



DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE NEW MEXICO

APR 22 2014

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APR 25 2014

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NMED
Hazardous Waste Bureau

Dear Ms. Jacques,

Attached is the "*Engineering Evaluation/Cost Analysis for site TS835-1940's Skeet Range*" for your review. If you have any questions regarding this submittal, please contact Mr. Ron Lancaster, Chief, Installation Management Flight at (575) 784-1146.

Sincerely

HEATHER L. BUONO, Colonel, USAF

Attachment:
Engineering Evaluation/Cost Analysis TS835-1940's Skeet Range

cc:
New Mexico Environment Department, Mr. Daniel Comeau, with Attachment

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4 March 2014

MEMORANDUM FOR: SEE DISTRIBUTION LIST

RE: Draft Final TS835 – 1940's Skeet Range MRS Engineering Evaluation / Cost Analysis
Cannon AFB
New Mexico – Arizona Group Performance Based Remediation (PBR)
Contract No. FA8903-13-C-0008
SubCLIN 0036AA

FPM Remediations, Inc. (FPM) is pleased to submit the above-referenced Engineering Evaluation / Cost Analysis. This deliverable is being provided under SubCLIN 0036AA – TS835 – Former Skeet Range – Achieve Engineering Evaluation / Cost Analysis:

If you have any questions or require additional information, please contact Maureen Whalen at 315-336-7721 or via e-mail at m.whalen@fpm-remediations.com.

Very truly yours,

Maureen S. Whalen, CG, CPG, PMP
Project Manager

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(1 electronic copy each)

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(4 hardcopies, 4 electronic copies)

TS835 - 1940's SKEET RANGE

**ENGINEERING EVALUATION/
COST ANALYSIS**

**CANNON AIR FORCE BASE
NEW MEXICO
RCRA PERMIT No. NM7572124454**

**Performance Based Remediation
Contract Number: FA8903-13-C-0008**

Prepared for



**AIR FORCE CIVIL ENGINEER CENTER
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March 2014

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Acronyms and Abbreviations

°F	degrees Fahrenheit
AAR	After Action Report
AF	Air Force
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
ARAR	applicable or relevant and appropriate requirement
BCY	bank cubic yards
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSE	Comprehensive Site Evaluation
CSM	conceptual site model
DERP	Defense Environmental Restoration Program
EE/CA	Engineering Evaluation/Cost Analysis
FPM	FPM Remediations, Inc.
FS	Feasibility Study
Ft	Feet
ID	identification
IRA	Interim Removal Action
IRP	Installation Restoration Program
MEC	Munitions and Explosives of Concern
MC	Munitions Constituents
mg/kg	milligrams per kilogram
MMRP	Military Munitions Response Program
MRA	munitions response area
MRS	munitions response site
MRSPP	Munitions Response Site Prioritization Protocol
NMED	New Mexico Environment Department
NCP	National Oil and Hazardous Substances Contingency Plan
ND	Non-detect
NFA	No Further Action

NTCRA	non-time critical removal action
O&M	operation and maintenance
PAH	Polycyclic Aromatic Hydrocarbon
PP	Proposed Plan
PRSC	post-removal site control
PSV	Preliminary Screening Value
RAO	Removal Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
RSL	Regional Screening Level
SSL	Soil Screening Level
TBC	to be considered
TFW	Tactical Fighter Wing
U.S.C.	United States Code
USAF	United States Air Force
USEPA	United States Environmental Protection Agency
XRF	X-ray fluorescence

This Engineering Evaluation/Cost Analysis (EE/CA) is being performed in support of the United States Air Force (USAF) Military Munitions Response Program (MMRP) at Cannon Air Force Base (AFB) near Clovis, New Mexico. The goal of the USAF MMRP is to make Munitions Response Areas (MRAs) and Munitions Response Sites (MRSs) safe for reuse and to protect human health and the environment in the process. This document was prepared in accordance with requirements under the National Oil and Hazardous Substances Contingency Plan (NCP), Code of Federal Regulations (CFR), Title 40, Part 300.415.

1.1 AUTHORITY

The MMRP was created by Congress in 2001 under the Defense Environmental Restoration Program (DERP) as established by Section 211 of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and is codified in Sections 2701-2710 of Title 10 of the United States Code (U.S.C.). This EE/CA is being completed in accordance with the USAF MMRP cleanup process that follows the requirements of the NCP as promulgated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by SARA. This EE/CA is being completed by the FPM Remediations, Inc. (FPM) Team, under FPM's Air Force Civil Engineering Center (AFCEC) Contract FA8903-13-C-0008, to support the USAF MMRP.

The USAF is the acting lead agency for this EE/CA. Participation of and cooperation with federal, state, and local authorities and the local public will be solicited for the duration of proposed activities and for all environmental restoration activities at Cannon AFB. Participation by these entities is required for the environmental restoration process and aids in ensuring the protection of human health and the environment. Federal, state, and local authorities will have input into the actions implemented at Cannon AFB through planning meetings, plan review, and the public comment process. Federal, state, and local authorities concerns will be solicited and provisions of federal, state, and local regulations will be given full consideration for all actions taken at Cannon AFB.

1.2 PURPOSE AND SCOPE

The purpose of this EE/CA is to evaluate alternatives and associated costs to mitigate hazards to human health and the environment associated with polycyclic aromatic hydrocarbon (PAHs)-impacted soils present within the TS835 - 1940's Skeet Range MRS to support a non-time critical removal action (NTCRA). The Comprehensive Site Evaluation (CSE) Phase II analytical laboratory results indicated that concentrations of five PAH compounds (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene) were detected at concentrations greater than the current New Mexico Environment Department (NMED) soil screening levels (SSLs) and also greater than the United States Environmental Protection Agency (USEPA) residential Regional Screening Levels (RSLs). While one additional PAH (benzo(k)fluoranthene) was detected at concentrations greater than the applicable USEPA residential RSL only.

1.3 INSTALLATION DESCRIPTION AND BACKGROUND

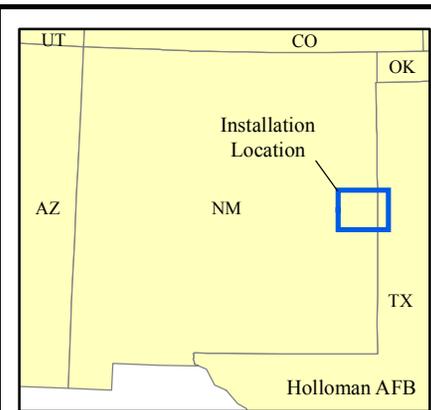
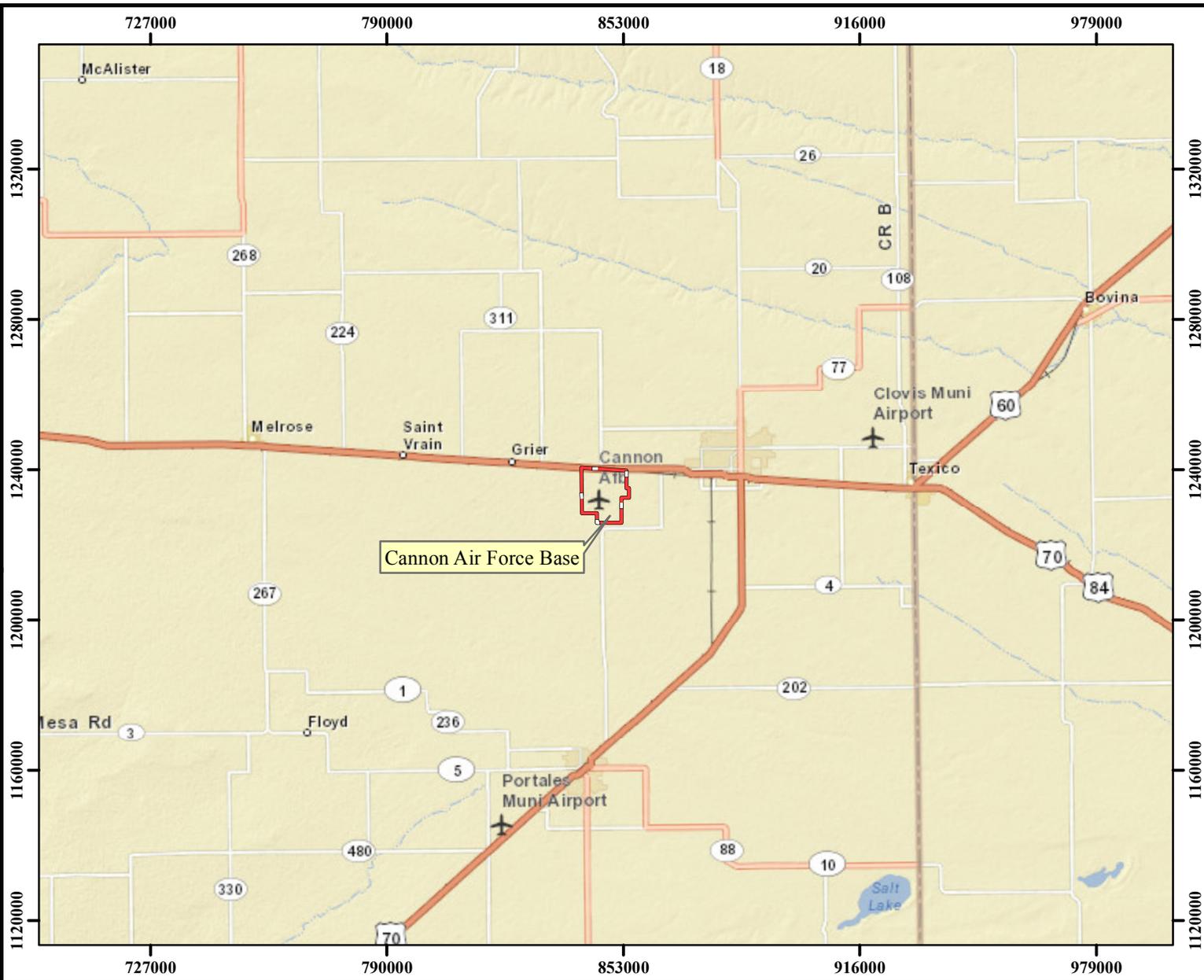
Cannon AFB is located in Curry County, New Mexico, about eight miles west of the City of Clovis, 12 miles north of the City of Portales, and 190 miles east-southeast of the City of Albuquerque. It is situated in New Mexico's high plains, near the Texas Panhandle (**Figure 1-1**). Cannon AFB is bordered to the east by Curry Road P and to the west by Curry Road R. The boundary of the main portion of the base has remained relatively unchanged since the base's inception.

The base encompasses approximately 3,789 acres (5.9 square miles) of federally-owned land. Buildings and administrative areas are generally found in the northern portion of the AFB, while the southern portion is comprised mainly of access roads and the flight line. Off-base facilities include the Melrose Air Force Range (formerly the Melrose Bombing Range), located approximately 24 miles west-southwest of the base and the Conchas Lake Recreation Annex, located approximately 80 miles northwest of the base (USACE, 2009).

The history of Cannon AFB began in 1929 with the establishment of Portair Field (later Clovis Municipal Airport), a civilian passenger terminal for early commercial transcontinental flights. The Army Air Corps took control of the site in 1942, and it became known as Clovis Army Air Base (renamed Clovis Army Air Field in 1945, and later Clovis AFB). Through the end of World War II, the base was used for flying, bombing, and gunnery classes. It was placed on reduced operational status in mid-1946 and flying activity decreased. The installation was deactivated in 1947. Up until that point, aircraft at Cannon AFB included the B-17, B-24, and B-29 heavy bombers. The base was reassigned to the Tactical Air Command in mid-1951 and was reactivated later that year. Between 1951 and 1957, aircraft at the base included the P-51 "Mustang" and F-86 "Sabre" fighter jets. The base later became a permanent installation in June 1957 and was renamed Cannon AFB in honor of the late General John K. Cannon, a former commander of the Tactical Air Command. In 1959, the 312th Tactical Fighter Wing (TFW) was deactivated and replaced by the 27th TFW (which, by the mid-1970s, had become the principal USAF unit at Cannon AFB). In 1965, the base's mission changed to that of a replacement training unit. Until 2005, the function and operations of Cannon AFB has remained relatively unchanged. (USACE, 2009)

In May 2005, the Secretary of Defense recommended the closure of Cannon AFB to the Base Realignment and Closure Commission. The Commission's subsequent September 2005 final report to the President recommended that the base remain open as an enclave until at least 31 December 2009 (or until a new mission was found) and that the 27th TFW be dis-established. The Secretary of Defense designated Special Operations as the new mission at Cannon AFB on 19 June 2006, and the 27th Special Operations Wing was activated under the control of Air Force Special Operations Command (USACE, 2009).

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Legend

Base Boundary

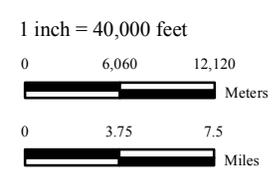
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 New Mexico-Arizona
 Cannon Air Force Base
 Clovis, NM
 AFCEC

FIGURE 1-1

Cannon AFB
Location

NOTES:
 Revision Date: 1/30/2014

Coordinate System: NAD 1983 StatePlane New Mexico East FIPS 3001 Feet
 Projection: Transverse Mercator
 False Easting: 541,337.5000
 Central Meridian: -104.3333
 Latitude Of Origin: 31.0000
 Horizontal Datum: North American 1983
 False Northing: 0.0000
 Scale Factor: 0.9999
 Units: Foot US



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2014

Report Organization

This EE/CA is organized into the following seven sections:

- **Section 1 – Introduction.** Introduces the project authority, purpose, and scope. The Cannon AFB location and operational history are described herein.
- **Section 2 – MRS Characterization.** Presents MRS description and background information; previous investigations; the source, nature, and extent of contamination; and a streamlined risk evaluation for TS835 - 1940's Skeet Range MRS.
- **Section 3 – Development of Removal Action Objectives.** States the justification for the proposed removal action; chemical-specific, location-specific, and action-specific applicable or relevant and appropriate requirements (ARARs); and the removal action objectives (RAOs) for the TS835 - 1940's Skeet Range MRS.
- **Section 4 – Development of Removal Action Alternatives.** Details the development of the removal action alternatives.
- **Section 5 – Analysis of Alternatives.** Presents and compares the effectiveness, implementability, and cost of each identified alternative.
- **Section 6 – Recommended Alternative.** Documents the recommended alternative for the removal action at the TS835 - 1940's Skeet Range MRS.
- **Section 7 – References.** Provides references used to develop this document.
- **Appendix A – Removal Action Alternatives Cost Estimates**

The following subsections present the MRS description and background information; previous investigations; the source, nature, and extent of contamination; and a streamlined risk evaluation for the TS835 - 1940's Skeet Range MRS.

