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# FINAL DECISION DOCUMENT

## TOBYHANNA ARTILLERY RANGE FORMERLY USED DEFENSE SITE TOBYHANNA, PENNSYLVANIA

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**September 2010**

*Prepared For:*



Baltimore District  
US Army Corps of Engineers  
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Baltimore, Maryland 21201-1715

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*Final*

**Decision Document  
For  
Tobyhanna Artillery Range  
Formerly Used Defense Site**

**Tobyhanna, Pennsylvania**

Task Order 0014  
Contract Number W912DR-05-D-0022

Prepared for

**U.S. Army Corps of Engineers  
Baltimore District**

Baltimore, Maryland 21201-1715

**September 2010**

## TABLE OF CONTENTS

<b><u>Section</u></b>	<b><u>Page</u></b>
LIST OF ACRONYMS .....	4
EXECUTIVE SUMMARY .....	6
DECLARATION FOR THE DECISION DOCUMENT .....	9
DECISION SUMMARY .....	15
SECTION 1 – SITE NAME, LOCATION AND DESCRIPTION .....	15
1.1. Site Name and Location.....	15
1.2. Site Description.....	15
SECTION 2 – SITE HISTORY AND ENFORCEMENT ACTIVITIES .....	16
2.1. Site History .....	16
2.2. Munitions Response (MR) Activities .....	18
SECTION 3 – COMMUNITY PARTICIPATION .....	20
SECTION 4 – SCOPE AND ROLE OF RESPONSE ACTION .....	20
SECTION 5 – SITE CHARACTERISTICS .....	20
5.1. Environmental Setting .....	20
5.1.1. Physiography .....	20
5.1.2. Geology .....	20
5.1.3. Hydrology .....	21
5.1.4. Ecology.....	21
5.2. Nature and Extent of MEC.....	21
5.3. Nature and Extent of Munitions Constituents (MC) Contamination.....	21
SECTION 6 – CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES.....	25
SECTION 7 – SUMMARY OF SITE RISKS .....	26
SECTION 8 – REMEDIAL ACTION OBJECTIVES .....	27
SECTION 9 – DESCRIPTION OF ALTERNATIVES.....	27
SECTION 10 – COMPARATIVE ANALYSIS OF ALTERNATIVES .....	30
10.1. MRSs with Low or Low-Moderate Potential Risk .....	30
10.2. MRSs with High Potential Risk .....	31
SECTION 11 – PRINCIPAL THREAT WASTES .....	33
SECTION 12 – SELECTED REMEDY .....	33
12.1. Selected Remedy for MRSs with Low or Low-Moderate Potential Risk .....	33
12.1.1. Summary of the Rationale for the Selected Remedy .....	33
12.1.2. Detailed Description of the Selected Remedy .....	33
12.1.3. Summary of the Estimated Costs .....	34

## TABLE OF CONTENTS (CONTINUED)

<b><u>Section</u></b>	<b><u>Page</u></b>
12.2. Selected Remedy for MRSs with High Risk.....	35
12.2.1. Summary of the Rationale for the Selected Remedy .....	35
12.2.2. Detailed Description of the Selected Remedy .....	35
12.2.3. Summary of the Estimated Costs .....	37
12.3. Expected Outcomes of the Selected Remedy.....	37
<b>SECTION 13 – STATUTORY DETERMINATIONS.....</b>	<b>38</b>
13.1. Protection of Human Health and the Environment.....	38
13.1.1. MRSs with Low or Low-Moderate Potential Risk – LUCs .....	38
13.1.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs .....	38
13.2. Compliance with ARARs .....	38
13.2.1. MRSs with Low or Low-Moderate Potential Risk – LUC .....	38
13.2.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs .....	38
13.3. Cost Effectiveness.....	38
13.3.1. MRSs with Low or Low-Moderate Potential Risk – LUCs .....	38
13.3.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs .....	39
13.4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Possible .....	39
13.4.1. MRSs with Low or Low-Moderate Potential Risk – LUCs .....	39
13.4.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs .....	39
13.5. Preference for Treatment as a Principal Element.....	39
13.5.1. MRSs with Low or Low-Moderate Potential Risk – LUCs .....	39
13.5.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs .....	39
13.6. Recurring Review Requirements .....	40
13.6.1. MRSs with Low or Low-Moderate Potential Risk – LUCs .....	40
13.6.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs .....	40
<b>SECTION 14 – DOCUMENTATION OF SIGNIFICANT CHANGES .....</b>	<b>40</b>
<b>RESPONSIVENESS SUMMARY .....</b>	<b>42</b>
<b>SECTION 1 – OVERVIEW .....</b>	<b>42</b>
<b>SECTION 2 – SUMMARY OF COMMENT RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES .....</b>	<b>42</b>
<b>GLOSSARY OF TERMS.....</b>	<b>43</b>
<b>REFERENCES .....</b>	<b>47</b>

## LIST OF FIGURES

<b><u>Figure</u></b>	<b><u>Page</u></b>
Figure 1 TOAR FUDS Location Map .....	15
Figure 2 Original Range and Target Area .....	17
Figure 3 Munitions Response Site Designation Map .....	19
Figure 4 MRS-R01 and Adjacent Areas .....	23

## LIST OF TABLES

<b><u>Table</u></b>	<b><u>Page</u></b>
Table 1. TOAR FUDS MRS Current Cost-to-Complete .....	7
Table 2. TOAR FUDS MRS Designation .....	10
Table 3. UXO Recovered at TOAR FUDS and TYAD .....	22
Table 4. Summary of Explosive Safety Risk Evaluation Results for TOAR FUDS .....	27

## LIST OF ACRONYMS

3Rs	Recognize, Retreat, Report
ACSIM	Assistant Chief of Staff for Installation Management
AM	Action Memorandum
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
Army	Department of the Army
bgs	below ground surface
BIP	blown-in-place
CA	chemical agent
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	chemicals of concern
CTC	cost-to-complete
CTT	Closed, Transferring, and Transferred
DCNR	Department of Conservation and Natural Resources
DD	Decision Document
DERP	Defense Environmental Restoration Program
DMM	discarded military munitions
DoD	Department of Defense
EE/CA	Engineering Evaluation and Cost Analysis
EM CX	Environmental and Munitions Center of Expertise
EO	Executive Order
EOD	explosive ordnance disposal
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FUDS	Formerly Used Defense Site
GPO	Geophysical Prove-Out
GPR	ground penetrating radar
HE	high explosive
IGD	Interim Guidance Document
LTM	long-term monitoring
LUCs	Land Use Controls
MC	munitions constituents
MD	munitions debris
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MOU	Memorandum of Understanding

## LIST OF ACRONYMS (CONTINUED)

MR	munitions response
MRA	Munitions Response Area
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operation and Maintenance
OERIA	Ordnance and Explosives Risk Impact Assessment
PADEP	Pennsylvania Department of Environmental Protection
PGC	Pennsylvania Game Commission
RA	remedial action
RAO	Remedial Action Objective
RD	remedial design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
SAA	small arms ammunition
SARA	Superfund Amendments and Reauthorization Act of 1986
TBC	To Be Considered Criteria
TCRA	Time Critical Removal Action
TMV	Toxicity, Mobility, or Volume
TNT	trinitrotoluene
TOAR FUDS	Tobyhanna Artillery Range Formerly Used Defense Site
TOAR	Tobyhanna Artillery Range
TRC	technical review committee
TYAD	Tobyhanna Army Depot
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance

# TOBYHANNA ARTILLERY RANGE FORMERLY USED DEFENSE SITE

MONROE AND WAYNE COUNTIES, PENNSYLVANIA

## EXECUTIVE SUMMARY

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### SEPTEMBER 2010

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Decision Document (DD) - Tobyhanna Artillery Range (TOAR) Formerly Used Defense Site (FUDS)  
FUDS Property No. CO3PA0396

Military Munitions Response Program (MMRP) Numbers No. 01-16

The Assistant Chief of Staff for Installation Management (ACSIM) granted approval of this DD and signed it on 6 September 2010.

This DD presents the selected remedy for the TOAR FUDS, located in Tobyhanna and Gouldsboro State Parks (Park) and Pennsylvania State Game Lands Number 127 (Game Lands) in Monroe and Wayne Counties, Tobyhanna, Pennsylvania.

The primary source of potential munitions and explosives of concern (MEC) at TOAR FUDS was live-fire training on former artillery ranges. The Pennsylvania Department of Environmental Protection (PADEP), in cooperation with the U.S. Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA), conducted a Remedial Investigation/Feasibility Study (RI/FS) in 2005 and determined unexploded ordnance (UXO) is present on TOAR FUDS. Discarded military munitions (DMM) were not found on TOAR FUDS. Although munitions constituents (MC) were found on TOAR FUDS, screening-level results and a fate and transport analysis indicated that any MC present on TOAR FUDS would not present a threat to human health or the environment.

TOAR FUDS consists of the 16 munitions response sites (MRSs) shown in Table 1. These MRSs are categorized based on the evaluation of the explosives hazards associated with the potential presence of MEC. Based on a qualitative risk evaluation of the explosive risks to the public at TOAR FUDS, MRS-R01, -R06, -R07, -R08, -R09A, and -R09B are categorized as having low or low-moderate potential risk and MRSs -R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C are categorized as having a high potential risk.

The remedial action objective for TOAR FUDS is to minimize or eliminate any potential explosives safety risks to the public and site personnel. To address TOAR FUDS, the U.S. Department of Army (Army) developed five remedial alternatives and compared these against the nine criteria established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). The remedial alternatives considered included (1) no action; (2) land use controls (LUCs); (3) surface removal of MEC with LUCs; (4) removal of MEC to a depth of one foot with LUCs; and (5) removal of MEC to detection depth with LUCs. The remedy selected for MRSs categorized as having high potential risk is removal of MEC to detection depth with LUCs. The remedy selected for MRSs categorized as having low or low-moderate potential risk is LUCs.

Interim LUCs, implemented at TOAR FUDS in 2009, include: (a) placement of hazard/warning signs and/or of an information display board at Park and Game Lands entrance points and high use areas; (b) UXO hazard notification as part of the permitting process for ground disturbing activities (e.g., construction, excavation) and timber harvesting; (c) community education and outreach activities, including the provision of 3Rs (Recognize, Retreat, Report) explosives safety education informational brochures and fact sheets; and (d) the provision of required construction support in areas where removal activities have not been conducted. The total cost-to-complete (CTC) all remedies for TOAR FUDS is \$89,275,687. This CTC includes remedial action (RA), remedial design (RD), and 30-year long-term monitoring (LTM). (See Table 1 for the CTC for each MRS.)



**Table 1. TOAR FUDS MRS Current Cost-to-Complete**

MRS	UXO Source Area	Risk	Selected Response Action	Cost of RA	Remedial Design		Cost of LTM***
					Cost	Fiscal Year	
R01	Buffer Zone Park/Lake Watawga Area	Low	RA/LUC	NA*	NA	NA	\$1,018,483
R02A	Impact Area Park	High	RA/LUC	\$8,297,288	\$50,000	2014	\$1,061,494
R02B	Impact Area Park	High	RA/LUC	\$5,954,016	\$50,000	2011	\$1,061,494
R02C	Impact Area Park	High	RA/LUC	\$7,554,020	\$50,000	2012	\$1,061,494
R02D	Impact Area Park	High	RA/LUC	NA**	NA	NA	\$1,061,494
R03	Impact Area Park	High	RA/LUC	\$8,123,247	\$50,000	2031	\$1,061,494
R04A	Impact Area Game	High	RA/LUC	\$10,252,916	\$50,000	2017	\$1,061,494
R04B	Impact Area Game	High	RA/LUC	\$9,762,388	\$50,000	2018	\$1,061,494
R05A	Impact Area Game	High	RA/LUC	\$6,746,424	\$50,000	2020	\$1,061,494
R05B	Impact Area Game	High	RA/LUC	\$9,609,163	\$50,000	2022	\$1,061,494
R05C	Impact Area Game	High	RA/LUC	\$5,774,097	\$50,000	2029	\$1,061,494
R06	Firing Points Park and Buffer Zone Park	Low-Moderate	LUC	NA	NA	NA	\$1,061,494
R07	Firing Points Game and Buffer Zone Game	Low-Moderate	LUC	NA	NA	NA	\$1,061,494
R08	Other Areas Park	Low-Moderate	LUC	NA	NA	NA	\$1,061,494
R09A	Other Areas/Game	Low-Moderate	LUC	NA	NA	NA	\$1,061,494
R09B	Game/Machine Gun Range	Low-Moderate	LUC	NA	NA	NA	\$872,729
<b>Total</b>				<b>\$72,073,559</b>	<b>\$450,000</b>		<b>\$16,752,128</b>

\* RA completed in 2006 via time-critical removal action

\*\* RA complete in 2009 via PADEP voluntary removal action

\*\*\* LTM (30-year duration after RA)

## DECLARATION FOR THE DECISION DOCUMENT

# TOBYHANNA ARTILLERY RANGE FORMERLY USED DEFENSE SITE

MONROE AND WAYNE COUNTIES, PENNSYLVANIA

## DECLARATION FOR THE DECISION DOCUMENT

SEPTEMBER 2010

(Note: The "Glossary of Terms" provides definitions for the bold-faced terms used in the text.)

### 1. PROJECT NAME AND LOCATION

Site Name: Tobyhanna Artillery Range (TOAR) Formerly Used Defense Site (FUDS)

Address: Monroe and Wayne Counties, Pennsylvania

FUDS Property Number: CO3PA0396

### 2. STATEMENT OF BASIS AND PURPOSE

This **Decision Document (DD)** presents the selected remedy for the TOAR FUDS located in Tobyhanna and Gouldsboro State Parks (Park), and Pennsylvania State Game Lands Number 127 (Game Lands) in Monroe and Wayne Counties, Pennsylvania. The remedy is selected in accordance with the **Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)**, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**. This decision is based on the **Administrative Record** file for TOAR FUDS. The U.S. Army Corps of Engineers (USACE), which is the lead agency for the munitions responses required to address **unexploded ordnance (UXO)**, **discarded military munitions (DMM)**, and **munitions constituents (MC)** at TOAR FUDS, issued this DD. The Pennsylvania Department of Environmental Protection (PADEP) (on behalf of the Commonwealth of Pennsylvania) agrees with the selected remedy. PADEP's formal agreement with the selected remedy is contained in the TOAR FUDS Administrative Record. USACE anticipates that this will be the final decision for TOAR FUDS.

This document, which presents the selected remedy that has a present worth cost estimate of \$55,004,000, is approved by the undersigned, pursuant to Memorandum, DAIM-ZA, September 9, 2003, subject: Policies for Staffing and Approving Decision Documents (DDs), and to Engineer Regulation 200-3-1, *Formerly Used Defense Sites (FUDS) Program Policy*.

