**U.S. Army Engineering and Support Center, Huntsville**

**Military Munitions Response Program**

# PROPOSED PLAN FOR MUNITIONS RESPONSE ACTIONS – FINAL

**Unpermitted Demolition Areas, Red River Army Depot, Bowie County, Texas** **August 2016**

## INTRODUCTION

### Purpose

This **Proposed Plan** is being presented by the United States Army Corps of Engineers (USACE) for the public to review and comment on the intended action to be taken at three **munitions response sites (MRSs)** within the 15,375-acre Red River Army Depot (RRAD) located in Bowie County, Texas (**Figure 1**). The three MRSs addressed by this Proposed Plan are:

- Demolition Area Creeks MRS (RRAD-011-R-01),
- Demolition Area Wash Rack/Storage/Trails MRS (RRAD-011-R-02), and
- Unpermitted Demolition Area MRS (RRAD-011-R-03)

These three MRSs are collectively referred to as the "Unpermitted Demolition Areas MRSs" in this Proposed Plan. The total area of the Unpermitted Demolition Areas MRSs is approximately 660 acres (**Figure 2**). A 4-acre portion of the site, the former Demolition Area Washrack, was recommended for no further action as a result of a 2012 Site Inspection (SI) (Parsons, 2012b) and is therefore not included as part of this Proposed Plan. This Proposed Plan does not address any areas within the RRAD other than these MRSs.

This Proposed Plan contains terms (**in bold letters**) used for environmental remediation and the overall **Military Munitions Response Program (MMRP)**. These terms are described in the Glossary found at the end of this document.

A list of acronyms and abbreviations used in this document is presented following the Glossary at the back of this document.

**Dates to Remember:**

**PLEASE MARK YOUR CALENDAR!**

**PUBLIC COMMENT PERIOD:**

**October 24 – November 25, 2016**

USACE will accept written comments on the Proposed Plan during the public comment period.

*Written comments may be sent to:*

Red River Army Depot
ATTN: TARR-OL (Jeffrey Gschwind)
Texarkana, TX 75507-5000

*A public meeting is not currently planned; however, a public meeting can be requested by contacting Mr. Gschwind at the above address or by email at Jeffrey.R.Gschwind.civ@mail.mil.*

**For more information, please see the Administrative Record at:**

Palmer Memorial Library, 1024 Tucker St., Texarkana, TX 75505

The purposes of this Proposed Plan are to:

- Provide background information.
- Describe remedial alternatives considered.
- Identify the Preferred Alternative(s) for remedial action for each evaluated MRS and explain the reasons for the preference.
- Solicit public review and comment on the alternatives described.
- Provide information on how the public can be involved in the remedy selection process.

The information and recommendations are based on the results of the recent **Remedial Investigation (RI)** and **Feasibility Study (FS)** conducted under the guidance of a Technical Project Planning (TPP) Team comprised of USACE, the U.S. Environmental Protection Agency (USEPA), the Texas Commission on Environmental Quality (TCEQ), and RRAD. The TPP Team reviewed the RI/FS approach, associated work plans, and the final reports for the three MRSs and agreed with the associated conclusions and recommendations.


**Figure 1: Red River Army Depot Location**

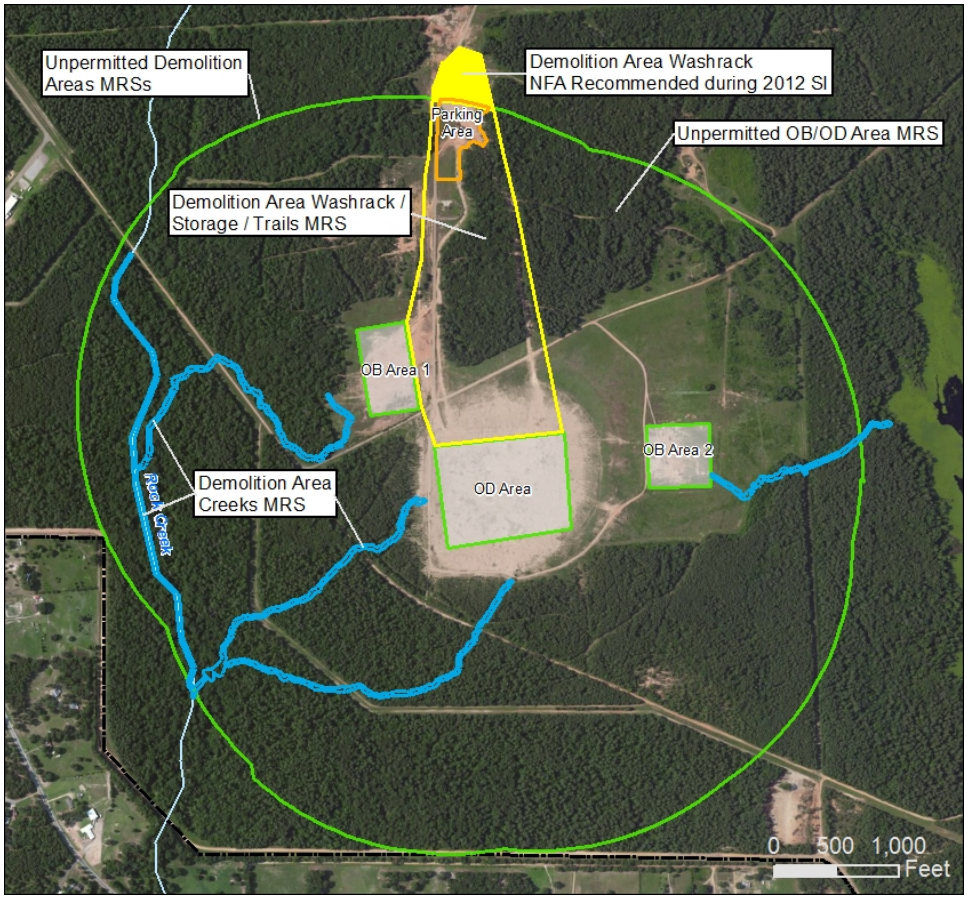



**Figure 2: Unpermitted Demolition Areas MRSs**

The RI and FS reports, along with other documents regarding the site, are part of the Red River Army Depot Environmental Collection Section which is located at **Texarkana College, Palmer Memorial Library, 1024 Tucker Street, Texarkana, Texas, 75505**.

### Public Involvement Process

Local community members and other interested parties are encouraged to review this Proposed Plan and submit comments. Public comments on all alternatives are considered before any action is selected and approved. USACE, the lead agency for site activities, in consultation with the TCEQ and USEPA, will select a final remedy for the site after reviewing and considering all information submitted during the public comment period. In consultation with TCEQ and USEPA, the USACE may modify the Preferred Alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented herein.

This Proposed Plan is part of USACE's community relations program, which is a component of the requirements of Section 117(a) of the **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)**, also known as **Superfund**, and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This document summarizes information that can be found in greater detail in the RI/FS reports and other documents contained in the Administrative Record file for this site. The public is encouraged to review these documents to gain a more comprehensive understanding of the site and activities conducted at the site.

The Proposed Plan follows the requirements from *Engineer Regulation 200-3-1, FUDS Program Policy* (USACE, 2004a), Military Munitions Response Program (MMRP) Interim Guidance Document 06-04 (USACE, 2006), and the USEPA guidance provided in *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA, 1999).

The decision for each MRS will be presented in a **Decision Document**. USACE responses to public comments on this Proposed Plan will appear in the "Responsiveness Summary" section of the Decision Document. The flow chart shown in **Figure 3** summarizes the various steps in the development and approval process for the Decision Document.

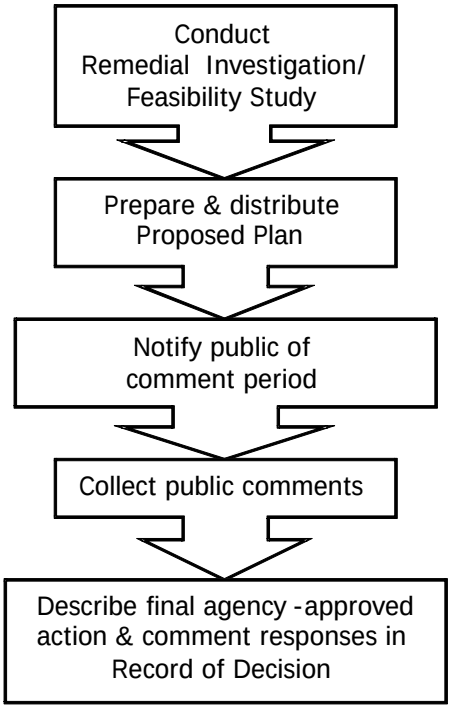



**Figure 3. Decision Document Process**

### Lead and Support Agencies

The U.S. Army is the lead agency for investigating, reporting, making remedial decisions, and taking remedial actions at the Unpermitted Demolition Area MRS, while the TCEQ and the USEPA are supporting agencies.

## PROJECT SITE BACKGROUND

### Site History and Causes of Contamination

From the 1940s until December 1988, RRAD used the Unpermitted Demolition Areas to destroy unserviceable and unsafe ammunition by demolition and to burn waste explosives. In December 1988, RRAD was issued a Part B Permit for a Municipal Hazardous Waste Management site (Permit No. HW-50178-000, USEPA identification [ID] No. TX3213820738), and subsequent open burn/open detonation (OB/OD) activities were limited by the permit to three specific areas in the center of the Unpermitted Demolition Areas. These three specific areas (**Figure 2**), including OB Ar-

ea 1, OB Area 2, and the OD Area, are collectively called the "Permitted OB/OD Areas."

Based on the history of OB/OD activities, the site was investigated for contamination caused by past munitions demolition, explosives burning, incomplete "low-order" detonations and "kickouts", as well as disposal of related munitions packing material. Over the site's 40+ years of use, a wide range of munitions types were disposed there. The site was investigated for residual **unexploded ordnance (UXO)/munitions and explosives of concern (MEC)**, as well as contamination resulting from release of **munitions constituents (MC)** to the environment, specifically to site soil, sediment, and surface water. MC are considered to be the chemicals that could cause contamination as a result of munitions use/disposal at the site, and include explosives, perchlorate, and the metals antimony, barium, cadmium, copper, lead, mercury, and selenium, as well as hydrocarbons used for burning activities. Results of well monitoring conducted since 1988 as a condition of the permit has shown that groundwater has not been contaminated with MC.

