FINAL DECISION DOCUMENT

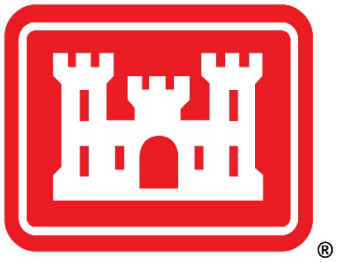
WESTERN MUNITIONS AND EXPLOSIVES OF CONCERN CONTAMINATED MUNITIONS RESPONSE SITE

WITHIN

CAMP BUTNER FORMERLY USED DEFENSE SITE

PROJECT NO. I04NC000909

GRANVILLE, PERSON, AND DURHAM COUNTIES, NORTH CAROLINA



U.S. Army Corps of Engineers
U.S. Army Engineering and Support Center, Huntsville
and
U.S. Army Corps of Engineers
Savannah District

SEPTEMBER 2022

EXECUTIVE SUMMARY

ES 1. This Decision Document is presented by the United States Army Corps of Engineers to describe the selected remedy for the Western Munitions and Explosives of Concern Contaminated Munitions Response Site, within the Camp Butner Formerly Used Defense Site, Property No. I04NC0009, in Granville, Person, and Durham counties, North Carolina. The Munitions Response Site 07 is designated as Formerly Used Defense Site Project I04NC000909 (Project 09).

ES 2. Munitions Response Site 07 comprises approximately 1,385 acres within the Camp Butner Formerly Used Defense Site.

ES 3. The Remedial Action Objective is to mitigate the unacceptable risk of an incident occurring to human receptors at Munitions Response Site 07. Mitigation actions will be taken to address applicable munitions of concern to their detection depths, reducing the risk of an incident occurring.

ES 4. The selected remedy in this Decision Document is Alternative 5, which consists of surface and subsurface removal of munitions and explosives of concern to a depth of detection using Advanced Geophysical Classification and Land Use Controls in the form of public educational pamphlets. Implementation of this selected remedy at Munitions Site Response 07 meets the Remedial Action Objective established in the Feasibility Study, but it will not achieve unlimited use/unrestricted exposure because munitions and explosives of concern could remain within Munition Response Site 07 due to the presence of physical obstructions that USACE will not obtain permission to remove (e.g., houses and roads). Therefore, Five-Year Reviews that evaluate the effectiveness of the selected remedy to protect human health and the environment are required. The regulator, North Carolina Department of Environmental Quality, concurs with the selected remedy.

ES 5. The selected remedy is protective of human health and the environment and is cost effective. The total costs associated with implementing the selected remedy is $32,698,301.

ES 6. Other munitions response alternatives were considered in the Proposed Plan and evaluated against the National Oil and Hazardous Substances Pollution Contingency Plan's nine criteria. The alternatives considered in the Proposed Plan are the following: No Further Action (Alternative 1); Land Use Controls (Alternative 2); Surface Removal of Munitions and Explosives of Concern Using Analog Detection Methods (Alternative 3); Surface Clearance and Subsurface Removal of Munitions and Explosives of Concern to the Depth of Instrument Detection Using Digital Geophysical Mapping Methods (Alternative 4); and Surface Clearance and Subsurface Removal of Munitions and Explosives of Concern to a Depth of Detection Using Advanced Geophysical Classification Methods (Alternative 5).

ES 7. Alternatives 4 and 5 in the Proposed Plan did not include Land Use Controls as a remedy component because the Proposed Plan anticipated that Alternatives 4 and 5 would remove munitions and explosives of concern hazards to a degree that would allow for unlimited use/unrestricted exposure. The analysis, however, did not account for certain physical obstructions on the site that would prevent the alternatives from achieving a clearance level that would allow for unlimited use/unrestricted exposure. For example, complete removal of structures (e.g., residences) and other infrastructure would be required to implement these alternatives; however, such efforts would be very costly not supported by property owners. Consequently, an unlimited use/unrestricted exposure alternative would be impossible to implement for this site. To account for MEC hazards remaining due to physical obstructions, U.S. Army Corps of Engineers added Land Use Controls to Alternatives 4 and 5 post-Proposed Plan for consideration in this Decision Documents to ensure the alternatives are protective. The documentation of this significant change to the preferred alternative in the Proposed Plan is in Section 2.15 below. The No Further Action alternative was considered but determined to not be protective of human health and the environment. All other alternatives including Alternative 3, provide protection of human health and the environment, and Alternative 5 with the inclusion of Land Use Controls was selected to best meet the Remedial Action Objective and the evaluation criteria. Munitions constituents were investigated but determined not to pose an unacceptable risk to human health and the environment. As such, no further action is necessary for munitions constituents.

ES 8. The selected remedy is protective of human health and the environment by reducing receptor exposure risk to explosive hazards. Munitions Response Site 07 contained munitions and explosives of concern and munitions debris that are indicative of the potential presence of munitions and explosives of concern. The receptors include residents, occupational workers, recreational users, and visitors. The selected remedy, Surface Clearance and Subsurface Removal of Munitions and Explosives of Concern to a Depth of Detection Using Advanced Geophysical Classification Methods and Land Use Controls, reduces munitions and explosives of concern hazards and informs people of the actions to take should they encounter a suspected military munition to reduce exposure with explosive hazards. The selected remedy satisfies the statutory requirements of the Comprehensive Environmental Response, Compensation, and Liability Act § 121 regarding the former use of the Western Munitions and Explosives of Concern Contaminated Munitions Response Site 07 by the Department of Defense.

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ACRONYMS AND ABBREVIATIONS

AGC	Advanced Geophysical Classification
ARAR	Applicable or relevant and appropriate requirements
ARNG	Army National Guard
ASR	Archives Search Report
bgs	Below Ground Surface
BIP	Blow-In-Place
BLRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CRP	Community Relations Plan
CSM	Conceptual Site Model
DD	Decision Document
DGM	Digital Geophysical Mapping
DMM	Discarded Military Munitions
DNT	Dinitrotoluene
DoD	Department of Defense
DU	Decision Unit
Eco-SSL	Ecological Soil Screening Level
EE/CA	Engineering Evaluation/Cost Analysis
FS	Feasibility Study
ft	Feet/Foot
FUDS	Formerly Used Defense Site
HA	Hazard Assessment
HE	High Explosive
HGL	Hydrogeologic, Inc.
HGR	Hand Grenade Range
HHRA	Human Health Risk Assessment
ISM	Incremental Sampling Method
LUC	Land Use Control
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
mm	Millimeter
MMRP	Military Munitions Response Program
MPPEH	Material Potentially Presenting an Explosives Hazard
MRA	Munitions Response Area
MRS	Munitions Response Site
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
PP	Proposed Plan
QC	Quality Control

ACRONYMS AND ABBREVIATIONS (continued)

RA	Remedial Action
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RC1	Range Complex 1
RC2	Range Complex 2
RI	Remedial Investigation
ROE	Right-of-Entry
SARA	Superfund Amendments and Reauthorization Act
SLERA	Screening Level Ecological Risk Assessment
SUXOS	Senior Unexploded Ordnance Supervisor
TBD	To Be Determined
TCRA	Time Critical Removal Action
TMV	Toxicity, Mobility, or Volume
TNT	Trinitrotoluene
TPP	Technical Project Planning
TPV	Total Present Value
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UU/UE	Unlimited Use and Unrestricted Exposure
UXO	Unexploded Ordnance
UXOQCS	UXO Quality Control Specialist
UXOSO	UXO Safety Officer

PART 1 - DECLARATION

1.1 PROJECT NAME AND LOCATION

This Decision Document (DD) was developed for Western Munitions and Explosives of Concern (MEC) Contaminated Munitions Response Site 07 (MRS-07), within the Camp Butner Formerly Used Defense Site (FUDS) Property No. I04NC0009 located in Granville, Person, and Durham counties, North Carolina. The Camp Butner FUDS comprises 40,384 acres and MRS-07 comprises 1,385 acres. MRS-07 lies mostly within the former Range Complex 1 (RC1) is privately owned, and is used for residential, commercial/industrial, agricultural, and recreational purposes. The MRS number and project number for the Western MEC Contaminated are MRS-07 and I04NC000909 (Project 09).

Based on the information and recommendations in the Final Remedial Investigation Report (RI), the revised Final Feasibility Study (FS), and the revised Final Proposed Plan (PP), Project 02 was delineated into nine separate projects (revising Project 02 and adding new Projects 04 through 11). This DD addresses the selected remedy for MRS-07. The other projects will be addressed in separate DDs. The acreages and land use of the nine projects are described below:

Table 1.1 - Former Camp Butner Munition Response Area Delineation

MRS	Project	MRS Title	Acreage
MRS-01	11	Military Training MEC Contaminated	1,429
MRS-02	04	Military Training Buffer Area	391
MRS-03	05	Buffer Area	924
MRS-04	06	Central MEC Contaminated	2,202
MRS-05	07	Northern MEC Contaminated	1,807
MRS-06	08	Eastern MEC Contaminated	1,451
MRS-07	09	Western MEC Contaminated	1,385
MRS-08	10	South MEC Contaminated	1,179
MRS-09	02	No Action Area	7,148

MRS denotes munitions response site
MEC denotes munitions and explosives of concern

1.2 STATEMENT OF BASIS AND PURPOSE

The U.S. Army is DoD's lead agent for the Defense Environmental Restoration Program (DERP) FUDS Program. The Secretary of the Army delegated program management and execution responsibilities for the FUDS Program to the U.S. Army Corps of Engineers (USACE).

This DD describes the selected remedy for MRS-07 within the Camp Butner FUDS (Figures 1 and 2). The selected remedy involves surface and subsurface removal of munitions and explosives of concern (MEC) to a depth of detection using Advanced Geophysical Classification (AGC) Methods and Land Use Controls (LUCs) consisting of public educational pamphlets. USACE made this selection in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, 42 U.S.C. § 9601 et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. The determination presented in this DD is based on information contained in the Administrative Record file for the Camp Butner FUDS.

The regulatory agency for the Camp Butner FUDS is the North Carolina Department of Environmental Quality (NCDEQ). In its letter dated June 2, 2022, NCDEQ provided written concurrence with the selected remedy.

1.3 ASSESSMENT OF THE PROJECT SITE

The response action selected in this DD is necessary to protect human health and the environment. The hazards at the site include a potential for people to come into contact with MEC and munitions debris (MD) at MRS-07. Environmental sampling for munitions constituents (MC) was also conducted during the Remedial Investigation (RI). The RI determined that no unacceptable risk to human or ecological receptors exists from MC-related contamination present at MRS-07. The most likely exposure scenario is direct interaction between human receptors (residents, occupational workers, recreational users, and visitors) and residual MEC potentially present at MRS-07. Receptor activities are anticipated to be conducted in both the surface and subsurface soils, to a depth of 15 feet (ft) below ground surface (bgs). Based on the results of the RI and previous investigations, MEC hazards are not expected to be found at depths of 40 inches bgs (USACE, 2019).

1.4 DESCRIPTION OF SELECTED REMEDY

The selected remedy consists of surface and subsurface removal of MEC hazards to depth of detection, with exceptions for inaccessible areas, and LUCs. The selected remedy includes vegetation clearance, surface removal, classification of anomalies, and removal of anomalies classified as MEC using AGC methods, as well as disposal of any MEC, material potentially presenting an explosives hazard (MPPEH), and MD recovered in the search for MEC hazards. If there are areas where AGC is not feasible, USACE-approved standard digital geophysical mapping (DGM) or analog methods would be used, with 100 percent coverage of the MRS by AGC methods to be attempted. Public educational pamphlets would inform people of hazards that may be present through the 3Rs (Recognize, Retreat, and Report) Explosives Safety Education Program. Costs for removal of munitions would include those for vegetation removal, surface and subsurface removal within the MEC contaminated area, munitions disposal, MPPEH disposition, and site restoration. Costs for LUCs would include development, reproduction, and distribution of educational pamphlets.

