

# DRAFT FINAL

## Site Inspection Report

### Former Carlsbad Army Airfield

Eddy County, New Mexico

U.S. Army Corps of Engineers  
Southwest IMA Region

FUDS Project No. K06NM034203  
Contract No. W912DY-04-D-0005  
Task Order 0009



Prepared for

U.S. Army Corps of Engineers, Albuquerque District  
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U.S. Army Corps of Engineers  
South Pacific Division Range Support Center

Prepared by

**PARSONS**

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January 2008



*The views, opinions, and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.*

January 23, 2008

U.S. Army Corps of Engineers, Albuquerque District  
ATTN: CESPAC-EC-G (Ms. Lara Beasley)  
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Subject: Contract W912DY-04-D-0005, Delivery Order 0009  
MMRP SI for SW IMA Region – Draft Final Site Inspection Report  
Former Carlsbad Army Airfield, Eddy County, New Mexico

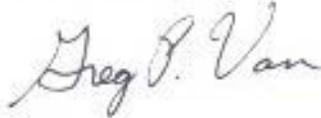
Dear Ms. Beasley:

Parsons has prepared this Draft Final Site Inspection Report for the former Carlsbad Army Airfield site. Five copies have been provided for your backcheck and distribution to key TPP Stakeholders. We have simultaneously forwarded copies to Monique Ostermann, and the EM CX. Electronic copies have also been provided.

If you have any questions or comments, please contact me at (303) 764-1927 or the Program Manager (Mr. Don Silkebakken) at (678) 969-2384.

Sincerely,

**PARSONS**



Greg P. Van  
SI Task Manager

cc: SPD Monique Ostermann – 1 copy / 1 CD  
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**CONTRACTOR STATEMENT OF INDEPENDENT TECHNICAL REVIEW**

Parsons has completed the Draft Final Site Inspection Report for the former Carlsbad Army Airfield, New Mexico. Notice is hereby given that an independent technical review has been conducted that is appropriate to the level of risk and complexity inherent in the project, as defined in the Quality Control Plan. The independent technical review verified compliance with established policy principles and procedures, using justified and valid assumptions. This included review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; appropriateness of data used and level of data obtained; and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing Corps policy.

  
\_\_\_\_\_  
Study/Design Team Leader January 23, 2008  
Date

  
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Study/Design Team Members January 23, 2008  
Date

  
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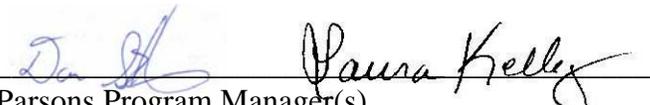
  
\_\_\_\_\_  
Review Team January 23, 2008  
Date

  
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Independent Technical Review Team Leader January 23, 2008  
Date

Significant concerns and the explanation of the resolution are as follows:

None

As noted above, all concerns resulting from independent technical review of the project have been considered.

  
\_\_\_\_\_  
Parsons Program Manager(s) January 23, 2008  
Date



**U.S. Army Corps of Engineers  
Southwest IMA Region**

**DRAFT FINAL**  
**Site Inspection Report**  
**Former Carlsbad Army Airfield**  
**Eddy County, New Mexico**

**FUDS Project No. K06NM034203**

**January 2008**

*In Support of*  
**FUDS MMRP Site Inspections Project**

*Prepared by*

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5390 Triangle Parkway, Suite 100  
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**U.S. Army Corps of Engineers, Albuquerque District  
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**U.S. Army Corps of Engineers  
South Pacific Division Range Support Center**

**Contract No. W912DY-04-D-0005  
Task Order 0009  
Project No. 744653**

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**ACRONYMS AND ABBREVIATIONS**

°F	degrees Fahrenheit
AAF	Army Airfield
amsl	above mean sea level
ASR	archives search report
bgs	below ground surface
BLM	Bureau of Land Management
CCAT	Cavern City Air Terminal
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
CRREL	Cold Regions Research and Engineering Laboratory
CSEM	conceptual site exposure model
CSM	conceptual site model
CWM	chemical warfare materiel
CZMP	Coastal Zone Management Program
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DQO	data quality objective
ER	Engineer Regulation
FUDS	Formerly Used Defense Site
GIS	Geographic Information System
GPS	Global Positioning System
HE	high explosive
HPD	(New Mexico) Historic Preservation Division
HRS	Hazard Ranking System
HTW	hazardous and toxic waste
INPR	inventory project report
MC	munitions constituent
MEC	munitions and explosives of concern
MMRP	Military Munitions Response Program
MRDS	Mineral Resources Data System
MRS	munitions response site
MRSPP	Munitions Response Site Prioritization Protocol
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NDAI	no Department of Defense action indicated
NHA	National Heritage Area
NHL	National Historic Landmark
NHNM	Natural Heritage New Mexico
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
No.	Number
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRHD	National Register Historic District

NRHP	National Register of Historic Places
NRIS	National Register Information System
NWI	National Wetlands Inventory
NWRS	National Wildlife Refuge System
OSE	Office of the State Engineer
PAH	polycyclic aromatic hydrocarbon
Parsons	Parsons Corporation
PBR	Precision Bombing Range
PRG	preliminary remediation goal
PSAP	programmatic sampling and analysis plan
PWP	programmatic work plan
QA	quality assurance
QC	quality control
QR	qualitative reconnaissance
RAC	risk assessment code
RAIS	Risk Assessment Information System
RI/FS	remedial investigation and feasibility study
SI	site inspection
SLRA	screening-level risk assessment
SSL	soil screening level
SS-WP	site-specific work plan
T&E	threatened and endangered
TESS	Threatened and Endangered Species System
TestAmerica	TestAmerica Analytical Testing Corporation
TPP	technical project planning
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	<i>U.S. Code</i>
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UXO	unexploded ordnance

## GLOSSARY OF TERMS

<b>inhabited structure</b>	Permanent or temporary structures, other than military munitions-related structures, that are routinely occupied by one or more persons for any portion of a day.
<b>magnetometer</b>	An instrument for measuring the strength of a magnetic field; used to detect buried iron and other metal objects.
<b>military munitions</b>	All ammunition products and components produced for or used by the armed forces for national defense and security, including ammunition products or components under the control of the Department of Defense, the Coast Guard, the Department of Energy, and the National Guard. The term includes confined gaseous, liquid, and solid propellants; explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries, including bulk explosives and chemical warfare agents; chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges; and devices and components thereof.
<b>munitions and explosives of concern (MEC)</b>	Military munitions that may pose unique explosives safety risks, including unexploded ordnance, discarded military munitions, or munitions constituents present in high enough concentrations to pose an explosive or other health hazard.
<b>munitions constituents (MC)</b>	Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.
<b>munitions debris</b>	Remnants of munitions (for example, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.
<b>munitions response</b>	Response actions, including investigation, removal actions, and remedial actions, to address the explosive safety, human health, or environmental risks presented by unexploded ordnance, discarded military munitions, or munitions constituents, or to support a determination that no removal or remedial action is required.

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<b>munitions response area</b>	Any area on a defense site that is known or suspected to contain unexploded ordnance, discarded military munitions, or munitions constituents. Examples include former ranges and munitions burial areas. A munitions response area includes one or more munitions response sites.
<b>munitions response site (MRS)</b>	A discrete location within a munitions response area that is known to require a munitions response.
<b>projectile</b>	Object projected by an applied force and continuing in motion by its own inertia. This includes bullets, bombs, shells, grenades, guided missiles, and rockets.
<b>unexploded ordnance (UXO)</b>	Military munitions that have been primed, fuzed, armed, or otherwise prepared for action; that have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material; and that remain unexploded whether by malfunction, design, or any other cause.

## **EXECUTIVE SUMMARY**

### **ES.1 PROJECT OBJECTIVES**

ES.1.1 The objective of this site inspection (SI) is to determine whether the former Carlsbad Army Airfield (AAF) Formerly Used Defense Site (FUDS) in Eddy County, New Mexico, warrants further investigation under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The former Carlsbad AAF was used as a training facility between 1942 and 1946. The SI at the former Carlsbad AAF was performed to confirm munitions response site (MRS) locations and to evaluate evidence for the presence of munitions and explosives of concern (MEC) and munitions debris at the FUDS. To accomplish this objective, qualitative reconnaissance (QR) and munitions constituent (MC) sampling were performed at the two MRSs at the FUDS: (Demonstration Bombing Target and Range Complex Number [No.] 1).

ES.1.2 Outcomes for the MRSs could include MEC response actions or no Department of Defense action indicated (NDAI), among others. If NDAI status is recommended and approved after evaluation of the SI data, the process to close out the former Carlsbad AAF will be initiated. If an imminent threat is identified to the public or the environment, a time-critical removal action (TCRA) or non-time critical removal action (NTCRA) may be performed as an interim action, or a remedial investigation and feasibility study (RI/FS) may be initiated to evaluate feasible MEC response actions.

ES.1.3 The technical project planning (TPP) process determined that the collection of 11 soil samples would be sufficient to meet the SI project objectives. Three of these samples were collected at locations outside any identified MRS for use in determining ambient conditions at the FUDS. Two of the remaining eight samples were collected in the Demonstration Bombing Target MRS, and the other six were collected in the Range Complex No. 1 MRS. All of the samples were collected at or near locations defined in the site specific work plan (SS-WP) for the project except for the Demonstration Bombing Target samples. These two samples were moved from the proposed locations to the west side of the MRS as the original locations were in an area currently used by a gravel company.

### **ES.2 SUMMARY OF RESULTS**

ES.2.1 The SI evaluation included approximately 5.0 miles of walked QR and the collection of 11 surface soil samples within the former Carlsbad AAF boundary (Figure ES.1). TestAmerica Analytical Testing Corporation (TestAmerica) in Arvada, Colorado, analyzed the samples for various compounds depending on the locations they were collected. All of the samples, except for the two samples collected in the Demonstration Bombing Target, were analyzed for select small arms munitions related metals; the two samples collected in the triple skeet range portion of Range Complex No. 1 and the three ambient samples were also analyzed for polycyclic aromatic hydrocarbons (PAHs); and

## DRAFT FINAL

the two samples collected in the Demonstration Bombing Target were analyzed for explosives. Soil analytical results were compared to the following two criteria to determine the need to perform a screening level risk assessment (SLRA) for each particular analyte:

- Was the analyte detected above the background screening concentration?
- Was the analyte a potential constituent of munitions known or suspected of being used on site?

ES.2.2 SLRAs were performed for each analyte that met both conditions. The SLRAs compared MC detections to the more stringent of the residential soil screening levels (SSLs) from the New Mexico Environment Department (NMED) and the residential SSLs from the USEPA Region 6 human health medium-specific screening levels. For those analytes that do not have NMED or USEPA residential SSLs, USEPA Region 9 residential soil preliminary remediation goals (PRGs) were used. No explosive compounds were detected in either of the soil samples collected in the Demonstration Bombing Target. No metals exceeded the background screening criteria established for the project, and of the six PAHs that exceeded background, five were below the screening criteria. The sixth PAH retained for the SLRA, benzo(g,h,i)perylene, does not have an applicable screening level.

ES.2.3 The field team did not find MEC during the QR at the former Carlsbad AAF, although munitions debris from small arms was observed during the QR. Table ES.1 and Figure ES.1 summarize the results of the SI.

**TABLE ES.1**  
**SUMMARY OF RESULTS**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>MRS</b>	<b>Acreage</b>	<b>Surface MEC Found</b>	<b>Munitions Debris Found</b>	<b>MC Contamination</b>
Demonstration Bombing Target	72	No	Yes (during ASR)	No
Range Complex No. 1	927	No	Small arms only	No

### **ES.3 CONCLUSIONS REGARDING POTENTIAL MUNITIONS AND EXPLOSIVES OF CONCERN**

ES.3.1 No MEC were found during the SI, although the field team did observe large amounts of small arms munitions debris in the vicinity of the former Range Complex No. 1 firing line. Small arms do not pose a threat if encountered by receptors; therefore, there is no potential for MEC or a complete MEC exposure pathway at Range Complex No. 1.

ES.3.2 Munitions debris from practice bombs were also found in a draw immediately adjacent to the Demonstration Bombing Target during a 1995 site visit in support of the

preparation of the Archives Search Report for the former Carlsbad AAF (USACE, 1995). These bombs typically use spotting charges that are explosively hazardous, so the existence of bomb debris suggests the potential presence of MEC at this MRS. The Demonstration Bombing Target is currently owned and used by a gravel company, suggesting the potential for a completed MEC exposure pathway at this MRS.

#### **ES.4 CONCLUSIONS REGARDING POTENTIAL MUNITIONS CONTITUENTS EXPOSURE PATHWAYS**

ES.4.1 An exposure pathway is not considered to be completed unless all four of the following elements are present (USEPA, 1989):

- A source and mechanism for chemical release;
- An environmental transport or exposure medium;
- A receptor exposure point; and
- A receptor and a likely route of exposure at the exposure point.

ES.4.2 No explosive compounds were detected in the soil samples collected in the Demonstration Bombing Target MRS. Based on the analytical results and potential exposure pathways evaluated in this SI, it is concluded that MC contamination is not present in the Demonstration Bombing Target MRS and that there are no completed MC exposure pathways for human or ecological receptors.

ES.4.3 Metals concentrations detected in the Range Complex No. 1 soil samples were all below the background values established for the former Carlsbad AAF, but the concentrations of six detected PAHs exceeded background values. A SLRA was performed for the five PAHs with published screening criteria, and all five were below their respective criteria. The sixth PAH, benzo(g,h,i)perylene, did not have a screening value, but the detected concentrations were below the screening level for benzo(a)pyrene, which is considered a more toxic substance. There is no identifiable risk associated with the PAHs detected in Range Complex No. 1.

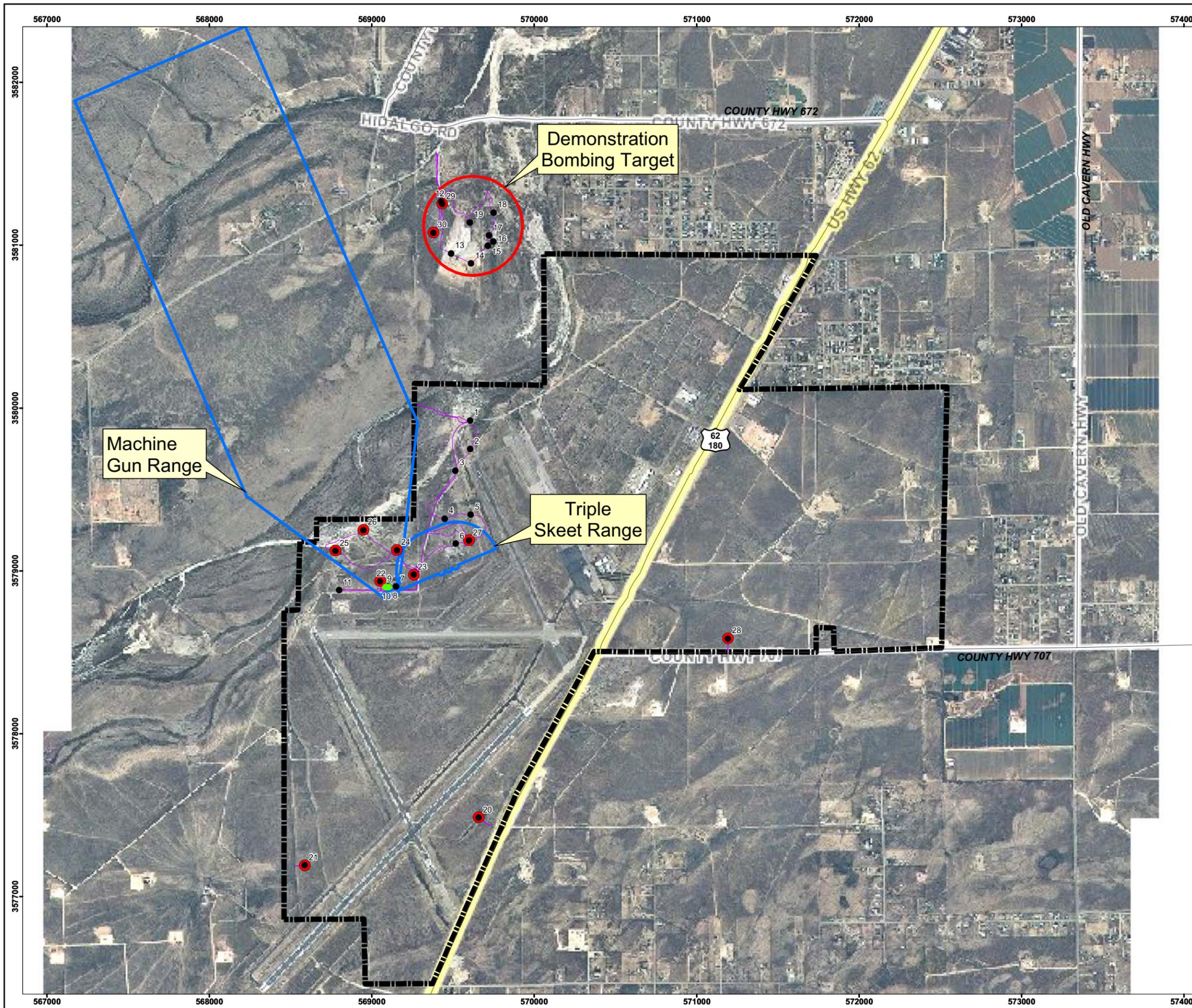
#### **ES.5 RECOMMENDATIONS**

Based on the observation of practice bomb debris by the ASR site visit team, the Demonstration Bombing Target MRS is recommended to proceed to RI/FS status for MEC. However, the data supports no further MC sampling during the RI/FS, and a removal action is not warranted at this time. Range Complex No. 1 is recommended to proceed to NDAI status, as no risk was associated with either the munitions debris or MC identified in this MRS during the SI.

Figure ES.1

**General Site Overview**  
**Formerly Used Defense Site**  
**Carlsbad Army Airfield**  
**FUDS Project # K06NM034203**

Eddy County, New Mexico



**Legend**

- 8 ● Small Arms Debris Location
- 7 ● Other Field Observation Location
- Soil Sample Location
- Bombing Range Boundary
- Range Complex No. 1
- Qualitative Reconnaissance Track
- FUDS Boundary



Image Source: Orthoimagery, 2005  
 Projection: UTM Zone 13 NAD83, Map Units in Meters  
 2,000 1,000 0 2,000 Feet

PARSONS		U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER	
DESIGNED BY: BT	<b>General Site Overview</b>		
DRAWN BY: BT			
CHECKED BY: GV	SCALE: As Shown	PROJECT NUMBER: 744653.65000	
SUBMITTED BY: GV	DATE: January 2008	PAGE NUMBER: ES-4	
	FILE: X:\GIS\Site_inspections_sw\Maps\carlsbad_NMI\FigES_1.mxd		

## CHAPTER 1

### INTRODUCTION

#### 1.1 BACKGROUND

1.1.1 Parsons Corporation (Parsons) received Contract Number W912DY-04-D-0005, Task Order Number 0009, from the United States (U.S.) Army Corps of Engineers (USACE) Engineering and Support Center, Huntsville to perform a site inspection (SI) of the former Carlsbad Army Airfield (AAF) Formerly Used Defense Site (FUDS), Project Number K06NM034203, Federal Facility Identification NM9799F6147. The former Carlsbad AAF is in Eddy County in southeast New Mexico, approximately 5 miles from the center of the city of Carlsbad, New Mexico. The main portion of the site, approximately 1,700 acres, lay west of U.S. Route 62, while the ordnance storage area was on approximately 662 acres east of the highway. Figure 1.1 shows the site location.

1.1.2 The Department of Defense (DoD) established the Military Munitions Response Program (MMRP) to address DoD sites suspected of containing munitions and explosives of concern (MEC) or munitions constituents (MC). Under the MMRP, the USACE is conducting environmental response activities at FUDS for the Army, the DoD's executive agent for the FUDS program.

1.1.3 Pursuant to the USACE's Engineer Regulation (ER) 200-3-1 (USACE, 2004b) and the *Management Guidance for the Defense Environmental Restoration Program* (DERP) (Office of the Deputy Under Secretary of Defense [Installations and Environment], 2001), USACE is conducting FUDS response activities. All work is performed in accordance with the following:

- The DERP statute (10 U.S. Code [USC] 2701 *et seq.*);
- The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC §9601 *et seq.*);
- Executive Orders 12580 and 13016; and
- The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300).

