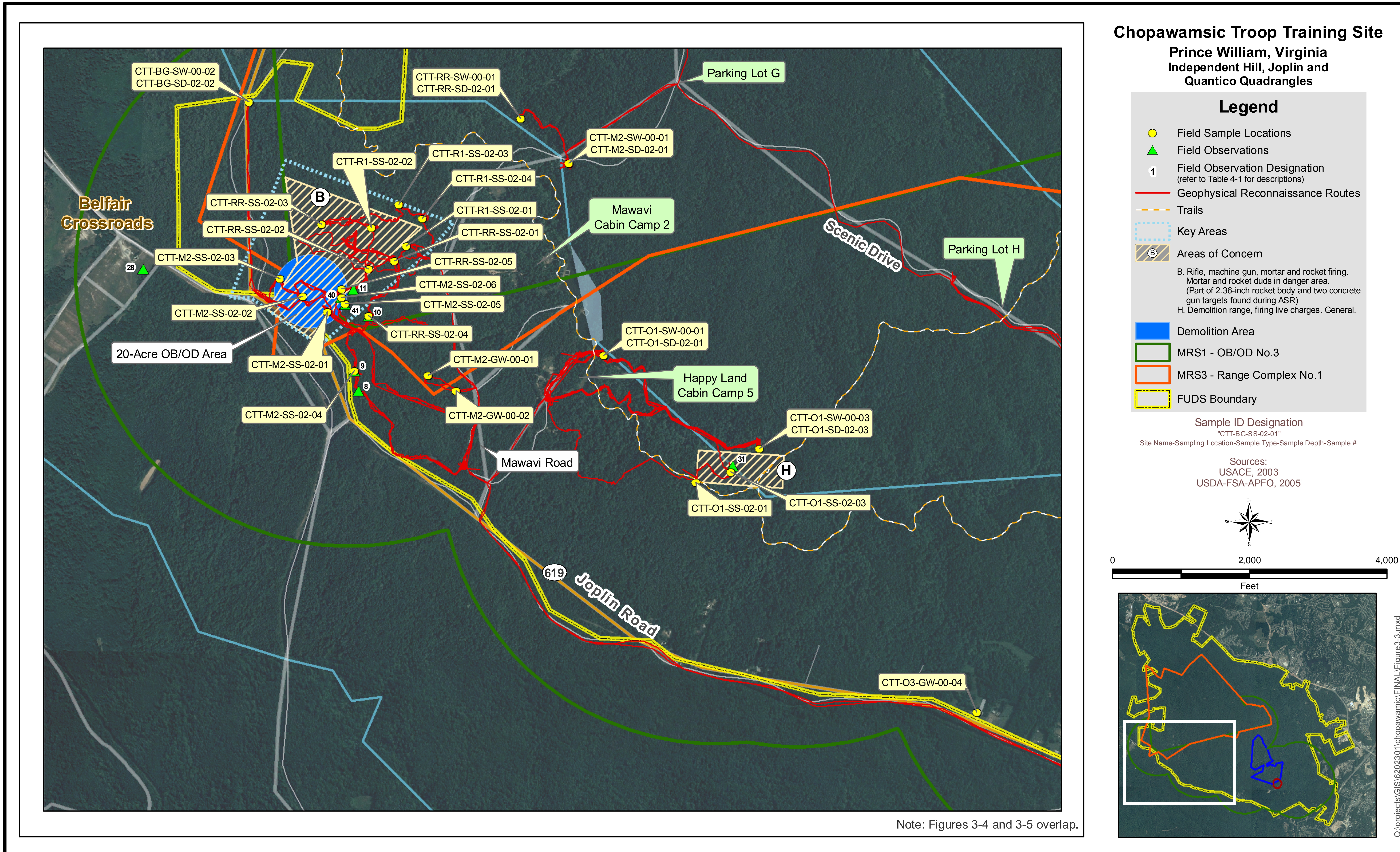

Figure 3-3. Sample Locations and Geophysical Site Reconnaissance Findings (Southwest).

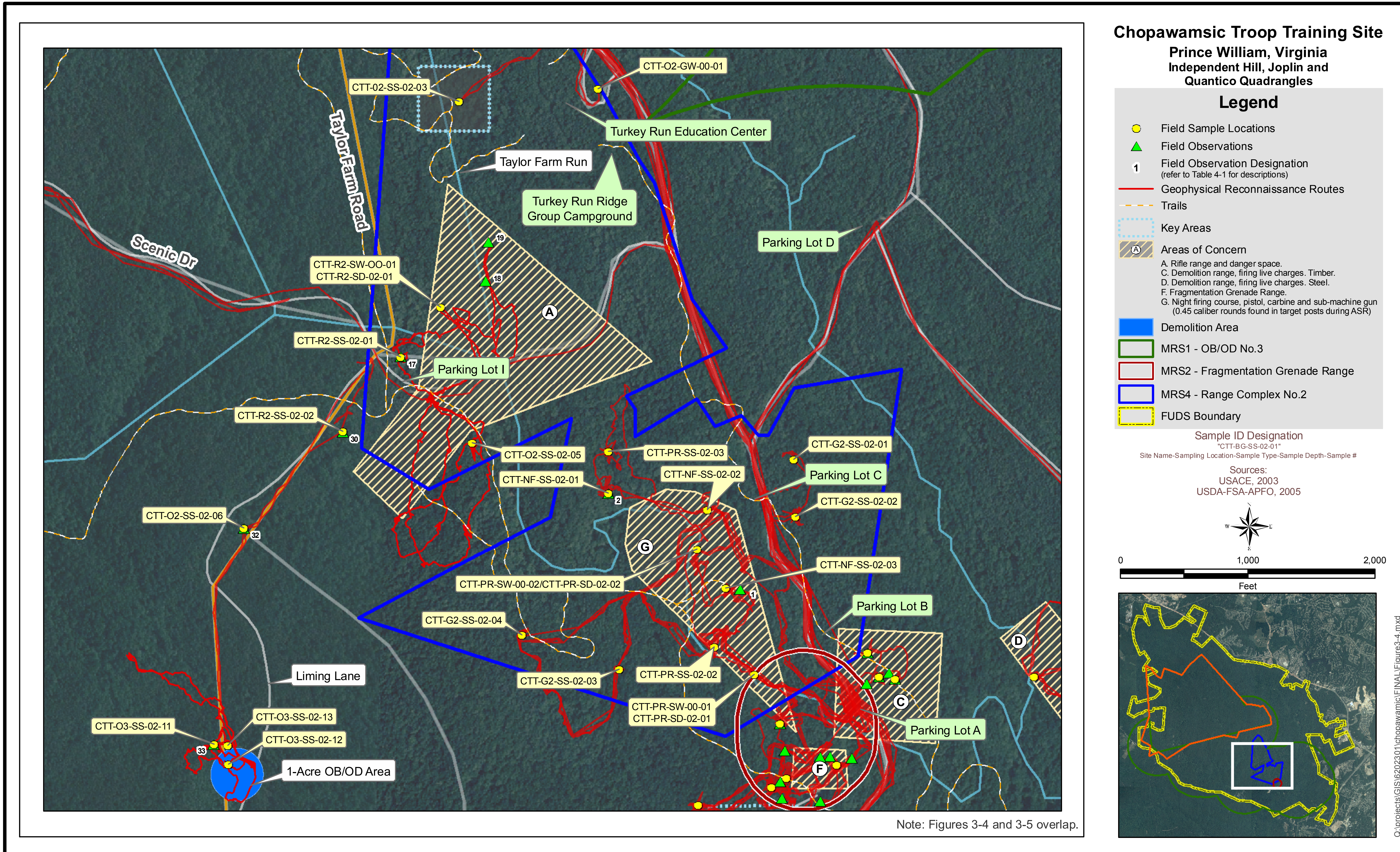

Figure 3-4. Sample Locations and Geophysical Site Reconnaissance Findings (Southeast 1 of 2).

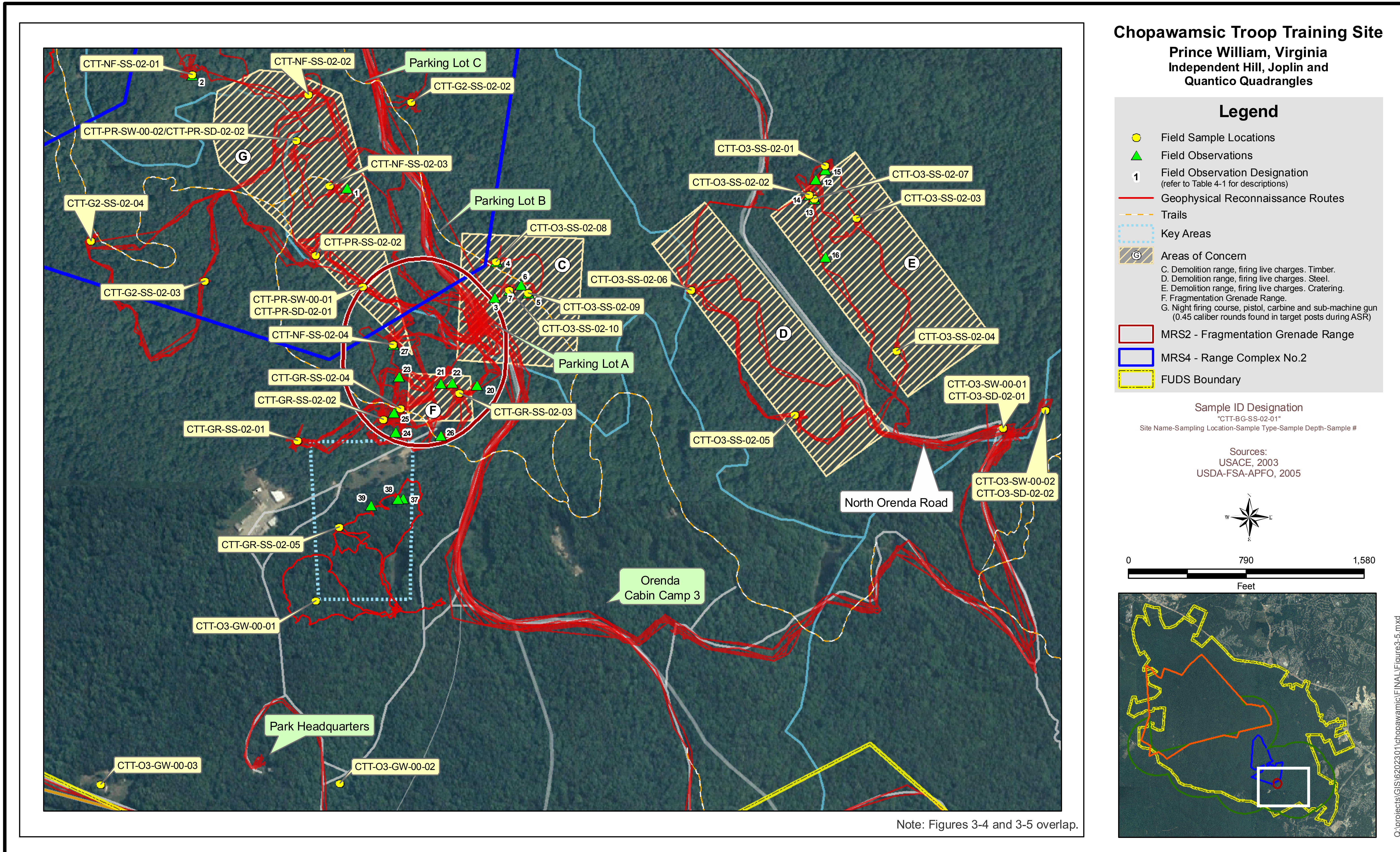

Figure 3-5. Sample Locations and Geophysical Site Reconnaissance Findings (Southeast 2 of 2).

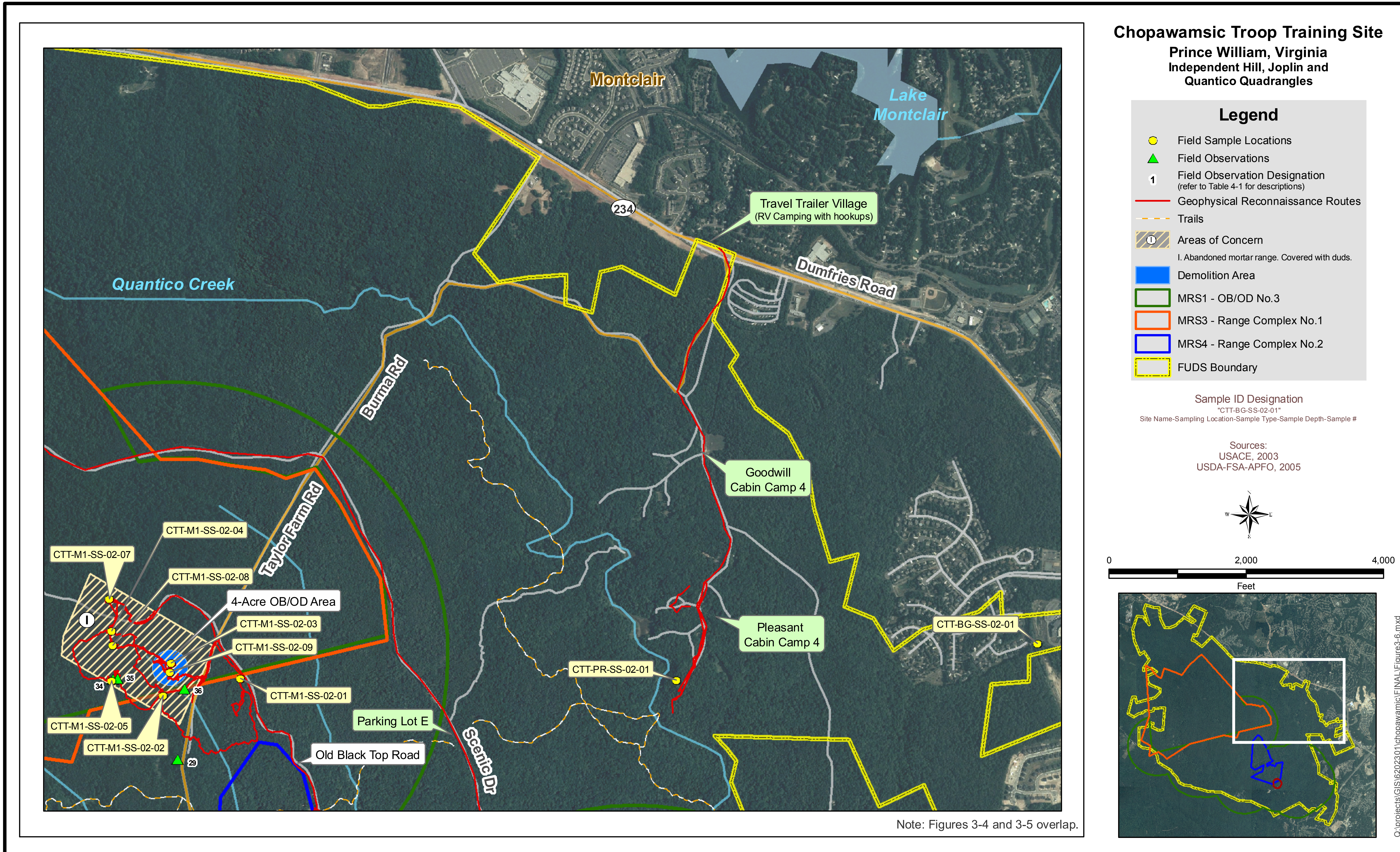

Figure 3-6. Sample Locations and Geophysical Site Reconnaissance Findings (Northeast).

4. MUNITIONS AND EXPLOSIVES OF CONCERN SCREENING LEVEL RISK ASSESSMENT

4.1 Operational History

4.1.1 Conventional military munitions were used at the FUDS including Small Arms, Live Hand Grenades, Blasting Caps, Demolitions Materials, Live Ground Rockets, and High Explosive Mortars. Historical documents refer to "duds" lying on the mortar ranges. These mortar range boundaries as drawn in the supplemental ASR are within MRS 3 and partially within MRS 1. Remediation and restoration of the FUDS property took place in 1947. The ASR identified a certificate of clearance for the entire site; however, no information concerning the process used to declare the FUDS property as clear was identified in historical records (USACE 1992, 1996, and 2004b).

4.1.2 The ASR identified nine training areas/ranges designated with the following letters: A-Rifle Range; B-Rifle, Machine Gun, Mortar, and Rocket Firing Range; C-Demolition Range (for timber); D-Demolition Range (for Steel); E-Demolition Range (Cratering); F-Fragmentation Grenade Range; G-Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range; H-Demolition Range; and I-Mortar Range. The ASR also noted 1-acre, 4-acre, and 20-acre OB/OD areas. NPS pointed out another suspect pistol range, located in the H-Demolition Range of MRS 1, which was not identified in historic documents or during the TPP process.

4.1.3 The ranges, as documented in the ASR Supplement and described in Section 2.2, include OB/OD No. 3 (MRS 1); Fragmentation Grenade Range (MRS 2); Range Complex No. 1 (MRS 3); and Range Complex No. 2 (MRS 4). A cross-tabulation of the training areas/ranges documented in the ASR and the MRSs is presented in Table 2-2.

4.2 SI MEC Field Observations

4.2.1 A qualitative reconnaissance consisting of visual reconnaissance of the FUDS property surface to provide qualitative data on potential subsurface anomalies and the identification of visual indicators of suspect areas, such as distressed vegetation, stained soil, target remnants, and visual metallic debris was completed. This survey included use of analog geophysics to support anomaly avoidance activities for the field crew. Where appropriate, anomalies possibly attributable to MEC or MD were documented.

4.2.2 The SI findings are presented below, and MD and cultural debris items observed during the SI reconnaissance and sampling are summarized in Table 4-1. For those overlapping areas

(MRS 1 encompasses MRS 2 and MRS 4 and overlaps MRS 3), the findings are attributed to the primary range (for instance, target posts in G-Night Firing Course are attributed to Range Complex No. 2/MRS 4 and not OB/OD No. 3 /MRS 1). The total acreage estimated to have been covered during reconnaissance was approximately 144 acres.[6] recon, including a 25-ft radius around each sample, and the global positioning system tracks (with a 6-ft radius on them) is approximately 144 acres.

4.2.1 OB/OD No. 3 (MRS 1)

4.2.1.1 OB/OD No. 3 (MRS 1) encompasses five training areas/ranges including C-Demolition Range, D-Demolition Range, E-Demolition Range, and H-Demolition Range as well as a 1-acre OB/OD area. Alion completed reconnaissance of the former range areas within MRS 1 using analog geophysics (magnetometer) following a meandering path. Site reconnaissance and sampling locations are shown on Figures 3-1, 3-3, 3-4, 3-5 and 3-6. Field observations related to cultural debris, range-related features, and MD/MEC finds are summarized in Table 4-1 and presented below.

4.2.1.2 1-acre OB/OD Area (Figure 3-4)

- The area is located near Liming Lane.
- The area was overgrown and difficult to navigate.
- There was no evidence of burial pits, berms, or other features indicative of an OB/OD area.
- Cultural debris (metal and concrete debris) was found on the surface. Unknown subsurface anomalies were identified and recorded.
- No MD/MEC was observed.
- Three surface soil samples were collected near designated sampling locations or relocated near anomalies in the area.
- Additionally, two groundwater samples were collected at the outside tap of two homeowners, downgradient of the 1-acre OB/OD area. The addresses of the two homes are 17937 Joplin Road and 18049 Joplin Road.

[6] Extent of reconnaissance estimated from global positioning system (GPS) tracks and includes a 25-ft radius around each sample and observations along the GPS tracks covering a 6-ft swath.

4.2.1.3 D-Demolition Range and E-Demolition Range (Figure 3-5)

- These ranges are located on either side of North Orenda Road.
- The area was overgrown and hard to navigate.
- These demolition areas are adjacent to one another and contain documented articles of cultural significance.
- Several unknown subsurface anomalies were noted while performing reconnaissance and collecting surface soil samples in this area.
- Two pieces of MD were encountered near an old homestead identified on a PWFP archaeological map. These were identified as suspect 40-mm illuminator rounds by the Unexploded Ordnance Technician.[7]
- No evidence of burial pits, craters, or MEC was observed.
- Seven surface soil, two surface water, and two sediment samples were collected.

4.2.1.4 H-Demolition Range (Figure 3-3)

- The range is located southeast of PWFP Camp 5.
- The area was overgrown and difficult to navigate.
- NPS personnel identified a suspect pistol Range near Camp 4. NPS personnel guided the field team to the suspect pistol range used by the OSS. The field team could not find the exact location for the pistol range (no target posts observed), but a surface soil sample was collected in the suspected backstop location.
- There was no evidence of burial pits, berms, or other features indicative of an OB/OD area.
- Several unknown subsurface anomalies were noted while performing reconnaissance and collecting surface soil samples in this area.
- No MD/MEC was observed.
- Two surface water, two sediment, and two surface soil samples were collected in and around H-Demolition Range.

[7] Two expended 40-mm illumination rounds were encountered during the SI field activities. Similar 40-mm illumination rounds were used by the military between 1953 and 1971, when they were replaced by newer models in the 1970s, and has been in use, in that configuration or an updated one, since. The 40-mm illumination rounds found at the FUDS property are not representative of munitions that would have been used at Chopawamsic during the period of activities at the FUDS property (1942 to 1945). Additional research regarding the source of the 40-mm illumination rounds should be compiled by USACE during the next phase of the investigation.

4.2.1.5 Remainder of the OB/OD No .1 (MRS 1) outside Ranges C, D, E, and H and including Suspect Pistol Range (Figure 3-3, 3-4, and 3-5)

- The area surrounds the aforementioned areas and includes the suspect pistol range near Camp 4.
- The area was overgrown and hard to navigate.
- There was no evidence of burial pits, berms, or other features indicative of an OB/OD area.
- Several unknown subsurface anomalies were noted while performing reconnaissance and collecting surface soil samples in this area.
- No MD/MEC was observed.
- One surface soil sample was collected near the suspect pistol range backstop area. No MEC/MD was observed.
- One surface soil sample was collected west of the A-Rifle Range north 1-acre OB/OD area.
- Two surface soil samples were collected in an area identified as the location of mortar findings south of the fragmentation grenade range (F-Fragmentation Grenade Range).
- Three groundwater samples were collected from existing wells.

4.2.2 Fragmentation Grenade Range (MRS 2)

4.2.2.1 The former Fragmentation Grenade Range (MRS 2) encompasses F-Fragmentation Grenade Range as designated in the ASR. Alion completed reconnaissance of the former range areas within MRS 2 using analog geophysics (magnetometer) following a meandering path. Site reconnaissance and sampling locations are shown on Figures 3-1, 3-4, and 3-5. Field observations related to cultural debris, range-related features, and MD/MEC finds are summarized in Table 4-1 and presented below.

- The Supplemental ASR indicates the fragmentation range was located in a small gully or draw, the walls of which rise over 100 ft – The location does not match the mapped location on ASR/ASR Supplement, but low lying areas noted nearby were included in reconnaissance.
- Reconnaissance was conducted around existing park service buildings in the area and up- and down-hill hillsides through surrounding gullies and drainage areas. Areas with partially overgrown topography were difficult to navigate.
- There was no evidence of throwing lines, targets, burial pits, berms, or other features indicative of a grenade court.

- Cultural debris (including vehicle debris, a metal plate, and rope), and several subsurface anomalies and depressions were found.
- Three surface soil samples were collected in this area near depressions or subsurface anomalies.

4.2.3 Range Complex No. 1 (MRS 3)

4.2.3.1 Range Complex No. 1 (MRS 3) encompasses two training areas/ranges including B-Rifle, Machine Gun, Mortar, and Rocket Firing Range and I-Mortar Range along with two OB/OD areas (the 4-acre and 20-acre OB/OD areas). Alion completed reconnaissance of the former range areas within MRS 3 using analog geophysics (magnetometer) following a meandering path. Site reconnaissance and sampling locations are shown on Figures 3-1, 3-3, and 3-6. Field observations related to cultural debris, range-related features, and MD/MEC finds are summarized in Table 4-1 and presented below.

4.2.3.2 B-Rifle, Machine Gun, Mortar, and Rocket Firing Range; 20-acre OB/OD Area (Figure 3-3)

- The area is located near PWFP Camp 2.
- The area was overgrown and hard to navigate.
- The former concrete gun mounts were located (the gun mounts were approximately 40 meters [m] apart). It appeared that the gun mounts were used as targets. One of the gun mounts had a hole in the side where it appears that a 2.36-inch rocket may have impacted it.
- Several unknown subsurface anomalies were noted while performing reconnaissance and collecting surface soil samples in this area.
- There was no evidence of burial pits, berms, or other features indicative of an OB/OD area.
- No MD/MEC was observed.
- Fifteen surface soil samples were collected in this area. Two of the surface soil samples were collected near gun targets and others were collected around the range area. Two surface water samples and two sediment sample were collected on South Fork Quantico Creek where it crosses Mawavi Road (within the B-Rifle range fan).
- Two groundwater samples were collected southeast of the area.

<u>4.2.3.3 Area I-Mortar Range; 4-acre OB/OD Area (Figure 3-6)</u>

- The area was located near the intersection of Old Black Top Road and Taylor Farm Road
- The area was overgrown and hard to navigate.
- A wooden post with barbed wire was encountered. Several subsurface anomalies were found while performing reconnaissance and collecting surface soil samples in this area.
- Several dirt mounds were identified in the area, but no surface or subsurface anomalies were identified in the mounds.
- Two depressions/craters with metal fragments were identified near the outer rim and bottom of the depressions.
- There was no evidence of firing points or targets associated with the mortar range.
- There was no evidence of burial pits, berms, or other features indicative of an OB/OD area.
- No MD/MEC was observed.
- Eight surface soil samples were collected in I-Mortar Range.

4.2.4 Range Complex No. 2 (MRS 4)

4.2.4.1 Range Complex No. 2 (MRS 4) encompasses two training areas/ranges including A-Rifle Range and G-Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range. Alion completed reconnaissance of the former range areas within MRS 4 using analog geophysics (magnetometer) following a meandering path. Site reconnaissance and sampling locations are shown on Figures 3-1, 3-4, 3-5, and 3-6. Field observations related to cultural debris, range-related features, and MD/MEC finds are summarized in Table 4-1 and presented below.

<u>4.2.4.2 A-Rifle Range (Figure 3-4)</u>

- The range is located south of parking lot I.
- The area was overgrown and hard to navigate.
- There was some cultural debris in A-Rifle Range near an old house foundation including barbed wire and an old drum near the stream. The field team found several depressions (thought to be potential craters) in the area and collected a surface soil sample near one of the depressions.
- There was no evidence of firing points or targets associated with the rifle range.
- The field team located a suspected natural backstop area and collected a surface soil sample from this area.
- Several subsurface anomalies, a mounded area, and several depressions were found.

- No MD/MEC was observed.
- Four surface soil samples, one sediment sample, and one surface water sample were collected.

4.2.4.3 C-Demolition Range (Figure 3-4 and 3-5)

- The range is located along Scenic Drive near Parking Lot A.
- Timbers were found in the area with some small craters/depressions.
- No evidence of burial pits, berms, or other features indicative of an OB/OD area was observed.
- A few subsurface anomalies were observed.
- No evidence of MD/MEC was observed
- Three surface soil samples in the areas downgradient of subsurface anomalies were collected.

4.2.4.4 G -Former Night Firing Course, Pistol, Carbine, and Sub-machine Gun Range (Figure 3-4 and 3-5)

- The range is located along Scenic Drive near Parking Lot A.
- Several subsurface anomalies and depressions were found while performing reconnaissance and collecting surface soil samples in this area.
- Three wooden posts in a line with several subsurface anomalies nearby were identified.
- Posts from former targets (bullets imbedded in the posts) were identified. Surface soil samples were collected from the backstop area (hill) behind the posts.
- No additional MD was observed.
- No MEC was observed.
- Ten surface soil were collected within and immediately surrounding this area.
- Two surface water and two sediment samples were collected in the stream in G-Night Firing Course.

4.2.5 Background Samples

4.2.5.1 Background samples were collected away from DoD activity and other anthropogenic operations. Three surface soil background samples were collected from the northern boundary of the FUDS property. Two surface water and two sediment background samples were collected from the northern and western part of the FUDS property. Site reconnaissance and sampling locations are shown on Figures 3-1, 3-2, 3-3, and 3-6. There was no observed evidence of MEC or MD in the any of the background sample locations.

4.3 MEC Risk Assessment

4.3.1 A qualitative MEC screening level risk assessment was conducted based on the SI qualitative reconnaissance, as well as historical data documented in the INPR, ASR, and ASR Supplement (USAESCH 2001). An explosive safety risk is the probability for an MEC item to detonate and potentially cause harm as a result of human activities. An explosive safety risk exists if a person can come near or in contact with MEC and act on it to cause a detonation. The potential for an explosive safety risk depends on the presence of three elements: a source (presence of MEC), a receptor (person), and interaction (e.g., touching or picking up an item). The CSM for each MRS reflects this MEC assessment strategy (Appendix J).

4.3.2 The exposure route for an MEC receptor typically is direct contact with an MEC item on the surface or through subsurface activities (e.g., digging during farming or construction). An MEC item tends to remain in place unless disturbed through human or natural forces (e.g., frost heaving and erosion). If MEC movement occurs, the probability of direct human contact may increase, but not necessarily result in direct contact or exposure.

4.3.3 Each of these primary risk factors were used to evaluate the field and historic data to generate an overall hazard assessment rating of either low, moderate, or high. An evaluation of low risk indicates that the MEC type would not result in major injury or the item is insensitive or inert; site characteristics are such that there is limited to no site access and the FUDS property is stable; and potential for contact is low for either surface or subsurface based on human receptor activities and the population accessing the FUDS property. An evaluation of high risk indicates that the MEC type would result in major injury or the item is sensitive; site characteristics are such that there is frequent access and the FUDS property is unstable; and potential for contact is high for either surface or subsurface based on human receptor activities and the population accessing the FUDS property.

4.3.1 OB/OD No. 3 (MRS 1)

4.3.1.1 MRS 1 encompasses C-Demolition Range, D-Demolition Range, E-Demolition Range, and H-Demolition Range as well as a 1-acre OB/OD area. MRS 1 overlaps these ranges and includes a blast radius associated with the demolition ranges. As discussed in Sections 2.4.4, 2.5, and 4.2.1, MEC/MD have been recovered in MRS 1. MEC discoveries included a mortar found in 1985 embedded in the roof of one of the munitions storage buildings. As recently as June 2005, a rocket (MPPEH) was found in Taylor Farm Run (Alion 2006a). No MEC was identified during the SI reconnaissance; however, MD (expended 40-mm illuminators) was identified in the former demolition ranges (D-Demolition Range and E-Demolition Range). Given the limited SI reconnaissance, MEC could be present in other areas of the FUDS property. Since mortars and rockets have been found within this MRS, the range fans developed for MRS 3 may not be accurate.

4.3.1.2 No documented injuries have occurred since the FUDS was transferred back to the current owners by DoD. The ranges are comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the former demolition ranges and OB/OD areas in this MRS. The MRS contains trails and campgrounds which are accessible to park visitors for hiking, biking, and picnicking, though some trails and roads are gated and only accessible to NPS employees. The most likely human receptors are recreational users and park personnel who may travel through the park on foot.

4.3.1.3 Given the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. The overall MEC risk is considered low to moderate.

4.3.2 Fragmentation Grenade Range (MRS 2)

4.3.2.1 MRS 2 encompasses F-Fragmentation Grenade Range. MRS 1 overlaps MRS 2 and includes a blast radius associated with the demolition ranges. Historically, MPPEH and MEC was discovered in MRS 1 (a mortar and rocket), but no MEC/MD was found in MRS 2. In addition, no MEC/MD was identified during the SI reconnaissance. Given the limited SI reconnaissance, MEC could be present in MRS 2.

4.3.2.2 No documented injuries have occurred since the FUDS property was transferred to the NPS. The Range in MRS 2 is comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the former grenade range in MRS 2. The MRS contains trails which are accessible to park visitors for hiking, biking, and picnicking, though some trails and roads are gated and only accessible to NPS employees. The most likely human receptors are recreational users and park personnel who may travel through the park on foot.

4.3.2.3 Given the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. The overall MEC risk is considered low to moderate.

4.3.3 Range Complex No. 1 (MRS 3)

4.3.3.1 MRS 3 encompasses B-Rifle, Machine Gun, Mortar, and Rocket Firing Range and I-Mortar Range as well as the 4-acre and 20-acre OB/OD areas. MRS 1 overlaps these ranges and includes a blast radius associated with the demolition ranges. As discussed in Sections 2.4.4 and 2.5, MEC/MD have been recovered in MRS 3. MEC discoveries included one 2.36-inch rocket body found in B-Rifle in January 1993 and a portion of a 2.36-inch rocket body found in 1996 during the ASR site reconnaissance. No MEC/MD was identified in MRS 3 during the SI reconnaissance; however, anomalies were noted around former targets. Given the limited SI reconnaissance, MEC could be present in other areas of the FUDS property.

4.3.3.2 No documented injuries have occurred since the FUDS property was transferred to the NPS. The ranges are comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the former mortar and rocket ranges and OB/OD areas in this MRS. The MRS contains trails and campgrounds which are accessible to park visitors for hiking, biking, and picnicking, though some trails and roads are gated and only accessible to NPS employees. The most likely human receptors are recreational users and park personnel who may travel through the park on foot.

4.3.3.3 Given the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. The overall MEC risk is considered moderate.

4.3.4 Range Complex No. 2 (MRS 4)

4.3.4.1 MRS 4 encompasses A-Rifle Range and G-Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range. MRS 1 overlaps these ranges and includes a blast radius associated with the demolition ranges. As discussed above, MPPEH and MEC were discovered in MRS 1 including a mortar and rocket. No MEC was found in MRS 4 and no MEC was identified during the SI reconnaissance. MD (bullets) was identified in target posts; and anomalies were noted during the reconnaissance. Given the limited SI reconnaissance, it is possible that MEC remains in other areas of the MRS as a result of activities in MRS 3.

4.3.4.2 No documented injuries have occurred since the FUDS property was transferred to the NPS. The ranges are comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the former ranges in this MRS. The MRS contains trails and campgrounds which are accessible to park visitors for hiking, biking, and picnicking, though some trails and roads are gated and only accessible to NPS employees. The most likely human receptors are recreational users and park personnel who may travel through the park on foot.

4.3.4.3 Given the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. The overall MEC risk is considered low to moderate.

Table 4-1 Locations of Site Inspection Reconnaissance Findings/Field Observations.

No.[1]	ITEM	NAD 83, UTM Zone 18 North	
		Easting (m)	Northing (m)
1	Barbed wire on ground surface in G-Night Firing Course.	293658	4271805
2	Depression in hill overlooking stream in G-Night Firing Course (6 x 4 x 1.5 ft)	293343	4272035
3	Metal trash on surface including cans, bottles, metal wheel frame in C-Demolition Range.	293960	4271580
4	Felled timber in C-Demolition Range.	293963	4271654
5	Circular depression in C-Demolition Range (7 ft diameter and 4 ft deep)	294029	4271590
6	Scattered metal surface debris in C-Demolition Range.	294014	4271606
7	Small depression in C-Demolition Range.	293990	4271596
8	Rusty cans nearby on the ground surface in B-Rifle.	288955	4272489
9	Circular depression in B-Rifle (6 ft diameter and 5 ft deep). Looks like the depression could possibly have been dug out.	288936	4272579
10	Circular depression in B-Rifle (2 ft diameter and 1 ft deep).	289001	4272822
11	Metal surface debris and pile of rocks in B-Rifle.	288931	4272939
12	Mounded area in and around mounds in D-Demolition Range/E-Demolition Range.	294615	4271822
13	MD tentatively identified as an expended 40 mm illumination round (appeared hollow) in D-Demolition Range/E-Demolition Range.	294612	4271782
14	Circular depression in D-Demolition Range/E-Demolition Range (2 ft diameter and 1 ft deep).	294602	4271790
15	Possible bunker or old homestead-foundation, covered well, and large hole with trash in it (glass bottles)	294635	4271842
16	Suspected MD tentatively identified as an expended 40 mm illumination round (appeared hollow) in D-Demolition Range/E-Demolition Range.	294635	4271663
17	Old house foundation, barbed wire nearby, drum downhill near stream in A-Rifle Range.	292846	4272362
18	Bermed area in A-Rifle Range.	293049	4272543
19	Post found in A-Rifle Range.	293056	4272636
20	Steel plate on ground surface (not MD) in F-Fragmentation Grenade Range.	293924	4271402
21	Square metal item on ground surface in F-Fragmentation Grenade Range.	293873	4271406
22	Vehicle debris in F-Fragmentation Grenade Range.	293850	4271405
23	Rope in F-Fragmentation Grenade Range.	293765	4271419
24	License plate in F-Fragmentation Grenade Range.	293758	4271306
25	Three stakes and a flag in F-Fragmentation Grenade Range (possible survey point).	293754	4271346
26	NPS debris in F-Fragmentation Grenade Range.	293850	4271299
27	Posts from former targets in G-Night Firing Course with MD (bullets) embedded.	293753	4271484

Table 4-1 Locations of Site Inspection Reconnaissance Findings/Field Observations.

No.[1]	ITEM	NAD 83, UTM Zone 18 North	
		Easting (m)	Northing (m)
28	Fallen trees found in B-Rifle.	288000	4273031
29	Post with barbed wire in I-Mortar Range.	292638	4273373
30	Small crater in A-Rifle Range.	292708	4272182
31	CO2 cylinder around sample CTT-O1-SS-02-03 in H-Demolition Range.	290615	4272157
32	Old magazine located on Liming Road	292471	4271952
33	Pipe in 1 Acre OB/OD area.	292399	4271434
34	Circular depression in I-Mortar Range (8 ft diameter and 4 ft deep). Suspect demolition pit with metal fragments near outer rim, sides, and bottom of depression.	292349	4273728
35	Circular depression in I-Mortar Range (8 ft diameter and 4 ft deep).	292371	4273730
36	Metal surface trash in I-Mortar Range.	292668	4273686
37	Circular depression in F-Fragmentation Grenade Range (6 ft diameter and 3 ft deep).	293773	4271170
38	Circular depression in F-Fragmentation Grenade Range (6 ft diameter and 3 ft deep).	293763	4271169
39	Suspect concrete bunker in F-Fragmentation Grenade Range.	293708	4271157
40	Dummy/target Gun Mount A in B-Rifle.	288879	4272905
41	Dummy/target Gun Mount B in B-Rifle.	288897	4272873

[1]-Numbers arbitrarily assigned; coincide with field observations on Figures 3-1a through 3-1e.
UTM-Universal Transverse Mercator
NAD-North American Datum
m-meter
No.-Number
Letter designations (e.g. A-Rifle Range) corresponds with ranges identified as “Areas” in the ASR (USACE 1996).

5. MUNITIONS CONSITUENTS SAMPLING AND ANALYSIS

5.0.1 The analytical results for the MC sampling are presented below along with the screening methodology and the results of the screening assessment. Data are provided by MRS and grouped by media within each MRS.

5.1 Data Evaluation Methodology

5.1.1 The following sections present the process used to evaluate the MC data collected for the FUDS. This process is consistent with the decision rules outlined in Section 3.1. Identification/refinement of MC associated with munitions used at the FUDS property is discussed below.

5.1.1 Refinement of Munitions Constituents

5.1.1.1 During the SI process, the Alion Team further evaluated the munitions reportedly used at the site. Research was conducted to refine the specific list of constituents potentially associated with the MRS/range based on munitions reportedly used. Refinement of the MC list is presented in Table 2-2. Samples were analyzed for the full target analyte list of metals and target compound list of explosives in accordance with the approved SS-WP (Alion 2006b). Summary tables are arranged by media and contain the complete analyte lists. ***However, the following discussions are limited to those analytes associated with past munitions used and how these munitions were used (i.e., the full analyte list has been reduced to reflect actual munitions firing conditions and operational procedures). Specifically, based on the range and munitions-related operations, MC from the rifle, machine gun, mortar and rocket ranges are associated with the firing point and the impact area and the fragmentation grenade range impact areas; therefore, the propellant and the projectile/grenade constituents are carried forward in this SI.*** Specific MC associated with the MRS, as presented in Table 2-2, is summarized below:

5.1.1.2 OB/OD No. 3 (MRS 1) / [encompassing C-Demolition Range, D-Demolition Range, E-Demolition Range, H-Demolition Range, and 1-acre OB/OD Area] –

- Explosives (trinitrotoluene [TNT], hexahydro-1,3,5-trinitro-1,3,5-triazine [RDX], 2,4,6-trinitrophenyl-n-methylnitramine [tetryl], pentaerythrite tetranitrate [PETN], octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine [HMX])
- Metals (aluminum, lead)

5.1.1.3 Fragmentation Grenade Range (MRS 2) / [encompassing F-Fragmentation Grenade Range] –

- Explosives (TNT)
- Metals (barium, chromium, iron, lead, nickel)
- Other (perchlorate)

5.1.1.4 Range Complex No. 1 (MRS 3) / [encompassing the Mortar Range 1, rifle range, machine gun range and rocket range, and 20-acre OB/OD area in B-Rifle and Mortar Range 2 and the 4-acre OB/OD area in I-Mortar Range] –

- Explosives (TNT, RDX, tetryl, PETN, HMX, nitroglycerin [NG], and dinitrotoluene [DNT])
- Metals (aluminum, antimony, copper, iron, lead, nickel, and zinc)

5.1.1.5 Range Complex No. 2 (MRS 4) / [encompassing A-Rifle Range and G-Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range] –

- Explosives (NG and DNT)
- Metals (aluminum, antimony, barium, copper, iron, lead, magnesium, nickel, strontium, and zinc)

5.1.1.6 ***Given that the four MRS overlap and munitions usage was shown to have extended beyond the boundaries of the individual MRS areas, the data evaluation performed in Section 5.4 includes a larger list of analytes than was associated with each MRS listed above. Specifically each MRS has been evaluated for the combined list of MC of potential use which includes TNT, RDX, tetryl, PETN, HMX, NG, DNT, aluminum[8], antimony, barium, copper, chromium, iron, magnesium, lead, nickel, strontium, zinc, and perchlorate.*** This measure of conservatism reduces the risk of making recommendations only on the basis of the MRS-specific MC, which is a smaller subset than the list carried forward for analysis and risk screening.

[8] Aluminum, iron, and magnesium are essential nutrients and as such are excluded from further consideration as a chemical of potential concern (COPC) or chemical of potential ecological concern (COPEC). For completeness iron is listed as MC, but it will not be further evaluated. Refer to Section 5.1.3 for additional information regarding the screening process.

5.1.2 Data Quality

5.1.2.1 Only validated data are used in the screening process. All of the samples noted in this bulleted list below have been sampled by Alion, analyzed by GPL Laboratories, and validated using EPA Region III validation guidance:

- 59 surface soil samples (between 0 and 2 ft below ground surface)
- nine surface water samples
- nine sediment samples
- seven groundwater samples
- three background surface soil samples
- two background sediment samples
- two background surface water samples
- duplicate samples

5.1.2.2 The first step in the process of identifying chemicals of potential concern (COPCs) and chemicals of potential environmental concern (COPECs) is the evaluation of analytical data on the basis of qualifiers in each medium of concern. Inclusion or exclusion of data on the basis of analytical qualifiers is performed in accordance with EPA guidance (EPA 1989) and considers the following:

- Analytical results bearing the U or UJ qualifiers (indicating that the analyte was not detected at the given detection limit) are retained in the data set. These are considered a quantitation estimate of the actual concentration based on EPA guidance (USEPA 1989).
- Analytical results bearing the J qualifier (indicating that the reported value was estimated) are retained at the measured concentration.
- Analytical results bearing the K qualifier (indicating that the reported value may be biased high) are retained at the measured concentration.
- Analytical results bearing the L qualifier (indicating that the reported value may be biased low) are retained at the measured concentration.
- Analytical results bearing the B qualifier (indicating the chemical was detected in an associated blank) are retained at the measured concentration if greater than five times the concentration reported for the associated blank or ten times for common laboratory contaminants.

5.1.3 Screening Values

5.1.3.1 Screening for human health COPCs is conducted by comparing maximum detected chemical concentrations to EPA Region III RBCs, as shown in Tables 5-2 though 5-5 (EPA 2007). The complete report of the analytical results and the analytical quality assurance/quality control (QA/QC) report are included in Appendix F and G, respectively. For the human health risk screening, the surface and subsurface soil sample analytical results are compared to residential and industrial soil RBCs (EPA 2007). In accordance with EPA guidance, RBC values used are those at a cancer risk level of $1x10^{-6}$ and a non-cancer hazard quotient (HQ) of 0.1, for the purposes of screening. Sediment sample analytical results are compared to the residential and industrial soil RBCs. The soil RBCs are increased by a factor of ten to account for typical reduced sediment exposures compared to that of soils, based on professional judgment. For groundwater, the tap water RBCs are utilized (EPA 2007). Surface water sample analytical results are compared to the tap water RBCs, which are increased by a factor of ten to account for reduced surface water exposures compared to that of tap water, based on professional judgment.

5.1.3.2 For the ecological risk screening, the surface soil sample results are compared to ecological soil screening levels (ECOSSLs) presented in Table 5-6. If the concentration exceeded the screening value that analyte was retained as a COPEC. The same process was followed for surface water concentrations at Chopawamsic Troop Training Site, using respective screening values shown in Table 5-6. COPEC selection tables for surface water, sediment, and soil are shown in Tables 5-3, 5-4, and 5-5, respectively.

5.1.3.3 Per EPA guidance, the following screening process is utilized.

1. The concentration of each chemical detected in each medium is identified.

2. If the concentration of a specific chemical exceeds its screening value, the chemical is retained as a COPC/COPEC.

3. If a chemical was detected in at least one sample in a specific medium, it is retained for consideration in the screening of COPCs/COPECs.

4. If a screening concentration is not available for a specific chemical in a particular medium, the screening concentration for a structurally similar compound is used, if warranted. The screening tables list any surrogates that are used.

5. An analyte is eliminated from the list of COPCs/COPECs if it is an essential nutrient of low toxicity, and its reported maximum concentration is unlikely to be associated with adverse health impacts. COPCs/COPECs excluded from further consideration on this basis include aluminum, iron, and magnesium.

5.1.4 Comparison of Screening Levels with Detection Limits for Non-detected Analytes

5.1.4.1 Current EPA guidance (EPA 1989, 2001) requires that detection limits be addressed, particularly as related to the screening values used to select COPCs/COPECs. If a chemical is never detected, but the detection limit is higher than the screening value, or there is no screening value, then it may or may not be appropriate to designate the chemical as a COPC/COPEC, depending on whether the chemical is site-related or not. Insufficient information is available in this case to exclude or include the chemical and this would be noted as a source of uncertainty in the risk assessment screening. Tables 5-7 and 5-8 show a comparison of the detection limits and screening values for all analytes in sediment, soil, surface water, and groundwater for those analytes never detected for human health and ecological risk, respectively. All screening values are higher than the detection limits for these analytes, with the exception of NG in groundwater, surface water, and soil. The screening values were recently revised (April 2007) and the revised screening criteria for NG in groundwater are now below the detection limits (Tables 5-2 and 5-7). The new screening values for NG are based on an unknown (and unobtainable) document and reflects an interim value that could be removed at any time. However, because the new screening value is below the detection limit for NG in groundwater the data quality indicator has not been achieved, and this represents a source of uncertainty in the risk screening. The absence of risk in groundwater from other explosives would imply, although not confirm, that risks from explosives due to the consumption of this groundwater with NG are acceptable. As noted, this represents a source of uncertainty. As discussed in 3.5, metals have been reported to the MDL and these are the values shown in Tables 5-7 and 5-8. However, the RL for antimony and lead in surface water are 1 and 2 µg/L, respectively. Antimony human health and ecological screening values are 15 and 30 µg/L, respectively; therefore, the antimony DQI for surface water has been achieved. Lead human health and ecological screening values are 150 and 2.5 µg/L, respectively; therefore, the lead DQI for surface water has been achieved. Where no screening values are available, it is not possible to say whether the available detection limits were sufficient to detect these chemicals at concentrations that may pose risk to ecological receptors.

5.2 CSMs

5.2.1 CSM diagrams were prepared for each MRS for the Chopawamsic Troop Training Site. Each of the four CSMs define the source (e.g., the secondary source/media), interaction (e.g., the secondary release mechanism, the tertiary source, and the exposure route), and human receptors (CSMs are found in Appendix J). The CSMs for each MRS reflect the results of this SI in terms of whether or not there are complete, potentially complete, or incomplete pathways. Complete pathways are noted where the risk screening results indicates a potential risk to the receptor and the MC are above background concentrations (if available).

5.2.2 Current and future potential human receptors for MC are expected to be trespassers/recreational users, construction workers, and site workers as depicted in the CSM diagrams in Appendix J. Both residential and industrial receptor scenarios are evaluated in the human health screening-level risk assessment. The residential scenario was assessed for the protection of current and future recreational users on the FUDS. The industrial scenario is assessed for the protection of construction or other workers that may frequent the FUDS property. The ecological receptors of concern for the four MRSs include terrestrial plant/invertebrates (insects and worms), benthic organisms, aquatic organisms, terrestrial-feeding/predatory animals, terrestrial feeding/predatory birds, aquatic-feeding mammals, and aquatic-feeding birds.

5.2.3 The media of concern for human receptors at the FUDS property are surface soil, surface water, sediment, and groundwater. The media of concern for ecological receptors for each MRS are similar to the media of concern for human health. The exception to this statement is that groundwater is not a medium of concern for ecological receptors.

5.3 Background Data Evaluation

5.3.1 Table 5-1 presents a range of concentrations in the three background soil samples for chemicals detected on-site. A qualitative comparison of the maximum and average FUDS property concentrations was made relative to background samples for the metals associated with past munitions use (including antimony, barium, chromium, copper, lead, nickel, strontium, and zinc) which excludes those essential nutrients called out in Section 5.1.3. The maximum FUDS property concentrations for all of the metals exceeded the background maximum concentration; however, average antimony and nickel FUDS property concentration were less than background concentrations.