## Previous Investigations

In accordance with the CERCLA process, several phases of investigation were conducted at the site to determine if UXO/MEC and/or MC are present, and if so, to determine the extent of contamination. A summary of the activities conducted during these phases, as well as the phase conclusions, are provided in **Table 1**.

**Table 1. Summary of Previous Investigations**

| Summary of Activities for each Phase | Conclusions |
|---|---|
| **Historical Records Review (Parsons, 2012a)**<br>*Purpose: Determine if and where waste disposal activities took place* | |
| • Historical aerial photographs were reviewed to identify past disturbed areas.<br>• Historical records were reviewed to identify types of disposal activities and munitions/waste managed. | • Wide variety of munitions were used/ disposed.<br>• Several trench areas were identified in aerial photos.<br>• Large cratered area in the central part of the site. |
| **Site Inspection (Parsons, 2012b)**<br>*Purpose: Determine if waste disposal activities caused contamination* | |
| • Visual surveys to determine if **munitions debris (MD)** or MEC are present on the ground surface.<br>• Surface soil, sediment, and surface water samples collected to determine if MC are present above TCEQ screening levels or RRAD background metals levels. | • Quantity of MD found indicates that MEC is likely present.<br>• MC contamination detected above screening/ background levels in soil, sediment, and surface water. |
| **Remedial Investigation (Parsons, 2015)**<br>*Purpose: Determine nature and extent of contamination and risk that it poses* | |
| • **Digital geophysical mapping (DGM)** and intrusive investigation along transects and grids to estimate extent of overall area affected by MEC.<br>• DGM and intrusive investigation of vehicle storage area.<br>• Exploratory trenching to identify nature and extent of waste buried in trenches.<br>• Subsurface and surface soil, sediment, and surface water sampling to determine extent of MC present above TCEQ screening levels or RRAD background metals levels.<br>• Ecological and human health risk assessment conducted to identify contamination levels above acceptable levels based on site receptors. | • Nature and extent of MEC and MC contamination was identified. Conclusions are summarized in the section titled "Nature and Extent of Contamination" on page 5.<br>• Risk the contamination poses is summarized in the section titled "Summary of Site Risks" on page 8. |
| **Feasibility Study (Parsons, 2016)**<br>*Purpose: Identify alternatives to clean up contamination and/or reduce risk* | |
| • Established **remedial action objectives** (RAOs) and **preliminary remediation goals** (PRGs).<br>• Evaluated remedial alternatives to address MEC and MC contamination. | • Five alternatives identified to address MEC.<br>• Three alternatives identified to address MC in soil.<br>• Three alternatives identified to address MC in surface water/sediment. |

This Proposed Plan describes the remedial alternatives that were evaluated as part of the Feasibility Study and identifies the Preferred Alternatives for the contamination identified.

# PROJECT SITE CHARACTERISTICS

## Location

RRAD is located on 15,375 acres of land in central Bowie County, approximately 18 miles west of Texarkana, Texas (**Figure 1**). The Unpermitted Demolition Areas MRSs are located in the south-central portion of RRAD. **Figure 2** shows the orientation of the MRSs and the Permitted OB/OD Areas that are surrounded by the MRSs.

## Physical Characteristics

The regional topography in Northeast Texas slopes gently southeastward approximately 10 feet per mile. Topography in the Unpermitted Demolition Areas MRSs is nearly flat, with elevations ranging from 300 feet to 361 feet above mean sea level.

There are no perennial surface water features at site. Surface water in the western portion is intermittent, and when present, flows southwesterly through three creeks which are tributaries to Rock Creek, and Rock Creek flows then to Big Creek, then to Wright Patman Lake, then to the Sulphur River. The Unpermitted Demolition Areas MRSs are not located in the 100-year floodplain (Parsons, 2012a). The tributaries located on site are depicted on **Figure 2**.

Vegetation in the center of the MRSs is limited to patchy areas of grasses. Past demolition and earth-moving activities have denuded the areas of trees and other vegetation. The outer portions of the MRSs contain heavily wooded pine forests.

## Land Use

Land use is generally classified as commercial/industrial. Until March 2011, the former Permitted OB/OD Areas were used for ordnance disposal, and the Unpermitted Demolition Areas MRSs were part of the surrounding safety buffer. Consequently, they were unused except for a vehicle wash rack, demolition explosives storage area, and vehicle storage area. Regular demolition activities have now ceased at the former Permitted OB/OD Areas, and the wash rack and explosives storage area are also no longer in use. Since March 2011, the Permitted OB/OD Areas have been used occasionally for emergency detonations only. In addition, an approximate 4-acre area on the northern edge of the site continues to be used for vehicle storage.

Potential land users include the following:

- RRAD-authorized site workers may access the site to park and retrieve stored vehicles; conduct road, vegetation, or land maintenance; or to conduct future emergency detonations.
- RRAD-authorized recreational users may access the site for hunting or fishing in Caney Creek Reservoir (but not in unnamed intermittent tributaries).
- Unauthorized trespassers or site visitors, though these are unlikely because the MRSs are located entirely within RRAD's fenced restricted-access boundary.
- Wildlife.

## Nature and Extent of Contamination

Past studies and investigations have identified both MEC and MC contamination at the Unpermitted Demolition Areas MRSs.

### *Munitions and Explosives of Concern*

To complete the characterization of MEC at the Unpermitted Demolition Areas MRSs, DGM and analog geophysical surveys were conducted along paths and patterns polygons ("grids") across the site. The purpose of performing these surveys was to identify **concentrated munitions use areas (CMUAs)** and **non-concentrated munitions use areas (NCMUAs)** and estimate their extent. The surveys were performed in three general areas:

- The "Buffer Area" which comprises the majority of the area within the Unpermitted Demolition Areas MRSs boundary.
- The "Parking Area" which is a 4-acre area in the northern portion of the Unpermitted Demolition Areas MRSs that RRAD currently uses for vehicle storage; and
- The "Trench Areas," which includes several trench features identified through photo analysis in the 2012 HRR (Parsons, 2012a).

Overall, five MEC items were found during the RI: a MkII 57mm practice projectile, a Mk2 40mm high explosive (HE) projectile, and three unfired MkII 37mm practice projectiles. Additionally, several

BLU-91/BB Gator anti-tank mines have been found in the site (Parsons, 2015). These are submunitions, which are considered the most hazardous category of munitions because they can contain very sensitive fuzing systems.

*Buffer Area*

The results of the geophysical surveys were used to delineate the Buffer Area into an area of higher anomaly density (i.e., "HD Area") and an area of lower anomaly density (i.e., "LD Area") (**Figure 4**). The approximately 256-acre HD Area in the center part of the site (the area that received the majority of the historic use) is considered a CMUA (i.e., an area where MEC presence is likely). The approximately 430-acre surrounding LD Area is assumed to be an NCMUA (i.e., an area where there is low potential for MEC). The results of the intrusive investigation in the HD Area suggest that any remaining MEC would be found on the surface or in the upper 24 inches of soil. The vertical extent of MEC in the Buffer Area might increase gradually to depths of closer to 5 to 10 feet moving toward the former Permitted OD Area. While the LD area is considered an NCMUA, this does not mean MEC hazards are completely absent; however, the potential for residual MEC items is anticipated to be low. Based on the MD found during the intrusive investigation in the LD area, if isolated MEC items remain, they would most likely be located in the upper 12 inches of soil.

*Parking Area*

The Parking Area is assumed to be an NCMUA and, based on the RI characterization, there is a low likelihood for individual MEC items to be present. This does not mean MEC hazards are completely absent from this area, though the potential for exposure is anticipated to be low. Based on the MD found during the intrusive investigation in the Parking Area and in the LD portion of the Buffer Area, if isolated MEC items were present in the Parking Area, they would most likely be located in the upper 10 inches of soil.

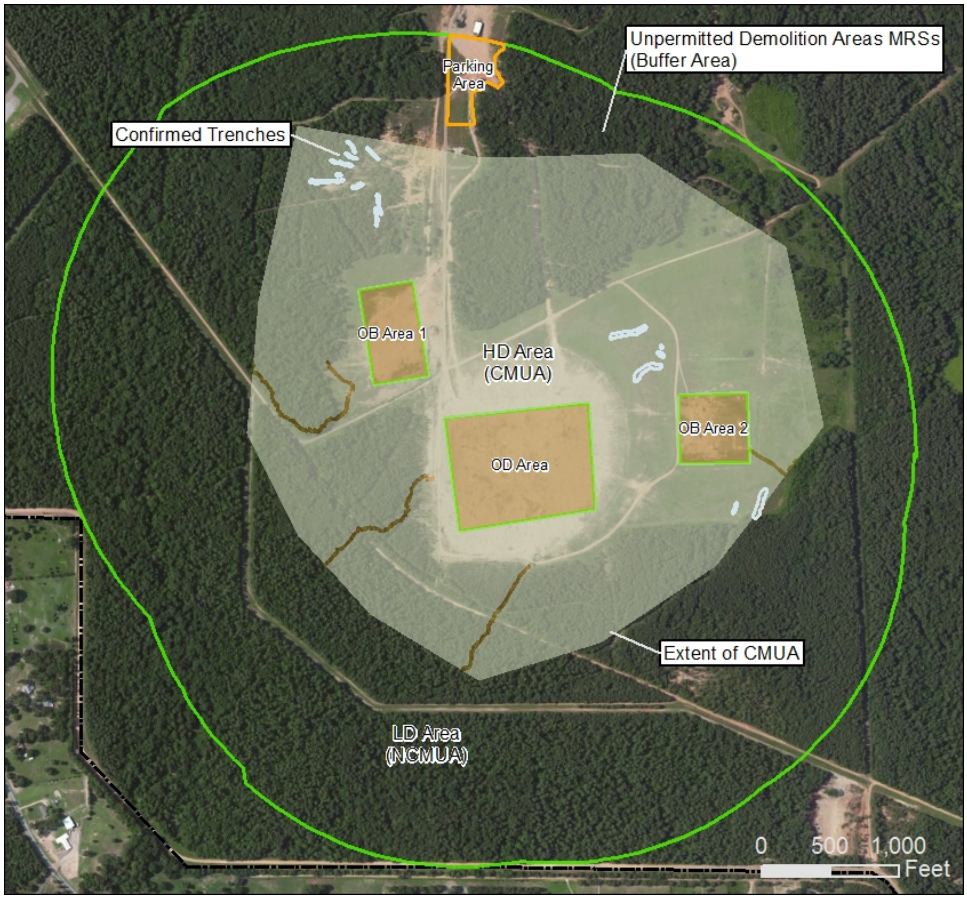



**Figure 4: Extent of MEC Contamination**

*Trench Areas*

Fifteen MEC contaminated trenches were identified as shown on **Figure 4**. These trenches are all located within the delineated CMUA. They are generally between 10 and 200 feet long and 6 to 12 feet wide, with depths between 12 to 60 inches.