1.5 STATUTORY DETERMINATIONS

Based on the information currently available, the selected remedy for MRS-07, Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using AGC Methods and LUCs, minimizes exposure to explosive hazards, is protective of human health and the environment, and satisfies the statutory requirements of CERCLA § 121 with regards to the former use by the DoD. 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.

The selected remedy for MRS-07 will not allow for unlimited use/unrestricted exposure (UU/UE). Accordingly, USACE must conduct statutory reviews every five years after initiation of the remedial action to assure that human health and the environment are being protected by the selected remedy.

1.6 DATA CERTIFICATION CHECKLIST

The following information is included or otherwise addressed in this DD. Additional information can be found in the Administrative Record file for this site.

- Information on MEC encountered at the project site and risk characterization for MEC.
- A summary of the risk assessment for MC-related contamination.
- Explanation of how source materials constituting threats will be addressed.

- Current and reasonably anticipated future land use assumptions at the MRS;
- Estimated costs associated with the implementation of the selected remedy.
- Key factors that led to the determination of Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using AGC Methods and LUCs as the selected remedy.

Previous investigations and risk assessment during the RI concluded that the exposure pathways for MC-related contamination are incomplete because MC-related contamination is not present. Moreover, metals detected at the site do not present any unacceptable risks at the site (see section 2.7.4.2 Investigation of Munitions Constituents). For this reason, the following information does not apply and is not included in this DD:

- Cleanup levels established for chemicals of concern and the basis for these levels.

1.7 AUTHORIZING SIGNATURE

This DD presents Surface and Subsurface Removal of MEC to a Depth of Detection Using AGC Methods and LUCs as the selected remedy for Western MEC Contaminated Munition Response Site 07, within the Camp Butner FUDS, Property No. I04NC0009, in Granville, Person, and Durham counties, North Carolina. The U. S. Army is the lead agency under the Defense Environmental Restoration Program at the Camp Butner FUDS and has developed this Decision Document consistent with the CERCLA, as amended, and the NCP. This Decision Document will be incorporated into the larger Administrative Record file for the Camp Butner FUDS, which is available for public view at the South Granville Public Library, Creedmoor, NC 27522. This DD, which presents the selected remedy of removal of MEC using AGC and LUCs with an estimated capital cost of $32,698,301, is approved by the undersigned, pursuant to the CEMP-CED (200-1a) Memorandum, "Re-delegation of Assignment of Mission Execution Functions Associated with Department of Defense Lead Agent Responsibilities for the Formerly Used Defense Site Program," dated July 8, 2022.

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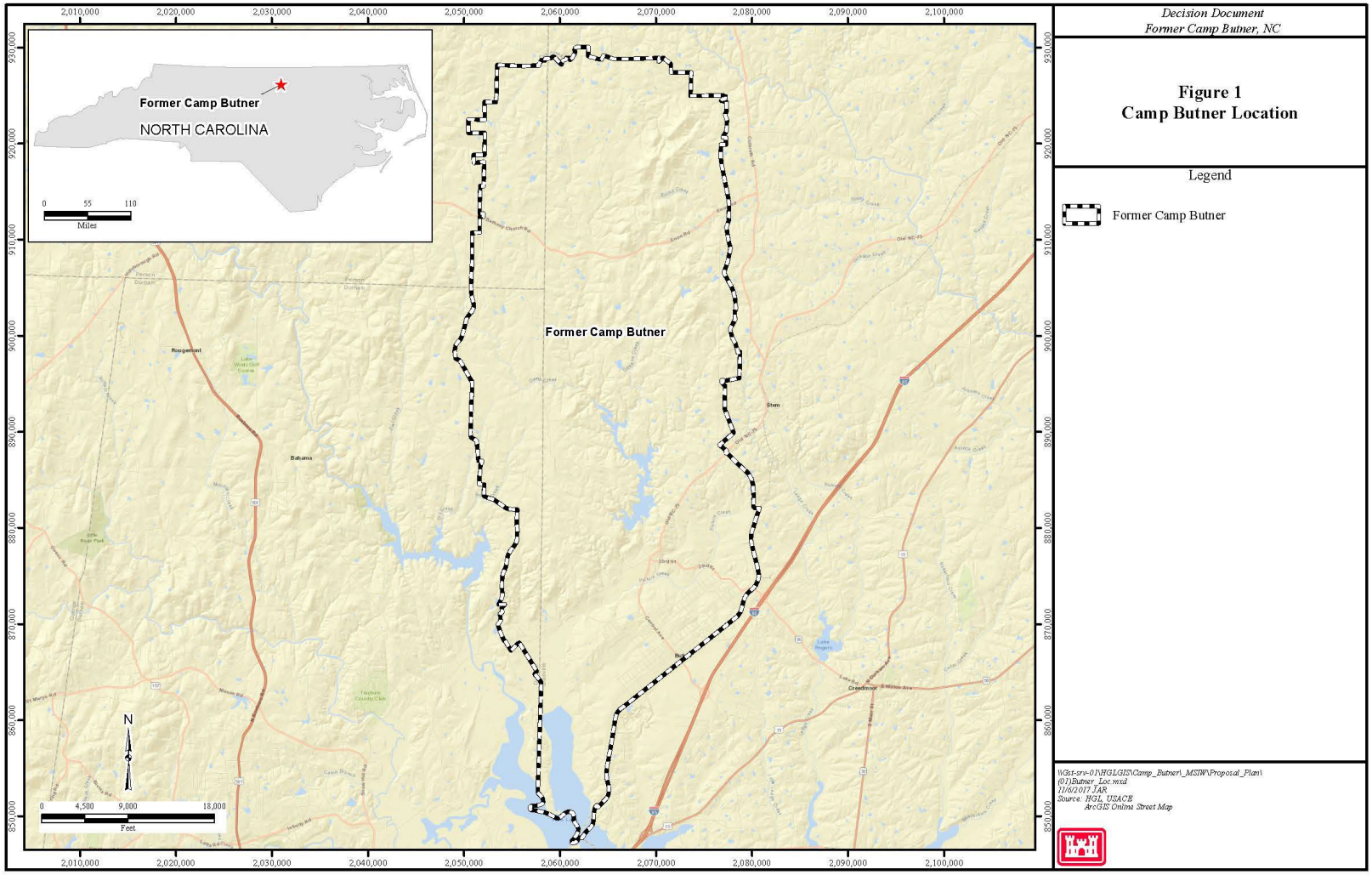
6 December 2022

KIMBERLY M. COLLOTON
Major General, U.S. Army
Deputy Commanding General, MIO
HQUSACE

DATE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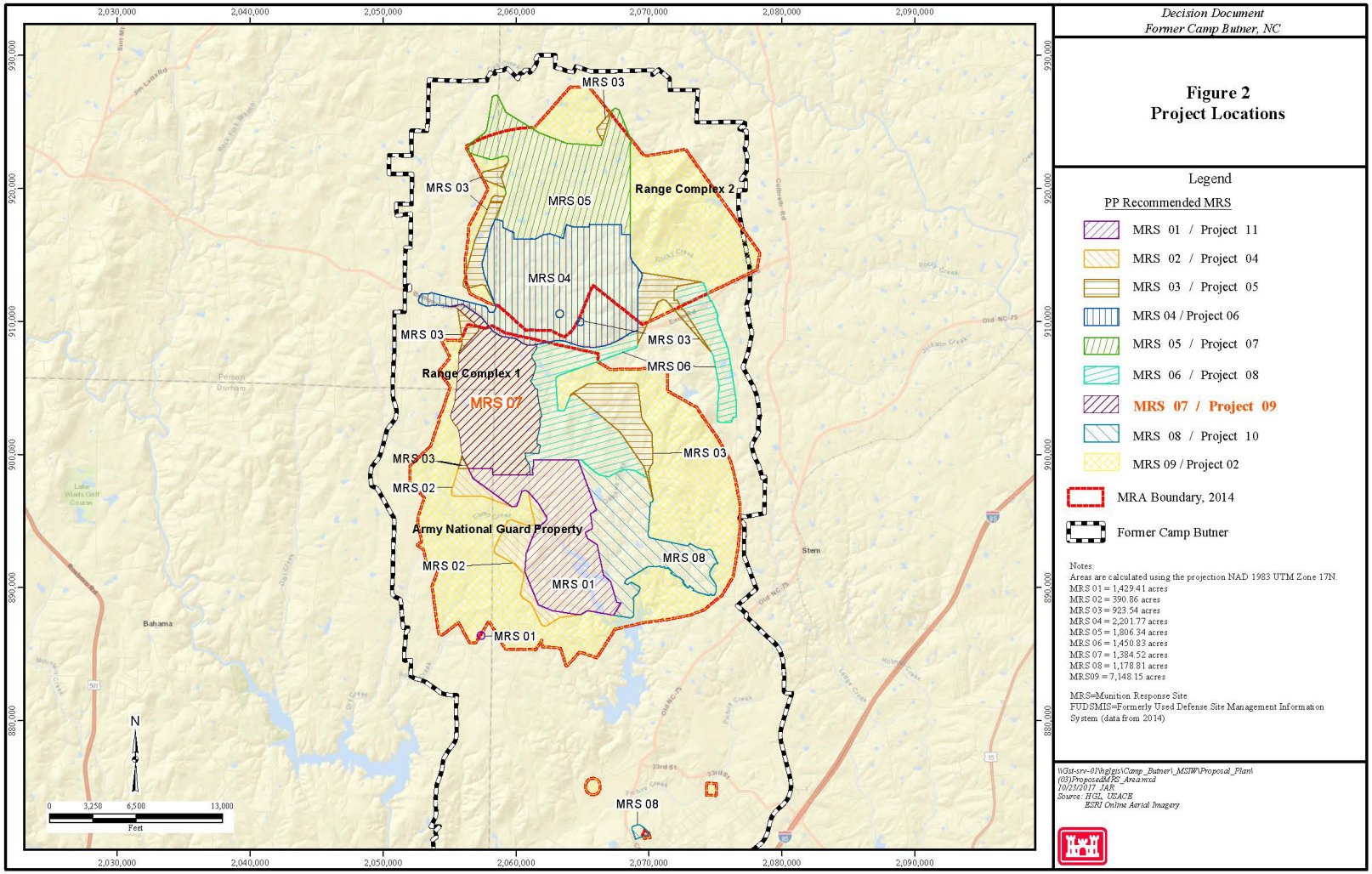

USACE Proposed Plan
Former Camp Butner

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March 2020

PART 2 - DECISION SUMMARY

2.1 PROJECT NAME, LOCATION, AND BRIEF DESCRIPTION

The Camp Butner FUDS is located 15 miles north of Durham, North Carolina, and encompasses approximately 40,384 acres in Granville, Person, and Durham counties. MRS-07 mostly lies within the former Range Complex 1 (RC1), is privately owned, and is used for residential, commercial/industrial, agricultural, and recreational purposes. Most parcels of land are less than 10 acres in size with about 134 parcels larger than 50 acres. A large portion of the land is undeveloped and forested, with private residences located throughout the area. Timber harvesting is a common practice across this portion of the Former Camp Butner. The majority of the area is located in Granville County; the remaining portion is located within Durham and Person counties. (HGL, 2016).

