FINAL

RCRA FACILITY INVESTIGATION WORK PLAN
PARCEL 16

FORT WINGATE DEPOT ACTIVITY

McKinley County, New Mexico

1 October 2012

Contract No. W9126G-10-C-0088

Prepared for:

United States Army Corps of Engineers
Fort Worth District
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14. ABSTRACT

This RCRA Facility Work Plan for Parcel 16 at Fort Wingate Depot Activity (FWDA) is a summary of historical information and a description of field activities that will be conducted in Area of Concern (AOC) 41 that includes Igloo Block K and Solid Waste Management Unit (SWMU) 16 that includes Functional Test Range (FTR) 2/3 within Parcel 16 at FWDA. This report was prepared for submission to the New Mexico Environment Department (NMED), Hazardous Waste Bureau (HWB) as required by Section VII.H.1.a of RCRA Permit, No. NM 6213820974.

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FWDA ARM = Fort Wingate Depot Activity Administrative Records Manager
NMED = New Mexico Environment Department

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LIST OF ACRONYMS

%	percent
°F	degrees Fahrenheit
AOC	Area of Concern
BR	Building Removed
BRAC	Base Realignment and Closure
BRACD	BRAC Division
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain of Custody
COPC	Contaminants of Potential Concern
COR	Contracting Officer's Representative
DB	Debris
DG	Disturbed Ground
DK	Dark Toned
DOI	Department of the Interior
DQO	Data Quality Objectives
DU	Decision Unit
EB	Equipment Blank
ft	foot
FTR	Functional Test Range
FWDA	Fort Wingate Depot Activity
GPS	Global Positioning System
GS	Ground Scar
HE	High Explosive
HSP	Health and Safety Plan
HTW	Hazardous and Toxic Waste
HWB	Hazardous Waste Bureau
HWMU	Hazardous Waste Management Unit
IDW	Investigation-Derived Waste
in	inch
mi	mile
mm	millimeter
MI	Multi Incremental
MSL	Mean Sea Level
NMED	New Mexico Environment Department
NRCS	National Resource Conservation Service
OB/OD	Open Burning/Open Detonation
OE	Ordnance and Explosive
PA	Programmatic Agreement
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness

LIST OF ACRONYMS

PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance and Quality Control
RCRA	Resource Conservation and Recovery Act
RFI	Resource Conservation and Recovery Act Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
RSL	Regional Screening Levels
S	Structure
SB	Soil Boring
SS	Surface Soil
SSL	Soil Screening Levels
ST	Stained
SVOC	Semi Volatile Organic Compound
SRHI	Summary Report of Historical Information
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TB	Trip Blank
TEAD	Tooele Army Depot
TCL	Target Compound List
TCP	Traditional Cultural Properties
TNT	Trinitrotoluene
TP	Test Pit
µg/cm^2	micrograms/square centimeter
µg/g	microgram/gram
USACE	U.S. Army Corps of Engineers
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UTM	Universal Transverse Mercator
UXO	Unexploded Ordnance
VOC	Volatile Organic Compound
WSMR	White Sands Missile Range
WWI	World War I

ES.1 EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan summarizes previous investigations at Solid Waste Management Unit (SWMU) 16 and Area of Concern (AOC) 41 within Parcel 16 at Fort Wingate Depot Activity (FWDA), New Mexico. This plan also describes additional investigation activities to be completed at SWMU 16 and AOC 41.

A companion to this document, the Summary Report of Historical Information (SRHI) for Parcel 16, has been prepared to compile and summarize historical documents available for SWMU 16 and AOC 41, which are the only SWMU and AOC sites located within Parcel 16. The SRHI provides further detail regarding the operational history, site or facility drawings, and environmental information contained in previously completed reports for the areas encompassing SWMU 16 and AOC 41.

ES.2 PURPOSE

This RFI Work Plan has been prepared for submission to the New Mexico Environment Department – Hazardous Waste Bureau (NMED-HWB), as required by Section VII.H.1.a of RCRA Permit NM 6213820974 for the FWDA, which became effective December 31, 2005.

ES.3 PROPOSED INVESTIGATIONS

Existing data have been evaluated to determine whether additional field activities are required to characterize the nature and extent of potential environmental impacts at SWMU 16 and AOC 41. Sections 5 through 7 of this RFI Work Plan evaluate the existing data for the individual sites and propose additional data-gathering activities. Brief summaries of the recommended actions for SWMU 16 and AOC 41 are provided below.

All RFI activities will be conducted in accordance with proposed actions and procedures specified in the NMED-approved work plan. Other associated project-specific planning documents are discussed in this work plan and provided as appendices.

ES.3.1 SWMU 16: Functional Test Range (FTR) 2/3

FTR 2 and 3 (FTR 2/3) are two adjacent ranges encompassing approximately 555 acres located in the northeast corner of FWDA. FTR 2/3 was used to test various munitions and explosives that were associated with past munitions maintenance, renovation, and demilitarization operations at FWDA. Contamination from these activities is most likely to be found near the firing areas and in the impact area. In addition, at various times in the history of the base, areas within SWMU 16 were used as outside storage areas for munitions and materials handling. Previous investigations also identified three geophysical anomalies within SWMU 16. The proposed data gathering activities in SWMU 16 are summarized in Table ES 1.

Table ES-1. Summary of Data Gathering Activities for SWMU 16

Area	Investigation	Sample Analysis
FTR 2/3 Range Use Areas	Twenty five multi-incremental samples in the suspected range impact areas (Samples FTR23-1, -2, and -3 are located on the surface area of the trench within the 300 yard buffer zone of the firing range).	Explosives, RCRA 8 Metals, and Perchlorate
	Twenty four discrete samples in the suspected range impact areas (FTR23-19 analyzed for explosives only).	Semi-volatile organic compounds (SVOC)
FTR 2/3 Outside Materials Storage and Use Areas (X and Z open storage areas)	One hundred twenty multi-incremental samples in the 15 areas used for materials storage and handling.	Explosives and RCRA 8 Metals
SWMU 16 Geophysical Anomalies	Six investigation trench pits will be excavated to three depths and a discrete sample taken from each depth for a total of 18 samples.	Explosives, Semi-volatile analysis, Perchlorate, and RCRA 8 Metals.

ES.3.2 AOC 41: Area K Igloo Block

AOC 41 is an area of approximate 276 acres containing 27 earth-covered concrete munitions storage igloos with concrete or hard packed drive ways. AOC 41 also contains 24 open bermed revetment areas between the igloos. These revetments were used for high demand open storage when covered space inside the igloos was not available. The proposed data gathering activities necessary to characterize potential contamination in AOC 41 are summarized in Table ES-2.

Table ES-2. Summary of Data Gathering Activities for AOC 41

Area	Investigation	Sample Analysis
27 Igloo munitions storage magazines	Fifty-four discrete soil samples collected at igloo drain outlets. Each of the 27 igloos has two drains.	Explosives and RCRA 8 Metals
	Twenty-seven multi-incremental samples collected in the drainage areas of each igloo	Explosives and RCRA 8 Metals
24 revetments	Twenty-four multi-incremental samples collected from the interior bottom of each revetment.	Explosives and RCRA 8 Metals

ES.3.3 World War I Magazine Sites

During and after World War I, up to 28 magazines within Parcel 16 were used to store explosives. These magazines are dispersed in both SWMU 16 and AOC 41. Two magazines are within Parcel 16 but not in AOC 41 or SWMU 16; these sites were previously sampled in 2007. The proposed data gathering activities necessary to characterize potential contamination in the remaining 26 World War I magazine sites are summarized in Table ES-3.

Table ES-3. Summary of WWI Open Storage Areas Investigation

Area	Investigation	Sample Analysis
WWI magazine sites	Twenty-six multi-incremental samples collected from the assumed structure foot print.	Explosives

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1.0 INTRODUCTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan summarizes previous investigations and describes additional investigation activities to be completed at Solid Waste Management Unit (SWMU) 16 and Area of Concern (AOC) 41 within Parcel 16 at Fort Wingate Depot Activity (FWDA), New Mexico. The location of FWDA is shown on Figure 1-1. Major land use areas and parcels within FWDA are shown on Figure 1-2. Parcel 16 contains one SWMU and one AOC, SWMU 16 and AOC 41, as shown on Figure 1-3.

A companion to this document, the Summary Report of Historical Information (SRHI) for Parcel 16, was prepared to compile and summarize historical documents available for SWMU 16 and AOC 41 (USACE, 2010). The SRHI provides further detail regarding the operational history, site or facility drawings, and environmental information contained in previously completed reports for SWMU 16 and AOC 41.

1.1 Purpose and Scope

This RFI Work Plan has been prepared for submission to the New Mexico Environment Department–Hazardous Waste Bureau (NMED-HWB), as required by Section VII.H.1.a of the RCRA Permit (NM 6213820974) for FWDA, which became effective December 31, 2005.

This RFI Work Plan was prepared by Toeroek Associates, Inc. (Toeroek) and pH7 Logistics and Support (pH7) in partial fulfillment of the requirements of Contract Number W9126G-10-C-0088. The Contracting Officer's Representative (COR) and technical oversight responsibilities for the tasks described in this document were provided by the U.S. Army Corps of Engineers (USACE), Fort Worth District.

1.2 Document Organization

The remainder of this RFI Work Plan is organized into the following sections:

- Section 2 – Describes the cultural resources within Parcel 16.
- Section 3 – Presents background information for the FWDA and Parcel16 including operational histories and site conditions.
- Section 4 – Describes the proposed investigation methods.
- Section 5 – Presents information for SWMU 16 including the site background, previous investigations, investigation methods, and field activities.
- Section 6 – Presents information for AOC 41 including the site background, previous investigations, investigation methods, and the release assessment.
- Section 7 – Presents information for World War I Storage Areas, including previous investigations, investigation methods, and the release assessment.
- Section 8 – Provides the project management summary.
- Section 9—References – Presents works cited within this report.

