U.S. Army Corps of Engineers, Los Angeles District
Formerly Used Defense Sites (FUDS) Program

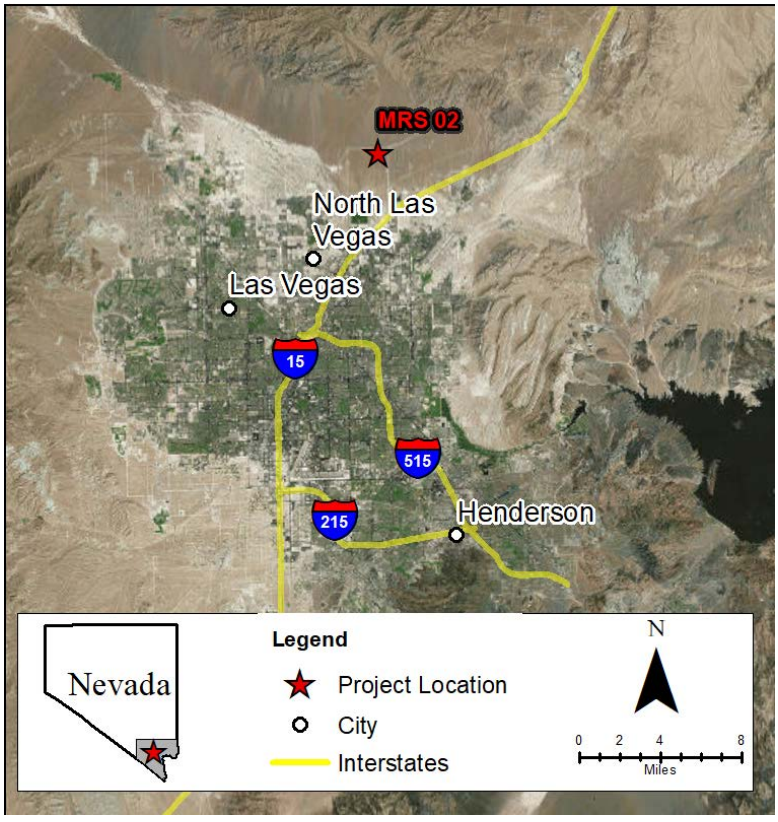
PROPOSED PLAN
FOR
University of Nevada – Las Vegas (UNLV) Study Area Munitions Response Site (MRS) 02, Clark County, Nevada

FUDS Project No. J09NV051002

INTRODUCTION

The U.S. Army Corps of Engineers (USACE) presents this Proposed Plan (PP) to allow the public the opportunity to review and comment on the Preferred Remedial Alternative for **UNLV Study Area MRS02** (a part of the Nellis Small Arms Range Annex [RGE AX] FUDS) located adjacent and to the west of Nellis Air Force Base in Clark County, Nevada. Figure 1 shows the location of **UNLV Study Area MRS02**.

Figure 1: UNLV Study Area MRS02 Site Location



MARK YOUR CALENDARS

PUBLIC COMMENT PERIOD:

24 June to 2 August 2019

USACE will accept written comments on the PP during the public comment period. Comment letters must be postmarked by 2 August, and should be submitted to:

Mr. Randy Tabije
USACE, LA District
915 Wilshire Boulevard, Suite 930
Los Angeles, CA 90017-3401
Phone: (951) 898-6144
Fax: (213) 452-4213
Email: roland.r.tabije@usace.army.mil

To request an extension of the public comment period, send a written request to Mr. Tabije by 1 August.

PUBLIC MEETING:

1 August 2019, 5:30PM – 7:30PM

USACE will host a public meeting to explain the PP and all of the alternatives resulting from the Feasibility Study (FS) (the study completed prior to this PP). Oral and written comments will be accepted at the meeting, held at:

MEETING LOCATION
Aliante Hotel
7300 Aliante Parkway, North Las Vegas, NV 89084

FOR MORE INFORMATION:

Project documents are available in the Administrative Record file, which includes copies of the *Final Remedial Investigation (RI) Report* and the *Final FS Report*, at the following location:

https://www.spl.usace.army.mil/Missions/Formerly-Used-Defense-Sites/Nellis-Small-Arms-Range-Annex/

This document presents (and provides discussion regarding) the rationale for selecting the Preferred Alternative for **UNLV Study Area MRS02**. USACE, Los Angeles District, which is the lead agency for this munitions response, issued this PP for **UNLV Study Area MRS02**. The Nevada Division of Environmental Protection (NDEP), which is the regulatory agency, has reviewed this PP and concurs with the Preferred Alternative. USACE, Los Angeles District, is presenting this information to

facilitate public involvement in the remedy selection process and to keep the public fully-informed of the decision making process regarding impacts from former military use in the **UNLV Study Area MRS02**; fulfilling the public participation requirements under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 United States Code [USC] Section (§) 9601 et seq. (Ref. 1) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 Code of Federal Regulations [CFR] §300.430(f)(2)]) (Ref. 2).

Figure 2 shows the MRS and Table 1 summarizes information about **UNLV Study Area MRS02** including the Preferred Alternative.

Figure 2: UNLV Study Area MRS02 Layout

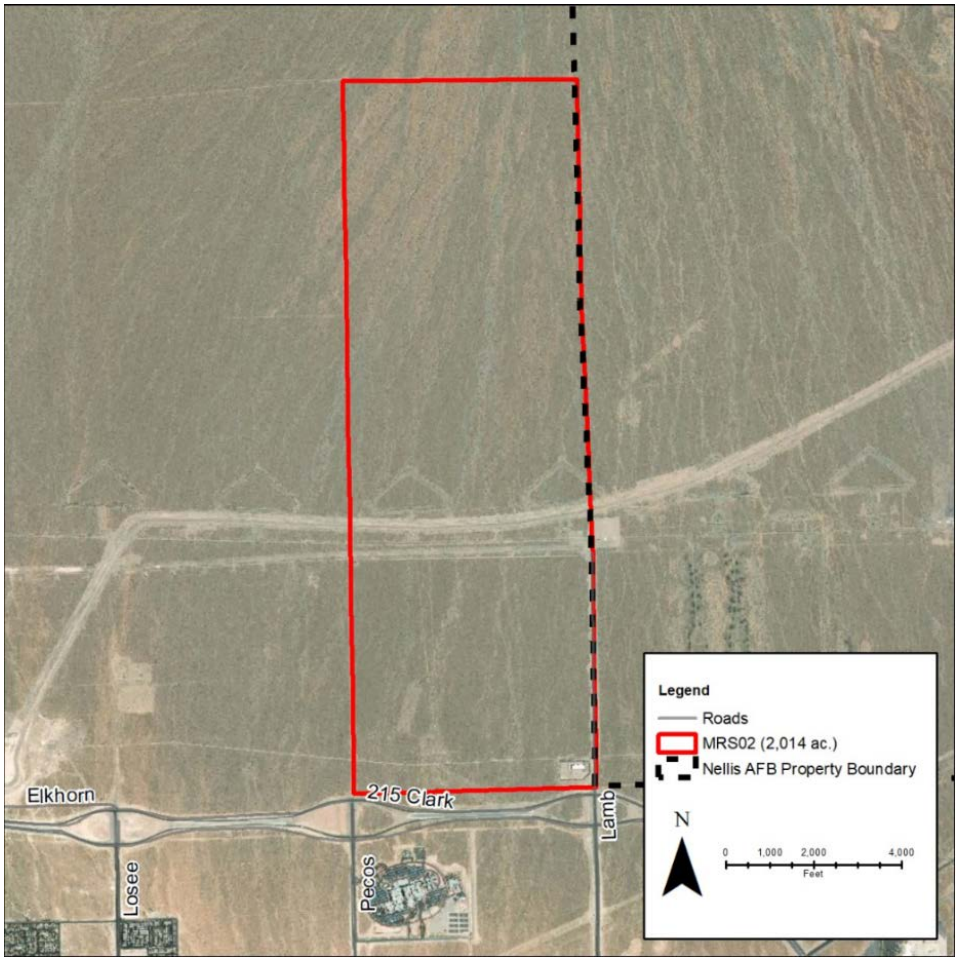


Table 1: UNLV Study Area MRS02 Description				
MRS	**Acreage**	**Current Land Use**	**Future Land Use**	**Preferred Alternative**
UNLV Study Area MRS02	2,014	Recreation and wildlife management interests	Development of the land (i.e., UNLV campus and residential facilities)	Alternative 3[1]

[1] The remedy (consisting of soil removal, transportation, and disposal, followed by confirmation sampling and analysis of soil below and adjacent to the removal area) will only be implemented for a portion of the MRS (63.9 acres) in areas identified as the Moving Target Berms, Small Arms Debris Areas, and Clay Target Debris Area Soil Remediation Areas (Figure 6).

3 Proposed Plan – UNLV Study Area MRS02

This PP identifies the Preferred Alternative that is protective of both human health and the environment, and was developed to reduce the potential risk to human receptors from Munitions Constituents (MC) in site soils associated with Department of Defense (DoD) military munitions in **UNLV Study Area MRS02**. In this PP, USACE both provides the rationale for the Preferred Alternative and includes summaries of the other remedial alternatives it evaluated based on the current and reasonably anticipated future use for **UNLV Study Area MRS02**. The alternatives are identified below. Details regarding the decision process and the alternative selection are discussed in the Summary of Remedial Alternatives and Summary of Preferred Alternative sections.

- Alternative 1 — No Action;
- Alternative 2 — Institutional Controls (ICs) to Protect Current and Future Site Users; and
- Alternative 3 — Excavation, Transportation, and Disposal of Contaminated Soils.

The Preferred Alternative for **UNLV Study Area MRS02** is based on the RI and FS findings and discussions among the lead and support agencies, the affected community, and other stakeholders.

The PP:

- Presents basic background information;
- Identifies the Preferred Alternative for **UNLV Study Area MRS02** and explains the rationale for each identified alternative;
- Encourages public review and comment on the recommended Preferred Alternative; and
- Provides information on how the public can be involved in the process.

A Decision Document (DD) will provide the final Selected Remedy for **UNLV Study Area MRS02**. The DD's "Responsiveness Summary" section will include USACE's responses to all regulator and public comments. Diagram 1 summarizes the various steps in the development and approval process for the **UNLV Study Area MRS02** DD. After consideration of each comment received during the public comment period, USACE as the lead agency, will select and approve the final remedy for **UNLV Study Area MRS02** in the DD.

PUBLIC INVOLVEMENT PROCESS

USACE encourages the public and other interested parties to review this document and submit comments. USACE will consider the public comments before selecting and approving the Selected Remedy for **UNLV Study Area MRS02**.