1.1.4 USACE is conducting SIs, as set forth in the NCP, to evaluate hazardous substance releases or threatened releases from eligible FUDS.

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1.1.5 While not all MEC or MC constitute CERCLA hazardous substances, pollutants, or contaminants, the DERP statute provides the DoD with the authority to respond to releases of MEC or MC. DoD policy states that such responses shall be conducted in accordance with CERCLA and the NCP.

1.1.6 This report summarizes the work performed during the SI and presents an accounting of any MEC and MC contamination identified at the FUDS. The SI is limited exclusively to MEC and MC contamination issues and does not consider unrelated hazardous and toxic waste (HTW) concerns that the FUDS may pose. Polycyclic aromatic hydrocarbons (PAHs) are considered an incidental contaminant (primarily in skeet ranges) and may be programmatically investigated. Per ER 200-3-1 guidance for conducting an SI, “The SI is not intended as a full-scale study of the nature and extent of contamination or explosive hazards”; instead, it requires the collection of a sufficient and appropriate amount of information.

### **1.2 PROJECT OBJECTIVES**

1.2.1 The primary objective of the MMRP SI is to determine whether a FUDS project warrants further response action under CERCLA. The SI collects sufficient and appropriate information necessary to make this determination, as well as it

- 1) Determines the potential need for a removal action;
- 2) Collects or develops additional data, as appropriate, for Hazard Ranking System (HRS) scoring by the U.S. Environmental Protection Agency (USEPA); and
- 3) Collects data, as appropriate, to characterize the release for effective and rapid initiation of the remedial investigation and feasibility study (RI/FS).

1.2.2 An additional objective of the MMRP SI is to collect the additional data necessary to complete the Munitions Response Site Prioritization Protocol (MRSPP).

### **1.3 PROJECT SCOPE**

1.3.1 The primary project planning documents used to perform the SI include the Site-Specific Work Plan (SS-WP) Addendum for the Carlsbad AAF (Parsons, 2007a), the South Pacific Division Range Support Center Programmatic Work Plan (PWP) (Parsons, 2005), the Programmatic Sampling and Analysis Plan (PSAP) (USACE, 2005), and the PSAP Addendum (Parsons, 2006). The performance work statement for this project is in Appendix A.

1.3.2 The USACE Albuquerque District facilitated a technical project planning (TPP) meeting on March 20, 2007, that included representatives of the USACE, USEPA Region 6, Parsons, the New Mexico Environment Department (NMED), and the City of Carlsbad. The TPP Team unanimously concurred with the technical approach presented in the Final TPP Memorandum (Parsons, 2007b), including the collection of 11 soil samples, sampling methods, and laboratory analyses for MC. Team members also agreed

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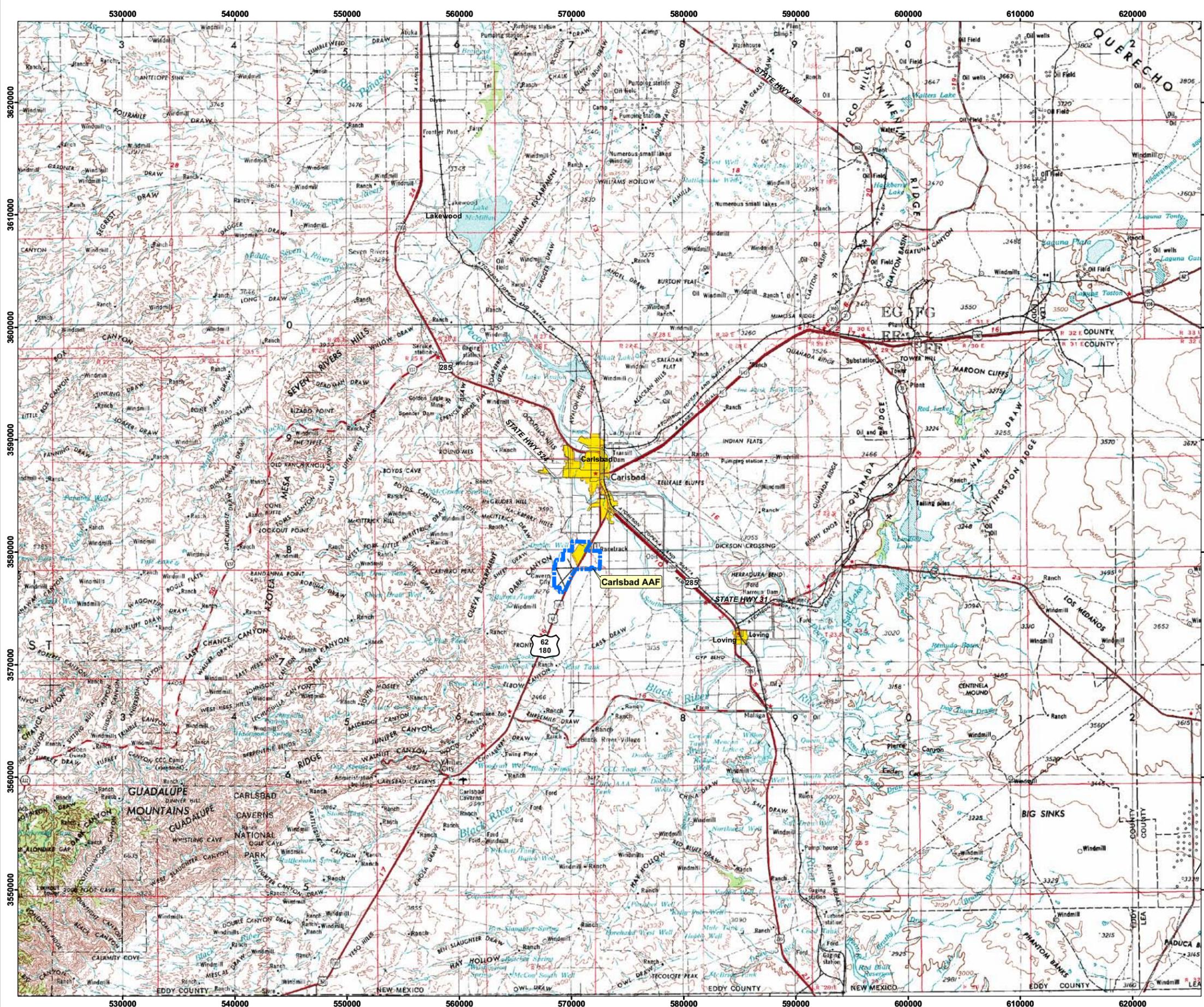
that a human drinking water exposure pathway was not likely complete at the former Carlsbad AAF based on the locations of drinking water wells within the FUDS and the depth to water in these wells. Given the lack of a drinking water pathway, it was agreed that the collection of water samples was not warranted during the SI.

1.3.3 The TPP Team concurred that the comparison criteria for soil sample results would be the more conservative of the NMED residential soil screening levels (SSLs) and the USEPA Region 6 SSLs in its medium-specific screening levels for 2007. If relevant residential SSLs were unavailable from both sources, USEPA Region 9 residential soil preliminary remediation goals (PRGs) would be used. The team also concurred that a sample depth of 2 inches to 6 inches below ground surface (bgs) was appropriate for the windblown soil at sites in New Mexico.

Figure 1.1

# Site Location Map Formerly Used Defense Site Carlsbad Army Airfield FUDS Project No. K06NM034203

Eddy County, New Mexico



**Legend**  
FUDS Boundary



Image Source: USGS Topos  
Projection: UTM Zone 13 NAD83, Map Units in Meters  
6 3 0 6 Miles

PARSONS		U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER	
DESIGNED BY: BT	<b>Site Location Map</b>		
DRAWN BY: BT			
CHECKED BY: GV	SCALE: As Shown	PROJECT NUMBER: 744653.65000	
SUBMITTED BY: GV	DATE: January 2008	PAGE NUMBER: 1-4	
	FILE: X:\GIS\Site_inspection_sw\Maps\carlsbad_NM\Fig1_1.mxd		

## **CHAPTER 2**

### **PROPERTY DESCRIPTION AND HISTORY**

#### **2.1 SITE DESCRIPTION**

The former Carlsbad AAF is in Eddy County approximately 5 miles southwest of the center of the City of Carlsbad in southeastern New Mexico (Figure 1.1). Figure 2.1 shows the FUDS boundary and the locations of the Range Complex Number (No.) 1 and Demonstration Bombing Target munitions response sites (MRSs). The former facility consisted of approximately 2,362 acres and was used as a training base for bombardiers between 1942 and 1946. Carlsbad AAF was declared excess in 1946 and was disposed of by the War Assets Administration by 1947. The site is currently owned by various parties, including the City of Carlsbad, the Bureau of Land Management (BLM), and private land owners.

#### **2.2 SITE LOCATION AND SETTING**

##### **2.2.1 Topography and Vegetation**

2.2.1.1 The former Carlsbad AAF FUDS is in the Pecos Valley section of the Great Plains Physiographic Province. Figure 2.1 shows the site elevation, which ranges from approximately 3,190 to 3,290 feet above mean sea level (amsl) and slopes generally down to the northeast. Other than the gentle southwest to northeast slope, the site is flat and covered by low grasses and sagebrush. There are no permanent water bodies on-site, although the USGS map of the site shows two significant arroyos or draws in the vicinity of the site, Little McKittrick Draw and Dark Canyon Draw. These features could possibly contain water during periods of significant precipitation. Little McKittrick and Canyon Draw both pass through the safety fan for Range Complex No. 1, and Dark Canyon Draw passes through the northwestern portion of the FUDS boundary. Of the two draws, Dark Canyon was the only one crossed by the SI team, and no water was observed. The Pecos River flows through Carlsbad, approximately 6 miles northeast of the FUDS.

2.2.1.2 Vegetation in the area is dominated by shrubs and grasses, which can stabilize the sandy soil in the area and reduce the effects of wind erosion. Creosote is dominant in the area along with tarbush, fourwing saltbrush, acacias, gyp gramma, and alkali sacaton. Horse crippler and other cacti are also common (USEPA, 2007a). Vegetation observed during the SI was consistent with these descriptions and consisted of low grasses and shrubs, as shown in site photographs taken on August 7 to 13, 2007 (see Appendix E).

### **2.2.2 Soil**

The Carlsbad AAF FUDS is underlain by sands that can extend to a depth of 60 inches or more. Sands in this part of New Mexico were generally formed during the deposition of terraces, alluvial fans, and sand dunes. The sands have a very high vertical permeability with rates between 6 to 20 inches per hour. Available water capacity is low, surface runoff is very slow, and the shrink-swell potential is low. The hazard of soil erosion is high, with most erosive effects due to the strong winds in the area. Site soils are highly corrosive for uncoated steel (USACE, 1995). The surface soil observed during the SI was typically tan or white sand, with the white sand most likely representing a salt-rich caliche layer. Subchapter 5.2.1 describes the regional geology and hydrogeology for this area.

### **2.2.3 Climate**

The climate in the Eddy County, New Mexico, area follows the basic trend of the four seasons. Rainfall is highest in the summer, with the most precipitation occurring in July (average 1.61 inches), August (1.81 inches), and September (2.15 inches). The climate is driest in late fall and winter, with an average of less than 0.5 inches of precipitation occurring in November, December, January, and February. Snowfall occurs as early as October and as late as May, with the most snowfall during November, December, and January, averaging nearly 1 inch each month (Western Regional Climate Center [WRCC], 2007). The hottest month is July, with an average maximum temperature of 94 degrees Fahrenheit (°F). The coldest month is January, with an average maximum of 56°F and an average minimum of 28°F. Winds are highest in the spring, averaging 12 miles per hour. Sunshine is well above the U.S. average at nearly 80% sunshine year round (City-Data.com, 2007).

### **2.2.4 Significant Structures**

The majority of the land within the former FUDS boundary is now the Cavern City Air Terminal (CCAT), which serves as a regional airport and industrial park. The City of Carlsbad owns the CCAT, leasing portions of the site to various private parties. The Rose Gravel Company uses the Demonstration Bombing Target MRS, which is not within the designated FUDS boundary. There are no residences within the FUDS or MRS boundaries, but residences are within 2 miles of the FUDS. There are also culturally significant resources within the Range Complex No. 1 MRS boundary. The nature of these sites is not known, as the SI field team avoided them during their investigation of the site.

### **2.2.5 Demographics**

2.2.5.1 The former Carlsbad AAF is in Eddy County, New Mexico, approximately 5 miles southwest of the City of Carlsbad, New Mexico. According to the 2000 U.S. census, the population density of Carlsbad is 903 persons per square mile, and the population density of Eddy County is 12.4 persons per square mile. The census data also

indicate that 15,982 people live within four miles of the boundary of the former Carlsbad AAF, as shown in Table 2.1 and Figure 2.2.

**TABLE 2.1  
POPULATION WITHIN 4-MILE BUFFER  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>Range</b>	<b>On Site</b>	<b>0 to ¼ Mile</b>	<b>¼ to ½ Mile</b>	<b>½ to 1 Mile</b>	<b>1 to 2 Miles</b>	<b>2 to 3 Miles</b>	<b>3 to 4 Miles</b>	<b>Total</b>
<b>FUDS Boundary</b>	789	1,239	72	978	3,638	3,433	5,833	15,982
<b>Demonstration Bombing Target</b>	9	271	377	421	1,862	4,680	10,117	17,737
<b>Range Complex No. 1</b>	112	97	105	427	2,450	4,531	12,314	20,036

Source: U.S. Census 2000 data. The population within the FUDS, MRS, or any buffer area is determined using a conservative approach to calculate the population of an area by including the total number of people for any census block that falls within or overlaps the site boundary, MRS boundary, or buffer line.

2.2.5.2 Although the census data indicate that 789 people live within the boundaries of the FUDS, this overestimation is based on the conservative approach used to calculate the population numbers. Using this approach, the entire population contained in a census block is counted within any overlapping buffer line. No residences were observed within the FUDS or MRS boundaries during the SI field work, and therefore it is inferred that very few, if any, of the 789 “on-site” residents actually live within the FUDS boundary.

**2.2.6 Current and Future Land Use**

The former Carlsbad AAF is currently owned by the City of Carlsbad, the BLM, and at least one private party. The City of Carlsbad uses the airfield as the CCAT, which supports various commercial and industrial activities. The BLM leases its portion of the site, which includes most of the Range Complex No. 1 MRS, for livestock grazing. A gravel company uses much of the former Demonstration Bombing Target MRS. There is no anticipated change in the uses of the site.

**2.3 SITE OWNERSHIP AND HISTORY**

2.3.1 The War Department acquired the land for the Carlsbad AAF in 1942. It was originally owned by the State of New Mexico, the City of Carlsbad, the Department of the Interior, and two private landowners. Prior to the War Department’s acquisition of the land, the City of Carlsbad had been using its portion as the Carlsbad City Airport. The city airport was subsequently expanded for use by the Army. Construction at the site included over 500 buildings, a demonstration bombing target, an ordnance area, additional runways, and skeet, rifle, and pistol ranges.

2.3.2 Carlsbad AAF was used as a training base for bombardiers. Students at the Airfield were trained using AT-11 and B-34A aircraft, typically using either M38A2 (sand-filled) or M85 (concrete) 100-pound practice bombs. Flight crews also dropped a limited number of high explosive (HE) demolition bombs as a final exercise prior to graduation. All of this ordnance would have been stored in the Carlsbad AAF ordnance

area, and it is possible that M38A2 and/or M85 bombs were dropped on the Demonstration Bombing Target. However, most of the bombing operations were performed on 26 precision bombing ranges (PBRs) constructed in the Carlsbad area for use by Carlsbad AAF. On June 6, 1946, the site was declared excess and relinquished to the War Assets Administration, which subsequently released the property to a variety of owners, including the State of New Mexico, City of Carlsbad, and private owners.

## **2.4 SITE OPERATIONS AND WASTE CHARACTERISTICS**

### **2.4.1 Munitions Response Site-Specific Descriptions/Operations**

The former Carlsbad AAF consists of the 2,362-acre FUDS with two MRSs, Range Complex No. 1 and the Demonstration Bombing Target. Range Complex No. 1 is a 927-acre area, most of which consists of the safety fan for the machine gun and rifle range portion of the MRS. Nearly all of the safety fan extends outside the FUDS boundary and is not included in the acreage calculation for the FUDS itself. The Demonstration Bombing Target, a 72-acre site north of the FUDS, is also not included in the acreage calculation for the FUDS. The land within the FUDS boundary is primarily owned by the City of Carlsbad and is operated as the CCAT; the portion of the Range Complex No. 1 safety fan outside the FUDS boundary is owned by the BLM; and the former Demonstration Bombing Target property is owned by a private party. The risk assessment performed as part of the Archives Search Report (ASR) Supplement evaluated the various ranges in Range Complex No. 1 separately but determined that a risk assessment code (RAC) score of 5 applied to each. Evaluation of the Demonstration Bombing Target resulted in a RAC score of 3.

### **2.4.2 Regulatory Compliance**

The USACE is conducting the SI at the former Carlsbad AAF as part of FUDS response activities pursuant to and in accordance with the guidance, regulations, and legislation listed in subchapter 1.1.

## **2.5 PREVIOUS INVESTIGATIONS**

2.5.1 Parsons performed a document review for the former Carlsbad AAF including the Inventory Project Report (INPR; USACE, 1990), the Archives Search Report (USACE, 1995), and the ASR Supplement (USACE, 2004a).

2.5.2 Previous investigations determined that the former Carlsbad AAF was used as a training base for pilots and bombardiers between 1942 to 1946. The INPR identified the site as a FUDS, and the ASR included interviews, record reviews, and a site visit. The research performed in support of the ASR identified the types of ordnance potentially used at the FUDS.

### **2.5.1 1990 Inventory Project Report**

By a memorandum dated November 26, 1990, the Commanding Officer of the USACE Southwestern Division submitted the Findings of Fact and Determination of Eligibility (the INPR) for the DERP-FUDS program covering the Carlsbad AAF. The INPR indicated that the site was established and used by the DoD as a pilot and bombardier training base. The only ordnance concern identified in the INPR was possible remnants from the ordnance storage area established at the airfield. However, the INPR referenced a 1947 certificate of clearance which stated that the former ordnance storage area was searched and cleared by an ordnance disposal team in March of that year. Interviews with land owners and a site visit conducted as part of the INPR investigation indicated that there was no evidence of ordnance remaining in the area. The INPR recommended no additional action with respect to ordnance and explosives hazards. However, the INPR did not mention the Demonstration Bombing Target, and it is unknown if the authors were aware of its existence. Given the lack of any identified ordnance and explosives hazards, no RAC worksheet was completed as part of the INPR.

### **2.5.2 1995 Archives Search Report**

The ASR, completed by the USACE St. Louis District, compiled information obtained through historical research at various archives and records-holding facilities, interviews with individuals associated with the FUDS or its operations, and a site visit. Efforts were directed at determining types of munitions used at the FUDS, possible disposal areas, and any unknown training areas. During the site visit conducted in February 1995, the investigation team found clay pigeon pieces, several shell casings (.22, .30, .32, .38, and .45 caliber), and lead bullets (.22, .32, and .45 caliber) in Range Complex No. 1, debris from M38A2 and M85 100-pound practice bombs in a draw running through the Demonstration Bombing Target, and fuzes in the former ordnance storage area. The investigation also found remnants of smoke grenades and evidence of the use of chlorpicrin in the vicinity of the former gas chamber. Information obtained during this process was used in developing recommendations for further actions at the FUDS regarding potential ordnance and explosives. The ASR provides most of the historical information pertaining to site operations and identifies the key areas of focus for the SI.