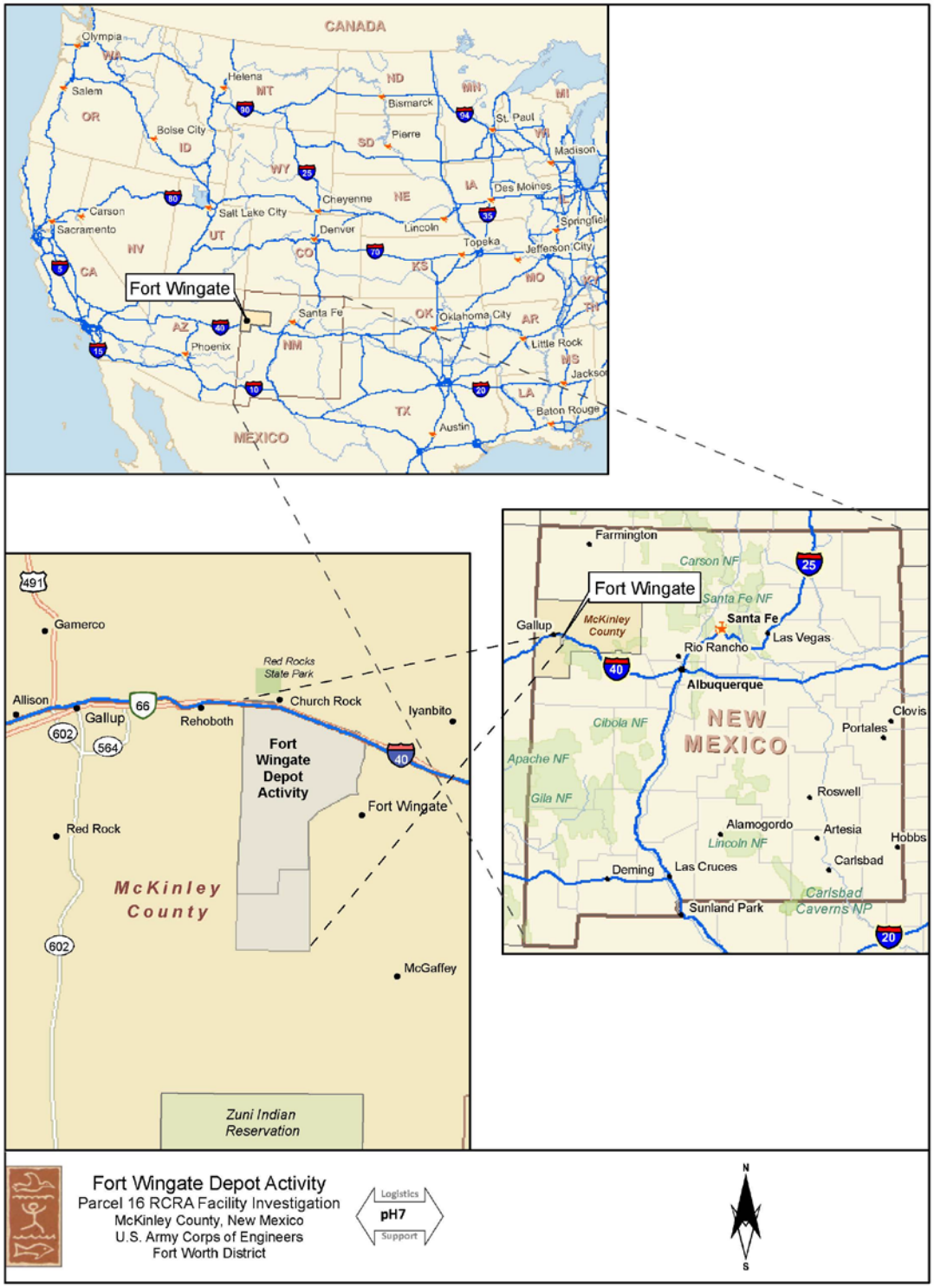

Figure 1-1. Fort Wingate Regional Map

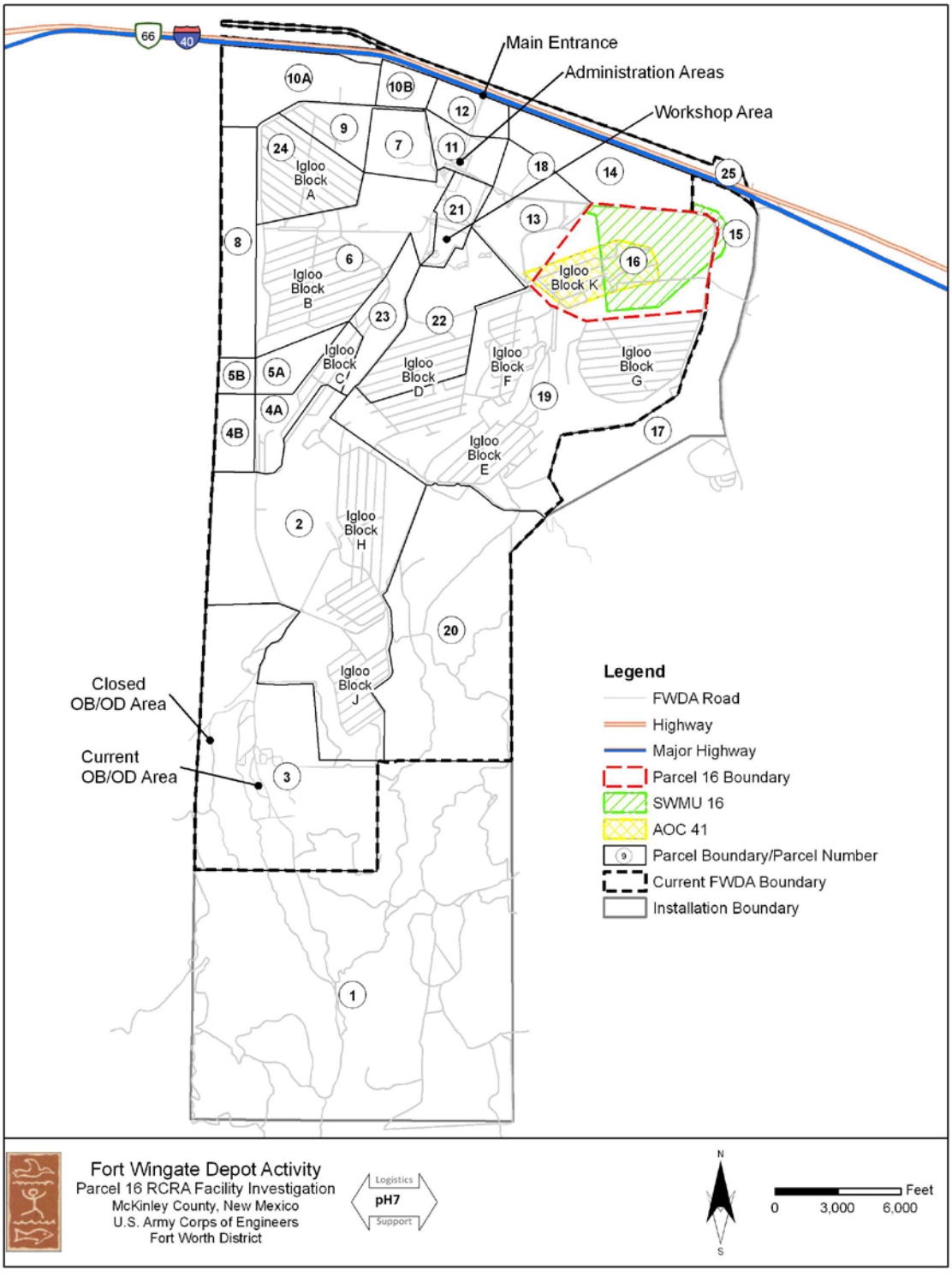

Figure 1-2. Fort Wingate Major Land Use Map

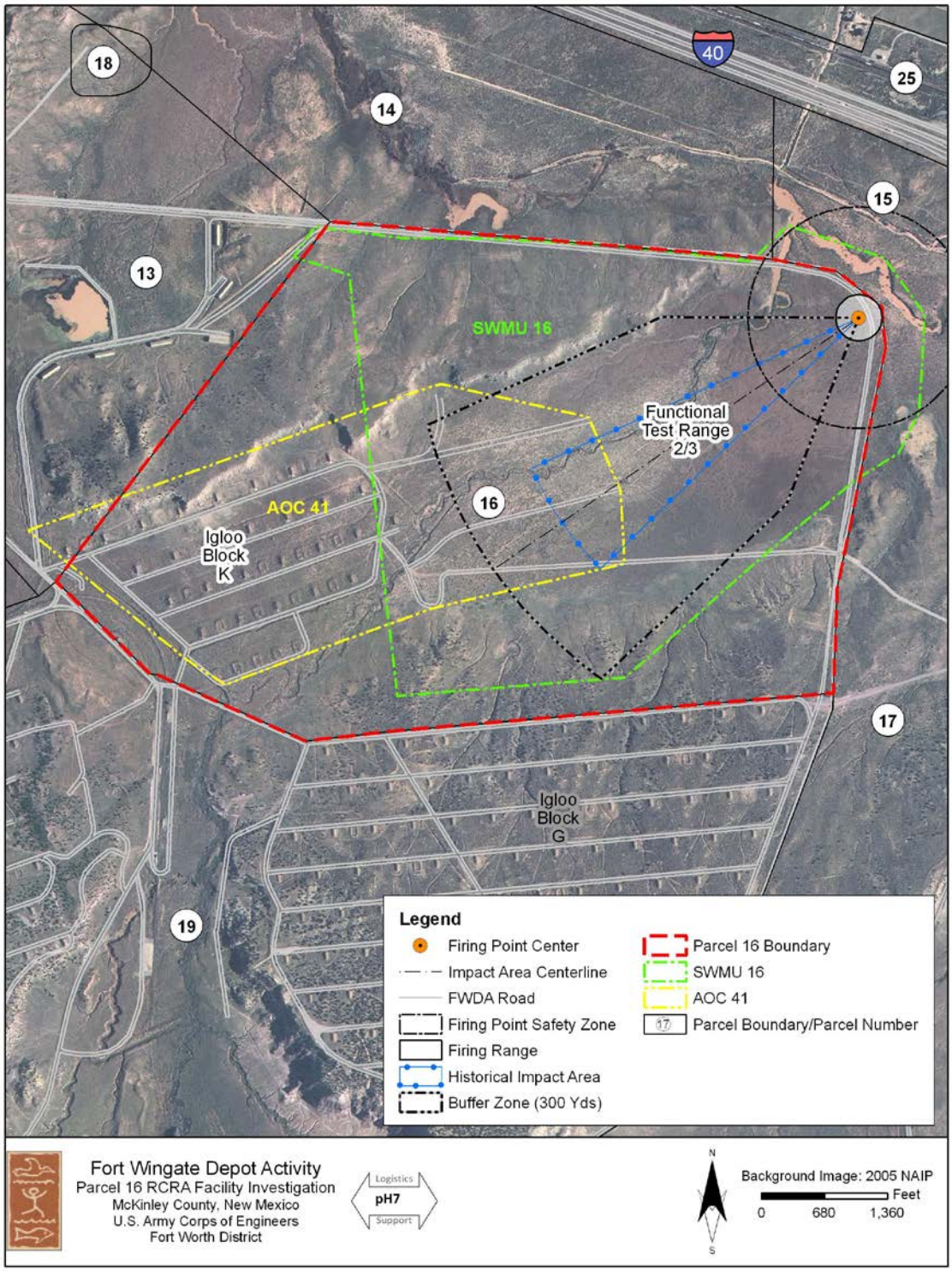

Figure 1-3. Parcel 16 Map Showing Locations of SWMU 16 and AOC 41

2.0 CULTURAL RESOURCES

Traditional cultural properties (TCPs) and other cultural resources have been documented within the FWDA boundaries. Based on a review of available mapping provided by USACE, it appears that there are a limited number of identified sites within Parcel 16.

The USACE, Fort Worth District has developed a Programmatic Agreement (PA) to specify procedures to be employed during environmental characterization and remediation activities. The PA is provided as Appendix A.

In order to protect the integrity of TCPs and other cultural resources, maps showing their locations relative to proposed investigation locations will not be included in this Work Plan, which will be a public document when final. Investigation and intrusive sampling will be adjusted to avoid identified TCPs. If needed, tribal cultural resource personnel will be contacted to walk each proposed investigation location prior to the initiation of intrusive activities.

The Army will provide a letter to the Pueblo of Zuni, Navajo Nation, and State Historic Preservation Officer seeking comments on field operating procedures pursuant to the PA prior to commencement of fieldwork.

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3.0 FORT WINGATE INTRODUCTION

FWDA is located in McKinley County in northwestern New Mexico, approximately 130 miles west of Albuquerque on Interstate 40 and approximately 30 miles from the New Mexico - Arizona border (Figure 1-1). FWDA is almost entirely surrounded by federally owned or administered lands including both national forest and tribal lands. The town of Fort Wingate, located immediately to the east of FWDA on Native American land, was the original fort headquarters site. To the south and southeast is the largely undeveloped Cibola National Forest. The land to the west is in checkerboard ownership, with management responsibilities divided between the Bureau of Land Management (BLM), Bureau of Indian Affairs (Navajo tribal trust land), Navajo tribe (fee lands), and individual Native American allottees. Most of this land is undeveloped, except for the Sundance subdivision and coal mine, and Rehoboth Mission, which are located approximately 0.5 and 1.5 miles west of FWDA, respectively. The corporate limit of Gallup is located approximately eight miles west of FWDA.

3.1 Background

FWDA is a closed U.S. Army depot whose former mission was to receive, store, maintain, and ship assigned materials (primarily explosives and military munitions), and to dispose of obsolete or deteriorated explosives and military munitions.

3.1.1 Site History and Description

From 1975 to January 2008, the installation has been under the administrative command of the Tooele Army Depot (TEAD), located near Salt Lake City, Utah. The active mission of FWDA ceased and the installation closed in January 1993, as a result of the Defense Authorization Amendments and Base Realignment and Closure (BRAC) Act of 1988. In 2002, the Army reassigned many functions at FWDA to the BRAC Division (BRACD), including property disposal, caretaker duties, management of caretaker staff, and performance of environmental restoration and compliance activities. TEAD retained command and control responsibilities, and continued to provide support services to FWDA until January 31, 2008. On January 31, 2008, command and control and support functions were transferred to White Sands Missile Range (WSMR).

FWDA operations ended with the closure of FWDA in January 1993. FWDA has been undergoing final environmental restoration prior to property transfer/reuse. As part of the planned property transfer to the Department of the Interior (DOI), the installation has been divided into reuse parcels (Figure 1-2). Parcels transferred to date consist of Parcels 1, 15, and 17. This RFI Work Plan only includes information related to the SWMU and AOC located within Parcel 16. The areas identified in the Permit are SWMU 16 and AOC 41 Area K-Block Igloos.

The RCRA Permit lists one SWMU and one AOC located within the boundary of Parcel 16, as shown in Figure 1-3. The sites included in this RFI Work Plan are:

- SWMU 16: Functional Test Range 2/3
- AOC 41: Area K-Block, Igloos

The future land use for Parcel 16, FTR 2/3 and Igloo Block K is Mixed Commercial / Institutional / Office (DOI, 2005).

Specific operations and investigations conducted within Parcel 16 are discussed in Sections 5 through 7.

3.1.2 General Description

FWDA currently occupies approximately 24 square miles (approximately 15,277 acres) of land in northwestern New Mexico, in McKinley County. FWDA contains facilities formerly used to operate a reserve storage activity providing for the care, preservation, and minor maintenance of assigned commodities, primarily conventional military munitions. The installation mission included the disassembly and demilitarization of unserviceable and obsolete military munitions. Ammunition maintenance facilities existed for the clipping, linking, and repackaging of small arms ammunition.

The installation can be divided into several areas based upon location and historical land use. These major land-use areas include:

- The Administration Area - located in the northern portion of the installation and encompassing approximately 800 acres; contains former office facilities, housing, equipment maintenance facilities, warehouse buildings, and utility support facilities;
- The Workshop Area - located south of the Administration Area and encompassing approximately 700 acres; consisting of an industrial area containing former ammunition maintenance and renovation facilities, the former trinitrotoluene (TNT) washout facility, and the TNT Leaching Beds Area;
- The Magazine (Igloo) Area - covering approximately 7,400 acres in the central portion of the installation and encompassing ten Igloo Blocks (A through H, J and K) consisting of 732 earth-covered igloos and 241 earthen revetments previously used for storage of munitions;
- Protection and Buffer Areas - encompassing approximately 4,050 acres consisting of buffer zones surrounding the former magazine and demolition areas; these areas are located adjacent to the eastern, northern, and western boundaries of the installation;
- The Open Burning/Open Detonation (OB/OD) Area - located within the west central portion of the installation and encompassing approximately 1,800 acres; the OB/OD Area can be separated into two subareas based on period of operation: the Closed OB/OD Area and the Current OB/OD Area. The OB/OD Unit Hazardous Waste Management Unit (HWMU) is an area within the Current OB/OD Area;

- The Functional Test Range Areas – Fort Wingate has two FTR Areas, FTR 1 is approximately 345 acres in the east-central portion of FWDA in Parcel 20, and FTR 2/3 is located in Parcel 16. FTR 2/3 encompasses approximately 600 acres in the northeast corner of Fort Wingate and includes two range areas adjacent to one another.

3.1.3 Parcel 16 Operations Overview

Parcel 16 contains SWMU 16 (FTR 2/3) and AOC 41 (Area K-Block igloos). FTR 2/3 was used to test various munitions and explosives that were associated with past munitions maintenance, renovation, and demilitarization operations at FWDA. It is reported that FTR 2 was used in the 1960s to test munitions that included 3.5-inch rockets and 4.2-inch mortars. During that same time FTR 3 was used to test high explosives. AOC 41 K-Block igloos and revetments were used to store munitions such as land mines, 155-millimeter (mm) and 8-inch shells (USATHAMA, 1980). There is no record of biological or radiological materials being stored or used at FWDA, however mustard shells were reported stored at FWDA from 1942 to 1949. There is no record that indicates these munitions were stored at AOC 41 (ERM PMC, 1997).

3.2 Site Conditions

3.2.1 Climate

Northwestern New Mexico is characterized by a semiarid continental climate. Most precipitation occurs from May through October as localized and brief summer storms. Spring and fall droughts characterize the area.

Mean annual rainfall for the area ranges between 10 and 16 inches, while the recorded average annual precipitation for FWDA is 11 inches. Depending on local elevations, mean annual rainfall fluctuates between 8 and 20 inches. Most of the precipitation occurs as rain or hail in summer thunderstorms, and the remainder results from light winter snow accumulations (M&E, 1992).

The average seasonal temperatures for the area vary with elevation and topographic features. During winter, daily temperatures fluctuate as much as 50 to 70 degrees Fahrenheit (°F) in a 24-hour period. In summer, daily high temperatures are between 85°F and 95°F (M&E, 1992). Average temperatures in winter are about 27°F and in summer 70°F, while extreme temperatures are as low as -30°F in winter and as high as 100°F in summer. There are 100 to 150 frost-free days during the year from the middle of May to the middle of October (M&E, 1992).

The area has generally sunny weather, with the sun shining more than 3000 hours annually. Average relative humidity varies from 50 to 15 percent, during the wet season (fall) and the dry season (spring), respectively (M&E, 1992). During spring, the area experiences strong winds from the west and southwest, with an average wind speed of 12 miles per hour. Strong wind, high temperature, and low relative humidity in the area contribute to high evaporation rates (M&E, 1992).

3.2.2 Topography

Topography in and around Parcel 16 is shown in Figure 3-1. Topographically, FWDA includes the rugged north-to-south trending Hogback along the western and the southwestern FWDA

boundaries, the northern hill slopes of the Zuni Mountain Range in the southern portion of FWDA, and the alluvial plains marked by bedrock remnants in the northern portion of FWDA.