5.3.2 A qualitative comparison was made between the range of concentrations for on-site surface water samples and the range of background samples for surface water. The comparison focused on the metals associated with past munitions use at the FUDS property (including antimony, barium, copper, lead, nickel, strontium, and zinc) excluding essential nutrients. Table 5-3 shows the on-site and background sample results. Barium in background surface water samples was noted as exceeding ecological screening criteria. Most sample results were also noted as exceeding screening criteria but were below the range of background concentrations for barium.

5.3.3 A qualitative comparison was made between the range of concentrations for on-site sediment samples and the range of background samples for sediment. The comparison focused on the metals associated with past munitions use at the FUDS property (including antimony, barium, copper, iron, magnesium, lead, nickel, strontium, and zinc). Table 5-4 shows the on-site and background sample results. Most sample results were noted as exceeding the range of background concentrations but were below screening criteria.

5.3.4 Some detected concentrations tentatively identified as COPCs/COPECs in soil are below background concentrations in certain cases. In those cases involving exceedance of screening criteria but not background, weight of evidence is used to determine if those analytes are considered COPECs in a particular MRS. Screening values are by definition very conservative, and often screening values are below commonly occurring background concentrations. This indicates that the screening values are artificially low, and do not represent realistic screening values. Background concentrations of metals are utilized to assess the site if concentrations of metals are similar to background. The weight of evidence thus becomes comparison of site concentrations to both screening values and background before the chemical is labeled a COPEC (or COPC), and the pathway found complete. These instances are documented in the results sections below and conclusions are drawn based on the weight of evidence in each case. The detected background concentrations do not exceed the human health screening criteria.

5.4 OB/OD No. 3 (MRS 1)

5.4.0.1 As presented in Section 5.1.1, due to overlap in MRSs, seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT), 11 metals (aluminum, antimony, barium, chromium, copper, iron, magnesium, lead, nickel, strontium, and zinc), and perchlorate are the MC of interest. As discussed in Section 5.1.3, aluminum, magnesium, and iron are essential nutrients and dropped from consideration/analysis below. Tables 5-2 through 5-5 include a summary of all data including those analytes that are not associated with the munitions used in MRS 1. Sections 5.4.1 through 5.4.3 address any exceedances of the seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT) and eight metals (antimony, barium, chromium, copper, lead, nickel, strontium, and zinc) in MRS 1.

5.4.1 Groundwater Pathway and Screening Results

5.4.1.1 Five wells/springs are located within MRS 1. Three wells currently are out of service and NPS personnel have indicated these will be closed. Two wells are associated with private residences in the southern part of the FUDS. All five wells were viewed as potentially complete pathways in the SS-WP (Alion 2006b). Table 5-2 presents a summary of groundwater sample results for explosives and perchlorate compared to human health screening values (EPA Region III RBCs) by MRS. No MC were detected above the tap water RBCs; therefore, there are no COPCs for groundwater. Based on the groundwater sample results, no source has been identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.4.2 Surface Water and Sediment Pathway and Screening Results

5.4.2.1 Surface water exists in MRS 1 near D-Demolition Range, E-Demolition Range and H-Demolition Range (South Fork River). The surface water pathway was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). Samples were collected from four locations in the river to evaluate the surface water pathway. Table 5-3 presents a summary of surface water sample results compared to human health and ecological screening values for MRS 1. No MC were detected above the adjusted tap water RBC (used for human health screening). Barium was detected above ecological screening criteria in all four samples from MRS 1 and identified as a COPEC. Barium in sample CTT-01-SW-00-01 (45 μg/L) exceeded the ecological screening criteria (4 μg/L) as well as the background barium concentration range (22-27 μg/L). Based on the surface water sample results, the pathway in the CSM is identified as complete for ecological receptors but incomplete for human receptors in this SI Report (no COPCs identified for human receptors).

5.4.2.2 Sediment exists in MRS 1 near D-Demolition Range, E-Demolition Range and H-Demolition Range (South Fork River). The sediment pathway was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). Samples were collected from four locations in the river to evaluate the sediment pathway. Table 5-4 presents a summary of sediment sample results compared to human health and ecological screening values for MRS 1. No MC were detected above the adjusted residential soil RBCs and ecological screening criteria, including the seven explosives and eight metals associated with munitions use in this MRS. Based on the sediment sample results, no sediment COPCs/COPECs were identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.4.3 Terrestrial Pathway and Screening Results

5.4.3.1 The FUDS property contains natural barriers to include lush vegetation, mature forests and very rugged terrain. However, surface soil in MRS 1 was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). A total of 19 soil samples were collected from C-Demolition Range, D-Demolition Range, E-Demolition Range, H-Demolition Range, the 1-acre OB/OD area, and other areas within MRS 1. Table 5-5 presents a summary of soil sample results compared to human health screening values (residential and industrial) and ecological screening criteria for MRS 1. No MC were detected above the human health screening criteria (residential or industrial RBCs) for soil, including the seven explosives and eight metals associated with munitions use in this MRS. Based on the surface soil sample results, no COPC were identified; therefore, the pathway in the CSM is identified as incomplete for human receptors in this SI Report.

5.4.3.2 Antimony, copper, lead, nickel, and zinc were reported in surface soil samples as exceeding ecological screening criteria and identified as COPECs for MRS 1. The range of background concentrations (minimum to maximum) at the FUDS exceeds the ecological screening criteria for lead and antimony. Detections of antimony are between the MDL and RL; therefore, there is a higher level of uncertainty with these concentrations. The lead concentrations are all above RL and have less associated uncertainty. The range of background concentrations for copper, nickel, and zinc are below the screening criteria. The two exceedances for copper (55 and 64 mg/kg) and the single exceedance for nickel (41 mg/kg) are close to the screening criteria (28 and 38 mg/kg for copper and nickel, respectively) and exceed the maximum background soil concentration of 23 and 22 mg/kg for copper and nickel, respectively. Lead, zinc, and antimony in surface soil at MRS 1 exceeded both screening criteria and background. Based on the sample results, antimony, copper, lead, nickel, and zinc were identified as COPECs; therefore, the ecological pathway in the CSM is identified as complete in this MRS for the SI Report.

5.4.4 Air Pathway

5.4.4.1 The air migration pathway for MRS 1 has an extremely low potential, if any, for human and/or environmental receptors to come into contact with the analytes detected in surface soil (metals and explosives) because of the vegetative cover.

5.5 Fragmentation Grenade Range (MRS 2)

5.5.0.1 As presented in Section 5.1.1, due to overlap in MRSs, seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT), 11 metals (aluminum, antimony, barium, chromium, copper, iron, magnesium, lead, nickel, strontium, and zinc), and perchlorate are the MC of interest. As discussed in Section 5.1.3, aluminum, magnesium, and iron are essential nutrients and dropped from consideration/analysis below. Tables 5-2 through 5-5 include a summary of all data including those analytes that are not associated with the munitions used in MRS 2. Sections 5.5.1 through 5.5.3 address any exceedances of the seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT) and eight metals (antimony, barium, chromium, copper, lead, nickel, strontium, and zinc) in MRS 2.

5.5.1 Groundwater Pathway and Screening Results

5.5.1.1 Groundwater was not considered a potentially complete pathway in the SS-WP (Alion 2006b) as there are no groundwater wells or groundwater usage in MRS 2. No groundwater sampling was conducted in this MRS. No source has been identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.5.2 Surface Water and Sediment Pathway and Screening Results

5.5.2.1 Surface water and sediment were not considered as potentially complete pathways for MC for MRS 2 in the SS-WP (Alion 2006b). No surface water or sediment sampling was conducted in this MRS. No source has been identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.5.3 Terrestrial Pathway and Screening Results

5.5.3.1 The FUDS property contains natural barriers to include lush vegetation, mature trees, and very rugged terrain. However, surface soil in MRS 2 was viewed as a potentially complete pathway for human and ecological receptors for MC in the presentation of the CSM in the work plan. A total of three surface soil samples were collected from MRS 2. Table 5-5 presents a summary of soil sample results compared to human health screening values (residential and industrial) and ecological screening criteria for MRS 2. With the exception of chromium, no MC, including the seven explosives and eight metals associated with munitions use at this MRS, were detected above the human health screening criteria (residential or industrial RBCs) for soil. Chromium concentrations at MRS 2 range from 15 to 31 mg/kg, which are within the background chromium range of 4 to 71 mg/kg. Based on the surface soil sample results, no COPCs were identified for human receptors; therefore, the pathway in the CSM is identified as incomplete for human receptors in this SI Report.

5.5.3.2 Antimony, copper, lead, and zinc were reported in surface soil samples as exceeding ecological screening criteria at MRS 2. Antimony exceeds the ecological screening criteria for antimony results at MRS 2 but the concentrations are below background ranges; therefore, antimony is not considered a COPEC. Detections of antimony are between the MDL and RL; therefore, there is a higher level of uncertainty with these concentrations. Copper, lead, and zinc results from MRS 2 exceeded both the ecological screening values and background concentrations. Based on the sample results, COPECs identified at MRS 2 include copper, lead, and zinc, and COPECs were identified; therefore, the ecological pathway in the CSM is identified as complete in this SI Report.

5.5.4 Air Pathway

5.5.4.1 The air migration pathway for MRS 2 has an extremely low potential, if any, for human and/or environmental receptors to come into contact with the analytes detected in surface soil (metals and explosives) because of the vegetative cover.

5.6 Range Complex No. 1 (MRS 3)

5.6.0.1 As presented in Section 5.1.1, due to overlap in MRSs, seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT), 11 metals (aluminum, antimony, barium, chromium, copper, iron, magnesium, lead, nickel, strontium, and zinc), and perchlorate are the MC of interest. As discussed in Section 5.1.3, aluminum, magnesium, and iron are essential nutrients and dropped from consideration/analysis below. Tables 5-2 through 5-5 include a summary of all data including those analytes that are not associated with the munitions used in MRS 3. Sections 5.6.1 through 5.6.3 address any exceedances of the seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT) and eight metals (antimony, barium, chromium, copper, lead, nickel, strontium, and zinc) in MRS 3.

5.6.1 Groundwater Pathway and Screening Results

5.6.1.1 Two wells/springs are located within MRS 3. These wells currently are out of service and NPS personnel have indicated these will be closed. Both wells were viewed as potentially complete pathways in the presentation of the CSM in the SS-WP (Alion 2006b). Table 5-2 presents a summary of groundwater sample results compared to human health screening values (EPA Region III tap water RBCs) by MRS. Table 5-2 presents a summary of groundwater sample results for explosives and perchlorate compared to human health screening values (EPA Region III RBCs) by MRS. No MC were detected in MRS 3 groundwater; therefore, there are no COPCs for groundwater in this MRS. Based on the groundwater sample results, no source has been identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.6.2 Surface Water and Sediment Pathway and Screening Results

5.6.2.1 Surface water exists in MRS 3 near B-Rifle (South Fork River). The surface water pathway was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). Samples were collected from two locations in the South Fork River to evaluate the pathway. Table 5-3 presents a summary of surface water sample results compared to human health and ecological screening values for MRS 3. Barium was detected above ecological screening criteria in both samples from MRS 3. Barium concentrations in surface water at MRS 3 were within the range of background barium concentrations (minimum to maximum); therefore the results are not considered significant. No additional MC were detected above the ecological screening criteria; therefore, there were no surface water COPECs identified for MRS 3. No MC were detected above the adjusted tap water RBC (human health screening criteria); therefore, no surface water COPCs identified for MRS 3. Based on the surface water sample results, the pathway in the CSM is identified as incomplete for both human and ecological receptors in this SI Report (no COPCs or COPECs identified).

5.6.2.2 Sediment exists in MRS 3 near B-Rifle (South Fork River). The sediment pathway was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). Samples were collected from two locations in the river to evaluate the sediment pathway. Table 5-4 presents a summary of sediment sample results compared to human health and ecological screening values for MRS 3. No MC, including the seven explosives and eight metals associated with munitions use at this MRS, were detected above the human health screening criteria (consisting of adjusted residential soil RBCs) or the ecological screening criteria. Based on the sediment sample results, no sediment COPCs/COPECs were identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.6.3 Terrestrial Pathway and Screening Results

5.6.3.1 The FUDS property contains natural barriers to include lush vegetation, mature trees, and very rugged terrain. However, surface soil in MRS 3 was viewed as a potentially complete pathway for human and ecological receptors for MC in the presentation of the CSM in the work plan. A total of 23 surface soil samples were collected from MRS 3 (specifically B-Rifle and I-Mortar Range). Table 5-5 presents a summary of soil sample results compared to human health screening values (residential and industrial criteria) and ecological screening criteria for MRS 3. No MC, including the seven explosives and eight metals associated with munitions use at this MRS, were detected above the human health screening criteria (residential or industrial RBCs) for soil. Based on the surface soil sample results, no COPCs were identified for human receptors; therefore, the pathway in the CSM is identified as incomplete for human receptors in this SI Report.

5.6.3.2 Antimony, copper, lead, and zinc were reported in surface soil samples as exceeding ecological screening criteria. Antimony concentrations at MRS 3 do not exceed the range of background concentrations for the FUDS property; therefore, these results are not considered significant. Detections of antimony are between the MDL and RL; therefore, there is a higher level of uncertainty with these concentrations. In addition to exceeding ecological screening values, copper, lead, and zinc concentrations in soil at MRS 3 exceed the range of background concentrations (minimum to maximum). Consequently copper, lead and zinc are identified as COPECs and the ecological pathway in the CSM is identified as complete in this SI Report.

5.6.4 Air Pathway

5.6.4.1 The air migration pathway for MRS 3 has an extremely low potential, if any, for human and/or environmental receptors to come into contact with the analytes detected in surface soil (metals and explosives) because of the vegetative cover.

5.7 Range Complex No. 2 (MRS 4)

5.7.0.1 As presented in Section 5.1.1, due to overlap in MRSs, seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT), 11 metals (aluminum, antimony, barium, chromium, copper, iron, magnesium, lead, nickel, strontium, and zinc), and perchlorate are the MC of interest. As discussed in Section 5.1.3, aluminum, magnesium, and iron are essential nutrients and dropped from consideration/analysis below. Tables 5-2 through 5-5 include a summary of all data including those analytes that are not associated with the munitions used in MRS 4. Sections 5.7.1 through 5.7.3 address any exceedances of the seven explosives (TNT, RDX, tetryl, PETN, HMX, NG, and DNT) and eight metals (antimony, barium, chromium, copper, lead, nickel, strontium, and zinc) in MRS 4.

5.7.1 Groundwater Pathway and Screening Results

5.7.1.1 Groundwater was not considered a potentially complete pathway in the SS-WP (Alion 2006b). No groundwater sampling was conducted in this MRS. No source has been identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.7.2 Surface Water and Sediment Pathway and Screening Results

5.7.2.1 Surface water exists in MRS 4 near A-Rifle Range and G-Night Firing Course (Taylor Farm Run). The surface water pathway was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). Samples were collected from three locations in the stream/run to evaluate the pathway. Table 5-3 presents a summary of surface water sample results compared to human health and ecological screening values for MRS 4. Only one MC, barium, was detected above ecological screening criteria in all three samples collected from MRS 4; however, site concentrations were within the range of background concentrations and therefore barium has not been designated as a COPEC. No MC were detected above the adjusted tap water RBC (human health screening criteria); therefore, no surface water COPCs identified for MRS 4. Based on the surface water sample results, the pathway in the CSM is identified as incomplete for human and ecological receptors in this SI Report.

5.7.2.2 Sediment exists in MRS 4 near A-Rifle Range and G-Night Firing Course (Taylor Farm Run). The sediment pathway was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). Samples were collected from three locations in the stream/run to evaluate the sediment pathway. Table 5-4 presents a summary of sediment sample results compared to human health and ecological screening values for MRS 4. No MC, including the seven explosives and eight metals associated with munitions use at this MRS, were detected above the adjusted residential soil RBCs and ecological screening criteria; therefore, no sediment COPCs/COPECs were identified for MRS 4. Based on the sediment sample results, no sediment COPCs/COPECs were identified; therefore, the pathway in the CSM is identified as incomplete in this SI Report.

5.7.3 Terrestrial Pathway and Screening Results

5.7.3.1 The FUDS property contains natural barriers to include lush vegetation and very rugged terrain. However, surface soil in MRS 4 was viewed as a potentially complete pathway for human and ecological receptors for MC in the SS-WP (Alion 2006b). A total of 14 surface soil samples were collected from A-Rifle Range and G-Night Firing Course. Table 5-5 presents a summary of soil sample results compared to human health screening values (residential and industrial) and ecological screening criteria for MRS 4. Lead was detected above the human health screening criteria (residential) for soil. Lead does not exceed the industrial criteria of 1,000 milligrams per kilogram (mg/kg). Copper was identified as exceeding human health screening criteria. In addition, concentrations of copper and lead at MRS 4 exceed concentrations found in background samples. Based on the sample results, COPCs (copper and lead) were identified; therefore, the human health pathway in the CSM is identified as complete in this SI Report.

5.7.3.2 Antimony, barium, copper, lead, and zinc were reported in surface soil samples at concentrations exceeding ecological screening criteria at MRS 4. Other than antimony, concentrations of these metals at MRS 4 also exceeded concentrations found in background. Consequently, barium, copper, lead, and zinc are identified as COPEC in surface soil and the ecological pathway in the CSM is identified as complete in this SI Report for these metals.

5.7.4 Air Pathway

5.7.4.1 The air migration pathway for MRS 3 has an extremely low potential, if any, for human and/or environmental receptors to come into contact with the analytes detected in surface soil (metals and explosives) because of the vegetative cover.

TABLE 5-1
COMPARISON OF ON-SITE AND BACKGROUND SURFACE SOIL CONCENTRATIONS (mg/kg)
CHOPAWAMSIC TROOP TRAINING MMRP FUDS SITE

	On-site				Background				Comparisons	
Chemical	**Minimum Concentration/ Qualifier**	**Maximum Concentration/ Qualifier**	**Mean Concentration**	**Detection Frequency**	**Minimum Concentration/ Qualifier**	**Maximum Concentration/ Qualifier**	**Mean Concentration**	**Detection Frequency**	**Site Maximum > Background Maximum**	**Site Mean > Background Mean**
ALUMINUM	4680	39100	14000	68/68	2770	27300	12000	3/3	Yes	Yes
ANTIMONY	0.17 UL	2.4 L	0.40	15/64	0.3 B	0.79 B	0.54	0/3	Yes	No
ARSENIC	1.1 J/J/B	4.3	2.42	53/68	1.6 J	4.4	2.60	3/3	No	No
BARIUM	23.8	467	93.6	68/68	27.8	149	70.5	3/3	Yes	Yes
BERYLLIUM	0.16 J	1.6	0.60	67/68	0.15 J	0.95	0.47	3/3	Yes	Yes
CADMIUM	0.016 U	1.6	0.13	11/68	0.028 U	0.033 U	0.03	0/3	Yes	Yes
CALCIUM	54.9 B	5000	1430	65/68	75.3 B	1020 K	451	2/3	Yes	Yes
CHROMIUM	5.7	165	29	68/68	4.3	70.9	37.1	3/3	Yes	No
COBALT	0.81	40.7	8.98	68/68	0.49 B	13.6	6.40	2/3	Yes	Yes
COPPER	4	605	38.3	68/68	2.6	23	13.0	3/3	Yes	Yes
IRON	4710	53500	21500	68/68	3600	31100	18000	3/3	Yes	Yes
LEAD	9.6	478	34	68/68	12.2	27.4	19.3	3/3	Yes	Yes
MAGNESIUM	190	12300 K	2260	68/68	154	6440	2280	3/3	Yes	No
MANGANESE	19.2	3680	600	68/68	11.4	325	152	3/3	Yes	Yes
MERCURY	0.03 J	0.26	0.08	60/68	0.026 J	0.088	0.05	3/3	Yes	Yes
MOLYBDENUM	0.11 B	2.9	0.61	5/68	0.37 B	0.71 B	0.59	0/3	Yes	Yes
NICKEL	1.6	40.6	10.10	68/68	0.97	21.9	10.2	3/3	Yes	No
POTASSIUM	254	4770 K	863	68/68	153	3520	1390	3/3	Yes	No
SELENIUM	0.19 U	1.5 J	0.55	23/68	0.41 B	0.88 B	0.69	0/3	Yes	No
SILVER	0.044 U	0.38 J	0.10	1/68	0.11 U/U	0.13 U	0.12	0/3	Yes	No
SODIUM	25.8 B	299 B	86.0	8/68	26.1 B	61.5 B	42.8	0/3	Yes	Yes
STRONTIUM	1.5	40.1	9.79	68/68	2	9.9	5.07	3/3	Yes	Yes
THALLIUM	0.28 U	1.6 J	0.69	10/68	0.27 U	1.2 B	0.62	0/3	Yes	Yes
TITANIUM	87.9	1140	301	68/68	67	564	242	3/3	Yes	Yes
VANADIUM	15.2	130	44.2	68/68	13.1	70.9	35.3	3/3	Yes	Yes
ZINC	9.8	2290	87	68/68	10.8	48.8	27.3	3/3	Yes	Yes
ZIRCONIUM	2.3 J	53.3	24.6	68/68	12.7 L	29.2	21.1	3/3	Yes	Yes

Qualifiers:

B = Value is less than the reporting limit (RL) but greater than the method detection limit (MDL).

J = Analyte is present. Reported value may not be accurate or precise.

K = Reported value may be biased high.

L = Reported value may be biased low.

U = Not detected. The associated number indicates the approximate sample concentration necessary to be detected.

Yellow shaded analytes are those constituents associated with past munitions use.

Table 5-2 Summary of Groundwater Analytical Results

		Sample Name:	EPA Region III RBC Screening Value [1]	CTT-02-GW-00-01	CTT-03-GW-00-01	CTT-03-GW-00-02	FIELD DUP 4	CTT-03-GW-00-03	CTT-03-GW-00-04	FIELD DUP 1	CTT-M2-GW-00-01	CTT-M2-GW-00-02
		Sample Date:		8/16/2006	8/16/2006	8/15/2006	8/15/2006	11/28/2006	11/28/2006	11/28/2006	8/15/2006	8/15/2006
		Parent Name:					CTT-03-GW-00-02			CTT-03-GW-00-04		
		MRS:		MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 3	MRS 3
Analyte	**CAS**	**Unit**										
Explosives												
1,3,5-TRINITROBENZENE	99-35-4	ug/L	110	0.21 UL	0.24 UL	0.21 UL	0.2 U	0.2 U	0.21 U	0.2 U	0.21 U	0.2 U
1,3-DINITROBENZENE	99-65-0	ug/L	0.37	0.21 U	0.24 U	0.21 U	0.2 U	0.2 U	0.21 U	0.2 U	0.21 U	0.2 U
2,4-DINITROTOLUENE	121-14-2	ug/L	7.3	0.21 U	0.24 U	0.21 UL	0.2 U	0.2 U	0.21 U	0.2 U	0.21 U	0.2 U
2,6-DINITROTOLUENE	606-20-2	ug/L	3.7	0.21 U	0.24 U	0.21 U	0.2 U	0.2 U	0.21 U	0.2 U	0.21 U	0.2 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	ug/L	7.3	0.21 U	0.24 U	0.21 U	0.2 U	0.2 U	0.21 U	0.2 U	0.21 U	0.2 U
2-NITROTOLUENE	88-72-2	ug/L	6.1	0.42 U	0.47 U	0.42 U	0.41 U	0.41 U	0.42 U	0.41 U	0.42 U	0.4 U
3-NITROTOLUENE	99-08-1	ug/L	NA	0.42 U	0.47 U	0.42 U	0.41 U	0.41 U	0.42 U	0.41 U	0.42 U	0.4 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	ug/L	7.3	0.21 U	0.24 U	0.21 U	0.2 U	0.2 U	0.21 U	0.2 U	0.21 U	0.2 U
4-NITROTOLUENE	99-99-0	ug/L	NA	0.42 U	0.47 U	0.42 U	0.41 U	0.41 U	0.42 U	0.41 U	0.42 U	0.4 U
HMX	2691-41-0	ug/L	180	0.42 UL	0.47 UL	0.42 UL	0.41 UL	0.41 U	0.42 U	0.41 U	0.42 UL	0.4 UL
NITROBENZENE	98-95-3	ug/L	0.35	0.21 U	0.24 U	0.21 U	0.2 U	0.19 J	0.11 J	0.22 J	0.21 U	0.2 U
NITROGLYCERIN	55-63-0	ug/L	0.37	21 U	24 U	21 U	20 U	20 U	21 U	20 U	21 U	20 U
PERCHLORATE	14797-73-0	ug/L	24	0.200 U	0.200 U	0.200 U	0.0872 J	1.91	0.200 U	0.200 U	0.200 U	0.200 U
PETN	78-11-5	ug/L	NA	1.1 U	1.2 U	1.1 U	1 U	1 U	1.1 U	1 U	1 U	1 U
RDX	121-82-4	ug/L	0.61	0.42 U	0.47 U	0.42 U	0.41 U	0.41 U	0.42 U	0.41 U	0.42 U	0.4 U
TETRYL	479-45-8	ug/L	15	0.42 U	0.47 U	0.42 U	0.41 U	0.41 U	0.42 U	0.41 U	0.42 U	0.4 U
TNT	118-96-7	ug/L	2.2	0.21 UL	0.24 UL	0.21 U	0.2 U	0.2 U	0.21 U	0.2 U	0.21 U	0.2 U

(1) USEPA Region III Risk Based (RBCs) Table, April 2007.   For non-carcinogens, value shown is equal to 1/10 the tap water RBC value. For carcinogens the value shown is equal to the tap water RBC value. The two exceptions are perchlorate, in which the DoD action level was used (DoD 2006), and lead, which is lead MCL was used.

Notes:
Blue shaded and bolded values represent exceedance of human health screening criteria.
Yellow shaded analytes are those constituents associated with past munitions use.

GW=ground water
J=Analyte is present. Reported value may not be accurate or precise.
U=Not detected. Associated number indicates approximate sample concentration necessary to be detected.
UL=Not detected, quantitation limit is probably higher
µg/L=micrograms per liter
CAS=Chemical Abstract Service
NA=not available

Analyte	CAS	Unit	EPA Region III RBC Screening Value (1)	Ecological Screening Values (2)	CTT-01-SW-00-01	CTT-01-SW-00-03	CTT-03-SW-00-01	CTT-03-SW-00-02	CTT-M2-SW-00-01	FIELD DUP 4	CTT-RR-SW-00-01	CTT-PR-SW-00-01	CTT-PR-SW-00-02	CTT-R2-SW-00-01
Sample Date:					8/16/2006	8/16/2006	8/17/2006	8/17/2006	11/30/2006	11/30/2006	11/30/2006	8/15/2006	8/15/2006	8/14/2006
Parent Name:										CTT-M2-SW-00-01				
MRS:					MRS 1	MRS 1	MRS 1	MRS 1	MRS 3	MRS 3	MRS 3	MRS 4	MRS 4	MRS 4
Explosives														
1,3,5-TRINITROBENZENE	99-35-4	ug/L	1100	11	0.24 UL	0.22 UL	0.24 UL	0.21 UL	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
1,3-DINITROBENZENE	99-65-0	ug/L	3.7	20	0.24 U	0.22 U	0.24 U	0.21 U	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
2,4-DINITROTOLUENE	121-14-2	ug/L	73	310	0.24 U	0.22 U	0.24 U	0.21 U	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
2,6-DINITROTOLUENE	606-20-2	ug/L	37	81	0.24 U	0.22 U	0.24 U	0.21 U	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	ug/L	73	20	0.24 U	0.22 U	0.24 U	0.21 U	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
2-NITROTOLUENE	88-72-2	ug/L	61	750	0.47 U	0.44 U	0.47 U	0.42 U	0.41 U	0.41 U	0.4 U	0.41 U	0.42 U	0.42 U
3-NITROTOLUENE	99-08-1	ug/L	NA	750	0.47 U	0.44 U	0.47 U	0.42 U	0.41 U	0.41 U	0.4 U	0.41 U	0.42 U	0.42 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	ug/L	73	NA	0.24 U	0.22 U	0.24 U	0.21 U	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
4-NITROTOLUENE	99-99-0	ug/L	NA	1,900	0.47 U	0.44 U	0.47 U	0.42 U	0.41 U	0.41 U	0.4 U	0.41 U	0.42 U	0.42 U
HMX	2691-41-0	ug/L	1800	330	0.47 UL	0.44 UL	0.47 UL	0.42 UL	0.41 U	0.41 U	0.4 U	0.41 UL	0.42 UL	0.42 UL
NITROBENZENE	98-95-3	ug/L	3.5	6,680	0.24 U	0.22 U	0.24 U	0.21 U	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
NITROGLYCERIN	55-63-0	ug/L	3.7	138	24 U	22 U	24 U	21 U	21 U	20 U	20 U	21 U	21 U	21 U
PETN	78-11-5	ug/L	NA	85,000	1.2 U	1.1 U	1.2 U	1.1 U	1 U	1 U	1 U	1 U	1.1 U	1.1 U
RDX	121-82-4	ug/L	6.1	190	0.47 U	0.44 U	0.47 U	0.42 U	0.41 U	0.41 U	0.4 U	0.41 U	0.42 U	0.42 U
TETRYL	479-45-8	ug/L	150	NA	0.47 U	0.44 U	0.47 U	0.42 U	0.41 U	0.41 U	0.4 U	0.41 U	0.42 U	0.42 U
TNT	118-96-7	ug/L	22	90	0.24 UL	0.22 UL	0.24 UL	0.21 UL	0.21 U	0.2 U	0.2 U	0.21 U	0.21 U	0.21 U
Metals														
ALUMINUM	7429-90-5	ug/L	37000	87	111	22.8 J	22.8 J	105	55.4 B	65.6 B	111 B	143	60.6 J	26.7 J
ANTIMONY	7440-36-0	ug/L	15	30	0.19 B	0.12 U	0.12 U	0.14 B	0.12 U	0.12 U	0.12 U	0.22 B	1 B	0.24 B
ARSENIC	7440-38-2	ug/L	0.45	5	0.8 UL	0.8 UL	0.8 UL	0.8 UL	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
BARIUM	7440-39-3	ug/L	7300	4	*44.7*	*14.6*	*22.6*	*18.3*	*25.4*	*25.7*	*18.1*	*17.8*	*18*	*14.2*
BERYLLIUM	7440-41-7	ug/L	73	0.66	0.028 U	0.028 U	0.028 U	0.028 U	0.048 J	0.036 J	0.054 J	0.028 U	0.028 U	0.028 U
CADMIUM	7440-43-9	ug/L	37	0.25	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
CALCIUM	7440-70-2	ug/L	NA	NA	4070	3600	4840	4550	2790	3040	1100	4090	4110	3490
CHROMIUM	7440-47-3	ug/L	110	74	1.8 UL	1.8 UL	1.8 UL	1.8 UL	1.8 U	1.8 U	1.9 J	1.8 U	1.8 U	1.8 U
COBALT	7440-48-4	ug/L	NA	23	1.9	0.14 B	0.13 J	0.11 J	0.64 B	0.46 B	0.47 B	0.11 J	0.12 J	0.11 J
COPPER	7440-50-8	ug/L	1500	9	0.95 J	1.1 J	0.97 J	0.94 J	1.7 J	1.7 J	1.1 J	0.98 J	1.2 J	0.99 J
IRON	7439-89-6	ug/L	26000	NA	1030	786	44.9 B	92.5 B	360	255	221 B	167	78.4 L	280
LEAD	7439-92-1	ug/L	150	2.5	0.34 U	0.34 U	0.34 U	0.34 U	0.64 B	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
MAGNESIUM	7439-95-4	ug/L	NA	NA	1680	1530	2020	1920	1400	1420	648	1670	1670	1480
MANGANESE	7439-96-5	ug/L	730	120	***964***	45.4	29.5	21	72.2	70	79.1	24.6	25	20.8
MERCURY	7439-97-6	ug/L	3.7	0.77	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U	0.034 U
MOLYBDENUM	7439-98-7	ug/L	180	370	0.23 U	0.23 U	0.23 U	0.23 U	0.32 J	0.23 U	0.23 U	0.23 J	0.23 J	0.23 U
NICKEL	7440-02-0	ug/L	730	52	1.3	0.9 J	0.81 J	0.69 J	1.8	2.2	1.2	0.58 J	0.61 J	0.68 J
POTASSIUM	7440-09-7	ug/L	NA	NA	1190	1150	1400	1440	760 J	760 J	804 J	1290	1280	1170
SELENIUM	7782-49-2	ug/L	180	5	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.63 J
SILVER	7440-22-4	ug/L	180	3.2	0.023 U	0.023 U	0.023 U	0.029 B	0.042 B	0.023 U	0.023 U	0.023 U	0.023 U	0.023 U
SODIUM	7440-23-5	ug/L	NA	NA	4060	3830	3980	4030	3750	3840	1920	4050	4070	3940
STRONTIUM	7440-24-6	ug/L	22000	1500	34.9	30	32	29.6	20.4	20.8	9.3	31.2	30.9	28.6
THALLIUM	7440-28-0	ug/L	2.6	NA	0.17 U	0.17 U	0.17 U	0.17 U	0.17 B	0.17 U	0.17 U	0.17 U	0.17 U	0.28 B
TITANIUM	7440-32-6	ug/L	NA	NA	4	2 U	2 U	2.3	2.7	2.1	3.8	3.4	2.4	2.9
VANADIUM	7440-62-2	ug/L	37	19	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U	3.2 U
ZINC	7440-66-6	ug/L	11000	120	7.3 B	11.3 B	8.8 B	6.9 B	15.7 B	21.2 N	10.3 B	6.8 B	5.7 B	5.3 B
ZIRCONIUM	7440-67-7	ug/L	NA	17	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 U	2.4 UL	2.4 UL	2.4 UL

		Sample Name:	EPA Region III RBC Screening Value (1)	Ecological Screening Values (2)	CTT-BG-SW-00-01	FIELD DUP 7	CTT-BG-SW-00-02
		Sample Date:			8/18/2006	8/18/2006	8/18/2006
		Parent Name:				CTT-BG-SW-00-01	
		MRS:					
Analyte	**CAS**	**Unit**					
Explosives							
1,3,5-TRINITROBENZENE	99-35-4	ug/L	1100	11	-	-	-
1,3-DINITROBENZENE	99-65-0	ug/L	3.7	20	-	-	-
2,4-DINITROTOLUENE	121-14-2	ug/L	73	310	-	-	-
2,6-DINITROTOLUENE	606-20-2	ug/L	37	81	-	-	-
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	ug/L	73	20	-	-	-
2-NITROTOLUENE	88-72-2	ug/L	61	750	-	-	-
3-NITROTOLUENE	99-08-1	ug/L	NA	750	-	-	-
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	ug/L	73	NA	-	-	-
4-NITROTOLUENE	99-99-0	ug/L	NA	1,900	-	-	-
HMX	2691-41-0	ug/L	1800	330	-	-	-
NITROBENZENE	98-95-3	ug/L	3.5	6,680	-	-	-
NITROGLYCERIN	55-63-0	ug/L	3.7	138	-	-	-
PETN	78-11-5	ug/L	NA	85,000	-	-	-
RDX	121-82-4	ug/L	6.1	190	-	-	-
TETRYL	479-45-8	ug/L	150	NA	-	-	-
TNT	118-96-7	ug/L	22	90	-	-	-
Metals							
ALUMINUM	7429-90-5	ug/L	37000	87	85.4 J	210	75.5 J
ANTIMONY	7440-36-0	ug/L	15	30	0.26 B	0.17 B	0.12 U
ARSENIC	7440-38-2	ug/L	0.45	5	0.8 UL	0.8 UL	0.8 UL
BARIUM	7440-39-3	ug/L	7300	4	*24.2*	*26.8*	*22.1*
BERYLLIUM	7440-41-7	ug/L	73	0.66	0.028 U	0.028 U	0.028 U
CADMIUM	7440-43-9	ug/L	37	0.25	0.11 U	0.11 U	0.11 U
CALCIUM	7440-70-2	ug/L	NA	NA	5990	4550	4390
CHROMIUM	7440-47-3	ug/L	110	74	1.8 UL	1.8 UL	1.8 UL
COBALT	7440-48-4	ug/L	NA	23	0.78 J	0.45 J	0.39 J
COPPER	7440-50-8	ug/L	1500	9	0.92 U	1.1 J	0.92 U
IRON	7439-89-6	ug/L	26000	NA	127 B	432	642
LEAD	7439-92-1	ug/L	150	2.5	0.34 U	0.34 U	0.34 U
MAGNESIUM	7439-95-4	ug/L	NA	NA	2050	2080	2060
MANGANESE	7439-96-5	ug/L	730	120	*182*	83.5	72.1
MERCURY	7439-97-6	ug/L	3.7	0.77	0.034 U	0.034 U	0.034 U
MOLYBDENUM	7439-98-7	ug/L	180	370	0.23 U	0.23 U	0.23 U
NICKEL	7440-02-0	ug/L	730	52	0.9 J	0.82 J	0.73 J
POTASSIUM	7440-09-7	ug/L	NA	NA	1050	1060	1030
SELENIUM	7782-49-2	ug/L	180	5	0.59 U	0.59 U	0.59 U
SILVER	7440-22-4	ug/L	180	3.2	0.023 U	0.023 U	0.045 B
SODIUM	7440-23-5	ug/L	NA	NA	8680	5380	5360
STRONTIUM	7440-24-6	ug/L	22000	1500	44.6	35.9	33.8
THALLIUM	7440-28-0	ug/L	2.6	NA	0.17 U	0.18 B	0.17 U
TITANIUM	7440-32-6	ug/L	NA	NA	4	6.1	3
VANADIUM	7440-62-2	ug/L	37	19	3.2 U	3.2 U	3.2 U
ZINC	7440-66-6	ug/L	11000	120	4.4 B	7.6 B	4.5 B
ZIRCONIUM	7440-67-7	ug/L	NA	17	2.4 U	2.4 U	2.4 U

(1) USEPA Region III Risk-Based (RBCs) Table, April 2007.
For non-carcinogens, value shown is equal to 1/10 the tap water RBC value.
For carcinogens the value shown is equal to the tap water RBC value. To account for surface water exposures, the resulting values have been increased by a factor of ten.
The only exception is lead, in which the MCL was used.
(2) Ecological Screening Value refernces are found in Table 5-6.

Notes:
Blue shaded and bolded values represent exceedance of human health screening criteria.
Blue shaded and italicized values represent exceedance of ecological screening criteria.
Blue shaded, bolded and italicized values represent exceedance of both human health and ecological screening criteria.
Yellow shaded analytes are those constituents associated with past munitions use.

Qualifiers:
B=Not detected substantially above the level reported in the laboratory field blanks.
J = Analyte is present. Reported value may not be accurate or precise.
K = Reported value may be biased high.
L = Reported value may be biased low.
U = Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
BG=background sample
SW=surface water

Table 5-4 Summary of Sediment Analytical Results

Sample Name:			EPA Region III RBC Residential Screening Value (1)	EPA Region III RBC Industrial Screening Value (2)	Ecological Screening Values (3)	CTT-01-SD-02-01	CTT-01-SD-02-03	CTT-03-SD-02-01	CTT-03-SD-02-02	CTT-M2-SD-02-01	CTT-RR-SD-02-01	CTT-PR-SD-02-01	CTT-PR-SD-02-02	CTT-R2-SD-02-01	CTT-BG-SD-02-01	CTT-BG-SD-02-02
Sample Date:						8/16/2006	8/16/2006	8/17/2006	8/17/2006	11/30/2006	11/30/2006	8/15/2006	8/15/2006	8/14/2006	8/18/2006	8/18/2006
Parent Name:																
MRS:						MRS 1	MRS 1	MRS 1	MRS 1	MRS 3	MRS 3	MRS 4	MRS 4	MRS 4		
Analyte	**CAS**	**Unit**														
Explosives																
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	2300	31000	2659	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	-	-
1,3-DINITROBENZENE	99-65-0	mg/kg	7.8	100	371	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	-	-
2,4-DINITROTOLUENE	121-14-2	mg/kg	160	2000	0.0416	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	-	-
2,6-DINITROTOLUENE	606-20-2	mg/kg	78	1000	0.0416	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	-	-
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	160	2000	876	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	-	-
2-NITROTOLUENE	88-72-2	mg/kg	780	10000	4.06	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	-	-
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	4.06	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	-	-
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	160	2000	444	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	-	-
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	4.06	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	-	-
HMX	2691-41-0	mg/kg	3900	51000	2.17	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	-	-
NITROBENZENE	98-95-3	mg/kg	39	510	4729	0.04 U	0.031 J	0.04 U	0.04 U	0.033 J	0.04 U	0.04 U	0.04 U	0.04 U	-	-
NITROGLYCERIN	55-63-0	mg/kg	7.8	100	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	-	-
PETN	78-11-5	mg/kg	NA	NA	34627	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	-	-
RDX	121-82-4	mg/kg	58	260	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	-	-
TETRYL	479-45-8	mg/kg	310	4100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	-	-
TNT	118-96-7	mg/kg	210	950	100	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	-	-
Metals																
ALUMINUM	7429-90-5	mg/kg	78000	1000000	pH < 5.5	5150	3480	13100	2500	7500	1460	11700	3650	2250	833	1500
ANTIMONY	7440-36-0	mg/kg	31	410	2	0.42 B	0.19 UL	1.1 B	0.4 B	0.37 B	0.26 L	0.35 R	0.23 R	0.2 R	0.24 B	0.32 B
ARSENIC	7440-38-2	mg/kg	4.3	19	9.8	1.3 J	2.1	3.3 J	0.2 UL	2.6 J	0.79 J	1.6 J	0.34 U	0.41 J	0.45 J	0.8 J
BARIUM	7440-39-3	mg/kg	16000	200000	NA	50.4 K	41.4 K	140	20	74.3	9.4	99.1	32.1	20.5	10.9	16.3
BERYLLIUM	7440-41-7	mg/kg	160	2000	NA	0.56	0.4	0.95	0.2	0.72	0.4	0.75	0.27	0.21	0.11 J	0.26
CADMIUM	7440-43-9	mg/kg	78	510	0.99	0.058 J	0.068 J	0.071 U	0.03 U	0.13 J	0.017 U	0.14 B	0.039 B	0.022 B	0.025 U	0.026 U
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	333	208	4850 K	311 K	514	70.2 J	993 K	346 K	144 B	107 B	132 B
CHROMIUM	7440-47-3	mg/kg	230	3100	43.4	20.7	15	19.8	7.4	16.6	10.3	23	11.2	8	2.4	5.8
COBALT	7440-48-4	mg/kg	NA	NA	50	11.8	8.9	14.7	3.6	11.6	2.6	11.8	5.8	4.1	1.2	3.8
COPPER	7440-50-8	mg/kg	3100	41000	31.6	20.9	5.3	29	3.9	27.8	2.4	17	6.9	3	0.54 J	2
IRON	7439-89-6	mg/kg	55000	720000	NA	29000	18100	28700	5810	11300	9110	22300	9280	8130	2480	5200
LEAD	7439-92-1	mg/kg	400	800	35.8	4.4	3.2	13	2.1	10.4	3.3 B	9.5	3.1	2	1.2	2.9
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	1890	1130	2990	1000	1090	201	3640	1220	792	173	196
MANGANESE	7439-96-5	mg/kg	1600	20000	460	*736*	328	*699*	186	*723*	81.6	366	231	355	99.7	77.4
MERCURY	7439-97-6	mg/kg	7.8	100	0.18	0.012 J	0.011 U	0.051 J	0.0068 U	0.028 B	0.0087 U	0.029 J	0.0087 J	0.014 J	0.0083 U	0.011 U
MOLYBDENUM	7439-98-7	mg/kg	390	5100	NA	0.13 B	0.22 B	0.19 B	0.046 U	0.15 B	0.092 U	0.25 B	0.35 B	0.12 B	0.038 U	0.074 B
NICKEL	7440-02-0	mg/kg	1600	20000	22.7	12.5	7.5	11.5	3.8	8.9	2.2	15.4	5.5	4.7	0.7 J	2.3
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	1170 K	690 K	1220	290	621	167	1910	630	455	103	145
SELENIUM	7782-49-2	mg/kg	390	5100	2	0.51 J	0.26 U	1.6 B	0.5 B	0.3 B	0.26 B	0.26 U	0.32 B	0.17 B	0.24 B	0.2 U
SILVER	7440-22-4	mg/kg	390	5100	1	0.044 U	0.05 U	0.28 U	0.12 U	0.071 U	0.048 U	0.069 U	0.045 U	0.039 U	0.098 U	0.1 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	64.2 B	64.4 B	139 B	51.5 B	151 B	110 B	120 J	66.2 J	56.9 J	47.9 B	52.5 B
STRONTIUM	7440-24-6	mg/kg	47000	610000	NA	3	2.1	23.7	1.9	4.7	1.5	7.9	3.3	1.6 B	0.91	1.3
THALLIUM	7440-28-0	mg/kg	5.5	72	NA	0.59 B	0.32 U	1.2 B	0.31 B	0.97 U	0.66 U	0.96 U	0.63 U	0.54 U	0.24 U	0.28 B
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	342 K	177 K	314	149	253	91.3	584 K	197 K	122 K	49.3	65.5
VANADIUM	7440-62-2	mg/kg	78	1000	NA	37.1	16.8	48.9	10.5	21	10.8	31.2	14.1	9.6	3.6	7
ZINC	7440-66-6	mg/kg	23000	310000	121	31.5	35.3	71	13.4	77	12.1	55.5	19.2	15.9	4.7 B	11.1
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	5.5 J	3.9 J	24.8 L	6.6 J	20	5.3 J	13.2 L	6.6 J	3.5 J	4.5 J	5.7 J

(1) USEPA Region III Risk Based (RBCs) Table, April 2007. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value.
For carcinogens the value shown is equal to the residential soil RBC value. To account for sediment exposure, the resulting values have been increased by a factor of ten.
The only exception is lead, which is the USEPA Region III recommended value.
(2) USEPA Region III Risk Based (RBCs) Table, April 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value.
For carcinogens the value shown is equal to the industrial soil RBC value. To account for sediment exposure, the resulting values have been increased by a factor of ten.
(3) Ecological Screening Value refernces are found in Table 5-6.

Notes:
Blue Shaded and bolded values represent exceedance of human health screening criteria.
Blue Shaded and italicized values represent exceedance of ecological screening criteria.
Blue Shaded, bolded and italicized values represent exceedance of both human health and ecological screening criteria.
Yellow shaded analytes are those constituents associated with past munitions use.

