



# SITE-SPECIFIC WORK PLAN ADDENDUM

**FORMERLY USED DEFENSE SITE  
MILITARY MUNITIONS RESPONSE PROGRAM  
SITE INSPECTION PHASE**

**•FINAL•**

**February 14, 2012**

**West Virginia Maneuver Area / Dolly Sods  
MRS02 – Ammunition Depot  
Randolph County, West Virginia**

**FUDS No. G03WV0013**

**Contract No. W912PP-11-C-0007**

**Task Order 0001**

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## ABBREVIATION AND ACRONYMS

AHA	Activity Hazard Analysis
ANSI	American National Standards Institute
APPL	Agricultural and Priority Pollutant Laboratories, Inc. (or APPL, Inc.)
ASR	Archives Search Report
BD/DR	Building Demolition/ Debris Removal
CELRH	USACE 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	USACE Walla Walla District
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHE	Chemical Hazard Evaluation
CON/HTRW	Containerized Hazardous, Toxic, and Radioactive Waste
CPR	cardiopulmonary resuscitation
CRREL	Cold Regions Research and Engineering Laboratory
CSEM	Conceptual Site Exposure Model
CSM	Conceptual Site Model
CVNWR	Canaan Valley National Wildlife Refuge
CWM	Chemical Warfare Material
DCPM	Design Center Program Manager
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DQO	Data Quality Objective
DSN	Dolly Sods North
DSSA	Dolly Sods Scenic Areas
DSW	Dolly Sods Wilderness
EA	Environmental Assessment
Eco	Eco & Associates, Inc.
EcoSSL	Ecological Soil Screening Level
EE/CA	Engineering Evaluation/Cost Analysis
EHE	Explosive Hazard Evaluation
ELAP	Environmental Laboratory Accreditation Program
EOD	Explosive Ordnance Disposal
EPP	Environmental Protection Plan
ER	Engineering Regulation
ERFPP	Emergency Response and Fire Prevention Plan
ESL	Ecological Screening Level
ESV	Ecological Screening Value
FDE	Findings and Determination of Eligibility
FDEP	Federal Department of Environmental Protection
FONSI	Findings of No Significant Impact
FS	Feasibility Study
FSP	Field Sampling Plan

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FTL	Field Team Leader
FUDS	Formerly Used Defense Site
FUDSMIS	Federally Used Defense Sites Management Information System
GIS	Geographic Information System
GPS	global positioning system
HE	high explosive
HFA	Human Factors Applications, Inc.
HHE	Health Hazard Evaluation
HRR	Historical Records Review
HRS	Hazard Ranking System
HTRW	Hazardous, Toxic, and Radioactive Waste
HTW	Hazardous and Toxic Waste
IDW	investigative-derived waste
INPR	Inventory Project Report
IRA	Interim Removal Action
LANL	Los Alamos National Laboratory
M&E	Metcalf & Eddy, Inc.
MC	munitions constituents
MCL	Maximum Contaminant Level
MDL	Method Detection Limit
MEC	Munitions and Explosives of Concern
mm	millimeter
MMDC	Military Munitions Design Center
MMRP	Military Munitions Response Program
MNF	Monongahela National Forest
MRS	Munitions Response Site
MRSP	Munitions Response Site Prioritization Protocol
MS/MSD	matrix spike/matrix spike duplicate
msl	mean sea level
NBE	New Bold Enterprises
NCDC	National Climate Data Center
NDAI	No Department of Defense Action Indicated
NELAC	National Environmental Laboratory Accreditation Conference
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
OE	ordnance and explosives
OEW	ordnance and explosive waste
OSD	Office of the Secretary of Defense
PA	Preliminary Assessment
PAPP	Programmatic Accident Prevention Plan
Parsons	Parsons Infrastructure and Technology Group, Inc.
PFSP	Programmatic Field Sampling Plan
PM	Project Manager
POP	period of performance
PPE	Personal Protective Equipment
PQL	Practical Quantitation Limit
PSAP	Programmatic Sampling and Analysis Plan
PSD	Public Service District
PVC	polyvinyl chloride
PWP	Programmatic Work Plan
QA	quality assurance

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QAPP	Quality Assurance Project Plan
QC	quality control
QR	Qualitative Reconnaissance
QSM	Quality Systems Manual
RAC	risk assessment code
RBC	Risk-Based Concentrations
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROE	Right-of-Entry
RSL	Regional Screening Level
SHPO	State Historic Preservation Office
SI	Site Inspection
SLERA	Screening Level Ecological Risk Assessment
SLRA	Screening Level Risk Assessment
SOP	Standard Operating Procedure
SOW	Statement of Work
SR	smoke rounds
SS-WP	Site-Specific Work Plan
T&E	Threatened and Endangered
TCRA	Time Critical Removal Action
TPP	Technical Project Planning
USACE	United States Army Corps of Engineers
USAESCH	United States Army Engineering and Support Center, Huntsville
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UXB	UXB International, Inc.
UXO	unexploded ordnance
WSA	Watershed Atlas
WV	West Virginia
WVDCH	West Virginia Division of Culture and History
WVDEP	West Virginia Department of Environmental Protection
WVDNR	West Virginia Department of Natural Resources
WVMA	West Virginia Maneuver Area

## CHAPTER 1: INTRODUCTION

### 1.1 APPLICATION

This Site-Specific Work Plan (SS-WP) Addendum document concerns the Ammunition Depot Munitions Response Site (MRS) at the West Virginia Maneuver Area (WVMA) / Dolly Sods Formerly Used Defense Site (FUDS) in Randolph County, West Virginia (FUDS Property Number G03WV0013). The 4-acre WVMA Ammunition Depot MRS (MRS02) is one of seven MRSs within the 2,180,367-acre FUDS and is located in the City of Elkins, in the southwest portion of the FUDS. The MRS served as the main ammunition storage area for the WVMA / Dolly Sods FUDS.

The SS-WP Addendum serves as an extension to the Programmatic Work Plan (PWP) for the FUDS Military Munitions Response Program (MMRP) – Site Inspections (SI) Phase at Multiple Sites in the Southwest Region (Parsons 2010) and the Programmatic Sampling and Analysis Plan (PSAP) for MMRP SIs (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 SI procedures, resources, and methods that are common to most SI field actions. The PWP and PSAP have been reviewed and approved by the 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, as well as the SS-WP Addendum, will accompany the site visit team during SI field activities.

### 1.2 SI PROJECT OBJECTIVE – WVMA AMMUNITION DEPOT MRS

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 constituents (MC) sampling, as to whether the site warrants further response action. A NDAI recommendation would be limited exclusively to Munitions and Explosives of Concern (MEC) and MC contamination issues and would 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. According to Engineering Regulation (ER) 200-3-1, “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 Preliminary Assessment (PA), 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 toward providing compelling evidence in support of a No Department of Defense Action Indicated (NDAI) assertion or for demonstrating a strategy for focusing a Remedial Investigation/Feasibility Study (RI/FS) to substantially smaller tracts within the site.

For the Ammunition Depot MRS, insufficient data exist to support a recommendation for an NDAI or a further response (e.g., RI/FS) for the MRS prior to conducting the field portion of the SI.

An INPR was completed in 1990 and the 2,180,367-acre WVMA / Dolly sods FUDS was approved as eligible for the FUDS program, including the 4-acre Ammunition Depot MRS. A site visit to the WVMA Ammunition Depot MRS conducted in November 2007 yielded no indications of the presence of MEC, nor was any evidence of the former Ammunition Depot found. Interviews with local persons knowledgeable about the area did not reveal any reports of MEC or munitions incidents at this site. 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) based on a hazard severity of *critical* and a hazard probability of *probable* (USACE 2009).

In addition to the Archives Search Report (ASR) completed for a portion of the former WVMA (Dolly Sods North) issued in September 1995, an HRR was also conducted. The HRR and ASR considered the potential for Hazardous, Toxic and Radioactive Waste (HTRW); containerized HTRW (CON/HTRW); and Building Demolition or Debris Removal (BD/DR) concerns associated with Department of Defense (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 former WVMA including high explosive (HE) and short-range (SR) mortars, a 105-millimeter (mm) HE howitzer round, and a 3.25-inch rocket. The HRR and ASR listed no evidence of chemical warfare materials (CWM) storage, usage, or disposal at the FUDS.

The PA prepared by the USACE in 2009 identified seven MRSs for the WVMA/Dolly Sods FUDS including the 4-acre Ammunition Depot MRS.

In December 2010, an INPR was prepared by the USACE, Louisville District (CELRL) requesting approval of the on-going Dolly Sods MMRP and proposing the 7 MRSs identified in the PA. The USACE Great Lakes and Ohio River Division (CELRD) granted approval of the Dolly Sods MMRP and the 7 new MRSs in December 2010 that included the Ammunition Depot MRS.

### 1.3 TPP SUMMARY

The WVMA Ammunition Depot MRS 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, USACE Walla Walla (CENWW), Parsons Infrastructure and Technology Group, Inc. (Parsons), Eco & Associates, Inc. (Eco), the Canaan Valley Institute (CVI), the US Forest Service, and the West Virginia Department of Environmental Protection (WVDEP). A Draft TPP Memo was issued on June 14, 2011 (see Appendix A). This Draft SS-WP Addendum reflects the TPP Team decisions resulting from the meeting. Review comments received on the Draft TPP Memo were included in the Final TPP Memo. Key TPP facts and decisions are summarized below:

- The location of the WVMA Ammunition Depot MRS was described in the text and indicated in the figures of the Preliminary Assessment (PA) for the site. The acreage for the MRS area was given; however, the specific shape and dimensions of the MRS were not illustrated. Based on the descriptions of the MRS in the PA, Parsons proposed an appropriate MRS boundary during the TPP Meeting. The TPP Team agreed that the proposed boundaries are acceptable based on lease documentation. The TPP Team also agreed that the MRS acreage of the proposed

boundary as presented in the TPP meeting is acceptable, even though it differs from the acreage listed in the PA.

- The TPP Team agreed that portions of the MRS that are close to Leading Creek may not represent true DoD-era soil conditions due to historic flooding that occurred in approximately 1985. The TPP Team agreed that surface soil samples should be focused on higher ground, away from low areas around the stream. Additionally, the site visit team should attempt to collect the soil samples from the A-horizon, which may be as deep as 2 feet bgs.
- Due to historic flooding, the soils along Leading Creek may contain metallic debris not related to DoD use.
- Analyses for perchlorate and white phosphorous are not required, per WVDEP direction.
- Ambient soil samples will be collected from the northern portion of the MRS, in a cleared area near the trees.
- The TPP Team concurred that no known cultural or ecological resources exist within the MRS.
- The TPP Team agreed that surface water and sediment sampling was not warranted, based on the absence of surface water within the MRS.
- Based on well data collected after the TPP Meeting, there are no wells within the WVMA Ammunition Depot MRS. Therefore, groundwater samples will not be collected during the SI.
- The proposed screening levels to be used for the human health risk assessment are described as follows, and are listed in Table 4.4:

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

All Qualitative Reconnaissance (QR) and MC results will be fully documented in an SI Report for the TPP Team and other stakeholders' review. The SI Technical Approach described above will not be modified without consultation and agreement by the TPP Team.

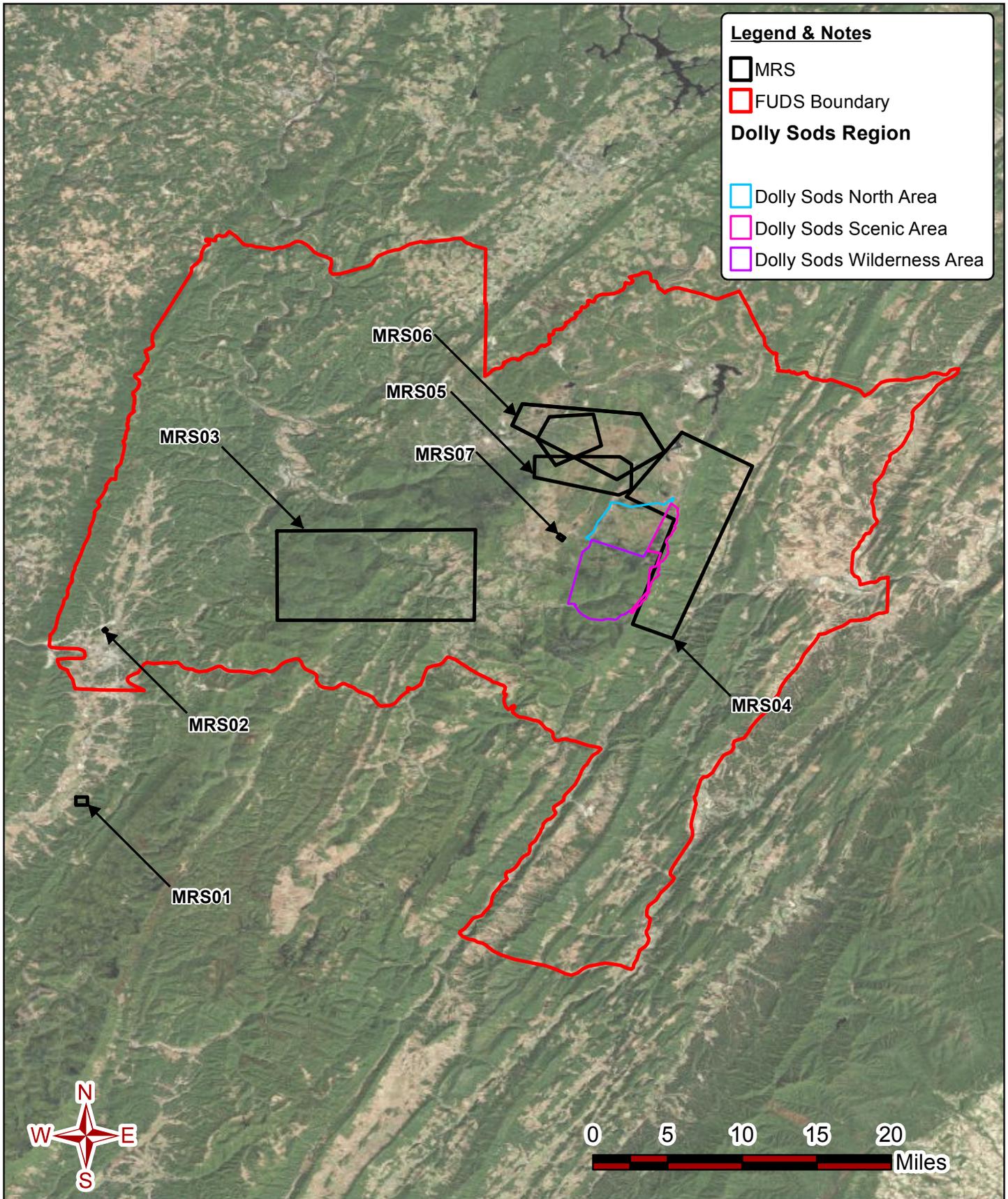
#### **1.4 SITE-SPECIFIC WORK PLAN ADDENDUM ORGANIZATION**

This SS-WP Addendum covers the investigation and all associated preparations necessary for SI activities at the WVMA Ammunition Depot MRS. 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



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**FUDS Location Map**  
 West Virginia Maneuver Area  
 FUDS No. G03WV0013

Project No. Eco-11-452 February 2012

FIGURE  
 1.1

## CHAPTER 2: PROJECT DESCRIPTOR

### 2.1 PROJECT LOCATION

The WVMA Ammunition Depot MRS is located in Randolph County, West Virginia, in the Highland Park area at the northern end of the City of Elkins. Figures 2.1 and 2.2 show the site location and boundaries.

### 2.2 SITE DESCRIPTION

The WVMA Ammunition Depot MRS is 4 acres in aerial extent and consists of vacant land located at the southeast corner of the intersection of Old Route 219 and County Route 11 / State Highway 219. The site is bordered by Old Route 219 and a concrete company to the north, Leading Creek, the Western Maryland RR line, and residences to the south, vacant land to the east, and County Route 11 / State Highway 219 with vacant land beyond to the west. Currently, the site is part of a vacant 12-acre parcel recently used for agriculture. The site is believed to be the location of the ammunition depot for the WVMA/Dolly Sods FUDS.

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 (USACE 2009). The Allegheny Front, a prominent geological feature bordering the western edge of the WVMA/Dolly Sods FUDS boundary, runs northeast and 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).

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/Dolly Sods FUDS boundary primarily drain within the Ohio River Basin except for the North Branch and South Branch of the Potomac.

Prominent features and areas within the former WVMA's 2,180,367-acre area include the Monongahela National Forest (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; the Canaan Valley State Park; Blackwater Falls State Park; Blackbird Knob; Cabin Mountain; Shavers Mountain; Rich Mountain; Bearden Knob; Canaan Mountain and Canaan Valley wetlands; the Blackwater River, Shavers River, the Cheat River, the Tygart Valley River, and their tributaries. The Bear Rocks Preserve, located north of Dolly Sods, is managed by The Nature Conservancy.

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 United States Forest Service (USFS) 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) (United States Fish and Wildlife Service [USFWS] 2007).

### **2.2.1 GEOLOGY AND SOILS**

The WVMA/Dolly Sods FUDS 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 complex boundary between two provinces that changes abruptly from the folded and faulted surficial strata of the Valley and Ridge province to the gentler faulted strata of the High Plateau province. East of the Allegheny Front the strata are found to dip steeply on the limbs of many anticlines, 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 FUDS, 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 the Allegheny Front 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 which 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. The Greenbrier Group, composed mainly of limestone, was deposited during this period. 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 during 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 the FUDS. 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.

In the area of the Ammunition Depot MRS, the soil types consist of Atkins silt loam, the Berks-Weikert complex, and Philo loam. In addition to the soil types listed above, an area of cut and fill is identified directly adjacent to County Route 219/86 along the northwest edge of the MRS (United States Department of Agriculture [USDA] 2011b).

Atkins silt loam is a poorly draining soil found in flood plains. It consists of silt loam and loam within the upper four feet of the surface with gravelly sandy loam to silty clay loam at depth. Loam is a soil type composed of various mixtures of silt, sand, and clay that generally contains greater than 60% silt and less than 40% clay. Atkins silt loam underlies the central portion of the MRS.

The Berks-Weikert complex is found on mountain slopes. The complex consists of channery silt loam with weathered and unweathered bedrock at depth. Channery soils are soils that contain more than 15% of flat rock fragments up to 6 inches long on their long axis. The Berks-Weikert complex underlies the extreme northern corner of the MRS.

The Philo loam is a moderately well drained soil found in flood plains. The soil consists of loam within the upper two feet with fine sandy loam at depth. Philo loam underlies the southern and southwestern portion of the MRS.

The TPP Team determined that this site may have been impacted by flooding in the mid 1980s. Therefore, the TPP Team decided that soil samples should be collected from a depth of 2 feet below the surface. Soil encountered at this depth at the proposed sample locations should consist of loam with the exception of the extreme northern portion of the MRS adjacent to County Route 219/86. The soil in this area consists of channery silt loam of the Berks-Weikert complex (USDA 2011b).

### **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 (National Climate Data Center [NCDC] 2007). Annual precipitation is plentiful and evenly distributed with short, infrequent periods of water deficit. Average high temperatures in the MRS 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 May when field work will be performed range from a high of approximately 72° F (22° C) to a low of approximately 44° F (7° C) (Climate-Charts 2011).

### **2.2.3 TOPOGRAPHY AND VEGETATION**

The WVMA Ammunition Depot MRS lies in a relatively level plain on the north side of Leading Creek. Leading Creek flows southwest parallel to the southern edge of the MRS. The MRS is at an elevation of approximately 1920 feet above mean sea level (msl) and slopes very gradually toward the creek (USGS 1995).

The majority of the MRS consists of a vacant agricultural field. There are some wooded areas along the southern and northern edges of the site. There are no wetlands noted on the site (USFWS 2011c). However, photographs taken at the MRS during a site visit in 2007 show ponded water (See Appendix M, photo M83 of the PA, dated February 2009).

## **2.2.4 HYDROLOGY**

There are no perennial or intermittent surface water bodies within the WVMA Ammunition Depot MRS. Leading Creek, a tributary of the Tygart Valley River, flows parallel to and just outside of the southern edge of the MRS. Based on a review of topographic maps of the area, runoff at the MRS would likely follow the local topography and flow southeast toward Leading Creek. Leading Creek flows southwest and joins the Tygart Valley River. The Tygart Valley River joins the Monongahela River, the Ohio River, and eventually flows into the Gulf of Mexico.