The Hogback area is formed by interbedded Mesozoic sedimentary rocks dipping sharply to the west and is dissected by northeastern-trending intermittent streams. During rainfall and snowmelt events, streams transport sediment to low-lying areas in the northern part of the installation, creating an extensive alluvial deposit among remnants of bedrock. The streams eventually discharge to the South Fork of the Puerco River near the northern boundary of FWDA.

The elevation of FWDA ranges from approximately 8,200 feet above mean sea level (MSL) in the south to 6,660 feet above MSL in the north. Main drainages, following the topography, flow from south to north and discharge to the South Fork of the Puerco River. However, many tributaries follow the regional trend, flowing from southwest to northeast. Because of the nature of precipitation in this semi-arid region, the surface drainage is relatively shallow near headwaters. Downward erosion intensifies as the stream moves downstream, resulting in a system of well-developed steep-walled arroyos. Arroyos form because of the erodibility of localized areas of silt- and clay-rich bedrock.

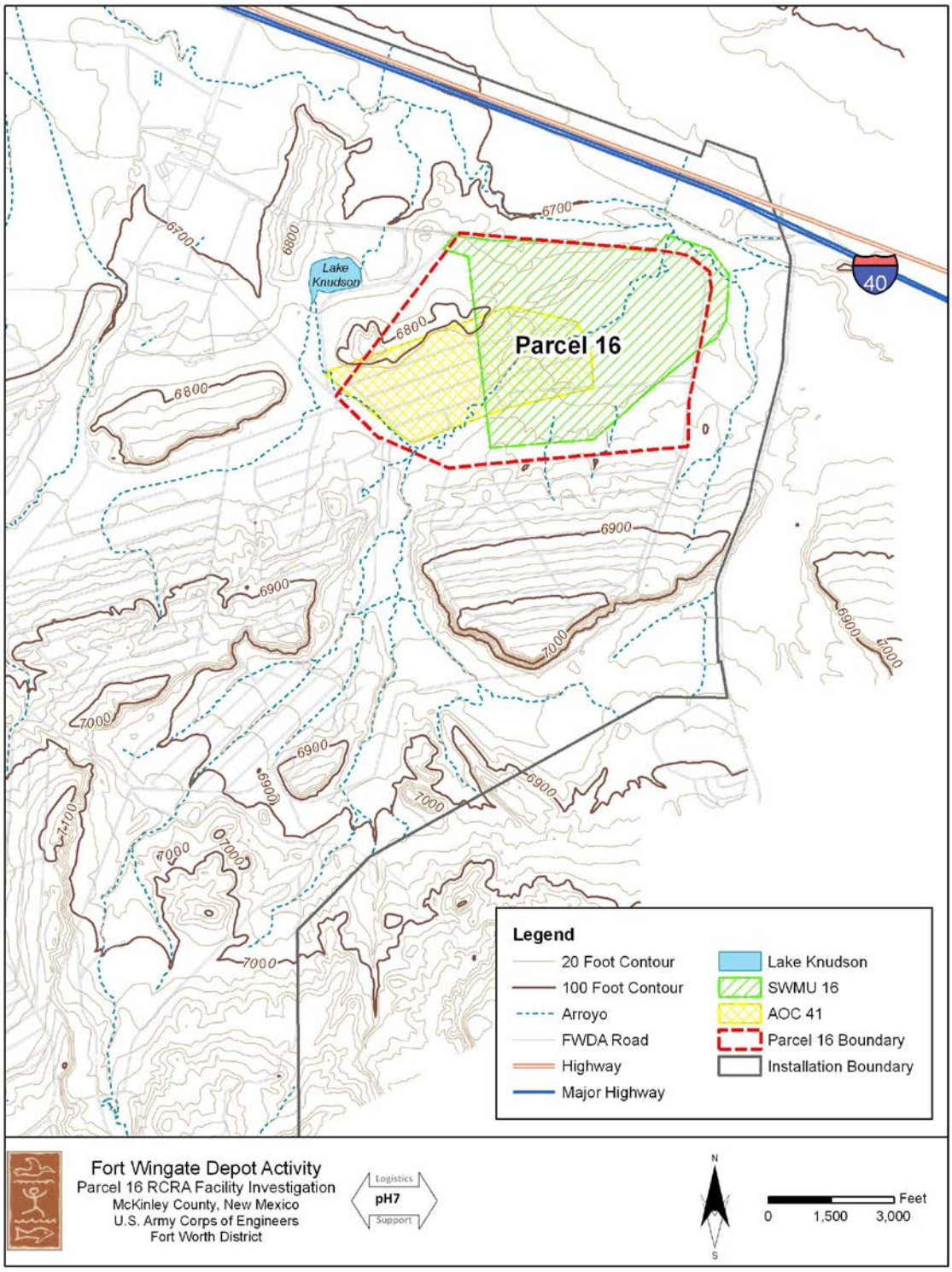

Figure 3-1. Topography and Watershed Map of Parcel 16

3.2.3 Vegetation/Habitat

The vegetation cover types for Parcel 16 include moderate sagebrush and intermittent grass lands, with drainage to the northeast through an arroyo. Parcel 16 provides habitat for antelope, coyotes, prairie dogs, rattlesnakes, field mice, various other insects and animals, and occasionally mountain lions and bear.

3.2.4 Soils

The soils found on the installation are similar to those occurring in cool plateau and mountain regions of New Mexico. The major soil types at FWDA are variants/complexes of sands, loams, clays, and rocks. These soils are relatively thin, and the parent bedrock is either at or near the surface in more than a quarter of the installation.

United States Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) soils mapping for Parcel 16 is shown in Figure 3-2. The primary soil type in most of the central FTR is Rehobeth silty clay loam (1 to 10 percent slopes), with the Evpark-Arabrab complex (2 to 6 percent slopes) to the south, areas of Rizno-Tekapo Rock outcrop complex to the northwest (8 to 35 percent slopes), and Celavar-Atarque complex (1 to 8 percent slopes) on the northwestern edge of the FTR.

3.2.5 Geology

The site can be geologically divided into two parts: an alluvial plain created by the South Fork of the Puerco River in the north and a drainage basin between two bedrock ridges in the south. The northern area is primarily composed of alluvial deposits of a combination of clay, silt, sand, and gravel underlain by the Chinle Group of Triassic age. The alluvial thickness increases from a veneer near the bedrock ridge in the south to approximately ten feet toward the channel of the South Fork of the Puerco River in the north. Many washes have developed on the alluvium; they remain dry most of the year (USATHMA, 1990). Groundwater may be present near the channel of the Puerco River, especially during rainstorms or snowstorms.

Figure 3-3 shows the geological formations in the FTR area and the Parcel 16 boundaries. The majority of Parcel 16 is alluvial deposits, flanked to the north and south by areas of Petrified Forest Formation, Painted Desert Members.

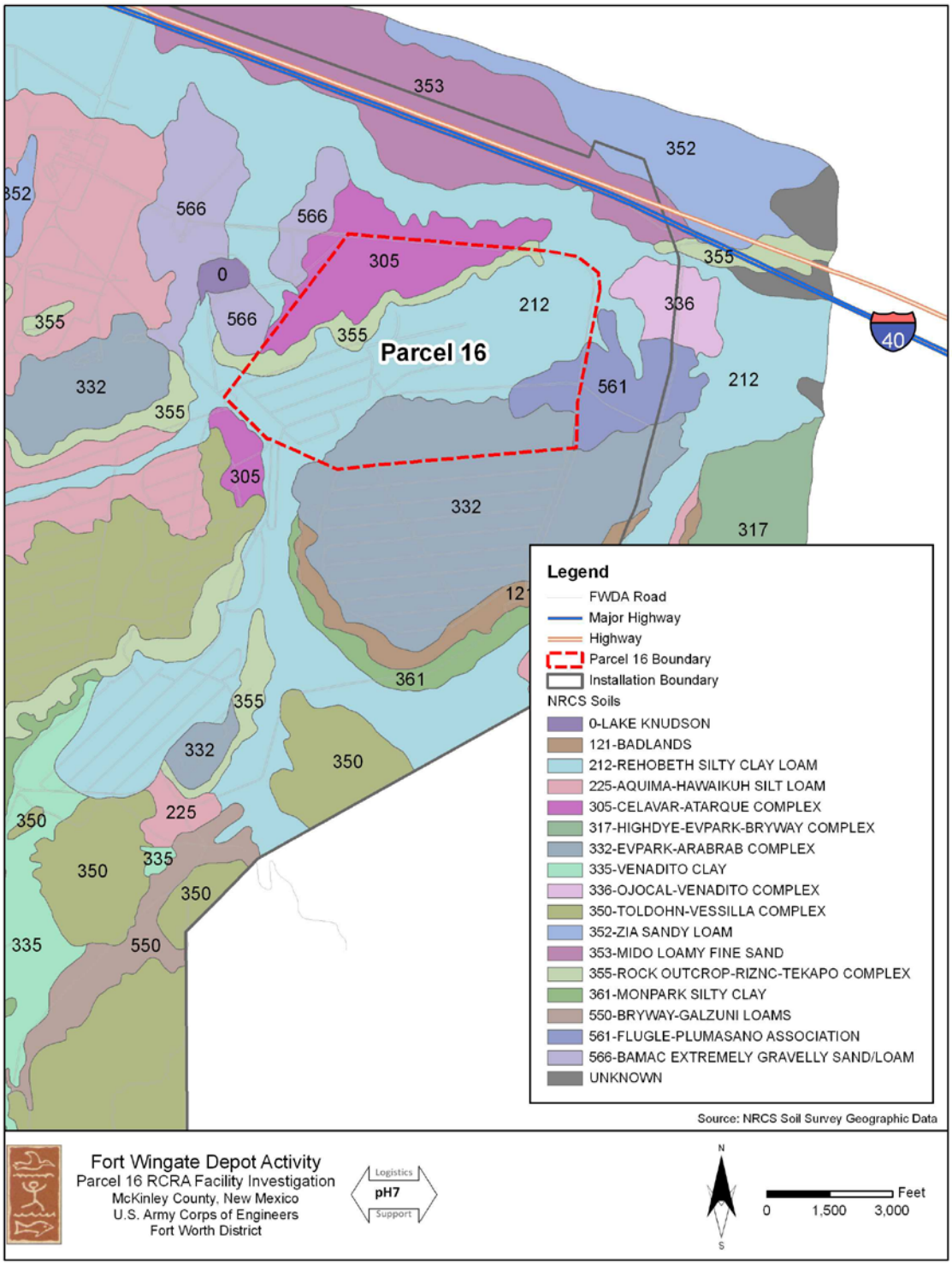

Figure 3-2. Natural Resource Conservation Service Soil Map for Parcel 16

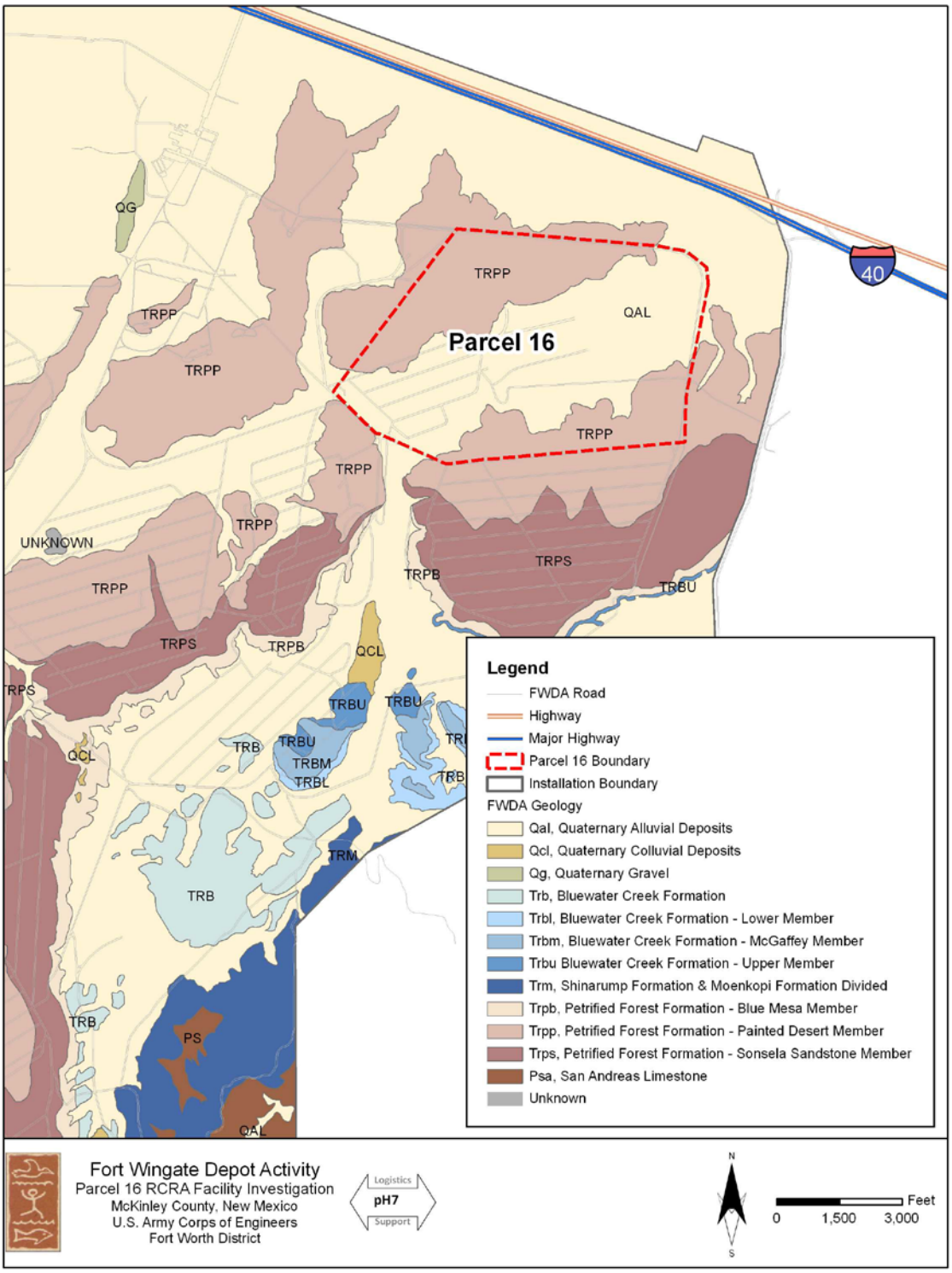

Figure 3-3. Geological Formation Map for Parcel 16

3.3 Environmental Investigation and Restoration Activities

The environmental restoration process at FWDA had been underway for 25 years prior to Permit issuance. With the exception of the OB/OD Area, environmental restoration activities at FWDA began in 1980 under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines, with the U.S. Environmental Protection Agency (USEPA) Region 6 as the lead regulatory agency.

In 1996, the USEPA authorized the State of New Mexico for RCRA corrective action. Since that time, NMED has become the lead regulatory agency, and the pathway for environmental restoration has been evolving for a number of years. In 2002, NMED determined that the pathway would be a RCRA permit for post-closure care of the OB/OD Area, with a RCRA corrective action module attached to address requirements for other sites. The Permit (NM 6213820974) was finalized in December 2005 and became effective 31 December 2005 (NMED, 2005).