BG=background sample
SD=sediment
B=Not detected substantially above the level reported in the laboratory field blanks.
J=Analyte is present. Reported value may not be accurate or precise.
K=Analyte is present. Reported value may be biased high. Actual value is expected to be lower.
U=Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UL=Not detected, quantitation limit is probably higher
mg/kg=milligrams per kilogram
CAS=Chemical Abstract Service
NA=not available
NUT= Essential Nutrient

Table 5-5 Summary of Soil Analytical Results

		Sample Name:	EPA Region III RBC Residential	EPA Region III RBC Industrial	Ecological Screening	CTT-01-SS-02-01	CTT-01-SS-02-03	CTT-02-SS-02-06	CTT-03-SS-02-01	FIELD DUP 6	CTT-03-SS-02-02	CTT-03-SS-02-03	CTT-03-SS-02-04
		Sample Date:				8/17/2006	8/17/2006	8/17/2006	8/17/2006	8/17/2006	8/17/2006	8/17/2006	8/17/2006
		Parent Name:	Screening Value (1)	Screening Value (2)	Values (3)					CTT-03-SS-02-01			
		MRS:				MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1
Analyte	**CAS**	**Unit**											
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	13000	12300	24100	12100	12200	12900	13100	16100
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	0.3 B	0.38 B	2.4 L	0.52 B	0.35 J	0.63 B	0.5 B	1.1 B
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	2.4 J	2.2	1.8 J	2.2 L	1.9 B	2.4 L	2.6 L	2.4 L
BARIUM	7440-39-3	mg/kg	1600	20000	330	172 K	47.8 K	137	99.6	94.6	142	54.4	132
BERYLLIUM	7440-41-7	mg/kg	16	200	21	1.3	0.45	1.5	0.65	0.58	0.58	0.53	0.69
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.22 J	0.059 J	0.11 B	0.04 B	0.036 U	0.032 U	0.03 U	0.058 B
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	4300	503	2080 K	1290 K	1190	2890 K	529 K	2430 K
CHROMIUM	7440-47-3	mg/kg	23	310	81	24.5	22.6	37.2	30.6	28.2	84.2	93.9	66.5
COBALT	7440-48-4	mg/kg	NA	NA	13	9.4	5.4	19.7	10.4	10.1	9.2	13.6	17.8
COPPER	7440-50-8	mg/kg	310	4100	28	15.6	14.7	28.9	14.4	14.2	17.5	18.2	37.5
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	28400	22900	35700	15100	13500	22100	20900	27100
LEAD	7439-92-1	mg/kg	400	800	11	17.4	20.8	35.3	23.7	23	31.3	27.4	28.2
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	3380	1560	4150	2760	2760	1590	2750	5610
MANGANESE	7439-96-5	mg/kg	160	2000	500	1040	122	531	1130	1090	1130	825	1460
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.09	0.04	0.034 J	0.056	0.055	0.26	0.075	0.097
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.36 B	0.53 B	0.25 B	0.29 B	0.34 B	0.42 B	0.42 B	0.26 B
NICKEL	7440-02-0	mg/kg	160	2000	38	17.4	11.1	11.4	12	12.2	16	18.7	25
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	1760 K	1040 K	2990	331	327 K	429	275	488
SELENIUM	7782-49-2	mg/kg	39	510	1	0.5 J	0.49 J	0.83 B	0.52 U	0.34 J	0.5 U	0.97 B	0.52 U
SILVER	7440-22-4	mg/kg	39	510	4.2	0.074 U	0.045 U	0.14 U	0.26 U	0.14 U	0.25 U	0.12 U	0.26 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	71.5 B	43.9 B	135 U	71.9 B	70.8 B	46.1 B	40.8 B	72.9 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	40.1	5.7	11.7	6.8	6.6	16.4	3.6	11.2
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	0.72 B	0.68 B	1.3 B	0.64 U	0.39 J	0.62 U	0.6 B	1 B
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	579 K	421 K	806	166	164 K	204	187	307
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	45.8	36.8	93.8	37.2	36.3	52.1	52	68.9
ZINC	7440-66-6	mg/kg	2300	31000	50	58.5	33	2290	38	34.5	46.3	25.1	52.9
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	11.1 J	18.7	12.7 L	32.4	28.3	34.1	35.1	24.7

Table 5-5 Summary of Soil Analytical Results

		Sample Name:	EPA Region III	EPA Region III	Ecological	CTT-03-SS-02-05	CTT-03-SS-02-06	CTT-03-SS-02-07	CTT-03-SS-02-11	CTT-03-SS-02-12	FIELD DUP 3	CTT-03-SS-02-13	CTT-GR-SS-02-01
		Sample Date:	RBC Residential	RBC Industrial	Screening	8/17/2006	8/17/2006	8/17/2006	11/28/2006	11/29/2006	11/29/2006	11/29/2006	8/15/2006
		Parent Name:	Screening Value (1)	Screening Value (2)	Values (3)						CTT-03-SS-02-12		
		MRS:				MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1
Analyte	**CAS**	**Unit**											
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 UL	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.028 J	0.04 U
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4.6	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	11200	9910	6770	11800	10300	9170	10800	18400
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	*0.62 B*	*0.31 B*	*0.35 B*	0.27 B	*0.29 B*	*0.32 B*	*0.37 B*	*0.43 B*
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**3.5 L**	**1.4 J**	**1.7 J**	**3.1**	**2.6**	**2.5**	**2.5**	**2.8**
BARIUM	7440-39-3	mg/kg	1600	20000	330	61.1	55.4	71.1	29	26.6	31.2	86.8	61
BERYLLIUM	7440-41-7	mg/kg	16	200	21	0.59	0.46	0.35	0.24	0.22	0.2 J	0.5	0.35
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.031 U	0.031 U	0.034 U	0.016 U	0.019 U	0.019 U	0.021 U	0.072 B
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	249 K	468 K	1390 K	514	187	344	1850	437
CHROMIUM	7440-47-3	mg/kg	23	310	81	**34.8**	**26.3**	12.1	21.6	15.9	13.9	17.2	**23.9**
COBALT	7440-48-4	mg/kg	NA	NA	13	10.7	8.5	5.3	1.1	1.3	1.5	6.4	2.7
COPPER	7440-50-8	mg/kg	310	4100	28	5	15.8	8.9	7.6	6.5	7.4	11	8
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	14700	14800	7520	28300	16400	13800	15500	13400
LEAD	7439-92-1	mg/kg	400	800	11	*32.4*	*19*	*19.3*	*14.1*	*15.9*	*18*	*15.4*	*22.1*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	823	3280	818	330	396	416	1310	642 K
MANGANESE	7439-96-5	mg/kg	160	2000	500	***1230***	**431**	**474**	47.4	45.9	77.9	**288**	***517***
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.049	0.052	0.053	0.046 B	0.064 B	0.051 B	0.057 B	*0.11*
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.59 B	0.34 B	0.24 B	0.54 B	0.38 B	0.38 B	0.8 B	0.71 B
NICKEL	7440-02-0	mg/kg	160	2000	38	6.7	11	5.5	2.6	2.5	2.8	8.6	6.5
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	317	633	351	269	254	275	904	596 K
SELENIUM	7782-49-2	mg/kg	39	510	1	0.49 U	0.69 B	0.52 B	0.58 B	0.51 B	0.57 B	0.69 B	0.53 B
SILVER	7440-22-4	mg/kg	39	510	4.2	0.24 U	0.12 U	0.13 U	0.045 U	0.054 U	0.052 U	0.38 J	0.05 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	44.6 B	52.7 B	50.8 B	96.9 B	128 B	114 B	120 B	73.9 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	3.1	3.6	9.1	4.9	2.6	3.5	12.3	6.2
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	**0.6 U**	**0.61 B**	0.42 B	**0.62 U**	**0.74 U**	**0.71 U**	**0.8 U**	**0.7 U**
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	145	336	116	93	103	94.6	262	118
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***36.4***	***34.6***	***22.1***	***45.8***	***33.5***	***29.9***	***28.2***	***43.5 K***
ZINC	7440-66-6	mg/kg	2300	31000	50	27.9	35.1	25.7	18.6	19.3	24	46.6	23.3
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	53.3	16.5	32.6	33.5	32	38.7	25.6	28.8

Table 5-5 Summary of Soil Analytical Results

		Sample Name:	EPA Region III RBC Residential Screening Value (1)	EPA Region III RBC Industrial Screening Value (2)	Ecological Screening Values (3)	FIELD DUP 2	CTT-GR-SS-02-05	CTT-PR-SS-02-01	CTT-03-SS-02-08	CTT-03-SS-02-09	CTT-03-SS-02-10	CTT-GR-SS-02-02	CTT-GR-SS-02-03
		Sample Date:				8/15/2006	11/30/2006	8/18/2006	8/15/2006	8/15/2006	8/15/2006	8/15/2006	8/15/2006
		Parent Name:				CTT-GR-SS-02-01							
		MRS:				MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 1	MRS 2	MRS 2
Analyte	**CAS**	**Unit**											
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.015 J	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	17600	6040	17900	16000	20900	39100	16200	13000
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	0.22 UL	0.25 UL	0.22 UL	0.25 R	*0.5 J*	*0.3 R*	*0.39 B*	*0.51 B*
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**2.8**	**1.4 J**	**2.9 B**	**2.8**	**2.7**	**3.7**	**3.5**	**2.4**
BARIUM	7440-39-3	mg/kg	1600	20000	330	59.9	37.5	177	174	134	138	152	63.1
BERYLLIUM	7440-41-7	mg/kg	16	200	21	0.33	0.19 J	0.7	0.84	0.65	1.1	0.69	0.4
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.1 B	0.018 U	0.038 U	0.22 B	0.14 B	0.27 B	*1.6*	0.096 B
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	443	119	5000	2170 K	2480 K	2060 K	3720	1350
CHROMIUM	7440-47-3	mg/kg	23	310	81	22.9	5.7	22.4	22	**47.5**	***165***	**31.2**	14.7
COBALT	7440-48-4	mg/kg	NA	NA	13	2.5	0.81	9.4	*14.2*	10.6	*40.7*	12.1	4.9
COPPER	7440-50-8	mg/kg	310	4100	28	7.8	5.9	*64.2*	20.4	12.4	*54.8*	*92.2*	10.3
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	13100	4710	20000	18400	25300	53500	21700	14700
LEAD	7439-92-1	mg/kg	400	800	11	*21.6*	*15.3*	*26.9*	*23.2*	*29.4*	*38.3*	*93.9*	*24.9*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	591 K	332	2900	2720	1290	9490	4380 K	916 K
MANGANESE	7439-96-5	mg/kg	160	2000	500	**428**	19.2	***666***	***1190***	***608***	***848***	***1150***	**236**
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.093	0.054 B	*0.11*	0.071	0.086	0.093	*0.24*	0.064
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.62 B	0.21 B	1.3	0.57 B	0.55 B	2	0.5 B	0.48 B
NICKEL	7440-02-0	mg/kg	160	2000	38	6.1	1.6	7.8	10.7	11.9	*40.6*	18.2	5.1
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	545 K	264	594 K	1140	559	532	1200 K	569 K
SELENIUM	7782-49-2	mg/kg	39	510	1	0.47 B	0.27 B	0.79 J	0.3 B	0.73 B	0.22 U	0.66 B	0.54 B
SILVER	7440-22-4	mg/kg	39	510	4.2	0.045 U	0.051 U	0.15 U	0.05 U	0.054 U	0.059 U	0.065 B	0.05 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	55.2 B	117 B	81.3 B	72.4 J	70.6 J	102 J	105 B	74.2 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	6	3.2	34.4	15.1	17.2	12.4	22.8	12.5
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	**0.62 U**	**0.7 U**	0.37 U	**0.7 U**	**0.74 U**	***1.4 J***	***1.6 J***	**0.69 U**
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	92.8	87.9	151 K	331 K	303 K	541 K	242	118
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***42.4 K***	***15.6***	***30.3***	***43.3***	***76.4***	***130***	***47.7 K***	***35.8 K***
ZINC	7440-66-6	mg/kg	2300	31000	50	22.1	17.7	48.1	36.9	28.3	*62.9*	*490*	21.5
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	28.9	21.5	26.6	33.2	28.7	26.2	32.6	37.5

Table 5-5 Summary of Soil Analytical Results

		Sample Name:	EPA Region III RBC Residential Screening Value [(1)]	EPA Region III RBC Industrial Screening Value [(2)]	Ecological Screening Values [(3)]	CTT-GR-SS-02-04	CTT-M1-SS-02-03	CTT-M1-SS-02-07	CTT-M1-SS-02-08	CTT-M1-SS-02-09	CTT-M2-SS-02-01	FIELD DUP 5	CTT-M2-SS-02-02
		Sample Date:				8/15/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006
		Parent Name:										CTT-M2-SS-02-01	
		MRS:				MRS 2	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3
Analyte	**CAS**	**Unit**											
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	32400	4680	4840	8640	7690	11800	11700	10500
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	0.26 UL	0.2 UL	0.23 J	*0.48 J*	*0.32 J*	0.25 UL	*0.52 J*	*0.63 J*
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**1.1 J**	**1.6 B**	**1.1 B**	**2.1 B**	**1.7 B**	**2.7 B**	**2.5 B**	**3 B**
BARIUM	7440-39-3	mg/kg	1600	20000	330	84	23.8	65.9	31.9	50.4	66.6	65.7	45.3
BERYLLIUM	7440-41-7	mg/kg	16	200	21	1.6	0.16 J	0.31	0.37	0.49	0.74	0.78	0.42
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.17 B	0.035 U	0.036 U	0.031 U	0.035 U	0.043 U	0.044 U	0.034 U
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	2070	124	470	230	227	146	143	850
CHROMIUM	7440-47-3	mg/kg	23	310	81	**28.3**	10.7	7.7	**30.6**	14.5	14.4	14.5	**27.1**
COBALT	7440-48-4	mg/kg	NA	NA	13	11.1	1.1	3.3	2.2	6.9	5.6	5.3	2
COPPER	7440-50-8	mg/kg	310	4100	28	17	5	4	12	10.9	16.9	15.7	14.4
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	38400	9440	4720	28300	12000	17100	17100	37700
LEAD	7439-92-1	mg/kg	400	800	11	*22.4*	*18.7*	*18.2*	*21*	*17.9*	*24.1*	*23.1*	*32.9*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	5480 K	190	331	237	829	466	458	236
MANGANESE	7439-96-5	mg/kg	160	2000	500	**329**	32	**183**	141	**285**	149	141	**463**
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.045	0.045	0.035 J	0.064	0.054	0.06	0.053	0.092
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.33 B	0.23 B	0.3 B	0.48 B	0.29 B	0.59 B	0.57 B	0.64 B
NICKEL	7440-02-0	mg/kg	160	2000	38	9	2.4	3	5.2	7.7	6.3	6.4	6.1
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	2570 K	362 K	327 K	401 K	652 K	616 K	605 K	385 K
SELENIUM	7782-49-2	mg/kg	39	510	1	0.45 B	0.28 J	0.34 J	0.61 J	0.54 J	0.45 J	0.35 U	0.85 J
SILVER	7440-22-4	mg/kg	39	510	4.2	0.053 U	0.14 U	0.14 U	0.12 U	0.14 U	0.17 U	0.17 U	0.13 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	76.8 B	62.4 B	91.2 B	50.3 B	76.3 B	79.2 B	103 B	70.1 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	15.9	2.4	6.9	2.7	3.7	2.5	2.5	8.4
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	***1.2 J***	0.34 U	0.35 U	***1.2 J***	0.34 U	0.42 U	0.43 U	**1 J**
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	304	140 K	130 K	168 K	216 K	175 K	181 K	234 K
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***86.8 K***	***19.5***	***15.2***	***44.6***	***23.9***	***31.4***	***31***	***56.8***
ZINC	7440-66-6	mg/kg	2300	31000	50	44.2	9.8	16	14.2	30.2	20.7	19.7	20.1
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	28.3	18.5	30.1	22.5	19.8	17.9	18	16.6

Table 5-5 Summary of Soil Analytical Results

Analyte	CAS	Unit	EPA Region III RBC Residential Screening Value (1)	EPA Region III RBC Industrial Screening Value (2)	Ecological Screening Values (3)	CTT-M2-SS-02-03	CTT-M2-SS-02-04	CTT-M2-SS-02-05	CTT-M2-SS-02-06	CTT-MI-SS-02-01	CTT-MI-SS-02-02	CTT-MI-SS-02-04	CTT-MI-SS-02-05
Sample Date:						8/16/2006	8/16/2006	11/30/2006	11/30/2006	11/29/2006	11/29/2006	11/29/2006	11/29/2006
Parent Name:													
MRS:						MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.02 J
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	8920	12700	13100	12000	10700	9150	9880	9440
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	*0.62 J*	*0.41 J*	*0.4 B*	*0.31 B*	*0.28 UL*	0.26 UL	*0.29 UL*	*0.29 UL*
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**3.1 B**	**2.7 B**	**4.3**	**3.3**	**2.8**	**2 J**	**2.7**	**2.6**
BARIUM	7440-39-3	mg/kg	1600	20000	330	25.3	52.7	52.6	32	53.6	43.2	52	76.3
BERYLLIUM	7440-41-7	mg/kg	16	200	21	0.23	0.44	0.5	0.53	0.53	0.45	0.73	0.63
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.034 U	0.034 U	*0.57 J*	0.02 U	0.02 U	0.019 U	0.021 U	0.021 U
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	128	343	4520	1760	255	139	152	1730
CHROMIUM	7440-47-3	mg/kg	23	310	81	**34.5**	**32.3**	***92.6***	**30.1**	**27.8**	**35.2**	**27.9**	**29.8**
COBALT	7440-48-4	mg/kg	NA	NA	13	1.5	3	5	5.4	9.3	*19.1*	12.7	*13.8*
COPPER	7440-50-8	mg/kg	310	4100	28	7.9	16.2	*39.5*	*32.2*	16.5	15	16.3	25.6
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	20000	32600	39300	35400	27700	26200	26100	28000
LEAD	7439-92-1	mg/kg	400	800	11	*22.4*	*41*	*79*	*69.1*	*24.4*	*19.4*	*31.3*	*44.9*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	263	470	738	545	1590	1710	660	1140
MANGANESE	7439-96-5	mg/kg	160	2000	500	**180**	**234**	**424**	**454**	**500**	***621***	**380**	***553***
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.034 J	0.063	0.082	0.1	0.064 B	0.083	0.096	*0.19*
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.72 B	0.61 B	1.2 B	0.56 B	0.41 B	0.29 B	0.42 B	0.62 B
NICKEL	7440-02-0	mg/kg	160	2000	38	3.7	6.8	13.7	6.4	12.2	14.7	10.4	10.8
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	280 K	519 K	663	521	1350	1160	700	1100
SELENIUM	7782-49-2	mg/kg	39	510	1	0.71 J	0.73 J	0.44 B	0.72 B	0.45 B	0.22 B	0.63 B	0.57 B
SILVER	7440-22-4	mg/kg	39	510	4.2	0.13 U	0.13 U	0.052 U	0.055 U	0.055 U	0.051 U	0.059 U	0.057 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	76.6 B	70.6 B	299 B	219 B	134 B	126 B	137 B	132 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	2.4	4.5	15.2	7.3	5.4	2.3	3.3	12
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	0.43 J	**0.96 J**	**0.71 U**	**0.76 U**	**0.76 U**	**0.71 U**	**0.81 U**	**0.79 U**
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	149 K	232 K	258	299	338	395	188	273
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***37.2***	***55.6***	***57.9***	***57.2***	***39.4***	***39.7***	***38.3***	***39.1***
ZINC	7440-66-6	mg/kg	2300	31000	50	16.1	27.7	*650*	38.2	39.6	44	31.5	*100*
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	23.3	24.6	22.2	18.2	20.1	13.1	17.8	19.6

Table 5-5 Summary of Soil Analytical Results

		Sample Name:	EPA Region III	EPA Region III	Ecological	CTT-R1-SS-02-01	FIELD DUP A	CTT-R1-SS-02-02	CTT-R1-SS-02-03	CTT-R1-SS-02-04	CTT-RR-SS-02-01	FIELD DUP B	CTT-RR-SS-02-02
		Sample Date:	RBC Residential	RBC Industrial	Screening	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006	8/16/2006
		Parent Name:	Screening Value (1)	Screening Value (2)	Values (3)		CTT-R1-SS-02-01					CTT-RR-SS-02-01	
		MRS:				MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3	MRS 3
Analyte	**CAS**	**Unit**											
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	9200	9450	9350	6730	7900	8400	8320	12900
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	0.21 UL	0.22 J	0.23 UL	*0.29 B*	0.17 UL	0.68 J	*0.22 B*	*0.31 B*
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**2.9 B**	**2.6 B**	**1.9 B**	2	**2.1**	**2 B**	**2.1**	**3.6**
BARIUM	7440-39-3	mg/kg	1600	20000	330	42	42	39.6	35.6 K	37.2 K	33.9	33.2 K	44.3 K
BERYLLIUM	7440-41-7	mg/kg	16	200	21	0.21 J	0.23	0.42	0.19	0.24	0.22	0.22	0.41
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.037 U	0.031 U	0.04 U	0.031 U	0.029 U	0.034 U	0.03 U	0.035 U
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	135	116	151	248	95.2 B	61.1 J	54.9 B	209
CHROMIUM	7440-47-3	mg/kg	23	310	81	12.9	13.9	11.8	10.7	15.5	21.1	20.5	**32.1**
COBALT	7440-48-4	mg/kg	NA	NA	13	2.2	2.2	7.8	2.4	4	2.9	2.8	3.4
COPPER	7440-50-8	mg/kg	310	4100	28	5.6	5.9	17.7	6.7	7.8	10.6	10.4	10.5
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	11600	12000	19400	11800	16200	20400	21900	28300
LEAD	7439-92-1	mg/kg	400	800	11	*24.9*	*25.6*	*25.5*	*15.7*	*18.9*	*18.3*	*18.8*	*32.5*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	518	538	1450	422	520	528	519	570
MANGANESE	7439-96-5	mg/kg	160	2000	500	98.1	120	**220**	92.6	78	61.9	60.9	131
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.075	0.072	0.069	0.052	0.046	0.052	0.054	0.061
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.51 B	0.48 B	0.41 B	0.45 B	0.47 B	0.37 B	0.41 B	0.72 B
NICKEL	7440-02-0	mg/kg	160	2000	38	4.5	4.5	10.4	3.9	5.6	6	5.9	6.2
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	499 K	516 K	1470 K	466 K	570 K	661 K	633 K	566 K
SELENIUM	7782-49-2	mg/kg	39	510	1	0.78 J	0.37 J	0.32 U	0.39 J	0.44 J	0.34 J	0.75 J	0.97 J
SILVER	7440-22-4	mg/kg	39	510	4.2	0.14 U	0.12 U	0.16 U	0.046 U	0.044 U	0.13 U	0.046 U	0.053 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	75.6 B	48.6 B	80.8 B	25.8 B	36.7 B	73.4 B	48.1 B	49.1 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	3.2	3	2.6	3.6	2.3	1.6	1.5	2.8
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	0.35 U	0.3 U	0.39 U	0.3 U	0.28 U	0.78 J	**0.37 B**	**0.7 B**
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	197 K	190 K	466 K	195 K	179 K	269 K	248 K	246 K
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***26.1***	***27.1***	***26***	***21***	***24.2***	***33.2***	***34.1***	***44.7***
ZINC	7440-66-6	mg/kg	2300	31000	50	18.6	18	33.7	15.2	19.5	16.3	18.1	21.4
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	34.9	35.1	9 J	27.8	27.7	18	19.5	33.2

Table 5-5 Summary of Soil Analytical Results

		Sample Name:	EPA Region III	EPA Region III	Ecological	CTT-RR-SS-02-03	CTT-RR-SS-02-04	CTT-RR-SS-02-05	CTT-02-SS-02-03	CTT-02-SS-02-05	FIELD DUP 2	CTT-G2-SS-02-01	CTT-G2-SS-02-02
		Sample Date:	RBC Residential	RBC Industrial	Screening	8/16/2006	8/16/2006	8/16/2006	8/17/2006	11/29/2006	11/29/2006	8/15/2006	8/15/2006
		Parent Name:	Screening Value (1)	Screening Value (2)	Values (3)						CTT-02-SS-02-05		
		MRS:				MRS 3	MRS 3	MRS 3	MRS 4	MRS 4	MRS 4	MRS 4	MRS 4
Analyte	**CAS**	**Unit**											
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	0.037 J	0.041	0.04 U	0.04 U
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	7460	9100	10200	14700	11800	12300	6650	16700
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	0.2 UL	0.2 UL	*0.36 B*	0.25 B	0.24 UL	*0.28 UL*	*0.41 B*	0.25 UL
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**2 J**	**2.6**	**2.9**	**1.6 J**	**2.4**	**2.7**	**1.4 J**	**3.5**
BARIUM	7440-39-3	mg/kg	1600	20000	330	59.9 K	72.8 K	62.5 K	83.6	106	104	29.3	203
BERYLLIUM	7440-41-7	mg/kg	16	200	21	0.3	0.48	0.54	1	0.69	0.74	0.19	1.2
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.058 J	0.095 J	0.17 J	0.034 U	0.017 U	0.02 U	0.053 B	*0.41 J*
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	141 B	489	2110	775 K	1690	1620	416	4410
CHROMIUM	7440-47-3	mg/kg	23	310	81	14.1	15	21.8	**24.8**	11.7	12.7	7	**47.1**
COBALT	7440-48-4	mg/kg	NA	NA	13	2	7.9	2.9	10.4	10.1	10.3	2.9	*34.9*
COPPER	7440-50-8	mg/kg	310	4100	28	8.1	19.3	27.9	18	12.8	14.1	5.5	23.8
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	15500	15600	38200	22700	10900	12300	9160	30200
LEAD	7439-92-1	mg/kg	400	800	11	*23.3*	*23.6*	*51.1*	*11.8*	*19*	*19.1*	*21*	*53.5*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	382	555	495	3840	1360	1410	471 K	1600 K
MANGANESE	7439-96-5	mg/kg	160	2000	500	74.7	**499**	**420**	***683***	***843***	***836***	100	***3680***
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.061	*0.11*	0.094	0.053	0.066 B	0.067 B	0.073	*0.13*
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.56 B	0.51 B	0.61 B	0.21 B	0.54 B	0.6 B	0.31 B	0.36 B
NICKEL	7440-02-0	mg/kg	160	2000	38	4.3	5.1	6.4	19.8	6.2	6.4	2.8	18.4
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	473 K	596 K	714 K	1020	503	520	316 K	512 K
SELENIUM	7782-49-2	mg/kg	39	510	1	0.6 J	0.42 J	0.85 J	0.91 B	0.52 B	0.33 B	0.41 B	1 B
SILVER	7440-22-4	mg/kg	39	510	4.2	0.052 U	0.051 U	0.3 U	0.13 U	0.048 U	0.056 U	0.046 U	0.049 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	55.2 B	49.6 B	37.4 B	60.3 B	103 B	122 B	69 B	64.1 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	3.9	5.4	18.4	10	10	9.6	3.5	30.6
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	0.33 U	0.33 U	**0.67 B**	**0.87 B**	**0.67 U**	**0.78 U**	**0.64 U**	**0.68 U**
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	135 K	171 K	258 K	531	192	213	130	136
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***23.9***	***26.5***	***49.5***	***31.9***	***27.9***	***31.1***	***24.6 K***	***57.9 K***
ZINC	7440-66-6	mg/kg	2300	31000	50	21.3	31.3	41.3	*58.5*	32.8	33.4	14.4	*55*
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	23.3	30.4	13.1	12.3 L	35	29.5	36.3	29.9

Table 5-5 Summary of Soil Analytical Results

Sample Name:			EPA Region III RBC Residential Screening Value (1)	EPA Region III RBC Industrial Screening Value (2)	Ecological Screening Values (3)	CTT-G2-SS-02-03	CTT-G2-SS-02-04	CTT-NF-SS-02-01	FIELD DUP 3	CTT-NF-SS-02-02	CTT-NF-SS-02-03	CTT-NF-SS-02-04	CTT-PR-SS-02-02
Sample Date:						8/15/2006	8/15/2006	8/15/2006	8/15/2006	8/15/2006	8/15/2006	8/15/2006	8/15/2006
Parent Name:									CTT-NF-SS-02-01				
MRS:						MRS 4	MRS 4	MRS 4	MRS 4	MRS 4	MRS 4	MRS 4	MRS 4
Analyte	**CAS**	**Unit**											
Explosives													
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 UL	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U	0.08 U
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Metals													
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	21100	13200	28200	27000	17700	14000	26100	8700
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	*0.43 B*	*0.29 UL*	*0.29 R*	*0.37 B*	*0.37 J*	0.23 UL	*0.5 B*	*0.38 J*
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**1.4 J**	**1.1 J**	**3.5**	**2.7**	3	**2.2**	**1.5 J**	**1.3 J**
BARIUM	7440-39-3	mg/kg	1600	20000	330	166	121	*467*	*461*	225	87.8	178	59.4
BERYLLIUM	7440-41-7	mg/kg	16	200	21	0.85	0.91	1.4	1.4	0.98	0.59	0.68	0.41
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.14 B	0.18 B	*0.7 J*	*0.49 J*	0.28 B	0.11 B	0.17 B	0.099 B
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	1910	1640	4450 K	4110	4700 K	1880	3040	568 K
CHROMIUM	7440-47-3	mg/kg	23	310	81	20.9	12.4	19	21.6	22.5	20.5	**36.5**	14.9
COBALT	7440-48-4	mg/kg	NA	NA	13	11.7	9.5	*16.9*	*17.4*	*14.7*	10.5	*15.5*	5.3
COPPER	7440-50-8	mg/kg	310	4100	28	*35*	*48.7*	***605***	***584***	*43*	*30.6*	*89*	10.6
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	18600	14200	27800	29200	23800	14000	27300	12200
LEAD	7439-92-1	mg/kg	400	800	11	*21.2*	*9.6*	*34.9*	*35.5*	*23.4*	*22.3*	***478***	*16*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	8170 K	3410 K	7260	7070 K	4220	2900 K	12300 K	1980
MANGANESE	7439-96-5	mg/kg	160	2000	500	***631***	**329**	***2530***	***2660***	***1500***	**301**	***848***	**219**
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.1	0.03 J	*0.11*	0.094	0.087	0.057	0.042	0.054
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.24 B	*2.6*	*2.7*	*2.9*	0.52 B	0.95 B	0.17 B	0.34 B
NICKEL	7440-02-0	mg/kg	160	2000	38	15.1	13.8	14	13.9	14.4	8.3	22	8.7
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	1210 K	1300 K	2330	2120 K	2170	557 K	4770 K	715
SELENIUM	7782-49-2	mg/kg	39	510	1	0.22 B	0.66 B	*1.5 J*	0.64 B	0.57 B	0.42 B	0.31 B	0.19 U
SILVER	7440-22-4	mg/kg	39	510	4.2	0.048 U	0.058 U	0.2 B	0.13 B	0.06 U	0.045 U	0.05 U	0.05 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	118 B	84.4 B	79.1 J	94.2 B	90.5 J	60.6 B	104 B	71.3 J
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	10.6	10.2	26.7	27.1	23	9.9	15.7	4.8
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	**0.66 U**	**0.8 U**	**0.81 U**	**0.74 U**	**0.83 U**	**0.63 U**	**0.69 U**	**0.69 U**
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	844	324	643 K	558	393 K	432	1100	347 K
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***47.4 K***	***31.1 K***	***59.9***	***60.9 K***	***46.3***	***36.7 K***	***60 K***	***26.6***
ZINC	7440-66-6	mg/kg	2300	31000	50	*52.9*	42.2	*109*	*107*	*67.1*	28.7	*68.2*	31.5
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	20.6	16 L	21.9 L	21 L	22.3 L	33.7	20.6 L	13.1 L

Table 5-5 Summary of Soil Analytical Results

		Sample Name:	EPA Region III RBC Residential Screening Value (1)	EPA Region III RBC Industrial Screening Value (2)	Ecological Screening Values (3)	CTT-PR-SS-02-03	CTT-R2-SS-02-01	FIELD DUP 1	CTT-R2-SS-02-02	CTT-BG-SS-02-01	CTT-BG-SS-02-02	CTT-BG-SS-02-03
		Sample Date:				8/15/2006	8/14/2006	8/14/2006	8/17/2006	8/18/2006	8/18/2006	8/18/2006
		Parent Name:						CTT-R2-SS-02-01				
		MRS:				MRS 4	MRS 4	MRS 4	MRS 4			
Analyte	**CAS**	**Unit**										
Explosives												
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	230	3100	NA	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
1,3-DINITROBENZENE	99-65-0	mg/kg	0.78	10	NA	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.94	200	30	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.94	100	30	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	16	200	20	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
2-NITROTOLUENE	88-72-2	mg/kg	78	1000	30	0.08 U	0.08 U	0.08 U	0.08 U	-	-	-
3-NITROTOLUENE	99-08-1	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	-	-	-
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	16	200	30	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
4-NITROTOLUENE	99-99-0	mg/kg	NA	NA	30	0.08 U	0.08 U	0.08 U	0.08 U	-	-	-
HMX	2691-41-0	mg/kg	390	5100	NA	0.08 U	0.08 U	0.08 U	0.08 UL	-	-	-
NITROBENZENE	98-95-3	mg/kg	3.9	51	40	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
NITROGLYCERIN	55-63-0	mg/kg	0.78	10	NA	4 U	4 U	4 U	4 U	-	-	-
PETN	78-11-5	mg/kg	NA	NA	NA	0.2 U	0.2 U	0.2 U	0.2 U	-	-	-
RDX	121-82-4	mg/kg	5.8	26	100	0.08 U	0.08 U	0.08 U	0.08 UL	-	-	-
TETRYL	479-45-8	mg/kg	31	410	NA	0.08 U	0.08 U	0.08 U	0.08 U	-	-	-
TNT	118-96-7	mg/kg	21	95	30	0.04 U	0.04 U	0.04 U	0.04 U	-	-	-
Metals												
ALUMINUM	7429-90-5	mg/kg	7800	100000	pH < 5.5	18500	27800	32500	23800	2770	6050	27300
ANTIMONY	7440-36-0	mg/kg	3.1	41	0.27	0.27 J	0.24 R	*0.43 B*	*0.68 B*	*0.3 B*	*0.54 B*	*0.79 B*
ARSENIC	7440-38-2	mg/kg	0.43	1.9	18	**2.5**	**2.8**	**2.9**	**2 J**	**1.6 J**	**1.8 L**	**4.4**
BARIUM	7440-39-3	mg/kg	1600	20000	330	189	104	120	102	27.8	34.7	149
BERYLLIUM	7440-41-7	mg/kg	16	200	21	1.2 B	0.65	0.75	0.53	0.15 J	0.32	0.95
CADMIUM	7440-43-9	mg/kg	3.9	51	0.36	0.16 J	0.26 B	0.31 B	0.039 U	0.028 U	0.029 U	0.033 U
CALCIUM	7440-70-2	mg/kg	NUT	NUT	NUT	2310 K	2300 K	2750	3910 K	75.3 B	259 K	1020 K
CHROMIUM	7440-47-3	mg/kg	23	310	81	16.8	**42.1**	**48.7**	**61.6**	4.3	**36.1**	**70.9**
COBALT	7440-48-4	mg/kg	NA	NA	13	*14.9*	10.7	12.8	*25.8*	0.49 B	5.1	*13.6*
COPPER	7440-50-8	mg/kg	310	4100	28	23.3	*52.1*	*54.1*	*60.9*	2.6	13.3	23
IRON	7439-89-6	mg/kg	NUT	NUT	NUT	18700	30200	34900	33100	3600	19200	31100
LEAD	7439-92-1	mg/kg	400	800	11	*23.4*	*31.2*	*37.1*	*18.7*	*12.2*	*18.3*	*27.4*
MAGNESIUM	7439-95-4	mg/kg	NUT	NUT	NUT	3170	4110	4660 K	8420	154	247	6440
MANGANESE	7439-96-5	mg/kg	160	2000	500	***1860***	**360**	**436**	**490**	11.4	119	**325**
MERCURY	7439-97-6	mg/kg	0.78	10	0.1	0.063	0.079	0.098	0.036 J	0.026 J	0.046	0.088
MOLYBDENUM	7439-98-7	mg/kg	39	510	2	0.51 B	0.7 B	0.76 B	0.11 B	0.37 B	0.71 B	0.68 B
NICKEL	7440-02-0	mg/kg	160	2000	38	9.6	13.4	15.7	22.6	0.97	7.8	21.9
POTASSIUM	7440-09-7	mg/kg	NUT	NUT	NUT	660	836	832 K	2290	153	496	3520
SELENIUM	7782-49-2	mg/kg	39	510	1	0.72 B	0.25 B	0.2 U	0.69 B	0.41 B	0.78 B	0.88 B
SILVER	7440-22-4	mg/kg	39	510	4.2	0.052 U	0.048 U	0.052 U	0.15 U	0.11 U	0.11 U	0.13 U
SODIUM	7440-23-5	mg/kg	NUT	NUT	NUT	79 J	75.6 J	68.2 B	212 B	26.1 B	40.7 B	61.5 B
STRONTIUM	7440-24-6	mg/kg	4700	61000	NA	12.6	13.8	17.7	13.4	2	3.3	9.9
THALLIUM	7440-28-0	mg/kg	0.55	7.2	1	**0.72 U**	***1.1 J***	**0.72 U**	**1 B**	0.27 U	0.4 B	***1.2 B***
TITANIUM	7440-32-6	mg/kg	NA	NA	NA	317 K	474 K	475	1140	67	95.9	564
VANADIUM	7440-62-2	mg/kg	7.8	100	7.8	***47.1***	***85***	***113 K***	***93.1***	***13.1***	***21.9***	***70.9***
ZINC	7440-66-6	mg/kg	2300	31000	50	45.9	*74.1*	*83.9*	*72.2*	10.8	22.2	48.8
ZIRCONIUM	7440-67-7	mg/kg	NA	NA	NA	19.6	18.7	24.3	2.3 J	12.7 L	21.3	29.2

Table 5-5 Summary of Soil Analytical Results

(1) USEPA Region III Risk Based (RBCs) Table, April 2007. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value.
For carcinogens the value shown is equal to the residential soil RBC value. The only exception is lead, which is the USEPA Region III recommended value.
(2) USEPA Region III Risk Based (RBCs) Table, April 2007. For non-carcinogens, value shown is equal to 1/10 the industrial soil RBC value.
For carcinogens the value shown is equal to the industrial soil RBC value.
(3) Ecological Screening Value refernces are found in Table 5-6.

BG=background sample
SS=surface soil
SB=subsurface soil
B=Not detected substantially above the level reported in the laboratory field blanks.
J=Analyte is present. Reported value may not be accurate or precise.
K=Analyte is present. Reported value may be biased high. Actual value is expected to be lower.
L=Analyte is present/ Reported value may be biased low. Actual value is expected to be higher.
U=Not detected. The associated number indicates the approximate sample concentration necessary to be detected.
UJ=Not detected, quantitation limit may be inaccurate or imprecise.
UL=Not detected, quantitation limit is probably higher
mg/kg=milligrams per kilogram
CAS=Chemical Abstract Service
NA=not available
NUT=Essential Nutrient

Notes:
Blue shaded and bolded values represent exceedance of human health screening criteria.
Blue shaded and italicized values represent exceedance of ecological screening criteria.
Blue shaded, bolded and italicized values represent exceedance of both human health and ecological screening criteria.
Yellow shaded analytes are those constituents associated with past munitions use.

Table 5-6. Sediment, Soil and Surface Water Ecological Screening Values and Sources

Analyte	Value	Source
Sediment (mg/kg)		
1,3,5-TRINITROBENZENE	2,659	Spectrum (2003a), from K_{ow} values
1,3-DINITROBENZENE	371	Spectrum (2003b), from K_{ow} values
2,4-DINITROTOLUENE	0.0416	EPA (2006c), from K_{ow} values
2,6-DINITROTOLUENE	0.0416	2,4-Dinitrotoluene as surrogate
2-AMINO-4,6-DINITROTOLUENE	876	Robb et al. (2002), from K_{ow} values
2-NITROTOLUENE	4.06	4-Nitrotoluene as surrogate
3-NITROTOLUENE	4.06	4-Nitrotoluene as surrogate
4-AMINO-2,6-DINITROTOLUENE	444	Robb et al. (2002), from K_{ow} values
4-NITROTOLUENE	4.06	Talmage et al. (1999)
HMX	2.17	Robb et al. (2002), from K_{ow} values
NITROGLYCERIN	NA	
PETN	34,627	USCHPPM (2001), from K_{ow} values
RDX	0.36	Calculated from K_{ow} value[1]
TETRYL	NA	
TNT	100	EPA (2006c), from K_{ow} values
NITROBENZENE	4,729	EPA (1995)
ALUMINUM	pH < 5.5	EPA (2003)
ANTIMONY	2	Long et al. (1990)
ARSENIC	9.8	MacDonald et al. (2000)
BARIUM	NA	
BERYLLIUM	NA	
CADMIUM	0.99	MacDonald et al. (2000)
CALCIUM	NA	Essential nutrient
CHROMIUM	43.4	MacDonald et al. (2000)
COBALT	50	Persaud et al. (1993)
COPPER	31.6	MacDonald et al. (2000)
IRON	NA	Essential nutrient
LEAD	35.8	MacDonald et al. (2000)
MAGNESIUM	NA	Essential nutrient
MANGANESE	460.0	Persaud et al. (1993)
MERCURY	0.18	MacDonald et al. (2000)
MOLYBDENUM	NA	
NICKEL	22.7	MacDonald et al. (2000)
POTASSIUM	NA	Essential nutrient
SELENIUM	2	Lemley (2002)
SILVER	3.2	EPA(2006b)
SODIUM	NA	Essential nutrient
STRONTIUM	NA	
THALLIUM	NA	
TITANIUM	NA	
VANADIUM	NA	
ZINC	121	MacDonald et al. (2000)
ZIRCONIUM	NA	

Table 5-6. Sediment, Soil and Surface Water Ecological Screening Values and Sources

Analyte	Value	Source
Surface Soil (mg/kg)		
1,3,5-TRINITROBENZENE	NA	
1,3-DINITROBENZENE	NA	
2,4-DINITROTOLUENE	30	TNT as surrogate
2,6-DINITROTOLUENE	30	TNT as surrogate
2-AMINO-4,6-DINITROTOLUENE	20	Talmage et al. (1999)
2-NITROTOLUENE	30	TNT as surrogate
3-NITROTOLUENE	30	TNT as surrogate
4-AMINO-2,6-DINITROTOLUENE	30	TNT as surrogate
4-NITROTOLUENE	30	TNT as surrogate
HMX	NA	
PETN	NA	
RDX	100	Talmage et al. (1999)
TETRYL	NA	
TNT	30	Talmage et al. (1999)
NITROBENZENE	40	Efroymson et al. (1997b)
NITROGLYCERINE	NA	
ALUMINUM	pH > 5.5	EPA (2003)
ANTIMONY	0.27	EPA (2005a)
ARSENIC	18	EPA (2005b)
BARIUM	330	EPA (2005c)
BERYLLIUM	21	EPA (2005d)
CADMIUM	0.36	EPA (2005e)
CALCIUM	NA	Essential nutrient
CHROMIUM	81	EPA (2005f)
COBALT	13	EPA (2005g)
COPPER	28	EPA (2007a)
IRON	NA	Essential nutrient
LEAD	11	EPA (2005h)
MAGNESIUM	NA	Essential nutrient
MANGANESE	500	Efroymson et al. (1997a)
MERCURY	0.1	Efroymson et al. (1997b)
MOLYBDENUM	2	Efroymson et al. (1997a)
NICKEL	38	EPA (2007b)
POTASSIUM	NA	Essential nutrient
SELENIUM	1	Efroymson et al. (1997a)
SILVER	4.2	EPA (2006a)
SODIUM	NA	Essential nutrient
STRONTIUM	NA	
THALLIUM	1	Efroymson et al. (1997a)
TITANIUM	NA	
VANADIUM	7.8	USEPA (2005i)
ZINC	50	Efroymson et al. (1997a)
ZIRCONIUM	NA	
Surface Water (ug/L)		
1,3,5-TRINITROBENZENE	11	Talmage et al. (1999)
1,3-DINITROBENZENE	20	Talmage et al. (1999)
2,4-DINITROTOLUENE	44	Ohio EPA (2002)
2,6-DINITROTOLUENE	81	EPA (2005j), from LC50 values
2-AMINO-4,6-DINITROTOLUENE	80	Talmage et al. (1999)

Table 5-6. Sediment, Soil and Surface Water Ecological Screening Values and Sources

Analyte	Value	Source
2-NITROTOLUENE	750	3-Nitrotoluene as surrogate
3-NITROTOLUENE	750	EPA (2005j), from LC50 values
4-AMINO-2,6-DINITROTOLUENE	750	3-Nitrotoluene as surrogate
4-NITROTOLUENE	1,900	EPA (2005j), from LC50 values
HMX	330	Talmage et al. (1999)
NITROBENZENE	6,680	EPA (1995)
NITROGLYCERIN	138	EPA (2005j), from LC50 values
PETN	85,000	EPA (2005j), from LC50 values
RDX	190	Talmage et al. (1999)
TETRYL	NA	
TNT	100	EPA (2005j), from LC50 values
ALUMINUM	87	EPA (2006b)
ANTIMONY	30	Suter and Tsao (1996)
ARSENIC	5	EPA (1996)
BARIUM	4	Suter & Tsao (1996)
BERYLLIUM	0.66	Suter & Tsao (1996)
CALCIUM	NA	Essential nutrient
CADMIUM	0.25	EPA (2006b)
CHROMIUM	11	EPA (2006b)
COBALT	23	Suter & Tsao (1996)
COPPER	9	EPA (2006b)
IRON	NA	Essential nutrient
LEAD	2.5	EPA (2006b)
MAGNESIUM	NA	Essential nutrient
MANGANESE	120	Suter & Tsao (1996)
MERCURY	0.77	EPA (2006b)
MOLYBDENUM	73	CCME (2003)
NICKEL	52	EPA (2006b)
POTASSIUM	NA	Essential nutrient
SELENIUM	5	EPA (2006b)
SILVER	3.2	EPA (2006b)
SODIUM	NA	Essential nutrient
STRONTIUM	1,500	Suter & Tsao (1996)
THALLIUM	0.8	CCME (2003)
TITANIUM	NA	
VANADIUM	20	Suter and Tsao (1996)
ZIRCONIUM	17	Suter and Tsao (1996)
ZINC	120	EPA (2006b)

NA - No screening value
mg/kg = milligram per kilogram
ug/L = microgram per liter
(1) Calculated from Kow = 100 (Talmage et al. 1999), assuming 1% organic carbon, using water concentration from EPA (2005j)
Yellow shaded analytes are those associated with past munitions use

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Table 5-7
Non-Detection Concentrations and Screening Values for Human Health Screening at Chopawamsic Troop Training Site

Analyte	Cas no.	Units	Minimum Non-Detect Concentration	Maximum Non-Detect Concentration	Screening [1] Value
Sediment					
Explosives					
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	0.04	0.04	2300
1,3-DINITROBENZENE	99-65-0	mg/kg	0.04	0.04	7.8
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.04	0.04	160
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.04	0.04	78
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	0.04	0.04	160
2-NITROTOLUENE	88-72-2	mg/kg	0.08	0.08	780
3-NITROTOLUENE	99-08-1	mg/kg	0.08	0.08	
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	0.04	0.04	160
4-NITROTOLUENE	99-99-0	mg/kg	0.08	0.08	
HMX	2691-41-0	mg/kg	0.08	0.08	3900
NITROGLYCERIN	55-63-0	mg/kg	4	4	7.8
PETN	78-11-5	mg/kg	0.2	0.2	
RDX	121-82-4	mg/kg	0.08	0.08	58
TETRYL	479-45-8	mg/kg	0.08	0.08	310
TNT	118-96-7	mg/kg	0.04	0.04	210
MOLYBDENUM	7439-98-7	mg/kg	0.038	0.14	390
Inorganics					
SILVER	7440-22-4	mg/kg	0.039	0.28	390
THALLIUM	7440-28-0	mg/kg	0.24	0.97	5.5
Surface Soil					
Explosives					
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	0.04	0.04	230
1,3-DINITROBENZENE	99-65-0	mg/kg	0.04	0.04	0.78
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.04	0.04	16
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.04	0.04	7.8
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	0.04	0.04	16
2-NITROTOLUENE	88-72-2	mg/kg	0.08	0.08	78
3-NITROTOLUENE	99-08-1	mg/kg	0.08	0.08	
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	0.04	0.04	16
4-NITROTOLUENE	99-99-0	mg/kg	0.08	0.08	
NITROGLYCERIN[2]	**55-63-0**	**mg/kg**	**4**	**4**	**0.78**
HMX	2691-41-0	mg/kg	0.08	0.08	390
PETN	78-11-5	mg/kg	0.2	0.2	
RDX	121-82-4	mg/kg	0.08	0.08	5.8
TETRYL	479-45-8	mg/kg	0.08	0.08	31
TNT	118-96-7	mg/kg	0.04	0.04	21
Groundwater					
Explosives					
1,3,5-TRINITROBENZENE	99-35-4	ug/L	0.2	0.24	110
1,3-DINITROBENZENE	99-65-0	ug/L	0.2	0.24	0.37
2,4-DINITROTOLUENE	121-14-2	ug/L	0.2	0.24	7.3
2,6-DINITROTOLUENE	606-20-2	ug/L	0.2	0.24	3.7
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	ug/L	0.2	0.24	7.3
2-NITROTOLUENE	88-72-2	ug/L	0.4	0.47	6.1
3-NITROTOLUENE	99-08-1	ug/L	0.4	0.47	
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	ug/L	0.2	0.24	7.3
4-NITROTOLUENE	99-99-0	ug/L	0.4	0.47	
HMX	2691-41-0	ug/L	0.4	0.47	180
NITROGLYCERIN[3]	**55-63-0**	**ug/L**	**20**	**24**	**0.37**
PETN	78-11-5	ug/L	1	1.2	
RDX	121-82-4	ug/L	0.4	0.47	0.61
TETRYL	479-45-8	ug/L	0.4	0.47	15
TNT	118-96-7	ug/L	0.2	0.24	2.2

Table 5-7
Non-Detection Concentrations and Screening Values for Human Health Screening at Chopawamsic Troop Training Site

Analyte	Cas no.	Units	Minimum Non-Detect Concentration	Maximum Non-Detect Concentration	Screening [1] Value
Surface Water					
Explosives					
1,3,5-TRINITROBENZENE	99-35-4	ug/L	0.2	0.24	1100
1,3-DINITROBENZENE	99-65-0	ug/L	0.2	0.24	3.7
2,4-DINITROTOLUENE	121-14-2	ug/L	0.2	0.24	73
2,6-DINITROTOLUENE	606-20-2	ug/L	0.2	0.24	37
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	ug/L	0.2	0.24	73
2-NITROTOLUENE	88-72-2	ug/L	0.4	0.47	61
3-NITROTOLUENE	99-08-1	ug/L	0.4	0.47	
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	ug/L	0.2	0.24	73
4-NITROTOLUENE	99-99-0	ug/L	0.4	0.47	
HMX	2691-41-0	ug/L	0.4	0.47	1800
NITROBENZENE	98-95-3	ug/L	0.2	0.24	3.5
NITROGLYCERIN[4]	**55-63-0**	**ug/L**	**20**	**24**	**3.7**
PETN	78-11-5	ug/L	1	1.2	
RDX	121-82-4	ug/L	0.4	0.47	6.1
TETRYL	479-45-8	ug/L	0.4	0.47	150
TNT	118-96-7	ug/L	0.2	0.24	22
Inorganics					
ANTIMONY	7440-36-0	ug/L	0.12	0.12	15
ARSENIC	**7440-38-2**	**ug/L**	**0.8**	**0.8**	**0.45**
CADMIUM	7440-43-9	ug/L	0.11	0.11	18
LEAD	7439-92-1	ug/L	0.34	0.34	150
MERCURY	7439-97-6	ug/L	0.034	0.034	3.7
SILVER	7440-22-4	ug/L	0.023	0.023	180
THALLIUM	7440-28-0	ug/L	0.17	0.17	2.6
VANADIUM	7440-62-2	ug/L	3.2	3.2	37
ZIRCONIUM	7440-67-7	ug/L	2.4	2.4	

[1]USEPA Region III Risk Based (RBCs) Table, April 2007 unless noted. For non-carcinogens, value shown is equal to 1/10 the residential soil RBC value. For carcinogens the value shown is equal to the residential soil RBC value. To account for ssediment and surface water exposure, the resulting values have been increased by a factor of ten.

[2]USEPA Region III Risk Based (RBCs) Table issued in October of 2006 listed Nitroglycerine surface soil screening criteria as 1300 mg/kg which using the 1/10 th rule translated to a screening criteria of 130 mg/kg. The approved site-specific work plan had a laboratory MDL which was below the screening value.

[3]USEPA Region III Risk Based (RBCs) Table issued in October of 2006 listed Nitroglycerine Tap Water screening criteria as 620 ug/L which using the 1/10 th rule translated to a screening criteria of 62 ug/L The approved site-specific work plan had a laboratory MDL which was below the screening value.