2.1 MRS DESCRIPTION AND BACKGROUND

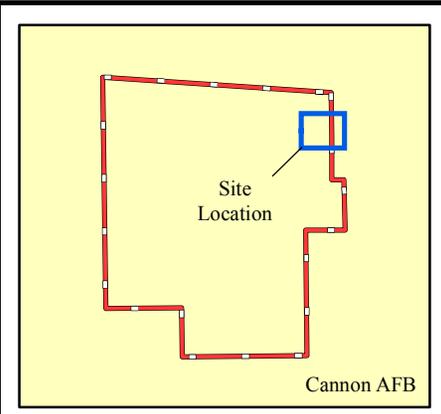
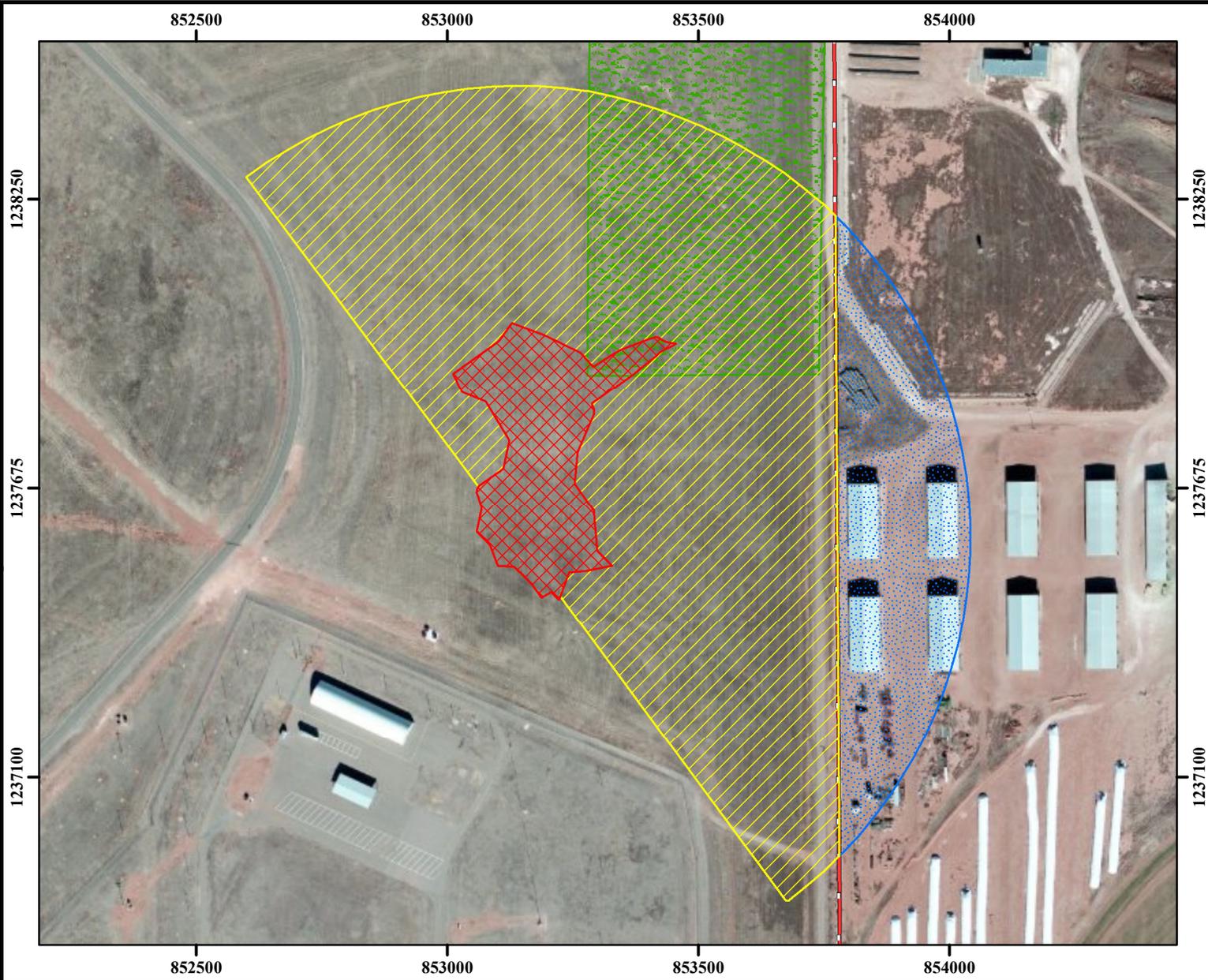
2.1.1 MRS Location and History

Based on the Modified CSE Phase I Report, the 1940's Skeet Range MRA was the only MRA identified and multiple associated components of the Cannon AFB Modified CSE Phase I were deferred to the CSE Phase II. These elements included the conceptual site model (CSM), the Munitions Response Site Prioritization Protocol (MRSP) scoring elements, and the Hazard Ranking System data elements (VERSAR, 2012). The aforementioned elements were evaluated through the USAF MMRP CSE Phase II process and reporting. The CSE Phase II investigated potential sources of munitions constituents (MC) from previous range related activities at the 1940's Skeet Range MRA. As the site history of the MRA indicated range usage was limited to small arms, Munitions and Explosives of Concern (MEC) larger than small arms was not suspected to be present.

The 1940's Skeet Range MRA consisted of approximately 29.4 acres, and is located in the northeast portion of the base, just north of the Former Ordnance/Current Munitions Storage Area (**Figure 2-1**). The firing direction at the range was orientated to the northeast. The range fan from MRA extended beyond the installation boundary to the east onto the Rajen Dairy property and also overlaps with a portion of Installation Restoration Program (IRP) Site LF-02 (SWMU82) to the north. Based on the CSE Phase I the 1940's Skeet Range was likely active from at least 1943 to at least 1946 (VERSAR 2012). During operation, munitions use was suspected to be limited to 12-, 16-, or 20-gauge shotgun with shells containing lead shot. During the active time period for the MRA, clay targets were composed of various PAH compounds. Typically, skeet ranges were used for training and/or recreational target shooting. No further documentation has been provided regarding the history of munitions-related activities in this area.

Based on the CSE Phase II findings, the 1940's Skeet Range MRA was recommended to be divided into 3 MRSs: TS835a (≅21.7 acres) comprised of the on-base portion not impacted by PAH or lead contamination (**Figure 2-1**) and was recommended for no further action (NFA) due to the lack of MEC and MC exceeding residential RSLs and/or SSLs, TS835b (≅6.32 acres) defined as the off-base portion was also recommended for NFA, and TS835 (≅2.45 acres) was recommended for further munitions response action based on elevated PAH concentrations and visual confirmation of clay target debris. The boundary of the TS835 MRS also extends slightly beyond the original boundary to the south and to the northeast into IRP Site LF-02. **Based on the CSE Phase II results, this EE/CA addresses the TS835 - 1940's Skeet Range MRS only and not TS835a or TS835b.**

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Legend

- LF-02
- TS835
- TS835a
- TS835b
- Base Boundary

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 Cannon Air Force Base
 Clovis, NM
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FIGURE 2-1

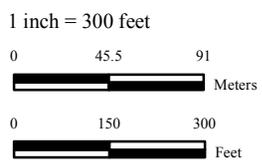
TS835
 1940's Skeet Range MRS



2014

NOTES:
 Revision Date: 1/30/2014

Coordinate System: NAD 1983 StatePlane New Mexico East FIPS 3001 Feet
 Projection: Transverse Mercator
 False Easting: 541,337.5000
 Central Meridian: -104.3333
 Latitude Of Origin: 31.0000
 Horizontal Datum: North American 1983
 False Northing: 0.0000
 Scale Factor: 0.9999
 Units: Foot US



2.1.2 Physical and Environmental Setting

Structures

The TS835 – 1940’s Skeet Range MRS does not contain any structures. The only remnants of the range observed during the CSE Phase II visual survey included clay target debris and several slabs of concrete (VERSAR, 2012).

Climate

The climate at Cannon AFB is mainly hot and dry. Monthly average high temperatures range from 50 degrees Fahrenheit (°F) in January to 89 °F in July. Average monthly low temperatures range from 25 °F in January to 65 °F in July. Annual mean precipitation is approximately 15.8 inches (USACE, 2009). Cannon AFB receives approximately 13.3 inches of snowfall annually.

Topography

Cannon AFB is situated in the Southern High Plains section of the Great Plains physiographic province. This section of the plateau is bordered to the north by the Canadian River (which lies approximately 60 miles north of the base), to the east and west by escarpments rising up to 300 feet (ft), and to the south by the Edwards Plateau in western Texas (USACE, 2009). Cannon AFB is situated near the center of the plateau and features relatively flat land with nearly no topographic relief. Elevations range from 4,260 ft above mean sea level in the southeast to 4,330 ft above mean sea level in the northwest portion (USACE, 2009).

The TS835 - 1940’s Skeet Range MRS is relatively flat with a gentle sloping to the southeast.

Soil and Vegetation Types

Soils at Cannon AFB mainly consist of Amarillo fine sandy loam. This soil is well-drained, and the depth of the underlying water table is approximately 250ft (USACE, 2009).

The vegetation at the base is typical of semiarid short grass prairies and is limited by water availability. This vegetation type is consistent with what is found at the TS835 – 1940’s Skeet Range MRS (USACE, 2009).

Geology and Hydrogeology

The geology beneath Cannon AFB mainly consists of a thick 200 to 400ft layer of unconsolidated sediments deposited over Triassic sandstone. The sandstone forms the base of the High Plains aquifer (regionally called the Ogallala aquifer), which is situated within the overlying gravel, sand, and clay sediments (Black & Veatch, 2008). The unconfined aquifer beneath Cannon AFB is the sole source of water supply for the Base. Groundwater flow is typically east to southeast, and water table slope is approximately 7 to 15ft per mile (Black & Veatch, 2008).

Hydrology

The southern High Plains area generally does not contribute to stream flow except during rare periods of excessive rainfall. Cannon AFB is positioned near the headwaters of the Brazos River, nonetheless due to low precipitation, high evapotranspiration, and gently-sloping terrain, little if any runoff ever reaches the river. Additionally, surface water streams are non-existent in the vicinity of the base. The nearest drainage feature is located approximately 10 miles north of Cannon AFB and is mostly dry throughout the seasons. Drainage in the vicinity of the AFB is poorly developed due to low annual rainfall and lack of relief. The only significant surface water features at the installation are several playas and ponds, located in the northern, eastern, and southern portions of the base (USACE, 2009).

2.1.3 Sensitive Ecosystems

There are two identified communities of black-tailed prairie dogs, which are federally listed endangered wildlife species, found at the base (one near the active munitions storage area and one near the runways). These communities have also been documented in the vicinity of the Melrose Air Force Range. However, the black-tailed prairie dog has not been identified at the TS835 – 1940’s Skeet Range MRS. Furthermore, there are no cultural or archaeological sites documented for the TS835 – 1940’s Skeet Range MRS (USACE, 2009).

2.1.4 Current and Future Land Use

The TS835 - 1940’s Skeet Range MRS consists largely of an open field. The TS835a MRS encompasses TS835 on the west, northwest, and eastern boundaries. Installation Restoration Program Site LF-02 (SWMU82) is situated northeast of the TS835 MRS. This site consists of an unlined, inactive cut-and-fill landfill that was active from 1946 through 1947, then from 1952 through 1959. It is reportedly covered by 4 to 4.5 ft of cover material consisting of sandy clay (**Figure 2-1**) (VERSAR, 2012). To the east of the MRS (off-base) is a privately owned property consisting of few buildings and is used mainly for storage and TS835b. No future land use changes are anticipated.

2.2 PREVIOUS INVESTIGATIONS

Two previous investigations, a Modified CSE Phase I Report (USACE, 2009) and a MMRP CSE Phase II Report (VERSAR, 2012), have been completed at the 1940’s Skeet Range MRA (and subsequently the TS835 - 1940’s Skeet Range MRS).

2.2.1 Modified Comprehensive Site Evaluation Phase I

The Modified CSE Phase I Report (USACE, 2009) was conducted with the objective to characterize sites and sources; evaluate actual or potential releases(s) of related MC to migration/exposure pathways (groundwater, soil, air); and evaluate associated MRAs. The primary goal of the CSE Phase I was to determine whether individual MRAs within the identified installation warrant additional munitions response activities or documentation for a NFA determination. Historical records from on-site and off-site data repositories were reviewed

and interviews were completed with personnel knowledgeable about historical munitions activities. A non-intrusive visual survey of the MRA was completed to identify physical evidence of potential range related activities. A complete visual reconnaissance was not completed during the Phase I activities due to access to privately owned land being denied. Clay target debris and several slabs of concrete were observed within the boundary. Based on the Phase I findings, a CSE Phase II was recommended (USACE, 2009).

2.2.2 Comprehensive Site Evaluation Phase II

The CSE Phase II (VERSAR 2012) activities compiled and evaluated information on Cannon AFB relating to the possible presence of MEC and associated soil contamination from MC. During the CSE Phase II fieldwork, a visual reconnaissance survey of the 1940's Skeet Range MRA was completed on 100% of the on-base portion. Fluctuating densities of clay target fragments were observed, and the localized areas of these fragments were delineated according to medium and low density (VERSAR, 2012). It was determined that the total area impacted by clay target debris is approximately 2.45 acres.