3.3.1 Previous Investigations

FTR Area. The FTR 2/3 area is the most heavily reported upon area in Parcel 16. The location of the area is consistent through the documented history. Early documents represent FTR 2 as a smaller area near the North Boundary road, but the 1990 Master Environmental Plan joins the two ranges that are now called FTR 2/3. The literature and documents remain consistent that the use of the ranges has been to test explosives, 3.5-inch rockets and 4.2-inch mortars. FTR 2/3 has three areas based on use: (1) the northeastern-most end of the FTR, which has historically been designated as the "firing point" for the ranges; (2) the cone-shaped impact area where shells and rounds were most likely to land; and (3) a surrounding buffer zone where off-target munitions could land. The results of previous investigations, data gaps and data gap remedies are in Section 5.

Area K-Block Igloos. The K-Block igloos are mentioned in each of the historic reports as being part of the munitions storage area. Area K-Block consists of 27 concrete earth-covered munitions storage magazine igloos and 24 bermed uncovered revetment areas used for temporary storage of munitions. Area K-Block igloos were used to store mines, 155-mm and 8-inch high explosive projectiles. There is no record of K-Block igloos being used to manufacture, store, or use chemical, biological, or radiological agents. The results of previous investigations, data gaps and data gap remedies are in Section 6.

Other Use Areas: World War I (WWI) Magazine Sites. Other than pre-World War II aerial photographs and historic drawings, no information was found in the historic records about the WWI Magazine sites. The results of previous investigations, data gaps and data gap remedies are in Section 7.

Previous environmental and unexploded ordnance investigations activities have been described in the companion SRHI for Parcel 16, submitted as a separate document. The results of that SRHI are incorporated into the Work Plan discussion for the SWMU and AOC.

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4.0 INVESTIGATION METHODS

4.1 Previous Investigations

The environmental restoration process has been underway for more than 30 years at the FWDA. In 1980, the CERCLA began to guide the environmental restoration activities other than those in the OB/OD Area, with the USEPA Region 6 as the lead regulatory agency. In 1996 the NMED was granted regulatory authority under RCRA and they became the lead regulatory agency at the site. Activities are currently performed under the RCRA Permit issued in 2005.

SWMU 16 and AOC 41 constitute the relevant sites listed in the RCRA Permit for Parcel 16. Available historical information from prior investigations at these sites has been compiled and summarized in a SRHI, which serves as a companion to this RFI Work Plan. The SRHI provides a listing of site surveys, data compilation efforts, operational history, site or facility drawings, and environmental investigations contained in previously completed reports which are pertinent to the Parcel 16 sites. The SRHI also provides a brief summary of findings and conclusions from the relevant historical investigation efforts. Additionally, summaries of prior environmental investigations pertinent to the Parcel 16 sites are provided in the individual sections of this RFI Work Plan.

4.2 Evaluation of Existing Data

Existing data have been evaluated to determine whether additional field activities are required to characterize the nature and extent of potential environmental impacts at the SWMU and AOC located within Parcel 16. The following sections present a brief discussion of the general types of existing data available for Parcel 16. Existing data for the individual SWMU and AOC sites within Parcel 16 are evaluated further as part of site-specific sections of this document.

4.2.1 Nonsampling Data

Nonsampling data available for Parcel 16 include facility drawings, maps, photographs, aerial imagery, historical documents, and interviews. Specific nonsampling data available for the individual SWMU and AOC sites will be discussed further in the site-specific sections of this document.

4.2.2 Sampling Data

Sampling data available for Parcel 16 include surface soil, sediment, and wipe samples collected and analyzed during prior investigations. Specific sampling data available for SWMU 16 and AOC 41 are evaluated in the site-specific sections of this document. As part of this RFI Work Plan, available soil analytical data have been compared to the most recent version of the NMED Residential Soil Screening Levels (SSL, December 2009) and the EPA Residential Screening Levels (RSL, November 2010).

This investigation will use the results from the *Soil Background Study and Data Evaluation Report (Version 2)*, dated October 2010, by Shaw. The report was approved by NMED on November 23, 2010. This document was prepared using the NMED SSLs dated December 2009 and EPA RSLs dated November 2010. For this RFI Work Plan, all positively detected inorganic constituents were included in the screening assessments.

4.3 Data Quality Objectives

The process used for development of the data quality objectives (DQOs) for additional characterization and/or remediation activities in Parcel 16 is as follows:

1. Statement of Problem

Determine the impacts of historic use of the Parcel 16 area. The problem at SWMU 16 is to determine the presence or absence of RCRA 8 metals, semi volatile organic compounds (SVOCs), perchlorate, and explosives which are the contaminants of potential concern (COPCs) identified for the ranges. Also in SWMU 16, determine the presence or absence of explosives and RCRA 8 metals at SWMU 16 open storage areas as these are the COPCs identified for the storage areas. If present, delineate the horizontal and/or vertical extent and magnitude of the contaminants. The problem at AOC 41 and the WWI magazine sites is to determine the presence or absence of RCRA 8 metals and explosives which are the COPCs identified for the igloos and revetments, and the presence of explosives as a COPC at the WWI magazine sites. If present, delineate the horizontal and/or vertical extent and magnitude of the contaminants.

2. Identification of a Decision that Addresses the Problem

The presence or absence and horizontal and vertical extent of contamination in the soils at Parcel 16 can be determined by collecting and analyzing surface and subsurface soil samples and evaluating whether or not the sample results are indicative of the presence of contamination. Groundwater will not be investigated unless the vertical extent of soil contamination at an individual site is sufficient to suspect migration of contaminants to groundwater by transport through the vadose zone.

3. Identification of Inputs that Affect the Decision

Inputs that will affect the decision of whether or not soil samples from the site are contaminated include the validated analytical results for collected soil samples, the December 2009 NMED Residential SSL, and the November 2010 EPA RSL.

4. Specification of the Domain of the Decision

The domain of the decision of whether or not soils at the site have been negatively impacted is restricted to evaluation of only those parameters for which samples are analyzed and for which a screening level has been defined (that is, NMED SSL or EPA RSL).

5. Development of a Logic Statement

If the validated analytical data for samples collected during this RFI exceed NMED Residential SSL and/or EPA RSL, the area from which the sample was collected will be considered contaminated. Additional horizontal and/or vertical delineation may then be required until uncontaminated samples are encountered.

6. Establishment of Constraints on Uncertainty

Uncertainty in the data used to evaluate the logic statement will be constrained by following the quality assurance and quality control (QA/QC) guidelines specified in the Quality Assurance Project Plan (QAPP) (Appendix B); selecting the appropriate analytical support level for the soil sample

data; and by adhering to both the field and laboratory data quality indicator objectives (precision, accuracy, representativeness, comparability, and completeness [PARCC]). Under this project, all reasonable attempts will be made to ensure laboratory reporting limits and/or method detection limits are below the SSLs and RSLs. This may be difficult, however, for a few of the exotic semivolatile compounds.

7. Optimization of Design for Obtaining Data

To optimize the quality of data collected for evaluation, this RFI Work Plan has been developed to be used as guidance during field activities.

Quality assurance and quality control procedures associated with the field activities described in this document are presented in the QAPP (Appendix B).

4.4 Planned Investigations

This RFI Work Plan describes additional field activities to be conducted in Parcel 16 to further delineate the nature and extent of environmental releases within Parcel 16 that are listed in Section 4.3 Statement of Problem. Cultural resources oversight, specific sampling methods and procedures, management of investigation-derived waste (IDW), decontamination of equipment, and health and safety procedures are presented in the following sections and in specified appendices to this document.

4.4.1 Cultural Resources Oversight

Traditional cultural properties (TCPs) and other cultural resources have been documented within the FWDA boundaries. The USACE, Fort Worth District has developed a PA to specify procedures to be employed during environmental characterization and remediation activities. A copy of the PA is provided in Appendix A.

In order to protect the integrity of TCPs and other cultural resources, maps showing their locations relative to proposed investigation locations are not included in this Work Plan, which will be a public document when final. Sampling locations will be adjusted to not impede upon TCPs. The Army will provide a letter to the Pueblo of Zuni, Navajo Nation, and State Historic Preservation Officer seeking comments on field operating procedures pursuant to the PA prior to commencement of fieldwork.

4.4.2 Health and Safety

The project-specific Health and Safety Plan (HSP) is being prepared for Parcel 16 and will be delivered to the USACE prior to field sampling activities and will be included with the Field Sampling Plan.

4.4.3 Soil Investigations

Soil sampling is proposed in Parcel 16 as described in Sections 5, 6, and 7. Basic soil sampling procedures are described in Sections 4.4.4 and 4.4.5. Sample locations will be surveyed as described in Section 4.4.6. Sample identification, management, and field documentation will be conducted as described in the Sections 4.4.7 and 4.4.8. Decontamination of non-disposable

sampling equipment and drilling equipment will be conducted as described in Section 4.4.9. Any IDW generated during the investigation will be managed as described in Section 4.4.10.

4.4.4 Discrete Soil Sampling

Discrete soil sampling will be conducted to delineate the nature and extent of COPCs in Parcel 16. Specific sampling activities are described in Sections 5 through 7. The samples will be collected using either a new or decontaminated sampling tool as required by the analytical method.

- The samples will be placed into new, laboratory provided sample containers. Each sample container will be labeled and the information will include; site name and building number, sample number, date, time of sample and analysis.
- The sample information will be recorded on the field sample collection form,
- The sample information recorded on the Chain of Custody (COC); and
- The sample container will be placed in a zip lock bag, sealed and placed on ice until prepared for shipping to the laboratory.
- The samples will then be packaged under chain-of-custody for shipment to the laboratory for analysis.

Sample collection volumes, bottle requirements, preservation, and holding times are described in the project QAPP (Appendix B).

4.4.5 Multi-Incremental Soil Sampling

Multi-incremental (MI) soil sampling will be conducted to delineate the nature and extent of COPCs in Parcel 16. Specific sampling activities are described in Sections 5 through 7. All MI samples collected in Parcel 16 will consist of the volume of one 7/8-inch diameter slotted push probe collected at each increment within a DU. Specific sample collection volumes, bottle requirements, preservation, and holding times are described in the project QAPP (Appendix B).

4.4.6 Survey of Points

All discrete soil sample locations will be marked with a survey stake and flagged when sampling is complete. Following the field sampling program a global positioning system (GPS) data point will be taken of all discrete sample locations with a hand held Trimble with an accuracy of 1 foot, which is the Ft. Wingate standard. The corners of each MI decision unit (DU) will also be recorded using the GPS. Horizontal coordinates for all sample locations will be referenced to the New Mexico State Planar grid and Universal Transverse Mercator (UTM) coordinates.

4.4.7 Sample Identification, Chain-of-Custody, Packaging, and Shipping Procedures

4.4.7.1 Sample Identification

The sample identification will consist of a combination of the Parcel number, SWMU or AOC number, source of sample, sequential number, type of sample, and depth of sample collection, in accordance with the latest conventions for FWDA Environmental Information Management Plan (USACE, 2007). Additional description of the proposed sample nomenclature system is as follows:

Parcel:	16
SWMU or AOC:	16 or 41
Source of sample:	designator based on area such as FTR23
Sequential Number:	XX or XXX, sequence number as appropriate
Type of Sample:	SS (surface soil), EB (equipment blank), RIN (rinsate);
	M (multi-incremental), D (discrete);
	SO (soil)
Discrete Sample Depth:	1 (6-12 inches), 2 (2-3 feet), 3 (4-5 feet) etc., as appropriate depending on the COPCs at an individual site. Surface soil samples (0-6 inches) do not have a depth number.
MI Sample Depth:	Surface soil samples (0-6 inches) do not have a depth number. When two depths are sampled at less than one foot, the first depth is "A" and the second depth is "B".

QA/QC samples (as described in the QAPP) will carry the same sample nomenclature as the parent sample with a unique suffix and numeral (if required) to distinguish individual samples. Equipment rinsate blanks, trip blanks, and field blanks will carry the sample location identifier with an additional designation of TBXX or EBXX (where the XX representing the sequence number of the sample). Each blank will have a unique tracking number. Sections 5, 6, and 7 contain tables with specific sample numbers for each of the samples proposed. At the end of each sample detail table an explanation of the numbering system is provided for the samples in the table.

4.4.7.2 Chain-of-Custody

Chain-of-custody forms will be completed and will accompany each sample at all times. Data on the forms will include the sample number, date sampled, time sampled, project name, project number, and signatures of those in possession of the sample. Forms will accompany those samples shipped to the designated laboratory so that sample possession information can be maintained. The field team will retain a separate copy of the chain-of-custody reports at the field office. Additionally, the sample numbers, date and time collected, collection location, tracking number, and analysis will be documented in the field log book.

4.4.7.3 Packaging and Shipping Procedures

All samples will be shipped by overnight air freight to the laboratory. Unless otherwise indicated, samples will be treated as environmental samples, shipped in heavy-duty coolers, packed in materials to prevent breakage, and preserved with ice in sealed plastic bags. Each shipment will include the appropriate field QC samples (such as, trip blanks, duplicates, field blanks, and rinsate blanks). Corresponding chain-of-custody forms will be placed in waterproof bags and taped to the inside of the cooler's lids.

4.4.8 Field Documentation

Appropriate field documentation for all activities will be maintained as part of the formal project documentation. Field sampling documentation and data reporting will adhere to those procedures specified in the QAPP (Appendix B).

4.4.9 Decontamination Procedures

The decontamination of reusable sampling equipment and personnel will be performed to ensure chemical analyses reflect actual concentrations at sampling locations by maintaining the quality of samples and preventing cross-contamination. The standard equipment decontamination procedures to be used during completion of soil sampling activities are as follows:

All hand auger and push rods will be decontaminated between samples and sample locations.

A triple wash/rinse will be used to decontaminate this equipment. The auger bits and push rod will be washed using a bristle brush in potable water to which alconox or liquinox laboratory detergent has been added. All items will then be thoroughly rinsed twice with potable water and once with ASTM Type II deionized water, then allowed to air dry.

Decontamination will be performed on plastic sheeting near the sampling area. Once sampling is completed the decontamination water will be accumulated, transported to and put into the evaporation tank in the area where Building 542 was located. The plastic sheeting will be disposed of at FWDA-provided dumpster.

After decontamination, the equipment will be handled only by personnel wearing clean gloves. To prevent recontamination, the equipment will be moved away from the cleaning area, covered with plastic sheeting or wrapped in aluminum foil if it is not to be immediately used. The area where the equipment is stored prior to reuse must be free of contaminants.

4.4.10 Investigation-Derived Waste Disposal

Three types of IDW may be generated during the sampling of environmental media: residual soil volume from sampling probes, decontamination fluids, and disposable sampling equipment and personal protective equipment (PPE). These IDW categories will be managed as follows:

- Soil that remains after required sample volumes will be miniscule and placed back into the sampling hole after the samples are collected.
- Volumes of decontamination fluids are anticipated to be small and will be dumped into the evaporation tank in the area where Building 542 was located.
- PPE and plastic will be placed into the dumpster for disposal.