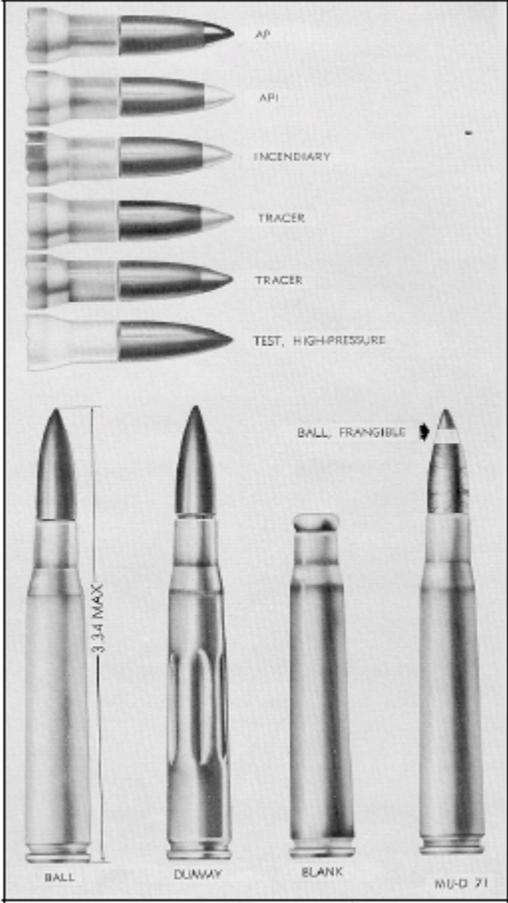
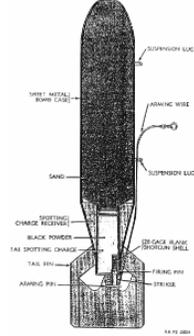
### **2.5.3 2004 Archives Search Report Supplement**

The ASR Supplement was completed by the USACE St. Louis District as an addition to the 1995 ASR. This document applied standard range configurations to the ranges at the former Carlsbad AAF, yielding standardized boundaries for the Demonstration Bombing Target and the skeet, pistol, rifle, and machine gun ranges in Range Complex No. 1. The ASR Supplement also developed a list of MEC that may be found within the MRSs at the FUDS: M38A2 and M85 100-pound practice bombs and M1A1, M3, and M5 spotting charges for the Demonstration Bombing Target and general small arms for all of the ranges now included as part of Range Complex No. 1. The ASR Supplement assigned a RAC score of 3 to the Demonstration Bombing Target MRS and RAC scores of 5 for all of the small arms ranges. No site visit was conducted for the ASR

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Supplement. Table 2.2 shows the known and potential munitions at the former Carlsbad AAF, including items listed in the ASR Supplement and items found during the 2007 SI.

**TABLE 2.2**  
**SUSPECTED OR KNOWN MUNITIONS**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

Munitions	Photograph/Diagram
<p>Small Arms, General                      (.30-cal shown)</p>	 <p style="text-align: center;"><i>Figure 7. Caliber .30 cartridges</i></p>
<p>Bomb, 100-Pound,                      Practice, M38A2</p>	

**TABLE 2.2 (Continued)**  
**SUSPECTED OR KNOWN MUNITIONS**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

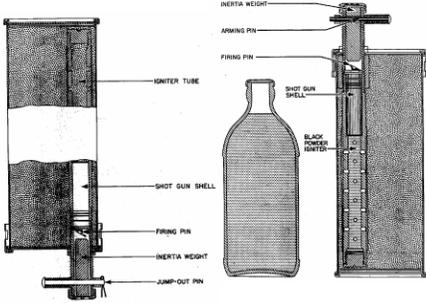
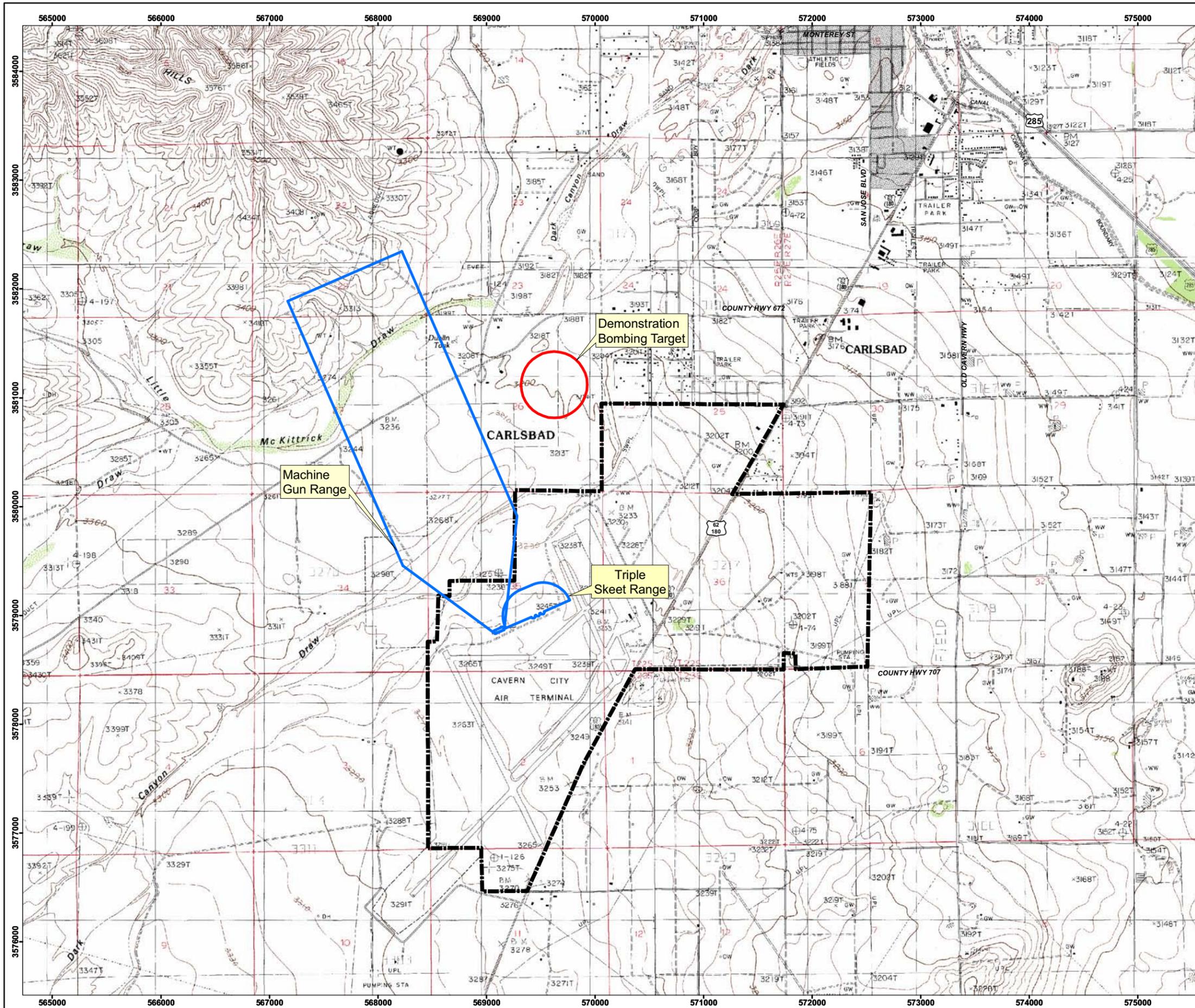
<p>Bomb, 100-Pound, Practice, M85 (Reinforced Concrete)</p>	
<p>Signals, Spotting Charge, M1A1, M5, and M3</p>	 <p><b>M1A1</b>                      <b>M5</b>                      <b>M3</b></p>

Figure 2.1

### Site Setting Formerly Used Defense Site Carlsbad Army Airfield FUDS Project # K06NM034203

Eddy County, New Mexico



**Legend**

- - - Bombing Range Boundary
- Range Complex No. 1
- - - FUDS Boundary



Image Source: USGS 7.5' Topo Quadrangles, 1987  
 Projection: UTM Zone 13 NAD83, Map Units in Meters  
 3,000 1,500 0 3,000 Feet

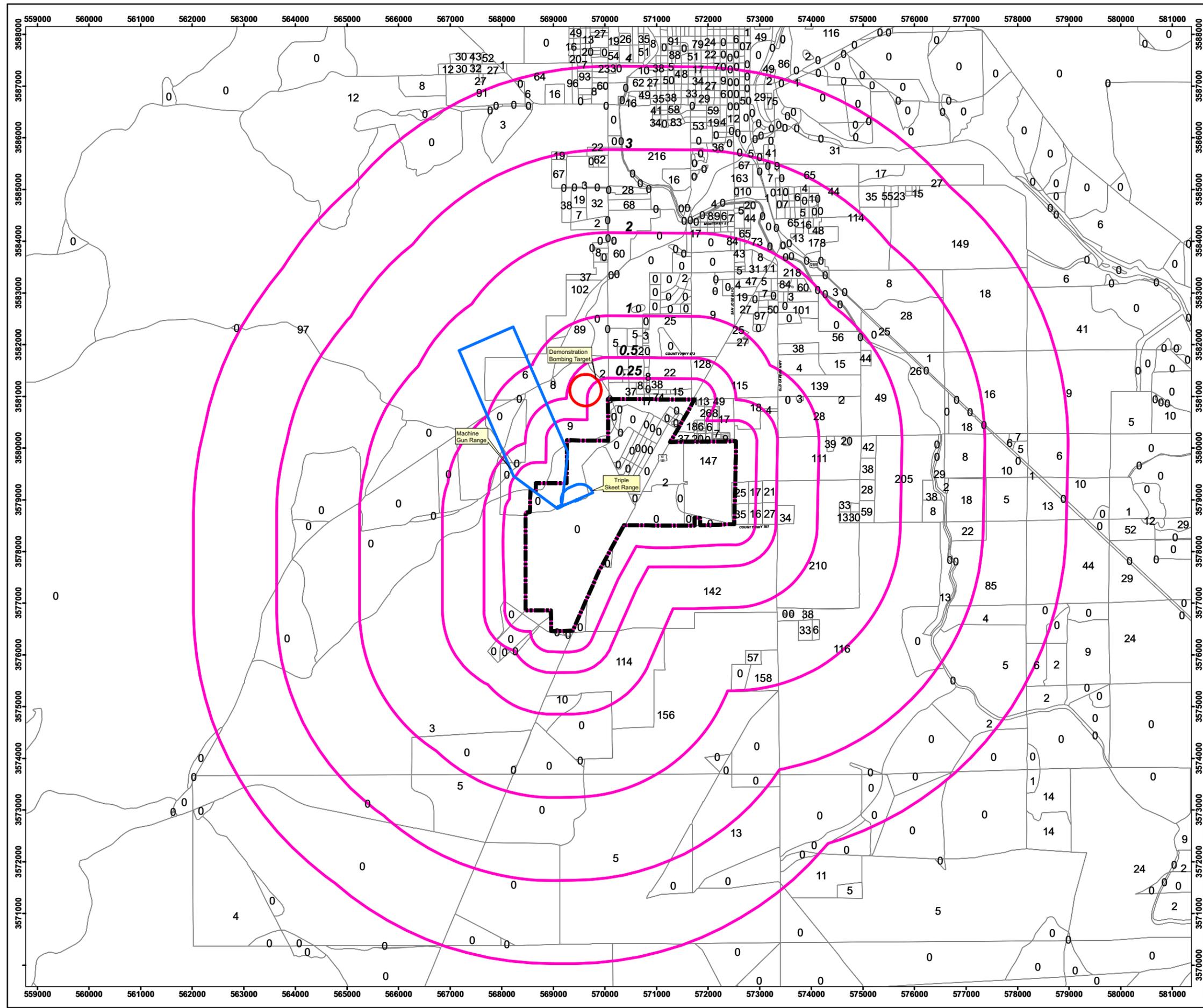
PARSONS U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER

DESIGNED BY: BT	<b>Site Setting</b>		PROJECT NUMBER: 744653.65000
DRAWN BY: BT			PAGE NUMBER: 2-9
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SUBMITTED BY: GV	DATE: January 2008		

Figure 2.2

### 2000 Census Data Formerly Used Defense Site Carlsbad Army Airfield FUDS Project # K06NM034203

Eddy County, New Mexico



**Legend**

- 3 2000 Census Block Boundary with Total Population
- Buffer (Mile)
- Bombing Range Boundary
- Range Complex No. 1
- FUDS Boundary



Image Source: USGS 7.5' Topo Quadrangles, 1987  
 Projection: UTM Zone 13 NAD83, Map Units in Meters  
 1 0.5 0 1 Miles

PARSONS		U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER	
DESIGNED BY: BT	<b>2000 Census Data</b>		
DRAWN BY: BT			
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SUBMITTED BY: GV	DATE: January 2008	PAGE NUMBER: 2-10	
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## **CHAPTER 3**

### **SITE INSPECTION TASKS**

#### **3.1 HISTORICAL RECORD REVIEW**

Parsons performed a document review for the former Carlsbad AAF, including the INPR, the ASR, and the ASR Supplement.

#### **3.2 TECHNICAL PROJECT PLANNING**

The former Carlsbad AAF falls under the purview of the USACE Albuquerque District, which facilitated a TPP meeting on March 20, 2007. Participants included representatives of USACE, USEPA, Parsons, NMED, and the City of Carlsbad. The TPP Team unanimously concurred with the technical approach presented in the final TPP Memorandum (Parsons, 2007b; see Appendix B of this report). Key TPP findings and decisions are summarized below:

- The TPP Team concurred with the technical approach (developed to meet the need for an RI/FS recommendation) as presented and revised at the TPP meeting including the number, type, and location of samples, sampling methods and laboratory analyses.
- The TPP Team agreed that ambient samples and samples collected within the Machine Gun Range and Triple Skeet Range would be analyzed for small arms metals (copper, antimony, and lead) and geochemistry constituents including aluminum, iron, and manganese. Samples within the Demonstration Bombing Target MRS would be analyzed for explosives. Samples 4 and 5 within the boundary of the former Triple Skeet Range would be analyzed for PAHs in addition to the metals, since the clay pigeons used at the Triple Skeet Range could have released PAHs. Ambient samples will also be analyzed for PAHs.
- The City of Carlsbad representatives (Mr. John Haag and Mr. Richard Aguilar) mentioned during the TPP meeting that two arroyos in the portion of the Small Arms Range Boundary extend off the installation to the northwest. The area between these two arroyos is considered a flood plain and reportedly flooded in 2004. The TTP Team agreed that qualitative reconnaissance (QR) and soil sampling would not be useful in this area because the flooding probably disrupted the soil. The portion of the field work that extended into the floodplain was removed.

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- NMED indicated that the storage bunkers east of the highway could have stored practice bombs as well as small arms munitions. These bunkers are mentioned in the ASR but not in the ASR supplement. Parsons agreed to research the storage bunkers and confirmed that they were used to store practice bombs and ammunition. However, the MMRP guidance does not allow investigation of the bunkers during the SI.
- Parsons and USACE indicated that the more conservative value between the NMED residential SSLs and the residential SSLs from the USEPA Region 6 medium-specific screening levels would be used for this site.
- The TPP Team concurred that the depth of soil sampling (2 to 6 inches below surface) as adopted for other New Mexico sites would be appropriate for the former Carlsbad AAF.
- The TPP Team concurred that groundwater sampling is not warranted during the SI based on the locations and depths of domestic wells discussed during the meeting.
- The TPP Team discussed the potential presence of threatened and endangered (T&E) species in Eddy County, but no specific occurrences or critical habitats were known within the property. The TPP Team agreed that the field team would watch for T&E species and note any observed during the site inspection.
- The TPP Team discussed the use of USEPA Region 4 ecological screening values for the site if the ecological pathway is considered complete. If USEPA Region 4 ecological screening values were not available, then supplemental values would be obtained from the Risk Assessment Information System (RAIS) from the Oak Ridge National Laboratory.
- The TPP Team noted that no culturally significant sites were known within the site boundaries. However, cultural sites were identified after the TPP meeting. The locations were forwarded to Parsons for avoidance during the SI field work.

### **3.3 NON-MEASUREMENT DATA COLLECTION**

3.3.1 The USGS Albuquerque District provided geological and hydrogeological consultation, including information about wells on and near the FUDS. The New Mexico Office of the State Engineer (OSE) also provided well information. Ken Williams of the USEPA Region 6 Source Water Protection Program provided information about tribal drinking water supplies (USEPA, 2007b), and Darren Padilla of the NMED Drinking Water Bureau (NMED, 2007) provided information regarding wellhead protection areas on nontribal lands and surface water intakes for drinking water systems in the area.

3.3.2 The following printed and electronic information sources were consulted as part of the former Carlsbad AAF:

- USGS – topographic maps

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- USGS – Groundwater Atlas of the United States, <http://capp.water.usgs.gov/gwa/gwa.html>
- USGS – National Geochemical Survey, <http://tin.er.usgs.gov/geochem/doc/averages/as/south-central.html>
- U.S. Fish and Wildlife Service (USFWS), National Wetlands Inventory (NWI) – Wetlands Online Mapper, <http://wetlandsfws.er.usgs.gov/wtlnds/launch.html>
- USFWS, Endangered Species Program – Threatened and Endangered Species System (TESS), [http://ecos.fws.gov/tess\\_public/StateListing.do?state=all](http://ecos.fws.gov/tess_public/StateListing.do?state=all)
- USFWS – National Wildlife Refuge System (NWRS), <http://www.fws.gov/refuges/profiles/bystate.cfm>
- U.S. Department of Agriculture Forest Service, <http://www.fs.fed.us>
- National Oceanic and Atmospheric Administration., <http://coastalmanagement.noaa.gov>
- National Park Service (NPS), <http://www.nps.gov/applications/parksearch/geosearch.cfm>
- National Register Information System (NRIS) – National Register of Historic Places (NRHP), <http://www.nr.nps.gov/>
- NRIS – National Register Historic Districts (NRHD), <http://www.historicdistricts.com/nm/districts.html> and <http://www.historicdistricts.com/nm/eddy/districts.html>
- National Historic Landmarks Program (New Mexico) – List of National Historic Landmarks (NHLs), <http://www.nps.gov/history/nhl/>
- National Heritage Areas Program – List of National Heritage Areas (NHAs), <http://www.nps.gov/history/heritageareas/>
- Natural Heritage New Mexico (NHNM), Museum of Southwestern Biology at the University of New Mexico, [http://nhnm.unm.edu/data/free\\_info.html](http://nhnm.unm.edu/data/free_info.html)
- New Mexico Department of Game and Fish (NMDGF), <http://www.wildlife.state.nm.us/index.htm>
- New Mexico Historic Preservation Division (HPD), [http://www.nmhistoricpreservation.org/PROGRAMS/registers\\_statenatl.html](http://www.nmhistoricpreservation.org/PROGRAMS/registers_statenatl.html)
- New Mexico HPD, ARMS, <http://www.nmhistoricpreservation.org/PROGRAMS/arm.html>

### **3.4 SITE-SPECIFIC WORK PLAN**

3.4.1 The SS-WP (Parsons, 2007a) augments the PWP and PSAP, as warranted, to present pertinent site-specific information and procedural adjustments that could not be readily captured in the programmatic documents or that resulted from TPP Team agreements that required modifying the preliminary SI technical approach. The NMED concurred with the technical approach and field procedures in the SS-WP.

3.4.2 The PWP and PSAP are umbrella documents that set overall programmatic objectives and approaches, whereas the SS-WP provides site-specific details and action plans. The PWP, PSAP, and SS-WP accompanied the SI field team during SI field activities.

3.4.3 The SS-WP includes the project description, the field investigation plan, the sampling and analysis plan, the environmental protection plan, and the health and safety plan specific for the former Carlsbad AAF. The field investigation plan developed a technical approach to guide sample collection and analysis for MEC and MC to ensure that the results were sufficient to determine whether additional investigations or implementation of a remedy are necessary for the FUDS. Key elements of the technical approach include the conceptual site model (CSM) to help determine types of samples and their locations, data quality objectives (DQOs) to ensure that the data acquired are sufficient to characterize MEC and MC at the FUDS, and QR to confirm known target locations and to evaluate the presence or absence of MEC or MC in remote portions of the FUDS.

3.4.4 The sampling and analysis plan discusses procedures for soil sample acquisition from locations biased toward the highest potential for MEC contamination; quality control (QC) and quality assurance (QA) for the sampling process; sample shipment to an approved, independent laboratory; and analysis of the samples by the laboratory. The environmental protection plan presents procedures for avoiding, minimizing, and mitigating potential impacts on environmental and cultural resources during site field activities. The health and safety plan supplements the programmatic accident prevention plan with site-specific emergency contact information and directions to the nearest hospital.