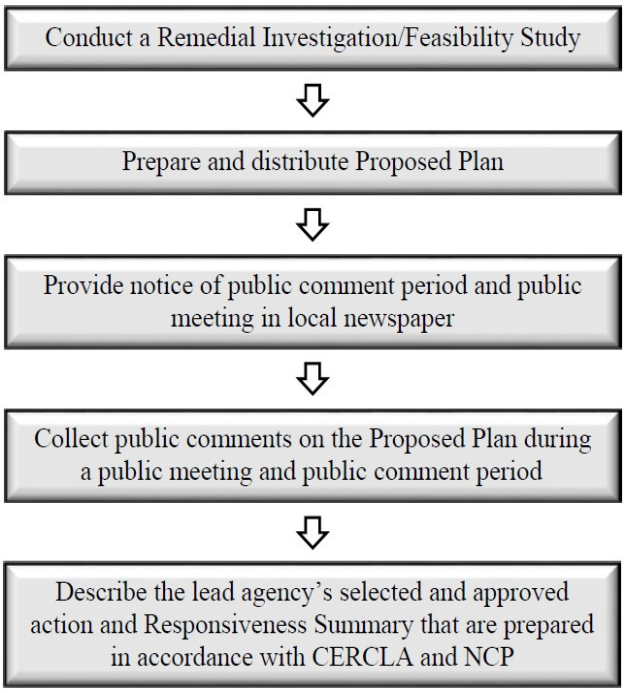
USACE will accept comments on the PP during the public comment period. During the public comment period, USACE will present the PP at the public meeting (see Mark Your Calendars notification on Page 1). USACE will also accept verbal and written comments at the public meeting. USACE will document and consider comments before selecting the final remedy. The first page of this PP provides the location, date and time of the public meeting. There are two locations for the Administrative Record files for **UNLV Study Area MRS02**: The online location:

https://www.spl.usace.army.mil/Missions/Formerly-Used-Defense-Sites/Nellis-Small-Arms-Range-Annex/.

And the physical location:

United States Army Corps of Engineers
Los Angeles District
915 Wilshire Blvd., Ste. 930
Los Angeles, CA 90017-3401

Diagram 1: CERCLA Process for Selecting a Remedy for UNLV Study Area MRS02



The PP, RI report, and FS report are part of the **UNLV Study Area MRS02** Administrative Record file that contains the documents used in making decisions on remedial projects at the site.

SITE HISTORY AND BACKGROUND

This PP summarizes information that can be found in greater detail in the Final RI and Final FS reports (Refs. 3 and 4) and other documents contained in the Administrative Record file for the **UNLV Study Area MRS02**. USACE encourages the public to review these documents to gain a more comprehensive understanding of **UNLV Study Area MRS02** and previous interim removal activities that have been conducted at **UNLV Study Area MRS02** (and the Nellis Small Arms RGE AX FUDS).

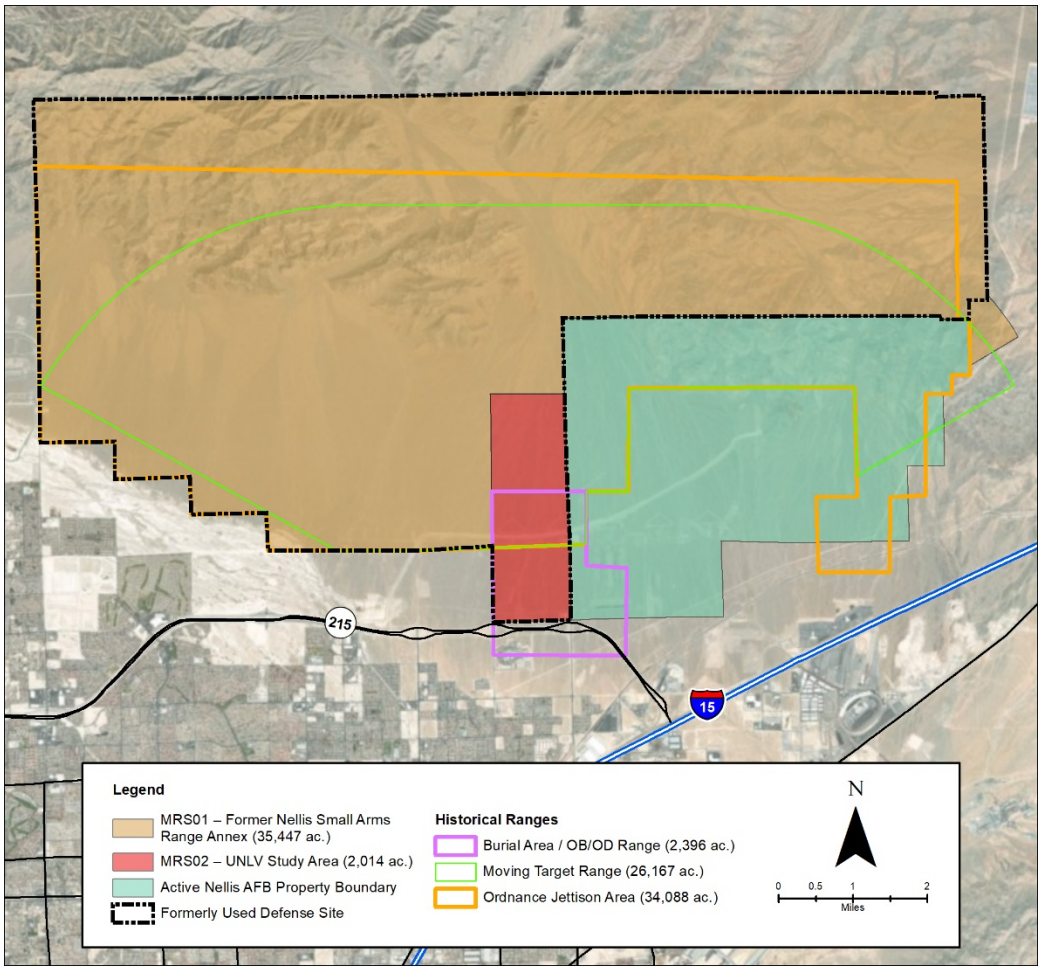
The Nellis Small Arms RGE AX comprises three overlapping historic ranges: the Burial Area (including open burn/open detonation [OB/OD] burial areas), the Moving Target Area, and the Ordnance Jettison Area (Figure 3). As a result of UNLV interest in development of a portion of the range complex (to construct the new UNLV campus), the Nellis Small Arms Range Complex was delineated into two MRSs: the 35,447-acre Nellis Small Arms RGE AX MRS01 (not addressed in this PP) and the 2,014-acre **UNLV Study Area MRS02**. **UNLV Study Area MRS02** is the MRS that will be transferred to UNLV.

UNLV Study Area MRS02 is a part of the Former Nellis Small Arms Range FUDS, which was used as a moving target machine gun and small arms range, as well as an emergency drop site for pylons, hung bombs, and wing-tip tanks. A portion of the site was also used as an explosive ordnance disposal area. The original land area, 46,954 acres, was acquired from the Department of the Interior in December 1941 for use as a moving target machine gun range. During World War II (WWII), the site was used to train aerial gunners. After WWII, the site was used as a small arms range by the U.S. Marine Corps, Navy, and Air Force.

In August 1954, approximately 25,620 acres were relinquished to the U.S. Bureau of Land Management (BLM), and in July 1961, an additional 10,758 acres were transferred to the U.S. Fish and Wildlife Service (USFWS). A portion of the range, approximately 10,600 acres, is within the boundary of the active Nellis Air Force Base. A range clearance was conducted in 1953 by the Nellis Air Force Base Explosive Ordnance Disposal Team, and a certificate of clearance was issued for 26,000 acres of the FUDS. Subsequent range clearances conducted in 1972, 1977, 1978, and 1995 recovered Munitions and Explosives of Concern (MEC) (Ref. 5).

UNLV Study Area MRS02 is located within Sections 6, 7, and 18 of Township 19 South, Range 62 East, Mount Diablo Meridian, Clark County, Nevada, approximately six miles northeast of Las Vegas on property managed by BLM (Figure 1). Figure 3 depicts the relationship between **UNLV Study Area MRS02** and historical ranges.

Figure 3: UNLV Study Area MRS02



USACE completed RI and FS reports for **UNLV Study Area MRS02** in February 2019. USACE developed this PP based on findings of the Final RI and FS reports (Refs. 3 and 4).

SITE CHARACTERISTICS

Current and Anticipated Land Use

The current and reasonably anticipated future land use for **UNLV Study Area MRS02** is summarized in Table 1. BLM manages the property on which **UNLV Study Area MRS02** is located for the Department of the Interior. Current land use is for recreation and wildlife management interests. However, UNLV will develop the entire MRS. Preliminary plans call for a full campus development, including academic, research, student recreation, administration, student and family housing, daycare/childcare for infants, preschoolers, and kindergartners, and other improvements on the property. UNLV currently intends to develop campus facilities starting from the southern end of the site, moving northwards, although that may change based on program initiatives, infrastructure coordination and other items.

Topography, Soils, and Vegetation

Topographically, **UNLV Study Area MRS02** is located within the Southern Basin and Range Physiographic Province (consisting of mountain ridges with steeply sloped talus and alluvial plains). The site is traversed by numerous ephemeral washes, gullies, and/or arroyos. Elevations of over 5,000 feet above mean sea level (msl) exist in the mountainous areas and decrease rapidly to the south (toward Clark County Highway 215) to approximately 2,000 feet above msl (Ref. 6). The western most Moving Target Berm, Berm 1, rises 14 feet above its floor of 2,336 feet above msl. The eastern Moving Target Berm, Berm 2, rises 16 feet off its floor level of 2,359 feet above msl.

The predominant soil units within the MRS are the Wechech-Weiser association and the Weiser-Wechech association. Soils at the MRS consist of alluvium derived from weathering of the mountain ranges. The predominant soil types are extremely fine sandy loam and typically form 2 to 8 percent (%) slopes (Weiser-Wechech association) and 4 to 15% slopes (Wechech-Weiser association) (Ref. 6).

UNLV Study Area MRS02 is located within a desert habitat, with creosote shrubs as the dominant vegetation interspersed with unvegetated/rocky areas. Specific vegetation and habitat information within the boundary of **UNLV Study Area MRS02** is presented in the Biological Resources Survey and Monitoring Work Plan (Appendix H of the *Final Uniform Federal Policy for Quality Assurance Project Plan* [UFP-QAPP] [Ref. 7]).

Special Status Species and Critical Habitat

Special status species include those federally-listed and those protected by the Migratory Bird Treaty Act (MBTA).

The Endangered Species Act (ESA) is intended to prevent the extinction of plant and animal species, provide a means to conserve the ecosystems on which federally-listed endangered and threatened species depend, and to provide a program for conservation and recovery of these species. The MBTA prohibits the taking, possession of, buying, selling, purchasing, or bartering of any migratory bird, including feathers or other parts, nest eggs, or products, except as allowed by regulations.

Critical habitat, as designated by the USFWS, is defined in the ESA as a specific geographic area that contains the features essential to the conservation of federally-listed species and that may require special

management and protection. There is no USFWS designated critical habitat located within **UNLV Study Area MRS02**.

The Mojave Desert tortoise (*Gopherus agassizii*) is the only federally-listed species (threatened) known to inhabit **UNLV Study Area MRS02**. During the April 2017 biological surveys conducted in advance of RI fieldwork, 13 live tortoises and 190 tortoise burrows of varying quality and age were observed. Five active bird nests were identified as well as ten potentially suitable ground nesting bird burrows/burrow complexes (e.g., burrowing owl). During biological resources monitoring during the RI fieldwork, five live tortoises and three live burrowing owls were observed, as well as sightings of several migratory bird species. Impacts to biological resources were avoided or minimized during RI field activities. Detailed information on the survey/monitoring protocol and findings is described in the Biological Resources Survey and Monitoring Work Plan and Biological Resources Findings Technical Memorandum (Appendix H of the *Final UFP-QAPP* [Ref. 7]), as well as the Biological Resources Report (Appendix M of the Final RI report [Ref. 3]).