5.0 SWMU 16 – FUNCTIONAL TEST RANGE 2/3

5.1 Background

FTR 2 and 3 (FTR 2/3) were two adjacent ranges encompassing approximately 555 acres located in the northeast corner of FWDA, to the north of Igloo Block G and to the east of Igloo Block K (Figure 1-3). FTR 2/3 was used to test various munitions and explosives that were associated with past munitions maintenance, renovation, and demilitarization operations at FWDA. It is reported that FTR 2 was used in the 1960s to test munitions that included 3.5-inch rockets and 4.2-inch mortars. During that same time FTR 3 was used to test high explosives. These two ranges are located adjacent to each other and for investigation, sampling and analysis purposes are treated as one area.

5.1.1 Description

As shown in Figure 5-1 the FTRs have been depicted on historical figures with the firing point in the far northeast corner of FWDA near the intersection of the northern and eastern boundary roads; and the ranges are shown with a firing fan that extends to the southwest approximately 3900 feet, with a 900 foot buffer zone on three sides. The FTR 2/3 is depicted as ending near the Areas K and G igloo blocks. The SRHI revealed the FTR 2/3 use of this area has been varied; and can be divided into four investigation units; the firing point, range and impact area, range buffer area, and other use areas. The use of these areas was different and as such so are the potential impacts and the investigational approach.

5.1.2 Surface Soils

As shown in Figure 3-2 the primary soil type in most of the central FTR is Rehobeth silty clay loam (1 to 10 percent slopes), with the Evpark-Arabrab complex (2 to 6 percent slopes) to the south, the Rizno-Tekapo Rock outcrop complex to the northwest (8 to 35 percent slopes), and Celavar-Atarque complex (1 to 8 percent slopes) on the northwestern edge of the FTR.

5.1.3 Subsurface Geological Conditions

The FWDA site can be geologically divided into two parts: an alluvial plain created by the South Fork of the Puerco River in the north and a drainage basin between two bedrock ridges in the south. The northern area, which contains FTR 2/3, is primarily composed of alluvial deposits of a combination of clay, silt, sand, and gravel underlain by the Chinle Group of Triassic age.

Figure 3-3 shows the geological formations in the FTR area. The majority of this area, as previously stated is alluvial deposits, flanked to the north and south by areas of Petrified Forest Formation, Painted Desert Members.

5.2 Evaluation of Existing Data for SWMU 16

5.2.1 Environmental Assessment or Investigations and Unexploded Ordnance Survey or Clearance

Twelve environmental assessment or investigation reports were reviewed that were dated from January 1980 to March 2010. FTR 2/3 ranges were included in each of those documents, but only seven documents of the twelve provided specific information relevant to FTR 2/3. The only environmental samples collected as a result of the assessments and investigations in the FTR 2/3 were collected during the Site Wide Remedial Investigation/Feasibility Study (RI/FS) (ERM PMC, 1997) environmental investigation. Table 5-1 below contains a summary of the seven reports that specifically addressed FTR 2/3, the recommendations or findings and the status of those recommendations.

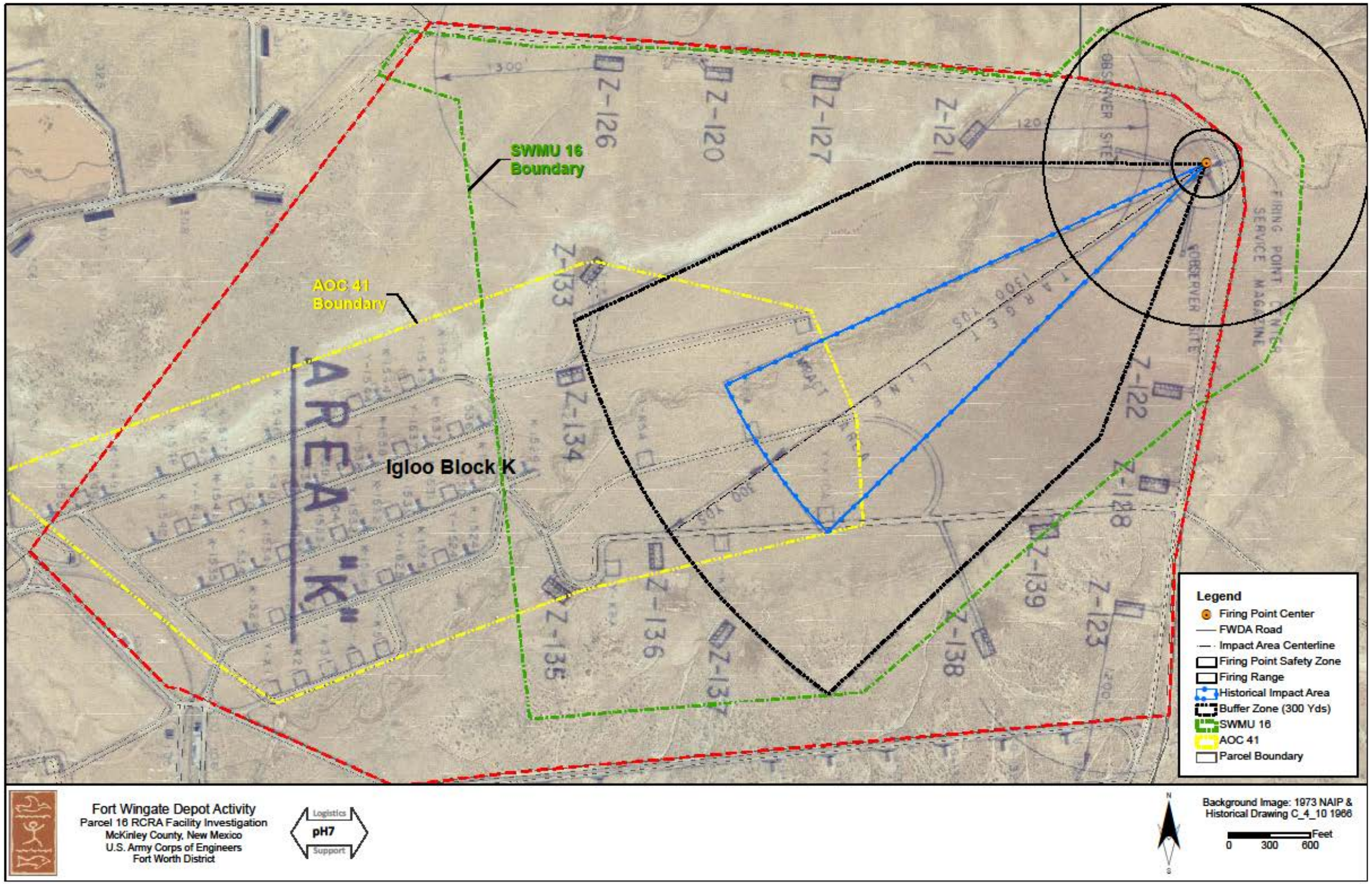

Figure 5-1. Historical Drawing Showing Location of FTR 2/3 in SWMU 16, Parcel 16

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Table 5-1. Historical Document Summary and Status

Document	Summary of Report	Recommendations/Conclusions	Status
*Fort Wingate Depot Activity, NM6213820974, Gallup, New Mexico. RCRA Facility Assessment Report,*1990	Review of historical use and historical reports of FTR.	All three FTR are potentially contaminated with unexploded ordnances (UXO). Locate and remove UXO.	Implemented - UXO surveys conducted 1994 and 1998
		Perform soil testing for explosives residues and heavy metals.	Implemented – RI/FS 1997, collected surface soil and sediment samples and analyzed for explosives and metals.
Master Environmental Plan: Fort Wingate Depot Activity, Gallup, New Mexico 1990	Review of historical use and historical documents of FTR, this report depicts the two ranges as one area.	FTR 2 & 3 - Visual reconnaissance survey to delineate boundaries of past activities.	Implemented
		FTR 2 & 3 - Using geophysical methods that are available, the Army should also conduct an ordnance reconnaissance to recover UXO.	Implemented – Aerial Geophysical survey, COE 2009. Geophysical findings are included in Section 5.2.3.
		FTR 2 - At least one sediment sample should be taken from each wash in the northern part of the site and five sediment samples from the drainage in the southern part of the site. The suggested depth of each sample is 1 ft. All samples should be analyzed for metals and explosives.	Implemented – RI/FS 1997, collected surface 5 sediment samples in the FTR arroyo and analyzed for explosives and metals.
		FTR 3 - Surficial soil samples should be collected in the craters created by past explosives testing. The locations of the craters can be identified from the 1962 aerial photograph.	Implemented – RI/FS 1997, collected 10 surface soil samples and analyzed for explosives and metals. The sampling locations appear to include the detonation area along with other suspected FTR use areas. Section 5.3 contains data gap analysis and recommendations.
		FTR 3 - Sampling of the drainage north of this site can be integrated with the sampling plan in Functional Test Range 2. The suggested depth of each sample is 1 ft. All samples should be analyzed for metals and explosives.	Implemented – RI/FS 1997, collected surface soil and sediment samples and analyzed for explosives and metals.

Table 5-1. Historical Document Summary and Status

Document	Summary of Report	Recommendations/Conclusions	Status
Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation /Feasibility Study & RCRA Corrective Action Program Document, 1997	FTR 2/3 - 10 surface soil samples collected and analyzed for explosives, nitrate/nitrite, and total phosphorus. - 4 sediments samples collected and analyzed for Target Compound List (*TCL) VOCS, TCL SVOCS, explosives, pesticides, TAL metals, nitrate/nitrite, and total phosphorus.*	None	No significant contamination detected.
Aerial Photographic Site Analysis, Fort Wingate Depot Activity, 2006	12 aerial photographs of FWDA; the photographs show the use of FWDA between from 1935 to 1997.	None, report presents aerial photograph analysis.	N/A
Final Report on Airborne Geophysical Survey at Fort Wingate Depot Activity, McKinley County, New Mexico, 2009	A low-level aerial geophysics survey of FTR was conducted. Figures within this report provide the geophysical findings.	None, report presents aerial geophysical data.	N/A

Unexploded Ordnance Survey/Investigations

Document	Summary of Report	Recommendations	Status or Recommendations
*Final Report Fort Wingate Depot Activity Unexploded Ordnance (UXO) Survey Report,*1994	UXO survey and removal of UXO for 555 acres in FTR 2/3. No live ordnances were discovered.	Surface debris be removed in the areas of heavy surface contamination	Implemented – Final OE sampling and removal action, 1998.
		Subsurface investigation performed.	Implemented – Final ordnance and explosive (OE) sampling and removal action, 1998.
Final Removal Report, OE Sampling and Removal Action, Ft. Wingate, New Mexico, 1998	Surface clearance 611 acres, subsurface clearance 5 acres, and subsurface investigation sampling 11.5 acres.	Hazardous toxic waste (HTW) exist in grid BDI 5 based upon the visible stains remaining on the ground after the work force recovered loose explosives in the grid.	To Be Determined
		Conclusion: "after performing a 100% surface clearance but less than I'% subsurface clearance, it remains inconclusive the level of subsurface OE contamination possibly remaining at Site 4" (FTR 2/3).	To Be Determined

1 Documents without recommendations or findings relevant to FTR 2/3 were not included in this table.

5.2.2 Evaluation of Existing Environmental Characterization Data

During the 1997 site-wide RI/FS five sediment samples and ten discrete soil samples were collected in SWMU 16. These sample locations are shown on Figure 5-2. The samples collected during the RI/FS were consistent with the Master Environmental Plan, which called for sediment sampling of the drainages, and surface samples of the impact crater area.

Ten discrete surface soil samples (FTR23SO01 through FTR23SO10) were collected and analyzed for explosives, nitrate/nitrite, and total phosphorus. The sampling locations shown on Figure 5-2 are primarily perimeter locations, with two samples collected in the area that may be the impact area for the range. All sample results were below screening levels and the results for explosives for all ten samples were below the reporting limits which ranged from <0.357 to <1.51 µg/g. Sample results for the ten samples are shown on Table 5-2. Note that these reporting limits are all well below the current NMED and EPA screening levels (see Table 6-2 for a detailed listing of the current explosives RSL and SSL values).

Five sediment samples (ESE09 through ESE13) were collected from the arroyo, which is the primary drainage for the northeast portion of FWDA. The samples were analyzed for explosives, metals, pesticides, TCL VOCs, TCL SVOCs, nitrate/nitrite, and phosphorus as recommended; no explosives, pesticides, VOCs or SVOCs were detected above background levels and results were either non-detect or less than the reporting limits. Nitrate/Nitrite and phosphorus were both below the background levels. Two metals, lead and barium were detected above background levels in ESE09 and ESE11 respectively. The remaining metals were non-detect or below screening levels, both for the screening levels at the time of the 1997 RI/FS report and for the current RSL and SSL values. Sample locations are shown on Figure 5-2, and sampling results are shown in Table 5-2.

5.2.3 Evaluation of Other Parcel 16 Data

Historic files or studies such as aerial photographs, historic site maps, geophysical survey and other background data were reviewed for FTR 2/3.

The aerial photographs show that Parcel 16 has been used for many years for outdoor material storage. Most of these areas exhibit surface discoloration as a result of that use. Table 5-3 provides a summary of the aerial photograph review, and Figure 5-2 shows the areas of interest that were discovered in the aerial photograph review. These areas are designated DK (Dark Toned), ST (Stained), GS (Ground Scar), DG (Disturbed Ground), and DB (Debris) in Figure 5-2.

Historical building drawings also depict areas designated for storage in and around Parcel 16. Table 5-4 provides a summary of the historical building review. Figure 5-2 contains the areas of interest that were discovered in the review of the historical site drawings (BR-Building Removed; S-Structure).

The aerial geophysical survey conducted in 2010 showed four primary areas of high metallic content (anomalies) within Parcel 16; however, the anomaly in the center of FTR 2/3 was found to be a metal agricultural trough and eliminated from further investigation. The remaining three

areas are indicated on Figure 5-2 by a white box with a red-X. One anomaly area is snake-like in shape and is located in FTR's north-central buffer zone near the outcrop. The second area in the south west corner of SWMU 16 contains three distinct anomalies: the northernmost anomaly is a bridge over the arroyo and requires no further investigation, but the southern two anomalies in the vicinity of open storage area Z-135 require further investigation. The third anomaly area contains one anomaly and is located in the south east corner of Parcel 16 in the vicinity of open storage area Z-123.