### 3. ASSESSMENT OF MUNITIONS RESPONSE SITES (MRSSs)

Past live-fire training conducted at artillery ranges located on TOAR FUDS resulted in the presence of **munitions and explosives of concern (MEC)**, specifically UXO, on portions of TOAR FUDS. The primary source of UXO at these MRSSs was from live-fire training conducted on former ranges on TOAR FUDS during World Wars I and II. At TOAR FUDS, two firing range areas were used: the northeast firing range area (located in what is now State Park lands), and the southwest firing range area (located in what is now State Game Lands 127). The northeast range area contained two firing points, four target areas, and a portion of a range fan from a target area located on the U.S. Military Reservation Tobyhanna Army Depot (TYAD). The southwest artillery range area had four firing points and six target areas. Based on historical information and previous site investigations, the munitions most probably used at TOAR FUDS included .30 and .50-caliber small arms ammunition (SAA), and 37-mm, 75-mm, 3-inch, and 155-mm artillery munitions.

In 1998 and 2004, the Army conducted several **removal actions** and provided **construction support** in high use and development areas of TOAR FUDS and at TYAD to limit the potential exposure of the public and site workers to MEC. In 2004, PADEP, USACE, and the U.S. Environmental Protection Agency (EPA) worked together to complete the sitewide **remedial investigation** and **feasibility study (RI/FS)** for the 25,218 acres of TOAR FUDS. As a result of the RI, a total of nine **areas of concern (AOC-1 through AOC-9)** were identified at TOAR FUDS. In addition, PADEP conducted extended investigations beyond the FUDS boundary on adjacent private properties.

Due to a change in terminology, which occurred after completion of the RI, any range, range complex, or non-range **Munitions Response Area (MRA)** that was determined to contain UXO, DMM, or MC and that the RI Report previously defined as an AOC is now referred to as a **Munitions Response Site (MRS)**. This change has been implemented through the *Munitions Response Site Prioritization Protocol* (32 Code of Federal Regulations (CFR) Part 179) and USACE guidance to ensure that response actions (projects) conducted under the Army's Military Munitions Response Program (MMRP) are defined based on geographic areas and effectively tracked and efficiently managed at the MRS level. Details of USACE's guidance are provided in the *Implementation Plan for Completion of MRSP Scores on all FUDS MMRP Projects*, dated 19 December 2007. Based on the MMRP project designation, a total of 16 MRSs are identified at TOAR FUDS. (Table 2 presents this change.)

**Table 2. TOAR FUDS MRS Designation**

Previous AOC	New MRS
AOC-1	MRS-R01
AOC-2	MRS-R02A
	MRS-R02B
	MRS-R02C
	MRS-R02D
AOC-3	MRS-R03
AOC-4	MRS-R04A
	MRS-R04B
AOC-5	MRS-R05A
	MRS-R05B
	MRS-R05C
AOC-6	MRS-R06
AOC-7	MRS-R07
AOC-8	MRS-R08
AOC-9	MRS-R09A
	MRS-R09B

As shown in Table 2, AOC-2, AOC-4, AOC-5, and AOC-9 were further divided to effectively manage the potential risk based on the estimated density of UXO determined to be present in certain areas (i.e., target areas) and the anticipated response. During the RI, each AOC was evaluated for potential **explosive hazards**. Based on the evaluation, the potential risk associated with MRSs-R01, -R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C is categorized as high. The potential risk associated with MRSs-R06, -R07, -R08, -R09A, and -R09B is categorized as low to low-moderate.

Subsequent to the completion of the RI/FS, USACE initiated a **time-critical removal action (TCRA)** in MRS-R01 located along the northern FUDS boundary and abutting an expanding Lake Watawga residential community (WESTON, 2007). USACE conducted this TCRA, which included the physical removal of all detected MEC to **detection depth**, to address potential explosive hazards posed by MEC to neighboring residents. Based on the completed TCRA, the Army reevaluated the potential explosive hazards and determined the potential risk associated with MRS-R01 to be low (WESTON, 2008a).

USACE has determined that the response action selected in this DD is necessary to protect human health and the environment from the potential explosive hazards associated with UXO given the current and reasonably intended future recreational use of TOAR FUDS as State Parks and Game Lands. PADEP and EPA agree with this determination.

#### 4. DESCRIPTION OF THE SELECTED REMEDY

##### 4.1. MRSs with Low or Low-Moderate Potential Risk

The selected remedy for MRSs with low or low-moderate potential risk is **Land Use Controls (LUCs)**. The implementation of LUCs would provide a means to reduce the potential exposure of the public and site workers to the potential hazards posed by military munitions (e.g., UXO) that may be encountered at TOAR FUDS. Collectively, the types of LUCs selected and discussed more fully below accomplish this by warning people of the potential presence of explosive hazards and educating people about the actions to take if they believe they may have encountered a military munition (e.g., UXO).

- Placement of UXO hazard/warning signs and/or an information display board at Park and Game Lands entrance points and high use areas.
- Provision of UXO hazard notifications as part of the permitting process for construction/excavation and timber harvesting activities.
- Provision of community 3Rs explosives safety education and outreach activities including, but not limited to:
  - Distribution of 3Rs informational brochures and/or fact sheets.
  - Distribution of visual and audio educational and training media.
  - Performance of classroom education and training.
  - Operation and maintenance of educational Internet website.
- **On-site or on-call construction support** in areas where a removal has not been conducted.

The LUCs will be implemented as described in Section 12.1.2 of the DD Decision Summary. The Pennsylvania Game Commission (PGC) and the Pennsylvania Department of Conservation and Natural Resources (DCNR) will be responsible for enforcing their existing codes and ordinances. USACE will coordinate with Monroe and Wayne Counties concerning code and ordinance issues related to TOAR FUDS, and will report on LUCs as specified in the LUC Plan. USACE, with input from PADEP and EPA, may arrange with other local interest groups or municipalities to maintain LUCs. USACE is the lead agency for protecting human health and the environment through this remedy.

##### 4.2. MRSs with High Potential Risk

The selected remedy for MRSs with high potential risk is removal of MEC (UXO) to detection depth with LUCs. Removal of MEC to detection depth includes the removal of all UXO and DMM detected. The depth of detection varies based on the detection technology used (as will be specified in the **remedial action** work plan), as well as several other UXO and site-specific factors (e.g., terrain, depth of a munition's penetration). Specific components of the selected remedy include:

- Mobilization/demobilization.
- Survey/positioning.
- Detection.
- Excavation
- Removal.
- Disposal.
- Determining the explosives safety status of any munitions and/or range-related debris recovered.
- Scrap/waste disposal.
- LUCs.

Technologies used for survey/positioning and detection, excavation, removal, and disposal, as well as the procedures to be used, will be specified in the remedial action work plan.

The objectives and responsibility for implementation and enforcement of LUCs for MRSs categorized as high potential risk are the same as those described above for MRSs with low or low-moderate potential risk.

## 5. STATUTORY DETERMINATIONS

### 5.1. MRSs with Low or Low-Moderate Potential Risk – LUCs

The selected remedy is protective of human health and the environment, complies with Federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable.

Although the selected remedy does not satisfy the statutory preference for treatment as a principal element (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment), PADEP and USACE determined in the Feasibility Study that treatment of MEC is not cost-effective in MRSs categorized as posing a low or low-moderate potential risk. The detection, excavation, removal, and disposal of MEC over the approximately 22,500 acres that comprise MRS-R01, -R06, -R07, -R08, -R09A, and -R09B would require significant resources, but would result in only a slight reduction in the potential risk posed by any MEC present. USACE, with the approval of PADEP, believes that the selected remedy provides the best balance of trade-offs among the considered remedial alternatives with respect to the CERCLA/NCP criteria.

Because this remedy may result in hazardous substances, pollutants, or contaminants remaining at TOAR FUDS above levels that would allow for unrestricted use or exposure, a statutory review will be conducted within 5 years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Statutory reviews will be conducted at the prescribed intervals until such time as LUCs are no longer necessary.

### 5.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs

The selected remedy:

- Is protective of human health and the environment, complies with Federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and uses permanent solutions and alternative treatment technologies to the maximum extent practicable.
- Satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Because the selected remedy may result in hazardous substances, pollutants, or contaminants remaining at TOAR FUDS above levels that allow for unrestricted use or exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Statutory reviews will be conducted at the prescribed intervals until such time as LUCs are no longer necessary.

## 6. DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this DD. Additional information can be found in the Administrative Record file for TOAR FUDS.

- **Nature and extent of UXO, DMM, and MC:** Section 5.2 – Nature and Extent of MEC, and Section 5.3 – Nature and Extent of MC Contamination.
- **Baseline risk represented by UXO, DMM, and MC:** Section 7 – Summary of Site Risks.
- **Remediation objectives:** Section 8 – Remedial Action Objectives.
- **How source materials constituting principal threats are addressed:** Section 11 – Principal Threat Wastes.

- **Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and DD:** Section 6 – Current and Potential Future Land and Resource Uses.
- **Potential land use that will be available at the site as a result of the selected remedy:** Section 12.3 – Selected Remedy (Expected Outcomes of the Selected Remedy).
- **Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected:** Section 9 – Description of Alternatives.
- **Key factors that led to selecting the remedy (i.e., describe how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision):** Section 10 – Comparative Analysis of Alternatives, Section 12 – Selected Remedy, and Section 13 – Statutory Determinations.

## 7. AUTHORIZING SIGNATURE

This DD presents the selected remedy for TOAR FUDS. Under the Defense Environmental Restoration Program (DERP), USACE, which is the lead agency, has developed this DD consistent with CERCLA, as amended, and the NCP. This DD will be incorporated into the larger Administrative Record file for TOAR FUDS, which is available for public view at 5540 Memorial Boulevard, Tobyhanna, Pennsylvania. This DD, which presents a selected remedy with an estimated present worth cost of \$55,004,000, and a current CTC of \$89,275,687, is approved by the undersigned, pursuant to Memorandum, DAIM-ZA, September 9, 2003, subject: Policies for Staffing and Approving Decision Documents (DDs), and to Engineer Regulation 200-3-1, *Formerly Used Defense Sites (FUDS) Program Policy*.

APPROVED:

  
\_\_\_\_\_  
RICK LYNCH  
Lieutenant General, GS  
Assistant Chief of Staff for  
Installation Management  
\_\_\_\_\_  
Date

## DECISION SUMMARY



# TOBYHANNA ARTILLERY RANGE FORMERLY USED DEFENSE SITE

MONROE AND WAYNE COUNTIES, PENNSYLVANIA

## DECISION SUMMARY

SEPTEMBER 2010

(Note: The Glossary of Terms provides definitions for the bold-faced terms used in the text.)

### SECTION 1 – SITE NAME, LOCATION AND DESCRIPTION

#### 1.1. Site Name and Location

The majority of the Tobyhanna Artillery Range Formerly Used Defense Site (TOAR FUDS) is located in Monroe County, with a small portion of the northeast quadrant of the site falling within Wayne County, in northeastern Pennsylvania (see Figure 1). The U.S. Army Corps of Engineers (USACE) FUDS Property Number for TOAR FUDS is CO3PA0396. Cleanup monies for the implementation of the TOAR FUDS selected remedy will be provided by the Department of Defense (DoD).

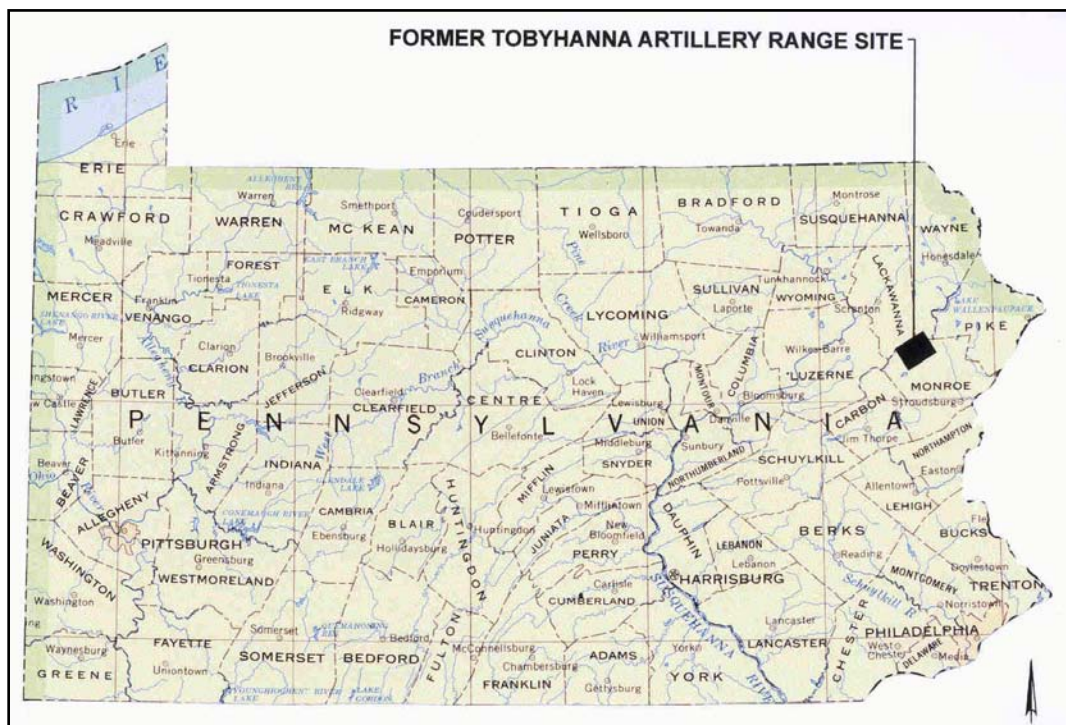


Figure 1 TOAR FUDS Location Map

#### 1.2. Site Description

TOAR FUDS comprises a total of 25,218 acres and consists of two adjacent land areas owned by the Commonwealth of Pennsylvania and divided by Interstate 380. The northeastern portion is comprised of portions of Tobyhanna State Park and Gouldsboro State Park (Park). The southwestern portion is comprised of portions of State Game Lands Number 127 (Game Lands).

The Park covers the northeastern third of TOAR FUDS and is used for multiple recreational purposes, including camping, boating, swimming, hunting, fishing, hiking, snowmobiling, and mountain biking. The Park currently contains minimal infrastructure except within the Campground and Day Use Areas. The Game Lands cover the remaining southwestern two-thirds of TOAR FUDS, serve as a habitat for large and small game animals that are hunted in season,

and feature several lakes and streams that are fished regularly. The Pennsylvania Game Commission (PGC) uses some of this land for food plots, and has designated much of the land for future timber sales.

USACE is the lead agency for the munitions response at TOAR FUDS. The Pennsylvania Department of Environmental Protection (PADEP) is the lead regulatory agency, and the U.S. Environmental Protection Agency (EPA) has a concurrence role as a support regulatory agency. USACE is issuing this Decision Document (DD) in consultation with PADEP and EPA.