### **3.5 DEPARTURES FROM PLANNING DOCUMENTS**

Samples CAAF-MRS01-SS-06-07 and -08 were moved more than 150 feet from their proposed locations because the proposed locations were within an area currently used by a gravel company. The two samples were moved to undisturbed ground on the western side of the MRS.

## **CHAPTER 4**

### **MUNITIONS AND EXPLOSIVES OF CONCERN FINDINGS**

#### **4.1 GENERAL INFORMATION**

##### **4.1.1 Qualitative Reconnaissance**

4.1.1.1 The primary task of the SI was to assess the presence of MEC, munitions debris, and MC. To assess the presence of MEC, the field team conducted QR by walking approximately 5.0 miles between August 7 and August 13, 2007.

4.1.1.2 The QR consisted of visual reconnaissance of the site surface to identify indicators of suspect munitions-related areas, including earthen berms, distressed vegetation, stained soil, ground scars or craters, target remnants, and visible metallic debris. QR activities focused on the two MRSs at the FUDS, which were judged the most likely location for MEC or MC contamination because training activities during the history of the former Carlsbad AAF were concentrated in this area.

4.1.1.3 All 11 of the soil sample locations were chosen prior to the TPP meeting and were agreed to by the TPP Team. During the QR, the exact sample locations were chosen based on observed conditions, with samples generally collected from the immediate vicinity of munitions debris or in suspect locations such as former target locations or areas of distressed vegetation. All sample locations were cleared by the UXO technician, who used a Schonstedt GA-92XTi magnetic locator to screen each location prior to any digging. Per the PWP, the UXO technician performed QC and battery checks prior to use to confirm that the instrument was working properly. Most of the sample locations were moved slightly from the proposed locations based on the field team's observations but generally by no more than 100 feet from the planned location. The exceptions were the two samples collected in the Demonstration Bombing Target, CAAF-MRS01-SS-06-07 and -08. Because the site is currently used by a gravel company and was covered by a layer of gravel, both samples were moved more than 600 feet to undisturbed ground on the western side of the MRS.

4.1.1.4 The team recorded field observations when collecting samples; if they observed munitions debris, munitions-related features, or terrain changes; or if they encountered any barriers. Figure 4.1 shows the QR routes and the locations where field observations were recorded during the SI. As discussed in the SS-WP, the field team was given the flexibility to revise the route based on visual observations and site features (Parsons, 2007a). Where possible, samples were collected directly adjacent to munitions

**TABLE 4.1  
CHEMICAL COMPOSITION OF MEC AND POTENTIAL MUNITIONS CONSTITUENTS  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

General Munition Type	Type/Model	Case Composition	Filler	Potential Constituent
Small Arms Ammunition, .50 caliber	M2 ball M2 AP M1 tracer M10 tracer M17 tracer M21 tracer M1 incendiary M23 incendiary M1 blank Propellant Primer, percussion	Brass, steel, aluminum	Lead antimony Tungsten chrome steel Tracer composition Tracer composition Tracer composition Incendiary composition Single based powder Incendiary composition Single- or double-based powder Single- or double-based powder Primer composition	Calcium, iron, strontium, lead, magnesium, molybdenum, antimony, potassium, perchlorate, nitrocellulose, potassium nitrate, barium nitrate, diphenylamine
Small Arms Ammunition, .45 caliber	M1911 ball Propellant	Brass, steel, aluminum	Lead antimony Single- or double-based powder	Calcium, iron, perchlorate, nitrocellulose, diphenylamine
Small Arms Ammunition, .30 caliber	M2 ball M2 AP M1/T10 tracer M1 incendiary Propellant	Brass, steel, aluminum	Lead antimony Tungsten steel Tracer composition Incendiary composition Single-based powder	Lead, antimony, copper, zinc, molybdenum, iron, aluminum, calcium, nitrocellulose, potassium nitrate, barium nitrate, diphenylamine
Small Arms Ammunition, 12 gauge	No. 00 buckshot No. 4 buckshot No. 6, 7½, 8 shot	Brass, paper, plastic	Incendiary composition Smokeless powder	Lead, antimony, nitrocellulose
Bomb, 100 pound, practice	M38A2	Sheet Metal	Sand, wet sand, or water	Iron
Bomb, 100 pound,, practice	M85	Sheet Metal	Concrete	Iron
Signal, spotting charge	M1A1, M3	Tin	Black powder	Iron, potassium
Signal, spotting charge	M5	Glass	FS smoke mixture (sulfur trioxide and chlorosulfonic solution)	

Although not munitions, the clay pigeons used at the Skeet Range are a potential source of PAHs.

debris. Table 4.1 presents the MEC potentially present at the FUDS, based on the ASR and ASR Supplement, and munitions debris found during the SI. Appendix J includes the MEC CSM.

4.1.1.5 As shown in Appendix E (Photograph Documentation Log), the SI team noted 33 discrete field observations throughout the course of the SI, such as topography, soil color, drainage, and the presence of any barriers. Table 4.2 summarizes pertinent field observations. Appendix D includes related field forms.

**TABLE 4.2  
SUMMARY OF QUALITATIVE RECONNAISSANCE OBSERVATIONS  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>MRS</b>	<b>MEC</b>	<b>Munitions Debris</b>	<b>Other Observations</b>
<b>Range Complex No. 1</b>	None	Small arms debris (.22-, .30-, .32-, .38-, and .45-caliber shell casings and .22-, .32-, and .45- caliber lead bullets)	None
<b>Demonstration Bombing Target</b>	None	None	None

**4.1.2 Data Quality Objectives**

**4.1.2.1 Introduction**

4.1.2.1.1 DQOs are qualitative and quantitative statements that clarify study objectives and specify the type and quality of the data necessary to support decisions. The development of DQOs for a specific site takes into account factors that determine whether the quality and quantity of data are adequate for project needs, such as data collection, uses, types, and needs. While developing these DQOs in accordance with the process presented in Chapter 3, paragraph 3.1.2 of the PWP, Parsons followed the *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA QA/G-4, EPA/240/B-06/001 (USEPA, 2006a).

4.1.2.1.2 The goal of the TPP process is to achieve stakeholder, USACE, and applicable state and federal regulatory concurrence with the DQOs for a given site. The TPP Team approved the Carlsbad AAF DQOs at the TPP meeting in March 2007. Appendix B of this SI Report presents the TPP documentation, including the DQO worksheets.

4.1.2.1.3 As stated in subchapter 1.2 of this SI Report, data must be sufficient to do the following: 1) determine whether a removal action is necessary; 2) enable HRS scoring by the USEPA; 3) characterize the release for RI/FS initiation; and 4) complete the MRSPP.

4.1.2.1.4 DQOs cover four project objectives that SI data must satisfy: 1) evaluate potential presence of MEC; 2) evaluate potential presence of MC; 3) collect data needed to complete MRSPP scoring sheets; and 4) collect information for HRS scoring.

#### **4.1.2.2 Munitions and Explosives of Concern Data Quality Objective**

The MEC DQO was achieved by evaluating potential presence of MEC within the MRS boundaries. The SI field team searched for visual evidence of MEC and munitions debris along the QR transects. MEC were not visually identified anywhere in the former Carlsbad AAF, but munitions debris was observed in numerous locations within the Range Complex No. 1 MRS.

#### **4.1.2.3 Munitions Constituents Data Quality Objective**

The MC DQO was achieved by evaluating the potential presence of MC within the MRS boundaries. The TPP Team agreed on the list of analytes for sample analysis based on the munitions potentially used at the site. Table 4.1 summarizes the MC associated with the ordnance potentially used at the former Carlsbad AAF. Chapter 5 presents the MC sampling and analysis results, and Appendix G presents the QA and QC reports generated during the data validation process. No concerns regarding data quality were noted.

#### **4.1.2.4 Munitions Response Site Prioritization Protocol Data Quality Objective**

The MRSPP DQO was achieved by obtaining sufficient information to complete the MRSPP scoring sheets. Specific input data were collected, and the three modules for the MRSPP were populated as part of the SI. Appendix K includes the scoring sheets for the MRSPP.

#### **4.1.2.5 Hazard Ranking System Data Quality Objective**

The HRS DQO was achieved by including information in the SI report necessary for the USEPA to populate the HRS score sheets. Source documents for the HRS information include the INPR, the ASR, the ASR Supplement, the MC sampling results in Chapter 5 of this SI report, and information from local and state agencies regarding population, groundwater well users, and drinking water well use.

### **4.2 DEMONSTRATION BOMBING TARGET**

#### **4.2.1 Historical Munitions and Explosives of Concern**

The Demonstration Bombing Target MRS is a 72-acre circle north of the Carlsbad AAF FUDS boundary. Although there is no specific information available regarding the use of this MRS, demonstration bombing targets were used for competition or public demonstrations. Demonstration bombing was typically performed from much lower altitudes than normal bombing operations, resulting in much greater accuracy. The expected increase in accuracy for a demonstration bombing target explains the relatively small size of this target compared to the 649 acres typical for the PBRs used by Carlsbad AAF trainees. However, the ordnance dropped at the Demonstration Bombing Target would have been the same as that dropped at the PBRs: M38A2 and M85 100-pound practice bombs (USACE, 2004a). A site visit conducted in support of the ASR identified

bomb scrap in Dark Canyon, which runs along the eastern side of the MRS. The specific type of bomb debris was not indicated in the document (USACE, 1995).

#### **4.2.2 Inspection Activities**

To assess the presence of MEC contamination within the former Demonstration Bombing Target, the SI field team conducted approximately 1.4 miles of QR within the MRS (Figure 4.1). No munitions debris were observed within the MRS, although the SI team did not investigate Dark Canyon, where the ASR team found the bomb debris. Most of the area covered by the QR was being used as part of a gravel and crushed stone operation. Very little undisturbed ground was present anywhere other than the western side of the MRS. The team did not find any remaining evidence of the bomb target itself, and no MEC were identified.

### **4.3 RANGE COMPLEX NO. 1**

#### **4.3.1 Historical Munitions and Explosives of Concern**

Range Complex No. 1 includes four small arms ranges in the west central portion of the former Carlsbad AAF FUDS: a triple skeet range, a machine gun range, a rifle range, and a pistol range. The MRS covers approximately 927 acres, most of which is included in the safety fan for the machine gun and rifle ranges. The safety fan extends outside of the FUDS boundary, although the ranges themselves (firing lines, berms, etc.) were completely within the FUDS. The ASR team found clay pigeons in the former skeet range and various types of small arms bullets and casings near the former location of the machine gun range. The berms for the range had been leveled by 1995, but there were remains of concrete sidewalks that may have been associated with the firing positions.

#### **4.3.2 Inspection Activities**

The SI field team conducted approximately 2.25 miles of QR within the former Range Complex No. 1 (Figure 4.1). Conditions were similar to those encountered by the ASR team, with casings and bullets from various types of small arms scattered throughout the area. The team found no evidence of any of the former ranges such as berms or firing positions and identified no MEC.

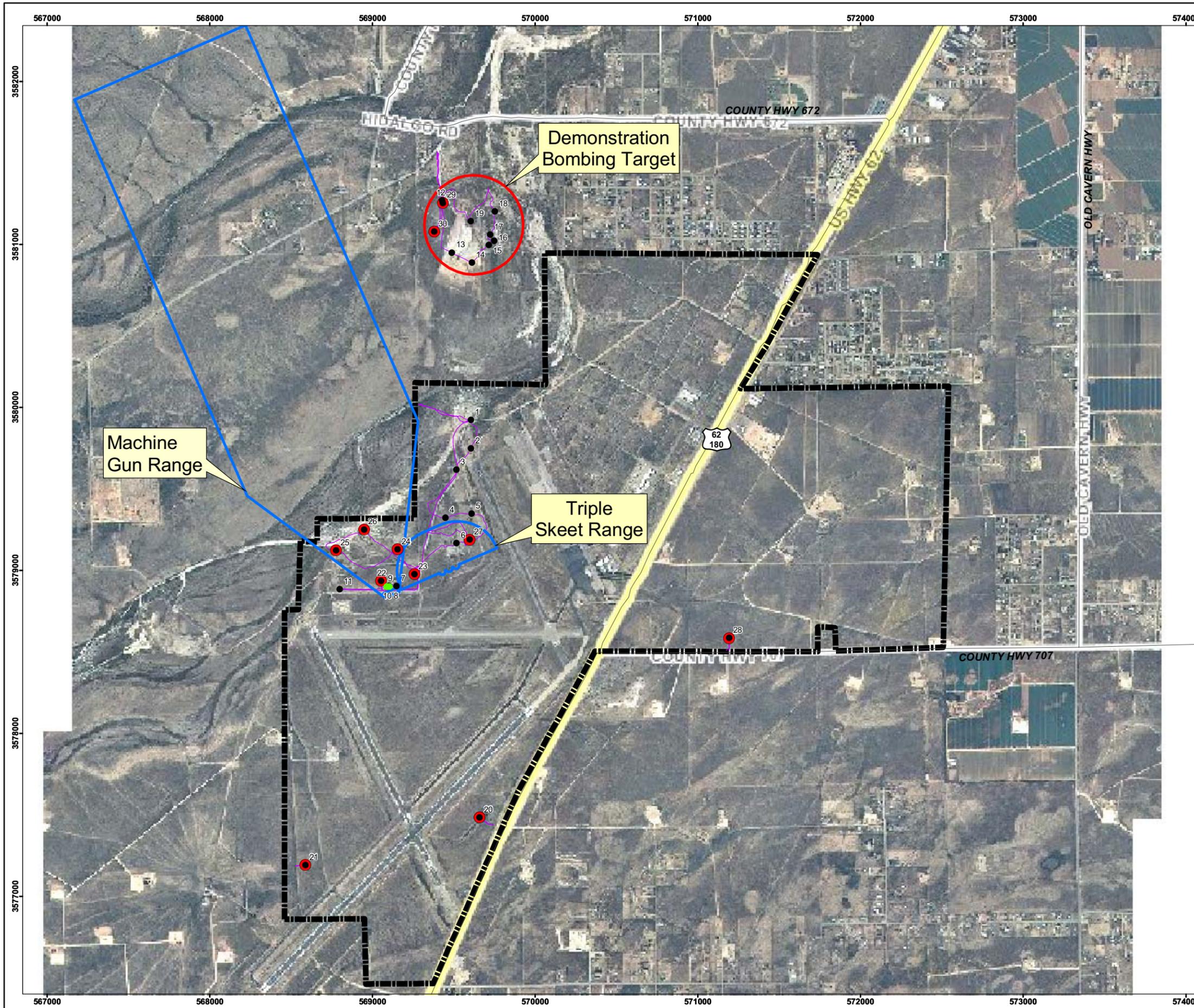


Figure 4.1  
**Qualitative Reconnaissance and  
 Field Observation Locations  
 Formerly Used Defense Site  
 Carlsbad Army Airfield  
 FUDS Project # K06NM034203**  
 Eddy County, New Mexico

**Legend**

- 8 ● Small Arms Debris Location
- 7 ● Other Field Observation Location
- Soil Sample Location
- Bombing Range Boundary
- Range Complex No. 1
- Qualitative Reconnaissance Track
- FUDS Boundary



Image Source: Orthoimagery, 2005  
 Projection: UTM Zone 13 NAD83, Map Units in Meters  
 2,000 1,000 0 2,000 Feet

PARSONS		U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER	
DESIGNED BY: BT	<b>Qualitative Reconnaissance and Field Observation Locations</b>		
DRAWN BY: BT			
CHECKED BY: GV	SCALE: As Shown	PROJECT NUMBER: 744653.65000	
SUBMITTED BY: GV	DATE: January 2008	PAGE NUMBER: 4-6	
	FILE: X:\GIS\Site_inspections_sw\Maps\carlsbad_NM\Fig4_1.mxd		

## CHAPTER 5

### MIGRATION/EXPOSURE PATHWAYS AND RECEPTORS

#### 5.1 INTRODUCTION

5.1.1 For the former Carlsbad AAF, the potential contaminant exposure pathways are through soil, groundwater, surface water, and air. This chapter describes each medium and its impact, if any, on the completion of an exposure pathway. According to the USEPA *Risk Assessment Guidance for Superfund* (1989), for an exposure pathway to be complete, all of the following elements must be present. An example regarding a hypothetical groundwater pathway accompanies the elements.

- *A source and mechanism for chemical release.* For example, a site has known MEC from which MC have leached and contaminated surface soil.
- *An environmental transport/exposure medium.* In the example, the MC in soil is mobile and can contaminate groundwater.
- *A receptor exposure point; that is, a route exists for the medium and receptor to interact at the point of exposure.* A drinking water well drawing from the contaminated aquifer is at the site.
- *A receptor and a likely route of exposure at the exposure point.* An on-site resident uses groundwater as a source of drinking water.

5.1.2 In this hypothetical resident example, all four factors are present and, therefore, the groundwater exposure pathway is complete. If any single factor was not present (for example, the MC was immobile in soil, or the resident used drinking water from another source), the pathway would not be complete.

5.1.3 This chapter presents information required to evaluate the potential for adverse impact on a receptor from each pathway. It also addresses those constituents that require further consideration in a screening-level risk assessment (SLRA). Chapter 6 assesses the potential significance of completed pathways (i.e., whether there is an unacceptable risk).

#### 5.2 GENERAL INFORMATION

General information regarding the geology, hydrogeology, and hydrology of the former Carlsbad AAF is presented below, followed by a discussion of MRS-specific

characteristics and sampling results for the Demonstration Bombing Target and Range Complex No. 1 MRSs.

## **5.2.1 Regional Geologic and Hydrogeologic Setting**

5.2.1.1 The former Carlsbad AAF is within the Pecos Valley Section of the Great Plains Physiographic Province (USGS, 1995). The geologic framework of southeastern New Mexico is defined primarily by large sedimentary basins and mountain uplifts. The largest such feature in the vicinity of the FUDS is the Delaware Basin, a large, sediment-filled depression of the earth's crust occupying over 17,000 square miles in southeastern New Mexico and west Texas (New Mexico Bureau of Geology and Mineral Resources, 2003). Carlsbad, New Mexico, lies on the northwest edge of the basin.

5.2.1.2 Bedrock units in the Carlsbad area are from the Permian Period and include, from youngest to oldest, the Rustler Formation, the Salado Formation, and the Yates and Tansill Formations. The Salado Formation is an evaporite deposit primarily consisting of the Salado Halite. The other formations are more varied in nature and contain siltstone, sandstone, dolomite, limestone, and various anhydrites (USGS, 1997). Solution openings are common in these rocks, resulting in solution-subsidence troughs throughout the region. These troughs form as near surface blocks of material subside to fill voids due to dissolved material (USACE, 1995). The nearby Carlsbad Caverns are another example of the high solubility of these materials.

5.2.1.3 The former Carlsbad AAF is not underlain by any major aquifer system, although the Roswell Basin Aquifer System extends to within approximately 10 miles of Carlsbad. However, the Quaternary Period deposits in the area can act as a surficial aquifer, especially in sections close to the Pecos River. In this case, the water table in the alluvium is the top of the aquifer, and the saturated thickness is the distance between the water table and the base of the aquifer. Typically, the bedrock at the base of the alluvium is much more impermeable than the alluvium and acts as a confining layer (USGS, 1995).

## **5.2.2 Regional Groundwater Use**

5.2.2.1 The NMED Drinking Water Bureau is designated as the lead agency for the state's wellhead protection program, and the USEPA is designated as the lead agency for tribal source water protection areas. The NMED indicated that four wellhead protection areas are within 4 miles of the FUDS: the protection areas for the Carlsbad Municipal Water System, the Loving Water System, the Otis Mutual Domestic Water Consumers Association, and the West Winds Mobile Home Park (NMED, 2007). The USEPA indicates that there are no wellhead or tribal source water protection areas within 4 miles of the FUDS (USEPA, 2007b).

5.2.2.2 Almost 1,200 water wells are known within a 4-mile buffer of the FUDS, with 14 within the FUDS boundary. The locations of the wells are shown on Figure 5.1 and listed in Table 5.1. Over 800 of these wells are identified as drinking water wells,

nine of which are within the FUDS boundary. Another 61 drinking water wells are within a 1-mile buffer of the FUDS.