Access to MRS-07 is unrestricted. Current land use is residential, commercial/industrial, agriculture, and recreational. Future land use, accessibility, and receptors associated with MRS-06 are not expected to change. Current and future receptors at the MRS include residents, workers (commercial, industrial, construction and utility), recreational users, and visitors. Receptors would primarily be those associated with surface activities; however, some intrusive activities are anticipated (i.e., farming, residential activities, utility construction, and commercial construction). Intrusive activities are anticipated at the MRS to a maximum depth of 15 feet bgs. The RI concluded that MEC found in or around the MRS in surface and subsurface soils confirm the potential for MEC presence to a depth of 40-inches bgs. Therefore, some level of remedial action (RA) is necessary to minimize the risk associated with exposure to MEC potentially present at MRS-07 (HGL, 2016).

2.2 PROJECT HISTORY AND ENFORCEMENT ACTIVITIES

Camp Butner was primarily established to train infantry, artillery, and engineering combat troops for deployment and redeployment overseas during World War II. The installation was active from 1942 until 1946; however, training was only conducted through 1943. Construction of Camp Butner was authorized by the War Department on February 12, 1942. The camp was officially active on August 4, 1942, and occupied approximately 40,384 acres. The various acres compiling the Camp Butner FUDS were acquired by the War Department by:

- 40,201 acres acquired in fee.
- 128.4 acres acquired in 82 easements.
- 2.5 acres acquired in licenses.
- 52.4 acres acquired in 26 leased tracts.

The acquired acreage was owned by multiple private owners and consisted of rural, agricultural, undeveloped wooded, commercial, and residential land use parcels. Camp Butner was established to train infantry divisions and miscellaneous artillery and engineer units. Camp Butner was declared excess by the War Department on January 31, 1947. The installation included approximately 15 live-fire ammunition training ranges, a grenade range, a 1,000-inch (historical reference for an approximately 25-meter range) .22 and .30 caliber range, a gas chamber [personal protective equipment training facility], and a flame thrower training pad. Munitions used at the site included small arms, 2.36-inch rockets, rifle and hand grenades, 37-millimeter (mm) through 155-mm high explosive (HE) projectiles, 60- and 81-mm mortars, and antipersonnel practice mines. Training activities also included the use of demolition items such as trinitrotoluene (TNT) and various initiating and priming materials. Following World War II, the camp was

closed, limited ordnance clearances were performed, and the property was conveyed to the National Guard, the state of North Carolina, local municipalities, and private owners (HGL, 2016).

RC1 existed near the center of the Camp Butner FUDS and contained an artillery impact area, two mortar ranges and several small arms ranges. The range fans for the artillery impact area were identified from historical maps, while the remainder of the range fans used were standard range fans for the individual type of range. All range fans remain within site boundaries and some range fans overlap with others within the complex. Munitions types expected and/or identified included 37mm, 40mm, 57mm, 105mm, 155mm and 240mm projectiles; 60mm and 81mm mortars; 2.36-inch rockets; hand and rifle grenades; and antipersonnel practice mines (HGL, 2016).

2.3 PREVIOUS INVESTIGATIONS AND REMOVAL ACTIONS

The following subsections summarize the findings of historical reports developed for the Camp Butner FUDS and relate to the current MRS-07. There have been three previous Military Munitions Response Program (MMRP) investigations conducted at RC1 and, therefore, MRS-07. The MRS is located in the north-western portion of the RC1 Area of Interest (AOI) as shown in Figure 2. The following information is presented to summarize current site conditions and historical site investigation activities and findings, and to provide background for the discussion on the implementation of AGC and LUCs at MRS-07.

2.3.1 Archives Search Report, 1993 and 2003

An Archives Search Report (ASR) was completed by USACE, Rock Island District for the Camp Butner FUDS in September 1993. The Final ASR summarizes the known nature and extent of MEC contamination as of 1993 and identified several areas requiring further evaluation. A supplement to the 1993 ASR was completed in 2003 in support of preparing the Military Munitions Response Range Inventory (HGL, 2016).

The ASR supplement identified RC1 situated in the east-central portion of the Camp Butner FUDS Munitions Response Area (MRA), which contained an artillery impact area, two mortar ranges, and several small arms ranges. All range fans remain within site boundaries, and some range fans overlap with others within the complex. Munitions types expected and/or identified for the RC1 included: small arms, 2.36-inch rockets, hand grenades, rifle grenades, 37mm, 40mm, 57mm, 105mm, and 155mm projectiles, and 60mm and 81mm mortars (HGL, 2012b).

2.3.2 Engineering Evaluation/Cost Analysis, 2001-2004

The Engineering Evaluation/Cost Analysis (EE/CA) addressed the Flame Thrower Range, RC1, Range Complex 2 (RC2), and Hand Grenade Range (HGR) at the Camp Butner FUDS. At RC1 and RC2, 77 acres were evaluated and divided into approximately 330 grids of 0.25 acres. Grids were distributed throughout suspected former munitions use areas within RC1 and RC2. Intrusive results provided evidence that identified actual impact and munitions use areas. A total of 13 MEC and 1,485 MD items were recovered during the EE/CA. Munitions identified at these AOIs included:

- 37mm, 40mm, 57mm, 105mm, and 155mm projectiles.
- 60mm and 81mm mortars.
- 2.36-inch rockets.
- Hand grenades and rifle grenades.

During the EE/CA investigation, findings made by a property owner at the Lakeview Subdivision, which is within RC1, resulted in the allocation of sampling grids at this location. Based on the intrusive results, which included the demolition of a 37mm projectile, a Time Critical Removal Action (TCRA) was conducted at the Lakeview Subdivision. At the HGR, approximately 8.5 acres were mapped using geophysical techniques and intrusively investigated. No MEC or MD was identified during the HGR

EE/CA. Based on these results, the EE/CA concluded that the nature and extent of MEC had been adequately characterized at the HGR (HGL, 2016).

2.3.3 Time Critical Removal Actions

A TCRA was conducted at the 26-acre Lakeview Subdivision (within RC1 and outside MRS-07) in tandem with the 2001 EE/CA investigation to remove the immediate and imminent danger to public safety posed by the presence of MEC. The TCRA was conducted between November 2002 and March 2003 and included land survey, brush clearance, intrusive removal action, and post-removal digital geophysical mapping (DGM). The TCRA included clearing of all metallic items comparable in mass or larger than a 37mm projectile in the top six inches of soil. During the clearance, six MEC items were recovered and destroyed:

- An electric blasting cap.
- Mk II hand grenade.
- 37mm HE projectile.
- Ml Al Mine fuze.
- 2.36-inch rocket motor with fuze.
- 2.36-inch HE warhead.

The DGM survey indicated the potential for additional UXO contamination. As a result, the EE/CA report recommended an additional removal action for the property (HGL, 2016).

USACE conducted a second TCRA north of Enon Road between June 2003 and May 2004, just north of the 2002/2003 TCRA (within RC1 and outside MRS-07). Approximately 13 acres were cleared around a residential property where HE projectiles had been encountered. Although ordnance debris was prevalent, no MEC was recovered (HGL, 2016).

The above summary is specific to Projects 06 and 10. A TCRA has not been conducted at Projects 07, 08 and 09.

2.3.4 Drinking Well MC Sampling and Characterization, 2004 - 2005

USACE Wilmington District conducted a drinking well sampling event in Camp Butner in August 2004. During the groundwater sampling event, perchlorate concentrations were detected at relatively shallow depths (between 15 and 78 ft) in 12 of 23 drinking water wells, including detected concentrations at one off-site well location. The off-site location was selected for comparison purposes because it was located outside the boundaries of the Camp Butner FUDS. Perchlorate was detected at concentrations that exceed project screening criteria at two well locations, both of which were relatively shallow wells. One homeowner, whose drinking water well was sampled, confirmed the use of Bulldog Soda fertilizer at his residence. Bulldog Soda contains naturally occurring perchlorate concentrations.

Lead concentrations were detected at nine well locations during the drinking well sampling activities. Lead was detected at concentrations that exceeded the project screening criteria at one unfiltered sample location and at one filtered sample location. Lead typically adsorbs to sediment, and these detected concentrations could have been the result of elevated turbidity present in the samples. Other potential sources of lead at the Camp Butner FUDS included munitions, water supply piping, gasoline, vehicle exhaust, and lead-based paint. Groundwater analytical results did not indicate that former DoD activities at the Camp Butner FUDS had impacted the groundwater quality; however, perchlorate and lead concentrations detected in the groundwater warranted supplemental investigation (HGL, 2016).

2.3.5 Munitions Constituents Sampling, Analysis, and Evaluation of FUDS, 2006

A supplemental investigation for MC was conducted at the Camp Butner FUDS MRA in 2006 and is documented in the Munitions Constituents Sampling Report (August 2006). The objective of the investigation was to evaluate MC potentially at six FUDS. Sampling was biased toward heavy use target/impact areas, firing point, and low order detonations/exposed explosives locations, etc. Soil samples were collected from HE impact craters. These samples were analyzed for TAL metals, explosives, and perchlorate. Thirteen soil samples (including one background) and three surface water samples were collected. Only lead was identified as a potential MC associated with former use. Lead was detected in soils at concentrations that exceed U.S. Environmental Protection Agency's (USEPA's) Ecological Soil Screening Levels at 11 of the 13 sample locations, including the background sample location. The report concluded metals detected are not due to MC/MEC based on the presence in background sample results. In addition, impact from MEC on the surface water was not discernable and the regional geology supports the natural occurrence as a potential source of metals detected in the soil and surface water. The results of the study indicated that explosive compound concentrations were not detected in the soil or surface water.

2.3.6 Interim Removal Actions, 2008, 2009, and 2010

Portions of the Lakeview Subdivision that were previously only cleared to a depth of six inches were cleared to depth of detection (within RC1 and outside MRS-07). In addition, Removal action activities were completed at more than 250 parcels (average parcel was approximately 1.75 acres). Land parcel grids investigated were distributed throughout RC1 (and portions of the current MRS-07) and RC2. Removal Action activities were generally focused around existing residential dwellings. Intrusive results indicate the presence of former impact and munitions-use areas. Munitions recovered included 37mm, 57mm, 105mm, and 155mm projectiles; 60mm and 81mm mortars; 2.36-inch rockets; and hand grenades and rifle grenades (HGL, 2016).

2.3.7 Remedial Investigation, 2016

During the RI field investigation, transects of DGM data were collected to develop anomaly densities. At the RC1 AOI, full coverage grid surveys were completed over 3.4 acres of the site, with an additional 1.4 acres of grid coverage completed by analog methods. A total of 749 targets were selected for intrusive investigation; only 1 target resulted in a MEC item, a 2.36-inch rocket warhead, 243 targets resulted in MD items, and 283 targets were miscellaneous farm debris. The remaining 161 targets consisted of "same as" targets, geology, false positives, and no finds. One MEC item (57mm HE projectile, unfuzed) was identified during geophysical data collection. Two additional 57mm projectiles were identified in the same location while establishing the location for demolition operations (HGL, 2016). Figure 3 presents the RI field investigation conducted at the Camp Butner FUDS AOIs. An overview of MRS-07-specific results can be found in Section 2.7.

Ten Incremental Sampling Methodology (ISM) surface soil samples were collected throughout the RC1 AOI in areas of high anomaly density and analyzed for explosives and metals. Because of anomalous dinitrotoluene (DNT) results for the background samples, all background samples and five ISM surface soil sample locations within RC1 were re-sampled and re-analyzed for explosives using an alternate laboratory. The original and re-sampled results were pooled into one dataset. The laboratory analysis revealed that surface soil does not pose a threat to human health, and that no unacceptable ecological risk was associated with MC in surface soil (HGL, 2016).