## SECTION 2 – SITE HISTORY AND ENFORCEMENT ACTIVITIES

### 2.1. Site History

In 1912, the U.S. Department of the Army (Army) originally leased the lands making up TOAR FUDS for the purpose of troop training. Later that year, the Army formally acquired the lands. Both Regular Army and National Guard Field Artillery units from throughout the Northeast and Mid-Atlantic states trained at Tobyhanna. During World War I, Tobyhanna also served as a training center for tank and ambulance units. Prior to World War II, training was expanded to include cadets from the U.S. Army's Military Academy at West Point. Training reached its height during World War II with intensive live-fire artillery training being conducted on Tobyhanna's operational ranges.

An operational range consists of a **firing point**, an **impact area**, and a **buffer zone** (or range fan). At TOAR FUDS, two former operational ranges were used: the northeast firing range area (located in what is now the Park), and the southwest firing range area (located in what is now Game Lands). Figure 2 illustrates the various range fans used at these ranges.

As shown in Figure 2, the northeast range area contained two firing points, No. 1 and No. 2/2A, and four target areas, T1 through T4. Figure 2 also shows T5, which is located on Powder Smoke Ridge within the Tobyhanna Army Depot (TYAD) boundary; however, this range fan overlaps to the east into the TOAR FUDS Munitions Response Site (MRS)-R02C-D and the southern portion of MRS-R06. The southwest artillery range area had four firing points, No. 3, No. 4, No. 4A, and No. 5, and six target areas, T6 through T11. Based on historical information and site investigations, the munitions most probably used at TOAR FUDS included .30 and .50-caliber SAA, and 37-mm, 75-mm, 3-inch, and 155-mm artillery munitions.

After the end of World War II, both the mission and activities of Tobyhanna's operational ranges were phased out. In 1949, the Army deeded 14,000 acres to the PGC. This acreage formed the basis for what is now Game Lands. Also in 1949, the Army deeded an additional 7,080 acres to the Commonwealth of Pennsylvania's Department of Forest and Waters. This land formed the basis for what is now the Park.

In 1952, the Commonwealth of Pennsylvania sold 1,418 acres of the area back to the U.S. Government. This tract of the original TOAR was required for the establishment and development of the Tobyhanna Signal Depot, later renamed Tobyhanna Army Depot (TYAD). TYAD remains active today; therefore, it is not part of TOAR FUDS.

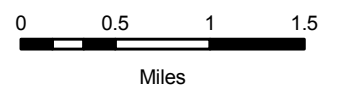
TOAR FUDS falls under the Defense Environmental Restoration Program - Formerly Used Defense Sites (DERP-FUDS) Program, which is managed by USACE. The TOAR FUDS project was originally scoped with the objective of conducting adequate field investigations to allow the preparation and approval of an **Engineering Evaluation and Cost Analysis (EE/CA)** for the project site. This work, begun in 2003, focused primarily on the potential hazards associated with the presence of munitions and explosives of concern (MEC) as part of a removal response action. In May 2004, USACE published ER 200-3-1, FUDS Program Policy. This policy requires that all response activities undertaken by USACE that address MRSs under the FUDS Military Munitions Response Program (MMRP) be conducted in accordance with Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Executive Order (EO) 12580, Superfund Implementation (January 23, 1986); EO 13016, Superfund Amendments (August 28, 1996); and the National Oil and Hazardous Substance Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300). CERCLA's ultimate objective is to protect human health and the environment from releases or threatened releases of hazardous substances. Based on the requirements in ER 200-3-1, the scope of the TOAR FUDS project was transitioned from an EE/CA to a **remedial investigation/feasibility study (RI/FS)** to meet the substantive requirements of ER 200-3-1.



**Legend**

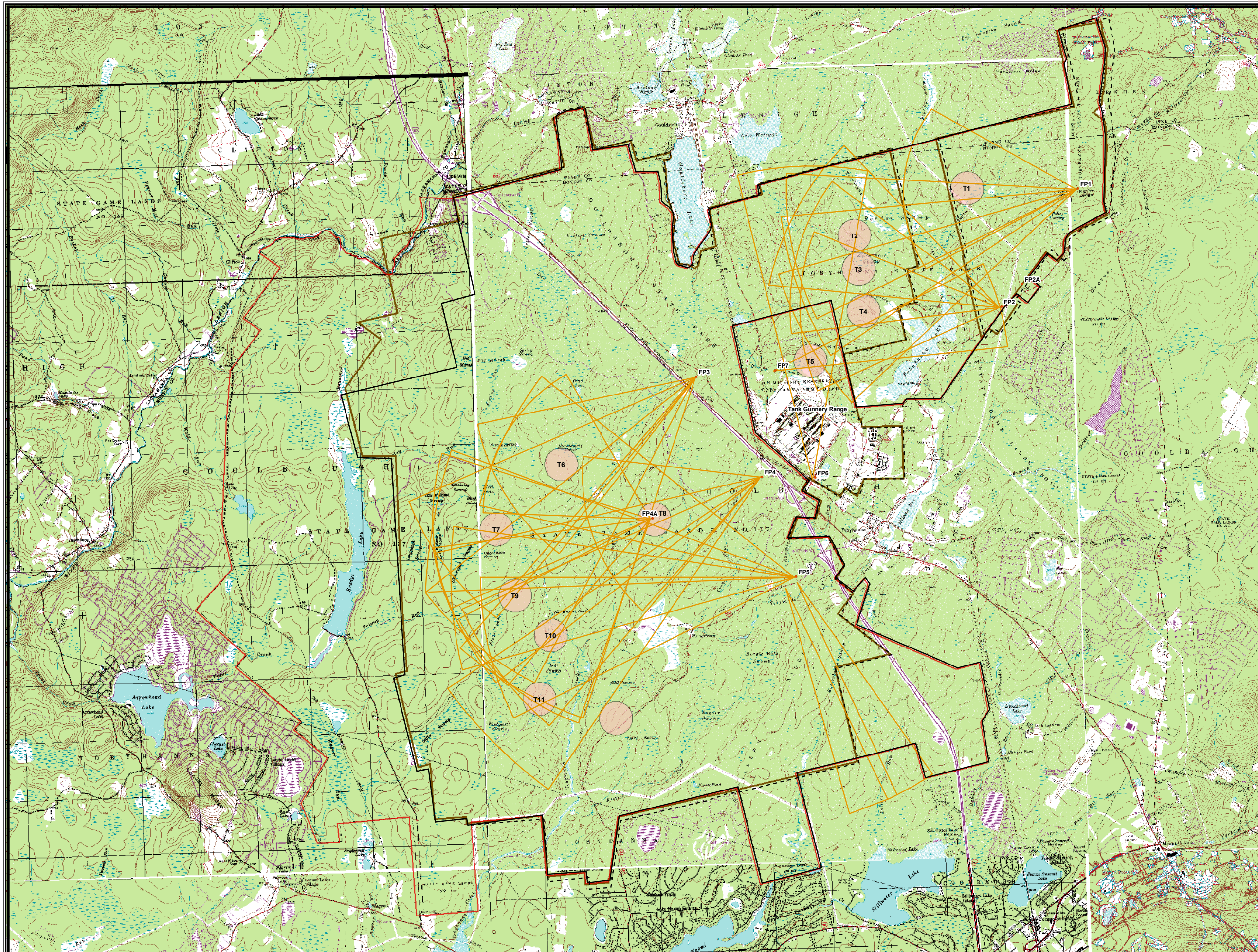
- 1932 Firing Points
- Range Fan
- 1932 Target Areas
- 1932 Boundary
- 1918 Boundary
- EPA Boundary

Base Map:  
USGS Topographic Quadrangles  
Blakeslee; Buck Hill Falls; Moscow;  
Mount Pocono; Newfoundland; Pocono  
Pines; Sterling; Thornhurst; Tobyhanna



**Figure 2**  
**Original Range and Target Area**

Tobyhanna Artillery Range  
Formerly Used Defense Site





Due to funding constraints, USACE was unable to immediately execute an RI/FS at TOAR FUDS. To aid the process and speed the protection of the public and site workers, PADEP agreed to both contract and fund the RI/FS phase of the munitions response (MR). USACE agreed to support PADEP with technical expertise in the execution of an RI/FS that involved MEC. In 2003, PADEP and USACE entered into a Memorandum of Understanding (MOU) that describes each agency's roles, responsibilities, and authorities (PADEP, 2003).

## 2.2. Munitions Response (MR) Activities

Over the past decade, several MR actions have occurred at TOAR FUDS, including **removal actions**, the provision of **construction support**, and an RI/FS analysis. In 1998 and 2004, USACE conducted several removal and construction support actions in high use and development areas of TOAR FUDS and at TYAD to limit the potential for public and worker exposure to MEC. Also in 2004, PADEP, USACE, and the EPA worked together to complete the site-wide RI/FS for the 25,218 acres of TOAR FUDS.

The purpose of the RI was to identify the nature and extent of UXO, DMM, or MC at TOAR FUDS. To characterize TOAR FUDS, the RI evaluated historical information; any MEC, particularly UXO, recovered at either TOAR FUDS or TYAD; **munitions debris (MD)** recovered during the 2004 RI field effort; the operational range layouts (historical and current standards); visual evidence of targets; and the extensive local knowledge that area residents, Park and Game Lands employees, and TYAD employees provided.

For MC, the RI evaluated metals and explosive chemical contamination in site soils, sediments, and surface water to identify potential **chemicals of concern (COCs)** that may have originated from military munitions. MC generally means any materials originating from UXO, DMM, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

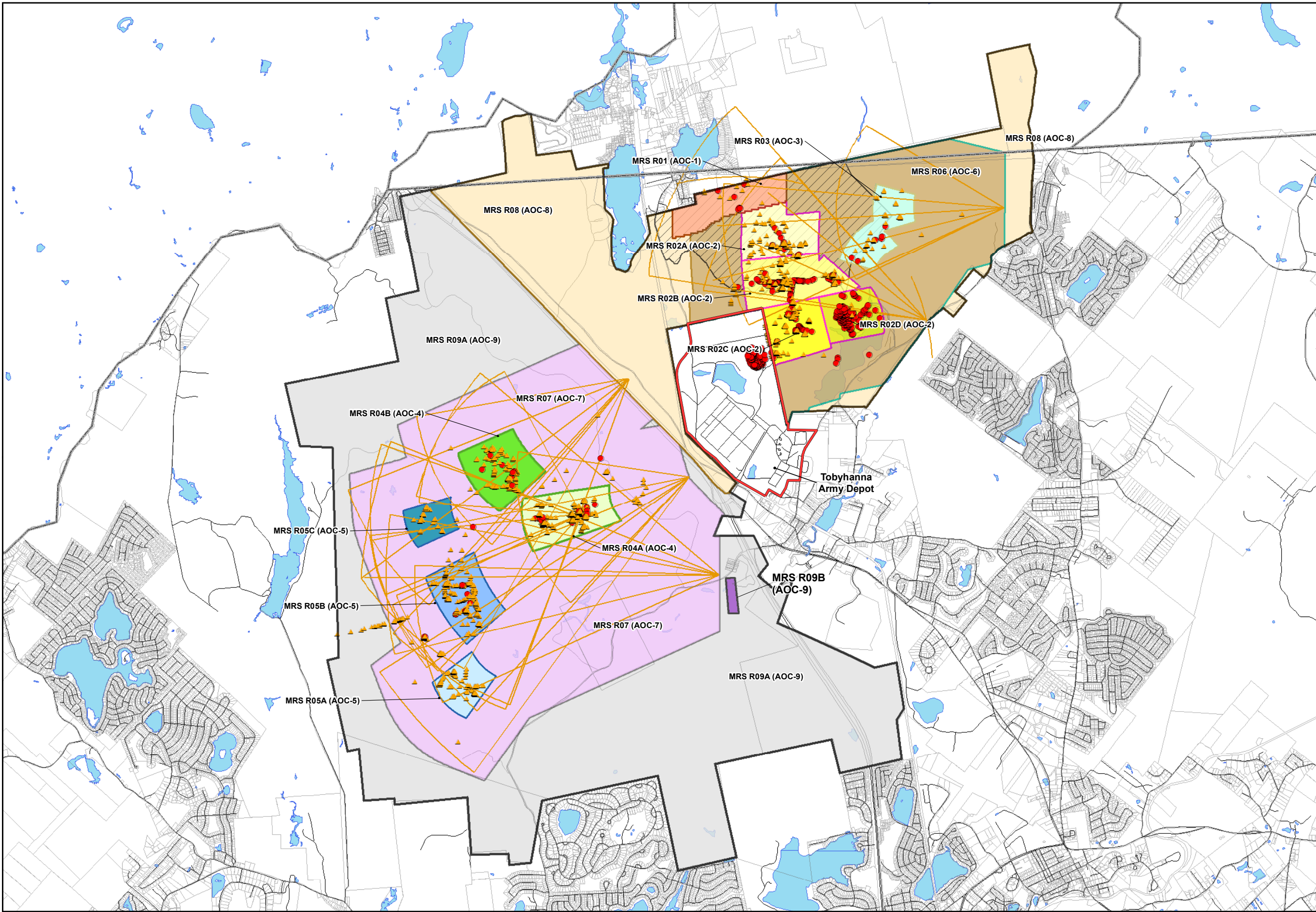
As a result of the work completed as part of the RI, a total of nine areas of concern (AOC-1 through AOC-9) were identified at TOAR FUDS. In addition, PADEP conducted extended investigations beyond the FUDS boundary on adjacent private properties.

Due to a change in terminology, which occurred after completion of the RI, any range, range complex, or non-range munitions response area that was determined to contain MEC and that the RI Report previously defined as an AOC is now referred to as a **Munitions Response Site (MRS)**. This change has been implemented through the *Munitions Response Site Prioritization Protocol* (32 CFR Part 179) and USACE guidance to ensure that response actions (projects) conducted under the Army's MMRP are defined based on geographic areas and effectively tracked and efficiently managed at the MRS level. Details of USACE's guidance are provided in the *Implementation Plan for Completion of MRSPP Scores on all FUDS MMRP Projects*, dated 19 December 2007.

As shown in Table 2, to effectively manage the potential risk, AOC-2, AOC-4, AOC-5, and AOC-9 were further divided based on the estimated density of UXO determined to be present in certain areas (i.e., target areas), and the anticipated response. Based on the MMRP project designation, a total of 16 MRSs are identified at TOAR FUDS (WESTON, 2008a). The locations of the 16 MRSs are shown in Figure 3. The results of the RI are presented in the *Final Remedial Investigation Report, Tobyhanna Artillery Range Formerly Used Defense Site, Tobyhanna, Pennsylvania*, which was completed in July 2005 (WESTON, 2005a) and is on file in the Administrative Record.

The RI results were used to develop the FS that identified remedial objectives and goals for TOAR FUDS to protect human health and the environment, and evaluated remedial alternatives to address any MEC determined to be present in the 16 MRSs. The results of the FS were presented in the *Final Feasibility Study, Tobyhanna Artillery Range Formerly Used Defense Site, Tobyhanna, Pennsylvania*, which was also completed in July 2005 (WESTON, 2005b) and is on file in the Administrative Record.