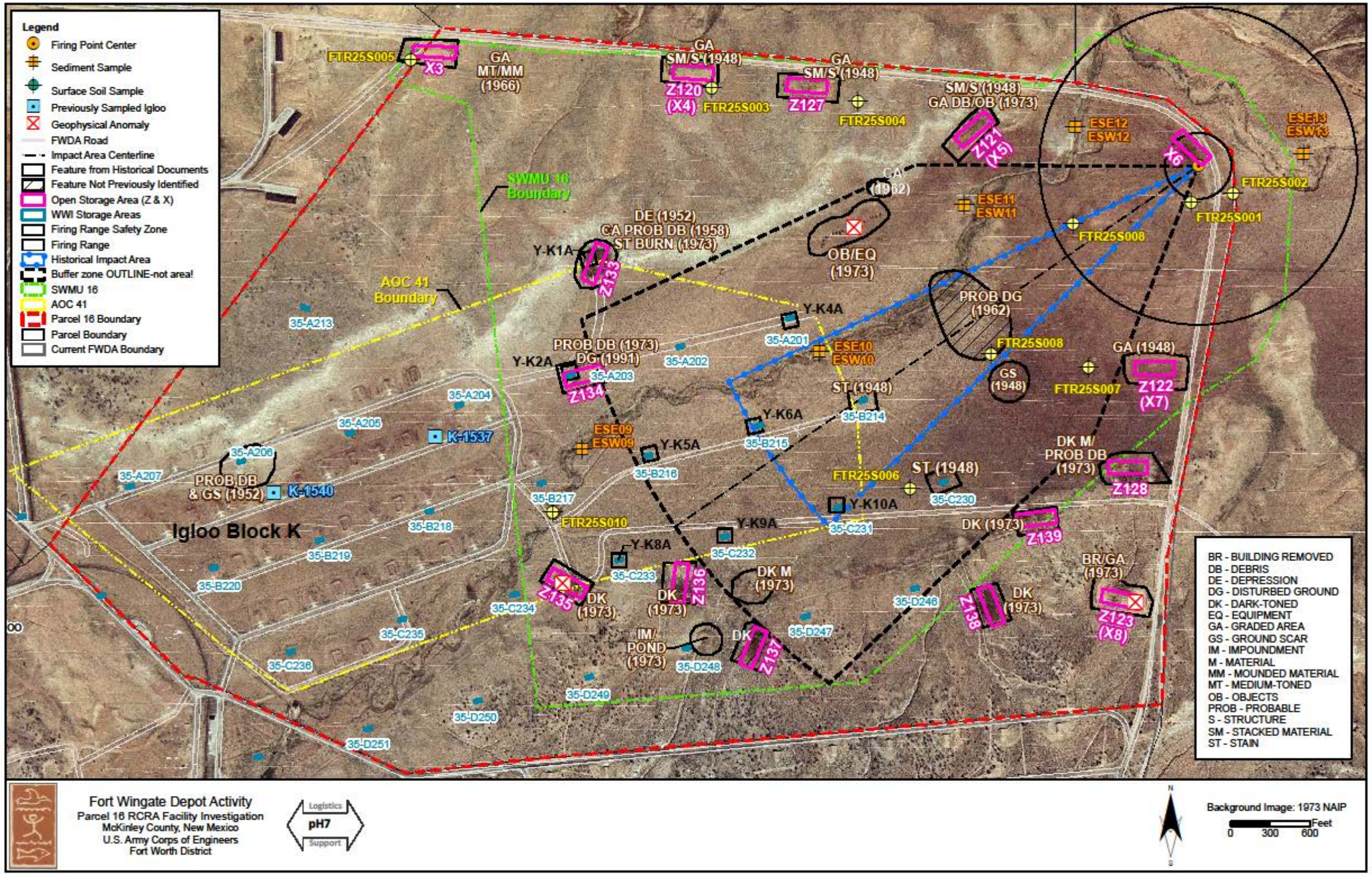

Figure 5-2. Historical Sampling Locations, Areas of Interest, and Geophysical Anomalies in SWMU 16, Parcel 16

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Table 5-2. Historic Soil and Sediment Sample Results for SWMU 16, Parcel 16

Soil Samples

												Historical		Current	
Sample ID	CAS #	Units	**FTR23SO01**	**FTR23SO02**	**FTR23SO03**	**FTR23SO04**	**FTR23SO05**	**FTR23SO06**	**FTR23SO07**	**FTR23SO08**	**FTR23SO09**	**FTR23SO10**	**BKG**	**Screening**	**Nov, 2010 EPA RSL**	**Dec, 2009 NM SSL**
Explosives			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND				
Inorganic																
Nitrite, Nitrate	NA		1.46	1.46	<1	<1	2.43	8.36	1.7	2.28	<1	5.35	30	27000	130,000	125,143
Phosphorus	NA		481	436	182	313	546	436	453	544	454	461	659			

Sediment Samples

Sample ID			**ESE09**	**ESE10**	**ESE11**	**ESE12**	**ESE13**	**Historical**		**Current**	
Date Sampled			11/30/1992	11/30/1992	11/30/1992	11/30/1992	11/30/1992	**BKG**	**Screening**	**Nov, 2010**	**Dec, 2009**
Metals	CAS #	Units								**EPA RSL**	**NMSSL**
Arsenic		µg/g	<2.50	<2.50	<2.50	<2.50	No Data	2.50			
Selenium		µg/g	<0.449	<0.449	<0.449	<0.449	No Data	0.45			
Lead	7439-92-1	µg/g	16.8	8.40	8.84	11.0	No Data	16.4		400	400
Silver		µg/g	<0.803	<0.803	<0.803	<0.803	No Data	0.80			
Barium	7440-39-3	µg/g	394	254	868	ND317	No Data	484.0	18,900	15,000	15,600
Cadmium		µg/g	<1.20	<1.20	<1.20	<1.20	No Data	1.20			
Chromium		µg/g	20.6	8.82	14.7	21.0	No Data	36.00	1,350		
Explosives			ND	ND	ND	ND	ND				
TLC			ND	ND	ND	ND	ND				
VOCs			ND	ND	ND	ND	ND				
TCL SVOCs			ND	ND	ND	ND	ND				
Pesticides			ND	ND	ND	ND	ND				
Inorganic											
Nitrite, Nitrate			2.15	1.21					27,000		
Phosphorus			459	184							

ND - Not Detected
NA – Not Available
Samples exceeding background, 1997 RI/FS
BKG - Background
RSL - Residential Screening Level
NMSSL - New Mexico Soil Screening Level

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Table 5-3. Summary Table Parcel 16 Aerial Photographs, 1935 to 1997

Year	Summary Analysis Findings	Specific Details of Analysis of SWMU 16
1935	No significant findings	"Trenches", outside Parcel 16
1948	Three areas of stacked materials or structures are present in the northern portion of the site. A graded area is present to the east. Two stained probable burn areas are present. An area of ground scarring is also present.	-Northern road - Graded area, near western end SWMU, "stacked material/Structures" -Out crop - northern end "stacked material/structure" -Out crop South end of FTR - Stained areas, south end of FTR -Eastern Road "graded area"
1952	Four rectangular graded areas are visible in the northern portion of the site.	-Northern road - Graded area, near western end SWMU, same area as 1948 "stacked material/Structures" -Outcrop – northern end is "graded area" - as area 1948 "stacked material/structure" -Outcrop – southern end "debris" area -Eastern Road "graded area" – same as 1948
1958	Mounded material has been added to the previously cleared area located in the northwestern portion of the site. A cleared area is present in the eastern portion of the site. Graded areas remain.	-Northern road - Graded area, near western end SWMU (same area as 1948, 1952) -Outcrop - northern end is "graded area"; same as 1952 "graded area" and same areas as 1948 "stacked material/structure" -Outcrop – central area "cleared area" -Outcrop – southern end "cleared area/Probable debris". Same area as 1952 "debris" area -Eastern Road "graded area" – same as 1948 -Northeast end of FTR, near northern road, bermed or depressed area appears, depicted and identified as FTR 2 in 1980 & 1981 document figures.
1962	Medium-toned mounded material is present in the northwestern portion of the site. Graded areas and cleared areas are present in the central and eastern portions of the site.	-Northern road - Graded area, near western end SWMU (same area as 1948, 1952, &1958) -Outcrop - northern end is "graded area" - as areas as 1952, 1958 & 1948 "stacked material/structure" -Outcrop – central area "cleared area", same area as 1958 -Outcrop – southern end "cleared area/Probable debris. Same area as 1952 "debris" area & 1958 "cleared area/Probable debris". -Northeast end of FTR, near northern road, appears bermed or depression area. Appears to be same area as depicted and identified as FTR 2 in 1980 & 1981document figures. -Also appears a "road, or centerline" of FTR area. -South central area of FTR possible impact area of FTR 3
1966	Medium-toned mounded material is present in the northwestern portion of the site. Graded areas and cleared areas are present in the central and eastern portions of the site.	-Northern road - Graded area, near western end SWMU (same area as 1948, 1952, 1958, 1962) -Outcrop - northern end is "graded area" - as areas as 1948, 1952, 1962 and in 1958 "stacked material/structure" -Outcrop – central area "cleared area", same area as 1958 and 1962 -Outcrop –southern end, "cleared area", same as 1962 "cleared area/Probable debris. Same area as 1952 "debris" area & 1958 "cleared area/Probable debris".

Table 5-3. Summary Table Parcel 16 Aerial Photographs, 1935 to 1997

Year	Summary Analysis Findings	Specific Details of Analysis of SWMU 16
1973	Graded areas remain on site. Debris or objects are located within the easternmost graded area. Dark-toned objects or debris are present south of the graded areas. A stained or burned area and a bermed pit are present near the center of the site. Several other dark-toned areas are located within and near the southern portion of the site.	-Northern road - Graded area, near western end SWMU (same area as 1948, 1952, 1958, 1962, 1966) -Outcrop - northern end is "graded area" on north and south sides are "debris/objects" – same as areas as 1948, 1952, 1962, 1966 and in 1958 "stacked material/structure" -Outcrop –southern end, "staining/Burn" area. Same area as 1966 "cleared area", same as 1962 "cleared area/Probable debris. Same as area 1952 "debris" & 1958 "cleared area/Probable debris". -Outcrop south of central– serpentine line of "objects/equipment" -Southwest end of FTR, southeast of K-Block, two "dark" areas -Eastern road – "graded area". -South end near road, "dark material, probably debris" -Southern road, south side "dark" area. -Northeast end of FTR, near northern road, appears bermed or depression area. Appears to be same area as depicted and identified as FTR 2 in 1980 & 1981 document figures. Also seen in 1962.
1978	Graded areas remain although appear inactive. Probable debris or dark objects are visible with a drainage ditch in the eastern portion of the site. An impoundment or pond is present in the southern portion of the site. Disturbed ground and a graded area are visible southeast of the site.	-Northern road - Graded area, near western end of SWMU (same area as 1948, 1952, 1958, 1962, 1966, 1973) -Outcrop - northern end is "graded area"- same area as 1973 "graded area" on north and south sides and "debris/objects" are same as areas as 1948, 1952, 1962, 1966 and in 1958 "stacked material/structure" -South of central Outcrop – "objects/debris" – same areas as 1973 serpentine line of "objects/equipment" -East of K-block – "disturbed ground" -Eastern road – "graded area" same as 1973 and 1948 -Northeast end of FTR, near northern road, appears bermed or depression area. Appears to be same area as depicted and identified as FTR 2 in 1980 & 1981 document figures. Also seen in 1962, 1958.
1985	The dark-toned objects or debris remain. The impoundment or pond remains to the south.	-South of central Outcrop – "objects/debris" – same areas as 1978, 1973 serpentine line of "objects/equipment" -Northeast end of FTR, near northern road, appears bermed area configured, depicted and identified as FTR 2 in 1980 & 1981 document figures; same as 1973, 1962, 1958. -South central area of FTR possible impact area of FTR 3, same area as 1962
1991	Graded areas remain; however, appear inactive. Dark-toned objects or materials and the impoundment or pond remain.	-Northern road - Graded area, near western end SWMU (same area as 1948, 1952, 1958, 1962, 1966, 1973, 1978) -South of central Outcrop – "objects/debris" – same areas as 1985, 1978, 1973 serpentine line of "objects/equipment" -East of K-block – "disturbed ground", same area as 1978
1993	The dark-toned objects or equipment remains in the northern portion of the site. The impoundment or pond remains to the south.	-South of central Outcrop – "objects/debris" – same areas as 1991, 1985, 1978, 1973 serpentine line of "objects/equipment" -Northeast end of FTR, near northern road, appears bermed or depression area appears to be same area as depicted and identified as FTR 2 in 1980 & 1981 document figures. Also seen in 1962, 1958 and 1973. -Eastern road – "graded area" same as 1973 and 1948, is apparent but not noted.
1997	The impoundment or pond remains	

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Table 5-4. Summary Table Parcel 16 Historical Drawings for FTR 2/3

Drawing and Date	FTR 2/3 Information
A-1-12, General Layout Plan, 1943	Nothing shown in the northeast corner of FWDA
C-8-9, Land Use Map, 1947	Shows six (6) X-sites for open storage; four (4) correspond to Z-sites on C-10-4, but X-6 and X-3 do not correspond to Z sites.
C-9-30, General Site and Building Use Map, 1963	Shows the FTR 2/3, northeast corner of FWDA identified as "functional test Site No. 140" -depicts a 1200' Firing point area -Impact area center line from the firing point to the southwest and depicts a firing fan -shows a 900' area beyond the firing fan to the northwest, southeast and southwest.
C-10-4, Index & Open Storage Plan, 1966	Shows the FTR 2/3, northeast corner of FWDA -depicts Firing Point Center Service Magazine and 2 observer sites -Impact area center "target line" from the firing point to the southwest 3900' and depicts a firing fan. -shows a 900' area beyond the firing fan to the northwest, southeast and southwest. Shows fourteen (14) Z-sites for open storage, mostly around the perimeter of FTR 2/3
A-2-7, General Site Map, 1986	Northeast corner of FTR depicts "A.P.C. Monitoring Station #3" – East Patrol road at the start of turning south. Appears same spot as RI/FS surface soil
C-10-15 Master Building and Structure Numbering Plan, 1970 (Same drawing as 1963 above, amended in 1970)	Same as C-9-30 above

5.3 Data Gap Analysis

There has been only limited environmental data collected within the firing range area of SWMU 16 (discrete surface soil samples collected in ten locations, only two of which were inside the firing fan). The number and type of samples are not considered adequate to fully characterize any health risk that might be associated with the firing ranges, and this is perceived as a data gap. The sediment samples (ten samples at five locations, designated "ES..." in Figure 5-2), however, provide adequate data to determine that the arroyo is sufficiently characterized.

The following data gaps have been identified from the documents and files that were reviewed.

- The probable impact area within FTR 2/3 has not been sampled sufficiently
- There are no subsurface soil characterization data within FTR 2/3.
- 1935 aerial photographs show munitions storage areas or structures, which have not been characterized;
- Historical site drawings identify X- and Z- outside storage areas around SWMU 16, which have not been characterized;

- The aerial photographs depict areas of prolonged use and discoloration of certain areas, but specific details of what caused the discoloration cannot be determined from the document review.
- Field confirmation is needed to define the exact number and locations of WWI structures in SWMU 16.
- HTW may exist in UXO grid BD15 based upon the visible stains remaining on the ground after the work force recovered loose explosives in the grid. (Sample location FTR23-19 on Figure 5-3 is located in the center of BD15).
- The geophysical survey indicated three areas of high metallic content that have not been sampled.