**TABLE 5.1  
GROUNDWATER WELLS WITHIN 4-MILE BUFFER OF THE FUDS  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>Distance from FUDS</b>	<b>Public/ Domestic Wells</b>	<b>Stock/ Irrigation Wells</b>	<b>Prospecting Wells</b>	<b>Other Wells</b>	<b>Total</b>
On site	9	1	0	4	14
0 to ¼ mile	38	0	0	0	38
¼ to ½ mile	62	8	0	7	77
½ to 1 mile	70	12	0	5	87
1 to 2 miles	198	45	2	23	268
2 to 3 miles	315	78	4	39	436
3 to 4 miles	139	79	5	49	272
Site to 4 miles	831	223	11	127	1,192

Detailed well information is included in Appendix L

5.2.2.3 Using available population information based on U.S. Census 2000 data (Table 2.1 and Figure 2.2), 15,982 people live in census blocks within 4 miles of the FUDS boundary. Almost 800 people show as living within the FUDS itself; however, population information was based on a conservative approach that counted the entire population in a census block within any overlapping buffer line. No residences were observed within the FUDS or MRS boundaries during the SI field work, and therefore it is inferred that very few “on-site” residents actually live within the FUDS boundary.

5.2.2.4 Additional research regarding the number of individuals using drinking water wells was not conducted because the groundwater pathway was determined to be incomplete based on the depth to groundwater in the area and the lack of drinking water wells in the FUDS. Water well depths within 1 mile of the FUDS are generally greater than 100 feet bgs and can approach depths of 300 feet in some cases. The Carlsbad region is arid with high evapo-transpiration rates, and despite the relatively high porosity of the bedrock in the area, precipitation is not a significant source of groundwater recharge.

**5.2.3 Regional Hydrologic Setting**

5.2.3.1 The former Carlsbad AAF FUDS is within the Upper Pecos-Long Arroyo watershed (USEPA, 2007a). The Pecos River is approximately 6 miles northeast of the FUDS boundary. From the area just north of Roswell to Carlsbad, the Pecos River basin is bounded to the west by a series of mountain ranges, including the Sacramento and Capitan ranges. To the east, the land rises slowly from the river, terminating in a low-elevation escarpment that forms the eastern boundary of the drainage. Below its headwaters in north-central New Mexico, most of the tributaries to the Pecos River basin originate in the ranges west of the river. Primary sources of water for the Pecos River include snowmelt and runoff from the headwaters in the Sangre de Cristo Mountains, overland flow generated by precipitation, and groundwater flow (base inflow). Overland flow provides most of the surface water supply. However, significant groundwater

inflow occurs in the Roswell-Artesian area, originating from the artesian and shallow aquifers of the Roswell artesian basin. The Pecos River basin drains an area within New Mexico of approximately 19,500 square miles (New Mexico Bureau of Geology and Mineral Resources, 2003). As described in subchapter 5.2.1, the primary alluvial aquifer in this area is associated with the Pecos River.

5.2.3.2 The only significant water body in the vicinity of the former Carlsbad AAF is the Pecos River, which passes within approximately 6 miles of the site at its closest point. Two arroyos in the area, Little McKittrick Draw and Dark Canyon Draw, may contain water during significant precipitation events; however, these features are dry most of the time. Little McKittrick Draw passes north of the FUDS but through the northern portion of the machine gun range safety fan in Range Complex No. 1. It also passes north of the Demonstration Bombing Target, where it connects with Dark Canyon Draw. Prior to the junction with Little McKittrick Draw, Dark Canyon Draw passes through the southern portion of the machine gun range safety fan, through the northwestern corner of the FUDS, and within 100 feet of the northeastern boundary of the Demonstration Bombing Target. Following the junction with McKittrick Draw, Dark Canyon Draw continues to the Pecos River. The NMED Drinking Water Bureau indicated that there are no surface water intakes for drinking water systems within 15 miles of the FUDS boundary (NMED, 2007).

#### **5.2.4 Regional Sensitive Environmental Resources**

Although 10 of the 45 federally listed species found in New Mexico are known to exist in Eddy County (Parsons, 2007a), the TPP Team noted during the TPP meeting that no occurrences or critical habitats are known within this FUDS. Furthermore, no wetlands or other sensitive environmental resources are at the site, and the site is not managed for ecological purposes. Based on this information and a review of the Army Checklist for Important Ecological Places (USACE, 2006), this FUDS is not considered an important ecological place. Therefore, ecological receptors are not considered to be present at the site.

#### **5.2.5 Sample Locations and Methods**

5.2.5.1 Direct release of MC from munitions activities at the former Carlsbad AAF would have been to soil, with potential migration to surface water, sediment, groundwater, or air (through fugitive dust). The TPP Team agreed that the human drinking water exposure pathway is likely not complete at this FUDS based on the depth to water in the area and the locations of drinking water wells. Additionally, there are no permanent surface water bodies at the FUDS. Therefore, the TPP Team agreed that only soil sampling for MC analysis should be performed during the SI. The TPP Team also agreed that if laboratory analysis detected MC in soil during the SI, then sampling in other media may be recommended for the subsequent RI/FS at this FUDS.

5.2.5.2 Soil samples were collected from 11 locations within the former Carlsbad AAF (Figure 5.2). Three of these samples were collected at locations outside any identified MRS for to determine ambient conditions at the FUDS. Six samples were

collected in Range Complex No. 1, and two samples were collected in the Demonstration Bombing Target. The samples in Range Complex No. 1 were collected at or near the locations defined in the SS-WP, but the Demonstration Bombing Target samples were moved from the proposed locations to the west side of the MRS because the original locations were in an area currently used by a gravel company. Samples CAAF-MRS01-SS-06-07 and -08 were moved more than 150 feet from their proposed locations because the proposed locations were within an area currently used by a gravel company. The two samples were moved to undisturbed ground on the western side of the MRS. Table 5.2 shows the location of each sample and the rationale behind each location. Soil samples were collected from 2 to 6 inches bgs.

5.2.5.3 The unexploded ordnance (UXO) technician screened and approved each soil sample location before final location selection and sample collection. In accordance with the PSAP Addendum, the Cold Regions Research and Engineering Laboratory (CRREL) seven-point wheel sampling technique was employed. The coordinates for each sample location were recorded and updated in the Geographic Information System (GIS) database.

5.2.5.4 Soil samples were analyzed for explosives (Method SW8330) by TestAmerica Analytical Testing Corporation (TestAmerica) in Arvada, Colorado.

## **5.2.6 Background Concentrations**

5.2.6.1 No site-specific statistical evaluation of background metals concentrations is available. Due to the limited scope of the SI, conducting a site-specific statistical background evaluation of metals concentrations (which typically requires collection of at least 10 background samples) was not considered practical or warranted at this stage of investigation. Two sources of information, each described in detail in the following paragraphs, were used to approximate background metals concentrations in soil at the site:

- Average concentrations of elements in Eddy County, New Mexico, identified by the USGS (USGS, 2007); and
- Analytical results of three ambient samples and one duplicate sample collected during the SI field activities within the FUDS boundary in areas outside the MRSs that are not expected to be affected by munitions activities. These values are used in the absence of a USGS county-specific background concentration.

5.2.6.2 The nationwide Mineral Resources Data System (MRDS) database of concentrations of elements provides county-specific background concentrations for selected metals. The MRDS includes mineral resource occurrence data covering the world, most thoroughly within the United States. This database contains the records previously provided in the MRDS of USGS and the Mineral Availability System / Mineral Industry Locator System originated by the U.S. Bureau of Mines, which is now part of the USGS. According to the USGS, the MRDS is a large and complex relational

**TABLE 5.2  
SAMPLING RATIONALE  
FORMER CARLSBAD ARMY AIRFIELD  
EDDY COUNTY, NEW MEXICO**

Sample ID	Sample Coordinates		Media	Analysis	Potential Munitions	Rationale
	Longitude	Latitude				
CAAF-A-SS-06-01	-104.2712	32.3295	Soil	Select metals, PAHs	None	Sampled for ambient metal and PAH concentrations within installation boundary. Collected at proposed location.
CAAF-A-SS-06-02	-104.2434	32.3419	Soil	Select metals, PAHs	None	Sampled for ambient metal and PAH concentrations within installation boundary. Collected at proposed location.
CAAF-A-SS-06-03	-104.2598	32.3321	Soil	Select metals, PAHs	None	Sampled for ambient metal and PAH concentrations within installation boundary. Collected at proposed location.
CAAF-MRS02-SS-06-04	-104.2604	32.3474	Soil	Select metals, PAHs	Small arms, general	Sampled inside Range Complex No. 1, Triple Skeet Range. Collected at proposed location.
CAAF-MRS02-SS-06-05	-104.2640	32.3456	Soil	Select metals, PAHs	Small arms, general	Sampled inside Range Complex No. 1, Triple Skeet Range. Collected at proposed location.
CAAF-MRS02-SS-06-06	-104.2691	32.3469	Soil	Select metals	Small arms, general	Sampled inside Range Complex No. 1, Machine Gun Range. Collected at proposed location.
CAAF-MRS01-SS-06-07	-104.2619	32.3661	Soil	Explosives	Bomb, 100-pound, practice, M38A2; Bomb, 100-pound, practice, M85 Signal, spotting charge, M1A1, M3 and M5	Sampled inside the Demonstration Bombing Range. Moved to the west side of the MRS due to use of the proposed location by the gravel company that owns the land.
CAAF-MRS01-SS-06-08	-104.2626	32.3645	Soil	Explosives	Bomb, 100-pound, practice, M38A2; Bomb, 100-pound, practice, M85 Signal, spotting charge, M1A1, M3 and M5	Sampled inside the Demonstration Bombing Range. Moved to the west side of the MRS due to use of the proposed location by the gravel company that owns the land.
CAAF-MRS02-SS-06-09	-104.2651	32.3469	Soil	Select metals	Small arms, general	Sampled inside Range Complex No. 1, Machine Gun Range. Collected at proposed location.
CAAF-MRS02-SS-06-10	-104.2673	32.3481	Soil	Select metals	Small arms, general	Sampled inside Range Complex No. 1, Machine Gun Range. Collected at proposed location.
CAAF-MRS02-SS-06-11	-104.2662	32.3452	Soil	Select metals	Small arms, general	Sampled inside Range Complex No. 1, Machine Gun Range. Collected at proposed location.

MRS01 = Demonstration Bombing Target munitions response site (MRS)

MRS02 = Range Complex No. 1 MRS, which includes the triple skeet range and machine gun range

A = ambient sample

PAH = polycyclic aromatic hydrocarbon

database developed over several decades by hundreds of researchers and reporters (USGS, 2007). This dataset is considered to likely represent conditions within Eddy County; however, the data available are limited to a select group of metals.

5.2.6.3 To provide an indication of the concentration of metals naturally present at the site, three ambient samples, CAAF-A-SS-06-01, CAAF-A-SS-06-02, and CAAF-A-SS-06-03, as shown on Figure 5.2 and in Table 5.2, were collected during the SI. All three samples were analyzed for metals and PAHs. Because of this small number of samples, calculation of statistically robust site-specific background values is not possible. However, these ambient samples provide an indication of the range of naturally occurring metals concentrations.

5.2.6.4 Table 5.3 summarizes the USGS background concentrations for Eddy County and the maximum concentrations detected in the collected ambient samples. These values are used to determine the background concentration in soil for the site, one of the criteria used to evaluate whether or not a source of MC contamination is present (subchapters 5.3.4.5 and 5.4.3). Eddy County background concentrations were derived by adding two standard deviations to the mean concentration of each analyte as determined by the USGS (2007). County-specific data were used as the selected background criteria if they were available. If not, the maximum detected value in the ambient samples was used. There is no potential source of explosives at the former Carlsbad AAF except for DoD use of the FUDS; therefore, there are no applicable background values for explosives.

## **5.2.7 Munitions Constituents Source Evaluation**

5.2.7.1 As explained in subchapter 5.1, an exposure pathway is not considered to be complete unless there is a source of contamination present. To make this determination, analytical results for MCs were screened against several criteria to evaluate whether MC contamination was present. For a chemical to be considered as contamination potentially related to a release from munitions-related activities at the site, all of the following conditions must be met:

- The chemical is detected in the sample medium;
- The chemical is present above the established background concentration (see subchapter 5.2.6); and
- The chemical is a potential constituent of the munitions formerly used at the site (see Table 4.1).

5.2.7.2 The MCs analyzed for at the former Carlsbad AAF were evaluated against these conditions to determine whether a source of MC contamination was present at the MRS. Only detections of metals or PAHs that meet the conditions above were retained for consideration in the SLRA in Chapter 6. Any detection of explosives was considered to be a source of MC contamination and was retained for the SLRA. However, no explosives were detected in samples collected at this site.

**TABLE 5.3**  
**BACKGROUND COMPARISON CONCENTRATIONS**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

Analyte	Maximum Ambient Concentration (mg/kg) <sup>(1)</sup>	Eddy County Background Concentration <sup>(2)</sup> (mg/kg)	Selected Background Criteria (mg/kg)
<b>Metals</b>			
Aluminum	16,000	48,850	48,850
Antimony	< 0.26	NA	< 0.26
Copper	8.0	14.4	14.4
Iron	13,000	37,030	37,030
Lead	13	23.9	23.9
Manganese	280	514	514
<b>PAHs</b>			
2-Methylnaphthalene	< 0.0052	NA	< 0.0052
Acenaphthene	< 0.0052	NA	< 0.0052
Acenaphthalene	< 0.0052	NA	< 0.0052
Anthracene	0.00021	NA	0.00021
Benzo(a)anthracene	0.00027	NA	0.00027
Benzo(a)pyrene	0.00045	NA	0.00045
Benzo(b)fluoranthene	0.0018	NA	0.0018
Benzo(g,h,i)perylene	0.00061	NA	0.00061
Benzo(k)fluoranthene	0.0018	NA	0.0018
Chrysene	0.0014	NA	0.0014
Dibenz(a,h)anthracene	< 0.0052	NA	< 0.0052
Fluoranthene	0.0035	NA	0.0035
Fluorene	< 0.0052	NA	< 0.0052
Indeno(1,2,3-cd)pyrene	0.00053	NA	0.00053
Naphthalene	0.00036	NA	0.00036
Phenanthrene	0.0017	NA	0.0017
Pyrene	0.0021	NA	0.0021

(1) mg/kg = milligram per kilogram.

(2) USGS derived background concentration for Eddy County  
<http://tin.er.usgs.gov/geochem/county.php?place=f35015&el=As&rf=south-central>.  
 Value = mean + 2 \*standard deviation

## 5.3 DEMONSTRATION BOMBING TARGET

### 5.3.1 Historical Munitions Constituent Information

The Demonstration Bombing Target MRS is a 72-acre circle north of the Carlsbad AAF FUDS boundary. Although there is no specific information available regarding the use of this MRS, demonstration bombing targets were typically used for competition or public demonstrations. Although no munitions debris was found in this MRS during the SI field work, practice bomb debris was found in a canyon immediately east of the MRS during the ASR site visit. No historical MC-related groundwater, surface water, soil, or

air sampling has been documented at the Demonstration Bombing Target or anywhere else at the former Carlsbad AAF.

### **5.3.2 Groundwater Migration Pathway**

Groundwater can serve as a contaminant transport mechanism that may affect surface water bodies, drinking water supplies, vegetation, and sensitive environments such as wetlands. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil at the ground surface that can be transported to the groundwater, site-specific geology, climate, and the expected future land use.

#### **5.3.2.1 Geologic and Hydrogeologic Setting**

There are no known differences between the geologic and hydrogeologic setting at the Demonstration Bombing Target MRS and the setting described for the overall FUDS in subchapter 5.2.

#### **5.3.2.2 Releases and Potential Releases to Groundwater**

There are no known releases or potential releases of MC to groundwater at the former Carlsbad AAF FUDS, including the Demonstration Bombing Target MRS.

#### **5.3.2.3 Groundwater Migration Pathway Receptors**

5.3.2.3.1 Nine hundred and ninety-five groundwater wells are known within a 4-mile buffer of the Demonstration Bombing Target MRS, although only one is within the MRS. Table 5.4 summarizes the numbers and types of wells as well as their distance from the bombing target boundary. As shown, 743 of these wells are identified as drinking water wells, six of which are within ¼ mile of the MRS boundary in addition to the one within the MRS.

5.3.2.3.2 A population of 17,737 people within the 0- to 4-mile buffer was assumed using conservative estimates for the distances shown in Table 2.1, based on U.S. Census 2000 data. Conservative population estimates indicate a population of nine people within the MRS boundary; however, no residences were observed during the SI field work, and the MRS is entirely owned by a private company. While a populated census block may overlap a portion of the MRS, it is assumed that all nine residents live in a portion of that block outside the MRS boundary. The six drinking wells within ¼ mile of the MRS boundary indicate that there might be residences in the immediate vicinity of the MRS. The groundwater receptors at this MRS include commercial and industrial (gravel mining) workers and site visitors.

**TABLE 5.4**  
**GROUNDWATER WELLS IN THE VICINITY OF**  
**THE DEMONSTRATION BOMBING TARGET MRS**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>Distance from MRS</b>	<b>Public/Domestic Wells</b>	<b>Stock / Irrigation Wells</b>	<b>Prospecting Wells</b>	<b>Other Wells</b>	<b>Total</b>
On Site	1	0	0	0	1
0 to ¼ Mile	6	1	0	0	7
¼ to ½ Mile	58	2	0	2	62
½ to 1 Mile	59	4	1	4	68
1 to 2 Miles	132	15	1	6	154
2 to 3 Miles	294	69	1	40	404
3 to 4 Miles	193	65	3	38	299
Site to 4 Miles	743	156	6	90	995

Detailed well information is included in Appendix L.

#### **5.3.2.4 Groundwater Sample Locations and Methods**

Groundwater samples were not collected during the SI at the former Carlsbad AAF FUDS. The TPP Team agreed that if laboratory analysis detected MC in soil during the SI, then groundwater sampling would be recommended for the subsequent RI/FS at this site.

#### **5.3.2.5 Groundwater Migration Pathway Analytical Results**

Groundwater samples were not collected during the SI at the former Carlsbad AAF FUDS.

#### **5.3.2.6 Groundwater Migration Pathway Conclusions**

As discussed in subchapter 5.3.4.6, no potential MC contamination was detected in the soil at this MRS. Therefore, based on the assumption that potential MC contamination in soil is necessary for migration of MC to groundwater, the lack of soil contamination indicates that the groundwater pathway is incomplete for commercial and industrial (gravel mining) workers and visitors at this MRS.

### **5.3.3 Surface Water Migration Pathway**

Surface water can serve as a contaminant transport mechanism that may affect surface water bodies, sediment, drinking water supplies, vegetation, and sensitive environments such as wetlands.

#### **5.3.3.1 Hydrologic Setting**

The USGS topographic map covering the former Carlsbad AAF FUDS indicates that surface water most likely flows east across the Demonstration Bombing Target MRS. There are no permanent or intermittent water bodies within the MRS (Figures 1.1 and 5.2), but Dark Canyon Draw passes just east of the MRS. The draw is typically dry,

although it does carry water during periods of heavy precipitation and has been known to flood in the past. It is likely that runoff from the Demonstration Target MRS reaches Dark Canyon Draw during significant precipitation. As discussed in subchapter 5.2.2, the NMED indicated that four well-head protection areas are within 4 miles of the FUDS boundary. However, according to the NMED and the USEPA, no tribal source water protection areas are within a 4-mile buffer of the FUDS and no surface water intakes are within a 15-mile buffer of the FUDS.

### **5.3.3.2 Releases and Potential Releases to Surface Water**

There are no known releases of MC to surface water at the former Carlsbad AAF.

### **5.3.3.3 Surface Water Migration Pathway Receptors**

No permanent surface water bodies are within or near the MRS boundary. Therefore, surface water and sediment migration pathways are unlikely to be complete at this MRS. Receptors at this MRS include commercial and industrial (gravel mining) workers and site visitors.

### **5.3.3.4 Surface Water Sample Locations and Methods**

Neither surface water nor sediment sampling was performed during the SI at the former Carlsbad AAF because there are no water bodies within the MRS.

### **5.3.3.5 Surface Water Migration Pathway Analytical Results**

Neither surface water nor sediment sampling was performed during the SI at the former Carlsbad AAF because there are no water bodies within the MRS.