### *Munitions Constituents*

Samples of soil, sediment, and surface water were collected and analyzed for selected analytes to characterize the extent of MC contamination. MC contamination is defined as contamination, resulting from munitions use, in environmental media at concentrations above those allowed by state or federal regulations for unrestricted land use. Sampling was conducted in two general areas across the site:

- Soil sampling was conducted in the "Buffer Area"; and
- Surface water and sediment sampling was conducted in the "Eastern and Western Creeks," which includes the unnamed intermittent tributaries draining to the east and west of the site.

*Buffer Area*

MC was detected in soil at concentrations above RRAD background metals levels and TCEQ screening levels for unrestricted site use, as shown in **Figure 5**. Concentrations of antimony, copper, lead, and mercury exceeded the criteria in several samples collected from 0 to 2 feet below ground surface (bgs); however, near OB Area 1, elevated mercury concentrations were detected down to 5 feet bgs. In addition, selenium concentrations exceeded screening criteria in the vicinity of several of the trenches. As described in the section titled "Summary of Site Risks," not all concentrations were above acceptable risk levels for the anticipated current and future land use.

*Eastern and Western Creeks*

Barium, cadmium, copper, lead, mercury, and perchlorate concentrations above TCEQ screening levels for unrestricted site use were identified in the eastern and western creek tributaries. MC contamination was not detected in Rock Creek nor in Caney Creek Reservoir.

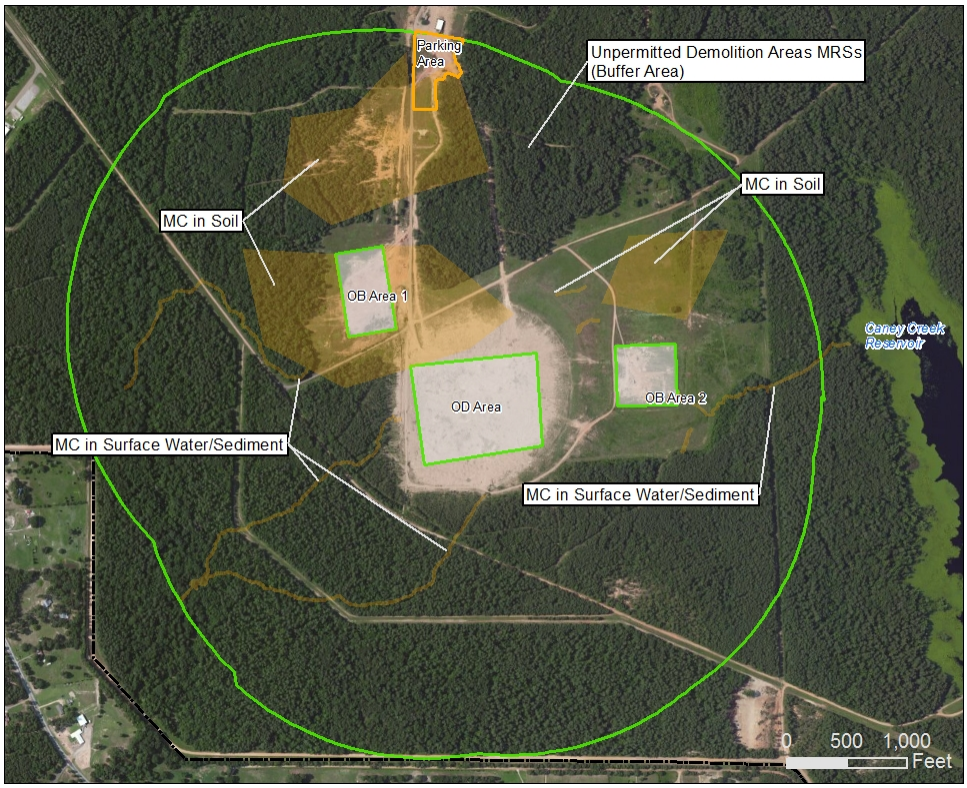



**Figure 5: Extent of MC Contamination**

## SCOPE AND ROLE OF RESPONSE ACTION

The scope of the response action is to conduct remedial activities that will:

- Minimize current and future human exposure to MEC;
- Prevent exposure of human receptors to MC contamination; and
- Mitigate effects of exposure to environmental receptors to MC contamination.

Though no residential land uses are planned for the Unpermitted Demolition Areas MRSs, a deed notice will be placed on the MRSs to prevent future **residential land uses** due to the potential for MEC in the area.

In addition to the deed notice, response actions will be taken at all three MRSs of the Unpermitted Demolition Areas to address MEC and MC exposure to current receptors. These actions will be conducted as one coordinated effort for the three MRSs. In addition, contamination in the Permitted OB/OD Areas will be similarly addressed, following the 2014 completion of a RCRA Corrective Measures Study.

## SUMMARY OF SITE RISKS

The human health and ecological risks posed by the site determine whether or not a remedial action is warranted.

Based on the evidence of MEC and/or MD found, MEC hazards are present at the Unpermitted Demolition Areas MRSs. These MEC hazards are potentially present throughout each of the MRSs, on either the surface or in the subsurface. MEC hazard assessments (HA) were performed to qualitatively evaluate the MEC hazards. The MEC HA method generates a score and a corresponding "Hazard Level" ranging from 1 (highest) to 4 (lowest) that provides a qualitative indication of the MEC hazard in each area (these are not quantitative measures of explosive hazard). The results of the MEC HA for the HD, LD, and Parking Area are summarized in **Table 2**.

**Table 2.**
**Summary of MEC Hazard Assessment Results**

| Assessment Area | Baseline MEC HA Score | Hazard Level | Potential Explosive Hazard Conditions |
|---|---|---|---|
| HD Area | 840 | 1 | Highest |
| LD Area | 720 | 3 | Moderate |
| Parking Area | 555 | 3 | Moderate |

Results of the RI concluded that unacceptable risks to human health are not expected as a result of exposure to MC in soil, surface water, or sediment under the current (commercial/industrial) land use scenario, as summarized in **Table 3**; though risks are present under an unrestricted land use scenario. These areas are identified as the Human Health Exceedance Area (HHEAs) on **Figure 6**. Unacceptable risks to avian and burrowing mammal ecological receptors are possible resulting from exposure to certain metals in soil, surface water, and sediment, as summarized in **Table 3** below.

**Table 3. Summary of MC Risk Assessment Results**

| Area | Medium | Human Health Risk? (Chemicals of Concern [COCs]) | | Ecological Risk? (COCs) |
|---|---|---|---|---|
| | | Unrestricted Land Use | Commercial/ Industrial | |
| Buffer Area | Soil | YES (antimony, copper, and lead) | NO | YES (antimony, copper, and lead) |
| Western Creeks | Sediment | NO | NO | YES (barium, cadmium, copper, lead, and mercury) |
| | Surface Water | YES (perchlorate) | NO | YES (lead) |
| Eastern Creek | Sediment | NO | NO | YES (lead) |
| | Surface Water | YES (perchlorate) | NO | YES (cadmium, copper, and lead) |

Metals contamination in sediment and surface water is largely confined to the upper reach of the intermittent creeks adjacent to the MRSs, and it does not reach the receiving water bodies (Caney Creek Reservoir for eastern creek and Rock Creek for the western creeks). These areas are identified as the Ecological Exceedance Areas (EEAs) on **Figure 6**.

## Risk Assessment Conclusions

Based on the conclusions that MEC hazards and MC risks are present, the RI recommended further action at the MRSs. It is the U.S. Army's (lead agency) current judgment that the Preferred Alternatives identified in this Proposed Plan for the Unpermitted Demolition Areas MRSs, or one of the other active measures considered in this Proposed Plan, is necessary to protect public health or welfare or the environment from actual or potential future interaction with MEC and MC.