Drinking water in the area of the MRS is supplied by the Elkins Public Service District (PSD), which obtains water from the Tygart Valley River. The intake is located approximately two miles south of the MRS at river mile marker 81.95 (latitude 38° 55' 00.44" N – longitude 79° 50' 47.01" W). The PSD provides water to the City of Elkins and three additional PSDs: Midland PSD, Huttonville PSD, and Leadsville PSD. Figure 5.2 displays the reported wells within 4 miles of the MRS.

## **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. Due to the short duration of the maneuver actions (October 1943 to 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, impacts to groundwater. Therefore, the logical focus for potential groundwater contamination appears to be on the more heavily used target areas rather than storage areas such as the Ammunition Depot. Because there is no record of any munitions incidents or detonations at the MRS, the potential for impacted groundwater is reduced.

The Tygart Valley is underlain by Devonian shale and sandstone covered by a thin layer of alluvium. In 1980, a hydrologic study was conducted to locate groundwater supplies to supplement surface water supplies during periods of low surface flow and drought conditions. The study concluded that sufficient groundwater supplies existed to develop a water system capable of supplying up to 200 gallons per minute. However, most of the groundwater is contained in the alluvial deposits. Wells developed in the underlying shale units have highly variable yields with the highest yields obtained from wells in extensively fractured units and sand and gravel lenses within the shale. The study noted that the most desirable water is located within 100 feet of the surface with salty water located below 140 feet (Hobba 1980).

## **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, acquired through 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 landowners 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 indicated that there was 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 granted 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.

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 Ammunition Depot MRS is outside of the former 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 former 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 former 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.

Prior to establishment of the former WVMA, the area was largely forest, primarily 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 (a result of logging activities) occurred in what would become a portion of the former WVMA's Impact Area and dramatically changed 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 agriculture and recreation. 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. Two popular state parks (Canaan Valley and Blackwater Falls) were developed in Tucker County in the years following the former WVMA operations. Hiking, skiing, rock climbing, rafting, hunting, and fishing are 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 MNF, The Nature Conservancy, Canaan Valley Institute, USFWS, hunting clubs, and private residents. The MNF owns 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 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 make 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 USFWS operate the Canaan Valley NWR, which consists of 15,245 acres of land that generally run from the western face of Cabin Mountain into central Canaan Valley. 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).

Based upon information contained in the PA, the former ammunition depot was believed to be located in an area currently occupied by the Mountain State Memorial Gardens cemetery, approximately 3 miles north of the MRS. According to lease records, 4 acres of a 400 acre farm was leased to the Army by Victor Del Sordo. However, Del Sordo was unable to recall which 4 acres were leased. Historical photos taken in the area of the current cemetery show army activities but they appear to be related to vehicle storage. A site visit to the cemetery in 2007 did not reveal any evidence of army activity. Subsequently, the location shown in the TPP Memo

documents was chosen as the most likely location for the former Ammunition Depot (CELRH 2009).

The purpose of the WVMA Ammunition Depot was to provide a storage area for all of the ordnance and munitions used at the former WVMA. The potential munitions stored at the ammunition depot included small arms ammunition (.22, .30, .38, .45, and .50 Caliber); 40, 57, 60, and 75mm HE and SR; 4.2 inch HE and SR shells; 81 and 105mm HE and SR cartridges; 155mm HE projectiles; 3.25-inch target rockets; fragmentation, smoke, and practice hand grenades; and antitank mines (practice).

## **2.4 CURRENT AND PROJECTED LAND USE**

Currently, the WVMA Ammunition Depot MRS is a vacant agricultural field. The property is located near the northern edge of the City of Elkins. The MRS is bordered by Old Highway 219 and a concrete company to the north, the Western Maryland Railroad and Leading Creek to the south, County Route 11 / State Highway 219 to the west, and similar vacant land to the east. Because the MRS is located in a relatively urbanized area, land use is expected to remain the same (Google Earth 2011).

## **2.5 PREVIOUS INVESTIGATIONS**

Ordnance clearance operations began almost immediately after military use of the former WVMA ended in 1944. Initial clearance operations in 1946 focused on known target areas which were located in the Dolly Sods region; a high plateau located in the eastern central portion of the FUDS (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 former WVMA / Dolly Sods are described below (USACE 2009). Note that no clearance activity has ever been conducted at the Ammunition Depot MRS.

As part of the USACE Defense Environmental Restoration Program (DERP) FUDS program, a PA of the *entire* former WVMA was prepared by the CELRH in 2009. Information used to prepare the PA included military records, historical documents, historical newspaper reports, interviews with local residents, interviews with former Army officials stationed at the site, and historic aerial photographs. Based upon a review of this information, the CELRH identified a total of 7 MRSs warranting further investigation, in addition to the Dolly Sods Area which had been previously identified. Included in these 7 additional MRSs is the WVMA Ammunition Depot MRS (MRS02) which is the subject of this SS-WP (USACE 2009).

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 Ammunition Depot MRS.

### **2.5.1 INITIAL CLEARANCE OPERATIONS**

Following the 1943 to 1944 military maneuvers, and prior to returning the land to the public and 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 (which were pointed out to the team by USFS personnel), with the exception of certain regions to the north and northeast of DSN and 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 Explosive Ordnance Disposal (EOD) team from Baltimore, Maryland 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 regarding 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 TO 1992**

The preliminary assessment of the “Dolly Sods Wilderness Area (West Virginia Maneuver Area),” for eligibility under the DERP-FUDS program, was initiated by 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 INPR proposed DERP-FUDS Project No. G03WV006500 to conduct a 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).

CELRH 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 to replace the erroneously numbered DERP-FUDS Project No. G03WV006500 with the DERP-FUDS OE project number G03WV006504 and to conduct a RI/FS of the maneuver area (USACE 1992).

In 2005, CELRH 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 May 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 the 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 were discovered approximately 120 feet to the west of Forest Service Road 75 in the vicinity of Bell Knob Tower; the gun emplacements were distinguishable by the distinctive pattern of their eroded, yet visible berms. 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 (UXO) 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, while the third was found among the gun emplacements west of Forest Service Road 75. Ordnance fragments were found near the area where the 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 hilltops, 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. In addition, 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 was defined for ten, one-acre sites within the DSW, selection based on the results of the surface investigation. 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 which 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 travel ways, 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 dump site 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 USACE, Rock Island District, prepared an ASR for the Dolly Sods Area (specifically DSN) 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 surrounding a prominent feature called Blackbird Knob. Blackbird Knob consists of 670 acres that were used as an artillery target. The entire 6,168 acres were noted as part of the MNF 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 value of the acres as 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 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 CELRH Commander 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**

Additional funding became available to USACE to perform an ordnance removal activity in the DSN and 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 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 since the DSW and DSN areas were similar in climate and somewhat similar in terrain and ecosystems, and that the environmental consequences and mitigation activities for the DSN OE removal action would be similar. On September 23, 1997, the CELRH Commander signed (with concurrence from the USDA 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 TO 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-TCRA 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, Site Conditions, and Background sections of the memorandum. The revised memorandum noted that the USFS and USACE had jointly prepared instructions to protect the endangered Cheat Mountain Salamander that were more detailed. 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 MNF 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 TO 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 between October 20, 1997, and August 18, 1998, immediately following the DSW OE removal action. 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, including 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 1,043.5 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 TO AUGUST 2004**

CELRH, with technical support provided by the 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 conducted for operable units on the National Priority List hazardous waste sites due to the fact 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 and 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, and 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 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 toward 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* former 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 Munitions response sites (MRSs) warranting further investigation including the Ammunition Depot MRS which is the subject of this SS-WP.

### **2.5.12 INVENTORY PROJECT REPORT (INPR) – DECEMBER 2010**

An Inventory Project Report (INPR) for the former 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 Ammunition Depot MRS 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 Ammunition Depot MRS.

### **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 and 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 Ammunition Depot was not included in these visits however. 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 MEC was 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, PA, reported findings, visual observations, and other sources were used to develop the list of potential MEC items for WVMA Ammunition Depot MRS. 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 munitions debris 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**

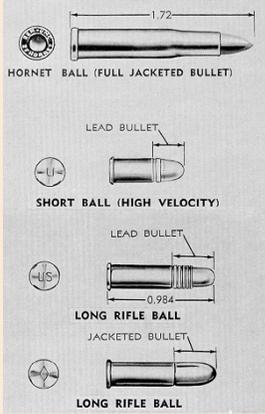
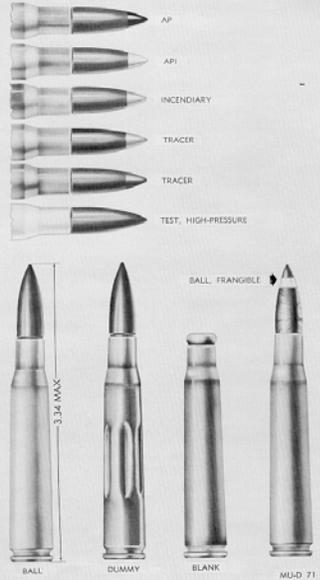
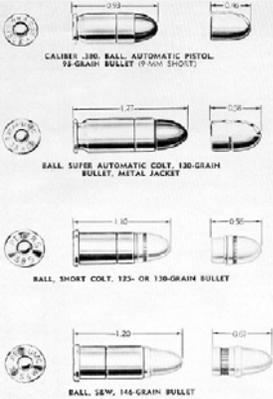
The local USACE District for the WVMA Ammunition Depot MRS is located in Huntington, West Virginia. The regulatory authority for this site is the WVDEP. To date, USEPA has not participated in planning associated with this site and has deferred to the WVDEP. A list of key technical contacts involved in this SI study is included in Table 2.3.

The site visit team for the WVMA Ammunition Depot 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. The site visit team will include a UXO Technician III tasked with ensuring all aspects of field safety, as well as identification of MEC or other munitions debris encountered.

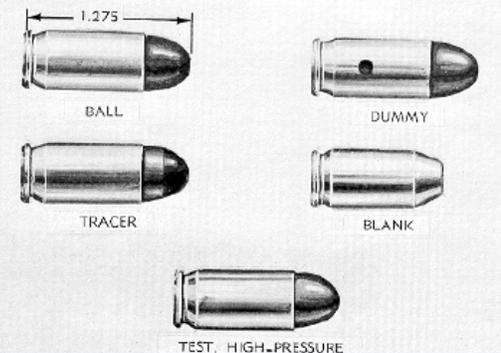
## **2.8 PROJECT SCHEDULE**

The project schedule, shown on Figure 2.3, is dynamic but has been updated to reflect actual milestones achieved to date, as well as to incorporate government and regulatory review cycles and submittals for pending milestones. The site visit will be conducted between April 30 and May 4, 2012. The period of performance (POP) to complete the task order scope of work is scheduled for December 29, 2012.

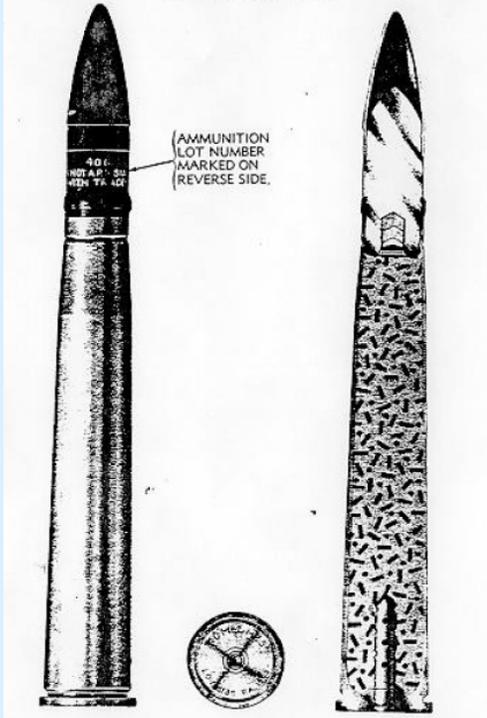
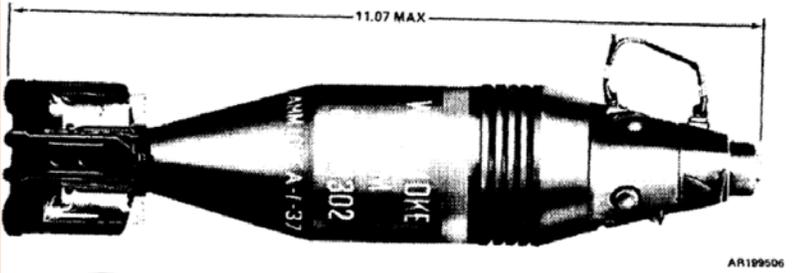
**TABLE 2.1**  
**SUSPECTED OR KNOWN MUNITIONS**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munition	Photograph/Diagram
<p><b>Small arms, ammunition, general; Cartridge, .22 caliber</b></p>	 <p>The diagram shows four types of .22 caliber ammunition. At the top is a 'HORNET BALL (FULL JACKETED BULLET)' with a length dimension of 1.72. Below it is a 'SHORT BALL (HIGH VELOCITY)' with a 'LEAD BULLET' label. Next is a 'LONG RIFLE BALL' with a 'LEAD BULLET' label and a length dimension of 0.984. At the bottom is another 'LONG RIFLE BALL' with a 'JACKETED BULLET' label.</p>
<p><b>Small arms, ammunition, general; Cartridge, .30 caliber (includes Carbine)</b></p>	 <p>The diagram displays various .30 caliber ammunition types. The top row includes AP, API, INCENDIARY, TRACER, TRACER, and TEST, HIGH-PRESSURE. The bottom row includes BALL, DUMMY, BALL, FRANGIBLE, BLANK, and MUD 71. A vertical dimension of 3.34 MAX is shown for the BALL type.</p>
<p><b>Small arms, ammunition, general; Cartridge, .38 caliber</b></p>	 <p>The diagram shows four types of .38 caliber ammunition. The first is 'CALIBER .380 BALL, AUTOMATIC PISTOL, 72-GRAIN BULLET (P-100 SHORT)' with dimensions 2.93 and 0.46. The second is 'BALL, SUPER AUTOMATIC COLT, 130-GRAIN BULLET, METAL JACKET' with dimensions 1.27 and 0.68. The third is 'BALL, SHORT COLT, 125- OR 130-GRAIN BULLET' with dimensions 1.10 and 0.50. The fourth is 'BALL, S&amp;W, 145-GRAIN BULLET' with dimensions 1.20 and 0.62.</p>

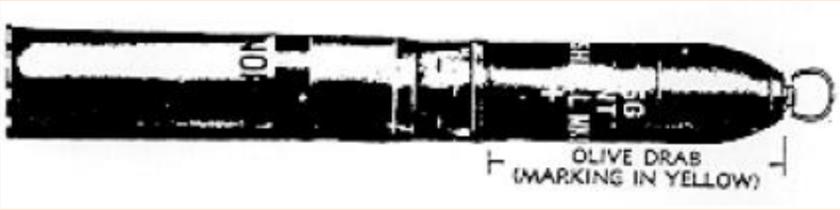
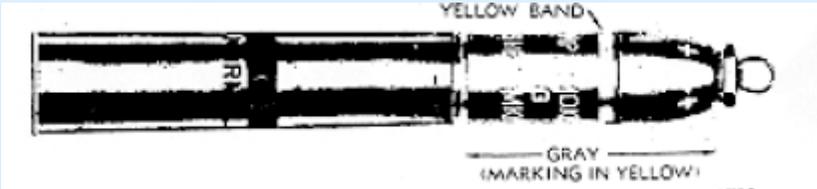
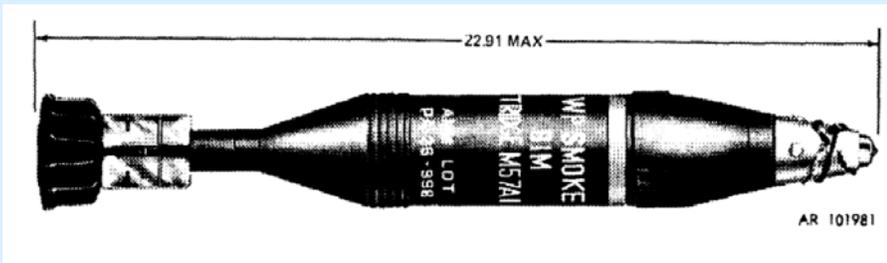
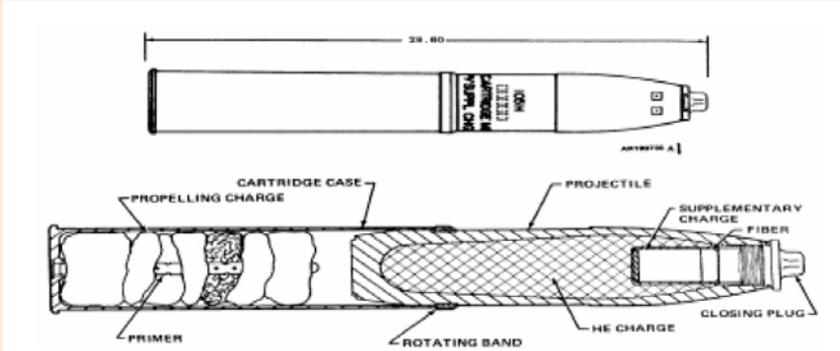
**TABLE 2.1**  
**SUSPECTED OR KNOWN MUNITIONS**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munition	Photograph/Diagram
<p><b>Small arms, ammunition, general; Cartridge, .45 caliber</b></p>	
<p><b>Small arms, ammunition, general; Cartridge, .50 caliber, Machine Gun</b></p>	

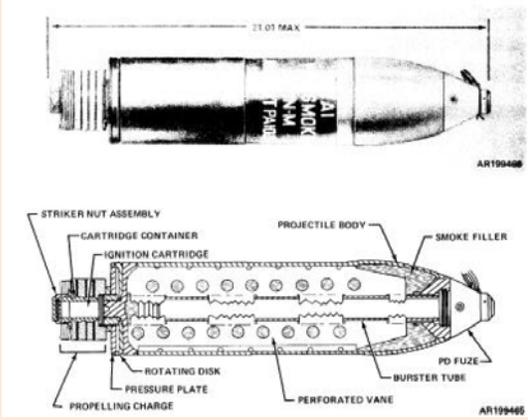
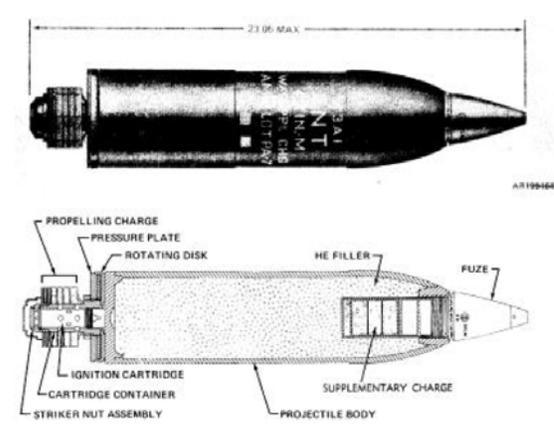
**TABLE 2.1**  
**SUSPECTED OR KNOWN MUNITIONS**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munition	Photograph/Diagram
<p>Cartridge, 40mm, Armor Piercing-Tracer (AP-T), M81</p>	
<p>Cartridge, 57mm, AP-T, M70</p>	
<p>Shell, 60mm, High Explosive (HE), M49A2</p>	
<p>Shell, 60mm, Smoke, White Phosphorous (WP), M302</p>	

