



September 22, 2011

Mr. Richard Meadows
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via FedEx

SUBJECT: SUBMITTAL OF FINAL SITE-SPECIFIC WORK PLAN, FUDS MMRP SI PHASE
SITE: WEST VIRGINIA MANEUVER AREA
MRS04 FORE KNOBS / BEAR ROCKS FIRING RANGE
GRANT AND TUCKER COUNTIES, WV
FUDS PROPERTY NO.: G03WV0013
USACE CONTRACT NO. W912PP-11-C-0007 TASK ORDER 0001

Dear Mr. Meadows:

Please find enclosed twelve (12) paperbound copies along with twelve copies in PDF on CD-ROM of the Final Site-Specific Work Plan for West Virginia Maneuver Area MRS04, Fore Knobs/Bear Rocks Firing Range, located in Grant and Tucker Counties, WV for your records. Eight of the copies included in your package are for distribution to stakeholders.

This document is prepared by Parsons Infrastructure and Technology Group, Inc. (Parsons) as sub-contractor to Eco & Associates, Inc. (Eco) under U.S. Army Corps of Engineers (USACE) Contract W912PP-11-C-0007 Task Order 0001.

Please do not hesitate to contact me at (714) 289-0995 if there are questions regarding the presentation of this document or its contents.

Sincerely,
ECO & ASSOCIATES, INC.

A handwritten signature in blue ink, appearing to read "Mohammad Estiri", is written over a light blue circular stamp.

Mohammad Estiri, PhD
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Enclosures



SITE-SPECIFIC WORK PLAN ADDENDUM

FORMERLY USED DEFENSE SITE
MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTION PHASE

•FINAL•

September 22, 2011

**West Virginia Maneuver Area
FUDS No.: G03WV0013
MRS04 Fore Knobs/Bear Rocks Firing Range
Grant and Tucker Counties, West Virginia
Contract No.: W912PP-11-C-0007
Task Order: 0001**

**Prepared for:
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ABBREVIATION AND ACRONYMS

AHA	Activity Hazard Analysis
ASR	Archives Search Report
APPL	Agricultural and Priority Pollutant Laboratories, Inc.
BD/DR	Building Demolition or Debris Removal
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CELRH	U.S. Army Corps of Engineers, Huntington District
CELRL	U.S. Army Corps of Engineers, Louisville District
CELRD	U.S. Army Corps of Engineers, Great Lakes and Ohio River Division
CENWW	U.S. Army Corps of Engineers, Walla Walla District
CHE	Chemical Hazard Evaluation
CON/HTRW	Containerized Hazardous, Toxic, and Radioactive Waste
CRREL	Cold Regions Research and Engineering Laboratory
CSEM	Conceptual Site Exposure Model
CSM	Conceptual Site Model
DC PM	Design Center Program Manager
DERM	Department of Environmental Resource Management
DERP	Defense Environmental Restoration Program
DID	Data Item Description
DoD	Department of Defense
DQO	Data Quality Objective
EHE	Explosive Hazard Evaluation
ELAP	Environmental Laboratory Accreditation Program
EPP	Environmental Protection Plan
ER	Engineering Regulation
ERFPP	Emergency Response and Fire Prevention Plan
ESV	Ecological Screening Value
FDE	Findings and Determination of Eligibility
FSP	Field Sampling Plan
FTL	Field Team Leader
FUDS	Formerly Used Defense Site
FUDSMIS	FUDS Management Information System
GIS	Geographic Information System
GPS	Global Positioning System
HHE	Health Hazard Evaluation
HRR	Historical Records Review
HRS	Hazard Ranking Score
HTRW	Hazardous, Toxic and Radioactive Waste
HTW	Hazardous and Toxic Waste
IDW	Investigative Derived Waste
IGD	Interim Guidance Document

INPR	Inventory Project Report
MC	Munitions Constituents
MD	Munitions Debris
MDL	Method Detection Limits
MEC	Munitions and Explosives of Concern
MM CX	Military Munitions Center of Expertise
MM DC	Military Munitions Design Center
MMR	Military Munitions Response
MMRP	Military Munitions Response Program
MRS	Munitions Response Site
MRSP	Munitions Response Site Prioritization Protocol
MS/MSD	Matrix Spike/Matrix Spike Duplicate
msl	mean sea level
NCDC	National Climactic Data Center
NDAI	No DoD Action Indicated
NELAP	National Environmental Laboratory Accreditation Program
NOAA	National Oceanic and Atmospheric Administration
OCHP	Office of Cultural and Historical Programs
OSD	Office of the Secretary of Defense
PAOI	Potential Area of Interest
PAPP	Programmatic Accident Prevention Plan
Parsons	Parsons Infrastructure and Technology Group
PFSP	Programmatic Field Sampling Plan
PM	Program Manager
POP	Period of Performance
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limits
PSAP	Programmatic Sampling and Analysis Plan
PSHM	Parsons Safety and Health Manager
PWP	Programmatic Work Plan
PWS	Performance Work Statement
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QR	Qualitative Reconnaissance
RAC	Risk Assessment Code
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation / Feasibility Study
ROE	Right-of-Entry
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SAR	Small Arms Range
SCTLs	Soil Cleanup Target Levels
SHPO	State Historic Preservation Office
SI	Site Inspection

SLERA	Screening Level Ecological Risk Assessment
SLRA	Screening Level Risk Assessment
SOP	Standard Operating Procedure
SQAG	Sediment Quality Assessment Guidelines
SS-WP	Site-Specific Work Plan
T&E	Threatened and Endangered
TBD	To Be Determined
TCRA	Time Critical Removal Action
TPP	Technical Project Planning
USACE	U.S. Army Corps of Engineers
USAESCH	U.S. Army Engineering and Support Center, Huntsville
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
UXO	Unexploded Ordnance
WVDEP	West Virginia Department of Environmental Protection
WVDNR	West Virginia Department of Natural Resources
WVGES	West Virginia Geologic and Economic Survey
WVMA	West Virginia Maneuver Area

CHAPTER 1: INTRODUCTION

1.1 APPLICATION

This Site-Specific Work Plan (SS-WP) Addendum document concerns the West Virginia Maneuver Area/Dolly Sods FUDS, MRS04 Fore Knobs/Bear Rocks Firing Range located in Grant and Tucker Counties, West Virginia (Formerly Used Defense Site [FUDS] Project Number G03WV0013). The Fore Knobs/Bear Rocks Firing Range is one of seven sites comprising the 2,180,367-acre West Virginia Maneuver Area (WVMA). The Fore Knobs/Bear Rocks Firing Range is a 42,000-acre site located in the eastern portion of the FUDS near the community of Petersburg. The Fore Knobs/Bear Rocks Firing Range Munition Response Site (MRS) was used for firing points and target locations for 105mm and 155mm High Explosive (HE) howitzer rounds. This site is generally bounded by the Dolly Sods Wilderness Area and Cabin Mountain to the west, North Fork of Lunice Creek to the north, New Creek Mountain to the east, and High Ridge Run and Pendleton County to the south. The North Fork South Branch Potomac River passes near the southeast corner of the site. The area is currently part of Monongahela National Forest, part of the Nature Conservancy's Bear Rocks Preserve, and forested land and farmland with residences. The western edge of the MRS is located in the Dolly Sods Wilderness Area (Figure 1.1).

The SS-WP Addendum serves as an extension to the *Final Programmatic Work Plan for Southwest IMA Region: South Pacific Division Range Support Center FUDS Military Munitions Response Program for Site Inspections at Multiple Sites* (Parsons 2010) and the *Programmatic Sampling and Analysis Plan (PSAP) for MMRP Site Inspections* (U.S. Army Corps of Engineers [USACE] 2005). The reader is directed to the Final PWP and PSAP for additional detail regarding the majority of Site Investigation (SI) procedures, resources, and methods that are common to most SI field actions. The PWP and PSAP have been reviewed and approved by USACE for use during implementation of the SI program. Copies of the PWP and PSAP can be found in the document repository for this project located in the City of Elkins.

The intent of this SS-WP Addendum is merely to augment the PWP and PSAP, as warranted, to present pertinent site-specific information and procedural deviations that could not be readily captured in the programmatic documents or were the result of Technical Project Planning (TPP) Team agreements requiring modifications to the preliminary SI Technical Approach (see Subchapter 1.3 below). The PWP and PSAP are intended to be all-inclusive documents specifically tailored to address the foreseeable universe of potential SI actions. Conversely, the SS-WP Addendum has been prepared with emphasis on brevity and usability (with regard to the site visit team) and is not intended to restate protocol already addressed elsewhere. The PWP and PSAP will accompany the SS-WP Addendum during the conduct of SI field activities.

1.2 SI PROJECT OBJECTIVE – MRS04 FORE KNOBS/BEAR ROCKS FIRING RANGE

The purpose and scope of the SI is described in Subchapter 1.2 of the PWP. However, the primary objective can be summarized as the determination, through reconnaissance and munitions constituent (MC) sampling, as to whether the site should be recommended for immediate action (Time Critical Removal Action [TCRA]), subsequent characterization actions (such as a remedial investigation/feasibility study [RI/FS]), or no Department of

Defense (DoD) Action Indicated (NDAI). An NDAI recommendation is limited exclusively to Munitions and Explosives of Concern (MEC) and MC contamination issues and does not address Hazardous and Toxic Waste (HTW) concerns the site may pose.

The key to performing a successful and cost effective SI is the understanding that a SI is not designed to characterize or delineate (to a lateral or vertical extent) potential site contamination. It is merely a *site-screening* initiative to address whether MEC, MC, or both, are present at the site. Per Engineering Regulation (ER) 200-3-1 Guidance for Conducting SI, “the SI is not intended as a full-scale study of the nature and extent of contamination or explosive hazards” and only requires collection of “the minimum amount of information necessary” (USACE 2004b).

Frequently, sufficient data from prior studies, such as the Historical Records Review (HRR), Inventory Project Report (INPR) or the Archives Search Report (ASR) Supplement, exist to support an anticipated recommendation for the site concerning MEC, MC, or both prior to the conduct of SI fieldwork. In such instances, data collection is tailored more towards providing compelling evidence in support of an NDAI assertion or for demonstrating a strategy for focusing an RI/FS to substantially smaller tracts within the site.

Based upon available information about the Fore Knobs/Bear Rocks Firing Range MRS, the TPP team considers it an anticipated RI/FS site. MEC has been confirmed on site (105mm artillery and 60mm and 81mm mortars), and there is potential for additional MEC. Exposure pathways may be complete based on the possibility of MEC and MCs. In accordance with ER 200-3-1, sufficient data need to be collected during the SI to evaluate the potential presence of MEC and MC contamination for effective RI/FS initiation. In addition, the data necessary for the United States Environmental Protection Agency (USEPA) to complete the Hazard Ranking Score and for completion of the Munitions Response Site Prioritization Protocol (MRSPP) will be collected and developed.

An INPR was completed in 1990 and the 2,180,367-acre FUDS was approved as eligible for the FUDS program including the 42,000-acre Fore Knobs/Bear Rocks Firing Range MRS. A clearance around the Bear Rocks area was conducted in 1999 by Human Factors Applications for the Nature Conservancy (HFA 1999a). During that clearance, a 105mm HE howitzer round was found. An interview conducted during the Preliminary Assessment (PA) indicated that ordnance has also been found near Stack Rocks. The INPR assigned the entire 2,180,367-acre FUDS site a risk assessment code (RAC) of 2 (on a scale of 1 to 5, 1 being the most hazardous) and based a hazard severity of *critical* and a hazard probability of *probable*. The PA reports an MRSPP score of 3 for the Fore Knobs/Bear Rocks Firing Range MRS (USACE 2009).

In addition to the ASR completed for the Dolly Sods North (DSN) portion of the WVMA issued in September 1995, an HRR was also conducted. The HRR and ASR considered the potential for MMRP; Hazardous, Toxic, and Radioactive Waste (HTRW); containerized HTRW (CON/HTRW); and Building Demolition or Debris Removal (BD/DR) concerns associated with DoD use of the WVMA/Dolly Sods FUDS. The HRR investigation team did not find any additional environmental investigations or reports concerning the FUDS. The HRR states that a variety of ordnance has been found at the WVMA including High Explosive (HE) and Smoke Round (SR) mortars, a 105mm HE howitzer round, and a 3.25-inch rocket. The HRR and ASR listed no evidence of chemical warfare materials storage, usage or disposal at the FUDS (USACE 2009).

The PA prepared by the USACE in 2009 identified seven MRSs for the WVMA/Dolly Sods FUDS including the 42,000-acre Fore Knobs/Bear Rocks Firing Range MRS.

In December 2010, an INPR was prepared by the CELRL requesting approval of the on-going Dolly Sods MMRP and proposing the 7 MRSs identified in the PA. The CELRD granted approval of the Dolly Sods MMRP and the 7 new MRSs in December 2010 including the MRS04 Fore Knobs/Bear Rocks Firing Range.

1.3 TPP SUMMARY

The WVMA MRS04 Fore Knobs/Bear Rocks Firing Range falls under the purview of the USACE Huntington District (CELRH). A TPP Meeting was facilitated by CELRH on April 7, 2011 that included representatives of CELRH, CENWW, Parsons, Eco & Associates, Inc. (Eco), the US Forest Service, the Canaan Valley Institute, and the West Virginia Department of Environmental Protection (WVDEP). A Final TPP Memo was issued concurrently (see Appendix A). This SS-WP Addendum reflects the TPP Team decisions resulting from the meeting. Key TPP facts and decisions are summarized below:

- Portions of the MRS are within the Monongahela National Forest, the Bear Rocks Wildlife Preserve, and the Dolly Sods Wilderness Area, therefore, this MRS is considered to be ecologically sensitive. The proposed screening levels to be used for the ecological risk assessment are described as follows, and are listed in Table 4.4.

Soil: USEPA EcoSSLs. In absence of EcoSSLs, values obtained from the Los Alamos National Laboratory (LANL), EcoRisk Database, and USEPA Region 3 Ecological Screening Levels will be used.

Sediment: USEPA Region 3 Ecological Screening Benchmarks, Freshwater Sediment Screening Benchmark, National Oceanic and Atmospheric Administration Screening Quick Reference Tables, LANL Ecorisk Database, and USEPA Region 3 ESLs.

Surface water: WV Requirements Governing Water Quality Standards (47CSR2) supplemented with USEPA National Recommended Water Quality Criteria, USEPA Region 3 Freshwater Screening Benchmark, LANL Ecorisk Database.

- The proposed screening levels to be used for the human health risk assessment are described below, and are listed in Table 4.4.

Soil and Sediment: WVDEP Risk-Based Concentrations (RBCs), Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) supplemented with USEPA Regional Screening Levels.

Surface water: WV Requirements Governing Water Quality Standards (47CSR2) supplemented with USEPA National Recommended Water Quality Criteria and USEPA Regional Screening Levels for tap water.

Groundwater: WV Requirements Governing Water Quality Standards (47CSR2) then WV Risk-Based Concentrations (RBCs), Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) supplemented with USEPA Maximum Contaminant Levels, National Primary Drinking Water Standards, and USEPA Regional Screening Levels for tap water.

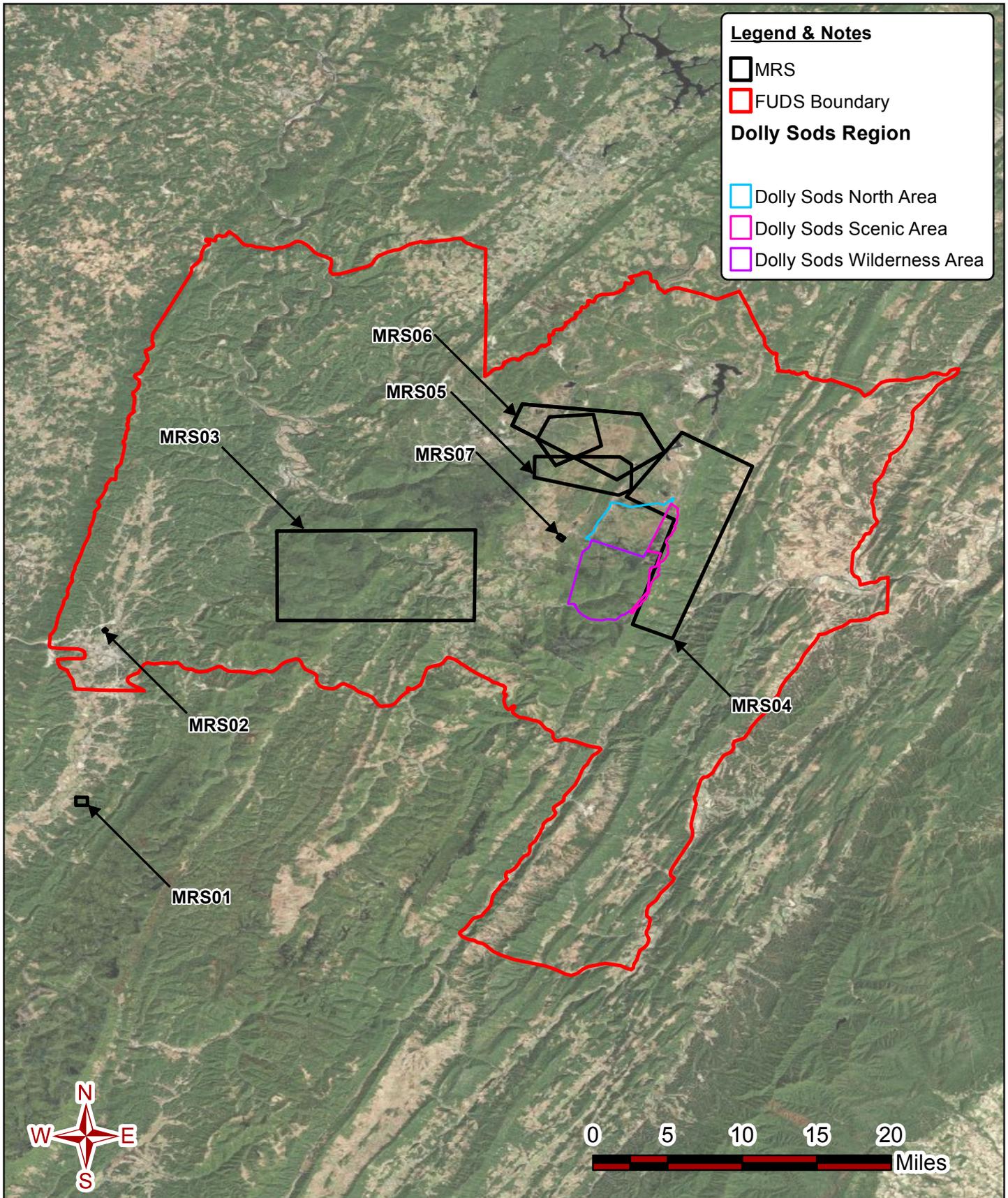
- The TPP team noted that clearance conducted by HFA was not a sufficient clearance of the area, and that there was in fact minimal clearance activity in support of the construction of a fire ring.
- Information regarding the actual firing locations might be obtained from Norman Black, a local farmer who grew up in the area. Mr. Black was interviewed during preparation of the Preliminary Assessment.
- Collect surface water sample on both sides of the ridge to obtain samples from both the dip slope and anti-dip slope. One of the samples should be collected as noted on Slide 121 of the TPP Presentation, and one sample should be collected near the head of Red Creek.
- Two sample locations will be added near Old Stoney Reservoir, which has been previously drained and remains dry.
- Bear Rocks trail can be used to access sample locations. It was also noted that all personnel should remain on trails when attempting to access sampling locations.
- The TPP Team concurred that no known cultural resources exist within MRS.
- Physical hazards in this area include poison ivy, stinging nettles, and rattlesnakes.
- The timeframe for fieldwork should be between September and October.

1.4 SITE-SPECIFIC WORK PLAN ADDENDUM ORGANIZATION

This SS-WP Addendum covers the investigation and all associated preparations necessary for SI activities at WVMA, MRS04 Fore Knobs/Bear Rocks Firing Range. The reader is referred to the PWP or PSAP for the general programmatic information intentionally excluded from this document.

The SS-WP Addendum is organized as follows:

- Chapter 1 – Introduction
- Chapter 2 – Project Description
- Chapter 3 – Field Investigation Plan
- Chapter 4 – Sampling and Analysis Plan
- Chapter 5 – Environmental Protection Plan
- Chapter 6 – Site-Specific Accident Prevention Plan
- Chapter 7 – References
- Appendices



Legend & Notes

- MRS
- FUDS Boundary

Dolly Sods Region

- Dolly Sods North Area
- Dolly Sods Scenic Area
- Dolly Sods Wilderness Area



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FUDS Location Map
 West Virginia Maneuver Area
 MRS04 Fore Knobs/Bear Rocks Firing Range
 FUDS No. G03WV0013

Project No. Eco-11-452 September 2011

FIGURE
 1.1

CHAPTER 2: PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The MRS04 Fore Knobs/Bear Rocks Firing Range portion of the WVMA/Dolly Sods FUDS is located in Grant and Tucker Counties, West Virginia, approximately 8 miles west of the City of Petersburg. Figures 2.1 and 2.2 show the MRS location and boundaries.

2.2 SITE DESCRIPTION

The Fore Knobs/Bear Rocks Firing Range MRS is 42,000 acres in aerial extent and consists of Monongahela National Forest land, the Bear Rocks Nature Preserve and agricultural fields with residences. The site is bordered by North Fork Lunice Creek to the north, High Ridge Run and Pendleton County to the south, New Creek Mountain to the east, and the Dolly Sods Wilderness Area and Cabin Mountain to the west. The property is currently owned and operated by a variety of public and private individuals consisting of the National Forest Service, the Bear Rocks Nature Conservancy, and private individuals.

The 2,180,367-acre WVMA is located in the Allegheny Mountain Province of the Potomac Highlands Region and includes parts of Preston, Tucker, Grant, Randolph, and Pendleton Counties of West Virginia. The Allegheny Front, a prominent geological feature bordering the western edge of the WVMA boundary, runs northeast to southwest across the State, separates the Allegheny Plateau Province to the west and the Valley and Ridge Province to the east. The Allegheny Front is an almost unbroken wall of mountains rising more than 4,000 feet. The Front follows the trend of the Appalachian Mountains northwest to southeast for more than 160 miles (WV Geologic and Economic Survey, 2004). The more than 40 mountains that make up this wall of mountains induce heavy precipitation in the area (See Figure 2.1 for regional orientation of the site location).

Spruce Knob is West Virginia's highest elevation at 4,861 feet, and the tallest mountain in the Alleghenies (WV Geologic and Economic Survey, 2004). Spruce Knob is located in Pendleton County, WV, and is within the Spruce Knob-Seneca Rocks National Recreation Area administered by the USFS Monongahela National Forest (MNF). Portions of the Recreation Area are located in the most southern portion of the WVMA project boundary. Northeast of the Spruce Knob-Seneca Rocks National Recreation Area the landscape includes several adjoining plateaus: Dolly Sods (Bear Rocks), Flatrock Plains, Red Creek Plains, and Roaring Plains, which culminates in the 4,770-foot summit of Mount Porte Crayon. Canaan Valley, which lies to the west of Cabin Mountain and the Dolly Sods area, is the highest large valley in the eastern United States. Canaan Valley contains the largest freshwater wetland area in West Virginia (approximately 8,475 acres), of which, approximately 5,662 acres are public lands managed by the Canaan Valley National Wildlife Refuge (CVNWR) (USFWS 2007).

The Allegheny Front divides waters that flow to the Atlantic Ocean from those flowing to the Gulf of Mexico. The Allegheny Plateau covers the western two-thirds of West Virginia and coincides with the Ohio River Basin. The eastern edge of the state and the eastern panhandle comprise most of the Potomac River Basin. The pattern of drainage east of the Allegheny Front features a short, trellised drainage system flowing toward the northeast and ultimately draining into the Potomac. The western portions drain across an inclined plane by a longer system that flows generally northwest into the Ohio River. Waters from within the WVMA

boundary primarily drain with the Ohio River Basin except for the North Branch and South Branch of the Potomac (USACE 2009).

Prominent features and locations within the WVMA's 2,180,367-acre area include the MNF (Dolly Sods, Spruce Knob-Seneca Rocks National Recreation Area, Blackbird Knob, Otter Creek Wilderness Area, and Stuart Recreation Area); the Towns of Sully, Kerens, Bowden, Jennings, Gladwin, and Dailey; the Cities of Elkins, Davis, and Parsons; the CVNWR; the former Stony River Reservoir; Seneca Rocks; Mount Storm Lake; Canaan Valley State Park; Blackwater Falls State Park; Blackbird Knob; Cabin Mountain; Shavers Mountain; Rich Mountain; Bearden Knob; Canaan Mountain and the Canaan Valley wetlands; the following rivers: Blackwater River, Shavers River, Cheat River, the Tygart Valley River, and their tributaries. The Bear Rocks Preserve, located north of Dolly Sods, is managed by the Nature Conservancy (USACE 2009).

2.2.1 GEOLOGY AND SOILS

The WVMA is located to the west of the Allegheny Front with approximate centralized coordinates of latitude 39° 07' 08" N and longitude 79° 27' 09" W. The Allegheny Front is a boundary between two provinces and is a complex with abrupt change of folded and faulted surficial strata of the Valley and Ridge and the gentler faulted strata of the High Plateau. East of the Allegheny Front the strata are found to dip steeply on the limbs of many of the anticline, many of which are asymmetrical, with more steeply dipping to overturned western limbs. West of the Front the strata dip much less steeply, usually less than 30 degrees and surface faulting is rare. This western side of the Front forms a high plateau of essentially horizontal strata and capped predominantly with resistant sandstones and conglomerates. Spruce Knob, located approximately 15 miles south of the WVMA, is West Virginia's highest elevation at 4,861 feet, the tallest mountain in the Alleghenies, and formed on a resistant bed of Pennsylvanian Pottsville Sandstone (WV Geologic and Economic Survey 2004).

The rocks underlying this mountainous area are of sedimentary origin, deposited during the Paleozoic Era (600 to 230 million years ago), being chiefly composed of limestone, sandstone and shale. The first mountain-building episode that affected the topography of WV was the Taconic Orogeny, which formed the mountains in eastern WV that were a source of sediments during the Ordovician, Silurian, and early Devonian periods. Highlands to the northeast, formed in the Acadian Orogeny, were the source of sediments in the Middle and Late Devonian. During the Middle Mississippian, about 330 million years ago, a sea covered West Virginia. During this period, the Greenbrier Group, composed mainly of limestone, was deposited. During the Pennsylvanian, WV was low-lying and swampy. Deposition during this period included sandstone, shale, and coal. The Allegheny formation of Middle and Late Pennsylvanian age is a coal-bearing sequence consisting largely of sandstone, siltstone, and shale. The youngest strata are of Pennsylvanian age and occur in southeastern Randolph County. In the Permian Period, significant faulting and folding occurred in the Appalachian Orogeny—the dominant geologic event in the formation of the Appalachian Mountains. Since Permian time, weathering and stream erosion have been at work. No sedimentary rocks from the Mesozoic Era (230 to 70 million years ago) exist in WV. The glaciers of the ice ages never reached WV. The only Cenozoic deposits in WV result from alluvial deposits in the southern part of the state (WV Geologic and Economic Survey 2004).

Podzolic or leached soils are predominant within this area. Many of the soils occur as long irregular and broken bands of different widths, paralleling the ridge tops, mountain tops, and stream valleys. Others occur as widely scattered areas ranging in size from 10 acres to more

than a square mile. Still others where the underlying rocks are uniform cover many square miles. Substantial Quaternary alluvial deposits can be found within the Tygart Valley, Randolph County, Cheat Valley, Tucker County, and Grant County.

A wide variety of soil types are located in the 42,000-acre MRS04 Fore Knobs/Bear Rocks Firing Range Area consisting of the Berks-Weikert; the Berks-Lehew-Dekalb; the Shouns-Belmont-Calvin High Base Substratum; and the Wharton-Gilpin-Cavode (USDA 1980).

Berks soil is found along the gentler slopes along Lunice Creek and Patterson Creek watersheds. Berks are medium textured moderately deep soils. Limited depth to bedrock, droughtiness and steep slopes are characteristic. Water from wells usually has a high concentration of dissolved minerals including iron and sulfur.

Weikert soil is found along the gentler slopes along Lunice Creek and Patterson Creek watersheds. Weikert soils are considered medium textured, shallow depth soils. Limited depth to bedrock, droughtiness, and steep slopes are characteristic. Water from wells usually has a high concentration of dissolved minerals including iron and sulfur.

Lehew soil is medium textured, channery subsoil formed in material weathered mostly from sandstone. Lehew soil is characteristic of steep slopes, stoniness, droughtiness, and limited depth to bedrock.

Dekalb soil consists of deep, upland and foot slope soils. Steep slopes, stones on the surface, and shallowness to bedrock are characteristics. Pollution of ground water by waste disposal facilities is a hazard in areas with limestone bedrock. The hazard of erosion is moderate, especially in steep areas. Dekalb soil is very strongly acidic or extremely acidic and moderately permeable. The depth to bedrock ranges from 20 to 48 inches with an average of 30 inches.

Shouns soils are deep and moderately steep soils found on foot slopes on the uplands. The soil is medium textured with moderately fine textured subsoil.

Belmont soils are deep and moderately steep to very steep and are found throughout the uplands. The Belmont soils occupy narrow strips along the lower slopes of Limestone Mountain, McGowan Mountain, Green Mountain, and on the floor of Canaan Valley. They are extensive along Dry Fork in the south-central area. Belmont soils are moderately permeable with a high erosion hazard. The depth to bedrock ranges from 20 to 50 inches; the average depth is 35 inches.

Calvin soils are high base substratum soils that are moderately deep and moderately steep to very steep and are located throughout the uplands. Calvin soils are well drained and strongly acidic to very strongly acidic. The depth to bedrock ranges from 22-48 inches with an average of 32 inches.

Wharton soils consist of deep, moderately drained, and gently sloping to very steep soils.

Gilpin soils are moderately deep, well drained, and gently sloping to very steep. Wetness and stones on the surface with limited depth to bedrock are characteristics. Gilpin soils have slopes of less than 15 percent. Both The Gilpin and Dekalb soils are acidic and droughty. Gilpin Soils are very strongly acidic to extremely acidic with a moderate erosion hazard.

Cavode soil is somewhat poorly drained, deep, and gently sloping.

The Dolly Sods area is bounded on the southeast by the scarp of the Allegheny Front and on the northwest by Cabin Mountain and Canaan Valley. The geologic structure is synclinal, with edges formed by the Pottsville Sandstone and the interior by the successively younger Allegheny formation and Conemagh Group, which have more diverse lithologies including beds of coal and limestone (Cardwell, *et al* 1968). The area has extensive flat rocky plains and upland bogs. Blackbird Knob, with an elevation of approximately 3,950 feet, is located within Dolly Sods North and is east of the Red Creek Campground located in the Dolly Sods Scenic Area. Red Creek Campground lies in the area of a Pottsville Sandstone outcrop. The southeastern region of the Wilderness area is characterized by deeply cut ravines and side streams that feed into the main branch of Red Creek. The south-western and north areas of the Wilderness are characterized by hanging valleys and rolling hills (USDA 2007).

2.2.2 CLIMATE

The Allegheny Mountain Province has distinct seasons of approximate equal length. It has a humid continental climate except for a marine modification in the lower panhandle. Average annual temperatures range from below 50°F (10°C) in the north to about 64° F (18° C) in the south to about 48° F (9° C) in areas of high altitude. Average annual precipitation varies from more than 80 inches in the high mountain areas to 35 inches in the valleys (NCDC 2007). Annual precipitation is plentiful and evenly distributed with short, infrequent periods of water deficit. Average high temperatures in the MRS04 region range from a high of approximately 82° F (28° C) in July to a low of approximately 18° F (8° C) in January. The temperatures in September/October, when fieldwork will be performed, range from a high of approximately 74° F (23° C) to a low of approximately 50° F (10° C) in September. The temperatures in October range from a high of approximately 64° F (18° C) to a low of approximately 37° F (3° C) (Climate-Charts.com, 2011).

2.2.3 TOPOGRAPHY AND VEGETATION

The topography of the area of the MRS04 Fore Knobs/Bear Rocks Firing Range is dominated by the Fore Knobs; a series of hills forming a northeast trending ridge at the foot of the Allegheny Front. The northern portion of the MRS includes a portion of the Allegheny Front and the plateau west of the Front. This area includes the area of the former Stoney River Reservoir which has since been drained. The MRS is drained by numerous drainage courses that dissect the area. Little Star Run, Big Star Run, Broad Run, Laurel Run, Big Run, Samuel Run, Broad Run, and Moyer Run are the major drainage courses that extend east from the Allegheny Front across the Fore Knobs and into the bottomland along the eastern edge of the MRS. The elevation of the MRS ranges from approximately 4091 feet above mean sea level (msl) near the former Stoney River Reservoir to approximately 1520 feet near the southeast corner of the property (USGS 1984).

2.2.4 HYDROLOGY

As stated above, the Fore Knobs/Bear Rocks area is drained by numerous drainage courses that dissect the MRS. The courses extend down from the Allegheny Front to the west and flow into South Fork Lunice Creek and Jordan Run. Lunice Creek and Jordan Run flow into the South Branch Potomac River and eventually discharge into the Chesapeake Bay (Agrim, Inc. 2011).

2.2.5 HYDROGEOLOGY

The former WVMA covered an area of 2,180,367 acres, incorporating portions of Grant, Pendleton, Preston, Randolph, and Tucker counties. Groundwater impacts, if any, would have likely come from the artillery and mortar firing that occurred within the WVMA Impact Area. Due to the short duration of the maneuver actions (October 1943 – July 1944), surface use and activities in the tent encampments, battalion headquarters, hospital, storage areas, mountain climbing areas, small arms firing ranges, and troop maneuver areas likely had little, if any, impact to groundwater. Therefore, the logical focus for potential groundwater contamination appears to be on the more heavily used target areas including the Fore Knobs/Bear Rocks Firing Range (USACE 2009).