[4]USEPA Region III Risk Based (RBCs) Table issued in October of 2006 listed Nitroglycerine as 620 ug/L The approved site-specific work plan had a laboratory MDL which was below the screening value.

NA - No screening value
mg/kg = milligram per kilogram
ug/L = microgram per liter
Yellow shaded analytes are those constituents associated with past munitions use.

Table 5-8
Non-Detection Concentrations and Screening Values for Ecological Screening at Chopawamsic Troop Training Site

Analyte	Cas no.	Units	Minimum Detection Limit	Maximum Detection Limit	Screening Value	Screening Source
Sediment						
Explosives						
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	0.04	0.04	2,659	Spectrum (2003a), from K_{ow} values
1,3-DINITROBENZENE	99-65-0	mg/kg	0.04	0.04	371	Spectrum (2003b), from K_{ow} values
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.04	0.04	0.0416	EPA (2006c), from K_{ow} values
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.04	0.04	0.0416	2,4-Dinitrotoluene as surrogate
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	0.04	0.04	876	Robb et al. (2002), from K_{ow} values
2-NITROTOLUENE	88-72-2	mg/kg	0.08	0.08	4.06	4-Nitrotoluene as surrogate
3-NITROTOLUENE	99-08-1	mg/kg	0.08	0.08	4.06	4-Nitrotoluene as surrogate
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	0.04	0.04	444	Robb et al. (2002), from K_{ow} values
4-NITROTOLUENE	99-99-0	mg/kg	0.08	0.08	4.06	Talmage et al. (1999)
HMX	2691-41-0	mg/kg	0.08	0.08	2.17	Robb et al. (2002), from K_{ow} values
NITROGLYCERIN	55-63-0	mg/kg	4	4	NA	
PETN	78-11-5	mg/kg	0.2	0.2	34,627	USCHPPM (2001), from K_{ow} values
RDX	121-82-4	mg/kg	0.08	0.08	0.36	Calculated from K_{ow} value[1]
TETRYL	479-45-8	mg/kg	0.08	0.08	NA	
TNT	118-96-7	mg/kg	0.04	0.04	100	EPA (2006c), from K_{ow} values
Inorganics						
Molybdenum	7439-98-7	mg/kg	0.038	0.14	NA	---
Silver	7440-22-4	mg/kg	0.039	0.28	3.2	EPA(2006b)
Thallium	7440-22-4	mg/kg	0.24	0.97	NA	---
Surface Soil						
Explosives						
1,3,5-TRINITROBENZENE	99-35-4	mg/kg	0.04	0.04	NA	
1,3-DINITROBENZENE	99-65-0	mg/kg	0.04	0.04	NA	
2,4-DINITROTOLUENE	121-14-2	mg/kg	0.04	0.04	30	TNT as surrogate
2,6-DINITROTOLUENE	606-20-2	mg/kg	0.04	0.04	30	TNT as surrogate
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	mg/kg	0.04	0.04	20	Talmage et al. (1999)
2-NITROTOLUENE	88-72-2	mg/kg	0.08	0.08	30	TNT as surrogate
3-NITROTOLUENE	99-08-1	mg/kg	0.08	0.08	30	TNT as surrogate
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	mg/kg	0.04	0.04	30	TNT as surrogate
4-NITROTOLUENE	99-99-0	mg/kg	0.08	0.08	30	TNT as surrogate
HMX	2691-41-0	mg/kg	0.08	0.08	NA	
PETN	78-11-5	mg/kg	0.2	0.2	NA	
RDX	121-82-4	mg/kg	0.08	0.08	100	Talmage et al. (1999)
TETRYL	479-45-8	mg/kg	0.08	0.08	NA	
TNT	118-96-7	mg/kg	0.04	0.04	30	Talmage et al. (1999)
Surface Water						
Explosives						
1,3,5-TRINITROBENZENE	99-35-4	ug/L	0.2	0.24	11	Talmage et al. (1999)
1,3-DINITROBENZENE	99-65-0	ug/L	0.2	0.24	20	Talmage et al. (1999)
2,4-DINITROTOLUENE	121-14-2	ug/L	0.2	0.24	44	Ohio EPA (2002)
2,6-DINITROTOLUENE	606-20-2	ug/L	0.2	0.24	81	EPA (2005j), from LC50 values
2-AMINO-4,6-DINITROTOLUENE	35572-78-2	ug/L	0.2	0.24	80	Talmage et al. (1999)
2-NITROTOLUENE	88-72-2	ug/L	0.4	0.47	750	3-Nitrotoluene as surrogate
3-NITROTOLUENE	99-08-1	ug/L	0.4	0.47	750	EPA (2005j), from LC50 values
4-AMINO-2,6-DINITROTOLUENE	19406-51-0	ug/L	0.2	0.24	750	3-Nitrotoluene as surrogate
4-NITROTOLUENE	99-99-0	ug/L	0.4	0.47	1,900	EPA (2005j), from LC50 values
HMX	2691-41-0	ug/L	0.4	0.47	330	Talmage et al. (1999)
NITROBENZENE	98-95-3	ug/L	0.2	0.24	6,680	EPA (1995)
NITROGLYCERIN	55-63-0	ug/L	20	24	138	EPA (2005j), from LC50 values
PETN	78-11-5	ug/L	1	1.2	85,000	EPA (2005j), from LC50 values
RDX	121-82-4	ug/L	0.4	0.47	190	Talmage et al. (1999)
TETRYL	479-45-8	ug/L	0.4	0.47	NA	
TNT	118-96-7	ug/L	0.2	0.24	100	EPA (2005j), from LC50 values
Inorganics						
ANTIMONY	7440-36-0	ug/L	0.12	0.12	30	Suter and Tsao (1996)
ARSENIC	7440-38-2	ug/L	0.8	0.8	5	EPA (1996)
CADMIUM	7440-43-9	ug/L	0.11	0.11	0.25	EPA (2006b)
LEAD	7439-92-1	ug/L	0.34	0.34	2.5	EPA (2006b)
MERCURY	7439-97-6	ug/L	0.034	0.034	0.77	EPA (2006b)
SILVER	7440-22-4	ug/L	0.023	0.023	3.2	EPA (2006b)
THALLIUM	7440-28-0	ug/L	0.17	0.17	0.8	CCME (2003)
VANADIUM	7440-62-2	ug/L	3.2	3.2	20	Suter and Tsao (1996)
ZIRCONIUM	7440-67-7	ug/L	2.4	2.4	17	Suter and Tsao (1996)

NA - No screening value
mg/kg = milligram per kilogram
ug/L = microgram per liter
(1) Calculated from Kow = 100 (Talmage et al. 1999), assuming 1% organic carbon, using water concentration from EPA (2005j)
Yellow shaded analytes are those constituents associated with past munitions use.

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6. SUMMARY AND CONCLUSIONS

6.0.1 Chopawamsic Troop Training Site was used as a training area under a special use permit for the NPA from 1942 to 1946. Four MRSs at Chopawamsic Troop Training Site were addressed in this SI consistent with the MMRP Inventory in the DERP Fiscal Year 2005 Annual Report to Congress (DoD 2005). The four identified ranges are as follows (see Table 2-1):

- MRS 1 – OB/OD No. 3
- MRS 2 – Fragmentation Grenade Range
- MRS 3 – Range Complex No. 1 – This range included six subranges, namely, Mortar Range No. 01, Mortar Range No. 02, Rifle Range No. 01, Machine Gun Range No. 01, Rocket Range, and an OB/OD Range
- MRS 4 – Range Complex No. 2 – This range included five subranges, namely, Rifle Range No. 02, Pistol Range, Night Firing Course, Machine Gun Range No. 02, and OB/OD No. 02

6.0.2 A summary of the results and conclusions, by MRS, is presented below and included in Table 6-1.

6.1 OB/OD No. 3 (MRS 1)

6.1.1 MRS 1 encompasses five ASR-identified training areas/ranges (C-Demolition Range, D-Demolition Range, E-Demolition Range, and H-Demolition Range as well as a 1-acre OB/OD area). MRS 1 encompasses all of these training areas/ranges and includes a blast radius associated with the demolition ranges. MEC discoveries included a mortar found in 1985 embedded in the roof of one of the munitions storage buildings. As recently as June 2005, a rocket (MPPEH) was found in Taylor Farm Run (Alion 2006a). No MEC was identified during the SI reconnaissance; however, MD (expended 40-mm illuminators) was identified in the former demolition ranges (D-Demolition Range and E-Demolition Range). Given the limited SI reconnaissance, MEC may remain in other areas of MRS 1. The fact that mortars and rockets have been found within this MRS indicates that the range fans developed for MRS 3 may not be accurate. The ranges are comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the former demolition ranges and OB/OD areas in this MRS.

6.1.2 No documented injuries have occurred since the FUDS property was transferred to the NPS. Given the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. The overall MEC risk is considered low to moderate.

6.1.3 No COPCs were reported for the human health screening assessment for MRS 1. One surface water COPEC (barium) and five soil COPECs (antimony, copper, lead, nickel, and zinc) were reported as a result of the ecological screening level risk assessment. Based on the screening results, the surface water and surface soil pathways for ecological receptors are considered complete and the other pathways/receptors are considered incomplete for MRS 1.

6.2 Fragmentation Grenade Range (MRS 2)

6.2.1 MRS 2 encompasses one ASR-identified range (F-Fragmentation Grenade Range). MRS 1 overlaps this range and includes a blast radius associated with the demolition ranges. Historically, MPPEH and MEC was discovered in MRS 1 including a mortar and rocket. No MEC was found in MRS 2 and no MEC/MD was identified during the SI reconnaissance. Given the limited SI reconnaissance, MEC could be present in other areas of MRS 2. The fact that mortars and rockets have been found within MRS 1 (which overlaps MRS 2) indicates that the range fans developed for MRS 3 may not be accurate. The ranges are comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the former grenade range in this MRS.

6.2.2 Given the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. No documented injuries have occurred since the FUDS property was transferred to the NPS and the overall MEC risk is considered low to moderate.

6.2.3 No COPCs were reported for the human health screening assessment for MRS 2. Three surface soil COPECs (copper, lead, and zinc) were reported as a result of the ecological screening level risk assessment. Based on the screening results, the surface soil pathway for ecological receptors is considered complete and the other pathways/receptors are considered incomplete for MRS 2.

6.3 Range Complex No. 1 (MRS 3)

6.3.1 Range Complex No. 1/MRS 3 encompasses six subranges (labeled as Mortar Range No. 01, Mortar Range No. 02, Rifle Range No. 01, Machine Gun Range No. 01, Rocket Range, and an OB/OD Range). These ranges correspond to four ASR-identified training areas/ranges

(ranges B-Rifle, Machine Gun, Mortar, and Rocket Firing Range and I-Mortar Range as well as the 4-acre and 20-acre OB/OD areas). MRS 1 overlaps parts of these ranges. MEC/MD discoveries included one 2.36-inch rocket body found in B-Rifle in January 1993 and a portion of a 2.36-inch rocket body found in 1996 during the ASR site reconnaissance. No MEC/MD was identified in MRS 3 during the SI reconnaissance; however, anomalies were noted around former targets. Given the limited SI reconnaissance, MEC could be present in other areas of the FUDS property. The ranges are comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the former mortar and rocket ranges and OB/OD areas in this MRS.

6.3.2 Due to the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. No documented injuries have occurred since the FUDS property was transferred to the NPS; however, because of past finds the overall MEC risk is considered moderate.

6.3.3 No COPCs were reported for the human health screening assessment for MRS 3. Three metals (copper, lead, and zinc) were reported in surface soil samples as exceeding ecological screening criteria and background concentrations and were therefore identified as COPECs. Based on the screening results, surface soil pathway for ecological receptors is considered complete and the other pathways/receptors are considered incomplete for MRS 3.

6.4 Range Complex No. 2 (MRS 4)

6.4.1 Range Complex No. 2/MRS 4 includes five subranges (labeled as Rifle Range No. 02, Pistol Range, Night Firing Course, Machine Gun Range No. 02, and OB/OD area No. 02). These ranges correspond to the two training areas/ranges identified in the ASR (A-Rifle Range and G-Night Firing Course, Pistol, Carbine, and Sub-Machine Gun Range). MRS 1 overlaps these ranges and includes a blast radius associated with the demolition ranges. MEC/MPPEH was discovered in MRS 1, including a mortar and rocket, respectively. No MEC was found in MRS 4 and no MEC was identified during the SI reconnaissance. MD (bullets) was identified in target posts, and unknown anomalies were noted during the SI reconnaissance. Given the limited SI reconnaissance, MEC could be present in other areas of MRS 4 as a result of activities in MRS 3. The ranges are comprised of rugged terrain with varying elevations; however, there are no fences restricting access to the ranges in this MRS.

6.4.2 Because of the limited use and nature of the training conducted, the aerial extent of contamination is estimated to be relatively small. This conclusion is based on the number of personnel trained and the short period during which the FUDS property operated. No documented injuries have occurred since the FUDS property was transferred to the NPS; therefore, the overall MEC risk is considered low to moderate.

6.4.3 No COPC/COPEC were identified for surface water and sediment at MRS 4. Four metals (barium, copper, lead, and zinc) were identified as COPECs in surface soil as a result of the ecological screening level risk assessment. Lead and copper were reported in surface soil at concentrations exceeding human health residential screening criteria and are identified as COPCs. Lead does not exceed the industrial criterion of 1,000 mg/kg. Based on the screening results, the surface soil pathways for human and ecological receptors are considered complete and the other pathways/receptors are considered incomplete for MRS 4.

Table 6-1. Summary of Human Health and Ecological Screening-Level Risk Assessment Results.

Medium of Concern	Human Health COPCs[1]				Ecological COPECs (SLERA)[2]			
	MRS 1. OB/OD No. 3	MRS 2. Fragmentation Grenade Range	MRS 3. Range Complex No. 1	MRS 4. Range Complex No. 2	MRS 1. OB/OD No. 3	MRS 2. Fragmentation Grenade Range	MRS 3. Range Complex No. 1	MRS 4. Range Complex No. 2
Groundwater	No exceedances of EPA Region III screening values	No sampling completed in accordance with CSM and SS	No exceedances of EPA Region III screening values	No sampling completed in accordance with CSM and SS-WP	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Surface Water	No exceedances of EPA Region III screening values	No sampling completed in accordance with CSM and SS	No exceedances of EPA Region III screening values	No exceedances of EPA Region III screening values	One metal (barium)	No sampling completed in accordance with CSM and SS-WP	No exceedances of EPA Region III screening values	No exceedances of EPA Region III screening values
Sediment	No exceedances of EPA Region III screening values	No sampling completed in accordance with CSM and SS	No exceedances of EPA Region III screening values	No exceedances of EPA Region III screening values	No exceedances of EPA Region III screening values	No sampling completed in accordance with CSM and SS-WP	No exceedances of EPA Region III screening values	No exceedances of EPA Region III screening values
Surface Soil	No exceedances of EPA Region III screening values	No exceedances of EPA Region III screening values	No exceedances of EPA Region III screening values	Two metals (lead and copper)	Five metals (antimony, copper, lead, nickel, and zinc)	Three metals (copper, lead, and zinc)	Three metals (copper, lead, and zinc)	Four metals (barium, copper, lead, and zinc)

1 For the Human Health Risk Screen, EPA Region III RBC screening values were used for soil, sediment, surface water, and groundwater comparisons. See Tables 5-2 through 5-5 for the screening values.
2 For Ecological Risk Screen, the screening values identified in Tables 5-6 were applied.

7. RECOMMENDATIONS

7.0.1 Historical documentation and interviews performed as part of the SI reveal that MEC, MPPEH, and MD associated with conventional munitions have been found at the Chopawamsic Troop Training Site since the FUDS property was transferred from DoD to the NPS. During the SI field event, the Alion Team observed various MD on the surface. Additionally, subsurface anomalies were found and documented. The Chopawamsic Troop Training Site FUDS has four designated MRSs identified as MRS 1 – OB/OD No. 3, MRS 2 – Fragmentation Grenade Range, MRS 3 – Range Complex No. 1, and MRS 4 – Range Complex No. 2. Due to the nature of activities (training) and the history of MEC/MD discovery at the FUDS property, MEC/MD is likely to be present in the undeveloped portions of the FUDS property. Given the overlap associated with the MRSs, an RI/FS for MEC is recommended at all four MRSs. In addition, potential ecological risk was identified for MC in MRSs 1, 2, 3, and 4 and potential risk to human health was identified in MRS 4 (Table 6-1). Therefore, an RI/FS for MC is recommended at this site at MRSs 1, 2, 3, and 4. The RI/FS should focus on those exceedances considered to be at significant levels (above background). A TCRA or NTCRA is not recommended for this site.

7.0.2 The boundary and acreage of the MRSs in the Supplemental ASR should be revised and the INPR should be amended to include the land located in the range fan beyond the FUDS boundary for investigation and delineation during the RI/FS. Additionally, MRS acreage should be revised so that the MRSs do not overlap; therefore, a decision can be made for each MRS separately.

7.0.3 In the DERP Annual Report to Congress Fiscal 2006, MMRP Site Inventory website, the name of this site is spelled incorrectly (Chopawamic). The FUDS property name should be corrected (Chopawamsic).

8. REFERENCES

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APPENDIX A - SCOPE OF WORK

Located on CD.

APPENDIX B - TPP MEMORANDUM

- TPP 1 Memorandum (Located on CD).
- TPP 2 Memorandum (Located on CD).
- DQO Verification Worksheets

Data Quality Objective Worksheet			
Site: **Chopawamsic Troop Training Site**			
Project: **FUDS MMRP SI Project Number C03VA019401**			
DQO Statement Number: **1 of 6**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Determine the presence or absence of MEC	Yes__X__ No ____	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MEC, Compliance	Yes__X__ No ____	
Contaminant or Characteristic of Interest	Conduct a site reconnaissance and visual search as depicted on Figures E.1-3A and E.1-3B located in Appendix E of the SS-WP Addendum using a trained Unexploded Ordnance (UXO) Technician with a handheld analog magnetometer searching for physical evidence to indicate the presence of Material Potentially Presenting an Explosive Hazard [MPPEH] or confirmed MEC (i.e. on surface/subsurface, munitions debris, soil discoloration, magnetometer hits etc.).	Yes__X__ No ____	
Media of Interest	Surface Soil, Subsurface Soil, Sediment, Surface Water (near edges), and Groundwater	Yes__X__ No ____	
Required Sampling Locations or Areas	Ranges and OB/OD areas (Refer to Table 3-1 of the SS-WP Addendum)	Yes__X__ No ____	
Number of Samples Required	Not Applicable (N/A)		
Reference Concentration of Interest or Other Performance Criteria	If one piece of MPPEH or confirmed MEC is found with the magnetometer or if physical evidence indicating the presence of MPPEH or confirmed MEC is found during the visual inspection, then a RI/FS may be recommended. If no anomalies, MPPEH, or confirmed MEC are found, or if the UXO Technician indicates that there is no potential hazard from MEC, then MEC found previously may be considered an anomaly and No Department of Defense Action Indicated (NDAI) will be recommended. In each of these instances, all lines of evidence (e.g., historic data, field data, etc.) will be used to make a final decision for an NDAI or RI/FS.	Yes__X__ No ____	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	Geophysics with a handheld analog magnetometer.	Yes__X__ No ____	
Analytical Method	N/A		

Data Quality Objective Worksheet			
Site: **Chopawamsic Troop Training Site**			
Project: **FUDS MMRP SI Project Number C03VA019401**			
DQO Statement Number: **2 of 6**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Eliminate from further consideration those releases that pose no significant threat to public health or the environment by using data collected by others (if available) and collecting adequate samples to assess the presence or absence of Munitions Constituents (MC) at the site.	Yes__X__ No ____	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MC, Compliance	Yes__X__ No ____	
Contaminant or Characteristic of Interest	Metals, explosives, and perchlorate are tabulated in the chemical-specific MQO Tables E.1-5A-E.1-15 of the SS-SAP.	Yes__X__ No ____	
Media of Interest	Surface Soil, Subsurface Soil, Sediment, Surface Water, and Groundwater	Yes__X__ No ____	
Required Sampling Locations or Areas	Ranges and OB/OD areas (Refer to Table 3-1 of the SS-WP Addendum).	Yes__X__ No ____	
Number of Samples Required	76 soil samples (including 3 background soil samples), 13 sediment samples (including 2 background sediment samples), 13 surface water samples (including 2 background surface water samples), and 10 groundwater samples are detailed in Table E.1-3 of the SS-SAP (Subject to change due to anomalies identified during meandering geophysical activities)	Yes____ No __X__	While in the field, the Alion Team ran into some very rugged terrain and had difficulty locating all the historic AOC; as a result, many samples were relocated and not all of the samples were collected. Following a discussion with CENAB, CX, and CENAO regarding the field observations from the initial SI event a modified sampling plan was drafted and used to guide a second field effort.62 soil samples (including 3 background soil samples), 11 sediment samples (including 2 background sediment samples), 11 surface water samples (including 2 background surface water samples), and 7 groundwater samples. Refer to Section 3.4 of the SI Report for additional details regarding this deviation from the SS-WP.
Reference Concentration of Interest or Other Performance Criteria	In most cases, contamination findings that exceed federal or state Maximum Contaminant Levels (MCLs), Preliminary Remediation Goals (PRGs), or Risk Based Concentrations (RBCs) (based on current land use), or background levels (based on previous studies) posing a risk to receptors will be sufficient to signal the need for a detailed investigation of the nature and extent of contamination (RI/FS) for a particular MMRP site. These values are specified in the chemical-specific MQO Tables E.1-5A-E.1-15 of the SS-SAP. Note that in addition to the MC data, all lines of evidence (e.g., historic data, field data, etc.) will be used to make a final decision for an NDAI or RI/FS.	Yes__X__ No ____	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	Sampling methods for each media are described in detail in Section 5 Field Activities in the PFSP (Appendix E.1).		
Analytical Method	The following analytical methods are detailed in Table E.1-4A-E.1-4D of the SS-SAP. Explosives - SW8330A, SW8330M; Metals - SW6010B, 6020, SW7470/7470; Perchlorate - SW6850.		

Data Quality Objective Worksheet			
Site: **Chopawamsic Troop Training Site**			
Project: **FUDS MMRP SI Project Number C03VA019401**			
DQO Statement Number: **3 of 6**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Determine the potential need for an emergency response action and/or a Time-Critical Removal Action (TCRA) of Munitions and Explosives of Concern (MEC) by collecting data from previous investigations/reports, conducting site visits, and performing analog geophysical activities.	Yes__X__ No ____	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MEC, Compliance	Yes__X__ No ____	
Contaminant or Characteristic of Interest	Conduct a site reconnaissance and visual search as depicted on Figures E.1-3A and E.1-3B located in Appendix E of the SS-WP using a trained UXO Technician with a handheld analog magnetometer searching for physical evidence requiring an emergency response or a TCRA	Yes__X__ No ____	
Media of Interest	Surface Soil, Subsurface soil, Sediment, Surface Water, and Groundwater	Yes__X__ No ____	
Required Sampling Locations or Areas	Ranges and OB/OD areas (Refer to Table 3-1 of the SS-WP Addendum).	Yes__X__ No ____	
Number of Samples Required	N/A		
Reference Concentration of Interest or Other Performance Criteria	**<u>Emergency Removal Actions</u> -** If there is a complete pathway between source and receptor and the confirmed MEC (i.e. UXO/DMM) and the situation is viewed as an "immediate and unacceptable hazard" to the local populace or site personnel, the Alion Team will immediately notify the Military Munitions Design Center Project Manager at USACE and the property owner. The property owner will contact the local law enforcement since emergency removal actions are not normally a USACE responsibility. Additionally, the Alion Team will flag the area and move on. **<u>TCRA</u>**- If there is a complete pathway between source and receptor and the MEC and the situation is viewed as an "imminent danger threat posed by the release or threat of a release, where cleanup or stabilization actions must be initiated within six months to reduce risk to public health or the environment", the Alion Team will immediately notify the USACE Military Munitions Design Center Project Manager and the property owner. USACE will determine, with input from the Alion Team and stakeholders, whether or not a TCRA will be implemented. Note that a non-time TCRA may be initiated in response to a release or threat of release that poses a risk where more than six months planning time is available. Once the imminent threat at a site is addressed through the TCRA, additional work that is necessary is completed through the non-time TCRA process (> 6 months).	Yes__X__ No ____	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	Geophysics with a handheld analog magnetometer.	Yes__X__ No ____	
Analytical Method	N/A		

Data Quality Objective Worksheet			
Site: **Chopawamsic Troop Training Site**			
Project: **FUDS MMRP SI Project Number C03VA019401**			
DQO Statement Number: **4 of 6**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Collect, or develop, additional data, as appropriate, for Hazard Ranking System (HRS) scoring by Environmental Protection Agency (EPA)[1].	Yes__X__ No ____	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MEC and MC, Compliance	Yes__X__ No ____	
Contaminant or Characteristic of Interest	Data for HRS worksheet parameters will be compiled by gathering basic identifying information, general site description, site type, waste description, demographics, water use, sensitive environments, and response actions.	Yes__X__ No ____	
Media of Interest	Surface Soil, Subsurface Soil, Sediment, Surface Water, and Groundwater	Yes__X__ No ____	
Required Sampling Locations or Areas	Ranges and OB/OD areas (Refer to Table 3-1 of the SS-WP Addendum).	Yes__X__ No ____	
Number of Samples Required	N/A		
Reference Concentration of Interest or Other Performance Criteria	The HRS levels of contamination are Level I (concentrations that meet the criteria for actual contamination and are at or above media-specific benchmark levels), Level II (concentrations that either meet the criteria for actual contamination but are less than media-specific benchmarks, or meet the criteria for actual contamination based on direct observation), and Potential (no observed release is required but targets must be within the target distance limit). These levels are weighted for each target by EPA (Level I carries the greatest weight) and scores of 28.5 or above are then eligible for listing on the National Priorities List (NPL).	Yes__X__ No ____	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	Data gathering prior to field activities as well as additional data gathered during field reconnaissance and sampling. Refer to National Priorities List (NPL) Characteristics Data Collection Form, version 3.0 (EPA 2001).	Yes__X__ No ____	
Analytical Method	N/A		
1, The HRS scoring may or may not be completed by EPA and is an activity separate from the SI process. Information is contained in the SI Report and its appendices to support HRS scoring.			

Data Quality Objective Worksheet			
Site: **Chopawamsic Troop Training Site**			
Project: **FUDS MMRP SI Project Number C03VA019401**			
DQO Statement Number: **5 of 6**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Collect data, as appropriate, to determine if a release has occurred to confirm the need to transition the project into a Remedial Investigation and Feasibility Study (RI/FS).	Yes__X__ No ____	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MEC and MC, Compliance	Yes__X__ No ____	
Contaminant or Characteristic of Interest	MEC and MC	Yes__X__ No ____	
Media of Interest	Surface Soil, Subsurface Soil, Sediment, Surface Water, and Groundwater	Yes__X__ No ____	
Required Sampling Locations or Areas	Ranges and OB/OD areas (Refer to Table 3-1 of the SS-WP Addendum).	Yes__X__ No ____	
Number of Samples Required	N/A		
Reference Concentration of Interest or Other Performance Criteria	If historic data indicate the presence of MEC and one piece of MEC is found with the magnetometer or if physical evidence indicating the presence of MEC is found during the visual inspection, then RI/FS may be recommended. If any MC samples exceed the action levels and are greater than background levels (for metals), RI/FS may be recommended. . In each of these instances, all lines of evidence (e.g., historic data, field data, screening level risk assessments, etc.) will be used to make a final decision for an NDAI or RI/FS.	Yes__X__ No ____	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	For MEC, geophysics with a handheld analog magnetometer; for MC, Sampling methods for each media are described in detail in Section 5 Field Activities in the PFSP (Appendix E.1) and are listed in Tables E.1-4A though E.1-4D.	Yes__X__ No ____	
Analytical Method	N/A		

Data Quality Objective Worksheet			
Site: **Chopawamsic Troop Training Site**			
Project: **FUDS MMRP SI Project Number C03VA019401**			
DQO Statement Number: **6 of 6**			
DQO Element Description	**Site-Specific DQO Statement**	**Attained?**	**Required Corrective Action**
Intended Data Use(s):			
Project Objective(s) Satisfied	Collect the additional data necessary to the complete the Munitions Response Site Prioritization Protocol (MRSPP).	Yes__X__ No ____	
Data Needs Requirements:			
Data User Perspective(s)	Risk-MEC and MC, Compliance	Yes__X__ No ____	
Contaminant or Characteristic of Interest	Explosive Hazard Evaluation (EHE), Chemical Warfare Material Hazard Evaluation (CHE), and Health Hazard Evaluation (HHE). For the EHE and CHE modules, factors evaluated include the details of the hazard, accessibility to the Munitions Response Site (MRS), and receptor information. HHE factors include an evaluation of MC and any non-munitions-related incidental contaminants present, receptor information, and details pertaining to environmental migration pathways. Typical information compiled includes details pertaining to historical use, current/future use and ownership, cultural/ecological resources, and structures.	Yes__X__ No ____	
Media of Interest	Surface Soil, Subsurface Soil, Sediment, Surface Water, and Groundwater	Yes__X__ No ____	
Required Sampling Locations or Areas	Ranges and OB/OD areas (Refer to Table 3-1 of the SS-WP Addendum).	Yes__X__ No ____	
Number of Samples Required	N/A		
Reference Concentration of Interest or Other Performance Criteria	A MRS priority is determined by USACE based on integrating the ratings from the EHE, CHE, and HHE modules. Refer to Federal Register/Volume 70, Number 192/Wednesday, October 5, 2005/Rules and Regulations.	Yes__X__ No ____	
Appropriate Sampling and Analysis Methods:			
Sampling Method and Depths	Data gathering prior to field activities as well as additional data gathered during field reconnaissance and sampling (DoD 2005).	Yes__X__ No ____	
Analytical Method	N/A		

APPENDIX C - INTERVIEW DOCUMENTATION

Appendix not used.

APPENDIX D - FIELD NOTES AND FIELD FORMS

- Daily Quality Control Reports
- Field Sheets
- Chains of Custody
- Logbook

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number:	08-14-06-01	**Date:** 08-14-06	
Project Name:	Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017	
Location of Work:	Prince William Forest Park (Triangle, Virginia)		
Description of Work:	SI sampling at Chopawamsic Troop Training Site		

Weather: Sunny/ humid	**Rainfall:** 0	**Temperature:** **Min.** 85 **Max.** 90

1. Work performed today by Alion Team.

Met with National Park Service (NPS) employees-George Liffert (Assistant Superintendent at Prince William Forest Park [PWFP]) and Paul Petersen (Acting Chief of Resource Management at PWFP) to discuss activities planned for the week.

Health and Safety briefing, reviewed Health and Safety Plan – all field team members signed Health and Safety review form.

Recorded anomaly counts, locations, and descriptions while performing site reconnaissance (meandering paths).

Completed surface soil, sediment, and surface water sampling.

Reconnaissance Acreage / Discussion:

Meandering path reconnaissance was conducted during travel to sample locations. Travel paths varied from Figure E.1-3 in the SS-WP due to the site terrain and the sampling order. Additional geophysical reconnaissance was conducted to obtain more complete coverage of the site and to try and locate areas of concern.

Samples Collected:

Samples collected:

CTT-R2-SW-00-01	CTT-R2-SD-02-01
CTT-R2-SS-02-01	CTT-R2-SS-02-01-QA
Field Dup 1 (CTT-R2-SS-02-01)	Total: 3 surface soil, 1 sediment, 1 surface water samples collected (includes QA/QC samples)

Field Tests:

Schonstedt-tested OK

YSI-used to test surface water parameters (See #4 of this Daily Quality Control Report)

Trimble-Benchmark (Designation Prince AZ MK) was located. The Trimble was checked/confirmed to be within 1 meter of the coordinate obtained from the NOAA website.

Calibration of Instruments:

YSI-see field calibration sheet

Other:

Photos were taken of SI activities and sample locations.

2. Work performed today by other subcontractors.

None

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)	
All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.	
4. List type and location of tests performed and results of these tests.	
1 surface water sample (YSI results below)	
CTT-R2-SW-00-01 Temp (C) = 23.28 SC (uS/cm2) = 53 Turbidity (NTU) = 3.4 pH = 6.62	
5. List material and equipment received.	
None. All material/equipment already mobilized.	
6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.	
None	
7. Off-site surveillance activities, including action taken.	
None	
8. Job Safety. (Report safety violations observed and actions taken)	
No safety violations observed. Safety orientation and briefing conducted prior to fieldwork.	
9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)	
In our initial meeting upon arriving to NPS headquarters, Liffert and Petersen requested that Alion notify them if any samples designated as 2 inch surface soil samples are converted to 4 foot subsurface samples. NPS also requested that Alion notify them before entering archeologically sensitive areas so that they can send a NPS employee with Alion to oversee sampling in those areas. NPS also requested a daily email summarizing the day's activities. Alion agreed to all NPS requests.	
The Alion field teams (2 teams) began reconnaissance and sampling in Range A (Rifle Range and Danger Space). Additional reconnaissance will be performed in this area later this week to cover the area south of Scenic Drive. Some barbed wire and a drum were seen on the ground surface during site reconnaissance. No MEC/MD or subsurface anomalies were found during site reconnaissance.	
A daily summary email was sent to George Liffert, Kathy Caudill, Bob Hickman, and Paul Petersen of NPS stating that no MEC was found today.	

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

Curtis Mitchell
Quality Control System Manager

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number: 08-15-06-01	**Date:** 08-15-06
Project Name: Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017

Location of Work: Prince William Forest Park (Triangle, VA)

Description of Work: SI sampling at Chopawamsic Troop Training Site

Weather: Sunny/ humid	**Rainfall:** 0	**Temperature:** **Min.** 77 **Max.** 88

1. Work performed today by Alion Team.

Recorded anomaly counts, locations, and descriptions while performing site reconnaissance (meandering paths).

Completed surface soil, sediment, surface water, and groundwater sampling.

Reconnaissance Acreage / Discussion:

Meandering path reconnaissance was conducted during travel to sample locations. Travel paths varied from Figure E.1-3 in the SS-WP due to the site terrain and the sampling order. Additional geophysical reconnaissance was conducted to obtain more complete coverage of the site and to try and locate areas of concern.

Samples Collected:

Samples collected:

CTT-PR-SW-00-01	CTT-PR-SD-02-01
CTT-PR-SS-02-02	CTT-NF-SS-02-03
CTT-PR-SW-00-02	CTT-PR-SD-02-02
CTT-NF-SS-02-02	CTT-NF-SS-02-01
CTT-NF-SS-02-01-QA	CTT-NF-SS-02-01-MS
CTT-NF-SS-02-01-MSD	Field Dup 3 (CTT-NF-SS-02-01)
CTT-PR-SS-02-03	CTT-G2-SS-02-01
CTT-G2-SS-02-02	CTT-O3-SS-02-09
CTT-O3-SS-02-08	CTT-O3-SS-02-10
CTT-M2-GW-00-02	CTT-M2-GW-00-01
CTT-O3-GW-00-02	CTT-GR-SS-02-03
CTT-O3-GW-00-02-QA	CTT-O3-GW-00-02-MS
CTT-O3-GW-00-02-MSD	Field Dup 4 (CTT-O3-GW-00-02)
CTT-GR-SS-02-02	CTT-GR-SS-02-01
CTT-GR-SS-02-01-QA	CTT-GR-SS-02-01-MS
CTT-GR-SS-02-01-MSD	Field Dup 2 (CTT-GR-SS-02-01)
CTT-GR-SS-02-04	CTT-G2-SS-02-03
CTT-G2-SS-02-04	CTT-NF-SS-02-04

Total: 25 surface soil, 2 sediment, 2 surface water, and 7 groundwater samples collected (including QA/QC samples)

Field Tests:

Schonstedt-tested OK

YSI-used to test surface water parameters (See #4 of this Daily Quality Control Report)

Trimble-Benchmark (Designation Prince AZ MK) was located. The Trimble was checked/confirmed to be within 1 meter of the coordinate obtained from the NOAA website.

Calibration of Instruments:

YSI-see field calibration sheet

Other:

Photos were taken of SI activities and sample locations.

2. Work performed today by other subcontractors.

none

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)

All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.

4. List type and location of tests performed and results of these tests.

1 surface water sample (YSI results below)

CTT-PR-SW-00-01 Temp (C) = 22.61 SC (uS/cm2) = 64 Turbidity (NTU) = 8.8 pH = 6.20	CTT-PR-SW-00-02 Temp (C) = 22.83 SC (uS/cm2) = 58 Turbidity (NTU) = 7.2 pH = 6.49
CTT-M2-GW-00-02 Temp (C) = 12.64 SC (uS/cm2) = 26 Turbidity (NTU) = 4.4 pH = 5.14	CTT-M2-GW-00-01 Temp (C) = 13.01 SC (uS/cm2) = 31 Turbidity (NTU) = 3.0 pH = 5.13
CTT-O3-GW-00-02 Temp (C) = 13.48 SC (uS/cm2) = 85 Turbidity (NTU) = 0.1 pH = 5.06	

5. List material and equipment received.

None. All material/equipment already mobilized.

6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.
None
7. Off-site surveillance activities, including action taken.
None
8. Job Safety. (Report safety violations observed and actions taken)
No safety violations observed. Safety orientation and briefing conducted prior to fieldwork.
9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)
The Alion field teams performed site reconnaissance and sampling in Area C (demolition range), Area F (fragmentation grenade range), and Area G (pistol, carbine and sub-machine gun night firing course). Subsurface anomalies were discovered throughout these areas. Three wooden target posts were found on Area G east of Scenic Drive-sample CTT-G2-SS-02-02 was relocated near the posts. Metal surface trash was found on the surface in Area C. Two depressions, possibly craters, were also found in Area C. Sample CTT-O3-SS-02-09 was relocated to the depressions. Metal surface trash was found on the surface throughout Area F. Subsurface anomalies were also present in Area F while meandering to sample locations. Additional posts from former targets were found in Area G west of Scenic Drive-sample CTT-G2-22-02-04 was relocated near the target posts.
A daily summary email was sent to George Liffert, Kathy Caudill, Bob Hickman, and Paul Petersen of NPS stating that no MEC was found today.

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

Curtis Mitchell
Quality Control System Manager

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number: 08-16-06-01	**Date:** 08-16-06
Project Name: Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017
Location of Work: Prince William Forest Park (Triangle, VA)	
Description of Work: SI sampling at Chopawamsic Troop Training Site	

Weather: Sunny/ humid	**Rainfall:** 0	**Temperature:** **Min.** 70 **Max.** 85

1. Work performed today by Alion Team.	
Recorded anomaly counts, locations, and descriptions while performing site reconnaissance (meandering paths).	
Completed surface soil, sediment, surface water, and groundwater sampling.	
Reconnaissance Acreage / Discussion:	
Meandering path reconnaissance was conducted during travel to sample locations. Travel paths varied from Figure E.1-3 in the SS-WP due to the site terrain and the sampling order. Additional geophysical reconnaissance was conducted to obtain more complete coverage of the site and to try and locate areas of concern.	
Samples Collected:	
Samples collected:	
CTT-M2-SS-02-04	CTT-RR-SS-02-04
CTT-RR-SS-02-05	CTT-M2-SS-02-01
CTT-M2-SS-02-01-QA	CTT-M2-SS-02-01-MS
CTT-M2-SS-02-01-MSD	Field Dup 5 (CTT-M2-SS-02-01)
CTT-M2-SS-02-03	CTT-M2-SS-02-02
CTT-O1-SW-00-01	CTT-O1-SD-02-01
CTT-O1-SW-00-03	CTT-O1-SD-02-03
CTT-O3-GW-00-01	CTT-O2-GW-00-01
CTT-R1-SS-02-01	CTT-R1-SS-02-01-QA
Field Dup A (CTT-R1-SS-02-01)	CTT-RR-SS-02-01
CTT-RR-SS-02-01-QA	Field Dup B (CTT-RR-SS-02-01)
CTT-RR-SS-02-02	CTT-R1-SS-02-02
CTT-RR-SS-02-03	CTT-R1-SS-02-03
CTT-R1-SS-02-04	CTT-M1-SS-02-09
CTT-M1-SS-02-03	CTT-M1-SS-02-08
CTT-M1-SS-02-07	
Total: 25 surface soil, 2 sediment, 2 surface water, and 2 groundwater samples collected (including QA/QC samples)	
Field Tests:	

Schonstedt-tested OK
YSI-and to try and locate areas of concern (See #4 of this Daily Quality Control Report)
Trimble-Benchmark (Designation Prince AZ MK) was located. The Trimble was checked/confirmed to be within 1 meter of the coordinate obtained from the NOAA website.
Calibration of Instruments:
YSI-see field calibration sheet
Other:
Photos were taken of SI activities and sample locations.
2. Work performed today by other subcontractors.
None
3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)
All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.
4. List type and location of tests performed and results of these tests.
1 surface water sample (YSI results below)

CTT-O1-SW-00-01 Temp (C) = 23.40 SC (uS/cm^2) = 60 Turbidity (NTU) = 11 pH = 6.52	CTT-O1-SW-00-03 Temp (C) = 26.62 SC (uS/cm^2) = 42 Turbidity (NTU) = 5.7 pH = 7.01
CTT-O3-GW-00-01 Temp (C) = 13.98 SC (uS/cm^2) = 123 Turbidity (NTU) = 41 pH = 5.41	CTT-O2-GW-00-01 Temp (C) = 13.92 SC (uS/cm^2) = 272 Turbidity (NTU) = 1.0 pH = 6.96

5. List material and equipment received.
None. All material/equipment already mobilized.
6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.
None
7. Off-site surveillance activities, including action taken.
None
8. Job Safety. (Report safety violations observed and actions taken)
No safety violations observed. Safety orientation and briefing conducted prior to fieldwork.

9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)

The Alion field teams performed site reconnaissance and sampling on the west side of the park in Area B (rifle, machine gun, mortar and rocket firing) in the morning and moved to Area I (abandoned mortar range) and Area H (demolition range) in the afternoon. Subsurface anomalies were found throughout Area B. A large area that appeared to be disturbed (dug out) was present in Area B. Sample CTT-M2-SS-02-04 was relocated to the disturbed area. Depression areas and scrap metal on the ground surface were also present (sample located in/around) in Area B. A post with barbed wire and several subsurface anomaly hits were observed in Area I. The surface water samples in Area H were collected. The remainder of Area H will be inspected in the morning.

A daily summary email was sent to George Liffert, Kathy Caudill, Bob Hickman, and Paul Petersen of NPS stating that no MEC was found today.

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

C. Mitchell

Curtis Mitchell
Quality Control System Manager

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number: 08-17-06-01	**Date:** 08-17-06
Project Name: Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017
Location of Work: Prince William Forest Park (Triangle, VA)	
Description of Work: SI sampling at Chopawamsic Troop Training Site	

Weather: Sunny/ humid	**Rainfall:** 0	**Temperature:** **Min.** 75 **Max.** 85

1. Work performed today by Alion Team.

Recorded anomaly counts, locations, and descriptions while performing site reconnaissance (meandering paths).

Completed surface soil, sediment, surface water, and groundwater sampling.

Reconnaissance Acreage / Discussion:

Meandering path reconnaissance was conducted during travel to sample locations. Travel paths varied from Figure E.1-3 in the SS-WP due to the site terrain and the sampling order. Additional geophysical reconnaissance was conducted to obtain more complete coverage of the site and to try and locate areas of concern.

Samples Collected:

Samples collected:

CTT-O3-SW-00-01	CTT-O3-SD-02-01
CTT-O3-SS-02-05	CTT-O3-SS-02-06
CTT-O3-SS-02-04	CTT-O3-SS-02-03
CTT-O3-SS-02-01	CTT-O3-SS-02-01-QA
Field Dup 6 (CTT-O3-SS-02-01)	CTT-O3-SS-02-07
CTT-O3-SS-02-02	CTT-O3-SW-00-02
CTT-O3-SD-02-02	CTT-O1-SS-02-03
CTT-O1-SS-02-01	CTT-R2-SS-02-02
CTT-O2-SS-02-06	CTT-O2-SS-02-03

Total: 14 surface soil, 2 sediment, and 2 surface water samples collected (including QA/QC samples)

Field Tests:

Schonstedt-tested OK

YSI-used to test surface water parameters (See #4 of this Daily Quality Control Report)

Trimble-Benchmark (Designation Prince AZ MK) was located. The Trimble was checked/confirmed to be within 1 meter of the coordinate obtained from the NOAA website.

Calibration of Instruments:

YSI-see field calibration sheet

Other:

Photos were taken of SI activities and sample locations.

2. Work performed today by other subcontractors.

None

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)

All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.

4. List type and location of tests performed and results of these tests.

1 surface water sample (YSI results below)

CTT-O3-SW-00-01	CTT-O3-SW-00-02
Temp (C) = 20.92	Temp (C) = 24.74
SC (uS/cm^2) = 62	SC (uS/cm^2) = 59
Turbidity (NTU) = 7.5	Turbidity (NTU) = 3.2
pH = 6.83	pH = 7.43

5. List material and equipment received.

None. All material/equipment already mobilized.

6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.

None

7. Off-site surveillance activities, including action taken.

None

8. Job Safety. (Report safety violations observed and actions taken)

No safety violations observed. Safety orientation and briefing conducted prior to fieldwork.

9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)

The Alion field teams performed site reconnaissance and sampling in Area D and Area E (demolition ranges). The teams also conducted additional site reconnaissance and sampling in Area A, Area B, and Area H. Area D and Area E are located in an archaeologically significant area. Therefore, the NPS museum caretaker (Judy) accompanied the field team into this area. Judy informed the team that munitions debris from the site was present in the museum collection. The field team viewed the collection and found the following: 1) tail fin and top end of a 60 mm mortar illumination round 2) the top half of a bazooka rocket (rusted out) and 3) 2, 40 mm illumination rounds. The UXO Technician (Jason Cebula) stated that the items were all inert (not explosive). The UXO Technician suggested that Judy get certificates that identifying the items as inert. Jason also advised Judy and Paul Petersen to get a certificate for the rocket on display at the visitor's center. The team then proceeded to Area D. Several subsurface anomalies were recorded in the area. In Area E the field team found 2 expended 40 mm illumination rounds on the surface near a depression in the ground (possible crater). Sample CTT-O3-SS-02-02 was collected near the depression. The UXO Technician indicated that the rounds were not explosive. An old homestead-foundation, covered well, and a large hole with several bottles inside were found in Area E. Judy indicated to the field team that there was an old pistol range near Camp 4. She gave a vague description of the area the range was located and indicated that Paul may have a map displaying the exact location of the range.

The second field team went back to Area H to finish site reconnaissance and sampling. Subsurface anomalies were observed in the area. Samples were relocated near the anomalies. The field team then moved to Area A south of Scenic Drive. Several mounds and craters were observed in the area. Several subsurface anomaly hits

were also observed in the area. A sample was collected in a possible crater (CTT-R2-SS-02-02) in this area. The field team moved to Area B to look for the gun emplacement (coordinates were given by Paul Petersen). The field team could not find the gun emplacement and moved to a magazine on Liming Road. A sample was taken at the magazine (CTT-O2-SS-02-06). The team spoke to Paul Petersen and he indicated he would provide a map of the gun emplacement to the team on Friday.
A daily summary email was sent to George Liffert, Kathy Caudill, Bob Hickman, and Paul Petersen of NPS stating that 2 expended 40 mm illuminator rounds were found in Area E. The items were left where they were found.

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

C. Mitchell

Curtis Mitchell
Quality Control System Manager

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number:	08-18-06-01	**Date:** 08-18-06
Project Name:	Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017
Location of Work:	Prince William Forest Park (Triangle, VA)	
Description of Work:	SI sampling at Chopawamsic Troop Training Site	

Weather: Sunny/ humid	**Rainfall:** 0	**Temperature:** **Min.** 75 **Max.** 85

1. Work performed today by Alion Team.

Recorded anomaly counts, locations, and descriptions while performing site reconnaissance (meandering paths).

Completed surface soil, sediment, surface water, and groundwater sampling.

Reconnaissance Acreage / Discussion:

Meandering path reconnaissance was conducted during travel to sample locations. Travel paths varied from Figure E.1-3 in the SS-WP due to the site terrain and the sampling order. Additional geophysical reconnaissance was conducted to obtain more complete coverage of the site and to try and locate areas of concern.

Samples Collected:

Samples collected:

CTT-BG-SW-00-01	CTT-BG-SW-00-02
CTT-BG-SW-00-02-QA	CTT-BG-SW-00-02-MS
CTT-BG-SW-00-02-MSD	Field Dup 7 (CTT-BG-SW-00-02)
CTT-BG-SD-02-01	CTT-BG-SD-02-02
CTT-BG-SS-02-01	CTT-BG-SS-02-02
CTT-BG-SS-02-03	CTT-PR-SS-02-01

Total: 4 surface soil, 2 sediment, and 6 surface water samples collected (including QA/QC samples)

Field Tests:

Schonstedt-tested OK

YSI-used to test surface water parameters (See #4 of this Daily Quality Control Report)

Trimble-Benchmark (Designation Prince AZ MK) was located. The Trimble was checked/confirmed to be within 1 meter of the coordinate obtained from the NOAA website.

Calibration of Instruments:

YSI-see field calibration sheet

Other:

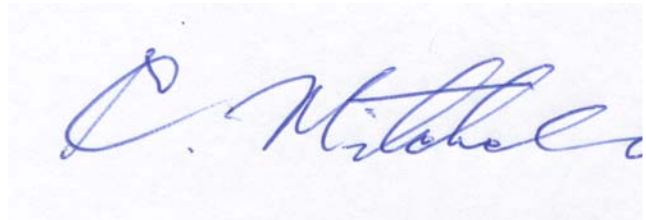
Photos were taken of SI activities and sample locations.