### **5.3.3.6 Surface Water Migration Pathway Conclusions**

Because no permanent or intermittent water bodies are within or near Carlsbad AAF, there are no surface water or sediment migration pathways at this MRS. Therefore, surface water and sediment migration pathways are incomplete for commercial and industrial (gravel mining) workers and site visitors at Carlsbad AAF.

## **5.3.4 Soil Exposure Pathway**

### **5.3.4.1 Physical Source Access Conditions**

The Demonstration Bombing Target MRS is currently on private property and is used by the Rose Gravel Company. The MRS is surrounded by a barbed wire fence with a no trespassing sign posted at the entrance gate. There may be other signs along the fence, although none were noted by the SI field team. However, the fence is unpatrolled, and there is little to stop anyone from climbing over or under it. There are no other impediments to access.

#### **5.3.4.2 Actual or Potential Contamination Areas**

No known MC contamination areas are within the Demonstration Bombing Target boundary. Contamination is not expected because there is no known source of MC contamination.

#### **5.3.4.3 Soil Exposure Receptors**

5.3.4.3.1 Potential soil exposure pathways at this MRS include incidental ingestion, dermal contact, and inhalation of resuspended particulates by human receptors, as well as leaching to groundwater. The likelihood of exposure is influenced by such factors as the volume and concentration of contaminated soil exposed at the ground surface; site-specific geology, hydrogeology, and climate; and expected future land use.

5.3.4.3.2 Although the Demonstration Bombing Target MRS is owned by the Rose Gravel Company and used to some degree in the company's operations, it is unknown how often the company has employees on site, and none were observed during the SI. The SI field team also found no equipment or any other signs indicating recent use of the site. Rose Gravel Company employees and visitors to the gravel operation should still be considered possible receptors.

5.3.4.3.3 According to the 2000 census, 17,737 persons live within 4 miles of the Demonstration Bombing Target MRS (Table 2.1). Although nine persons are listed as living in the MRS itself, it is likely that no one actually lives within the MRS, as discussed in subchapter 5.3.2.3. However, it is possible that some residences may be within ¼ mile of the MRS boundary. No structures were identified during the QR, and any structures within the immediate vicinity of the site are believed to be residences and not schools or places of business. Although there is a barbed wire fence surrounding the land owned by the gravel company, local residents and trespassers would have little difficulty entering the MRS.

#### **5.3.4.4 Soil Sample Locations and Methods**

5.3.4.4.1 As specified in the SS-WP (Parsons, 2007a) and subchapter 5.2.5, the UXO technician screened soil sample locations before final location selection and sample collection. In accordance with the PSAP Addendum, the CRREL seven-point wheel sampling technique was employed. The GPS coordinates for each sample location were recorded and updated in the GIS database.

5.3.4.4.2 Two soil samples, CAAF-MRS01-SS-06-07 and -08 (see Figure 5.2), were collected within the MRS boundary. Because both samples were within an area affected by gravel company operations, they were moved to undisturbed locations on the western side of the MRS. Table 5.2 shows the rationale for the locations of the samples collected during the SI.

#### **5.3.4.5 Soil Migration Pathway Analytical Results**

The two soil samples collected in the Demonstration Bombing Target were analyzed for explosives only. Table 5.5 shows the soil sample analytical results for the former Carlsbad AAF. No explosive analytes were detected in any of the samples collected during the project.

#### **5.3.4.6 Soil Exposure Conclusions**

No explosives were detected in the soil samples collected in the Demonstration Bombing Target MRS; therefore, there is no potential MC contamination in the soil at the Demonstration Bombing Target, and the soil pathway is incomplete for commercial and industrial (gravel mining) workers and site visitors at Carlsbad AAF.

#### **5.3.5 Air Migration Pathway**

The air migration pathway accounts for hazardous substance migration in gaseous or particulate form through the air. Airborne transport of contaminants can be a potential threat to people and sensitive environments.

##### **5.3.5.1 Climate**

Subchapter 2.2.3 discusses climate.

##### **5.3.5.2 Releases and Potential Releases to Air**

There are no known releases to air at the Demonstration Bombing Target MRS or the remainder of the Carlsbad AAF FUDS. Releases to air are not expected to occur because there are no known sources of MC contamination in soil at the former Demonstration Bombing Target.

##### **5.3.5.3 Air Migration Pathways and Receptors**

Target populations potentially affected by the air pathway consist of people who reside, work, or go to school within the target distance limit of 4 miles around the MRS. According to the 2000 census, 17,737 persons live within 4 miles of the Demonstration Bombing Target MRS (Table 2.1). Although nine persons are listed as living in the MRS itself, it is likely that no one actually does, as discussed in subchapter 5.3.2.3. However, it is possible that there are residences within  $\frac{1}{4}$  mile of the MRS boundary. Any structures within the immediate vicinity of the site are believed to be residences.

##### **5.3.5.4 Air Sampling and Monitoring Locations and Methods**

There is no historical record of air sampling at the former Carlsbad AAF. Air sampling was not conducted as part of the SI within the Demonstration Bombing Target MRS or elsewhere at the FUDS.

TABLE 5.5  
SUMMARY OF SOIL ANALYTICAL RESULTS  
FORMER CARLSBAD ARMY AIRFIELD  
EDDY COUNTY, NEW MEXICO

SAMPLE ID:	CAAF-A-SS-06-01*	CAAF-A-SS-06-03*	CAAF-A-SS-06-02*	CAAF-A-SS-06-22/**	CAAF-MRS02-SS-06-04	CAAF-MRS02-SS-06-05	CAAF-MRS02-SS-06-06	CAAF-MRS01-SS-06-07	CAAF-MRS01-SS-06-27**	CAAF-MRS01-SS-06-08	CAAF-MRS02-SS-06-09	CAAF-MRS02-SS-06-29**	CAAF-MRS02-SS-06-10	CAAF-MRS02-SS-06-11						
DATE SAMPLED:	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07	08/13/07						
LAB SAMPLE ID:	D7H150227001	D7H150227004	D7H150227002	D7H150227003	D7H150227005	D7H150227006	D7H150227007	D7H150227008	D7H150227009	D7H150227010	D7H150227011	D7H150227012	D7H150227013	D7H150227014						
Units																				
<b>Explosives - SW8330</b>																				
1,3,5-Trinitrobenzene	ug/kg							250	U	250	U	250	U							
1,3-Dinitrobenzene	ug/kg							250	U	250	U	250	U							
2,4,6-Trinitrotoluene (TNT)	ug/kg							250	U	250	U	250	U							
2,4-Dinitrotoluene	ug/kg							250	U	250	U	250	U							
2,6-Dinitrotoluene	ug/kg							500	U	500	U	500	U							
2-Amino-4,6-dinitrotoluene	ug/kg							500	U	500	U	500	U							
2-Nitrotoluene	ug/kg							300	U	300	U	300	U							
3-Nitrotoluene	ug/kg							250	U	250	U	250	U							
4-Amino-2,6-dinitrotoluene	ug/kg							500	U	500	U	500	U							
4-Nitrotoluene	ug/kg							500	U	500	U	500	U							
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	ug/kg							300	U	300	U	300	U							
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	ug/kg							500	U	500	U	500	U							
Nitrobenzene	ug/kg							250	U	250	U	250	U							
Nitroglycerin	ug/kg							6000	U	6000	U	6000	U							
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	ug/kg							250	U	250	U	250	U							
Pentaerythritol Tetranitrate (PETN)	ug/kg							5000	U	5000	U	5000	U							
<b>Polycyclic Aromatic Hydrocarbons - SW8270C</b>																				
2-Methylnaphthalene	ug/kg	5.2	U	5.2	U	5.2	U	5.1	U	5.1	U									
Acenaphthene	ug/kg	5.2	U	5.2	U	5.2	U	5.1	U	5.1	U									
Acenaphthylene	ug/kg	5.2	U	5.2	U	5.2	U	5.1	U	5.1	U									
Anthracene	ug/kg	0.21	J	5.2	U	5.2	U	5.1	U	5.1	U									
Benzo(a)anthracene	ug/kg	0.27	J	5.2	U	0.25	J	5.2	U	0.50	J	0.30	J							
Benzo(a)pyrene	ug/kg	0.41	J	0.45	J	0.31	J	0.24	J	0.83	J	0.51	J							
Benzo(b)fluoranthene	ug/kg	1.2	J	1.8	J	0.89	J	0.61	J	2.1	J	0.85	J							
Benzo(g,h,i)perylene	ug/kg	0.44	J	0.61	J	0.35	J	0.36	J	0.98	J	0.48	J							
Benzo(k)fluoranthene	ug/kg	1.2	J	1.8	J	0.89	J	0.61	J	2.1	J	0.34	J							
Chrysene	ug/kg	0.71	J	1.4	J	0.56	J	0.51	J	1.1	J	0.76	J							
Dibenz(a,h)anthracene	ug/kg	5.2	U	5.2	U	5.2	U	5.1	U	5.1	U									
Fluoranthene	ug/kg	5.2	U	3.5	J	5.2	U	5.2	U	1.8	J	5.1	U							
Fluorene	ug/kg	5.2	U	5.2	U	5.2	U	5.2	U	5.1	U	5.1	U							
Indeno(1,2,3-cd)pyrene	ug/kg	0.39	J	0.53	J	0.31	J	5.2	U	0.77	J	0.39	J							
Naphthalene	ug/kg	5.2	U	0.36	J	5.2	U	0.34	J	5.1	U	5.1	U							
Phenanthrene	ug/kg	0.47	J	1.7	J	0.66	J	0.34	J	0.72	J	0.52	J							
Pyrene	ug/kg	0.94	J	2.1	J	0.84	J	0.44	J	1.3	J	0.89	J							
<b>Metals - SW6010B/6020</b>																				
Aluminum	mg/kg	14000		16000		14000		9800		9600		7500		10000	J	11000		5900		8800
Antimony	mg/kg	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.25	U	0.27	UJ	0.27	U	0.25	U	0.26
Copper	mg/kg	7.0		8.0		7.1		5.3		4.9		3.4		4.7	J	5.2		3.3		4.8
Iron	mg/kg	12000		13000		12000		8700		8700		6900		9100	J	9700		5600		7900
Lead	mg/kg	13		12		12		17		16		4.4		7.6		8.5		7.3		23
Manganese	mg/kg	260		280		280		230		230		180		260	J	300		180		190

**QA NOTES AND DATA QUALIFIERS:**

(NO CODE) - Confirmed identification.  
 U - Analyte was analyzed for but not detected above the adjusted practical quantitation limit (PQL).  
 UJ - Analyte not detected, reported PQL may be inaccurate or imprecise.  
 J - Analyte detected, estimated concentration.  
 \* - Ambient sample.  
 \*\* - Field duplicate of sample on left.  
 Detections are bolded.

### **5.3.5.5 Air Migration Pathway Analytical Results**

Air sampling was not conducted as part of the SI at the former Carlsbad AAF.

### **5.3.5.6 Air Migration Pathway Conclusions**

The air migration exposure pathway for dust inhalation at the Demonstration Bombing Target is considered incomplete for commercial and industrial (gravel mining) workers and site visitors because there is no source of MC contamination in soil (subchapter 5.3.4.6). There are no other inhalation pathways at this MRS because there are no volatile contaminants associated with the previously used munitions.

## **5.4 RANGE COMPLEX NO. 1**

Subchapters 5.2 and 5.3 summarize information on the regional setting, migration and exposure pathways, and exposure targets for the former Carlsbad AAF. This subchapter provides additional details specific to Range Complex No. 1. This MRS includes four small arms ranges in the west central portion of the former Carlsbad AAF FUDS: a triple skeet range, a machine gun range, a rifle range, and a pistol range. The MRS covers approximately 927 acres, most of which is included in the safety fan for the machine gun and rifle ranges. The safety fan extends outside of the FUDS boundary, although the ranges themselves (firing lines, berms, etc.) were completely within the FUDS. Access to the portion of Range Complex No. 1 inside the FUDS boundary is restricted by fencing and an electric gate because it is inside the current airport property. There is no restriction to access to the portion of the MRS outside of the airport property, which includes most of the safety fan for the machine gun range.

### **5.4.1 Groundwater Migration Pathway**

5.4.1.1 More than 1,000 water wells are known to exist within a 4-mile buffer of Range Complex No. 1, and more than 800 of these are identified as drinking water wells. Table 5.6 summarizes the number and type of wells as well as their distance from Range Complex No. 1. Information regarding the number of individuals using each of the drinking water wells within the 4-mile buffer is unavailable. Therefore, a population of 20,036 people within the 4-mile buffer (same range as for the drinking water wells) was assumed using conservative estimates for the distances shown in Table 2.1 for Range Complex No. 1, based on the U.S. census data for 2000.

5.4.1.2 The census data indicate that 112 people live within census blocks overlapped by Range Complex No. 1. However, no residences were evident during the QR performed at the MRS. It is likely that most residents in these census blocks live outside the Range Complex No. 1 boundaries. There are, however, six drinking water wells within the boundaries of the machine gun range safety fan portion of the MRS. It is possible that there are residences in this portion of the MRS.

**TABLE 5.6**  
**GROUNDWATER WELLS IN THE VICINITY OF RANGE COMPLEX NO. 1**  
**MRS**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

Distance from Site	Public/Domestic Wells	Stock/Irrigation Wells	Commercial/Industrial Wells	Other Wells <sup>(1)</sup>	Total
On site	6	1	0	0	7
0 to ¼ mile	10	0	0	0	10
¼ to ½ mile	9	1	0	0	10
½ to 1 mile	55	4	0	0	59
1 to 2 miles	302	32	3	14	351
2 to 3 miles	235	69	7	27	338
3 to 4 miles	195	53	10	23	281
Site to 4 miles	812	160	20	64	1,056

(1) Other wells include sanitary, exploration, prospecting, observation, or unknown-use wells.  
Detailed well information is included in Appendix L.

5.4.1.3 As indicated in subchapter 5.4.3, various PAHs in soil exceeded the background values established for the former Carlsbad AAF. Although the exceedances indicate a completed soil exposure pathway, it is not likely that contamination in the surface soil would reach groundwater at the FUDS. PAHs are generally insoluble in water, and water well depths within a mile of the FUDS are generally greater than 100 feet bgs and sometimes approach depths of 300 feet. There is no reason to believe that PAHs could be mobilized to such depths at this site. The groundwater pathway at Range Complex No. 1 is, therefore, considered incomplete.

#### 5.4.2 Surface Water Migration Pathway

There are no permanent surface water bodies in Range Complex No. 1, although Dark Canyon Draw passes through the safety fan for the machine gun range. As described in subchapter 5.3.3.1, the draw contains water, likely including runoff from Range Complex No. 1, only during periods of significant precipitation. Because there are no permanent surface water bodies in this MRS, surface water and sediment samples were not collected during the SI. However, as discussed in subchapter 5.4.3, the concentrations of various PAHs detected in soil samples collected in Range Complex No. 1 exceeded the background concentrations established for the former Carlsbad AAF, indicating a completed soil exposure pathway. Because it is possible for runoff and erosion from Range Complex No. 1 to enter Dark Canyon Draw, it is also possible that the surface water and sediment exposure pathways are complete. Therefore, since no surface water or sediment samples were collected, the surface water and sediment exposure pathways are potentially complete but not quantitatively evaluated. The surface water risk associated with the soil exceedances will be discussed in subchapter 6.2.

### **5.4.3 Soil Migration Pathway**

5.4.3.1 To evaluate the soil exposure pathway, six samples were collected in Range Complex No. 1. Two of these, samples CAAF-MRS02-SS-06-04 and -05, were collected within the former triple skeet range and were analyzed for PAHs and related metals, including antimony, copper, and lead. The remaining four samples, CAAF-MRS02-SS-06-06 and -09, -10, and -11, were analyzed for only the small arms related metals. The maximum detected concentration of each metal and PAH was compared to its respective background value from Table 5.3 to determine whether a SLRA was required for that compound. Table 5.7 shows the comparison with background for the analytes at Range Complex No. 1.

5.4.3.2 As indicated in Table 5.7, no metals exceeded the selected background criteria, although six PAHs did exceed the ambient samples representative of background. The exceedances indicate a complete soil exposure pathway at Range Complex No. 1. Therefore, the six PAHs exceeding background will be retained for consideration in the SLRA in Chapter 6.

### **5.4.4 Air Migration Pathway**

Target populations potentially affected by the air migration pathway include people who reside, work, or go to school within the target distance limit of 4 miles around the site. As shown in Table 2.1, 20,036 people live within 4 miles of Range Complex No. 1. The former Carlsbad AAF is operated by the City of Carlsbad as a regional airport and industrial park, meaning that businesses are within a 4-mile radius of Range Complex No. 1. The radius also extends into the City of Carlsbad, possibly including schools within the 4-mile buffer. Because there is surface soil contamination, the air migration pathway is complete for fugitive dust emissions. The six PAHs exceeding background values in Table 5.7 are retained for consideration in the SLRA. Chapter 6 evaluates the potential risk from metals exposure through inhalation of fugitive dust, using the soil screening criteria discussed in subchapter 1.3.

**TABLE 5.7**  
**RANGE COMPLEX NO. 1 SOIL SOURCE EVALUATION**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

Analyte	Units	Maximum Detected Site Concentration	Background Concentration <sup>(1)</sup>	Exceeds Background Concentration? <sup>(1)</sup>	Potential MC? <sup>(2)</sup>	SLRA Required?	Primary reason for exclusion from SLRA
<b>Metals</b>							
Antimony	mg/kg	< 0.26	< 0.26	No	Yes	No	Not detected at MRS
Copper	mg/kg	5.2	14.4	No	Yes	No	Not detected above background
Lead	mg/kg	23	23.9	No	Yes	No	Not detected above background
<b>PAHs<sup>*</sup></b>							
2-Methylnaphthalene	µg/kg	< 5.1	< 5.2	No	Yes	No	Not detected at MRS
Acenaphthene	µg/kg	< 5.1	< 5.2	No	Yes	No	Not detected at MRS
Acenaphthalene	µg/kg	< 5.1	< 5.2	No	Yes	No	Not detected at MRS
Anthracene	µg/kg	< 5.1	0.21	No	Yes	No	Not detected at MRS
Benzo(a)anthracene	µg/kg	0.50	0.27	Yes	Yes	Yes	--
Benzo(a)pyrene	µg/kg	0.83	0.45	Yes	Yes	Yes	--
Benzo(b)fluoranthene	µg/kg	2.1	1.80	Yes	Yes	Yes	--
Benzo(g,h,i)perylene	µg/kg	0.98	0.61	Yes	Yes	Yes	--
Benzo(k)fluoranthene	µg/kg	2.1	1.80	Yes	Yes	Yes	--
Chrysene	µg/kg	1.1	1.40	No	Yes	No	Not detected above background
Dibenz(a,h)anthracene	µg/kg	< 5.1	< 5.2	No	Yes	No	Not detected at MRS
Fluoranthene	µg/kg	1.8	3.50	No	Yes	No	Not detected above background
Fluorene	µg/kg	< 5.1	< 5.2	No	Yes	No	Not detected at MRS
Indeno(1,2,3-cd)pyrene	µg/kg	0.77	0.53	Yes	Yes	Yes	--
Naphthalene	µg/kg	< 5.1	0.36	No	Yes	No	Not detected at MRS
Phenanthrene	µg/kg	0.72	1.7	No	Yes	No	Not detected above background
Pyrene	µg/kg	1.3	2.1	No	Yes	No	Not detected above background