According to Ms. Frances Phares with the Grant County Health Department, the majority of Grant County obtains water from the Petersburg PSD using the Potomac River as a source. Where no information could be provided regarding residences that were on private water versus public water as provided by the Grant County PSD, the assumption was made that the residences shown in the Jordan Run area, within the four-mile radius from the Bear Rocks and Stack Rocks Impact Areas, use groundwater wells for their water supplies. The residences in the Jordan Run area include the Wilderness Retreat at Dolly Sods development. Although it is assumed that these residences utilize groundwater wells, Ms. Phares could not locate any well permits to verify this assumption.

Some limited information on historic groundwater levels in the area was obtained from the USGS National Water Information System website. Well number Grt-0018 is located along Jordan Run Road near the southern portion of the MRS. In July 1969, the water level was measured at 13 feet below the ground surface (bgs). Well number Grt-0021 is also located along Jordan Run Road slightly north of Grt-0018. In July 1969, the water level was measured at 41 feet bgs. Well number Grt-0041 is located along Jordan Run Road near the northeast corner of the MRS. In August 1965, the water level was measured at 33 feet bgs (USGS 2011). Based on these measurements, groundwater levels are relatively shallow in the Jordan Run area at the base of the Allegheny Front.

Well number Grt-0074 is located northeast of Mount Storm Lake, outside of the MRS04 boundary, but at the top of the Allegheny Front in a geographic area similar to the northwest portion of the MRS. In July 1969, the water level was measured at 17 feet bgs in this area (USGS 2011). Even though this well is outside of the MRS, the topography and geomorphology are very similar to the northwest portion of MRS04 and could be considered representative of this area.

The Fore Knobs are a series of low hills trending northeast along the eastern edge of the Allegheny Front. The Allegheny Front extends along the edge of the Appalachian Mountains and forms a drainage divide separating the Potomac and Ohio River watersheds. Geologically, the area of MRS04 consists of Mississippian and Pennsylvanian sedimentary rocks folded into a synclinal structure with the axis located beneath the northwestern portion of the MRS (near the former Stoney River Reservoir). The geology underlying the Fore Knobs and Allegheny Front in the area of MRS04 consists of the eastern limb of the syncline composed of interbedded siltstone, sandstone, limestone, shale, and coal. Because there are no extensive deposits of alluvium mapped in this area, groundwater is most likely produced from fractured bedrock with highly variable yields.

Even though the available water well measurements are decades old in some instances, the population of the area has not increased significantly and remains sparsely populated.

Furthermore, there is no evidence of agriculture or industry in the area that would utilize large quantities of groundwater. Therefore, it is reasonable to assume that groundwater use in the area consists of a relatively small number of private residential wells producing groundwater from shallow bedrock aquifers.

2.3 GENERAL HISTORY

The former WVMA consisted of approximately 2,180,367 acres of land covering portions of Grant, Pendleton, Preston, Randolph, and Tucker counties in northeastern West Virginia generally near the town of Davis. Maneuver rights (secured by the Rents and Claims Board, Fifth Service Command) secured 350,416 acres of public lands (all part of the Monongahela National Forest), 48,557 acres of leased property for inclusion in the Impact Area, and 1,781,394 acres of so-called “lesser interests”. According to a warning order notice dated March 26, 1945, these “lesser interests” were covered by “trespass agreements”. The land owners had granted use of these lands to the Army verbally; there are no records that describe the “trespass agreements” or the areas that they covered (USACE 1990). A letter dated July 15, 1943 from the Secretary of War to the Secretary of Agriculture requested that there is a military necessity for the use of portions of the Monongahela National Forest for Army Maneuver purposes. In a response letter dated August 4, 1943 from the Secretary of Agriculture to the Secretary of War, the Department of Agriculture grants permission for the Army to use all Monongahela National Forest land in Preston, Grant, Randolph, Tucker, and Pendleton Counties in West Virginia, covering 341,266 acres (USACE 2009).

Based upon lease records and other information contained in the PA, areas where live artillery fire was conducted was informally designated the WVMA Impact Area. Therefore, the MRS04 Fore Knobs/Bear Rocks Firing Range is within the WVMA Impact Area. Property outside of the Impact Area was utilized for other purposes such as tent encampments, vehicle repair, the base hospital, and the ammunition depot. A record of the lease agreements associated with the WVMA is contained in the PA (USACE 2009).

The former WVMA was the scene of special low-altitude mountain training activities during World War II. Regiments and battalions of larger Infantry Divisions came to the area from maneuvers and installations in other parts of the country to introduce the troops to various aspects of mountain warfare. Based on preliminary reconnaissance of the area within the WVMA, it was found to be similar to that of the Apennines and lower ranges of the Alps in Italy. This allowed the troops to simulate conditions that would possibly be encountered during the invasion of Italy and other mountainous regions in the wartime theater (USACE 2009).

Prior to the establishment of the WVMA, the area was largely forest, mainly being used for logging and agriculture (farming, grazing) purposes. Extensive logging began during the late 1800s and slowed considerably in the late 1910s to early 1920s although logging is still prevalent in the area today. Several large forest fires, as a result of logging activities, occurred in what would become a portion of the WVMA’s Impact Area, dramatically changing the regions’ soil structure, exposing bedrock. Local family farms and grazing fields dotted the landscape prior to, during, and following the maneuver area, occupying most open areas including valley floors and bare mountaintops. Once logging in the area slowed, the land’s primary use shifted to agricultural and recreational uses. Farming, grazing, hunting and fishing were all activities that flourished prior to and following World War II. Today the area is well known in the eastern United States for the wide variety of outdoor activities available. Two popular state parks (Canaan Valley and Blackwater Falls) were developed in Tucker

County in the years following the WVMA operations. Hiking, skiing, rock climbing, rafting, hunting, and fishing are also popular activities, and attract thousands of visitors annually to the area (USACE 2009).

Currently, the majority of the former WVMA Impact Area is owned by both private and public entities including the Monongahela National Forest, The Nature Conservancy, Canaan Valley Institute, U.S. Fish and Wildlife Service, hunting clubs, and private residents. The Monongahela National Forest owns what is now the DSW (including the DSN and DSSA) which consists of 18,651.5 acres of the former WVMA Impact Area. This property was established as a wilderness area to minimize environmental impact and allow hiking and camping within the region. The Nature Conservancy owns the Bear Rocks Preserve which comprises 477 acres adjacent to the DSN and DSSA. This preserve was established to preserve the Bear Rocks area. The Canaan Valley Institute owns and maintains 3,208 acres of property that made up a portion of the northern boundary of the former WVMA Impact Area. This property is just east of Davis, WV and is used for environmental preservation, wildlife, and stream study. The U.S. Fish and Wildlife Service operates the Canaan Valley National Wildlife Refuge (CVNWR), which generally runs from the western face of Cabin Mountain into central Canaan Valley and consists of 15,245 acres of land. This property was established to preserve the habitat of several endangered species that inhabit the Canaan Valley area. The remaining property that comprised the former WVMA Impact Area is owned by private entities, hunting clubs, or other businesses (USACE 2009).

The purpose of the WVMA Fore Knobs/Bear Rocks Firing Range was to provide firing points and target locations for 105mm and 155mm HE howitzer rounds (USACE 2009). The potential munitions utilized at the site included 105mm and 155mm high explosive (HE) howitzer rounds, 60mm HE mortars, and 81mm HE and SR mortars (Table 2.1).

2.4 CURRENT AND PROJECTED LAND USE

Currently, the area of MRS04 Fore Knobs/Bear Rocks Firing Range consists of National Forest property, the Bear Rocks Preserve, and private land holdings. The property is bordered by the Dolly Sods Wilderness Area on the west, New Fork Lunice Creek to the north, High Ridge Run and Pendleton County to the south, and New Creek Mountain to the east. Because the MRS04 site is located in both developed and protected forested areas, land use is expected to change in the developed areas and remain the same in the protected/forested regions (Google 2011).

2.5 PREVIOUS INVESTIGATIONS

Ordnance clearance operations began almost immediately after military use of the site ended in 1944. Initial clearance operations in 1946 focused on known target areas that were located in the Dolly Sods region, a high plateau located in the eastern central portion of the WVMA (west of MRS04). The property was returned to the private landholders and the Forest Service upon completion of the initial clearing operations. A follow up operation in 1953 found and destroyed six live rounds but determined that the previous clearance operations were “good”. However, the public continued to encounter ordnance on an annual basis. Subsequent site reconnaissance and clearance operations conducted in 1984, 1991, and 1997–1998 continued to encounter ordnance. As before, the clearance operations were focused in the Dolly Sods Region in publicly used areas such as trails and campgrounds. Since then, recurring reviews of the clearance operations have been conducted to ensure that the

previous operations continue to protect the safety of the public. The previous investigations conducted at the WVMA are described below (USACE 2009).

As part of the USACE DERP FUDS program, a Preliminary Assessment (PA) of the *entire* WVMA was prepared by the CELRH in 2009. Information used to prepare the PA included military records, interviews with former Army officials stationed at the site, historical documents, historical newspaper reports, interviews with local residents, and historic aerial photographs. Based upon a review of the information above, the CELRH identified a total of 7 Munition Response Sites (MRSs) warranting further investigation including the MRS04 Fore Knobs/Bear Rocks Firing Range which is the subject of this SS-WP.

In December 2010, an INPR was prepared by the CELRL requesting approval of the on-going Dolly Sods MMRP and proposing the 7 MRSs identified in the PA. The CELRD granted approval of the Dolly Sods MMRP and the 7 new MRSs in December 2010 including the MRS04 Fore Knobs/Bear Rocks Firing Range.

2.5.1 INITIAL CLEARANCE OPERATIONS

Following the 1943 to 1944 military maneuvers, and prior to returning the land to the public and U.S. Forest Service (USFS) in 1950, Engineer Bomb and Shell Disposal Team No. 6 conducted an ordnance clearance during May 1946 (USACE 2004a). The team completed a “thorough reconnaissance of the entire WVMA”. Records indicate that the team found and destroyed 189 4.2-inch SR mortars, one 155mm HE projectile, three 105mm HE projectiles, two 40mm projectiles, and 12-inch or 14-inch inert (sand-loaded) rounds in the Dolly Sods region; information concerning the locations of all of these found items is not available. All suspected impact areas pointed out to the team by USFS personnel, with the exception of certain regions to the north and northeast of the Dolly Sods North (DSN) and Dolly Sods Scenic Area (DSSA) (which were too rough or overgrown to be searched), were thoroughly searched during the 1946 clearance effort. All lands except for the regions not searched were “recommended as safe for grazing, lumbering, or hunting” subsequent to the clearance (USACE 2004a).

During May 1953, the 549th Ordnance Explosive Ordnance Disposal (EOD) from Baltimore, MD, conducted a follow-up reconnaissance and disposal mission of suspected impact areas, as noted above, in the Dolly Sods region. Six live rounds were located and destroyed during this mission, and from the fieldwork it was determined that “previous clearance operations were good.” Additional information concerning these clearance operations is not available. Records regarding military operations in the area are scarce because the majority of pertinent documents have been lost or destroyed over time (USACE 2004a).

2.5.2 FINDINGS AND DETERMINATION OF ELIGIBILITY/INVENTORY PROJECT REPORT 1984 – 1992

The Preliminary Assessment of Eligibility of the “Dolly Sods Wilderness Area (West Virginia Maneuver Area)”, for eligibility under the DERP-FUDS program, was initiated by the CELRH with a site visit of the former maneuver area on December 3, 1984. The purpose of the site visit was to determine the presence of unsafe debris, hazardous or toxic waste, and unexploded ordnance at the site. The Findings and Determination of Eligibility (FDE), dated May 21, 1990, concluded that the property had been formerly owned or used by the Army for mountain training and maneuvering. See Section 3.2 of the PA, FUDS Eligible Property for information regarding the May 21, 1990 FDE. The Inventory Project Report (INPR) proposed DERP-FUDS Project No. G03WV006500 to conduct a Remedial Investigation and Feasibility

Study (RI/FS) to determine the types and extent of ordnance contamination at the site and develop alternatives to safeguard the public, due to public discovery of ordnance on the property on an annual basis (USACE 1990).

The Huntington District USACE revised the FDE in 1991 to include information for FUDS-eligible property that had been omitted in the original FDE (May 21, 1990). Specifically, the original FDE omitted the Blackbird Knob target area from the eligible DERP-FUDS property and thus, the recommended ordnance and explosives (OE) project. See Section 3.2 of the PA, FUDS Eligible Property for additional information regarding the FDE revision. The INPR was also revised in 1991 to correct the DERP-FUDS OE project number to G03WV006504 and to conduct an RI/FS of the maneuver area, to replace the erroneously numbered DERP-FUDS Project No. G03WV006500 (USACE 1992).

In 2005, the Huntington District revised the DERP-FUDS property name for Property No. G03WV0013 from Dolly Sods Wilderness Area to WV Maneuver Area/Dolly Sods. A duplicate DERP-FUDS property, Property No. G03WV0065, West Virginia Maneuver Area, existed in the inventory of DERP-FUDS properties. The previous INPRs, FDEs, investigations, and ordnance removal actions contained references to G03WV0065 in the documents, and in many instances, these documents also contained the combined name “Dolly Sods Wilderness Area (West Virginia Maneuver Area)”, which was actually not the accurate DERP-FUDS property name. However, project funding for these investigations and removal actions had actually been programmed under DERP-FUDS Property No. G03WV0013, Dolly Sods Wilderness Area. Since the Dolly Sods Wilderness Area is contained within the former WVMA DERP-FUDS property, and no work other than INPR preparation had been funded under Property No. G03WV0065, the USACE declared NDAI for DERP-FUDS Property No. G03WV0065 on April 7, 2005 and revised the name of DERP-FUDS Property No. G03WV0013 to WV Maneuver Area/Dolly Sods. The name Dolly Sods was retained in the property name due to the name of the ordnance removal project G03WV001304 and the vast references to the Dolly Sods Wilderness in past documents. All current and future projects have and will be programmed under DERP-FUDS Property G03WV0013.

2.5.3 SITE VISIT FOR PREPARATION OF THE WORK PLAN FOR THE FEASIBILITY STUDY TO DETERMINE THE NATURE AND EXTENT OF SURFACE AND SUBSURFACE ORDNANCE CONTAMINATION – 1991

From May 20 to 31, 1991, personnel from Metcalf & Eddy, Inc. (M&E) and UXB International, Inc. (UXB), the ordnance specialist subcontractor, conducted a site visit of the Dolly Sods area for the development of a work plan for the Feasibility Study (FS) for surface and subsurface investigation and disposal of OE (M&E 1991). Based upon records search data obtained by M&E, personnel searched areas that were likely to contain OE. The results of the site visit would then be used to select areas for surface and subsurface OE clearing. Areas searched included the locations of ordnance which had been uncovered in recent years and areas close to Blackbird Knob, a primary target for artillery during the maneuvers. Other areas searched included the vicinity of the intersection of Fisher Spring Run and Red Creek; the area around Breathed Mountain where additional rounds of ordnance had been found in the recent past; portions of trails 514, 513, and 554; the area between Red Creek and the Left Fork near the northern border of DSW; higher grounds and open areas likely to have been targets for mortar fire; the bogs at the head of Fisher Spring Run; and the high ground just north of Fisher Spring Run (M&E 1991).

Gun emplacements, distinguishable by the distinctive pattern of their eroded, yet visible berms, were discovered approximately 120 feet to the west of Forest Service Road 75 in the vicinity of Bell Knob Tower. Additionally, the ridge north of Breathed Mountain and between the Red Creek and Stonecoal Run was searched, as well as the area where Red Creek meets the Left Fork. No unexploded ordnance was discovered during the site visit. Buried metal items were found at three locations, but due to their depth beneath the surface, these could not be confirmed as ordnance-related materials. Two of these finds were in the bog at the headwaters of Fisher Spring Run; the third was found among the gun emplacements west of Forest Service Road 75. Ordnance fragments were found near the area where Red Creek meets Fisher Spring Run. The locations where OE was considered likely to exist were recorded with a global positioning system (GPS) (M&E 1991).

2.5.4 SITE VISIT FOR THE FEASIBILITY STUDY TO DETERMINE THE NATURE AND EXTENT OF SURFACE AND SUBSURFACE ORDNANCE CONTAMINATION – 1991

M&E conducted an FS to characterize the nature and extent of ordnance and explosive waste (OEW) contamination in the DSW and to determine cost-effective remedial actions to reduce the dangers of OEW contamination that would be protective of the wilderness area and provide public safety. The conclusions and recommendations from the FS are presented in *Feasibility Study Dolly Sods Wilderness: Engineering Report for Extent of OEW Contamination and Evaluation of Remedial Action Alternatives, January 21, 1992* (M&E 1992).

M&E and Baltimore UXO Safety personnel conducted the surface investigation for the FS from July 29 through August 29, 1991. The investigation was performed in accordance with the *Final Work Plan, Surface and Subsurface Investigation and Onsite Disposal of Ordnance* (M&E 1991). Clearance protocol was defined for fifty 5-acre sites within the DSW. These sites were distributed into sixteen areas. Two additional areas were added during the course of the surface investigation. The areas were chosen as those that would most likely contain ordnance based upon topography and information obtained during the records search and site investigation (M&E 1991). Areas that were chosen were often hill tops because these were most likely to have been used as targets. In addition, locations which likely contained under-shots or over-shots from the artillery firing at Blackbird Knob were investigated. Several other areas were then chosen to distribute the investigation throughout the wilderness area. A total of forty-eight surface sweep areas were investigated, covering approximately 281 acres in the DSW. Forty-eight areas were investigated instead of fifty because several adjacent five-acre areas were combined into ten-acre sweep areas. Non-OEW materials (railroad spikes, horseshoes, logging chains, tin cans, tent stakes, and other miscellaneous scrap metals) were found in areas from past human activities (logging railroads and logging camps) and present human activities (hiking and camping). Isolated discoveries of non-OEW materials were made throughout the DSW. Ordnance was found in northern Dolly Sods, in the Breathed Mountain region and in the Red Creek floodplain adjacent to Breathed Mountain. Summaries of OEW and non-OEW wastes from the surface investigation are compiled in the FS Engineering Report (M&E 1992).

M&E and UXB personnel conducted the subsurface investigation immediately following the surface investigation, from September 3 to October 3, 1991. This investigation was also performed in accordance with the *Final Work Plan, Surface and Subsurface Investigation and Onsite Disposal of Ordnance* (M&E 1991). Clearance protocol, based on the results of the surface investigation, was defined for ten, one-acre sites within the DSW. M&E and UXB decided to sweep twenty, 1/2-acre sites to allow concentrated coverage in areas where mortars had been found while maintaining an equitable distribution of subsurface search

areas. The subsurface investigation covered a total of 10.5 acres. Non-OEW discoveries were similar to the materials that were found during the surface investigation. Ordnance was found in northern Dolly Sods and in the Red Creek flood plain near Breathed Mountain. Summaries of OEW and non-OEW wastes from the subsurface investigation are compiled in the FS Engineering Report (M&E 1992). Appendix D of the FS Engineering Report contains the ordnance clearance and disposal documentation.

Based upon the results from the surface and subsurface investigations, several ordnance remediation options to varying extents and depths were evaluated for the FS as well as a No-Action alternative. The DoD evaluated the results from the FS and determined that it was an unacceptable risk to allow the areas to remain as potentially dangerous sites. The USACE attempted to determine the level of remediation that was appropriate for the ordnance contamination and to identify the locations where this remediation would be of the greatest benefit. In coordination with the USFS, the following alternatives were eventually developed from the FS:

- **Alternative 1** – No action. This alternative involved no search for ordnance; if users of DSN found ordnance, they would contact appropriate personnel who would dispose of the ordnance when it was found. This was the practice that was currently being followed.
- **Alternative 2** – Clearing trails only. This alternative involved a search to 20 feet on each side of 23 miles of USFS designated hiking trails, old roads, and travelways, to a depth of one foot and detonating in-place any ordnance that was found. The Blackbird Knob, campsites, the three hunting cabins, and the trailer dumpsite would not be searched. This alternative would involve 114.3 acres.
- **Alternative 3** – Clearing publicly used areas. This alternative involved a search to 20 feet of each side of 23 miles of USFS designated hiking trails, old roads, and travel ways, to a depth of one foot, and detonating in-place any ordnance that was found (114.3 acres); a search of the area around Blackbird Knob to a depth of 1 foot and detonating in-place any ordnance that was found (98.9 acres); a search of 75 USFS inventoried campsites to a depth of four feet and detonating in-place any ordnance that was found (1.1 acres); a search of the area around three hunting cabins to a depth of four feet and detonating in-place any ordnance that was found (1.5 acres); and a search of an old trailer dumpsite to a depth of four feet and detonating in-place any ordnance that was found (0.5 acre). This alternative would involve searching approximately 216.3 acres.

Other alternatives had been considered in the very early stages of the FS project, such as searching and clearing the entire area, but these were deemed too aggressive and environmentally damaging. The three alternatives were considered to be the most appropriate for the area, with Alternative 3 being selected.

2.5.5 ARCHIVES SEARCH REPORT – SEPTEMBER 1995

The Rock Island District, USACE, prepared an Archives Search Report (ASR) for the Dolly Sods Area (specifically Dolly Sods North) in September 1995 under DERP-FUDS Project Number G03WV006504. The findings and conclusions and recommendations of the ASR are presented in two documents: *Archives Search Report: Findings for the Former Dolly Sods North*,

Tucker County, West Virginia, Project Number G03WV006504 and Archives Search Report: Conclusions and Recommendations, for the Former Dolly Sods North, Tucker County, West Virginia, Project Number G03WV006504 (USACE 1995a and b). The ASR consisted of a search of historical documents and a field visit for OE concerns at the former DSN. The research area consisted of 6,168 acres of land with a prominent knob called Blackbird Knob (670 acres) that was used as an artillery target. The entire 6,168 acres were noted as part of the Monongahela National Forest and were used for hiking and camping. The ASR confirmed that OE contamination was present at the Blackbird Knob target area and recommended an Interim Removal Action (IRA). The ASR noted that the area was covered with rocks and foliage, making it very difficult to see the ground, and also stated that any clearance of the ground would ruin the areas' value as a wilderness area. Signs were observed at the entrance to the forest to warn visitors of the presence of ordnance. The ASR recommended that if an ordnance removal action was not performed (to retain the wilderness), that additional OE warning signs should be posted throughout the area as an IRA. The ASR concluded that the other 5,498 acres of the Dolly Sods North area had potential OE contamination and recommended that an Engineering Evaluation/Cost Analysis (EE/CA) be performed to determine the need for additional investigation or response actions. The ASR found no hazardous, toxic, or radioactive waste (HTRW) or demolition or debris concerns in the DSN (USACE 1995a and b).

2.5.6 ENVIRONMENTAL ASSESSMENT OF ORDNANCE REMOVAL ACTION IN THE DOLLY SODS WILDERNESS AREA – SEPTEMBER 1995

In 1995, the USACE determined that removal of unexploded ordnance from DSW was necessary. To comply with National Environmental Policy Act (NEPA) requirements, USACE contracted New Bold Enterprises (NBE) to conduct an Environmental Assessment (EA) of the three proposed alternatives (two action and one no-action alternative) and presented the results in *Dolly Sods Wilderness Ordnance Removal Project Environmental Assessment, September 1995* (NBE 1995). The EA concluded that no significant effects on human health and the environment would result from the recommended OE removal action, Alternative 1, as presented in the FS (M&E 1992). On September 15, 1995, the Commander, CELRH, signed, with concurrence from the USDA on September 22, 1995, a Findings of No Significant Impact (FONSI) for the Dolly Sods Wilderness Area Ordnance Removal Action EA (NBE 1995).

2.5.7 ENVIRONMENTAL ASSESSMENT OF ORDNANCE REMOVAL ACTION IN THE DOLLY SODS NORTH AREA – SEPTEMBER 1997

As additional funding became available to USACE to perform an ordnance removal activity in the DSN, the decision was made to conduct the removal action concurrent with the DSW OE removal action following the same work plan that was developed for DSW. Information that was presented in the *Dolly Sods Wilderness Ordnance Removal Project Environmental Assessment–Final* (NBE 1995) was applied to the EA that NBE prepared for the DSN OE removal action. The results and conclusions of the EA were presented in *Dolly Sods North Ordnance Removal Project Environmental Assessment, September 1997* (NBE 1997). The EA determined that because the DSW and DSN areas were similar in climate and somewhat similar in terrain and ecosystems, the environmental consequences and mitigation activities for the DSN OE removal action would be similar as well. On September 23, 1997, the Commander, CELRH, signed, with concurrence from the U.S. Department of Agriculture on September 25, 1997, a FONSI for the Dolly Sods North Ordnance Removal Action EA (NBE 1997).

2.5.8 ACTION MEMORANDA FOR ORDNANCE AND EXPLOSIVES REMOVAL ACTIONS – 1996 – 1997

In May 1996, the USACE signed an Action Memorandum to document the proposed OE removal action for the DSW area. The memorandum explained that the removal action was a non-time-critical removal action to minimize the threat to the public due to the presence of OE, stating that the risk of exposure to OE would be reduced by a projected 58.9 percent for the selected alternative, Alternative 3 (USACE 1996). In July 1997, the USACE revised the Action Memorandum to include the adjacent DSN area in the Purpose Statement and Site Conditions and Background sections of the memorandum. The revised memorandum noted that the USFS and USACE had jointly prepared more detailed instructions to protect the endangered Cheat Mountain Salamander. The memorandum also stated “It was further concluded by the Forest Service and the Corps that Dolly Sods North has almost identical conditions as the Wilderness and that the alternatives considered and conclusions of the Wilderness's EA and Risk Analysis are also applicable to it. Subsequently the Wilderness's EA, Risk Analysis, and operational instructions were adopted for the entire site” (USACE 1997). Additionally, since the DSW was a congressionally-designated “Wilderness”, to protect the environment for both OE removal actions, a new paragraph was added to stress that all activities would conform to “Wilderness” guidelines. Further, Management Prescription 5, from USDA, USFS, Land and Resource Management Plan for the Monongahela National Forest was attached, which contained the wilderness preservation standards and guidelines to follow during the OE removal actions. Finally, the three alternatives that had been developed for the DSN OE removal action were added, listing Alternative 3 as the selected action, with similar projected risk reductions as for the DSW OE removal action (USACE 1997).

2.5.9 ORDNANCE REMOVAL ACTIONS – DOLLY SODS WILDERNESS, DOLLY SODS NORTH, AND DOLLY SODS SCENIC AREAS – 1997 – 1998

Ordnance removal activities in the DSW occurred between June 4, 1997 and October 17, 1997. Using hand-held magnetometers, Human Factors Applications, Inc. (HFA) cleared 26.14 miles of designated and maintained trails and 20 feet on each side of the trail (126.7 total acres) to a depth of one foot. Inventoried campsites (112 campsites, 8.83 total acres) were cleared to a depth of four feet. Magnetic anomalies resulted in 32,594 digs. Most anomalies resulted from railroad debris and spikes; artifacts such as axes, hammers, picks, and stove parts; and magnetic rocks. Such items were returned to their original location. A total of 14 live mortars including 60mm HE and 81mm HE were found and destroyed by detonation. OE-related scrap (a total of 108 pounds) was recovered in DSW, inspected, certified, and then turned over to ENVIRCO, Inc. of Baker, WV. This removal action is documented in *Final Removal Report: Ordnance and Explosives Removal Action Dolly Sods Wilderness, Monongahela National Forest*, (HFA 1998).

The DSN and DSSA ordnance removal activities occurred immediately following the DSW OE removal action between October 20, 1997 and August 18, 1998. Due to inclement weather, no fieldwork occurred between November 1997 and May 1998. Using handheld magnetometers, HFA cleared 29.65 miles of designated and maintained trails to 20 feet each side to a depth of one foot (143.76 total acres) and 66 campsites and 6 cabins to a depth of four feet (2.18 total acres). A total of eight live mortars that included 60mm HE and 4.2-inch SR and HE were found and destroyed by detonation. Nineteen inert 4.2-inch mortar rounds were also located during the clearance and properly disposed. OE related scrap (a total of 1043.5 pounds) was recovered in DSN and DSSA, inspected, certified, and then turned over to Champs Salvage of Petersburg, WV. This removal action is documented in *Final Removal Report: Ordnance and Explosives Removal Action Dolly Sods North, Monongahela National Forest* (HFA 1999).

2.5.10 ORDNANCE AND EXPLOSIVES RECURRING REVIEW – JUNE – AUGUST 2004

CELRH, with technical support provided by the U.S. Army Engineering and Support Center (USAESC), Ordnance and Explosives Center of Expertise, Huntsville, conducted the first OE Recurring Review of the Dolly Sods region of the former WVMA in 2004. This review is comparable to a five-year review that is conducted for operable units on National Priority List hazardous waste sites in that it was conducted five years following the 1997-98 ordnance removal actions at the Dolly Sods Wilderness and Dolly Sods North areas. Subsequent OE Recurring Reviews will be conducted at five-year intervals. The results, conclusions, and recommendations are documented in *Ordnance and Explosives Recurring Review, Dolly Sods Project, Former West Virginia Maneuver Area, Monongahela National Forest, West Virginia, Draft Final Report* (USACE 2004c).

The OE Recurring Review was conducted to ensure that the 1997 and 1998 ordnance removal actions continued to minimize explosives safety risks and remained protective of human health, safety, and the environment. The OE Recurring Review consisted of the following activities: the notification and involvement of stakeholders, the review of existing and relevant documentation and data, the identification and review of recent and new information, a community survey and public interviews, and an assessment of site conditions (USACE 2004c).

The OE Recurring Review concluded that the 1997-98 ordnance removal actions that were completed in the DSW, DSN, and DSSA areas (referred to as the Dolly Sods region) of the former WVMA were functioning as intended and were still protective of human health, safety, and the environment. No UXO or OE-related scrap were identified during the Recurring Review site assessment, nor were any OE concerns due to erosion, storm damage, changes in land-use, or recreational use found. Prior to the 1997-98 ordnance removal actions, there had been an average of ten reports per year, during one ten-year period, in which UXO had been found along designated trails and at inventoried campsites. However, since 1998, the OE Recurring Review found that there had only been seven cases of encountered UXO by recreational visitors. In each case, UXO had been found in an area that had not been cleared during 1997-98 (USACE 2004c).

The review stated that although institutional controls (ordnance warning signs) were in place, the controls required improvement. Additional measures were recommended to increase public awareness and ensure continued safety. Warning signs did not exist in some highly-used areas. Certain trails were well-marked and maintained, whereas some designated trails were not making it difficult for visitors to remain in areas that had been previously cleared. Community survey results found that many visitors had not seen the ordnance warning signs, did not know of the potential to find hazardous ordnance items, were not aware of the proper locations to hike and/or camp, and did not know the procedures to report an ordnance-related incident. The review provided several recommendations to improve the institutional controls and educate the public on the ordnance hazards of the region (USACE 2004c). It is noted that CELRH has implemented some of the recommendations and is working towards fully implementing all of the recommendations from the first OE Recurring Review.

2.5.11 PRELIMINARY ASSESSMENT – FEBRUARY 2009

As stated above, a Preliminary Assessment (PA) of the *entire* WVMA was prepared by the CELRH in 2009. Information used to prepare the PA included military records, interviews with former Army officials stationed at the site, historical documents, historical newspaper

reports, interviews with local residents, and historic aerial photographs. Based upon a review of the information above, the CELRH identified a total of 7 Munition Response Sites (MRSs) warranting further investigation including the MRS04 Fore Knobs/Bear Rocks Firing Range that is the subject of this SS-WP.

2.5.12 INVENTORY PROJECT REPORT (INPR) – DECEMBER 2010

An Inventory Project Report (INPR) for the WVMA was prepared by the CELRL in December 2010. The INPR requested “after the fact” approval for the Dolly Sods MMRP and proposed 7 new MMRPs including the MRS04 Fore Knobs/Bear Rocks Firing Range described in this SS-WP. In December 2010, the CELRD granted “after the fact” approval for the Dolly Sods MMRP and approved the 7 new MMRPs including the MRS04 Fore Knobs/Bear Rocks Firing Range.

2.5.13 LIMITED SITE RECONNAISSANCE BY TPP TEAM – APRIL 2011

A limited reconnaissance of some of the MRSs was conducted by members of the TPP team on April 7-8, 2011. The team visited the area of the Buena Small Arms Range (MRS07), Bearden Knob (MRS05), and a portion of the Brown-Cabin Mountain Firing Range (MRS06). The team located and obtained the GPS coordinates of remnants of berms within the former Buena SAR but did not encounter any MEC in this area. The team also located features within the Bearden Knob MRS but did not encounter any MEC in this area. However, some 3.25-inch rockets were encountered within the Brown-Cabin Mountain MRS in the area of Yellow Creek. The location of all encountered MEC was marked with a GPS unit and the USACE notified. The property owner contacted local state police officials to dispose of the rockets that were discovered.

2.6 MUNITIONS AND EXPLOSIVES OF CONCERN

Information provided in the INPR, ASR, reported findings, visual observations, and other sources was used to develop the list of potential MEC items for MRS04 Fore Knobs/Bear Rocks Firing Range. Tables 2.1 and 2.2 were prepared as visual and informational identification guides for use by the SI site visit team to ensure proper MEC and MD documentation. Information in these tables is further expanded in subsequent chapters of this report to include fillers, corresponding MC components, and MC sampling analytes.