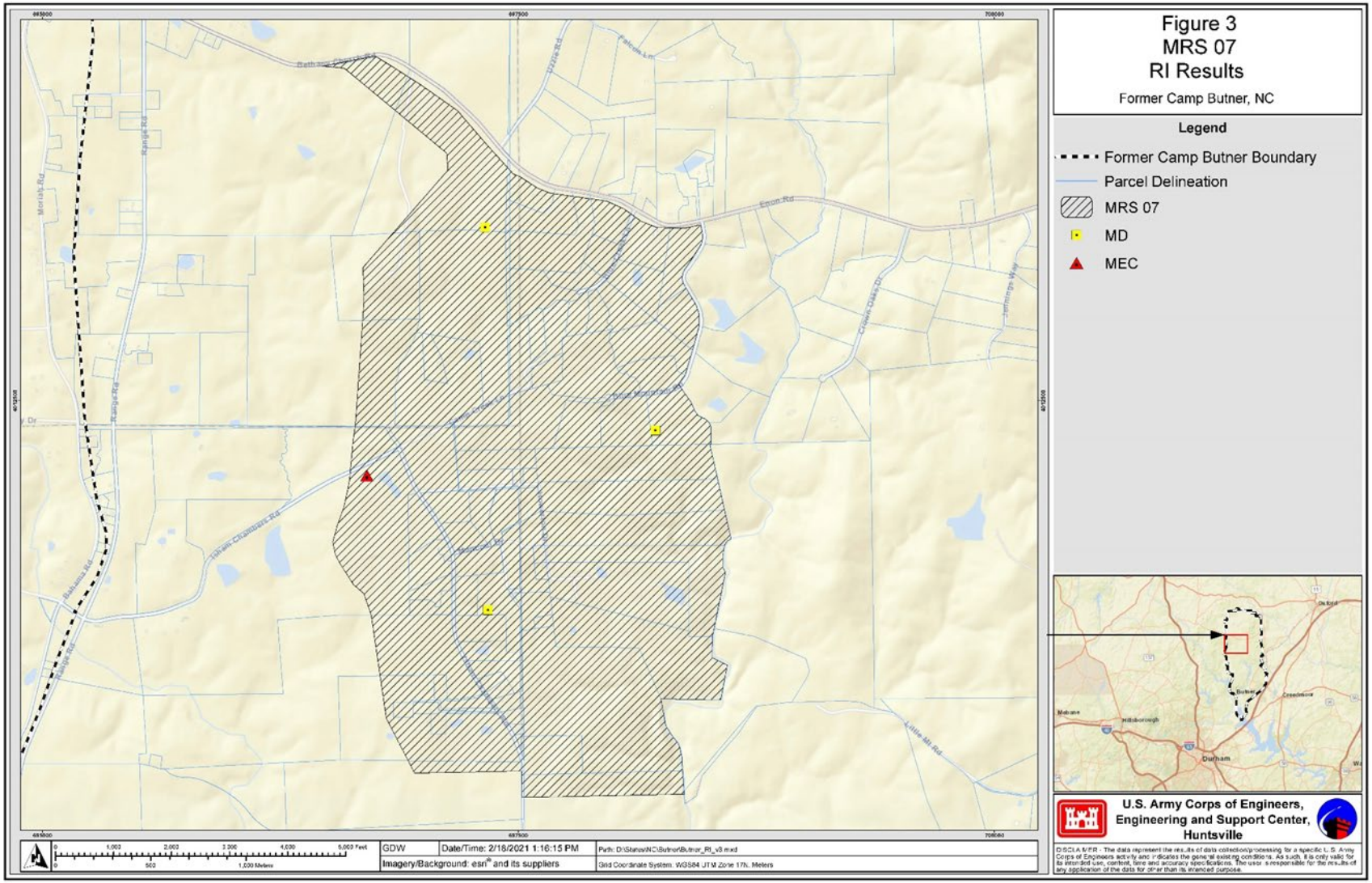
Figure 3
MRS 07
RI Results
Former Camp Butner, NC
Legend
Former Camp Butner Boundary
Parcel Delineation
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Engineering and Support Center,
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Imagery/Background: esri and its suppliers

2.4 CERCLA ENFORCEMENT ACTIVITIES

To date, there have been no CERCLA-related enforcement activities at the project site.

2.5 COMMUNITY PARTICIPATION

Community participation in the process leading to this Decision Document falls into three categories: 1) dissemination of information to the community; 2) stakeholder involvement in the technical project planning (TPP) process; and 3) community participation. These three areas are described in more detail below. USACE developed and updated a Community Relations Plan (CRP) for the purposes of managing this effort (HGL, 2012a).

2.5.1 Information Dissemination

The following activities were conducted to disseminate information to the community near the Camp Butner FUDS:

- A public record repository for the Camp Butner FUDS Administrative Record was established at the South Granville Public Library, located at 1550 S. Campus Drive, Creedmoor, NC 27522.
- A public information session (public meeting) was held during a Restoration Advisory Board (RAB) meeting on April 26, 2012, at the Butner Town Hall. The purpose of the public meeting was to provide an overview of the RI/FS work planned for the Camp Butner FUDS. A public notice was published in the local newspaper to announce the public information session.
- A CRP was prepared and finalized in August 2012 for the Camp Butner FUDS (HGL, 2012a). The CRP was completed to encourage two-way communication between USACE and the community surrounding the Camp Butner FUDS. The CRP included plans to disseminate information to the public via direct mailings, public meetings, and the establishment of the public record repository.
- A second public meeting was held on April 18, 2013, at the Butner Town Hall. The purpose was to discuss the planned activities to be conducted during the RI/FS fieldwork in May of 2013. The meeting allowed for the exchange of information between USACE and the community regarding site activities. Public notice was provided in the local newspaper announcing the second public meeting.
- A third public meeting was held on April 16, 2018, at the Butner Town Hall to present the findings of the RI, and FS, and discuss the Preferred Alternative presented in the Proposed Plan (PP). This public meeting encouraged public feedback on the PP during the public comment period being held from March 26, 2018, to April 30, 2018.
- In total, five RAB meetings have been held. They were held on April 26, 2012; April 25, 2013; May 6, 2014; June 1, 2016; and November 28, 2017, at the Butner Town Hall Multi-Purpose Room, to provide the public with a status update and present the results and recommendations of the 2016 Final RI Report (HGL, 2016) and 2018 Final FS Report (HGL, 2018a), respectively. The RAB is still active but has not met since 2017. The RAB chairman postponed further meetings until new items became available for the agenda. The Savannah District project manager maintains contact with the chairman and will schedule the next meeting at the discretion of the RAB.

2.5.2 Technical Project Planning

The initial TPP Meeting was held on November 10, 2011. Participants (stakeholders) were provided with an overview of the TPP process, the site history, project objectives, proposed remedial approach, data

quality objectives, and the project schedule. Officials from public offices (regulators, law enforcement, fire departments, elected officials, utilities, etc.) whose departments may be affected by the activities at the Camp Butner FUDS were invited to participate in the TPP process for the investigation of the project site. Stakeholders then worked with USACE to identify concerns related to ordnance activities at Camp Butner FUDS, to agree upon a general approach to further investigation(s), and to reach a consensus on a site closeout statement. Further communication with stakeholders took place during subsequent TPP meetings held on September 5, 2012, and May 6, 2014.

2.5.3 Community Participation

Public meetings were held on April 26, 2012, April 18, 2013, and April 16, 2018, at the Butner Town Hall (see Part 2.5.1). Based on the results and conclusions of the RI and prior investigations, the presence of MEC has been confirmed and the potential for receptors to come into contact with MEC at MRS-07 remains. For these reasons, evaluation of MRS-07 in a FS was necessary. USACE recommended Alternative 5, Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using AGC Methods, as the Preferred Alternative in the PP (USACE, 2020). The PP was made available to the public between March 26, 2018, and April 30, 2018, for public review and comment. Part 3 of this DD documents the feedback received during the public comment period.

Alternatives 4 and 5 in the Proposed Plan did not include Land Use Controls as a remedy component because the Proposed Plan anticipated that Alternatives 4 and 5 would remove munitions and explosives of concern hazards to a degree that would allow for UU/UE. The analysis, however, did not account for certain physical obstructions on the site that would prevent the alternatives from achieving a clearance level that would allow for UU/UE. For example, complete removal of structures (e.g., residences) and other infrastructure would be required to implement these alternatives; however, such efforts would be very costly and, importantly, not supported by property owners. Consequently, a UU/UE alternative would be impossible to implement for this site. To account for MEC hazards remaining due to physical obstructions, USACE added Land Use Controls to Alternatives 4 and 5 post-Proposed Plan for consideration in this Decision Document to ensure the alternatives are protective. The documentation of this significant change to the preferred alternative in the Proposed Plan is in Section 2.15 below.

2.6 SCOPE AND ROLE OF RESPONSE ACTION

The selected remedy must be protective of the receptors associated with current and reasonably anticipated future land use. Current and future land use throughout MRS-07 includes residential, commercial/industrial, agriculture, and recreational uses. The final response action for this site, as described in this Decision Document, is focused on eliminating surface and subsurface hazards to potential receptors (residents, occupational workers, recreational users, and visitors) and educating and making those receptors aware of possible munitions related hazards that may be present within MRS-07.

2.7 PROJECT CHARACTERISTICS

2.7.1 Conceptual Site Model

A conceptual site model (CSM) is a representation of a site and its environment that is used to facilitate understanding of the site and the potential contaminant exposure pathways that might be present. The CSM describes potential contamination sources and their known or suspected locations, human and/or ecological receptors present, and the possible interactions between the two. The CSM summarizes which potential receptor "exposure pathways" for MEC and MC-related contamination are (or may be) "complete" and which are (and are likely to remain) "incomplete." An exposure pathway is considered incomplete unless all of the following elements are present: (a) a source of MEC or MC-related contamination; (b) a receptor that might be affected by that contamination; and (c) a method for the receptor to be exposed to (i.e., come

into contact with) the contamination. If all of these elements are present, an exposure pathway is considered complete.

Following completion of the RI, the MEC CSM for the recommended MEC contaminated areas of the Camp Butner FUDS was created to reflect the status of MEC exposure pathways using the results of the investigations. The MEC CSM for the project site indicated that MEC is potentially present in surface and subsurface soil at the MEC contaminated portions of the RC1 AOI (which includes MRS-07). MEC present at the surface or subsurface soil would provide a source of MEC for a complete exposure pathway (HGL, 2016).

MRS-07 is located primarily within the RC1 AOI investigated during the RI. Current land use within the MRS is residential, commercial/industrial, agricultural, and recreational. It is anticipated that future land use will remain the same. Based on this land use, the primary receptors in the site are residents, occupational workers, recreational users, and visitors. The presence of a known/suspected source of MEC and possible receptors means that potentially complete exposure pathways are present at the site that could result in these identified current or future receptors being exposed to explosive hazards at the project site.

The MEC exposure pathways are summarized in Table 2.1. USACE determined that MC exposure pathways are incomplete; therefore, the CSM does not include consideration of MC.

Table 2.1 - MEC Conceptual Site Model

Primary Source	Munitions Items Identified	Current/Future Land use	Potential Receptors	Receptor/Interaction Exposure Route	Pathway Complete/ Incomplete
Western MEC Contaminated MRS	2.36-inch rocket warhead; 37 mm projectile; 40 mm expended projectile; 57 mm projectile; 57 mm projectile (AP-T, HE); 105 mm (MK1, HE); 155 mm projectile (rotating band); Hand grenade; and unidentifiable fragmentation debris	Residential, Commercial/ Industrial, Agricultural, and Recreational Use	Residents, Occupational workers, Recreational users, and Visitors	Handling or stepping on surface munitions; and contacting subsurface munitions during intrusive activities (such as digging)	Complete

2.7.2 MRS Overview

MRS-07 is the Western MEC Contaminated Area MRS. The property that comprises the MRS-07 area is approximately 1,385 acres in size within the 12,363-acre RC1 property investigated during the RI. The 1,385 acres associated with the MRS were used for military training as part of the Camp Butner FUDS according to previous investigations and historical aerial photographic analysis.