2. Work performed today by other subcontractors.

None

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)	
All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.	
4. List type and location of tests performed and results of these tests.	
1 surface water sample (YSI results below)	
CTT-BG-SW-00-01	CTT-BG-SW-00-02
Temp (C) = 19.76	Temp (C) = 19.76
SC (uS/cm^2) = 91	SC (uS/cm^2) = 81
Turbidity (NTU) = 8.4	Turbidity (NTU) = 8.4
pH = 6.55	pH = 6.60
5. List material and equipment received.	
None. All material/equipment already mobilized.	
6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.	
None	
7. Off-site surveillance activities, including action taken.	
None	
8. Job Safety. (Report safety violations observed and actions taken)	
No safety violations observed. Safety orientation and briefing conducted prior to fieldwork.	
9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)	
The field teams attempted to meet with Paul Petersen at 8am, but found that he would not be in the office until later that day. The teams began collecting the background samples. After the background surface water, sediment, and surface soil samples were collected the teams attempted to contact Paul. Paul was still unavailable. One team attempted to locate the gun emplacement for a second time, but was unable to locate it. The other team attempted to locate the pistol range near Camp 4 with the directions/description that Judy had provided. Paul contacted the team at Camp 4, but indicated he did not have any further information on the location of the pistol range. A surface soil sample was collected in the area Judy had described as pistol range. However, no evidence of a pistol range near Camp 4 was present.	
Paul Petersen contacted the team as the team was leaving the site. He indicated that he had found map for the gun emplacement wanted to meet at Park Headquarters for a closing briefing. George Liffert, Bob Hickman, and Paul Petersen of NPS were present at the closing briefing. Alion informed NPS of all findings on the site and indicated that all the samples were not collected. Alion focused the sampling in the critical areas presented in the ASR. Alion will be coming back to the site to collect the private well samples. Based on a discussion between Alion and USACE, the remainder of the samples will be collected or the samples will be scaled down. The remaining samples include: 26 soil samples, 4 sediment samples, 4 surface water samples and the 5 groundwater samples (from the private wells). NPS requested a copy of the ROE that will be presented to the private landowners. Alion agreed to pass the message on to USACE. NPS also wanted to know if they could abandon the supply wells since they were now on public water. Alion stated that they would get back to NPS on the supply well question.	

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.



Curtis Mitchell
Quality Control System Manager

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number: 11-28-06-01	**Date:** 11-28-06
Project Name: Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017
Location of Work: Prince William Forest Park and private homeowners (Triangle, Virginia)	
Description of Work: Field Sampling and anomaly avoidance	
Weather: sunny; **Rainfall:** none	**Temperature: Min.** 58 **Max.** 65

1. Work performed today by Alion Team.

Health and Safety briefing, reviewed Health and Safety Plan – all field team members signed Health and Safety review form.

Recorded anomaly counts, locations, and descriptions while performing site reconnaissance (meandering paths).

Performed surface soil and groundwater sampling.

Reconnaissance Acreage / Discussion:

Reconnaissance was performed by the UXO Technician at the 1 acre open burn/open detonation area near Liming Lane (upgradient of the private homeowners). One soil sample was taken offset from several subsurface anomalies in this area. Metal and concrete surface trash were found and recorded in this area.

Samples Collected:

CTT-O3-SS-02-11

CTT-O3-GW-00-03

CTT-O3-GW-00-04 (QA and Field Dup 1)

Field Tests:

Schonstedt check OK.

YSI-used to test groundwater parameters (See #4 of this Daily Quality Control Report)

Trimble-Benchmark (Designation Prince AZ MK). The Trimble was checked/confirmed to be within 1 meter of the coordinate obtained from the NOAA website.

Calibration of Instruments:

YSI Calibration-see field sheet

Other:

None.

2. Work performed today by other subcontractors.

None.

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)

All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.

4. List type and location of tests performed and results of these tests.	
CTT-O3-GW-00-03	CTT-O3-GW-00-04
pH=5.40	pH=6.53
Turbidity=0.5 NTU	Turbidity=0.7 NTU
Specific Conductance=0.083 mS/cm2	Specific Conductance=0.257 mS/cm2
Temperature=58.48 F	Temperature=58.72 F
5. List material and equipment received.	
None.	
6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.	
None.	
7. Off-site surveillance activities, including action taken.	
None.	
8. Job Safety. (Report safety violations observed and actions taken)	
No safety violations.	
9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)	
Reconnaissance was performed by the UXO Technician at the 1 acre open burn/open detonation area. One soil sample was taken offset from several subsurface anomalies in this area. Water samples were collected at the outside tap of 2 homeowners downgradient of the 1 acre open burn/open detonation area. The addresses of the two homes are 17937 Joplin Road (William Weisenberger) and 18049 Joplin Road (Larry Hill). Larry Hill is the next-door-neighbor of Vernal Timmons (USACE had ROE to sample Mr. Timmons' well). We met with Mr. Timmons in the early afternoon and determined that we could not sample the well at his house because he has no electricity at the home and hooking up a generator would have involved some electrical rewiring. Mr. Timmons told us that he had spoken to his neighbor, Larry Hill, and he was willing to have his water sampled. We went over and talked to Larry Hill and explained who we were. Larry Hill signed a hand-written permission letter giving his permission to sample the water at his outside tap.	
Two samples in the 1 acre open burn/open detonation area were not collected because only one area of interest was found (subsurface anomalies). The field team will attempt to go back to this area later in the week to walk around and attempt to position sample locations near debris, subsurface anomalies, etc.	
A daily summary email was sent to George Liffert, Kathy Caudill, Bob Hickman, and Paul Petersen of NPS and Adriane James of CENAO.	

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Curtis Mitchell
Quality Control System Manager

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number:	11-29-06-01	**Date:** 11-29-06
Project Name:	Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017
Location of Work:	Prince William Forest Park (Triangle, VA)	
Description of Work:	Field Sampling and anomaly avoidance	

Weather:	foggy in a.m.; sunny in p.m.	**Rainfall:**	none	**Temperature:**	**Min.**	55	**Max.**	65

1. Work performed today by Alion Team.

Health and Safety briefing

Recorded anomaly counts, locations, descriptions while performing reconnaissance (meandering paths)

Performed surface soil sampling

Reconnaissance Acreage / Discussion:

Reconnaissance was conducted in the meandering path fashion during travel to sample locations. Travel paths varied from the sampling figures in the SS-WP due to natural terrain and a revision to the sampling order.

Samples Collected:

CTT-M1-SS-02-01	CTT-O2- SS-02-05 (QA, FIELD DUP 2)
CTT-M1-SS-02-02	CTT-O3- SS-02-12 (QA, FIELD DUP 3)
CTT-M1-SS-02-04	CTT-O3- SS-02-13
CTT-M1-SS-02-06	

Field Tests:

Schonstedt check good.

Trimble-Benchmark Prince AZ MK checked/confirmed to be within 1 meter

Calibration of Instruments:

None

Other:

None.

2. Work performed today by other subcontractors.

None.

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)

All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.

4. List type and location of tests performed and results of these tests.

None

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

5. List material and equipment received.
None.
6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.
None.
7. Off-site surveillance activities, including action taken.
None.
8. Job Safety. (Report safety violations observed and actions taken)
No safety violations.
9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)
Today, we performed reconnaissance and sampling at the intersections of Old Black Top Road and Taylor Farm Road. USACE reports indicate that this area was a former mortar range. We found several dirt mounds in the area but no surface or subsurface anomalies in the mounds. We also found 2 holes/craters with fragment near the outer rim and bottom of the holes. We found several subsurface anomalies in the area and offset 4 surface soil samples near the subsurface anomalies and the holes.
The field team also performed reconnaissance and sampling south of parking lot I. USACE reports indicate this area was a former rifle range firing point. We did not find any subsurface anomalies in this area. We did find a suspected natural backstop area and collected a surface soil sample in this area.
We ended up the day at the 1 acre open burn/open detonation area near Liming Lane (upgradient of the private homeowners). We found many subsurface anomalies and collected 2 additional surface soil samples offset from subsurface anomalies (locations were recorded in the field log book).
Area I (mortar range), Area A firing point (rifle range), and the 1 acre demolition area near Liming Lane have been completed.
A daily summary email was sent to George Liffert, Kathy Caudill, Bob Hickman, and Paul Petersen of NPS and Adriane James of CENAO.

Alion Science and Technology, Inc's Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

C. Mitchell

Curtis Mitchell
Quality Control System Manager

Alion Science and Technology, Inc.

DAILY QUALITY CONTROL REPORT

Report Number: 11-30-06-01	**Date:** 11-30-06
Project Name: Chopawamsic Troop Training Site C03VA019402	**Contract Number:** W912DY-04-D-0017
Location of Work: Prince William Forest Park (Triangle, VA)	
Description of Work: Field Sampling and anomaly avoidance	
Weather: Party cloudy **Rainfall:** none	**Temperature: Min.** 65 **Max.** 75

1. Work performed today by Alion Team.

Health and Safety briefing

Recorded anomaly counts, locations, descriptions while performing reconnaissance (meandering paths)

Surface soil, sediment, and surface water sampling

Reconnaissance Acreage / Discussion:

Reconnaissance was conducted in the meandering path fashion during travel to sample locations. Travel paths varied from the sampling figures in the SS-WP due to natural terrain and sampling order.

Samples Collected:

CTT-GR-SS-02-05	CTT-M2-SD-02-01
CTT-M2-22-02-05	CTT-RR-SW-00-01
CTT-M2-22-02-06	CTT-RR-SD-02-01
CTT-M2-SW-00-01 (QA and FIELD DUP 4)	

Field Tests:

Schonstedt check good.

YSI-used to test surface water parameters (See #4 of this Daily Quality Control Report)

Trimble-Benchmark Prince AZ MK checked/confirmed to be within 1 meter

Calibration of Instruments:

YSI-see field sheets.

Other:

None.

2. Work performed today by other subcontractors.

None.

3. Type and results of Control Phases and Inspection. (Indicate whether Preparatory – P, Initial – I, or Follow-Up – F and include satisfactory work completed or deficiencies with actions to be taken)

All preparatory phase inspections for field work were completed prior to mobilizing to Virginia. Initial phase of inspections were completed upon site arrival. No follow-up inspections were completed today. Satisfactory work completed.

4. List type and location of tests performed and results of these tests.

CTT-M2-SW-00-01	CTT-RR-SW-00-01

pH=6.82	pH=6.35
Turbidity=4.5 NTU	Turbidity=3.3 NTU
Specific Conductance=0.084 mS/cm2	Specific Conductance=0.048 mS/cm
Temperature=52.44 F	Temperature=60.76 F

5. List material and equipment received.

None.

6. Submittals reviewed. (Include Transmittal No., Item No., Spec/Plan Reference, by whom, and any action.

None.

7. Off-site surveillance activities, including action taken.

None.

8. Job Safety. (Report safety violations observed and actions taken)

No safety violations.

9. Remarks. (Instructions received or given. Conflicts in Plans or Specifications)

We performed reconnaissance and sampling in the area south of parking lot A near the former fragmentation grenade range. USACE reports indicate that a mortar was found in the roof in this area in 1985. We did not find this structure and Paul Petersen (NPS) could not find anyone who had knowledge of where this structure was located. We found subsurface anomalies in the area and offset one surface soil sample from the subsurface anomalies. We also found 2 concrete boxes but could not identify what they were (photos were taken). Several trenches were also found in the area.

We met Paul Petersen near Cabin Camps 2 and 5 and he led us to the 2 “dummy” concrete gun mounts in area B (the gun mounts are approximately 40 m apart). It appears that the gun mounts were used as targets. One of the gun mounts had a hole in the side where it appears that a 2.36 in. rocket may have impacted it. We took a soil sample next to each gun mount.

We collected 1 surface water and 1 sediment samples on South Fork Quantico Creek where it crosses Mawavi Road (area B range fan). We took a second surface water and sediment sample on a tributary draining south into South Fork Quantico Creek (also in area B range fan).

At the conclusion of the sampling event, I met with George Liffert to give him a summary of the field event. We discussed the fact that all of the data for the field sampling as well as the locations of the samples, where we walked, and what we found would all be included in the SI Report. I also told Mr. Liffert that NPS would be given a copy (via USACE) of the Draft SI Report to provide comments.

Kathy Caudill of NPS sent an email following up on the Alion Team’s suggestion that Quantico check out the items in the museum are inert and provide documentation certifying this. NPS has followed up as Alion Team suggested (Attachment 1).

NPS requested that Alion Team send a daily email summary of the field activities. The daily summary email was sent to George Liffert, Kathy Caudill, Bob Hickman, and Paul Petersen of NPS and Adriane James of CENAO. The emails have been attached (Attachment 2).

Alion Science and Technology, Inc’s Verification: On behalf of Alion, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as noted above.

Curtis Mitchell
Quality Control System Manager

Attachment 1

-----Original Message-----
From: Kathy_Caudill@nps.gov [mailto:Kathy_Caudill@nps.gov]
Sent: Wednesday, November 29, 2006 11:21 AM
To: McGinty, Angela
Subject: Re: 11/28/06 COE field work

Hi Angela,

Just a quick follow-up to one of the previous e-mails (below). We did have Quantico come out and look at the museum items and the rocket that is on display at the Visitor Center. Quantico did say they were inert and will be following up with documented paperwork certifying this. Thought it would be good to have this included as follow-up in our records!

Kathy Caudill

Attachment 2

From: McGinty, Angela
Sent: Friday, December 01, 2006 9:59 AM
To: 'george_liffert@nps.gov'; 'bob_hickman@nps.gov'; 'paul_e_petersen@nps.gov'; 'kathy_caudill@nps.gov'
Cc: O'Neill, Mike; 'cshia@alionscience.com'; 'Adriane.B.James@nao02.usace.army.mil'
Subject: 11/30/06 COE field work

Hello,

Here is a brief summary of our day on the site.

On Thursday, we performed reconnaissance and sampling in the area south of parking lot A near the former fragmentation grenade range. USACE reports indicate that a mortar was found in the roof in this area in 1985. We did not find this structure and Paul Petersen (NPS) could not find anyone who had knowledge of where this structure was located. We found subsurface anomalies in the area and offset one surface soil sample from the subsurface anomalies.

We met Paul Petersen near Cabin Camps 2 and 5 and he led us to the 2 “dummy” concrete gun mounts in area B (the gun mounts are approximately 40 m apart). It appears that the gun mounts were used as targets. One of the gun mounts had a hole in the side where it appears that a 2.36 in. rocket may have impacted it. We took a soil sample next to each gun mount.

We collected 1 surface water and 1 sediment samples on South Fork Quantico Creek where it crosses Mawavi Road (area B range fan). We took a second surface water and sediment sample on a tributary draining south into South Fork Quantico Creek (also in area B range fan).

At the conclusion of the sampling event, I met with George Liffert to give him a summary of the field event. We discussed the fact that all of the data for the field sampling as well as the locations of the samples, where we walked, and what we found would all be included in the SI Report. I also told Mr. Liffert that NPS would be given a copy (via USACE) of the Draft SI Report to provide comments.

Thanks,
angela

Angela McGinty
EA Engineering, Science, and Technology
Woodbridge Office Center
1319 Woodbridge Station Way, Suite 200
Edgewood, MD 21040

P: 410-538-8202 Ext. 115
F: 410-538-8207
Amcginty@eaest.com

From: McGinty, Angela
Sent: Wednesday, November 29, 2006 9:12 PM
To: george_liffert@nps.gov; bob_hickman@nps.gov; paul_e_petersen@nps.gov; kathy_caudill@nps.gov
Cc: O'Neill, Mike; cshia@alionscience.com; Adriane.B.James@nao02.usace.army.mil
Subject: 11/29/06 COE field work

Hello,

Here is a brief summary of our day on the site.

Today, we performed reconnaissance and sampling at the intersections of Old Black Top Road and Taylor Farm Road. USACE reports indicate that this area was a former mortar range. We found several dirt mounds in the area but no surface or subsurface anomalies in the mounds. We also found 2 holes/craters with fragment near the outer rim and bottom of the holes. We found several subsurface anomalies in the area and offset 4 surface soil samples near the subsurface anomalies.

The field team also performed reconnaissance and sampling south of parking lot I. USACE reports indicate this area was a former rifle range firing point. We did not find any subsurface anomalies in this area. We did find a suspected natural backstop area and collected a surface soil sample in this area.

We ended up the day at the 1 acre open burn/open detonation area near Liming Lane (upgradient of the private homeowners). We found many subsurface anomalies and collected 2 additional surface soil samples offset from subsurface anomalies.

On Thursday we intend to perform reconnaissance south of parking lot I at the former fragmentation grenade range. We are also going to meet Paul Petersen at 10 near the entrance to Cabin Camps 2 and 5 on Mawavi Road so that he can show us where the gun mount is located. We intend to take surface soil samples near the gun mount. We also intend to take 2 surface water/sediment samples in the stream that crosses Mawavi Road and potentially 2 additional surface soil samples if anything of interest is found in the area.

We will end the day by giving a briefing of our field work to George Liffert. I will call in the early afternoon to give you a better idea when we will be finished.

Thanks,
angela

From: McGinty, Angela
Sent: Tue 11/28/2006 10:24 PM
To: george_liffert@nps.gov; bob_hickman@nps.gov; paul_e_petersen@nps.gov; kathy_caudill@nps.gov
Cc: O'Neill, Mike; cshia@alionscience.com; Adriane.B.James@nao02.usace.army.mil
Subject: 11/28/06 COE field work

Hello,

Here is a brief summary of our day on the site.

We arrived at the site this afternoon and reconnaissance was performed by the UXO Technician at the 1 acre open burn/open detonation area near Liming Lane (upgradient of the private homeowners). One surface soil sample was taken offset from several subsurface anomalies in this area. Metal and concrete surface trash were found and recorded in this area.

Additionally, water samples were collected at the outside tap of 2 homeowners downgradient of the 1 acre open burn/open detonation area. The addresses of the two homes are 17937 Joplin Road (William Weisenberger) and 18049 Joplin Road (Larry Hill). Larry Hill is the next-door-neighbor of Vernal Timmons (we originally intended to sample Mr. Timmons' well). We met with Mr. Timmons in the early afternoon and determined that we could not sample the well at his house because he has not had electricity at the home for almost 1 year and hooking up a generator would involved some electrical rewiring. Mr. Timmons told us that he had spoken to his neighbor, Larry Hill, and he was willing to have his water sampled. We went over and talked to Larry Hill and explained who we were. Larry Hill signed a hand-written permission letter giving his permission to sample the water at his outside tap.

On Wednesday we intend to perform reconnaissance and sampling at the intersections of Old Black Top Road and Taylor Farm Road as well as the areas near parking lots A and I.

Thanks,
angela

From: McGinty, Angela
Sent: Thu 8/17/2006 7:16 PM
To: McGinty, Angela; george_liffert@nps.gov; bob_hickman@nps.gov; paul_e_petersen@nps.gov; kathy_caudill@nps.gov
Cc: O'Neill, Mike; Harvey, William
Subject: RE: 8/16/06 COE field work

Hello,

Here is a brief summary of our day on the site.

We spent the day with Judy near North Orenda Drive in the area of archaeological significance. Near the end of the day we found 2 pieces of munitions debris which the UXO technician believes are 40 mm illuminator rounds. These items were near an old homestead that Judy identified on her archaeological map. These munitions debris were expended and inert and are not dangerous. We left the items where we found them. Here are the coordinates:
UTM NAD83
4271663N 294635E
4271782N 294612E

Our UXO technician also looked at the munitions items in the museum collection and determined that they were intert and are not dangerous. The UXO technician stated that these items should be certified inert at some point. It was mentioned that there is a rocket in the visitor's center on display. The UXO technician requested to Judy and Paul that Quantico should be called if the rocket is not already certified as inert.

We also collected some remaining samples east of Camp 5 and a few other scattered samples.

We will be meeting with Paul in the morning to get a better idea where a gun mount is located and we would like to ask Paul if we can get access to the gate at Camp 4 to check out a pistol range used by the OSS (mentioned to us by Judy).

Thanks,
angela

From: McGinty, Angela
Sent: Wed 8/16/2006 11:14 PM
To: McGinty, Angela; george_liffert@nps.gov; bob_hickman@nps.gov; paul_e_petersen@nps.gov; kathy_caudill@nps.gov
Cc: O'Neill, Mike; Harvey, William
Subject: 8/16/06 COE field work

Hello,

Here is a brief summary of our day on the site.

As anticipated, we sampled in the southwest portion of the site near Camp 2 and Camp 5 as well as the area near the intersections of Old Black Top Road and Taylor Farm Road. We collected 16 soil, 2 sediment, 2 surface water, and 2 groundwater samples. No MEC was found while walking and collecting samples in these areas.

Rocky Schroeder spent the morning with one of our field team members and provided access to the 2 remaining supply wells.

As I indicated in my email yesterday, we would like to walk through and sample around North Orenda Road on Thursday. This area contains 7 surface soil samples in areas of archaeological significance. There are also 2 sediment and 2 water samples in the stream south of this area. I received the message from Paul that an NPS employee would like to be out with us when we sample. I left a message for Paul that we would be at Parking Lot D at 8am Thursday morning.

Thank you,
angela

From: McGinty, Angela
Sent: Tue 8/15/2006 10:41 PM
To: george_liffert@nps.gov; bob_hickman@nps.gov; paul_e_petersen@nps.gov; kathy_caudill@nps.gov
Cc: O'Neill, Mike; Harvey, William
Subject: 8/15/06 COE field work

Hello,

Here is a brief summary of our day on the site.

As anticipated, we spent the day in the vicinity of parking lots A, B, and C as well as the area along Scenic Drive south of the South Valley Trail. In this area, we collected 17 surface soil samples, 2 sediment samples, and 2 surface water samples. No MEC was found while walking and collecting samples in this area.

Additionally, Rocky Schroeder spent the afternoon with one of our field team members and provided access to 3 of the supply wells (springs). We have coordinated with Rocky to finish sampling the final 2 supply wells Wednesday morning.

Also, on Wednesday, we anticipate sampling in the southwest portion of the site near Camp 2 and Camp 5 as well as the area near the intersections of Old Black Top Road and Taylor Farm Road (if time permits). Would it be possible to get access to the unpaved road that leads to Happy Land (Camp 5) as well as the unpaved Old Black Top Road at Parking Lot F? From your Park map, it looks like these roads have gates. You mentioned possibly "dummy locking" these gates for us? We will be on-site at 7am but do not need access to these areas until 10am at the earliest. Possibly Rocky can open these gates for us? We will discuss this with him in the morning. If he is not able to give us access, I will call George and Paul.

On Thursday, we anticipate sampling on the east side of the site around North Orenda Road. This area contains 7 surface soil samples in areas of archaeological significance. There are also 2 sediment and 2 water samples in the stream south of this area. You mentioned that you would like a park employee to accompany our field teams while we are in this area of archaeological significance. I will give you a call on Wednesday, George, to coordinate this with you.

Thanks in advance for your help.

angela

From: McGinty, Angela
Sent: Mon 8/14/2006 10:32 PM
To: george_liffert@nps.gov; kathy_caudille@nps.gov; bob_hickman@nps.gov; paul_e_petersen@nps.gov
Cc: O'Neill, Mike; Harvey, William
Subject: 8/14/06 COE field work

Hello,

Here is a brief summary of our afternoon on the site.

We parked in Parking Lot I and collected 1 surface soil, 1 surface water, and 1 sediment sample north of Scenic Drive in an old rifle range area. We did not find any surface or subsurface anomalies while doing reconnaissance in the area.

On Tuesday, we anticipate being in the vicinity of parking lots A, B, and C as well as the area along Scenic Drive south of the South Valley Trail.

If you need to contact me while in the field, my cell phone number is 215-280-0591.

Thanks,
angela

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

1 of 5 Pgs.

Project: Chopawamsic
Client: Corinne Shia / Allion
Send Results To: Corinne Shia
Address: 3975 Fair Ridge Dr, Suite 125 S.
Fairfax, VA 22033
Phone: 703-259-5747

Turnaround Time: Std →
# of Containers: 1/2 | 1 | 1
Container Type: 8oz/1L | 8oz | 1L
Preservative Used: — | — | HNO_3
Type of Analysis: Explosives 8330A * | 6010B Metals x | Metals 6020 o

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Explosives 8330A	6010B Metals	Metals 6020	Lab Cooler No.	CLIENT COMMENTS
TT-M1-SS-02-03	8/16	1610	SOIL	DA	X	X		1	* analyze NG +
TT-M1-SS-02-07	8/16	1715	SOIL	DA	X	X		1	PETN by 8330A
TT-M1-SS-02-08	8/16	1645	SOIL	DA	X	X		1	x analyze zirconium
TT-M1-SS-02-09	8/16	1520	SOIL	DA	X	X		1	by 6010B
TT-M2-SS-02-01	↓	1210	↓	ALM	X	X		1	o analyze zirconium
TT-M2-SS-02-01-MS		1210		ALM	X	X		1	by 6020
TT-M2-SS-02-01-MSD		1210		ALM	X	X		1	
TT-M2-SS-02-02		1425		ALM	X	X		1	
TT-M2-SS-02-03		1345		BH	X	X		1	
TT-M2-SS-02-04		0945		ALM	X	X		1	
TT-R1-SS-02-01		0851		JO	X	X		1	
TT-R1-SS-02-02		1250		DA	X	X		1	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
John Owoyemi	08/18 3:31Pm				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ______________

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: Chopawamsic
Client: Corinne Shia / Alion
Send Results To: Corinne Shia
Address: 3975 Fair Ridge Dr, Suite 125 South
Fairfax, VA 22033
Phone: 703-259-5747

	Std →			
Turnaround Time	Std	→		
# of Containers	1	2	1	1
Container Type	8oz/1liter	8oz		1L
Preservative Used	—	—		HNO_3
Type of Analysis	Explosives* 8330A	6010B x Metals°	6020 (filtered) Metals	

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Explosives* 8330A	6010B x Metals°	6020 (filtered) Metals	Lab Cooler No.	CLIENT COMMENTS
TT-R1-SS-02-03	8/16	1150	SOIL	DA	X	X		1	*analyze NG+
TT-R1-SS-02-04	↓	1325	↓	JO	X	X		1	PETN by 8330A
TT-RR-SS-02-01		0945		DA	X	X		1	X analyze Zirconium
TT-RR-SS-02-02		1042		DA	X	X		1	by 6010 B
TT-RR-SS-02-03		1155		DA	X	X		1	° analyze Zirconium
TT-RR-SS-02-04		1010		ALM	X	X		1	by 6020
TT-RR-SS-02-05	↓	1148	↓	ALM	X	X		1	
TT-01-SS-02-01	8/17	1100	↓	BH	X	X		1	
TT-01-SS-02-03	8/17	1000	↓	BH	X	X		1	
TT-01-SD-02-01	8/16	1525	SOIL	BH	X	X		1	
TT-01-SD-02-03	↓	1720	SOIL	BH	X	X		1	
TT-01-SW-00-01	↓	1520	water	ALM	X		X	2	field filtered metals 0.45µ

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
John Onafemi	08/18 3:39Pm				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ______________

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7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: Chopawamsic
Client: Corinne Shia / Alion
Send Results To: Corinne Shia
Address: 3975 Fair Ridge Dr, Suite 125 South
Fairfax, VA 22033
Phone: 703-259-5147

	Explosives* 8330A	Metals* 6010B	Metals (filtered) 6020 &	Perchlorate SOP 8321M (filtered)
Turnaround Time	Std	→	→	→
# of Containers	2	1	1	1
Container Type	8oz/liter	8oz	liter	500mL
Preservative Used	—	—	HNO_3	—

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Explosives* 8330A	Metals* 6010B	Metals (filtered) 6020 &	Perchlorate SOP 8321M (filtered)		Lab Cooler No.	CLIENT COMMENTS
TT-01-SW-00-03	8/16	1715	water	BH	X		X		field filtered 0.45 µm metals	(2)	*analyze PETN
TT-R2-SS-02-02	8/17	1145	SOIL	BH	X	X				1	+NG by 8330A
TT-02-SS-02-03	8/17	1630	SOIL	BH	X	X				1	x analyze Zirconium
TT-02-SS-02-06	8/17	1520	SOIL	BH	X	X				1	by 6010B
TT-02-GW-00-01	8/16	1000	water	BH	X			X	field filtered 0.2 µm perchlorate		& analyze Zirconium
TT-03-SS-02-01	8/17	1455	SOIL	ALM	X	X				1	by 6020
TT-03-SS-02-02	↓	1530	↓	ALM	X	X				1	
TT-03-SS-02-03	↓	1430	↓	ALM	X	X				1	
TT-03-SS-02-04	↓	1425	↓	ALM	X	X				1	
TT-03-SS-02-05	↓	1115	↓	ALM	X	X				1	
TT-03-SS-02-06	↓	1140	↓	ALM	X	X				1	
TT-03-SS-02-07	↓	1515	↓	ALM	X	X				1	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
John Amperi	8/18/06 1539				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ______________

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7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: Chopawamsic
Client: Corinne Shia / Alien
Send Results To: Corinne Shia
Address: 3175 Fair Ridge Dr, Suite 125 South
Fairfax, VA 22033
Phone: 703 - ~~395~~ 259 - 5147

	Explosives* 8330A	Metals × 6010B	Metals (Filtered) 6020 °	Perchlorate SOP 8321M (Filtered)						Lab Cooler No.	
Turnaround Time	Std →										
# of Containers	2	1	1	1							
Container Type	8oz / liter	8oz	liter	500mL							
Preservative Used	—	—	HNO_3	—							

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Explosives* 8330A	Metals × 6010B	Metals (Filtered) 6020 °	Perchlorate SOP 8321M (Filtered)		Lab Cooler No.	CLIENT COMMENTS
TT-03-SD-02-01	8/17	1045	SOIL	DA	X	X				1	* analyze PETN
TT-03-SD-02-02	↓	1630	SOIL	ALM	X	X				1	+ NG by 8330A
TT-03-SW-00-01	↓	1020	water	BH	X		X		field filtered 0.45um metals	2	× analyze
TT-03-SW-00-02	↓	1625	water	ALM	X		X		field filtered 0.45um metals	2	Zirconium by 6010B
TT-03-~~GW~~-00-01	8/16	0900	water	BH	X			X	field filtered 0.2 µm perchlorate	2	° analyze Zirconium by 6020
TT-BG-SS-02-01	8/18	0900	SOIL	DA		X				1	
TT-BG-SS-02-02	↓	0925	SOIL	DA		X				1	
TT-BG-SS-02-03	↓	0945	SOIL	DA		X				1	
TT-BG-SW-00-01	↓	0945	water	BH			X		field filtered 0.45um metals	2	
TT-BG-SW-00-02	↓	0905	water	BH			X		field filtered 0.45um metals	2	
TT-BG-SD-02-01	↓	0950	soil	BH		X				1	
TT-BG-SD-02-02	↓	0900	soil	BH		X				1	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
John [illegible]	8/18/06 1539				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ________

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: Chopawamsic
Client: Corinne Shia / Alion
Send Results To: Corinne Shia
Address: 3975 Fair Ridge Dr, Suite 125 South
Fairfax, VA 22033
Phone: 703-259-5147

					Explosives* 8330A	Metals + 6010B	Metals ° 6020							Lab Cooler No.	CLIENT COMMENTS
Turnaround Time					std	std	std								
# of Containers					1	1	2								
Container Type					8oz	8oz	1 liter								
Preservative Used					—	—	HNO_3								
Sample ID#	**Date Sampled**	**Time Sampled**	**Sample Matrix**	**Sampler's Initials**											
Field Dup 5	8/16	—	SOIL	ALM	X	X								1	* analyze NOT
Field Dup 6	~~8/16~~ 8/17 ALM	—	SOIL	AM	X	X								1	PETN by 8330A
Field Dup A	8/16	—	SOIL	DA	X	X								1	+ analyze Zirconium
Field Dup B	8/16	—	SOIL	DA	X	X								1	by 6010B
Field Dup 7	8/18	—	water	BA ALM	~~X~~		X							2	° analyze
TT-B6-SW-00-02 MS	8/18	0905	water	BA	~~X~~		X							2	Zirconium by 6020
TT-B6-SW-00-02 MSD	8/18	0905	water	BA			X							2	
PR-SS-02-01	8/18	1125	SOIL	DA	X	X								1	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
John Onyemi	08/18/06 1539				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ____________

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: Chopawamsic C03VA019402

Client: Alion

Send Results To: Corinne Shia

Address: 3975 Fair Ridge Drive Suite 103
Fairfax, VA 22033

Phone: 703-259-5147

	Metals 6010B	Explosives 8330A	Metals 6020 (filtered)	Explosives 8330A	Perchlorate 8321M (filtered)	PETN ** 8330A	NG ** 8330A	~~[illegible]~~ MJO 6		Lab Cooler No.
Turnaround Time	Std →									
# of Containers	1	1	1	2	1	1/2	1/2	~~1~~		
Container Type	8oz	8oz	1L	1L	500mL	8oz/1L	8oz/1L	~~8oz~~		
Preservative Used	—	—	HNO3	—	—	—	—	—		

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Metals 6010B	Explosives 8330A	Metals 6020 (filtered)	Explosives 8330A	Perchlorate 8321M (filtered)	PETN ** 8330A	NG ** 8330A	~~[illegible]~~		Lab Cooler No.	CLIENT COMMENTS
CTT-03-SS-02-08	8/15	1540	soil	AM	X	X				X	X	~~X~~ MJO		1 *	Entire MMRP List of Metals
CTT-03-SS-02-09	8/15	1555	soil	↓	X	X				X	X	~~X~~ MJO		1	** Run with other Explosives 8330A
CTT-03-SS-0210	8/15	1615	soil		X	X				X	X	~~X~~ MJO		1	
CTT-03-GW-00-02	8/15	1445	water					X	X	X	X			2	filtered 0.2um (field)
~~CTT-03-GW-00-02DA~~	~~8/15~~		~~water~~												AM
CTT-03-GW-00-02MS	8/15	1445	water					X	X	X	X			2	field filtered 0.2um
CTT-03-GW-00-02MSD	8/15	1445	water					X	X	X	X			2	field filtered 0.2um
CTT-M2-GW-00-01	8/15	1340	water					X	X	X	X			2	field filtered 0.2um
CTT-M2-GW-00-02	8/15	1255	water					X	X	X	X	MJO		2	field filtered 0.2um
CTT-R2-SS-02-01	8/14	1650	soil		X	X				X	X	~~X~~ MJO		1	
CTT-R2-SD-02-01	8/14	1715	soil		X	X				X	X	~~X~~		1	
CTT-R2-SW-00-01	8/14	1700	water	↓			X	X					MJO	1	field filtered 0.45µm

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Michael O'Neill	8/16/06 10:00AM				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

 G.P. W.O. ____________

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference	2 of 4 Pgs.

Project:	Chopawamsic C03VA019402
Client:	Alion
Send Results To:	Corinne Shia
Address:	3975 Fair Ridge Drive Suite 103, Fairfax, VA 22033
Phone:	703-259-5147

Turnaround Time	STD →			
# of Containers	1	1	1	2
Container Type	8oz	8oz	1L	1L
Preservative Used	–	** –	–	–
Type of Analysis	Metals* 6010B	Explosives 8330A	Metals (filtered) 6020	Explosives 8330A

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Metals* 6010B	Explosives 8330A	Metals (filtered) 6020	Explosives 8330A							Lab Cooler No.	CLIENT COMMENTS
CTT-PR-SS-02-02	8/15	0940	SOIL	AM	X	X									1	*Entire MMRP Metals List
CTT-PR-SS-02-03	8/15	1200	SOIL	↓	X	X									1	** Run Entire List of Explosives under 6010B
~~CTT-R2-SS-0201-DA~~	~~8/14~~		~~SOIL~~													ALM
CTT-PR-SD-02-01	8/15	0911	SOIL		X	X									1	
CTT-PR-SD-02-02	8/15	1035	SOIL		X	X									1	
CTT-PR-SW-00-01	8/15	0930	Water				X	X							MS/D 1	field filtered 0.45 µm
CTT-PR-SW-00-02	8/15	0940	Water				X	X							MS/D 1	field filtered 0.45 µm
CTT-NF-SS-02-01	8/15	1140	SOIL		X	X									1	
~~CTT-NF-SS-02-01-DA~~	~~8/15~~		~~SOIL~~													ALM
CTT-NF-SS-02-01-MS	8/15	1140	SOIL		X	X									1	
CTT-NF-SS-02-01-MSD	8/15	1140	SOIL		X	X									1	
CTT-NF-SS-02-02	8/15	1100	SOIL	↓	X	X									1	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Michael O'Neill	8/16/06 10:00AM				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

 G.P. W.O. ______________

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference:

Project: Chopawamsic C03VA019402
Client: Alion
Send Results To: Corinne Shia
Address: 3975 Fair Ridge Drive Suite 103
FAIRFAX, VA 22033
Phone: 703-259-5147

	Metals* 6010B	Explosives** 8330A
Turnaround Time	STD →	
# of Containers	1	1
Container Type	8oz	8oz
Preservative Used	—	—

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Metals* 6010B	Explosives** 8330A								Lab Cooler No.	CLIENT COMMENTS
CTT-NF-SS-02-03	8/15	1010	SOIL	AM	X	X								/	*Entire MMRP List of Metals
CTT-G2-SS-02-01	8/15	1420	↓	↓	X	X								/	**RUN Entire List of Explosives under 6010B
CTT-G2-SS-02-02	8/15	1445			X	X								/	
CTT-GR-SS-02-01	8/15	1105			X	X								/	
~~CTT-GR-SS-02-01-DA~~	↓	~~1105~~			~~X~~	~~X~~									AZM
CTT-GR-SS-02-01-MS		1105			X	X								/	
CTT-GR-SS-02-01-MSD		1105			X	X								/	
CTT-GR-SS-02-02		1030			X	X								/	
CTT-GR-SS-02-03		1015			X	X								/	
CTT-GR-SS-02-04	↓	1155	↓		X	X								/	
Field Dup 1	8/14	—	SOIL		X	X								/	
Field Dup 2	8/15	—	SOIL	↓	X	X								/	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Michael O'Neill	8/16/06 10:00 AM				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ____________

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: Chopawamsic C03VA019402
Client: Alion
Send Results To: Corinne Shia
Address: 3975 FAir Ridge Drive Suite 103
Fairfax, VA 22033
Phone: 703-259-5147

Turnaround Time	STD →								
# of Containers	1	1	~~1~~ 2	2					
Container Type	8oz	8oz	1L	1L					
Preservative Used	—	—	—	—					
Type of Analysis	Metals* 6010B	Explosives** 8330A	Explosives 8330A	Perchlorate (filtered) 8321M					Lab Cooler No.

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Metals* 6010B	Explosives** 8330A	Explosives 8330A	Perchlorate (filtered) 8321M						Lab Cooler No.	CLIENT COMMENTS
Field Dup3	8/15	—	Soil	AM	X	X								1	*ENTIRE MMRP List of Metals
Field Dup4	8/15	—	water	↓			X	X						2	field filtered 0.2 µm
CTT-NFSS-02-04	8/15	1630	SOIL	↓	X	X								1	**Run Entire List
CTT-G2-SS-02-03	8/15	1450	SOIL	↓	X	X								1	of Explosives under
CTT-G2-SS-02-04	8/15	1515	SOIL	↓	X	X								1	6010B

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Michael O'Neill	8/16/06 10:00 AM				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ____________

STL Denver
4955 Yarrow Street
Arvada, CO 80002
phone 303-736-0100 fax 303-431-7171

Chain of Custody Record

SEVERN TRENT STL
Severn Trent Laboratories, Inc.

Client Contact	Project Manager: Alan Warminski	Site Contact: Angela McGinty	Date: 8/18/06	COC No: 1 of 1 COCs
USACE Baltimore District, CENAB	Tel/Fax: (410) 962-2179	Lab Contact: Lyn Benkers	Carrier: FedEX	Job No.
City Crescent Building, 10 S. Howard St., 10th	Analysis Turnaround Time			
Baltimore, MD 21201	Calendar (C) or Work Days (W)			
(410) 962-2179 Phone	TAT if different from Below standard			SDG No.
(410) 962-4266 FAX	☐ 2 weeks			
Project Name: Chopawamsic	☐ 1 week			
Site: Triangle, VA	☐ 2 days			
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	* Explosives 8330A	X Metals 6010B	o Metals 6020	Perchlorate 8321M	Sample Specific Notes:
CTT-M2-SS-02-01-QA	8/16	1210	SOIL	SOIL	1		X	X			
CTT-03-SS-02-01-QA	8/17	1455	SOIL	SOIL	1		X	X			
CTT-R1-SS-02-01-QA	8/16	0851	SOIL	SOIL	1		X	X			
CTT-RR-SS-02-01-QA	8/16	0945	SOIL	SOIL	1		X	X			
CTT-BG-SW-00-02-QA	8/18	0905	water	water	1				X		field filtered 0.45 μm
CTT-03-GW-00-02-QA	8/15	1445	Water	water	3		X		~~X~~ X AZM 8/22		
CTT-R2-SS-02-01-QA	8/14	1650	SOIL	Soil	1		X	X			
CTT-NF-SS-02-01-QA	8/15	1140	Soil	Soil	1		X	X			
CTT-GR-SS-02-01-QA	8/15	1105	SOIL	SOIL	1		X	X			

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____

Possible Hazard Identification
☒ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☒ Disposal By Lab ☐ Archive For ____ Months

Special Instructions/QC Requirements & Comments:
* analyze PETN + NG under 8330A
X analyze Zirconium by 6010B
o analyze Zirconium by 6020

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
William R Harvey	EA Eng.	8/18/06 1430			
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: MMRP SI - Chopawamsic
Client: Alion
Send Results To: Corrine Shia
Address: 3975 Fair Ridge Dr., suite 1255
Fairfax, VA 22033
Phone: 703-259-5747

	Metals (6010B)	Explosives (8330)	Explosives (8330A)	Perchlorate (EPA method)	PETN (8330 mod)	Nitroglycerin (8330 mod)	Metals (6020)	* Zirconium 6020 (ulm...)		
Turnaround Time	Std	→	→	→	→	→	→	→		
# of Containers	2	2	3	1	3	3	2			
Container Type	4oz	8oz	amber liter	HDPE liter	amber liter	amber liter	HNO3			
Preservative Used	—	—	—	filtered	—	—	HDPE liter			

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Metals (6010B)	Explosives (8330)	Explosives (8330A)	Perchlorate (EPA method)	PETN (8330 mod)	Nitroglycerin (8330 mod)	Metals (6020)	* Zirconium 6020		Lab Cooler No.	CLIENT COMMENTS
CTT-03-SS-02-11	11/28/06	1215	Soil	AZM	X	X						X		2	* emailed and called Paul Tomiczek To add to COC
CTT-03-GW-00-04	11/28/06	1345	Water	AZM			X	X	X	X				1, 2	perchlorate filtered 0.2 μm
CTT-03-GW-00-03	11/28/06	1500	water	AZM			X	X	X	X				1, 2	perchlorate filtered 0.2 μ
CTT-M1-SS-02-01	11/29/06	0825	soil	JO	X	X						X		2	
CTT-M1-SS-02-02	11/29/06	0920	Soil	JO	X	X						X		2	
CTT-M1-SS-02-04	11/29/06	1000	Soil	JO	X	X						X		2	
CTT-M1-SS-02-05	11/29/06	1030	soil	JO	X	X						X		2	
CTT-02-SS-02-05	11/29/06	1445	soil	JO	X	X						X		3	
CTT-03-SS-02-12	11/29/06	1525	soil	JO	X	X						X		3	
CTT-03-SS-02-13	11/29/06	1630	soil	JO	X	X						X		2	
CTT-GR-SS-02-05	11/30/05	0840	Soil	AZM	X	X						X		3	
CTT-MW-SW-00-01	11/30/05	1215	water	AZM			X		X	X	X			1	metals filtered with 0.45

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Angela McGinty	11/30 705p				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ______________

GPL LABORATORIES, LLLP

7210A Corporate Court
Frederick, MD 21703
(301) 694-5310
Fax (301) 620-0731

Contract #/Billing Reference

Project: MMRP SI-Chopawamsic
Client: Alion
Send Results To: Corinne Shia
Address: 3975 Fair Ridge Dr. Suite 1135
Fairfax, VA 22033
Phone: 703-259-5747

	Metals (6010B)	Explosives (8330)	Explosives (8330A)	PETN (8330 mod)	Nitroglycerin (8330 Amended)	Metals (6020)	Perchlorate EPA Method	*Zirconium 6020 (Mn filtered)		
Turnaround Time	Std →									
# of Containers	2	2	3	3	3	2	1			
Container Type	8oz	8oz	amber 1 liter →			HDPE	HDPE			
Preservative Used	—	—	—	—	—	HNO3	filtered			

Sample ID#	Date Sampled	Time Sampled	Sample Matrix	Sampler's Initials	Metals (6010B)	Explosives (8330)	Explosives (8330A)	PETN (8330 mod)	Nitroglycerin (8330 Amended)	Metals (6020)	Perchlorate EPA Method	*Zirconium 6020		Lab Cooler No.	CLIENT COMMENTS
TT-M2-SD-02-01	11/30/06	1220	soil	AZM	X	X						X		3	
TT-RR-SW-00-01	11/30/06	1330	water	AZM			X	X	X	X				2	metals filtered with 0.45
TT-RR-SD-02-01	11/30/06	1335	soil	AZM	X	X						X		2	
Field Dup 1	11/28/06	—	water	AZM			X	X	✓	NO	X			1, 2	filtered w/ 0.2 µm
Field Dup 2	11/29/06	—	soil	AZM	X	X						X		2	
Field Dup 3	11/29/06	—	soil	AZM	X	X						X		2	
Field Dup 4	11/30/06	—	water	AZM			X	X	X	X				1	metals filtered with 0.45
TT-M2-SS-02-05	11/30/06	1055	SOIL	AZM	X	X						X		3	
TT-M2-SS-02-06	11/30/06	1105	SOIL	AZM	X	X						X		3	

Relinquished By:	Date/Time	Received By:	Relinquished By:	Received for Laboratory By:	Date/Time
Angela McGinty	11/30 2050				

Relinquished By:	Date/Time	Received By:	Date/Time	Shipper:	Airbill No.:

Relinquished By:	Date/Time	Received By:	Lab Comments:	Temp:

G.P. W.O. ______________

STL Denver
4955 Yarrow Street
Arvada, CO 80002
phone 303-736-0100 fax 303-431-7171

Chain of Custody Record

SEVERN TRENT **STL**
Severn Trent Laboratories, Inc.

8330A alm 12/1/06

Client Contact	Project Manager: Alan Warminski	Site Contact: Angela McGinty	Date: 11/30/06	COC No:
USACE Baltimore District, CENAB	Tel/Fax: (410) 962-2179	Lab Contact: Lyn Benkers	Carrier: FedEx	1 of 1 COCs
City Crescent Building, 10 S. Howard St., 10th	**Analysis Turnaround Time**			Job No.
Baltimore, MD 21201	Calendar (C) or Work Days (W) ____			
(410) 962-2179 Phone	TAT if different from Below standard			
(410) 962-4266 FAX	☐ 2 weeks			SDG No.
Project Name: Chopawamsic	☐ 1 week			
Site: C03VA019402	☐ 2 days			
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample	Metals (~~8330A~~ 6010B)	Explosives (~~6010B~~ 8330A)	Explosives (8330A)	Perchlorate (EPA method)	Metals (6020)	PETN (8330 Mod)	Nitroglycerin (8330A mod)	Zirconium (6020C)	Sample Specific Notes:
CTT-03-GW-00-04-QA	11/28/06	1345		water	4				X	X		X	X		perchorate filtered with 0.2 µm filter
CTT-02-SS-02-05-QA	11/29/06	1445		soil	2		X	X						X	
CTT-03-SS-02-12-QA	11/29/06	1525		soil	2		X	X						X	
CTT-M2-SW-00-01-QA	11/30/06	1215		water	5				X		X				metals filter with 0.45 µm filter & preserved with HNO_3

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____________

Possible Hazard Identification
☒ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☐ *Unknown*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☒ *Disposal By Lab* ☐ *Archive For* ________ *Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Angela McGinty	EA Engineering	11/30/06 445			
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

ALL-WEATHER
ENVIRONMENTAL FIELD BOOK

Name Angela McGinty - Field Team Leader
Mike Shoop / Jason Cebula - UXO Techs
Address 15 Loveton Circle
Sparks, MD 21152
Phone 410-771-4950 / 410-538-8202
X115

Project MMRP Chopawamsic Troop
Training Site FUDS
C03VA019402
QA: Neill O'Neill

This book is printed on "Rite in the Rain" All-Weather Writing Paper - A unique paper created to shed water and enhance the written image. It is widely used throughout the world for recording critical field data in all kinds of weather. For best results, use a pencil or an all-weather pen.

Specifications for this book:

Page Pattern		Cover Options	
Left Page	Right Page	Polydura Cover	Fabrikoid Cover
Columnar	1/4" Grid	Item No. 550	Item No. 550F

CONTENTS

1st of 2 field books used for sampling

Reference Page Index

Location Chopawamsic Date 8/14/06
Project / Client CO3VA019402 / USACE

Weather: sunny 85-90°F

Arrival on site: 1400

(NPS = National Park Service)
Upon arrival to the site, the team went directly to NPS Park Headquarters to meet with George Liffert (Assistant Superintendent @ Prince William Forest Park [PWFP]) and Paul Peterson (Acting Chief of Resource Management at PWFP). Angela McGinty, Mike O'Neill, + Bill Harvey gave a brief overview of what was planned for the week, including surface soil, surface water, groundwater, + sediment samples. NPS requested that they be

Angela McGinty

Location Chopawamsic Date 8/14/06
Project / Client CO3VA019402 / USACE

notified if we decided to change any surface soil samples (2 inches) to subsurface soil samples (4 feet). ~~Alan~~ 8/14 AM Alan agreed. NPS requested ~~Alan~~ 8/14 AM Alan let them know when we will be in the archaeological sensitive areas - They would like to send someone with the ~~Alan~~ 8/14 AM field team. Alan agreed. NPS requested a daily email update - Alan agreed. NPS requested a briefing on Friday after field work was completed - Alan agreed.