The Preferred Alternative chosen based on this PP must comply with substantive ESA requirements regarding take of federally-listed species and avoiding jeopardizing the continued existence of these listed species. In order to minimize the potential effects to the tortoise, and in order to ensure the remedial activities are consistent with the ESA and associated Applicable or Relevant and Appropriate Requirements (ARARs), USACE will coordinate with BLM and USFWS about potential effects to the tortoise and seek avoidance and minimization measures. The approach for tortoise relocation during implementation of intrusive alternatives is presented in the description of the Preferred Alternative. In order to minimize the potential effects to migratory birds, and in order to ensure the remedial activities are consistent with the MBTA and associated ARAR, USACE will coordinate with BLM and USFWS about the potential for work to be completed outside the MBTA breeding/nesting season (15 February – 30 August).

Surface Water/Groundwater/Wetlands

Groundwater in Clark County, Nevada is derived, for the most part, from alluvial basins contained within Las Vegas Valley, recharged from surrounding mountain ranges, with local groundwater ranging from 140 to 190 feet below ground surface. **UNLV Study Area MRS02** is arid, averaging just over four inches of precipitation per year. Runoff from the mountains is the primary source of surface water (Ref. 6). Specific surface water feature information within the boundary of **UNLV Study Area MRS02** is presented in the Biological Resources Report (Appendix M of the *Final RI report* [Ref. 3]).

The USFWS Wetlands Online Mapper, through the National Wetlands Inventory (NWI) database, was used to identify if wetlands are present within **UNLV Study Area MRS02**. According to the NWI, there are no wetlands within **UNLV Study Area MRS02**.

Cultural and Archaeological Resources

Information regarding the potential presence of cultural resources within the boundary of **UNLV Study Area MRS02** is presented in the *Cultural Resources Survey and Monitoring Work Plan*. Initial cultural resources surveys were conducted in April 2017, a brief summary of the results and monitoring protocol is included in Section 17.1.5 of the *Final UFP-QAPP* (Ref. 7). Any possible impacts to cultural or archaeological resources will be coordinated with appropriate state and local officials. (Note: Detailed, site-specific cultural resources data is not included in any reports/documents prepared for public distribution.)

SUMMARY OF PREVIOUS INVESTIGATION RESULTS

Previous investigations and surface clearances were conducted at **UNLV Study Area MRS02** from 1953 to 2007. A brief summary of previous investigations conducted at **UNLV Study Area MRS02** is included in the following sections. The previous investigations summarized below present data and results for the entire FUDS and are not limited to **UNLV Study Area MRS02**.

1994 *Inventory Project Report* (INPR) (Ref. 8) includes the Preliminary Assessment and previous findings during clearance activities in 1953 and the 1970s.

USACE, Los Angeles District, performed a site visit in September 1993, and two .50 caliber bullet clips were observed near the moving target range. The findings from the INPR indicate that the site did not appear to present an immediate risk; however, the findings indicated that there was a potential for the presence of ordnance and explosive waste, and that it should be evaluated (Ref. 8).

The INPR included a summary of the Preliminary Assessment findings which concluded that 36,378 acres had been formerly owned or used by the Army Air Force and DoD. The INPR also concluded that the area was eligible for the Defense Environmental Restoration Program (DERP) FUDS program (Site No. J09NV051000). An ordnance and explosives project was recommended and a DERP/FUDS Project Number J09NV051001 was assigned (Ref. 8).

1996 Archives Search Report (ASR) – The ASR was completed by the USACE, Los Angeles District, in July 1996. The ASR is the source of most of the historical information pertaining to site operations and identifies the key areas of focus for the Site Inspection (SI). As part of the ASR, a site visit was conducted in February 1996. Based on review of historical documents and reports of MEC/Munitions Debris (MD) found since site closure, the site was considered by USACE to be potentially contaminated with MEC/MD (Ref. 5).

2004 ASR Supplement – The ASR Supplement was prepared in November 2004 as a supplement to the 1996 ASR. This document identified three overlapping areas (i.e., Burial Area, Moving Target Area, and Ordnance Jettison Area [Figure 3]) relating to ordnance use and munitions types that potentially may have been used in these areas (Ref. 9).

2007 Final SI Report, Former Nellis Small Arms Range Site – The SI was conducted to determine whether the individual ranges identified within the Nellis Small Arms Range warranted subsequent characterization as part of a RI/FS. The SI was performed to gather and evaluate evidence of the potential residual presence of MEC and MC at three ranges – Burial Area, Moving Target Area, and Ordnance Jettison Area. The Moving Target Range and Ordnance Jettison Area are overlapping ranges, which cover the majority of the Nellis Small Arms Range site. The Burial Area range (including the OB/OD burial areas) is in the south-central portion of the Nellis Small Arms Range site. Although no MEC was observed during the SI, the entire area was recommended for further investigation under an RI/FS (Ref. 6).

SUMMARY OF REMEDIAL INVESTIGATION RESULTS

2018 Remedial Investigation/Feasibility Study – USACE conducted an RI to characterize the nature and extent of DoD military munitions and MC and assess potential explosives safety hazards within **UNLV Study Area MRS02** (Ref. 3). The FS evaluated remedial alternatives for their ability to reduce the potential risk to human health and the environment associated with contaminated soils under current and reasonably anticipated future land use (Ref. 4).

RI field operations were conducted at **UNLV Study Area MRS02** from November 2017 to March 2018. The objectives of the RI were accomplished using Light Detection and Ranging (LiDAR) Survey (including ground-truthing of LiDAR survey results); analog geophysical surveys (also known as real-time mag and dig); Digital Geophysical Mapping (DGM); intrusive anomaly investigations; and environmental sampling to collect data to characterize the nature and extent of potential MEC, MD, and MC. No MEC items were recovered during the RI field investigation. Collectively, these investigations were sufficient to characterize the nature and extent of MEC, MD, and MC.

Munitions and Explosives of Concern Characterization

During the RI field operations, 84.19 line miles of DGM and 5.56 line miles of analog geophysical survey were completed within UNLV Study Area MRS02. The 20 MD items (10 items found off-transect) discovered in the MRS during field operations are listed in Table 2.

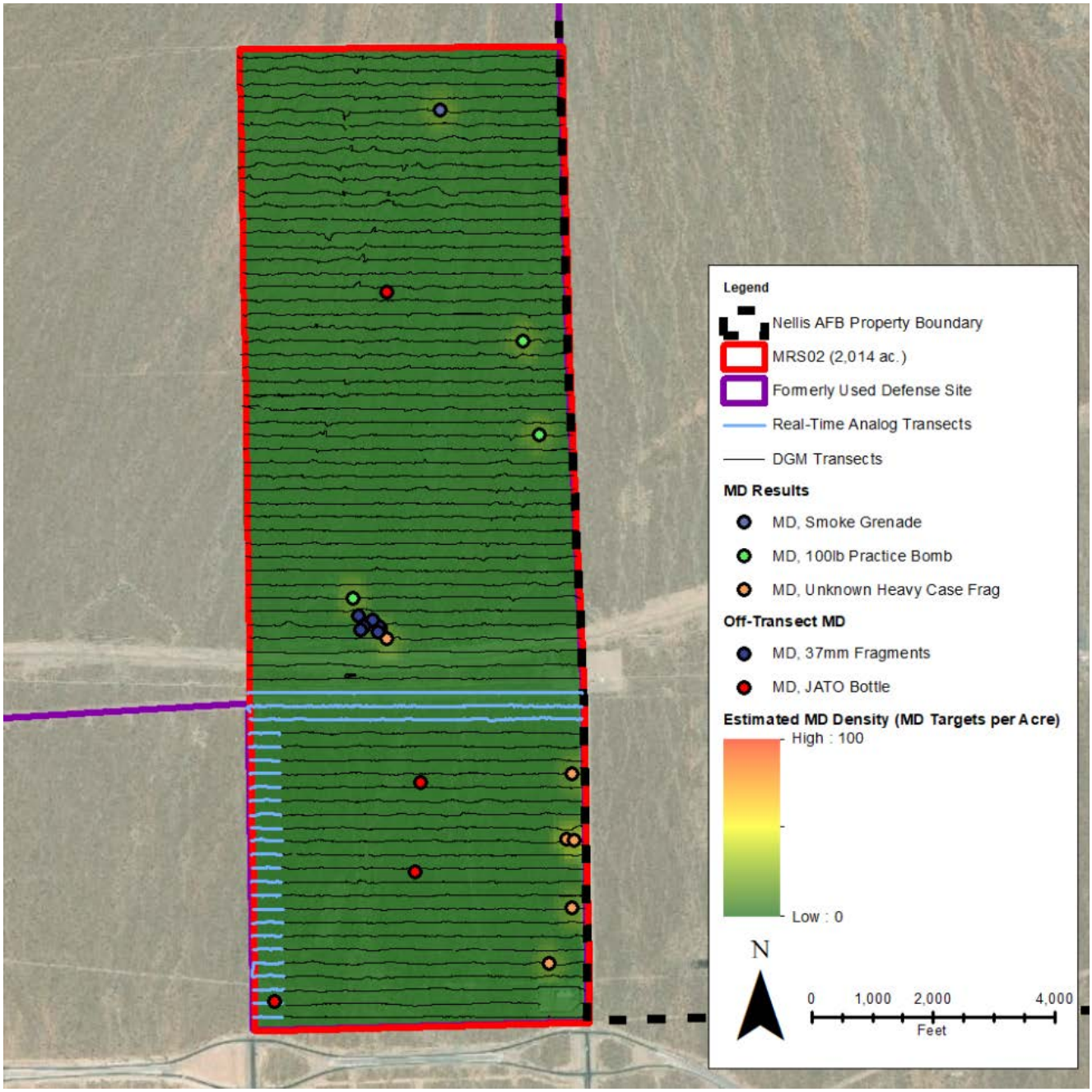
Table 2: UNLV Study Area MRS02 MD Overview

MD	Number Found	Depth Range (inches)
100-pound Practice Bomb, M38A2 Components	3	0
M18 Smoke Grenade, Expended	1	0
37 millimeter (mm), Indeterminate Type, Fragments[1]	6	0
Jet-Assisted Take-Off Bottles	4	0
Unknown Heavy Case Fragments	6	0-3
Total	**20**	**0-3**

[1] The fragments recovered were positively identified as from a 37mm projectile but a model could not be determined, nor could it be determined if the projectiles were Low Explosive or High Explosive. Analysis of the fragments by subject matter experts determined they were likely remnants from a disposal operation. The fragments recovered were crimped inward or showed deformation. The types of crimping and deformation seen indicates that the explosive origin came from an external source; likely this was a demolition charge placed on top of the item. The tight clustering of these six fragments is also indicative of a demolition shot. This conclusion was supported by the unexploded ordnance (UXO) quality control specialist, the senior UXO supervisor, and the USACE ordnance and explosives safety specialists.