Subsequent to the completion of the RI/FS, USACE initiated a time-critical removal action (TCRA) in MRS-R01 (formerly AOC-1), which is located along the northern FUDS boundary and abuts the expanding Lake Watawga residential community. USACE conducted this TCRA, which included the removal of any MEC detected to detection depth, to address the potential explosive risk to neighboring residents.



**Legend**

- FUDS Boundary
- Black Bear and Bender Swamps Natural Area
- ▲ MD (RI: WESTON, 2005)
- UXO (RI: WESTON, 2005)
- Firing Fans
- MRS R01 (AOC-1)
- MRS R02A (AOC-2)
- MRS R02B (AOC-2)
- MRS R02C (AOC-2)
- MRS R02D (AOC-2)
- MRS R03 (AOC-3)
- MRS R04A (AOC-4)
- MRS R04B (AOC-4)
- MRS R05A (AOC-5)
- MRS R05B (AOC-5)
- MRS R05C (AOC-5)
- MRS R06 (AOC-6)
- MRS R07 (AOC-7)
- MRS R08 (AOC-8)
- MRS R09A (AOC-9)
- MRS R09B (AOC-9)

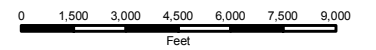
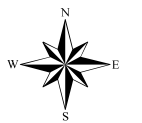


Figure 3  
Munitions Response Site Designation Map  
  
Tobyhanna Artillery Range  
Formerly Used Defense Site

## SECTION 3 – COMMUNITY PARTICIPATION

A summary of the community participation process is provided in the Responsiveness Summary, which is included as part of this DD. Throughout the RI/FS process, the plans and results of ongoing investigations and actions have been presented to a technical review committee (TRC) established for TOAR FUDS. The TRC includes landowners (the Pennsylvania Department of Conservation and Recreation [DCNR] for the Park Area and the PGC for the Game Lands); representatives of Coolbaugh Township, Monroe County, and Wayne County; and other concerned stakeholders and citizens.

Pursuant to CERCLA Section 113(k)(2)(B) and Section 117, USACE released the **Proposed Plan** for TOAR FUDS to the public for comment on November 8, 2006 (WESTON, 2006). This Proposed Plan, as well as the RI/FS reports, were made available to the public, in the Administrative Record, located in the Pocono Mountain Public Library in Tobyhanna, PA.

A public comment period was held from November 8 to December 8, 2006. On November 8, a public meeting was held at the Coolbaugh Township Volunteer Fire House in Tobyhanna, PA, to present the Proposed Plan and to entertain questions and comments from the public. The notification for the Proposed Plan 30-day public comment period and meeting was published in the *Scranton Times-Tribune* and *Pocono Record* the first week of November 2006. Representatives from USACE and PADEP attended the public meeting. Details of the public comment and response are provided in the Responsiveness Summary.

## SECTION 4 – SCOPE AND ROLE OF RESPONSE ACTION

The subject of this DD is the entire TOAR FUDS. Past live-fire training conducted at artillery ranges located on TOAR FUDS resulted in the presence of MEC, specifically UXO, on portions of TOAR FUDS. The role of the remedial action selected for TOAR FUDS is to reduce the potential risk associated with any MEC to human health and the environment based on the current and reasonably anticipated future land use of TOAR FUDS for outdoor recreational activities in both the Park and Game Lands.

## SECTION 5 – SITE CHARACTERISTICS

The following information documents the site characteristics of TOAR FUDS. The information pertaining to the conceptual site model and the nature and extent of MEC is presented in Subsections 5.2 and 5.3. Detailed information on TOAR FUDS characteristics and on the conceptual site model can be found in the *Final Remedial Investigation Report, Tobyhanna Artillery Range Formerly Used Defense Site, Tobyhanna, Pennsylvania* (WESTON, 2005a).

In total, approximately 714 acres of TOAR FUDS have been physically investigated or subjected to a removal action. In addition, USACE visually inspected numerous acres during site visits.

### 5.1. Environmental Setting

#### 5.1.1. Physiography

TOAR FUDS is characterized as partly swampy and heavily wooded, with dense brush and outcroppings of bedrock. The majority of TOAR FUDS is undeveloped. The terrain has slopes ranging from 0 to 20%. Based on historical aerial photographs, when the artillery range was in operation, very few trees existed on-site. Now, about 81% of TOAR FUDS is wooded.

#### 5.1.2. Geology

TOAR FUDS is located within the Pocono Plateau Section of the Appalachian Plateau Geologic Province. Glaciation throughout this region during Pleistocene geologic time has resulted in a veneer of glacial fill blanketing the land surface. The glacial fills range from stratified drift deposits to unsorted glacial till. The glacial till consists of mixtures of clay, silt, sand, gravel, and boulders. The glacial fills are thickest in former stream valleys and thinnest near ridge tops.

Bedrock beneath the glacial deposits consists of the Duncannon and Poplar Gap Members of Catskill Formation of Devonian Geologic Age. Both of these members are composed of interbedded conglomerate, sandstone, siltstone, and shale, ranging from red to medium gray in color. The rocks within the Pocono Plateau are gently folded



with the axis of the folds striking to the northeast. Overall, the Catskill Formation dips gently to the west, resulting in progressively older members of the formation cropping out to the east.

As a result of glaciation, most of the soils are too stony for cultivation. About 81% of the county is woodlands. Soil erosion, low available water capacity in rapidly permeable soils, and insufficient drainage in wet soil are the major problems in areas developed for recreation.

### 5.1.3. Hydrology

Groundwater throughout the region generally occurs under unconfined conditions; the groundwater profile is a subsurface expression of the surface topography with groundwater closely mimicking surface water. Local or semi-confined conditions may occur beneath portions of glacial till deposits that are very low in hydraulic conductivity and within some fractures in the bedrock. Recharge to the water table occurs on topographically high areas, with discharge to streams and marshes in low-lying areas. Rainfall in the region averages 45 inches each year. About 16 to 19 inches of the total annual rainfall infiltrates to the water table. Evaporation losses are less in this region than elsewhere in Pennsylvania due to the high altitude, prolonged snow cover, and low average annual air temperature.

### 5.1.4. Ecology

The land at TOAR FUDS consists mainly of upland and lowland forests, forested wetland, emergent wetland, and aquatic habitats. Wildlife is abundant in all habitats. Numerous mammals, birds, reptiles, and fish species inhabit these areas.

## 5.2. Nature and Extent of MEC

The only MEC recovered at TOAR FUDS was UXO. **Discarded military munitions (DMM)** were not found during the RI. **Munitions constituents (MC)**, such as trinitrotoluene (TNT), in concentrations high enough to pose an explosive hazard were also not found. There were no munitions **disposal pits** found. UXO recovered during response activities at both TOAR FUDS and TYAD is summarized in Table 3.

A total of 406 UXO were recovered at TOAR FUDS. These consisted primarily of 37-mm, 75-mm, and 155-mm artillery rounds. All UXO were recovered in former range impact areas and their associated buffer zones. There was no MEC recovered at firing points or **other areas** (areas outside range impact areas and their associated buffer zones where UXO would be expected to be encountered).

Approximately 95% of the UXO recovered during the site-wide RI were found within 12 inches of the ground surface (and 80% within 6 inches of the ground surface). The deepest UXO recovered was 24 inches below the ground surface. The recovery of UXO at shallow or surficial depths is attributed to the rocky geology of the region limiting munitions penetration depth, as well as **frost heave** causing the upward migration of UXO over the past 60 years.

## 5.3. Nature and Extent of Munitions Constituents (MC) Contamination

To assess the presence or absence of MC (related to materials originating from UXO, DMM, or other military munitions) at TOAR FUDS, the sampling program included the collection of 50 surface soil, sediment, and surface water samples that were analyzed for metals and explosives. Samples were collected at biased-high locations (such as within impact areas, around targets, and from detonation craters) where MC contamination, if present, would most likely be located. In addition, nine surface soil samples were collected at TOAR FUDS to establish comparison background levels. The sample locations were outside areas of known or suspected MC contamination and analyzed for metals only.

Analytical results were used to assess the potential risk to human health and the environment by a comparison to established human health and ecological risk levels and background levels. Analytical results indicated the detection of only one explosive compound (HDX), in a low concentration, from a single soil location. Metals, including lead, copper, and antimony, were found exceeding background levels in soil, sediment, and surface water. However, risk screening results and fate and transport analysis indicated that concentrations of MC present at TOAR FUDS do not pose an unacceptable risk to human health or the environment and additional evaluation or sampling for MC is not warranted.

**Table 3. UXO Recovered at TOAR FUDS and TYAD**

Year	Activity	Location	No. of UXO Recovered
1998	TCRA for Campground and Trails	TOAR FUDS Park	278
1998	Construction Support for Radar Site	TYAD	228
2004	Construction Support for Radar Site	TYAD	7
2004	Construction Support for Training and Conference Center	TYAD	0
2004	TCRA for Roadways and Trails	TOAR FUDS Game	1
2004	Site Visit	TOAR FUDS Park	3
2004	Site Visit	TOAR FUDS Park	2
2004	RI	TOAR FUDS Park	40
2004	RI	TOAR FUDS Game	38
2006	TCRA for MRS-R01 (formerly AOC-1)	TOAR FUDS Park	44
2006	TCRA - Transects within areas north of MRS-R01	Lakeview Estates Community	2
2007	TCRA - North of MRS-R01	Lake Watawga Community	2
		Lakeview Estates Community	0
2007	TCRA - West of 2006 TCRA	TOAR FUDS Park	0
<b>Total UXO Recovered =</b>			<b>645</b>

The following subsections present a summary of site characteristics for each of the 16 MRSs.

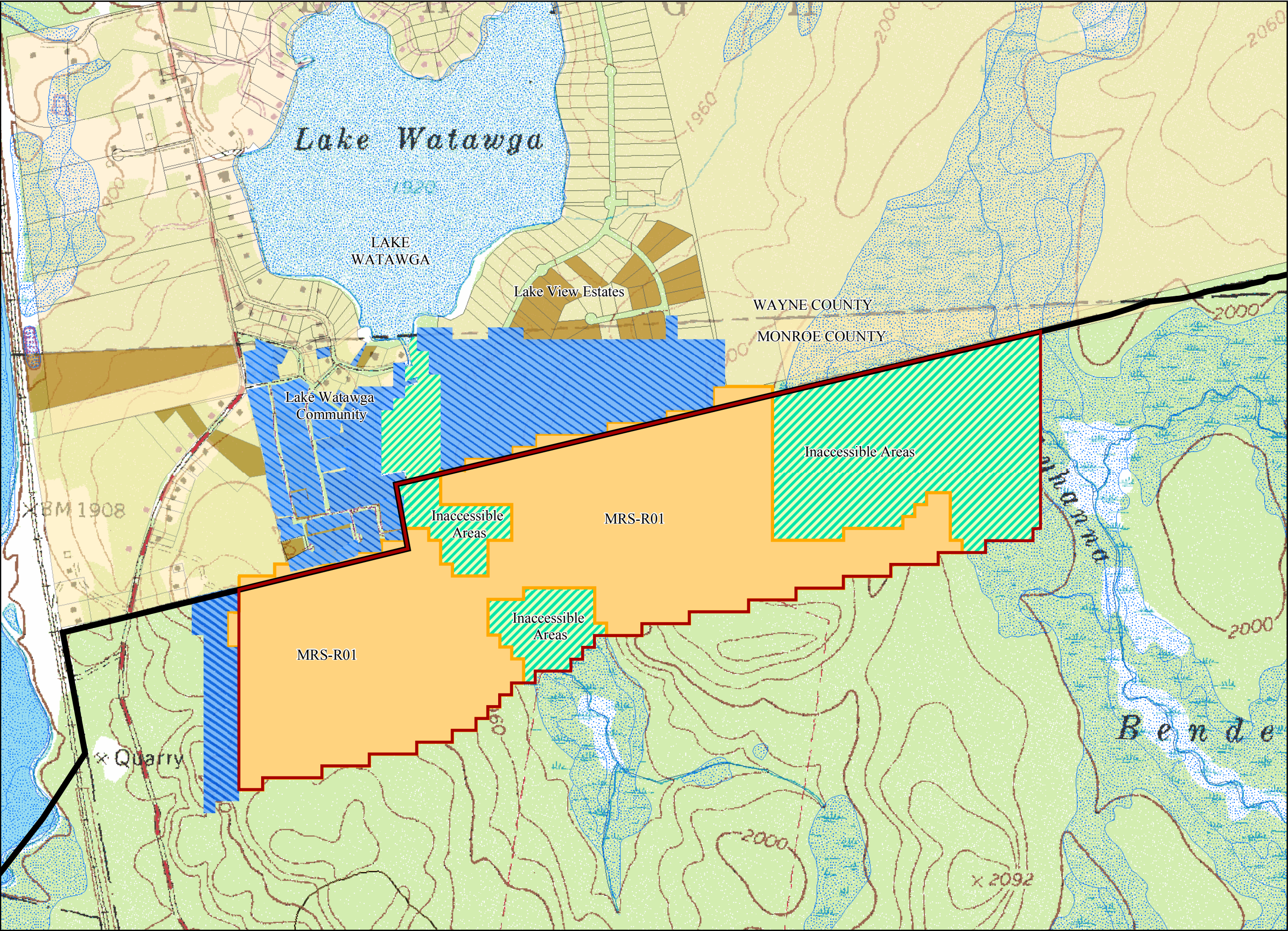
### **MRS-R01 (FORMERLY AOC-1)**

MRS-R01 is located in the Park along the northern boundary of TOAR FUDS, near Lake Watawga, and is approximately 279 acres. Approximately 89 acres in MRS-R01 are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). MRS-R01 is located adjacent to residential housing and within a designated natural area open only to passive recreation and hunting.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, MRS-R01 encompasses an area that was formerly a buffer zone. During the RI field investigation, approximately 55 acres within MRS-R01 were investigated for MEC, with four UXO and numerous MD items, which were determined not to pose an explosive hazard, recovered. As noted previously, subsequent to the RI/FS, USACE conducted a Time-Critical Removal Action (TCRA) at MRS-R01 in 2006 to address the potential explosive hazards posed by MEC to neighboring residents in the Lakeview Estates Community. During the TCRA, a removal of detected MEC (e.g., UXO) was conducted to detection depth of over 190 acres of MRS-R01’s accessible area. During this removal, 44 UXO were recovered, along with 1,857 pounds of MD, which was determined not to pose an explosive hazard. Based on the results of the TCRA, the borders of MRS-R01 have been revised from the RI/FS. The southern and western borders of MRS-R01 were expanded to allow additional removal activities. The northern border was revised to parallel the northern FUDS border to provide a consistent buffer zone based on the fragmentation distance of the most likely munitions to be encountered in MRS-R01, which is the 75-mm high explosive (HE) artillery round.