Surface and subsurface soil sampling were performed to evaluate potentially impacted environmental media from range related MC. The CSE Phase II Report recommended splitting the MRA into the three following MRSs which were scored individually utilizing the Munitions Response Sites Prioritization Protocol. TS835a MRS (21.7 acres) encompasses the on-base portion of the MRA not impacted by PAH or lead contamination. The results of the CSE Phase II indicated that TS835a MRS receive a Priority of 8 (Priority 1 indicates the highest potential hazard and Priority 8 indicates the lowest potential hazard) and was recommended for NFA. TS835b MRS (6.32 acres) defined as the off-base portion was also recommended for NFA and also received a Priority of 8. TS835 MRS (2.45 acres), delineated based on the visual extent of clay target debris was recommended for future munitions response actions due to the presence of MC-impacted soil and received a Priority of 4. Analytical results are detailed in the USAF MMRP CSE Phase II Report for Cannon AFB, New Mexico Version 2.0 (VERSAR, 2012).

2.3 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

Land associated with the TS835 - 1940's Skeet Range MRS was used as a skeet range. During the use of the site, lead shot and clay targets (potentially containing PAH compounds) were deposited on the surface of the skeet range. The primary range-related contaminants are considered lead and PAH compounds which may have been released directly to the soil during the initial deposition activity or through weathering.

The CSE Phase II field activities included X-ray fluorescence (XRF) field analysis of surface and subsurface soil samples at the entire 1940's Skeet Range MRA to evaluate and define the nature and extent of any lead contamination. A total of 41 investigative samples were collected and analyzed. Results indicated no elevated concentrations of lead in the surface soil and therefore no subsurface samples were collected. Lead was significantly below the NMED SSL of 400 milligram per kilogram (mg/kg) and USEPA residential RSL also 400 mg/kg for unrestricted/residential land use in all samples collected. All XRF results were less than 50 mg/kg, and concentrations ranged from 0 mg/kg to 26 mg/kg (VERSAR, 2012). The CSE Phase

II correlation coefficient of the XRF and laboratory data was 0.92, which was sufficient to define the extent of lead contamination in the field.

Surface soil XRF lead results collected during the CSE Phase II activities are summarized in **Table 2-1**. XRF sample locations are shown on **Figure 2-2**. Based on the results from the CSE Phase II, lead from small arms ammunition is not considered to pose an unacceptable risk under any potential land use scenario.

Table 2-1
CSE Phase II XRF Lead Results, Surface Soil Samples (0 to 6 inches bgs)

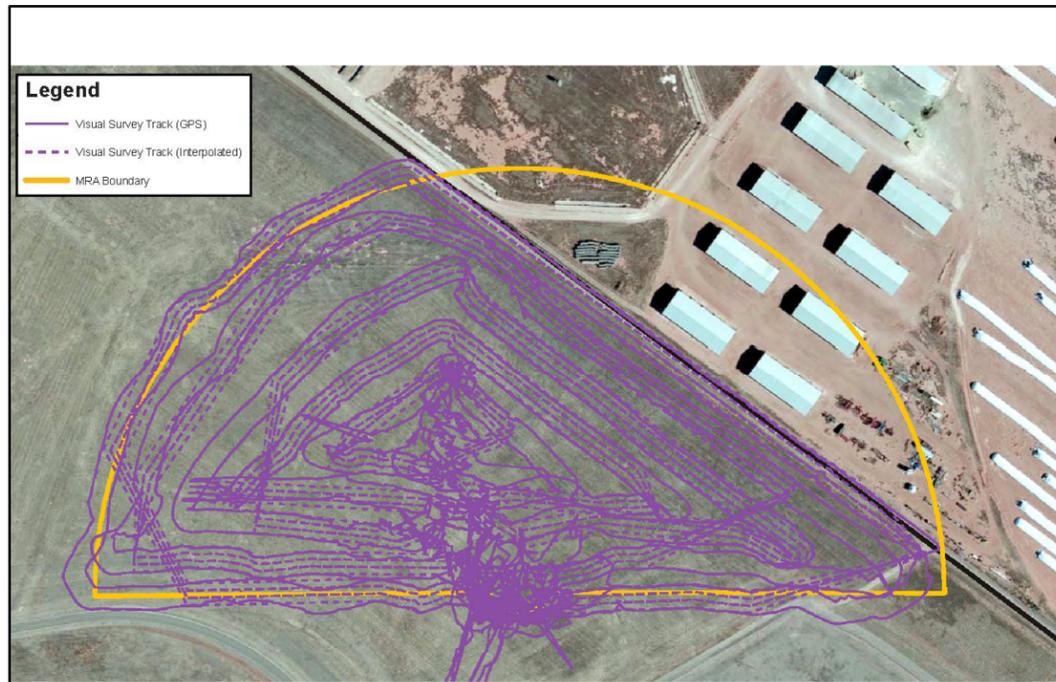
Sample ID	Lead (mg/kg)	Sample ID	Lead (mg.kg)
SR001	12	SR022	6.3
SR002	9.7	SR023	9.7
SR003	6.3	SR024	17
SR004	10	SR025	15.3
SR005	13.7	SR026	9.3
SR006	8.7	SR027	25
SR007	11.3	SR028	17.7
SR008	19.3	SR029	10
SR009	10.3	SR030	12.3
SR010	15.3	SR031	10
SR011	12.3	SR032	8
SR012	16.3	SR033	11
SR013	9.7	SR034	26
SR014	13.3	SR035	12.3
SR015	12	SR036	10.5
SR016	9	SR037	13
SR017	9.7	SR038	11
SR018	14.3	SR039	12.3
SR019	11	SR040	12
SR020	21	SR041	11
SR021	14		

(VERSAR, 2012)

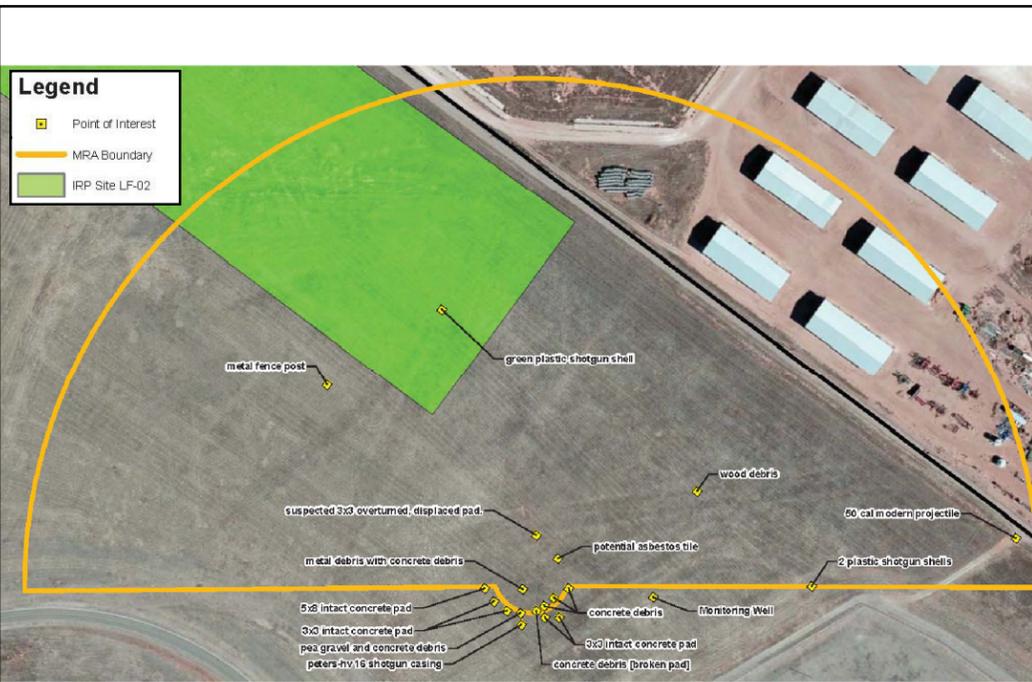
Notes: bgs – below ground surface
ID - identification

A background comparison for metals was also conducted during the CSE Phase II. Of the 41 lead samples analyzed by XRF two samples yielded results between the background concentration of 5.6 – 7.4 mg/kg. All other samples yielded results above the background. The highest reported XRF value was 26 mg/kg. Although all but two XRF samples exceeded the background value, all samples analyzed were below the NMED SSL and USEPA RSL of 400 mg/kg (VERSAR, 2012).

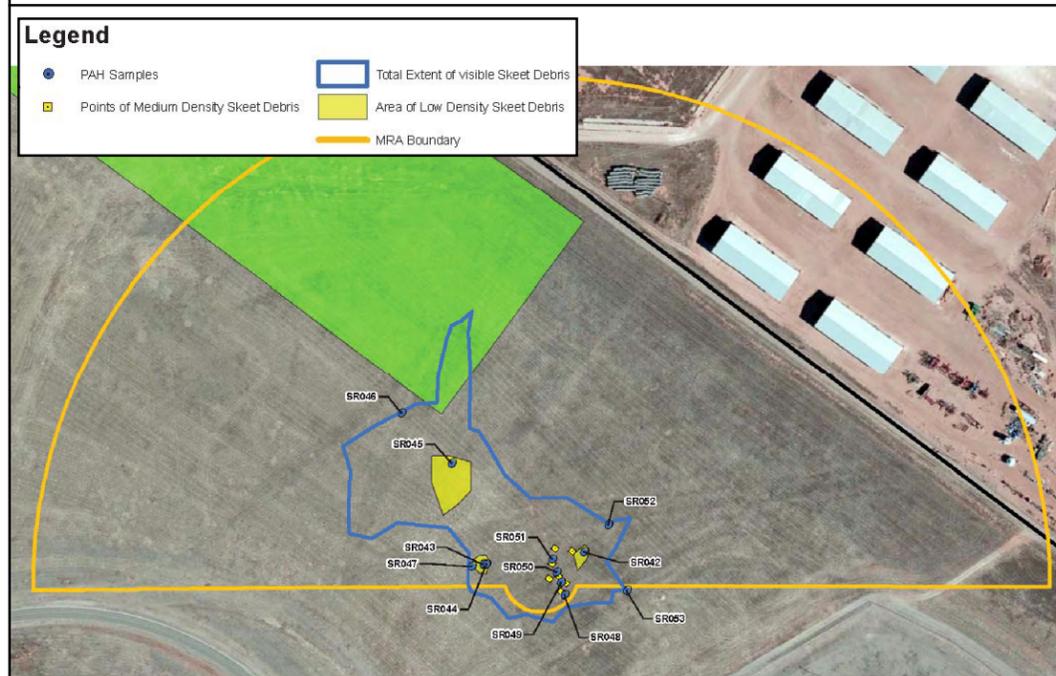
A total of 25 samples were collected from representative soils at 12 locations within the clay target debris area for potential PAH analysis at a fixed-based laboratory. In summary, 14 of the 25 samples collected and analyzed for PAHs yielded concentrations greater than current NMED. SSLs, and 20 of the 25 samples yielded concentrations greater than the USEPA RSLs. Analytes detected at concentrations greater than the NMED SSLs and also greater than the USEPA RSLs include; benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenz(a,h)anthracene, and



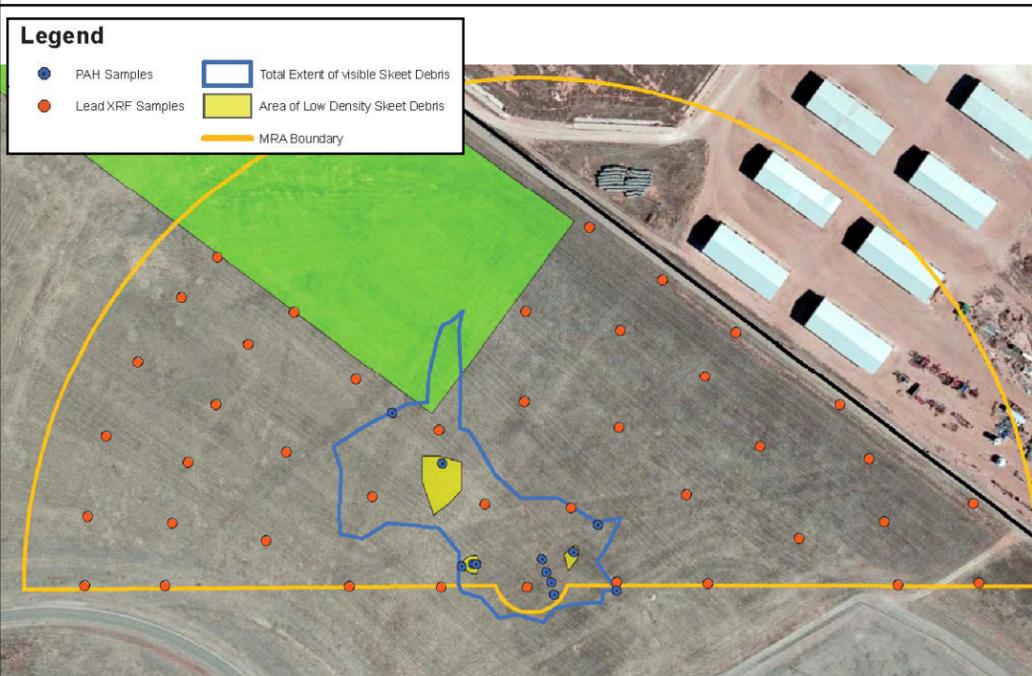
Former 1940's Skeet Range (TS835) - Visual Survey Tracts



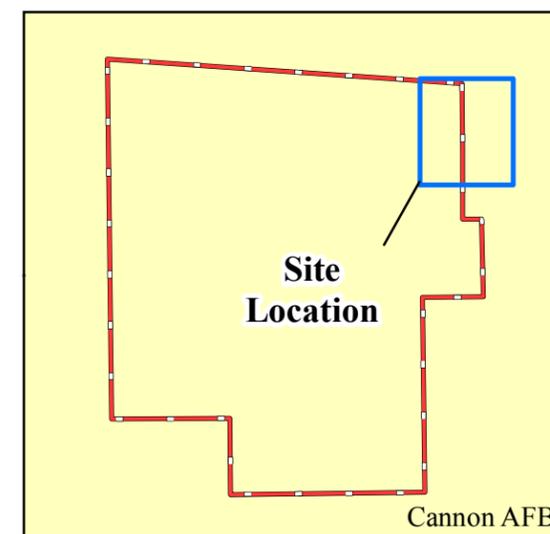
Former 1940's Skeet Range (TS835) - Visual Survey Results



Former 1940's Skeet Range (TS835) - Clay Target Debris & PAH Sample Locations



Former 1940's Skeet Range (TS835) - Soil Sample Locations



Legend

Performance Based Remediation
 New Mexico-Arizona
 Cannon Air Force Base
 Clovis, NM
 AFCEC

FIGURE 2-2

TS835
 1940's Skeet Range
 CSE Phase II Summary



FPM Remediations, Inc.