2.7 PROJECT ORGANIZATION/POINTS OF CONTACT

The local USACE District for the MRS04 Fore Knobs/Bear Rocks Firing Range is located in Huntington, West Virginia. The regulatory authority for this site is the WVDEP. To date, USEPA has not participated in planning associated with this site and has deferred to the WVDEP. A list of key technical contacts involved in this SI study is included in Table 2.3.

The site visit team for the Fore Knobs/Bear Rocks MRS will be comprised of three persons, each qualified in a specific area of expertise. The site visit team will be lead by the Field Team Leader (FTL) who will be knowledgeable of the historical and logistical details regarding the FUDS. The FTL will manage the site visit team and make decisions on behalf of the Project Manager. The FTL will be supported by an individual charged with implementation of the approved MC sampling protocol as well as the techniques of the QR. Lastly, the site visit team will include an UXO Technician III tasked with ensuring all aspects of field safety as well as identification of MEC, or other MD encountered.

2.8 PROJECT SCHEDULE

The project schedule, shown on Figure 2.3, is dynamic, but has been updated to reflect actual milestones achieved to date as well as incorporate government and regulatory review cycles and submittals for pending milestones. The period of performance (POP) to complete the task order scope of work is scheduled for December 29, 2012.

TABLE 2.1
Suspected or Known Munitions
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Ranges

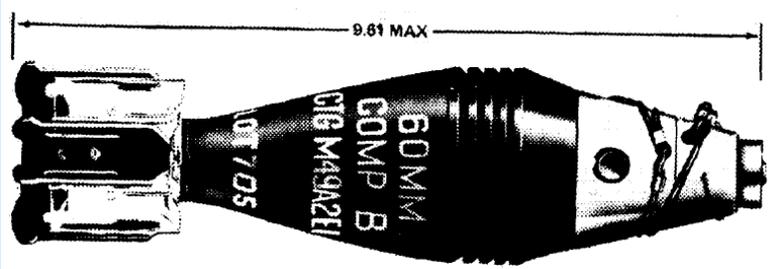
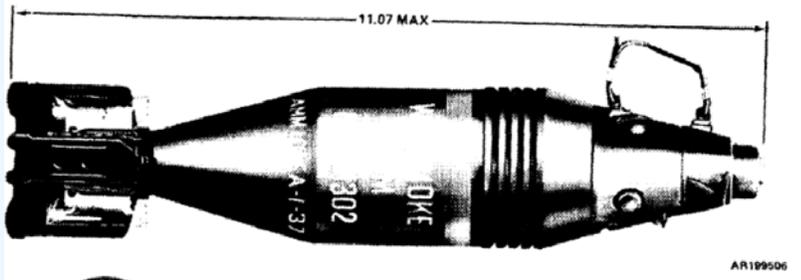
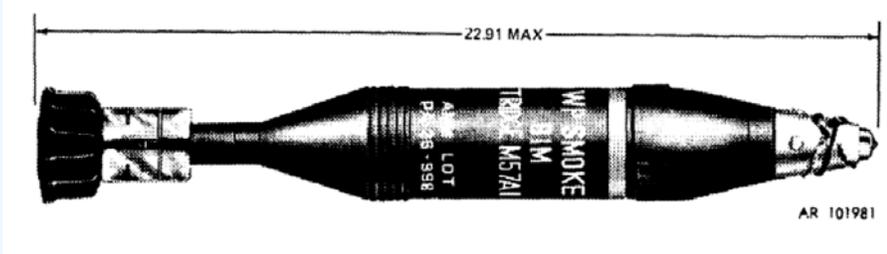
Munition	Photograph/Diagram
Shell, 60mm, High Explosive (HE), M49A2	
Shell, 60mm, Smoke, White Phosphorous (WP), M302	
Cartridge, 81mm, HE, M43	
Cartridge, 81mm, Smoke, WP, M57	

TABLE 2.1 (CONT')
Suspected or Known Munitions
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Ranges

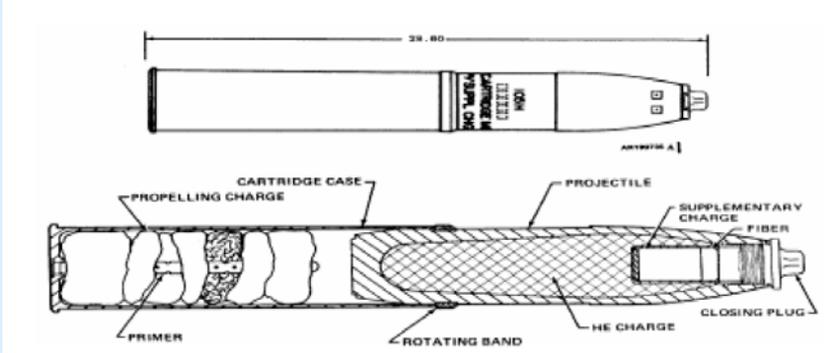
Munition	Photograph/Diagram
<p>Cartridge, 105mm, HE, M1</p>	
<p>Cartridge, 105mm, Smoke, HC, M84</p>	
<p>Projectile, 155mm, HE, M102</p>	

TABLE 2.2
Chemical Composition of MEC and Potential Munitions Constituents
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Munitions Type/ Model	Composition (Case and Filler) ⁽²⁾	MC Analysis ⁽¹⁾
Shell, 60mm HE, M49A2	<p>Propelling Assembly: Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc Propellant: Diethylphthalate, Nitrocellulose⁽⁵⁾, Nitroglycerin, Potassium Nitrate Primer ⁽⁷⁾: Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT Projectile: Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur Projectile Filler: TNT Fuze, Point Detonating (PD), M52 series: Aluminum Alloy, Zinc Alloy - Aluminum, Bismuth, Cadmium, Copper, Iron, Magnesium, Manganese, Nickel, Phosphorus, Silicon, Sulfur, Tin, Zinc Fuze Filler: Tetryl Fuze Primer ⁽⁷⁾: Antimony Sulfide, Carborundum, Copper, Lead Azide, Potassium Chlorate, Zinc</p>	<p align="center"><u>Metals</u> ⁽⁹⁾ Aluminum, Copper, Zinc</p> <p align="center"><u>Explosives</u> ⁽⁹⁾ As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
Shell, 60mm, Smoke, White Phosphorus (WP), M302	<p>Propelling Assembly: Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc Propellant: Diethylphthalate, Dinitrotoluene, Diphenylamine, Nitrocellulose⁽⁵⁾, Nitroglycerin, Potassium Nitrate Primer ⁽⁷⁾: Antimony Sulfide, Lead Sulphocyanate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Cyclotrimethylenetrinitramine (RDX), TNT Projectile: Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur Projectile Filler: Cyclotrimethylenetrinitramine (RDX), Stearic Acid, White Phosphorus Fuze: Aluminum Alloy, Brass, Plastic - Aluminum, Copper, Iron, Manganese, Plastic, Silicone, Zinc Fuze Filler: RDX, (Cyclotrimethylenetrinitramine), Stearic Acid, Tetryl Fuze Primer ⁽⁷⁾: Antimony Sulfide, Barium Nitrate, Carborundum, Copper, Lead Azide, Lead Styphnate, Potassium Chlorate, Zinc</p>	<p align="center"><u>Metals</u> Aluminum, Copper, Zinc</p> <p align="center"><u>Explosives</u> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS</p>
Cartridge, 81mm, HE, M43	<p>Propelling Assembly: Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc Propellant: Diethylphthalate, Nitrocellulose⁽⁵⁾, Nitroglycerin, Potassium Nitrate Primer ⁽⁷⁾: Antimony Sulfide, Copper, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT, Sulfur, Zinc Projectile: Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur Projectile Filler: TNT or Comp B - Cyclotrimethylenetrinitramine (RDX), TNT Fuze, PD, M52, M525: Aluminum Alloy - Aluminum, Copper, Iron, Lead, Magnesium, Zinc Fuze Filler: RDX , (Cyclotrimethylenetrinitramine), Tetryl Fuze Primer ⁽⁷⁾: Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Styphnate, Tetrazene</p>	<p align="center"><u>Metals</u> Aluminum, Copper, Zinc</p> <p align="center"><u>Explosives</u> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

TABLE 2.2 (CONT')
Chemical Composition of MEC and Potential Munitions Constituents
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Munitions Type/ Model	Composition (Case and Filler) ⁽²⁾	MC Analysis ⁽¹⁾
Cartridge, 81mm, Smoke, WP, M57	<p>Propelling Assembly: Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc Propellant: Diethylphthalate, Nitrocellulose⁽⁵⁾, Nitroglycerin, Potassium Nitrate Primer ⁽⁷⁾: Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT, Sulfur Projectile: Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur Projectile Filler: Aluminum, Barium Stearate, Copper, Magnesium, Nickel, Silicon, Tetryl, Tin, Titanium, White Phosphorus Fuze, PD, M52, M525: Aluminum Alloy - Aluminum, Copper, Iron, Lead, Magnesium, Zinc Fuze Filler: RDX , (Cyclotrimethylenetrinitramine), Tetryl Fuze Primer ⁽⁷⁾: Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Styphnate, Tetrazene</p>	<p align="center"><u>Metals</u> Aluminum, Copper, Zinc <u>Explosives</u> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
Cartridge, 105mm, HE, M1	<p>Cartridge Case: Copper Alloy - Copper, Iron, Lead, Zinc Propellant: Dibutylphthalate, Dinitrotoluene⁽⁶⁾, Diphenylamine, Lead Carbonate, Nitrocellulose⁽⁵⁾ Primer ⁽⁷⁾: Antimony sulfide, Carbon, Lead Thiocyanate, Potassium Chlorate, TNT Projectile/Rotating Band: Steel, Copper Alloy - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur. Zinc Projectile Filler: Amatol or Composition B or TNT - Ammonium Nitrate, Cyclotrimethylenetrinitramine (RDX), TNT Fuze, Projectile, PD, M51: Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur Fuze Filler: Tetryl Fuze Primer ⁽⁷⁾: Antimony Sulfide, Carborundum, Copper, Lead Azide, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur</p>	<p align="center"><u>Metals</u> Copper, Zinc <u>Explosives</u> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
Cartridge, 105mm, Smoke, HC, M84	<p>Cartridge Case: Brass - Copper, Iron, Lead, Zinc Propellant: Dibutylphthalate, Dinitrotoluene⁽⁶⁾, Diphenylamine, Nitrocellulose⁽⁵⁾ Primer ⁽⁷⁾: Antimony Sulfide, Arsenic, Bismuth, Boron, Carbon, Lead Thiocyanate, Lead Carbonate, Potassium Chlorate, Potassium Nitrate, Sulfur, Tin, TNT Projectile/Rotating Band: Steel, Copper Alloy - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur. Zinc Projectile Filler: Burster, Black Powder, White Smoke Mixture – Aluminum Powder, Hexachloroethane, Iron Oxide, Nitrocellulose, Potassium Nitrate, Silicon, Sulfur, Zinc Oxide Fuze, Projectile, Time Super Quick, M54: Aluminum Alloy, Copper Alloy – Aluminum, Bismuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc Fuze Filler: Tetryl Fuze Primer ⁽⁷⁾: Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene</p>	<p align="center"><u>Metals</u> Aluminum, Copper, Zinc <u>Explosives</u> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

TABLE 2.2 (CONT')
Chemical Composition of MEC and Potential Munitions Constituents
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Munitions Type/ Model	Composition (Case and Filler) ⁽²⁾	MC Analysis ⁽¹⁾
<p>Projectile, 155mm, HE, M102</p>	<p>Propellant: Dibutylphthalate, Dinitrotoluene (DNT), Diphenylamine, Nitrocellulose⁽⁵⁾ Flash Reducer/Ignition Charge: Potassium Nitrate, Potassium Sulfate, Sodium Nitrate, Sulfur Primer ⁽⁷⁾: Aluminum, Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Lead Dioxide, Lead Styphnate, Nitrocellulose, PETN, Tetrazene, Zinc, Zirconium Projectile/Rotating Band: Steel/Copper Alloy - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur, Zinc Projectile Filler: TNT or Amatol - Ammonium Nitrate, TNT Fuze, Projectile, PD, M46: Steel/Brass - Carbon, Iron, Manganese, Phosphorus, Sulfur Fuze Filler: Carbon, Copper, Mercury Fulminate, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc Fuze Primer ⁽⁷⁾: Antimony Sulfide, Carborundum 150, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc Fuze, Projectile, PD, M47: Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur Fuze Filler: Carbon, Copper, Lead Azide, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc Fuze Primer ⁽⁷⁾: Antimony Sulfide, Carborundum 150, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc Fuze, Projectile, PD, M51: Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur Fuze Filler: Tetryl Fuze Primer ⁽⁷⁾: Antimony Sulfide, Carborundum, Copper, Lead Azide, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur Fuze, Projectile, Time Super Quick, M54: Aluminum Alloy, Copper Alloy – Aluminum, Bismuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc Fuze Filler: Tetryl Fuze Primer ⁽⁷⁾: Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene Fuze, Projectile, Mechanical Time (MT), M67: Aluminum Alloy, Copper Alloy – Aluminum, Bismuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc Fuze Filler: Lead Azide, Tetryl Fuze Primer ⁽⁷⁾: Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene</p>	<p style="text-align: center;">Metals Aluminum, Copper, Lead, Zinc</p> <p style="text-align: center;">Explosives As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

TABLE 2.2 (CONT')
Chemical Composition of MEC and Potential Munitions Constituents
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Munitions Type/ Model	Composition (Case and Filler) ⁽²⁾	MC Analysis ⁽¹⁾
<p>(1) MC selected for analysis are typically non-essential nutrient metals and indicative of known or suspected DOD munitions used at this MRS.</p> <p>(2) MC not selected for analysis are essential nutrient metals, Semi-Volatile Organic Compounds (SVOCs) or materials that represent a very small percentage of the munitions weight.</p> <p>(3) Lead, antimony, and copper have been selected as programmatic SI "indicator" metals and reflects general former small arms range evaluation strategy and parallels the screening level decision-making objectives of SI. This 3-metals list was developed based on an extensive review of historical SAR studies, fate and transport mechanisms (specifically as they relate to shallow surface soil sampling), compositional prevalence, toxicity, environmental persistence and reactivity, and representativeness. This baseline list may be augmented, as appropriate, following TPP based on justifications of unique site specific considerations such as soils, geology, vegetation, topography, hydrology, land use, or ammunition type.</p> <p>(4) A full Explosives panel will be analyzed for from media collected at known firing points of small arms ranges and ambient samples. As a conservative measure, all explosives will be included when analyzing for explosive MC.</p> <p>(5) Nitrocellulose is not considered toxic, has no risk-based screening values and there are no chemical analysis techniques that quantify nitrocellulose separately from the natural common essential nutrient nitrate. Based on this, nitrocellulose analysis will not be conducted during this SI.</p> <p>(6) Dinitrotoluene products include: 2,4-and 2,6-dinitrotoluene; 2-Amino-4,6-dinitrotoluene; 2-and 3-nitrotoluene; 4-Amino-2,6-dinitrotoluene; 4-nitrotoluene.</p> <p>(7) Primer materials represent a very small percentage of the munition's weight. Therefore, analysis of primer constituents will not be conducted. However, if a primer constituent is associated with a larger component of the munition, then analysis of that constituent may be conducted.</p> <p>(8) Tracer element materials represent a very small percentage of the munitions weight and is consumed while the projectile travels to the target, therefore, tracer element constituents will not be analyzed for at this MRS (if a tracer element constituent is associated with a larger component of the munition it may be analyzed for).</p> <p>Source: Munitions information was supplied by the 2009 INPR, Munitions Items Disposition Action System (MIDAS) database, and USACE Range Operations Reports RO-01.</p>		

TABLE 2.3
MMRP SI Project Key Contacts
Former West Virginia Maneuver Area
Grant, Preston, Pendleton, Tucker, and Randolph Counties, West Virginia

Organization	Name	Telephone/FAX
U.S. Army SPD Range Support Center CESPD-EC-EG 4101 Jefferson Plaza NE	Mr. Brian Jordan USACE MMRP SI Program Manager Southwest USACE Geographic Region Email: Brian.D.Jordan@usace.army.mil	(505) 228-9275
U.S. Army Corps of Engineers, Huntington District (CELRH) CELRH-PP-P 502 8 th Street Huntington, WV 25701-2070	Mr. Richard Meadows Project Manager Email: Richard.L.Meadows@usace.army.mil	(304) 399-5388 (304) 399-5549 (FAX)
U.S. Army Corps of Engineers, Huntington District (CELRH) CELRH-PP-P 502 8 th Street Huntington, WV 25701-2070	Mr. Jason Smithson Email: Jason.T.Smithson@usace.army.mil	(304) 399-5040 (304) 399-5549 (FAX)
U.S. Army Corps of Engineers, Huntington District (CELRH) CELRH-EC-CE 502 8 th Street Huntington, WV 25701-2070	Mr. Wyatt Kmen Email: Wyatt.H.Kmen@usace.army.mil	(304) 399-5628 (304) 399-5549 (FAX)
U.S. Army Corps of Engineers, Huntington District (CELRH) CELRH-EC-CE 502 8 th Street Huntington, WV 25701-2070	Mr. Jean Read Email: Jean.L.Read@usace.army.mil	(304) 399-5094 (304) 399-5549 (FAX)
U.S. Army Corps of Engineers Walla Walla District (CENWW) CENWW-EC-X 825 Jadwin Avenue, Room 598-B Richland, WA 99352	Mr. Nickolas McHenry Environmental Engineer Email: Nickolas.Mchenry@rl.doe.gov	(509) 373-9333 (509) 372-2610 (FAX)
West Virginia Department of Environmental Protection 601 57 th Street, SE Charleston, WV 25304-2345	Mr. Donald Martin Email: Donald.W.Martin@wv.gov	(304) 926-0499 (304) 924-6781 (FAX)
West Virginia Department of Environmental Protection 601 57 th Street, SE Charleston, WV 25304-2345	Mr. Tom Bass Environmental Resources Specialist 3 Email: Thomas.L.Bass@wv.gov	(304) 926-0499 (304) 926-0457 (FAX)
U.S. Department of Agriculture Forest Service/Monongahela National Forest 200 Sycamore Street	Mr. Eric Sandeno Recreation/Wilderness Program Manager Email: esandeno@fs.fed.us	(304) 636-1800, ext 280

TABLE 2.3 (CONT')
MMRP SI Project Key Contacts
Former West Virginia Maneuver Area
Grant, Preston, Pendleton, Tucker, and Randolph Counties, West Virginia

Organization	Name	Telephone/FAX
U.S. Fish & Wildlife Service Canaan Valley National Wildlife Refuge 6263 Appalachian Highway	Mr. Brett Hartwig Law Enforcement Officer Email: brett_hartwig@fws.gov	(304) 866-3859 (304) 866-3852 (FAX)
Canaan Valley Institute 494 River Stone Road Davis, WV 26260	Mr. Ken Dzaack Land Manager/ NSD Construction Manager Email: ken.dzaack@canaanvi.org	(304) 259-4739 x 233 (304) 259-4759 FAX
Eco & Associates, Inc. 1855 W. Katella Ave., Suite 340 Orange, CA 92867	Mr. Mohammad Estiri Project Director Email: Mestiri@Ecoinc.info	(714) 289-0995 (714) 289-0965 (FAX)
Eco & Associates, Inc. 1855 W. Katella Ave., Suite 340 Orange, CA 92867	Mr. Opjit Ghuman Project Engineer Email: osghuman@Ecoinc.info	(714) 289-0995 (714) 289-0965 (FAX)
Eco & Associates, Inc. 1855 W. Katella Ave., Suite 340 Orange, CA 92867	Mr. Carlos Hernandez Project Scientist Email: chernandez@Ecoinc.info	(714) 289-0995 (714) 289-0965 (FAX)
Eco & Associates, Inc. 1855 W. Katella Ave., Suite 340 Orange, CA 92867	Mr. Steven Saunders Project Geologist Email: ssaunders@ecoinc.info	(714) 289-0995 (714) 289-0965 (FAX) (818) 397-2248 (cell)
Parsons 5390 Triangle Pkwy, Suite 100 Norcross, GA 30092	Ms. Laura Kelley Program Manager Email: Laura.Kelley@Parsons.com	(678) 969-2437 (770) 446-4910 (FAX) (404) 934-1266 (cell)
Parsons 1700 Broadway, Suite 900 Denver, CO 80290	Mr. Greg Van Task Manager Email: Greg.Van@Parsons.com	(303) 764-1927 (303) 831-8208 (FAX) (720) 480-6760 (cell)
Parsons 1700 Broadway, Suite 900 Denver, CO 80290	Ms. Lauren Johnson Technical Lead Email: Lauren.Johnson@Parsons.com	(303) 764-8830 (303) 831-8208 (FAX)
Parsons 1700 Broadway, Suite 900 Denver, CO 80290	Ms. Tammy Chang Project Chemist Email: Tammy.Chang@parsons.com	(512) 719-6092 (512) 719-6099 (FAX) (512) 590-1126 (cell)



Prepared by:
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 1855 W. Katella Avenue, Suite 340
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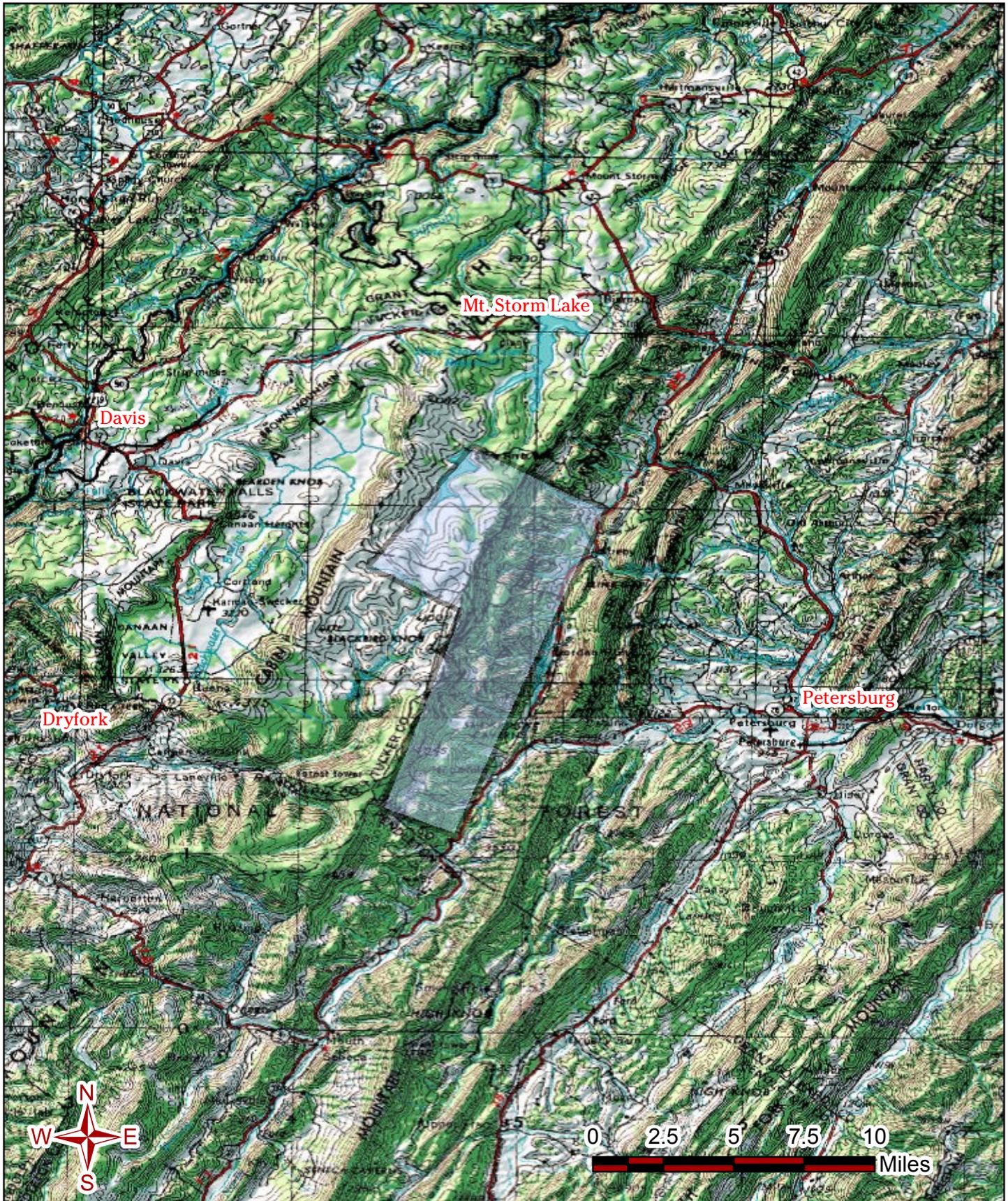
Phone: 714.289.0995 Fax 714.289.0965

Site Location Map - Satellite
 MRS04 - Fore Knobs / Bear Rocks Firing Ranges
 MMRP West Virginia

Project No. Eco-11-452

September 2011

FIGURE
2.1



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Site Location Map - Topo
 MRS04 - Fore Knobs / Bear Rocks Firing Ranges
 MMRP West Virginia

Project No. Eco-11-452

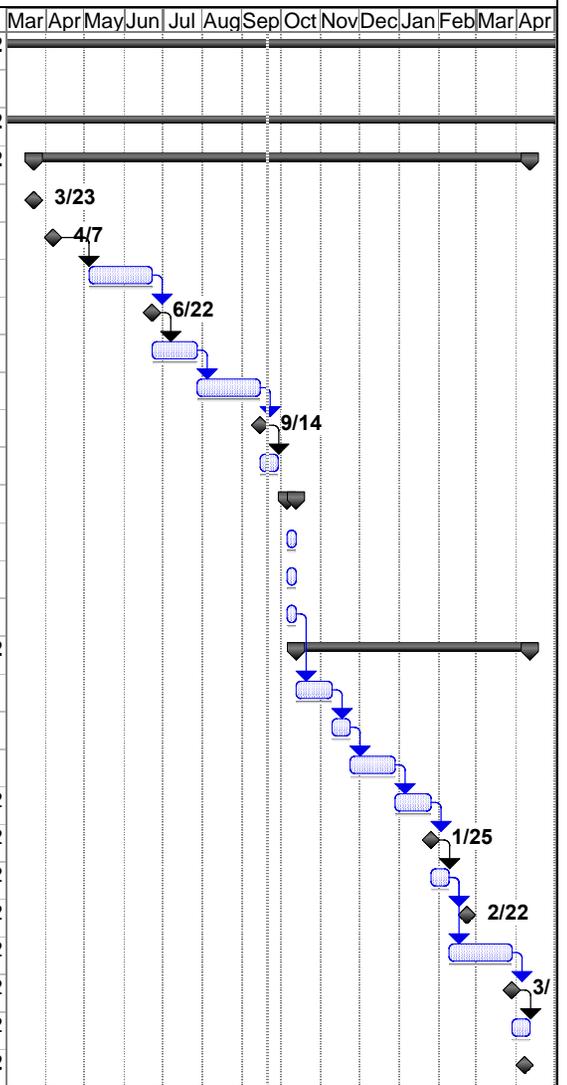
September 2011

FIGURE

2.2

Figure 2.3 - Project Schedule - Fore Knobs-Bear Rocks Firing Ranges MRS

ID	Task Name	Duration	Start	Finish	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	MMRP SI	1850 days	Thu 5/26/05	Mon 7/2/12														
2	Award Date	0 days	Fri 1/14/11	Fri 1/14/11														
3	HNC - Huntsville Center MM Design Center	1850 days	Thu 5/26/05	Mon 7/2/12														
5315	Fore Knobs-Bear Rocks Firing Ranges - Dolly Sods, WV	276 days	Wed 3/23/11	Wed 4/11/12														
5316	Site Specific Award Date	0 days	Wed 3/23/11	Wed 3/23/11														
5317	CSM/TPP Meeting 1	0 days	Thu 4/7/11	Thu 4/7/11														
5318	TPP Memorandum - Draft - Final	35 days	Thu 5/5/11	Wed 6/22/11														
5319	TPP Memorandum Approval/Acceptance	0 days	Wed 6/22/11	Wed 6/22/11														
5320	Draft Site Specific SI Work Plan	25 days	Thu 6/23/11	Wed 7/27/11														
5321	USACE/Stakeholder Review	35 days	Thu 7/28/11	Wed 9/14/11														
5322	Receive Comments	0 days	Wed 9/14/11	Wed 9/14/11														
5323	Final Site Specific SI Work Plan	10 days	Thu 9/15/11	Wed 9/28/11														
5324	Field Work	5 days	Thu 10/6/11	Wed 10/12/11														
5325	Site Visit	5 days	Thu 10/6/11	Wed 10/12/11														
5326	Qualitative Reconnaissance	5 days	Thu 10/6/11	Wed 10/12/11														
5327	MC Sampling and Analysis	5 days	Thu 10/6/11	Wed 10/12/11														
5328	SI Report	130 days	Thu 10/13/11	Wed 4/11/12														
5329	Laboratory Analyses	20 days	Thu 10/13/11	Wed 11/9/11														
5330	Data Validation	10 days	Thu 11/10/11	Wed 11/23/11														
5331	Submit Draft SI Report	25 days	Thu 11/24/11	Wed 12/28/11														
5332	USACE Review	20 days	Thu 12/29/11	Wed 1/25/12														
5333	Parsons Receives Comments	0 days	Wed 1/25/12	Wed 1/25/12														
5334	Submit Draft Final SI Report	10 days	Thu 1/26/12	Wed 2/8/12														
5335	TPP Meeting 2	0 days	Wed 2/22/12	Wed 2/22/12														
5336	USACE Backcheck & Stakeholders Review	35 days	Thu 2/9/12	Wed 3/28/12														
5337	Parsons Receives Comments	0 days	Wed 3/28/12	Wed 3/28/12														
5338	Submit Final SI Report	10 days	Thu 3/29/12	Wed 4/11/12														
5339	Site Completion Date	0 days	Sun 4/8/12	Sun 4/8/12														



Project: MMRP SE Schedule Nov 061
Date: Tue 9/20/11

Task  Summary 
Milestone  Rolled Up Milestone 

CHAPTER 3: FIELD INVESTIGATION PLAN

3.1 TECHNICAL APPROACH

The overall approach to munitions response activities is presented in Chapter 3, paragraph 3.1 of the PWP. As stated in Chapter 1 of this SS-WP, additional MEC/MC data need to be collected to support the anticipated RI/FS recommendation. Therefore, the Technical Approach, as established during the April 7, 2011, TPP Meeting, will focus on placement of MC sampling locations in and around areas where munitions debris has been found. Exposure pathways may be complete based on the possibility of MEC and MC. Details of the site-specific MC strategy for the MRS04 Fore Knobs/Bear Rocks Firing Range are described in subsequent sections of this chapter.

3.1.1 CONCEPTUAL SITE MODEL AND CONCEPTUAL SITE EXPOSURE MODEL

As part of the TPP process, a “living” Conceptual Site Model (CSM) and Conceptual Site Exposure Model (CSEM) have been developed for MRS04 Fore Knobs/Bear Rocks Firing Range. The current CSM and CSEMs are provided in Appendix B of this SS-WP Addendum. The CSM and CSEM will be revised throughout the SI process and with each subsequent stage of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process (NDAI, RI/FS, Risk Assessment, TCRA), as applicable.

3.1.2 DATA QUALITY OBJECTIVES

As stated in Subchapter 1.2, the primary objective of a SI project is to evaluate, through MC sampling (as necessary) and limited QR, the applicability of the next appropriate CERCLA phase. Potential subsequent post-SI phases include immediate action (TCRA), characterization action (RI/FS), or non-action (NDAI). In many instances, sufficient historical data exist (prior to the conduct of SI field activities) to justify proceeding directly to RI/FS. This predetermination is highly dependent on combinations and interactions of such parameters as demographics, land use, confirmed MEC presence, known pending development, existing deed restrictions, historical incidents, political concerns, endangered species, groundwater use, and others. In such cases, the SI field objective is transformed to emphasize the collection of data to support a focused RI/FS as well as provide compelling evidence and associated rationale for excluding large project areas from further consideration.

Secondary objectives of the SI also include collection of sufficient data for USEPA to support the development of the site-specific Hazard Ranking System (HRS) Score as well as for the completion of the Office of the Secretary of Defense’s (OSD) Munitions Response Site Prioritization Protocol (MRSPP).

To ensure accomplishment or attainment of the project objectives detailed above, Data Quality Objectives (DQOs) were developed for the MRS04 Fore Knobs/Bear Rocks Firing Range SI in accordance with the process presented in Chapter 3, paragraph 3.1.2 of the PWP. The DQOs are outlined below along with criteria for achieving the specific DQO. The DQO worksheets are provided in Appendix A of this SS-WP Addendum.

3.1.2.1 Qualitative Reconnaissance DQO

For the MRS04 Fore Knobs/Bear Rocks Firing Range, QR will be conducted within the MRS boundaries. QR will focus on areas where munitions debris was found. The QR will proceed in a meandering path format, vegetation and terrain permitting, traversing the MRS from one sampling location to the next to include the inspection of as much of the former site as possible. Data collected during the QR can be used as “optimum” SI data for refinement of any subsequent inspection as a separate project.

To accomplish the QR SI component, the site visit team (inclusive of an UXO qualified individual) will employ the QR protocol detailed in the PWP to document visual observations of field conditions (topography and vegetation) and evidence of MEC (or MD indicative of MEC). In addition, the presence of range debris, targets, and other pertinent site features will be recorded to support the SI recommendation. The Schonstedt® GA-92 XT_i magnetometer, or equivalent, has been selected to be used for identification of potential MEC and MD located on the surface but below the leaf litter, as well as for anomaly avoidance.