After the completion of the TCRA, PADEP conducted an investigation and removal to the west of MRS-R01 and outside the FUDS boundary to the north of MRS-R01 (within the Lakewood Estates and Lake Watawga Communities). Figure 4 shows the area in which additional removal activities were conducted. PADEP conducted these activities based on the recovery of two 75-mm HE projectiles and assorted MD in these areas during investigative transects conducted as part of the 2006 TCRA of MRS-R01. Due to the timing and constraints of the PADEP fiscal year, additional removal activities were approached in two separate mobilizations, one in March 2007 and the other in September 2007. A total of four UXO were recovered by PADEP during the additional removal activities conducted outside the FUDS. The results of these removal activities provide a 600-ft zone along the northern boundary of the expanded area in which MEC (i.e., UXO) would not be expected to be encountered, and an approximately 400-ft buffer around previously recovered UXO within the FUDS MRS-R01 (WESTON, 2007).





- Legend**
- TOAR FUDS Boundary
  - NWI and Survey Wetlands
  - Wetland/Inaccessible Areas
  - MRS-R01 (AOC -1)
  - MRS-R01 (AOC-1) 2006 TCRA
  - 2007 Continuation of TCRA (PADEP)

Base Map:  
USGS Topographic Quadrangle  
Tobyhanna

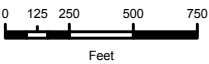


Figure 4  
MRS-R01 and Adjacent Areas

Tobyhanna Artillery Range  
Formerly Used Defense Site



### **MRS-R02A, R02B, R02C, AND R02D (FORMERLY AOC-2)**

MRSs-R02A, B, C, and D were grouped together as AOC-2 in the RI Report (WESTON, 2005a). These MRSs are located in the Park. MRS-R02A is approximately 297 acres, MRS-R02B is approximately 365 acres, MRS-R02C is approximately 259 acres, and MRS-R02D is approximately 220 acres. Combined, these MRSs are approximately 1,141 acres, of which approximately 274 acres are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). These MRSs are used for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling. Parts of these MRSs are located within a designated natural area open only to passive recreation and hunting.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, these MRSs encompass an impact area. To date, approximately 235 acres within these MRSs have been investigated for MEC. A total of 304 UXO were recovered from MRSs R02A-R02D (with 10, 76, 51, and 165 UXO, respectively), along with numerous MD items (no explosive hazard).

### **MRS-R03 (FORMERLY AOC-3)**

MRS-R03 is located in the Park and is approximately 255 acres. Approximately 98 acres in MRS-R03 are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). MRS-R03 is used for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling. Portions of MRS-R03 are located within a designated natural area open only to passive recreation and hunting.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, MRS-R03 encompasses an impact area. To date, approximately 9 acres within MRS-R03 have been investigated for MEC, with seven UXO and numerous MD items, which were determined not to pose an explosive hazard, recovered.

### **MRS-R04A AND R04B (FORMERLY AOC-4)**

MRS-R04A and R04B were grouped together as AOC-4 in the RI Report (WESTON, 2005a). These MRSs are located in the Game Lands. MRS-R04A is approximately 339 acres and MRS-R04B is approximately 317 acres. Combined, these MRSs are approximately 656 acres, of which approximately 142 acres are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). These MRSs are used primarily for hunting, but also for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, these MRSs encompass an area that was an impact area. To date, approximately 16 acres within these MRSs have been investigated for MEC. A total of 28 UXO have been recovered from MRS-R04A and R04B, along with numerous MD items, which were determined not to pose an explosive hazard.

### **MRS-R05A, R05B, AND R05C (FORMERLY AOC-5)**

MRS-R05A to R05C were grouped together as AOC-5 in the RI Report (WESTON, 2005a). These MRSs are located in the Game Lands. MRS-R05A is approximately 178 acres, MRS-R05B is approximately 309 acres, and MRS-R05C is approximately 138 acres. Combined, these MRSs are approximately 625 acres, of which approximately 126 acres are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). These MRSs are used primarily for hunting, but also for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, these MRSs encompass an area that was an impact area. To date, approximately 17 acres within these MRSs have been investigated for MEC, with seven UXO and numerous MD items, which were determined not to pose an explosive hazard, recovered from MRS-R05B.

### **MRS-R06 (FORMERLY AOC-6)**

MRS-R06 is located in the Park and is approximately 2,907 acres. Approximately 611 acres in MRS-R06 are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). MRS-R06 is used for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling. Parts of MRS-R06 are located within a designated natural area open only to passive recreation and hunting.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, MRS-R06 encompasses an area that included firing points and a buffer zone. To date, approximately 66 acres within MRS-R06 have been investigated for MEC, with five UXO and numerous MD items, which were determined not to pose an explosive hazard, recovered.

### **MRS-R07 (FORMERLY AOC-7)**

MRS-R07 is located in Game Lands and is approximately 7,193 acres. Approximately 1,577 acres in MRS-R07 are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). MRS-R07 is used primarily for hunting, but also for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling. In addition, the PGC uses some of this land for food plots and has designated much of the land for future timber sales.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, MRS-R07 encompasses an area that included firing points and a buffer zone. To date, approximately 67 acres within MRS-R07 have been investigated for MEC, with four UXO and numerous MD items, which were determined not to pose an explosive hazard, recovered.

### **MRS-R08 (FORMERLY AOC-8)**

MRS-R08 is located in the Park and is approximately 3,456 acres. Approximately 519 acres in MRS-R08 are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). MRS-R08 is used for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling. Parts of MRS-R08 are located within a designated natural area open only to passive recreation and hunting.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, portions of MRS-R08 are outside areas of expected UXO contamination. To date, approximately 59 acres within MRS-R08 have been investigated for MEC. During the investigation, there was no MEC or MD found.

### **MRS-R09A AND R09B (FORMERLY AOC-9)**

MRS-R09A - R09B were grouped together as AOC-9 in the RI Report (WESTON, 2005a). MRS-R09A is located in Game Lands and is approximately 8,679 acres. MRS-R09B is the location of a former machine gun range located in Game Lands and is approximately 27 acres (WESTON, 2008b). Combined, these MRSs are approximately 8,706 acres, of which approximately 1,847 acres are considered inaccessible “wet areas” (i.e., lakes, ponds, streams, wetlands). MRS-R09B is the site of a suspected former machine gun range located in Game Lands and is approximately 27 acres. MRS-R09A and R09B are used primarily for hunting, but also for recreational activities such as camping, hiking, fishing, mountain biking, and snowmobiling. In addition, the PGC uses some of this land for food plots and has designated much of the land for future timber sales.

Based on historical live-fire training conducted on artillery ranges at TOAR FUDS and the results of the RI, most of MRS-R09A and all of MRS-R09B are outside areas where MEC would be suspected to be present. To date, approximately 55 acres within these MRSs been investigated for MEC. Although MEC has not been found in either MRS, several MD items, which were determined not to pose an explosive hazard, have been recovered from MRS-R09A.

## **SECTION 6 – CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES**

The Park covers the northeastern third of TOAR FUDS, contains minimal infrastructure, and allows for public access for multiple recreational purposes, including camping, boating, swimming, hunting, fishing, hiking, snowmobiling, and mountain biking. The Game Lands cover the remaining southwestern two-thirds of TOAR FUDS, serve as a habitat for large and small game animals that are hunted in season, and feature several lakes and streams that are fished regularly. The PGC uses some of this land for food plots and has designated much of the land for future timber sales. Both Park and Game Lands representatives have stated that future site and resource uses will remain the same as current uses.

Residential communities border TOAR FUDS in the north near Lake Watawga at several locations (see Figure 4). Expansion through development of the residential community around Lake Watawga near the northern FUDS boundary is currently ongoing.

## SECTION 7 – SUMMARY OF SITE RISKS

The results of the RI conducted at TOAR FUDS were used to evaluate potential risks associated with UXO, DMM, and MC. Based on the screening-level risk assessment completed in the RI, MC, including metals and explosive compounds, were not detected at concentrations that pose an unacceptable risk to human health or the environment; the only risk considered for TOAR FUDS was the potential explosive hazards associated with MEC, specifically UXO.

An explosive hazard refers to a condition where danger exists because explosives are present that may react (e.g., detonate, deflagrate) in a mishap with potential unacceptable effects (e.g., death, injury, damage) to people, property, operational capability, or the environment. With regard to MEC, an **explosive safety risk** is the probability for a detonation to occur and potentially cause harm as a result of human activities. An explosive safety risk exists if a person can come into contact with MEC and act upon it to cause detonation. The potential for an explosives safety risk to exist depends on the presence of three critical elements: a source (e.g., the presence of MEC (e.g., UXO)), a receptor (person), and interaction (e.g., disturbing, moving the munitions) between the receptor and the source. There is no explosives safety risk if any one element is missing.

The **exposure pathway** for munitions to a receptor is primarily through direct contact as a result of some human activity. Agricultural or construction activities involving ground disturbing or intrusive activities are examples of human activities that may increase the likelihood for direct contact with subsurface munitions. Munitions will tend to remain in place unless disturbed by human activity or exposed by naturally occurring phenomena (e.g., erosion, frost heave). The movement or exposure of munitions by natural forces may increase the probability for direct human contact, but would not necessarily result in a direct contact.

A qualitative risk evaluation was conducted using the **Ordinance and Explosives Risk Impact Assessment (OERIA)** Interim Guidance document (USACE, 2001) to assess the potential risks to the public at TOAR FUDS. The potential explosive safety risk posed by UXO was characterized qualitatively by evaluating the following three primary risk factors and the associated secondary risk factors provided in parentheses:

1. Presence of munitions – a source (type, sensitivity, density, and depth distribution).
2. Site characteristics (site accessibility and stability).
3. Human factors (population and site activity).

Using these risk factors, the potential explosive safety risk associated with UXO at TOAR FUDS was evaluated for the following source areas: firing points, impact areas, buffer zones, and other areas. The results of the risk evaluation were used to assign a qualitative risk (low, moderate, or high), associated with the potential presence of UXO, to each of the 16 MRSs, as shown in Table 4. In general, the potential explosive safety risk is high in impact areas where UXO would most likely be encountered (estimated densities are highest). Where only a limited number of UXO were encountered during the RI, the potential explosive safety risk is considered low to moderate. Originally, there was a high potential explosive safety risk for MRS-R01 (during the FS) due to its proximity to residential housing; however, with the completion of the MRS-R01 TCRA, the explosive safety risk is now considered to be a low potential risk. This is documented in the 2008 Munitions Response Site Prioritization Protocol (MRSP) for TOAR FUDS (WESTON, 2008a).

**Table 4. Summary of Explosive Safety Risk Evaluation Results for TOAR FUDS**

MRS	Source Area	Potential Risk
R01	Buffer Zone Park/Lake Watawga Area	Low
R02A	Impact Area Park	High
R02B	Impact Area Park	High
R02C	Impact Area Park	High
R02D	Impact Area Park	High
R03	Impact Area Park	High
R04A	Impact Area Game	High
R04B	Impact Area Game	High
R05A	Impact Area Game	High
R05B	Impact Area Game	High
R05C	Impact Area Game	High
R06	Firing Points Park and Buffer Zone Park	Low-Moderate
R07	Firing Points Game and Buffer Zone Game	Low-Moderate
R08	Other Areas Park	Low-Moderate
R09A	Other Areas Game	Low-Moderate
R09B	Machine Gun Range	Low-Moderate

## SECTION 8 – REMEDIAL ACTION OBJECTIVES

TOAR FUDS is used by the public for outdoor recreational activities, including camping, hiking, hunting, and fishing. There is no stated intent by the landowners to modify the land use. The goal of the TOAR FUDS remedial action is to reduce the potential explosives safety hazards to ensure protection of human health and the environment. Objectives established for remedial action guide the development of remedial action alternatives. The **remedial action objective (RAO)** for TOAR FUDS is to minimize or eliminate the potential explosive safety risk to the public and site personnel.

## SECTION 9 – DESCRIPTION OF ALTERNATIVES

CERCLA requires that each selected remedial alternative be: (a) protective of human health and the environment; (b) cost effective; (c) comply with all applicable or relevant and appropriate Federal and state requirements; and (d) use permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment (i.e., removal and disposal of MEC) as a principal element for the reduction of toxicity, mobility, or volume (TMV) of hazardous substances. The five remedial alternatives evaluated for TOAR FUDS MRSs included the following:

1. No Action (Required to be evaluated by the NCP).
2. Land Use Controls (LUCs).
3. Surface removal of MEC (UXO) with LUCs.
4. Removal of MEC (UXO) to 1 foot with LUCs.
5. Removal of MEC (UXO) to detection depth with LUCs.

These alternatives are described below. The estimated costs shown have been rounded to the nearest thousand dollars. Costs associated with CERCLA-required five-year reviews are not included.

## ALTERNATIVE 1 – NO ACTION

The No Action Alternative is provided, as required under CERCLA and the NCP, as a baseline for comparison to the other proposed alternatives. Alternative 1 is for the government to take no action in regards to locating, removing, and disposing of any potential MEC that may be present within an MRS at TOAR FUDS. In addition, no public awareness or education training would be initiated with regard to the potential risk associated with the presence of MEC. The No Action Alternative assumes continued land use of the MRS in its present state.

*Estimated Capital Cost = \$0*

*Estimated Operation and Maintenance (O&M) Cost = \$0*

*Estimated Total Present Worth Cost = \$0*

*Estimated Time to Achieve RAO = 30 years\**

\*A 30-year time period is used by USACE to analyze “Cost to Complete” for all alternatives. Actual completion time could exceed 30 years, depending on the findings of **recurring reviews**.

## ALTERNATIVE 2 – LUCs

In addition to conducting munitions responses to address UXO, DMM, or MC, risks related to potential explosive hazards posed by any UXO that may remain on TOAR FUDS may be managed through LUCs that, among other actions, consist of various access control measures and/or public awareness components. Implementation of LUCs (access controls) provides the landowners or their representatives a means to participate in efforts to reduce the potential for public exposure to any MEC that may remain present. The use of LUCs (public awareness through 3Rs explosives safety education) helps landowners and others understand the actions they should take if they encounter or suspect they have encountered munitions (UXO, DMM). The LUCs alternative can be used in combination with other remedial alternatives or in cases where it may not be possible or practical to physically remove MEC from an MRS (e.g., in “wet areas”). Successful implementation of LUCs is contingent on the cooperation and active participation of landowners, as well as government (local, state, and Federal) agencies. The remedial design will specify steps and controls to be put in place that will ensure the LUCs are maintained and enforced, thus ensuring long-term effectiveness and permanence.