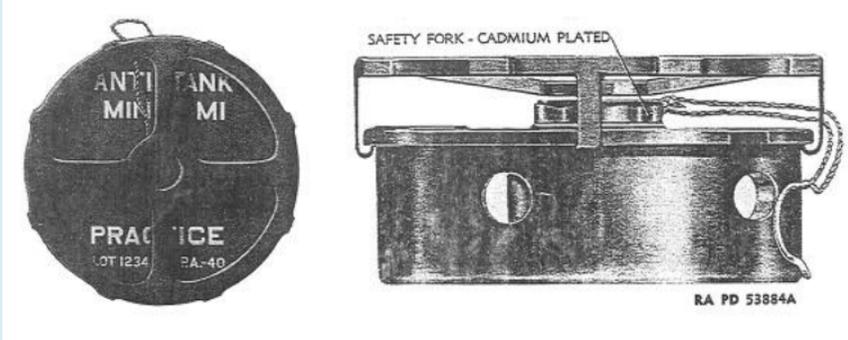
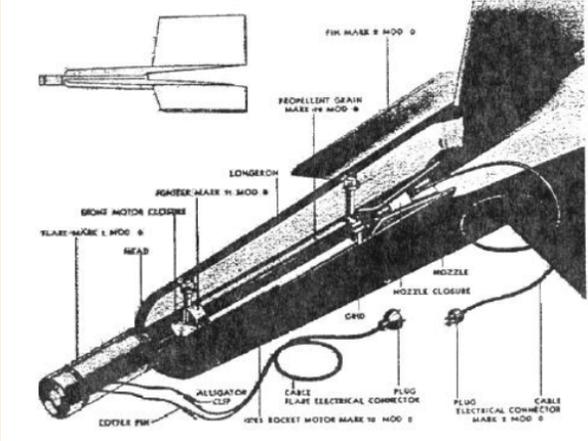
**TABLE 2.1**  
**SUSPECTED OR KNOWN MUNITIONS**  
 West Virginia Maneuver Area – FUDS No. G03WV0013  
 MRS02 Ammunition Depot

Munition	Photograph/Diagram
Shell, 75mm, HE, Mkl	
Shell, 75mm, Smoke, WP, Mkl	
Cartridge, 81mm, HE, M43	
Cartridge, 81mm, Smoke, WP, M57	
Cartridge, 105mm, HE, M1	

**TABLE 2.1**  
**SUSPECTED OR KNOWN MUNITIONS**  
 West Virginia Maneuver Area – FUDS No. G03WV0013  
 MRS02 Ammunition Depot

Munition	Photograph/Diagram
Cartridge, 105mm, Smoke, HC, M84	 <p>YELLOW BAND        GRAY        (MARKING IN YELLOW)</p>
Shell, 4.2-inch, Smoke, M2 (1918 – 1944)	 <p>23.01 MAX        AR19948B        STRIKER NUT ASSEMBLY        CARTRIDGE CONTAINER        IGNITION CARTRIDGE        PROJECTILE BODY        SMOKE FILLER        ROTATING DISK        PRESSURE PLATE        PROPELLING CHARGE        BURSTER TUBE        PERFORATED VANE        PD FUZE        AR199465</p>
Shell, 4.2-inch, HE, M3, M3A1	 <p>23.06 MAX        AR199464        PROPELLING CHARGE        PRESSURE PLATE        ROTATING DISK        HE FILLER        FUZE        IGNITION CARTRIDGE        SUPPLEMENTARY CHARGE        CARTRIDGE CONTAINER        PROJECTILE BODY        STRIKER NUT ASSEMBLY</p>
Projectile, 155mm, HE, M102	 <p>OLIVE DRAB        (MARKING IN YELLOW)        RA PD 80800A</p>

**TABLE 2.1**  
**SUSPECTED OR KNOWN MUNITIONS**  
 West Virginia Maneuver Area – FUDS No. G03WV0013  
 MRS02 Ammunition Depot

Munition	Photograph/Diagram
<p>Mine, Antitank, Practice, M1</p>	 <p>The photograph shows two items. On the left is a circular antitank mine with the text 'ANTI TANK MINE' and 'PRACTICE' on its top and bottom halves, respectively. Below 'PRACTICE' are the markings 'LOT 1234' and 'PA-40'. On the right is a rectangular metal safety fork with a handle and a hook, labeled 'SAFETY FORK - CADMIUM PLATED'. Below the safety fork is the reference number 'RA PD 53884A'.</p>
<p>Rocket, 3.25-inch, Target, Mk 1 through Mk 4</p>	 <p>The diagram is a detailed technical drawing of a rocket motor assembly. It includes various components labeled with their part names and modification numbers. The labels include: 'FIX. WARE # MOD #', 'REPELLENT DRAIN MARK # MOD #', 'LONGERON', 'IGNITER-MAKER # MOD #', 'BRONZ MOTOR CLOSURE', 'FLARE-MAKER # MOD #', 'HEAD', 'NOZZLE', 'NOZZLE CLOSURE', 'CABLE', 'PLUG ELECTRICAL CONNECTOR MARK # MOD #', 'CABLE ELECTRICAL CONNECTOR MARK # MOD #', '1/2" SOCKET MOTOR MARK # MOD #', 'ALLIGATOR CLIP', and 'EDDYER FIN'.</p>

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munitions Type/ Model	Composition (Case and Filler) <sup>(2)</sup>	MC Analysis <sup>(1)</sup>
<p><b>Small arms ammunition, general: Cartridge, .22 caliber</b></p>	<p><b>Cartridge case:</b> Copper Alloy – Copper, Iron, Lead, Zinc  <b>Propellant:</b> Dibutylphthalate, Diphenylamine, Nitrocellulose<sup>(5)</sup>, Nitroglycerin  <b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead, Lead Styphnate, Nitrocellulose<sup>(5)</sup>, Pentaerythritol Tetranitrate (PETN), Tetrazene, Zinc  <b>Projectile:</b> Antimony, Copper, Iron, Lead, Zinc</p>	<p style="text-align: center;"><u><b>Metals</b></u> <sup>(3)</sup> Lead  <u><b>Explosives</b></u> <sup>(4)</sup>  A full explosives panel will be analyzed for from media collected at the firing lines of this MRS.</p>
<p><b>Small arms ammunition, general: Cartridge, .30 caliber (includes carbine)</b></p>	<p><b>Cartridge case:</b> Copper Alloy – Copper, Iron, Lead, Zinc  <b>Propellant:</b> Calcium Carbonate, Copper, Dibutylphthalate, Diphenylamine, Dinitrotoluene<sup>(6)</sup>, Ethyl Centralite, Lead, Iron, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate, Sodium Sulfate, Zinc  <b>Primer</b> <sup>(7)</sup>: Aluminum Powder, Antimony Sulfide, Barium Nitrate, Copper, Iron, Lead, Lead Styphnate, PETN, Tetrazene, Zinc  <b>Projectile:</b> Antimony, Carbon, Copper, Iron, Lead, Manganese, Silicon, Sulfur, Zinc  <b>Tracer</b> <sup>(8)</sup>: Barium Peroxide, Calcium Resinate, Magnesium Powder, Polyvinyl Chloride, Strontium Nitrate, Strontium Oxalate, Strontium Peroxide, Zinc Stearate</p>	<p style="text-align: center;"><u><b>Metals</b></u> <sup>(3)</sup> Antimony, Copper, Lead  <u><b>Explosives</b></u> <sup>(4)</sup>  A full explosives panel will be analyzed for from media collected at the firing lines of this MRS.</p>
<p><b>Small arms ammunition, general: Cartridge, .38 caliber</b></p>	<p><b>Cartridge case:</b> Copper Alloy – Copper, Iron, Lead, Zinc  <b>Propellant:</b> Dinitrotoluene<sup>(6)</sup>, Diphenylamine, Ethyl Centralite, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Sulfate  <b>Primer</b> <sup>(7)</sup>: Aluminum Powder, Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead Oxide, Lead Styphnate, Nitrocellulose<sup>(5)</sup>, PETN, Tetrazene, Zinc  <b>Projectile:</b> Antimony, Copper, Iron, Lead, Zinc</p>	<p style="text-align: center;"><u><b>Metals</b></u> <sup>(3)</sup> Lead  <u><b>Explosives</b></u> <sup>(4)</sup>  A full explosives panel will be analyzed for from media collected at the firing lines of this MRS.</p>
<p><b>Small arms ammunition, general: Cartridge, .45 caliber</b></p>	<p><b>Cartridge case:</b> Copper Alloy – Copper, Iron, Lead, Zinc  <b>Propellant:</b> Diphenylamine, Dinitrotoluene<sup>(6)</sup>, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate, Potassium Sulfate  <b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead Styphnate, Lead Thiocyanate, Nitrocellulose<sup>(5)</sup>, PETN, Potassium Chlorate, Tetrazene, Trinitrotoluene (TNT), Zinc  <b>Projectile:</b> Antimony, Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Silicon, Sulfur, Zinc</p>	<p style="text-align: center;"><u><b>Metals</b></u> <sup>(3)</sup> Lead  <u><b>Explosives</b></u> <sup>(4)</sup>  A full explosives panel will be analyzed for from media collected at the firing lines of this MRS.</p>

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munitions Type/ Model	Composition (Case and Filler) <sup>(2)</sup>	MC Analysis <sup>(1)</sup>
<p><b>Small arms ammunition, general: Cartridge, .50 caliber, Machine Gun</b></p>	<p><b>Cartridge case:</b> Brass – Copper, Zinc  <b>Propellant:</b> Calcium Carbonate, Dibutylphthalate, Diphenylamine, Dinitrotoluene<sup>(6)</sup>, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate, Potassium Sulfate, Sodium Sulfate  <b>Primer</b> <sup>(7)</sup>: Aluminum Powder, Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Iron, Lead, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, PETN, Tetrazene, Zinc  <b>Projectile:</b> Antimony, Carbon, Copper, Iron, Lead, Manganese, Molybdenum, Sodium Carbonate Monohydrate, Silicon, Sulfur, Zinc  <b>Tracer</b> <sup>(8)</sup>: Barium Peroxide, Calcium Resinate, Magnesium Powder, Polyvinyl Chloride, Potassium Perchlorate, Strontium Nitrate, Strontium Oxalate, Strontium Peroxide, Zinc Stearate</p>	<p style="text-align: center;"><b><u>Metals</u></b> <sup>(9)</sup>            Antimony, Copper, Lead  <b><u>Explosives</u></b> <sup>(9)</sup>            A full explosives panel will be analyzed for from media collected at the firing lines of this MRS.</p>
<p><b>Cartridge, 40mm, Armor Piercing-Tracer (AP-T), M81</b></p>	<p><b>Cartridge case:</b> Brass - Copper, Iron, Lead, Zinc  <b>Propellant:</b> Dibutylphthalate, Dinitrotoluene<sup>(6)</sup>, Diphenylamine, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate, Sulfur  <b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, TNT  <b>Projectile/Rotating Band:</b> Steel/Copper Alloy - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur, Zinc  <b>Projectile Filler:</b> Solid steel  <b>Tracer</b> <sup>(8)</sup>: Aluminum, Barium Peroxide, Calcium Resinate, Magnesium, Polyvinyl Chloride, Strontium Nitrate</p>	<p style="text-align: center;"><b><u>Metals</u></b>            Copper, Zinc  <b><u>Explosives</u></b>            As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
<p><b>Cartridge, 57mm, Armor Piercing-Tracer (AP-T), M70</b></p>	<p><b>Cartridge Case:</b> Brass, Steel – Carbon, Copper, Iron, Manganese, Phosphorus, Sulfur, Zinc  <b>Propellant:</b> Dibutylphthalate, Dinitrotoluene<sup>(6)</sup>, Diphenylamine, Nitrocellulose<sup>(5)</sup>  <b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sulfur, TNT,  <b>Projectile:</b> Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur  <b>Tracer</b> <sup>(8)</sup>: Aluminum Alloy, Magnesium, Strontium Nitrate, Polyvinyl Chloride</p>	<p style="text-align: center;"><b><u>Metals</u></b>            Copper, Zinc  <b><u>Explosives</u></b>            As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS</p>
<p><b>Shell, 60mm HE, M49A2</b></p>	<p><b>Propelling Assembly:</b> Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc  <b>Propellant:</b> Diethylphthalate, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate  <b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT  <b>Projectile:</b> Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur  <b>Projectile Filler:</b> TNT  <b>Fuze, Point Detonating (PD), M52 series:</b> Aluminum Alloy, Zinc Alloy - Aluminum, Bismuth,</p>	<p style="text-align: center;"><b><u>Metals</u></b>            Aluminum, Copper, Zinc  <b><u>Explosives</u></b>            As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munitions Type/ Model	Composition (Case and Filler) <sup>(2)</sup>	MC Analysis <sup>(1)</sup>
	Cadmium, Copper, Iron, Magnesium, Manganese, Nickel, Phosphorus, Silicon, Sulfur, Tin, Zinc <b>Fuze Filler:</b> Tetryl <b>Fuze Primer <sup>(7)</sup>:</b> Antimony Sulfide, Carborundum, Copper, Lead Azide, Potassium Chlorate, Zinc	
<b>Shell, 60mm, Smoke, White Phosphorus (WP), M302</b>	<b>Propelling Assembly:</b> Kraft Paper, Steel - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc <b>Propellant:</b> Diethylphthalate, Dinitrotoluene, Diphenylamine, Nitrocellulose <sup>(5)</sup> , Nitroglycerin, Potassium Nitrate <b>Primer <sup>(7)</sup>:</b> Antimony Sulfide, Lead Sulphocyanate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Cyclotrimethylenetrinitramine (RDX), TNT <b>Projectile:</b> Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur <b>Projectile Filler:</b> Cyclotrimethylenetrinitramine (RDX), Stearic Acid, White Phosphorus <b>Fuze:</b> Aluminum Alloy, Brass, Plastic - Aluminum, Copper, Iron, Manganese, Plastic, Silicone, Zinc <b>Fuze Filler:</b> RDX, (Cyclotrimethylenetrinitramine), Stearic Acid, Tetryl <b>Fuze Primer <sup>(7)</sup>:</b> Antimony Sulfide, Barium Nitrate, Carborundum, Copper, Lead Azide, Lead Styphnate, Potassium Chlorate, Zinc	<p style="text-align: center;"><b>Metals</b> Aluminum, Copper, Zinc</p> <p style="text-align: center;"><b>Explosives</b> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS</p>
<b>Shell, 75mm, HE, Mkl</b>	<b>Cartridge Case:</b> Copper - Copper, Zinc <b>Propellant:</b> Dibutylphthalate, Dinitrotoluene <sup>(6)</sup> , Diphenylamine, Nitrocellulose <sup>(5)</sup> , Nitroglycerin, Sulfur, TNT <b>Primer <sup>(7)</sup>:</b> Antimony Sulfide, Barium Nitrate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT <b>Projectile:</b> Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur <b>Projectile Filler:</b> Amatol, Tetryl, TNT - Ammonium Nitrate, Tetryl, TNT <b>Fuze, Projectile, PD, M46:</b> Steel - Carbon, Iron, Manganese, Phosphorus, Sulfur <b>Fuze Filler:</b> Carbon, Copper, Mercury Fulminate, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc <b>Fuze Primer <sup>(7)</sup>:</b> Antimony Sulfide, Carborundum 150, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc	<p style="text-align: center;"><b>Metals</b> Copper, Manganese, Mercury Fulminate, Zinc</p> <p style="text-align: center;"><b>Explosives</b> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munitions Type/ Model	Composition (Case and Filler) <sup>(2)</sup>	MC Analysis <sup>(1)</sup>
Shell, 75mm, Smoke WP, MkII	<p><b>Cartridge Case: Copper</b> - Copper, Zinc</p> <p><b>Propellant:</b> Dibutylphthalate, Dinitrotoluene<sup>(6)</sup>, Diphenylamine, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Chlorate</p> <p><b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Barium Nitrate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sulfur, TNT</p> <p><b>Projectile/Rotating Band: Steel/Copper Alloy</b> - Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur, Zinc</p> <p><b>Projectile Filler:</b> Tetryl, White Phosphorus</p> <p><b>Fuze, Projectile, PD, M46: Steel/Brass</b> - Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Fuze Filler:</b> Carbon, Copper, Mercury Fulminate, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc</p> <p><b>Fuze Primer</b> <sup>(7)</sup>: Antimony Sulfide, Carborundum 150, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc</p>	<p style="text-align: center;"><b>Metals</b> Copper, Zinc</p> <p style="text-align: center;"><b>Explosives</b></p> <p>As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
Cartridge, 81mm, HE, M43	<p><b>Propelling Assembly: Kraft Paper, Steel</b> - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc</p> <p><b>Propellant:</b> Diethylphthalate, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate</p> <p><b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Copper, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT, Sulfur, Zinc</p> <p><b>Projectile: Steel</b> - Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Projectile Filler: TNT or Comp B</b> - Cyclotrimethylenetrinitramine (RDX), TNT</p> <p><b>Fuze, PD, M52, M525: Aluminum Alloy</b> - Aluminum, Copper, Iron, Lead, Magnesium, Zinc</p> <p><b>Fuze Filler:</b> RDX , (Cyclotrimethylenetrinitramine), Tetryl</p> <p><b>Fuze Primer</b> <sup>(7)</sup>: Antimony Sulfide, Barium Nitrate, Lead Azide, Lead Styphnate, Tetrazene</p>	<p style="text-align: center;"><b>Metals</b> Aluminum, Copper, Zinc</p> <p style="text-align: center;"><b>Explosives</b></p> <p>As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
Cartridge, 81mm, Smoke, WP, M57	<p><b>Propelling Assembly: Kraft Paper, Steel</b> - Iron, Manganese, Paper, Phosphorus, Sulfur, Zinc</p> <p><b>Propellant:</b> Diethylphthalate, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate</p> <p><b>Primer</b> <sup>(7)</sup>: Antimony Sulfide, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, TNT, Sulfur</p> <p><b>Projectile: Steel</b> - Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Projectile Filler:</b> Aluminum, Barium Stearate, Copper, Magnesium, Nickel, Silicon, Tetryl, Tin, Titanium, White Phosphorus</p> <p><b>Fuze, PD, M52, M525: Aluminum Alloy</b> - Aluminum, Copper, Iron, Lead, Magnesium, Zinc</p> <p><b>Fuze Filler:</b> RDX , (Cyclotrimethylenetrinitramine), Tetryl</p>	<p style="text-align: center;"><b>Metals</b> Aluminum, Copper, Zinc</p> <p style="text-align: center;"><b>Explosives</b></p> <p>As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