The DGM data were used to analyze the potential for munitions to be present at the MRS based on the geophysical anomalies that were identified and then intrusively investigated. The results of this analysis are presented in Figure 4. Analog geophysical survey was conducted where electromagnetic interference from high voltage power lines precluded DGM usage (5.56 line miles). **UNLV Study Area MRS02** has an average estimated density of MD of 0.3 MD geophysical targets per acre. A complete detailed listing of the investigation results for the project is contained in the Final RI report (Ref. 3).

Figure 4: UNLV Study Area MRS02 MD Density Estimate



No target areas or areas of sustained elevated MD density were indicated from analysis of field data using Visual Sample Plan software. Histogram analysis showed no areas where the density of geophysical anomalies was significantly different from that observed in unimpacted areas. Therefore, no areas on the site meet the criteria for classification as a concentrated munitions use area (CMUA).

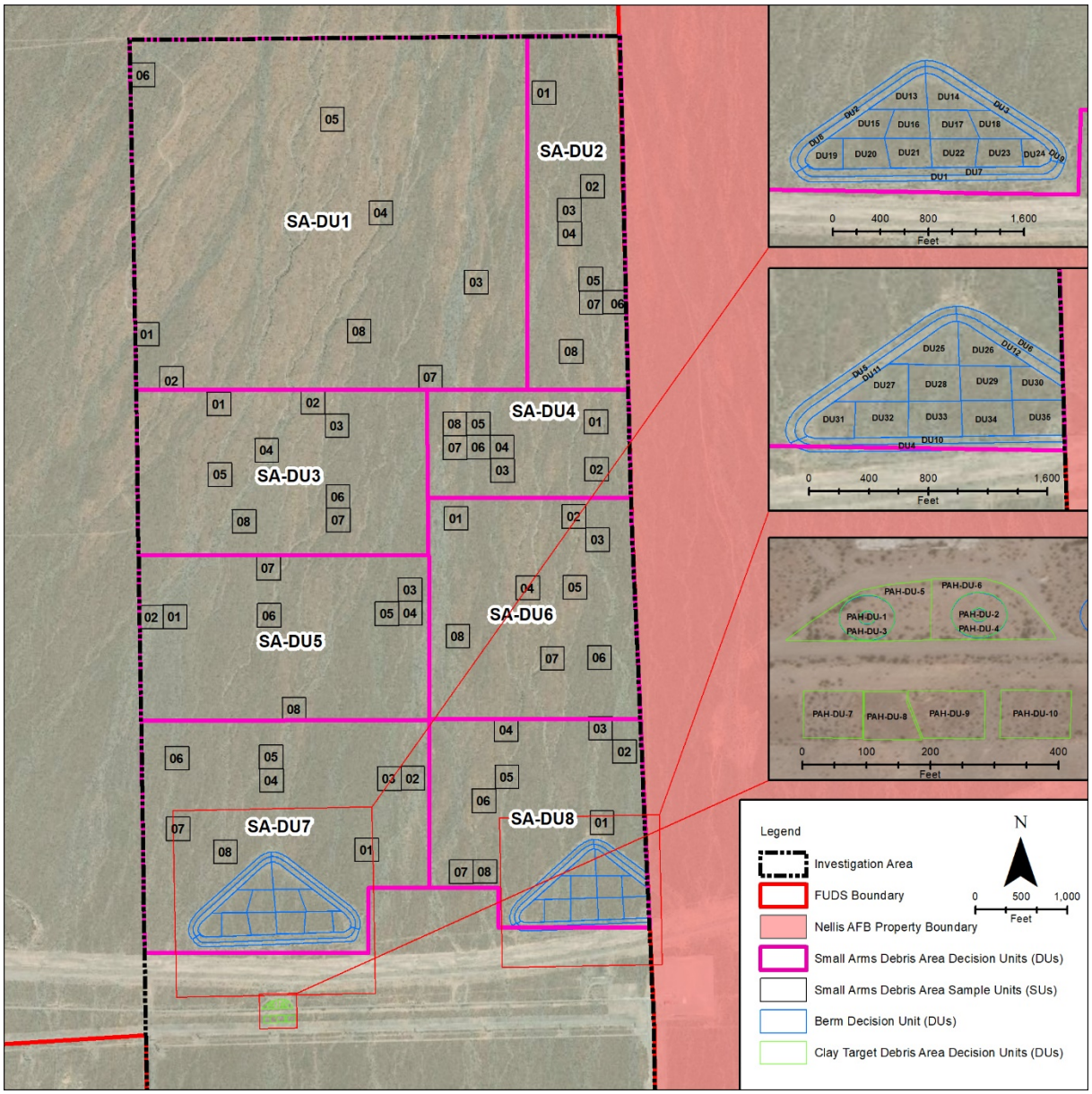
Based on these observations, the whole site was classified as Non-CMUA for UXO Estimator analysis, which is a tool that is used to calculate the potential for UXO to remain at the site (Section 5.2.1.9, Final RI report, [Ref. 3]).

Based on these analyses and all lines of evidence produced in the RI (including the current baseline risk condition in Appendix K in the Final RI report [Ref. 3]), no unacceptable current or future MEC hazards are expected for current or reasonably anticipated future receptors at the **UNLV Study Area MRS02** and remedial action for DoD military munitions is not required.

Summary of Nature and Extent of MC at the Project Site

In accordance with the Data Quality Objectives presented in the *Final UFP-QAPP* (Ref. 7) and based on the results of the RI, MC soil samples were collected within **UNLV Study Area MRS02** in the following areas: Moving Target Berms, Clay Target Debris Areas, and Small Arms Debris Area, as shown on Figure 5 (see Summary of Feasibility Study section for further details). Soil samples were collected in Decision Units (DU) using the incremental sampling technique as indicated in Worksheet #17 in the *Final UFP-QAPP* (Ref. 7).

Figure 5: Soil Sampling Location Summary



Moving Target Berms

Lead concentrations in the six Moving Target Berms DUs situated on the inner and outer walls of both triangular berms (Berm 1 and Berm 2) had lead concentrations significantly above human health residential (400 milligram/kilogram [mg/kg]) and industrial (800 mg/kg) soil screening criteria. Based on the magnitude of soil lead concentrations relative to the residential screening criterion, and because residential land use is possible at the location of Berm 1 and Berm 2 (see Figure 2-10 in the Final RI report [Ref. 3]), unacceptable residential risks were identified for many of the Berm 1 and Berm 2 DUs. Ecological risk screening for the DUs also suggests potential risk to ecological receptors at Berms 1 and 2. However, the anticipated future land use of UNLV campus development indicates human exposures are more relevant than ecological exposures as a basis for remediation. For this reason, the Final RI report suggested that human health be the primary basis of remedial decisions, and that the ecological screening results be considered secondarily when determining which DUs are to be included in the scope of remedial action.

Clay Target Debris Area

Polycyclic aromatic hydrocarbon (PAH) data were acquired from soil samples in the Clay Target Debris Area as well as an area representative of background conditions (i.e., where PAH concentrations are not related to the clay target sources). The results of statistical background comparison tests for the 10 PAH-DUs at the Clay Target Debris Area indicate that soil concentrations of PAHs expressed as benzo[a]pyrene (B[a]P) equivalents were significantly elevated relative to background at PAH-DUs. B[a]P is classified as a human carcinogen by the U.S. Environmental Protection Agency (USEPA), and the results of the screening assessment were therefore, evaluated relative to USEPA's 10^{-6} to 10^{-4} cancer risk management range described in the NCP. PAHs also present health hazards other than cancer, which were evaluated by comparing potential levels of site exposure to a reference level protective of these hazards. Chemical non-cancer hazards at the Clay Target Debris Area evaluated in the human health screening risk assessment were determined to be acceptable (the ratio of site to reference exposure levels was below one). Therefore, given the results of the human and ecological screening assessments and anticipated future land use, the Final RI report recommended that risk management decisions for the Clay Target Debris Area should be made based on human carcinogenic effects rather than ecological risk.

Small Arms Debris Area

During the RI fieldwork small arms debris associated with .50 caliber munitions was identified and this area was designated as the Small Arms Debris Area. Based on the density of this debris, eight Small Arms Debris Area (SA) DUs (SA-DU1 through SA-DU8) were identified within this area for incremental sampling. The evaluation of soil metal concentrations at the Small Arms Debris Area indicates that releases of antimony, copper, and lead have occurred. Soil concentrations of these metals are highest in areas of SA-DUs 7 and 8 immediately north of the Moving Target Berms and decrease with increasing distance from the berms. To support evaluation of remedial decisions in the FS, the estimated boundaries of regions in the Small Arms Debris Area with soil lead concentrations above the residential screening criterion of 400 mg/kg were modeled. As discussed in the Section 7.2.2.4 of the Final RI report (Ref. 3), spatial interpolation methods were used to create statistical confidence limits for the area where soil lead concentrations are predicted to exceed 400 mg/kg using lead soil data from the individual SA-DUs. Ecological screening assessment results for SA-DUs 7 and 8 also suggest potential risk from antimony and lead to ecological receptors, although human exposures are of greatest concern under anticipated future land use. The anticipated future land use of UNLV campus development indicates that human

rather than ecological exposures are of primary concern, and for this reason visualization of areas of elevated antimony and lead soil concentrations in the Final RI report employed human health soil screening criteria.

Remedial Investigation Conclusions

Evaluation of historical information, previous investigations, and the results of the RI, as well as the lines of evidence presented in the Final RI report resulted in the current baseline risk condition for MEC of Acceptable, per the Decision Logic to Assess Risks Associated with Explosive Hazards and to Develop Remedial Action Objectives for Munitions Response Sites within the Risk Management Methodology (Ref. 10). Therefore, no unacceptable MEC hazards are expected for current or reasonably anticipated future receptors at **UNLV Study Area MRS02** and MEC were not further evaluated in the FS.

Concentrations of lead in soil exceed the residential risk-based level of 400 mg/kg in the Moving Target Berms Area and in a portion of the Small Arms Debris Area nearest to the berms. Concentrations of PAHs in a portion of the Clay Target Debris Area present residential incremental lifetime cancer risks at the upper bound of the CERCLA risk management range, but within the 10^{-6} to 10^{-4} range in other portions. These contaminants in surface and subsurface soils within the boundaries of **UNLV Study Area MRS02** present potentially unacceptable health risks. There is the potential for exposure through the ingestion, inhalation, and dermal soil exposure pathways, to the following receptors under the anticipated future land use of UNLV campus development: (1) construction workers developing the UNLV campus; (2) residents of student and family housing and infants and children in daycare/childcare facilities; and (3) UNLV faculty, staff, students, and guests of the university. The anticipated future land use of UNLV campus development prioritizes human health rather than ecological exposures.

SUMMARY OF STAKEHOLDER AND PUBLIC INVOLVEMENT

USACE, Los Angeles District, has discussed information related to the RI/FS with the public and stakeholders (NDEP, BLM, USFWS, UNLV, local government, and property owners) during several technical project planning (TPP) meetings. Prior to initiating the RI fieldwork, TPP meetings were held on 15 November 2016, 7 June 2017, and 25 October 2017.