MEC and MD have been identified within MRS-07 during previous investigations and the RI. Access to the area is unrestricted, and the current/future land use consist of residential, commercial/industrial, agricultural, and recreational land uses.

2.7.3 Potential Contamination Sources

RC1 was evaluated for potential contamination sources using past investigations, information of previous land use, munitions found or suspected munitions use areas, and the current land use. MEC and MD were

found within RC1 (which surrounds MRS-07) and within MRS-07 during previous investigations and the RI field effort (Figure 3).

2.7.4 Sampling Strategy

2.7.4.1 Investigation of Munitions and Explosives of Concern

To support MEC characterization during the RI, DGM transects, DGM grids, and Analog grids were completed within RC1. A total of 6.83 miles of DGM transects, four DGM grids, 0 Analog grids, and 83 targets were intrusively investigated within RC1. Of the intrusively investigated targets, targets resulted in four MEC items recovered, seven MD items, 29 were classified as miscellaneous cultural debris, and 43 targets were described by the field teams as geology, false positives, quality control (QC) seeds, or no finds.

Table 2.2 summarizes the RI field activities that lie within MRS-07. Table 2.3 summarizes the intrusive results at the RC1 AOI that lies within MRS-07.

Table 2.2 - Summary of RI Field Activities Completed

Activity Description	Unit	Quantity
Site Acreage	Acres	1,385
DGM Transects	Miles	6.83
DGM Grid Investigations	Each	4
Analog Grid Investigations	Each	0
Reconnaissance Transects	Miles	0.2
Intrusive Targets	Each	83

Table 2.3 - Summary of RI Intrusive Investigation Results

Anomaly Type	No. Items Found	Description
Miscellaneous Debris	29	Farm Debris – Barbed wires, cans, bolts, wires, nails, chain links, etc.
MD	7	Fragments
Other	43	Geology, No Contacts, QC Seeds, No Finds
MEC	4	Munitions and Explosives of Concern

2.7.4.2 Investigation of Munitions Constituents

Following the completion of the DGM surveys and intrusive investigation activities, USACE completed environmental sampling activities in biased locations to determine if MC-related contamination was present. Based on the analytical results, a Baseline Risk Assessment (BLRA) was conducted to characterize the nature and extent of the release and to assess whether the MC present poses a potential risk to human health and the environment.

As summarized in the RI Report, the presence of two explosives analytes were reported in all sample locations. Two explosives (2,4-DNT and 2,6-DNT) were detected in all samples, including the background samples. For data quality control, select sample locations from each MRS and background areas were re-collected as confirmation samples and re-analyzed for explosives using an alternate laboratory (TestAmerica) from the laboratory used in the analyses conducted in July and August 2013 (Microbac). The re-analyzed results were treated as duplicate results of the original samples. Because of anomalous 2,4-DNT and 2,6-DNT results in the background soil samples, all background locations and select sample locations from each MRS were resampled for explosives analysis in October 2013. Based on the evaluation

of all analytical data packages, it was determined that both the initial and re-sampled explosives results were usable. The results of the MC investigation at the RC1 AOI conducted during the RI are described in further detail below.

- May 2013 - 10 ISM soil samples collected; 100-ft by 100-ft ISM decision units (DUs), 36 increments each, analyzed for explosives and select metals.
- October 2013 – All background and five ISM background soil sample locations; 100-ft by 100-ft ISM DUs, 36 increments each, analyzed for explosives only.
- Explosives analysis was conducted by Method 8330B and select metals analysis for copper, lead, antimony, and zinc was conducted by method 6010B.
- Based on the conclusion that no MC is present on site at levels that present a risk to human health or the environment, there is no MC contamination identified in surface soils. Therefore, no sampling of additional media such as sediment, surface water, subsurface soils, or groundwater was necessary.

Concentrations from the May 2013 sampling exceeded health-based screening values. Because the screening level risk estimates were in the middle or on the low end of the target risk range and because the October 2013 re-sampling results did not replicate the original detections, it was concluded that MC at the three AOIs (RC1, RC2, and Army National Guard) does not pose an unacceptable risk to human health (HGL, 2016).

2.7.5 Known or Suspected Sources of Contamination

Seven items classified as MD were recovered during the RI within RC1 which lies within the MRS-07 boundary. The MD items recovered were determined to be fragmentation associated with 37mm and 57mm projectiles. MD items associated with the 37mm were recovered between two and six inches bgs. MD items associated with the 57mm were recovered between six and 14 inches bgs. Four items that were recovered within the MRS-07 boundary during the intrusive investigations at RC1 were determined to pose an explosive hazard (classified as MEC). The MEC items were three 57mm HE projectiles and a 2.36-inch Rocket Warhead between 6-14 inches and two inches bgs, respectively. Previous investigations and removal actions have also recovered MEC and MD from 11 locations throughout MRS-07.

2.7.6 Types of Contamination and Affected Media

Anticipated contamination at MRS-07 consists of MEC. The contaminated media include surface and subsurface soils to a depth of 40 inches bgs.

2.7.7 Location of Contamination and Exposure Routes

DGM transects, grids, and subsequent intrusive investigations confirmed the presence of MD within Project 09 as shown on Figure 3. The maximum suspected depth of munitions contamination anticipated at Project 09 is 40 inches bgs. Based on the current and future land use as residential, commercial/industrial, agricultural, and recreational, the receptors at MRS-07 include residents, occupational workers, recreational users, and visitors. These receptors are anticipated to potentially handle or step on MEC located on the surface; or contact subsurface MEC during intrusive activities, such as residential activities, farming, and utility construction from 0 to 40 inches and deeper. Unless physically moved by human activities, the munitions contamination potentially remaining within the surface and subsurface soils of the MRS is unlikely to migrate from its current location, or to other media.

The exposure pathways for MC-related contamination are incomplete for the site because comparison of data to site screening levels indicate there is no unacceptable risk (see section 2.7.4.2).

2.8 CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

2.8.1 Land Use

Current land use within MRS-07 includes residential, commercial/industrial, agricultural, and recreational. It is anticipated that future land use will remain consistent with current land use, with anticipated future residential development. The presence of a known/suspected source of MEC and possible receptors means that complete exposure pathways are present at the site that could result in current or future human receptors being exposed to explosive hazards at MRS-07.

2.8.2 Groundwater and Surface Water Uses

Groundwater and nearby surface water could potentially be used for domestic, irrigation, or drinking water sources for the area. Groundwater results from the 2005 Residential Well Sampling Event (groundwater) and the 2006 MC Sampling Event (soil and surface water) were considered during the planning process of the RI. The Residential Well Sampling and MC Sampling reports identified the presence of metals and perchlorate and indicated their presence is most likely due to non-DoD sources. Based on this information and the RI conclusions, there are no complete exposure pathways for groundwater or surface water identified for MC at MRS-07.

2.9 SUMMARY OF PROJECT RISKS

2.9.1 Human Health and Ecological Risks

2.9.1.1 Risks from Munitions and Explosives of Concern

Evaluation of previous investigation findings and data collected during the RI identified an area within the Camp Butner FUDS as MEC contaminated. After completions of the RI, the MEC contaminated area was delineated into nine MRSs based on land use and munitions types. MD from 37mm, 57mm mortars and unknown fragments) were identified within the MRS during the RI field effort. Several historical investigations and removal actions have resulted in the identification of items determined to pose an explosive safety hazard (Table 2.1). Therefore, an explosive hazard to current and future receptors exists within MRS-07 (USACE, 2019).

The MEC exposure pathway is complete for surface and subsurface soil because the presence of MEC has been confirmed at the project site. Therefore, there exists a potential for current and future human receptors to come into contact with MEC. Implementation of Surface and Subsurface Removal of MEC to a Depth of Detection Using AGC Methods and LUCs will reduce the risk of human exposure to explosive hazards by removing potential MEC items and educating people of the actions to take should they encounter a suspected military munitions.

Land use at MRS-07 consists of residential, commercial/industrial, agriculture, and recreational land uses. The expected current and future receptors at the MRS includes residents, occupational workers, recreational users, and visitors. There are no ecological receptors for explosive hazards. Receptors are anticipated to conduct surface and subsurface activities to a maximum depth of 15 feet throughout the MRS. Munitions contamination is not expected to occur at depths greater than 40 inches bgs. Receptors within the site will remain consistent throughout the foreseeable future and future land use will potentially include both intrusive and non-intrusive activities.

2.9.1.2 Risks from Munitions Constituents

A Baseline Risk Assessment (BLRA), conducted during the RI in accordance with USACE and U.S. Environmental Protection Agency (USEPA) guidance, included a human health risk assessment (HHRA) and a Screening Level Ecological Risk Assessment (SLERA). The HHRA evaluated current and potential future receptors that could come into contact with soil at the project site. As discussed in section 2.7.4.2 of

this DD, soil samples were collected throughout the Camp Butner FUDS and analyzed for explosives and select metals (antimony, copper, lead, and zinc); however, all results indicate that MC-related contamination in the Camp Butner FUDS soil does not pose a threat to human health. MC-related contamination exposure pathways are considered incomplete and the baseline human health risk assessment indicates that MC-related contamination does not pose a risk to current or future human receptors.

2.9.2 Ecological Risks

Based on the site history, the potential contaminants of ecological concern include antimony, lead, zinc, copper, and explosives. The SLERA, conducted as a part of the BLRA, evaluated potential threats to terrestrial plants, soil invertebrates, terrestrial wildlife (mammals and birds) to contaminants at RC1. This evaluation considered exposure of upper trophic level receptors through the food web. Conclusions of the SLERA included the following:

- The initial screening of maximum concentrations to benchmark values identified lead as a contaminant of potential ecological concern.
- Lead was retained for food web analysis with respect to birds and mammals.
- Lead contamination in soil at the RC1 AOI was determined to pose a minimal threat to herbivorous birds, carnivorous birds, and mammals. Lead does not pose a threat to plants or soil invertebrates.

The SLERA evaluated potential threats from exposure to plants, soil invertebrates, mammals, and birds to the contaminants of potential ecological concern identified for RC1. As documented in the Final RI Report, no actionable ecological risk was identified for RC1 (HGL, 2016). Based on this conclusion, no ecological risks are anticipated within MRS-07.

2.9.3 Basis for Response Action

The RI results were sufficient to characterize MRS-07. The RI and previous investigations identified MEC and MD within the portions of RC1 that compose MRS-07, the delineated "Western MEC Contaminated" MRS. These results were used to define the MEC contaminated area at the Camp Butner FUDS and to support the development and future execution of a response action within the MRS. Accordingly, a remedial action is necessary to protect the human health or welfare and the environment from the threat of explosive hazards, but not from MC.

2.10 REMEDIAL ACTION OBJECTIVES

RAOs are both site-specific and contaminant-specific and define the conditions determined by the project team to be protective of human health and the environment. The RAO for MRS-07 addresses the goals for reducing the MEC hazards within the Western MEC Contaminated MRS to ensure protection of human health, safety and the environment. It was determined during the RI that MC-related contamination did not present a risk to human health or the environment. Therefore, no RAO for MC-related contamination has been established (HGL, 2016).

The RAO established in the FS and summarized in the PP for MRS-07 is to mitigate the unacceptable risk of an incident to occur for human receptors over the entire MRS-07 to the detection depths of the applicable munitions of concern such that a determination can be made that there is a negligible risk of an incident to occur.