2014

NOTE:
 1. Not to scale.
 2. Source: CSE Phase II, 2012, VERSAR.

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SECTION TWO

indeno(1,2,3-c,d)pyrene (VERSAR, 2012). Benzo(k)fluoranthene was the only analyte detected at concentrations greater than the USEPA RSLs only. **Figure 2-2** shows the locations of the soil samples collected during the CSE Phase II. Surface (0-0.5ft bgs) and subsurface (0.5-1ft bgs) samples were collected at each location with a deeper interval (1-1.5ft bgs) collected from a low density area with clay target debris was found in the 0.5 to 1ft interval.

A background PAH study was also conducted as part of the CSE Phase II activities. A total of 10 surface soil samples were collected and analyzed for PAHs. The location where the samples were collected from was similar in soil type and human impact as the 1940's Skeet Range (with the exception of range related impacts). The maximum background concentrations were initially used to screen the data from the MRA to assess whether the concentrations were elevated, potentially representing contamination from range related activities (VERSAR, 2012). It was determined that PAH concentrations in soil at the 1940's Skeet Range MRA were higher than the background concentrations for several compounds. **Table 2-2** summarizes the PAH comparison of the background samples to the samples collected at the MRA.

**Table 2-2
CSE PHASE II PAH Background Level Comparison**

PAH	Background Value (mg/kg)	Range Surface Soil		Range Subsurface Soil	
		# Samples above Background ¹	Max Concentration (mg/kg)	# Samples above Background ¹	Max Concentration (mg/kg)
1-methylnaphthalene	(<0.00125)	1	0.0202	1	0.00691
2-methylnaphthalene	(<0.00125)	5	0.0614	1	0.00916
Acenaphthene	(<0.00125)	10	1.45	7	0.0393
Acenaphthylene	(<0.00125)	1	0.0155	0	Not Detected
Anthracene	(<0.00125)	9	0.19	4	0.293
Benzo(a)anthracene	0.00833	11	2.98	7	1.710
Benzo(a)pyrene	0.00953	12	10.2	10	1.53
Benzo(b)fluoranthene	0.00929	11	4.44	8	1.58
Benzo(g,h,i)perylene	0.0075	12	9.42	11	0.94
Benzo(k)fluoranthene	0.0102	11	6.94	8	1.43
Chrysene	0.0104	11	3.49	8	1.86
Dibenz(a,h)anthracene	(<0.00125)	11	3.7	8	0.377
Fluoranthene	0.026	9	3.08	6	3.39
Fluorene	(<0.00125)	6	0.0809	1	0.0364
Indeno(1,2,3-cd)pyrene	0.00704	11	8.43	11	0.909
Naphthalene	(<0.00125)	4	0.0319	3	0.245
Phenanthrene	0.0109	9	0.823	3	1.29
Pyrene	0.0183	9	2.23	6	2.3

(VERSAR, 2012)

Notes: ¹ Non-detect values assumed to be less than background concentration.
(<0.00125) – less than the largest limit of detection

2.4 STREAMLINED RISK EVALUATION

The following subsections summarize the human health risk evaluation screening applicable to the TS835 - 1940's Skeet Range MRS.

SECTION TWO

2.4.1 Conceptual Site Model

The CSM for exposure to PAHs at the TS835 - 1940's Skeet Range MRS is presented in **Figure 2-3**. The potential for exposure to PAHs results from clay targets in the surface and subsurface soil.

Based on the CSE Phase II findings, potentially complete exposure pathways exist whereby current and future installation personnel, current and future construction workers, and future potential residents may be exposed to PAH-impacted soil (where present) at the TS835 - 1940's Skeet Range MRS. Current land use is not anticipated to change, however, exposure to residents was evaluated due to the objective of site closeout and unrestricted reuse. To meet the objective of site closeout, USEPA Residential RSLs and NMED SSLs will be utilized as project action limits. Based on the CSE Phase II evaluation of lead, the CSM does not indicate lead pathways. Only PAH compounds will be addressed as contaminants of concern.

Although elevated levels of PAHs were identified in surface and subsurface soils, the pathway for ecological receptors is considered incomplete due to habitat constraints at the TS835 - 1940's Skeet Range MRS. Most of the vegetation at the site is grass typical of semiarid short grass prairies and as such most biota would not likely find suitable habitat in the grassy areas with limited cover. The pathway for ecological receptors is therefore considered incomplete. Furthermore, the MRS does not support suitable habitat for ecologically sensitive species and there are no known ecologically sensitive areas identified within the MRS. PAH contamination identified at the MRS does not pose a risk to ecological receptors.

2.4.2 Human Health Risk Screening

Human health risk screening evaluation assesses the potential of adverse impacts to human health or risks associated with current or future receptor exposures to PAHs in soil and at the TS835 - 1940's Skeet Range MRS. Samples within the MRS were compared to human health screening criteria including the NMED SSLs and the USEPA RSLs. Based on the results of the human health risk screening evaluation, PAH compounds were detected in soils at the MRS at concentrations that exceeded the human health screening criteria. Concentrations exceeding both (NMED SSLs and USEPA residential RSLs) were reported in the surface soils and also subsurface soils. **Tables 2-3** and **2-4** illustrate these findings. Lead was not detected at concentrations exceeding human health screening criteria and does not indicate a potential risk to current or future site workers or residents.

Surface water and sediment are not present within the MRS; therefore, risk screening conclusions for surface water or sediment are not considered applicable to TS835 - 1940's Skeet Range MRS.

Figure 2-3 Conceptual Site Model for TS835 - 1940's Skeet Range MRS

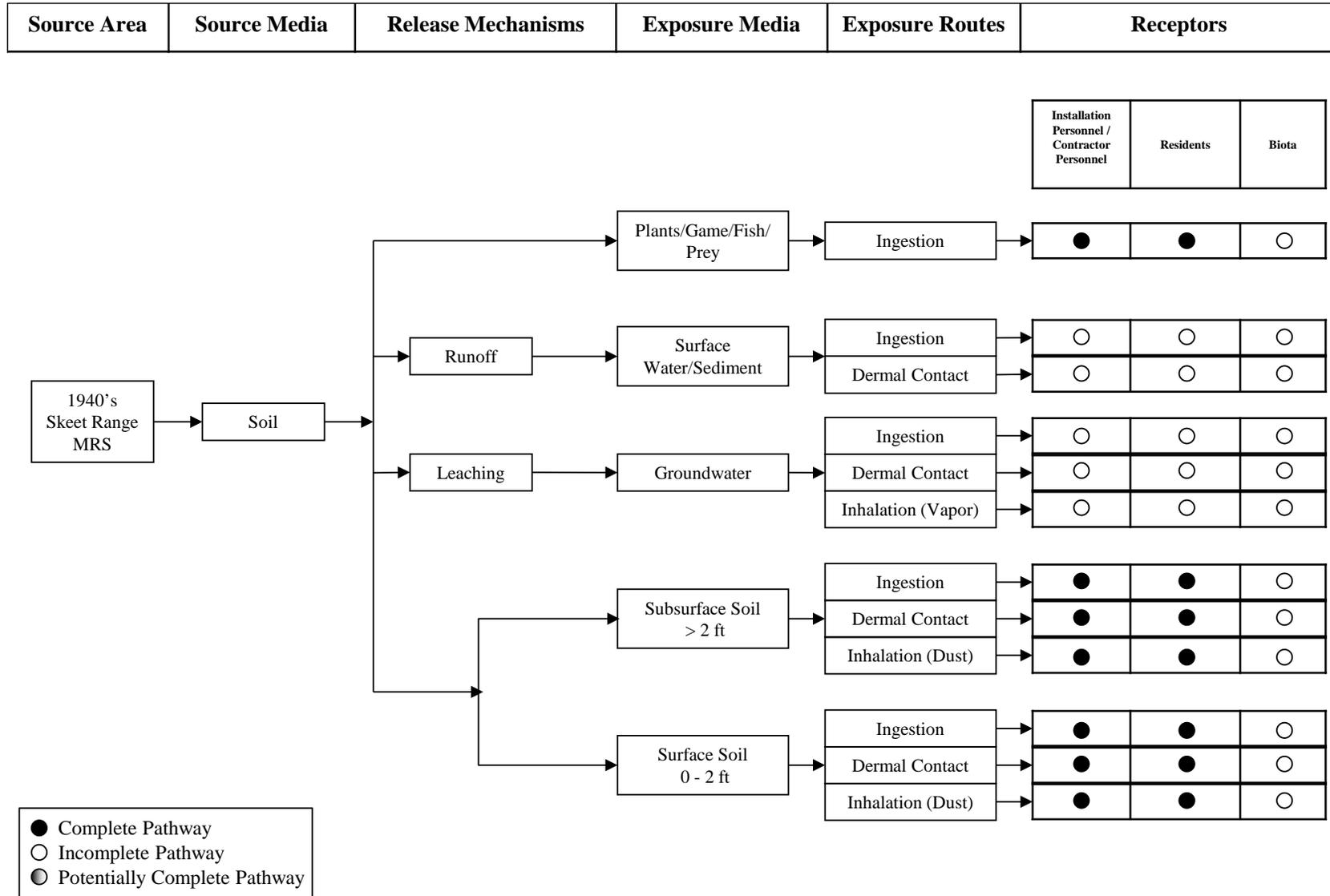


Table 2-3
Screening Level Human Health Risk Evaluation for Surface Soil PAH Exceedances

PAH	NMED SSL (µg/kg)	Frequency of Exceedance of NMED SSL	USEPA RSL (µg/kg)	Frequency of Exceedance of USEPA RSL	Maximum Detected Concentration (µg/kg)
Benzo(a)anthracene	1,480	3 / 22	150	7 / 22	2,980
Benzo(a)pyrene	148	9 / 22	15	11 / 22	10,200
Benzo(b)fluoranthene	1,480	3 / 22	150	8 / 22	4,440
Benzo(k)fluoranthene	14,800	0 / 22	1,500	3 / 22	6,940
Dibenz(a,h)anthracene	148	4 / 22	15	10 / 22	3,700
Indeno(1,2,3-cd)pyrene	1,480	2 / 22	150	9 / 22	8,430

Table 2-4
Screening Level Human Health Risk Evaluation for Subsurface Soil PAH Exceedances

PAH	NMED SSL (µg/kg)	Frequency of Exceedance of NMED SSL	USEPA RSL (µg/kg)	Frequency of Exceedance of USEPA RSL	Maximum Detected Concentration (µg/kg)
Benzo(a)anthracene	1,480	1 / 13	150	2 / 13	1,710
Benzo(a)pyrene	148	5 / 13	15	9 / 13	1,530
Benzo(b)fluoranthene	1,480	1 / 13	150	3 / 13	1,580
Benzo(k)fluoranthene	14,800	0 / 13	1500	0 / 13	1,430
Dibenz(a,h)anthracene	148	2 / 13	15	6 / 13	377
Indeno(1,2,3-cd)pyrene	1,480	0 / 13	150	5 / 13	909

The following sections discuss the justification for the removal action, the ARARs, and the specific RAOs developed for the NTCRA at the TS835 - 1940's Skeet Range MRS.

3.1 JUSTIFICATION FOR THE PROPOSED REMOVAL ACTION

The purpose of the NTCRA is to reduce human health risks associated with complete exposure pathways at the MRS. Based on CSE Phase II sampling and analysis results, surface and subsurface soils at the 1940's Skeet Range MRS are impacted by PAHs above the NMED SSLs and USEPA RSLs. A NTCRA to address PAH-impacted soil is justified for the following reasons as identified in Section 300.415(b)(2)(i)-(viii) of the NCP:

- Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
- High levels of contaminants (PAHs) in surface and/or subsurface soils that have the potential to migrate.

At the TS835 - 1940's Skeet Range MRS, PAHs in surface and shallow subsurface soils that could also migrate to deeper subsurface soil, air, and/or biota pose potential risk to current and future installation workers, current or future construction workers, and future potential residents (**Figure 2-3**).

3.2 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The ARARs addressing contaminated environmental media are identified in the following subsections. The NCP (40 CFR 300.5) defines "applicable" requirements as: "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site." Only those promulgated state standards identified by a state in a timely manner that are substantive and equally or more stringent than federal requirements may be applicable. The NCP (40 CFR 300.5) further defines "relevant and appropriate" requirements as: "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility citing laws that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstances at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site." Like "applicable" requirements, the NCP also provides that only those promulgated state requirements identified in a timely manner and are more stringent than corresponding federal requirements may be relevant and appropriate. USEPA identifies three basic types of ARARs. They include chemical-specific, location-specific, and action-specific, as described below:

- Chemical-specific ARARs are based on health- or risk-based concentration limits or discharge limitations in environmental media (i.e., air, soil, or water) for specific

hazardous chemicals. These requirements may be used to set cleanup levels for the chemicals of concern in the designated media.

- Action-specific ARARs generally set performance, design, or other similar operational controls or restrictions on particular activities related to management of hazardous substances or pollutants. These requirements address specific activities that are used to accomplish a remedy. Action-specific requirements do not in themselves determine the remedial action; rather, they indicate how a selected remedial action alternative must be designed, operated, or managed.
- Location-specific ARARs are restrictions placed on the types of activities that may occur in particular locations. The location of a site may be an important characteristic in determining its impact on human health and the environment.