USACE also hosted a public meeting on 25 October 2017 at the Aliante Hotel at 7300 Aliante Parkway, North Las Vegas, Nevada 89084. The purpose of the meeting was for USACE to provide the community with an update on the status of munition response activities and to give community members the opportunity to discuss their concerns with USACE personnel. USACE published an announcement for the meeting in the local newspapers (*Las Vegas Review Journal* and *El Mundo Las Vegas*). Three community members and one representative from local print media attended the meeting in addition to representatives from NDEP and UNLV.

SCOPE AND ROLE OF THE RESPONSE ACTION

USACE, Los Angeles District, is developing a response or action plan to address MC contamination present at **UNLV Study Area MRS02**. The scope of the response action is to address the potential risks of exposure by receptors to MC in the soils in the Moving Target Berms, Clay Target Debris Area, and the Small Arms Debris Area at **UNLV Study Area MRS02**. Ultimately, the goal is to remove or reduce the probability that current or reasonably anticipated future site users would encounter MC contaminated soils. The alternatives USACE is considering in this PP have been developed in accordance with

CERCLA and complement USACE's overall strategy for addressing contamination at a property and allowing for the safe use of the land to continue.

SUMMARY OF POTENTIAL SITE RISKS/HAZARDS

Based on the results of the RI, MC soil sampling, analytical result screening, and subsequent risk assessments, there are unacceptable risks due to the presence of lead and antimony (in the Moving Target Berms and Small Arms Debris Area) and PAHs (in Clay Target Debris Area) (contaminants) in surface and subsurface soils (media) within the boundaries of UNLV Study Area MRS02, as presented in Figure 6. There is the potential for exposure to the following receptors: (1) construction workers developing UNLV campus; (2) residents of student and family housing and infants and children in daycare/childcare facilities; and (3) UNLV faculty, staff, students, and guests of the university, via ingestion, inhalation, and dermal exposures (pathway). Detailed information on analytical results are provided in the Final RI and FS reports (Refs. 3 and 4).

Based on the analyses summarized above and the other lines of evidence produced in the RI (including the current baseline risk condition referenced in Appendix K in the Final RI report [Ref. 3]), no unacceptable current or future MEC hazards are expected for current or reasonably anticipated future receptors at the **UNLV Study Area MRS02** and remedial action for DoD military munitions is not required.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAO) drive the formulation and development of response actions. The aim is to achieve the NCP's threshold criteria of "Overall Protection of Human Health and the Environment" and "Compliance with ARARs."

Because USACE did not find evidence of unacceptable explosive hazard/risk from DoD military munitions from historical operations within **UNLV Study Area MRS02**, the RAO does not address explosive hazards.

The results of the RI indicate that there is a potentially unacceptable risk from receptor interaction with MC in soil. This information, along with the historical details of military operations has been used to develop an RAO for the MRS that addresses site-specific goals to ensure protection of human health and the environment.

The RAO for **UNLV Study Area MRS02** is:

> *To reduce risks to human health presented by ingestion, inhalation, and dermal exposures by (1) construction workers developing the UNLV campus, (2) residents of student and family housing and clients of daycare/childcare facilities, and (3) UNLV faculty, staff, students, and guests of the university, for the future land use of UNLV Study Area MRS02 (i.e., development as UNLV Campus) to soil concentrations of lead and antimony in the Moving Target Berms and Small Arms Debris Areas, and PAHs in the Clay Target Debris Area to acceptable levels (400 mg/kg lead, 31 mg/kg antimony, and 0.11 mg/kg benzo[a]pyrene equivalent), achieving unlimited use/unrestricted exposure.*

SUMMARY OF FEASIBILITY STUDY

Remedial action alternatives have been evaluated in the Final FS report (Ref. 4) for contaminated soils in the Moving Target Berm Area (Berm 1 and Berm 2), the Small Arms Debris Area, and the Clay Target Debris Area (Figure 6). Lead soil concentrations for wall DUs in the Moving Target Berms Area are between 9,000 and 20,000 mg/kg, and lead concentrations in floor DUs exceed the 400 mg/kg residential standard in about one-half of the DUs. Based on analysis of soil metal concentrations in the Moving Target Berms Area, the physical contiguity of DUs on the floors of the berms, and the Final RI report recommendation to consider removal of floor DUs where soil concentrations exceed ecological screening criteria but are below the human health criterion, the entirety of these areas (all DUs in Berm 1 and in Berm 2) is recommended for remediation. The practical effect of this recommendation is that average residual soil lead concentrations across the Moving Target Berms Area are likely to be further below the human health criterion than would be the case otherwise.

B[a]P-equivalent residential cancer risk in PAH-DUs 1 and 2 was calculated to be 2×10^{-4}, and risks in PAH-DUs 3 – 6 were between 4×10^{-6} and 2×10^{-5}. The total area of DUs 1 – 6 is approximately one-half acre. Based on analysis of soil PAH concentrations in PAH-DUs 1 – 6 of the Clay Target Debris Area, the presence of debris piles and fragments of clay targets well mixed in the surface and subsurface soils and the relatively small area, all six PAH-DUs are recommended for remediation.

Spatial interpolation methods were applied to the Sampling Unit lead data in the RI evaluation of the Small Arms Debris Area (Section 7.2.2.4 in the Final RI report [Ref. 3]) to estimate where soil lead concentrations exceeded the 400 mg/kg human health screening criterion. The best estimate of the area presenting potentially unacceptable risk (i.e., the region where the mean concentration of lead is estimated to be above the residential screening level of 400 mg/kg based on spatial analysis of the RI soil data) was chosen to be the proposed remediation area presented in the Final FS report (Ref. 4). This area represents the best estimate of the region of impacted soil above the Remedial Action Goal (see Table 3) that requires remediation. Although it is possible that average lead concentrations exceed 400 mg/kg in an area smaller than this best estimate region, the FS included the proposal of soil confirmation sampling within the region bounded by the best estimate (mean) and upper-bound estimate (95 upper confidence limit [UCL] on the mean) of soil lead concentrations above 400 mg/kg (see Figure 6) to determine whether additional remediation of lead-impacted soil is necessary in this region to meet the Remedial Action Goal. Ultimately, soil remediation followed by confirmation sampling will be conducted until achievement of the Remedial Action Goal is demonstrated. This approach is protective of human health and the environment, including possible future residential receptors associated with the development of the UNLV Campus.

Remedial Action Goals for PAHs in soil are only presented in Table 3 for B[a]P-equivalent. Remedial Action Goals for B[a]P-equivalent are above the 0.0034 mg/kg mean background concentration shown in Table 5-19 of the Final RI report (Ref. 3). Remedial Action Goals are presented for antimony and lead, because potentially significant human or ecological risks described in the Final RI report were primarily associated with lead, and to a lesser degree antimony.

Table 3: Remedial Action Goals[1] for Soil Confirmation Sampling					
COC	**Units**	**Residential Land Use (c)**	**Industrial Land Use (c)**	**Residential Land Use (nc)**	**Industrial Land Use (nc)**
Antimony	mg/kg	N/A	N/A	**31**	470
Benzo[a]pyrene[2]	mg/kg	**0.11**	2.1	18	220
Lead	mg/kg	N/A	N/A	**400**	800

Key: COC - Contaminant of Concern; nc – based on noncarcinogenic effects (target hazard index = 1); c – based on carcinogenic effects (threshold risk = 1 in 1,000,000, or 10^{-6})

[1]Remedial action goals are based on USEPA regional screening levels (RSL), as described in the Final RI report.

[2] The B[a]P -equivalent soil concentration is the sum of the weighted soil concentrations of seven carcinogenic PAHs, where the weighting factors are based on scaling to B[a]P carcinogenic potency (see discussion in Section 7.2.2.3 in the Final RI report).

N/A: Not applicable, no RSL is published for this health effect endpoint.

mg/kg = milligrams per kilogram

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Section 121(d) of CERCLA [42 USC §9621(d)] states that remedial actions on CERCLA sites must comply with or waive any ARAR, which include regulations, standards, criteria, or limitations promulgated under federal environmental, or more stringent state environmental or state facility siting laws, which are identified by a state in a timely manner. Substantive requirements of laws and regulations may be designated as ARARs for on-site response actions, but administrative requirements (such as permits or recordkeeping) are not ARARs for on-site response actions.

ARAR identification considers a number of site-specific factors, including the potential remedial action, chemicals at the site, site physical characteristics, and site location. ARARs are generally divided into three categories: action-specific, location-specific, and chemical-specific. The results of the evaluation of ARARs for **UNLV Study Area MRS02** (applicable to all evaluated remedial alternatives) are:

Action-Specific Applicable or Relevant and Appropriate Requirements

No action-specific ARARs have been identified for **UNLV Study Area MRS02**.

Location-Specific Applicable or Relevant and Appropriate Requirements

These ARARs are triggered by the particular location and the proposed remedial activity at the site. Some of these requirements govern activities in certain environmentally sensitive areas. Location-specific ARARs for **UNLV Study Area MRS02** include:

1. ***Endangered Species Act,*** 16 USC §1538(a). The substantive requirement under this act is to ensure that any action taken is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of designated critical habitat, see 16 USC §1536(a)(2); 50 CFR §402.01(a), and that no action that results in a "take" of a threatened or endangered species be undertaken without a determination that any "take" is not likely to jeopardize the continued existence of any threatened or endangered species, see 16 USC §1538(a); 50 CFR §402.14(i). Applicable because the federally threatened Mojave Desert tortoise (*Gopherus agassizii*) has been observed within **UNLV Study Area MRS02**. (Refer to Section 2.2.1.7 in the Final RI report for further detail on the species present [Ref. 3]). (See Alternative

description in the Summary of Remedial Alternatives for tortoise relocation approach, including USACE coordination with the BLM and USFWS.) This ARAR applies to Alternative 3.

2. ***Migratory Bird Treaty Act (MBTA),*** 16 USC §703(a) (prohibition on take of migratory birds). Prohibits pursuit, hunting, taking, capture, or killing, or attempting the same, of migratory birds native to the United States. Migratory birds (burrowing owl [*Athene cunicularia*], black throated sparrow [*Amphispiza bilineata*], verdin [*Auriparus flaviceps*], Brewer's sparrow [*Spizella breweri*], and loggerhead shrike [*Lanius ludovicianus*] have been previously observed within the MRS) nest in the area. Timing is open for fluctuation based on the project breeding bird behavioral survey review by a qualified and knowledgeable bird biologist. Evidence and experience shows that vegetation clearance and soil excavation, as presented in this PP, could cause take or killing of these species. To comply with this ARAR, fieldwork in areas where these species are known to be present would be avoided during the bird breeding seasons of 15 February to 30 August. This ARAR applies to Alternative 3.

3. ***Archaeological Resources Protection Act (ARPA),*** 16 USC §470ee(a). Requires protection of archaeological resources if discovered on federally-owned lands within the boundary of **UNLV Study Area MRS02**. Remedial activities may uncover or disturb cultural resources that are known to exist within **UNLV Study Area MRS02**; therefore, remedial action activities may not excavate, remove, damage, or otherwise alter or deface such resources. Based on the prevalence of these archaeological sites, it is expected that thorough investigation and disturbance of **UNLV Study Area MRS02** will lead to further encounters with archaeological resources. This ARAR applies to Alternative 3.