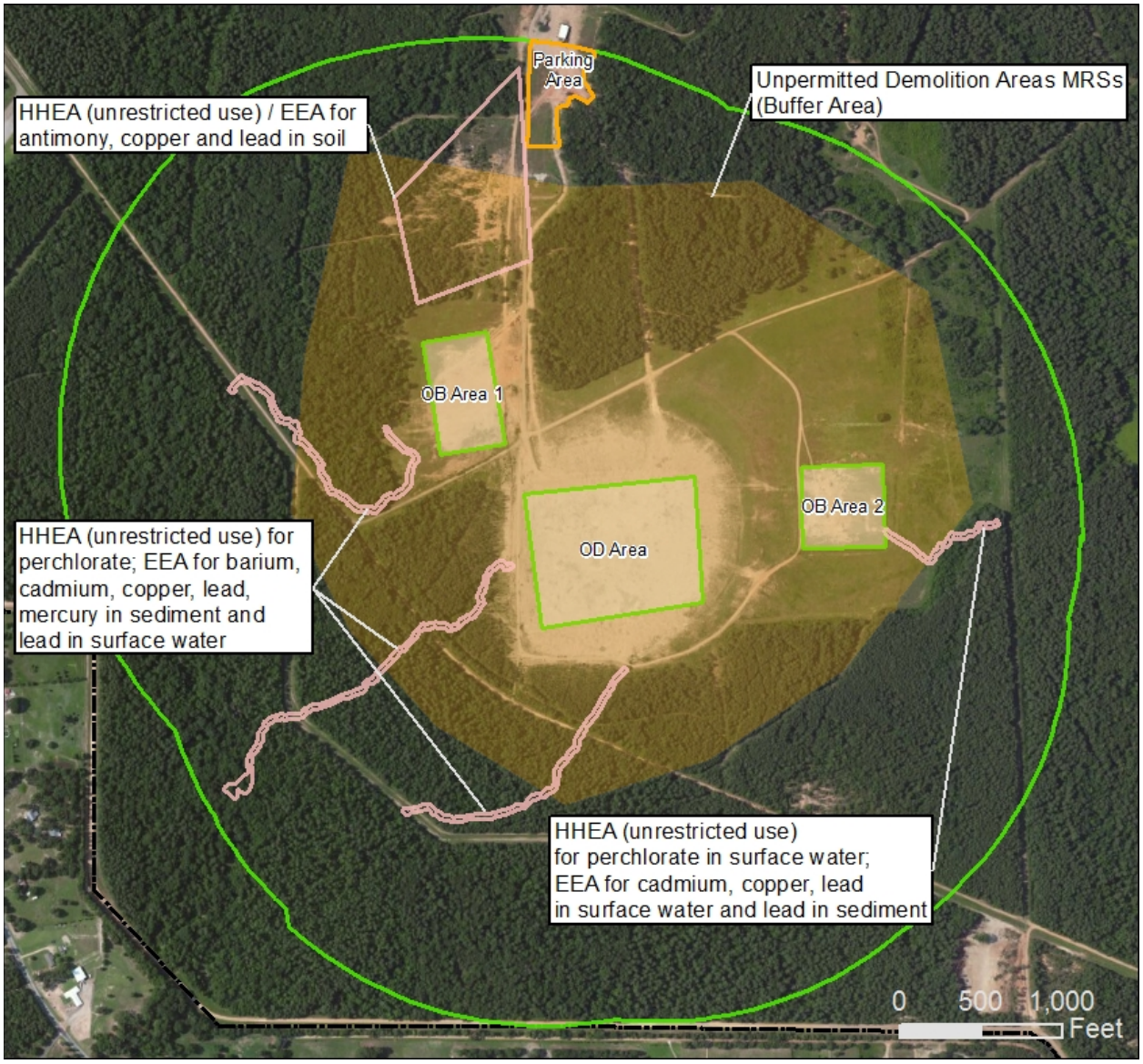



**Figure 6. Hazard and Risk Assessment Results**

# REMEDIAL ACTION OBJECTIVES

Site-specific RAOs were developed to address MEC and MC based on the known current conditions, the explosive safety hazards, and the potential risks to human and ecological receptors identified during the RI (Parsons, 2015). These include:

- Zero injuries resulting from site worker and site visitor exposure to UXO on surface and in subsurface soil to 18 inches bgs;
- Prevent exposure of residents to MC concentrations in soil exceeding PRGs in the future (1);
- Mitigate population effects by limiting exposure of avian receptors to MC concentrations exceeding PRGs in surface soil;
- Mitigate population effects by limiting exposure of burrowing mammals to MC concentrations exceeding PRGs in surface and subsurface soil to 12 inches bgs;
- Prevent exposure of site visitors and recreational users to MC concentrations exceeding PRGs in surface water in the future (1); and
- Mitigate population effects by limiting exposure of ecological receptors to MC concentrations exceeding PRGs in surface water and sediment.

(1) There are no plans for residential/recreational land use at this site, but the RAO accounts for this possibility to adequately address risks.

# SUMMARY OF REMEDIAL ALTERNATIVES

General response actions are selected to satisfy the RAOs. The types of general response actions identified to address MEC in soil, MC in soil, and MC in surface water and sediment are summarized in **Table 4**. Land use controls include a variety of measures, such as deed notice, fencing, educational materials, and for this site with ecological risks, **Compensatory Ecological Restoration**. Compensatory Ecological Restoration is the protecting or setting aside of uncontaminated land for ecological receptors to compensate for the contaminated land. Compensatory Ecological Restoration is allowed for sites in Texas where **chemicals of concern (COCs)** do not exceed human health based screening levels and would involve the preparation of an Ecological Services Analysis (ESA). This ESA documents an area to be restored or otherwise set aside to compensate for the MC-contaminated area. The ESA and any compensatory ecological restoration must be approved by the Natural Resources Trustees for Texas.

**Monitored Natural Recovery** (**MNR**) addresses MC contamination in sediment by relying on a range of naturally occurring processes to reduce risk to human and/or ecological receptors by containing, destroying, altering, or reducing the bioavailability and toxicity of contaminants. Monitoring is an integral component of the MNR remedy. It is appropriate in situations where the source of contamination has been controlled or sufficiently minimized that natural recovery can take place (ESTCP, 2009).

Specific technologies associated with these general response actions were identified and evaluated based on screening criteria that included effectiveness, implementability, and cost. All technologies considered technically implementable were included in the process. The technologies deemed to be viable were combined into the remedial alternatives presented below. The remedial alternatives were developed based on the **conceptual site model (CSM)** and the current and possible future land uses.

**Table 4. General Response Actions for MEC and MC**

| General Response Action | MEC | MC in Soil | MC in SW/Sediment |
|---|---|---|---|
| No Action | √ | √ | √ |
| Land Use Controls, including Compensatory Ecological Restoration | √ | √ | √ |
| Monitored Natural Recovery (MNR) | | | √ |
| Source Containment | √ | √ | √ |
| Physical/Chemical Treatment | | √ | √ |
| Thermal Treatment | | √ | √ |
| Source Removal and Disposal | √ | √ | √ |

## Remedial Alternatives for MEC

As described above, the objective of the remedial action is zero injuries from site worker and site visitor exposure to UXO on surface and in subsurface soil to 18 inches bgs. While MEC items might be present on the surface or in the subsurface, the current limited land use means that land use controls (LUCs) only (e.g., deed notice, additional access restrictions, coupled with intrusive activity restrictions) could be sufficiently protective. However, removing MEC items from the surface in addition to implementing the LUCs would improve the protectiveness of human health under current conditions and for the possible future land uses. The remedial alternatives for MEC developed at the Unpermitted Demolition Areas MRSs are presented in **Table 5**.

## Remedial Alternatives for MC in Soil

Potential risks exist to current ecological receptors and human receptors under a future unrestricted land use scenario. As described above, the objectives of the remedial action are to prevent exposure of MC above PRGs to human receptors under a future unrestricted land use scenario, as well as to mitigate effects of exposure to MC above PRGs to ecological receptors. The remedial alternatives developed for MC in soil are summarized in **Table 6**.

The presence of ecological receptors makes all LUCs ineffective for addressing MC in soil except for compensatory ecological restoration, though deed notice would limit the site to commercial/industrial land use in the future and prevent human health risks under the unrestricted use scenario. Therefore, the only remedial technologies retained for consideration following the evaluation in the section titled "Project Site Characteristics" were compensatory ecological restoration/deed notice and excavation, though soil stabilization was also retained as a possible method of treating excavated soil before disposal.

## Remedial Alternatives for MC in Surface Water and Sediment

The remedial alternatives developed for MC in surface water and sediment are summarized in **Table 7.**

**Table 5.**
**Remedial Action Alternatives for MEC**

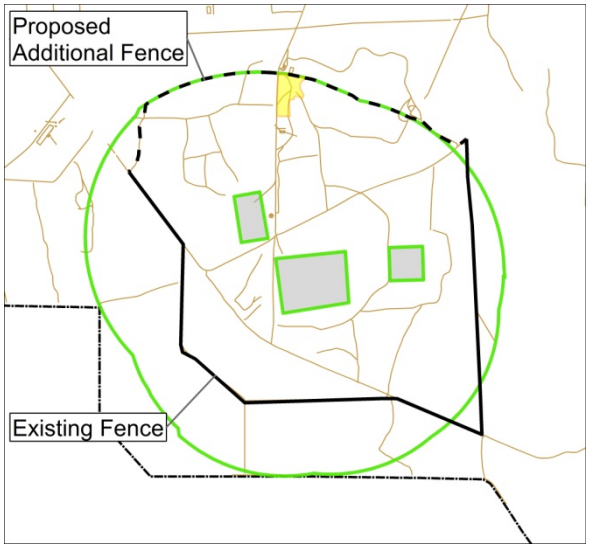
| Alternative | Map | Major Components |
|---|---|---|
| MEC 1:<br>No Action | Not Applicable | None |
| MEC 2:<br>Implement LUCs |  | • Implement LUCs including deed notice, fencing, warning signs, activity restrictions (including MEC support). |

**Table 5.**
**Remedial Action Alternatives for MEC (*continued*)**

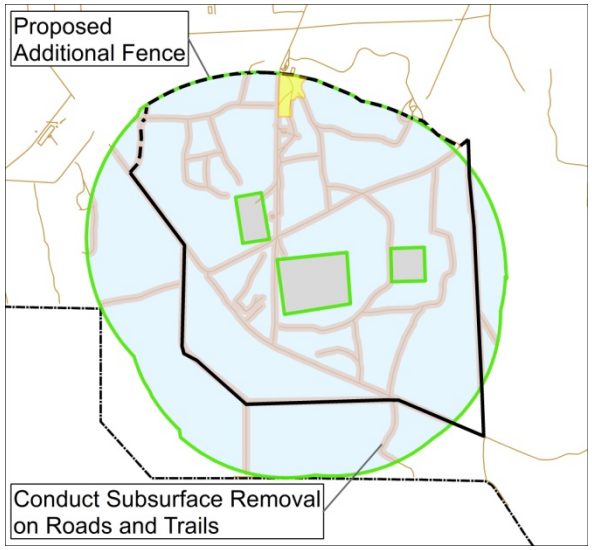
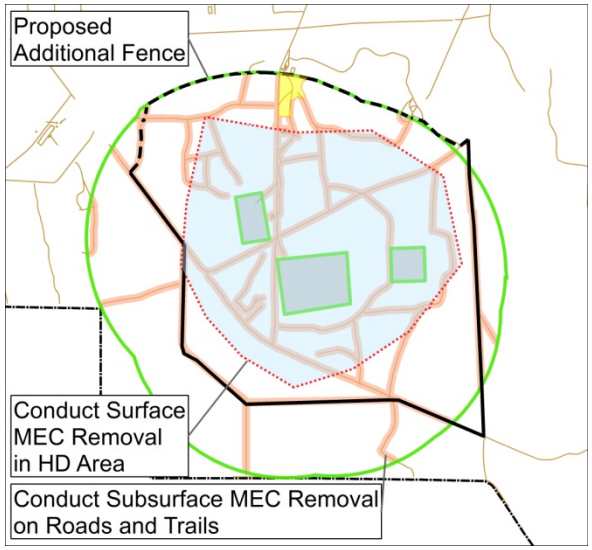
| Alternative | Map | Major Components |
|---|---|---|
| MEC 3:<br>Implement LUCs, Subsurface MEC Removal on Roads/Trails, and Complete Surface MEC Removal |  | • Conduct surface MEC removal across the whole site;<br>• Conduct subsurface MEC removal along roads and trails in HD Area and LD Area; and<br>• Implement LUCs as in Alternative MEC 2. |
| MEC 4:<br>Implement LUCs, Subsurface MEC Removal on Roads/Trails, and Surface MEC Removal at HD Area |  | • Conduct surface MEC removal in HD Area;<br>• Conduct subsurface MEC removal along roads and trails across entire site; and<br>• Implement LUCs as in Alternative MEC 2. |