1500 Health + Safety Briefing + Weekly overview:

Angela McGinty	Mike Shoop
Bill Harvey	Jason Cebula
Mike O'Neill	John Owoyemi
Delyn Alumbaugh	

All signed Health + Safety review.

Angela McGinty

Location Chopawamsic Date 8/14/06
Project / Client C03VA019402 / USACE

~~1530~~ ~~AZMK~~
Benchmark Prince - UTM 18, NAD 83
GPS 2: N 4270492.15 meters
E 295478.01 meters

GPS 1: N 4270493.67
E 295479.38

1630
YSI Calibration - see field calibration sheet

Parked at Parking Lot I - meandering path to sample locations - no surface or subsurface targets found. Parking Lot I is in the vicinity of Range A (this is where we started recon. & sampling).
Area A
1700 CCT-R2-SW-00-01
N 4272480.21
E 292942.92

2 amber jars - explosive

Jason J. Cebula Angela McGinty

Location Chopawamsic Date 8/14/06
Project / Client C03VA019402 / USACE

1 L plastic - metals (filtered)
photo 117
GRAB
1715 CCT-R2-SD-02-01
N 4272480.21
ALM 8/14 ~~YS~~ E 292942.92
1 8oz - metals + explosives
GRAB
YSI Readings:

pH = 6.62
T = 23.28°C
SC = 53 μS/cm²
Turbidity = 3.4 NTU

1630
Benchmark Prince AZMK

GPS #1 N 4270492.99
E 295478.96

Jason J. Cebula Angela McGinty

Location Chopawamsic Date 8/14/06
Project / Client C03VA019402 / USACE

GPS #2
N 4276491.68
E 295481.55

Departed from site at 1830

GPS #1 - Model TSCe
P/N 45268-50
Barcode 00037325

GPS #2 - Model TSCe
P/N 45268-00
Barcode 00023870

Downloaded files:
GPS #1 - 0814061
GPS #2 - 0814062

Jason J. Cabal Angela McGinty

Location Chopawamsic Date 8/14/06
Project / Client C03VA019402 / USACE

An email was sent with a summary of the day's activities and what areas are expect to sample on Tuesday 8/15/06.

Email sent to:
George Liffert
Kathy Caudill
Bob Hickman
Paul Pettersen
Mike O'Neill
Bill Harvey

NOT USED

Jason J. Cabal Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402/USACE

Weather: overcast, 77° - 88

Arrived on site @ benchmark 0700

0700 Benchmark Prince AZ MK
GPS #1 UTM 18 lat/long
N 4270492.22 / 38 33 33.71
E 295479.14 / 077 20 50.12

GPS #2 UTM 18 lat long
N 4270492.75 / 38 33 33.725
E 295479.50 / 077 20 50.134

8/15 AM/S

Alion team discussed plan for the day to include sampling in the vicinity of parking lots A, B, & C and the area along Scenic drive south of South Valley Trail
Completed Health + Safety Briefing
YSI calibration - see calibration sheet.

[signature] Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

Area G
0907 YSI Readings for CTT-PR-SW-00-01

PH = 6.20
Turbidity = 8.8
T = 22.61 °C
SC = 64 µS/cm²

0911 CTT-PR-SD-02-01
N 4271601.94 m
E 293691.38
Discrete Sample
1 8 oz - metals, explosives
Sandy silty sediment
0930 CTT-PR-SW-00-01
co-located with sediment
2 L amber - explosives
1 L plastic - metals filtered
Photo 172

Meandering path to next sample

[signature] Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

Small subsurface anomaly
N 427/691.94
E 293607.41

427/671.59 N several medium
293600.90 E subsurface
anomalies

0940 CTT-PR-SS-02-02
N 427/666.89
E 293595.77

med brown sandy loam -
leaf cover

1 8oz metals + explosives
7-wheel composite
photo 171 for all soil
samples (SS)
sampled downgradient of
subsurface targets /
anomalies

Jason J. Cebel Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

427/800.76 small
293664.79 subsurface

427/792.62 small
293654.90 subsurface

427/804.62 surface -
293657.60 barbed wire

427/795.39 subsurface
293626.17 small

1010 CTT-NF-SS-02-03
N 427/808.73
E 293622.97
1 8oz - metals + explosives
7-wheel composite
photo 170

light brown sandy silt
leaf covered

Jason J. Cebel Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

sampled downgradient of small subsurface anomalies

1030 YSI Readings @ CTT-PR-SW-00-02

PH = 6.49
T = 22.83°C
SC = 58 uS/cm²
Turbidity = 7.2

1035 CTT-PR-SD-02-02
N 4271901.05
E 293555.71

1 8oz - metals explosives
Discrete Sample

photo 169

gravelly sediment

Jason J. Cabral Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

1040 CTT-PR-SW-00-02
co-located with
CTT-PR-SD-02-02
2 amber liters - explosives
1 L plastic - metals filtered

1100
CTT-NF-SS-02-02
N 4271994.88
E 293580.38

1 8oz soil - metals + explosives

Photo 168

meandering path to next sample - no anomalies

Jason J. Cabral Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

1140 CTT-NF-SS-02-01
4272035.24
293343.49

CTT-NF-SS-02-01-QA
CTT-NF-SS-02-01-MS
CTT-NF-SS-02-01-MSD
Field Dup 3

5, 8 oz Soil-metal + explosives

Photo 167
Sampled in a depression in hill overlooking stream 6 x 4 x 1.5 ft.

meandering path to next sample - no anomalies

1200 CTT-PR-SS-02-03
N ~~4272035.24~~ 4272135
E AM 8/15 ~~293242.49~~ 293342

7-wheel composite

Angela McGinty

Jason J Cabral

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

1 8oz - metals, explosives

Photo 166

Meandering path back to the stream because we had poor GPS coverage. reoriented ourselves for the next sample.

Meandered to next sample - poor GPS coverage - estimated location for sample based on maps.

1420 CTT-GR-SS-02-01
N 0427216 (Garmin)
E 0293782

7-wheel composite.
1 8oz - metals, explosives

photo 165 / 600

light brown silty sand

Jason J Cabral Angela McGinty

Location Chopawamsic Date 7/15/06
Project / Client CO3VA019402 / USACE

wooded area with leaf cover

Meandering path to next sampling location

4271974.81 23 small
293794.06 subsurface anomalies
near 3 wooden posts in a line
Photo 164/601
163/602

1445 GTT-G2-SS-02-02
N 4271979.57
E 293790.96

1 8oz - metals + explosives
7-wheel composite soil

Angela McGinty

Photo 603 Jason J. Cobal

Location Chopawamsic Date 7/15/06
Project / Client CO3VA019402 / USACE

med brown silt with some sand

took sample downgradient of potential target post - offset from small subsurface anomalies upgradient
meandering path to next sample
Metal trash debris
Photo 604 1525

4271580
293960 (Garmin)

cans & bottles littered in area
metal wheel frame for car

Jason J. Cobal Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

Area C
1540 CTT-03-SS-02-08
4271654
293963

Photo 605

1, 8oz - metals + explosives

med brown sandy silty and organics
1548 Photo 606 - timber meandering path to

1555 CTT-03-SS-02-09
4271590
294029

Photo 607
Sample taken in depression - 7 ft diam
3-4 ft deep
no anomalies in the area
1 8oz - metals, explosives
7-wheel composite

[signature] [signature]

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

4271606 small
294014 Subsurface Anomalies

1605 Scattered metal debris on surface
→ photo 608

meandering path to small depression
sample relocated from road/parking lot area

1615 CTT-03-SS-02-10
4271596
0293990
Photo 610

red/brown silty clayey,
1 8oz - metals, explosives

7-wheel composite

[signature] [signature]

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

Groundwater samples collected during the afternoon by Bill Harvey - escorted by Rocky Schroeder (NPS Maintenance) to unlock the supply wells.

Arrived to sample location CT-M2-GW-00-02 at 1220. (NPS identification [ID] Spring #1 (#51-SS-1). Readings were taken with YSI until the readings stabilized.
Final YSI Reading:
pH = 5.14
T = 12.64°C
SC = 26 uS/cm²
Turbidity = 4.4 NTU

Additional readings are found on the Well Purging and

Jason J. Cebula Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

Sampling Record.
N 4272490.48 E 289388.31
Sample taken at 1255

2, 1L amber bottles collected for explosives

1, 500 mL bottle field filtered with 0.2 um filter - perchlorate.

Arrived at sample location CT-M2-GW-00-01 at 1320 (NPS ID Spring #2 (#51-SS-2). Readings were taken with YSI until readings stabilized.
Final YSI Readings:
pH - 5.13
T - 13.01 °C
SC - 31 uS/cm²
Turbidity = 3.0 NTU

Jason J. Cebula Angela McGinty

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

Additional readings are found on the Well Purging and Sampling Record.
N 4272559.17 E 289263.96
Sample taken @ 1340
2, 1L amber - explosives
1,500 mL plastic - perchlorate - field filtered w/ 0.2 µm filter

Arrived at sampling location CT-03-GW-00-02 at 1410. NPS ID Spring #1 (#52-SS-1). Readings taken with YSI until stabilized.
Final YSI Reading:
pH = 5.06 N 4270588.57
T = 13.48 E 293644.13
SC = 85 µS/cm² Field Dup 4
Turbidity = 0.10 NTU QA/MS/MSD
Additional YSI Reading are found on the Well Purging + Sampling Record - sample taken at 1445.
2, 1L amber - explosives Angela McGinty
1,500 mL plastic - perchlorate - field filtered with 0.2 µm filter

Jason [signature]

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

Samples taken through today were packed up and iced to be sent to APL - 3 coolers.

Benchmark Prince 12 MK
GPS #1 1830
N 4270492.11 / 38 33 33.68
E 295479.34 / 077 20 50.21

Departed site at 1830.

Downloaded files

GPS #1 - 0815061, 081506IA, 081506IB
GPS #2 - 0815062

Sent email to NPS - daily summary and anticipated sample for Wednesday + Thursday

Jason [signature] Angela McGinty

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

Arrival on site
0700

Weather: overcast
70 - 85

Benchmark Prince AZMK:

GPS # 1 N 38 33 3.848
W 77 20 50.191

GPS # 2 N 38 33 3.788
W 77 20 50.180

Health and Safety Briefing
YSI Calibration -
see data calibration
sheet
Area B
Teams separated and
went to designated
sampling areas - both teams
at Target B (west side of park)
Began meandering path to samples -
area with several mounds

Signatures: [illegible] Angela McGinty

Location Chopawamsic Date 8/16
Project / Client C03VA019402 / USACE

0920 4272192.50 small
289235.15 subsurface
anomaly

0940 4272488.65 2 small
288954.74 subsurface
cable?

metal surface debris -
rusty cans

0945 large hole 6 × 6 × 5
looks like it had been
dug out - subsurface
anomaly in hole

0945 Relocated #1
CTT-M2-SS-02-04
N 4272518.59
E 288935.89

1 8oz - Metals + explosives
w/ wheel
red clayey silty soil
photo 691

Signatures: [illegible] Angela McGinty

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402/USACE

1010 CTT-RRSS-02-04
N 4272821.67
E 289001.09

1 8oz - metals + explosives
7-wheel
photo 612

Small crater/depression
2x2x1
sampled on edge -
anomaly @ bottom
reddish brown silty
clayey soil

~~1040 CTT-M2-SS-02-01~~ 8/16 ALM
~~N 3062.24~~
~~E 9109.85~~

~~1 8oz - metals + explosives~~
~~7-wheel~~
~~photo 613~~ ALM 8/16

[signatures]

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402/USACE

metal debris on
surface + pile of rocks
4272939
288931

1148 CTT-RR-SS-02-05
N 288881
E 4272942 (Garmin)
Trimble coverage poor

1 8oz - metals + explosives
7-wheel composite
downgradient of subsurface
anomaly + near post
with nails

photo 614 + 615

redish brown silty sandy
soil

[signatures]

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

small subsurface Anomaly
4272775
288805

Meandering path to sample
CTT-M2-SS-02-01-MSD
CTT-M2-SS-02-01-MS
CTT-M2-SS-02-01-QA
1210 CTT-M2-SS-02-01
N 4272840 (Garmin)
E 288818
Field Dup 5
1 8oz - metals + explosives
7-wheel composite

area littered with surface scrap metal

photo 616

Meandering path to next sample location - no anomalies

Sam L. Cabal Angela McGinty

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

1345 CTT-M2-SS-02-03
N 4272986.99
E 288606.61

1 8oz - metals + explosives
7-wheel Sampling
no anomalies nearby
photo 617

light brown sandy silt

1425 CTT-M2-SS-02-02
N 4272908.89
E 288707.20

1 8oz - metals + explosives
7-wheel Sampling
No anomalies nearby
photo 618

reddish brown sandy silt, some organics

Sam L. Cabal Angela McGinty

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

Area H

1520 CTT-01-SW-00-01
N 4272647.17
E 290044.10
YSI Readings:
pH = 6.52
T = 23.40
SC = 60
Turbidity = 11 NTU

1525 CTT-01-SD-02-01
N co-located with
E CTT-01-SD-02-01

1 8oz - metals + explosives

sandy + gravelly

samples below dam

photo 619 + 020 + 621

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

4272501.17 small
290024.73 subsurface
anomaly

Began path to next
sample location.

1715 CTT-01-SW-00-03
N 4272234 (Garmin)
E 290736
poor Trimble
coverage

YSI Readings:
T = 26.62 °C
SC = 42 uS/cm²
pH = 7.01
Turbidity = 5.7

1720 CTT-01-SD-02-03
N co-located with SW
E CTT-01-SW-00-03

1 8oz - metals + explosives
discrete sample

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

The final 2 supply wells were sampled this morning.

Arrived at sample location CTT-03-GW-00-01 at 0815 (NFS ID: Well #1 (#52-S-14). Readings were taken with YSI until readings stabilized. Final YSI Reading:

pH = 5.41
T = 13.98°C
SC = 123 uS/cm2
Turbidity = 41.0 NTU

Additional readings are ~~found~~ found on the Well Purging and Sampling Record Sample taken at 0900.

N 4270961.52 E 293595.59

2, 1L amber bottles - explosives
1, 500 mL plastic - perchlorate
→ field filtered with 0.2 um filter

8/16 AM

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

Arrived at sample location CTT-02-GW-00-01 at 0935 NPS Well ID: Well #1 (52-S-18). Readings were taken with YSI until readings stabilized. Final YSI Reading:

pH = 6.96
T = 13.92 °C
SC = 272 uS/cm2
Turbidity: 1.0

Addional Readings are found on the Well Purging + Sampling Record. Sample taken at 1000.

N 4273003.10 E 293318.91

2, 1L amber bottles - explosives
1, 500 mL plastic - perchorate
→ field filtered with 0.2 um filter

Location Chopawamsic Date 8/16/06
Project / Client C03VA019402 / USACE

Benchmark Prince AZ MK

GPS#1 4270490.96 / 38 33 33.741
295480.15 / 77 20 50.186

GPS#2 4270491.26 / 38 33 33.745
295480.41 / 77 20 50.177

Departed Site at 1830.

Downloaded files:
GPS#1 0816061, 0816061A,
0816061B, 0816061C
GPS#2 0816062, 0816062B

Sent email to NPS - daily summary + set up meeting for NPS escort to archaeology areas.

[signatures]

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

Arrival on site: 0700

Weather: Clear Sky 75-85

Health and Safety Briefing

Prince AZ MK
Benchmark: GPS#2
GPS #1 N 4270491.48 / 4270490.98
E 295480.29 / 295480.41

38° 33' 33.762" N / 38 33 33.721
77° 20' 50.194" W / 77 20 50.211

Calibrated YSI - See field calibration sheet

Met with Judy Volmoski (museum caretaker). Judy told the field team that there was munitions ~~debris~~ AM in her museum collection. The field team looked

[signatures]

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

at the collection and saw the following:
- tail fin + top end of a 60mm mortar illumination round (photo 623)
- top half of a bazooka rocket (photo 624)
- 2 40mm illumination rounds (photos 625, 626, 627)

The UXO tech (Jason Cebula) stated that the items were all inert and not explosive. He suggested that Judy get certificates for the items.

Jason also suggested that NPS (Judy + Paul Peterson were in attendance) get a certificate for the rocket on display at the visitor's center.

Jason J. Cebula Angela McGinty

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402/USACE

Area E
1040 CTT-03-SW-00-01
N 427314.23
E 2949977.42

YSI Readings

T = 20.92
SC = 62
pH = 6.83
Turbidity = 7.5

2 1L amber explosives
1 1L plastic filtered HNO_3

1045 CTT-03-SD-02-01
N E co-located with CTT-03-SW-00-01

photo 629

1 8oz - metals + explosives
Grab / discrete

Jason J. Cebula Angela McGinty

Location Chopawamsic Date 8/17/06

Project / Client C03VA0194402 / USACE

AM 8/17 ~~4271296~~ ~~small~~
~~0294657~~ ~~subsurface~~

4271318.39 small
294674.80 subsurface

offset sample from
small subsurface
anomaly
Area D
CTT-03-SS-02-05
0294573 E
4271341 N
11:15

photo 630

1 8oz - metals + explosives

gray clayey soil

Lane L. Cabel Angela McGinty

Location Chopawamsic Date 8/17/06

Project / Client C03VA0194402 / USACE

medium
subsurface

offset from anomaly -
downgradient
1140 CTT-03-SS-02-06
N 4271596
E 294361

1 8oz - metals + explosives

AM 8/17 ~~phot~~ camera battery died
AM 8/17
~~subsurface~~

met up with 2nd field
team for lunch. John
Owoyemi was stung 3
times in the back of the
head by a large bee. NPS
first aid was called and he
was checked out. John + deLyn
went to hotel so John could rest.
Trimble GPS #1 - datalogger battery
not working

Lane L. Cabel Angela McGinty

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

Area E
offset from small subsurface
sampled down hill of
1415 CTT-03-SS-02-04
N 4271472
E 294781
l?
1 8oz - metals + explosives
brown clayey silt

small subsurface
N 4271497
E 294782

medium subsurface -
sample offset

1430 CTT-03-SS-02-03
N 4271743
E 294699

1 8oz - metals + explosives
brown clayey silt

[signature] Angela McGinty

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

4271706 294679	suspected 0-6" subsurface anomaly
4271693 294652	subsurface anomaly

subsurface - sample offset

1455 CTT-03-SS-02-01
N 4271850
E 294634

1 8oz - metals + explosives

CTT-03-SS-02-01-QA
Field Dup

4271826 subsurface
294614

mounded area with
multiple subsurface hits
in and around mounds

[signature] Angela McGinty

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

1515 CTT-03-SS-02-07
(relocated below
downhill of mounded
area)

1 8oz - metals + explosives
N 4271822
E 294615

7-wheel composite

1520
40 mm (?) illumination round
expended (appeared to be hollow)
N 4271782
E 294612 ←

40 meters from mounded
area - could be bunker?

photo

Jason L. Cabral Angela McGinty

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

Small crater - sampled
in and around crater
2 x 2 x 1 ft edge of
Relocated sample

1530 CTT-03-SS-02-02
N 4271790
E 294602

7-wheel composite
brown silty sandy soil -
loose soil

1 8oz - metals + explosives

Mark 006 (Garmin)

50 m from mounds -
possibly a bunker or
part of homestead
nearby - found house
foundation, covered well,
and large hole with
trash in it (glass bottles)

Jason L. Cabral Angela McGinty

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

1550 40 mm(?) illuminator round
427,663
294,635
2 photos
1 expended munitions debris

1625 CTT-03-SW-00-02
N 427,1350
E 295084
YSI Readings
T = 24.74
SC = 59
PH = 7.43
Turbidity = 3.2

1630 CTT-03-SD-02-02
N co-located with
E CTT-03-SW-00-02
Discrete Sample

Location Chopawamsic Date 8/17/06
Project / Client C03VA019402 / USACE

Benchmark Prince A2 MK

GPS#1 38 33 33.765 / 427049.92
77 20 50.107 / 295479.63

GPS#2 38 33 33.636 /
77 20 50.137 /

Departed site @ 1800

Downloaded files.

GPS #1 : 0817061

GPS #2 081706A2

Sent email to NPS with a daily summary of activities.

Location Chopawamsic Date 8/18/06
Project / Client C03VA019402 / USACE

Weather - Sunny 75-85
Arrival 0700

GPS 2 (Western Data)

38° 31 33.672 N Lat Long
77° 20 ~~15~~ 50.102 W

4270494.21 N UTM
295480.09 E

GPS 1 (EA)

38° 33' 33.676" N
77° 20' 50.065" W

4270490.01 N
295482.06 E

Jason J. Cabral Angela McGinty

Location Chopawamsic Date 8/18/06
Project / Client C03VA019402 / USACE

Went to TREC to see if Paul Peterson was in to ask about the pistol range + gun emplacement. He was not available so we went to collect the surface soil background samples.

0900 CTT-BG-SS-02-01
N 4273885
E 0296453

1 8oz - metals
7 wheel

0925 CTT-BG-SS-02-02
N 4277344
E 0291133

1 8oz - metals Angela McGinty Jason J. Cabral

Location Chopawamsic Date 8/18/06
Project / Client C03VA019402 / USACE

7 wheel composite

0945 CTT-BGR-SS-02-03
N 4278740
E 288881

1 8oz - metals
7-wheel composite

Drove to Camp 4 to look for the Pistol Range that Judy mentioned. We did not have a definite location so we took a sample near where Judy described the pistol range.
1125 CTT-PR-SS-02-01
N 4273723
E 0294851 ±dA

1 8oz - metals + explosives
7-wheel composite

Photo 631

Location Chopawamsic Date 8/18/06
Project / Client C03VA019402 / USACE

0294851 E
4273723 N
No sign of back stop
Bench mark Prince AZ MK
GPS #1
N 4270493.25 UTM
E 295478.54

38° 33' 33.741" N Lat
77° 20' 50.193" W Long

GPS #2 (western Data)

4270491.67 N
295477.55 E

38 33 33.690
77 20 50.203

Prepared samples for transfer to GPL - samples will be delivered in person to GPL by EA team member

Downloaded Trimble files

GPS#1 0818061, 0818A1

GPS#2 081806WD

1400 Met with George Liffert, Paul Peterson & Bob Hickman of NPS to give them a review of the week's activities. George asked if it was OK to abandon the supply wells now that we have sampled. I said that Angela would ask for Alan's opinion. NPS

Ken J. Cabral Angela McGinty

also requested that they receive a copy of the letter sent to the private well owners. Angela McGinty stated that she would pass the message along to USACE. ~~Paul~~ Paul Peterson gave Angela a map to the location of the gun emplacement to find it on the next trip.

1445 Departed Park Headquarters Building and the site.

Angela McGinty

Location Chopawamsic Date 11/28/06

Project / Client C03VA019402 / USACE

Weather: Sunny, 55°F-

Arrival on site: 10:30

Upon arrival to the site the CA members of the Allen field team checked the bench-mark and calibrated to YSI.

1130 (after UXO Tech arrived) Overview of Field Work + Health and Safety Meeting.
Attendees: Angela McGinty
delyn Alumbaugh
Stu Carr (UXO)

11:15
Benchmark Prince AZ MK
GPS (Trimble) Model
N 4270492.73 PIN
E 295479.75 Lat 38 33 3.115N
Long 77 26 50.110W

GPS (Garmin)
N 4270488 38° 33 33.8"
E 0295484 77° 30 49.9"

Angela McGinty Stu Carr

Location Chopawamsic Date 11/28/06

Project / Client C03VA019402 / USACE

1130 YSI Calibration - see field sheets

~~Benchmark Check~~ dA 11/28/06
~~Trimble~~ dA 11/28/06

Schonstedt check by UXO Tech - OK

Traveled to the 1 acre demolition area (OB/OD) as noted on maps

CTT-03-SS-02-11
1210 (waypoint 001)
N 4271433.91
E 292401.35

Soil sample
0-2 in, composite

2, 8oz jars
7-wheel Comp.

Stu Carr Angela McGinty

Location Chopawamsic Date 11/28/06

Project / Client C03VA019402 / USACE

~~CTT-03-GW-00-02~~

1345 CTT-03-GW-00-024-09
Field Dup
N 4271063.46
E 2917??.26

YSI Readings:

PH = 6.53
Turbidity = 0.7 NTU
SC = 0.257 mS/cm²
T = 58.72 °F

Explosives - 3 amber liters
Perchlorate - 1L HDPE
filtered with 0.2 μm
filter

pictures

William Reisenberger
17937 Joplin Road

Angela McGinty Stu Carr

Location Chopawamsic Date 11/28/06

Project / Client C03VA019402 / USACE

1500 CTT-03-GW-00-03
N 4270587.23
E 293156.47

YSI Readings:

PH = 5.40
Turbidity = 0.5 NTU
SC = 0.083 mS/cm²
T = 58.48 °F

Explosives - 3 amber liters
perchlorate - 1L HDPE
filtered with 0.2 μm
filter

permission letter signed
by Mr. Larry Hill
18049 Joplin Rd.

ALM ~~N 4270587.23~~ pictures
~~E 293156.47~~ Stu Carr

Angela McGinty

Location Chopawamsic Date 11/28/06

Project / Client C03VA019402 / USACE

~~went back to 1 acre OB/OD area~~ -
large mounded area -
metal and concrete
debris littered on
surface, tires
No evidence of MD or munitions
Photos

Lot of felled trees and
brambles in the area -
we had to walk around
the very thick area there
was no way in through.
We also encountered a
very swampy area that
we had to walk around

photos

Left 1 acre OB/OD area
and site at dusk
at 1645.

StarCan
Angela McGinty

Location Chopawamsic Date 11/28/06

Project / Client C03VA019402 / USACE

Trimble Model TSCe
P/N 45268-00
used during site visit.

Sent email summary to:
George Lippert
Kathy Caudill
Bob Hickman
Paul Petersen
Mike O'Neill
Corinne Shia
Adrianne James

StarCan Angela McGinty

The second field effort began today (11/28/06).
During this ~~2nd~~ event, the Field Team will
focus on the following areas: Private
Well sampling (2 of 5 ROEs obtained),
1-acre demo area, Area A Firing Point,
Area B + 26-acre demo area, Area F,
Area I + 4-acre demo area. This
revised sampling effort was discussed
with and agreed to by CENAO.

Location Chopawamsic Date 11/29/06

Project / Client C03VA019402 / USACE

Arrived onsite at 7:25 am

Health + Safety Briefing

Angela McGinty
Jelyn Alumbaugh
Stu Carr
John Owoyemi

Weather - foggy in the a.m. 55-
Sunny in the p.m. 65°F

745
Benchmark:
Prince AZ MK

4270492.43 N
295478~~88~~4.08 E
Trimble

38°33 34.082" N
77°20'50.170" W

2543240 E
4518753 N
Garman
38°33 563' N
77°20 836' W

Stu Carr Angela McGinty

Location Chopawamsic Date 11/29/06

Project / Client C03VA019402 / USACE

Began recon in Area I / Mortar Range near (3565)

825 CTT-MHSS-02-01

N 4273730
E 292915

2, 8oz jars

Metals, Explosives
7-single composite
Sample offset from subsurface anomally
wire scattered throughout area - + cable -
sampled near this area - additional subsurface anomaly (6515)
newer looking wooden posts

Large mounds near old road (no subsurface anomalies in mounds)

Subsurface Anomaly
4273655.18 N
292572.98 E

Stu Carr Angela McGinty

Location Chopawamsic Date 11/29/06
Project / Client C03VA019402 / USACE

0920 (near 5 sub)
Sample CTT-MI-SS-02-02
N 4273655.18
E 292572.98
surface Soil sample
Metals, Explosives
7-wheel composite
Offset downgradient of
(3) subsurface anomalies
(5 sub) very close together

Several subsurface
anomalies with 100 ft
radius - did not see
any wire or other
surface debris
(6-9 sub)

some small holes found
in tree near subsurface
anomalies

Stu Carr Angela McGinty

Location Chopawamsic Date 11/29/06
Project / Client C03VA019402 / USACE

Additional subsurface
anomalies
(10-11 sub)

Walked in meandering
path - still in Area E

1000 CTT-MI-SS-02-04
N 4273940.56
E 292343.78
surface soil sample
Metals, Explosives
7-wheel comp.
Offset sample from
subsurface anomalies
(12 sub)

More subsurface anomies
(13-16 sub) near
sampling location

Stu Carr Angela McGinty

62 Location Chopawamsic Date 11/29/06
Project / Client C03VA019402 / USACE

Suspected frag near surface (17 sub)

suspected small impact craters - subsurface anomalies within 20 ft of subsurface anomalies (18-20 sub)

large symmetrical crater 8 ft across and 4 ft deep - looks like a potential demolition pit - fragment near outer rim + sides + bottom (21 sub)

1030 CTI-M1-SS-02-05
N 4273721.10
E 292346.00

Surface soil composite
Metals, Explosives
7-wheel comp.
Stu Carr

Angela McGinty

Angela McGinty

Location Chopawamsic Date 11/29/06 63
Project / Client C03VA019402 / USACE

Sample located near rim of large crater

another large crater and subsurface anomalies (22-24 sub)

left the Mortar Area I

Drove to the firing point of Area A (near parking lot I) - this area has not been walked yet - south of p-lot I

(sample 002)
1445 CTI-02-SS-02-05
N 4272154.85
E 293017.98
7-wheel composite
CTI-02-SS-02-05-04
Field Dup 2
metals, explosives
Stu Carr

Before sampling at firing point A, we walked around the 400m x 300m area and did not find any subsurface anomalies in the entire area. The area was very hilly - after walking around the area, we found a "natural backstop" that may have been fired into and that is where we decided to take the sample (in the side of the hill/backstop. The team travelled back to the 1 acre demo area (CC3)

1525 CTT-03-SS-02-12

N 4271386.16
E 292434.41

7 wheel composite
Metals explosives
Field Dup 3
CTT-03-SS-02-12-QA

Angela McGinty Stu Carr

The team sampled near metal + concrete trash that was found the previous day. The team then walked more around the demo area to see if another sample could be located there

Metal pipe found in hole near tree

did not pick up subsurface anomalies

Trail / Old road near / in demo area - mounds on either side of road - lots of trash + concrete littered in area -

Walked on path out of demo area to a family cemetary - not to the demo area as we suspected.

Stu Carr Angela McGinty

Location Chopawamsic Date 11/29/06
Project / Client C03VA019402 / USACE

1630
CTT-03-SS-02-13
N 4271432.30
E 292433.24
metals
explosives
Sampled at bottom of a depression
Vegitation 0"-12" surrounding
sampled ~~below~~ Agm subsurface
anomaly downgradient of

Walked more of the demo area and found many subsurface anomalies in and along several ditches (38 sub) No samples collected in this area.
Departed site at 1700

Stu Carr Angela McGinty

Location Chopawamsic Date 11/30/06
Project / Client C03VA019402 / USACE

Arrived onsite at 0715
Weather - partly cloudy 65-75
0720 Health & Safety Briefing
Benchmark 0720
Prince A2MK

Trimble N 4270498.74
E 295478.11
Lat 38 33 33.763
Long 77 20 50.226

Garmin N 4270502
E 295480
Lat 38 33.566'
Long 77 20.833'

YSI Calibration 725 - see field sheet

Stu Carr Angela McGinty

Began walking /reconnaissance southwest of Fragmentation range - mortar found in roof in this area in the past.
Meandering path
(39 Sub) → subsurface anomaly

- possibly a piece of wire

Walked more of area and found additional subsurface AVM ~~samples~~ anomalies
also found a few holes/craters approx 6 ft wide and 3 ft deep - target in one hole

(40, 41, 42, Sub)
43, 44

Concrete "bunker" - no targets around it

Concrete block - could

Stu Carr Angela McGinty

not determine what it is - in trench approx 30 yards long
Photos taken
840 (005)
CTT - GR - SS - 02 - 05

N 4271112.46
E 293642.66

Metals, Explosives
8 oz surface soil
Stu Carr composite

Did not find building with mortar in roof.
After leaving this area, we ~~left~~ to meet Paul Petersen (NPS) so that he could show us where the gun mounts are located - the field team could not find them in August

Angela McGinty

Location Chopawamsic Date 11/30/06
Project / Client C03VA019402 / USACE

Gun mount
37 mm Tank - dummy
used as a target
2 tanks/gun mounts
approximately 40 m from each other
1055, CTT-M2-SS-02-05
N 4272874.76
E 288897.05
7-wheel Composite
2 8oz soil jars - composite
metals, explosives

next to Gun Mount B
(2nd picture)

CTT-M2-SS-02-06
11:05 metals, Explosives
N 4272902.53
E 288880.00

next to Gun Mount A
(first picture)
hole in side of gun mount - likely a rocket
Stu Cain impacted it
2 8oz soil jars - composite
metals, explosives 7-wheel.

Angela McGinty

Location Chopawamsic Date 11/30/06
Project / Client C03VA019402 / USACE

YSI Readings

52.44 °F
0.114 mS/cm^c
0.084 mS/cm
111.6 DO%
12.12 DO mg/L
6.82 pH

140.2 ORP
4.5 NTU

CTT-M2-SW-00-01
1215 CTT-M2-SW-00-01-QA
Field Dup 4.
N 4273501.57
E 289888.79

Metals - filtered, preserved
0.45 µm with HNO_3
Explosives
South Fork Quantico creek at Hawaii Rd intersection
1220 CTT-M2-SD-02-01
N 4273501.57
E 289888.79
photo taken

Metals
Explosives
2 8oz sediment jars (grab)

Meandering path along the stream to the second surface water sample

Angela McGinty
Stu Cain

Location Chopawamsic Date 11/30/06
Project / Client C03VA0194O2 / USACE

1330 CTT-RR-SW-00-01
N ~~4273490~~ 4273699 alm
E ~~289646~~ 289675 11/30

Metals - filtered 0.45um + preserved with HNO3
Explosives -

Tributary draining south into South Fork Quantico Cr. from Area 8 range fans

1335 CTT-RR-SD-02-01
N 4273490
E 289646

Metals 2 8oz Sediment
Explosives jars (grab) discrete sample

YSI Readings

StuCun Angela McGinty

pH = 6.35
Turbidity = 3.3 NTU
SC = 0.046 mS/cm
Temp = 60.76 °F

Location Chopawamsic Date 11/30/06
Project / Client C03VA0194O2 / USACE

1500 Closing briefing with George Lafferty - Sent email summarizing the day's activities on 12/1/06

Packed up samples and left the site at 1630.

Angela McGinty

All items identified are suspected munitions or suspected munitions debris - the items have not been certified.

"Rite in the Rain"®
ALL-WEATHER WRITING PAPER

ALL-WEATHER
ENVIRONMENTAL FIELD BOOK

Name Angela McGinty - Field Team Leader
Mike Shoop / Jason Cebula - UXO Techs
Address 15 Loveton Circle
Sparks, MD 21152
Phone 410-771-4950 / 410-537-8202
x115

Project MMRP Chopawamsic Troop
Training Site FUDS
C03VA0694102
QA: [illegible]

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CONTENTS

2nd of 2 field books used at sample time

Reference Page Index

Location Chopawamsic Date 08/14/06
Project / Client C03VA019402 / USACE

Benchmark:
GPS 2: N4270492.15
E 295478.01

GPS 1: N4270493.67
E 295479.38

Weather: Sunny 85-90°F

Arrival on site: 1400

After the initial NPS meeting, the Alion team had a health and safety meeting (see other logbook) and strategized to begin reconnaissance and sampling. The Alion team was split into 2 groups with two EA field members and 1 UXO Tech each.

Angela McGinty
[signature] 8-18-06

Location Chopawamsic Date 8/14/06
Project / Client C03VA019402 / USACE

A meandering path to the first sample location was initiated.

MJO
8/14/06

Angela McGinty
[signature] 8-18-06

Location Chopawamsic Date 8/14/06
Project / Client C03VA019402 / USACE

Weather: Hot Sunny 85°F
Area A
1640 CTT-R2-~~5S~~-02-01
Near old house foundation,
noted barb wire, fox pockets.
drum down hill near stream.
~~CTT R2 01~~ CTT R2-SS-02-01
Will sample in circular hole, ~~to~~
~~me~~ away from coordinates
4272361.54 N
292845.80 E
7-wheel Comp.
Collected ~~QA~~ CTT-R2-SS-02-01-QA
and Field Dup 1

1745 029304[illegible] E CTT-R2-SS-02-02
4272543 N
Sample not collected
Nothing found. Bermed area, no
reasonable line-of-sight for
Rifle range. Scrap sample
for present
1752 Post (Sl02) found, 4272634N
293056E.
Angela McGinty
Michael Sharp 8-18-06

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

~~Mag. hit - steel plate on surface~~
~~N 4271402.36~~
~~E 293923.92~~

~~Mag hit Surface Square item wierd CAP~~
~~Rusted 2"x4" Near~~
~~N 4271406.00 CAR Head Light~~
~~E 293873.01~~

~~Vehicle Debris~~
~~N 4271404.51~~
~~E 293849.61~~

MOVED TO NEXT
Page MJO 8/15/06
Angela McGinty
Michael Sharp 8-18-06

Location Chopawamsic Date 08/15/06
Project / Client C03VA019402 / USACE

~~Area~~ F

Weather:

GPS1 N4270492.22 | 383333.72
E295479.14 | 10772050.14

GPS2 N4270492.75 | ~~383333~~ N 383333.725
E 295479.50 | ~~1077205~~ E 772050.134

Began Meandering walk through "GR" Area
MAG Hit - Steel Plate on Surface NOT MD
N 4271402.36 E 293823.92
MAG HIT - Surface square item weird metal cap ~~Tin~~ 2" x 4" near car headlight (GR = grenade range)
N 4271406 E 293873
Vehicle Debris
N 4271404.51 E 293849.61

Rope
N 4271419.05
E 293764.80
License Plate
4271386.1
293758.31
Three stakes & a Flag (survey Pt?
N 4271345.65
E 293753.65
Subsurface hit in Park Debris area
N 4271369.08 E 293814.09

Michael Sharp 8-18-06
Michael O'Neill 8-15-06

Location Chopawamsic Date 8/15/06
Project / Client C03VA019402 / USACE

PARK Service Debris Area
N 4271298.93 293849.61

Completed Meandering walk around ~~+~~ through clearing around GR Sample Location no solid evidence of GR Range or MD/MEC.

Began sample collecting activities
CTT-GR-SS-02-03 (Comp SS)
N 4271385.40
E 293888.76 (Sample located North of Pit) 1015 AM
No MEC/MD observed
Meandering walk to CTT-GR-SS-02-02
Sample was located in Gravel Covered Area used by Park Service relocated 100 M SW of original location to low downgradient point in terraced Area
Collected Sample CTT-GR-SS-02-02
N 4271331.74 E 293783 42.7m MSL
Time 10:30 AM
NO MEC/MD observed
Composite Sample 7 wheel 2-in Surface Soil

Michael O'Neill 8/15/06
Michael Sharp 8-18-06

Location Chopawamsic Date 8/15/06

Project / Client C03VA019402 / USACE

~~Area F~~ AEM 8/15

Meandered to sample location

GR-SS-02-01 Sample Near

Park Service - Staging / Storage

area. Camp Buildings nearby

Relocated Sample 2160 m to SW

in Area w/ 3 small craters

No MEC / MD observed

1105 AM Sample time GR-SS-02-01

Split / Dup & MS / MSD Collected

N 4271289.0 E 293558.38

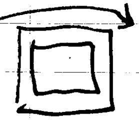
Comp sample 7 wheel

2 in Surface Soil

Subsurface anomaly - No surface evidence

N 4271378.13 E 293825.47 of MEC / MD

Observed 6 Poured Concrete



Squares - nothing

in Center of

Squares

□ heading

□ down

□ hill

Moved GR-SS-02-04 Can't Get Reception will use Hand held

No coordinates for GR-SS-02-04 to mark Location

Composite 7 wheel SS NO MEC or MD

Michael O'Neill 8/15/06 OBSERVED TIME 1155 AM

Michael Shay 8-15-06

Location Chopawamsic Date 8/15/06

Project / Client C03VA019402 / USACE

CTT-GR-SS-02-04 293768

sample location 4271354

Subsurface Mag hit

No Satellite Coverage - Green Rocks

Area G

Collected CTT G2-SS-02-03

@ 1450 NO MD or MEC

N 4271614.20 E 293368.69

7 wheel Composite

Surface Sample

CTT - G2-SS-02-04 15:15

semi-dry creek bed

N 4271696.38

E 293137.22

modified 7 wheel approach

2 food diameter

Found Posts for former Target (Area G?)

N 4271489.36 E 0293753.25 Trimble

N 4271487 E 0293757 Chapman

Composite taken at ~~1630 PM~~ 1630 PM

Moved NESS-02-04 to Target Area

Poles

Photo Taken - Sampled behind Poles

Michael O'Neill 8/15/06

Michael Shay 8/15/06

Location Chopawamsic Date 08/16/06

Project / Client C03VA019402/USACE

Weather : ~~cloudy~~ Sunny 70°F

Area B

0851 Meandered to Sample location
CTT-R1-SS-02-01
lightly wooded area
Flat terrain
Meandered around Sample location
Found nothing Significant
No Hits found
Composite Sample for (7-wheel)
CTT-R1-SS-SS-02-01 @ 0927
N 4273133.74
E 289168.75
Photo ID:
Soil Sample taken, field dup (A) $ QA
Soil is sandy loamy soil
looked around to see anything of Significance
Continued Meandering around $ to the
next Sample location
QA ID: CTT-R1-SS-02-01-QA

William R Harry
Michael Sharp 8-18-06

Location Chopawamsic Date 08/16/06

Project / Client C03VA019402/USACE

0945 Arrived at the next Sample
location Slightly Slopy terrain
Lightly wooded area.
No sign of rocket or remnants
around the Sample location.
Uxo tech Meandered around the
location. No hits found.
CTT-RR-SS-02-01
N 4273065.65
E 289113.75
Soil Sample taken for Matrix, field
dup (B) and QA Split (CTT-RR-SS-02-01)
Soil appears to be loamy. (7-wheel)

1042 Meandered to new Sample
location CTT-RR-SS-02-02
No sign of Rockets in the
area. Fallen trees seen in the
area. Uxo tech ~~Cleared~~ Checked that area
Soil Sample taken in the area of
Sample location. Nothing Significant
found in the area.
N 4273031.40
E 289000.02

Michael Sharp

William R Harry 8-18-06

Location Chopawamsic Date 08/16/06
Project / Client C03VA019402 / USACE

11·20 Arrived at Sample location
CTT-R1-SS-02-03.
Slightly swampy area. Moderately wooded. No hits found. No sign of range or bullet fragments found.
N 4273214.40
E 289012.31
Sample time 1150
Soil Sample taken for CTT-R1-SS-02-03
Soil is loamy and sandy (7-wheel)
No photo taken.
~~[illegible]~~ Uxo tech meandered around the area where sample was taken. Nothing significant discovered. Moved on to the next Sample location in a ~~meandered~~ path.

11·55 Got to Sample location
CTT-RR-SS-02-03 7-wheel Comp.
N 4273228.23
E 288792.68
Soil Sample taken at location
Slightly wooded area.
Swampy to the western part of the location.
Michael Shaw 8-18-06 William R Harry

Location Chopawamsic Date 08/16/06
Project / Client C03VA019402 / USACE

Sample # CTT-RR-SS-02-03 @ 12:01
~~Sandy loamy soil~~
looks like loamy soil.
Uxo tech got not hit around the sample location. ~~Move~~ Moved to the next sample location in a meandering path.

No sign of MEC along the ~~path~~ meandering path and around the area. bits of fallen ~~wood~~ trees in the area.

12·50 Arrived at Sample location
CTT-R~~I~~-SS-02-~~03~~ to Sample Soil. Lots of fallen trees around the area. No evidence of MEC or rifle range in the area.
N 4273318.10
E 289134.44
Soil Sample is loose silty clay soil
Highly wooded area.
7-wheel Comp.

William R Harry
Michael Shaw 8-18-06

Location Chopawamsic Date 08/16/06
Project / Client C03VA019402 / USACE

11· 1125 Got to Sample location
CTT-R1-SS-02-04
N 4273253.19
E 289239.40
7-wheel Camp.
No evidence of MEC in the area. UXO tech got no hits from the ground.
Soil Sample is ~~dc~~ looks dense and loamy. WMH
Soil Sample with ID:
CTT-R1-SS-0204

Area I

1520 Initiated the path to sample
11· location CTT-M1-SS-02-09
Area on the path ~~is mostly very weedy~~ has a lot of ferns on the ground and weeds. WMH
* Encountered a post with a barbed wire with GPS location
N: 4273373.04
E: 292638.22
Photo ID: 125.

~~7-wheel C~~
William R Haney
Michele Sharp
8-18-06

Location Chopawamsic Date 8/16
Project / Client C03VA019402 / USACE

UXO tech walked around by found nothing of significance.
Continued on the meandered path to the sample location.

1530 Arrived at Sample location
CTT-M1-SS-02-09
Flat terrain in the middle and slightly hilly sides of the ground.
Nothing significant found at the location. Moved around with UXO tech ~~to~~ around the Sample location
Photo ID: 129
N 42737588.26
E 2926002.64
Sample ID: CTT-M1-SS-02-09@
Soil looks ~~the~~ very loamy and sandy. WMH
No ~~other~~ discovery at the sample location. 7-wheel Camp.

William R Haney
Michele Sharp 8-18-06

Location Chopawimsic, VA Date 08/16/06
Project / Client C03VA019402/USACE

11. 1610 Arrived at Sample location
CTT-M1-SS-02-03
The area looks clear
WRH ~~not~~ Meandered ~~WRH~~ around the Sample location to see if anything Significant would be found. Nothing around the Sample location.
Photo ID: 130
N: 4273799.69
E: 292609.63
Sample ID: CTT-M1-SS-02-03
7-wheel Camp

Small hit encountered at location
N: 4273865.60
E: 292486.17
11. at 1630

William R Harry
M... 8-18-06

Location Chopawamsic, VA Date 08/16/06
Project / Client C03VA019402/USACE

1645 Sample ID CTT-M1-SS-02-08
N 4273879.24
E 292349.43
Anomaly discovered around the Sample location.
Photo ID: 131
7-wheel Camp.

Very large anomaly discovered at
N ~~4273938.99~~ N: 4273938.67
E ~~292333.~~ E: 292332.37
Photo ID: 132 & 133

1715 Sample ID: CTT-M1-SS-02-07
N: 4274084.21
E 292333.42
Flat terrain. No hits around Sample location.
Soil: loamy Soil 7-wheel Camp.
Slightly wooded area
Photo ID: 134

William R Harry
... 8-18-06

Location Chopawamsic. VA Date 08/16/06

Project / Client ~~[illegible]~~ C03VA019402 / USACE

11·

GPS Coordinates 8/16/06

6:30pm

BM 4270498.21 N

295474.52 E

All samples collected submitted for metals and explosives analysis

—

11·

William R Henry

Michael Short 8-18-06

Location Chopawamsic, VA Date 08/17/06

Project / Client ~~[illegible]~~ C03VA019402 / USACE

Sunny bright 89°F

0700 - GPS Coordinate 8/17/06

N 38° 31' 33.748

W 77° 20' 50.238

Safety briefing and strategy for days work outlined. Divided into 2 groups.

9:30 - Initiated Meandering path to Sample location CTT-01-SS-02-03 in area H

Couple of Subsurface hits and Sample location CTT-01-SS-02-03

Encountered a CO_2 Cylinder around Sample location CTT-01-SS-02-03

Photo ID: 135 & 136

N: 4272157.26

E: 290614.77

Small hits also encountered in the area.

7-sheet Comp.

William R Henry

Michael Short 8-18-06

Location Chopawamsic Date 08/17/06
Project / Client CO3VA019402 / USACE

Sample ~~taken~~ Adjacent to Small ~~[illegible]~~ hill
11· Sample ID: CTT-01-SS-02-03@10:00am
GPS Coordinate
N: 4272128·25
E: 290607·73 Photo ID: 137
Uxo tech Scanned around the Sample location. Nothing Significant discovered.

Meandered ~~around~~ to the ~~next~~ Next Sample location. Small hits around the stream path at Sample location CTT-01SS-020-1,

Uxo tech ~~[illegible]~~ Meandered around the ~~[illegible]~~
11 location. ~~No discovery of any~~

11:00 Sample ID: CTT-01-SS-02-01
N: 4272083·35
E: 290453·02
Soil Sample looks Dark brown clay Soil.
7-wheel Camp.

[signatures] 8-18-06

Location Chopawamsic Date 08/17/06
Project / Client CO3VA019402 / USACE

Moved to Area A South of Scenic Drive
~~[illegible]~~ Started Meandering to the Next Sample location at 11·25.
Nothing ~~[illegible]~~ Significant found along ~~[illegible]~~ the path.

11:33 Strong hits all over the area around
N: 4272226·45 Photo ID: 138 & 139
E: 292722·37
3 foot Mounted area with ~~[illegible]~~ above 10 ft Sq. area.
Uxo tech got Several hits around the mounted area.
Meandered around the area to See if anything would be discovered.
~~[illegible]~~

11:40 Strong hit discovered around:
N 4272214·14
E 292694·18
Close to post #851
Photo IDs: ~~[illegible]~~ 140

[signatures] 8-18-06

Location Chopawamsic Date 08/17/06

Project / Client CO3VA019402 / USACE

11.42 Strong hit discovered at a location close to ~~the~~ WRH previous hit stop. it looks like a Crater.
N: 4272182.43
E: 292707.70
Photo ID: 141

Moved Sample location TCC-R2-SS-02-02 @ 11.45 to this spot. 7-wheel Comp.

11.47 Initiated a meandering path from Sample location ~~to the trail~~ WRH across the trail to see if any hit would be encountered. No hits found across the trail.

William R Harry
Michael Sharp 8-18-06

Location Chopawamsic Date 08/17/06

Project / Client CO3VA019402 / USACE

12.00 Moved to the next Sample location ~~is~~ WRH

12.13 Sample location is ~~[illegible]~~ WRH hilly on the side with some ~~[illegible]~~ rocks discovered on it. Nothing

1230 John stung by bees. Requires first aid treatment. Met up w/ rest of team. Found Ranger EMT. Blood pressure pulse normal. Decide to Send John + DeyLyn to Hotel.