Specific components of the LUCs in this alternative for TOAR FUDS include the following:

- Placement of UXO hazard/warning signs and/or an information display board at Park and Game Lands entrance points and high use areas.
- Provision of UXO hazard notifications as part of the permitting process for construction/ excavation and timber harvesting activities.
- Provision of community 3Rs explosives safety education and outreach activities including, but not limited to:
  - Distribution of 3Rs informational brochures and/or fact sheets.
  - Distribution of visual and audio educational and training media.
  - Performance of classroom education and training.
  - Operation and maintenance of educational Internet website.
- Construction support, either on-site or on-call, in areas where a munitions response (removal) has not been conducted and UXO are known or suspected to be present.

*Estimated Capital Cost for MRSS with Low or Low-Moderate Risk = \$598,000*

*Estimated O&M Cost for MRSS with Low or Low-Moderate Risk = \$2,061,000*

*Estimated Total Present Worth Cost for MRSS with Low or Low-Moderate Risk = \$2,659,000*

*Estimated Time to Achieve RAO for MRSS with Low or Low-Moderate Risk = 30 years\**

*Estimated Capital Cost for MRSS with High Risk = \$479,000*

*Estimated O&M Cost for MRSS with High Risk = \$4,057,000*

*Estimated Total Present Worth Cost for MRSS with High Risk = \$4,536,000*

*Estimated Time to Achieve RAO for MRSS with High Risk = 30 years\**

\*A 30-year time period is used by USACE to analyze “Cost to Complete” for all alternatives. Actual completion time could exceed 30 years, depending on the findings of recurring reviews.

### **ALTERNATIVE 3 – SURFACE REMOVAL OF MEC (UXO) WITH LUCs**

Alternative 3 includes removal of any UXO or DMM detected on the surface using visual observation and analog instrument assistance. (Note: MEC is considered on the surface when it is entirely or partially exposed above the ground surface or above the surface of a water body at any time.) LUCs, as described in Alternative 2, would also be implemented as part of this alternative. LUCs would also be used to address the potential explosive hazards associated with any subsurface MEC in the “wet areas.”

*Estimated Capital Cost = \$24,022,000*  
*Estimated O&M Cost = \$4,057,000*  
*Estimated Total Present Worth Cost = \$28,079,000*  
*Estimated Time to Complete Removal = 2 years*  
*Estimated Time to Achieve RAO = 30 years\**

\*A 30-year time period is used by USACE to analyze “Cost to Complete” for all alternatives. Actual completion time could exceed 30 years, depending on the findings of recurring reviews.

### **ALTERNATIVE 4 – REMOVAL OF MEC (UXO) TO ONE FOOT WITH LUCs**

Removal of MEC to 1 foot includes removal of any UXO or DMM detected on the ground surface and within 1 foot of the ground surface. A detection depth of 1 foot was chosen as a general remedial action because 95% of the UXO recovered during the RI were located within 1 foot of the ground surface. LUCs, as described in Alternative 2, would also be implemented as part of this alternative. LUCs would also address the potential explosive hazards associated with any subsurface MEC in the “wet areas.”

*Estimated Capital Cost = \$45,285,000*  
*Estimated O&M Cost = \$4,057,000*  
*Estimated Total Present Worth Cost = \$49,342,000*  
*Estimated Time to Complete Removal = 3 ½ years*  
*Estimated Time to Achieve RAO = 30 years\**

\*A 30-year time period is used by USACE to analyze “Cost to Complete” for all alternatives. Actual completion time could exceed 30 years, depending on the findings of recurring reviews.

### **ALTERNATIVE 5 – REMOVAL OF MEC (UXO) TO DETECTION DEPTH WITH LUCs**

Removal of MEC to detection depth includes removal of all UXO and DMM detected. The depth of detection varies based on the depth at which UXO or DMM may be present at TOAR FUDS, the detection technology used, as well as several other munitions and site-specific factors. LUCs would also be implemented as part of this alternative as described in Alternative 2. LUCs would also address the potential explosive hazards associated with “wet areas.”

*Estimated Capital Cost = \$50,697,000*  
*Estimated O&M Cost = \$1,648,000*  
*Estimated Total Present Worth Cost = \$52,345,000*  
*Estimated Time to Complete Removal = 4 years*  
*Estimated Time to Achieve RAO = 30 years\**

\*A 30-year time period is used by USACE to analyze “Cost to Complete” for all alternatives. Actual completion time could exceed 30 years, depending on the findings of recurring reviews.

## SECTION 10 – COMPARATIVE ANALYSIS OF ALTERNATIVES

Pursuant to CERCLA and the NCP, nine criteria are used to evaluate the different remediation alternatives individually and against each other to select a remedy. This section presents the relative performance of each alternative against the nine criteria, noting how the evaluated alternative compares with the other options under consideration. The nine evaluation criteria are described as follows:

### EVALUATION CRITERIA FOR CERCLA/NCP REMEDIAL ALTERNATIVES

#### Threshold Criteria:

- 1. Overall Protectiveness of Human Health and the Environment** determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
- 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** evaluates whether the alternative meets Federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

#### Balancing Criteria:

- 3. Long-Term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time.
- 4. Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
- 5. Short-Term Effectiveness** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
- 6. Implementability** considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
- 7. Cost** includes estimated capital and annual O&M costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30%.

#### Modifying Criteria:

- 8. State Acceptance** considers whether the state agrees with USACE's analyses and recommendations, as described in the RI/FS and Proposed Plan.
- 9. Community Acceptance** considers whether the local community agrees with USACE's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Remedial alternatives for MRSs with the same risk were combined to minimize redundancy in the detailed analysis. Therefore, remedial alternatives for MRSs with low or low-moderate potential risk (MRS-R01, -R06, -R07, -R08, -R09A, and -R09B) were analyzed together, and remedial alternatives for MRSs with high potential risk (MRS-R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C) were analyzed together. The remedial alternatives evaluated for TOAR FUDS included the following:

For MRSs with low or low-moderate potential risk (MRS-R01, -R06, -R07, -R08, -R09A, and -R09B):

1. No Action.
2. LUCs.

For MRSs with high potential risk (MRS-R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C):

1. No Action.
2. LUCs.
3. Surface removal of MEC (UXO) with LUCs.
4. Removal of MEC (UXO) to 1 foot with LUCs.
5. Removal of MEC (UXO) to detection depth with LUCs.

### 10.1. MRSs with Low or Low-Moderate Potential Risk

The alternatives for MRSs with low or low-moderate potential risk (Alternatives 1 and 2) can be compared relative to the NCP criteria as follows:

- **Overall Protectiveness of Human Health and the Environment** - Alternative 1 is not protective because no action would be taken to prevent human exposure to any MEC present. Alternative 2 is more protective than Alternative 1 because the LUCs would reduce the potential for unacceptable exposure. No unacceptable ecological risk exists that must be addressed.



- **Compliance with ARARs** - No regulations or criteria are associated with Alternative 1, and Alternative 2 would be implemented to comply with all **ARARs** and **To Be Considered Criteria (TBCs)**, including DoD and Army explosives safety policies for the removal of MEC and control of property known or suspected to contain MEC.
- **Long-Term Effectiveness and Permanence** - Alternative 1 is not effective or permanent. Alternative 2 is more effective and permanent than Alternative 1, assuming the cooperation and active participation of the existing powers and authorities of government agencies. The LUCs recommended as Alternative 2 have been designed to provide effectiveness over the long-term.
- **Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants Through Treatment** - Neither alternative will reduce the potential toxicity, mobility, or volume of any MEC present on TOAR FUDS.
- **Short-Term Effectiveness** - Because no construction activities are associated with either alternative, Alternatives 1 and 2 would not present significant additional risk to the community or to workers at TOAR FUDS. Also, Alternatives 1 and 2 would not cause damage to the environment because clearing and/or grubbing of vegetation would not be conducted and excavation would not be required.
- **Implementability** - Alternative 1 would be easily implemented because it requires no action. The LUCs recommended as Alternative 2 could also be easily implemented because they pose no technical difficulties and the materials and services needed are available.
- **Cost** - The total present-worth cost to perform each alternative is as follows:
  - Alternative 1 - \$0.
  - Alternative 2 - \$2,659,000.

(Note: Costs have been rounded to the nearest thousand dollars. Costs associated with CERCLA-required recurring reviews are not included here.)

- **State Acceptance** - Based on concerns for public safety and the environment, PADEP would prefer the more protective alternative (Alternative 2) for MRSs with low or low-moderate risk.
- **Community Acceptance** - Based on comments received and input from various stakeholders and public interest groups, the community supports the more protective alternative (Alternative 2) for MRSs with low or low-moderate risk.

## 10.2. MRSs with High Potential Risk

The alternatives for MRSs with high potential risk (Alternatives 1 through 5) can be compared relative to the NCP criteria as follows:

- **Overall Protectiveness of Human Health and the Environment** - Based on the RI, the estimated density of UXO in high-risk MRSs ranges from 1.9 to 2.6 UXO per acre. Approximately 95% of the UXO recovered during the site-wide RI were found within 12 inches of the ground surface (80% within 6 inches of the ground surface) and the remaining 5% between 12 and 24 inches below the ground surface. Therefore, Alternative 1 is not protective because no action would be taken to prevent potential human exposure to MEC. Alternative 2 is more protective than Alternative 1 because the LUCs would minimize the potential risk of exposure to MEC; however, Alternative 2 is less protective than Alternatives 3 through 5 because MEC would not be removed. Alternatives 3 and 4 would provide limited removal of MEC, and are less protective than Alternative 5. Alternative 4 is more protective than Alternative 3 because it would remove all MEC detected (encountered) down to 1 foot below ground surface. Alternative 5 is the most protective by removing all detectable MEC to detection depth.
- **Compliance with ARARs** - Alternatives 1 through 5 would be implemented and performed to comply with all ARARs and TBCs.
- **Long-Term Effectiveness and Permanence** - Alternative 1 is not effective or permanent. Alternative 2 is more effective and permanent than Alternative 1, assuming the cooperation and active participation of the existing powers and authorities of government agencies. The LUCs recommended as Alternative 2 have been

designed to provide effectiveness in the long-term. Alternatives 3 through 5 would all be more effective and more permanent than Alternative 2 because detected MEC would be removed permanently from TOAR FUDS. Alternative 4 would be more effective than Alternative 3, while Alternative 5 would be most effective and permanent because all detectable MEC would be removed permanently, including MEC detected deeper than 1 foot, which could potentially move to the surface due to naturally occurring phenomena.

- **Reduction of MEC (Toxicity, Mobility, or Volume (TMV) Through Treatment** - Alternatives 1 and 2 will not reduce the TMV of MEC at the site. Alternative 4 would reduce the TMV more than Alternative 3, while Alternative 5 would reduce the TMV of MEC the most because all detectable MEC would be removed, including MEC deeper than 1 foot, which could potentially move to the surface due to naturally occurring phenomena.
- **Short-Term Effectiveness** - Because there are no construction activities associated with either alternative, Alternatives 1 and 2 would not present significant additional risk to the community or to workers at TOAR FUDS. Alternatives 3 through 5 would increase the potential risk to the community and to workers at TOAR FUDS during removal of MEC. Increased risk to the community during removal of MEC would be significantly mitigated by the use of engineering controls and/or evacuations to maintain minimum safe distances. Alternatives 1 and 2 would not cause damage to the environment because clearing and/or grubbing of vegetation would not be conducted and excavation would not be required. Alternatives 3 through 5 could cause some damage to the environment because those activities would be conducted. Alternative 5 would likely cause the most damage because more extensive excavations would be necessary for the removal of MEC deeper than 1 foot.
- **Implementability** - Alternative 1 would be easily implemented because it requires no action. The LUCs recommended as Alternative 2 could also be easily implemented because they pose no technical difficulties and the materials and services needed are available. Removal of MEC to various depths, like those proposed in Alternatives 3 through 5, has been implemented effectively at TOAR FUDS during earlier removal actions, the RI field efforts, and the recently completed TCRA at MRS-R01. Alternatives 3 through 5 would be equally implementable.
- **Cost** - The total present-worth cost to perform each alternative is as follows:
  - Alternative 1 - \$0.
  - Alternative 2 - \$4,536,000.
  - Alternative 3 - \$28,079,000.
  - Alternative 4 - \$49,342,000.
  - Alternative 5 - \$52,345,000.

(Note: Costs have been rounded to the nearest thousand dollars. Costs associated with CERCLA-required five-year reviews are not included here.)

- **State Acceptance** - Based on concerns for public safety and the environment, PADEP would prefer the most protective alternative (Alternative 5) for MRSs with high risk.
- **Community Acceptance** - Based on comments received and input from various stakeholders and public interest groups, the community supports the most protective alternative (Alternative 5) for MRSs with high risk.

## SECTION 11 – PRINCIPAL THREAT WASTES

Principal threat wastes are “source materials” considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. A source material is a material that includes or contains hazardous substances, pollutants, or contaminants that act as a reservoir for migration of contaminants to groundwater, surface water, or air, or act as a source for direct exposure.

Because MEC, particularly UXO, presents a significant potential risk to human health if exposure occurs, it is considered to be a principal threat waste. Addressing the principal threat waste through treatment (i.e., removal and disposal) is preferred. Alternative 2 would address the principal threat waste by reducing the potential for exposure through increased public awareness rather than treatment. Alternatives 3, 4, and 5 would address the principal threat waste by reducing the TMV through treatment and by reducing the potential for exposure through increased public awareness. Alternative 5 would be the most protective to human health by addressing the principal threat waste through treatment as well as reducing the potential for exposure through increased public awareness.

It should be noted that treatment technologies would be impracticable to implement in certain areas within high risk areas at TOAR FUDS, due to site conditions and physical constraints (i.e., inaccessible or wetland areas). In these areas within high risk MRSs, the principal threat waste would be addressed by increasing public awareness, as part of Alternatives 3, 4, or 5.

## SECTION 12 – SELECTED REMEDY

### 12.1. Selected Remedy for MRSs with Low or Low-Moderate Potential Risk

#### 12.1.1. Summary of the Rationale for the Selected Remedy

Based on the requirements of CERCLA and the NCP, and on a detailed analysis of the response alternatives using the nine criteria (which include public and state comments), USACE selected Alternative 2 (LUCs) as the remedy for TOAR FUDS MRSs with low or low-moderate potential risk (MRS-R01, -R06, -R07, -R08, -R09A, and -R09B). Alternative 2 includes public education and notification, and construction support, either on-site or on-call, in areas where a removal has not been conducted. Alternative 2 meets the remedial action objective of minimizing or eliminating the potential explosive safety risk to the public and site personnel.

The selected remedy is believed to provide the best balance among the alternatives with respect to the CERCLA/NCP criteria. USACE believes that the selected remedy is the most protective of human health in the long-term, can be easily implemented, and is most cost effective for MRSs with low or low-moderate risk. USACE will implement Alternative 2 at these MRSs.

The selected remedy is endorsed by the Commonwealth of Pennsylvania and the community.