**Table 5. (*continued*)**
**Remedial Action Alternatives for MEC**

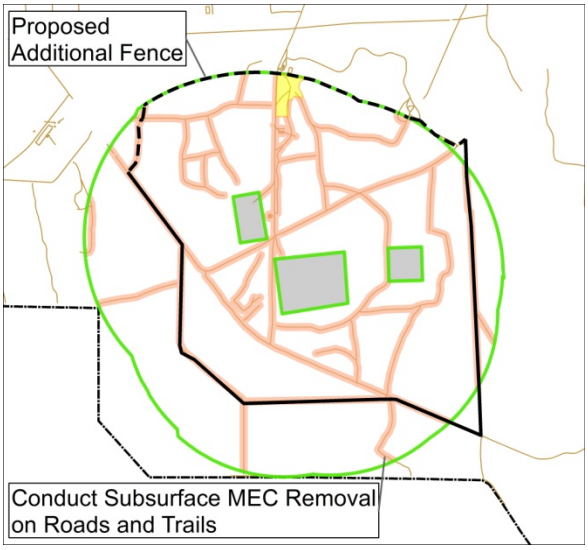
| Alternative | Map | Major Components |
|---|---|---|
| MEC 5:<br>Implement LUCs and Subsurface MEC Removal on Roads/Trails |  | • Conduct subsurface MEC removal along roads and trails in HD Area and LD Area; and<br>• Implement LUCs as in Alternative MEC 2. |
| Option: Implement Subsurface MEC Removal in Parking Area (Option for Alternatives MEC 2 through MEC 5) | | • Conduct subsurface MEC removal in Parking Area; |

**Table 6.**
**Summary of Remedial Alternatives for Munitions Constituents in Soil**

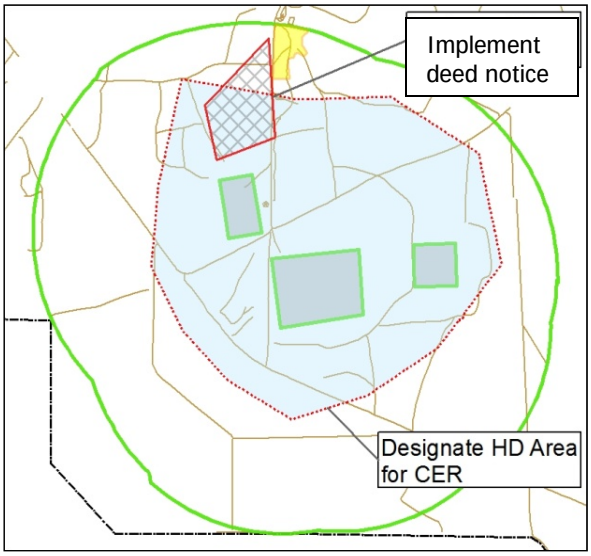
| Alternative | Map | Major Components |
|---|---|---|
| Soil 1: No Action | Not Applicable | None(2) |
| Soil 2:<br>Implement LUCs and Compensatory Ecological Restoration (CER) |  | • Implement land use controls to limit soil HHEA/EEA to commercial/industrial use;<br>• Perform ESA and designate HD Area to be set aside for compensatory ecological restoration; |

**Table 6. (*continued*)**
**Summary of Remedial Alternatives for Munitions Constituents in Soil**

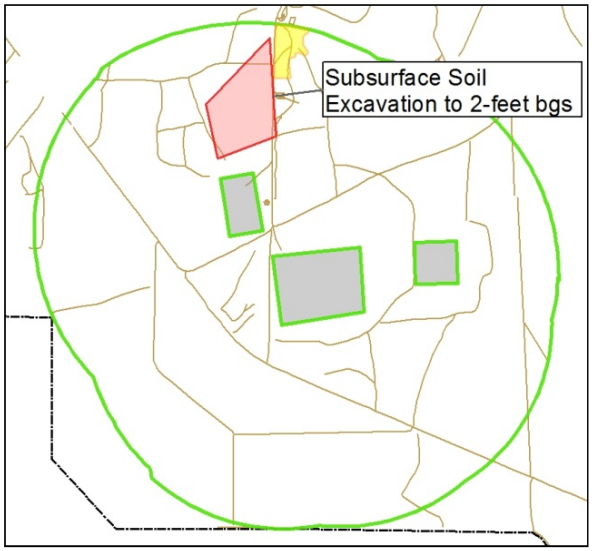
| Alternative | Map | Major Components |
|---|---|---|
| Soil 3:<br>Excavate Soil |  | • Conduct MEC removal in HHEA/EEA to prepare area for soil removal (use mechanical sifting if DGM impractical);<br>• Excavate and remove soil to 2 feet bgs in soil HHEA/EEA; |

**Table 7.**
**Summary of Remedial Alternatives for Munitions Constituents in Sediment**

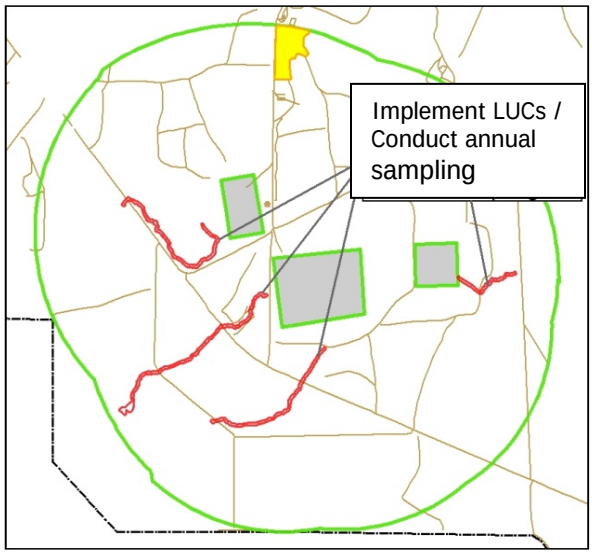
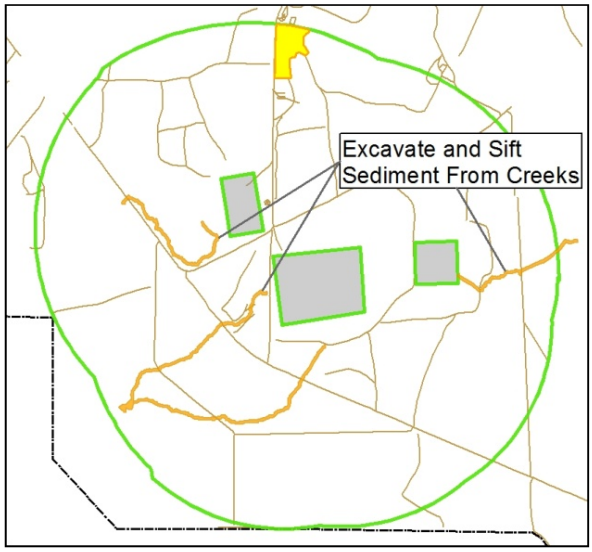
| Alternative | Map | Major Components |
|---|---|---|
| Creek 1: No Action | Not Applicable | None [(2)] |
| Creek 2:<br>Implement LUCs and MNR |  | • Implement LUCs to limit HHEA/EEA to commercial/industrial use;<br>• Conduct annual sampling of sediment in creeks; |

**Table 7. (*continued*)**
**Summary of Remedial Alternatives for Munitions Constituents in Sediment**

| Alternative | Map | Major Components |
|---|---|---|
| Creek 3:<br>Excavate Sediment |  | • Excavate and sift sediment in creeks HHEA/EEA to remove MEC;<br>• Excavate and dispose sediments collected from the creeks. |

### Five-Year Reviews

Five-year reviews are required for sites where hazardous substances, pollutants, or contaminants remain at a site above levels that allow unlimited use and unrestricted exposure following the completion of remedy. For all alternatives except the No Action alternative, five-year reviews would be conducted to:

1) Ensure public health, safety, and the environment are being protected by the implemented response actions;
2) Verify integrity of site controls;
3) Determine if new information has become available that may warrant further action or a change in action;
4) Determine if there is an immediate threat to the public or environment that may require an accelerated or different response; and
5) Review remediation decisions for technical impracticability to determine if new or different technologies should be applied to address risk.

Data may be gathered during the five-year review process to determine if further action needs to be taken to protect public safety and the environment, although collection of additional data is not anticipated. If no changes have taken place, implementation of the remedy would continue. At the completion of each five-year review, a report would be prepared concerning the continued effectiveness of the selected remedy.

## ALTERNATIVES EVALUATION

A detailed analysis was completed for the various remedial alternatives developed to address the MEC hazards and MC risks identified. The purpose of this detailed analysis was to evaluate and compare the range of remedial action alternatives against the baseline condition (no action) and each other to select one preferred alternative that was considered the most suitable to address the hazards and/or risks present. The preferred alternatives are presented here for review by the public.