3.1.2.2 Munitions Constituents DQO

For the MRS04 Fore Knobs/Bear Rocks Firing Range, the MC samples will be collected at locations determined by the site visit team. The sample locations identified on Figure 3.1 and 3.2 were proposed based on TPP Team discussions. However, these locations are for representative purposes only. The decision to collect and where to collect will be based on current site observations at the time of the site visit. See the Sampling Rationale (Table 3.1) for a complete list of samples and pertinent information on each.

Groundwater samples will only be collected if an appropriate source is identified. Currently, there are no known existing groundwater wells within the MRS, and there are 13 groundwater wells within four-miles of the MRS (Figure 5.1).

If biased surface soil samples are collected, at least one surface soil sample will be collected from a location within the MRS in an area where there is no evidence of munitions debris or DoD-use and upgradient from any areas where there is evidence of DoD-use or munitions debris. This sample will serve as ambient data to provide information for MRSPP scoring and for use by USACE. The decision to collect and where to collect will be based on current site observations at the time of the site visit. The rationale for each potential sample location is presented in Table 3.1.

In order to accomplish the MC SI component, the site visit team (inclusive of a UXO qualified individual) will employ the MC sampling protocol detailed in the PWP, PSAP, and SS-WP. For the MRS04 Fore Knobs/Bear Rocks Firing Range, the MC samples will be analyzed for potential MC as specified in Table 3.1 and as detailed further in Chapter 4. The Schonstedt® GA-92XT_i magnetometer (or its equivalent) has been selected to be used for subsurface anomaly screening prior to sample collection.

3.1.2.3 Hazard Ranking System DQO

Specific input data will be collected for USEPA to populate the HRS score sheets. The data will be collected from existing document sources. Source documents for HRS information will include the 1990 INPR, 1992 Revised INPR, and the 1995 ASR. Data gaps will be filled via MC sampling, as well as collection from local and state agencies (demographics/population, groundwater well users and supply and supply sources/served population, surface water within 2 miles, etc).

3.1.2.4 Munitions Response Site Prioritization Protocol DQO

Specific input data will be collected and the three modules of the MRSPP score will be populated as part of the SI. The modules include Explosive Hazard Evaluation (EHE), Chemical Hazard Evaluation (CHE), of which Chemical Warfare Material (CWM) is a sub set, and Health Hazard Evaluation (HHE). The data will be collected from existing document sources. Source documents for MRSPP information will include the 1990 INPR, 1992 Revised INPR, and 1995 ASR.

Data gaps will be filled via MC sampling and data collection from local/state agencies. The Tax Assessor's Office may be contacted for up-to-date property ownership information, State Historic Preservation Office (SHPO) for archeological and cultural resources, and other county agencies for current receptor information, groundwater well users, and supply sources/served population, etc.

3.2 SI FIELD PLANNING AND LOGISTICS

3.2.1 HISTORICAL RESEARCH AND REVIEW

The existing body of information pertinent to the MRS04 Fore Knobs/Bear Rocks Firing Range was thoroughly reviewed in advance of the TPP Meeting on April 7, 2011, and summarized to the TPP Team as part of the development and concurrence of the selected Technical Approach for the site. Sample collection planning, as presented in this SS-WP Addendum, was the direct result of this review process. This information has been augmented with institutional knowledge and additional documentation provided by CELRH or was obtained during coordination of the field effort. As part of mobilization preparation, the site visit team will review existing site information.

3.2.2 RIGHTS-OF-ENTRY

CELRH will secure the necessary Rights-of-Entry (ROEs). Copies of the ROEs will remain in the custody of the FTL at all times during the performance of the SI field activities. Prior to the actual SI visit, the FTL will contact any property owners directly affected by the sampling effort to coordinate the visit.

3.2.3 SENSITIVE ENVIRONMENTS AND CULTURAL RESOURCES

The MRS04 Fore Knobs/Bear Rocks Firing Range site is located within the Allegheny Mountains. The federally-designated endangered (or threatened) species that are listed for this region of the Allegheny Mountains are running buffalo clover (*Trifolium stoloniferum*), shale barren rock cress (*Arabis serotina*), small whorled pogonia (*Isotria medeoloides*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Indiana bat (*Myotis sodalis*), and the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*). Federally-threatened species include the bald eagle (*Haliaeetus leucocephalus*) and the Cheat Mountain salamander (*Plethodon nettingi*). Globally rare and imperiled species include an isopod (*Caecidotrea sinuncus*), tall larkspur (*Delphinium exaltatum*), eastern small-footed bat (*Myotis leibii*), Allegheny woodrat (*Neotoma magister*), Timber Ridge cave beetle (*Pseudanophthalmus hadenoecus*), and the South Branch Valley cave millipede (*Pseudotremia princeps*). Two other endangered species, the gray wolf (*Canis lupus*) and the eastern cougar (*Puma concolor cougar*), are believed to be extirpated from the region during the late 1800s or early 1900s (USDA 2006).

In 1996, the MNF prepared a survey which located and identified cultural resources in the Dolly Sods area. One reason for conducting the survey was to provide advice to the USACE for ordnance removal projects. The survey focused on trails and campsites in the DSA and resulted in the addition of nine previously-unrecorded historic sites, beyond four other known sites. Historic site locations include Shay Falls, Stonecoal Run, Red Creek Trail, homestead site near Laneville, Stonecoal Trail, homestead site near Dolly Sods road, several commercial coal mine sites (dating back to 1905), logging and railroad site at the confluence of Big Stonecoal and Red Creek, four other sites along Red Creek, and isolated finds in various locations. The field reconnaissance revealed a large concentration of artifacts dating from the early 1900s and associated with the logging and railroad history of the region. No prehistoric material was found during the 1996 survey, but large amounts have been located in previous surveys within the boundary of Dolly Sods. According to the survey, as of 1993 there were 86 prehistoric sites recorded for Tucker County and 110 for Grant County (USDA 1996).

Registered National Natural Landmarks (NPS 2011c) within the WVMA boundary include the following:

- Canaan Valley – designated a National Nature Landmark in 1974
- Germany Valley Karst Area – part of the Spruce Knob-Seneca Rocks National Recreation Area
- Big Run Bog – an open fen close to the City of Davis, WV
- Fisher Spring Run Bog – located in the Red Creek area of Dolly Sods
- Shavers Mountain Spruce-Hemlock Stand – mostly within Otter Creek Wilderness

The MRS does not contain any areas designated as critical habitat for T&E species. However, the site is considered suitable habitat for the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) and the Cheat Mountain salamander (*Plethodon nettingi*). There are no known cultural or historically significant sites in the area of the MRS04 Fore Knobs/Bear Rocks Firing Range. There are, however, several areas of wetlands adjacent to Stoney River Reservoir near the northwest corner of the MRS. Primarily, the wetlands are lake type, forested/shrub type, and freshwater emergent. Even though the MRS contains some wetlands and is considered suitable habitat for at least two T&E species, sensitive environments are not anticipated to be impacted by the SI effort. Chapter 5 of this SS-WP Addendum addresses precautions and identification procedures to ensure the SI actions are tailored to minimize any impacts at the MRS.

3.2.4 EQUIPMENT

There are no site-specific changes to the general SI equipment presented in the PWP. A magnetic locator, such as the Schonstedt® GA-92 XT_i magnetometer, or equivalent, will be used for anomaly avoidance at this site. The QR tracks of each site visit team member will be logged using Garmin® Rino™120 hand held GPS units with an accuracy of less than 15 meters. Observation points will be logged in a Trimble GeoXT GPS receiver with an accuracy of less than one meter. Because the MRS is located in both developed and forested areas, a four-wheel drive vehicle may be necessary. Safety equipment is listed in Chapter 6.

3.2.5 COMMUNICATIONS

The primary means of on-site communication will be cellular telephones or radios in areas where cell phone coverage is limited. The site visit team will also carry a satellite phone for communication. The three-person site visit team will remain together throughout all aspects of the field activities.

3.2.6 TRAINING AND BRIEFING

Training and briefing requirements are presented in Chapter 3, paragraph 3.3.5 of the PWP. For the SI field activities, any additional training will be conducted on-site during the Daily Tailgate Safety Briefing and will include (but is not limited to) T&E species, anticipated ordnance types, and weather hazards.

3.3 SI FIELD DATA COLLECTION

The SI field activities at MRS04 include MC sampling and QR. No intrusive MEC investigations, explosives handling, or MEC detonation will be conducted. In the unlikely event that a MEC item is identified during the SI, the approved procedures for reporting will be implemented as presented in the PWP.

The MC sampling approach was agreed upon during the TPP Meeting on April 7, 2011, and through review of the subsequent revisions to the technical approach as presented in the TPP Memorandum. As stated previously, sensitive environments will be avoided.

The duration of the SI field effort, inclusive of MC sampling, is anticipated to be approximately five days but will not be terminated until the objectives for the site are met. During this time, the Technical Approach will be implemented as described in the PWP and as established by the TPP Team. In addition to sampling and QR, the following field components at the FUDS will be conducted:

- Document vegetation and topographic conditions.
- Photograph the site and significant features.
- Collect necessary MC-related data to provide to USEPA to conduct HRS scoring.
- Collect all data necessary to complete the MRSPP.

Data will also be gathered to identify any potential limitations to subsequent response actions.

3.3.1 QUALITATIVE RECONNAISSANCE

An integral part of the SI field activities will be the implementation of QR in accordance with the baseline procedures described in Chapter 3, paragraph 3.4.3 of the PWP. For the MRS, QR will be performed within the accessible portions of the MRS to further evaluate the presence or absence of MEC and/or MD. To achieve the project objective, the site visit team must have the ability to remain flexible during the QR to navigate towards the areas indicating the highest likelihood of containing MEC. Visual indicators of suspect areas include (but are not limited to) distressed vegetation, stained soil, range remnants or debris, bunker/target remnants, and visible MD. The QR will incorporate the use of magnetometers, Global Positioning System (GPS) technology, Geographic Information System (GIS) data loggers, and digital photography. The planned QR route is approximately 21.5 miles.

3.3.2 MUNITIONS CONSTITUENTS SAMPLING

The PSAP has been developed by U.S. Army Engineering and Support Center, Huntsville (USAESCH) as part of the PWP. For the MRS04 Fore Knobs/Bear Rocks Firing Range, the TPP Team agreed during the TPP process that the collection of surface soil samples from a total of up to 7 biased locations would be sufficient to meet the SI project objectives. If biased samples are collected, at least one ambient surface soil sample will be collected from a location within the MRS in an area where there is no evidence of munitions debris or DoD-use and upgradient from any areas where there is evidence of DoD-use or munitions debris. The sample will be used to provide ambient metals data comparison. The sample locations identified on Figures 3.1 and 3.2 are for representative purposes only. The location and collection of the proposed samples are discretionary and will be placed based on site observations. Table 3.1 provides the sample identifications, munitions suspected, and rationale for selecting the sample locations. Data collected from all biased samples will be analyzed to determine if the site warrants further investigation or other action.

The following guidelines will be adhered to in order to obtain the actual sample locations. Because of site conditions, all sample locations are discretionary and, therefore, the actual coordinates of the samples presented in Table 3.1 are not available in advance of the site visit. The TPP Team supports the following sampling protocol concerning final location selection. The site visit team will survey the immediate visible area to select the most appropriate biased (toward finding MC) location based on the objective of the sample (with the exception of ambient sample selection). Criteria considered to be indicative of a MC-biased sample location are visual signs of MEC and/or MD, possible range debris, stained soils, disturbed vegetation, or subsurface magnetic evidence of high metal (ferrous) content.

Any sample location must be screened and approved by the UXO Technician III (concerning potential subsurface anomalies) prior to final location selection and sample collection. In accordance with the TPP Memorandum, the Cold Regions Research and Engineering Laboratory (CRREL) “seven-point wheel sampling technique” will be employed. The actual GPS coordinates for each sample location will be recorded and will be updated in the GIS database. The process will be repeated for each sample location.

3.3.3 SAMPLE COLLECTION

The sample collection procedures presented in the PSAP and in the PWP will be followed. If sandy soils are encountered on the site, sample locations may be selected as necessary to acquire samples with more organic matter that are more likely to hold contaminants. The programmatic sample depth of 2 inches will be used, but sample depths up to 6 inches are approved if the FTL determines this depth will achieve a more representative soil sample. No other procedural variances are anticipated for the MRS04 Fore Knobs/Bear Rocks Firing Range SI. Additional details regarding sample collection, investigative-derived waste (IDW) handling, and packaging are presented in Chapter 4 of this SS-WP Addendum.

3.3.4 ANALYTICAL PROCEDURES AND DATA VALIDATION

Analytical procedures and data validation are presented in Chapter 3, paragraph 3.5.3 of the PWP. The analytical methods to be used for the MC samples collected are listed in Chapter 4 of this SS-WP Addendum.

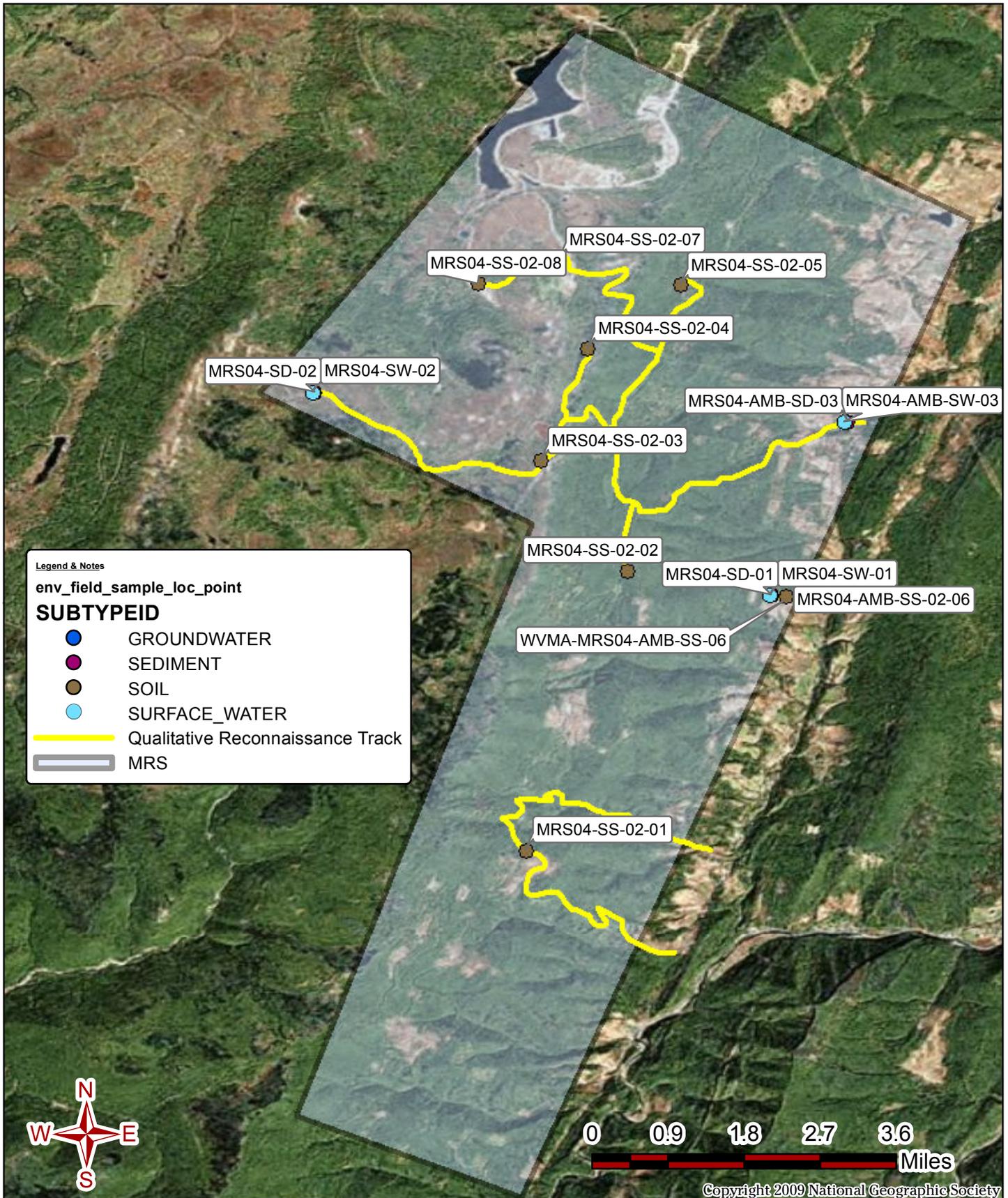
**TABLE 3.1
SAMPLING RATIONALE
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 - Fore Knobs / Bear Rocks Firing Ranges**

Sample ID	Sample Coordinates (Decimal Degree)		Medium	Analysis ⁽¹⁾	Potential Munitions	Rationale
	Longitude	Latitude				
WVMA-MRS04-SS-02-01	-79.304275	38.999151	Soil	Explosives, Selected metals, pH	<u>Shell</u> : 60mm, high explosive (HE), M49A2; 60mm, smoke, white phosphorus (WP), M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, hexachloroethane (HC), M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected in proximity to possible firing point observed on 1945 aerial photos, the most likely place for MC presence. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-SS-02-02	-79.286864	39.047075	Soil	Explosives, Selected metals, pH	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected in proximity to ground scars and a possible firing point observed on 1945 aerial photos, the most likely place for MC presence. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-SS-02-03	-79.30171	39.065912	Soil	Explosives, Selected metals, pH	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected in proximity to ground scars observed on 1945 air photos, the most likely place for MC presence. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-SS-02-04	-79.293742	39.085138	Soil	Explosives, Selected metals, pH	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected in proximity to area where munitions debris was reportedly found within the MRS (near Stack Rock), the most likely place for MC presence. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-SS-02-05	-79.277776	39.096209	Soil	Explosives, Selected metals, pH	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected in proximity to observed munitions debris within the MRS, the most likely place for MC presence. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-AMB-SS-02-06	-79.259581	39.042808	Soil	Explosives, Selected metals, pH	None	Sample will be collected will be collected from within the MRS in an area free of munitions debris or evidence of DoD use and upgradient from areas where there is evidence of DoD use. Anticipated to serve as ambient data for comparison to biased samples.
WVMA-MRS04-SS-02-07	-79.298661	39.100374	Soil	Explosives, Selected metals, pH	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected in proximity to observed munitions debris within the MRS, the most likely place for MC presence. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-SS-02-08	-79.312495	39.096316	Soil	Explosives, Selected metals, pH	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected in proximity to observed munitions debris within the MRS, the most likely place for MC presence. Will assist in development of RI/FS sampling strategy, if warranted.

TABLE 3.1 (CONT')
SAMPLING RATIONALE
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 - Fore Knobs / Bear Rocks Firing Ranges

Sample ID	Sample Coordinates (Decimal Degree)		Medium	Analysis ⁽¹⁾	Potential Munitions	Rationale
	Longitude	Latitude				
WVMA-MRS04-SW-01	-79.262344	39.042948	Surface Water	Explosives, Selected metals	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected from Big Star Run as decided during the TPP meeting. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-SW-02	-79.340764	39.077769	Surface Water	Explosives, Selected metals	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected from the head of Red Creek as decided during the TPP meeting. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-AMB-SW-03	-79.249739	39.072679	Surface Water	Explosives, Selected metals	None	Sample will be collected from within the MRS in an area free of munitions debris or evidence of DoD use and upstream from munition debris areas. Anticipated to serve as ambient data for comparison to biased samples.
WVMA-MRS04-SD-01	-79.262167	39.042948	Sediment	Explosives, Selected metals	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected from Big Star Run as decided during the TPP meeting. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-SD-02	-79.340431	39.077769	Sediment	Explosives, Selected metals	<u>Shell</u> : 60mm, HE, M49A2; 60mm, smoke, WP, M302 <u>Cartridge</u> : 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, HC, M84 <u>Projectile</u> , 155mm, HE, M102	Sample will be collected from the head of Red Creek as decided during the TPP meeting. Will assist in development of RI/FS sampling strategy, if warranted.
WVMA-MRS04-AMB-SD-03	-79.249111	39.072731	Sediment	Explosives, Selected metals	None	Sample will be collected from within the MRS in an area free of munitions debris or evidence of DoD use and upstream from munition debris areas. Anticipated to serve as ambient data for comparison to biased samples.

(1) Selected metals include: aluminum, copper, lead, and zinc
MRS = munitions response site
MC = munitions constituents
RI/FS = Remedial investigation/Fesasibility Study
HE = high explosive



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**Qualitative Reconnaissance and
 Sample Locations - Satellite**

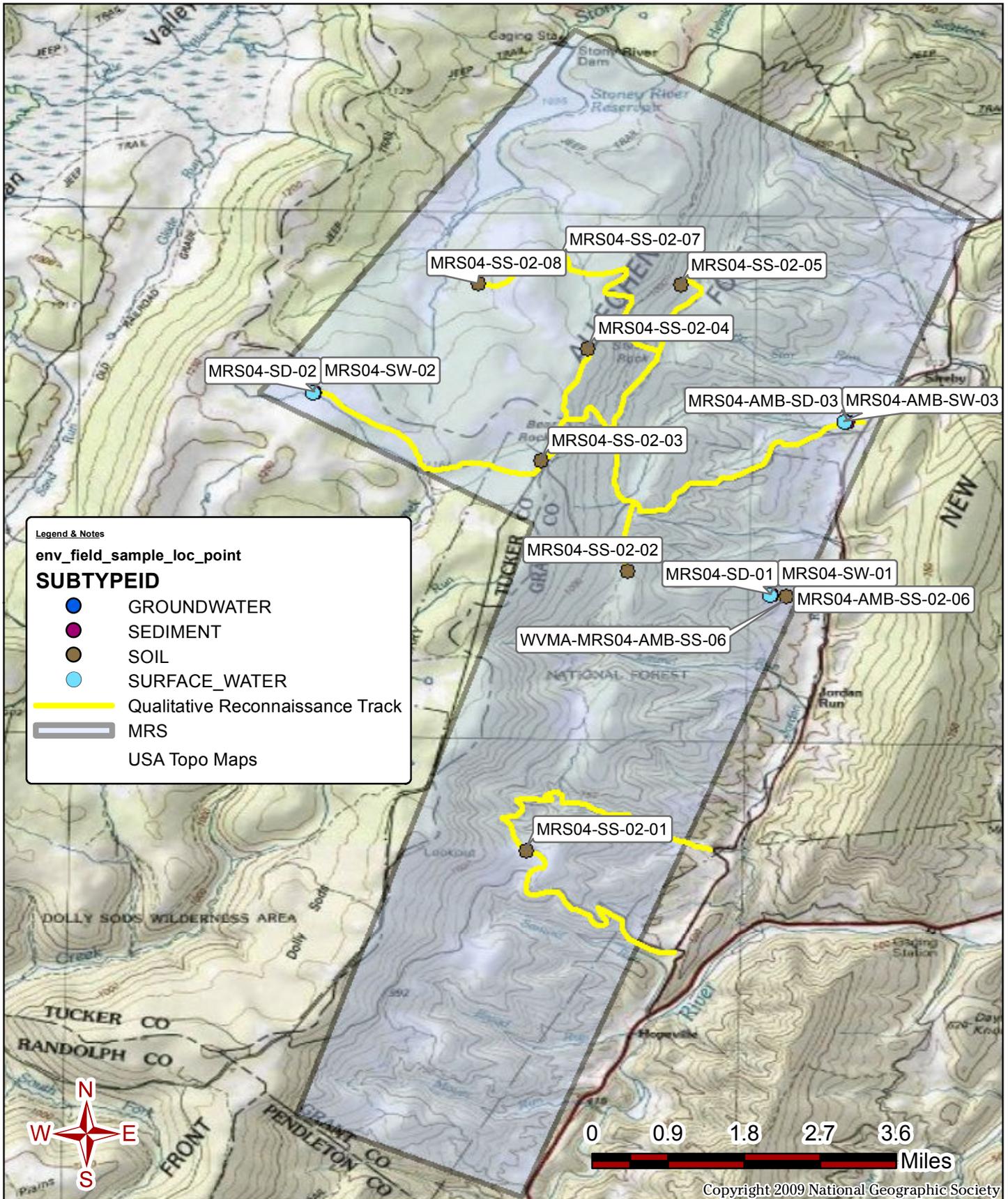
MRS04 - Fore Knobs / Bear Rocks Firing Ranges
 MMRP West Virginia

Project No. Eco-11-452

September 2011

FIGURE

3.1



Legend & Notes

env_field_sample_loc_point

SUBTYPEID

- GROUNDWATER
- SEDIMENT
- SOIL
- SURFACE_WATER

— Qualitative Reconnaissance Track

MRS

USA Topo Maps



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Qualitative Reconnaissance and Sample Locations - Topo

MRS04 - Fore Knobs / Bear Rocks Firing Ranges
 MMRP West Virginia

Project No. Eco-11-452

September 2011

FIGURE

3.2

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CHAPTER 4: SAMPLING AND ANALYSIS PLAN

4.1 INTRODUCTION

The USAESCH prepared the PSAP (consisting of the Field Sampling Plan [FSP] and the Quality Assurance Project Plan [QAPP]) for the MMRP SI Program. This PSAP Addendum was developed to describe specific activities and procedures to be conducted during SIs. The Addendum augments the Final PSAP, documenting specific variances from the PSAP and presenting APPL's laboratory-specific procedures, detection and quantitation limits, and precision and accuracy criteria. APPL is certified with DoD under Environmental Lab Accreditation Program (ELAP) and National Environmental Laboratory Accreditation Conference (NELAC). This Site-Specific Sampling and Analysis Plan is not meant to be a stand-alone document and should be used in conjunction with the Final PSAP. This document only addresses information directly related to the site and any variances from the program-wide procedures presented in the PSAP. The PSAP is presented in Appendix D of the PWP and apply to all work performed by the consultants and subcontractors.

4.2 SAMPLE COLLECTION

4.2.1 SURFACE SOIL SAMPLES

Up to seven biased surface soil samples, associated QC samples, and at least one ambient surface soil sample will be collected at the MRS04 Fore Knobs/Bear Rocks Firing Range. The required QC samples will be collected at biased sample locations. Each soil sample location will consist of seven sampling points that will be homogenized into a composite sample. If site conditions are such that seven sampling points at a given location are not feasible, fewer sampling points may be collected and homogenized at the site visit team's discretion and will be so noted in the site Daily Contractor Quality Control Report and field notes. If biased samples are collected, one ambient surface soil sample will be collected within the MRS in an area where there is no evidence of munitions debris or DoD-use. The ambient sample(s) will be collected upgradient from any areas where there is no evidence of DoD-use or munitions debris (Figures 3.1 and 3.2).

The following guidelines will be adhered to in order to obtain the actual sample locations. Prior to advancing any sampling equipment, each discrete sampling location will be screened by the UXO-qualified team escort to verify that no metallic items are present in the subsurface. The samples will be collected using the procedures described in Subchapter 5.1.2 of the Programmatic Field Sampling Plan (PFSP). The soil samples will be composited using the procedure described in Subchapter 5.1.2 of the PFSP. If access to the sampling location is restricted, then the soil samples will be collected and composited as follows: Surface soil samples will be collected using a disposable plastic trowel rather than spoon or hand auger as stated in the PFSP. This will eliminate the need to carry decontamination equipment. Soil samples will be collected and homogenized in USACE-approved, certified, and pre-cleaned plastic bags during collection rather than in disposable plastic bowls as stated in the PFSP. The plastic bags are more efficient to carry during the QR than the mixing bowls that would otherwise be required. No effects are anticipated on the data quality based on the use of these plastic bags. After compositing, the soil samples will be transferred to the

appropriate sample collection containers as presented in Table 4.1. All remaining soils will be returned to the discrete sample locations to assist the site visit team in restoring the site to its original condition. The coordinates will be documented to show the exact location of the sampling points in the SI Report.

4.2.2 SURFACE WATER SAMPLES

As discussed during the TPP meeting on April 7, 2011, two surface water samples will be collected from the areas shown on Figures 3.1 and 3.2. At least one ambient sample will be collected from a surface water source within the MRS in an area where there is no evidence of munitions debris or DoD-use and upgradient from areas where there is evidence of DoD-use or munitions debris. The surface water samples will be grab samples collected using the procedure described in Subchapter 5.4.2 of the PFSP. Downstream samples will be collected first to minimize disturbance of sediment. At locations where both surface water and sediment samples will be collected, the surface water samples should be collected before sediment samples. Specific steps for sample collection can be found in Subchapter 5.4.2 of the PFSP.

4.2.3 SEDIMENT SAMPLES

As determined during the TPP meeting on April 7, 2011, biased and ambient sediment grab samples will be collected at the same locations as the surface water samples. The sediment samples will be collected using the procedure described in Subchapter 5.1.3 of the PFSP. Background or ambient samples will be collected first to minimize the potential for cross-contamination. Thereafter, the most downstream sediment samples will be collected followed by the next upstream samples. If surface water samples are to be collected at the same location, they should be collected before the sediment samples. Please see Subchapter 5.1.3 of the PFSP for a description of the sampling procedure.

4.2.4 GROUNDWATER SAMPLES

Per TPP Team concurrence, groundwater samples are only proposed if appropriate sources can be identified. Currently, there are no known groundwater wells within MRS04. If conducted, groundwater sampling will be performed using the procedure outlined in Subchapter 5.3 of the PFSP.

4.2.5 SAMPLE CONTAINERS

Samples will be collected in the appropriate sample containers and using the preservative as listed in Table 4.1. The cap shall be secured tightly and the container clearly labeled as identified in Table 4.2. The sample containers will be placed on ice as soon as the field team reaches their vehicle. The sample handling and packaging procedures presented in Chapter 7 of the PSAP will be followed for all sample containers.

4.2.6 QUALITY CONTROL/QUALITY ASSURANCE SAMPLES

For this SI, QC samples will be collected at the required frequency as specified in the PSAP, if samples are collected. Field duplicate samples will be collected at a frequency of 10 percent per matrix (one in ten samples) and matrix spike/matrix spike duplicate (MS/MSD) samples will be collected at a frequency of 5 percent per matrix (one pair in twenty samples). The QC samples will be collected in accordance with the procedures identified in Subchapters 5.6 of the PFSP. The sample identifications for the QC samples are included in Table 4.2. The QC

samples will be analyzed for the same parameters as the parent sample and will be collected simultaneously with the parent sample. The samples will be placed on ice as soon as possible until they are delivered to the laboratory. Equipment blanks will not be collected during this SI since disposable sampling equipment will be used for sample collection. Temperature blank will be included with each cooler sent to the laboratories. ***Quality assurance (QA) split samples will not be collected at the direction of the Design Center Program Manager (DC PM).***

4.2.7 SAMPLE SHIPMENT

The samples will be packaged and shipped in accordance with the procedures presented in Chapter 7 of the PFSP. The laboratory for this SI effort is Agricultural and Priority Pollutant Laboratories, Inc. (APPL). Point of contact is Ms. Diane Anderson. Ms. Anderson's email address is danderson@applinc.com.

The laboratory address for the field samples is:

APPL, Inc.
908 North Temperance Avenue
Clovis, CA 93611

(APPL accepts Saturday deliveries via Federal Express only.)

4.3 INVESTIGATIVE DERIVED WASTE

The site visit team will use disposable sampling equipment for the surface soil samples. Therefore, no IDW is anticipated to be generated with the exception of used gloves, paper, tape, etc. This IDW will be collected in trash bags and disposed of in a waste receptacle.

4.4 NON-MEASUREMENT DATA

Non-measurement data will be collected for the FUDS using the information found in the INPR, Revised INPR, and ASR. This initial information collected has been incorporated in the SS-WP Addendum. This site information will be supplemented using research via internet searches, requests from agency contacts (e.g., SHPO, U.S. Fish and Wildlife Service [USFWS]), and site contacts, if applicable. Non-measurement data will include information relating to geology, climate, hydrogeology, federally and state-listed T&E species known to be or potentially on-site, sensitive habitats, wetlands, cultural and archeological resources, water resources, trees and shrubs, waste disposal sites, and impact mitigation measures.

Further data collection will be conducted to fulfill the contract requirements to complete the MRSPP scoring sheets and to collect the pertinent MC-related HRS scoring information. The primary information needed to complete the MRSPP scoring, such as hazard type (i.e. explosive or chemical) and accessibility, will come from historical site documents (e.g., INPR, Revised INPR, and ASR) and field observations. To further supplement current on- and off-site information needed for receptor scoring, additional data collection may be conducted to fulfill the contract requirements to complete the MRSPP scoring sheets and to collect the MC-related HRS scoring information. Additional data will include information regarding current on- and off-site activities/structures, population density, CERCLA sites, Resource Conservation and Recovery Act (RCRA) sites, well locations, and water supply information. Once the sampling has been completed and samples analyzed, the sample data will be used to score the health hazard evaluation of the MRSPP.

4.5 MUNITIONS CONSTITUENTS ANALYSIS

The list of MC for which the samples will be analyzed was derived based on the MEC known or suspected to have been used at the MRS04 Fore Knobs/Bear Rocks Firing Range. Each of the munitions was broken down by case/cartridge and filler composition and those constituents were included in the analysis list. Tables 2.1 and 2.2 present the potential MEC for the site as well as the fillers and case composition. These are further broken down into specific explosives and metals that would be indicative of the fillers. Table 2.2 was used to develop the analyte list for samples collected from the MRS.

The potential MC list has been used as a guide for developing a list of MC specific for each SI project. Varying quantities of the listed MC are found in munitions depending upon the type of munitions of interest. The analysis will focus on the major MC that are likely found in higher amounts of the complete munitions and those potentially hazardous MC that may remain on-site at concentrations that may be hazardous to human health and the environment. Because USACE cannot respond to non-CERCLA hazardous substances under the FUDS program, the MC analytes selected are typically limited to CERCLA-hazardous substances. In addition, some major MC are the same as common materials found in the environment in high quantities (such as magnesium, potassium, manganese, iron, and others depending on the type of native soils and waters).