2.11 DESCRIPTION OF ALTERNATIVES

Five remedial alternatives were evaluated during the 2018 FS, based on the nature, extent, reasonably anticipated future land uses, and RAO. The selected alternative was identified as Alternative 5, Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using AGC Methods. The Proposed

Plan anticipated that Alternatives 4 and 5 would remove MEC hazards to a degree that would allow for UU/UE. The analysis, however, did not account for certain physical obstructions on the site that would prevent the alternatives from achieving a clearance level that would allow for UU/UE. For example, complete removal of structures and other infrastructure would be required to implement these alternatives; however, such efforts would be very costly and not supported by property owners. Consequently, a UU/UE alternative would be impossible to implement for this site. To account for MEC hazards remaining due to physical obstructions, USACE added LUCs to Alternatives 4 and 5 for consideration in this DD to ensure the alternatives are protective. A description of each of the alternatives developed for consideration is presented below.

Five-Year Reviews, as outlined in Section 121(c) of CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and Section 300.430 (f) (ii) of the NCP, are required for sites (at minimum of every five years) where hazardous substances, pollutants, or contaminants remain above levels that allow UU/UE following implementation of the remedy.

Because UU/UE will not be achieved with the selected remedy, Five-Year Reviews are required.

2.11.1 Alternative 1: No Further Action

2.11.1.1 Remedy Components

Under Alternative 1, No Further Action would be taken to address the MEC identified at the project site.

2.11.1.2 Common Elements and Distinguishing Features

The No Further Action alternative means that no remedial action would be implemented to reduce MEC that potentially remain at the site. No Further Action would be taken to address the MEC identified at the project site. This alternative would involve continued use of the site in its current condition. Under CERCLA, evaluation of a No Further Action alternative is required pursuant to the NCP to provide a baseline for comparison with other remedial technologies and alternatives. Alternative 1 does not implement any remedy to reduce potential risk. Therefore, it does not provide long-term protection of human health and the environment.

Estimated Total Cost: $0
Estimated Total Present Value: $0
Estimated Timeframe: NA

2.11.1.3 Expected Outcomes

This alternative would involve continued use of the site in its current condition and would not alter the explosive hazards present in the MRS.

2.11.2 Alternative 2: Land Use Controls (LUCs)

2.11.2.1 Remedy Components

The components of Alternative 2 would include:

- Educational pamphlets, including development and distribution.

2.11.2.2 Common Elements and Distinguishing Features

LUCs are composed of administrative institutional controls and/or physical measures (engineering controls) to prevent or limit exposure of receptors to MEC. Deed notices, zoning ordinances, special use permits, and restrictions on excavation are examples of institutional controls. Physical barriers and access restrictions (for example, fencing, locked gates, and warning signs) or activity restrictions (prohibiting intrusive activities) are examples of engineering controls. LUCs can be cost effective, reliable, and immediately

effective, and can be implemented either alone or in conjunction with other remedial components. Inspections and monitoring typically are required to document the long-term effectiveness of LUCs.

Alternative 2 includes making educational pamphlets available to site workers, visitors/recreational users, and other personnel who are known to access the site. The pamphlet would inform people of potential explosive hazards and safety precautions to be taken to avoid contact with MEC. No MEC clearance would be conducted prior to proceeding with this alternative. Costs would include those for developing educational (initial) pamphlets and their periodic reoccurring distribution. There are no applicable or relevant and appropriate requirements (ARARs) identified for this alternative. The period of performance of Alternative 2 is perpetuity and when the actual length of time cannot be determined, EPA policy allows for 30-year estimates. This timeframe limit is utilized for the purposes of cost estimation. Alternative 2 would not allow UU/UE following completion of the remedy, thus Five-Year Reviews would be required.

Long-term effectiveness of this alternative is limited because educational pamphlets may not be effective for all human receptors.

Estimated Capital Cost: $131,339
Estimated Maintenance Cost for 30 years: $48,224
Estimated Five-Year Review Costs for 30 years: $201,560

2.11.2.3 Expected Outcomes

This alternative would involve continued use of the site in its current condition. The alternative will reduce the probability of human encounters with MEC and the probability of an encounter resulting in an unintended detonation of MEC. The alternative will not allow UU/UE following completion of the remedy and thus would require Five-Year Reviews.

2.11.3 Alternative 3: Surface Removal of MEC Using Analog Detection Methods and LUCs

2.11.3.1 Remedy Components

The components of Alternative 3 would include:

- Conducting a surface clearance of MEC throughout the MRS.
- Educational pamphlets, including development and distribution.

2.11.3.2Common Elements and Distinguishing Features

The primary component of Alternative 3 is surface removal of MEC from MRS-07. Surface removal at MRS-07 would result in a reduction in hazards on the ground surface; however, hazards would remain within the subsurface soils of MRS-07. Field tasks associated with Alternative 3 would include surveying, vegetation clearance, surface clearance, investigation and removal of anomalies potentially representing MEC using analog magnetometers, and disposal of any MEC, MPPEH, or MD. Vegetation cutting/clearance would only be conducted where necessary to complete surface clearance operations. Surface clearance would be completed by qualified UXO technicians using analog magnetometers, such as the Schonstedt GA-52Cx, or equivalent. For the purposes of cost estimation, this alternative assumes that there would be seven clearance teams composed of two UXO Technician IIs, and one UXO Technician III (team leader) each, with oversight provided by one Senior UXO Supervisor (SUXOS), one UXO Quality Control Specialist (UXOQCS), and one UXO Safety Officer (UXOSO) completing the work over 40-hour workweeks. Any MEC encountered during the surface clearance would be blow-in-place (BIP). If acceptable to move, MEC would potentially be consolidated for demolition. It is assumed that on-call explosives would be used for one demolition event per week of investigation. MEC items would be guarded by an unarmed security guard during nonworking hours. All MD recovered would be inspected, verified, certified as material documented as safe, containerized, and shipped to an approved off-site facility for disposal. All areas disturbed during surface clearance activities would be restored and re-seeded. Similar to

Alternative 2, educational pamphlets would be developed and distributed within and around the MRS. When the actual length of time cannot be determined, then EPA Policy allows for 30-year estimates.

Estimated Capital Cost: $16,866,570
Estimated Maintenance Cost for 30 years: $39,142
Estimated Five-Year Review Costs for 30 years: $201,560

2.11.3.3 *Expected Outcomes*

This alternative would involve continued use of the site in its current condition. The alternative will reduce the probability of human encounters with MEC and the probability of an encounter resulting in an unintended detonation of MEC. The alternative will not allow UU/UE following completion of the remedy and thus would require Five-Year Reviews.

2.11.4 Alternative 4: Surface Clearance and Subsurface Removal of MEC to the Depth of Instrument Detection Using DGM Detection Methods and LUCs

2.11.4.1 Remedy Components

The components of Alternative 4 would include:

- Surface clearance and subsurface removal of MEC to a depth of detection using DGM detection methods.
- Educational pamphlets, including development and distribution; and
  Warning signs, including development and installation.

2.11.4.2 Common Elements and Distinguishing Features

The primary component of Alternative 4 is surface clearance and subsurface removal of MEC from MRS-07 to a Depth of Detection. Based on land use, the estimated maximum depth of intrusive activities to potentially occur within the MEC-contaminated area of the MRS is 15 feet bgs, with maintenance and utility workers potentially conducting trenching activities for underground utilities. The minimum depth of removal as required to meet the RAO may be to the depth of 40 inches bgs; however, this depth will be munitions-specific. An evaluation of the depth of detection specific to each munition present in the MRS was completed in the FS and summarized in the PP. The depth of a majority of items located within the MRS during the RI field activities was 24 inches bgs. However, previous historical investigations have recovered items as deep as 40 inches bgs. Therefore, surface clearance and subsurface removal of MEC would result in a reduction of accessible, potentially explosive hazards.

Field tasks associated with Alternative 4 would include vegetation clearance, surface clearance, DGM surveys, intrusive investigation, and removal of anomalies potentially representing subsurface MEC to a depth of detection using DGM methods, as well as disposal of any MEC (i.e., MEC, UXO, discarded military munitions [DMM]), MPPEH, or MD recovered in the search of hazards. DGM technology has been proven effective at detecting metallic subsurface anomalies; however, these detections do not differentiate between munitions items and harmless metallic debris. DGM methods are technically feasible but limited in some areas based on vegetation, terrain, structures (e.g., buildings, slabs) and infrastructure (e.g., roads, parking lots, utilities). MEC items encountered during the clearance would be BIP. Post-BIP sampling of soil for explosives residue would be conducted following detonation of MEC items.

This alternative also includes LUCs because physical obstructions (i.e., buildings, roads, dense vegetation, etc.) may prevent removal of MEC hazards in certain areas. The LUCs will make educational pamphlets available to site workers, school children, visitors/recreational users, and other personnel who are known to access the site. The pamphlet would inform the public of potential explosive hazards and safety precautions to be taken to avoid contact with potential remaining MEC. Additionally, warning signs would

be installed with the intent of limiting exposure to potential remaining MEC by informing site users about the potential hazards at the site.

The period of performance of this alternative is perpetuity and when the actual length of time cannot be determined, EPA policy allows for 30-year estimates. This timeframe limit is utilized for the purposes of cost estimation. This alternative would not allow UU/UE following completion of the remedy, thus Five-Year Reviews would be required.

Estimated Capital Cost: $88,066,856
Estimated Maintenance Cost for 30 years: $48,224
Estimated Five-Year Review Costs for 30 years: $201,560

2.11.4.3 Expected Outcomes

It is anticipated that surface and subsurface removal of MEC under this alternative would reduce exposure to hazards to a minimal likelihood of a potential MEC encounter. Exposure to remaining MEC hazards will be reduced by the dissemination of educational pamphlets and posting warning signs.

2.11.5 Alternative 5: Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using Advanced Geophysical Classification Methods and LUCs

2.11.5.1 Remedy Components

The primary component of Alternative 5 would include:

- Surface and subsurface removal of MEC to a depth of detection using AGC methods.
- Educational pamphlets, including development and distribution.
- Warning signs, including development and installation.

2.11.5.2 Common Elements and Distinguishing Features

Alternative 5 would consist of conducting surface and subsurface removal of MEC to depth of detection using Advanced Geophysical Classification (AGC) methods. Similar to Alternative 4, Alternative 5 would involve DGM surveys; however, subsurface metallic anomalies would be further characterized using AGC methods prior to intrusive investigation. The implementation of AGC will differentiate between munitions items and non-hazardous metallic debris. Implementation of AGC would reduce the required intrusive investigations resulting in lower costs and time to complete the removal action. Similar to DGM, AGC would result in a digital record that can be easily verified. Long-term reliability associated with this alternative is considered high because of the effectiveness of the detection technology, and the permanence associated with subsurface MEC removal. Alternative 5 would reduce the risk posed by MEC.

Field tasks associated with Alternative 5 would include vegetation clearance, surface clearance, dynamic survey, classification of anomalies using AGC, and removal of anomalies classified as targets of interest (TOIs) using AGC methods, and disposal of any MEC and MD recovered in the search for MD. AGC is technically feasible in most locations. If classification was not feasible, standard DGM or analog methods would be used with approval by USACE. MEC items encountered during the clearance would be BIP. Post-BIP sampling of soil for explosives residue would be conducted following demilitarization of MEC.

MEC items encountered during clearance would be Blow-In-Place (BIP). Post-BIP sampling of soil for explosives residue would be conducted following demilitarization of MEC.