(1) Background concentration, as established in Table 5.3

(2) Potential MCs, as listed in Table 4.1

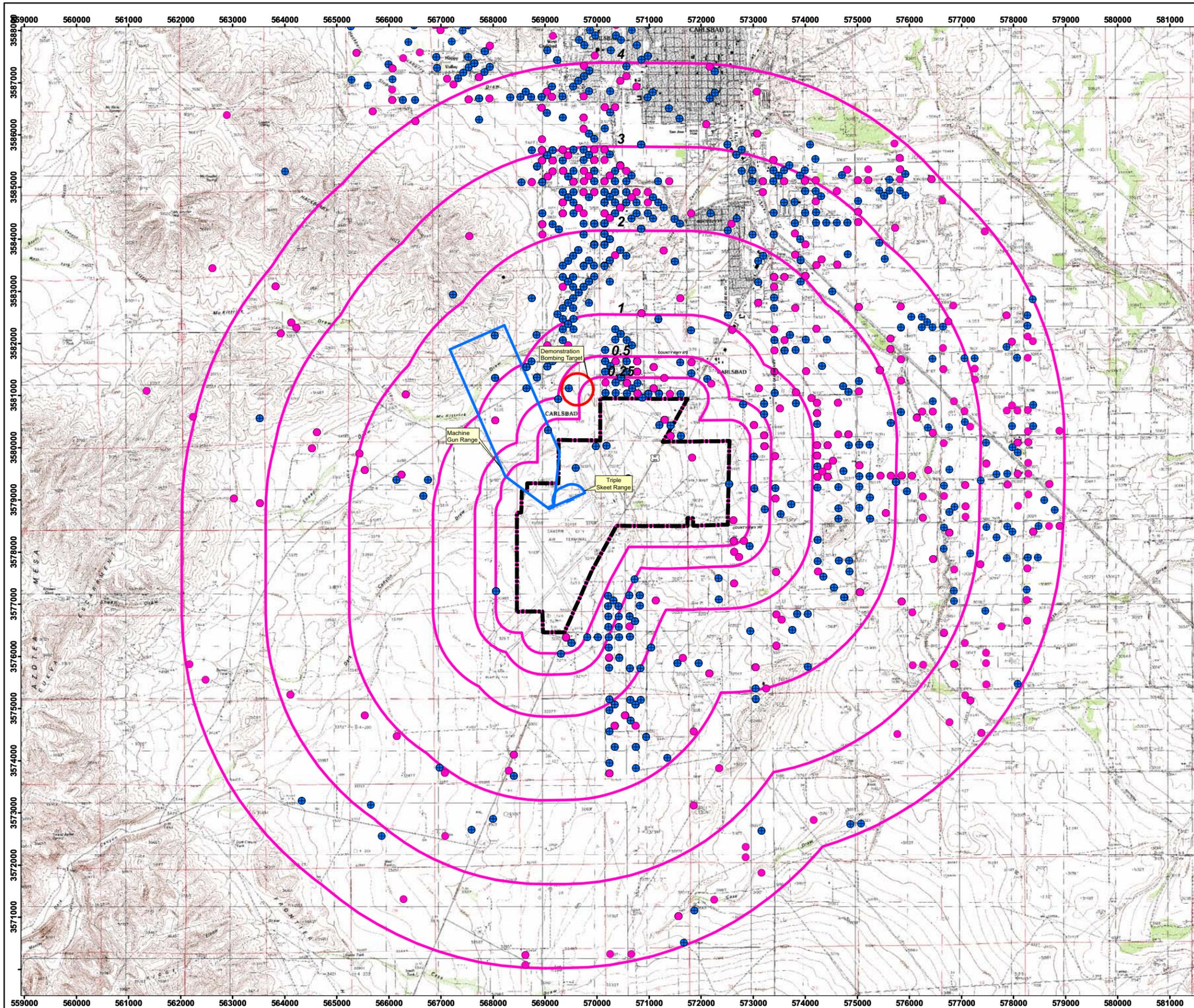
\* PAHs are considered an incidental contaminant (primarily in skeet ranges) and may be programmatically investigated.

Al, Fe, and Mn were only included for future Geochemical analysis

Figure 5.1

### Water Wells within 4-Mile Buffer Formerly Used Defense Site Carlsbad Army Airfield FUDS Project # K06NM034203

Eddy County, New Mexico



#### Legend

- Drinking Water Well
- Other Wells
- Buffer (Mile)
- Bombing Range Boundary
- Range Complex No. 1
- FUDS Boundary

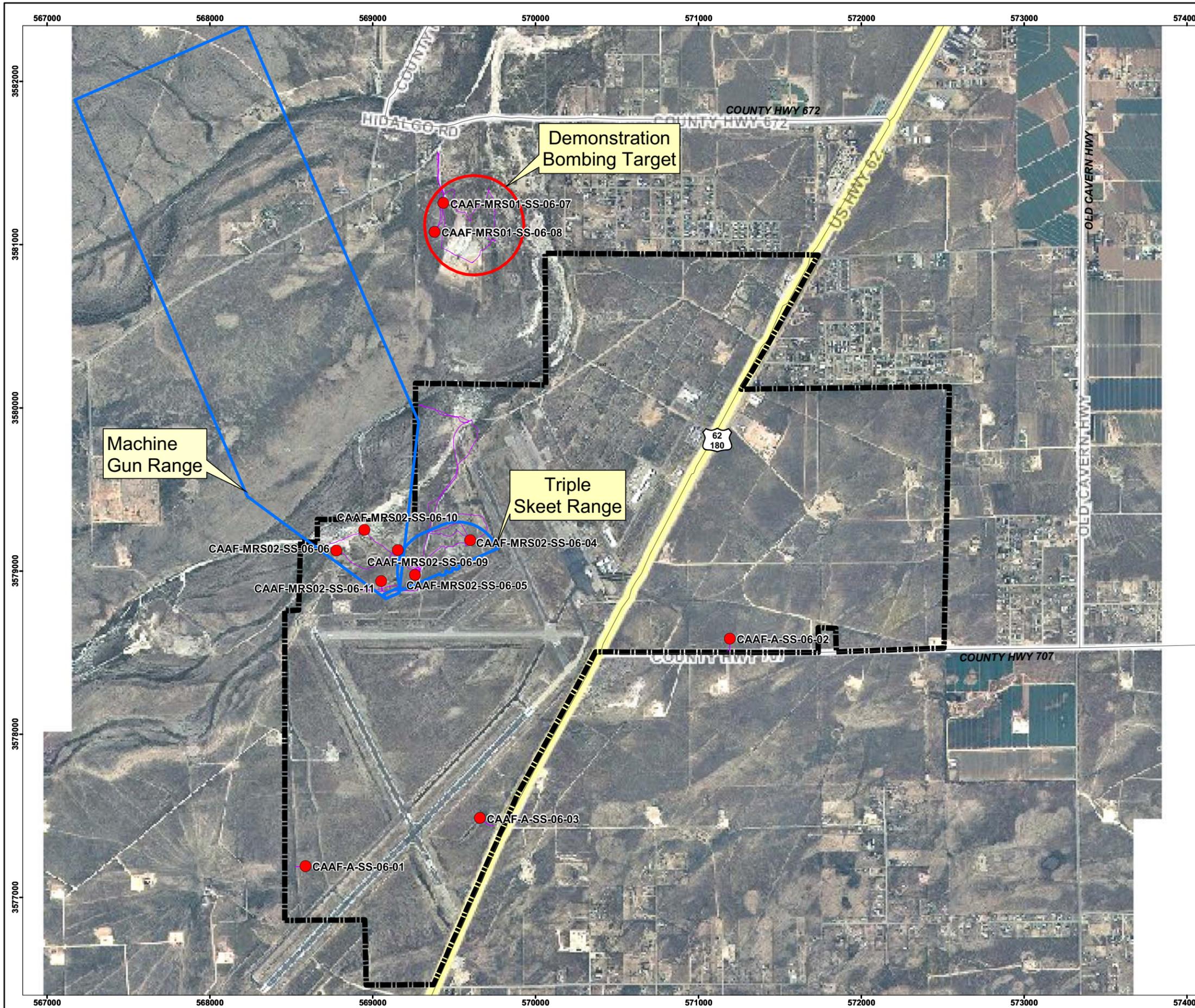


Image Source: Landsat Orthoimagery, 2000-2001  
 Projection: UTM Zone 13 NAD83, Map Units in Meters



PARSONS		U.S. ARMY SOUTH PACIFIC DIVISION RANGE SUPPORT CENTER	
DESIGNED BY: BT	<b>Water Wells within 4-Mile Buffer</b>		
DRAWN BY: BT			
CHECKED BY: GV	SCALE: As Shown	PROJECT NUMBER: 744653.65000	
SUBMITTED BY: GV	DATE: January 2008	PAGE NUMBER:	
	FILE: X:\GIS\Site_inspections_sw\Maps\carlsbad_NM\Fig5_2_aaf.mxd	5-19	

Figure 5.2  
**Qualitative Reconnaissance and  
 Sample Locations**  
**Formerly Used Defense Site**  
**Carlsbad Army Airfield**  
**FUDS Project # K06NM034203**  
 Eddy County, New Mexico



**Legend**

- Soil Sample Location
- Bombing Range Boundary
- Range Complex No. 1
- Qualitative Reconnaissance Track
- FUDS Boundary



Image Source: Orthoimagery, 2005  
 Projection: UTM Zone 13 NAD83, Map Units in Meters  
 2,000 1,000 0 2,000 Feet

PARSONS

U.S. ARMY SOUTH  
 PACIFIC DIVISION  
 RANGE SUPPORT CENTER

DESIGNED BY: BT	<b>Qualitative Reconnaissance and Sample Locations</b>		PROJECT NUMBER: 744653.65000
DRAWN BY: BT			PAGE NUMBER: 5-20
CHECKED BY: GV	SCALE: As Shown	DATE: January 2008	
SUBMITTED BY: GV	FILE: X:\GIS\Site_inspections_sw\Maps\carlsbad_NM\Fig5_1.mxd		

## **CHAPTER 6**

### **SCREENING-LEVEL RISK ASSESSMENT**

#### **6.1 MUNITIONS AND EXPLOSIVES OF CONCERN SCREENING-LEVEL RISK ASSESSMENT**

##### **6.1.1 Conceptual Site Model**

The CSM for the former Carlsbad AAF, included in Appendix J, summarizes conditions at the FUDS that could result in human exposure to MEC. It describes the types of MEC potentially present in the Demonstration Bombing Target and Range Complex No. 1 MRSs, past MEC and munitions debris findings, and current and projected future land use and receptors.

##### **6.1.2 Introduction**

6.1.2.1 A qualitative risk evaluation assessed the potential explosive safety risk to the public at the former Carlsbad AAF. This risk evaluation communicates whether a potential risk is present at the FUDS and the primary causes of that potential risk. The risk evaluation is based on historical information presented in prior studies (e.g., the INPR, the ASR, and the ASR Supplement) and on observations made during the SI QR.

6.1.2.2 An explosive safety risk exists if a person can come near or into contact with MEC and interact with that MEC in a manner that results in a detonation. The potential for an explosive safety risk depends on the presence of three critical elements:

- A source (i.e., presence of MEC),
- A human receptor (i.e., a person), and
- The potential for interaction between the source and receptor (i.e., the possibility that the receptor might pick up or disturb the source).

6.1.2.3 All three of these elements must be present for an explosive safety risk to exist. There is no risk if any one element is missing. Each of these three elements provides a basis for implementing effective risk management response actions.

**6.1.3 Qualitative Risk Evaluation**

6.1.3.1 For the two MRSs, the potential risk posed by MEC was characterized qualitatively by evaluating three primary risk factors related to the three critical elements listed above:

- 1) MEC presence: whether there is potential for MEC at the MRS
- 2) MEC type: the type(s) of MEC that might be at the MRS and the related potential explosive hazards
- 3) Site accessibility: how the potential receptors at the MRS might interact with the MEC.

6.1.3.2 The known or suspected presence of an explosive hazard and any potential human receptors at a given MRS will typically be considered sufficient justification for RI/FS implementation at that MRS. The following paragraphs describe each of the primary risk factors.

6.1.3.3 **MEC presence** describes whether MEC either has been confirmed or is suspected to be at the MRS, either at the surface or in the subsurface, based on historical information in prior studies (e.g., the INPR, the ASR, and the ASR Supplement) and observations made during the SI QR. If there is historical evidence of potential MEC presence at a site, lack of confirmation of MEC presence during the SI QR will not be considered as evidence of MEC absence for this qualitative risk evaluation. Table 6.1 lists the three possible categories used to describe MEC presence for this evaluation.

**TABLE 6.1  
CATEGORIES OF MEC PRESENCE  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

MEC Presence	Description
Confirmed or suspected	There is physical or confirmed historical evidence of MEC presence at the MRS, or there is physical or historical evidence indicating that MEC may be present at the MRS.
Small arms only <sup>(1)</sup>	The presence of small arms ammunition is confirmed or suspected, and there is evidence that no other types of munitions were used or are present at the MRS.
Evidence of no munitions	Following investigation of the MRS, there is physical or historical evidence that there are no UXO or discarded military munitions present.

(1) Small arms ammunition is “ammunition, without projectiles that contain explosives (other than tracers), that is .50 caliber or smaller or for shotguns” (Department of the Army, 2005a).

6.1.3.4 **MEC type** determines whether the MEC potentially present at the MRS might be detonated, resulting in a minor injury or worse to one or more human receptors. If

multiple MEC types are potentially present at the MRS, the type that poses the greatest risk to public health is selected for this qualitative risk evaluation. This determination is based on historical information in prior studies and observations made during the SI QR. Table 6.2 lists the three possible categories used to describe MEC type for this evaluation.

**TABLE 6.2  
CATEGORIES OF MEC TYPE  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>MEC Type</b>	<b>Description</b>
Potentially hazardous	Fuzed or unfuzed MEC that may result in physical injury to an individual if detonated by an individual’s activities.
Small arms only <sup>(1)</sup>	Small arms ammunition is confirmed or suspected, and there is evidence that no other types of munitions were used or are present at the MRS.
Inert	Munitions debris or other items that will cause no injury (e.g., training ordnance containing no explosives, fuzes, spotting charges, etc.).

(1) Small arms ammunition is defined as “ammunition, without projectiles that contain explosives (other than tracers), that is .50 caliber or smaller or for shotguns” (Department of the Army, 2005a).

6.1.3.5 **Site accessibility** describes whether human receptors have access to the MRS and, therefore, may interact with any MEC that is present at the surface or in the subsurface. For this qualitative risk evaluation, if MEC are confirmed or suspected to be present at the MRS, it is assumed that human receptors might come into contact with that MEC unless there is complete restriction to access. This assessment will also describe the potential receptors. Table 6.3 lists the two possible categories used to describe site accessibility for this evaluation.

**TABLE 6.3  
CATEGORIES OF SITE ACCESSIBILITY  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>Site Accessibility</b>	<b>Description</b>
Accessible	Access control is not complete: residents, site workers, visitors, or trespassers can gain access to all or part of the MRS.
Complete restriction to access	Human receptors are completely prevented from gaining access to the MRS.

6.1.3.6 For this qualitative risk evaluation, further evaluation (i.e., RI/FS) for the MRS will typically be justified if the following conditions are true:

- MEC are confirmed or suspected to be present,
- The MEC confirmed or suspected to be present are potentially hazardous, and

- The MRS is accessible.

6.1.3.7 The primary risk factors identified above were evaluated for the two MRSs at the former Carlsbad AAF using the data collected during the SI field investigation and the historical data available from other studies. The following subchapters discuss the qualitative risk evaluation by each primary risk factor to determine whether further evaluation is justified at this MRS.

#### **6.1.4 Munitions and Explosives of Concern Risk Assessment**

6.1.4.1 Based on the ASR and the ASR Supplement, the only munitions observed during previous site visits to the former Carlsbad AAF MRSs were debris from practice bombs at the Demonstration Bombing Target and various types of small arms at Range Complex No. 1. The ASR Supplement reports no documented MEC incidents at either MRS. The SI field team observed no MEC but observed small arms munitions debris in Range Complex No. 1. No munitions debris was observed in the Demonstration Bombing Target during the SI. However, the ASR site visit team reported finding bomb debris in Dark Canyon Draw, immediately adjacent to the Demonstration Bombing Target. Based on the discovery of small arms-related munitions debris in Range Complex No. 1 during the SI and practice bomb munitions debris in the vicinity of the Demonstration Bombing Target during the ASR site visit, the MEC presence category is considered to be “Small Arms Only” for the Range Complex No. 1 MRS and “Confirmed or Suspected” for the Demonstration Bombing Target MRS.

6.1.4.2 The ASR and ASR Supplement list small arms ammunition as munitions known or suspected at Range Complex No. 1; the QR conducted for the SI found evidence of no additional munitions at this MRS. At the Demonstration Bombing Target, although the SI field team identified no bomb debris or other munitions debris, the ASR site visit in 1995 found unspecified bomb debris, likely from M38A2 and/or M85 100-pound practice bombs. These bombs are typically associated with the M1A1, M3, and M5 spotting charges, which may pose an explosive hazard if they remain intact within the MRS. Based on these results, the MEC type for Range Complex No. 1 is considered “small arms only,” and the MEC type for the Demonstration Bombing Target is considered “potentially hazardous.”

6.1.4.3 The former Carlsbad AAF, approximately 5 miles southwest of the City of Carlsbad, New Mexico, is currently used for a variety of purposes. The former airfield itself, including the area formerly occupied by the berms and firing positions in Range Complex No. 1, is now used as a regional airport and industrial park; most of the safety fan for the machine gun range in Range Complex No. 1 is owned by the BLM and is leased for cattle grazing; and the Demonstration Bombing Target is owned by a private company that uses the site for a gravel operation. Barbed wire fences restrict access to the Demonstration Bombing Target and portions of Range Complex No. 1. Despite the fences, airport/industrial area personnel, workers at the gravel site, ranchers, nearby residents, visitors, trespassers, and recreational users could access portions of both MRSs with little trouble. Therefore, the site accessibility category at both the Demonstration Bombing Target and Range Complex No. 1 is considered “Accessible.”

**6.1.5 Risk Summary**

Table 6.4 summarizes the qualitative MEC risk evaluation for the former Carlsbad AAF. Based on this qualitative MEC risk evaluation, there is a possibility that human receptors might contact explosively hazardous MEC at the Demonstration Bombing Target MRS and therefore a potential explosive safety risk exists at this MRS. There is no possibility for contact with explosively hazardous MEC at Range Complex No. 1 and therefore no explosive safety risk exists at this MRS.

**TABLE 6.4  
MEC RISK EVALUATION  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>MRS</b>	<b>MEC Presence</b>	<b>MEC Type<sup>(1)</sup></b>		<b>Site Accessibility</b>	<b>Further Evaluation?</b>
Demonstration Bombing Target	Confirmed or suspected	Bomb, 100-pound, Practice, M38A2; Bomb, 100-pound, Practice, M85; Signals, spotting charge, M1A1, M3 and M5	Potentially hazardous	Accessible	Yes
Range Complex No. 1	Small arms only	Munitions, small arms (various types of casings and bullets)	Small arms only	Accessible	No

(1) Where multiple MEC items were used at an MRS, the item that poses the greatest risk to public health is listed for this risk assessment.

**6.2 MUNITIONS CONSTITUENTS SCREENING-LEVEL HUMAN HEALTH RISK ASSESSMENT**

**6.2.1 Conceptual Site Model**

The MC conceptual site exposure models (CSEMs) for the Demonstration Bombing Target and Range Complex No. 1 identified affected media, transport mechanisms, exposure routes, and potential receptors (Appendix J). The CSEM for the Demonstration Bombing Target indicates that there are no completed exposure pathways because there were no sources of MC contamination identified at this MRS. However, the CSEM for Range Complex No. 1 indicates completed exposure pathways at this MRS based on soil background exceedances by six PAHs.

**6.2.2 Affected Media**

6.2.2.1 The TPP Team agreed that releases of MC through munitions activities at the former Carlsbad AAF were most likely to affect surface soil, and this was the only medium sampled during the SI. Surface water sampling was unnecessary because no permanent surface water bodies are present on site, and groundwater sampling was unnecessary given the depth to groundwater in the area. However, the TPP Team agreed

that MC contamination in soil could result in completed exposure pathways for other media. Re-entrainment of dust, for example, could result in transport to air, and surface water and sediment could potentially be affected by transport of MC via overland flow following precipitation.

6.2.2.2 Although soil was the only medium sampled, the TPP Team agreed that the sampling of additional media would be recommended if contamination identified during the SI posed a potential risk. No MC was detected in the soil samples collected in the Demonstration Bombing Target; thus, there is no risk associated with this MRS. Based on the findings in Chapter 5, there is potential MC contamination at Range Complex No. 1.