Some of these MC also are key nutrients for humans, flora, and fauna and are not expected to pose a risk to those potential receptors. These factors were evaluated during selection of the key target MC for the project. There are occasions when the selection of the metals will deviate from this process, typically during the TPP and SS-WP stages to address local and/or state regulatory concerns.

The biased samples collected at former firing points and target areas from the MRS will be analyzed for the full list of explosives as presented in the PSAP and in Table 4.3. The metals analyses for all samples include aluminum, copper, lead, and zinc due to their presence in the ordnance associated with the MRS. In addition, pH of soil samples will be measured.

If unanticipated munitions are found on-site, the UXO technician will identify the munitions and alert the FTL (or his designee). The FTL will contact the project manager, who along with the project chemist will determine if additional laboratory analysis will be required for any additional metal constituents. Any additional metal analysis will be identified on the chain-of-custody.

4.6 ANALYTICAL METHODS

All samples will be analyzed in accordance with the procedures presented in the PSAP Addendum. Table 4.3 lists the appropriate analysis for each constituent.

4.7 DATA QUALITY OBJECTIVES

The DQOs have been developed for the MRS in accordance with the process presented in Chapter 3, paragraph 3.1.2 of the PWP and are provided as part of the Final TPP Memorandum documentation (see Appendix A of this SS-WP Addendum). The screening values as agreed upon by the TPP Team are presented in Table 4.4.

The following process will be used to evaluate the surface soil analytical results. Each analyte will be evaluated to verify that it is a potential MC for the site (i.e. in the munitions known or suspected for the site). Only those analytes that are detected at the site and are

potential MC will be retained for consideration in the Screening Level Risk Assessment (SLRA).

The soil screening values for human health at the MRS, as shown in Table 4.4, consist of WV Risk-Based Concentrations (RBCs) Table 60-3B supplemented with USEPA Regional Screening Levels. The Ecological Screening Values (ESVs) for surface soil at the MRS consist of USEPA Ecological Soil Screening Levels (EcoSSLs). In absence of EcoSSLs, values obtained from the Los Alamos National Laboratory (LANL), EcoRisk Database, and USEPA Region 3 Ecological Screening Levels were used. The site visit team will not collect “background” samples but rather “ambient” samples in order to provide separation from the statistical-based and baseline risk assessment connotation. For MRS04, one surface soil location was selected at a location determined to be in the least likely MEC or MC-contaminated area and therefore potentially provide ambient condition data concerning metals concentrations at the site. The ambient soil location was chosen based upon available information regarding the location of former firing points and target locations obtained from historical aerial photo reviews. In addition, the ambient sample location was selected based upon the location of MEC finds and was placed upgradient of these areas. The ambient sample data will be used for comparison to the biased samples for use in the MRSPP scoring. As previously discussed, only those analytes that are detected in concentrations above the ambient levels at the MRS and are potential MC will be retained for consideration in the SLRA.

Values detected in the range between the Method Detection Limits (MDL) and the Practical Quantitation Limit (PQL) will be reported as “estimated” concentrations and will be used for risk screening evaluations. Any U-flagged value is treated as “not detected,” and is assumed to not be present in the sample. In some cases, the PQL is greater than the screening value. This is common in some analyses due to sample preparation and analytical limitations. This could lead to a situation where the analyte is present at a concentration greater than the screening value, but is reported as "not detected or estimated" leading to an underestimate of risk. However, such occasions are expected to be rare and are not likely to drive the recommendation for the SI.

TABLE 4.1
Sample Containers, Preservatives, and Holding Times
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knobs/Bear Rocks Firing Range

Analysis	Sample Matrix	Sample Container			Preservative	Holding Time
		No.	Size	Type		
Explosives	Soil/Sediment	1	4 oz	Wide-mouth glass w/ Teflon-lined cap	Cool to 4° C	14/40 days ⁽¹⁾
Metals	Soil/Sediment	1	4 oz	Wide-mouth glass w/ Teflon-lined cap	Cool to 4° C	180 days
pH	Soil	1	4 oz	Wide-mouth glass w/ Teflon-lined cap	Cool to 4° C	ASAP
Explosives	Water	2	1 L	Amber bottle	Cool to 4° C	7/40 days ⁽¹⁾
Metals	Water	1	500 ml	Plastic bottle	pH<2, HNO ₃ , Cool to 4° C	180 days

(1) Number of days between sample collection and extraction/number of days between extraction and analysis.

TABLE 4.2
Quality Control Samples
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 - Fore Knobs/Bear Rocks Firing Ranges

Sample ID	Medium	Analysis ⁽¹⁾	Quality Control Samples		
			Field Duplicate	Matrix Spike	Matrix Spike Duplicate
WVMA-MRS04-SS-02-01	Soil	Explosives, Selected metals, pH	X	X	X
WVMA-MRS04-SS-02-02	Soil	Explosives, Selected metals, pH			
WVMA-MRS04-SS-02-03	Soil	Explosives, Selected metals, pH			
WVMA-MRS04-SS-02-04	Soil	Explosives, Selected metals, pH			
WVMA-MRS04-SS-02-05	Soil	Explosives, Selected metals, pH			
WVMA-MRS04-AMB-SS-02-06	Soil	Explosives, Selected metals, pH			
WVMA-MRS04-SS-02-07	Soil	Explosives, Selected metals, pH			
WVMA-MRS04-SS-02-08	Soil	Explosives, Selected metals, pH			
WVMA-MRS04-SW-01	Surface Water	Explosives, Selected metals	X	X	X
WVMA-MRS04-SW-02	Surface Water	Explosives, Selected metals			
WVMA-MRS04-AMB-SW-03	Surface Water	Explosives, Selected metals			
WVMA-MRS04-SD-01	Sediment	Explosives, Selected metals	X	X	X
WVMA-MRS04-SD-02	Sediment	Explosives, Selected metals			
WVMA-MRS04-AMB-SD-03	Sediment	Explosives, Selected metals			

(1) Selected metals include: aluminum, copper, lead, and zinc

TABLE 4.3
List of Target Analytes
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knobs/Bear Rocks Firing Ranges

Analyte	Abbreviation	CAS Number	Method
<i>Explosives</i>			
1,3,5-trinitrobenzene	1,3,5-TNB	99-35-4	8330B
1,3-dinitrobenzene	1,3-DNB	99-65-0	8330B
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	8330B
2,4-Dinitrotoluene	2,4-DNT	121-14-2	8330B
2,6-Dinitrotoluene	2,6-DNT	606-20-2	8330B
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	8330B
2-Nitrotoluene	2-NT	88-72-2	8330B
3-Nitrotoluene	3-NT	99-08-1	8330B
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	8330B
4-Nitrotoluene	4-NT	99-99-0	8330B
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	8330B
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	8330B
Nitrobenzene	NB	98-95-3	8330B
Nitroglycerin	NG	55-63-0	8330B
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	8330B
Pentaerythritol tetranitrate	PETN	78-11-5	8330B
<i>Selected metals</i>			
Aluminum	Al	7429-90-5	6010B
Copper	Cu	7440-50-8	6010B
Lead	Pb	7439-92-1	6010B
Zinc	Zn	7440-66-6	6010B
<i>Miscellaneous</i>			
pH			9045D

Note: The extraction method for explosives in soil/sediment is SW8330B and waters is SW3535.

CHAPTER 5: ENVIRONMENTAL PROTECTION PLAN

5.1 INTRODUCTION

This Environmental Protection Plan (EPP) has been prepared for the WVMA Fore Knobs/Bear Rocks Firing Range SI in accordance with Statement of Work (SOW) for this contract task order. Procedures for avoiding, minimizing, and mitigating potential impacts to biological and cultural resources during site field activities are described below. Chapter 7 of the PWP contains extensive general procedures that will be adhered to by the site visit team.

The following sources were consulted for identifying biological and cultural resources at the MRS04 Fore Knobs/Bear Rocks Firing Range site:

- USGS – topographic map (USGS 1984)
- U. S. Fish and Wildlife Service, America’s National Wildlife Refuge System, (www.fws.gov, Canaan Valley National Wildlife Refuge, September 28, 2007)
- Wildlife Resource Section, Eagles of West Virginia, Wildlife Diversity Program, Elkins WV, Publication 10V 4/06, April 2006
- West Virginia Division of Natural Resources, Wildlife Diversity Program, June 2011
- West Virginia Department of Natural Resources, Elkins, WV
- U.S. Fish and Wildlife Service, Elkins, WV
- USFWS, National Wetlands Inventory – Wetlands Mapper (USFWS 2011c)
- USFWS, Critical Habitat Portal and Mapper Database (USFWS 2011a)
- U.S. Forest Service. List of National Forests and Grasslands (U.S Forest Service 2011)
- National Park Service. List of National Parks by State (National Park Service 2011a)
- National Historic Landmarks Program (National Park Service 2011b)
- National Heritage Areas Program. List of National Heritage Areas (National Park Service 2011c)
- National Register of Historic Places (National Park Service 2011d)

5.2 THREATENED AND ENDANGERED SPECIES

According to the USFWS T&E Species System database, the State of West Virginia supports 17 federally listed T&E species consisting of 11 animals and 6 plants (USFWS 2011b). The USFWS Elkins, WV Office indicates there are 17 Threatened and/or Endangered species occurring in the Allegheny Mountains including: running buffalo clover (*Trifolium stoloniferum*), shale barren rock cress (*Arabis serotina*), small whorled pogonia (*Isotria medeoloides*), northeastern bulrush (*Scirpus ancistrochaetus*), Harperella (*Ptilimnium nodosum*), Virginia Spiraea (*Spiraea virginiana*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), Indiana bat (*Myotis sodalis*), Gray bat (*Myotis grisescens*), Clubshell (*Pleurobema clava*), Fanshell (*Cyprogenia stegaria*), Pink mucket (*Lampsilis abrupta*), Northern riffleshell

(*Epioblasma torulosa rangiana*), Cheat Mountain salamander (*Plethodon netting*), flat-spined three-toothed snail (*Triodopsis platysayoides*), James spinymussel (*Pleurobema collina*), and the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*). Federally-threatened species include the bald eagle (*Haliaeetus leucocephalus*) and the Cheat Mountain salamander (*Plethodon nettingi*). Globally rare and imperiled species include an isopod (*Caecidotea sinuncus*), tall larkspur (*Delphinium exaltatum*), eastern small-footed bat (*Myotis leibii*), Allegheny woodrat (*Neotoma magister*), Timber Ridge cave beetle (*Pseudanophthalmus hadenoecus*), and the South Branch Valley cave millipede (*Pseudotremia princeps*). Two other endangered species, the gray wolf (*Canis lupus*) and the eastern cougar (*Puma concolor cougar*), are believed to be extirpated from the region during the late 1800s or early 1900s (USDA 2006). In addition to the species identified above, the West Virginia Wildlife Diversity Program lists 397 endangered, threatened, or rare plant species and 491 rare, threatened, or endangered animal species occurring in West Virginia (WVDNR 2011). The federally listed T&E species are detailed in Table 5.1.

Bald Eagle nests have been located in the Potomac River drainage in Grant, Hampshire, Hardy, Jefferson, Mineral, and Pendleton counties (West Virginia Department of Natural Resources (WVDNR 2006). The South Branch Valley cave millipede occurs in surface and cave locals and has been found in only six sites in Pendleton County (Lewis 2001a). The Timber Ridge cave beetle is an extremely rare ground beetle that has been reported from a single cave in Pendleton County (Lewis 2001b). West of the Otter Creek Wilderness area, and within the MNF, is a federally designated critical habitat and hibernacula for the endangered Virginia big-eared bat. The Cheat Mountain salamanders, according to Marshall University Herpetology Lab, are “endemic to West Virginia and typically inhabit red spruce and yellow birch forests in higher elevations of Grant, Pendleton, Pocahontas, Randolph, and Tucker counties (Marshall University 2002).”

The area of the former MRS04 Fore Knobs/Bear Rocks Firing Range consists of national forest land, the Bear Rocks Preserve, and farmland with residences. Based upon information provided in the PA, the MRS is considered suitable habitat for the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) and the Cheat Mountain salamander (*Plethodon netting*).

There are no federally designated critical habitats located within the MRS04 Fore Knobs/Bear Rocks site (USFWS 2011).

Because there are no known caves or karst areas within the MRS, the species of bats and cave inhabiting animals listed above are not likely to be encountered on the site. However, portions of the site are considered suitable habitat for the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*) and the Cheat Mountain salamander (*Plethodon netting*). The Flat-spined three-toothed snail is found only in the Cheat River gorge located approximately 36 miles northwest of the site and is not anticipated to be encountered. The remaining animal species listed are found in larger river systems and are not anticipated to inhabit the area of the Fore Knobs/Bear Rocks Firing Range.

No additional information on the occurrence of T&E species or natural communities is known at this time. Due to the non-intrusive nature of the SI field effort, no federally listed T&E species are anticipated to be impacted by the SI field effort.

The PM and FTL will ensure that the site visit team is versed in identifying and avoiding any sensitive species and will provide species awareness training in the daily tailgate safety meetings. If any T&E species are observed, care will be taken to not disturb them or their

immediate habitat. The site visit team will record the GPS location if a member of a listed species is observed.

5.3 SENSITIVE ENVIRONMENTS

The MRS04 Fore Knobs/Bear Rocks Firing Range property is not within a national wildlife refuge, national park, state, or county park (USFWS 2011d, National Park Service 2011a, U.S. Forest Service 2011). A major portion of the property is within the Monongahela National Forest and the property also includes the 477-acre Bear Rocks Preserve. However, sensitive environments are not anticipated to be impacted by the SI effort and will be avoided if possible. The site visit team will be well-versed in identifying and avoiding ecologically sensitive areas, and if any are observed, care will be taken to not disturb them. The FTL will provide this sensitive environments awareness training during the daily tailgate safety meetings.

According to the current data in the USFWS Critical Habitat Portal database and mapper, there are no critical habitats identified within the boundaries of the MRS.

5.4 WETLANDS

The USFWS Wetlands Mapper, through the National Wetlands Inventory, was used to search for designated wetlands within the former Fore Knobs/Bear Rocks Firing Range MRS (USFWS 2011c). Wetlands are land areas that are transitional between terrestrial and deep-water habitats in which the water table is usually at or near the surface or in which the land is covered by shallow water. As described above, there are several wetlands on the site located in the area of the Stoney River Reservoir near the northwest corner of the MRS. The wetlands consist of lake, forest/shrub, and freshwater emergent types (Figure 5.2).

The Wetlands Mapper is used primarily for planning and does not accurately indicate jurisdictional limits of wetlands that are Waters of the United States. Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies.

Other wetlands not identified by the Wetland Mapper may be on the site. If additional wetlands are within the sampling area, they will be avoided if possible. However, the shallow sampling method and QR track planned will not have negative permanent impacts to any wetland nor warrant mitigation. Formal wetland delineation will not be performed by the site visit team.

5.5 CULTURAL AND ARCHEOLOGICAL RESOURCES

According to the national register databases, the MRS04 Fore Knobs/Bear Rocks Firing Range is not in a National Heritage Area, nor does it contain a National Historic Landmark (National Park Service 2011b-c). According to the National Register of Historic Districts and the National Register of Historic Places, there are no recorded cultural/archaeological sites located within the site (National Park Service 2011d). The MRS does not contain any sites identified in the West Virginia Historical Marker Program (WVDCH 2011b).

A request for a site review regarding potential cultural and archaeological resources within the MRS04 Fore Knobs/Bear Rocks Firing Range was submitted to the West Virginia Division of Culture and History. According to the West Virginia Division of Culture and History, there are no archaeological resources within the MRS04 Fore Knobs/Bear Rocks Firing Range that are eligible for or listed in the National Register of Historic Places that would be affected by the SI field effort (WVDCH 2011a).

There is a potential for unknown archeological and/or cultural resources within the MRS04 Fore Knobs/Bear Rocks Firing Range, however, care will be taken during sampling to avoid any possible historic items that may be present at the site. If an archeological remnant is discovered or suspected during the SI effort, soil sampling will cease in that area. The location of any archeologically significant items found by the site visit team will be noted in the field log; however, these items will not be flagged. Additionally, the GPS coordinates of the item will be recorded and the site owners will be notified. The GPS coordinates will not be included in the SI Report since this is considered sensitive information for a public document. Photographs of any archeological or cultural items found may be included in the SI Report. Archeological and cultural resources are not anticipated to be impacted by the SI field effort.

5.6 WATER RESOURCES

The MRS04 Fore Knobs/Bear Rocks Firing Range is located in the Potomac River Watershed. The Potomac River watershed spans nearly 14,670 square miles. Land cover in the watershed primarily consists of agriculture and forested land with some minor developed areas. This watershed encompasses lakes, ponds and swamp habitats interspersed with numerous creeks and small rivers draining to the northeast and then to the southeast (USGS 1984). The natural hydrology of the watershed has been altered by water control structures consisting of dams, drainage ditches, and locks.

Big Star Run and its tributaries are located within ¼ mile north, east, and south of Bear Rocks. Big Star Run is a tributary of South Fork Lunice Creek, which is a tributary of the South Branch Potomac River that drains into the Chesapeake Bay. To the west of the preserve, water flows into Dolly Sods from Red Creek. There are no surface water intakes in use within the immediate downstream surface water pathway(s) surrounding the Bear Rocks Preserve.

Lunice Creek (WV Stream segment WVPSP-26_00) is categorized by WVDEP as a category 4A, which means the stream is impaired or threatened for one or more designated uses and TMDL has been completed. Big Star Run (WV Stream Code WVPSP-26-D-2_00) was categorized 4A in 2008 but is not included on the 2010 303(d) list. West Virginia's 2008 Fish Consumption Advisory did not include Big Star Run or Lunice Creek as having areas of concern (WVDHHR 2010).

There are two USFS groundwater wells within the Dolly Sods Wilderness Area portion of the WVMA: one in the Red Creek Campground and one at the Red Creek Wildlife Cabin. These wells serve visitors to the area. The annual visitation to the Dolly Sods Wilderness area is estimated at 45,000 to 75,000 per year; however, there is no estimate of the population which utilizes these two hand-pumped wells. The Red Creek Campground well is east of and within two miles of the Blackbird Knob impact area, south and within three miles of the Bear Rocks impact area, and south and within four miles of the Stack Rocks impact area. The well at the Red Creek Wildlife Cabin is outside the four-mile radius of any impact area (Figure 5.1).

Ms. Frances Phares, Grant County Health Department, stated that no residential wells were registered prior to 1985. The county's registered wells are by year, and not by location, so a search of their records would be very labor intensive, and was not performed for the PA. Where no information could be provided regarding residences that were on private water versus public water as provided by the Grant County PSD, the assumption was made that the residences shown in the Jordan Run area (within the four-mile radius from the Bear Rocks and Stack Rocks Impact Areas) used a groundwater well for their water supply. The residences in the Jordan Run area include the Wilderness Retreat at Dolly Sods development. Although it is assumed that these residences utilize a groundwater well, Ms. Phares could not locate any well permits to verify this assumption. According to Ms. Phares, the majority of Grant County obtains water from the Petersburg PSD using the Potomac River as a source.

A review of the West Virginia Department of Health and Human Resources online permits archive database indicated only one water well permit was issued in Grant County. The permit was issued for construction of a water well at K & A Campgrounds near Mount Storm. No other water well permits were listed in the database (WVDHHR 2011).

During the SI effort, the site visit team will not conduct any activities that discharge pollutants into waterways or water bodies within, adjacent to, or outside of the former training areas.

5.7 COASTAL ZONES

This site is not located in a Coastal Zone as defined by the National Oceanic Atmospheric Administration Coastal Zone Management Program (NOAA 2011).

5.8 TREES AND SHRUBS

Protection of trees and shrubs is covered in the PWP. There are no site-specific changes to the tree and shrub policy for the MRS04 Fore Knobs/Bear Rocks Firing Range. Neither cutting nor pruning of trees and shrubs is anticipated to be necessary. In order for the samples to be collected from native soil, ground cover will be removed prior to soil sample collection, unless it is an identifiable T&E plant species.

5.9 WASTE DISPOSAL SITES

There are no known waste disposal sites within the project area. There are no site-specific changes from the PWP policies at the MRS. Disposable sampling equipment and other garbage generated will be collected and disposed of off-site as municipal waste.

Waste disposal policies are covered in the PWP. In general, excess soil generated during sampling will be returned to the original sampling location and the area will be restored as near as possible to the pre-sampling condition. Disposable sampling equipment and other garbage generated will be collected and disposed offsite.

5.10 IMPACT MITIGATION MEASURES

Impact mitigation measures are outlined in the PWP. There are no site-specific mitigation measures for the MRS04 Fore Knobs/Bear Rocks Firing Range site.

5.11 SUMMARY

Based on the above information and a review of the Army Checklist for Important Ecological Places (Department of the Army 2006), the MRS04 Fore Knobs Firing Range is considered to be an important ecological place due to the presence of possible T&E species and an established nature preserve (Bear Rocks Preserve). The determinations regarding important ecological places pertain to whether or not ecological receptors are considered to be present at the site (Subchapter 4.7.2). Sensitive environments, if encountered, are not anticipated to be impacted by the SI effort. The QR and SI field efforts will be performed so as to minimize any intrusion in sensitive areas. A Screening Level Ecological Risk Assessment (SLERA) will be conducted if there is an observed release of potential MC. The SI Report will document and assess any new sensitive environments or T&E species information gathered during the site visit.

TABLE 5.1
Threatened and Endangered Species
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knob/Bear Rocks Firing Range

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
Running Buffalo Clover 	<i>Trifolium stoloniferum</i>	Endangered	Most frequently found in habitats with filtered sunlight that have had some kind of recent disturbance, including jeep trails, old logging roads, skid roads, and wooded thickets.	Yes
Shale Barren Rock Cress 	<i>Arabis serotina</i>	Endangered	A shale barren has soil which contains many hard, small shale fragments. The hillsides typically face the south or the east, so they get very hot during summer days. Shale barrens occur on Devonian-aged shale exclusively in the Valley and Ridge Geographic Province of the Allegheny Mountains.	No
Small Whorled Pogonia 	<i>Isotria medeoloides</i>	Threatened	Small whorled pogonia often emerges from 2-3 inches of deciduous leaf litter, and at most sites, the plants can be found growing with large whorled pogonia orchids and Indian cucumber root plants. Only two sites discovered to date in West Virginia.	No
Northeastern Bulrush 	<i>Scirpus ancistrochaetus</i>	Endangered	Grows in or at the edge of ponds and other small expanses of standing water whose levels fluctuate through the year. In West Virginia the species grows in four small sinkhole ponds on two private property locations in Berkeley County, and in a sinkhole pond in Hardy County.	No
Harperella 	<i>Ptilimnium nodosum</i>	Endangered	Grows in wet soil near a body of water and can survive periodic, moderate flooding. In West Virginia Harperella grows in rocky or gravelly beds along three clear, swiftly-flowing streams, namely, Sleepy Creek and the Cacapon and Potomac rivers in Morgan County.	No
Virginia Spiraea 	<i>Spiraea virginiana</i>	Threatened	Rocky, flood scoured banks of high-energy (high gradient) streams or rivers.	Yes

TABLE 5.1 (CONT')
Threatened and Endangered Species
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knob/Bear Rocks Firing Range

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p align="center">Clubshell</p> 	<p align="center"><i>Pleurobema clava</i></p>	<p align="center">Endangered</p>	<p>Freshwater mussels live in a variety of substrates including sand, gravel, cobble and mixed materials on the bottoms of streams and rivers. They generally require free-flowing, clean, well-oxygenated water. The Clubshell lives in a variety of environments ranging from large rivers to shallow streams.</p>	<p align="center">No</p>
<p align="center">Fanshell</p> 	<p align="center"><i>Cyprogenia stegaria</i></p>	<p align="center">Endangered</p>	<p>Freshwater mussels live in a variety of substrates including sand, gravel, cobble and mixed materials on the bottoms of streams and rivers. They generally require free-flowing, clean, well-oxygenated water. The fanshell lives in the sediments beneath large rivers.</p>	<p align="center">No</p>
<p align="center">Pink Mucket</p> 	<p align="center"><i>Lampsilis abrupt</i></p>	<p align="center">Endangered</p>	<p>Freshwater mussels live in a variety of substrates including sand, gravel, cobble and mixed materials on the bottoms of streams and rivers. They generally require free-flowing, clean, well-oxygenated water. The Pink Mucket mussel lives in the sediments beneath large rivers.</p>	<p align="center">No</p>
<p align="center">Northern Riffleshell</p> 	<p align="center"><i>Epioblasma torulosa rangiana</i></p>	<p align="center">Endangered</p>	<p>Freshwater mussels live in a variety of substrates including sand, gravel, cobble and mixed materials on the bottoms of streams and rivers. They generally require free-flowing, clean, well-oxygenated water. The Northern Riffleshell is found in swift flowing riffles and runs of smaller streams.</p>	<p align="center">Yes</p>
<p align="center">Cheat Mountain Salamander</p> 	<p align="center"><i>Plethodon netting</i></p>	<p align="center">Threatened</p>	<p>Red spruce forrest but many were cut down, populations today occur in mixed deciduous forests. Typically, this species is found in cool, moist red spruce forests with a ground cover and an abundance of leaf litter, fallen logs, and sticks.</p>	<p align="center">Yes</p>
<p align="center">James Spiny mussel</p> 	<p align="center"><i>Pleurobema collina</i></p>	<p align="center">Endangered</p>	<p>Freshwater mussels live in a variety of substrates including sand, gravel, cobble and mixed materials on the bottoms of streams and rivers. They generally require free-flowing, clean, well-oxygenated water. The James Spiny mussel is found in a variety of environments from large rivers to shallow streams.</p>	<p align="center">Yes</p>

TABLE 5.1 (CONT')
Threatened and Endangered Species
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knob/Bear Rocks Firing Range

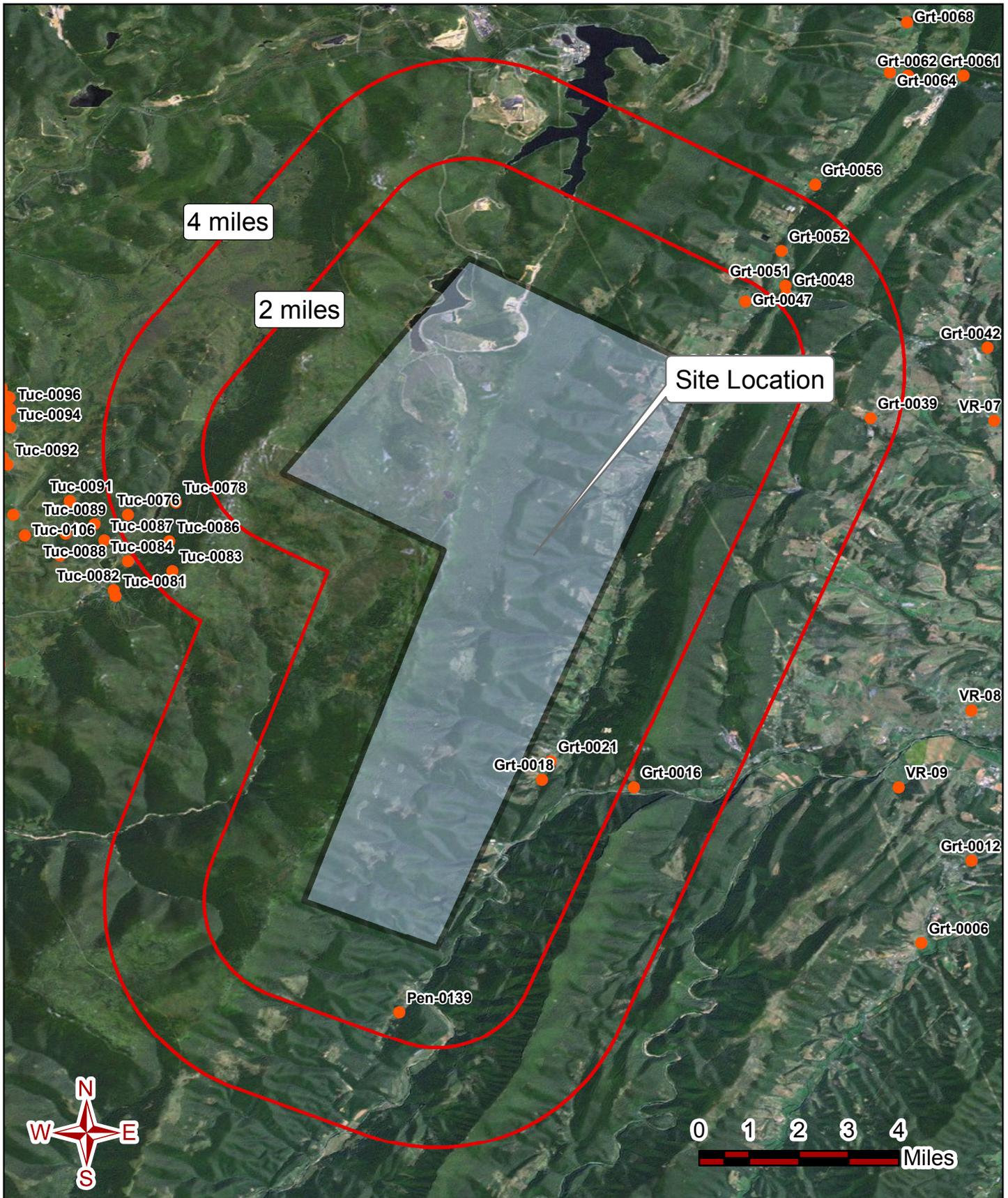
Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p align="center">Bald Eagle</p> 	<p align="center"><i>Haliaeetus leucocephalus</i></p>	<p align="center">Threatened</p>	<p>Usually nest in large trees near large streams or lakes. Its migration routes follow river systems or mountain ranges which run in a general north-south direction. Except during migration, bald eagles are seldom found far from water.</p>	<p align="center">No</p>
<p align="center">Allegheny Woodrat</p> 	<p align="center"><i>Neotoma magister</i></p>	<p align="center">Species of concern</p>	<p>Mountain cliffs, caves, Mines, and tunnels. In West Virginia, woodrats are found on ridges but also on side slopes in caves and talus fields. The surrounding forest is usually deciduous.</p>	<p align="center">No</p>
<p align="center">Virginia Big eared Bat</p> 	<p align="center"><i>Corynorhinus townsendii virginianus</i></p>	<p align="center">Endangered</p>	<p>Precise conditions of physical structure, temperature, and humidity, these caves are suitable for use by the species as sites for hibernation and reproduction. The species are highly susceptible to changes in its habitat. Even minor disturbance or physical changes in the caves occupied may result in extinction.</p>	
<p align="center">Indiana Bat</p> 	<p align="center"><i>Myotis Sodalis</i></p>	<p align="center">Endangered</p>	<p>Indiana bats live in hardwood forests and hardwood-pine forests. It is common old-growth forest as well as agricultural land like croplands and old fields. Overall, the bats mostly live in forest, crop fields, and grasslands.</p>	
<p align="center">Grey Bat</p> 	<p align="center"><i>Myotis grisescens</i></p>	<p align="center">Endangered</p>	<p>With rare exceptions, gray bats live in caves year-round. During the winter gray bats hibernate in deep, vertical caves. In the summer, they roost in caves which are scattered along rivers. These caves are in limestone karst areas of the southeastern United States. They do not use houses or barns.</p>	
<p align="center">Flat Spined Three Toothed Snail</p> 	<p align="center"><i>Triodopsis platysayoides</i></p>	<p align="center">Threatened</p>	<p>The snail lives in cracks and crevices in rocks, and in the surrounding leaf litter. In dry seasons the snails retreat in among the huge, scattered and split boulders just below the summit. They can be found in cool, moist, deep fissures in shale, sandstone and limestone outcrops, and in talus. The snail occurs in various outcrops of rock from the bottom of the gorge to the ridgetops.</p>	

TABLE 5.1 (CONT')
Threatened and Endangered Species
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knob/Bear Rocks Firing Range

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p align="center">Flying Squirrel</p> 	<p align="center"><i>Glaucomys sabrinus fuscus</i></p>	<p align="center">Threatened</p>	<p>Pine and hardwood trees provide suitable foraging and nesting habitat for flying squirrels. Combinations of adults and juveniles may share a single nest, or as maternity sites. Nests are lined with shredded bark, moss, lichens, leaves, and feathers.</p>	
<p align="center">Isopod</p> 	<p align="center"><i>Caecidotea sinuncus</i></p>	<p align="center">Not Listed</p>	<p>Found in most marine environments, mostly on the sea floor. Found in fresh water; and also found in woodlice areas in the suborder Oniscidea, which are most successful group of terrestrial crustaceans.</p>	
<p align="center">Tall Larkspur</p> 	<p align="center"><i>Delphinium exaltatum</i></p>	<p align="center">Endangered</p>	<p>Tall larkspur likes rich soils and regular water, and is tolerant of full sun or partial shade.</p>	
<p align="center">Eastern Small-Footed Bat</p> 	<p align="center"><i>Myotis Lebii</i></p>	<p align="center">Endangered and threatened</p>	<p>Because of their apparent Rarity and small size, radio-tagging studies of this species have been limited, so very little summer roost have been found under rocks on hillsides and open ridges, in cracks and crevices in rocky outcrops and talus slopes, beneath the bark of dead and dying trees. Inbuilding and in bridge expansions joints</p>	
<p align="center">Timber Ridge Cave Beetle</p> 	<p align="center"><i>Pseudoanopthalmus hadenoecus</i></p>	<p align="center">Endangered threatened and sensitive species</p>	<p>Known as troglobite and will be found only in caves. The species were found beneath small stones embedded in silt at the edge of the cave stream.</p>	
<p align="center">South Branch Valley Cave Millipede</p> 	<p align="center"><i>Pseudotremia princeps</i></p>	<p align="center">Threatened</p>	<p>Although there are no specific references to the habitats from which it was collected, it is to be expected in leaf litter or organic debris.</p>	

TABLE 5.1 (CONT')
Threatened and Endangered Species
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knob/Bear Rocks Firing Range

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p style="text-align: center;">Grey Wolf</p> 	<i>Canus lupus</i>	Endangered	Ranges in all northern habitats where there is suitable food. Densities being highest where prey biomass is highest. Food is extremely variable, but the majority comprises large ungulates. Wolves will also eat small prey items, livestock, carrion, and garbage.	
<p style="text-align: center;">Eastern Cougar</p> 	<i>Puma concolor cougar</i>	Endangered	The Eastern Cougar was found in a variety of habitats, including tidal marshes, deserts, mountainous terrain and deciduous, coniferous and tropical forests.	