This alternative also includes LUCs because physical obstructions (i.e., buildings, roads, dense vegetation, etc.) may prevent removal of MEC hazards in certain areas. The LUCs will make educational pamphlets available to site workers, school children, visitors/recreational users, and other personnel who are known

to access the site. The pamphlet would inform people of potential explosive hazards and safety precautions to be taken to avoid contact with potential remaining MEC. Additionally, warning signs would be installed with the intent of limiting exposure to potential remaining MEC by informing site users about the potential hazards at the site.

The period of performance of this alternative is perpetuity and when the actual length of time cannot be determined, EPA policy allows for 30-year estimates. This timeframe limit is utilized for the purposes of cost estimation. This alternative would not allow UU/UE following completion of the remedy, thus Five-Year Reviews would be required.

Estimated Capital Cost: $32,448,517
Estimated Maintenance Cost for 30 years: $48,224
Estimated Five-Year Review Costs for 30 years: $201,560

2.11.5.3 Expected Outcomes

It is anticipated that surface and subsurface removal of MEC under this alternative would reduce exposure to hazards to a minimal likelihood of a potential MEC encounter. Exposure to remaining MEC hazards will be reduced by the dissemination of educational pamphlets and posting warning signs.

2.12 COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial action alternatives were compared and evaluated using nine criteria during the detailed analysis of alternatives in the FS. The nine criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description and purpose of the three groups follows:

- **Threshold criteria** - which are requirements that each alternative must meet in order to be eligible for selection.
- **Primary balancing criteria** - which are used to weigh major trade-offs among alternatives.
- **Modifying criteria** - which was fully considered after public comment was received on the Proposed Plan. In the final balancing of trade-offs between alternatives upon which the final remedy selection is based, modifying criteria, such as community acceptance, are of equal importance to the balancing criteria.

Table 2.5 describes each of these criteria that were used to evaluate the remedial alternatives for MRS-07. A summary of the detailed analysis of the remedial alternatives using the nine evaluation criteria as presented in the FS and PP are included in Table 2.6 for threshold criteria, Table 2.7 for primary balancing criteria, Table 2.8 for cost.

2.12.1 Overall Protection of Human Health and the Environment

The protectiveness criterion was evaluated in terms of possible future human interaction with MEC. Each alternative was also evaluated in terms of whether it would reduce the amount of munitions within the site, and the projected effects it would have on the existing environment.

Alternative 1, No Further Action, is not protective of human health and the environment. This alternative provides no reduction of MEC hazards, no reduction of future risk, and no protection to human receptors.

Alternative 2, LUCs, would restrict digging and minimize possible receptor interaction by providing warning of MEC contaminated soils, thus reducing the potential for contaminant exposure. Warning signs can be effective in reducing access to an area but are dependent on the cooperation of landowners and authorized visitors for implementation. Although there would still be risk to potential future receptors

conducting intrusive activities, Alternative 2 is considered overall protective of human health and the environment.

Alternative 3, surface removal and LUCs, provides protection to human receptors, but does not completely eliminate risk since MEC remains in the subsurface, where intrusive activities may result in receptors contacting MEC. Alternative 3 provides limited overall protection.

Alternatives 4 and 5 would provide surface clearance and subsurface removal of MEC hazards and LUCs throughout MRS-07, except for areas with physical obstructions (i.e., buildings, roads, dense vegetation, etc.). Where applicable, LUCs would be implemented. Therefore, Alternatives 4 and 5 would meet the threshold criteria of overall protection of human health and the environment.

Alternative 1 provides the least overall protection of human health and the environment. Alternatives 4 and 5 provide the most overall protection of human health and the environment. Alternative 2 and 3 are more protective than alternative 1. Alternative 3 provides more protection than Alternative 2 by having a surface removal conducted as a component of the alternative.

Table 2.4 - Overview of Estimated Costs

Remedial Alternative	Estimated Costs	
2: Land Use Controls (LUCs)	Capital Costs	**$131,339**
	Annual O&M	**$48,224**
	Periodic Costs	**$201,560**
	Total Costs	**$381,123**
3: Surface Removal of MEC Using Analog Detection Methods and LUCs	Capital Costs	$16,866,570
	Annual O&M	$39,142
	Periodic Costs	$201,560
	Total Costs	**$**17,107,272
4: Surface Clearance and Subsurface Removal of MEC to the Depth of Instrument Detection Using DGM Detection Methods and LUCs	Capital Costs	**$**88,066,856
	Annual O&M	$48,224
	Periodic Costs	$201,560
	Total Costs	$88,316,640
5: Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using Advanced Geophysical Classification Methods and LUCs	**Capital Costs**	**$32,317,178**
	Annual O&M	**$48,224**
	Periodic Costs	**$201,560**
	Total Costs	**$32,698,301**

Note: Selected remedy is in bold text. These estimates are based on a 30-year period as allowed by EPA policy when the remedial length is undetermined.

Table 2.5 - Evaluation Criteria for Superfund Remedial Alternatives

Criteria	**Threshold**	**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 Federal and State environmental statutes, regulations, and other requirements that have been determined to be applicable or relevant and appropriate to the site, or whether a waiver is justified.
	Primary Balancing	**Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time.
		Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of 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. 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 percent.
	Modifying	**State/Support Agency Acceptance** considers whether the State agrees with the analyses and recommendations, as described in the FS and Proposed Plan.
		Community Acceptance considers whether the local community agrees with analyses and Preferred Alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

2.12.2 Compliance with ARARs

No location-specific or chemical-specific ARARs have been identified for the Camp Butner FUDS. The location-specific ARAR identified for the project areas applies to the open detonation of consolidated MEC (40 C.F.R. § 264.601 [Miscellaneous Treatment Units]). This will occur when MEC can be safely moved from the location it was found to a safe area for demolition. MEC that cannot be moved safely will be blown in place. This ARAR would not apply to Alternatives 1 and 2 since no removal activities, and thus no consolidated shot activities, would be conducted. Alternatives 3, 4 and 5 will comply with this ARAR and this criterion will be achieved.

Table 2.6 - Evaluation of Alternatives Using Threshold Criteria

Threshold Criterion	Alternative 1: No Further Action	Alternative 2: Land Use Controls (LUCs)	Alternative 3: Surface Removal of MEC Using Analog Detection Methods and LUCs	Alternative 4: Surface Clearance and Subsurface Removal of MEC to the Depth of Instrument Detection Using DGM Detection Methods and LUCs	Alternative 5: Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using Advanced Geophysical Classification Methods and LUCs
Overall Protection of Human Health and the Environment	Does not provide overall protection of human health and the environment.	Provides protection of human health and the environment, though no reduction of MEC hazards. Exposure to hazards reduced by education pamphlets and warning signs.	Provides protection of human health and the environment, though only partial reduction of surface MEC hazards. Exposure to remaining hazards reduced by LUCs.	Provides protection of human health and the environment by reducing MEC hazards to depth of detection. Exposure to remaining hazards reduced by LUCs.	Provides protection of human health and the environment by reducing MEC hazards to depth of detection. Exposure to remaining hazards reduced by LUCs.
Compliance with ARARs	No ARARs apply to the Alternative.	No ARARs apply to the Alternative.	Complies with Subpart X 40 C.F.R. § 264.601, if consolidated shot activities are conducted.	Complies with Subpart X 40 C.F.R. § 264.601, if consolidated shot activities are conducted.	Complies with Subpart X 40 C.F.R. § 264.601, if consolidated shot activities are conducted.

2.12.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion evaluates the degree to which an alternative permanently reduces the potential for a MEC exposure hazard. Alternative 2 is likely effective in the short-term; however, long-term effectiveness is dependent on the maintenance of the warning signs and replenishment of educational materials. Alternative 3 provides some effectiveness by removing surface MEC; however, long-term effectiveness is considered to be low and Alternatives 2 and 3 are dependent on landowner compliance with public educational pamphlets and replenishment of educational materials.

Alternatives 4 and 5 provide greater long-term effectiveness by removal of surface and subsurface MEC excluding those areas limited by physical obstructions. Long-term effectiveness for Alternatives 4 and 5 would also be dependent on landowner participation compliance with public educational pamphlets replenishment of educational materials; however, the alternatives still provide the best long-term effectiveness and permanence because they would significantly reduce MEC hazards. The reasonably foreseeable land use is not anticipated to change.

2.12.4 Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion addresses the statutory preference for selecting remedies that employ treatment technologies that permanently and significantly reduce TMV of the MEC hazards. Alternatives 4 and 5 provide the greatest reduction of TMV through treatment as a result of subsurface removal of the source to the maximum anticipated depth of MEC contamination. Alternatives 1 and 2 offer no reduction in TMV through treatment of contaminants. Alternative 3 provides a partial reduction of TMV through treatment as a result of surface only removal of MEC.

2.12.5 Short-term Effectiveness

Alternative 1 presents no short-term effectiveness. Alternative 2 is considered to be effective in the short-term by reducing the likelihood of exposure to MEC. Alternative 3 would provide short-term effectiveness and also presents risk to workers implementing the removal. Alternatives 4 and 5 would provide some short-term effectiveness due to implementation of LUCs. Regarding the removal of MEC hazards, there would be no short-term effectiveness due to the significant amount of time to perform such work.

2.12.6 Implementability

There are no implementability limitations associated with Alternative 1. Alternative 2 requires coordination and cooperation with certain property owners. Alternatives 3, 4 and 5 are technically and administratively feasible but require specialized personnel and equipment to implement. Alternatives 3, 4, and 5 also require the development of work plan and right-of-entry (ROE) agreements. Physical obstructions (i.e., buildings, roads, dense vegetation, etc.) will affect the implementability of Alternatives 4 and 5.

2.12.7 Cost

The cost criterion evaluates the financial cost to implement the alternative. The cost criterion includes direct, indirect, and long-term operation and maintenance costs. Direct costs are those costs associated with the implementation of the alternative. Indirect costs are those costs associated with administration, oversight, and contingencies. These costs were adapted from costs associated with similar activities on site and cost estimates prepared for other similar sites. These costs do not include government administration and oversight for the respective activities.

The costs associated with Alternative 1 are $0 since no further action would be taken at MRS-07. Alternative 2 is less costly than Alternatives 4 and 5, which would be the costliest to implement. Alternative 4 has the highest cost because it includes surface clearance and subsurface clearance of MD and MEC throughout the MRS to depth of detection (Table 2.5) utilizing DGM detection methods. The scope of work for Alternative 5 is identical to Alternative 4; however, AGC methods would be used in Alternative 5. AGC methods reduce the number of subsurface anomalies that require intrusive investigation and, therefore, reducing the labor, time, and cost required to complete the field activities. For this reason, Alternative 5 is considered more cost effective than Alternative 4. Cost Estimate summaries can be found in Table 2.8.