5.3.1 Data Gap Remedies

Below are three data gathering activities to characterize the areas of used in FTR 2/3.

5.3.1.1 Characterize soil in FTR 2/3 impact area

Data Gathering Activity: Collect 25 MI soil samples to characterize the surface soil in the probable impact area, the impound pond, and the historic location of FTR 2. The proposed sample locations are shown on Figure 5-3. Based on historical use and materials potentially present on site, the analysis for these samples includes explosives, perchlorate and RCRA 8 metals. A second composite sample will be taken at each site for SVOC analysis, except FTR23-19 which will only be tested for explosives. The sample disbursement and rationale is in Section 5.4.2 below.

5.3.1.2 Characterize surface soil in X- and Z- outdoor storage areas

Data Gathering Activity: Collect eight MI samples from each X- and Z- area to determine the impact of historic use on the surface soil. The locations of the X and Z areas were obtained from the 1935 and 1973 aerial photographs overlaid with historical use maps depicting the X- and Z- locations. All of the X- and Z- locations will be field inspected for evidence of a former building. If the site inspection confirms evidence of a former building location (graded area, nails, shingles) then the site will be sampled. The proposed MI sample locations (shown on Figure 5-3) provide extensive coverage of each X- and Z- area. Based on historical use and materials potentially present on site, the analysis for these samples includes explosives and RCRA 8 metals.

5.3.1.3 Characterize surface and subsurface soil at geophysical anomalies

Data Gathering Activity: Collect surface and field-determined depth samples from excavated soil in the area of each geophysical anomaly. The proposed sample locations are shown on Figure 5-3. Based on historical use and materials potentially present on site, the analysis for these samples includes: explosives, RCRA 8 metals, perchlorate, and semi-volatiles, and if necessary, waste disposal characterization analysis will be conducted.

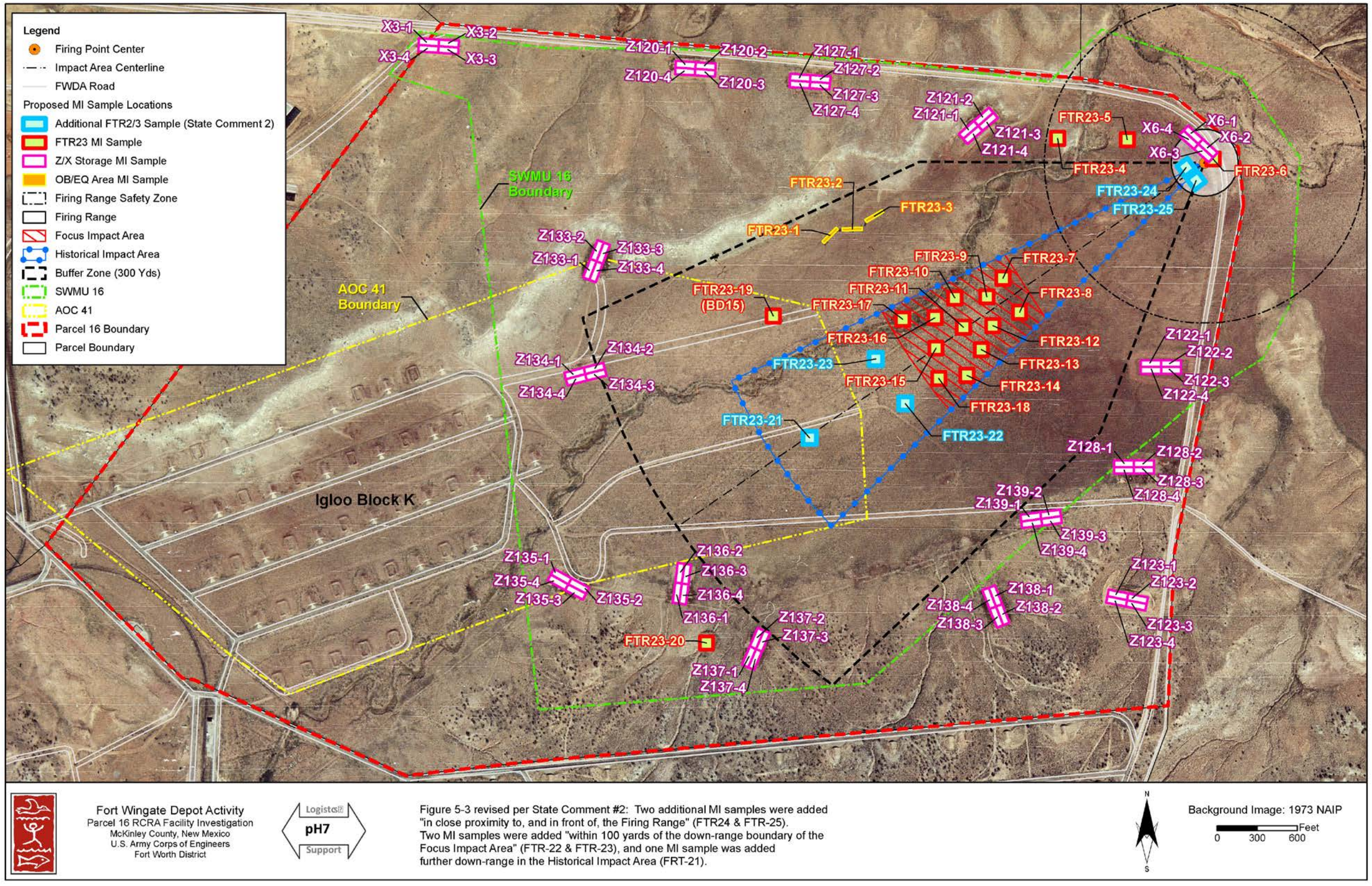

Figure 5-3. Locations of MI and Trench Samples for SWMU 16

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5.4 Scope of Activities

The following section provides the data gathering activities that will be conducted to characterize the surface and subsurface soils areas within SWMU 16 that may have been impacted during the mission of the FWDA.

5.4.1 Contaminants of Potential Concern

Because of the use of munitions and high explosives (HE) in this area, storage, processing and handling, and possible burning of high explosives or other material in the FTR area, the COPCs would be:

- Semi-volatile organics by EPA method 8270D
- Explosives by EPA method 8330 for the use, storage, or disposal of HE,
- Perchlorate by EPA methods 6850 for the use of propellants, burning of HE; and
- RCRA 8 metals by method 6010/7000 analysis that includes; Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium & Silver, use and storage of HE.

Analysis and methods are shown in Table 5-5.

Table 5-5. Soil Sample Analysis Specifications

Analysis	Method	Container	Handling	Extraction & Analysis Times
Explosives	SW846 8330B	1-4 OZ glass, wide mouth	Cool to 4 degree C	14 days to extraction / 40 days to analysis
RCRA 8 Metals	SW846 6010C/7000	1-4 OZ glass, wide mouth w/Teflon-lined lid	Cool to 4 degree C	6 months until extraction / analysis within 28 days
Perchlorate	SW 846 6850	1-4 OZ glass, wide mouth w/Teflon-lined lid	Cool to 4 degree C	28 days hold time
Semivolatiles (SVOCs)	SW 846 8270D	250-mL wide-mouth glass container with PTFE-lined lid	Cool to 4 degree C	Samples extracted within 14 days and extracts analyzed within 40 days following extraction.

5.4.2 FTR 2/3

Surface soils of the probable impact area in FTR 2/3 will be characterized by collecting 25 MI samples and 24 composite samples at locations that are dispersed as shown in Figure 5-3. Below is a summary of the sample disbursement and rationale. The sampling rationale for all of these samples is to collect surface soil samples and analyze the samples to determine the impacts of the use of each of these areas.

- Twelve samples will be located in the probable impact area, which appears in the 1965 aerial which shows this area as disturbed and there appears to be craters or impact areas.
- Three samples will be located down-range from the focus impact area
- Two samples in the areas suspected to be historic FTR2; historic report figures depict FTR2 as a smaller circular area east of the range firing point.
- Three samples at the historical FTR 2/3 firing point.

- One sample at the location of the historic impound pond.
- Three samples are located at the geophysical anomaly near the outcrop in the north central range areas to investigate the historic use of this area (FTR23-1, FTR23-2, and FTR23-3). Aerial photographs show long term and heavy use of this area. Trench samples will be taken to investigate subsurface impacts in this area (See Section 5.4.4 and Table 5-8).
- One sample at the UXO grid location BD15 (FTR23-19). This sample is to investigate the previous report that noted unexploded HE on the surface in this grid and will only be analyzed for explosives.

Multi-incremental DU samples collected in the heavily impacted areas will be collected from an established grid that is 100 feet by 100 feet square (unless otherwise specified) with 50 increments 0-6 inches in depth collected within that area. The southwest corner of each grid will be located using GPS coordinates and staked; the grid will be laid out and all four corners staked and GPS coordinates will be taken on each corner. The increments will be collected using a 7/8-inch diameter slotted push probe from the surface to approximately six inches using a meandering path traversing the area as shown in Figure 5-4. The increments will be placed in a clean sampling container and the entire sample shipped to the laboratory for analysis. The analytes for these samples will be explosives, RCRA 8 Metals, and perchlorates (with the exception of FTR23-19 which will only be analyzed for explosives).

A second composite sample consisting of 6 aliquots will be taken at each DU to be analyzed for SVOCs (with the exception of FTR23-19). Figure 5-3 shows the sampling locations in SWMU 16. Table 5-6 contains the sample collection details for this MI sampling in SWMU 16.

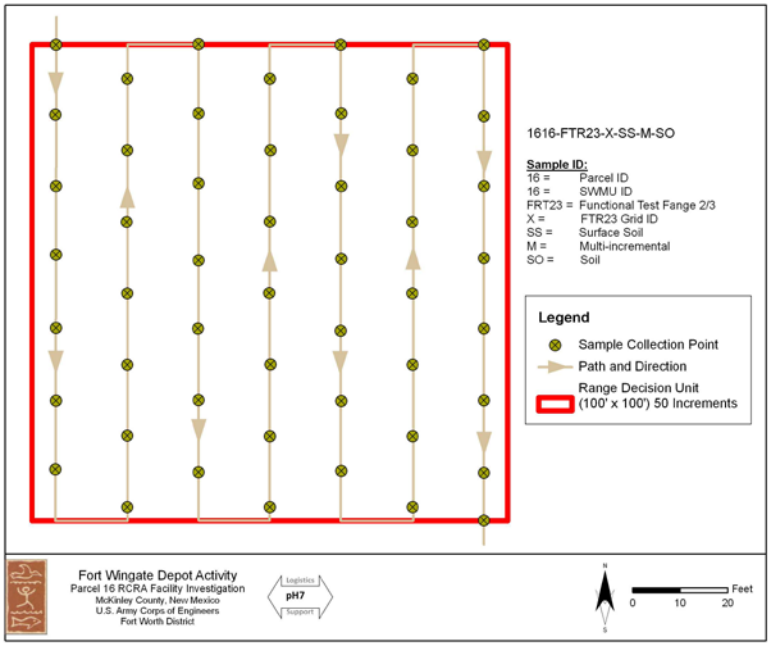

Figure 5-4. Systematic Random 50-Increment Sampling Pattern for 100'x100' FTR23 Samples

Table 5-6. Sample Collection Details for Range MI Samples in SWMU 16

Sample Count	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B	Perchlorates SW 846 6850	SVOC SW 846 8270D
1	FTR23-1	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-1-SS-M-SO	1	1	1	0
2	FTR23-1	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-1-SS-C-SO	0	0	0	1
3	FTR23-2	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-2-SS-M-SO	1	1	1	0
4	FTR23-2	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-2-SS-C-SO	0	0	0	1
5	FTR23-3	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-3-SS-M-SO	1	1	1	0
6	FTR23-3	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-3-SS-C-SO	0	0	0	1
7	FTR23-4	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-4-SS-M-SO	1	1	1	0
	FTR23-4	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-4-SS-M-SO-Dup	1	1	1	0
8	FTR23-4	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-4-SS-C-SO	0	0	0	1
	FTR23-4	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-4-SS-C-SO-Dup	0	0	0	1
9	FTR23-5	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-5-SS-M-SO	1	1	1	0
10	FTR23-5	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-5-SS-C-SO	0	0	0	1
11	FTR23-6	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-6-SS-M-SO	1	1	1	0
12	FTR23-6	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-6-SS-D-SO	0	0	0	1
13	FTR23-7	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-7-SS-M-SO	1	1	1	0
	FTR23-7	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-7-SS-M-SO-MS/MSD	1	1	1	0
14	FTR23-7	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-7-SS-D-SO	1	1	1	0
	FTR23-7	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-7-SS-C-SO-MS/MSD	0	0	0	1
15	FTR23-8	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-8-SS-M-SO	1	1	1	0
16	FTR23-8	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-8-SS-C-SO	0	0	0	1
17	FTR23-9	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-9-SS-M-SO	1	1	1	0
18	FTR23-9	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-9-SS-C-SO	0	0	0	1
19	FTR23-10	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-10-SS-M-SO	1	1	1	0
20	FTR23-10	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-10-SS-C-SO	0	0	0	1
21	FTR23-11	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-11-SS-M-SO	1	1	1	0
	FTR23-11	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-11-SS-M-SO-Dup	1	1	1	0

Table 5-6. Sample Collection Details for Range MI Samples in SWMU 16

Sample Count	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B	Perchlorates SW 846 6850	SVOC SW 846 8270D
22	FTR23-11	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-11-SS-D-SO	0	0	0	1
	FTR23-11	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-11-SS-D-SO-Dup	0	0	0	1
23	FTR23-12	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-12-SS-M-SO	1	1	1	0
24	FTR23-12	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-12-SS-D-SO	0	0	0	1
25	FTR23-13	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-13-SS-M-SO	1	1	1	0
26	FTR23-13	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-13-SS-D-SO	0	0	0	1
27	FTR23-14	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-14-SS-M-SO	1	1	1	0
28	FTR23-14	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-14-SS-D-SO	0	0	0	1
29	FTR23-15	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-15-SS-M-SO	1	1	1	0
30	FTR23-15	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-15-SS-D-SO	0	0	0	1
31	FTR23-16	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-16-SS-M-SO	1	1	1	0
32	FTR23-16	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-16-SS-D-SO	0	0	0	1
33	FTR23-17	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-17-SS-M-SO	1	1	1	0
34	FTR23-17	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-17-SS-D-SO	0	0	0	1
35	FTR23-18	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-18-SS-M-SO	1	1	1	0
36	FTR23-18	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-18-SS-M-SO	0	0	0	1
37	FTR23-19	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-19-SS-M-SO	1	0	0	0
38	FTR23-20	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-20-SS-M-SO	1	1	1	0
39	FTR23-20	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-20-SS-D-SO	0	0	0	1
40	FTR23-21	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-21-SS-M-SO	1	1	1	0
	FTR23-21	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-21-SS-M-SO-Dup	1	1	1	0
41	FTR23-21	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-21-SS-C-SO	0	0	0	1
	FTR23-21	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-21-SS-C-SO-MS/MSD	0	0	0	1
42	FTR23-22	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-22-SS-M-SO	1	1	1	0
43	FTR23-22	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-22-SS-C-SO	0	0	0	1
44	FTR23-23	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-23-SS-M-SO	1	1	1	0

Table 5-6. Sample Collection Details for Range MI Samples in SWMU 16

Sample Count	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B	Perchlorates SW 846 6850	SVOC SW 846 8270D
45	FTR23-23	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-23-SS-C-SO	0	0	0	1
46	FTR23-24	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-24-SS-M-SO	1	1	1	0
47	FTR23-24	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-24-SS-C-SO	0	0	0	1
48	FTR23-25	0 - 6"	16	SWMU 16	SO	M	1616-FTR23-25-SS-M-SO	1	1	1	0
49	FTR23-25	0 - 6"	16	SWMU 16	SO	C	1616-FTR23-25-SS-C-SO	0	0	0	1
	FTR23		16	SWMU 16	W	D	1616-FTR23-D-W-EB	1	1	1	1
	FTR23		16	SWMU 16	W	D	*1616-FTR23-D-W-RIN1	1	1	1	1
							Total	32	31	31	30

FTR23-1, -2, and -3: Multi-incremental Decision unit will be 25' X 125' or as necessary, to be determined in the field.