Identification and evaluation of additional ARARs will be an iterative process, which will be performed throughout the life of the project, and particularly when evaluating and recommending an appropriate removal/remedial response.

In addition to ARARs, “to be considered” (TBC) guidance are non-promulgated advisories, proposed rules, criteria, or guidance documents issued by federal or state governments that do not have the status of potential ARARs. This TBC guidance is utilized when determining protective cleanup levels where no ARAR exists, or where ARARs are not sufficiently protective of human health and the environment.

The chemical-specific, location-specific, and action-specific ARARs for this Cannon AFB EE/CA are discussed in the following sections.

3.2.1 Chemical-Specific ARARs

Chemical-specific ARARs are health- or risk-based concentration limits for specific hazardous chemicals that may be used to set cleanup levels for the contaminants in a designated media. Guidance was obtained from the NMED Risk Assessment Guidance for Site Investigations and Remediation Volume I, February 2012 (updated June 2012) (NMED, 2012). Chemical-specific ARAR guidance also includes USEPA RSLs. In addition, a PAH in soil background study from the CSE Phase II is included in the chemical-specific guidance. The residential NMED SSLs and USEPA RSLs for PAHs in soil are proposed for the NTCRA, which should facilitate unrestricted use and unlimited exposure of the property (i.e., no land use controls required). The chemical-specific ARARs and TBCs for soil are presented in **Table 3-1**. Final chemical-specific ARARs (statutes and regulations) will be determined in consultation with the USEPA, NMED, and other appropriate federal and state agencies. These agencies are responsible for administration of programs that implement the potential chemical-specific ARARs.

**TABLE 3-1
POTENTIAL ARARs AND TBCs**

Location	Law/Regulation	Description	ARAR/TBC Status
Chemical-Specific			
Impacted soil	SSLs/NMED	Provides SSLs hazardous chemicals in soil that NMED considers to be below thresholds of concern for risks to human health.	ARAR. Applicable to soil left in place at the MRS evaluated in this EE/CA.
Impacted soil	RSLs/USEPA	Provides RSLs of hazardous chemicals in soil that USEPA considers being protective for humans over a lifetime.	ARAR. Applicable to soil left in place at the MRS evaluated in this EE/CA.
Impacted soil	PAH Background Study (VERSAR, 2012)	Provides background levels in environmental media for PAHs.	TBC. Applicable to soil left in place at the MRS evaluated in this EE/CA.
Action-Specific			
Offsite hazardous waste disposal facility	NMED New Mexico Administrative Code Title 20 Chapter 4	Requirements for hazardous waste destined for disposal at commercial hazardous waste disposal facilities located in the State of New Mexico.	ARAR: Excavated PAH - impacted soil would be disposed of at an approved off-site landfill.
	NMED New Mexico Administrative Code Title 20 Chapter 9	Applies to the transportation, storage, transfer, processing, recycling, composting, nuisance abatement and disposal of solid waste.	ARAR. Excavated PAH - impacted soil would be disposed of at an approved off-site landfill.
	New Mexico Statutes and Codes Chapter 74 – Environmental Improvement.	Establishes a department that will be responsible for environmental management.	Applicable for remedial actions that involve waste management and cleanup.
Air Emissions	Clean Air Act 40 U.S.C. 7401 et seq.		
	NMED New Mexico Administrative Code Title 20 Chapter 2 Part 1 and 75	Fugitive emissions fee A fee that specifically allows fugitive dust producing operations or activities is responsible for controlling windblown dust from...earthmoving and other activities.	ARAR: Potentially applicable to fugitive dust emissions during excavation, backfilling, and landscaping activities.
	NMED New Mexico Administrative Code Title 20 Chapter 2 Part 7	General Provisions Emission of an air contaminant, including a fugitive emission, in excess of the quantity, rate, opacity or concentration specified by an air quality regulation or permit condition.	ARAR: Potentially applicable to fugitive dust emissions during excavation, backfilling and landscaping activities.

Table notes on following page

Notes:

NMED – New Mexico Environment Department
 ARAR - applicable or relevant and appropriate requirement
 EE/CA - Engineering Evaluation/Cost Analysis
 MRS - munitions response site
 RSL - Regional Screening Level
 SSLs - Soil Screening Levels
 TBC - to be considered
 U.S.C. - United States Code
 USEPA - United States Environmental Protection Agency

3.2.2 Location-Specific ARARs

Location-specific ARARs set restrictions on the types of activities that can be performed based on site-specific characteristics or location. Alternative actions may be restricted or precluded based on proximity to wetlands or floodplains, presence of natural or cultural resources, or to man-made features such as existing disposal areas and local historic buildings. No location-specific ARARs/TBC guidance was identified. Final location-specific ARARs (statutes and regulations) will be determined in consultation with the USEPA, NMED, and other appropriate federal and/or state agencies. These agencies are responsible for administration of programs that implement the potential location-specific ARARs.

3.2.3 Action-Specific ARARs

Based on the NTCRA alternatives developed to address PAH contamination at the TS835 - 1940's Skeet Range MRS, certain action-specific ARARs will be considered. The action-specific ARARs are presented in **Table 3-1**. At present, New Mexico regulates military munitions through CERCLA. In addition, an NTCRA plan approved by NMED must incorporate all substantive requirements of state law, including public participation and review, compliance with state laws and regulations, and all other technical elements to ensure protection of public health and the environment.

3.3 REMOVAL ACTION OBJECTIVES

Based on the NCP requirements and the applicable ARARs previously discussed, the following RAOs were developed for the NTCRA at the TS835 - 1940's Skeet Range MRS so the MRS can be recommended for site closeout under the USAF MMRP:

- Prevent exposure to PAH concentrations in surface and shallow subsurface soils above their respective USEPA Residential RSLs and/or NMED SSLs in soil.

The USEPA and NMED SSLs PAH soil Cleanup Levels for the NTCRA are shown on **Table 3-2**.

TABLE 3-2
TS835 - 1940's Skeet Range MRS CLEANUP LEVELS

Analyte	NMED Residential Soil Screening Levels (mg/kg)	USEPA Residential Regional Soil Screening Levels (mg/kg)
1-methylnaphthalene	none	16
2-methylnaphthalene	none	23
Acenaphthene	3440	340
Acenaphthylene	none	none
Anthracene	17,200	1,700
Benzo(a)anthracene	1.48	0.15
Benzo(a)pyrene	0.148	0.015
Benzo(b)fluoranthene	1.48	0.15
Benzo(g,h,i)perylene	none	none
Benzo(k)fluoranthene	14.8	1.5
Chrysene	148	15
Dibenz(a,h)anthracene	0.148	0.015
Fluoranthene	2,290	230
Fluorene	2,290	230
Indeno(1,2,3-cd)pyrene	1.48	0.15
Naphthalene	43.0	3.6
Phenanthrene	1,830	none
Pyrene	1720	170

Notes:

NMED SSLs obtained from Risk Assessment Guidance for Investigations and Remediation Volume I Feb. 2012 updated June 2012.

USEPA Residential Soil Screening Levels Regional Screening Level Summary Table May 2013

mg/kg = milligrams per kilogram

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This section presents the removal action alternatives developed from the technologies that are applicable to the conditions and contaminants at the TS835 - 1940's Skeet Range MRS. Technologies are combined, if applicable, to create alternatives that will meet the RAOs that are appropriate for the site conditions and have been shown to be effective at similar sites.

Based on the guidelines presented in the Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (USEPA 1993), only the most qualified technologies that apply to the media or source of contamination should be discussed in the EE/CA. Limiting the number of alternatives to those that have been selected in the past at similar sites or for similar contaminants provides an immediate focus to the discussion and selection of alternatives.

4.1 GENERAL RESPONSE ACTIONS

This section identifies general response action categories that include no action; land use controls; and removal, treatment, and disposal. Removal action alternatives were developed based on these general response actions. Each general response action is identified along with its advantages and limitations and potential for being retained for further evaluation.

4.1.1 No Action

The no action general response action is included in accordance with the NCP and is used to provide a baseline for alternative comparison. For the no action general response action at the MRS, PAH-contaminated soil would remain in place. The advantages of this alternative include no cost and no implementation. The limitations of this alternative include: the source not being mitigated; the contaminated soil would remain and would require land use controls (e.g., institutional controls and/or engineering controls); and there is no reduction in mobility, toxicity, or volume of chemicals. As required, this response action will be retained for further evaluation.

4.1.2 Land Use Controls

The land use controls general response action utilizes engineering controls (e.g., fencing or signage) and institutional controls (e.g., administrative or legal restrictions) at a site to protect human health and the environment by limiting access and exposure to contaminants. Engineering controls are physical controls put into place at a site to prevent human and ecological exposure to contamination. Institutional controls are legal controls intended to minimize the potential for human exposure to contamination by limiting land use. Land use controls do not address contamination but rather restrict access to and development of the affected area. The advantages of this alternative are that direct exposure through inadvertent site access is reduced, the costs are generally lower than other response actions, and time to implement the action (i.e., response time) is short. The limitations of this alternative include: required five year reviews; the source is not mitigated; there is no reduction in mobility, toxicity, or volume of chemicals; potential exposure through inhalation is not mitigated; and engineering controls would require maintenance costs until the contamination is mitigated. This response action will be retained for further evaluation.

4.1.3 Removal and Disposal

The removal general response action includes removal of contaminated soil (and by default source material consisting of clay target debris) and then backfilling the excavated areas with clean fill compacted to local standards. The advantages of this response action include: contaminated soil is permanently removed; potential exposure through inhalation, ingestion, and dermal contact is mitigated; time to implement the action (i.e., response time) is short; there is a reduction in volume of chemicals at the MRS; and should allow for unrestricted use and unlimited exposure. The limitations of this alternative include: if remediation becomes necessary at the off-site disposal facility, generators could be liable for cleanup of that facility; excavations remain open until material is placed, which creates potential short-term exposure risk via airborne chemicals unless backfilling is performed daily; and the cost can be high.

The disposal portion general response action involves the transfer and discarding of excavated contaminated soils with PAH concentrations greater than specified cleanup levels to an off-site location. This option is paired with the removal general response action. This combined response action will be retained for further evaluation.

4.2 ASSEMBLY AND DESCRIPTION OF ALTERNATIVES

The three alternatives in this EE/CA were assembled using the general response actions summarized in **Section 4.1**. A description of each alternative is provided below. An overview of each alternative is provided in **Table 4-1**.

4.2.1 Alternative One: No Action

The No Action alternative involves no action to be performed under current or future land use scenarios. This alternative is included in accordance with the NCP and is used to provide a baseline for alternative comparison.

4.2.2 Alternative Two: Land Use Controls

The Land Use Controls alternative includes engineering controls (e.g., fencing and warning signage) and institutional controls (e.g., military orders preventing access to the MRS). A Land Use Controls Plan would be developed to document engineering and institutional controls. The TS835 - 1940's Skeet Range MRS would be surrounded by fencing to prevent unauthorized access and/or warning signage would be posted around the perimeter of the fence to restrict unauthorized personnel from entering. The fencing and warning signage would be maintained indefinitely under this alternative. If Cannon AFB transfers the land associated with the TS835 - 1940's Skeet Range MRS, then land use controls including restrictions and a description of contaminated soil present at the MRS would need to be incorporated into any real property documents necessary for transferring ownership from Cannon AFB. An RI/Feasibility Study (FS) and Proposed Plan (PP)/Record of Decision (ROD) would also be needed to document regulatory approval of Alternative 2.

TABLE 4-1
REMOVAL ACTION ALTERNATIVES FOR EVALUATION

Removal Action Alternative	Task Activities
1. No Action	None
2. Land Use Controls	<p>Design Tasks</p> <ul style="list-style-type: none"> • Work Plan • Land Use Controls Plan • After Action Report • Remedial Investigation/Feasibility Study Report • Proposed Plan/Record of Decision <p>Field Tasks</p> <ul style="list-style-type: none"> • Install Fencing and Warning Signs • Other Activities <ul style="list-style-type: none"> — Project Management — Preparation of Health & Safety Plan — Preparation of Other Plans — 5-year Reviews
3. Excavation with Off-Site Disposal	<p>Design Tasks</p> <ul style="list-style-type: none"> • Action Memorandum • Removal Action Work Plan • After Action Report • Closure Documentation <p>Field Tasks</p> <ul style="list-style-type: none"> • Excavation, Disposal, and Restoration • Other Activities <ul style="list-style-type: none"> — Project Management — Preparation of Health and Safety Plan — Preparation of Other Plans

4.2.3 Alternative Three: Excavation with Off-Site Disposal

An estimated 4,000 bank cubic yard (BCY) of soil would be excavated from the TS835 – 1940's Skeet Range MRS and disposed at an approved off-base landfill. Soil would initially be excavated by heavy equipment to depths ranging from the surface to 2 ft bgs within the proposed excavation boundaries. Delineation for PAH soil contamination would be conducted utilizing a fixed-base laboratory and completed prior to the excavation to assist with the lateral and vertical delineation. This work will be described in detail in the NTCRA Work Plan along with a description on how any area requiring excavation that is within the comingled area of TS835 and the Installation Restoration Program Site LF-02 (SWMU82) site boundary will be handled. Post excavation confirmatory soil sampling will be conducted to ensure removal of all contaminated soil. If confirmatory sampling results indicate PAHs concentrations are above the cleanup levels, then additional soil would be excavated before collecting and submitting additional confirmation samples. An After Action Report (AAR) and closure documentation will also be completed to document the removal action detailed in Alternative 3.

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In this section of the EE/CA, the three alternatives developed in **Section 4** are individually analyzed and then compared to one another relative to the RAOs. This analysis is performed using the criteria of effectiveness, implementability, and cost outlined in the Guidance on Conducting Non-Time-Critical Removal Actions under CERCLA (USEPA 1993).