#### 12.1.2. Detailed Description of the Selected Remedy

The selected remedy for MRSs with low or low-moderate potential risk, LUCs, includes the following components:

##### LUCs

Specific components of the LUCs selected for TOAR FUDS include the following:

- Placement of UXO hazard/warning signs and/or an information display board at Park and Game Lands entrance points and high use areas.
- Provision of UXO hazard notifications as part of the permitting process for construction/excavation and timber harvesting activities.
- Provision of community 3Rs explosives safety education and outreach activities including, but not limited to:
  - Distribution of 3Rs informational brochures and/or fact sheets.
  - Distribution of visual and audio educational and training media.

- Performance of classroom education and training.
- Operation and maintenance of educational Internet website.
- Construction support in areas where MEC removal has not been conducted. Construction support, either on-site or on-call, will be provided by USACE to ensure the safety of workers and the public in the event that UXO are discovered during any future construction activities at TOAR FUDS in areas where MEC may be present.

USACE's LUC Plan provides details of the selected LUCs for TOAR FUDS and specifies the implementation and maintenance of the LUCs that shall remain in effect in perpetuity. PGC and DCNR will be responsible for enforcing their existing codes and ordinances. USACE will coordinate with Monroe and Wayne Counties concerning code and ordinance issues related to TOAR FUDS and will report on LUCs as specified in the LUC Plan. USACE, with input from PADEP and EPA, may arrange with other local interest groups or municipalities to maintain LUCs. USACE remains ultimately responsible for protecting human health and the environment through this remedy.

### **Recurring Reviews**

CERCLA will operate to require the review of this remedial action no less often than every 5 years. See CERCLA §121(c) and NCP §300.430(f)(5)(iii)(C). Recurring reviews determine if implemented response actions continue to be protective of human health and the environment. The review also provides an opportunity to assess the applicability of new technologies and to determine if such technologies can be applied where site constraints render the implementation of previous treatment technologies impracticable. Recurring reviews will be completed by USACE and will include the following general steps:

- Prepare Recurring Review Plan.
- Establish project delivery team and begin community involvement activities.
- Review existing documentation.
- Identify/review new information and current site conditions.
- Prepare preliminary Site Analysis and Work Plan.
- Conduct site visit.
- Prepare Recurring Review Report.

### **12.1.3. Summary of the Estimated Costs**

A summary of the estimated costs for the selected remedy for MRSs with low or low-moderate potential risk (LUCs) is presented below:

*Estimated Capital Cost = \$598,000*

*Estimated O&M Cost = \$2,061,000*

*Estimated Total Present Worth Cost = \$2,659,000*

*Estimated Time to Achieve RAO = 30 years\**

\*A 30-year time period is used by USACE to analyze "Cost to Complete" for all alternatives. Actual completion time could exceed 30 years, depending on the findings of recurring reviews.

The information in this cost estimate is based on the best available information regarding the anticipated scope of the response alternatives. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the selected alternative. Major changes, if they occur, may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences (ESD), or a DD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within + 50 to - 30% of the actual cost.

## 12.2. Selected Remedy for MRSs with High Risk

### 12.2.1. Summary of the Rationale for the Selected Remedy

Based on the requirements of CERCLA and the NCP, and on a detailed analysis of the response alternatives using the nine criteria (which includes public and state comments), USACE selects Alternative 5 (Removal of MEC to Detection Depth with LUCs) as the remedy for TOAR FUDS MRSs with high risk (MRS-R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C). Alternative 5 includes detection, removal, and disposal of all detectable UXO, public education and notification, and construction support in areas where clearance has not been conducted. Alternative 5 meets the remedial action objective of minimizing or eliminating the explosive safety risk to the public and site personnel.

The selected remedy is believed to provide the best balance of trade-offs among the alternatives with respect to the CERCLA/NCP criteria. USACE believes that the selected remedy is most protective of human health in the long-term, can be easily implemented based on similar investigations conducted previously at TOAR FUDS, and is most cost effective relative to the other response alternatives (Alternatives 3 and 4). USACE will implement and perform Alternative 5 to comply with all ARARs and TBCs.

The selected remedy is endorsed by the Commonwealth of Pennsylvania and the community.

### 12.2.2. Detailed Description of the Selected Remedy

The selected remedy for MRSs with high risk, Removal of MEC to Detection Depth with LUCs, includes the following components:

#### **Removal of MEC (UXO) to Detection Depth**

Removal of MEC to detection depth includes removal of all MEC detected. As discussed below, depth of detection varies based on depth of MEC and the detection technologies used. Removal of MEC includes the following tasks:

- Mobilization – Personnel and equipment will be mobilized to the site in preparation for the work.
- Survey/positioning – Positioning technologies include various methods and instruments that establish geo-referenced data for anomalies located using detection technologies. Each method and/or instrument has its own inherent advantages and disadvantages based on its operating characteristics, making the selection of the type of positioning method paramount to the survey success. Positioning technologies are impacted on-site primarily by terrain, including canopy, the density of trees, and topography. A **geophysical prove-out (GPO)** would be conducted prior to commencement of work to determine the most appropriate positioning technology for TOAR FUDS.
- Detection – There are two basic methods of detection. The first method, visual searching, has been successfully used on a number of sites where MEC are located at ground surface. When performing a visual search, the area to be searched is typically divided into 5-foot lanes that are systematically inspected for MEC. A metal detector is sometimes used to supplement the visual search in areas where ground vegetation may conceal surface MEC. Typically, any MEC found during these searches is flagged or marked on a grid sheet for immediate removal. The second method uses geophysical tools which include a family of detection instruments designed to locate subsurface MEC. The family of instruments designed to locate subsurface MEC include magnetic instruments, electromagnetic instruments, and ground penetrating radar (GPR). Each piece of equipment has its own inherent advantages and disadvantages based on its operating characteristics, making the selection of the type of geophysical instrument paramount to the survey success. A GPO would be conducted prior to commencement of work to determine the most appropriate detection technology for TOAR FUDS.
- Removal – During a surface removal, MEC (UXO, DMM), including suspected MEC, identified during the detection phase are removed. All munitions and related materials are inspected, identified, collected (if possible), and transported to a designated area for cataloging and subsequent disposal. If the risk of moving MEC, particularly UXO, is unacceptable, then it may be necessary to destroy the MEC in place. Potential MEC identified during subsurface removal operations by the geophysical survey or other

detection methods requires excavation for removal or detonation in place. Excavation of anomalies takes place with either hand tools or mechanical equipment depending on the suspected depth of the item and site conditions. Once UXO or DMM have been exposed, they are inspected, identified, removed (if possible), and transported to a designated area for cataloging and disposal. If the risk of moving munitions is unacceptable, the item may be destroyed in place.

- Disposal – Disposal of recovered munitions can take one of three different forms: off-site demolition and disposal; remote, on-site demolition and disposal; and in-place demolition and disposal. The decision regarding which of these techniques to use is based on the risk involved in employing the disposal option, as determined by the specific area's characteristics and the nature of any munitions recovered.
  - If UXO is recovered in proximity to occupied buildings, it may not be possible to safely destroy the UXO in place. In this instance, the UXO can be moved to a remote part of a site where demolition and disposal can safely take place.
  - Situations where UXO cannot be moved due to its fused state or deteriorated condition are addressed on a case-by-case basis. In instances where the risk of movement is not acceptable, a countercharge can be used to destroy it. Engineering controls, such as sandbag mounds and sandbag walls over and around the munition, are often used to minimize the blast effects when UXO is destroyed in this manner.
  - Alternatively, UXO may be blown-in-place (BIP). This technique is typically used when the risk of moving munitions is unacceptable. When employing this technique, procedures similar to those described above are used to destroy the item. When this technique is employed, engineering controls are again often used to minimize the blast effects.
- Scrap/waste disposal – All disposal technologies generate a waste stream that must be addressed when determining which technologies are most viable. Disposal of munitions (UXO, DMM) generally generates MC and/or MD. If the waste generated includes MC, then the waste stream may need to undergo additional treatment prior to final disposal. If the waste generated includes only MD, then additional treatment may not be necessary.
- Demobilization – Personnel and equipment will be demobilized from the site upon completion of the work.

### **LUCs**

Specific components of the LUCs selected for TOAR FUDS include:

- Placement of UXO hazard/warning signs and/or an information display board at Park and Game Lands entrance points and high use areas.
- Provision of UXO hazard notifications as part of the permitting process for construction/excavation and timber harvesting activities.
- Provision of community 3Rs explosives safety education and outreach activities including, but not limited to:
  - Distribution of 3Rs informational brochures and/or fact sheets.
  - Distribution of visual and audio educational and training media.
  - Performance of classroom education and training.
  - Operation and maintenance of educational Internet website.
- Construction support in areas where MEC removal has not been conducted. Construction support, either on-site or on-call, will be provided by USACE to help ensure the safety of workers and the public in the event that MEC is discovered during any future construction activities at TOAR FUDS in areas where MEC may be present.

The USACE LUC Plan provides details of the selected LUCs for TOAR FUDS and specifies the implementation and maintenance of LUCs, which shall remain in effect in perpetuity. The PGC and the DCNR will be

responsible for enforcing their existing codes and ordinances. USACE will coordinate with Monroe and Wayne Counties concerning code and ordinance issues related to TOAR FUDS and will report on LUCs as specified in the LUC Plan. USACE, with input from PADEP and EPA, may arrange with other local interest groups or municipalities to maintain LUCs. USACE remains ultimately responsible for protecting human health and the environment through this remedy.

### **Recurring Reviews**

CERCLA will operate to require the review of this remedial action no less often than every 5 years. See CERCLA §121(c) and NCP §300.430(f)(5)(iii)(C). Recurring reviews determine if implemented response actions continue to be protective of human health and the environment. The review also provides an opportunity to assess the applicability of new technologies and to determine if such technologies can be applied where site constraints render the implementation of previous treatment technologies impracticable. Recurring reviews will be completed by USACE and will include the following general steps:

- Prepare Recurring Review Plan.
- Establish project delivery team and begin community involvement activities.
- Review existing documentation.
- Identify/review new information and current site conditions.
- Prepare preliminary Site Analysis and Work Plan.
- Conduct site visit.
- Prepare Recurring Review Report.

### **12.2.3. Summary of the Estimated Costs**

A summary of the estimated costs for the selected remedy for MRSs with high risk (Removal of UXO to Detection Depth with LUCs) is presented below:

*Estimated Capital Cost = \$50,697,000*

*Estimated O&M Cost = \$1,648,000*

*Estimated Total Present Worth Cost = \$52,345,000*

*Estimated Time to Complete Removal = 4 years*

*Estimated Time to Achieve RAO = 30 years\**

\*A 30-year time period is used by USACE to analyze "Cost to Complete" for all alternatives. Actual completion time could exceed 30 years, depending on the findings of recurring reviews.

The information in this cost estimate is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements may occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes, if they occur, may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences (ESD), or a DD amendment. This cost is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30% of the actual project cost.

### **12.3. Expected Outcomes of the Selected Remedy**

Based on the information available at this time, USACE believes that the selected remedy for MRSs with low or low-moderate potential risk (LUCs) and the selected remedy for MRSs with high potential risk (Removal of MEC to Detection Depth with LUCs) are necessary to protect human health or welfare and the environment, comply with ARARs, and be cost-effective. Upon implementation of the remedy, no change in land or resource use at TOAR FUDS is anticipated. Upon remedy complete, it is anticipated that any local no-fire suppression zone(s) previously imposed by local authorities due to the presence of UXO will be reduced and/or eliminated based on a reduction of the hazards of UXO through the removal actions. It is expected the RAOs will be achieved within 30 years after implementing the selected remedy, although actual completion time could vary, depending on the findings of recurring reviews.

## **SECTION 13 – STATUTORY DETERMINATIONS**

Under CERCLA Section 121, USACE must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following subsections discuss the remedy in light of these statutory requirements.

### **13.1. Protection of Human Health and the Environment**

#### **13.1.1. MRSs with Low or Low-Moderate Potential Risk – LUCs**

MRS-R01, -R06, -R07, -R08, -R09A, and -R09B at TOAR FUDS were evaluated to have low or low-moderate risk, as described in Section 7. The estimated densities of UXO in these MRSs ranged from 0 to 0.33 UXO/acre. The components of LUCs that are recommended would raise public awareness and modify public behavior related to the activities they perform at TOAR FUDS, which would result in increased protection for human health. Also, the LUCs alternative would be protective of the environment because clearing and/or grubbing of vegetation and excavation would not be required.

#### **13.1.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs**

MRS-R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C at TOAR FUDS were evaluated to have high risk, as described in Section 7. Estimated densities of UXO in these MRSs ranged from 1.9 to 2.6 UXO per acre. Of the UXO recovered in these MRSs during the RI, 95% were located within 12 inches of the ground surface, and the remaining 5% were recovered between 12 and 24 inches below ground surface (bgs). Therefore, removal of UXO to detection depth would eliminate the potential risk related to UXO and provide significantly improved protection for human health. Removal activities for UXO would not be completely protective of the environment because they require extensive clearing and/or grubbing of vegetation and excavation at the site. LUCs would provide additional protection to human health and the environment as described above.

### **13.2. Compliance with ARARs**

Location-specific ARARs/TBCs were identified for TOAR FUDS and include 36 CFR 800 (excluding Section 800.8), 33 CFR 320.4, EO 11990, 16 U.S.C. 1536, 25 Pa Code 102.11, 102.22 and 123.2; 40 CFR 264 Subpart X and Memo, Interim Final (March 7, 2000) DoD and EPA Management Principles for Implementing Response Actions at Closed, Transferring, and Transferred (CTT) Ranges.

Alternative 1 through Alternative 5 would be implemented and performed to comply with all ARARs and TBCs.

#### **13.2.1. MRSs with Low or Low-Moderate Potential Risk – LUC**

LUCs would be implemented to comply with all ARARs and TBCs, including DoD and Army safety policies for the removal of MEC and control of property known or suspected to contain MEC.

#### **13.2.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs**

Removal of MEC to detection depth would be performed to comply with all ARARs and TBCs. LUCs would be implemented to comply with all ARARs and TBCs, including DoD and Army safety policies for the removal of MEC and control of property known or suspected to contain MEC.

### **13.3. Cost Effectiveness**

#### **13.3.1. MRSs with Low or Low-Moderate Potential Risk – LUCs**

The selected remedy, LUCs, provides the best balance among criteria used to evaluate the alternatives considered in the detailed analysis. The alternative was found to achieve both adequate protection of human health and the environment and to meet the statutory requirements of Section 121 of CERCLA. The selected remedy's costs are



proportional to its overall effectiveness. Therefore, the selected remedy is cost-effective. The estimated cost of Alternative 2 is \$2,659,000.