Table 2.7 - Evaluation of Alternatives Using Primary Balancing Criteria

Criterion	Alternative 1: No Further Action	Alternative 2: Land Use Controls (LUCs)	Alternative 3: Surface Removal of MEC Using Analog Detection Methods and LUCs	Alternative 4: Surface Clearance and Subsurface Removal of MEC to the Depth of Instrument Detection Using DGM Detection Methods and LUCs	Alternative 5: Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using Advanced Geophysical Classification Methods and LUCs
Long-Term Effectiveness & Permanence	Not effective, no reduction in MEC hazard.	Although there would be no reduction of MEC hazards, education can increase awareness and appropriate responses to safety hazards. Educational pamphlets aimed at making the public aware of potential hazards will reduce the risk of exposure. A limitation is that educational pamphlets may not be effective for all persons.	The overall long-term effectiveness of this alternative is potentially low due to the limited ability to prevent receptors from exposure to MEC hazards in the subsurface. LUCs would have the same benefits and limitations as described for Alternative 2.	Effective due to removal (surface and subsurface) of MEC, though MEC hazards may remain in some areas due to physical obstructions. LUCs would have the same benefits and limitation as described for Alternative 2.	Effective due to removal (surface and subsurface) of MEC, though MEC hazards may remain in some areas due to physical obstructions. LUCs would have the same benefits and limitation as described for Alternative 2.
Reduction of Toxicity, Mobility, or Volume through Treatment	No reduction of MEC hazards	No reduction of MEC hazards.	Partial reduction of MEC hazards. Identified surface MEC hazards are removed from the site. Involves treatment through the destruction of MEC.	Reduction of MEC hazards. Involves treatment through the destruction of MEC (surface and subsurface).	Reduction of MEC hazards. Involves treatment through the destruction of MEC (surface and subsurface).
Short-Term Effectiveness	Not effective.	No short-term risks to workers and provides short term protection/effectiveness due to LUCs.	During field activities to remove surface MEC, there will be risks to workers, the community, and the environment. Provides short term protection/effectiveness due to LUCs.	provides short term protection/effectiveness due to LUCs.	provides short term protection/effectiveness due to LUCs.

Implementability	Readily implementable.	Readily implementable. Requires coordination and cooperation with certain property owners. Short duration of field effort.	Readily implementable. Field activities require specially trained technicians qualified to perform the work. Physical obstructions may prevent implementation in some areas. Requires work plan and Right-of-Entry (ROE) access. LUCs require coordination and cooperation with certain property owners.	Readily implementable under most conditions. Physical obstructions may prevent implementation in some areas. DGM requires qualified technicians and specialized equipment. Requires work plan and ROE access. LUCs require coordination and cooperation with certain property owners.	Readily implementable under most conditions. Physical obstructions may prevent implementation in some areas. AGC requires qualified technicians and specialized equipment. Requires work plan and ROE access. LUCs require coordination and cooperation with certain property owners.
Total Cost	$0	$381,123	$17,107,272	$88,316,640	$32,698,301

2.12.8 State Acceptance

The regulator, NCDEQ, concurred with the selected remedy.

2.12.9 Community Acceptance

The public comment period was held subsequent to presentation of the PP to the public. No public comments were received.

2.12.10 Evaluation Summary

The five alternatives were evaluated in terms of the NCP criteria, including threshold factors, balancing factors, and modifying factors. Alternatives 4 and 5 are considered the most effective alternatives for reducing potential risk from explosive hazard within the site. Alternative 2 would reduce exposure to MEC or unintended detonation of MEC. Alternative 3 would provide a partial reduction in TMV through treatment and disposal; with MEC remaining in the subsurface; and is lower in cost than Alternatives 4 and 5. Alternatives 4 and 5 would remove MEC from the areas where it has the highest probability of being located, mitigating the explosive hazard due to MEC presence and reducing risk to potential receptors. Both Alternatives 4 and 5 utilize DGM technology proven effective at identifying subsurface metallic anomalies. However, the additional use of AGC methods to differentiate between munitions items and non-hazardous metallic debris further reduces the level of effort associated with intrusive investigation under Alternative 5. The costs associated with Alternatives 4 and 5 are relatively high. Costs associated with Alternative 5 would be minimized by using AGC methods.

MRS-07 is residential, commercial/industrial, agricultural, and recreational use. As such, access to the MRS is unrestricted and the current and future receptors consist of residents, workers (commercial, construction and utility), recreational users, and visitors. Following a comparison of all alternatives retained for detailed analysis, Alternative 5 is considered the most effective, cost-efficient, and appropriate alternative for reduction of MEC hazards at the MRS. MRS-07 will continue to be used as residential, commercial/industrial, agricultural, and recreational areas, and there was MEC confirmed in previous investigations and MD found during the RI. Accordingly, Alternative 5 (surface clearance and subsurface removal of MEC to a depth of detection using AGC with LUCs) is appropriate.

2.13 SELECTED REMEDY

Upon comparison of the alternatives and based on feedback received during the public comment period following the PP, USACE selected Alternative 5 for implementation at MRS-07.

2.13.1 Rationale for the Selected Remedy

Surface clearance and subsurface removal of MEC using AGC methods and implementing LUCs will achieve overall protectiveness of human health and the environment and meet the RAO. Alternative 5 will remove MEC hazards from the surface and subsurface to the depth of detection, except for areas with physical obstructions (i.e., buildings, roads, dense vegetation, etc.). Exposure to remaining MEC hazards will be reduce by disseminating education pamphlets. Completion of Alternatives 5 will not allow for UU/UE. Therefore, Five-Year Reviews would be required.

The costs associated with surface and subsurface removal of MEC are relatively high; however, they are reduced as compared to Alternative 4 by using AGC methods. The costs associated with LUCs are relatively low and easily implemented. Following a comparison of all alternatives retained for detailed analysis, Alternative 5 is considered the most effective, cost-efficient, and appropriate to reduce the probability of potential receptors from coming into contact with possible MEC hazards that may remain at MRS-07.

2.13.2 Description of the Selected Remedy

The selected remedy is completing a surface clearance and subsurface removal of MEC to a depth of detection using AGC methods and implementing LUCs at MRS-07. AGC selection criteria will be determined based on site-specific noise levels to maximize detection depth while minimizing false positives. The clean-up goal for the MEC clearance component of the remedy is to detect and classify munitions identified in Table 2-5 to the Forward Depth Detection Limit in Table 2-5 at a minimum with exceptions for inaccessible areas. LUCs would minimize possible receptor interaction with residual MEC by warning of potential explosive hazards present, thus reducing the potential for receptor exposure. An educational pamphlet incorporating 3Rs (Recognize, Retreat, and Report) would be created to inform residents, occupational workers, recreational users, and visitors in MRS-07 of potential explosive hazards and safety precautions to be taken to avoid contact with MEC.

Following MEC clearance, potential residual risks from MEC that may be present in inaccessible areas will be managed with the implementation of educational pamphlets and hazard notification measures identified in a LUC implementation plan. The pamphlets will be provided to receptors in MRS-07 (residents, workers (commercial, construction and utility), and recreational users). Methods of pamphlet distribution will be confirmed during remedy implementation. A mailing list of property owners/residents within the MRS will be developed and used to disseminate pamphlets annually. Letters accompanying the pamphlets will encourage property owners to provide the educational information to visitors, workers (i.e., farm workers) or recreational users (i.e., hunters) that may utilize the property.

2.13.3 Estimated Remedy Costs

The information in the cost estimate summary table below (Table 2.8) is based on the best available information regarding the anticipated scope of the selected remedy. Changes in the cost element are likely to accrue as a result of new information. This is an order-of-magnitude cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Table 2.8 - Cost Estimate Summary Table

	Cost		
	Land Use Controls (LUCs)	**Surface Clearance and Subsurface Removal of MEC to a Depth of Detection Using AGC Methods and LUCs**	**Total**
Capital Cost	$131,339	$32,317,178	$32,448,517
Annual Cost	$48,224	$0	$48,224
Periodic Cost	$201,560	$0	$201,560
Total Cost of Alternative	**$381,123**	**$32,317,178**	**$32,698,301**
USEPA'S Total Present Value (TPV) Analysis			
TPV at 7 percent Discount Rate [(1)]	$221,900	$32,539,078	$32,760,978
Lower End TPV Range at -30 percent	$144,235	$21,150,401	$21,294,636
Upper End of TPV Range at +50 percent	$332,850	$48,808,617	$49,141,467

Total Present Value (TPV) cost estimates are considered accurate to within -30 percent to +50 percent of actual costs. Time frames vary among alternatives and are based on the projected operation periods for active engineering remedial components and the time required to achieve RAOs. Discount rate of 7 percent per USEPA, 2000 guidance was used to estimate TPV.
Estimates are based on a 30-year period as allowed by EPA when remedial length is undetermined.

2.13.4 Expected Outcomes of the Selected Remedy

With the implementation of the selected remedy, the outcome achieves the criteria of overall protection of human health and the environment. The RAO is achieved by this remedy through removal of MEC and reducing exposure through educational pamphlets.

2.14 STATUTORY DETERMINATIONS

The results of the RI fieldwork at RC1 support the determination that there is an unacceptable risk associated with receptor exposure to MEC hazards at MRS-07. The selected remedy is protective of human health and the environment through removal of MEC using AGC and LUCs that minimize possible receptor interaction by warning of potential explosive hazards present, thus reducing the potential for receptor exposures. Surface and subsurface removal of MEC is acceptable for MRS-07 because of the risk associated with the residual explosive hazards that have been identified within MRS-07. LUCs are also acceptable for MRS-07 because physical obstructions (i.e., buildings, roads, dense vegetation, etc.) may prevent removal of MEC hazards in certain areas. Implementation of Alternative 5 with LUCs at MRS-07 would meet the RAO of reducing exposure through interaction of human receptors with surface and subsurface MEC. All ARARs identified will be complied with and the selected remedy meets the statutory requirements of CERCLA § 121 and the NCP. Based on the information currently available, the selected remedy is protective of human health and the environment and cost-effective. Additionally, there would be significant reduction of hazards due to treatment through destruction of MEC hazards. Therefore, the selected remedy would satisfy the preference for treatment as a principal element. Since the selected remedy will not allow for UU/UE, USACE will conduct statutory five-year review every five years after initiation of the remedy to ensure the selected remedy is still protective of human health and the environment.

With regard to MC, USACE determined that MC is not present at levels that pose a risk to human health and the environment. Therefore, no remedial action is necessary to ensure the protection of human health and the environment.

2.15 DOCUMENTATION OF SIGNIFICANT CHANGES FROM PREFERRED ALTERNATIVE IN PROPOSED PLAN

In accordance with CERCLA § 117(b) and Section 300.430(f)(3)(ii) of the NCP, this section discusses the significant change made to the recommended remedy in the Proposed Plan. This change, adding land use controls as a component of two of the alternatives, is not a fundamental change to the remedy and could have been reasonably anticipated based on the information available to the public in the Proposed Plan and the supporting analysis and information in the Administrative Record file.

More specifically, the Proposed Plan anticipated that Alternatives 4 and 5 (both conducting surface clearance and subsurface removal of MEC) would remove MEC hazards to a degree that would allow for UU/UE and, consequently, land use controls were not identified as needed for these alternatives as set forth in the Proposed Plan. The analysis, however, did not account for certain physical obstructions on the site that would prevent the alternatives from achieving a clearance level that would allow for UU/UE to be achieved. Complete removal of trees, structures, and other infrastructure would be required to implement fully these alternatives, but such efforts would not be supported by residential and other property owners. Consequently, in addition to a significant cost to remove even some physical obstructions, it was determined that a UU/UE alternative would be impossible to implement for this site due to the impossibility of removing all physical obstructions. Consequently, to account for MEC hazards remaining due to physical obstructions rather than due to funding or schedule limitations, USACE added LUCs to Alternatives 4 and 5 for consideration in this DD to ensure either alternative, if selected, remains protective.

PART 3 - RESPONSIVENESS SUMMARY

3.1 OVERVIEW

In March 2018, the Final PP for the Camp Butner FUDS was issued. A public meeting was held April 16, 2018, for the nine proposed MRSs evaluated during the RI and presented in the PP, including the Western MEC Contaminated MRS-07. The public comment period was held from March 26, 2018, to April 30, 2018.

3.2 SUMMARY OF PUBLIC COMMENTS AND LEAD AGENCY RESPONSES

No comments were received from the public on the Proposed Plan. In its letter dated June 2, 2022, NCDEQ provided written concurrence with the selected remedy.

3.3 TECHNICAL AND LEGAL ISSUES

There were no significant technical or legal issues raised during development of this DD.

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