5.1 EVALUATION CRITERIA

The USEPA EE/CA guidance document (USEPA 1993) recommends identifying and assessing a limited number of alternatives appropriate for addressing the RAOs. The technologies and methods are considered presumptive remedies, have been used before, and are generally accepted in the remediation industry. The analysis is qualitative in nature and is based on three evaluation criteria: effectiveness, implementability, and relative cost.

Effectiveness

In terms of effectiveness, alternatives are evaluated based on the following criteria:

- Protectiveness – Is the alternative protective of human health, and the environment? Does the alternative comply with the ARARs?
- Ability to achieve RAOs – What level of treatment is expected? Are there concerns of residual effects? Will control be maintained until a long-term solution is implemented?

Soil sampling activities conducted during the CSE Phase II show that PAH-impacted soils at the TS835 – 1940's Skeet Range MRS pose potential risks to current and future installation workers, current and future construction workers, and potential future residents. No ecologically sensitive species or ecologically sensitive areas were identified within the MRS; therefore, environmental protectiveness is not considered further.

Implementability

In terms of implementability, alternatives are evaluated based on the following criteria:

- Technical Feasibility (implementation factors, technology maturity, environmental conditions, and post-removal site control [PRSC] measures)
- Administrative Feasibility (permits and waivers)
- Availability of Services and Materials (personnel and technology, off-site disposal, services and materials, and prospective technologies)

Cost

In terms of cost, alternatives are evaluated based on the following criteria:

- Capital Costs
- PRSC Costs
- Present Value

For the purposes of the cost estimate summaries (**Appendix A**), Remedial Action Cost Engineering and Requirements (RACER) was utilized to develop alternative costs. RACER is an environmental remediation/corrective action cost-estimating system developed for Department of Defense cost-estimating use.

5.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

5.2.1 Alternative 1—No Action

Effectiveness

Alternative 1 does not provide short-term or long-term protection of public health. This alternative would not comply with the ARAR/TBC guidance. Time required to achieve RAOs is indefinite. Risks to current and future receptors would remain indefinitely. The toxicity, mobility, and volume of contamination at the TS835 - 1940's Skeet Range MRS would not be reduced and potential receptor exposure pathways would remain for current and future receptors.

Implementability

This alternative is technically feasible, administratively feasible, and no services or materials are needed for implementation.

Cost

The total estimated cost for Alternative 1 is \$0 (**Appendix A**). There are no capital or PRSC costs; contingencies; or professional or technical services associated with this alternative.

5.2.2 Alternative 2—Land Use Controls

Effectiveness

Alternative 2 provides limited short-term and long-term protection of public health. Short-term impacts related to construction activities can be implemented in a way that would minimize environmental impacts and human exposure. This alternative does not reduce or remove the volume of contaminated soil. RAOs would be achieved using land use controls. Risks to current and future receptors would remain indefinitely. Land use controls would limit access to the MRS; however, protection of human health would depend on the reliability of the access controls. If administered properly, ingestion and dermal contact exposure pathways for current and future receptors through unauthorized site access would be reduced. Regardless of the reliability of the access controls, a potential exposure pathway for current and future receptors through inhalation would remain. The toxicity, mobility, and volume of contamination at the MRS would not be reduced and potential receptor exposure pathways would remain for current and future receptors.

Implementability

This alternative is technically feasible, administratively feasible, and services and materials necessary to implement the land use controls are readily available in the local community. This alternative is considered technically feasible because the action is achievable using readily available construction equipment and accepted methods. Possible constraints to implementing the land use controls would be extreme weather conditions. In the case of extreme weather conditions, the installation of the fence and warning signage would be temporarily postponed. This alternative is considered administratively feasible because there are no foreseeable obstacles to implement land use controls. There are no permits, waivers, easements, or right-of-way agreements necessary to install fence and warning signage for the MRS. All equipment, personnel, and services necessary to implement Alternative 2 are available in the vicinity of Cannon AFB.

Cost

The total estimated cost for Alternative 2 is \$146,674 (**Appendix A**). Alternative 2 includes capital costs for developing and implementing land use controls including institutional restrictions and engineering controls. Engineering controls include installation of fencing and warning signs. Alternative 2 also includes costs for RI/FS and PP/ROD in accordance with USAF's direction on land use control implementation.

For the Alternative 2 cost estimate summary, total annual costs over 30 years are estimated at \$74,804 with a total capital cost of \$71,870. PRSC costs associated with this alternative include annual operation and maintenance for 30 years and periodic costs to perform Five Year Reviews for 30 years.

5.2.3 Alternative 3—Excavation with Off-Site Disposal**Effectiveness**

Alternative 3 provides short-term and long-term protection of human health. This alternative complies with chemical-specific ARAR/TBC guidance. Detailed planning, as described below, is needed to comply with location-specific and action-specific ARAR/TBC guidance. RAOs would be achieved at the conclusion of the excavation and off-site disposal activities. The volume of contamination at the TS835 - 1940's Skeet Range MRS would be reduced. Risks to current and future receptors related to PAH-impacted soils would be reduced to levels considered protective of human health. This alternative is considered to be reliable based on accepted industry standards for similar projects.

Short-term impacts related to construction activities can be implemented in a way that would minimize environmental impacts and human exposure. Worker protection would be provided during implementation of the alternative through strict adherence to a site-specific health and safety plan. An exclusion zone, a decontamination zone, and a staging zone would be established at the MRS to mitigate potential contamination of adjacent areas. The exclusion zone would encompass the contaminated areas and any persons entering this zone would be required to have the appropriate personal protective equipment (PPE). The decontamination

zone would be used to remove contamination from any equipment or PPE before it is cleared to leave the exclusion zone. The staging zone is where all decontaminated equipment would be kept when it is not in use in the exclusion zone.

To meet action-specific ARARs, dust suppression would be accomplished using water application, if necessary, to the ground surface, and real-time dust monitoring. Using real-time dust monitoring instrumentation would detect dust concentrations above the dust action levels. Dust suppression using water is generally highly effective and eliminates the need to use respiratory protection. Airborne dust monitoring would be completed using portable hand-held dust monitors to verify and document daily dust-suppression efforts. Fugitive dust control measures would be implemented at the site during excavation activities to mitigate off-site dust migration onto adjacent properties through light watering of the active excavation area. Factors considered in providing fugitive dust control measures include wind direction and speed monitoring, dust control, and dust suppression.

All excavated soil from the MRS would be transported and disposed of at an approved off-base landfill. Haul trucks would be properly placarded, licensed, and insured, for the transportation of soil. When transporting impacted soil, transport vehicles would be fitted with a tarp or other covering device to prevent dispersal of material during transport. To prevent material from spilling from the vehicle, each vehicle would be inspected prior to departure to ensure that the material is properly contained within the vehicle. This would include inspecting around the end-dump gates, belly-dump openings, and inspecting the tarp or other covering.

Backfill materials used at TS835 - 1940's Skeet Range MRS would be clean soils obtained from an approved off-site borrow source. The finished surface would be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish would be that ordinarily obtainable from a blade-grader. The final grades would provide positive drainage of surface water across the site with no closed drainage areas that would allow surface water to pond. Following backfilling and grading activities, the surface would be seeded with native vegetation. All temporary erosion control measures would be removed after establishing vegetation.

Implementability

This alternative is considered technically feasible, administratively feasible, and services and materials are readily available in Clovis, New Mexico. Excavation and off-site disposal is a proven method for achieving long-term contaminant reduction. The action would not affect future removal activities. The action could be implemented in a way that would minimize environmental impacts (e.g., dust suppression during excavation and disposal), and the action could be performed and completed in a relatively short time period. The terrain at TS835 - 1940's Skeet Range MRS is relatively flat and does not pose any additional concerns. Possible constraints to implementing this alternative would be extreme weather conditions. In the case of extreme weather conditions, the excavation and disposal would have to be temporarily postponed. This alternative is considered administratively feasible, but there are several factors that need to be addressed with regard to the excavation and disposal. Prior to the excavation and disposal, several plans and permits would be prepared and submitted to Cannon AFB, NMED, or

the State of New Mexico before the excavation and disposal could proceed. These submittals include:

- Action Memorandum;
- Site-Specific NTCRA Work Plan composed of the following: Technical Management Plan, Accident Prevention Plan with Site Safety and Health Plan, Sampling Plan with a Uniform Federal Policy Quality Assurance Project Plan, Investigation-Derived Waste Management Plan, and Environmental Protection Plan;
- Base Civil Engineering Work Clearance Request (Air Force Form 103 needed for utility clearance before excavation can begin);
- After the removal action is completed, an AAR and closure documentation would be prepared to document the completion of the action and gain regulatory approval for site closure.

All equipment, personnel, and services necessary to implement Alternative 3 are available in the vicinity of Clovis, New Mexico. An off-site disposal facility will be used for disposal of Resource Conservation and Recovery Act (RCRA) contaminated soils which has the capacity to accept approximately 4,000 BCY. There is no need for an on-site laboratory facility, disposal characteristics will be determined prior to transportation to the approved facility. Confirmation samples for would be shipped to a laboratory that is able to provide fast turnaround and has the capacity to test numerous samples seven days a week. There are reliable overnight shipping options within Clovis New Mexico.

Cost

The total estimated cost for Alternative 3 is \$978,000 (**Appendix A**). Alternative 3 includes capital costs for excavating PAH-impacted soil in order to achieve the TS835 - 1940's Skeet Range MRS cleanup levels for PAHs in soils. Approximately, 4,000 BCY of soil would be excavated from the MRS and disposed of at an approved off-base landfill. Following excavation, the area would be backfilled, re-graded to approximate pre-excavation contours, and restored to previous conditions. Alternative 3 also includes capital costs for AAR and closure documentation.

For the Alternative 3 cost estimate summary, there are no annual costs associated with the excavation and disposal. There are no PRSC costs associated with this alternative.

5.3 COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 5-1 presents a comparative analysis of the three alternatives for the TS835 - 1904's Skeet Range MRS.

TABLE 5-1
COMPARATIVE ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Evaluation Criteria	Alternative 1 - No Action	Alternative 2 - Land Use Controls	Alternative 3 - Excavation with Off-Site Disposal
Effectiveness	Qualitative Ranking		
Protection of Human Health/Environment	Low	Medium	High
Compliance with ARARs	Low	Medium	High
Long-Term Effectiveness	Low	Medium	High
Short-Term Effectiveness	Low	Medium	High
Achieve Removal Action Objectives	Low	Medium	High
Reduction of Toxicity, Mobility, or Volume	Low	Low	High
Implementability	Qualitative Ranking		
Technical Feasibility	High	High	High
Administrative Feasibility	High	High	High
Cost	Removal Cost		
Total Project Duration (Years)	0	30	1*
Capital Cost	\$0	\$71,870	\$978,000
Total O&M / Periodic Cost ¹	\$0	\$74,804	\$0
Total Present Cost of Alternative	\$0	\$146,674	\$978,000

Notes:

¹ - Annual O&M

*Removal action is anticipated at 14 days

ARAR - Applicable or Relevant and Appropriate Requirement

O&M - Operation and Maintenance

5.3.1 Effectiveness

Alternative 1 is considered the least effective alternative for public health protectiveness because risks to current and future receptors would remain indefinitely and the toxicity, mobility, and volume of contamination at the MRS would not be reduced. Alternative 2 is more effective than Alternative 1 but less effective than Alternative 3 for human health protectiveness because risks to current and future receptors would remain indefinitely and toxicity, mobility, and volume of contamination at the MRS would not be reduced. Alternative 3 is considered most effective for protectiveness of human health because PAH-impacted soil would be excavated and disposed of off-site at an approved landfill. The volume of contamination at the 1940's Skeet Range TS835 - 1940's Skeet Range MRS would be reduced. Risks to receptors with regards to PAH-impacted soils at the MRS would be reduced to levels considered protective of human health. Based on a comparative analysis of effectiveness, Alternative 3 is considered the most effective alternative for public health protectiveness.

5.3.2 Implementability

All three alternatives are technically feasible, administratively feasible, and the services and materials necessary to implement the alternatives are readily available.

5.3.3 Cost

The estimated costs for Alternatives 1, 2, and 3 at the MRS are shown in **Appendix A - Removal Action Alternatives Cost Estimates**.

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Three alternatives were evaluated to achieve the RAOs for the TS835 - 1940's Skeet Range TS385 MRS. These alternatives consist of the following:

- Alternative 1 – No Action
- Alternative 2 – Land Use Controls
- Alternative 3 – Excavation with Off-Site Disposal

Based on the analysis presented in **Section 5**, including Appendix A, Alternative 3 – Excavation with Off-Site Disposal of PAH-impacted soil is recommended as the preferred alternative for achieving the RAOs for the TS835 - 1940's Skeet Range MRS.

6.1 REMOVAL ACTION SCOPE

The estimated areal extent of the removal action for MRS is shown on **Figure 6-1**. The depth of excavation is anticipated at 2.0 feet bgs. The estimated PAH-impacted soil requiring treatment and/or removal is approximately 4,000 BCY. The removal will be extended laterally and vertically until confirmation results are below the cleanup levels for PAHs in soil.

The ultimate goal of the removal action, upon completion, is to document that the hazards to human health from PAHs have been removed and that no further contamination hazards remain at the TS835 - 1940's Skeet Range MRS. When this goal is met, the MRS will be proposed for Unlimited Use and Unrestricted Exposure in a TS835 - 1940's Skeet Range MRS Site Closeout Report.