### **13.3.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs**

The selected remedy, Removal of MEC to Detection Depth with LUCs, provides the best balance among criteria used to evaluate the remedial alternatives considered in the detailed analysis. The selected remedy was found to achieve both adequate protection of human health and the environment and to meet the statutory requirements of Section 121 of CERCLA. The selected remedy's costs are proportional to its overall effectiveness. Therefore, the selected remedy is cost-effective. The estimated cost of the selected remedy is \$52,345,000. This cost is the same order of magnitude as the cost for Alternative 3 (surface removal of MEC) and is only slightly more expensive than the cost for Alternative 4 (removal of MEC to 1 foot), and yet the selected remedy is significantly more protective of human health because all detectable MEC are removed.

## **13.4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Possible**

### **13.4.1. MRSs with Low or Low-Moderate Potential Risk – LUCs**

USACE has determined that the selected remedy, LUCs, represents the maximum extent to which permanent solutions can be used in a practicable manner in MRS-R01, -R06, -R07, -R08, -R09A, and -R09B at TOAR FUDS. Alternative treatment technologies and/or resource recovery technologies were found not to be appropriate for site conditions. Of those alternatives that are protective of human health and the environment and comply with ARARs and TBCs, USACE has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria.

### **13.4.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs**

USACE has determined that the selected remedy, Removal of MEC to Detection Depth with LUCs, represents the maximum extent to which permanent solutions can be used in a practicable manner in MRS-R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C at TOAR FUDS. Alternative treatment technologies and/or resource recovery technologies were found not to be appropriate for site conditions. Of those alternatives that are protective of human health and the environment and comply with ARARs and TBCs, USACE has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria.

## **13.5. Preference for Treatment as a Principal Element**

### **13.5.1. MRSs with Low or Low-Moderate Potential Risk – LUCs**

Treatment of MEC consists of detection, excavation, removal and disposal. Although the selected remedy, LUCs, does not satisfy the statutory preference for treatment as a principal element, USACE determined in the FS that treatment of MEC is not a viable remedy in MRS-R01, -R06, -R07, -R08, -R09A, and -R09B at TOAR FUDS based on cost effectiveness. The treatment of MEC over the approximately 22,500 acres in MRS-R01, -R06, -R07, -R08, -R09A, and -R09B would require significant costs, but would only reduce the presence of known or suspected UXO and the associated risk.

### **13.5.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs**

Treatment of MEC consists of removal and disposal. The selected remedy, Removal of MEC (UXO) to Detection Depth with LUCs, satisfies the statutory preference for treatment as a principal element of the remedy by removing and disposing of all detectable MEC.

## **13.6. Recurring Review Requirements**

### **13.6.1. MRSs with Low or Low-Moderate Potential Risk – LUCs**

Because this remedy may result in hazardous substances, pollutants, or contaminants remaining at TOAR FUDS above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

### **13.6.2. MRSs with High Potential Risk – Removal of MEC (UXO) to Detection Depth with LUCs**

Because this remedy may result in hazardous substances, pollutants, or contaminants remaining at TOAR FUDS above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

## **SECTION 14 – DOCUMENTATION OF SIGNIFICANT CHANGES**

USACE released the Proposed Plan for TOAR FUDS for public comment from November 8 to December 8, 2006. The Proposed Plan identified Alternative 2, LUCs, as the preferred alternative for MRSs with low or low-moderate risk, and Alternative 5, Removal of MEC (UXO) to Detection Depth with LUCs, as the preferred alternative for MRSs with high risk. A single comment was made at the public meeting and is discussed further in the Responsiveness Summary. No change to the proposed remedy for the site was warranted based on this comment. No additional verbal or written comments were received during the 30-day public comment period.

Although more than a year has elapsed since the release of the Proposed Plan, site conditions at TOAR-FUDS as well as the current and potential future land and resource use have not altered. USACE determined that no significant changes to the selected remedy, as identified in the Proposed Plan, were necessary. Accordingly, USACE has not made any significant changes to the preferred remedy identified in the Proposed Plan.

## RESPONSIVENESS SUMMARY

# TOBYHANNA ARTILLERY RANGE FORMERLY USED DEFENSE SITE

MONROE AND WAYNE COUNTIES, PENNSYLVANIA

## RESPONSIVENESS SUMMARY

**SEPTEMBER 2010**

### **SECTION 1 – OVERVIEW**

Based on an assessment of the site conditions, the U.S. Corps of Engineers (USACE), the lead agency for site activities, selected a remedy for the Tobyhanna Artillery Range Formerly Used Defense Site (TOAR FUDS), Tobyhanna, PA. The Commonwealth of Pennsylvania Department of Environmental Protection (PADEP) concurs with the selected remedy.

The selected remedy for munitions response sites (MRSs) with low or low-moderate risk at TOAR FUDS (MRS-R01, -R06, -R07, -R08, -R09A, and -R09B) is LUCs. USACE and PADEP have determined that this response action is necessary to protect human health and the environment in MRS-R01, -R06, -R07, -R08, -R09A, and -R09B based on the current and intended future recreational use of TOAR FUDS as State Parks and Game Lands.

The selected remedy for MRSs with high risk at TOAR FUDS (MRS-R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C) is Removal of UXO to Detection Depth with LUCs. USACE and PADEP have determined that this response action is necessary to protect human health and the environment in MRS-R02A, -R02B, -R02C, -R02D, -R03, -R04A, -R04B, -R05A, -R05B, and -R05C based on the current and intended future recreational use of TOAR FUDS as State Parks and Game Lands.

### **SECTION 2 – SUMMARY OF COMMENT RECEIVED DURING THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES**

The 30-day public comment period on the Proposed Plan for TOAR FUDS was held from November 8 to December 8, 2006. On November 8, 2006, a public meeting was held at the Coolbaugh Township Volunteer Fire House to present the Proposed Plan and to entertain questions and comments from the public. Copies of the Proposed Plan were available for the public at the meeting.

Representatives from USACE and PADEP attended the meeting. USACE and PADEP received one comment during the meeting.

*Comment:* A citizen from the local area praised the recent work that was being done to address explosives risks associated with UXO at TOAR FUDS and stressed how important it was to all the homeowners in the area, particularly those residing in Monroe County where a no fire suppression zone (a zone in which fires will not be suppressed) has been declared by the local authorities. The concern was that if a forest fire came through the area, the residents' property and safety would be at risk. This citizen noted that it was very important that this project be completed so that the no fire suppression restriction will be lifted by Monroe County. Note: A no fire suppression zone is an area where the local fire department has determined that, based on the risk to fire fighters, fires will not be suppressed.

*Response:* USACE certainly recognizes that the no fire suppression zone established by local authorities is of great concern to the local citizens. The no fire suppression zone was a contributing factor in focusing our attention and effort to address the explosives risks associated with the UXO at TOAR FUDS. USACE will remain accessible and helpful to the community by continuing to provide citizens and local authorities with information about the completed and future activities conducted at TOAR FUDS so that decisions on local issues can be addressed.

No additional written or verbal comments were received during the public comment period. None of the citizens present at the public meeting objected to USACE and PADEP's preferred remedy, nor did they recommend an alternative approach.

## GLOSSARY OF TERMS

Administrative Record	A collection of documents containing all the information and reports generated during the entire phase of investigation and cleanup at a site, which are used to make a decision on the selection of a response action under CERCLA. This file is to be available for public review and a copy maintained near the site, at the Pocono Mountain Public Library.
Applicable or Relevant and Appropriate Requirements (ARARs)	Federal (or state, if more stringent and timely identified) cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site or address problems or situations sufficiently similar to those encountered at such a site that their use is well suited to the particular site.
Area of Concern (AOC)	Areas identified as requiring remedial action. For military munitions responses, these are also often referred to as <b>Munitions Response Sites (MRSs)</b> .
Buffer Zone	A safety margin on either side, above, and below the approved target area extending to a distance at which the hazard distance limit is reached.
Chemicals of Concern (COCs)	Chemicals identified through the risk assessment process as the primary chemicals that may cause unacceptable human health and/or ecological risk.
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Congress enacted CERCLA, commonly known as Superfund, on 11 December 1980. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.
Construction Support	Assistance provided by DoD explosive ordnance disposal (EOD) or UXO-qualified personnel and/or by personnel trained and qualified for operations involving chemical agents (CA), regardless of configuration, during intrusive construction activities on property known or suspected to contain UXO, other munitions that may have experienced abnormal environments (e.g., DMM), munitions constituents in high enough concentrations to pose an explosive hazard, or CA, regardless of configuration, to ensure the safety of personnel or resources from any potential explosive or CA hazards.
Decision Document (DD)	A legal public document that describes the cleanup action or remedy selected for a site, the basis for the choice of that remedy, and public comments on alternative remedies. The DD is based on information and technical analysis generated during the RI/FS.
Detection Depth	The depth below ground surface at which munitions items can be reliably detected using the best available and most appropriate remote sensing equipment for a given environment. Detection depth is dependent on the equipment, the size/mass of item, the item's depth and orientation, and geological/soil conditions.
Discarded Military Munitions (DMM)	Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include UXO, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of, consistent with applicable environmental laws and regulations.

## GLOSSARY OF TERMS (Continued)

Disposal Pits	Areas within impact areas and/or buffer zones where munitions that were fired and scrap material (old targets or expended munitions) have been collected and buried.
Engineering Evaluation/Cost Analysis (EE/CA)	An EE/CA is prepared for all non-time-critical removal actions as required by Section 300.415(b)(4)(i) of the NCP. The goals of the EE/CA are to identify the extent of a hazard, to identify the objectives of the removal action, and to analyze the various alternatives that may be used to satisfy these objectives for cost, effectiveness, and implementability.
Explosive Hazard	A condition where danger exists because explosives are present that may react (e.g., detonate, deflagrate) in a mishap with potential unacceptable effects (e.g., death, injury, damage) to people, property, operational capability, or the environment.
Explosives Safety	A condition where operational capability and readiness, people, property, and the environment are protected from the unacceptable effects or risks of potential mishaps involving DoD military munitions or other encumbering explosives or munitions.
Explosive Safety Risk	For the purpose of this Action Memorandum, the probability for MEC to detonate and potentially cause harm to people, property, the environment, or operational capability and readiness as a result of human activities. A potential explosive safety risk exists if a person can come into contact with MEC and act upon it to cause detonation. The potential for an explosive safety risk depends on the presence of three critical elements: a source (presence of MEC), a receptor or person, and interaction between the source and receptor (such as picking up the item or disturbing the item by plowing). There is no explosive safety risk if any one element is missing.
Exposure Pathway	Describes the course a chemical or physical agent takes from the source to the exposed individual. Elements of the exposure pathway are: (1) the source of the released chemical or physical agent; (2) the contaminated medium (e.g., soil); (3) a point of contact with the contaminated medium; and (4) an exposure route (e.g., ingestion, inhalation) at a contact point.
Feasibility Study (FS)	An evaluation of potential remedial technologies and treatment options that can be used to clean up a site.
Firing Point	The point or location at which a weapon system (excluding demolitions) is placed for firing.
Frost Heave	The upthrust of ground caused by the freezing of moist soil.
Geophysical Prove-Out (GPO)	A field procedure to verify that methods and equipment proposed for use on a project are capable of achieving the required results.
Impact Area	The ground and associated airspace within a firing range used to contain fired, or launched ammunition and explosives, and the resulting fragments, debris, and components from various weapon systems.
Land Use Controls (LUCs)	Physical, legal, or administrative mechanisms that restrict the use of, or limit access to, real property, to prevent or reduce risks to human health and the environment.

## GLOSSARY OF TERMS (Continued)

Munitions Constituents (MC)	Any materials originating from UXO, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.
Munitions Debris (MD)	Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.
Munitions and Explosives of Concern (MEC)	<p>A term distinguishing specific categories of military munitions that may pose unique explosives safety risks:</p> <ul style="list-style-type: none"> <li>▪ UXO, as defined in section 101(e)(5) of title 10, United States Code.</li> <li>▪ DMM, as defined in section 2710(e)(2) of title 10, United States Code; or</li> <li>▪ Munitions constituents (MC) (e.g., TNT, cyclotrimethylene-trinitramine (RDX)), as defined in section 2710(e)(3) of title 10, United States Code, present in high enough concentrations to pose an explosive hazard.</li> </ul>
Munitions Response Area (MRA)	Any area on a defense site that is known or suspected to contain UXO, DMM, or MC. A munitions response area is comprised of one or more munitions response sites.
Munitions Response Site (MRS)	A discrete location within a <b>munitions response area (MRA)</b> that is known to require a munitions response.
National Oil and Hazardous Substances Pollution Contingency Plan (NCP)	The Federal regulation that implements CERCLA. The NCP was revised in February 1990. The purpose of the NCP is to provide the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances, pollutants, or contaminants.
Ordnance and Explosives Risk Impact Assessment (OERIA)	A qualitative risk assessment for MEC sites that uses direct analysis of site conditions and human issues that create MEC risk.
On-Call Construction Support	Construction support provided, on an as-needed basis, where the probability of encountering UXO, other munitions that may have experienced abnormal environments (e.g., DMM), MC in high enough concentrations to pose an explosive hazard, or CA, regardless of configuration, has been determined to be low. This support can respond from off-site when called, or be on-site and available to provide required construction support.
On-Site Construction Support	Dedicated construction support, where the probability of encountering UXO, other munitions that may have experienced abnormal environments (e.g., DMM), MC in high enough concentrations to pose an explosive hazard, or CA, regardless of configuration, has been determined to be moderate to high.
Other Areas	For the purpose of this Action Memorandum, areas outside an area where MEC is known or suspected to be present.
Proposed Plan	A document that presents a proposed cleanup alternative, rationale for the preference, and requests public input regarding the proposed alternative.
Recurring Reviews	Review required by CERCLA no less than every 5 years to assure that human health and the environment are being protected by the selected remedial action, where the remedial action does not allow for unlimited use and unrestricted exposure.

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## GLOSSARY OF TERMS (Continued)

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Remedial Action	Action consistent with a permanent remedy, taken to prevent or minimize the release of hazardous substances.
Remedial Action Objective (RAO)	Objectives established for remedial actions to guide the development of alternatives and focus the comparison of acceptable remedial action alternatives, if warranted. RAOs also assist in clarifying the goal of minimizing risk and achieving an acceptable level of protection for human health and the environment.
Remedial Investigation (RI)	A study of a site that provides information supporting the evaluation for the need for a remedy and/or selection of a remedy for a site where hazardous substances have been disposed. The RI identifies the nature and extent of contamination at the site.
Removal Action	Short-term immediate actions taken to address releases of hazardous substances that may require expedited response.
Time Critical Removal Action (TCRA)	Removal actions where, based on the site evaluation, a determination is made that a removal action is appropriate, and that less than six (6) months exists before on-site removal activity must begin.
To Be Considered Criteria (TBCs)	Non-binding criteria that the lead agency believes may be useful in developing CERCLA remedies, but that are otherwise not ARARs.
Unexploded Ordnance (UXO)	Military munitions that (A) have been primed, fuzed, armed, or otherwise prepared for action; (B) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installations, personnel, or material; and (C) remain unexploded either by malfunction, design, or any other cause. (10 U.S.C. 101(e)(5)(A) through (C)).



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