Chemical-Specific Applicable or Relevant and Appropriate Requirements

No chemical-specific ARARs have been identified for **UNLV Study Area MRS02**.

SUMMARY OF REMEDIAL ALTERNATIVES

To satisfy the RAOs, USACE has developed and conducted a detailed analysis of the following remedial alternatives for **UNLV Study Area MRS02**.

Alternative 1: No Action

The No Action Alternative provides a baseline for comparing other alternatives. Alternative 1 would have no effect to resources protected by the determined location-specific ARARs, such as threatened or endangered species and cultural resources (i.e., ARPA, ESA, MBTA); therefore, it is in compliance with ARARs. Alternative 1 does not provide overall protection to human health per the NCP criteria, and as a result, does not pass the threshold criterion. The alternative is only evaluated further as a baseline for the other alternatives. Additionally, this alternative, which has no associated costs nor required time to implement, does not achieve the RAO for **UNLV Study Area MRS02**.

Alternative 2: ICs to Protect Current and Future Site Users

Implementation of Alternative 2 includes ICs that would minimize the potential receptor exposure to hazards. A site-specific awareness program would be developed by USACE and would include development of educational tools and materials (e.g., brochures and fact sheets). Additionally, as the alternative would not achieve unlimited use/unrestricted exposure (UU/UE) at the MRS, Five-Year Reviews would be implemented.

Public awareness of existing hazards within **UNLV Study Area MRS02** would be facilitated and maintained through use of proven methods used by USACE during numerous public outreach campaigns. An awareness program, carried out by USACE, would focus on identifying those areas potentially containing soils contaminated by MC and providing information about the appropriate response to prevent exposure to contamination. All pertinent stakeholders (BLM, NDEP, and UNLV) would be invited to participate in developing the ICs intended to address **UNLV Study Area MRS02** as part of the implementation of the selected remedy. Direct mailing of fact sheets to BLM, NDEP, and UNLV and other local government entities, and distribution of fact sheets in local public locations are considered core activities of the alternative.

This measure implements ICs that would minimize the potential receptor exposure to hazards by educating the public on the potential hazards. The following is a brief description of the components for ICs that would be considered for **UNLV Study Area MRS02**:

1. *Awareness Program:* An awareness program would be implemented by USACE to inform the public about potential exposure to contaminated soils associated with **UNLV Study Area MRS02** to increase awareness. If members of the public are receptive to the awareness program, then the risk of exposure to contaminated soils would be reduced significantly.

   Specific printed media in the information packages would take the form of brochures, fact sheets, and posters. These information packages would be distributed via mail to property owners within the MRS (BLM and UNLV).

2. *Contact Information*: The awareness program would include contact information for the USACE FUDS Information Center and a local point of contact.

Table 4: Implementation of Alternative 2

MRS	Compatible with Future Land Use (Yes/No)	Achieves RAO (Yes/No)	Time Required for Completion	Cost
UNLV Study Area MRS02	No – Potential future land use includes development of the sub-area, which may result in encountering MC contaminated soils	No – Because any MC contaminated soils may be accessible to current/future site users engaging in intrusive activities (i.e., construction workers) and providing information may not be sufficient due to the greater potential for site users to encounter MC contaminated soils (based on reasonably anticipated use)	1 year	$159,193

Alternative 3: Excavation, Transportation, and Disposal of Contaminated Soils

This alternative uses a combination of activities to reduce the potential MC contamination and minimize receptor exposure to soils at the site. The activities comprise soil removal, transportation, and disposal, and post-removal confirmation sampling and analysis in the entirety of the Moving Target Berm Area and the Clay Target Debris Area, and from areas of high lead soil concentrations in the Small Arms Debris Area (Figure 6).

Pre-remediation activities that may be performed to support a soil remediation phase are as follows:

- Biological and Cultural Surveys and Mojave Desert tortoise removal (see Biological and Cultural Surveys section below).
- Haul road determination (and/or construction) to the intersection of North Lamb Boulevard and Clark County Highway 215, to support equipment mobilization and remediation activities.
- Clearing and grubbing site vegetation and dust control logistics set-up.
- Pre-remediation topographical survey using Global Positioning System (GPS).
- Remediation area boundaries surveyed using GPS. This activity will be performed as required throughout remediation activities.
- Confirmation soil sampling for lead and antimony within the UCL 400 mg/kg Lead Concentration Areas (subject to confirmation sampling as delineated by blue border in Figure 6, excluding the removal areas) will be implemented to determine if the areas require remediation.

The following bullets provide a summary of contaminated soil remediation, stockpiling, hauling, and disposal; confirmation sampling; and stormwater control installation work activities:

- Prepare an area for stockpiling of rock and other debris encountered during the remediation activities;
- All contaminated soils will be hauled, per toxicity characteristic leaching procedure (TCLP) analysis results, to approved landfill;
- Post-remediation topographical survey;
- Based on the anticipated future use of the site, no backfill material will be added to the site;
- Post-remediation confirmation soil samples collected subsequent to remediation activities in soil removal areas (i.e., Small Arms Debris Areas, Berm Floor Areas, Berm Wall Areas, [i.e., lead and antimony] and PAH Soil Removal Areas [i.e., PAHs]) (Figure 6) to determine if removal has achieved the RAO; and
- Best Management Practice/Stormwater Pollution Prevention Measures will include methods used to stabilize the slope and prevent erosion.

Table 5 presents the estimated acreage from which contaminated soils will be removed at the site.

Table 5 Estimated Acreage for Removal	
Removal Area	**Estimated Acreage[2] [3]**
Moving Target Berm Area (Berm 1) [1]	31.0
Moving Target Berm Area (Berm 2) [1]	25.7
Small Arms Debris Area (Best Estimate Remediation Area)	6.7
Total Soil Removal (lead contaminated soils)	**63.4**
Clay Target Debris Area	0.5
Total Soil Removal (PAH contaminated soils)	**0.5**

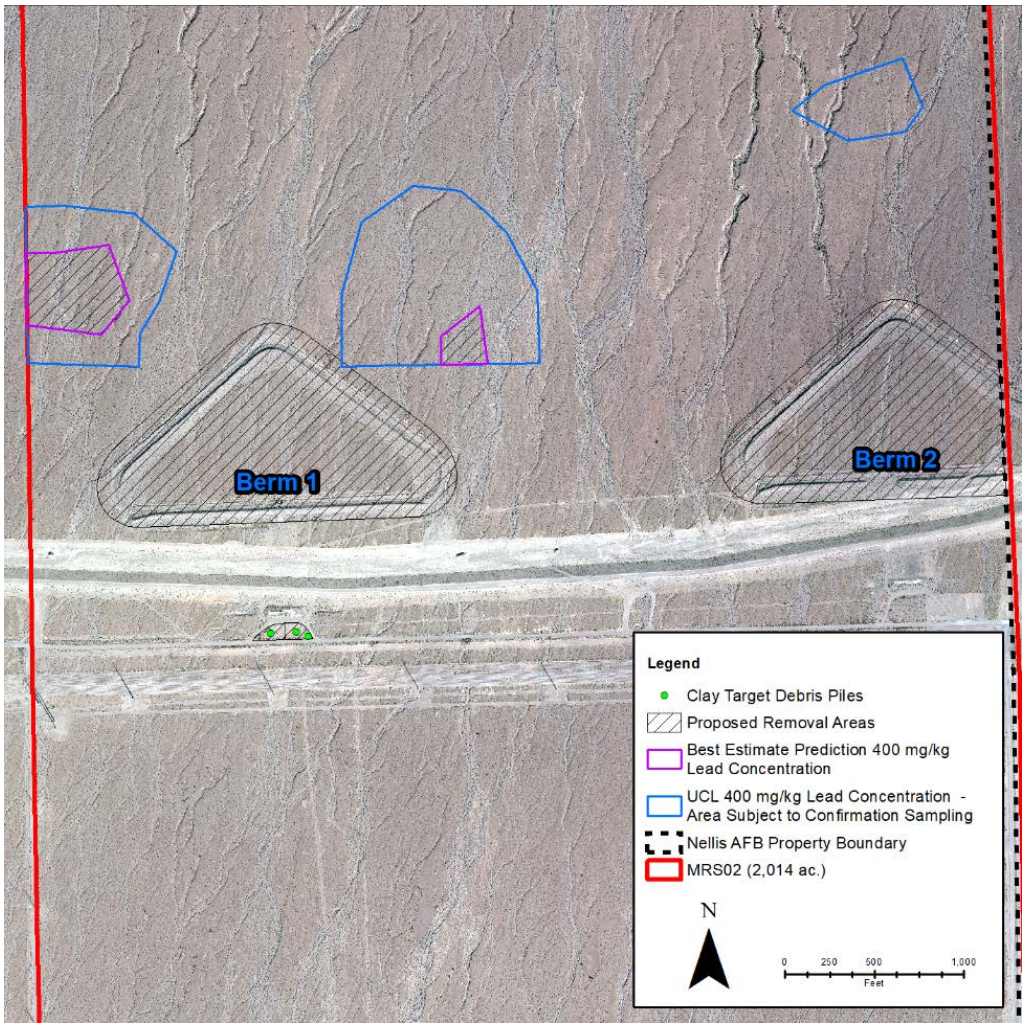
Notes:

[1] The berm acreage was developed using LiDAR Survey Data. Following the pre-excavation topographical GPS survey, acreage may be revised. Berm 1 and Berm 2 is a total acreage for the berm and the berm floor.

[2] Estimated soil volumes have been included in the FS report, Appendix B Cost Estimate (Ref. 4) for cost estimate purposes. Depth of removal will be based on meeting the RAO and performing soil confirmation sampling to meet the Remedial Action Goals as presented in Table 3 during the removal action. Soil remediation followed by confirmation sampling will be conducted until achievement of the RAO is demonstrated.

[3] Estimated acreage has been rounded to nearest tenth.

Figure 6: Proposed Moving Target Berms, Small Arms Debris Area, and Clay Target Debris Area Remediation Areas



Confirmation soil samples will be analyzed for contaminants of concern (Table 3) during excavation activities to ensure that contaminated soil has been excavated to the required limits and to determine if additional removal will be required horizontally and vertically. The confirmation samples will be sent to an off-site laboratory for analysis. As applicable, X-ray Fluorescence analytical technique may be used in addition (and as a supplement) to laboratory analysis to confirm excavation complete to required limits. In addition, confirmation sampling as identified in Figure 6 (in areas identified as UCL 400 mg/kg Lead Concentration Areas [subject to confirmation sampling as delineated by blue border in Figure 6]) will be implemented to verify those areas meet the RAO and Remedial Action Goals.

All remediation areas will have TCLP analysis to determine Resource Conservation and Recovery Act (RCRA) hazardous waste status. Contaminated soils, defined as such by TCLP results, will be disposed of as RCRA hazardous waste and transported using a Uniform Hazardous Waste Manifest. USACE will coordinate with NDEP to receive a temporary USEPA identification number as a hazardous waste generator. All hazardous waste manifests will be signed by an authorized USACE representative and included in the completion report.

It is anticipated that this alternative would require working in some areas of dense vegetation within the selected MRS removal areas. Dense vegetation can be a hindrance to, and can reduce, the overall effectiveness of a soil removal. As there are areas within **UNLV Study Area MRS02** characterized by dense brush, mainly along drainages, that would hinder soil removal activities, it may be necessary to cut back the areas of dense vegetation to perform the removal.