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Water Wells within 4-Mile Buffer

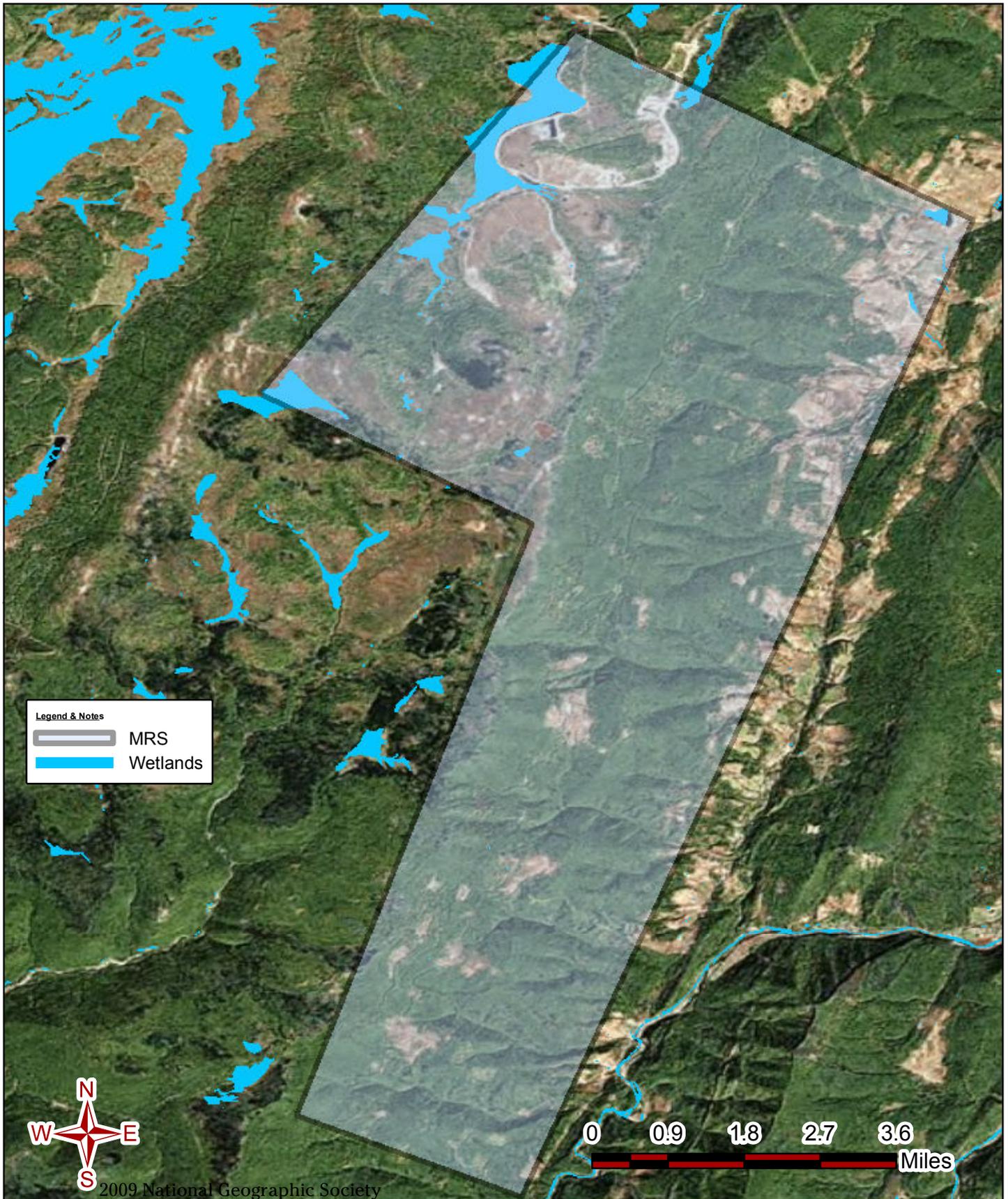
MRS04 - Fore Knobs / Bear Rocks Firing Ranges
 MMRP West Virginia

Project No. Eco-11-452

September 2011

FIGURE

5.1



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Wetlands Map
 MRS04 - Fore Knobs / Bear Rocks Firing Ranges
 MMRP West Virginia

Project No. Eco-11-452 September 2011

FIGURE
5.2

CHAPTER 6

**SITE-SPECIFIC ADDENDUM TO THE
PROGRAMMATIC ACCIDENT PREVENTION PLAN**

and

**PROGRAMMATIC WORK PLAN
SOUTHEAST AND PACIFIC IMA REGION
MILITARY MUNITIONS RESPONSE PROGRAM**

For:

**WVMA FORE KNOBS/BEAR ROCKS FIRING RANGE
GRANT COUNTY, WEST VIRGINIA**

Prepared for:

U.S. ARMY CORPS OF ENGINEERS, HUNTINGTON DISTRICT

and

U.S. ARMY ENGINEERING AND SUPPORT CENTER HUNTSVILLE

**Contract W912PP-11-C-0007, Task Order 0001
September 2011**

Eco Program Manager:

<u>Mohammad Esitiri, PD</u> Please Print	 Signature	<u>September 22, 2011</u> Date
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Eco Safety and Health Manager:

<u>Steven Saunders, PG</u> Please Print	 Signature	<u>September 22, 2011</u> Date
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CHAPTER 6: ACCIDENT PREVENTION PLAN

6.1 APPLICATION

The intent of this chapter is to augment the Programmatic Accident Prevention Plan (PAPP), as warranted, to present pertinent site-specific information and procedural deviations that could not be readily captured in the programmatic documents or were the result of TPP Team agreements requiring modifications to the preliminary SI Technical Approach (see Subchapter 1.3). It should be noted that the PAPP will accompany the SS-WP Addendum during the conduct of SI field activities.

6.2 MEDICAL SUPPORT

The PAPP documents the medical support plan for all sites associated with the Southeast and Pacific MM DC Region. Medical Support for the site visit team will be provided by the UXO Tech III / Safety Officer and the FTL, both First Aid and CPR certified personnel. The local emergency contact numbers are listed in Table 6.1. **The nearest hospital is Grant Memorial Hospital, 1 Hospital Drive, Petersburg, West Virginia 26847, (304) 257-1026.** Figure 6.1 shows the map and directions to the hospital from the MRS04 Fore Knobs/Bear Rocks Firing Range. In an emergency situation, the team will follow the guidelines set forth in the Emergency Response and Fire Prevention Plan (ERFPP) in Appendix J of the PWP. Non-emergent medical care should be obtained at Frostburg Medical Center, 10701 New Georges Creek Road SW, Frostburg, MD 21532 (301) 689-3229. The map and directions to the urgent care facility is shown on Figure 6.2.

6.3 HAZARDS AND RISKS

The hazards associated with tasks being performed at the Fore Knobs/Bear Rocks Firing Range site and the procedures that are to be employed to prevent accidents, injuries, and illness are discussed in Attachment A, Chapter 2 of the PAPP. The potential tasks associated with the MRS04 SI requiring an Activity Hazard Analysis (AHA) include the following:

- Motor Vehicle Operation
- Sample Collection and Packaging
- Qualitative Reconnaissance
- Treating Injured Personnel
- Site visit team operations in karst topography (Caves and Mines)

Site Specific AHAs can be found in Table 6.2.

For the Fore Knobs/Bear Rocks Firing Range site visit, the following driving guidelines will be observed:

- Check weather forecast daily, prior to commencing work.
- Recommend the following equipment: shovel, tire pressure gauge, first-aid kit, spare tire, towrope, litterbag, fire extinguisher, flashlight, and bumper jack (with sturdy board to support jack).

- Drive at a slow, steady pace as appropriate. If wheels start to spin, back up in your tire tracks for several car lengths. Accelerate slowly as you move forward. Sudden vehicle movement should be avoided.
- Slow down and allow additional space when passing or meeting other vehicles.
- Before driving through water, determine in advance its depth and the firmness of its underlying surface. Standing water that is greater than 6 inches in depth should not be crossed and another route should be taken.

6.4 PHYSICAL HAZARDS

6.4.1 SEVERE WEATHER

During the course of the SI field activities, severe weather may be encountered, including thunderstorms, rainstorms, and other unsafe weather conditions (i.e., high winds and tornadoes). A Severe Weather Procedure can be found in Appendix J (Standard Operating Procedures [SOPs]) of the PWP. Criteria indicating that severe weather conditions may exist include the following:

- High winds (>40 miles per hour-depending on the tree cover and other site specific conditions)
- Tornado or Hurricane watch or warning in place for the area near the site
- Audible thunder or positive reading from lightning detection equipment carried by the site visit team
- Extreme temperatures (e.g. greater than 100 degrees or less than 0 °F)
- Heavy rainfall that can make footing treacherous and visibility difficult

6.5 BIOLOGICAL HAZARDS

6.5.1 POISONOUS INSECTS AND ARACHNIDS

Numerous poisonous insects and arachnids may be encountered at or around the site during this SI. Those specific to the area of this SI are discussed in greater detail below. Symptoms of insect bites or stings are normally a sharp, immediate pain in the body part bitten followed by redness and swelling around the bite area. Additional information and hazard mitigation is found in the PWP Appendix D (PAPP). Poisonous insects and arachnids that may be encountered during the SI include the following:

- Black Widow Spiders
- Chiggers
- Ticks
- Mosquitoes
- Brown Recluse Spiders
- Bees, hornets, wasps, honeybees

The two poisonous spiders likely to be encountered during the Fore Knobs/Bear Rocks Firing Range SI Project are the Brown Recluse and the Black Widow. Illustrations of these spiders are shown on Table 6.3 and in the PWP Appendix D of the SSHP page A2-18, Figure A2.2.

- The Brown Recluse is up to one inch long with a violin or “fiddle” shaped mark on the top of the head.
- The Black Widow measures approximately 1.5 inches with legs extended. This bulbous black spider has a red “hourglass” mark on the underside of the abdomen.

6.5.1.1 Africanized Honey Bees (Killer Bees)

Hazard Identification: Africanized Honey Bees (AHBs) are a hybrid bee that originated when African bees were brought to Brazil for scientists to try to develop a honeybee that would be better adapted to tropical areas. Some of the bees escaped and began breeding with local bees and have been multiplying and migrating to other regions since 1957. While the venom in their sting is similar to other bees, they are known to viciously attack people and animals without direct provocation. Simple noises or vibrations can cause an attack. When they become agitated, they are known to swarm and attack in large numbers, and they pursue their victims for greater distances than other bees, sometimes as much as a quarter mile away from the hive. They are likely to develop hives near canals, drainage ditches and retention basins because they like to be near water, and when they sense rain, they swarm. An illustration of the AHB is shown in Table 6.3.

Hazard Mitigation and Prevention: Wearing light colored clothing and refraining from wearing after shave lotions or citrus and floral perfumes decreases unwanted attraction to AHBs. However, should an attack occur, the following steps should be taken:

- Quickly get into an enclosure (car, tent, etc.) if possible and close all windows and doors (do NOT jump into water to escape AHBs; they will wait on the surface for you to come up for air).
- If no enclosure is available, run away from the bees (may take up to ¼ mile).
- Protect your face to prevent stings to the eyes, nose, and mouth. Bees attack where carbon dioxide is expelled and facial stings are much more dangerous than stings to the body. Pull your shirt over your head if no other protection is available.
- If stung, stay calm and get to a cool, indoor location.
- Seek immediate medical attention if more than 10 or 12 stings occur, or if you have symptoms other than localized pain, itching or swelling.
- Keep the affected area below the heart.
- If stingers are still present, gently remove them with a blunt edged object (fingernail, credit card, etc.), but do not squeeze the stinger with fingers or tweezers, as the venom sack will still be attached and more venom will be released.
- Symptoms of an allergic reaction requiring immediate medical attention include: burning and itching, body swelling, body rash, difficulty breathing, weakness, nausea, shock, or unconsciousness.
- Persons with known bee allergies should consult their physicians about a preventative anti-venom first aid kit.

6.5.1.2 Ticks

Ticks are small, ranging from the size of a comma up to about one quarter inch. They are sometimes difficult to see. When embedded in the skin, they may look like a freckle. The tick season extends from spring through summer. Female deer ticks are about one quarter inch in size, and are black and brick red in color. Male deer ticks are smaller, and completely black. Lone star ticks are larger and chestnut brown in color.

6.5.1.3 Chiggers

Chiggers, or harvest mites, are red, eight-legged arachnids. They are grouped with spiders, ticks, and scorpions and they measure approximately 1/16 of an inch in length. The bites commonly cause itching in about 3 to 6 hours and dermatitis develops in about 10 to 16 hours. Some people experience allergic reactions to the bites and develop blister-like lesions. They are commonly encountered at the woodland borders, along the periphery of swamps, and in shrub thickets and un-mowed areas of lawn.

6.5.1.4 Mosquitoes

West Nile virus is one of several encephalitis-type viruses that are spread by infected mosquitoes. West Nile virus usually infects birds, but it can be spread to humans by mosquitoes that feed on infected birds and then bite humans. The virus cannot be spread by person-to-person contact.

6.5.1.5 Wasps, Hornets, and Other Insects

Symptoms of an insect bite or sting are normally a sharp, immediate pain in the body part bitten followed by redness and swelling around the bite area.

6.5.2 SNAKES

Poisonous snakes that may be encountered at the site are discussed in the PAPP Appendix D–Attachment and are shown on Table 6.3.

- **Copperhead:** These snakes are commonly found near water sources in wooded areas. Copperheads are generally less than four feet in length and are not particularly aggressive. Coloration ranges from golden brown to tan. These snakes have a banded pattern.
- **Timber Rattlesnake:** These are large, not particularly aggressive snakes (up to more than seven feet) with yellow through or gray to black, with dark back and side blotches on front of body and blotches fused to form cross bands on rear of body. These snakes have an unmarked head and a black tail. They can be found in many habitats, including rocky hillsides, swampy areas, and canebrake thickets.

6.5.3 WILDLIFE

Potentially hazardous mammals that could be encountered at the site include Black Bears (*Ursus americanus*); Bobcats (*Lynx rufus*); and Coyotes (*Canis latrans*). Illustrations of these animals are shown on Table 6.3.

6.5.4 POISONOUS PLANTS

Poisonous plants that may be encountered at the site and discussed in the PAPP include poison ivy and poison sumac. The majority of skin reactions following contact with offending plants are allergic in nature and are characterized by:

- redness,
- itching, and
- rash.

As with poisonous plants discussed in the PWP PAPP, avoidance of the plant, particularly the stems, is the most effective means of preventing poisoning. Barrier creams are available. If the plant is identified in a sampling area, wearing PVC or latex gloves will provide additional protection. A person experiencing symptoms of poisoning should remove contaminated clothing and wash all exposed areas thoroughly with soap and water. Apply calamine or other poison aid lotion if the rash is mild. Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity. Thorough washing of skin and clothing after site work or after potential exposure can reduce the severity of irritation.

Some of the most common and severe allergic reactions result from contact with poison ivy, poison oak, and poison sumac. Contact with the poisonous sap of these plants, or even exposure to pollen, droplets or various parts of the plants, produces a severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim also may develop a high fever and may be very ill. Ordinarily, the rash begins within a few hours after exposure, but it may be delayed for 24 to 48 hours. Poisonous plants that may be encountered are shown on Table 6.3.

Stinging nettle may also be encountered. There are several species referred to as “stinging nettles”, and all have similar stinging properties when brushed against. The species found in West Virginia include: Stinging Nettle (*Urtica dioica*) and the Wood Nettle (*Laportea canadensis*). Photographs of these species are found on Table 6.3. These plants should be avoided because of the stinging hairs on twigs and lower leaf surfaces. The stinging hairs project at an angle, have a needle-like point, and are filled with liquid. When the skin touches the stinging hair, the end breaks-off and injects the poisonous liquid into the flesh. The liquid is either Formic Acid, similar to that of ant stings, or a histamine, causing stinging pain that can last several hours. Contact with needle-like, stinging hairs on the twigs and lower surface of leaves of this plant can cause severe skin irritation and mild skin rash (dermatitis). Do not eat the leaves of this plant.

Nettle Hazard Mitigation and Prevention: If possible, avoid contact with the twigs and lower surface of its leaves. Long sleeves and pants should be worn to provide a barrier between this plant and the skin. Do not eat its leaves or bring them in contact with your eyes. If you inadvertently touch the leaves of this plant, wash your hands thoroughly before touching your mouth, eyes, or the area surrounding them. Over the counter topical analgesics or an anti-inflammatory may provide relief if the plant is encountered and dermatitis occurs.

6.5.5 BLOOD-BORNE PATHOGENS

Blood-borne pathogens enter the human body through punctures, cuts, or abrasions of the skin or mucous membranes. They are not usually transmitted through ingestion (swallowing), through the lungs (breathing), or by contact with whole, healthy skin.

However, under the principle of universal precautions, all blood should be considered infectious, and all skin and mucous membranes should be considered to have possible points of entry for pathogens.

6.6 PERSONAL PROTECTIVE EQUIPMENT

The minimum Personal Protective Equipment (PPE) required for site operations is as follows:

- ANSI approved safety glasses with side shields, if eye hazards such as, but not limited to, heavy brush will be encountered
- All-leather, above ankle work boots
- Nitrile gloves for collecting and handling samples, or gloves that provide an equivalent level of protection
- Snake chaps, as needed
- Leather palmed work gloves
- High visibility vests if the site visit team will be near roadways or heavy equipment

TABLE 6.1
Emergency Telephone Numbers
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knobs/Bear Rocks Firing Range

Name	Phone Number(s)
Poison Control Center of West Virginia	1-800-222-1222
Grant County Sheriff's Office	911 (emergency) (304) 257-1818 (non-emergency)
Grant County Emergency Medical Services	911 (emergency) (304) 257-1026 (non-emergency)
Grant Memorial Hospital	(304) 257-1026
Frostburg Medical Center (Workman's Comp clinic)	(301) 689-3229
Parsons Program Manager, Laura Kelley	(678) 969-2437 (404) 934-1266 (cell)
Parsons Project Safety and Health Manager, Timothy Mustard	(303) 764-8810 (303) 564-3537 (cell)
Parsons Denver Office Safety Manager, Judy Blakemore	(303) 764-8861 (303) 817-9743 (cell)
Parsons Workman's Compensation Analyst, Donna Miller	(661) 904-0978
Parsons MEC Technical Director, Michael Short	(678) 969-2451
Parsons Field Team Leader, Lauren Johnson	(303) 764-8830 (720) 988-4413 (cell) (303) 831-8208 (FAX)
Parsons UXO Technician and Safety Lead, Blair Oakes	(931) 638-2445 (cell)
Eco and Associates Project Manager, Mohammad Estiri	(714) 289-0995 (714) 289-0965 (FAX)
Eco and Associates Sampling Lead and QR Support, Steven Saunders	(714) 289-0995 (714) 289-0965 (FAX) (818) 397-2248 (cell)
CEHNC Chief, OE Safety Wayne Galloway	(256) 895-1582 (256) 895-1598
CELRH-PP-P Project Manager Richard Meadows	(304) 399-5388
USACE MMRP SI Project Manager (Southeast and Pacific) Becky Terry	(256) 895-1788 (office) (256) 895-1378 (FAX)
USACE MMRP SI Project Manger Paula Henderson	(256) 895-1269 (256) 655-1239 (cell)

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
Pre-operation Motor Vehicle Inspection	Failure to identify and correct mechanical problems that may degrade vehicle safety	Prior to operation of vehicle, the driver shall check, at a minimum, brakes, steering mechanism, seat and shoulder belts, lights, signals, wipers, horn, back-up alarm (if applicable), mirrors, glass, and fluids. The operator will also make sure there is a functioning jack and spare tire in the vehicle. If transporting cargo, restraints to prevent movement shall be employed. Vehicles with safety/ mechanical problems shall be removed from service until repaired.
On road driving	Accident	Vehicle operator shall possess a current valid driver's license for the equipment being used. Seat belts and shoulder restraints will be used by all personnel. Operator will practice defensive driving techniques, obey posted speed limits, and be vigilant for unsafe road conditions (e.g., reduced speed during rain or snow storms). Operator is prohibited from using any communication devices (e.g., cell phones) while operating any motor vehicles. Support vehicles shall have on board a minimum 5-lb ABC fire-extinguisher, which will be checked monthly. Try to avoid driving in poor weather conditions (icy roads, blizzard conditions, dust storm, etc...).
Off road driving	Getting stuck	Vehicle operator will not leave dirt roads or jeep trails except in emergency situations. On dirt roads, the operator will drive slowly and watch for ditches, holes, shrapnel, wildlife, livestock, and other obstacles. Hills/ditches will be inspected prior to the vehicle being driven over/into them. The operator must be sure there is an obvious route out or off of any obstacle that they drive into or over. Put vehicle in 4WD before it is needed and use chains in high probability areas for getting stuck. When in sand or soft ground keep your speed up and do not spin your tires.
	Break down	If it is safe to do so, the team will stay with the vehicle unless they have a clear and specific destination that can safely be achieved on foot. The vehicle's hood will be raised to indicate that help is needed. A vehicle can be seen for miles, but a person on foot is very difficult to spot. The team's cell phones or satellite phone should be used to call for assistance. If stuck or broken down in hot temperatures, the team should sit in the shade of the vehicle or other nearby shade. In cold temperatures, or at night, the team should stay in the vehicle. The heater can be run, if possible, a few minutes every hour, with a window cracked for fresh air. The team will not all sleep at the same time; one team member will stay awake to stand watch.
	Serious emergency in addition to breakdown	If absolutely necessary to attract attention from rescuers, the team may need to start a fire. Burning the vehicle's spare tire (with the air let out) or seats should start a smoky fire that can be seen by rescuers. If a fire is necessary, it will be started in a clear area where there is no chance for a brush fire. Vehicles shall carry at least 2 gallons of drinking water per person, and contain emergency rations of food. Other emergency survival kits items should include matches or lighters, knife, first aid kit, flashlight, duct tape, blankets, whistles, compass, maps, tow rope, and shovel.

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
Vehicle maintenance and repair	Improper vehicle maintenance or repair	Vehicle maintenance and repair shall be performed in accordance with manufacturer's instruction and schedule. Maintenance and repairs are only to be performed by qualified mechanics.
Treat injured personnel	General First Aid	A minimum of two field team members will be current in their CPR and first aid training, including the blood borne pathogen program, and will use appropriate PPE when handling injured personnel. Personnel trained in CPR and first aid shall be familiar with emergency response procedures and the location of the nearest medical center.
	Panic	Do not waste time blaming or contemplating what if. Take stock of items at hand, water, first aid, survival kits etc. Decide on a plan to ensure your safety. Execute the plan and stick with it unless conditions require changes.
	Serious Emergency	If you have a radio or cellular phone call 911 or the local emergency response number. Make your presence known, if in a vehicle sound your horn, or blow a whistle in sets of three. If possible, start a fire by burning the spare tire (let out the air first...and move it away from the vehicle) or use other materials at hand. Use flashlights or headlights by also turning them off and on in sets of three or use a signal mirror. Use a signal flare if available.
	Heart Attack	Heart attack symptoms include persistent chest pain or discomfort, difficulty breathing, changes in pulse rate (faster or slower than normal or irregular), and heavy sweating. Help the victim to rest comfortably. Call or send someone for assistance. Transport the victim to the hospital. Be prepared to administer CPR if the victim's heart stops beating.
	Lost/failure to check in	The field team leader will report to the field manager where the crew is going and when they will be finishing. If plans change, the FTL will report to the field manager. At the end of the day the FTL will check in with the field manager; failure to report at a designated time will result in a mobilization of a rescue team to search for missing crew. If you find yourself lost, do not panic. Make note of your surroundings, and do not wander off as it will make it more difficult for the search and rescue teams to find you. Carry a GPS and extra batteries to prevent a lost situation as well as survival gear such as a gallon or more of water, and a survival kit based on the area or work. Work in teams and never wander off alone.
	Twisted ankle or broken bone	Apply a hard or soft splint. Carry or assist the victim to the vehicle or other safe area. Transport the victim to the hospital.
	Heat stress injuries	Heat cramps (cramps in the arms, legs, abdomen) and exhaustion (characterized by heavy sweating, dizziness, nausea) - get the victim out of the heat as soon as possible. Provide water and electrolytes (such as Gatorade). Allow the victim to rest. Seek medical treatment, as necessary. Heat stroke (a life-threatening illness characterized by hot dry skin, fainting, coma) - cool the victim rapidly. Douse with water, fan the victim, and/or apply cool wet cloths to the skin. Seek medical attention immediately.

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
Treat injured personnel (cont')	Shock	Shock is common with many injuries, regardless of their severity. The first hour after an injury is most important because this is when shock appears. Shock is failure of the cardiovascular system to keep adequate blood circulating to the vital organs of the body, namely the heart, lungs and brain. Signs and symptoms of shock include confused behavior, very fast or very slow pulse rate and/or breathing, trembling and weakness in the arms or legs, cool and moist skin, pale or bluish skin, lips and fingernails and enlarged pupils. You should anticipate that shock will follow an injury (such as a snakebite) and to take measures to prevent it before it happens. Shock prevention involves the following steps: have the victim lie down to improve circulation; if the victim is not suspected of having head or neck injuries, or leg fractures, elevate the legs; if you suspect head or neck injuries, keep the victim lying flat; if the victim vomits, turn them on their side; if victim is experiencing trouble breathing, place them in a semi-reclining position; maintain the victim's body temperature, but do not overheat; a victim of shock requires advanced medical treatment as soon as possible.
	Snake Bite	Get safely away from the snake and call on the radio or cellular phone or send someone for emergency assistance; have the victim lie down with the affected limb lower than the heart; treat the victim for shock (see above); remove rings, boots, or other restricting items from the bitten limb; loosely immobilize the wounded limb (e.g., suspend arm in a sling just below heart level; wash the bite with soap and water (if available); if the victim has to walk out, sit calmly for 20-30 minutes to let the venom localize at the site, proceed calmly to the nearest source of help and try to avoid unnecessary exertion which will stimulate circulation of the poison; get the victim to a medical care facility for antivenin, which will provide the greatest relief from the toxic effects of the bite.
Equipment: Vehicles and hand tools	Training: All site personnel will be OSHA 40-HR HAZWOPER trained with current refresher. UXO personnel shall be certified as EOD-trained, and possess the qualifications for the UXO duties they will perform.	Inspection: All equipment and PPE shall be inspected daily prior to use. Equipment must be in safe operating condition, deficiencies shall be identified and corrected prior to use.

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
Surficial Soil Sampling	Physical Hazards (slips, trips, and falls)	Practice good housekeeping to keep ground clear of equipment and other obstructions. Wear appropriate footwear to prevent slips and trips. Use caution when working on uneven or wet ground surfaces.
	Physical Hazards (vehicle and pedestrian traffic)	Use traffic cones or delineators as necessary. Wear reflective vests if vehicles are present. Use guide outside vehicle if view is limited or obstructed.
	Physical Hazards (MEC)	SVT will include personnel trained in the identification of MEC hazards, as well as response procedures.
	Chemical Hazards	All personnel shall be familiar with potential chemical hazards that may be encountered. Wear appropriate PPE including gloves and/or eyewear. Perform environmental monitoring as described in the Accident Prevention Plan. Perform sampling in accordance with the Sampling and Analysis Plan.
	Biological Hazards	Wear long sleeves, work gloves, and other appropriate clothing to prevent exposure to hazardous plants or animal species. Workers with allergies shall carry necessary antidote kits. See Table 6.3 for site-specific biological hazards.
Equipment: First Aid Kit / Paramedics	Training: All rescue personnel will be trained in rescue procedures. When applicable, rescue personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). Rescue personnel will be trained in UXO awareness during site-specific training. All personnel will provide proof of competency with the equipment to the UXOSO prior to operating.	Inspection: All rescue equipment will be inspected by workers prior to use IAW the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be replaced. If any safety device on equipment is missing, that piece of equipment will be placed out of service until it can be repaired/replaced.

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
Qualitative reconnaissance	Motor vehicle operation	See Above
	Remote locations	Where warranted, the site visit team will use a satellite phone for emergency communication. Each team member will also carry their own GPS unit with radio for communication between team members. Although it is not anticipated that team members will be outside of voice range from one another, they will maintain radio contact at all times. The team will carry at least 1 gallon of drinking water per person. Other items that should at least be present in the vehicle include raingear, warm shirt or jacket, emergency food (non-perishable items), waterproof matches or cigarette lighter, pocket knife, flashlight, duct tape, emergency thermal blanket, and maps. These items should be carried with the site visit team if they are planning on hiking a long distance from the vehicle.
	Unplanned detonation	UXO awareness training will be provided by SSHO. The UXO technician will perform subsurface screening for metallic anomalies, and any detected anomalies will be avoided. In areas with high MEC potential, the UXO technician will lead the team during walked QR. No one on the field team will remove ordnance items from the site.
	Uneven terrain	Portions of the QR path may require hiking in areas of extremely steep, slippery slopes. Areas may have precipitous drop-offs, slippery rock surfaces, and loose sand and shale. These types of area should be avoided to the extent possible. The QR path can be modified without any adverse consequences. If it is absolutely necessary for the team to hike over potentially hazardous terrain, they will stay back from the edges, watch their footing, and wear appropriate footwear (over the ankle work boots or hiking boots required).
	Heat	Temperatures exceeding 90°F can pose serious health hazards. Avoid heat sickness by drinking plenty of water (at least one gallon or more a day). Be alert for symptoms of heat exhaustion or stroke—cramps (especially in legs and abdomen), weakness, nausea, and dizziness. Serious cases require immediate medical attention, as they can be fatal. All water found in the backcountry is likely contaminated with dissolved minerals and very fine sediment. Boiling water, treating it with chemicals, or using filters does not make it fit to drink. Consequently, no water found along the QR path should be considered potable (drinkable); an adequate supply must be packed in. The team will carry at least one gallon per person per day.
	Cold	Spring weather is unpredictable. Although days can be sunny, with temperatures generally above 60 degrees F, possible thunderstorms combined with strong winds can make backcountry survival difficult for those unprepared. Hypothermia (chilling of the body's core) is a very real threat. Staying warm, dry, and out of the wind is the best way to prevent problems.

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls	
Qualitative reconnaissance (cont')	Thunderstorms & Lightning	Hot summer weather is often interrupted by severe thunderstorms, complete with large hail and lightning. If caught in a sudden storm, the team should look for shelter from high winds and avoid ridges, exposed areas, and isolated trees where lightning may strike. If near a vehicle get inside and do not touch anything electrical or metal and roll up the windows. If lightening or thunder is present, seek shelter immediately and wait 30 minutes from the last strike before venturing out into the field.	
	Flash Floods	Rainstorms can result in flash flooding. If flash flooding occurs where the team is working, they will move to higher ground immediately. The team will not walk or drive through flooded areas.	
	High Winds	Working under windy conditions can range from being a nuisance to being dangerous. Wear eye goggles for eye protection from wind, dust and sand. Consider suspending outdoor field operations when winds exceed 50 MPH. Be aware of overhead hazards.	
	Personal Protective Equipment		The minimum Personal Protective Equipment (PPE) required for site operations is as follows:
			- American National Standards Institute (ANSI) approved safety glasses with side shields. Tinted sunglasses providing 100% UV protection should be used on sunny days.
			- All-leather, above ankle work boots
			- Long pants and long-sleeved shirt.
			- Nitrile gloves for collecting and handling samples, or gloves that provide an equivalent level of protection
- Snake chaps, as needed			
- Full waders, as needed if walking through swampy areas			
- Leather palmed work gloves			
- High visibility vests if the SVT will be near roadways or heavy equipment			

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
<p>Equipment: Hand held magnetometer, shovel, hand tools, heavy equipment, PPE to include gloves, work boots, and eye protection as necessary.</p>	<p>Training: All Site personnel will be current in their OSHA HAZWOPER training (received 40-hr initial training and attended an 8-hr refresher training within past 12 months) and be enrolled in a medical monitoring program. Additional training (such as first aid/CPR, bloodborne pathogens, respiratory protection, confined space entry, etc.) will be provided as applicable. Personnel will be trained in the safe use of required equipment and in the required PPE. UXO Personnel must be certified as EOD-trained and must be approved for the project by the USAESCH Safety Officer and Contracting Officer. This AHA will be discussed with workers during initial site safety training.</p>	<p>Inspection: PSHO and UXOSO will conduct spot checks of compliance. UXOSO will conduct daily audits of operations. Oversight by UXOSO, PHSO, and UXOSO follow SSHP guidelines. All site personnel report any potential hazards. Daily safety briefings on mitigation techniques will be conducted wherein, among other things, relevant portions AHAs will be reviewed. Conduct PPE audits. UXOSO to conduct daily site audits for compliance with MUTCD. PHSO and UXOSO will perform spot checks to verify compliance. Personnel will inspect tools prior to use. If during inspection or during use, equipment fails to function properly, the equipment shall be turned in for repair/ replacement. Daily audits to ensure compliance.</p>
<p>Surface soil and sediment sampling</p>	<p>Contact with hazardous chemicals</p>	<p>All personnel will don a level D ensemble, including nitrile or latex gloves. Personnel will be familiar with the potential chemical hazards that may be encountered during soil and sediment sampling.</p>
	<p>Unplanned detonation</p>	<p>UXO awareness training will be provided by SSHO. The UXO technician screen for subsurface metallic anomalies, any detected anomalies will be avoided during sampling. In areas with high MEC potential, the UXO technician will lead the field team during walked QR. No one on the site visit team will remove ordnance items from the site.</p>
	<p>Hand tools</p>	<p>The tool users will inspect the tools that they will use. No damaged equipment will be used until repaired or replaced. Personnel shall be familiar with proper operation of tools.</p>

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
Surface soil and sediment sampling (cont')	Biological Hazards	Snakes, spiders, chiggers, ticks, bees, bears, bobcats, and coyotes are the most likely biological hazards in this region. The site visit team will check carefully around rocks and logs before moving them for sampling or sitting down and will never place hands and feet where they can't be seen clearly. If biological hazards are found in the vicinity of a proposed sampling location, the sample will be moved to a less hazardous location or the team will wait until the animal leaves the area. More detailed information biological hazards can be found in Table 6.3.
	Back Injury	Soil samples will be collected using metal sample probes. The sample increments will be placed in lightweight nylon bags, so back injuries from carrying heavy sampling equipment and storage containers are unlikely. Sediment samples will be collected using a plastic trowel. The sediment samples will be placed in small glass jars. Personnel will wear cut-resistant gloves when tightening or loosening lids for glass containers. Collected samples will be split between team members as necessary to reduce the load carried by each person.
Surface water sample collection	Contact with hazardous chemicals	All personnel will don a modified level D ensemble, including nitrile or latex gloves. Personnel will be familiar with the potential chemical hazards that may be encountered during surface water sampling.
	Unplanned detonation	UXO awareness training will be provided by SSHO. The UXO technician screen for subsurface metallic anomalies, any detected anomalies will be avoided during sampling. In areas with high MEC potential, the UXO technician will lead the field team during walked QR. No one on the site visit team will remove ordnance items from the site.
	Hand tools	Sampling tools shall be used, inspected and maintained in accordance with manufacturer's instructions. No damaged equipment will be used until repaired or replaced. Personnel shall be familiar with proper operation, storage, and cleaning of equipment.
	Back Injury	Samples will be collected using both plastic bottles and large 1 liter glass bottles. The 1 liter glass bottles when filled with surface water present a potential risk of a back injury when carrying several glass jars at a time. Collected samples will be split between team members as necessary, or placed within a cooler to reduce the load carried by each person. Glass containers will be packed in such a way as to avoid breakage.