1330 Move to sample near supposed gun near western boundary. Moved to coordinates given by NPS:

Area B

N 4272634
E 288867

1415 Searched area around coordinates, which fell ≈ 30 m next to Joplin Rd. No gun, no hits.

William R Harry Michael Sharp 8-18-06

Location Chopawamsic Date 8/17/06

Project / Client C03VA019402 / USACE

11 1430 Near ~~hous~~ foundation of old structure, but no gun in sight

1500 Move to magazine, located off of Liming Rd.

South of Area A

Coordinates

4271951.63 N

292471.83 E

ACM ~~will move~~ WRH sample CTT-02-SS-02-06 to magazine location (Pic 142)

Sample Time - 1520.

1530 Take vehicle back to Visitor Center → out of gas.

Met Paul Peterson, described situation of not finding gun.

11 He will provide map to gun tomorrow AM.

1545 Off to look for CTT-02-SS-02-03.

1620 Found sample location. Sloping terrain, next to stream bed,

North of Area A

Coordinates: (pic # 143)

N 4272973.15

E 292985.83

[signature] 8-18-06

Location CHOPAWAMSIC Date 8/18/06

Project / Client C03VA019402 / USACE

Sunny Bright 80°F.

8:50 Arrived at the sample location (Background Sample) ~~CTT~~ WRH

Location is off Joplin rd, South of Quantico Creek. Turbidity, temp, PH & Coordinates taken at

Temp: 19.76°C

Conductivity: 51 us/cm

PH : 6.60

DO : 5.01

Turbidity: 8.4

N: 4273771.62

E: 288470.82

Sediment: CTT-BG-SD-02-02 @ 0900

Sample water Samples @ 9:05

Also took MS, MSD & QA Samples

CTT-BG-SW-00-02-MS

CTT-BG-SW-00-02

CTT-BG-SW-00-02-MSD

CTT-BG-SW-00-02-QA

[signature] 8-18-06 Field Dup 7

Location Chopawamsic Date 08/18/06
Project / Client C03VA019402 / USACE

11 Sediment Sample was also taken at the bed of the Creek.

~~Sediment Sample~~ WRH

Moved to the next Sample location.
CTT-BG-SW-00-01
Arrived at Sample location
Location is off d Rd (RT)

YSI Information
PH : 6.55
Temp: 19.76°c
Conductivity: 91
DO : 6.50
Turbidity : 8.4
GPS Coordinates:
N: 4277104.12
E: 290431.89

* Surface water ~~and Sediment Sample~~ WRH
Collected at 9.43 ~~[illegible]~~
CTT-BG-SW-00-01 William R. Hay
Michael [illegible] 8-18-06

Sediment collected at 9.50
CTT-BG-SD-02-01

Water at the location flows from a Creek from the Natural park. It seems to be at a Confluence of two Streams.

10.25: Headed back to Camp 2 off Poplin rd to try and locate the Gun emplacement discovered during the ASR.
Unable to locate gun locations. Moved about 500m E in the woods trying Gun. Unable to find Mr. Paul of the NPS who promised to take the team to the location.

11.53. Arrived at the Visitors Center to filter Surface water Sample.

William R. Hay
Michael [illegible] 8-18-06

APPENDIX E - PHOTO DOCUMENTATION LOG

APPENDIX E - PHOTOGRAPHIC LOG

Project/Site : MMRP SI for Chopawamsic Troop Training Site
Project No.: C03VA019401/USACE

Date	Photo ID	Description[1]
8/14/06	E.1	Drum downhill near stream in A-Rifle Range (Field Observation 17).
8/15/06	E.2	Surface water sample location CTT-PR-SW-00-01 at G-Night Firing Course.
8/15/06	E.3	7-point wheel sampling set-up
8/15/06	E.4	2-3 small subsurface anomalies near 3 wooden posts in a line in G-Night Firing Course (Field Observation 27).
8/15/06	E.5	Felled timber in C-Demolition Range (Field Observation 4).
8/15/06	E.6	Circular depression in C-Demolition Range (7 ft diameter and 4 ft deep), sample CTT-O3-SS-02-09 (Field Observation 5).
8/15/06	E.7	Posts from former targets in G-Night Firing Course (Field Observation 27).
8/15/06	E.8	Posts from former targets in G-Night Firing Course (Field Observation 27).
8/16/06	E.9	Scattered metal surface cultural debris in C-Demolition Range (Field Observation 6).
8/16/06	E.10	Circular depression with subsurface anomaly in B-Rifle (6 ft diameter and 5 ft deep), sample CTT-M2-SS-02-04. Looks like the depression could possibly have been dug out (Field Observation 9).
8/16/06	E.11	Circular depression with subsurface anomaly in B-Rifle (2 ft diameter and 1 ft deep), sample CTT-RR-SS-02-04 (Field Observation 10).
8/16/06	E.12	Post with barbed wire in I-Mortar Range (Field Observation 29).
8/16/06	E.13	Dam below which surface water/sediment samples CTT-O1-SW-00-01/CTT-O1-SD-02-01 were collected in AOC H.
8/16/06	E.14	Surface water/sediment samples CTT-O1-SW-00-

Date	Photo ID	Description[1]
		01/CTT-O1-SD-02-01 collected at this location in H-Demolition Range.
8/17/06	E.15	Inert MD in Prince William Forest Park museum collection-tail fin and top end of a suspected 60 mm mortar illumination round.
8/17/06	E.16	Inert MD in Prince William Forest Park museum collection-top half of a suspected bazooka rocket.
8/17/06	E.17	Inert MD in Prince William Forest Park museum collection-suspected 40 mm illumination rounds (end view).
8/17/06	E.18	Inert MD in Prince William Forest Park museum collection-suspected 40 mm illumination rounds (side view).
8/17/06	E.19	Surface water/sediment samples CTT-O3-SW-00-01/CTT-O3-SD-02-01 collected at this location in D-Demolition Range/E-Demolition Range.
8/17/06	E.20	Expended suspected 40 mm illumination round in D-Demolition Range/E-Demolition Range (top view) (Field Observation 16).
8/17/06	E.21	Expended suspected 40 mm illumination round in D-Demolition Range/E-Demolition Range (side view) (Field Observation 16).
8/17/06	E.22	Expended suspected 40 mm illumination round in D-Demolition Range/E-Demolition Range (end view) (Field Observation 16).
8/17/06	E.23	CO2 cylinder around sample CTT-O1-SS-02-03 in H-Demolition Range (Field Observation 31).
8/17/06	E.24	Old magazine located on Liming Road (Field Observation 32).
11/28/06	E.25	Drinking water collection point at 17937 Joplin Road.
11/28/06	E.26	Drinking water collection point at 18049 Joplin Road.
11/28/06	E.27	Overgrown area in 1 Acre OB/OD area on Liming Road.
11/29/06	E.28	Circular depression in I-Mortar Range (8 ft diameter and 4 ft deep) (Field Observation 35).
11/29/06	E.29	Circular depression in I-Mortar Range (8 ft diameter

Date	Photo ID	Description[1]
		and 4 ft deep) (Field Observation 35).
11/29/06	E.30	Metal surface cultural debris in I-Mortar Range (Field Observation 36).
11/30/06	E.31	Suspected concrete bunker in F-Fragmentation Grenade Range. No targets found around bunker (Field Observation 39).
11/30/06	E.32	Suspected concrete bunker in F-Fragmentation Grenade Range. No targets found around bunker (Field Observation 39).
11/30/06	E.33	Dummy Gun Mount A in B-Rifle (Field Observation 40).
11/30/06	E.34	Dummy Gun Mount A in B-Rifle, suspected rocket fired into side (Field Observation 40).
11/30/06	E.35	Dummy Gun Mount B in B-Rifle (Field Observation 41).
11/30/06	E.36	Dummy Gun Mount B in B-Rifle (Field Observation 41).

[1], Field Observations reference Figures 3-1a through 3-1e.


Photo E.1 – Drum downhill near stream in A-Rifle Range (Field Observation 17).


Photo E.2 – Surface water sample location CTT-PR-SW-00-01 at G-Night Firing Course.


Photo E.3 – 7-point wheel sampling set-up


Photo E.4 – 2-3 small subsurface anomalies near 3 wooden posts in a line in G-Night Firing Course (Field Observation 27).


Photo E.5 – Felled timber in C-Demolition Range (Field Observation 4).


Photo E.6 – Circular depression in C-Demolition Range (7 ft diameter and 4 ft deep), sample CTT-O3-SS-02-09 (Field Observation 5).

Photo E.7 – Posts from former targets in G-Night Firing Course (Field Observation 27).

Photo E.8 – Posts from former targets in G-Night Firing Course (Field Observation 27).

Photo E.9 – Scattered metal surface cultural debris in C-Demolition Range (Field Observation 6).

Photo E.10 – Circular depression with subsurface anomaly in B-Rifle (6 ft diameter and 5 ft deep), sample CTT-M2-SS-02-04. Looks like the depression could possibly have been dug out (Field Observation 9).

Photo E.11 – Circular depression with subsurface anomaly in B-Rifle (2 ft diameter and 1 ft deep), sample CTT-RR-SS-02-04 (Field Observation 10).

Photo E.12 – Post with barbed wire in I-Mortar Range (Field Observation 29).

Photo E.13 – Dam below which surface water/sediment samples CTT-O1-SW-00-01/CTT-O1-SD-02-01 were collected in AOC H.

Photo E.14 – Surface water/sediment samples CTT-O1-SW-00-01/CTT-O1-SD-02-01 collected at this location in H-Demolition Range.

Photo E.15 – Inert MD in Prince William Forest Park museum collection-tail fin and top end of a suspected 60 mm mortar illumination round.

Photo E.16 – Inert MD in Prince William Forest Park museum collection-top half of a suspected bazooka rocket.

Photo E.17 – Inert MD in Prince William Forest Park museum collection-suspected 40 mm illumination rounds (end view).

Photo E.18 – Inert MD in Prince William Forest Park museum collection-suspected 40 mm illumination rounds (side view).

Photo E.19 – Surface water/sediment samples CTT-O3-SW-00-01/CTT-O3-SD-02-01 collected at this location in D-Demolition Range/E-Demolition Range.

Photo E.20 – Expended suspected 40 mm illumination round in D-Demolition Range/E-Demolition Range (top view) (Field Observation 16).

Photo E.21 – Expended suspected 40 mm illumination round in D-Demolition Range/E-Demolition Range (side view) (Field Observation 16).

Photo E.22 – Expended suspected 40 mm illumination round in D-Demolition Range/E-Demolition Range (end view) (Field Observation 16).

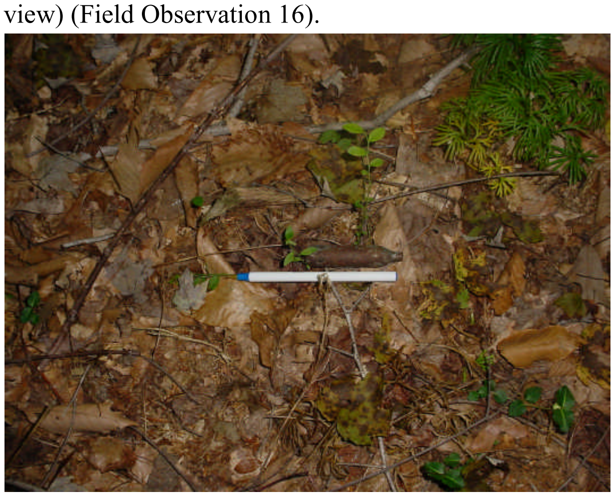


Photo E.23 - CO2 cylinder around sample CTT-O1-SS-02-03 in H-Demolition Range (Field Observation 31).

Photo E.24 – Old magazine located on Liming Road (Field Observation 32).

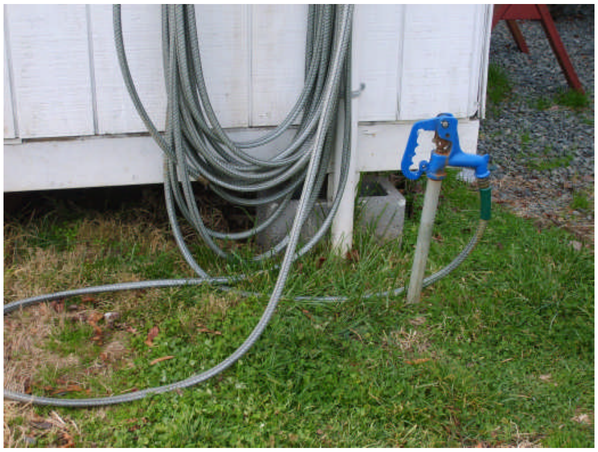


Photo E.25 – Drinking water collection point at 17937 Joplin Road.

Photo E.26 – Drinking water collection point at 18049 Joplin Road.

Photo E.27 – Overgrown area in 1 Acre OB/OD area on Liming Road.

Photo E.28 – Circular depression in I-Mortar Range (8 ft diameter and 4 ft deep) (Field Observation 35).

Photo E.29 – Circular depression in I-Mortar Range (8 ft diameter and 4 ft deep) (Field Observation 35).

Photo E.30 – Metal surface cultural debris in I-Mortar Range (Field Observation 36).

Photo E.31 – Suspected concrete bunker in F-Fragmentation Grenade Range. No targets found around bunker (Field Observation 39).

Photo E.32 – Suspected concrete bunker in F-Fragmentation Grenade Range. No targets found around bunker (Field Observation 39).

Photo E.33 – Dummy Gun Mount A in B-Rifle (Field Observation 40).

Photo E.34 – Dummy Gun Mount A in B-Rifle, suspected rocket fired into side (Field Observation 40).

Photo E.35 – Dummy Gun Mount B in B-Rifle (Field Observation 41).

Photo E.36 – Dummy Gun Mount B in B-Rifle (Field Observation 41).

APPENDIX F - ANALYTICAL DATA

- Screening Tables
- ADR Library
- ADR EDDs
- EDMS
- Analytical Summary Reports
- Analytical Data Reports
- SEDD Deliverable

Located on CD.

APPENDIX G - ANALYTICAL DATA QA/QC REPORT

- Validated Data from EDS
- USACE Memorandum for Record-CQAR of QA Split Samples.

Located on CD.

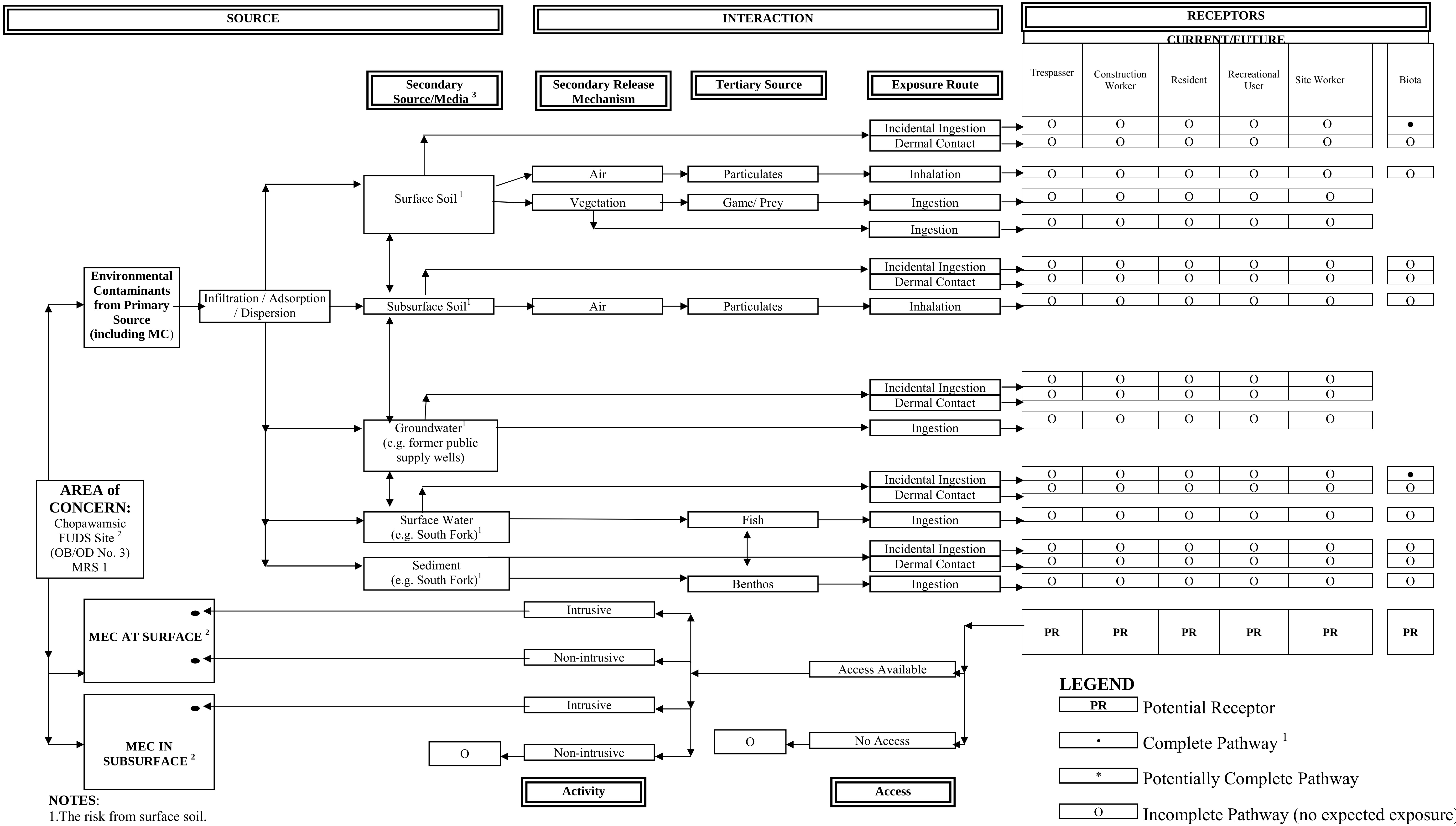
APPENDIX H - GEOGRAPHIC INFORMATION SYSTEMS DATA

Located on CD.

APPENDIX I - GEOPHYSICAL DATA

Appendix not used.

APPENDIX J - CONCEPTUAL SITE MODEL



NOTES:

1.The risk from surface soil.

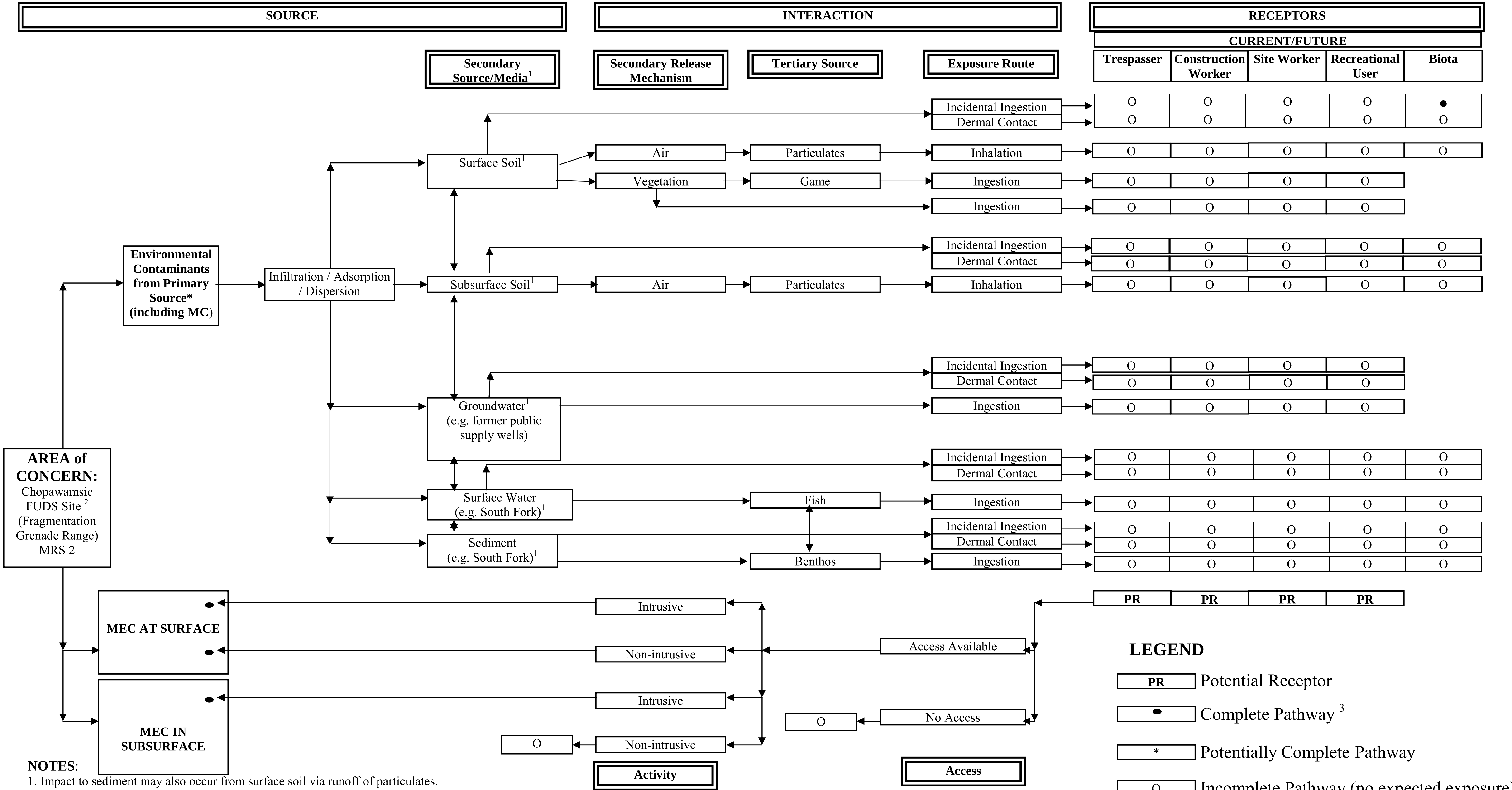
2. Primary source includes open burn/open detonation area; however MRS 1 overlaps with Range fans and source areas of MRSs 2, 3, and 4.

3. For a pathway to be complete, it must include a source, an exposure medium, an exposure route, and a receptor. A complete pathway may also include a release mechanism and a transport medium.

4. The CSM has evolved throughout the SI process to reflect a current understanding, following the SI, of the source, pathways and receptors potentially affected by MEC and MC.

Source: U.S. Army Corps of Engineers (USACE). 2003. *Conceptual Site Modals for Ordnance and Explosives (OE) and Hazardous, Toxic, and Radioactive Wastes (HTRW) Projects.* EM1110-1-1200.

DIAGRAM OF THE INTEGRATED CONCEPTUAL SITE MODEL[4] FOR CHOPAWAMSIC TROOP TRAINING SITE MMRP FUDS SITE, OPEN BURN /OPEN DETONATION (OB/OD) NO. 3 (MRS 1)

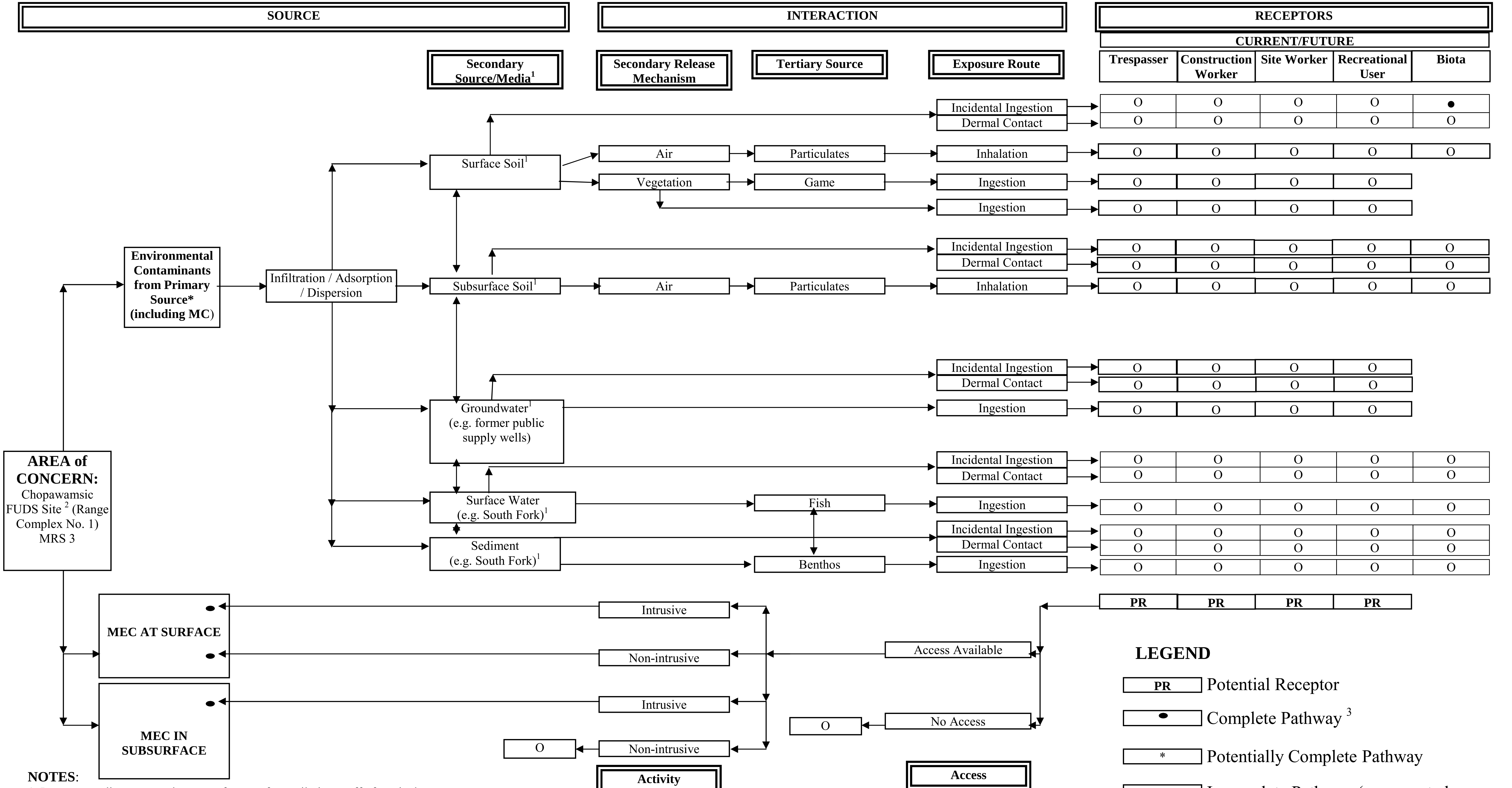


NOTES:

1. Impact to sediment may also occur from surface soil via runoff of particulates.
A separate risk for surface soil and subsurface soil may be combined to represent risk from total soil from some receptors. Impact to surface water may also occur from infiltration of groundwater.
2. Primary sources will vary but are expected to include open burn/open detonation areas (overlaps MRS 1), and grenade impact areas.
3. For a pathway to be complete, it must include a source, an exposure medium, an exposure route, and a receptor. A complete pathway may also include a release mechanism and a transport medium.
4. The CSM has evolved throughout the SI process to reflect a current understanding, following the SI, of the source, pathways and receptors potentially affected by MEC and MC.

Source: U.S. Army Corps of Engineers (USACE). 2003. *Conceptual Site Modals for Ordnance and Explosives (OE) and Hazardous, Toxic, and Radioactive Wastes (HTRW) Projects.* EM1110-1-1200.

DIAGRAM OF THE INTEGRATED CONCEPTUAL SITE MODEL[4] FOR CHOPAWAMSIC TROOP TRAINING SITE MMRP FUDS SITE, FRAGMENTATION GRENADE RANGE (MRS 2)

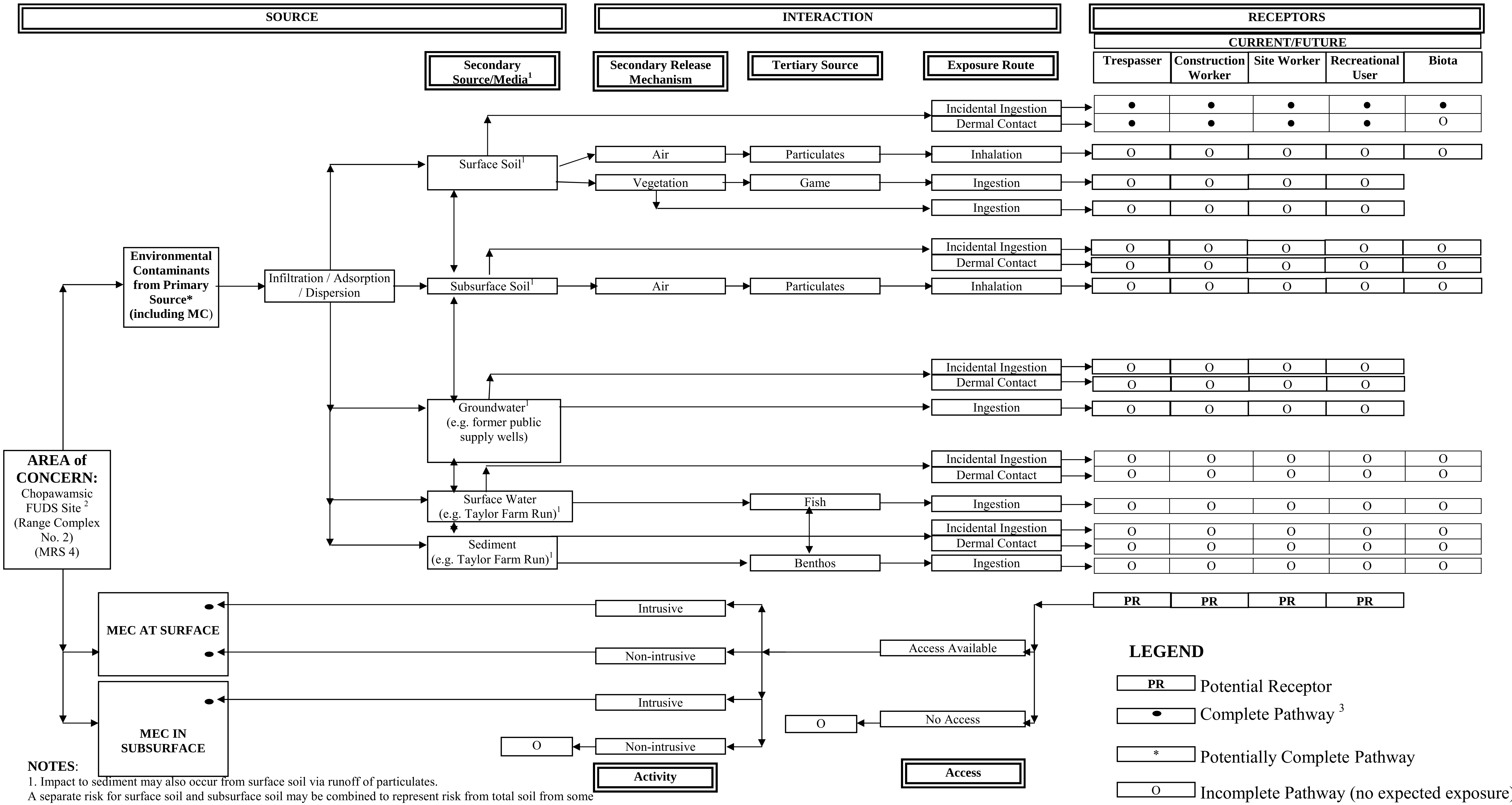


NOTES:

1. Impact to sediment may also occur from surface soil via runoff of particulates.
Impact to surface water may also occur from infiltration of groundwater.
2. Primary sources include open burn/open detonation areas (MRS 1 overlaps MRS 3), impact/target areas, and firing areas.
3. For a pathway to be complete, it must include a source, an exposure medium, an exposure route, and a receptor. A complete pathway may also include a release mechanism and a transport medium.
4. The CSM has evolved throughout the SI process to reflect a current understanding, following the SI, of the source, pathways and receptors potentially affected by MEC and MC.

Source: U.S. Army Corps of Engineers (USACE). 2003. *Conceptual Site Modals for Ordnance and Explosives (OE) and Hazardous, Toxic, and Radioactive Wastes (HTRW) Projects.* EM1110-1-1200.

DIAGRAM OF THE INTEGRATED CONCEPTUAL SITE MODEL[4] FOR CHOPAWAMSIC TROOP TRAINING SITE MMRP FUDS SITE, RANGE COMPLEX NO. 1 (MRS 3)



NOTES:

1. Impact to sediment may also occur from surface soil via runoff of particulates.
A separate risk for surface soil and subsurface soil may be combined to represent risk from total soil from some receptors. Impact to surface water may also occur from infiltration of groundwater.
2. Primary sources will vary but are expected to include open burn/open detonation areas, impact areas, and firing areas.
3. For a pathway to be complete, it must include a source, an exposure medium, an exposure route, and a receptor. A complete pathway may also include a release mechanism and a transport medium.
The CSM has evolved throughout the SI process to reflect a current understanding, following the SI, of the source, pathways and receptors potentially affected by MEC and MC.

Source: U.S. Army Corps of Engineers (USACE). 2003. *Conceptual Site Modals for Ordnance and Explosives (OE) and Hazardous, Toxic, and Radioactive Wastes (HTRW) Projects.* EM1110-1-1200.

DIAGRAM OF THE INTEGRATED CONCEPTUAL SITE MODEL[4] FOR CHOPAWAMSIC TROOP TRAINING SITE MMRP FUDS SITE, RANGE COMPLEX NO. 2 (MRS 4)

APPENDIX K - MUNITIONS RESPONSE SITE PRIORITIZATION PROTOCOL RESULTS

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site Name: Open Burn/Open Detonation (OB/OD) No. 3 - MRS 1

Component: Army

Installation/Property Name Chopawamsic Troop Training Site

Location (City, County, State): Triangle, Prince William County, Virginia

Site Name (RMIS ID)/Project Name (Project No.): Chopawamsic Troop Training Site (C03VA019401M01)/ (C03VA019401)

Date Information Entered/Updated: May 2007

Point of Contact (Name/Phone): Adriane James / 757-201-7701

Project Phase (check only one):

❑ PA	☑ SI	❑ RI	❑ FS	❑ RD
❑ RA-C	❑ RIP	❑ RA-O	❑ RC	❑ LTM

Media Evaluated (check all that apply):

☑ Groundwater	☑ Sediment (human receptor)
☑ Surface soil	☑ Surface Water (ecological receptor)
☑ Sediment (ecological receptor)	☑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

Unspecified types of demolition materials were employed at several locations throughout the entire southern portion and central portions of the site). Historical documents identify five (5) designated demolition areas (areas C, D, E, H and a 1-acre OB/OD area) and alludes to use of demolition materials at other locations. The size of the demolition area would be based on the explosive safety distance of the demolition material. Demolition charges most likely TNT and military dynamite were used. The training consisted of the emplacement of cratering and cutting charges. Assuming a safety distance of 1200 feet for each separate demolition area, the aggregate range cell acreage totals 4,824.09 acres (USACE 2004b) (See Sections 2.1 and 2.4.5 and Table 2-2 of the SI Report).

Description of Pathways for Human and Ecological Receptors: Groundwater, Surface Soil, Surface Water, and Sediment.

Description of Receptors (Human and Ecological): Receptors include site worker, residents, construction workers, recreational users, trespassers, and biota.

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ All UXO that are considered likely to function upon any interaction with exposed persons [e.g., submunitions, 40mm high-explosive (HE) grenades, white phosphorus (WP) munitions, high-explosive antitank (HEAT) munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions]. ◆ All hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	**30**
High explosive (used or damaged)	◆ All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ All DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	**25**
Pyrotechnic (used or damaged)	◆ All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ All DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	**20**
High explosive (unused)	◆ All DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	**15**
Propellant	◆ All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	**15**
Bulk secondary high explosives, pyrotechnics, or propellant	◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. ◆ Bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ All UXO that are practice munitions that are not associated with a sensitive fuze. ◆ All DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ All used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**30**

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

OB/OD No. 3 (MRS 1) covers the southern half of the FUDS and overlaps all or parts of each of the three other MRSs; therefore, this MRS has the potential to contain the same munitions types as located in each of the other MRSs. Live Mk II Fragmentation Hand Grenades were used at the Fragmentation Grenade Range (MRS 2). Demolition materials containing Composition A, B, and C as well as RDX, HMX, TNT, Tetryl, and PETN as well as blasting caps containing RDX were used at this MRS as well as Range Complex No. 1 (MRS 3) and Range Complex No. 2 (MRS 4). Small Arms were used at the pistol and rifle ranges on Range Complex No. 1 (MRS 3) and Range Complex No. 2 (MRS 4). The 81 mm mortar with M43 high explosive (HE) mortars were used at the mortar ranges on Range Complex No. 2 (MRS 4). The M6 2.36-inch HE anti-tank rocket was also used at the rocket range on Range Complex No. 2 (MRS 4). In 2005, a rocket was found at Taylor Farm Run, not far from Area A in MRS 3 (TPP Memorandum-Appendix B) and a mortar was found in the roof of a building in this MRS. See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the score(s) that correspond with **all** sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include: impact or target areas, associated buffer and safety zones, firing points, and live-fire maneuver areas.	10
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	8
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used [There must be evidence that no other types of munitions (e.g., grenades) were used or are present to place an MRS into this category.].	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**10**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

MRS 1is a former OB/OD area that covers the southern half of the FUDS and overlaps all or parts of each of the other MRS's; therefore, this MRS has the potential to contain the same munitions types as each of the other MRS. OB/OD No1 (MRS 3), 2 (MRS 4), and 3 (MRS 1) were all used as munitions treatment areas. Range Complex No. 1 (MRS 3) was also used as a mortar, rifle, machine gun, and rocket range while Range Complex Number 2 (MRS 4) was used as a rifle, pistol, and machine gun range as well as a night firing course. MRS 2 was a former Fragmentation Grenade Range. See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the score(s) that correspond with **all** locations where munitions are located or suspected of being found at the MRS.

Note: The terms *surface, subsurface, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS ◆ Historical evidence (e.g., a confirmed incident report or accident report) indicates there are UXO or DMM on the surface of the MRS.	**25**
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	**10**
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	**5**
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability [There must be evidence that no other types of munitions (e.g., grenades) were used or are present at the MRS to place an MRS into this category.].	**1**
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**25**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

All items found at the site were found on the surface but it is suspected that items could be found in the subsurface, especially in OB/OD areas. In 1985, a mortar shell was found embedded in the roof of one of munitions storage buildings; in January 1993, one 2.36 inch rocket body was found in Area B; during the ASR field inspection, .45 caliber rounds were embedded in target posts at the night firing course, pistol, carbine, and sub-machine gun range (Area G), a portion of a 2.36 inch rocket body was found at the multi-use assault range (Area B), and the field team found two trapezoidal concrete targets (one with a 20 mm gun barrel) in Area B. In 2005, a rocket was found at Taylor Run Farm, not far from Area A in MRS 4. See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report. (USACE 1998; 2004b).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to any explosive materiel. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

Prince William Forest Park is open to recreational users from dawn until dusk. Some roads in the park are gated and are not accessible to vehicles but hikers have access to most areas. There are private residences within the MRS along Joplin Road adjacent to the park USACE 1996; TPP Memorandum-Appendix B). See Sections 2.3.4 and 4.3.1of the SI Report.

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	5
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the rule is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

Prince William Forest Park is managed by the National Park Service. There are private residences within the MRS along Joplin Road adjacent to the park (USACE 1996; TPP Memorandum-Appendix B). See Sections 2.1, 2.3.3, and 2.3.4 of the SI Report.

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and circle the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

There are 831 persons per square mile in Prince William County, Virginia (U.S. Census Bureau 2000). Section 2.3.3 of the SI Report.

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the associated population near the known or suspected hazard.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the site and has many inhabited structures and there are many homes and commercial businesses north and east of the site. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures near the hazard and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the score(s) that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	• There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the site and has many inhabited structures and there are many homes and commercial businesses north and east of the site. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resource classifications at the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	**5**
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

There are several threatened and endangered species on the MRS as well as areas of cultural significance (Alion 2006). Refer to Sections 2.3.8 and 3.2 of the SI Report.

Table 10
Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	30	40
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	25	38
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	5	20
Population Near Hazard	Table 7	5	
Types of Activities/ Structures	Table 8	5	
Ecological and /or Cultural Resources	Table 9	5	
EHE MODULE TOTAL			98

EHE Module Total	**EHE Module Rating**
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**A**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to **all** CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ Explosively configured CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged, or nonexplosively configured CWM/DMM, or CWM not configured as a munition, that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM. ◆ Bulk CWM/DMM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ Only CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	**0**
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

CWM is not present at the MRS (USACE 1996, 2004a).

TABLES 12 THROUGH 19 EXCLUDED AS PER CX GUIDANCE

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11		
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**Alternative Rating: No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and perchlorate). The media was sampled but no munitions-related MC were detected. Samples CTT-02-GW-00-01, CTT-O3-GW-00-01, CTT-O3-GW-00-02, Field Dup 4 (CTT-O3-GW-00-02), CTT-O3-GW-00-03, CTT-O3-GW-00-04, Field Dup 1 (CTT-O3-GW-00-04).

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and perchlorate). The media was sampled but no munitions-related MC were detected. Samples CTT-02-GW-00-01, CTT-O3-GW-00-01, CTT-O3-GW-00-02, Field Dup 4 (CTT-O3-GW-00-02), CTT-O3-GW-00-03, CTT-O3-GW-00-04, Field Dup 1 (CTT-O3-GW-00-04).

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
		No Known or Suspected Groundwater MC Hazard	☑

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-O1-SW-00-01, CTT-O1-SW-00-03, CTT-O3-SW-00-01, and CTT-O3-SW-00-02.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
BARIUM	4.5E+01	7.3E+03	6.2E-03
COPPER	1.1E+00	1.4E+03	7.9E-04
NICKEL	1.3E+00	7.3E+02	1.8E-03
ZINC	1.1E+01	1.1E+04	1.0E-03
CHF Scale	**CHF Value**	**Sum The Ratios**	9.8E-03
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ❑

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-01-SD-02-01, CTT-01-SD-02-03, CTT-O3-SD-02-01, and CTT-O3-SD-02-02.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
ANTIMONY	1.1E+00	3.1E+01	3.5E-02
COPPER	2.9E+01	2.8E+03	1.0E-02
LEAD	1.3E+01	4.0E+02	3.3E-02
CHF Scale	**CHF Value**	**Sum The Ratios**	9.09E-02
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	**L (Low)**		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Human Endpoint) MC Hazard ❑

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-O1-SW-00-01, CTT-O1-SW-00-03, CTT-O3-SW-00-01, and CTT-O3-SW-00-02.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
BARIUM	4.5E+01	4.0E+00	1.1E+01
COPPER	1.1E+00	1.20E+01	9.2E-02
NICKEL	1.3E+00	1.60E+02	8.1E-03
ZINC	1.1E+01	1.10E+02	1.0E-01
CHF Scale	**CHF Value**	**Sum the Ratios**	1.1E+01
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-O1-SW-00-01, CTT-O1-SW-00-03, CTT-O3-SW-00-01, and CTT-O3-SW-00-02.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard			❑

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-01-SD-02-01, CTT-01-SD-02-03, CTT-O3-SD-02-01, and CTT-O3-SD-02-02.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
COPPER	2.9E+01	1.60E+01	1.8E+00
LEAD	1.3E+01	3.10E+01	4.2E-01
NICKEL	1.3E+01	1.60E+01	7.8E-01
ZINC	7.1E+01	1.20E+02	5.9E-01
CHF Scale	**CHF Value**	**Sum the Ratios**	3.59E+00
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-01-SD-02-01, CTT-01-SD-02-03, CTT-O3-SD-02-01, and CTT-O3-SD-02-02.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
		No Known or Suspected Sediment (Ecological Endpoint) MC Hazard	❑

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-O1-SS-02-01, CTT-O1-SS-02-03, CTT-O2-SS-02-06, CTT-O3-SS-02-01, Field Dup 6 (CTT-O3-SS-02-01), CTT-O3-SS-02-02, CTT-O3-SS-02-03, CTT-O3-SS-02-04, CTT-O3-SS-02-05, CTT-O3-SS-02-06, CTT-O3-SS-02-07, CTT-O3-SS-02-11, CTT-O3-SS-02-12, Field Dup 3 (CTT-O3-SS-02-12), and CTT-O3-SS-02-13, CTT-GR-SS-02-01, Field Dup 2 (CTT-GR-SS-02-01), CTT-GR-SS-02-05, and CTT-PR-SS-02-01.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
COPPER	6.4E+01	2.8E+03	2.3E-02
LEAD	3.5E+01	4.0E+02	8.8E-02
STRONTIUM	4.0E+01	4.6E+04	8.7E-04
ZINC	2.3E+03	2.3E+04	1.0E-01
CHF Scale	**CHF Value**	**Sum the Ratios**	2.13E-01
CHF > 100	**H (High)**	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	**M**
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	**M**
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L

Table 26

HHE Module: Surface Soil Data Element Table

<table>
<tr><td colspan="3">

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-O1-SS-02-01, CTT-O1-SS-02-03, CTT-O2-SS-02-06, CTT-O3-SS-02-01, Field Dup 6 (CTT-O3-SS-02-01), CTT-O3-SS-02-02, CTT-O3-SS-02-03, CTT-O3-SS-02-04, CTT-O3-SS-02-05, CTT-O3-SS-02-06, CTT-O3-SS-02-07, CTT-O3-SS-02-11, CTT-O3-SS-02-12, Field Dup 3 (CTT-O3-SS-02-12), and CTT-O3-SS-02-13, CTT-GR-SS-02-01, Field Dup 2 (CTT-GR-SS-02-01), CTT-GR-SS-02-05, and CTT-PR-SS-02-01.

</td></tr>
<tr><td>RECEPTOR FACTOR</td><td>DIRECTIONS: Record <u>the single highest value</u> from above in the box to the right (maximum value = H).</td><td>M</td></tr>
<tr><td colspan="3">No Known or Suspected Surface Soil MC Hazard ❑</td></tr>
</table>

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Analytes listed are munitions-related MC. Remember not to add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio
Sediment (Human)	NICKEL	1.3E+01	1.5E+03	8.3E-03
Sediment (Human)	STRONTIUM	2.4E+01	4.6E+04	5.2E-04
Sediment (Human)	ZINC	7.1E+01	2.3E+04	3.1E-03

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)	Not Applicable (N/A)	N/A	N/A	N/A	N/A
Surface Water/Human Endpoint (Table 22)	L	M	M	MML	E
Sediment/Human Endpoint (Table 23)	L	M	M	MML	E
Surface Water/Ecological Endpoint (Table 24)	M	M	M	MMM	D
Sediment/Ecological Endpoint (Table 25)	M	M	M	MMM	D
Surface Soil (Table 26)	L	M	M	MML	E

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box below.

HHE MODULE RATING	**D**

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

Evaluation Note: N/A=not applicable

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29

MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS priority is the single highest priority; record this number in the **MRS or Alternative Priority** box at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	**2**	**B**	2	**A**	2
B	3	**C**	3	**B**	3
C	4	**D**	4	**C**	4
D	5	**E**	5	**D**	**5**
E	6	**F**	6	**E**	6
F	7	**G**	7	**F**	7
G	8			**G**	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		No Known or Suspected CWM Hazard		No Known or Suspected MC Hazard	
MRS or ALTERNATIVE PRIORITY				**2**	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site Name: Fragmentation Grenade Range - MRS 2

Component: Army

Installation/Property Name Chopawamsic Troop Training Site

Location (City, County, State): Triangle, Prince William County, Virginia

Site Name (RMIS ID)/Project Name (Project No.): Chopawamsic Troop Training Site (C03VA019401R01)/ (C03VA019401)

Date Information Entered/Updated: May 2007

Point of Contact (Name/Phone): Adriane James / 757-201-7701

Project Phase (check only one):

❑ PA	☑ SI	❑ RI	❑ FS	❑ RD
❑ RA-C	❑ RIP	❑ RA-O	❑ RC	❑ LTM

Media Evaluated (check all that apply):

❑ Groundwater	❑ Sediment (human receptor)
☑ Surface soil	❑ Surface Water (ecological receptor)
❑ Sediment (ecological receptor)	❑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

The fragmentation range (identified in the ASR as area F) was located in a small gully or draw, the walls of which rise over 100 feet. Specific details of the range layout are unknown. Typically, a grenade range would have consisted of a trench with targets and an impact area approximately 25 yards to the front of the throwing line. Regulations describe the range being laid out with a ready line situated behind a barrier at least 5 feet high, and a throwing area situated a minimum of 15 yards to the front of this barrier. Targets may have consisted of a circular outline, a crater, and/or a foxhole. A danger area of approximately 600 feet would have been established around the entire range.

Description of Pathways for Human and Ecological Receptors: Surface Soil.

Description of Receptors (Human and Ecological): Receptors include site workers, construction workers, recreational visitors, trespassers, and biota.

Table 1
EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ All UXO that are considered likely to function upon any interaction with exposed persons [e.g., submunitions, 40mm high-explosive (HE) grenades, white phosphorus (WP) munitions, high-explosive antitank (HEAT) munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions]. ◆ All hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	**30**
High explosive (used or damaged)	◆ All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ All DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ All DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ All DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	**15**
Propellant	◆ All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	**15**
Bulk secondary high explosives, pyrotechnics, or propellant	◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. ◆ Bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ All UXO that are practice munitions that are not associated with a sensitive fuze. ◆ All DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ All used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**30**

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

Live Mark II Fragmentation Hand Grenades were used at this MRS (**MRS 2**). OB/OD No. 3 (**MRS 1**) and Range Complex No. 2 (**MRS 4**) overlap this MRS. Demolition materials containing Composition A, B, and C as well as RDX, HMX, TNT, Tetryl, PETN, and blasting caps containing RDX were used at OB/OD No. 3 and Range Complex No. 2 (**MRS 4**). Small Arms were used at the pistol and rifle ranges on Range Complex No. 2 (**MRS 4**). See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the score(s) that correspond with **all** sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include: impact or target areas, associated buffer and safety zones, firing points, and live-fire maneuver areas.	**10**
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	**8**
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used [There must be evidence that no other types of munitions (e.g., grenades) were used or are present to place an MRS into this category.].	**1**
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**10**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

MRS 2 was a former Fragmentation Grenade Range. MRS 1 OB/OD No. 3 was used as a munitions treatment area. Range Complex No. 2 (MRS 4) was used as a rifle, pistol, and machine gun range as well as a night firing course. Both of these areas overlap MRS 2. See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the score(s) that correspond with **all** locations where munitions are located or suspected of being found at the MRS.