Biological and Cultural Surveys

Biological and cultural surveys would need to be completed prior to field operations to identify habitat or cultural resources that may be sensitive and may need to be avoided, relocated, and protected. These areas would be clearly delineated in the remedial action work plan and field personnel would be briefed on their location. A biologist and/or archaeologist will be required to observe soil removal activities in areas known to have sensitive habitat or resources. Due to the presence of Mojave Desert tortoise and/or tortoise burrows and migratory birds within the Moving Target Berm and floor areas, the Best Estimate Remediation Areas within the Small Arms Debris Area, and the Clay Target Debris Areas, the following activities may need to be performed prior to remediation activities.

1. Biological resources survey over 100% of the remediation areas including haul routes and staging areas (multiple passes) to document the presence of burrows and tortoise.
2. Installation of fencing around removal area that will be trenched into the subsurface following standard Mojave Desert tortoise fencing protocols (concurrent with or before Item 1).
3. Relocation or removal of Mojave Desert tortoise following 100% survey and fencing installation.
4. Full-time biological resource monitors during vegetation cutting, excavation, loading, and transportation.

The soil removal action will not proceed until steps 1-3 are completed and there is confirmation to demonstrate no Mojave Desert tortoise is within the vicinity.

As described in Section 4.1.3 in the Final FS report (Ref. 4), in order to minimize effects to the Mojave Desert tortoise, any tortoise found within the remediation areas (and project support areas, including haul roads) are anticipated to be relocated while the remedy is implemented. In order to ensure all activities including any necessary relocation comply with the ESA and the associated ARAR, USACE will

coordinate with BLM and USFWS about potential effects to the tortoise and seek avoidance and minimization measures.

The implementation of the remedial alternative is expected to lead to a determination of UU/UE. Confirmation sampling will be used to ensure all contaminated soil is removed and that the site has achieved a determination of UU/UE. Implementation of Five-Year Reviews would not be required.

Table 6: Implementation of Alternative 3

MRS Sub-area	Compatible with Future Land Use (Yes/No)	Achieves RAO (Yes/No)	Time Required for Implementation	Cost
UNLV Study Area MRS02	Yes – Potential future land use includes development of the sub-area, which may result in encountering MC contaminated soils	Yes – Eliminates the potential for site users to encounter MC contaminated soils (based on reasonably anticipated future use)	4 years	$23,489,493

Long-term Management

As implementation of Alternatives 1 (No Action) and 2 (ICs) would not achieve UU/UE at the MRS, Five-Year Reviews would be implemented. Five-Year Reviews would not be required for Alternative 3, because it would allow for UU/UE.

Waste Associated with Alternative Selection

The waste expected from the implementation of Alternative 3 is contaminated soils. Contaminated soils would be transported to approved landfills.

EVALUATION OF ALTERNATIVES

USACE used the NCP nine required criteria to evaluate the remedial alternatives individually and against each other to select a remedy. This section of the PP presents the relative performance of each alternative against the nine criteria, noting how each alternative compares to the other options under consideration.

The nine criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria (Ref. 11). The purposes of these three groups are provided below.

- Threshold criteria (criteria 1 and 2 below) are requirements that each alternative must meet in order to be eligible for selection.
- Primary balancing criteria (criteria 3 through 7 below) are used to weigh major trade-offs among alternatives.
- Modifying criteria (criteria 8 and 9 below) may be considered to the extent that information is available during the FS, but can be fully considered only after public comment is received on the PP.

The nine evaluation criteria are discussed below. The "Detailed Analysis of Alternatives" can be found in the Final FS report (Ref. 4).

1. Overall Protection of Human Health and the Environment – Considers ability to eliminate, reduce, or control threats to public health and the environment.

2. Compliance with Applicable or Relevant and Appropriate Requirements – For an alternative to become eligible for selection it must meet cleanup levels or other remedial requirements identified as ARARs, or a waiver should be identified and the justification for invoking it must be provided. An alternative that cannot comply with these ARARs, or for which a waiver cannot be justified, would be eliminated from consideration for further discussions as a potential alternative in the PP.

3. Long-Term Effectiveness and Permanence – The ability to maintain protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment – Use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

5. Short-term Effectiveness – The length of time needed to implement an alternative and the hazards posed to residents, construction/commercial workers, visitors/recreational users, and trespassers, and the environment during implementation.

6. Implementability – The technical and administrative feasibility to implement the alternative, including factors such as the relative availability of goods and services.

7. Cost – Estimated cost for implementing the alternative. The basis for developing the cost estimates for the remedial alternatives is presented in Section 5.1.2 of the Final FS report (Ref. 4). All cost information is provided as an estimate, with an accuracy expectation of +50 to -30%. The cost estimates will be refined as the remedy is designed and implemented.

8. State/Regulatory Support Agency Acceptance – Considers whether NDEP agrees with USACE's analyses and recommendation based on the RI/FS and PP.

9. Community Acceptance – Considers whether the local community agrees with USACE's analyses and preferred alternative. Public comments on the PP are an important indicator of community acceptance.

The remedial alternatives developed for **UNLV Study Area MRS02** were evaluated and compared to the nine criteria specified above based on the following publications: United States Army Military Munitions Response Program *Munitions Response Remedial Investigation/Feasibility Study Guidance* (Ref. 11) and the USEPA *Guidance for Conducting Remedial Investigations and Feasibility Studies under Comprehensive Environmental Response, Compensation, and Liability Act* (Ref. 12).

The detailed analysis of alternatives may be thought of as proceeding in two steps: (1) a detailed evaluation of each alternative relative to the nine NCP criteria; and (2) evaluation of the remedial alternatives relative to each other, based on their ability to achieve the evaluation criteria. The Final FS report provides a detailed comparison of each alternative to the nine criteria (Ref. 4).

During the detailed analysis, the alternatives are refined, as appropriate, and analyzed in detail with respect to the evaluation criteria. The detailed analysis of alternatives consists of the analysis and presentation of the relevant information needed to allow decision makers to select a site remedy. However, it is not the decision making process. The results of this detailed analysis of alternatives are used to compare the alternatives and identify the key tradeoffs among them. This approach to analyzing alternatives is designed to provide decision makers with sufficient information to adequately compare the alternatives, select an appropriate remedy for a site, and demonstrate satisfaction of CERCLA requirements.

Table 7 presents an overview of the comparative evaluation for **UNLV Study Area MRS02**. Alternatives 1 and 2 do not pass the threshold criteria and are not further evaluated. Alternative 3 meets the threshold criteria (i.e., provides for overall protectiveness and compliance with ARARs). Alternative 3 has a lower qualitative assessment with regard to short-term effectiveness, implementability, and cost than other alternatives. This remedial action alternative has the highest qualitative assessment with regard to long-term effectiveness and provides a permanent solution with regard to MC contamination in the soil. Additionally, Alternative 3 meets the RAO and allows for future land use requirements to be met.

Table 7: EVALUATION OF REMEDIAL ALTERNATIVES

Evaluation Criteria		Remedial Alternatives		
		Alternative 1 – No Action.	**Alternative 2** – ICs to Protect Current and Future Site Users.	**Alternative 3**– Excavation, Transportation, and Disposal of Contaminated Soils
Overall Protection of Human Health and the Environment		x	x	■
Compliance with Applicable or Relevant and Appropriate Requirements		■	■	■
Long-term Effectiveness and Permanence		x	♦	◘
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment [5]		x	x	x
Short-term Effectiveness		x	◘	♦
Implementability		◘	◘	♦
Cost	Capital Cost[1]	$0	$159,193	**$23,489,493**
	Annual Operations & Maintenance Cost	$0	$0	$0
	Total Periodic Cost[4]	$0	$297,134	$0[2]
	Total Present Value of Alternative	$0	$456,327	$**23,489,493**[3]
State/Regulatory Acceptance		N/A	N/A	To Be Determined (TBD)
Community Acceptance		N/A	N/A	TBD
Estimated Project Duration (years)		0	30	4[2]

Ranking: ■ Meets Criteria (Yes, regarding the first two criteria)
◘ High ability to meet criteria
♦ Moderate ability to meet the criteria
x Does not meet criteria (No, regarding the first two criteria)

Notes: Preferred Alternative is highlighted and cost is **Bold Underline**.
TBD: These criteria will be further evaluated following the comment period for the PP.
N/A: Not applicable, alternative does not meet the threshold criterial.
[1] Estimated costs are the Present Value costs as presented in the FS report (Appendix B).
[2] The implementation of Alternative 3 is expected to lead to a determination of UU/UE.
[3] The cost without 45% contingency costs per USEPA guidance is $16,199,650.
[4] Total Periodic Costs represent the costs for Recurring Reviews.
[5] The Reduction in Toxicity, Mobility, or Volume through Treatment criteria addresses the preference for Remedial Action Alternatives that use treatment technologies that remove MC contaminated soils. The achievement of this criterion depends on the irreversibility of the response and the amount of soils removed from the MRS. The removal included in the Preferred Alternative is not considered treatment.

SUMMARY OF PREFERRED ALTERNATIVE

Based on detailed and comparative analyses of the alternatives (summarized in Table 7), USACE has identified Alternative 3 as the Preferred Alternative. The lead agency, USACE, considers the Preferred Alternative necessary to protect human health, welfare and the environment from actual or threatened releases of hazardous substances (i.e., to address risks to people posed by MC contamination present in the soils of **UNLV Study Area MRS02**) into the environment. Additionally, since future intrusive activities are planned within the footprint of **UNLV Study Area MRS02**, Alternative 3 allows for the RAO and future land use requirements to be met.

Based on information currently available, USACE believes the Preferred Alternative for **UNLV Study Area MRS02** meets both the Threshold criteria and provides the best balance of tradeoffs with respect to the Balancing criteria. The Preferred Alternative provides the greatest reduction of risk within the constraints imposed by the environmental conditions at a reasonable cost when compared to the other options. USACE expects the Preferred Alternative to fulfill the following statutory and regulatory requirements of Section 121(b) of CERCLA: (1) be protective of human health and the environment, (2) comply with ARARs (unless justified by a waiver), and (3) be cost-effective when evaluated against seven of the nine criteria (excluding the State/Regulatory Acceptance and Community Acceptance Criteria, as evaluation of these criteria is ongoing during circulation of the Proposed Plan) described in the NCP. Removal of MC contaminated soils (related to the Moving Target Berm Area, the Best Estimate Remediation Areas within the Small Arms Debris Area, and the Clay Target Debris Area) within the **UNLV Study Area MRS02** footprint would provide for the reduction of toxicity, mobility, and volume through removal only. The Reduction in Toxicity, Mobility, or Volume through Treatment criteria addresses the preference for Remedial Action Alternatives that use treatment technologies that remove MC contaminated soils. The achievement of this criterion depends on the irreversibility of the response and the amount of soils removed from the MRS. The removal included in the Preferred Alternative is not considered treatment. Treatment-based alternatives were screened out in the initial evaluation of alternatives because they would result in alterations/redesign to the current UNLV Campus Design and would not allow full land development. The removal of contaminated soils would eliminate the potential exposure risks that any receptors would be exposed to within **UNLV Study Area MRS02** related to MC contaminated soils.