The detailed analysis involved evaluating each identified remedial alternative against nine criteria, as defined by CERCLA. These nine criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description and purpose of the three groups of criteria follow:

- **Threshold criteria** are requirements that each alternative must meet in order to be eligible for selection and include (a) overall protectiveness of human health and the environment and (b) compliance with **applicable or relevant and appropriate requirements (ARARs).**

- **Balancing criteria** are used to weigh major trade-offs among alternatives and include:
  a) long-term effectiveness and permanence,
  b) reduction of toxicity, mobility, and volume (TMV) of contaminants through treatment,
  c) short-term effectiveness,
  d) implementability, and
  e) cost.
- **Modifying criteria** include (a) state/support agency acceptance and (b) community acceptance, and require review of the remedial alternatives by stakeholders. For this reason, while these criteria may be considered to the extent that information is available during the FS, they can only be fully considered after public comment is received on the Proposed Plan. In the final balancing of trade-offs between alternatives upon which the final remedy selection is based, modifying criteria are equally important as the balancing criteria.

The details of the nine evaluation criteria are explained further in **Table 8** below.

## Summary of ARARs

The ARARs for the remedial alternatives developed for the Unpermitted Demolition Areas MRSs are described in the FS Report (Parsons, 2016). A summary of these ARARs is presented in **Table 9**.

**Table 8.**
**Evaluation Criteria for Remedial Action Alternatives**

| | |
|---|---|
| **Threshold Criteria** | **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. |
| | **Compliance with ARARs** evaluates whether the alternative meets cleanup levels and remedial requirements based on relevant Federal or State environmental statutes or regulations, or whether a waiver is justified. |
| **Balancing Criteria** | **Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time. |
| | **Reduction of 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. |
| | **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. |
| | **Implementability** considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services. |
| | **Cost** includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Total present value (TPV) 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 percent. |
| **Modifying Criteria** | **State/Support Agency Acceptance** considers whether the State agrees with the USACE's analyses and recommendations, as described in the RI/FS and Proposed Plan. |
| | **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. |

**Table 9.**
**Applicable or Relevant and Appropriate Requirements**

| ARAR | Description |
|---|---|
| *Location Specific*:<br>Clean Water Act, Section 404 | This statute and the implementing requirements establish a program that regulates the discharge of dredged or fill material into waters of the United States, including wetlands. Remedial activities must: take steps to avoid wetland impacts; minimize potential impacts on wetlands; and provide compensation for any remaining unavoidable impacts. |
| *Action Specific:*<br>RCRA, 40 CFR 264 Subpart X (Miscellaneous Units – OB/OD) and 266.202 Subpart M – Military Munitions (Solid Waste Identification) | Remedial actions must appropriately identify and manage investigation derived wastes and remedial wastes (that are hazardous wastes) stored onsite, including measures such as post demolition samples to document lack of, or measure the amount of, MC released, and waste characterization samples to classify waste as hazardous or non-hazardous. |
| *Action Specific:*<br>Texas Risk Reduction Program (TRRP) Rule, 30 Texas Administrative Code (TAC) §350.4(a)(47) and §350.111 | TRRP requires the placement of institutional controls (e.g., deed notices or restrictive covenants) on affected property as part of completing a response action if contamination is not removed or otherwise decontaminated. |

## Alternatives Evaluation

The FS Report (Parsons, 2016) provides a detailed description of both the individual and comparative analyses of the remedial alternatives for the Unpermitted Demolition Areas MRSs. These analyses are summarized below. **Tables 10 through 12** also help describe all of the remedial alternatives listed below and are color coded based on desirability with respect to the evaluation criterion

### *Remedial Alternatives for MEC*

The detailed analysis of remedial alternatives for MEC is summarized below and in **Table 10**.

*Alternative MEC 1: No Action*

Alternative MEC 1, the no action alternative (also referred to as No Further Action under CERCLA), does not protect human health and the environment because it does nothing to reduce MEC hazards. This alternative is included as a baseline alternative to compare with the remaining remedial alternatives. This alternative is the least costly of the group and does not pose short term hazards to workers or the surrounding area if implemented. However, it does not protect human health or the environment and, therefore, is not suitable for implementation.

*Alternative MEC 2: Land Use Controls*

The components of Alternative MEC 2 are shown in **Table 5**. This alternative achieves RAOs by limiting human interaction with potential MEC hazards through the installation of chain link fences and requiring onsite construction support for intrusive activity, and increasing awareness of MEC hazards through public awareness measures and installation of signs.

Implementing Alternative MEC 2 protects human health and the environment. Implementation would pose the least hazards to site workers and the surrounding area than all alternatives, except the no action alternative. However, Alternative MEC 2 does not reduce TMV of wastes and is the least effective alternative at reducing MEC hazards over the long-term. Furthermore, Alternative MEC 2 is less implementable than Alternatives MEC 3 through MEC 5 because it is less likely to gain acceptance due to its low effectiveness. The implementation cost for this alternative ($1.54M **total present value [TPV]**) is the least of all alternatives, except the no action alternative, and is less than a third of the next most costly alternative (Alternative MEC 5).

*Alternative MEC 3: Implement LUCs, Subsurface MEC Removal on Roads/Trails, and Complete Surface MEC Removal*

The components of Alternative MEC 3 are shown in **Table 5**. This alternative achieves RAOs by conducting a subsurface MEC removal on roads and trails, performing a site wide surface MEC removal, limiting human interaction with potential MEC hazards through the installation of chain link fences and requiring onsite construction support for intrusive activity, and increasing awareness of MEC hazards through public awareness measures and the installation of warning signs.

Implementing Alternative MEC 3 protects human health and the environment, and complies with the applicable ARARs. Implementation would pose the greatest hazard reduction compared to all alternatives. Alternative MEC 3 would be readily implementable and uses well established technologies. However, Alternative MEC 3 would present the greatest short term hazard to site workers and the surrounding area compared to the other alternatives. Furthermore, Alternative MEC 3 is less implementable than Alternatives MEC 4 and MEC 5 because the implementation cost for this alternative ($12.5M TPV) is the greatest of all alternatives and is more than two times more costly than Alternative MEC 5.

*Alternative MEC 4: Implement LUCs, Subsurface MEC Removal on Roads/Trails, and Surface MEC Removal at HD Area, Roads and Trails*

The components of Alternative MEC 4 are shown in **Table 5**. This alternative achieves RAOs by conducting a subsurface MEC removal on roads/trails, performing a surface MEC removal at the HD area, limiting human interaction with potential MEC hazards through the installation of chain link fences and requiring onsite construction support for intrusive activity, and increasing awareness of MEC hazards through public awareness measures and installation of signs.

Implementing Alternative MEC 4 protects human health and the environment, and complies with the applicable ARARs. Implementation would be readily available due to the use of well-established technologies. This alternative would also be effective in the long term by resulting in an improvement in MEC HA scores and would provide a greater reduction in TMV of wastes compared to Alternative MEC 1 and 2. However, Alternative MEC 4 would pose moderate short term hazards to site workers and the surrounding area. This would result in being less effective in the short term compared to Alternatives MEC 1 and 2. The implementation cost for this alternative ($10.4M TPV) is the second greatest of all alternatives.

*Alternative MEC 5: Implement LUCs and Subsurface MEC Removal on Roads/Trails*

The components of Alternative MEC 5 are shown in **Table 5**. This alternative achieves RAOs by conducting a subsurface MEC removal on roads and trails, limiting human interaction with potential MEC hazards through the installation of chain link fences and requiring onsite construction support for intrusive activity, and increasing awareness of MEC hazards through public awareness measures and installation of signs.

Implementing Alternative MEC 5 protects human health and the environment, and complies with the applicable ARARs. Alternative MEC 5 would pose less of a hazard to site workers and the surrounding area than other alternatives, Alternative MEC 3 and 4. Implementation would be readily available due to the use of well-established technologies. However, Alternative MEC 5 provides partial reduction in TMV of wastes and is not the most effective alternative at reducing MEC hazards over the long-term. The implementation cost for this alternative ($4.94M TPV) is the third lowest of all alternatives, following the no action alternative and Alternative MEC 2.

*OPTION: Additional Subsurface MEC Removal at Parking Area*

An optional alternative is to supplement Alternatives MEC 3-5 by including a subsurface MEC removal at the Parking Area. Implementation of this option would reduce the MEC hazard level from 3 (moderate potential explosive hazard conditions) to 4 (low potential explosive hazard conditions). The parking area is suitable for vehicle storage and therefore the probability of human interaction with MEC or MD is elevated without this option. The implementation cost for this alternative would be a TPV of $476K when combined with Alternatives MEC 3 through MEC 5.

An additional alternative, Alternative MEC 6, was also developed which involves a subsurface clearance of the entire site. This was eliminated from consideration based on the estimated high cost, which was more than $80 million TPV.

### *Remedial Alternatives for MC in Soil*

The detailed analysis of remedial alternatives for MC in soil is summarized below and in **Table 11**.

*Alternative Soil 1: No Action*

Alternative Soil 1, the no action alternative (also referred to as No Further Action under CERCLA), does not protect human health and the environment because it does nothing to reduce MEC hazards. This alternative is included as a baseline alternative to compare with the remaining remedial alternatives. This alternative is the least costly of the group and does not pose short term hazards to workers or the surrounding area if implemented. However, it does not protect human health or the environment and, therefore, is not suitable for implementation.

*Alternative Soil 2: Implement LUCs and Compensatory Ecological Restoration*

The components of Alternative Soil 2 are shown in **Table 6**. This alternative achieves RAOs by establishing LUCs that include activity and use restrictions, and a Compensatory Ecological Restoration to protect ecological receptors.

Implementing Alternative Soil 2 protects human health and the environment, and complies with the applicable ARARs. Implementation would be readily available due to the use of well-established technologies. This alternative would be effective in the short and long term, unlike Soil Alternatives 1 and 3. However, Alternative Soil 2 would not reduce TMV of wastes because there would be no source removal. The implementation cost for this alternative ($186K TPV) is considerably less than Alternative Soil 3. Due to the munitions hazards of the 660 acres of the MRSs, future use of the site will be limited and restricted by deed, which will naturally result in improved environment for ecological receptors. This alternative leverages that situation by ensuring protected habitat for ecological receptors, mitigating the risks posed by the small area of soil contamination.