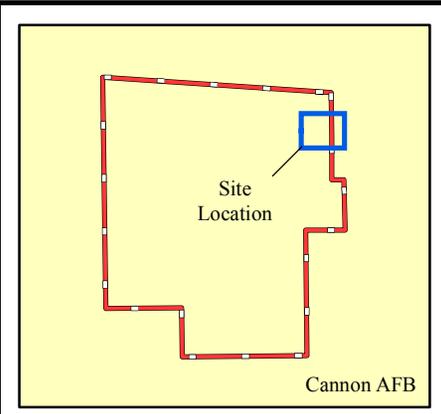
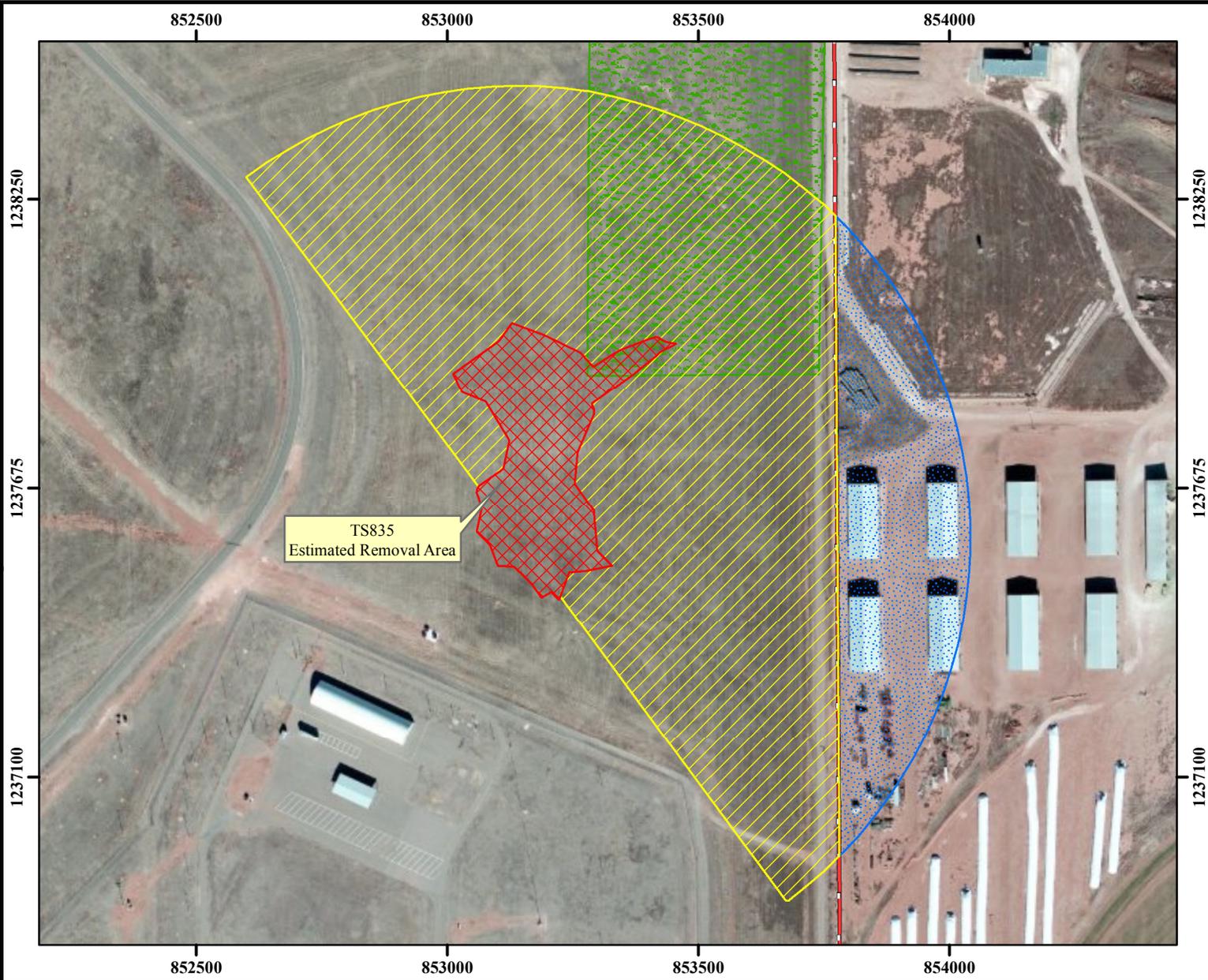
6.2 REMOVAL ACTION SCHEDULE

Following DoD and NMED approval of the Draft Final EE/CA, a public notice will be placed in the Clovis News Journal soliciting public comment on the EE/CA for a 30-day period. When and if public comments are received and addressed an Action Memorandum and a NTCRA Work Plan, including a Sampling Plan and an Accident Prevention Plan, will be prepared on a schedule that allows sufficient regulatory review before fieldwork commences. The following schedule identifies general completion time frames for activities associated with the removal action at the MRS.

- EE/CA and Action Memorandum (with public comment period) for TS835 MRS preparation, review, and approval (138 days: 27 September 2013 to 8 April 2014)
- NTCRA Work Plan for TS835 MRS preparation, review, and approval (133 days: 9 April 2014 to 10 October 2014)
- Removal Action field activities for TS835 MRS (85 days: 13 October 2014 to 6 February 2015)
- AAR for TS835 MRS preparation, review, and approval (133 days: 8 December 2014 to 10 June 2015)

- Site Closeout Report/Unlimited Use and Unrestricted Exposure DD for TS835 MRS preparation, review, and approval (128 days: 3 March 2016 to 29 August 2016)

Path: Y:\GIS_Projects\Cannon_AFB\Projects\Fig_6_1_ECA.mxd



Legend

- LF-02
- TS835
- TS835a
- TS835b
- Base Boundary

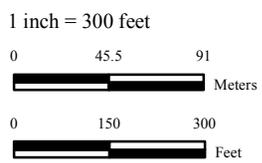
Performance Based Remediation
 New Mexico-Arizona
 Cannon Air Force Base
 Clovis, NM
 AFCEC

FIGURE 6-1

Proposed Removal Area at
 TS835 MRS

NOTES:
 Revision Date: 1/30/2014

Coordinate System: NAD 1983 StatePlane New Mexico East FIPS 3001 Feet
 Projection: Transverse Mercator
 False Easting: 541,337.5000
 Central Meridian: -104.3333
 Latitude Of Origin: 31.0000
 Horizontal Datum: North American 1983
 False Northing: 0.0000
 Scale Factor: 0.9999
 Units: Foot US



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Black & Veatch 2008. General Plan, Cannon AFB, New Mexico. February.

Code of Federal Regulations (CFR). 2003. Title 40 – Protection of the Environment, Part 300 - National Oil and Hazardous Substances Pollution Contingency Plan.

New Mexico Environment Department, 2012. Risk Assessment Guidance for Site Investigations and Remediation February. Updated June 2012.

TLI Solutions. 2008. Historical Records Review Sources Contacted Cannon Air Force Base. June.

United States Army Corps of Engineers (USACE), ITSI, Shaw 2009. Cannon Air Force Base Modified Comprehensive Site Evaluation Phase I Report. December.

United States Environmental Protection Agency (USEPA) 1970. Summary of the Clean Air Act. 42 U.S.C. 7401 et seq. <http://www.epa.gov/lawsregs/laws/caa.html>

USEPA. 1993. Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA. OSWER Directive Number 9360.0-32, EPA/540-R-93-057. August.

USEPA. 2000. A Guide to Developing and Documenting Cost Estimates During the Feasibility Study. July.

USEPA. 2013. Regional Screening Level (RSL) Summary Table. May.

VERSAR. 2012. Comprehensive Site Evaluation Phase II Report – Version 2.0 Military Munitions Response Program (MMRP) Cannon Air Force Base, New Mexico. August.

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**COMPARISON OF TOTAL COST OF REMOVAL ACTION ALTERNATIVES
1940's SKEET RANGE TS835 MRS
CANNON AFB, NEW MEXICO**

Site: TS835 MRS	Base Year: 2013		
Location: CANNON AFB			
<u>Description</u>	Option 1 - No Action	Option 2 - Land Use Controls	Option 3 - Excavation with Off-Site Disposal
Total Project Duration (Years)	0	30	1
Capital Cost	\$0	\$71,870	\$978,031
Total O&M/Periodic Cost	\$0	\$74,804	\$0
Total Cost of Alternative	\$0	\$146,674	\$978,031

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Alternative 1
No Action

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**ALTERNATIVE 1 - NO ACTION
1940'S SKEET RANGE TS835 MRS
CANNON AFB, NEW MEXICO**

COST ESTIMATE SUMMARY

Alternative 1 - No Action

Site: TS835 MRS
Location: CANNON AFB
Base Year: 2013
Date:

Description: Alternative 1 includes no action to be performed under current or future land use scenarios.

CAPITAL COSTS:

TOTAL CAPITAL COST

\$0

ANNUAL O&M COSTS:

TOTAL ANNUAL O&M COST

\$0

PERIODIC COSTS:

TOTAL PERIODIC COST

\$0

PRESENT VALUE ANALYSIS:

COST TYPE	YEAR	TOTAL COST	TOTAL COST PER YEAR	PRESENT VALUE	NOTES
Capital Cost	0	\$0	\$0	\$0	
Annual O&M Costs	1-30	\$0	\$0	\$0	Multi-year discount factor
Periodic Costs	1-30	\$0	\$0	\$0	
		\$0		\$0	

TOTAL PRESENT VALUE OF ALTERNATIVE

\$0

*Cost estimates are developed during the EE/CA primarily for the purpose of comparing remedial alternatives during the remedy selection process, not for establishing project budgets.

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Alternative 2
Land Use Controls

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Phase Cost Summary Report (with Markups)

System:

RACER Version: 10.4.0
Database Location: C:\Users\daniel.FPM-GROUP\Application Data\AECOM\RACER 10.4\Racer.mdb

Folder:

Folder Name: NM-AZ Group-EE/CAs

Project:

Project ID: Cannon AFB
Project Name: Cannon AFB
Project Category: None

Location

State / Country: NEW MEXICO
City: CANNON AFB

<u>Location Modifier</u>	<u>Default</u>	<u>User</u>
	1.101	1.101

Options

Database: System Costs
Cost Database Date: 2011
Report Option: Fiscal

Description

Phase Cost Summary Report (with Markups)

Site:

Site ID: TS835
Site Name: TS835
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Semi-Volatile Organic Compounds (SVOCs)
Secondary: None

Phase Names

Pre-Study:
Study:
Design:
Removal/Interim Action:
Remedial Action:
Operations & Maintenance:
Long Term Monitoring:
Site Closeout:

Documentation

Description:
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Daniel Baldyga
Estimator Title: FPM Estimator
Agency/Org./Office: FPM
Business Address: FPM
Rome, New York 13441
Telephone Number: 315-336-7721
Email Address: d.baldyga@fpm-remediations.com
Estimate Prepared Date: 04/18/2013

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:

Phase Cost Summary Report (with Markups)

Business Address:

Telephone Number:

Email Address:

Date Reviewed:

Reviewer Signature: _____

Date: _____

Phase Cost Summary Report (with Markups)

Phase:

Phase Type: Long Term Monitoring
Phase Name: LUC/IC Site Inspection
Description:

Start Date: October, 2014
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups

ADMINISTRATIVE LAND USE CONTROLS

<u>Markup</u>	<u>% Prime</u>	<u>% Sub.</u>
Yes	100	0

Phase Cost Summary Report (with Markups)

<u>Technology</u>	<u>Direct Cost</u>	<u>Markups</u>	<u>Total Cost</u>
ADMINISTRATIVE LAND USE CONTROLS	\$57,535	\$50,622	\$108,157
Total Capital Cost	\$57,535	\$50,622	\$108,157

<u>Technology</u>	<u>Direct Cost</u>	<u>Markups</u>	<u>Total Cost</u>
Total Phase Cost	\$57,535	\$50,622	\$108,157
		Escalation	\$38,517
		Escalated Phase Cost	\$146,674

Phase Cost Detail Report (with Markups)

System:

RACER Version: 10.4.0

Database Location: C:\Users\daniel.FPM-GROUP\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\...Application Data\AECOM\RACER 10.4\Racer.mdb

Folder:

Folder Name: NM-AZ Group-EE/CAs

Project:

Project ID: Cannon AFB

Project Name: Cannon AFB

Project Category: None

Location

State / Country: NEW MEXICO

City: CANNON AFB

Location Modifier

Default

User

1.101

1.101

Options

Database: System Costs

Cost Database Date: 2011

Report Option: Fiscal

Description

Phase Cost Detail Report (with Markups)

Site:

Site ID: TS835
Site Name: TS835
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Semi-Volatile Organic Compounds (SVOCs)
Secondary: None

Phase Names

Pre-Study:
Study:
Design:
Removal/Interim Action:
Remedial Action:
Operations & Maintenance:
Long Term Monitoring:
Site Closeout:

Documentation

Description:
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Daniel Baldyga
Estimator Title: FPM Estimator

Phase Cost Detail Report (with Markups)

Agency/Org./Office: FPM

Business Address: FPM

Rome, New York 13441

Telephone Number: 315-336-7721

Email Address: d.baldyga@fpm-remediations.com

Estimate Prepared Date: 04/18/2013

Estimator Signature: _____

Date: _____

Reviewer Information

Reviewer Name:

Reviewer Title:

Agency/Org./Office:

Business Address:

Telephone Number:

Email Address:

Date Reviewed:

Reviewer Signature: _____

Date: _____

Phase Cost Detail Report (with Markups)

Phase:

Phase Type: Long Term Monitoring
Phase Name: LUC/IC Site Inspection
Description:

Start Date: October, 2014
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups

<u>Markup</u>	<u>% Prime</u>	<u>% Sub.</u>
Yes	100	0

ADMINISTRATIVE LAND USE CONTROLS

Phase Cost Detail Report (with Markups)

Technology	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit Contingency	Owner Cost	Markup Total	Total
ADMINISTRATIVE LAND USE CONTROLS (100% Prime)	\$57,535						\$50,622	\$108,157
		\$0	\$0	\$37,278	\$5,370	\$0	\$7,974	
Total Phase Cost	\$57,535	\$0	\$0	\$37,278	\$5,370	\$0	\$7,974	\$50,622
								Escalation
								\$38,517
								Escalated Phase Cost
								\$146,674

Phase Cost Detail Report (with Markups)

Markup Template

System Defaults

Markup Percentage

Professional Labor Overhead/G&A	132.0
Field Office Overhead/G&A	25.0
Subcontractor Profit	8.0
Prime Profit	8.0
Contingency	0.0
Owner Cost	11.0