The state regulatory agency, NDEP, concurs that the selection of the Preferred Alternative, as presented above, is appropriate and provides the best balance of tradeoffs. Per USEPA guidance found in EPA 540-R.98-031, OSWER 9200.1-23P of July 1999, the Preferred Alternative can change in response to public comment or new information.

COMMUNITY PARTICIPATION

USACE provides information regarding the remedial alternatives for **UNLV Study Area MRS02** to the public through public meetings and the Administrative Record file for the site. Announcements about the meetings and Administrative Record will be published in the *Las Vegas Review Journal* and *El Mundo Las Vegas* (local newspapers). USACE encourages the public to gain a more comprehensive understanding of the site and the previous activities that have been conducted at the site.

Public input is a key element in the CERCLA process. The local community is encouraged to comment on this PP and the Preferred Alternative summarized herein. Comments from the public will be used to help determine what action to take. Members of the public may communicate verbally or in writing at the public meeting on 1 August 2019. Representatives from USACE and NDEP will be present at the meeting to explain the PP, hear concerns, and answer questions.

Members of the public may comment in writing during the public comment period (24 June through 2 August 2019).

Correspondence should be sent to:

Mr. Randy Tabije
United States Army Corps of Engineers
Los Angeles District
915 Wilshire Boulevard, Suite 930
Los Angeles, CA 90017-3401
Phone: (951) 898-6144
Fax: (213) 452-4213
Email: roland.r.tabije@usace.army.mil

If special correspondence or public meeting accommodations are needed, please call **(951) 898-6144**.

After considering public comments, USACE will select the final remedy. The Preferred Alternative may be modified based on public comment or new information. The final chosen remedy will be described in the DD phase (the next step after this PP). USACE will respond to comments from the public in a responsiveness summary, which will be part of the DD and will be available for review in the Administrative Record file.

REFERENCES

1. CERCLA, 11 December 1980, 42 USC 9601-9675, Public Law (PL) 96-510, as amended by the Superfund Amendment and Reauthorization Act (SARA). 17 October 1986.
2. NCP, 40 CFR Part 300.
3. USACE. 2019. Final Remedial Investigation Report, Nellis Small Arms RGE AX, University of Nevada – Las Vegas Study Area, Munitions Response Site 02, Formerly Used Defense Sites Project Number J09NV051002, Contract No. W912PL-16-C-0024. February..
4. USACE. 2019. Final Feasibility Study Report, Nellis Small Arms RGE AX, University of Nevada – Las Vegas Study Area, Munitions Response Site 02, Formerly Used Defense Sites Project Number J09NV051002, Contract No. W912PL-16-C-0024. Feburary.
5. USACE. 1996. Archives Search Report (ASR), Nellis Small Arms Range. July.
6. USACE. 2007. Final Site Inspection Report, Former Nellis Small Arms Range Site, Clark County, Nevada. July.
7. USACE. 2017. UNLV Study Area MRS02, Remedial Investigation/Feasibility Study, Uniform Federal Policy for Quality Assurance Project Plan (UFP-QAPP), Final. November.
8. USACE. 1994. Inventory Project Report (INPR), Nellis Small Arms Range Annex, Las Vegas, Nevada. August.
9. USACE. 2004. ASR Supplement, Nellis Small Arms Range. November
10. USACE. 2017. Memorandum Establishing Guidance and Implementing Trial Period for Risk Management Methodology at FUDS MMRP Projects. 3 January.
11. U.S. Army. 2009. Military Munitions Response Program – Munitions Response – Remedial Investigation/Feasibility Study Guidance. November.
12. USEPA. 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA. EPA/540/G-89/004, OSWER Directive 9355.3-01. October.

GLOSSARY OF TERMS

Administrative Record - The documents that form the basis for the selection of a response action and maintained by USACE.

Anomaly - Any item that is identified as a subsurface irregularity during geophysical investigation. This irregularity deviates from the expected subsurface ferrous and nonferrous material at a site (pipes, power lines, etc.).

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 (42 USC §9601 et seq.) **-** This Act authorizes the USEPA to respond to the release or potential release of hazardous substances into the environment or a release or threat of release of a pollutant or contaminant into the environment that may present an imminent or substantial danger to public health or welfare.

Decision Unit (DU) – The area for which a remedial decision will be made.

Decision Document (DD) (40 CFR §300.430 (f)(2)) **-** The documentation of remedial response decisions at FUDS. USACE, executing this project on behalf of the Army, shall select and approve the final Selected Remedy at this non-National Priority List site.

Feasibility Study (FS) (40 CFR §300.430 (f)(2)) - A study undertaken by the lead agency to develop and evaluate options for remedial action. The RI findings and recommendations are used to support development of remedial action objectives. Remedial action alternatives to achieve the objectives are defined and evaluated in the FS, and a recommended alternative is identified. The term also refers to a report that describes the results of the study.

Formerly Used Defense Sites (FUDS) - Facility or site that was under the jurisdiction of the Secretary of Defense and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to contamination by hazardous substances, for which the Secretary of Defense shall carry out all response actions with respect to releases of hazardous substances from that facility or site.

High Explosive (HE) - High explosives are materials that detonate (i.e., the front of the chemical reaction moves faster through the material than the speed of sound). Munitions Constituents (for example, TNT, RDX), as defined in 10 USC 2710(e)(3), posing an explosive hazard can be defined as high explosive.

Incremental Sampling – A type of sampling that uses many individual subsamples (increments) to obtain an estimate of the average concentrations of contaminants in a volume of soil.

Institutional Control (IC) - Proprietary Controls and state or local laws, regulations, ordinances, zoning restrictions, or other governmental controls or notices that: (i) limit land, water and/or resource use to minimize the potential for human exposure to waste materials at the site; (ii) limit land, water and/or resource use to implement, ensure non-interference with, or ensure the protectiveness of the Remedial Action; and/or (iii) provide information intended to modify or guide human behavior at the site.

Low Explosive (LE) - Low explosives are materials that exhibit deflagration (i.e., a rapid high energy release combustion event that propagates through a gas or an explosive material at subsonic speeds, driven by the transfer of heat). Low explosives include such materials as smokeless powder and black powder used as pyrotechnics and propellants.

Military Munitions - Military munitions means all ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the DoD, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs,

warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof. The term does not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components, except that the term does include non-nuclear components of nuclear devices that are managed under the nuclear weapons program of the Department of Energy after all required sanitization operations under the Atomic Energy Act of 1954 (42 USC §2011 et seq.) have been completed (10 USC §101(e)(4)).

Military Munitions Response Program (MMRP) – Program designed to address the remediation of unexploded ordnance, discarded military munitions, and munitions constituents located on defense sites.

Munitions Constituents (MC) - Any material originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 USC §2710(e)(3)).

Munitions and Explosives of Concern (MEC) - Specific categories of military munitions that may pose unique explosives safety risks, specifically composed of (a) unexploded ordnance, (b) discarded military munitions, or (c) munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

Munitions Debris (MD) - Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.

Munitions Response Site (MRS) - A discrete location within a Munitions Response Area that is known to require a munitions response.

Preferred Alternative (40 CFR §300.430 (f)(2)) - The alternative that USACE feels is the best way to address past military impacts to a site.

Proposed Plan (PP) (40 CFR §300.430 (f)(2)) - The Preferred Remedial Alternative for a site is presented to the public in a PP. The PP briefly summarizes the remedial alternatives studied in the detailed analysis phase of the RI/FS, highlighting the key factors that led to identifying the Preferred Alternative. The PP, as well as the RI/FS and the other information that forms the basis for the lead agency's response selection, is made available for public comment in the Administrative Record file.

Remedial Investigation (RI) (40 CFR §300.430 (f)(2)) - A process undertaken by the lead agency to determine the nature and extent of environmental contamination from a release. The RI emphasizes data collection and site characterization, and is generally performed concurrently and in an interactive fashion with the feasibility study. The RI includes sampling and monitoring, as necessary, and presents assessments of human and/or ecological risk to determine the necessity for remedial action and to support the evaluation of remedial alternatives.

Response Action - An action taken to achieve one or more remedial action objectives. General types of response actions include no action, institutional actions such as restricting access, containment actions, treatment actions, and removal actions.

Unexploded Ordnance (UXO) - Military munitions that have been (a) primed, fuzed, armed, or otherwise prepared for action; (b) have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material; and/or (c) remain unexploded either by malfunction, design, or any other cause (10 USC §101(e)(5)).

Upper Confidence Limit (UCL) – A confidence limit is a measure of how accurate an estimate of the mean (average) is likely to be. The 95% upper confidence limit value for the mean implies 95% confidence that the average is below that value.

ACRONYMS

%	percent
§	Section
ARARs	Applicable or Relevant and Appropriate Requirements
ARPA	Archaeological Resources Protection Act
ASR	Archives Search Report
B[a]P	benzo[a]pyrene
BLM	United States Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMUA	concentrated munitions use area
DD	Decision Document
DERP	Defense Environmental Restoration Program
DGM	Digital Geophysical Mapping
DoD	Department of Defense
DU	Decision Units
ESA	Endangered Species Act
FS	Feasibility Study
FUDS	Formerly Used Defense Sites
GPS	Global Positioning System
ICs	Institutional Controls
INPR	Inventory Project Report
LiDAR	Light Detection and Ranging
MBTA	Migratory Bird Treaty Act
MC	Munitions Constituents
MD	Munitions Debris
MEC	Munitions and Explosives of Concern
mg/kg	milligram/kilogram
mm	millimeter
MRS	Munitions Response Site
msl	mean sea level
N/A	not applicable
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDEP	Nevada Division of Environmental Protection
NWI	National Wetlands Inventory
OB/OD	open burn/open detonation
PAH	polycyclic aromatic hydrocarbon
PP	Proposed Plan
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RGE AX	Range Annex
RI	Remedial Investigation
RSL	Regional Screening Level
SA	Small Arms (Debris Area)
SI	Site Inspection
TBD	to be determined
TCLP	toxicity characteristic leaching procedure
TPP	technical project planning
95UCL	95% upper confidence limit of the mean
UFP-QAPP	Final Uniform Federal Policy for Quality Assurance Project Plan
UNLV	University of Nevada – Las Vegas
USACE	United States Army Corps of Engineers
USC	United States Code
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UU/UE	unlimited use/unrestricted exposure
UXO	Unexploded Ordnance
WWII	World War II

Follow the 3Rs of Explosives Safety:

- **Recognize:**
  when you may have encountered a munition and that munitions are dangerous.
- **Retreat:**
  do not approach, touch, move or disturb it, but carefully leave the area.
- **Report:**
  call 911 and advise the police of what you saw and where you saw it.

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USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for **UNLV Study Area MRS02** is important to United States Army Corps of Engineers. Comments provided by the public are valuable in helping United States Army Corps of Engineers select a final remedial alternative for the site.

You may use the space below to write your comments, then fold and mail. Comments must be postmarked by 1 August 2019. If you have any questions about the comment period, please contact Mr. Randy Tabije by phone at (951) 898-6144 or by email at roland.r.tabije@usace.army.mil.

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Name: _____

Address: _____

City: _____

State: _____ Zip: _____

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