*Alternative Soil 3: Excavate Soil*

The components of Alternative Soil 3 are shown in **Table 6**. This alternative achieves RAOs by conducting a subsurface MEC source removal.

Implementing Alternative Soil 3 protects human health and the environment, and complies with the applicable ARARs. Implementation would be readily available due to the use of well-established technologies. This alternative would also be effective in the long term due to the source removal of contaminated soil. This would provide the greatest reduction in TMV of wastes compared to all alternatives. However, Alternative Soil 3 would pose the greatest short term hazards to site workers and the surrounding area associated with the MEC removal process. Additionally, the implementation cost for this alternative ($11.6M TPV) is the greatest of all alternatives, and is more than fifty times the cost of Alternative Soil 2.

### *Remedial Alternatives for MC in Surface Water and Sediment*

The detailed analysis of remedial alternatives for MC in surface water and sediment is summarized below and in **Table 12**.

*Alternative Creek 1: No Action*

Alternative Creek 1, the no action alternative (also referred to as No Further Action under CERCLA), does not protect human health and the environment because it does nothing to reduce MEC hazards. This alternative is included as a baseline alternative to compare with the remaining remedial alternatives. This alternative is the least costly of the group and does not pose short term hazards to workers or the surrounding area if implemented. However, it does not protect human health or the environment and, therefore, is not suitable for implementation.

*Alternative Creek 2: Implement LUCS and MNR*

The components of Alternative Creek 2 are shown in **Table 7**. This alternative achieves RAOs by establishing LUCs that include deed notices for commercial/industrial use, and MNR to include annual monitoring at various points along the creeks to confirm MNR is achieving RAOs.

Implementing Alternative Creek 2 protects human health and the environment, and complies with the applicable ARARs. Implementation would be readily available due to the use of well-established technologies. This alternative would be effective in the short and long term, unlike Creek Alternatives 1 and 3. However, Alternative Creek 2 would not reduce TMV of wastes because there would be no source removal. The implementation cost for this alternative ($626K TPV) is considerably less than Alternative Creek 3 ($4.69M TPV), but more than the No Action Alternative. MNR is considered appropriate for this site for the following reasons:

- Contamination above PRGs is localized to streams' upper reaches;
- These intermittent drainage channels are not conducive to the development of fish or benthic communities;
- The RI results show that the source area is minimal, and no additional source will result as OB/OD activities have ceased; and
- No soil contamination above screening levels was detected in the Permitted OB/OD Areas MRS (Parsons, 2015).

*Alternative Creek 3: Excavate Sediment*

The components of Alternative Creek 3 are shown in **Table 7**. This alternative achieves RAOs by conducting a subsurface MEC source removal.

Implementing Alternative Creek 3 protects human health and the environment, and complies with the applicable ARARs. Implementation would be readily available due to the use of well-established technologies. This alternative would be effective in the long term due to the source removal of contaminated soil. This would provide the greatest reduction in TMV of wastes compared to all alternatives. However, Alternative Creek 3 would pose the greatest short term hazards to site workers and the surrounding area associated with the MEC removal process. Additionally, the implementation cost for this alternative ($4.69M TPV) is the greatest of all alternatives, and is more than nine times the cost of Alternative Creek 2.

## Table 10. Detailed Analysis of Alternatives for Munitions and Explosives of Concern

| Remedial Action Alternative | Threshold Criteria | | Primary Balancing Criteria | | | | |
|---|---|---|---|---|---|---|---|
| | Overall Protection of Human Health and Environment | Compliance with ARARs | Long-Term Effectiveness | Reduction in TMV of Wastes | Short-Term Effectiveness | Implementability | Cost [1] |
| **MEC 1: No Action** | Not protective of human health or environment | No ARARs | Not effective over long-term; no improvement in MEC HA score 840 / 720 [2] | No reduction in TMV of wastes (*no MEC removal*) | No short-term hazards to workers or the surrounding area | Readily implementable (*no actions required*); however, highly unlikely to gain approval | $0 |
| **MEC 2: Implement LUCs** | Protective of human health | Complies with ARARs through LUC implementation | Effective over long-term; least improvement in MEC HA score 800 / 720 [2] | No reduction in TMV of wastes (*no MEC removal*) | Low short-term hazards to workers and surrounding area (*associated with fence installation*) | Readily implementable (*uses well established technologies*); less likely to gain approval than MEC removal | $1,537,700 |
| **MEC 3: Implement LUCs, Subsurface MEC Removal on Roads/Trails, Complete Surface MEC Removal** | Protective of human health and environment | Complies with ARARs through LUCs and collection of post-detonation (PD) samples | Effective over long-term; greatest improvement in MEC HA score 635 / 605 [2] | Provides greatest reduction in TMV of wastes (*656-acre MEC removal footprint*) | Greatest short-term hazards to workers and surrounding area (*656-acre MEC removal and fence installation*) | Readily implementable (*uses well established technologies*) | $12,527,300 ($13,003,300) |
| **MEC 4: Implement LUCs, Subsurface MEC Removal on Roads/Trails, Surface MEC Removal at HD Area** | Protective of human health and environment | Complies with ARARs through LUCs and collection of PD samples | Effective over long-term; moderate improvement in MEC HA score 635 / 720 [2] | Provides moderate reduction in TMV of wastes (*265-acre MEC removal footprint*) | Moderate short-term hazards to workers and surrounding area (*265-acre MEC removal and fence installation*) | Readily implementable (*uses well established technologies*) | $10,376,900 ($10,852,900) |
| **MEC 5: Implement LUCs and Subsurface MEC Removal on Roads/Trails** | Protective of human health and environment | Complies with ARARs through LUCs and collection of PD samples | Effective over long-term; moderate improvement in MEC HA score 800 / 720 [2] | Provides partial reduction in TMV of wastes (*19-acre MEC removal footprint*) | Moderate short-term hazards to workers and surrounding area (*19-acre MEC removal and fence installation*) | Readily implementable (*uses well established technologies*) | $4,943,300 ($5,419,300) |

(1) Costs shown are 30-year costs with a 20% contingency reported as a total present value (TPV). The TPV is based on a discount rate of 7 percent. Details of the cost estimates and the development of the TPVs are provided in Appendix A of the FS (Parsons, 2016).

(2) MEC HA Scores are shown for the non-roads/trails HD Area and LD Area (i.e., Other Areas). Detailed MEC HA scores are shown in **Table 2**.

(3) Costs in parentheses include the optional cost for Additional Subsurface MEC Removal at the Parking Area ($476K).

Shading shows alternative desirability with respect to that criterion:

| Most acceptable | Significantly acceptable | Moderately acceptable | Least acceptable |
|---|---|---|---|

**Table 11. Detailed Analysis of Alternatives for Munitions Constituents in Soil**

| Remedial Action Alternative | Threshold Criteria | | Primary Balancing Criteria | | | | |
|---|---|---|---|---|---|---|---|
| | Overall Protection of Human Health and the Environment | Compliance with ARARs | Long-Term Effectiveness | Reduction in TMV of Wastes | Short-Term Effectiveness | Implementability | Cost (1) |
| **Soil 1: No Action** | Not protective of human health or environment | No ARARs | Not effective over long-term | No reduction in TMV of wastes (*no source removal*) | No short-term risks or hazards to workers or the surrounding area | Readily implementable (*no actions required*); however, highly unlikely to gain approval | $0 |
| **Soil 2: Implement LUCs and Compensatory Ecological Restoration** | Protective of human health and environment | Complies with ARARs through LUC implementation | Effective over long-term; does not involve source removal | No reduction in TMV of wastes (*no source removal*) | No short-term risks or hazards to workers or the surrounding area | Readily implementable (*uses well established technologies*) | $186,000 |
| **Soil 3: Excavate Soil** | Protective of human health and environment | No ARARs | Effective over long-term; involves source removal | Provides greatest reduction in TMV of wastes (*complete source removal*) | Greatest short-term hazards to workers and the surrounding area (*associated with MEC removal*) | Readily implementable (*uses well established technologies*) | $11,598,000 |

(1) Costs shown are 30-year costs with a 20% contingency reported as a TPV. The TPV is based on a discount rate of 7 percent. Details of the cost estimates and the development of the TPVs are provided in Appendix A of the FS (Parsons, 2016).

Shading shows alternative desirability with respect to that criterion:

| Most acceptable | Significantly acceptable | Moderately acceptable | Least acceptable |
|---|---|---|---|

**Table 12. Detailed Analysis of Alternatives for Munitions Constituents in Sediment**

| Remedial Action Alternative | Threshold Criteria | | Primary Balancing Criteria | | | | |
|---|---|---|---|---|---|---|---|
| | **Overall Protection of Human Health and the Environment** | **Compliance with ARARs** | **Long-Term Effectiveness** | **Reduction in TMV of Wastes** | **Short-Term Effectiveness** | **Implementability** | **Cost (1)** |
| **Creek 1: No Action** | Not protective of human health or environment | No ARARs | Not effective over long-term | No reduction in TMV of wastes (*no source removal*) | No short-term risks or hazards to workers or the surrounding area | Readily implementable (*no actions required*); however, highly unlikely to gain approval | $0 |
| **Creek 2: Implement LUCs and MNR** | Protective of human health and environment | Complies with ARARs through LUC implementation | Effective over long-term; does not involve source removal | No reduction in TMV of wastes (*no source removal*) | Minimal short-term hazards to workers or the surrounding area | Readily implementable (*uses well established technologies*) | $626,400 |
| **Creek 3: Excavate Sediment** | Protective of human health and environment | No ARARs | Effective over long-term; involves source removal | Provides greatest reduction in TMV of wastes (source removal in creeks) | Short-term hazards to workers and the surrounding area (*associated with MEC removal*) | Readily implementable (*uses well established technologies*) | $4,687,200 |

(1) Costs shown are 30-year costs with a 20% contingency reported as a TPV. The TPV is based on a discount rate of 7 percent. Details of the cost estimates and the development of the TPVs are provided in Appendix A of the FS (Parsons, 2016).