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
Sample packaging	Contact with hazardous chemicals	All personnel will don appropriate dermal protection and PPE (i.e. gloves, eye protection). Personnel will be familiar with the chemical hazards that may be encountered (sample preservatives, solvents, UXO constituents).
	Hand tools	The tool users will inspect the tools that they will use. No damaged equipment will be used until repaired or replaced. Personnel shall be familiar with proper operation of tools.
	Back Injury	Proper lifting techniques will be used while moving and carrying sample coolers. Proper lifting techniques will be reviewed by the SSHO. A hand truck shall be used to lift sample containers greater than 50 lb (two workers may lift containers >50 lb when the objects can be easily gripped [i.e. have handles or grip hold]).
Equipment: Hand tools	Training: All on-site personnel will be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER), and be enrolled in a medical monitoring program with a current occupational physical with physician's certificate in accordance with 29 CFR 1910.120(f). UXO Personnel must be certified as EOD-trained and have the required experience for the position being filled (i.e. UXO Tech I, II, or III).	Inspection: An inspection of PPE by workers will be conducted before each use.
SVT Operations in karst topography containing caves and mines	A karst is a landscape that is characterized by numerous caves, sinkholes, fissures, and underground streams. Karst topography usually forms in regions of plentiful rainfall where bedrock consists of carbonate-rich rock, such as limestone, gypsum, or dolomite, that is easily dissolved. Surface streams are usually absent from karst topography.	Situational awareness is a control which will be critical in all aspects of this AHA.
		Situational awareness consists of always being able to answer the following four questions:
		1) Where am I and where is my buddy?
		2) What things can hurt me?
		3) How do I get out?
		4) Where is the essential equipment (GPS, keys, phone, emergency contact numbers etc.)?
		Never enter any cave or mine.
		Prior to activity, ensure that the footwear has adequate non-slip soles and ankle-support.
Perform warm-up exercises before undertaking the activity. This will keep the muscles loose and ready for unforeseen movement.		
Show up fit, alert, and ready to work. Part of this site activity involves strenuous hiking in difficult terrain.		

TABLE 6.2
ACTIVITY HAZARD ANALYSES
West Virginia Maneuver Area, FUDS No. G03WV0013
MRS04 Fore Knobs / Bear Rocks Firing Range

Principle Task	Potential Hazards	Recommended Controls
<p>SVT Operations in karst topography containing caves and mines (cont')</p>	<p>Falling down and landing on ground.</p>	<p>If you do slip and commence to fall, attempt to fall on your side uphill and not on your outstretched arms. This will prevent injury to your hands, wrists, and arms.</p> <p>When walking across a side-hill, be careful not to walk directly above or below another person. Watch for loose and falling rocks.</p> <p>Be especially careful of foot placement while side hilling. Avoid twisting an ankle/knee.</p>
	<p>Walking/hiking in uneven areas</p>	<p>When hiking in wet areas or in proximity to water, beware of stepping onto slippery rocks, slopes, or ground. Be cautious of stepping onto unsupported vegetation, soft mud, or quicksand. Use a pole or branch to probe the path surface ahead of you when crossing wetland areas. Wet rocks can be slick. Take extra care when crossing these areas. Use a pole or branch to probe the path surface ahead of you, if visibility is impaired.</p>
	<p>Equipment: Hand held magnetometer, hand tools, PPE to include gloves, work boots, eye protection, and hard hats as necessary.</p> <p>Depending on condition requirements also make sure everyone has an adequate supply of water and emergency food or snacks. There should be at least one small first aid kit/team. Other items may include sunscreen, insect repellent, maps, compass, GPS, survival gear (matches/lighter, knife, emergency blanket, raingear, etc.)</p>	<p>Training: At least two personnel onsite will hold current certification in first aid and CPR. These personnel will also be current in OSHA training in accordance with 29 CFR 1910.120 (HAZWOPER) and enrolled in a medical monitoring program in accordance with 29 CFR 1910.120(f). These personnel will receive UXO awareness as a component of their site-specific training. Team members will also have Parsons Safety Training (ParsonsU), and 8-hr Supervisor's Training in accordance with 29 CFR Part 1910.120(e) for Supervisors.</p>

TABLE 6.3
Biological Hazards
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knobs/Bear Rocks Firing Ranges

Common Name	Scientific Name	Preferred Habitat	Habitat Potentially Present on
<p style="text-align: center;">Black Widow</p> 	<i>Latrodectus</i>	Prefers a dark, damp habitat. It is most often found outside, but can be found inside in dark places inside dwellings such as sheds, garages, and closets.	Yes
<p style="text-align: center;">Brown Recluse</p> 	<i>Loxosceles</i>	If outdoors, usually located underneath rocks or within hollow woods.	Yes
<p style="text-align: center;">Chiggers</p> 	<i>Trombiculidae</i>	Usually encountered in the late spring and summertime. Found in overgrown areas, lawns, leaf litter, shrubbery, and anywhere that is damp and shaded. Once the chigger larvae have found their way onto a suitable host, they proceed to areas of the body where clothing fits tightly over the skin or where the skin is delicate and/or wrinkled.	Yes
<p style="text-align: center;">Ticks</p> 	<i>Ixodoidea</i>	Tick species are widely distributed around the world. There must be a high enough population density of host species in the area. There must be a high enough humidity for them to remain hydrated.	Yes
<p style="text-align: center;">Africanized Honey Bees</p> 	<i>Apis mellifera scutellata</i> Lepeletier	Africanized honey bees tend to colonize large areas and swarm excessively. Also, the bees will leave the colony completely and move to a new location when conditions in the environment do not suit them	Yes
<p style="text-align: center;">Copperhead Snake</p> 	<i>Agkistrodon contortrix</i>	In most of North America it favors deciduous forest and mixed woodlands. It is often associated with rock outcroppings and ledges, but is also found in low-lying swampy regions. In the states around the Gulf of Mexico, however, this species is also found in coniferous forest. In the Chihuahuan Desert of west Texas and northern Mexico, it occurs in riparian habitats, usually near permanent or semipermanent water and sometimes in dry arroyos	Yes

TABLE 6.3 (CONT')
Biological Hazards
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knobs/Bear Rocks Firing Ranges

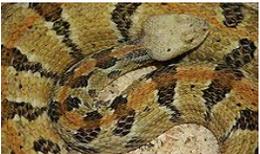
Common Name	Scientific Name	Preferred Habitat	Habitat Potentially Present on
<p style="text-align: center;">Timber Rattlesnake</p> 	<i>Crotalus horridus</i>	Generally, this species is found in deciduous forests in rugged terrain. During the summer, gravid (pregnant) females seem to prefer open, rocky ledges where the temperatures are higher, while males and non-gravid females tend to spend more time in cooler, denser woodland with a more closed forest canopy.[12]	Yes
<p style="text-align: center;">Black Bear</p> 	<i>Ursus americanus</i>	Black bears typically live in largely forested areas, but do leave forests in search of food. Sometimes they become attracted to human communities because of the immediate availability of food.	Yes
<p style="text-align: center;">Bobcat</p> 	<i>Lynx rufus</i>	The bobcat is an adaptable predator that inhabits wooded areas, as well as semi-desert, urban edge, forest edges, and swampland environments. It persists in much of its original range and populations are healthy.	Yes
<p style="text-align: center;">Coyote</p> 	<i>Canis latrans</i>	The coyote's habitat can be anywhere. They are scavengers and hunters. They may live in forests, on the plains, or in deserts. As humans move into areas where they live, they are forced to find new places to live and hunt. Coyotes now range from the middle of Alaska down to the south of Mexico. They live in Canada, parts of the United States, and Mexico.	Yes
<p style="text-align: center;">Poison Ivy</p> 	<i>Toxicodendron radicans</i>	Found in wooded areas, especially along edge areas. It grows in exposed rocky areas and in open fields and disturbed areas. It also grows as a forest understory plant. The plant is extremely common in suburban and exurban areas of New England, the Mid-Atlantic, and southeastern United States.	Yes
<p style="text-align: center;">Poison Sumac</p> 	<i>Toxicodendron vernix</i>	Poison sumac is much less common than poison ivy or poison oak. It is found in wooded, swampy areas, such as Florida and parts of other southeastern states. It is also found in wet, wooded areas in the northern United States.	Yes

TABLE 6.3 (CONT')
Biological Hazards
West Virginia Maneuver Area FUDS No. G03WV0013
MRS04 - Fore Knobs/Bear Rocks Firing Ranges

Common Name	Scientific Name	Preferred Habitat	Habitat Potentially Present on
<p style="text-align: center;">Stinging Nettle</p> 	<p><i>Urtica dioica</i></p>	<p>In North America it is widely distributed in every state except for Hawaii. It grows in abundance in the Pacific Northwest, especially in places where annual rainfall is high. In North America the stinging nettle is far less common than in northern Europe. The European subspecies has been introduced into North America as well as South America.</p>	<p>Yes</p>
<p style="text-align: center;">Wood Nettle</p> 	<p><i>Laportea canadensis</i></p>	<p>It is found growing in open woods with moist rich soils and along streams and in drainages.</p>	<p>Yes</p>

1. Head northeast on W Virginia 28 N/W Virginia 55 E
Grant Memorial Hospital

Hospital will be on right side in 10 miles



Site Location

Hospital Location
100 Hospital Drive
Petersburg, WV 26847



Prepared by:
Eco & Associates, Inc.
1855 W. Katella Avenue, Suite 340
Orange, California 92867

Phone: 714.289.0995 Fax 714.289.0965

Hospital Location Map

MRS04 - Fore Knobs / Bear Rocks Firing Ranges
MMRP West Virginia

Project No. Eco-11-452

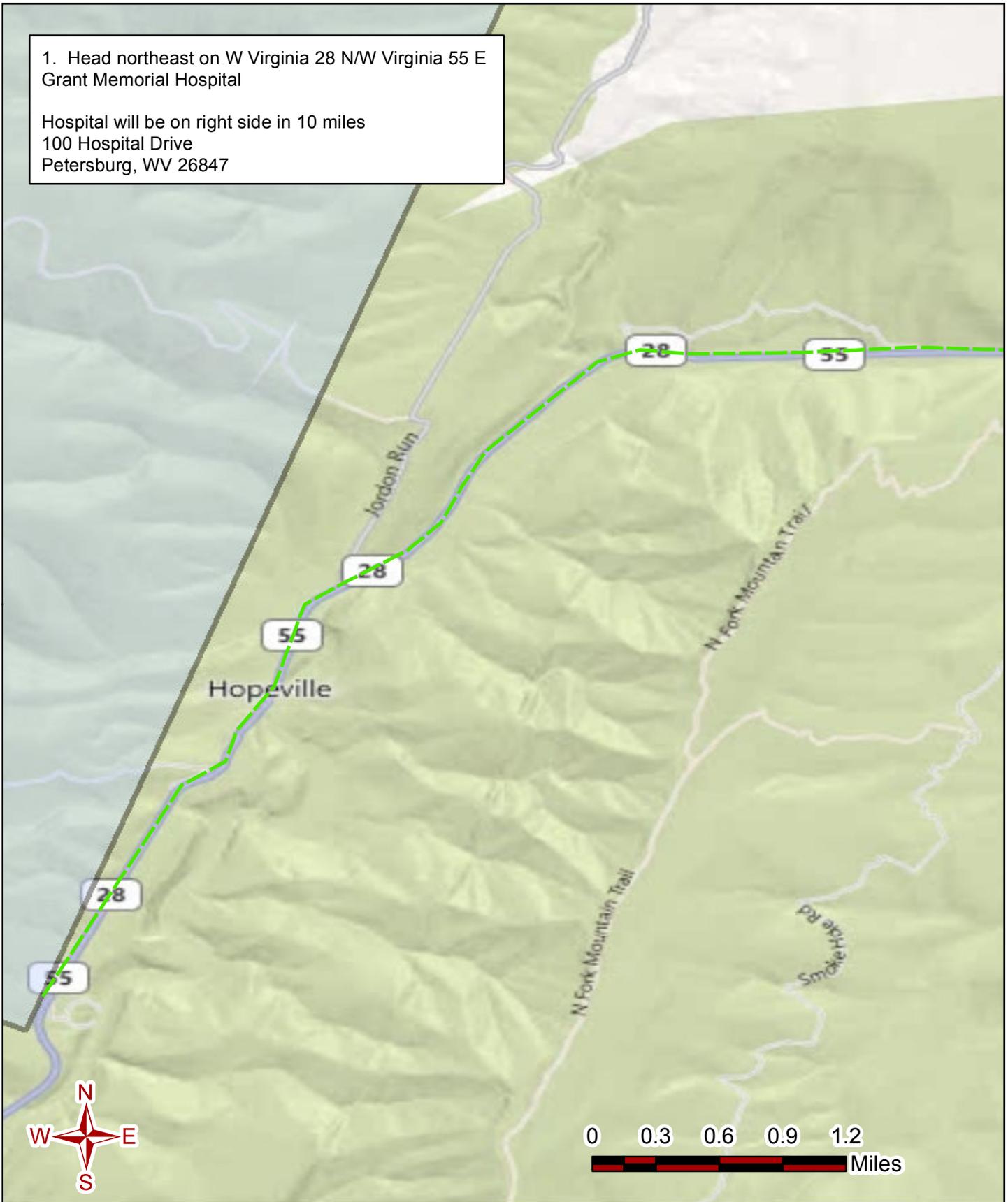
September 2011

FIGURE

6.1

1. Head northeast on W Virginia 28 N/W Virginia 55 E
Grant Memorial Hospital

Hospital will be on right side in 10 miles
100 Hospital Drive
Petersburg, WV 26847



Prepared by:
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Hospital Location Map

MRS04 - Fore Knobs / Bear Rocks Firing Ranges
MMRP West Virginia

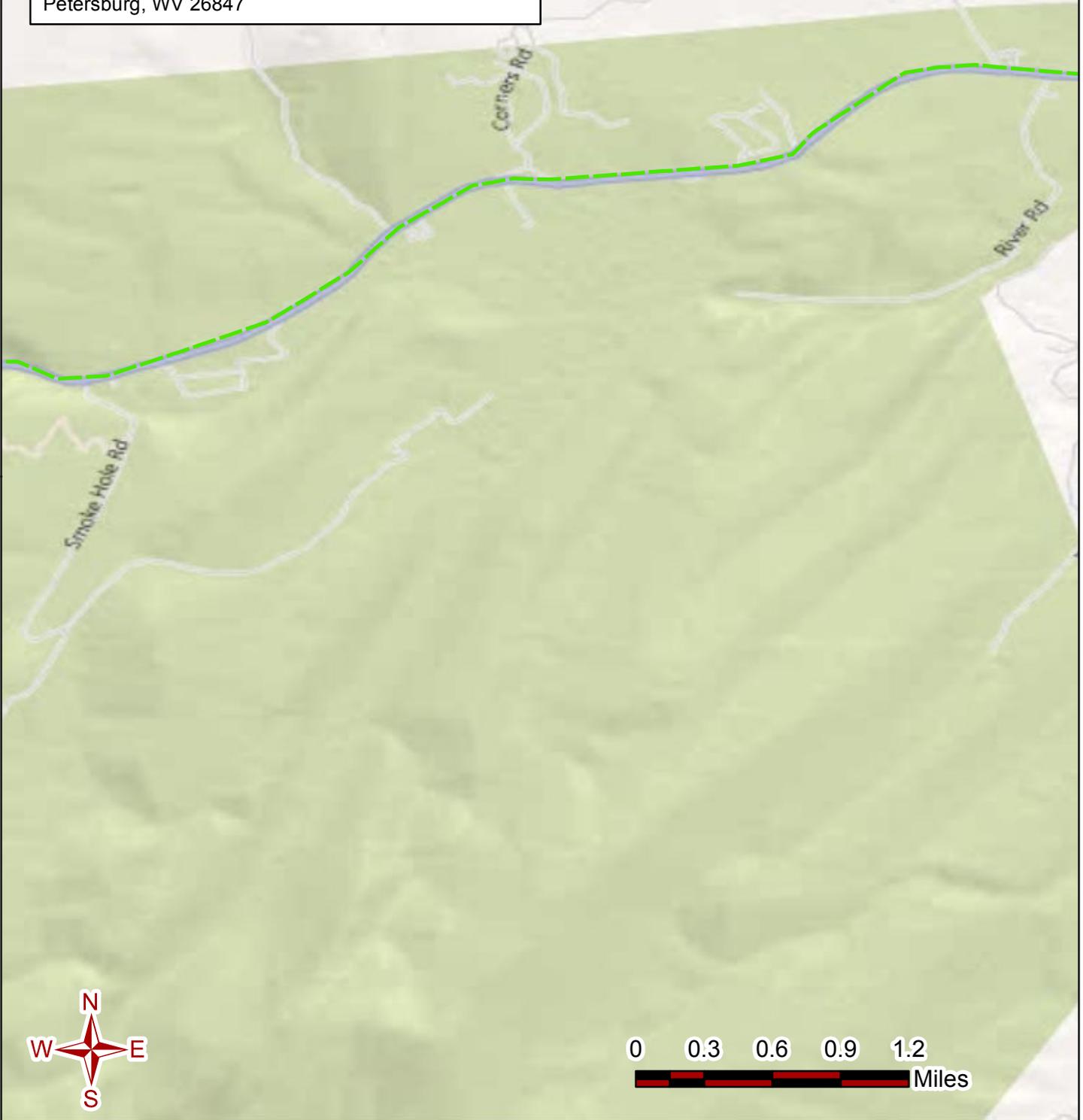
Project No. Eco-11-452

September 2011

FIGURE
6.1a

1. Head northeast on W Virginia 28 N/W Virginia 55 E
Grant Memorial Hospital

Hospital will be on right side in 10 miles
100 Hospital Drive
Petersburg, WV 26847



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Hospital Location Map

MRS04 - Fore Knobs / Bear Rocks Firing Ranges
MMRP West Virginia

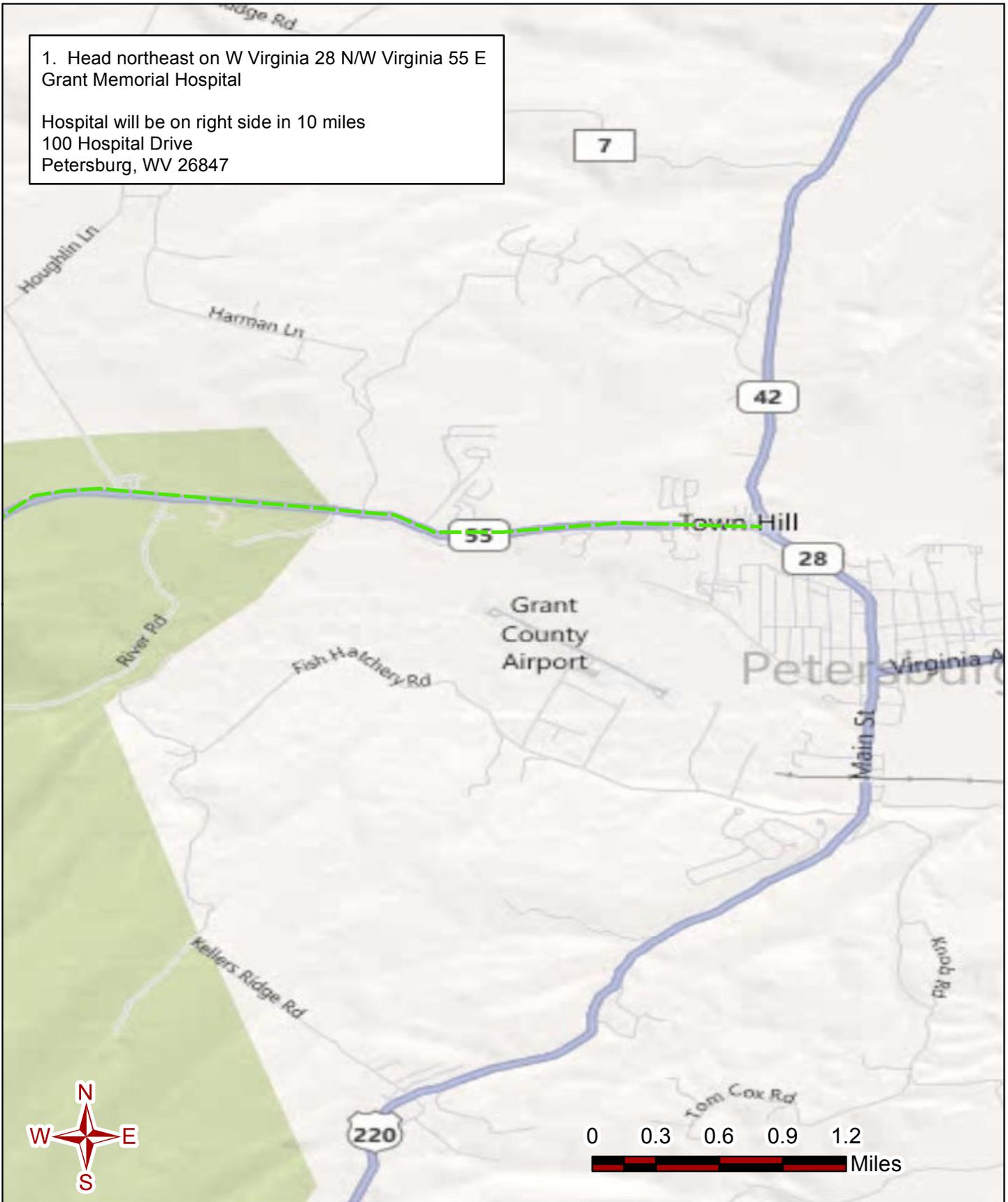
Project No. Eco-11-452

September 2011

FIGURE
6.1b

1. Head northeast on W Virginia 28 N/W Virginia 55 E
Grant Memorial Hospital

Hospital will be on right side in 10 miles
100 Hospital Drive
Petersburg, WV 26847



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Hospital Location Map

MRS04 - Fore Knobs / Bear Rocks Firing Ranges
MMRP West Virginia

Project No. Eco-11-452

September 2011

FIGURE
6.1c

Jordan Run Rd
 Maysville, WV 26833

1. Head north on Co Route 28/7/Jordan Run Rd
 Continue to follow Co Route 28/7
 8.3 mi
2. Turn left onto W Virginia 42 N
 5.0 mi
3. Turn right onto W Virginia 93 E
 12.2 mi
4. Continue onto US-50 E
 2.6 mi
5. Continue onto W Virginia 972 N/New Creek Dr
 Continue to follow W Virginia 972 N
 2.1 mi
6. Continue onto US-220 N
 Entering Maryland
 18.1 mi
7. Turn left onto MD-636/Warrior Ave
 0.3 mi
8. Turn right onto MD-53 N/Winchester Rd SW
 3.1 mi
9. Turn left onto US-40 Alt W/National Hwy
 4.1 mi
10. Turn left onto MD-36 S
 Destination will be on the right
 0.4 mi

10701 New Georges Creek Rd SW
 Frostburg, MD 21532

Clinic Location
 10701 New Georges Creek Rd SW,
 Frostburg, MD 21532



Prepared by:
Eco & Associates, Inc.
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Clinic Location Map
 MRS04 - Fore Knobs / Bear Rocks Firing Ranges
 MMRP West Virginia

Project No. Eco-11-452 September 2011

FIGURE
 6.2

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APPENDIX A

TPP DOCUMENTATION



TECHNICAL PROJECT PLANNING MEMORANDUM

FORMERLY USED DEFENSE SITE
MILITARY MUNITIONS RESPONSE PROGRAM
SITE INSPECTION PHASE

FUDS No.: G03WV0013

•FINAL•

September 22, 2011

**Former West Virginia Maneuver Area / Dolly Sods
Grant, Preston, Pendleton, Tucker, and Randolph
Counties, West Virginia**

**Contract No.: W912PP-11-C-0007
Task Order: 0001**

**Prepared for:
United States Army Corp of Engineers
Huntington District
502 8th Street
Huntington, West Virginia 25701**



TECHNICAL PROJECT PLANNING MEMORANDUM

Subject: Formerly Used Defense Site Military Munitions Response Program
Documentation of Technical Project Planning Team Concurrence for Site
Inspection Phase

Site: West Virginia Maneuver Area/Dolly Sods
Grant, Preston, Pendleton, Tucker, and Randolph Counties, West Virginia
FUDS Project No. G03WV0013

Contract: Contract No. W912PP-11-C-0007
Task Order 0001

INTRODUCTION

This document provides a record of the Technical Project Planning (TPP) Meeting for the West Virginia Maneuver Area/Dolly Sods Formerly Used Defense Site (FUDS) located in portions of Grant, Preston, Pendleton, Tucker, and Randolph Counties in northeastern West Virginia. The TPP Team members present indicated concurrence with the Site Inspection (SI) Technical Approach as developed during the TPP Meeting held at the Canaan Valley Resort State Park, Davis, West Virginia on April 7, 2011. An initial Technical Approach was developed using the collaborative experience of Eco & Associates, Inc. (Eco), Parsons Infrastructure and Technology Group (Parsons), the U.S. Army Corps of Engineers (USACE) technical experts, and available site information including the Inventory Project Report (INPR), revised INPR, Archives Search Report (ASR), Preliminary Assessment (PA), Historical Records Review (HRR), and other pertinent documents. The TPP Team discussed and refined the initial Technical Approach during the course of the TPP Meeting yielding a final Technical Approach for implementation at the seven munitions response sites (MRS) associated with this FUDS.

The Final Technical Approach agreed upon by the TPP Team is documented herein and will be further detailed in the forthcoming Draft Site-Specific Work Plan (SS-WP) Addendum (an addendum to the Programmatic Work Plan [PWP]). The Draft SSWP Addendum will be submitted to the TPP Team members for review to ensure that the key aspects of the TPP Meeting resolutions are fully captured.

The former West Virginia Maneuver Area/Dolly Sods site (FUDS Project No. G03WV0013) is located in portions of Grant, Preston, Pendleton, Tucker, and Randolph Counties in northeastern West Virginia. This property covers an area of approximately 2,180,367 acres: generally bounded by the city of Elkins to the west, U.S. Route 50 in Preston County to the north, Petersburg to the east, and U.S. Route 33 to the south, with a sliver of land extending farther south to Franklin. The FUDS incorporates the Dolly Sods Wilderness Area, which is located within the Monongahela National Forest. The property is centered at approximately N 39° 07' 08", W 79° 27' 09" (latitude, longitude).

According to the 2009 Preliminary Assessment (PA), maneuver rights obtained by the Rents and Claims Board, Fifth Service Command, secured 350,416 acres of public lands (part of the Monongahela National Forest), 48,557 acres of leased property (for inclusion in the impact area), and 1,781,394 acres of so-called "lesser interests" covered by "trespass agreements." Apparently, the landowners had given use of these lands to the Army on verbal commitment. "Trespass agreement" descriptions are not available in written documents for the properties.

The former West Virginia Maneuver Area/Dolly Sods property was used for special low altitude, mountain training activities during World War II. Regiments and battalions of larger infantry divisions went to the area from installations in other parts of the country to introduce the troops to various aspects of mountain warfare. Preliminary reconnaissance of the area by the Army found it to be similar to that of the Apennines and lower ranges of the Italian Alps, allowing troops to simulate conditions that could be encountered during the invasion of Italy and other mountainous regions during the war in Europe. Regiment exercises emphasized physical conditioning, navigation through mountainous terrain, map interpretation, bivouac establishment, stream crossing, and military problems unique to mountainous areas.

Based on information found on historical maps and historical site documents, munitions used during the 1943 to 1944 military training included the following:

- 40-millimeter (mm) and 57mm armor-piercing projectiles
- 105mm and 155mm high explosive (HE) howitzer rounds
- 105mm smoke rounds (SRs)
- 60mm HE mortars, 81mm HE and SR mortars, and 4.2-inch inert (sand-loaded) HE and SR mortars
- .30 caliber and .50 caliber machine gun rounds
- 75mm artillery (documented as being fired, but no physical evidence has been found)
- 3.25-inch rockets
- Practice antitank mines and fuses (no evidence of use or physical evidence has been found)

Before returning the land to the public and United States Forest Service (USFS) in 1950, Engineer Bomb and Shell Disposal Team Number 6 conducted an ordnance clearance of the West Virginia Maneuver Area during May 1946. Records indicate that the team found and destroyed 189 4.2-inch SR mortars, one 155mm HE projectile, three 105mm HE projectiles, two 40mm projectiles, and 12 or 14 inert (sand-loaded) rounds in the Dolly Sods region. The search did not include certain areas to the north and northeast of the Dolly Sods North (DSN) and Dolly Sods Scenic Area (DSSA) that were too rough and overgrown to be searched. During May 1953, the 549th Explosive Ordnance Disposal (EOD) from Baltimore, Maryland, conducted a follow-up reconnaissance and disposal mission of suspected impact areas, locating and destroying six live rounds. During a site visit in May 1991, in preparation of the work plan for the 1991 Feasibility Study, personnel from Metcalf & Eddy, Inc. (M&E) and UXB International, Inc. (UXB) found gun emplacements near Bell Knob Tower. Between June and October 1997 Human Factors Applications, Inc. (HFA) conducted a clearance in the Dolly Sods Wilderness (DSW). Fourteen (14) live mortars were found and destroyed by detonation, including 60mm HE and 81mm HE rounds. Ordnance and explosives (OE)-related scrap was recovered, inspected, and certified, then turned over to ENVIRCO, Inc. of Baker, WV. Between October 1997 and August 1998 HFA conducted a clearance in the DSN and DSSA. Eight (8) live mortars were found and destroyed by detonation, including 60mm HE and 4.2-inch SR and HE rounds. Unexploded ordnance (UXO) found from July 2004 through June 2007 includes one 105mm howitzer round, one 60mm mortar round, one 81mm mortar round, and five 3.25-inch rockets.

Currently, the Monongahela National Forest, the Nature Conservancy, Canaan Valley Institute, the U.S. Fish and Wildlife Service, hunting clubs, private individuals, large private entities, and other businesses own most of the former West Virginia Maneuver Area/Dolly Sods. There are two popular state parks in Tucker County: Canaan Valley State Park and Blackwater Falls State Park. Hiking, skiing, rock climbing, rafting, hunting, and fishing are extremely popular activities, and attract thousands of visitors annually to the area.

The 1990 INPR concluded that the West Virginia Maneuver Area had been formerly owned or used by the Army and was an eligible FUDS property. The USACE Huntington District conducted a field visit in the DSW and the DSSA on December 3, 1984. The report does not indicate whether munitions debris was observed onsite during the field visit. The report recommended a Remedial Investigation and Feasibility Study (RI/FS) to determine the types and extent of ordnance contamination at the site.

As part of the USACE DERP FUDS program, a Preliminary Assessment (PA) of the entire WVMA was prepared by the CELRH in 2009. The purpose of the PA was to collect sufficient information concerning conditions at the site to assess the immediate or potential threats posed to human health and the environment. The information was also used to support a decision regarding the need for further action. The PA included a review of available file information, collection and interpretation of historic aerial photographs, interviews, and site reconnaissance. This PA included only an assessment of possible environmental concerns associated with former DoD activities at the former WVMA. Information used to prepare the PA included military records, historical documents, historical newspaper reports, interviews with local residents, and historic aerial photographs. Based upon a review of the information above, the CELRH identified a total of 7 Munitions Response Sites (MRSs) warranting further investigation. For each of the MRSs, the PA recommended a SI to be conducted to determine the presence of munitions and explosives of concern (MEC). In the revised INPR, dated 1 December 2010, each of the MRS was assigned a priority, with 1 being the highest relative priority and 8 being the lowest. The seven MRSs associated with the West Virginia Maneuver

Area/Dolly Sods FUDS, and their corresponding Munitions Response Site Prioritization Protocol (MRSPP) are described in the table below.