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

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munitions Type/ Model	Composition (Case and Filler) <sup>(2)</sup>	MC Analysis <sup>(1)</sup>
<p><b>Shell, 4.2-inch, HE, M3, M3A1</b></p>	<p><b>Propelling Charge:</b> Diethylphthalate, Ethyl Centralite, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Nitrate</p> <p><b>Primer <sup>(7)</sup>:</b> Antimony Sulfide, Barium Nitrate, Copper, Iron, Lead, Lead Styphnate, Nitrocellulose, Tetrazene, Zinc</p> <p><b>Projectile/Rotating Disc: Steel/Copper Alloy –</b> Carbon, Copper, Lead Iron, Manganese, Phosphorus, Sulfur, Zinc</p> <p><b>Projectile Filler:</b> TNT</p> <p><b>Fuze, PD, M557: Steel -</b> Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Fuze Filler:</b> Tetryl</p> <p><b>Fuze Primer <sup>(7)</sup>:</b> Antimony Sulfide, Carborundum, Copper, Iron, Lead Azide, Lead Thiocyanate, Potassium Chlorate, TNT, Zinc</p>	<p style="text-align: center;"><b><u>Metals</u></b> Copper, Zinc</p> <p style="text-align: center;"><b><u>Explosives</u></b></p> <p>As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
<p><b>Shell, 4.2-inch, Smoke, M2 (1918 – 1944)</b></p>	<p><b>Propelling Charge:</b> Diethylphthalate, Ethyl Centralite, Nitrocellulose<sup>(5)</sup>, Nitroglycerin</p> <p><b>Primer <sup>(7)</sup>:</b> Antimony Sulfide, Barium Nitrate, Lead Styphnate, Potassium Nitrate, Tetrazene</p> <p><b>Projectile: Steel -</b> Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Projectile Filler: FM or FS Smoke -</b> Chlorsulfonic Acid, Sulfur trioxide, Titanium Tetrachloride</p> <p><b>Fuze:</b> Aluminum, Copper, Iron, Lead Azide, Magnesium, Manganese, Nickel, Potassium Chlorate, Silicon, Tin, Zinc, Tetryl</p> <p><b>Fuze Primer <sup>(7)</sup>:</b> Antimony Sulfide, Carborundum</p>	<p style="text-align: center;"><b><u>Metals</u></b> Aluminum, Copper, Zinc</p> <p style="text-align: center;"><b><u>Explosives</u></b></p> <p>As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
<p><b>Projectile, 155mm, HE, M102</b></p>	<p><b>Propellant:</b> Dibutylphthalate, Dinitrotoluene (DNT), Diphenylamine, Nitrocellulose<sup>(5)</sup></p> <p><b>Flash Reducer/Ignition Charge:</b> Potassium Nitrate, Potassium Sulfate, Sodium Nitrate, Sulfur</p> <p><b>Primer <sup>(7)</sup>:</b> Aluminum, Antimony Sulfide, Barium Nitrate, Calcium Silicide, Copper, Lead Dioxide, Lead Styphnate, Nitrocellulose, PETN, Tetrazene, Zinc, Zirconium</p> <p><b>Projectile/Rotating Band: Steel/Copper Alloy -</b> Carbon, Copper, Iron, Lead, Manganese, Phosphorus, Sulfur, Zinc</p> <p><b>Projectile Filler: TNT or Amatol -</b> Ammonium Nitrate, TNT</p> <p><b>Fuze, Projectile, PD, M46: Steel/Brass -</b> Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Fuze Filler:</b> Carbon, Copper, Mercury Fulminate, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc</p> <p><b>Fuze Primer <sup>(7)</sup>:</b> Antimony Sulfide, Carborundum 150, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc</p> <p><b>Fuze, Projectile, PD, M47: Steel -</b> Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Fuze Filler:</b> Carbon, Copper, Lead Azide, Potassium Nitrate, Sodium Nitrate, Tetryl, Zinc</p>	<p style="text-align: center;"><b><u>Metals</u></b> Aluminum, Copper, Lead, Zinc</p> <p style="text-align: center;"><b><u>Explosives</u></b></p> <p>As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munitions Type/ Model	Composition (Case and Filler) <sup>(2)</sup>	MC Analysis <sup>(1)</sup>
	<p><b>Fuze Primer</b> <sup>(7)</sup>: Antimony Sulfide, Carborundum 150, Copper, Iron, Lead, Lead Azide, Potassium Chlorate, Sulfur, Zinc</p> <p><b>Fuze, Projectile, PD, M51 Steel</b> - Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Fuze Filler</b>: Tetryl</p> <p><b>Fuze Primer</b> <sup>(7)</sup>: Antimony Sulfide, Carborundum, Copper, Lead Azide, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur</p> <p><b>Fuze, Projectile, Time Super Quick, M54: Aluminum Alloy, Copper Alloy</b> – Aluminum, Bismuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc</p> <p><b>Fuze Filler</b>: Tetryl</p> <p><b>Fuze Primer</b> <sup>(7)</sup>: Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene</p> <p><b>Fuze, Projectile, Mechanical Time (MT), M67: Aluminum Alloy, Copper Alloy</b> – Aluminum, Bismuth, Copper, Iron, Lead, Silicon, Sulfur, Zinc</p> <p><b>Fuze Filler</b>: Lead Azide, Tetryl</p> <p><b>Fuze Primer</b> <sup>(7)</sup>: Barium Nitrate, Copper, Lead Azide, Lead Styphnate, Lead Thiocyanate, Potassium Chlorate, Potassium Nitrate, Sodium Nitrate, Sulfur, Tetrazene</p>	
<p><b>Mine, Antitank, Practice, M1</b></p>	<p><b>Case: Steel (Inert)</b> - Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Fuze, Practice, M1</b>: Aluminum, Carbon, Copper, Iron, Zinc</p> <p><b>Fuze Filler</b>: Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Chlorate, Red Phosphorus,</p> <p><b>Primer</b> <sup>(7)</sup>: Potassium Nitrate, Sulfur</p>	<p style="text-align: center;"><b><u>Metals</u></b> N/A</p> <p style="text-align: center;"><b><u>Explosives</u></b> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>
<p><b>Rocket, 3.25-inch, Target, Mk 1 through Mk 4</b></p>	<p><b>Rocket Motor: Steel</b> - Carbon, Iron, Manganese, Phosphorus, Sulfur</p> <p><b>Propellant</b>: Diazodinitrophenol, Nitrocellulose<sup>(5)</sup>, Nitroglycerin, Potassium Chlorate, Potassium Nitrate, Potassium Perchlorate</p> <p><b>Flare</b>: Aluminum, Barium Nitrate, Hexachlorbenzene, Magnesium, Potassium Perchlorate</p>	<p style="text-align: center;"><b><u>Metals</u></b> Aluminum</p> <p style="text-align: center;"><b><u>Explosives</u></b> As a conservative measure, a full explosives panel will be analyzed for from media collected at this MRS.</p>

**TABLE 2.2**  
**Chemical Composition of MEC and Potential Munitions Constituents**  
**West Virginia Maneuver Area – FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Munitions Type/ Model	Composition (Case and Filler) <sup>(2)</sup>	MC Analysis <sup>(1)</sup>
<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" heavy 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, Parsons' policy is to include all explosives 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><b>Source:</b> Munitions information was supplied by the 2009 INPR, Munitions Items Disposition Action System (MIDAS) database, and USACE Range Operations Reports RO-01.</p>		

**MMRP SI Project Key Contacts**  
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West Virginia Department of Environmental Protection 601 57 <sup>th</sup> Street, SE Charleston, WV 25304-2345	Mr. Tom Bass Environmental Resources Specialist 3 <b>Email:</b> Thomas.L.Bass@wv.gov	(304) 926-0499 (304) 926-0457 (FAX)

**MMRP SI Project Key Contacts**  
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**Grant, Preston, Pendleton, Tucker, and Randolph Counties, West Virginia**

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U.S. Fish & Wildlife Service Canaan Valley National Wildlife Refuge 6263 Appalachian Highway Davis, WV 26260	Mr. Brett Hartwig Law Enforcement Officer	(304) 866-3858 (304) 866-3852 (FAX)
Canaan Valley Institute 494 River Stone Road Davis, WV 26260	Mr. Ken Dzaack Land Manager/ NSD Construction Manager <b>Email:</b> ken.dzaack@canaanvi.org	(304) 259-4739 x 233 (304) 259-4759 FAX
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**Site Location Map - Satellite**

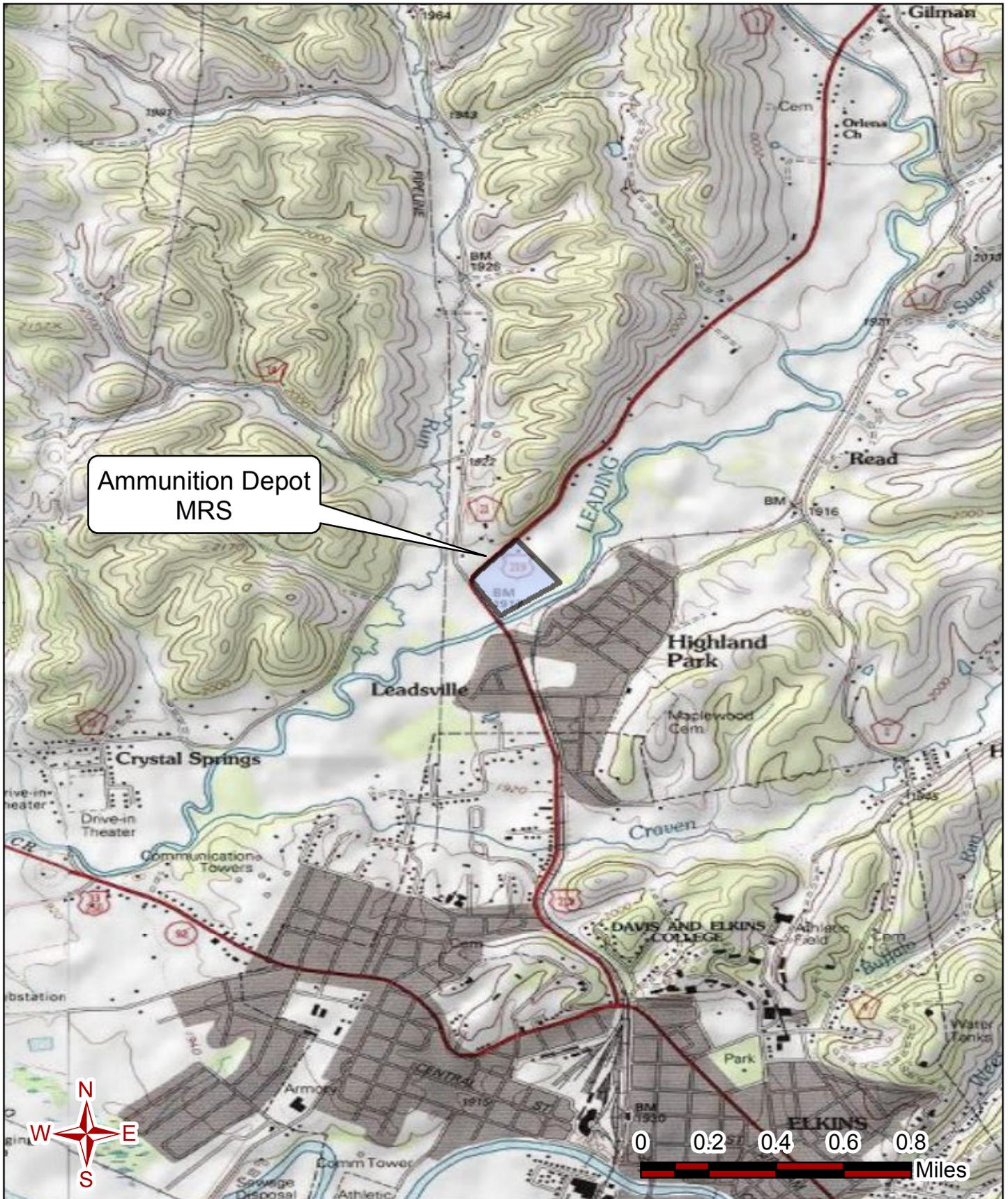
MRS02 - WV Maneuver Area Ammunition Depot  
 MMRP West Virginia

Project No. Eco-11-452

February 2012

FIGURE

2.1



Ammunition Depot  
MRS



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**Site Location Map - Topographic**

MRS02 - WV Maneuver Area Ammunition Depot  
 MMRP West Virginia

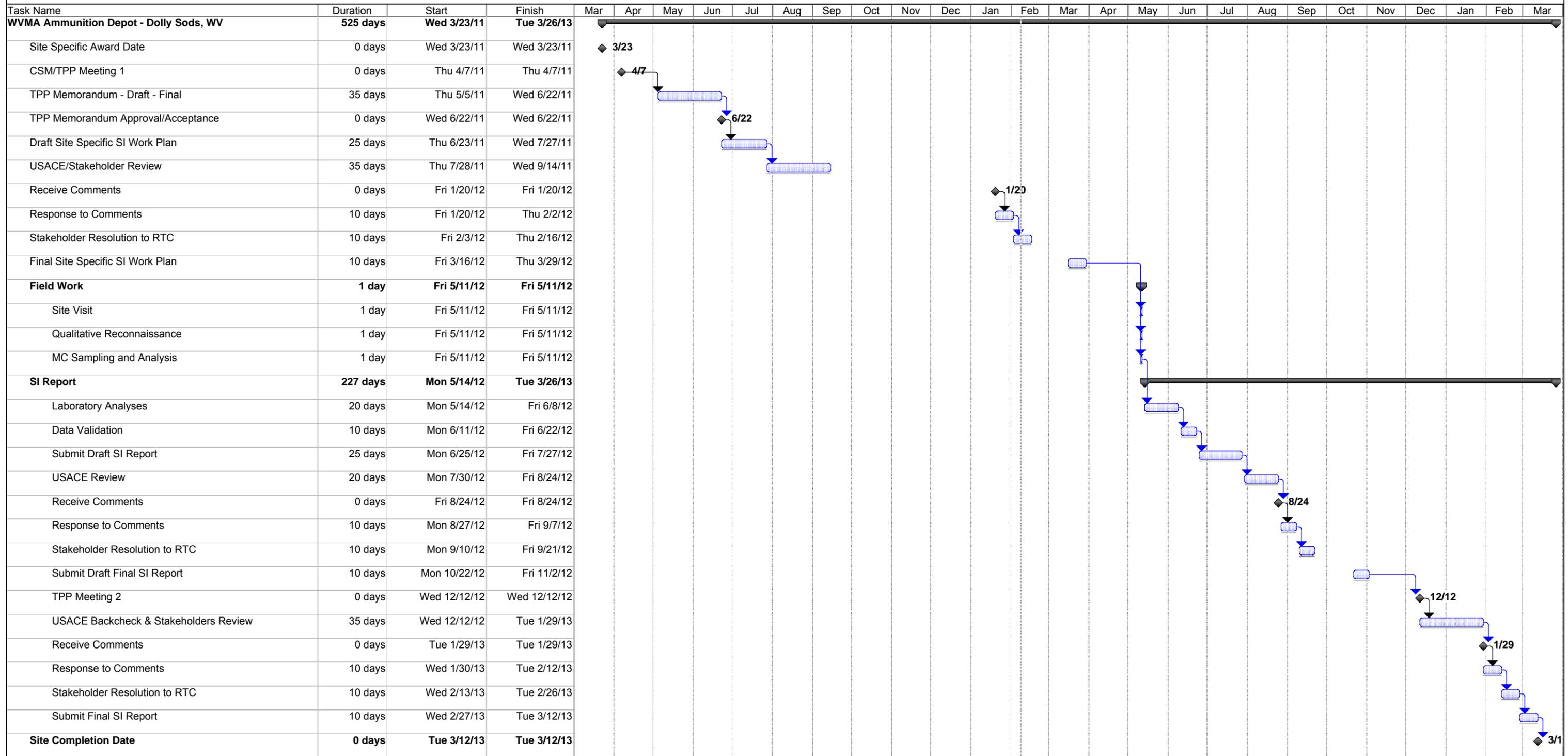
Project No. Eco-11-452

February 2012

FIGURE

2.2

Figure 2.3 - Project Schedule - WVMA Ammunition Depot MRS



Date: Wed 2/8/12

Task  Milestone  Summary  Rolled Up Milestone 

## CHAPTER 3: FIELD INVESTIGATION

### 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 NDAI 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 storage was reported. Details of the site-specific MC strategy for the WVMA Ammunition Depot MRS 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 WVMA Ammunition Depot MRS. 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), non-immediate action (NTCRA), characterization action (RI/FS), or non-action (NDAI). In many instances, sufficient historical data exist (prior to conducting the site visit) 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 HRS Score as well as for the completion of the Office of the Secretary of Defense’s (OSD) MRSPP.

To ensure accomplishment or attainment of the project objectives detailed above, Data Quality Objectives (DQOs) were developed for the SI at the WVMA Ammunition Depot MRS 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 each specific DQO. The DQO worksheets are provided in Appendix A of this SS-WP Addendum.

##### 3.1.2.1 Qualitative Reconnaissance DQO

For the WVMA Ammunition Depot MRS, QR will be conducted within the MRS boundaries and will focus on areas where ordnance storage was reported. 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 MRS 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 munitions debris 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 site visit team will use a global positioning system (GPS) unit to record observations during the QR.

### **3.1.2.2 Munitions Constituents DQO**

The TPP Team agreed that the Cold Regions Research and Engineering Laboratory (CRREL) “seven-point wheel sampling technique” will be employed at the WVMA Ammunition Depot MRS. MC soil samples will be collected adjacent to observed munitions debris within the MRS. If munitions debris is not observed, then samples will be collected from the proposed locations. Two biased surface soil samples (and associated Quality Control [QC] samples) will be collected within the MRS. The sample locations identified on Figure 3.1 and 3.2 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 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 wells within the MRS. Surface water and sediment samples will not be collected during the SI because there are no perennial or intermittent surface water bodies within the MRS.

At least one biased surface soil sample will be collected from a location within the MRS in an area where there is no evidence of munitions debris and upgradient from any areas where there is evidence of DoD-use or munitions debris. The sample will serve as ambient data for metals comparison and will aid in development of a potential RI/FS sampling plan, if warranted. The data will provide information for MRSPP scoring. The sample will also be analyzed for explosives to verify that the location represents ambient soil conditions.

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 WVMA Ammunition Depot MRS, the MC samples will be analyzed for potential MC as specified in Table 2.2 and as detailed further in Chapter 4. The Schonstedt® GA-92XTi 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 (HRS) 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, 1995 ASR, and the 2009 PA . 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 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, d 1995 ASR, and the 2009 PA.

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 WVMA Ammunition Depot MRS 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 either been augmented with institutional knowledge and additional documentation provided by CELRH, or it 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**

Although there are many T&E species listed throughout the Allegheny Mountains, no threatened species were identified in the area of the WVMA Ammunition Depot MRS. The MRS is not within a critical habitat, national park, national forest, or NWR (USFWS 2011d, National Park Service 2011a, and U.S. Forest Service 2011). Therefore, the MRS is not considered to be ecologically important. In addition, there are no known cultural or historically significant sites in the area of the Ammunition Depot. Although no wetlands were identified on the site, Leading Creek to the south is considered a riverine type wetland. However, 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 site.

### **3.2.4 EQUIPMENT**

A Schonstedt® GA-92XTi, or equivalent, magnetometer will be used for anomaly avoidance at this site. Because the MRS is located in a relatively urbanized area, a four-wheel drive vehicle should not 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 service 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 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 MRS02 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 the 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 munitions debris. To achieve the project objective, the site visit team must have the ability to remain flexible during the QR to navigate toward 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 munitions debris. The QR will incorporate the use of magnetometers, GPS technology, Geographic Information System (GIS) data loggers, and digital photography. The planned QR route is approximately 1 mile.

#### **3.3.2 MUNITIONS CONSTITUENTS SAMPLING**

The PSAP has been developed by USAESCH as part of the PWP. For the WVMA Ammunition Depot MRS, the TPP Team agreed during the TPP process that the collection of surface soil samples from a total of two 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 munitions debris, 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. As determined by the TPP Team, the site visit team will attempt to collect the soil samples from the A-horizon, which may be as deep as 2 feet bgs. No other procedural variances are anticipated for the SI at the WVMA Ammunition Depot MRS. 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**

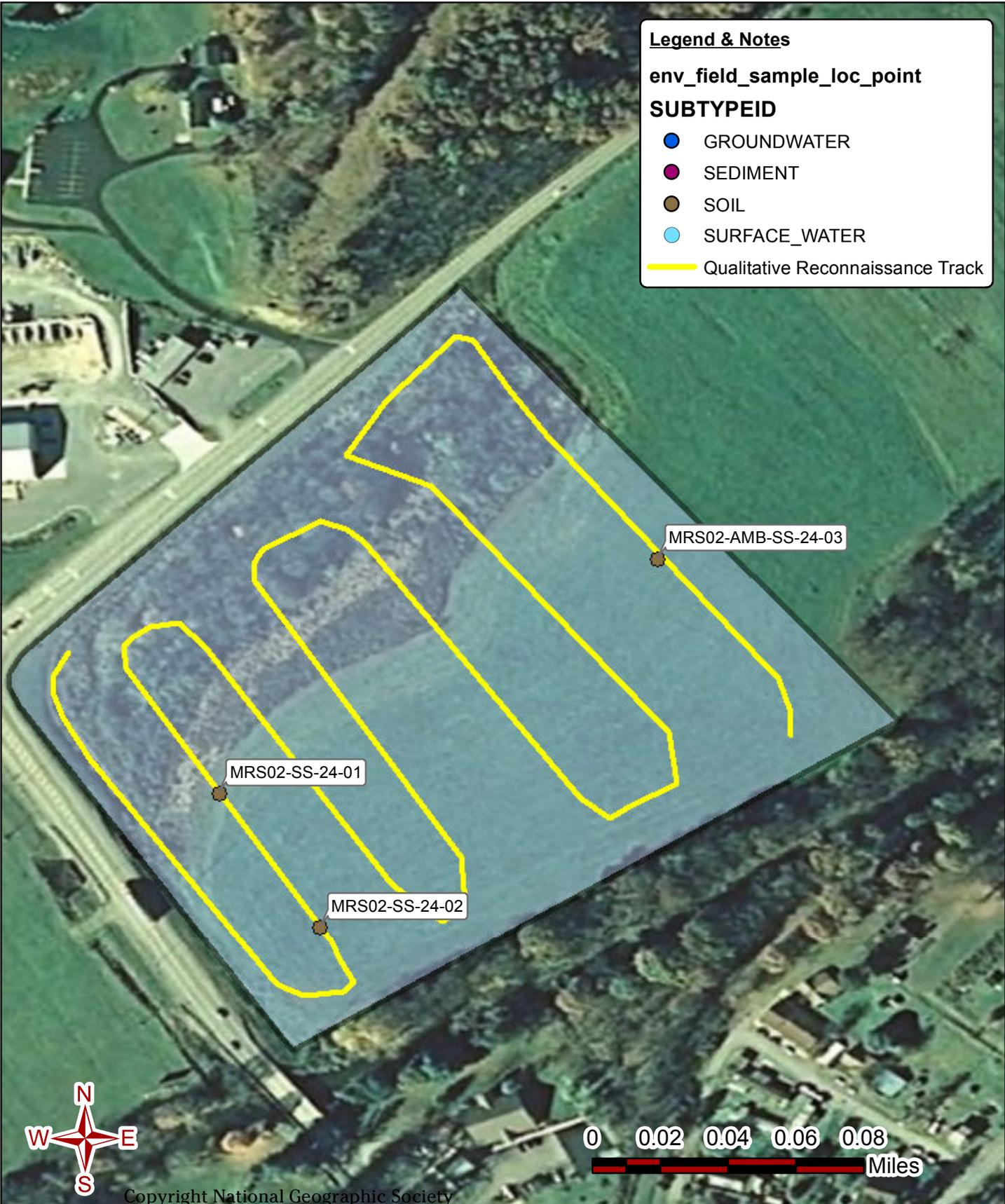
Analytical procedures and data validation are presented in the PWP. The analytical methods to be used for the MC samples collected are listed in Chapter 4 of this SS-WP Addendum.