Shading shows alternative desirability with respect to that criterion

| Most acceptable | Significantly acceptable | Moderately acceptable | Least acceptable |
|---|---|---|---|

# PREFERRED ALTERNATIVES

Remedial alternative were developed for each contaminant identified at the Unpermitted Demolition Areas MRSs. The contaminants and media at the site were MEC in soil, MC in soil, and MC in surface water and sediment. The preferred alternatives recommended to address MEC and MC contamination are:

- Alternative MEC 5: Implement LUCs and Subsurface MEC Removal on Roads/Trails, including the option of subsurface MEC removal in vehicle storage area
- Alternative Soil 2: Implement LUCs and Compensatory Ecological Restoration
- Alternative Creek 2: Implement LUCs and MNR

When compared to the other MEC alternatives, Alternative MEC 5 has the lowest relative cost of the three removal alternatives ($4.94M TPV) and reduces the hazard level to 4 (low potential) along roads and trails. This alternative is recommended because it provides an acceptable level of MEC reduction for the anticipated future land uses and is cost-effective. The approach is also consistent with the recommended approach for the Permitted OB/OD Areas. Implementing Alternative MEC 5 would protect human health and the environment, and complies with the applicable ARARs. Alternative MEC 5 would pose less of a hazard to site workers and the surrounding area than other alternatives. Additionally, implementation would be readily available due to the use of well-established technologies. The optional subsurface removal at the vehicle storage area would reduce MEC hazards to site workers accessing the site to store vehicles. Vehicle storage is a known activity at the site, and it can involve subsurface disturbance when heavy vehicles are moved in muddy conditions. Although the likelihood of MEC is lower in this area than the HD Area, the likelihood of encountering it is elevated by the increased area use. Addition of the optional subsurface removal increases the TPV of this alternative to $5.42M.

To address MC contamination in soil, Alternative Soil 2 is recommended as the preferred alternative. Alternative Soil 2 would be sufficient in protecting both humans and the environment by putting land use controls in place to limit the area to commercial/industrial use, and performing an ESA to designate an area to be set aside for compensatory ecological restoration. Implementing Alternative Soil 2 would protect human health and the environment, and complies with the applicable ARARs. Implementation would be readily available due to the use of well-established technologies. This alternative would be effective in the short and long term and has a moderate cost to implement ($186K TPV). Due to the munitions hazards of the 660 acres of the MRSs, future use of the site will be limited and restricted by deed, which will naturally result in improved environment for ecological receptors. Alternative Soil 2 leverages that situation by ensuring protected habitat for ecological receptors, thereby mitigating the risks posed by the small area of soil contamination.

Alternative Creek 2 is recommended to address MC in surface water and sediment, and would involve establishing land use controls for the creek footprints to limit those areas to commercial/industrial use and implementing MNR to measure the concentrations to confirm their reduction over time. Contaminant concentrations, which are very localized in upper reaches of the intermittent drainage channels and are not significantly greater than PRGs, are anticipated to decrease naturally. Implementing Alternative Creek 2 would protect human health and the environment, and complies with the applicable ARARs. Implementation would be readily available due to the use of well-established technologies. This alternative would be effective in the short and long term and has a moderate cost to implement ($626K TPV).

# COMMUNITY PARTICIPATION

## Public Comment

The USACE is the lead agency for investigating, reporting, making remedial decisions, and taking remedial actions at the RRAD. The RI report and FS Report (Parsons 2015 and Parsons, 2016) are comprehensive documents that describe the site history, details of previous investigations, the associated risk assessments and their conclusions. These reports and this Proposed Plan are part of the RRAD Administrative Record and are available for review at the repository listed below.

Public comments are considered before any action is selected and approved. Written and oral comments on this Proposed Plan will be accepted throughout a public comment period between **October 24, 2016** and **November 25, 2016**. Correspondence should be postmarked no later than **November 25, 2016** and should be sent to

the attention of **Mr. Jeffrey Gschwind** (see below). A public meeting is not currently scheduled; however a public meeting will be held if requested. Requests for a public meeting should also be sent to the attention of **Mr. Jeffrey Gschwind** (see below).

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### Administrative Record

Copies of the final RI Report and final FS Report for the RRAD Unpermitted Demolition Areas MRS can be found at the Red River Army Depot Environmental Collection section at the following location:

Texarkana College
Palmer Memorial Library
1024 Tucker Street
Texarkana, TX, 75505
Tel.: (903) 823-3027

**Hours of Operation**
**Monday – Thursday: 7:30 a.m. to 9:00 p.m.**
**Friday: 7:30 a.m. to 4:00 p.m.**
**Sunday: 2 p.m. to 9:00 p.m.**

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# GLOSSARY OF TERMS

**Anomaly** – Any item that is detected as a subsurface irregularity after geophysical investigation. This irregularity should deviate from the expected subsurface ferrous and non-ferrous material at a site (i.e., pipes, power lines, etc.).

**Applicable or relevant and appropriate requirements (ARAR)** – The Federal and State environmental laws that a selected remedy will meet. These requirements may vary among sites and alternatives.

**Chemical of Concern (COC)** – COCs are defined as the **chemicals of potential concern (COPCs)** that are present at sufficient concentrations to pose a risk to human health or the environment.

**Compensatory Ecological Restoration (CER)**– The restoration or otherwise setting aside an area of habitat to compensate for a contaminated area.

**Concentrated Munitions Use Area (CMUA)** – A CMUA is an MRS or part of an MRS where there is a high likelihood of finding UXO or DMM. There are typically large amounts of MD and/or elevated subsurface anomaly densities present in CMUAs as a result of historical munitions use and fragmentation. CMUAs are most commonly range target areas, though they may also be OD/OD areas, explosion sites, and large munitions disposal sites.

**Chemical of Potential Concern (COPC)** – COPCs are defined as any MC that are present at elevated concentrations with regard to local conditions. COPCs are carried forward for evaluation in the risk assessment to determine whether or not they are COCs.

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, commonly known as Superfund)** – A federal law that addresses the funding for and remediation of abandoned or uncontrolled hazardous waste sites. This law also establishes criteria for the creation of key documents such as the Remedial Investigation, Feasibility Study, Proposed Plan, and Decision Document.

**Decision Document** – A report documenting the final action, approved by the regulatory agencies, that is required at CERCLA sites.

**Discarded Military Munitions** – 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.

**Ecological Services Analysis (ESA)** – An ESA is a remedy under TRRP Remedy Standard B that allows contamination to be kept in place providing compensatory ecological restoration is provided at an alternative location.

**Feasibility Study (FS)** – The process during which potential remedial alternatives for a site are developed and evaluated to provide the basis of a rationale for remedy selection.

**Monitored Natural Recovery (MNR) –** The monitoring of naturally occurring processes that by their nature reduce risk to human and/or ecological receptors by containing, destroying, altering, or reducing the bioavailability and toxicity of contaminants.

**Munitions Constituents (MC)** – Any materials originating from unexploded ordnance, 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., penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal. Munitions debris is confirmed inert and free of explosive hazards by technically qualified personnel.

**Munitions and Explosives of Concern (MEC)** – This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means: (a) **unexploded ordnance**; (b) **discarded military munitions**; or (c) Explosive MC (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

**Munitions Response Site (MRS)** – A discrete location that is known to require a munitions response.

**Non-concentrated Munitions Use Area (NCMUA)** – An NCMUA is an MRS or part of an MRS where there is low (or no) potential for UXO or DMM resulting from historical munitions use.

NCMUAs may be entire MRSs (e.g., training and maneuver areas) or portions of an MRS outside a CMUA (e.g., buffer areas).

**Preferred Alternative(s)** – The alternative(s) that, when compared to other potential alternatives, was/were determined to best meet the CERCLA evaluation criteria and is proposed for implementation at an MRS.

**Preliminary Remediation Goal (PRG)** - analytical values developed to provide a target for the analysis of and selection of remedial alternatives. They are a screening tool rather than the final remediation target or cleanup level and they are designed to be conservative.

**Proposed Plan** – A plan that identifies the preferred remedial alternative(s) for a site, and is made available to the public for comment.

**Remedial Action Objective (RAO)** – Cleanup objectives that specify contaminants to be cleaned up, the cleanup standard, and the area of cleanup for the purpose of protecting human health and the environment.

**Remedial Investigation (RI)** – Exploratory inspection conducted at a site to define the nature and extent of contamination present, and to assess potential related hazards and risks.

**Superfund** – See Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) above.

**Total Present Value (TPV)** - The amount needed to be set aside at the initial point in time (the "base year," or "Year 0") to ensure funds will be available in the future as they are needed.

**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.

## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ARAR | applicable or relevant and appropriate requirement |
| ASR | Archives Search Report |
| bgs | below the ground surface |
| CER | Compensatory Ecological Restoration |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CMUA | concentrated munitions use area |
| COPC | contaminant of potential concern |
| CSM | conceptual site model |
| DERP | Defense Environmental Restoration Program |
| DGM | digital geophysical mapping |
| DoD | Department of Defense |
| EEA | Ecological Exceedance Area |
| ERA | ecological risk assessment |
| ESV | ecological screening value |
| FS | feasibility study |
| FUDS | formerly used defense site |
| GPS | global positioning system |
| HA | Hazard Assessments |
| HD | high density |
| HE | high explosive |
| HHEA | Human Health Exceedance Area |
| HHRA | Human Health Risk Assessment |
| HRA | historical records review |
| INPR | Inventory Project Report |
| K | thousand |
| LD | low density |
| LUC | land use control |
| M | million |
| MC | munitions constituents |
| MD | munitions debris |

# ACRONYMS AND ABBREVIATIONS (CONT'D.)

| | |
|---|---|
| MEC | munitions and explosives of concern |
| MMRP | Military Munitions Response Program |
| MRS | munitions response site |
| NCMUA | non-concentrated munitions use area |
| NCP | National Oil and Hazardous Substances Pollution Contingency Plan |
| OB/OD | Open Burning/Open Detonation |
| PD | post-detonation |
| PRG | preliminary remediation goal |
| RAO | remedial action objective |
| RI | remedial investigation |
| RRAD | Red River Army Depot |
| SI | site inspection |
| TCEQ | Texas Commission on Environmental Quality |
| TMV | toxicity, mobility, or volume |
| TPP | technical project planning |
| TPV | total present value |
| TRRP | Texas Risk Reduction Program |
| USACE | United States Army Corps of Engineers |
| USEPA | United States Environmental Protection Agency |
| UXO | unexploded ordnance |