### **6.2.3 Screening Values**

The TPP Team agreed on comparison levels for the former Carlsbad AAF FUDS, consisting of the more conservative residential SSLs from either NMED or USEPA Region 6. USEPA Region 9 residential PRGs were to be used if a residential SSL for a particular analyte was unavailable from either of these two sources. The NMED agreed at the TPP meeting that these screening values are protective of human health, and these soil screening values were used to evaluate the background exceedances noted in the soil samples collected in Range Complex No. 1.

### **6.2.4 Risk Characterization**

6.2.4.1 To determine whether potential human health risks are present at this FUDS, the maximum detected concentration of each analyte retained for consideration in the SLRA for Range Complex No. 1 was compared to the screening values described above.

6.2.4.2 For an analyte to be considered a possible health concern potentially related to a release from munitions activities at the former Carlsbad AAF, the following three conditions must be true:

- The analyte is present above the background screening concentration;
- The analyte is a potential constituent of the formerly used munitions or is considered an incidental contaminant; and
- The analyte is present above the human health screening level.

6.2.4.3 The following subchapters complete the MC evaluation started in Chapter 5 for potential effects on human health. Only those analytes that met the first two of the above-listed criteria, as discussed in Chapter 5, are included in the SLRA in this subchapter. The SLRA is limited to MC detected in surface soil because this was the only medium sampled during the SI. As discussed in Chapter 5, the following analytes were retained for consideration in the SLRA for soil:

- Benzo(a)anthracene

- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- Indeno(1,2,3-cd)pyrene

6.2.4.4 Table 6.5 provides the results of the human health screening for soil for the Range Complex No. 1 MRS. As shown, the maximum detected concentrations of the metals exceeding background did not exceed screening levels in the MRS included in the SLRA.

**TABLE 6.5**  
**SOIL SCREENING-LEVEL HUMAN HEALTH RISK ASSESSMENT**  
**FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

Analyte	Maximum Detected Site Concentration (µg/kg) <sup>(1)</sup>	Site-Specific Screening Value (µg/kg) <sup>(2)</sup>	Exceeds Screening Level?
Benzo(a)anthracene	0.50	150	No
Benzo(a)pyrene	0.83	15	No
Benzo(b)fluoranthene	2.1	150	No
Benzo(g,h,i)perylene	0.98	-	NA <sup>(3)</sup>
Benzo(k)fluoranthene	2.1	1500	No
Indeno(1,2,3-cd)pyrene	0.77	150	No

(1) µg/kg = microgram per kilogram.

(2) Screening values are the USEPA Region 6 residential SSLs, December 14, 2006, updated May 4, 2007, or the NMED residential SSLs, June 2006.

(3) NA = Screening value was not available for this compound

6.2.4.5 None of the analytes exceeded the screening values chosen for the former Carlsbad AAF. There is no published screening value for benzo(g,h,i)perylene. However, the maximum detected benzo(g,h,i)perylene concentration was detected at an estimated value of 0.98 µg/kg, which is less than 2% of the practical quantitation limit reported by the lab that analyzed the samples. Benzo(a)pyrene is generally considered the most toxic of the PAHs and has the lowest screening value (15 µg/kg). Comparison of the benzo(g,h,i)perylene result to the benzo(a)pyrene screening value indicates that it is unlikely that benzo(g,h,i)perylene poses any human health risk in Range Complex No. 1.

## 6.2.5 Discussion

6.2.5.1 No screening criterion was available for the sixth PAH, benzo(g,h,i)perylene. However, the maximum detected concentration of this compound was below the accepted screening level for benzo(a)pyrene, which is generally considered a more toxic substance. Therefore, no unacceptable human health risk from MC is expected at Range Complex No. 1.

6.2.5.2 Because there is no unacceptable human health risk posed by any of the compounds that exceeded soil background concentrations, no human health risk is expected at Range Complex No. 1.

6.2.5.3 There were no detections in the soil samples collected in the Demonstration Bombing Target; therefore, there is no risk at this MRS.

### **6.3 MUNITIONS CONSTITUENTS SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT**

As described in Section 5.2.4, the former Carlsbad AAF is not considered an ecologically important place. Therefore, ecological receptors are not considered to be present at the site, and a SLERA was not conducted.

## **CHAPTER 7**

### **SUMMARY AND CONCLUSIONS**

#### **7.1 SUMMARY**

7.1.1 The SI performed at the former Carlsbad AAF in Eddy County, New Mexico, evaluated site-specific conditions that could impact the potential for completed exposure pathways to human and ecological receptors at the FUDS. The project was planned and performed with the goal of satisfying the DQOs set for the project: 1) evaluate potential presence of MEC; 2) evaluate potential presence of MC; 3) collect data needed to complete MRSPP scoring sheets; and 4) collect information for HRS scoring. Successful completion of the DQOs allowed determination of whether this FUDS project warrants further response action under CERCLA.

7.1.2 The SI evaluation included approximately 5.0 miles of walked QR and the collection of 11 surface soil samples (with associated field duplicates). Three of the soil samples were collected at locations outside any identified MRS for use in determining ambient conditions at the FUDS. Two of the remaining eight samples were collected in the Demonstration Bombing Target MRS, and the other six were collected in the Range Complex No. 1 MRS. All of the samples were collected at or near locations defined in the SS-WP for the project except for the Demonstration Bombing Target samples CAAF-MRS01-SS-06-07 and -08, which were moved more than 150 feet from their proposed locations, because the proposed locations were in an area used by the gravel company that currently owns the land. No munitions debris was found in this MRS, so the two samples were moved to sample undisturbed ground on the western side of the MRS.

7.1.3 TestAmerica in Arvada, Colorado analyzed nine of the soil samples for selected metals related to small arms, five samples for PAHs, and two for explosives. PAH analysis was performed on the three ambient samples and the two samples collected in the triple skeet range portion of Range Complex No. 1, and explosives analysis was performed on the two Demonstration Bombing Target samples. The only samples for which metals analysis was not performed were the two Demonstration Bombing Target samples. Explosive compounds were not detected in either of the Demonstration Bombing Target samples, as discussed in Chapter 5, and therefore comparison to screening criteria was not necessary. Based on the absence of identified contamination in the soil samples, there is no potential for a completed MC exposure pathway at this MRS, and risk due to MC is not expected.

## **DRAFT FINAL**

7.1.4 Metals and PAHs both were detected in Range Complex No. 1 samples; however, only PAH concentrations exceeded the background values for the former Carlsbad AAF. Six PAHs exceeded these values and were retained for consideration in the SLRA in Chapter 6. Five of the six PAHs included in the SLRA were below their respective screening criteria, and there was no available screening value for the sixth, benzo(g,h,i)perylene. However, benzo(a)pyrene is generally considered the most toxic of the PAHs and has the lowest screening value (15 µg/kg). Comparison of the benzo(g,h,i)perylene result to the benzo(a)pyrene screening value indicates that it is unlikely that benzo(g,h,i)perylene poses any human health risk in Range Complex No. 1. Because there were no exceedances of the accepted criteria, risk due to MC is not expected in Range Complex No. 1.

7.1.5 No MEC were observed during the QR at the FUDS, and the only munitions debris observed by the SI field team were small arms. However, the ASR site visit team in 1995 identified munitions debris from practice bombs (likely M38A2 and M85) near the Demonstration Bombing Target in a draw to the east, a location not investigated during the SI. The identification of munitions debris indicates that MEC are potentially present at the former Carlsbad Army Airfield.

## **7.2 CONCLUSIONS REGARDING POTENTIAL MEC EXPOSURE PATHWAYS**

The evaluation of potential MEC exposure (subchapter 6.1) concluded that the MEC exposure pathway is potentially complete for the former Carlsbad AAF based on munitions debris observed during the SI and previous site visits, which indicates the potential presence of MEC only at the Demonstration Bombing Target MRS.

### **7.2.1 Demonstration Bombing Target**

The practice bombs identified by the ASR site visit team in the Demonstration Bombing Target MRS pose a potential explosive hazard based on the spotting charges typically associated with these bombs. Therefore, it is possible that human receptors might contact explosively hazardous MEC at the Demonstration Bombing Target MRS. The site is currently owned and used by a gravel company and is not heavily trafficked, so a removal action for MEC is not warranted at this time.

### **7.2.2 Range Complex No. 1**

Although munitions debris was found in Range Complex No. 1 during the SI, only small arms were identified. The small arms munitions found at Range Complex No. 1 are not explosively hazardous, so there is no MEC risk at this MRS.

## **7.3 CONCLUSIONS REGARDING POTENTIAL MC EXPOSURE PATHWAYS**

7.3.1 An exposure pathway is not considered to be complete unless all four of the following elements are present (USEPA, 1989):

- A source and mechanism for chemical release;
- An environmental transport/exposure medium;
- A receptor exposure point; and
- A receptor and a likely route of exposure at the exposure point.

7.3.2 The evidence for a complete or incomplete pathway at each MRS is discussed below.

### **7.3.1 Demonstration Bombing Target**

Two soil samples were collected within the Demonstration Bombing Target and were analyzed for explosives. No explosive compounds were detected in the soil samples collected in the Demonstration Bombing Target; therefore, exposure of human receptors to MC at this MRS is not expected. Without a source and mechanism for release, exposure pathways cannot be completed and will not be completed in the future. Based on evidence from the SI, no completed MC exposure pathways have been identified at the former Demonstration Bombing Target, and risks to human health or the environment from MC at this MRS are not expected.

### **7.3.2 Range Complex No. 1**

Six soil samples were collected within Range Complex No. 1: four within the boundaries of the former machine gun range and two within the former triple skeet range. The machine gun range samples were analyzed for small arms related metals only, while the triple skeet range samples were also analyzed for PAHs. None of the metals for which an analysis was performed exceeded the background levels selected for the project, but six PAHs did exceed background levels, indicating a complete exposure pathway at this MRS. However, the maximum detected concentrations of five of the six PAHs did not exceed the screening criteria used in the SLRA. No screening criterion was available for the sixth PAH, benzo(g,h,i)perylene. However, the maximum detected concentration of this compound was below the accepted screening level for benzo(a)pyrene, which is generally considered a more toxic substance. Therefore, no unacceptable human health risk from MC is expected at Range Complex No. 1.

**CHAPTER 8**

**RECOMMENDATIONS**

Due to reports of munitions debris found at the Demonstration Bombing Target during the ASR site visit, this MRS is recommended to proceed to RI/FS (Table 8.1). However, no further evaluation of MC is recommended during the RI/FS. No DoD action indicated (NDAI) status is recommended for Range Complex No. 1. The supporting evidence for these recommendations is as follows

- Although there is no specific information available regarding the actual use of the Demonstration Bombing Target MRS, practice bombs were typically dropped on this type of site during either competitions or public demonstrations.
- During the ASR site visit, munitions debris from practice bombs was observed in a draw immediately adjacent to the east side of the Demonstration Bombing Target MRS.

**TABLE 8.1  
RECOMMENDATIONS  
FORMER CARLSBAD AAF, EDDY COUNTY, NEW MEXICO**

<b>MRS</b>	<b>Recommendation</b>	<b>Justification</b>
<b>Demonstration Bombing Target</b>	RI/FS	Practice bomb munitions debris observed during the ASR site visit. No MC contamination identified during SI. RI/FS is recommended for MEC. No MC contamination identified during the SI.
<b>Range Complex No. 1</b>	NDAI	Only small arms munitions debris identified during the ASR and SI field work. No MC contamination exceeded the applicable screening criteria.

**CHAPTER 9**

**REFERENCES**

- City-Data.com. 2007. Carlsbad, New Mexico: Average Climate in Carlsbad, New Mexico. <http://www.city-data.com/city/Carlsbad-New-Mexico.html>.
- Department of the Army. 2005a. *Memorandum for the Assistant Chief of Staff for Installation Management. Subject: Munitions Response Terminology*. Prepared by the Office of the Assistant Secretary, Installations and Environment. April 21.
- Department of the Army. 2005b. *Technical Document for Ecological Risk Assessment: Process for Developing Management Goals*. Prepared by the U.S. Army Biological Technical Assistance Group. August.
- National Oceanic and Atmospheric Administration. 2006. *Coastal Zone Management Program, Office of Ocean and Coastal Resource Management, National Ocean Service*. <http://coastalmanagement.noaa.gov>.
- National Park Service. 2006a. *List of National Heritage Areas, National Heritage Areas Program*. <http://www.nps.gov/history/heritageareas/>.
- National Park Service. 2006b. *List of National Historic Landmarks, National Historic Landmarks Program*. <http://www.nps.gov/history/nhl/>.
- National Park Service. 2006c. *List of National Parks by State*. <http://www.nps.gov/applications/parksearch/geosearch.cfm>.
- National Park Service. 2006d. *National Register Information System, National Register Historic Districts*. <http://www.historicdistricts.com/nm/districts.html> and <http://www.historicdistricts.com/nm/eddy/districts.html>.
- National Park Service. 2006e. *National Register Information System, National Register of Historic Places*. <http://www.nr.nps.gov/>.
- New Mexico Bureau of Geology and Mineral Resources. 2003. *Water Resources of the Lower Pecos Region: New Mexico: Science, Policy, and a Look to the Future*. Edited by Peggy S. Johnson, Lewis A. Land, L. Greer Price, and Frank Titus.
- New Mexico Department of Game and Fish (NMDGF). 2006. *New Mexico Wildlife*. <http://www.wildlife.state.nm.us/index.htm>. Updated 2006.

## DRAFT FINAL

- New Mexico Environment Department (NMED). 2006. *Technical Background Document for Development of Soil Screening Levels*. Revision 4.0. Hazardous Waste Bureau and Groundwater Quality Bureau Voluntary Remediation Program. June. <http://www.nmenv.state.nm.us/HWB/guidance.html>.
- New Mexico Environment Department. 2007. Email from Darren Padilla to Cynthia Frazier, Parsons. September 5.
- New Mexico Historic Preservation Division. 2006a. *Archeological Records Management Section*. <http://www.nmhistoricpreservation.org/PROGRAMS/arm.html>.
- New Mexico Historic Preservation Division. 2006b. *Registers of Cultural Properties*. <http://www.nmhistoricpreservation.org/PROGRAMS/registers.html>.
- New Mexico Natural Heritage. 2006. *Museum of Southwestern Biology at the University of New Mexico*. [http://nhnm.unm.edu/data/free\\_info.html](http://nhnm.unm.edu/data/free_info.html).
- New Mexico Office of the State Engineer (OSE). 2006. Email from George Clark to Greg Van, Parsons. November 21.
- New Mexico Water Quality Control Commission. 2002. *Water Quality and Water Pollution Control in New Mexico*.
- Office of the Deputy Under Secretary of Defense. 2001. *Management Guidance for the Defense Environmental Restoration Program (DERP)*. September.
- Parsons. 2004a. Basis Munitions Response Contract W912DY-04-D-0005, February 27.
- Parsons. 2004b. *SHARP (Safety, Health, and Risk Program) Management: The Project Manager's Best Practices Manual*.
- Parsons. 2005. *Final Programmatic Work Plan for Southwest IMA Region: South Pacific Division Range Support Center FUDS Military Munitions Response Program for Site Inspections at Multiple Sites*. Prepared for USACE South Pacific Division Range Support Center. October.
- Parsons. 2006. *Final Sampling and Analysis Plan Addendum, Military Munitions Response Program Site Inspections, Southwest Region*. August.
- Parsons. 2007a. *Final Site-Specific Work Plan Addendum to the Programmatic Work Plan: Carlsbad AAF, Eddy County, New Mexico*. Prepared for USACE Albuquerque District. July 27.
- Parsons. 2007b. *Final Technical Project Planning Memorandum and Associated Documentation for Carlsbad AAF*. May 31.

## DRAFT FINAL

- U.S. Army Corps of Engineers (USACE). 1990. *Inventory Project Report: Carlsbad Army Airfield, NM*. Prepared by USACE Albuquerque District. March 26.
- U.S. Army Corps of Engineers. 1995. *Archives Search Report Findings: Carlsbad Army Airfield and Carlsbad Precision Bombing Range #1, Carlsbad, NM. Project Nos K06NM034202 and K06NM034601*. Prepared by USACE St. Louis District. May.
- U.S. Army Corps of Engineers. 2004a. *ASR Supplement: Carlsbad AAF*. Prepared by USACE St. Louis District. November 26.
- U.S. Army Corps of Engineers. 2004b. *Environmental Quality: Formerly Used Defense Sites (FUDS) Program Policy*. ER 200-3-1. May 10.
- U.S. Army Corps of Engineers. 2005. *Final Programmatic Sampling and Analysis Plan: Military Munitions Response Program Site Inspections*. Prepared by USACE Engineering Support Center, Huntsville. September.
- U.S. Army Corps of Engineers. 2006. Screening-Level Ecological Risk Assessments for FUDS MMRP Site Inspections. Prepared by the USACE HTRW CX. August 11.
- U.S. Department of Agriculture (USDA) Forest Service. 1994. *Ecological Subregions of the United States*. WO-WSA-5. Compiled by W. Henry McNab and Peter E. Avers. July.
- U.S. Department of Agriculture Forest Service. 2006. *USDA Forest Service: Welcome*. <http://www.fs.fed.us>.
- U.S. Environmental Protection Agency (USEPA). 1989. *Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part A), Interim Draft*. Office of Emergency and Remedial Response. EPA/540/1-89/002. December.
- U.S. Environmental Protection Agency. 2001a. *Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment*. Originally published November 1995; website updated November 30, 2001: <http://www.epa.gov/region4/waste/ots/ecolbul.htm>
- U.S. Environmental Protection Agency. 2004. Region 9 PRG Table. October 24; updated December 28. <http://www.epa.gov/region9/waste/sfund/prg/index.html#prgtable>.
- U.S. Environmental Protection Agency. 2006a. *Guidance on Systematic Planning Using the Data Quality Objectives Process*. EPA QA/G-4, EPA/240/B-06/001. February.

## DRAFT FINAL

- U.S. Environmental Protection Agency. 2006b. Region 6 Human Health Medium-Specific Screening Levels 2007. December 14; corrected February 6, 2007. [http://www.epa.gov/earth1r6/6pd/rcra\\_c/pd-n/screen.htm](http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).
- U.S. Environmental Protection Agency. 2007a. *Ecoregions of New Mexico*. [http://www.epa.gov/wed/pages/ecoregions/nm\\_eco.htm](http://www.epa.gov/wed/pages/ecoregions/nm_eco.htm).
- U. S. Environmental Protection Agency. 2007b. Email from Ken Williams to Cynthia Frazier, Parsons. September 11.
- U.S. Fish and Wildlife Service. 2006a. Endangered and Threatened Wildlife and Plants: Removing the Bald Eagle in the Lower 48 States From the List of Endangered and Threatened Wildlife. *Federal Register* 71:32. February 16.
- U.S. Fish and Wildlife Service. 2006b. *National Wildlife Refuge System*. <http://www.fws.gov/refuges/profiles/bystate.cfm>.
- U.S. Fish and Wildlife Service. 2006c. *National Wetlands Inventory: Wetlands Online Mapper*. <http://wetlandsfws.er.usgs.gov/wtlnds/launch.html>.
- U.S. Fish and Wildlife Service. 2006d. *Threatened and Endangered Species System (TESS) New Mexico*. Listings by State and Territory as of 03/27/2006. [http://ecos.fws.gov/tess\\_public/StateListing.do?state=all](http://ecos.fws.gov/tess_public/StateListing.do?state=all). Updated April 3, 2006.
- U.S. Geological Survey (USGS). 1995. *Groundwater Atlas of the United States: Arizona, Colorado, New Mexico, Utah*. HA 730-C. Prepared by S.G. Robson and E.R. Banta. [http://capp.water.usgs.gov/gwa/ch\\_c/index.html](http://capp.water.usgs.gov/gwa/ch_c/index.html).
- U.S. Geological Survey. 1997. *Geologic Map of New Mexico*. Compiled by O.J. Anderson, G.N. Green, and G.E. Jones.
- U.S. Geological Survey. 2007. *National Geochemistry Survey*. <http://tin.er.usgs.gov/geochem/doc/averages/countydata.htm>. Maintained by Jeff Grossmann. Updated July 2007.
- Western Regional Climate Center (WRCC). 2007. Carlsbad, New Mexico (291469): Period of Record Monthly Climate. <http://www.wrcc.dri.edu/cgi-bin/cliMAIN.pl?nmcarl>.