**TABLE 3.1**  
**SAMPLING RATIONALE**  
**West Virginia Maneuver Area, FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Sample ID	Sample Coordinates (Decimal Degree)		Medium	Analysis <sup>(1)</sup>	Potential Munitions	Rationale
	Longitude	Latitude				
<b>WVMA-MRS02-SS-24-01</b>	-79.856621	38.947622	Soil	Explosives, Selected metals, pH	<u>Small arms, general:</u> Cartridges: .22 cal, .30 cal (includes carbine), .38 cal, .45 cal, .50 cal, machine gun <u>Cartridge:</u> 40mm, armor piercing – tracer (AP-T), M81; 57mm, AP-T, M70 <u>Shell:</u> 60mm, high explosive (HE), M49A2; 60mm, smoke, white phosphorus (WP), M302; 75mm, HE, Mkl; 75mm, smoke, WP, Mkl <u>Cartridge:</u> 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, hexachloroethane (HC), M84 <u>Shell:</u> 4.2-inch, HE, Mm3, M3A1; 4.2-inch, smoke, M2 (1918 – 1944) <u>Projectile,</u> 155mm, HE, M102 <u>Mine, antitank,</u> practice, M1 <u>Rocket,</u> 3.25-inch, target, Mk1 through Mk4	Collected in proximity to observed munitions debris within the MRS, the most likely place for MC presence. Will help support NDAI recommendation.
<b>WVMA-MRS02-SS-24-02</b>	-79.856188	38.947051	Soil	Explosives, Selected metals, pH	<u>Small arms, general:</u> Cartridges: .22 cal, .30 cal (includes carbine), .38 cal, .45 cal, .50 cal, machine gun <u>Cartridge:</u> 40mm, armor piercing – tracer (AP-T), M81; 57mm, AP-T, M70 <u>Shell:</u> 60mm, high explosive (HE), M49A2; 60mm, smoke, white phosphorus (WP), M302; 75mm, HE, Mkl; 75mm, smoke, WP, Mkl <u>Cartridge:</u> 81mm, HE, M43; 81mm, smoke, WP, M57; 105mm, HE, M1; 105mm, smoke, hexachloroethane (HC), M84 <u>Shell:</u> 4.2-inch, HE, Mm3, M3A1; 4.2-inch, smoke, M2 (1918 – 1944) <u>Projectile,</u> 155mm, HE, M102 <u>Mine, antitank,</u> practice, M1 <u>Rocket,</u> 3.25-inch, target, Mk1 through Mk4	Collected in proximity to observed munitions debris within the MRS, the most likely place for MC presence. Will help support NDAI recommendation.
<b>WVMA-MRS02-AMB-SS-24-03</b>	-79.854748	38.9478624	Soil	Explosives, Selected metals, pH	None	Sample will be collected from within the MRS, in an area free of munitions debris or evidence of DoD-use.

(1) Selected metals include antimony, copper, lead, manganese, mercury, and zinc  
 AP-T = amor piercing – tracer  
 HE = high explosive  
 WP = white phosphorus

HC = Hexachloroethane  
 NDAI = No Department of Defense Action Indicated  
 MRS = munitions response site  
 MC = munitions constituents



**Legend & Notes**

env\_field\_sample\_loc\_point

**SUBTYPEID**

- GROUNDWATER
- SEDIMENT
- SOIL
- SURFACE\_WATER

— Qualitative Reconnaissance Track

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**Qualitative Reconnaissance and Sample Locations - Satellite**  
 MRS02 - WV Maneuver Area Ammunition Depot  
 MMRP West Virginia  
 Project No. Eco-11-452 February 2012

FIGURE  
**3.1**

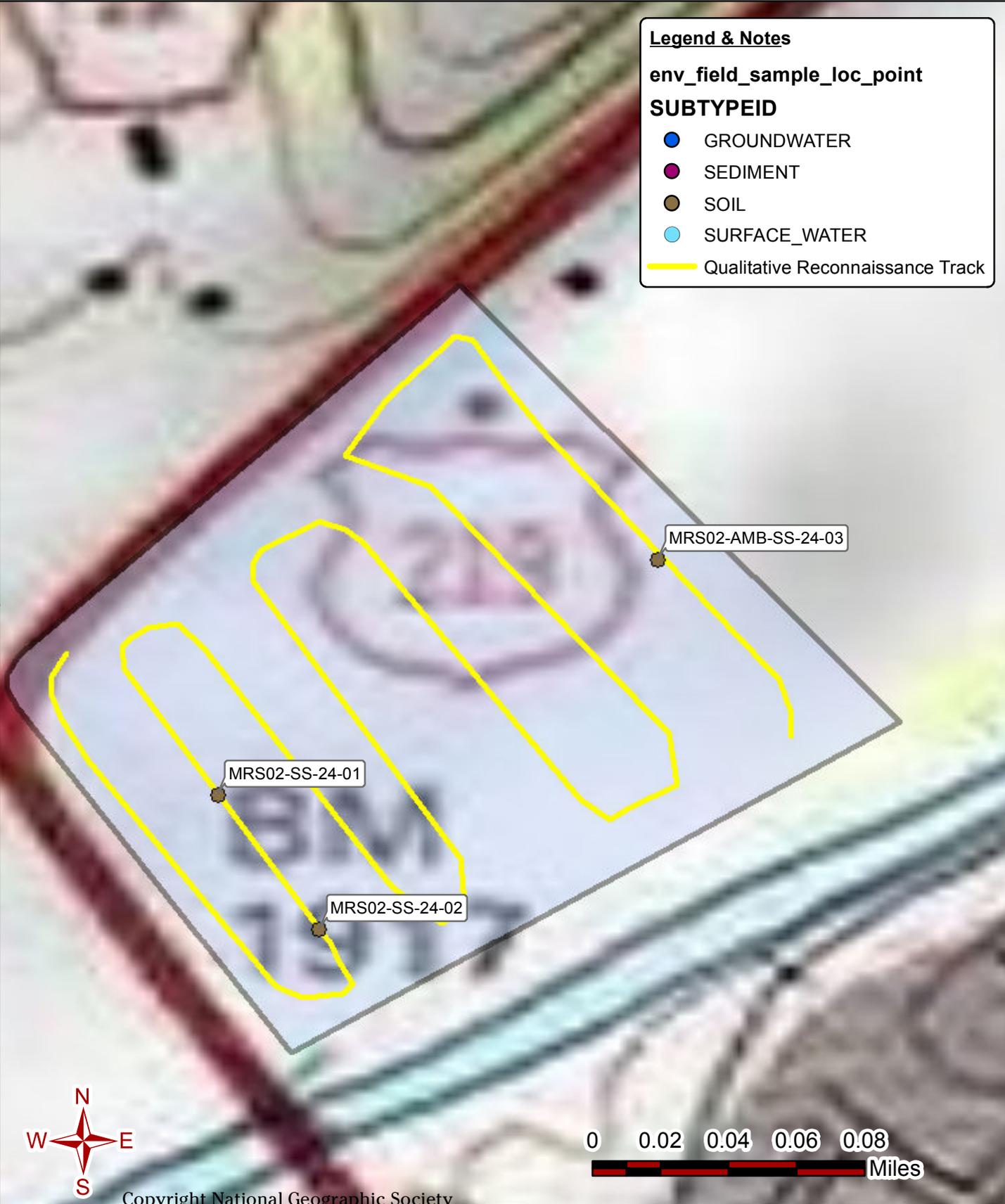
**Legend & Notes**

env\_field\_sample\_loc\_point

**SUBTYPEID**

- GROUNDWATER
- SEDIMENT
- SOIL
- SURFACE\_WATER

— Qualitative Reconnaissance Track



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**Qualitative Reconnaissance and Sample Locations - Topographic**  
 MRS02 - WV Maneuver Area Ammunition Depot  
 MMRP West Virginia

Project No. Eco-11-452      08/2016

FIGURE  
**3.2**

## 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. A 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 Agricultural and Priority Pollutant Laboratories, Inc. (APPL, Inc.'s) laboratory-specific procedures, detection and quantitation limits, and precision and accuracy criteria. APPL is certified with DoD under the Environmental Laboratories Accreditation Program (ELAP) and the National Environmental Laboratories Accreditation Program (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 and the Final PSAP Addendum. This document only addresses information directly related to the site and any variances from the program-wide procedures presented in the PSAP or PSAP Addendum. The PSAP and PSAP Addendum are 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

Two biased surface soil samples, associated QC samples, and one ambient surface soil sample will be collected at the WVMA Ammunition Depot MRS. 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 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 the Programmatic Field Sampling Plan (PFSP). However, as determined by the TPP Team, soils may be sampled to 2 feet (A Horizon soils). A hand auger will be used to excavate to the proposed depth. Samples will be collected directly from the auger and composited onsite. The soil samples will be composited using the procedure described in Subchapter 5.1.2 of the PFSP with the following variation: Soil samples will be collected and homogenized in USACE-approved, certified, 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. All field notes, including

documentation of the field parameters, will be maintained in the site visit team's GIS data logger. 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, surface water samples will not be collected because there are no perennial surface water sources within the MRS.

#### **4.2.3 SEDIMENT SAMPLES**

As discussed during the TPP Meeting on April 7, 2011, sediment samples will not be collected because there are no perennial surface water sources within the MRS.

#### **4.2.4 GROUNDWATER SAMPLES**

As discussed during the TPP Meeting on April 7, 2011, groundwater samples will not be collected because there are no groundwater wells within the MRS.

#### **4.2.5 SAMPLE CONTAINERS**

Samples will be collected in the appropriate sample containers, using the preservative 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 possible. The sample handling and packaging procedures presented in 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 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. At least one Equipment blank will be collected according to the procedure outlined in the PSAP. Temperature blanks 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 (DCPM).***

#### **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, Inc.). Point of contact is Ms. Diane Anderson. Ms. Anderson's email address is [danderson@applinc.com](mailto:danderson@applinc.com).

The laboratory address for the field samples is:

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

APPL, Inc. accepts Saturday deliveries via Federal Express.

#### **4.3 INVESTIGATIVE DERIVED WASTE**

The site visit team will use a hand auger for sample collection. The auger will be decontaminated according to the procedure described in the PSAP. It is estimated that the decontamination procedure will generate approximately one gallon of non-hazardous rinse water that will be disposed of onsite. No other 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, 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 WVMA Ammunition Depot MRS. 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. However, some major MCs 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 storage locations 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 antimony, copper, lead, manganese, mercury, and zinc due to their presence in the ordnance associated with the MRS.

If unanticipated munitions are found on site, the UXO technician will identify the munitions and contact 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 the PWP and as part of the Final TPP Memorandum documentation presented in 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 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 (ESLs) 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 the WVMA Ammunition Depot MRS, 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 munition storage areas obtained from historical document reviews. The ambient sample data will be used for comparison to the biased samples for use in the MRSP 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 Limit (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**  
**MRS02 -Ammunition Depot**

Analysis	Sample Matrix	Sample Container			Preservative	Holding Time
		No.	Size	Type		
Explosives	Soil	1	4 oz	Wide-mouth glass w/ Teflon-lined cap	Cool to 4° C	14 days to extraction, 40 days for analysis
Metals	Soil	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

(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**  
**MRS02 - Ammunition Depot**

Sample ID	Medium	Analysis <sup>(1)</sup>	Quality Control Samples		
			Field Duplicate	Matrix Spike	Matrix Spike Duplicate
WVMA-MRS02-SS-01	Soil	Explosives, Selected metals	X		
WVMA-MRS02-SS-02	Soil	Explosives, Selected metals		X	X
WVMA-MRS02-AMB-SS-03	Soil	Explosives, Selected metals			

(1) Selected metals include antimony, copper, lead, manganese, mercury, and zinc

**TABLE 4.3**  
**LIST OF TARGET ANALYTES**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Analyte	Abbreviation	CAS Number	Method
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***Explosives***

1,3,5-trinitrobenzene	1,3,5-TNB	99-35-4	8330
1,3-dinitrobenzene	1,3-DNB	99-65-0	8330
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	8330
2,4-Dinitrotoluene	2,4-DNT	121-14-2	8330
2,6-Dinitrotoluene	2,6-DNT	606-20-2	8330
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	8330
2-Nitrotoluene	2-NT	88-72-2	8330
3,5-Dinitroaniline	3,5-DNA	618-87-1	8330
3-Nitrotoluene	3-NT	99-08-1	8330
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	8330
4-Nitrotoluene	4-NT	99-99-0	8330
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	8330
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	8330
Nitrobenzene	NB	98-95-3	8330
Nitroglycerin	NG	55-63-0	8330
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	8330
Pentaerythritol tetranitrate	PETN	78-11-5	8330

***Selected Metals***

Antimony	Sb	7440-36-0	6020
Copper	Cu	7440-50-8	6020
Lead	Pb	7439-92-1	6020
Manganese	Mn	7439-96-5	6020
Mercury	Hg	7439-97-6	6020
Zinc	Zn	7440-66-6	6020

***Miscellaneous***

pH			
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**SCREENING LEVELS**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Analyte	Abbreviation	CAS Number	Human Health Screening Values	Laboratory Method Detection Limits <sup>3</sup>
			Soil <sup>1</sup>	Soil
			mg/kg	mg/kg
<b>Explosives</b>				
1,3,5-trinitrobenzene	1,3,5-TNB	99-35-4	1800	0.010
1,3-dinitrobenzene	1,3-DNB	99-65-0	6.1	0.0034
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	16	0.0095
2,4-Dinitrotoluene	2,4-DNT	121-14-2	120	0.0051
2,6-Dinitrotoluene	2,6-DNT	606-20-2	61	0.0042
2-Amino-4,6-dinitrotoluene	2-Am-DNT	35572-78-2	150	0.0050
2-Nitrotoluene	2-NT	88-72-2	2.8	0.0079
3-Nitrotoluene	3-NT	99-08-1	690	0.0053
4-Amino-2,6-dinitrotoluene	4-Am-DNT	19406-51-0	150	0.0054
4-Nitrotoluene	4-NT	99-99-0	40	0.0096
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	4.4	0.0059
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	479-45-8	240	0.088
Nitrobenzene	NB	98-95-3	20	0.0062
Nitroglycerin	NG	55-63-0	6.1	0.017
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetraz	HMX	2691-41-0	3800	0.0051
Pentaerythritol tetranitrate	PETN	78-11-5	120	0.047
<b>Selected Metals</b>				
Antimony	Sb	7440-36-0	31	0.049
Copper	Cu	7440-50-8	3100	0.094
Lead	Pb	7439-92-1	400	0.092
Manganese	Mn	7439-96-5	3300	0.13
Mercury	Hg	7439-97-6	23	0.01
Zinc	Zn	7440-66-6	23000	1.1
<b>Miscellaneous</b>				
pH	-	-		N/A

(1) Human health screening levels for soil used from WVDEP Risk-Based Concentrations (RBCs), Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) June 5, 2009 (<http://www.dep.wv.gov/dlr/oer/voluntarymain/Documents/60CSR3%20VRRRA%20rule%206-5-09.pdf>) supplemented with USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites for Soil, June 2011 ([http://www.epa.gov/reg3hwmd/risk/human/rb-concentration\\_table/Generic\\_Tables/pdf/master\\_sl\\_table\\_run\\_JUN2011.pdf](http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_JUN2011.pdf)).

(2) Human health screening levels for groundwater used from WV Requirements Governing Groundwater Standards (47CSR12) June 16, 2011 (<http://apps.sos.wv.gov/adlaw/csr/rule.aspx?rule=47-12>), supplemented with Table 60-3B in the Voluntary Remediation and Redevelopment Rule (60CSR3) June 5, 2009 (<http://www.dep.wv.gov/dlr/oer/voluntarymain/Documents/60CSR3%20VRRRA%20rule%206-5-09.pdf>), and USEPA Maximum Contaminant Level, National Primary Drinking Water Standards May 2009 (<http://www.epa.gov/drink/contaminants/index.cfm#List>), and USEPA Regional Screening Levels (RSLs) for Chemical Contaminants at Superfund Sites for Tap Water, June 2011 ([http://www.epa.gov/reg3hwmd/risk/human/rb-concentration\\_table/Generic\\_Tables/pdf/master\\_sl\\_table\\_run\\_JUN2011.pdf](http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/pdf/master_sl_table_run_JUN2011.pdf)).

(3) Analytical laboratory is Agricultural and Priority Pollutants Laboratories, Inc. (APPL)

## CHAPTER 5: ENVIRONMENTAL PROTECTION PLAN

### 5.1 INTRODUCTION

This Environmental Protection Plan (EPP) has been prepared for the SI at the WVMA Ammunition Depot MRS 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 WVMA Ammunition Depot MRS:

- United States Geological Survey (USGS), 1995 – topographic map
- USFWS, America’s National Wildlife Refuge System, [www.fws.gov](http://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, April 2006
- West Virginia Division of Natural Resources (WVDNR), Wildlife Diversity Program, June 2011
- West Virginia Department of Natural Resources, Elkins, WV
- USFWS, Elkins, WV
- USFWS, 2011a. National Wetlands Inventory – Wetlands Mapper
- USFWS, 2011c Critical Habitat Portal and Mapper Database
- USFS, 2011. List of National Forests and Grasslands
- National Park Service (NPS), 2011a. List of National Parks by State
- National Park Service, 2011b. National Historic Landmarks Program
- National Park Service, 2011c. National Heritage Areas Program, List of National Heritage
- National Park Service, 2011d. National Register of Historic Places

### 5.2 THREATENED AND ENDANGERED (T&E) SPECIES

West Virginia supports 24 federally-listed T&E species consisting of 18 animals and 6 plants (USFWS 2011e). The USFWS identifies 5 T&E species that occur among Grant, Randolph, and Tucker Counties, West Virginia (USFWS 2011b). These species are the cheat-mountain salamander (*Plethodon nettingi*), Indiana bat (*Myotis sodalis*), Virginia big-eared bat (*Corynorhinus townsendii virginianus*), and running buffalo clover (*Trifolium stoloniferum*). Additionally, the West Virginia northern flying squirrel (*Glaucomys sabrinus fuscus*), also known as the Virginia northern flying squirrel, was recently reinstated as a federally-listed endangered species in the state of West Virginia (Federal Register 2011). According to the WVDNR, these five species are listed as extremely rare, critically imperiled, or very rare and imperiled, or somewhat vulnerable to extirpation (WVDNR 2007a, b).