**MUNITIONS RESPONSE SITE DETAILS
WEST VIRGINIA MANEUVER AREA / DOLLY SODS
(GRANT, PRESTON, PENDLETON, TUCKER, AND RANDOLPH COUNTIES)**

MRS NAME	SIZE (ACRES)	MRSPP	MUNITIONS USED *
MRS01 Dailey Infiltration Camp	200	5	Small arms, general: Cartridge, .22 caliber Cartridge, .30 caliber (includes carbine) Cartridge, .38 caliber Cartridge, .45 caliber Grenade, hand, fragmentation, MkII (1917 – present) Grenade, hand, practice, MkII
MRS02 Ammunition Depot**	4	7	Small arms, general: Cartridge, .30 caliber (includes carbine) Cartridge, .50 caliber, machine gun Cartridge, 40mm, armor piercing – tracer (AP-T), M81 Cartridge, 57mm, AP-T, M70 Shell, 60mm, high explosive (HE), M49A2 Shell, 60mm, smoke, white phosphorus (WP), M302 Shell, 75mm, HE, Mkl Shell, 75mm, smoke, WP, MkII Cartridge, 81mm, HE, M43 Cartridge, 81mm, smoke, WP, M57 Cartridge, 105mm, HE, M1 Cartridge, 105mm, smoke, HC, M84 Shell, 4.2-inch, HE, Mm3, M3A1 Shell, 4.2-inch, smoke, M2 (1918 – 1944) Projectile, 155mm, HE, M102 Mine, antitank, practice, M1 Rocket, 3.25-inch, target, Mk1 through Mk4

MRS NAME	SIZE (ACRES)	MRSPP	MUNITIONS USED *
MRS03 Jenningsston Training Area**	40,000	7	Small arms, general: Cartridge, .30 caliber (includes carbine) Cartridge, .50 caliber, machine gun Cartridge, 40mm, armor piercing – tracer (AP-T), M81 Cartridge, 57mm, AP-T, M70 Shell, 60mm, high explosive (HE), M49A2 Shell, 60mm, smoke, white phosphorus (WP), M302 Shell, 75mm, HE, MkI Shell, 75mm, smoke, WP, MkII Cartridge, 81mm, HE, M43 Cartridge, 81mm, smoke, WP, M57 Cartridge, 105mm, HE, M1 Cartridge, 105mm, smoke, HC, M84 Shell, 4.2-inch, HE, Mm3, M3A1 Shell, 4.2-inch, smoke, M2 (1918 – 1944) Projectile, 155mm, HE, M102 Mine, antitank, practice, M1 Rocket, 3.25-inch, target, Mk1 through Mk4
MRS04 Fore Knobs / Bear Rocks Firing Ranges	42,000	3	Shell, 60mm, HE, M49A2 Shell, 60mm, smoke, WP, M302 Cartridge, 81mm, HE, M43 Cartridge, 81mm, smoke, WP, M57 Cartridge, 105mm, HE, M1 Cartridge, 105mm, smoke, HC, M84 Projectile, 155mm, HE, M102
MRS05 Bearden Knob Firing Range	8,000	3	Cartridge, .30 caliber (includes carbine) Cartridge, .50 caliber, machine gun Cartridge, 3-inch, armor piercing capped (APC), M62, M62A1 Cartridge, 3-inch, AP, M79 Cartridge, 105mm, HE, M1 Cartridge, 105mm, high explosive antitank (HEAT), M67 Projectile, 155mm, HE, M102 Projectile, 155mm, AP, M112
MRS06 Brown / Cabin Mountain Firing Ranges	16,000	3	Cartridge, 105mm, HE, M1 Cartridge, 105mm, smoke, HC, M84 Projectile, 155mm, HE, M102 Projectile, 155mm, WP, M110 Rocket, 3.25-inch, target, Mk1 through Mk4
MRS07 Buena Small Arms Firing Range	50	4	Small arms, general: Cartridge, .22 caliber Cartridge, .30 caliber (includes carbine) Cartridge, .38 caliber Cartridge, .45 caliber Grenade, hand, fragmentation, MkII (1917 – present) Grenade, hand, practice, MkII

* Munitions list from the Preliminary Assessment (USACE 2009).

** Includes all potential munitions listed for the FUDS

MRS04 – FORE KNOBS / BEAR ROCKS FIRING RANGES

The 2009 PA includes the 42,000-acre Fore Knobs / Bear Rocks Firing Ranges MRS, which was used for firing points and target locations for 105mm and 155mm howitzer rounds. A clearance around the Bear Rocks area was conducted in 1999 by Human Factors Applications for the Nature Conservancy, which owns and maintains the Bear Rocks Wildlife Preserve. During that clearance, a 105mm HE howitzer round was found. An interview conducted during the PA indicated that ordnance has also been found near Stack Rocks. The area is currently part of Monongahela National Forest, part of the Nature Conservancy's Bear Rocks Preserve, and forested land and farmland with residences. The revised INPR reports an MRSP score of 3 for the MRS. Table 1, in the introductory section of this document, summarizes the details of the Fore Knobs / Bear Rocks Firing Ranges MRS at the former West Virginia Maneuver Area.

Based upon available information about the project site, the TPP team considers it an anticipated RI/FS site. MEC has been confirmed on site (105mm artillery and 60mm and 81mm mortars), and there is potential for additional MECs. Exposure pathways may be complete based on the possibility of MEC and MCs. In accordance with ER 200-3-1, sufficient data need to be collected during the SI to evaluate the potential presence of MEC and MC contamination for effective RI/FS initiation. In addition, the data necessary for the USEPA to complete the HRS scoring and for completion of the MRSP will be collected and developed. The TPP team proposes the following activities in support of the SI for the Fore Knobs / Bear Rocks Firing Ranges MRS in Grant County, West Virginia:

- **Site Visit** – A site visit in accordance with the PWP and the SSWP Addendum will be conducted. The site visit will cover the entire MRS with emphasis on the areas where munitions debris has been previously reported. Data will be gathered to evaluate vegetation and topography as they pertain to site characterization and to identify potential limitations to subsequent recommended actions.
- **Qualitative Reconnaissance** – QR will be conducted in accordance with the PWP. The QR will focus on the areas where debris has previously been found to help support an anticipated RI/FS recommendation.
- **Munitions Constituent Sampling** – MC sampling in accordance with the PWP and the PSAP will be conducted. The MRS will be screened for the presence of MC contamination in the surface soil, surface water, sediment, and groundwater, if available and warranted. Surface soil sampling will be conducted using the CRREL 7-point wheel sampling approach. Background samples will also be collected from areas suspected to be unaffected by military activity to serve as ambient data for comparison. Sampling locations and specific analytes were discussed as part of the TPP process. Surface soil, surface water and sediment, and groundwater samples are planned as follows:
 - Surface soil samples will be collected and analyzed for explosives, selected metals (aluminum, copper, lead, and zinc), and pH;

- Surface water and sediment grab samples will be collected and analyzed for explosives and the selected metals as listed above;
- Groundwater samples will be collected if sources are identified, samples will be analyzed for explosives and the selected metals listed above.

In addition to the determinations stated above, the following issues and resolutions were noted from TPP Meeting minutes:

- Portions of the MRS are within the Monongahela National Forest and the Bear Rocks Wildlife Preserve, therefore, this MRS is considered to be ecologically sensitive. The proposed screening levels to be used for the ecological risk assessment are described as follows, and are listed in Table 4-1.
 - **Soil:** USEPA EcoSSLs. In absence of EcoSSLs, values obtained from the Los Alamos National Laboratory (LANL), EcoRisk Database, and USEPA Region 3 Ecological Screening Levels
 - **Sediment:** USEPA Region 3 Ecological Screening Benchmarks, Freshwater Sediment Screening Benchmark, National Oceanic and Atmospheric Administration Screening Quick Reference Tables, LANL Ecorisk Database, and USEPA Region 3 ESLs
 - **Surface water:** Requirements governing Water Quality Standards supplemented with USEPA National Recommended Water Quality Criteria, USEPA Region 3 Freshwater Screening Benchmark, LANL Ecorisk Database
- The proposed screening levels to be used for the human health risk assessment are described as follows, and are listed in Table 4-1.
 - **Soil and Sediment:** Risk-Based Concentrations supplemented with USEPA Regional Screening Levels
 - **Surface water:** Requirements governing Water Quality Standards supplemented with USEPA National Recommended Water Quality Criteria and USEPA Regional Screening Levels for tap water
 - **Groundwater:** Requirements governing Water Quality Standards then Risk-Based Concentrations supplemented with USEPA Maximum Contaminant Levels, National Primary Drinking Water Standards and USEPA Regional Screening Levels for tap water
- The TPP team noted that clearance conducted by HFA was not a sufficient clearance of the area, and that there was in fact minimal clearance activity in support of the construction of a fire ring.
- Information regarding the actual firing locations might be obtained from Norman Black, a local farmer who grew up in the area.
- Collect surface water sample on both sides of the ridge to obtain samples from both the dip slope and anti-dip slope. One of the samples should be collected as noted on Slide 121 of the TPP Presentation, and one sample should be collected near the head of Red Creek.

- Two sample locations will be added near Old Stoney Reservoir, which has been previously drained and remains dry.
- Bear Rocks trail can be used to access sample locations. It was also noted that all personnel should remain on trails when attempting to access sampling locations.
- The TPP Team concurred that no known cultural resources exist within MRS.
- Physical hazards in this area include poison ivy, stinging nettles, and rattlesnakes.
- The timeframe for fieldwork should be between June and August.

Former West Virginia Maneuver Area

TPP Team		E M 200-1-2, Paragraph 1.1.1
Decision Makers		
Customer	USACE Huntington District (CELRH)	
Project Manager	Richard Meadows, CELRH	
Regulators	West Virginia Department of Environmental Protection; EPA Region 3	
Primary Stakeholders	U.S. Department of Agriculture, The Nature Conservancy, private landowners	
Data Types	Data User(s)	Data Gatherer
Demographics/Land Use	Risk, Responsibility, and Compliance Perspectives	Eco/Parsons (Senior Scientist, Risk Specialist)
Site Conditions	Remedy Perspective	Eco/Parsons (Geologist, Senior Scientist)
Munitions and Explosives of Concern (MEC)	Risk and Remedy Perspectives	Eco/Parsons (UXO Technician III or higher, Risk Specialist, Senior Scientist)
Munitions Constituents (MC)	Risk and Remedy Perspectives	Eco/Parsons (Chemist, Risk Specialist, Senior Scientist)
Archaeology	Compliance and Remedy Perspectives	Eco/Parsons (Staff Scientist, Senior Scientist)
Endangered Species	Risk and Compliance Perspectives	Eco/Parsons (Staff Scientist, Senior Scientist)

CUSTOMER'S GOALS				E M 200-1-2, Paragraph 1.1.2
Potential Area of Interest (PAOI)	Contaminant Issues	Future Land Use	Site-specific Closeout Goal (if applicable)	
Fore Knobs/Bear Rocks Firing Ranges	TBD	National forest, wildlife preserve	See below	
		Private development		
		Agriculture		
Site Closeout Statement				
To manage the munitions and explosives of concern (MEC) and munitions constituents (MC) risk through a combination of removal, administrative controls, and public education; thereby rendering the site as safe as reasonably possible to humans and the environment and conducive to the anticipated future land use.				
Customer's Schedule Requirements				
Site Inspection and Reporting Complete by January 14, 2013				
Customer's Site Budget				
Site Inspection and Reporting: Fully Funded through SI Phase				

IDENTIFY SITE APPROACH		
EXISTING SITE INFORMATION & DATA EM 200-1-2, Paragraph 1.1.3 and 1.2.1		
Attachment(s) to Phase I TPP Memorandum	Located at Repository	Preliminary Conceptual Site Model
Preliminary Assessment (Archives Search Report)	N/A for SI Phase; Implemented in post-SI Phase as warranted	No
Site-Specific SI Work Plan	N/A for SI Phase; Implemented in post-SI Phase as warranted	Yes
POTENTIAL POINTS OF COMPLIANCE EM 200-1-2, Paragraph 1.2.1.3		
Determination of absence or presence of MEC/MC and applicability of RI/FS		
If MC are detected, comparison against Screening Levels (SSLs) as identified in "Site Constraints and Dependencies" below to determine if further MC evaluation during RI/FS is warranted.		
Avoidance of sensitive conditions: endangered species, archaeological sites		
MEDIA OF POTENTIAL CONCERN EM 200-1-2, Paragraph 1.2.1.4		
Qualitative review of MEC presence		
Quantitative screening of MC in soil		
Comparison criteria		
SITE OBJECTIVES EM 200-1-2, Paragraph 1.2.2		
Eliminate from further consideration those releases that pose no significant threat to public health or the environment.		
Collection of sufficient data to perform MRSPS scoring and USEPA to conduct MC-related HRS		
<i>See Programmatic and Site-Specific Work Plan</i>		
<i>See Attached Worksheets Developed by the Project Team</i>		
REGULATOR AND STAKEHOLDER PERSPECTIVES EM 200-1-2, Paragraph 1.2.3		
Regulators	Community Interests	Others
West Virginia Department of Environmental Protection; EPA Region 3	Undeveloped public land near town of Dailey	
	Portions of site within Monongahela National Forest, Bear Rocks Preserve	
PROBABLE REMEDIES E M 200-1-2, Paragraph 1.2.4		
RI/FS		
Institutional Controls / Public Education		
EXECUTABLE STAGES TO SITE CLOSEOUT EM 200-1-2, Paragraph 1.2.5		
Site Inspection (SI)		
Remedial Investigation/Feasibility Study (RI/FS)		
Proposed Plan		
Decision Document		
Remedial Design (RD)		
Remedial Action (as necessary)		
Recurring Review		
Time Critical Removal Action (as required)		

IDENTIFY CURRENT PROJECT		
SITE CONSTRAINTS AND DEPENDENCIES		EM 200-1-2, Paragraph 1.3.1
<u>Administrative Constraints and Dependencies</u>		
Right of Entry (ROE)		
Cultural Resources		
Funding beyond the SI		
Schedule		
Concurrent Planning Programs		
<u>Technical Constraints and Dependencies</u>		
Property owner/leaseholder site activities (Site access)		
Cultural Resources		
Topography/vegetation		
MEC avoidance screening of MC sample locations for safety		
Environmentally sensitive areas		
<u>Legal and Regulatory Milestones and Requirements</u>		
Consistent with CERCLA and NCP, and in compliance with all legally applicable federal and state requirements.		
Public, stakeholder and regulatory involvement and review of key documents		
Funding beyond the SI		
<p>Comparison criteria as agreed upon by the TPP Team. <u>Human Health</u>: RBCs supplemented with USEPA RSLs (soil and sediment); Requirements governing Water Quality Standards supplemented with USEPA National Recommended Water Quality Criteria and USEPA RSLs for tap water (surface water); Requirements governing Water Quality Standards then RBCs supplemented with USEPA MCLs, National Primary Drinking Water Standards and USEPA RSLs for tap water (groundwater). <u>Ecological</u>: USEPA EcoSSLs, or in absence of EcoSSLs - values obtained from LANL, EcoRisk Database, and USEPA Region 4 and Region 5 ESLs (soil); USEPA Region 3 Ecological Screening Benchmarks, Freshwater Sediment Screening Benchmark and NOAA Screening Quick Reference Tables, LANL Ecorisk Database and USEPA Region 4 and Region 5 ESLs (sediment); Requirements governing Water Quality Standards supplemented with USEPA National Recommended Water Quality Criteria, USEPA Region 3 Freshwater Screening Benchmark, LANL Ecorisk Database, USEPA Region 4 ESVs for Fresh Surface Water, and USEPA Region 5 ESVs (surface water). <u>Background</u>: Natural Background Levels of Inorganics in Soils in West Virginia and Surrounding Areas, three times USGS ambient concentrations, or mean concentration if multiple ambient samples (soil and sediment); three times ambient concentration, or mean concentration if multiple ambient samples (surface water); three times ambient concentration, or mean concentration if multiple ambient samples (groundwater).</p>		
CURRENT EXECUTABLE STAGE		EM 200-1-2, Paragraph 1.3.3
Site Inspection		
Basic (For Current Projects)	Optimum (For Future Projects)	Excessive (Objectives that do not lead to site closeout)
Site Reconnaissance	RI/FS	

Acronyms

- CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
- CELRH - United States Corps of Engineers, Huntington District
- DoD - Department of Defense
- ESL - Ecological Screening Level
- ESV - Ecological Screening Value

EPA/USEPA - United States Environmental Protection Agency
FUDS - Formerly Used Defense Sites
HRS - Hazard Ranking System
LANL - Los Alamos National Laboratory
MC - munitions constituents
MCL - Maximum Contaminant Level
MEC - munitions and explosives of concern
MRSP - Munitions Response Site Prioritization Protocol
NCP - National Contingency Plan
NDAI - No Department of Defense Action Indicated
PSAP - Programmatic Sampling and Analysis Plan
RBC - Risk-Based Concentration
RI/FS - Remedial Investigation and Feasibility Study
RSL - Regional Screening Level
SI - Site Inspection
SSL - Soil Screening Level
TBD - To be determined
TPP - Technical Project Planning
USFS - United States Forest Service
USGS - United States Geological Survey

MEC DATA QUALITY OBJECTIVE WORKSHEET

SITE: West Virginia Maneuver Area; FUDS Project No. G03WV0013
PROJECT: MMRP Site Inspection / MRS04 Fore Knobs/Bear Rocks Firing Ranges

DQO STATEMENT NUMBER: **1 of 4**

DQO Element Number*	DQO Element Description*	Site-Specific DQO Statement
Intended Data Use(s):		
1	Project Objective(s) Satisfied	Evaluate potential presence of munitions or explosives of concern (MEC)
Intended Need Requirements:		
2	Data User Perspective(s)	Risk, remedy
3	Contaminant or Characteristic of Interest	MEC, munitions debris
4	Media of Interest	N/A
5	Required Locations or Areas	Fore Knobs/Bear Rocks Firing Ranges
6	Number of Samples Required	N/A
7	Reference Concentration of Interest or Other Performance Criteria	Visual identification of MEC or munitions debris during qualitative reconnaissance (QR)
Appropriate Sampling and Analysis Methods:		
8	Sampling Method	QR with magnetometer (Schonstedt) for avoidance
9	Analytical Method	N/A

* Refer to EM 200-1-2, Paragraph 4.2.1

MC DATA QUALITY OBJECTIVE WORKSHEET

SITE: West Virginia Maneuver Area; FUDS Project No. G03WV0013
PROJECT: MMRP Site Inspection / MRS04 Fore Knobs/Bear Rocks Firing Ranges

DQO STATEMENT NUMBER: **2 of 4**

DQO Element Number*	DQO Element Description*	Site-Specific DQO Statement
Intended Data Use(s):		
1	Project Objective(s) Satisfied	Evaluate potential release of munitions constituents (MC)
Intended Need Requirements:		
2	Data User Perspective(s)	Risk, remedy
3	Contaminant or Characteristic of Interest	See CSM
4	Media of Interest	Surface soil, and surface water and sediments
5	Required Sampling Locations or Areas and Depths	Samples will be collected as determined by the TPP Team, see Figures 3 and 4. Sample depth is 0-3 inches for surface soil.
6	Number of Samples Required	7 discretionary biased surface soil samples and 1 ambient surface soil sample. 2 biased sample sets of surface water & sediment, and 1 ambient sample set. Plus associated QA/QC samples.
7	Reference Concentration of Interest or Other Performance Criteria	Human health selected values for soil and sediment are from the USEPA 'protection for groundwater' risk-based screening levels, supplemented with USEPA Region 3 Screening Levels. Human health selected values for surface and ground water are from <i>Requirements Governing Water Quality Standards Rule.</i> , supplemented by USEPA Region 3 levels for tap water (or MCLs if no value for tap water was found). Ecological selected values are from USEPA EcoSSLs, supplemented by Los Alamos National Laboratory's EcoRisk Database values and the relevant USEPA Ecological Screening Benchmarks.

Appropriate Sampling and Analysis Methods:		
8	Sampling Method	Seven-point wheel sampling method in accordance with the SS-WP, PSAP and PSAP Addendum
9	Analytical Method	Explosives: SW846-8321A Selected metals: SW846-6010B pH: EPA Method 150.1

Refer to EM 200-1-2, Paragraph 4.2.1

MRSPP Data Quality Objective Worksheet

Site: West Virginia Maneuver Area; FUDS No. G03WV0013
Project: MMRP Site Inspection / MRS04 Fore Knobs/Bear Rocks Firing Ranges
DQO Statement Number: 3 of 4

Module	Table #	Table Description	Known Data	Current Data Gap	Data Source
Explosive Hazard Evaluation (EHE)	1	Munitions Type	X		Historical records or field findings
	2	Source of Hazard	X		Historical maps
	3	Location of Munitions		X	Historical records or field findings
	4	Ease of Access		X	Field findings
	5	Status of Property	X		Historical records
	6	Population Density		X	U.S. Census Bureau
	7	Population Near Hazard		X	Field findings
	8	Types of Activities/Structures		X	Regional zoning
	9	Ecological and/or Cultural Resources	X		State Historic Preservation Office
	10	Determining the EHE		X	Scores from Tables 1 through 9
Chemical Warfare Materiel (CWM) Hazard Evaluation (CHE)	11	CWM Configuration	X		Historical records or field findings
	12	Sources of CWM	X		Historical records or field findings
	13	Location of CWM	X		Historical records or field findings
	14	Ease of Access		X	Historical records or field findings
	15	Status of Property	X		Historical records
	16	Population Density		X	U.S. Census Bureau
	17	Population Near Hazard		X	Field findings
	18	Types of Activities/Structures		X	Regional zoning
	19	Ecological and/or Cultural Resources	X		State Historic Preservation Office
	20	Determining the CHE		X	Scores from Tables 11 through 19
Health Hazard Evaluation (HHE)	21	Groundwater Data		X	N/A
	22	Surface Water - Human Endpoint		X	Field findings
	23	Sediment - Human Endpoint		X	Field findings
	24	Surface Water - Ecological Endpoint		X	Field findings
	25	Sediment - Ecological Endpoint		X	Field findings
	26	Surface Soil		X	Surface soil sampling results
	27	Supplemental Contaminant Hazard Factor		X	All MC sampling results
	28	Determining the HHE		X	Scores from Tables 21 through 27
	29	MRS Priority		X	Scores from Tables 10, 20, and 28
	A	MRS Background Information	X		DoD databases

HRS Data Quality Objective Worksheet

Site: West Virginia Maneuver Area; FUDS No. G03WV0013

Project: MMRP Site Inspection / MRS04 Fore Knobs/Bear Rocks Firing Ranges

DQO Statement Number: 4 of 4

Data Description	Known Data	Current Data Gap	Data Source
Source Type	X		Historical records or field findings
Estimated Volume or Area	X		Field findings
Hazardous Substance	X		Constituents of suspected munitions
Groundwater Sample Concentration		X	N/A
Groundwater Use		X	Well records and municipal data
Surface Water Sample Concentration		X	N/A
Surface Water Pathways		X	Field findings
Soil Sample Concentration		X	Sample results
Soil Pathways		X	Field findings
Sensitive Environments	X		State Historic Preservation Office, U.S. Fish and Wildlife Service, various government agencies
Attractiveness/Accessibility		X	Field findings and land use records

APPENDIX B

CONCEPTUAL SITE MODELS

**CONCEPTUAL SITE MODEL – MUNITIONS AND EXPLOSIVES OF CONCERN
FORE KNOBS / BEAR ROCKS FIRING RANGES MRS, GRANT COUNTY, WEST VIRGINIA**

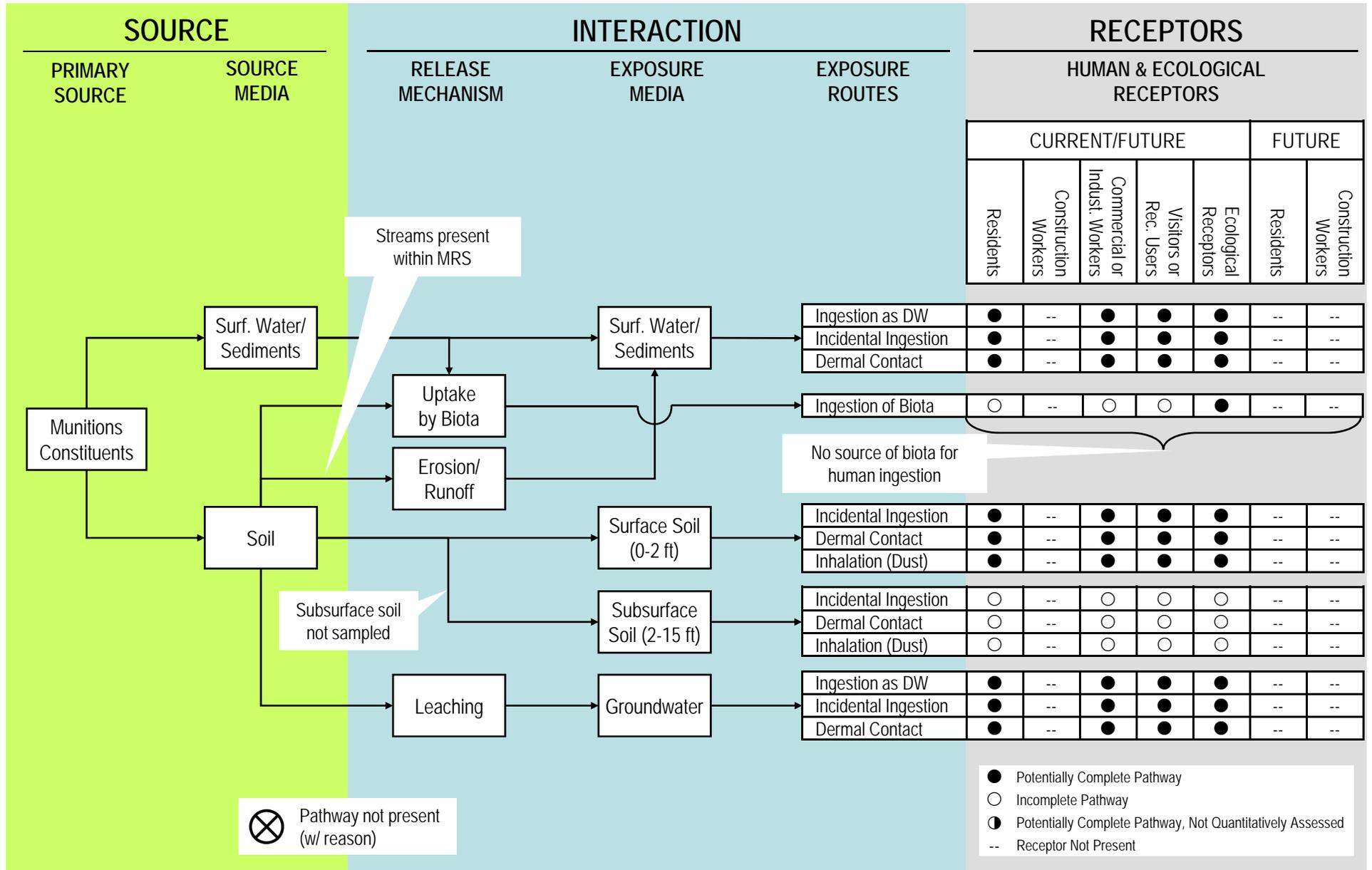
Subsite / Range	Acreage	Suspect Past DoD Activities	Potential MEC / Munitions Debris Present	MEC / Munitions Debris Found Since Closure	Previous Investigation / Clearance Actions	Post-DoD Land Use and Current Land Use	Potential Receptors	Potential Source and Receptor Interaction	Proposed Field Sampling / Qualitative Reconnaissance
FORE KNOBS / BEAR ROCKS	42,000	Firing points and target locations for 105mm and 155mm howitzer rounds	Shell, 60mm, HE, M49A2 Shell, 60mm, smoke, WP, M302 Cartridge, 81mm, HE, M43 Cartridge, 81mm, smoke, WP, M57 Cartridge, 105mm, HE, M1 Cartridge, 105mm, smoke, HC, M84 Projectile, 155mm, HE, M102	The 2009 PA indicates that MEC has reportedly been found within the MRS (105mm artillery and 60mm and 81mm mortars). However, the MRSPP scores in the PA only describe one MEC find: a 105mm howitzer HE round discovered during the 1999 clearance of the area around Bear Rocks. An interview in the PA also indicates that ordnance was found near Stack Rocks.	2009 PA A clearance around the Bear Rocks area was conducted in 1999 by Human Factors Applications for the Nature Conservancy.	Partially owned by the Nature Conservancy and operated as the Bear Rocks Preserve. Partially owned by the U.S. Department of Agriculture, managed by the U.S. Forest Service as a portion of the Monongahela National Forest. . Partially forested land and farmland with private residences.	Commercial/industrial workers (Nature Conservancy, U.S. Department of Agriculture, or U. S. Forest Service employees), recreational users (e.g., hikers), residents, site visitors.	Possible: Presence of potentially hazardous MEC is possible and site is accessible to receptors.	5 surface soil samples, and one or more ambient surface soil samples. Biased samples will be collected from potential firing points (3), stack rock area (1), and Bear Rocks area (1). 2 biased surface water/sediment sample couples. One set collected from Big Star Run, and the other collected from the northwest portion of the MRS. One ambient surface water/sediment sample couple. Plus associated QC samples QR length TBD, focused on areas where DoD-related features have been reported, and where MD has been found.
				Source: PA (2009)	DoD = Department of Defense MEC = munitions and explosives of concern PA = Preliminary Assessment QR = qualitative reconnaissance TBD = to be determined				

PRE-MC SAMPLING CONCEPTUAL SITE EXPOSURE MODEL

MRS Name: WEST VIRGINIA MANEUVER AREA: Fore Knobs / Bear Rocks MRS

Created/Revised By: Lauren Johnson, PARSONS

Last Revision Date: May 31, 2011



APPENDIX C

UXO ENCOUNTER PROCEDURES – IGD
06-05



DEPARTMENT OF THE ARMY
HUNTSVILLE CENTER, CORPS OF ENGINEERS
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REPLY TO
ATTENTION OF:

MAR 16 2006

CEHNC-OE-CX

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Procedure for Preliminary Assessment (PA) and Site Inspection (SI) Teams that Encounter Unexploded Ordnance (UXO) While Gathering Non-UXO Field Data, Military Munitions Center of Expertise (MM CX) Interim Guidance Document (IGD) 06-05

1. PURPOSE: This procedure describes the responsibilities of project teams during the preliminary assessment and site investigation phases should unexploded ordnance (UXO) be discovered.
2. APPLICABILITY: This guidance is applicable to the geographic military Districts, Military Munitions Response Program (MMRP) Design Centers, Major Subordinate Commands (MSCs), and designated Remedial Action Districts performing MMRP response actions.
3. REQUIREMENTS AND PROCEDURES:
 - a. During site visits to formerly used defense site (FUDS) properties to gather PA or SI information, in the rare instance that a UXO-qualified individual identifies an item that is an explosive hazard, the following actions will occur:
 - (1) The property owner or individual granting rights of entry to the property will be notified of the hazard and advised to call the local emergency response authority (i.e., police, sheriff, or fire department). The individual will also be informed that if they do not call the local response authority within 1 hour, the individual who identified the UXO item will notify the local emergency response authority.
 - (2) The local response authority will decide how to respond to the reported incident, including deciding not to respond (e.g., if the local response authority is already aware of the hazards on the property). If the local response authority decides to respond, the individual who identified the item or his designee will mark the location of the item and provide accurate location information to the emergency response authority. The individual who identified the item or his designee will generally remain in the area until the local response authority arrives, unless specifically indicated by the appropriate response authority that the individual may leave the area.
 - (3) During the SI, the state regulator may also be notified at their request.

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b. During site visits to active installations or Base Realignment and Closure (BRAC) sites to gather PA or SI information, in the rare instance that a UXO-qualified individual identifies an item that is an explosive hazard, the following actions will occur:

(1) The installation point of contact (POC) or the BRAC coordinator will be notified of the hazard and requested to notify explosive ordnance disposal (EOD) through their channels.

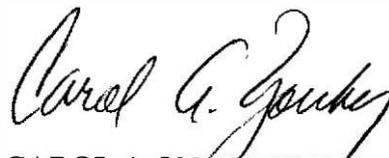
(2) The installation/EOD will make the determination if they are going to respond to the incident. The installation/EOD may be aware of the hazards at the site and make the decision not to respond. If the installation/EOD decides to respond, the individual who identified the item or his designee will mark the location and provide accurate location information to the installation/EOD unit and will remain in the area unless the installation/EOD unit requests otherwise.

c. Neither the US Army Corps of Engineers personnel, nor their contractors have the authority to call EOD to respond to an explosive hazard. This call is the responsibility of the local emergency response authority for FUDS properties and it must come through the proper chain of command on installations.

d. AR 75-14 and AR 75-15 contain the information on how EOD responds to explosives hazards.

4. EFFECTIVE DATES: The requirements and procedures set forth in this interim guidance are effective immediately. They will remain in effect indefinitely, unless superseded by other policy or regulation.

5. POINT OF CONTACT: If you need additional information, please contact Mr. Brad McCowan at 256-895-1174.



CAROL A. YOUKEY, P.E.
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and Explosives Directorate