Note: The terms *surface, subsurface, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS ◆ Historical evidence (e.g., a confirmed incident report or accident report) indicates there are UXO or DMM on the surface of the MRS.	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability [There must be evidence that no other types of munitions (e.g., grenades) were used or are present at the MRS to place an MRS into this category.].	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**25**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

All items found at the site were found on the surface but it is suspected that items could be found in the subsurface, especially in OB/OD areas. In 1985, a mortar shell was found embedded in the roof of one of munitions storage buildings in Range Complex No. 2 (MRS 4). During the ASR field inspection, .45 caliber rounds were embedded in target posts at the night firing course, pistol, carbine, and sub-machine gun range (Area G). Area G overlaps this MRS. The results and findings of previous MEC-related investigations are identified in See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report. (USACE 1998; 2004b).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to any explosive materiel. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

Prince William Forest Park is open to recreational users from dawn until dusk. Some roads in the park are gated and are not accessible to vehicles but hikers have access to most areas. There are private residences outside the MRS along Joplin Road adjacent to the park USACE 1996; TPP Memorandum-Appendix B). See Sections 2.3.4 and 4.3.1of the SI Report.

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	5
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the rule is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

Prince William Forest Park is managed by the National Park Service. There are private residences outside the MRS along Joplin Road adjacent to the park (USACE 1996; TPP Memorandum-Appendix B). See Sections 2.1, 2.3.3, and 2.3.4 of the SI Report.

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and circle the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

There are 831 persons per square mile in Prince William County, Virginia (U.S. Census Bureau 2000). Section 2.3.3 of the SI Report.

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the associated population near the known or suspected hazard.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road outside the MRS and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the site and has many inhabited structures and there are many homes and commercial businesses north and east of the MRS. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures near the hazard and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the score(s) that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road outside the MRS and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the site and has many inhabited structures and there are many homes and commercial businesses north and east of the MRS. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resource classifications at the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	**5**
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

There are several threatened and endangered species on the MRS as well as areas of cultural significance (Alion 2006). Refer to Sections 2.3.8 and 3.2 of the SI Report.

Table 10
Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	30	40
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	25	38
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	5	20
Population Near Hazard	Table 7	5	
Types of Activities/ Structures	Table 8	5	
Ecological and /or Cultural Resources	Table 9	5	
EHE MODULE TOTAL			98

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**A**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to **all** CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ Explosively configured CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged, or nonexplosively configured CWM/DMM, or CWM not configured as a munition, that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM. ◆ Bulk CWM/DMM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ Only CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	**0**
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

CWM is not present at the MRS (USACE 1996, 2004a).

TABLES 12 THROUGH 19 EXCLUDED AS PER CX GUIDANCE

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11		
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**Alternative Rating: No Known or Suspected CWM Hazard**

Table 21
HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Groundwater samples were not collected at this MRS.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

No Known or Suspected Groundwater MC Hazard ☑

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Surface water samples were not collected at this MRS.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	H (High)		
100 > CHF > 2	M (Medium)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ☑

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Sediment samples were not collected at this MRS.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).		**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

No Known or Suspected Sediment (Human Endpoint) MC Hazard ☑

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Surface water samples were not collected at this MRS.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum the Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ☑

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Sediment samples were not collected at this MRS.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios

CHF Scale	CHF Value	Sum the Ratios	
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ☑

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-GR-SS-02-02, CTT-GR-SS-02-03, and CTT-GR-SS-02-04.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
COPPER	92.2	2.8E+03	3.3E-02
LEAD	93.9	4.0E+02	2.3E-01
STRONTIUM	22.8	4.6E+04	5.0E-04
ZINC	490	2.3E+04	2.1E-02
CHF Scale	**CHF Value**	**Sum the Ratios**	2.85E-01
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Table 26

HHE Module: Surface Soil Data Element Table

<u>**Contaminant Hazard Factor (CHF)**</u>

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-GR-SS-02-02, CTT-GR-SS-02-03, and CTT-GR-SS-02-04.

No Known or Suspected Surface Soil MC Hazard ❑

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Only use this table if there are more than five contaminants present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Remember not to add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)	Not Applicable (N/A)	N/A	N/A	N/A	N/A
Surface Water/Human Endpoint (Table 22)	N/A	N/A	N/A	N/A	N/A
Sediment/Human Endpoint (Table 23)	N/A	N/A	N/A	N/A	N/A
Surface Water/Ecological Endpoint (Table 24)	N/A	N/A	N/A	N/A	N/A
Sediment/Ecological Endpoint (Table 25)	N/A	N/A	N/A	N/A	N/A
Surface Soil (Table 26)	L	M	M	MML	E

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box below.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

Evaluation Note: N/A=not applicable

HHE MODULE RATING	**E**

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	
HML	D
MMM	
HLL	E
MML	
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Table 29
MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS priority is the single highest priority; record this number in the **MRS or Alternative Priority** box at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	**B**	2	**A**	2
B	3	**C**	3	**B**	3
C	4	**D**	4	**C**	4
D	5	**E**	5	**D**	5
E	6	**F**	6	**E**	6
F	7	**G**	7	**F**	7
G	8			**G**	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		No Known or Suspected CWM Hazard		No Known or Suspected MC Hazard	
MRS or ALTERNATIVE PRIORITY				**2**	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site Name: **Range Complex No. 1- MRS 3**

Component: **Army**

Installation/Property Name: **Chopawamsic Troop Training Site**

Location (City, County, State): **Triangle, Prince William County, Virginia**

Site Name (RMIS ID)/Project Name (Project No.): **Chopawamsic Troop Training Site (C03VA019402R02)/ (C03VA019402)**

Date Information Entered/Updated: **May 2007**

Point of Contact (Name/Phone): **Adriane James / 757-201-7701**

Project Phase (check only one):

☐ PA	☑ SI	☐ RI	☐ FS	☐ RD
☐ RA-C	☐ RIP	☐ RA-O	☐ RC	☐ LTM

Media Evaluated (check all that apply):

☑ Groundwater	☑ Sediment (human receptor)
☑ Surface soil	☑ Surface Water (ecological receptor)
☑ Sediment (ecological receptor)	☑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

The range complex is located on the western portion of the site and included 2 mortar ranges, rifle, machine-gun, and 2.36-inch rocket ranges and two demolition areas (20-acre and 4-acre demolitions areas). The areas are referred to in the ASR as area B and area I. None of these ranges were of "standard" construction. However, the range cells presented are based on range standards, modified to fit the existing rugged terrain. The mortar range cells were derived by estimating the right and left limits of fire and the down range distance. The demolition areas were used to train with demolition charges (cratering and cutting). The range cells were derived based on the types of demolitions used. The total complex range cell acreage calculated is 3,106.9.

Description of Pathways for Human and Ecological Receptors: Groundwater, Surface Soil, Surface Water, and Sediment.

Description of Receptors (Human and Ecological): Receptors include National Park Service employees, construction workers, recreational visitors, trespassers, and biota.

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ All UXO that are considered likely to function upon any interaction with exposed persons [e.g., submunitions, 40mm high-explosive (HE) grenades, white phosphorus (WP) munitions, high-explosive antitank (HEAT) munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions]. ◆ All hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	30
High explosive (used or damaged)	◆ All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ All DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	25
Pyrotechnic (used or damaged)	◆ All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ All DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	20
High explosive (unused)	◆ All DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	15
Propellant	◆ All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	**15**
Bulk secondary high explosives, pyrotechnics, or propellant	◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. ◆ Bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ All UXO that are practice munitions that are not associated with a sensitive fuze. ◆ All DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ All used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**30**

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

Demolition materials containing Composition A, B, and C, RDX, HMX, TNT, Tetryl, and PETN as well as blasting caps containing RDX were used at this MRS. Small Arms were used at the pistol and rifle ranges. The 81 mm mortar with M43 high explosive shells were used at the mortar ranges. The M6 2.36-inch high explosive anti-tank rocket was also used at the rocket range on this MRS (USACE 1996 and 2004b). See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the score(s) that correspond with **all** sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include: impact or target areas, associated buffer and safety zones, firing points, and live-fire maneuver areas.	**10**
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	**8**
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used [There must be evidence that no other types of munitions (e.g., grenades) were used or are present to place an MRS into this category.].	**1**
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 10).	**10**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

<u>OB/OD No. 1, located on this MRS, was used as a munitions treatment areas. Range Complex No. 1 was also used as a mortar, rifle, machine gun, and rocket range (USACE 1996 and 2004b). See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).</u>

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the score(s) that correspond with **all** locations where munitions are located or suspected of being found at the MRS.

Note: The terms *surface, subsurface, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS ◆ Historical evidence (e.g., a confirmed incident report or accident report) indicates there are UXO or DMM on the surface of the MRS.	25
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	10
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	5
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability [There must be evidence that no other types of munitions (e.g., grenades) were used or are present at the MRS to place an MRS into this category.].	1
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**25**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

All items found at the site were found on the surface but it is suspected that items could be found in the subsurface, especially in OB/OD areas. In January 1993, one 2.36 inch rocket body was found in Area B (this MRS). A portion of a 2.36 inch rocket body was found at the multi-use assault range (Area B), and the field team found two trapezoidal concrete targets (one with a 20 mm gun barrel) in Area B. See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report. (USACE 1998; 2004b).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to any explosive materiel. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

Prince William Forest Park is open to recreational users from dawn until dusk. Some roads in the park are gated and are not accessible to vehicles but hikers have access to most areas. There are private residences outside the MRS along Joplin Road adjacent to the park USACE 1996; TPP Memorandum-Appendix B). See Sections 2.3.4 and 4.3.1of the SI Report.

Table 5

EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	5
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the rule is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **<u>the single highest score</u>** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

Prince William Forest Park is managed by the National Park Service. (USACE 1996; TPP Memorandum-Appendix B). See Sections 2.1, 2.3.3, and 2.3.4 of the SI Report.

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and circle the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

There are 831 persons per square mile in Prince William County, Virginia (U.S. Census Bureau 2000). Section 2.3.3 of the SI Report.

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the associated population near the known or suspected hazard.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road outside the MRS and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the site and has many inhabited structures and there are many homes and commercial businesses north and east of the MRS. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures near the hazard and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the score(s) that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	• Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	• There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road outside the MRS and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the MRS and has many inhabited structures and there are many homes and commercial businesses north and east of the site. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resource classifications at the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	**5**
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

There are several threatened and endangered species on the MRS as well as areas of cultural significance (Alion 2006). Refer to Sections 2.3.8 and 3.2 of the SI Report.

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.

4. Circle the appropriate range for the **EHE Module Total** below.

5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	30	40
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	25	38
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	5	20
Population Near Hazard	Table 7	5	
Types of Activities/ Structures	Table 8	5	
Ecological and /or Cultural Resources	Table 9	5	
EHE MODULE TOTAL			98

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**A**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to **all** CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ Explosively configured CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged, or nonexplosively configured CWM/DMM, or CWM not configured as a munition, that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM. ◆ Bulk CWM/DMM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ Only CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	**0**
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

CWM is not present at the MRS (USACE 1996, 2004a).

TABLES 12 THROUGH 19 EXCLUDED AS PER CX GUIDANCE

Table 20
Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
4. Circle the appropriate range for the **CHE Module Total** below.
5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11		
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**Alternative Rating: No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and perchlorate). The media was sampled but no munitions-related MC were detected. Samples CTT-M2-GW-00-01 and CTT-M2-GW-00-02.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

No Known or Suspected Groundwater MC Hazard ☑

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-M2-SW-02-01, Field Dup 4 (CTT-M2-SW-02-01), and CTT-RR-SW-00-01.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
COPPER	1.7E+00	1.4E+03	1.2E-03
NICKEL	2.2E+00	7.3E+02	3.0E-03
ZINC	2.1E+01	1.1E+04	1.9E-03
CHF Scale	**CHF Value**	**Sum The Ratios**	6.2E-03
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ❑

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-M2-SD-02-01 and CTT-RR-SD-02-01.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
ANTIMONY	3.7E-01	3.1E+01	1.2E-02
COPPER	2.8E+01	2.8E+03	9.9E-03
LEAD	1.0E+01	4.0E+02	2.6E-02
NICKEL	8.9E+00	1.5E+03	5.9E-03
STRONTIUM	4.7E+00	4.6E+04	1.0E-04
ZINC	7.7E+01	2.3E+04	3.3E-03
CHF Scale	**CHF Value**	**Sum The Ratios**	5.8E-02
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	**L (Low)**		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Human Endpoint) MC Hazard ❑

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-M2-SW-02-01, Field Dup 4 (CTT-M2-SW-02-01), and CTT-RR-SW-00-01

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
COPPER	1.7E+00	1.20E+01	1.4E-01
NICKEL	2.2E+00	1.60E+02	1.4E-02
ZINC	2.1E+01	1.10E+02	1.9E-01
CHF Scale	**CHF Value**	**Sum the Ratios**	3.5E-01
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ❑

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-M2-SD-02-01 and CTT-RR-SD-02-01.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
COPPER	2.8E+01	1.60E+01	1.7E+00
LEAD	1.0E+01	3.10E+01	3.4E-01
NICKEL	8.9E+00	1.60E+01	5.6E-01
ZINC	7.7E+01	1.20E+02	6.4E-01
CHF Scale	**CHF Value**	**Sum the Ratios**	3.3E+00
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ❑

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-MI-SS-02-01, CTT-MI-SS-02-02, CTT-M1-SS-02-03, CTT-MI-SS-02-04, CTT-MI-SS-02-05, CTT-M1-SS-02-07, CTT-M1-SS-02-08, CTT-M1-SS-02-09, CTT-M2-SS-02-01, Field Dup 5 (CTT-M2-SS-02-01), CTT-M2-SS-02-02, CTT-M2-SS-02-03, CTT-M2-SS-02-04, CTT-M2-SS-02-05, CTT-M2-SS-02-06, CTT-R1-SS-02-01, Field Dup A (CTT-R1-SS-02-01), CTT-R1-SS-02-02, CTT-R1-SS-02-03, CTT-R1-SS-02-04, CTT-RR-SS-02-01, Field Dup B (CTT-RR-SS-02-01), CTT-RR-SS-02-02, CTT-RR-SS-02-03, CTT-RR-SS-02-04, and CTT-RR-SS-02-05.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
COPPER	39.5	2.8E+03	1.4E-02
LEAD	79	4.0E+02	2.0E-01
STRONTIUM	18.4	4.6E+04	4.0E-04
ZINC	650	2.3E+04	2.8E-02
CHF Scale	**CHF Value**	**Sum the Ratios**	2.4E-01
CHF > 100	H (High)	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	M (Medium)		
2 > CHF	L (Low)		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-MI-SS-02-01, CTT-MI-SS-02-02, CTT-M1-SS-02-03, CTT-MI-SS-02-04, CTT-MI-SS-02-05, CTT-M1-SS-02-07, CTT-M1-SS-02-08, CTT-M1-SS-02-09, CTT-M2-SS-02-01, Field Dup 5 (CTT-M2-SS-02-01), CTT-M2-SS-02-02, CTT-M2-SS-02-03, CTT-M2-SS-02-04, CTT-M2-SS-02-05, CTT-M2-SS-02-06, CTT-R1-SS-02-01, Field Dup A (CTT-R1-SS-02-01), CTT-R1-SS-02-02, CTT-R1-SS-02-03, CTT-R1-SS-02-04, CTT-RR-SS-02-01, Field Dup B (CTT-RR-SS-02-01), CTT-RR-SS-02-02, CTT-RR-SS-02-03, CTT-RR-SS-02-04, and CTT-RR-SS-02-05.

RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**
	No Known or Suspected Surface Soil MC Hazard	❑

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

<u>Contaminant Hazard Factor (CHF)</u>

DIRECTIONS: Only use this table if there are more than five contaminants present at the MRS. This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Remember not to add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)	L	M	M	MML	E
Surface Water/Human Endpoint (Table 22)	L	M	M	MML	E
Sediment/Human Endpoint (Table 23)	L	M	M	MML	E
Surface Water/Ecological Endpoint (Table 24)	L	M	M	MML	E
Sediment/Ecological Endpoint (Table 25)	M	M	M	MMM	D
Surface Soil (Table 26)	L	M	M	MML	E

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box below.

HHE MODULE RATING	**D**

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

Evaluation Note: N/A=not applicable

Table 29

MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS priority is the single highest priority; record this number in the **MRS or Alternative Priority** box at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	**B**	2	**A**	2
B	3	**C**	3	**B**	3
C	4	**D**	4	**C**	4
D	5	**E**	5	**D**	5
E	6	**F**	6	**E**	6
F	7	**G**	7	**F**	7
G	8			**G**	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		No Known or Suspected CWM Hazard		No Known or Suspected MC Hazard	
MRS or ALTERNATIVE PRIORITY				**2**	

Table A

MRS Background Information

DIRECTIONS: Record the background information below for the MRS to be evaluated. Much of this information is available from DoD databases, such as RMIS. If the MRS is located on a FUDS property, the suitable FUDS property information should be substituted. In the MRS summary, briefly describe the UXO, DMM, or MC that are known or suspected to be present, the exposure setting (the MRS's physical environment), any other incidental non-munitions related contaminants found at the MRS (e.g., benzene, trichloroethylene), and any potentially exposed human and ecological receptors. Include a map of the MRS, if one is available.

Munitions Response Site Name: Range Complex No. 2 - MRS 4

Component: Army

Installation/Property Name Chopawamsic Troop Training Site

Location (City, County, State): Triangle, Prince William County, Virginia

Site Name (RMIS ID)/Project Name (Project No.): Chopawamsic Troop Training Site (C03VA019401R03)/ (C03VA019401)

Date Information Entered/Updated: May 2007

Point of Contact (Name/Phone): Adriane James / 757-201-7701

Project Phase (check only one):

❑ PA	☑ SI	❑ RI	❑ FS	❑ RD
❑ RA-C	❑ RIP	❑ RA-O	❑ RC	❑ LTM

Media Evaluated (check all that apply):

☐ Groundwater	☑ Sediment (human receptor)
☑ Surface soil	☑ Surface Water (ecological receptor)
☑ Sediment (ecological receptor)	☑ Surface Water (human receptor)

MRS Summary:

MRS Description: Describe the munitions-related activities that occurred at the installation, the dates of operation, and the UXO, DMM (by type of munition, if known) or munitions constituents (by type, if known) known or suspected to be present):

Range Complex No. 2 is located in the south-central portion of the site. It includes a night firing course, a rifle, pistol and machine gun range, and a demolition range (ASR areas A and G). Though no specific layout was found for each of the ranges, based on observations of the site, none of the ranges were of "standard" construction. The terrain in this portion of the site is rugged and restricted the range dimensions. Each of the ranges was located in small valleys or draws. The demolition area range cell is based on the explosive safety distance of a demolition charge.

Description of Pathways for Human and Ecological Receptors: Surface Soil, Surface Water, and Sediment.

Description of Receptors (Human and Ecological): Receptors include National Park Service employees, construction workers, recreational visitors, trespassers, and biota.

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Sensitive	◆ All UXO that are considered likely to function upon any interaction with exposed persons [e.g., submunitions, 40mm high-explosive (HE) grenades, white phosphorus (WP) munitions, high-explosive antitank (HEAT) munitions, and practice munitions with sensitive fuzes, but excluding all other practice munitions]. ◆ All hand grenades containing energetic filler. ◆ Bulk primary explosives, or mixtures of these with environmental media, such that the mixture poses an explosive hazard.	**30**
High explosive (used or damaged)	◆ All UXO containing a high-explosive filler (e.g., RDX, Composition B), that are not considered "sensitive." ◆ All DMM containing a high-explosive filler that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	**25**
Pyrotechnic (used or damaged)	◆ All UXO containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades). ◆ All DMM containing pyrotechnic fillers other than white phosphorous (e.g., flares, signals, simulators, smoke grenades) that have: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	**20**
High explosive (unused)	◆ All DMM containing a high explosive filler that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	**15**
Propellant	◆ All UXO containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor). ◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor) that are: ▪ Damaged by burning or detonation ▪ Deteriorated to the point of instability.	**15**
Bulk secondary high explosives, pyrotechnics, or propellant	◆ All DMM containing mostly single-, double-, or triple-based propellant, or composite propellants (e.g., a rocket motor), that are deteriorated. ◆ Bulk secondary high explosives, pyrotechnic compositions, or propellant (not contained in a munition), or mixtures of these with environmental media such that the mixture poses an explosive hazard.	10
Pyrotechnic (not used or damaged)	◆ All DMM containing a pyrotechnic fillers (i.e., red phosphorous), other than white phosphorous filler, that: ▪ Have not been damaged by burning or detonation ▪ Are not deteriorated to the point of instability.	10
Practice	◆ All UXO that are practice munitions that are not associated with a sensitive fuze. ◆ All DMM that are practice munitions that are not associated with a sensitive fuze and that have not: ▪ Been damaged by burning or detonation ▪ Deteriorated to the point of instability.	5
Riot control	◆ All UXO or DMM containing a riot control agent filler (e.g., tear gas).	3
Small arms	◆ All used munitions or DMM that are categorized as small arms ammunition [Physical evidence or historical evidence that no other types of munitions (e.g., grenades, subcaliber training rockets, demolition charges) were used or are present on the MRS is required for selection of this category.].	2
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
MUNITIONS TYPE	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**30**

Table 1

EHE Module: Munitions Type Data Element Table

DIRECTIONS: Below are 11 classifications of munitions and their descriptions. Circle the score(s) that correspond with **all** munitions types known or suspected to be present at the MRS.

Note: The terms *practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score

DIRECTIONS: Document any MRS-specific data used in selecting the ***Munitions Type*** classifications in the space provided.

Live Mk II Fragmentation Hand Grenades were used at the Fragmentation Grenade Range (MRS 2), which overlaps some of the ranges within this MRS. Demolition materials containing Composition A, B, and C as well as RDX, HMX, TNT, Tetryl, and PETN as well as blasting caps containing RDX were used at this MRS. Small Arms were used at the pistol and rifle ranges. (USACE 1996 and 2004b). In 2005 a rocket was found at Taylor Run Farm, not far from Area A in this MRS (TPP Memorandum-Appendix B). See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).

Table 2

EHE Module: Source of Hazard Data Element Table

DIRECTIONS: Below are 11 classifications describing sources of explosive hazards. Circle the score(s) that correspond with **all** sources of explosive hazards known or suspected to be present at the MRS.

Note: The terms *former range, practice munitions, small arms, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Former range	◆ The MRS is a former military range where munitions (including practice munitions with sensitive fuzes) have been used. Such areas include: impact or target areas, associated buffer and safety zones, firing points, and live-fire maneuver areas.	**10**
Former munitions treatment (i.e., OB/OD) unit	◆ The MRS is a location where UXO or DMM (e.g., munitions, bulk explosives, bulk pyrotechnic, or bulk propellants) were burned or detonated for the purpose of treatment prior to disposal.	**8**
Former practice munitions range	◆ The MRS is a former military range on which only practice munitions without sensitive fuzes were used.	6
Former maneuver area	◆ The MRS is a former maneuver area where no munitions other than flares, simulators, smokes, and blanks were used. There must be evidence that no other munitions were used at the location to place an MRS into this category.	5
Former burial pit or other disposal area	◆ The MRS is a location where DMM were buried or disposed of (e.g., disposed of into a water body) without prior thermal treatment.	5
Former industrial operating facilities	◆ The MRS is a location that is a former munitions maintenance, manufacturing, or demilitarization facility.	4
Former firing points	◆ The MRS is a firing point, where the firing point is delineated as an MRS separate from the rest of a former military range.	4
Former missile or air defense artillery emplacements	◆ The MRS is a former missile defense or air defense artillery (ADA) emplacement not associated with a military range.	2
Former storage or transfer points	◆ The MRS is a location where munitions were stored or handled for transfer between different modes of transportation (e.g., rail to truck, truck to weapon system).	2
Former small arms range	◆ The MRS is a former military range where only small arms ammunition was used [There must be evidence that no other types of munitions (e.g., grenades) were used or are present to place an MRS into this category.].	**1**
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that no UXO or DMM are present, or there is historical evidence indicating that no UXO or DMM are present.	0
SOURCE OF HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**10**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Source of Hazard*** classifications in the space provided.

OB/OD Number 2 (this MRS) was used as munitions treatment areas. This MRS was also used as a rifle, pistol, and machine gun range as well as a night firing course. MRS 2 was a former Fragmentation Grenade Range (overlaps this MRS) (USACE 1996 and 2004b). See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report (USACE 1996 and 2004b).

Table 3

EHE Module: Location of Munitions Data Element Table

DIRECTIONS: Below are eight classifications of munitions locations and their descriptions. Circle the score(s) that correspond with **all** locations where munitions are located or suspected of being found at the MRS.

Note: The terms *surface, subsurface, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Confirmed surface	◆ Physical evidence indicates that there are UXO or DMM on the surface of the MRS ◆ Historical evidence (e.g., a confirmed incident report or accident report) indicates there are UXO or DMM on the surface of the MRS.	**25**
Confirmed subsurface, active	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS, and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena (e.g., drought, flooding, erosion, frost, heat heave, tidal action), or intrusive activities (e.g., plowing, construction, dredging) at the MRS are likely to expose UXO or DMM.	20
Confirmed subsurface, stable	◆ Physical evidence indicates the presence of UXO or DMM in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed. ◆ Historical evidence indicates that UXO or DMM are located in the subsurface of the MRS and the geological conditions at the MRS are not likely to cause UXO or DMM to be exposed, in the future, by naturally occurring phenomena, or intrusive activities at the MRS are not likely to cause UXO or DMM to be exposed.	15
Suspected (physical evidence)	◆ There is physical evidence (e.g., munitions debris, such fragments, penetrators, projectiles, shell casings, links, fins), other than the documented presence of UXO or DMM, indicating that UXO or DMM may be present at the MRS.	**10**
Suspected (historical evidence)	◆ There is historical evidence indicating that UXO or DMM may be present at the MRS.	**5**
Subsurface, physical constraint	◆ There is physical or historical evidence indicating that UXO or DMM may be present in the subsurface, but there is a physical constraint (e.g., pavement, water depth over 120 feet) preventing direct access to the UXO or DMM.	2
Small arms (regardless of location)	◆ The presence of small arms ammunition is confirmed or suspected, regardless of other factors such as geological stability [There must be evidence that no other types of munitions (e.g., grenades) were used or are present at the MRS to place an MRS into this category.].	**1**
Evidence of no munitions	◆ Following investigation of the MRS, there is physical evidence that there are no UXO or DMM present, or there is historical evidence indicating that no UXO or DMM are present.	0
LOCATION OF MUNITIONS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 25).	**25**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Location of Munitions*** classifications in the space provided.

All items found at the site were found on the surface but it is suspected that items could be found in the subsurface, especially in OB/OD areas. In 1985, a mortar shell was found embedded in the roof of one of munitions storage buildings in this MRS. During the ASR field inspection, .45 caliber rounds were embedded in target posts at the night firing course, pistol, carbine, and sub-machine gun range (Area G). In 2005 a rocket was found at Taylor Run Farm, not far from Area A in this MRS (TPP Memorandum-Appendix B). See Sections 2.1 and 4.3.1 and Table 2-2 of the SI Report. (USACE 1998; 2004b).

Table 4

EHE Module: Ease of Access Data Element Table

DIRECTIONS: Below are four classifications of barrier types that can surround an MRS and their descriptions. The barrier type is directly related to the ease of public access to any explosive materiel. Circle the score that corresponds with the ease of access to the MRS.

Note: The term *barrier* is defined in Appendix C of the Primer.

Classification	Description	Score
No barrier	◆ There is no barrier preventing access to any part of the MRS (i.e., all parts of the MRS are accessible).	10
Barrier to MRS access is incomplete	◆ There is a barrier preventing access to parts of the MRS, but not the entire MRS.	8
Barrier to MRS access is complete but not monitored	◆ There is a barrier preventing access to all parts of the MRS, but there is no surveillance (e.g., by a guard) to ensure that the barrier is effectively preventing access to all parts of the MRS.	5
Barrier to MRS access is complete and monitored	◆ There is a barrier preventing access to all parts of the MRS, and there is active, continual surveillance (e.g., by a guard, video monitoring) to ensure that the barrier is effectively preventing access to all parts of the MRS.	0
EASE OF ACCESS	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 10).	**8**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ease of Access*** classification in the space provided.

Prince William Forest Park is open to recreational users from dawn until dusk. Some roads in the park are gated and are not accessible to vehicles but hikers have access to most areas. See Sections 2.3.4 and 4.3.1of the SI Report.

Table 5
EHE Module: Status of Property Data Element Table

DIRECTIONS: Below are three classifications of the status of a property within the Department of Defense (DoD) and their descriptions. Circle the score that corresponds with the status of property at the MRS.

Classification	Description	Score
Non-DoD control	◆ The MRS is at a location that is no longer owned by, leased to, or otherwise possessed or used by DoD. Examples are privately owned land or water bodies; land or water bodies owned or controlled by state, tribal, or local governments; and land or water bodies managed by other federal agencies.	5
Scheduled for transfer from DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD, and DoD plans to transfer that land or water body to the control of another entity (e.g., a state, tribal, or local government; a private party; another federal agency) within 3 years from the date the rule is applied.	3
DoD control	◆ The MRS is on land or is a water body that is owned, leased, or otherwise possessed by DoD. With respect to property that is leased or otherwise possessed, DoD must control access to the MRS 24 hours per day, every day of the calendar year.	0
STATUS OF PROPERTY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Status of Property*** classification in the space provided.

Prince William Forest Park is managed by the National Park Service. See Sections 2.1, 2.3.3, and 2.3.4 of the SI Report.

Table 6

EHE Module: Population Density Data Element Table

DIRECTIONS: Below are three classifications of population density and their descriptions. Determine the population density per square mile in the vicinity of the MRS and circle the score that corresponds with the associated population density.

Note: If an MRS is located in more than one county, use the largest population density value among the counties. If the MRS is within or borders a city or town, use the population density for the city or town, rather than that of the county.

Classification	Description	Score
> 500 persons per square mile	◆ There are more than 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	5
100–500 persons per square mile	◆ There are 100 to 500 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	3
< 100 persons per square mile	◆ There are fewer than 100 persons per square mile in the county in which the MRS is located, based on U.S. Census Bureau data.	1
POPULATION DENSITY	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Density*** classification in the space provided.

There are 831 persons per square mile in Prince William County, Virginia (U.S. Census Bureau 2000). Section 2.3.3 of the SI Report.

Table 7

EHE Module: Population Near Hazard Data Element Table

DIRECTIONS: Below are six classifications describing the number of inhabited structures near the MRS. The number of inhabited buildings relates to the population near the hazard. Determine the number of inhabited structures within two miles of the MRS boundary and circle the score that corresponds with the associated population near the known or suspected hazard.

Note: The term *inhabited structures* is defined in Appendix C of the Primer.

Classification	Description	Score
26 or more inhabited structures	◆ There are 26 or more inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	5
16 to 25 inhabited structures	◆ There are 16 to 25 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	4
11 to 15 inhabited structures	◆ There are 11 to 15 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	3
6 to 10 inhabited structures	◆ There are 6 to 10 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	2
1 to 5 inhabited structures	◆ There are 1 to 5 inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	1
0 inhabited structures	◆ There are no inhabited structures located up to 2 miles from the boundary of the MRS, within the boundary of the MRS, or both.	0
POPULATION NEAR HAZARD	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Population Near Hazard*** classification in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road outside the MRS and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the MRS and has many inhabited structures and there are many homes and commercial businesses north and east of the site. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 8

EHE Module: Types of Activities/Structures Data Element Table

DIRECTIONS: Below are five classifications of activities and/or inhabited structures near the hazard and their descriptions. Review the types of activities that occur and/or structures that are present within two miles of the MRS and circle the score(s) that correspond with **all** the activities/structure classifications at the MRS.

Note: The term *inhabited structure* is defined in Appendix C of the Primer.

Classification	Description	Score
Residential, educational, commercial, or subsistence	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with any of the following purposes: residential, educational, child care, critical assets (e.g., hospitals, fire and rescue, police stations, dams), hotels, commercial, shopping centers, playgrounds, community gathering areas, religious sites, or sites used for subsistence hunting, fishing, and gathering.	5
Parks and recreational areas	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with parks, nature preserves, or other recreational uses.	4
Agricultural, forestry	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with agriculture or forestry.	3
Industrial or warehousing	◆ Activities are conducted, or inhabited structures are located up to two miles from the MRS's boundary or within the MRS's boundary, that are associated with industrial activities or warehousing.	2
No known or recurring activities	◆ There are no known or recurring activities occurring up to two miles from the MRS's boundary or within the MRS's boundary.	1
TYPES OF ACTIVITIES/STRUCTURES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Types of Activities/Structures*** classifications in the space provided.

There are approximately 60 private parcels of land on the north side of Joplin Road outside the MRS and many of these parcels have homes on them. Quantico Marine Base is located south/southwest of the site and has many inhabited structures and there are many homes and commercial businesses north and east of the site. Refer to Sections 2.3.3 and 2.3.4 of the SI Report.

Table 9

EHE Module: Ecological and/or Cultural Resources Data Element Table

DIRECTIONS: Below are four classifications of ecological and/or cultural resources and their descriptions. Review the types of resources present and circle the score that corresponds with the ecological and/or cultural resource classifications at the MRS.

Note: The terms *ecological resources* and *cultural resources* are defined in Appendix C of the Primer.

Classification	Description	Score
Ecological and cultural resources present	◆ There are both ecological and cultural resources present on the MRS.	**5**
Ecological resources present	◆ There are ecological resources present on the MRS.	3
Cultural resources present	◆ There are cultural resources present on the MRS.	3
No ecological or cultural resources present	◆ There are no ecological resources or cultural resources present on the MRS.	0
ECOLOGICAL AND/OR CULTURAL RESOURCES	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 5).	**5**

DIRECTIONS: Document any MRS-specific data used in selecting the ***Ecological and/or Cultural Resources*** classification in the space provided.

There are several threatened and endangered species on the MRS as well as areas of cultural significance (Alion 2006). Refer to Sections 2.3.8 and 3.2 of the SI Report.

Table 10

Determining the EHE Module Rating

DIRECTIONS:

1. From Tables 1–9, record the data element scores in the **Score** boxes to the right.
2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
3. Add the three **Value** boxes and record this number in the **EHE Module Total** box below.
4. Circle the appropriate range for the **EHE Module Total** below.
5. Circle the **EHE Module Rating** that corresponds to the range selected and record this value in the **EHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
Explosive Hazard Factor Data Elements			
Munitions Type	Table 1	30	40
Source of Hazard	Table 2	10	
Accessibility Factor Data Elements			
Location of Munitions	Table 3	25	38
Ease of Access	Table 4	8	
Status of Property	Table 5	5	
Receptor Factor Data Elements			
Population Density	Table 6	5	20
Population Near Hazard	Table 7	5	
Types of Activities/ Structures	Table 8	5	
Ecological and /or Cultural Resources	Table 9	5	
EHE MODULE TOTAL			98

EHE Module Total	EHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected Explosive Hazard
EHE MODULE RATING	**A**

Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the score(s) that correspond to **all** CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO, CWM/DMM, physical evidence,* and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, explosive configuration either UXO or damaged DMM	The CWM known or suspected of being present at the MRS is: ◆ Explosively configured CWM that are UXO (i.e., CWM/UXO). ◆ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged.	30
CWM mixed with UXO	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged, or nonexplosively configured CWM/DMM, or CWM not configured as a munition, that are commingled with conventional munitions that are UXO.	25
CWM, explosive configuration that are undamaged DMM	◆ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged.	20
CWM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS is: ◆ Nonexplosively configured CWM/DMM. ◆ Bulk CWM/DMM (e.g., ton container).	15
CAIS K941 and CAIS K942	◆ The CWM/DMM known or suspected of being present at the MRS is CAIS K941-toxic gas set M-1 or CAIS K942-toxic gas set M-2/E11.	12
CAIS (chemical agent identification sets)	◆ Only CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS.	10
Evidence of no CWM	◆ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS.	**0**
CWM CONFIGURATION	**DIRECTIONS:** Record **the single highest score** from above in the box to the right (maximum score = 30).	**0**

DIRECTIONS: Document any MRS-specific data used in selecting the ***CWM Configuration*** classifications in the space provided.

CWM is not present at the MRS (USACE 1996, 2004a).

TABLES 12 THROUGH 19 EXCLUDED AS PER CX GUIDANCE

Table 20

Determining the CHE Module Rating

DIRECTIONS:

1. From Tables 11–19, record the data element scores in the **Score** boxes to the right.

2. Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.

3. Add the three **Value** boxes and record this number in the **CHE Module Total** box below.

4. Circle the appropriate range for the **CHE Module Total** below.

5. Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11		
Sources of CWM	Table 12		
Accessibility Factor Data Elements			
Location of CWM	Table 13		
Ease of Access	Table 14		
Status of Property	Table 15		
Receptor Factor Data Elements			
Population Density	Table 16		
Population Near Hazard	Table 17		
Types of Activities/ Structures	Table 18		
Ecological and /or Cultural Resources	Table 19		
CHE MODULE TOTAL			

CHE Module Total	CHE Module Rating
92 to 100	A
82 to 91	B
71 to 81	C
60 to 70	D
48 to 59	E
38 to 47	F
less than 38	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected CWM Hazard
CHE MODULE RATING	**Alternative Rating: No Known or Suspected CWM Hazard**

Table 21

HHE Module: Groundwater Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's groundwater and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the groundwater, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Groundwater samples were not collected at this MRS.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
CHF Scale	**CHF Value**	**Sum The Ratios**	
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**Not Applicable (N/A)**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the groundwater is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in groundwater has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the groundwater to a potential point of exposure (possibly due to geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the groundwater receptors at the MRS.

Classification	Description	Value
Identified	There is a threatened water supply well downgradient of the source and the groundwater is a current source of drinking water or source of water for other beneficial uses such as irrigation/agriculture (equivalent to Class I or IIA aquifer).	H
Potential	There is no threatened water supply well downgradient of the source and the groundwater is currently or potentially usable for drinking water, irrigation, or agriculture (equivalent to Class I, IIA, or IIB aquifer).	M
Limited	There is no potentially threatened water supply well downgradient of the source and the groundwater is not considered a potential source of drinking water and is of limited beneficial use (equivalent to Class IIIA or IIIB aquifer, or where perched aquifer exists only).	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**N/A**

No Known or Suspected Groundwater MC Hazard ☑

Table 22

HHE Module: Surface Water – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-R2-SW-00-01, CTT-PR-SW-00-01, and CTT-PR-SW-00-02.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
COPPER	1.2E+00	1.4E+03	8.6E-04
NICKEL	6.8E-01	7.3E+02	9.3E-04
ZINC	6.8E+00	1.1E+04	6.2E-04
CHF Scale	**CHF Value**	**Sum The Ratios**	2.4E-03
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Water (Human Endpoint) MC Hazard ❑

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-R2-SD-02-01, CTT-PR-SD-02-01, and CTT-PR-SD-02-02.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
COPPER	1.7E+01	2.8E+03	6.1E-03
LEAD	9.5E+00	4.0E+02	2.4E-02
NICKEL	1.5E+01	1.5E+03	1.0E-02
STRONTIUM	7.9E+00	4.6E+04	1.7E-04
ZINC	5.6E+01	2.3E+04	2.4E-03
CHF Scale	**CHF Value**	**Sum The Ratios**	4.3E-02
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{[\text{Maximum Concentration of Contaminant}]}{[\text{Comparison Value for Contaminant}]}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right maximum value = H).	**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Table 23

HHE Module: Sediment – Human Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the site's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for human endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-R2-SD-02-01, CTT-PR-SD-02-01, and CTT-PR-SD-02-02.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
		No Known or Suspected Sediment (Human Endpoint) MC Hazard	❑

Table 24

HHE Module: Surface Water – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface water and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the surface water, select the box at the bottom of the table.

Note: Use dissolved, rather than total, metals analyses when both are available.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-R2-SW-00-01, CTT-PR-SW-00-01, and CTT-PR-SW-00-02.

Contaminant	Maximum Concentration (μg/L)	Comparison Value (μg/L)	Ratios
COPPER	1.2E+00	1.20E+01	1.0E-01
NICKEL	6.8E-01	1.60E+02	4.3E-03
ZINC	6.8E+00	1.10E+02	6.2E-02
CHF Scale	**CHF Value**	**Sum the Ratios**	1.7E-01
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
2 > CHF	**L (Low)**		

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface water is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface water has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface water to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface water receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface water to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface water to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface water to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Surface Water (Ecological Endpoint) MC Hazard ❑

Table 25

HHE Module: Sediment – Ecological Endpoint Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's sediment and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard for ecological endpoints present in the sediment, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-R2-SD-02-01, CTT-PR-SD-02-01, and CTT-PR-SD-02-02.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratios
COPPER	1.7E+01	1.60E+01	1.1E+00
LEAD	9.5E+00	3.10E+01	3.1E-01
NICKEL	1.5E+01	1.60E+01	9.6E-01
ZINC	5.6E+01	1.20E+02	4.6E-01
CHF Scale	**CHF Value**	**Sum the Ratios**	2.8E+00
CHF > 100	**H (High)**		
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		

$$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$$

CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).	**M**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the sediment is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in sediment has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the sediment to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the sediment receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to sediment to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to sediment to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to sediment to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

No Known or Suspected Sediment (Ecological Endpoint) MC Hazard ❑

Table 26

HHE Module: Surface Soil Data Element Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-R2-SS-02-01, Field Dup 1 (CTT-R2-SS-02-01), CTT-R2-SS-02-02, CTT-PR-SS-02-02, CTT-PR-SS-02-03, CTT-NF-SS-02-01, Field Dup 3 (CTT-NF-SS-02-01), CTT-NF-SS-02-02, CTT-NF-SS-02-03, CTT-NF-SS-02-04, CTT-G2-SS-02-01, CTT-G2-SS-02-02, CTT-G2-SS-02-03, CTT-G2-SS-02-04, CTT-O2-SS-02-03, CTT-O2-SS-02-05, Field Dup 2 (CTT-O2-SS-02-05) CTT-03-SS-02-08, CTT-03-SS-02-09, and CTT-03-SS-02-10.

Contaminant	Maximum Concentration (mg/kg)	Comparison Value (mg/kg)	Ratio
COPPER	605	2.8E+03	2.2E-01
LEAD	478	4.0E+02	1.2E+00
STRONTIUM	30.6	4.6E+04	6.7E-04
ZINC	109	2.3E+04	4.7E-03
CHF Scale	**CHF Value**	**Sum the Ratios**	1.4E+00
CHF > 100	**H (High)**	$CHF = \sum \frac{\text{[Maximum Concentration of Contaminant]}}{\text{[Comparison Value for Contaminant]}}$	
100 > CHF > 2	**M (Medium)**		
2 > CHF	**L (Low)**		
CONTAMINANT HAZARD FACTOR	**DIRECTIONS:** Record **the CHF Value** from above in the box to the right (maximum value = H).		**L**

Migratory Pathway Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil migratory pathway at the MRS.

Classification	Description	Value
Evident	Analytical data or observable evidence indicates that contamination in the surface soil is present at, moving toward, or has moved to a point of exposure.	H
Potential	Contamination in surface soil has moved only slightly beyond the source (i.e., tens of feet), could move but is not moving appreciably, or information is not sufficient to make a determination of Evident or Confined.	M
Confined	Information indicates a low potential for contaminant migration from the source via the surface soil to a potential point of exposure (possibly due to presence of geological structures or physical controls).	L
MIGRATORY PATHWAY FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Receptor Factor

DIRECTIONS: Circle the value that corresponds most closely to the surface soil receptors at the MRS.

Classification	Description	Value
Identified	Identified receptors have access to surface soil to which contamination has moved or can move.	H
Potential	Potential for receptors to have access to surface soil to which contamination has moved or can move.	M
Limited	Little or no potential for receptors to have access to surface soil to which contamination has moved or can move.	L
RECEPTOR FACTOR	**DIRECTIONS:** Record **the single highest value** from above in the box to the right (maximum value = H).	**M**

Table 26

HHE Module: Surface Soil Data Element Table

<u>Contaminant Hazard Factor (CHF)</u>

DIRECTIONS: Record the **maximum concentrations** of all contaminants in the MRS's surface soil and their **comparison values** (from Appendix B) in the table below. Additional contaminants can be recorded on Table 27. Calculate and record the **ratios** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** by adding the **ratios** for each medium together, including additional contaminants recorded on Table 27. Based on the **CHF**, use the **CHF Scale** to determine and record the **CHF Value**. If there is no known or suspected MC hazard present in the surface soil, select the box at the bottom of the table.

Evaluation Note: Given the overlapping MRSs, the total list of munitions-related MC are reflected in the MRSPP (seven explosives and eleven metals). Samples CTT-R2-SS-02-01, Field Dup 1 (CTT-R2-SS-02-01), CTT-R2-SS-02-02, CTT-PR-SS-02-02, CTT-PR-SS-02-03, CTT-NF-SS-02-01, Field Dup 3 (CTT-NF-SS-02-01), CTT-NF-SS-02-02, CTT-NF-SS-02-03, CTT-NF-SS-02-04, CTT-G2-SS-02-01, CTT-G2-SS-02-02, CTT-G2-SS-02-03, CTT-G2-SS-02-04, CTT-O2-SS-02-03, CTT-O2-SS-02-05, Field Dup 2 (CTT-O2-SS-02-05) CTT-03-SS-02-08, CTT-03-SS-02-09, and CTT-03-SS-02-10.

No Known or Suspected Surface Soil MC Hazard ❑

Table 27

HHE Module: Supplemental Contaminant Hazard Factor Table

Contaminant Hazard Factor (CHF)

DIRECTIONS: **Only use this table if there are more than five contaminants present at the MRS.** This is a supplemental table designed to hold information about contaminants that do not fit in the previous tables. Indicate the **media** in which these contaminants are present. Then record all **contaminants**, their **maximum concentrations** and their **comparison values** (from Appendix B) in the table below. Calculate and record the **ratio** for each contaminant by dividing the **maximum concentration** by the **comparison value**. Determine the **CHF** for each medium on the appropriate media-specific tables.

Note: Remember not to add ratios from different media.

Media	Contaminant	Maximum Concentration	Comparison Value	Ratio

Table 28

Determining the HHE Module Rating

DIRECTIONS:

1. Record the letter values (H, M, L) for the **Contaminant Hazard, Migration Pathway, and Receptor Factors** for the media (from Tables 21–26) in the corresponding boxes below.
2. Record the media's three-letter combinations in the **Three-Letter Combination** boxes below (three-letter combinations are arranged from Hs to Ms to Ls).
3. Using the reference provided below, determine each media's rating (A–G) and record the letter in the corresponding **Media Rating** box below.

Media (Source)	Contaminant Hazard Factor Value	Migratory Pathway Factor Value	Receptor Factor Value	Three-Letter Combination (Hs-Ms-Ls)	Media Rating (A-G)
Groundwater (Table 21)	Not Applicable (N/A)	N/A	N/A	N/A	N/A
Surface Water/Human Endpoint (Table 22)	L	M	M	MML	E
Sediment/Human Endpoint (Table 23)	L	M	M	MML	E
Surface Water/Ecological Endpoint (Table 24)	L	M	M	MML	E
Sediment/Ecological Endpoint (Table 25)	M	M	M	MMM	D
Surface Soil (Table 26)	L	M	M	MML	E

DIRECTIONS (cont.):

4. Select the single highest Media Rating (A is highest; G is lowest) and enter the letter in the **HHE Module Rating** box below.

HHE MODULE RATING	**D**

HHE Ratings (for reference only)

Combination	Rating
HHH	A
HHM	B
HHL	C
HMM	C
HML	D
MMM	D
HLL	E
MML	E
MLL	F
LLL	G
Alternative Module Ratings	Evaluation Pending
	No Longer Required
	No Known or Suspected MC Hazard

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more media, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

Evaluation Note: N/A=not applicable

Table 29

MRS Priority

DIRECTIONS: In the chart below, circle the letter **rating** for each module recorded in Table 10 (EHE), Table 20 (CHE), and Table 28 (HHE). Circle the corresponding numerical **priority** for each module. If information to determine the module rating is not available, choose the appropriate alternative module rating. The MRS priority is the single highest priority; record this number in the **MRS or Alternative Priority** box at the bottom of the table.

Note: An MRS assigned Priority 1 has the highest relative priority; an MRS assigned Priority 8 has the lowest relative priority. Only an MRS with CWM known or suspected to be present can be assigned Priority 1; an MRS that has CWM known or suspected to be present cannot be assigned Priority 8.

EHE Rating	Priority	CHE Rating	Priority	HHE Rating	Priority
		A	1		
A	2	**B**	2	**A**	2
B	3	**C**	3	**B**	3
C	4	**D**	4	**C**	4
D	5	**E**	5	**D**	5
E	6	**F**	6	**E**	6
F	7	**G**	7	**F**	7
G	8			**G**	8
Evaluation Pending		Evaluation Pending		Evaluation Pending	
No Longer Required		No Longer Required		No Longer Required	
No Known or Suspected Explosive Hazard		No Known or Suspected CWM Hazard		No Known or Suspected MC Hazard	
MRS or ALTERNATIVE PRIORITY				**2**	

APPENDIX L - REFERENCE COPIES

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