### **5.2.1 HABITAT**

Habitat in the West Virginia Maneuver Area / Dolly Sods FUDS includes hickory, longleaf, shortleaf, loblolly pine (*Pinus* spp), and white and post oak (*Quercus* spp.). Other variations of the vegetation community include hemlock (*Tsuga canadensis*) along with a mixture of white pine (*Pinus strobus*), beech (*Fagus grandifolia*), and other hardwoods. The MRSs in this region range from 1,200 to 4,600 feet in elevation, and differences in forest communities, growing seasons and rainfall amounts are readily observed. Much of the Allegheny Plateau region is made up of sandstone, shale, conglomerate, and coal of Pennsylvanian and Mississippian age. Soils are mostly *mesic ultisols* and *inceptisols* (USEPA 2010).

### **5.2.2 CHEAT-MOUNTAIN SALAMANDER**

The cheat-mountain salamander is a federally-threatened species that only occurs in West Virginia at elevations ranging from 1,000 to 3,500 feet, primarily in the MNF. The salamander is lungless and requires habitats with high moisture levels in order to have respiratory exchange through its skin. The typical habitat of the salamander includes conifers, such as red spruce (*Picea rubens*) and eastern hemlock (*Tsuga canadensis*), and stands of mixed deciduous forests. Both young stand and old growth habitats are known to host the salamander; however, it is most often associated with old growth forests because these forests generally have denser leaf litter layers, abundant woody debris, and complex canopies that all contribute to higher microclimate conditions required by the species. Similarly, habitat that contains bryophytes (mosses) usually contains high soil moisture conditions, which is suitable for the cheat-mountain salamander (USFWS 2009). The cheat-mountain salamander is unlikely to occur in the MRS01 – Daily Infiltration Camp and MRS02 – WV Maneuver Area Ammunition Depot because these MRSs are outside of their known distribution (USFWS 2009). Additionally, MRS02 – WV Maneuver Area Ammunition Depot appears to be converted to pasture land and is devoid of old growth forest that would provide shade and moist habitat conditions. The cheat mountain salamander may occur in the remaining MRSs, which include: MRS03 – Jennings Training Area, MRS04 – Fore Knobs / Bear Rocks Firing Ranges, MRS05 – Beard Knob Firing Range, MRS06 – Brown / Cabin Mountain Firing Range and MRS07 – Buena Small Arms Firing Range. These MRSs are located within the known range of the cheat-mountain salamander and each MRS may contain suitable habitat conditions including high elevations, areas with northeasterly aspects, moderate slopes, and higher relative annual precipitation (Dillard, Russell, and Ford 2008, USFWS 2009). The cheat-mountain salamander is described further in Table 5.1

### **5.2.3 INDIANA BAT**

The Indiana bat is a federally-endangered species listed in several West Virginia counties. During winter months the Indiana bat hibernates in caves and mines. Summer roosting and foraging habitat occurs in wooded stream corridors, bottomland, and upland forests. The Indiana bat can be found roosting under loose bark of exfoliating trees and hollow or dead trees (USFWS 2007). According to aerial photography, habitat in the West Virginia Maneuver Area / Dolly Sods MRSs appear to include forested habitats, riverine ecosystems, wetlands, and open areas that may be conducive to the bat's habitat requirements. Because each of the MRSs contain an array of suitable habitats, the Indiana bat may occur at each MRS. The Indiana bat is described further in Table 5.1

### **5.2.4 VIRGINIA BIG-EARED BAT**

The endangered Virginia big-eared bat is a subspecies of Townsend's big-eared bat. The Virginia big-eared bat roosts in caves in both winter and summer. Foraging habitat for the bat includes old fields, hay fields, and forested areas. The largest populations of the Virginia big-eared bat occur

in West Virginia (USFWS 2008b). Federally designated critical habitat for the Virginia big-eared bat is designated in Cave Hollow / Arbogast Cave, located in southern Tucker County (Federal Register 1979). Cave Hollow / Arbogast Cave is located less than 1 mile south of West Virginia Highway 72 and within the MRS03 – Jennings Training Area MRS (Federal Register 1979, Compass and Tape 1983, USFWS 2008b, USFWS 2011a). Studies of the Virginia big-eared bat indicate they are able to travel up to 6 miles from roosting sites to forage. Foraging and roosting habitat for the Virginia big-eared bats may occur in the other West Virginia Maneuver Area / Dolly Sods MRSs; however, it is unknown if additional caves suitable for the Virginia big-eared bat exist in these MRSs. The Virginia big-eared bat is described further in Table 5.1.

### **5.2.5 WEST VIRGINIA NORTHERN FLYING SQUIRREL**

The West Virginia northern flying squirrel was reinstated as a federally listed endangered species on June 17, 2011 (Federal Register 2011). The West Virginia northern flying squirrel is a small squirrel with large black eyes, silky brown fur above and white fur below. A loose fold of skin between forelegs and hindlegs and the characteristic flattened appearance allow the squirrel to sail from tree to tree. The West Virginia northern flying squirrel inhabits high-elevation northern hardwood forests consisting of red spruce, fir, beech, yellow birch, sugar or red maple, hemlock and black cherry of the Allegheny Highlands. In the wake of landscape level habitat loss from logging, only a few scattered populations of West Virginia northern flying squirrels have survived in less than ideal habitat (USFWS 2006). The USFWS (2011b) does not currently define county-level distribution for the West Virginia northern flying squirrel; however, the squirrels are known to primarily occur within the Allegheny Highlands of West Virginia (USFWS 2006). The Grant, Tucker, and Randolph counties are all located within the Allegheny Highlands region of West Virginia, as are the West Virginia Maneuver Area / Dolly Sods MRSs. The West Virginia northern flying squirrel is likely to occur in all West Virginia Maneuver Area / Dolly Sods MRSs except MRS02 – WV Maneuver Area Ammunition Depot. According to aerial photography, MRS02 appears to be primarily agricultural land and does not have suitable forested habitat. The West Virginia northern flying squirrel is described further in Table 5.1.

### **5.2.6 RUNNING BUFFALO CLOVER**

Running buffalo clover (*Trifolium stoloniferum*) is a federally-listed threatened plant that occurs in mesic habitats of partial to filtered sunlight and where prolonged moderate periodic disturbance, such as trampling, grazing, or mowing occurs. Running buffalo clover is a perennial species, forming long stolons that root at the nodes and produce erect flowering stems 10-30 centimeters tall. This species is most often found in regions underlain with limestone or other calcareous bedrock. The elimination of bison and other large herbivores continues to be a threat to this species (Federal Register 2007). In West Virginia, running buffalo clover frequently occurs on old logging roads, off-road vehicle trails, hawthorne thickets, grazed woodlands, railroad grades, game trails, and fallow fields succeeding to mesic woodlands. Populations of the running buffalo clover are located in or near the Allegheny Mountains which includes both Randolph and Tucker counties (USFWS 2008a). The running buffalo clover is described further in Table 5.1.

### **5.2.7 SITE-VISIT TEAM**

The site-visit team will be well 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.

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.

There are no known federal critical habitats located within the Dailey Infiltration Camp MRS (USFWS 2011c).

### **5.3 SENSITIVE ENVIRONMENTS**

The WVMA Ammunition Depot MRS is not within a national wildlife refuge, national park, national forest, wilderness area, state, or county park (USFWS 2011d, National Park Service 2011a, USFS 2011). 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 federally designated critical habitats within the WVMA Ammunition Depot MRS (USFWS 2011c).

### **5.4 WETLANDS**

The USFWS Wetlands Mapper, through the National Wetlands Inventory, was used to search for designated wetlands within the WVMA Ammunition Depot 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. Although there are no wetlands identified within the WVMA Ammunition Depot MRS, Leading Creek just south of the MRS is considered a riverine type wetland (see Figure 5.1).

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 at the MRS. 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 WVMA Ammunition Depot MRS 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 (West Virginia Division of Culture and History [WVDCH] 2011a).

There is a potential for unknown archeological and/or cultural resources within the WVMA Ammunition Depot MRS; 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 WVMA Ammunition Depot MRS is located in the Monongahela River Watershed. There are no perennial or intermittent surface water bodies within the MRS. However, Leading Creek, a tributary of the Tygart Valley River, flows just south of the MRS. Leading Creek flows southwest and joins the Tygart Valley River, which eventually joins the Monongahela River. The Monongahela River watershed spans nearly 7,340 square miles. Land cover in the watershed primarily consists of agriculture and forested land. This watershed encompasses lakes, ponds and swamp habitats interspersed with numerous creeks and small rivers draining to the north (USGS 1984, Watershed Atlas [WSA] 2011). The natural hydrology of the watershed has been altered by water control structures consisting of dams, drainage ditches, and locks.

Drinking water in the area of the MRS is supplied by the Elkins Public Service District (PSD), which obtains water from the Tygart Valley River. The intake is located approximately two miles south of the MRS at river mile marker 81.95 (latitude 38° 55' 00.44" N – longitude 79° 50' 47.01" W). The PSD provides water to the City of Elkins and three additional PSDs: Midland PSD, Huttonville PSD, and Leadsville PSD. Figure 5.2 displays the reported wells within 4 miles of the MRS.

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 and Atmospheric Administration (NOAA) 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 WVMA Ammunition Depot MRS. Neither cutting nor is pruning of trees and shrubs 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 of offsite.

## **5.10 IMPACT MITIGATION MEASURES**

Impact mitigation measures are outlined in the PWP. There are no site-specific mitigation measures for the WVMA Ammunition Depot MRS.

## **5.11 SUMMARY**

Based on the above information and a review of the Army Checklist for Important Ecological Places (Department of the Army 2005), the WVMA Ammunition Depot MRS is not considered to be an important ecological place. 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). Although the site does not contain any known T&E species, critical habitats, or sensitive environments, there is the potential for T&E species to be encountered on the site. 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. 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**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p><b>Running Buffalo Clover</b></p> 	<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
<p><b>Shale Barren Rock Cress</b></p> 	<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
<p><b>Small Whorled Pogonia</b></p> 	<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
<p><b>Northeastern Bulrush</b></p> 	<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

**TABLE 5.1**  
**Threatened and Endangered Species**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p style="text-align: center;"><b>Harperella</b></p> 	<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
<p style="text-align: center;"><b>Virginia Spiraea</b></p> 	<i>Spiraea virginiana</i>	Threatened	Rocky, flood scoured banks of high-energy (high gradient) streams or rivers.	Yes
<p style="text-align: center;"><b>Clubshell</b></p> 	<i>Pleurobema clava</i>	Endangered	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.	No
<p style="text-align: center;"><b>Fanshell</b></p> 	<i>Cyprogenia stegaria</i>	Endangered	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.	No

**TABLE 5.1**  
**Threatened and Endangered Species**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p style="text-align: center;"><b>Pink Mucket</b></p> 	<i>Lampsilis abrupt</i>	Endangered	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.	No
<p style="text-align: center;"><b>Northern Riffleshell</b></p> 	<i>Epioblasma torulosa rangiana</i>	Endangered	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.	Yes
<p style="text-align: center;"><b>Cheat Mountain Salamander</b></p> 	<i>Plethodon netting</i>	Threatened	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.	Yes
<p style="text-align: center;"><b>James Spiny mussel</b></p> 	<i>Pleurobema collina</i>	Endangered	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.	Yes

**TABLE 5.1**  
**Threatened and Endangered Species**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p align="center"><b>Bald Eagle</b></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"><b>Allegheny Woodrat</b></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"><b>Indiana Bat</b></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>	

**TABLE 5.1**  
**Threatened and Endangered Species**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p style="text-align: center;"><b>Grey Bat</b></p> 	<i>Myotis grisescens</i>	Endangered	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 style="text-align: center;"><b>Flat Spined Three Toothed Snail</b></p> 	<i>Triodopsis platysayoides</i>	Threatened	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 style="text-align: center;"><b>Flying Squirrel</b></p> 	<i>Glaucomys sabrinus fuscus</i>	Threatened	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 style="text-align: center;"><b>Isopod</b></p> 	<i>Caecidotea sinuncus</i>	Not Listed	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.	

**TABLE 5.1**  
**Threatened and Endangered Species**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p align="center"><b>Tall Larkspur</b></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"><b>Eastern Small-Footed Bat</b></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"><b>Timber Ridge Cave Beetle</b></p> 	<p align="center"><i>Pseudoanophthalmus 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"><b>South Branch Valley Cave Millipede</b></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**  
**Threatened and Endangered Species**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Federal Status	Preferred Habitat	Habitat Potentially Present on Site?
<p style="text-align: center;"><b>Grey Wolf</b></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;"><b>Eastern Cougar</b></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.	



Prepared by:  
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Phone: 714.289.0995 Fax 714.289.0965

**Wetlands Map**

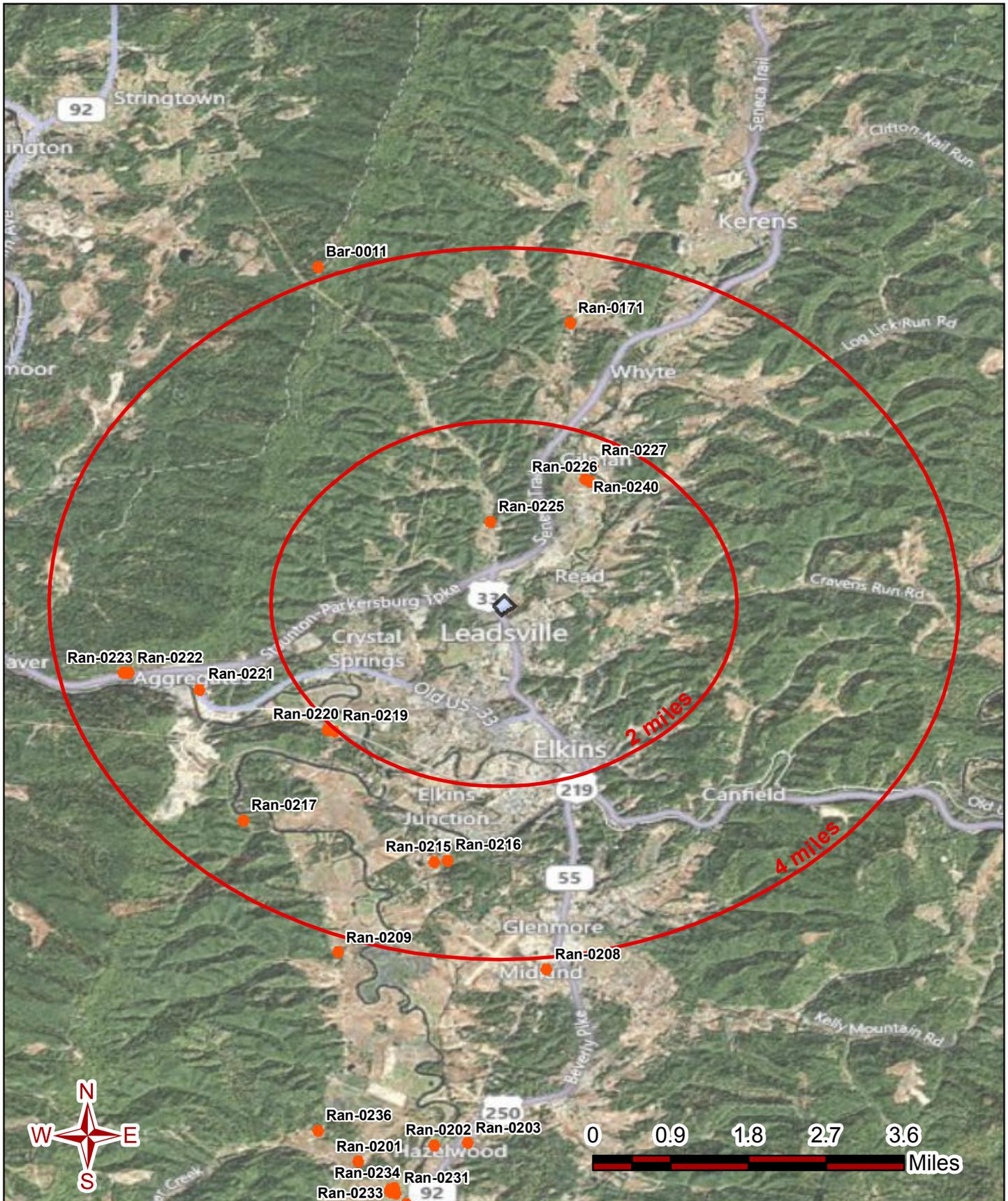
MRS02 - WV Maneuver Area Ammunition Depot  
 MMRP West Virginia

Project No. Eco-11-452

February 2012

FIGURE

5.1



	Prepared by: <b>Eco &amp; Associates, Inc.</b> 1855 W. Katella Avenue, Suite 340 Orange, California 92867	<b>Water Wells within 4-Mile Buffer</b> MRS02 - WV Maneuver Area Ammunition Depot MMRP West Virginia		<b>FIGURE</b>  <b>5.2</b>
	Phone: 714.289.0995    Fax 714.289.0965	Project No. Eco-11-452	February 2012	

**CHAPTER 6**

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

*and*

**PROGRAMMATIC WORK PLAN**

**SOUTHWEST IMA REGION  
MILITARY MUNITIONS RESPONSE PROGRAM**

*For:*

**WVMA AMMUNITION DEPOT  
RANDOLPH 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**

**February 14, 2012**

**Eco Program Manager:**



\_\_\_\_\_  
Signature

\_\_\_\_\_  
February 14, 2012

Date

**Eco Safety and Health Manager:**



\_\_\_\_\_  
Signature

\_\_\_\_\_  
February 14, 2012

Date

## 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. It should be noted that the PAPP will accompany the site visit team during SI field activities.

### 6.2 MEDICAL SUPPORT

The PAPP documents the medical support plan for all sites associated with the Southwest IMA 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 cardiopulmonary resuscitation (CPR) certified personnel. The local emergency contact numbers are listed in Table 6.1. **The nearest hospital is Davis Memorial Hospital, 812 Gorman Avenue, Elkins, West Virginia 26241-3181, (304) 636-3300.** Figure 6.1 shows the map and directions to the hospital from the WVMA Ammunition Depot MRS. 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-emergency medical care should be obtained at Medexpress Urgent Care Llc, 325 McClellandtown Road, Uniontown, PA 15401 (724) 439-3627. 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 WVMA Ammunition Depot MRS and the procedures that are to be employed to prevent accidents, injuries, and illness are discussed in the PAPP. The potential tasks associated with the SI at the WVMA Ammunition Depot MRS requiring an Activity Hazard Analysis (AHA) include the following:

- Motor Vehicle Operation
- Sample Collection and Packaging
- Qualitative Reconnaissance
- Treating Injured Personnel

All of the AHAs are presented in Appendix D (PAPP), Attachment B of the PWP. Site Specific AHAs can also be found in Table 6.2.

For the site visit at the WVMA Ammunition Depot MRS, 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 the 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
- Visible lightning
- Extreme temperatures (e.g. greater than 100 °F 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. Poisonous insects and arachnids that may be encountered during the SI include the following:

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

The two poisonous spiders likely to be encountered during the SI at the WVMA Ammunition Depot MRS Project are the Brown Recluse and the Black Widow. Illustrations of these spiders are shown on Table 6.3.

- 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 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 in 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 polyvinyl chloride (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.

Commonly, 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:

- American National Standards Institute (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**  
**MRS02 - Ammunition Depot**

Name	Phone Number(s)
Poison Control Center of West Virginia	1-800-222-1222
Randolph County Sheriff's Office	911 (emergency) (304) 636-2100 (non-emergency)
Randolph County Emergency Medical Services	911 (emergency) (304) 636-1213 (non-emergency)
Davis Memorial Hospital	(304) 636-3300
Medexpress Urgent Care Llc. (Workman's Comp clinic)	(724) 439-3627
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**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<b>Pre-operation Motor Vehicle Inspection</b>	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.
<b>On road driving</b>	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...).
<b>Off road driving</b>	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**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<b>Vehicle maintenance and repair</b>	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.
<b>Treat injured personnel</b>	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**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<b>Treat injured personnel (cont')</b>	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.
<b>Equipment:</b> Vehicles and hand tools	<b>Training:</b> 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.	<b>Inspection:</b> 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**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<b>Surficial Soil Sampling</b>	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.
<b>Equipment:</b> First Aid Kit / Paramedics	<b>Training:</b> 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.	<b>Inspection:</b> 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**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<b>Qualitative reconnaissance</b>	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. <b>The team will carry at least one gallon per person per day.</b>
	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**  
**MRS02 Ammunition Depot**

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**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<p><b>Equipment:</b>            Hand held magnetometer, shovel, hand tools, heavy equipment, PPE to include gloves, work boots, and eye protection as necessary.</p>	<p><b>Training:</b>            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><b>Inspection:</b>  <b>The Health and Safety Officer</b> and UXO Safety Officer will conduct spot checks of compliance. UXOSO will conduct daily audits of operations. Oversight by 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. 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><b>Surface soil and sediment sampling</b></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>
	<p>Biological Hazards</p>	<p>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.</p>

**TABLE 6.2**  
**ACTIVITY HAZARD ANALYSES**  
**West Virginia Maneuver Area, FUDS No. G03WV0013**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<b>Surface soil and sediment sampling (cont')</b>	Back Injury	Soil samples will be collected using lexan 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.
<b>Surface water sample collection</b>	Contact with hazardous chemicals	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 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**  
**MRS02 Ammunition Depot**

Principle Task	Potential Hazards	Recommended Controls
<b>Sample packaging</b>	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]).
<b>Equipment:</b> Hand tools	<b>Training:</b> 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).	<b>Inspection:</b> An inspection of PPE by workers will be conducted before each use.