Comment:

Phase Technology Cost Detail Report (with Markups)

System:

RACER Version: 10.4.0

Database Location: C:\Users\daniel.FPM-GROUP\Application Data\AECOM\RACER 10.4\Racer.mdb

Folder:

Folder Name: NM-AZ Group-EE/CAs

Project:

Project ID: Cannon AFB

Project Name: Cannon AFB

Project Category: None

Location

State / Country: NEW MEXICO

City: CANNON AFB

Location Modifier

Default

User

1.101

1.101

Options

Database: System Costs

Cost Database Date: 2011

Report Option: Fiscal

Description

Phase Technology Cost Detail Report (with Markups)

Site:

Site ID: TS835
Site Name: TS835
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Semi-Volatile Organic Compounds (SVOCs)
Secondary: None

Phase Names

Pre-Study:
Study:
Design:
Removal/Interim Action:
Remedial Action:
Operations & Maintenance:
Long Term Monitoring:
Site Closeout:

Documentation

Description:
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Daniel Baldyga
Estimator Title: FPM Estimator
Agency/Org./Office: FPM

Phase Technology Cost Detail Report (with Markups)

Business Address: FPM
Rome, New York 13441

Telephone Number: 315-336-7721

Email Address: d.baldyga@fpm-remediations.com

Estimate Prepared Date: 04/18/2013

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name:

Reviewer Title:

Agency/Org./Office:

Business Address:

Telephone Number:

Email Address:

Date Reviewed:

Reviewer Signature: _____ **Date:** _____

Phase Technology Cost Detail Report (with Markups)

Phase:

Phase Type: Long Term Monitoring
Phase Name: LUC/IC Site Inspection
Description:

Start Date: October, 2014
Labor Rate Group: System Labor Rate
Analysis Rate Group: System Analysis Rate
Phase Markups: System Defaults

Technology Markups

<u>Markup</u>	<u>% Prime</u>	<u>% Sub.</u>
Yes	100	0

ADMINISTRATIVE LAND USE CONTROLS

Phase Technology Cost Detail Report (with Markups)

Technology: ADMINISTRATIVE LAND USE CONTROLS

Element: Monitoring & Enforcement

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33010108	Sedan, Automobile, Rental	1.00	DAY	0.00	0.00	0.00	64.11	\$64.11	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33010202	Per Diem (per person)	1.00	DAY	0.00	0.00	0.00	123.00	\$123.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>
33041101	Airfare	1.00	LS	0.00	0.00	0.00	800.00	\$800.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>
33220102	Project Manager	2.00	HR	0.00	194.61	0.00	0.00	\$389.22	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220106	Staff Engineer	8.00	HR	0.00	188.26	0.00	0.00	\$1,506.06	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220110	QA/QC Officer	1.00	HR	0.00	160.13	0.00	0.00	\$160.13	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220114	Word Processing/Clerical	4.00	HR	0.00	82.31	0.00	0.00	\$329.23	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220115	Draftsman/CADD	1.00	HR	0.00	90.33	0.00	0.00	\$90.33	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220119	Health and Safety Officer	1.00	HR	0.00	143.13	0.00	0.00	\$143.13	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Element Cost								\$3,605.22		
Total 1st Year Technology Cost								\$3,605.22		
Total Phase Cost								\$3,605.22		

Alternative 3
Excavation with Off-Site Disposal

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Phase Cost Summary Report (with Markups)

System:

RACER Version: 10.4.0
Database Location: C:\Users\daniel.FPM-GROUP\Application Data\AECOM\RACER 10.4\Racer.mdb

Folder:

Folder Name: NM-AZ Group-EE/CAs

Project:

Project ID: Cannon AFB
Project Name: Cannon AFB
Project Category: None

Location

State / Country: NEW MEXICO
City: CANNON AFB

<u>Location Modifier</u>	<u>Default</u>	<u>User</u>
	1.101	1.101

Options

Database: System Costs
Cost Database Date: 2011
Report Option: Fiscal

Description

Phase Cost Summary Report (with Markups)

Site:

Site ID: TS835
Site Name: TS835
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Semi-Volatile Organic Compounds (SVOCs)
Secondary: None

Phase Names

Pre-Study:
Study:
Design:
Removal/Interim Action:
Remedial Action:
Operations & Maintenance:
Long Term Monitoring:
Site Closeout:

Documentation

Description:
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Daniel Baldyga
Estimator Title: FPM Estimator
Agency/Org./Office: FPM
Business Address: FPM
Rome, New York 13441
Telephone Number: 315-336-7721
Email Address: d.baldyga@fpm-remediations.com
Estimate Prepared Date: 04/18/2013

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name:
Reviewer Title:
Agency/Org./Office:

Phase Cost Summary Report (with Markups)

Business Address:

Telephone Number:

Email Address:

Date Reviewed:

Reviewer Signature: _____

Date: _____

Phase Cost Summary Report (with Markups)

Phase:

Phase Type: Removal/Interim Action

Phase Name: Excavation

Description:

Approach: Ex Situ

Start Date: April, 2015

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups

	<u>Markup</u>	<u>% Prime</u>	<u>% Sub.</u>
Excavation	Yes	100	0
Load and Haul	Yes	100	0
Professional Labor Management	Yes	100	0

Phase Cost Summary Report (with Markups)

<u>Technology</u>	<u>Direct Cost</u>	<u>Markups</u>	<u>Total Cost</u>
Excavation	\$156,834	\$131,614	\$288,448
Load and Haul	\$373,953	\$186,416	\$560,369
Professional Labor Management	\$66,343	\$0	\$66,343
Total Capital Cost	\$597,130	\$318,030	\$915,160

	<u>Direct Cost</u>	<u>Markups</u>	<u>Total Cost</u>
Total Phase Cost	\$597,130	\$318,030	\$915,160
		Escalation	\$62,871
		Escalated Phase Cost	\$978,031

Phase Cost Detail Report (with Markups)

System:

RACER Version: 10.4.0

Database Location: C:\Users\daniel.FPM-GROUP\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\...Application Data\AECOM\RACER 10.4\Racer.mdb

Folder:

Folder Name: NM-AZ Group-EE/CAs

Project:

Project ID: Cannon AFB

Project Name: Cannon AFB

Project Category: None

Location

State / Country: NEW MEXICO

City: CANNON AFB

Location Modifier

Default

User

1.101

1.101

Options

Database: System Costs

Cost Database Date: 2011

Report Option: Fiscal

Description

Phase Cost Detail Report (with Markups)

Site:

Site ID: TS835
Site Name: TS835
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Semi-Volatile Organic Compounds (SVOCs)
Secondary: None

Phase Names

Pre-Study:
Study:
Design:
Removal/Interim Action:
Remedial Action:
Operations & Maintenance:
Long Term Monitoring:
Site Closeout:

Documentation

Description:
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
References: Documentation of reference sources used in the preparation of the estimate.

Estimator Information

Estimator Name: Daniel Baldyga
Estimator Title: FPM Estimator

Phase Cost Detail Report (with Markups)

Agency/Org./Office: FPM

Business Address: FPM

Rome, New York 13441

Telephone Number: 315-336-7721

Email Address: d.baldyga@fpm-remediations.com

Estimate Prepared Date: 04/18/2013

Estimator Signature: _____

Date: _____

Reviewer Information

Reviewer Name:

Reviewer Title:

Agency/Org./Office:

Business Address:

Telephone Number:

Email Address:

Date Reviewed:

Reviewer Signature: _____

Date: _____

Phase Cost Detail Report (with Markups)

Phase:

Phase Type: Removal/Interim Action

Phase Name: Excavation

Description:

Approach: Ex Situ

Start Date: April, 2015

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups

<u>Markup</u>	<u>% Prime</u>	<u>% Sub.</u>
Excavation	Yes 100	0
Load and Haul	Yes 100	0
Professional Labor Management	Yes 100	0

Phase Cost Detail Report (with Markups)

Technology	Direct Cost	Sub Overhead	Sub Profit	Prime Overhead	Prime Profit Contingency	Owner Cost	Markup Total	Total	
Excavation (100% Prime)	\$156,834	\$0	\$0	\$83,780	\$19,249	\$0	\$28,585	\$131,614	\$288,448
Load and Haul (100% Prime)	\$373,953	\$0	\$0	\$93,488	\$37,395	\$0	\$55,532	\$186,416	\$560,369
Professional Labor Management (100% Prime)	\$66,343	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$66,343
Total Phase Cost	\$597,130	\$0	\$0	\$177,268	\$56,644	\$0	\$84,117	\$318,030	\$915,160
							Escalation		\$62,871
							Escalated Phase Cost		\$978,031

Phase Cost Detail Report (with Markups)

Markup Template

System Defaults

Markup Percentage

Professional Labor Overhead/G&A	132.0
Field Office Overhead/G&A	25.0
Subcontractor Profit	8.0
Prime Profit	8.0
Contingency	0.0
Owner Cost	11.0

Comment:

Phase Technology Cost Detail Report (with Markups)

System:

RACER Version: 10.4.0

Database Location: C:\Users\daniel.FPM-GROUP\Application Data\AECOM\RACER 10.4\Racer.mdb

Folder:

Folder Name: NM-AZ Group-EE/CAs

Project:

Project ID: Cannon AFB

Project Name: Cannon AFB

Project Category: None

Location

State / Country: NEW MEXICO

City: CANNON AFB

Location Modifier

Default

User

1.101

1.101

Options

Database: System Costs

Cost Database Date: 2011

Report Option: Fiscal

Description

Phase Technology Cost Detail Report (with Markups)

Site:

Site ID: TS835
Site Name: TS835
Site Type: None

Media/Waste Type

Primary: Soil
Secondary: N/A

Contaminant

Primary: Semi-Volatile Organic Compounds (SVOCs)
Secondary: None

Phase Names

Pre-Study:
Study:
Design:
Removal/Interim Action:
Remedial Action:
Operations & Maintenance:
Long Term Monitoring:
Site Closeout:

Documentation

Description:
Support Team: Documentation of personnel used to provide support for estimator and preparation of the estimate.
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Phase Technology Cost Detail Report (with Markups)

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Rome, New York 13441

Telephone Number: 315-336-7721

Email Address: d.baldyga@fpm-remediations.com

Estimate Prepared Date: 04/18/2013

Estimator Signature: _____ **Date:** _____

Reviewer Information

Reviewer Name:

Reviewer Title:

Agency/Org./Office:

Business Address:

Telephone Number:

Email Address:

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Reviewer Signature: _____ **Date:** _____

Phase Technology Cost Detail Report (with Markups)

Phase:

Phase Type: Removal/Interim Action

Phase Name: Excavation

Description:

Approach: Ex Situ

Start Date: April, 2015

Labor Rate Group: System Labor Rate

Analysis Rate Group: System Analysis Rate

Phase Markups: System Defaults

Technology Markups

	<u>Markup</u>	<u>% Prime</u>	<u>% Sub.</u>
Excavation	Yes	100	0
Load and Haul	Yes	100	0
Professional Labor Management	Yes	100	0

Phase Technology Cost Detail Report (with Markups)

Technology: Excavation

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
17020416	12 CY Dump Truck Haul/Hour	439.00	HR	0.00	104.09	65.46	0.00	\$74,430.92	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17030278	Excavate and load, bank measure, medium material, 3-1/2 C.Y. bucket, hydraulic excavator	4,000.00	BCY	0.00	1.15	1.43	0.00	\$10,309.65	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17030423	Unclassified Fill, 6" Lifts, Off-Site, Includes Delivery, Spreading, and Compaction	4,600.00	CY	11.94	1.47	1.28	0.02	\$67,704.65	<input type="checkbox"/>	<input checked="" type="checkbox"/>
18050402	Seeding, Vegetative Cover	1.49	ACR	4,778.35	678.58	292.30	0.00	\$8,566.35	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33020401	Disposable Materials per Sample	90.00	EA	14.16	0.00	0.00	0.00	\$1,274.63	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33021721	Testing, semi-volatile organics (625, 8270)	37.00	EA	0.00	0.00	0.00	179.82	\$6,653.34	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
33220102	Project Manager	40.00	HR	0.00	194.61	0.00	0.00	\$7,784.46	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220108	Project Scientist	320.00	HR	0.00	197.15	0.00	0.00	\$63,087.19	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220110	QA/QC Officer	100.00	HR	0.00	195.28	0.00	0.00	\$19,527.88	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220112	Field Technician	160.00	HR	0.00	116.75	0.00	0.00	\$18,679.85	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220114	Word Processing/Clerical	60.00	HR	0.00	100.38	0.00	0.00	\$6,022.54	<input type="checkbox"/>	<input checked="" type="checkbox"/>
33220115	Draftsman/CADD	40.00	HR	0.00	110.16	0.00	0.00	\$4,406.56	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Element Cost								\$288,448.01		
Total 1st Year Technology Cost								\$288,448.01		

Phase Technology Cost Detail Report (with Markups)

Technology: Load and Haul

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
17020401	Dump Charges	4,000.00	EA	112.39	0.00	0.00	0.00	\$449,550.00	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
17030224	966, 4.0 CY, Wheel Loader	21.00	HR	0.00	111.54	112.49	0.00	\$4,704.72	<input type="checkbox"/>	<input checked="" type="checkbox"/>
17030288	26 CY, Semi Dump	529.00	HR	0.00	104.09	96.50	0.00	\$106,114.06	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Total Element Cost								\$560,368.78		
Total 1st Year Technology Cost								\$560,368.78		

Phase Technology Cost Detail Report (with Markups)

Technology: Professional Labor Management

Assembly	Description	Quantity	Unit of Measure	Material Unit Cost	Labor Unit Cost	Equipment Unit Cost	Sub Bid Unit Cost	Extended Cost	Cost Override	Markups Applied
33220149	Lump Sum Percentage Labor Cost	1.00	LS	0.00	66,343.00	0.00	0.00	\$66,343.00	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Total Element Cost								\$66,343.00		
Total 1st Year Technology Cost								\$66,343.00		
Total Phase Cost								\$915,159.79		