**TABLE 6.3**  
**Biological Hazards**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Preferred Habitat	Habitat Potentially Present on
<p style="text-align: center;"><b>Black Widow</b></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;"><b>Brown Recluse</b></p> 	<i>Loxosceles</i>	If outdoors, usually located underneath rocks or within hollow woods.	Yes
<p style="text-align: center;"><b>Chiggers</b></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;"><b>Ticks</b></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

**TABLE 6.3**  
**Biological Hazards**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

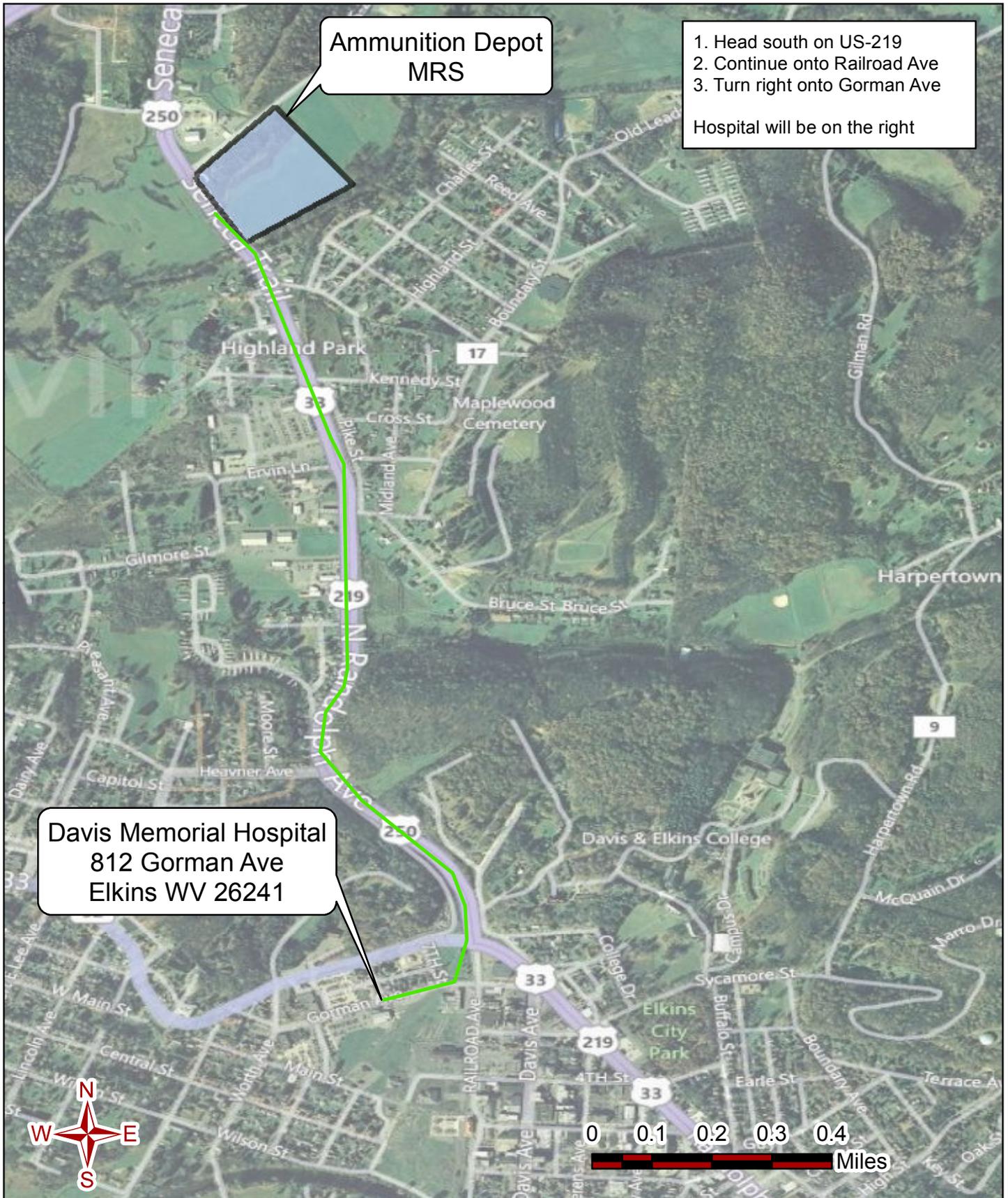
Common Name	Scientific Name	Preferred Habitat	Habitat Potentially Present on
<p><b>Africanized Honey Bees</b></p> 	<p><i>Apis mellifera scutellata</i>  Lepeletier</p>	<p>Africanized honey bees tend to colonize large areas and swarm excessively. Also, the bees will leave the colony completely and move to a new location when conditions in the environment do not suit them</p>	<p>Yes</p>
<p><b>Copperhead Snake</b></p> 	<p><i>Agkistrodon contortrix</i></p>	<p>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</p>	<p>Yes</p>
<p><b>Timber Rattlesnake</b></p> 	<p><i>Crotalus horridus</i></p>	<p>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]</p>	<p>Yes</p>
<p><b>Black Bear</b></p> 	<p><i>Ursus americanus</i></p>	<p>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.</p>	<p>Yes</p>

**TABLE 6.3**  
**Biological Hazards**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Preferred Habitat	Habitat Potentially Present on
<p style="text-align: center;"><b>Bobcat</b></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;"><b>Coyote</b></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;"><b>Poison Ivy</b></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;"><b>Poison Sumac</b></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**  
**Biological Hazards**  
**West Virginia Maneuver Area FUDS No. G03WV0013**  
**MRS02 - Ammunition Depot**

Common Name	Scientific Name	Preferred Habitat	Habitat Potentially Present on
<p style="text-align: center;"><b>Stinging Nettle</b></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;"><b>Wood Nettle</b></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>



Ammunition Depot  
MRS

1. Head south on US-219
  2. Continue onto Railroad Ave
  3. Turn right onto Gorman Ave
- Hospital will be on the right

Davis Memorial Hospital  
812 Gorman Ave  
Elkins WV 26241



Prepared by:  
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**Hospital Location Map**

MRS02 - WV Maneuver Area Ammunition Depot  
MMRP West Virginia

Project No. Eco-11-452

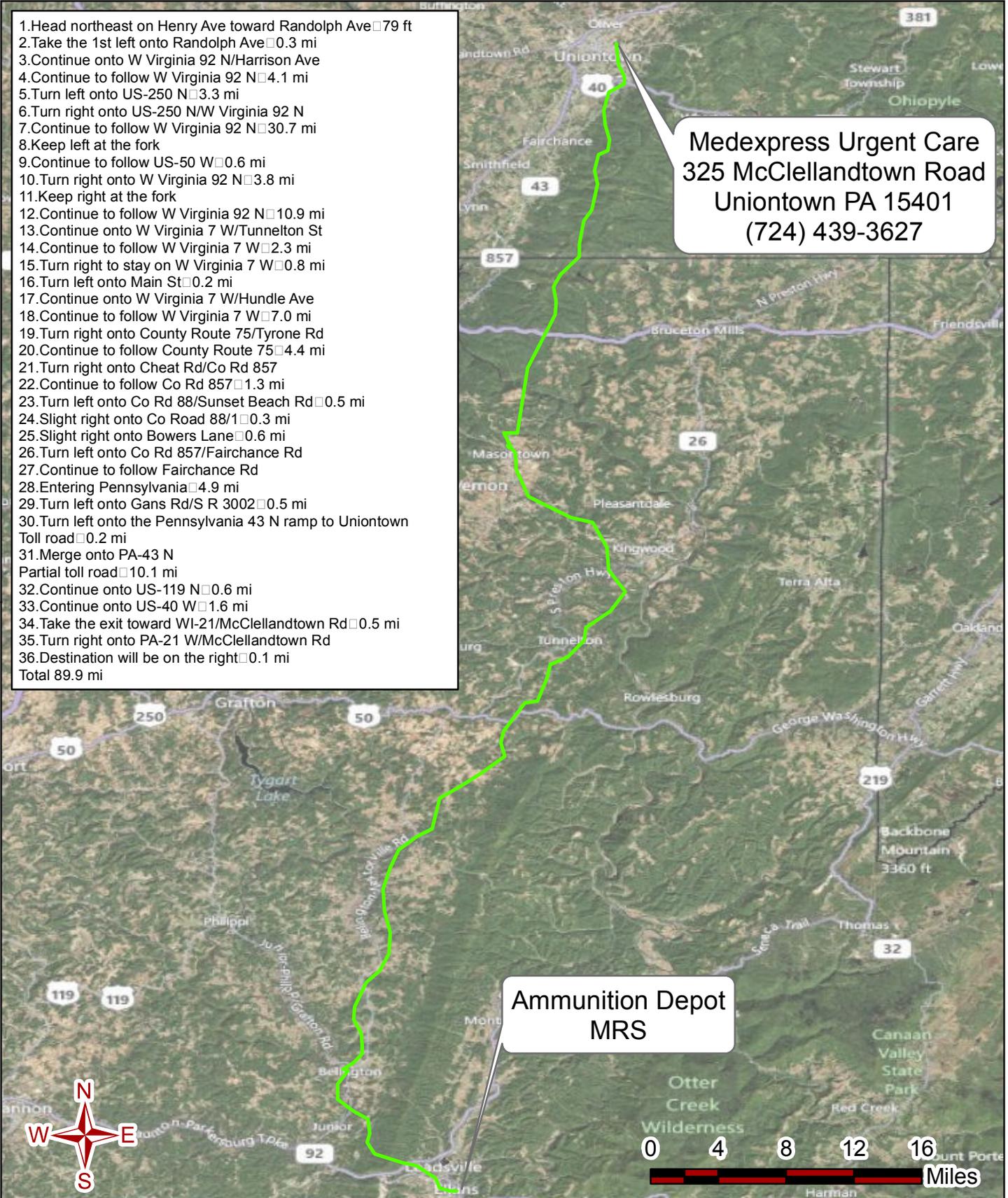
February 2012

FIGURE  
**6.1**

1. Head northeast on Henry Ave toward Randolph Ave 0.79 ft
  2. Take the 1st left onto Randolph Ave 0.3 mi
  3. Continue onto W Virginia 92 N/Harrison Ave
  4. Continue to follow W Virginia 92 N 4.1 mi
  5. Turn left onto US-250 N 3.3 mi
  6. Turn right onto US-250 N/W Virginia 92 N
  7. Continue to follow W Virginia 92 N 30.7 mi
  8. Keep left at the fork
  9. Continue to follow US-50 W 0.6 mi
  10. Turn right onto W Virginia 92 N 3.8 mi
  11. Keep right at the fork
  12. Continue to follow W Virginia 92 N 10.9 mi
  13. Continue onto W Virginia 7 W/Tunnelton St
  14. Continue to follow W Virginia 7 W 2.3 mi
  15. Turn right to stay on W Virginia 7 W 0.8 mi
  16. Turn left onto Main St 0.2 mi
  17. Continue onto W Virginia 7 W/Hundle Ave
  18. Continue to follow W Virginia 7 W 7.0 mi
  19. Turn right onto County Route 75/Tyrone Rd
  20. Continue to follow County Route 75 4.4 mi
  21. Turn right onto Cheat Rd/Co Rd 857
  22. Continue to follow Co Rd 857 1.3 mi
  23. Turn left onto Co Rd 88/Sunset Beach Rd 0.5 mi
  24. Slight right onto Co Road 88/1 0.3 mi
  25. Slight right onto Bowers Lane 0.6 mi
  26. Turn left onto Co Rd 857/Fairchance Rd
  27. Continue to follow Fairchance Rd
  28. Entering Pennsylvania 4.9 mi
  29. Turn left onto Gans Rd/S R 3002 0.5 mi
  30. Turn left onto the Pennsylvania 43 N ramp to Uniontown Toll road 0.2 mi
  31. Merge onto PA-43 N Partial toll road 10.1 mi
  32. Continue onto US-119 N 0.6 mi
  33. Continue onto US-40 W 1.6 mi
  34. Take the exit toward WI-21/McClellandtown Rd 0.5 mi
  35. Turn right onto PA-21 W/McClellandtown Rd
  36. Destination will be on the right 0.1 mi
- Total 89.9 mi

**Medexpress Urgent Care**  
**325 McClellandtown Road**  
**Uniontown PA 15401**  
**(724) 439-3627**

**Ammunition Depot**  
**MRS**



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**Clinic Location Map**  
 MRS02 - WV Maneuver Area Ammunition Depot  
 MMRP West Virginia  
 Project No. Eco-11-452 February 2012

**FIGURE**  
**6.2**

## CHAPTER 7: REFERENCES

- Climate-Charts.com, 2011. <http://www.climate-charts.com./States/West Virginia.html>
- Department of the Army, U.S. ARMY BIOLOGICAL TECHNICAL ASSISTANCE GROUP, 2005. *Technical Document for Ecological Risk Assessment: Process for Developing Management Goals.*
- Dillard, L. O., K. R. Russell, and W. M. Ford, 2008. Macrohabitat models of occurrence for the threatened Cheat Mountain salamander, *Plethodon nettingi*. Applied Herpetology. Volume 5. PP 201-224.
- Eco & Associates, Inc. (Eco), 2011. *Technical Project Planning Memorandum, Former West Virginia Maneuver Area / Dolly Sods Grant, Preston, Pendleton, Tucker, and Randolph Counties, West Virginia FUDS No.: G03WV0013.*
- Evaldi, et al, 2008. *Summary of West Virginia Water-Resources Data through September 2008. U.S. Geological Survey, Open-File Report 2009-1199.* Available at: <http://pubs.usgs.gov/of/2009/1199/pdf/OF2009-1199.pdf> .
- Federal Register, 1979. Endangered and Threatened Wildlife and Plants; Listing of Virginia and Ozark Big-Eared Bats as Endangered Species and Critical Habitat Determination. [http://ecos.fws.gov/docs/federal\\_register/fr366.pdf](http://ecos.fws.gov/docs/federal_register/fr366.pdf).
- Federal Register, 2007. Running Buffalo Clover (*Trifolium stoloniferum*) Recovery Plan Revision. June. Volume 72. Number 123. <http://www.gpo.gov/fdsys/search/citation.result.FR.action?>.
- Federal Register, 2011. Endangered and Threatened Wildlife and Plants; Reinstatement of Listing Protections for the Virginia Northern Flying Squirrel in Compliance With a Court Order. Volume 76. Number 117. June 17. <http://www.gpo.gov/fdsys/pkg/FR-2011-06-17/pdf/2011-15111.pdf>.
- Google Earth, 2010. <http://googleearth.com> Accessed June 2011.
- Hobba, Jr., 1980. *LOCATING GROUND-WATER SUPPLIES IN RANDOLPH COUNTY, WEST VIRGINIA, U.S. Geological Survey, Open-File Report 80-973*
- Human Factors Applications, Inc. (HFA), 1998. *Final Removal Report: Ordnance and Explosives Removal Action Dolly Sods Wilderness, Monongahela National Forest.* Prepared for U. S. Army Engineering and Support Center (USAESC), Huntsville, AL.
- HFA, 1999a. *Final Removal Report: Ordnance and Explosives Removal Action Dolly Sods North, Monongahela National Forest.* Prepared for USAESC, Huntsville, AL.
- Huttonville Public Service Department (HPSD), 2011. *Telephone conversation with Louise McAtee, Manager, HPSD, and Steven Saunders, Eco.* June 24, 2011.
- Lewis, Julian J., Ph.D., USDA Forest Service, Eastern Region, 2001a. *Conservation Assessment for South Branch Valley Cave Millipede (Pseudotremia princeps).*
- Lewis, Julian J., Ph.D., USDA Forest Service, Eastern Region, 2001b. *Conservation Assessment for Timber Ridge Cave Beetle (Pseudanophthalmus Hadenocetus).*

- Marshall University, Herpetology Lab, Dr. Thomas K. Pauley, Ph.D., 2002. *Cheat Mountain Salamander*. [http://www.marshall.edu/herp/Salamanders/cheat\\_mountain.htm](http://www.marshall.edu/herp/Salamanders/cheat_mountain.htm).
- Metcalf & Eddy, Inc. (M&E), 1991. *Feasibility Study Dolly Sods Wilderness: Final Work Plan for Surface and Subsurface Investigation and On-Site Disposal of Ordnance*. Prepared for USACE, Huntsville District, Huntsville, AL.
- Metcalf & Eddy, Inc. (M&E), 1992. *Feasibility Study Dolly Sods Wilderness: Engineering Report for Extent of OEW Contamination and Evaluation of Remedial Action Alternatives*. Prepared for USACE, Huntsville District, Huntsville, AL.
- New Bold Enterprises (NBE), 1995. *Dolly Sods Wilderness Ordnance Removal Project Environmental Assessment*. Prepared for USACE, Huntington District, Huntington, WV.
- NBE, 1997. *Dolly Sods North Ordnance Removal Project Environmental Assessment*. Prepared for USACE, Huntington District, Huntington, WV.
- National Climatic Data Center (NCDC), 2007. <http://www.ncdc.noaa.gov>. Accessed May 2, 2007.
- National Oceanic and Atmospheric Administration (NOAA), 2011. *Office of Ocean and Coastal Resource Management*. <http://coastalmanagement.noaa.gov/>.
- National Park Service (NPS), 2011a. *List of National Parks by State*. <http://www.nps.gov/applications/parksearch/geosearch.cfm>.
- NPS, 2011b. *National Heritage Areas Program*. <http://www.cr.nps.gov/heritageareas/>.
- NPS, 2011c. *National Historic Landmarks Program*. <http://www.nps.gov/history/nhl/>.
- NPS, 2011d. *National Register of Historic Places: West Virginia – Randolph County*. <http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome>.
- Parsons. 2010. *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*. February.
- USACE, 1990. *Inventory Project Report, Dolly Sods Wilderness Area (West Virginia Maneuver Area), Davis, West Virginia, Project No. G03WV006500*.
- USACE, 1992. *Revised Inventory Project Report and Findings and Determination of Eligibility for DERP-FUDS Site No. G03WV0065, West Virginia Maneuver Area (including Dolly Sods Wilderness Area), Davis, West Virginia*.
- USACE, 1995a. *Archives Search Report: Findings for the Former Dolly Sods North, Tucker County, West Virginia, Project Number G03WV006504*. Prepared by USACE, Rock Island District, Rock Island, IL and U.S. Army Defense Ammunition Center and School, Savanna, IL, for USACE, Huntsville District, Huntsville, AL.
- USACE, 1995b. *Archives Search Report: Conclusions and Recommendations for the Former Dolly Sods North, Tucker County, West Virginia, Project Number G03WV006504*. Prepared by USACE, Rock Island District, Rock Island, IL and U.S. Army Defense Ammunition Center and School, Savanna, IL, for USACE, Huntsville District, Huntsville, AL.
- USACE, 1996. *Action Memorandum, Dolly Sods Wilderness, Former West Virginia Maneuver Area, near Davis, West Virginia*.

- USACE, 1997. *Action Memorandum, Former West Virginia Maneuver Area, near Davis, West Virginia.*
- USACE, 2004a. *Subject: Potential DERP FUDS Projects – West Virginia Maneuver Area; CEMVS-ED-P Memorandum, dated 26 April 2004.*
- USACE, 2004b. *Environmental Quality – Formerly Used Defense Sites (FUDS) Program Policy. ER 200-3-1.*
- USACE, 2004c. *Ordnance and Explosives Recurring Review, Dolly Sods Project, Former West Virginia Maneuver Area, Monongahela National Forest, West Virginia, Draft Final Report – May 2004.*
- USACE, 2006. *Screening-Level Ecological Risk Assessments for FUDS MMRP Site Inspections. Presentation at the MMRP SI IPR, San Diego, CA, August 11, 2006.*  
<http://www.environmental.usace.army.mil/pps/august.ipr.ppt>.
- USACE, 2009. *Preliminary Assessment, Former WV Maneuver Area/Dolly Sods Grant, Preston, Pendleton, Tucker and Randolph Counties, West Virginia, FUDS Property Number G03WV0013, 2 Volumes.*
- USACE, 2010. *Inventory Project Report (INPR) for Property No. G03WV0013, WV Maneuver Area/Dolly Sods, Davis West Virginia*
- USDA, 1982. *Soil Conservation Service, Soil Survey of Randolph County Area Main Part, West Virginia, in cooperation with the Forest Service and the WV University Agricultural and Forestry Experiment Station.*
- USDA Forest Service, Monongahela National Forest, 1996. *Dolly Sods Wilderness UXO CR, Whetsell, Dahihelm, Paxton, Cogar, Brinker.*
- USDA Forest Service, Monongahela National Forest, 2006. *Biological Assessment for Threatened and Endangered Species, Karriker, Van Gundy, Arling.*
- USDA. Forest Service, 2011a. *Forests and Grasslands.* <http://www.fs.fed.us>.
- USDA. Natural Resources Conservation Service, 2011b. *Web Soil Survey.* <http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>
- U. S. Environmental Protection Agency, 2010. *Ecoregions of EPA Region 3: Delaware, Maryland, Pennsylvania, Virginia, and West Virginia.* Western Ecology Division. Prepared by A.J. Woods, J. M. Omernik, and D. D. Brown.  
[http://www.epa.gov/wed/pages/ecoregions/reg3\\_eco.htm#Principal%20Authors](http://www.epa.gov/wed/pages/ecoregions/reg3_eco.htm#Principal%20Authors).
- U.S. Fish and Wildlife Service, 2006. *West Virginia northern flying squirrel *Glaucomys sabrinus fuscus*. Fact Sheet. June.* <http://www.fws.gov/northeast/pdf/flyingsq.pdf>.
- U.S. Fish and Wildlife Service, 2007. *Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision.*  
<http://www.gpo.gov/fdsys/search/citation.result.FR.action?federalRegister.volume=2007&federalRegister.page=19015>.
- U.S. Fish and Wildlife Service, 2008a. *Running Buffalo Clover (*Trifolium stoloniferum*) 5-Year Review: Summary and Evaluation.*  
[http://www.fws.gov/midwest/endangered/plants/5yrreviews/rbc\\_5yrReview.html](http://www.fws.gov/midwest/endangered/plants/5yrreviews/rbc_5yrReview.html).

- U.S. Fish and Wildlife Service, 2008b. Virginia Big-Eared Bat (*Corynorhinus townsendii virginianus*) 5 Year Review Summary and Evaluation. [http://ecos.fws.gov/docs/five\\_year\\_review/doc1963.pdf](http://ecos.fws.gov/docs/five_year_review/doc1963.pdf).
- U.S. Fish and Wildlife Service, 2009. Cheat-Mountain Salamander (*Plethodon nettingi*). 5 Year Review: Summary and Evaluation. [http://www.fws.gov/northeast/Endangered/PDF/cheat\\_mountain\\_salamander.pdf](http://www.fws.gov/northeast/Endangered/PDF/cheat_mountain_salamander.pdf).
- USFWS, 2011a. *Critical Habitat Portal Database and Mapper*. <http://crithab.fws.gov/>.
- USFWS, 2011b. *Environmental Conservation Online System. Listings and occurrences of Threatened and Endangered Species for West Virginia*. [http://ecos.fws.gov/tess\\_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WV&s8fid=112761032792&s8fid=112762573902](http://ecos.fws.gov/tess_public/pub/stateListingAndOccurrenceIndividual.jsp?state=WV&s8fid=112761032792&s8fid=112762573902). Accessed June 22, 2011.
- USFWS, 2011c. *National Wetlands Inventory: Wetlands Mapper*. <http://www.fws.gov/wetlands/Data/mapper.html>.
- USFWS, 2011d. *National Wildlife Refuge System*. <http://www.fws.gov/refuges/>. Accessed June 22, 2011.
- U.S. Fish and Wildlife Service, 2011e. *Federally Listed Threatened & Endangered Species which may occur in Grant, Randolph, and Tucker Counties, WV*. [http://ecos.fws.gov/tess\\_public/](http://ecos.fws.gov/tess_public/).
- U.S. Geological Survey (USGS), 1995. *Elkins Quadrangle, West Virginia, 7.5 Minute Series (Topographic)*.
- WSA, 2011. *Watershed Atlas of the Monongahela and Allegheny Rivers*, [http://www.watershedatlas.org/fs\\_explrmon.html](http://www.watershedatlas.org/fs_explrmon.html). Accessed June 23, 2011.
- West Virginia Division of Culture and History, 2011a. *West Virginia Highway Historical Marker Program*, <http://www.wvculture.org/history/markers.html>. Accessed June 22, 2011.
- West Virginia Division of Culture and History (WVDCH), 2011b. *Tygart Valley Homesteads Historic District*, <http://www.wvculture.org/shpo/nr/pdf/randolph/04000304.pdf>. Accessed June 23, 2011.
- West Virginia Geological and Economic Survey (WVGES), 2004. *Physiographic Provinces of West Virginia*. <http://www.wvgs.wvnet.edu>.
- WV Department of Natural Resources (WVDNR), Wildlife Resource Section, 2006. *Eagles of West Virginia, Wildlife Diversity Program, Elkins WV*; Publication 10V, April 2006.
- West Virginia Division of Natural Resources (WVDNR), 2007a. *Rare, Threatened and Endangered Animals* West Virginia Natural Heritage Program. February 2007. <http://www.wvdnr.gov/Wildlife/RareSpecList.shtm>.
- West Virginia Water Science Center, *National Water Information System*. <http://wdr.water.usgs.gov/nwisgmap/?state=wv>.

# 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 8<sup>th</sup> 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

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## 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

## MRS02 – AMMUNITION DEPOT

The 4-acre Ammunition Depot MRS served as the main ammunition storage area. A field visit conducted by the CELRH on November 29, 2007 found no MEC or munitions debris and no outstanding markers or building foundations that would indicate remnants of the former depot. The area is currently a privately owned vacant field in the City of Elkins, north of downtown, and was previously used for growing crops. The revised INPR reports an MRSP score of 7 for the MRS. Table 1, in the introductory section of this document, summarizes the details of the Ammunition Depot MRS at the former West Virginia Maneuver Area.

Based on our understanding of the project site, MRS02 is anticipated as an NDAI site. Munitions debris has not been confirmed within the MRS. There is potential for MEC within the MRS. Exposure pathways may be complete based on the possibility of MEC and MC. 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 has proposed the following activities in support of the SI for the former Ammunition Depot MRS located just north of the city of Elkins in Randolph 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 ordnance storage 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 ordnance storage has been previously reported to help support an anticipated NDAI 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 and groundwater samples are planned as follows:
  - Surface soil samples will be collected and analyzed for explosives and selected metals (antimony, copper, lead, manganese, mercury, and zinc);
  - 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:

- The TPP team agreed that the proposed boundaries are acceptable based on lease documentation. The TPP Team also agreed that the MRS acreage on the proposed boundary as presented in the TPP meeting is acceptable, even though it differs from the acreage listed in the PA.
- Samples should be focused on higher ground away from low areas around the stream.
- Analyses for perchlorate and white phosphorous are not required, per WVDEP direction.
- The site may have been impacted by floods, approximately in 1985, and may have metallic debris not related to DoD use.
- Soils will be sampled to 2 feet (A-horizon soils).
- Ambient soil samples will be collected from the northern portion of the MRS, in a cleared area near the trees.
- The TPP Team agreed that surface water and sediment sampling was not warranted, based on the absence of surface water within the MRS.
- The TPP Team concurred that no known cultural or ecological resources exist within MRS.
- The proposed screening levels to be used for the human health risk assessment are described as follows, and are listed in Table 2-1.
  - **Soil:** Risk-Based Concentrations supplemented with USEPA Regional Screening Levels
  - **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

Former West Virginia Maneuver Area

TPP Team		EM 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	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		EM 200-1-2, Paragraph 1.1.2	
Potential Area of Interest (PAOI)	Contaminant Issues	Future Land Use	Site-specific Closeout Goal (if applicable)
Ammunition Depot	TBD	Agriculture	See below
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.			
<b>Customer's Schedule Requirements</b>			
Site Inspection and Reporting Complete by January 14, 2013			
<b>Customer's Site Budget</b>			
Site Inspection and Reporting: Fully Funded through SI Phase			



IDENTIFY CURRENT PROJECT		
<b>SITE CONSTRAINTS AND DEPENDENCIES</b>		<b>EM 200-1-2, Paragraph 1.3.1</b>
<u>Administrative Constraints and Dependencies</u>		
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		
Seek concurrence on key documents		
Comparison criteria as agreed upon by the TPP Team. <u>Human Health</u> : RBCs supplemented with USEPA RSLs		
<b>CURRENT EXECUTABLE STAGE</b>		<b>EM 200-1-2, Paragraph 1.3.3</b>
Site Inspection		
<b>Basic</b> (For Current Projects)	<b>Optimum</b> (For Future Projects)	<b>Excessive</b> (Objectives that do not lead to site closeout)
Site Reconnaissance	NDAI	

**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

**PROJECT OBJECTIVES WORKSHEET**

SITE: **MRS02 Ammunition Depot**  
 PROJECT: **MMRP Site Inspection / FUDS Project No. G03WV0013**

Site Objective <sup>a</sup>				Data Needs	Data Collection Methods	Project Objective Classification <sup>d</sup>	
No.	Executable Stage <sup>b</sup>		Description				Source <sup>c</sup>
	Current	Future					
1	Yes		Determine presence/lack thereof of MEC	PA, Recon	Are there any MEC? If so what type, where and hazard posed? Future LU.	Review of existing documents, drive by inspection	Basic
2	Yes		Determine presence/lack thereof of MC, both explosive and non-explosive concentrations.	Soil, surface water, sediment, groundwater sampling	Are there any explosives present in samples? If present, what is it, to what degree is it present, is it above the the designated screening level? And if so, is action required?	Sample collection IAW SAP	Basic

a Refer to EM 200-1-2, Paragraph 1.2.2

b Refer to EM 200-1-2, Paragraph 1.2.5

c For example, Meeting with Customer/stakeholder/Regulator, State Regulation\_\_\_\_,

d Classification of project objectives can only occur after the current project has been identified. Refer to EM 200-1-2, Paragraph 1.3.3.

PA - Preliminary Assessment

LU - Land Use

IAW - In accordance with

MC - Munitions Constituents

MEC - Munitions and Explosives of Concern

SAP - Sampling and Analysis Plan

**MEC DATA QUALITY OBJECTIVE WORKSHEET**

SITE: West Virginia Maneuver Area; FUDS Project No. G03WV0013

PROJECT: MMRP Site Inspection / MRS02 Ammunition Depot

DQO STATEMENT NUMBER: **1 of 4**

<b>DQO Element Number*</b>	<b>DQO Element Description*</b>	<b>Site-Specific DQO Statement</b>
<b>Intended Data Use(s):</b>		
1	Project Objective(s) Satisfied	Evaluate potential presence of munitions or explosives of concern (MEC)
<b>Intended Need Requirements:</b>		
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	Ammunition Depot MRS
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)
<b>Appropriate Sampling and Analysis Methods:</b>		
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 / MRS02 Ammunition Depot

DQO STATEMENT NUMBER: **2 of 4**

<b>DQO Element Number*</b>	<b>DQO Element Description*</b>	<b>Site-Specific DQO Statement</b>
<b>Intended Data Use(s):</b>		
1	Project Objective(s) Satisfied	Evaluate potential release of munitions constituents (MC)
<b>Intended Need Requirements:</b>		
2	Data User Perspective(s)	Risk, remedy
3	Contaminant or Characteristic of Interest	See CSM
4	Media of Interest	Surface soil
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.
6	Number of Samples Required	2 discretionary biased surface soil samples and 1 ambient surface soil sample. Plus associated QA/QC samples.
7	Reference Concentration of Interest or Other Performance Criteria	Human health selected values for soil are from the USEPA 'protection for groundwater' risk-based screening levels, supplemented with USEPA Region 3 Screening Levels. Ecological selected values are from USEPA EcoSSLs, supplemented by Los Alamos National Laboratory's EcoRisk Database values and the relevant USEPA Ecological Screening Benchmarks.
<b>Appropriate Sampling and Analysis Methods:</b>		
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

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 / MRS02 Ammunition Depot  
**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 / MRS02 Ammunition Depot

**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  
WV MANEUVER AREA AMMUNITION DEPOT MRS02, RANDOLPH COUNTY, WEST VIRGINIA**

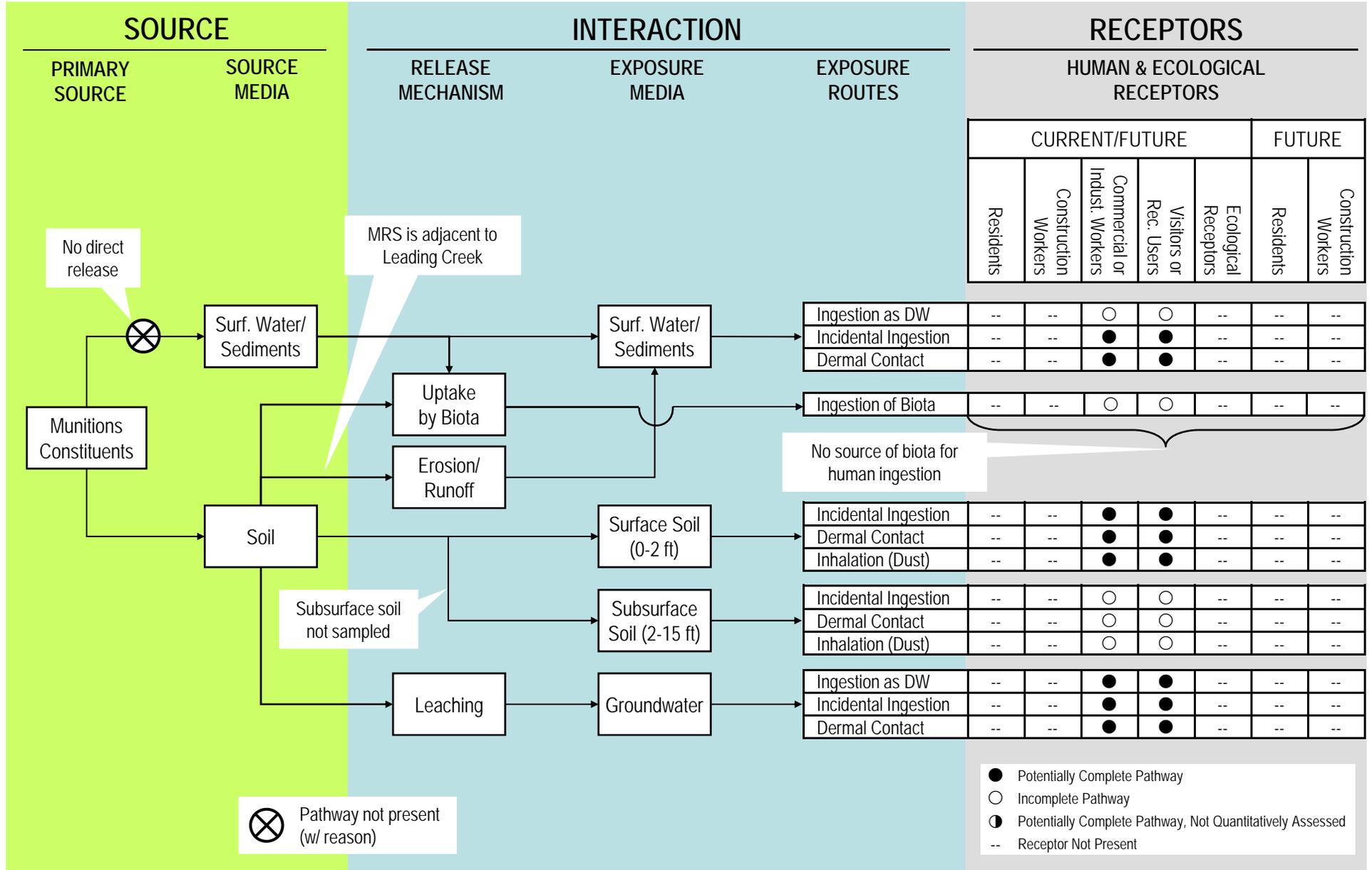
Subsite / Range	Acreage	Suspect Past DoD Activities	Potential MEC / Munitions Debris Present	MEC / Munitions Debris Found Since Closure	Previous Investigation / Clearance Actions	Post-DoD Land Use and Current Land Use	Potential Receptors	Potential Source and Receptor Interaction	Proposed Field Sampling / Qualitative Reconnaissance
WV MANEUVER AREA AMMUNITION DEPOT	4	Ammunition storage area	<p>Small arms, general:</p> <ul style="list-style-type: none"> <li>Cartridge, .30 caliber (includes carbine)</li> <li>Cartridge, .50 caliber, machine gun</li> <li>Cartridge, 40mm, armor piercing – tracer (AP-T), M81</li> <li>Cartridge, 57mm, AP-T, M70</li> <li>Shell, 60mm, high explosive (HE), M49A2</li> <li>Shell, 60mm, smoke, white phosphorus (WP), M302</li> <li>Shell, 75mm, HE, Mkl</li> <li>Shell, 75mm, smoke, WP, MklI</li> <li>Cartridge, 81mm, HE, M43</li> <li>Cartridge, 81mm, smoke, WP, M57</li> <li>Cartridge, 105mm, HE, M1</li> <li>Cartridge, 105mm, smoke, HC, M84</li> <li>Shell, 4.2-inch, HE, Mm3, M3A1</li> <li>Shell, 4.2-inch, smoke, M2 (1918 – 1944)</li> <li>Projectile, 155mm, HE, M102</li> <li>Mine, antitank, practice, M1</li> <li>Rocket, 3.25-inch, target, Mk1 through Mk4</li> </ul>	No MEC or munitions debris was found during the 2007 PA field visit.	<p>2009 PA</p> <p>No documentation of site clearance was found for this site.</p>	Privately owned. Previously used for growing crops. Currently a vacant field.	Commercial/Industrial workers (farmers), site visitors (e.g., landowners and nearby residents).	Possible: Presence of potentially hazardous MEC is possible and site is accessible to receptors.	<p>2 biased surface soil samples, 1 ambient surface soil sample, and associated QC samples.</p> <p>QR length approximately 1 mile, focused on area where Depot was previously reported.</p>
				Source: PA (2009)	<p>DoD = Department of Defense</p> <p>MEC = munitions and explosives of concern</p> <p>PA = Preliminary Assessment</p> <p>QR = qualitative reconnaissance</p> <p>TBD = to be determined</p>				

# PRE-MC SAMPLING CONCEPTUAL SITE EXPOSURE MODEL

MRS Name: WEST VIRGINIA MANEUVER AREA: WV Maneuver Area Ammunition Depot 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  
P.O. BOX 1600  
HUNTSVILLE, ALABAMA 35807-4301

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.

MAR 16 2006

CEHNC-OE-CX

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

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.

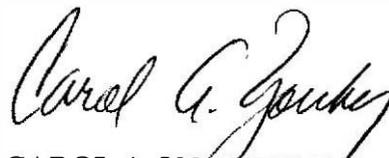
(2) The installation/EOD will make the determination if they are going to respond to the incident. The installation/EOD may be aware of the hazards at the site and make the decision not to respond. If the installation/EOD decides to respond, the individual who identified the item or his designee will 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.  
Chief, Center of Expertise for Ordnance  
and Explosives Directorate