FTR23-19: Sample BD15 for Explosives only

FTR23-21, 22, 23, 24, and 25 MI and D samples were added per Comment #2 from NMED

FTR23-1 through 18 and FTR23-20 samples were separated into 1 MI sample for explosives, RCRA metals and perchlorate and 1 discrete (D) for semi-volatile organic compounds (SVOCs) per comment #1 from NMED

Sample Count

49	Samples (25 MI + 24 Discrete)
5	Dup Samples
3	MS/MSD Sample
1	EB
1	Rinsate
59	**Total Samples**

Sample Naming Convention

16	Parcel
16	SWMU
-	Separator
FTR23-X	Grid ID
-	Separator
SS	Surface Soil
-	Separator
M, C, or D	Multi-incremental, Composite, or Discrete
-	Separator
SO	Soil

Table/Sample Key

Dup	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
EB	Equipment Blank
RIN	Rinsate
SVOCs	Semivolatiles
C	Composite
W	Water

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5.4.3 Multi-incremental Sampling for X- and Z- Open-Storage Areas in SWMU 16

In order to adequately characterize each X- or Z- storage area, a 100 foot by 300 foot area covering the center of each X- or Z- storage area will be laid out and then divided into four quadrants of 50 feet by 150 feet. Each quadrant will form a DU for MI sampling, and 50 increments will be collected at two depths from within each DU using a 7/8-inch diameter slotted push probe. The southwest corner of each grid will be located using GPS coordinates and staked; the rectangular grid will be laid out and all four corners staked and GPS coordinates will be taken of each corner. The increments will be collected from the top 1 to 6 inches of surface soil and from a depth of 6 to 12 inches using a serpentine path traversing the area similar to Figure 5-5. The increments will be placed in a clean sampling container and the entire sample sent to the laboratory for explosives and RCRA 8 metals analysis. Figure 5-3 shows the MI sampling locations in SWMU 16 (see USACE, 2007 for a detailed discussion on meandering path collection techniques for MI sampling). Table 5-7 contains the sample collection details for the Open Storage Areas.

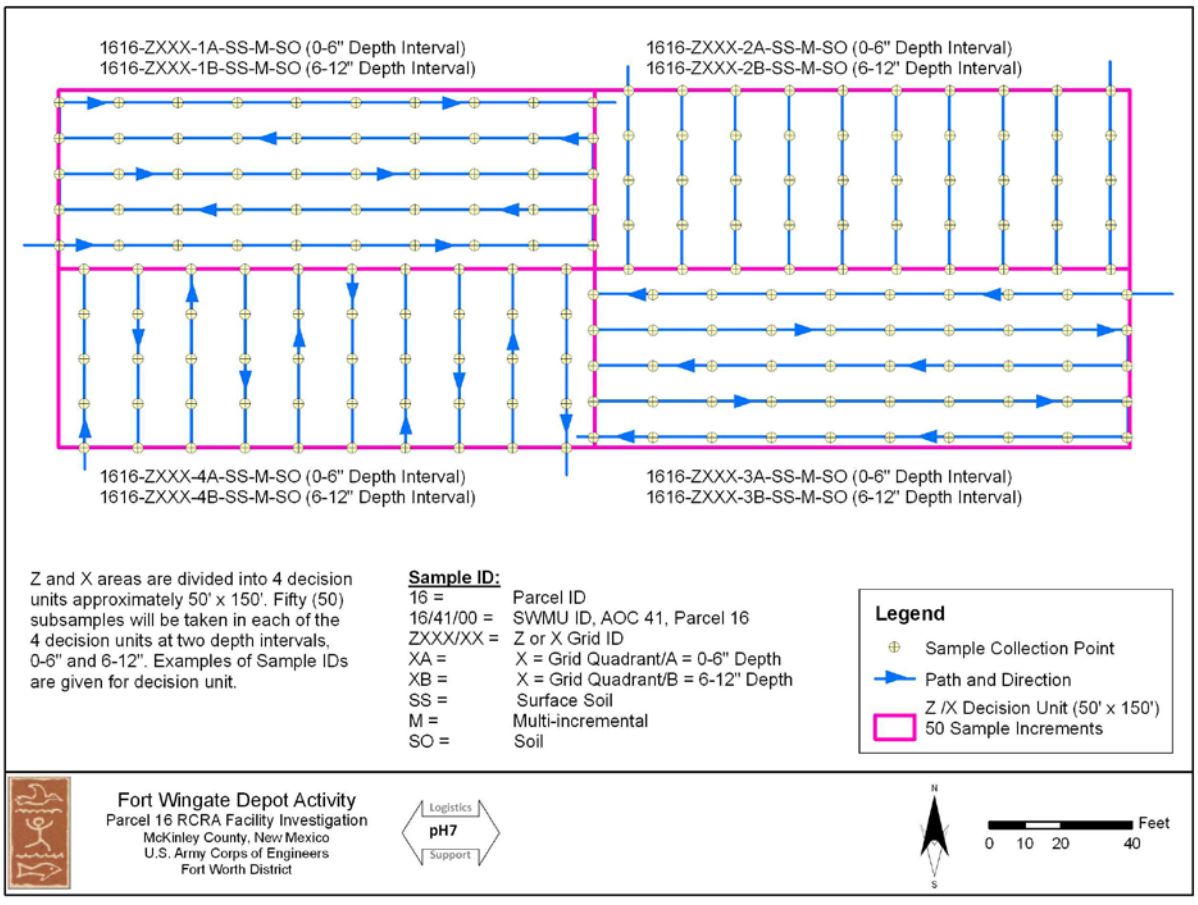

Figure 5-5. Systematic Random 50-Increment Sampling Pattern for Z and X Storage Area Samples

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Table 5-7. MI Sample Details for X- and Z- Open Storage Areas

Sample Count	Grid	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B
1	Z120	Z120-1	0 - 6"	16	16	SO	M	1616-Z120-1A-SS-M-SO	1	1
2		Z120-1	6 - 12"	16	16	SO	M	1616-Z120-1B-SS-M-SO	1	1
3		Z120-2	0 - 6"	16	16	SO	M	1616-Z120-2A-SS-M-SO	1	1
4		Z120-2	6 - 12"	16	16	SO	M	1616-Z120-2B-SS-M-SO	1	1
5		Z120-3	0 - 6"	16	16	SO	M	1616-Z120-3A-SS-M-SO	1	1
6		Z120-3	6 - 12"	16	16	SO	M	1616-Z120-3B-SS-M-SO	1	1
7		Z120-4	0 - 6"	16	16	SO	M	1616-Z120-4A-SS-M-SO	1	1
8		Z120-4	6 - 12"	16	16	SO	M	1616-Z120-4B-SS-M-SO	1	1
9	Z121	Z121-1	0 - 6"	16	16	SO	M	1616-Z121-1A-SS-M-SO	1	1
		Z121-1	0 - 6"	16	16	SO	M	1616-Z121-1A-SS-M-SO-Dup	1	1
		Z121-1	0 - 6"	16	16	SO	M	1616-Z121-1A-SS-M-SO-MS/MSD	1	1
10		Z121-1	6 - 12"	16	16	SO	M	1616-Z121-1B-SS-M-SO	1	1
11		Z121-2	0 - 6"	16	16	SO	M	1616-Z121-2A-SS-M-SO	1	1
12		Z121-2	6 - 12"	16	16	SO	M	1616-Z121-2B-SS-M-SO	1	1
13		Z121-3	0 - 6"	16	16	SO	M	1616-Z121-3A-SS-M-SO	1	1
14		Z121-3	6 - 12"	16	16	SO	M	1616-Z121-3B-SS-M-SO	1	1
15		Z121-4	0 - 6"	16	16	SO	M	1616-Z121-4A-SS-M-SO	1	1
16		Z121-4	6 - 12"	16	16	SO	M	1616-Z121-4B-SS-M-SO	1	1
17	Z122	Z122-1	0 - 6"	16	16	SO	M	1616-Z122-1A-SS-M-SO	1	1
18		Z122-1	6 - 12"	16	16	SO	M	1616-Z122-1B-SS-M-SO	1	1
19		Z122-2	0 - 6"	16	16	SO	M	1616-Z122-2A-SS-M-SO	1	1
20		Z122-2	6 - 12"	16	16	SO	M	1616-Z122-2B-SS-M-SO	1	1
21		Z122-3	0 - 6"	16	16	SO	M	1616-Z122-3A-SS-M-SO	1	1
22		Z122-3	6 - 12"	16	16	SO	M	1616-Z122-3B-SS-M-SO	1	1
23		Z122-4	0 - 6"	16	16	SO	M	1616-Z122-4A-SS-M-SO	1	1

Table 5-7. MI Sample Details for X- and Z- Open Storage Areas

Sample Count	Grid	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B
24		Z122-4	6 - 12"	16	16	SO	M	1616-Z122-4B-SS-M-SO	1	1
		Z122-4	6 - 12"	16	16	SO	M	1616-Z122-4B-SS-M-SO-Dup	1	1
25	Z123	Z123-1	0 - 6"	16	16	SO	M	1616-Z123-1A-SS-M-SO	1	1
26		Z123-1	6 - 12"	16	16	SO	M	1616-Z123-1B-SS-M-SO	1	1
27		Z123-2	0 - 6"	16	16	SO	M	1616-Z123-2A-SS-M-SO	1	1
28		Z123-2	6 - 12"	16	16	SO	M	1616-Z123-2B-SS-M-SO	1	1
29		Z123-3	0 - 6"	16	16	SO	M	1616-Z123-3A-SS-M-SO	1	1
30		Z123-3	6 - 12"	16	16	SO	M	1616-Z123-3B-SS-M-SO	1	1
31		Z123-4	0 - 6"	16	16	SO	M	1616-Z123-4A-SS-M-SO	1	1
32		Z123-4	6 - 12"	16	16	SO	M	1616-Z123-4B-SS-M-SO	1	1
33	Z127	Z127-1	0 - 6"	16	16	SO	M	1616-Z127-1A-SS-M-SO	1	1
		Z127-1	0 - 6"	16	16	SO	M	1616-Z127-1A-SS-M-SO-Dup	1	1
		Z127-1	0 - 6"	16	16	SO	M	1616-Z127-1A-SS-M-SO-MS/MSD	1	1
34		Z127-1	6 - 12"	16	16	SO	M	1616-Z127-1B-SS-M-SO	1	1
35		Z127-2	0 - 6"	16	16	SO	M	1616-Z127-2A-SS-M-SO	1	1
36		Z127-2	6 - 12"	16	16	SO	M	1616-Z127-2B-SS-M-SO	1	1
37		Z127-3	0 - 6"	16	16	SO	M	1616-Z127-3A-SS-M-SO	1	1
38		Z127-3	6 - 12"	16	16	SO	M	1616-Z127-3B-SS-M-SO	1	1
39		Z127-4	0 - 6"	16	16	SO	M	1616-Z127-4A-SS-M-SO	1	1
40		Z127-4	6 - 12"	16	16	SO	M	1616-Z127-4B-SS-M-SO	1	1
41	Z128	Z128-1	0 - 6"	16	16	SO	M	1616-Z128-1A-SS-M-SO	1	1
42		Z128-1	6 - 12"	16	16	SO	M	1616-Z128-1B-SS-M-SO	1	1
43		Z128-2	0 - 6"	16	16	SO	M	1616-Z128-2A-SS-M-SO	1	1
44		Z128-2	6 - 12"	16	16	SO	M	1616-Z128-2B-SS-M-SO	1	1
		Z128-2	6 - 12"	16	16	SO	M	1616-Z128-2B-SS-M-SO-Dup	1	1
		Z128-2	6 - 12"	16	16	SO	M	1616-Z128-2B-SS-M-SO-MS/MSD	1	1

Table 5-7. MI Sample Details for X- and Z- Open Storage Areas

Sample Count	Grid	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B
45		Z128-3	0 - 6"	16	16	SO	M	1616-Z128-3A-SS-M-SO	1	1
46		Z128-3	6 - 12"	16	16	SO	M	1616-Z128-3B-SS-M-SO	1	1
47		Z128-4	0 - 6"	16	16	SO	M	1616-Z128-4A-SS-M-SO	1	1
48		Z128-4	6 - 12"	16	16	SO	M	1616-Z128-4B-SS-M-SO	1	1
49	Z133	Z133-1	0 - 6"	16	16	SO	M	1616-Z133-1A-SS-M-SO	1	1
		Z133-1	0 - 6"	16	16	SO	M	1616-Z133-1A-SS-M-SO-Dup	1	1
		Z133-1	0 - 6"	16	16	SO	M	1616-Z133-1A-SS-M-SO-MS/MSD	1	1
50		Z133-1	6 - 12"	16	16	SO	M	1616-Z133-1B-SS-M-SO	1	1
51		Z133-2	0 - 6"	16	16	SO	M	1616-Z133-2A-SS-M-SO	1	1
52		Z133-2	6 - 12"	16	16	SO	M	1616-Z133-2B-SS-M-SO	1	1
53		Z133-3	0 - 6"	16	16	SO	M	1616-Z133-3A-SS-M-SO	1	1
		Z133-3	0 - 6"	16	16	SO	M	1616-Z133-3A-SS-M-SO-Dup	1	1
54		Z133-3	6 - 12"	16	16	SO	M	1616-Z133-3B-SS-M-SO	1	1
55		Z133-4	0 - 6"	16	16	SO	M	1616-Z133-4A-SS-M-SO	1	1
56		Z133-4	6 - 12"	16	16	SO	M	1616-Z133-4B-SS-M-SO	1	1
57	Z134	Z134-1	0 - 6"	16	16	SO	M	1616-Z134-1A-SS-M-SO	1	1
58		Z134-1	6 - 12"	16	16	SO	M	1616-Z134-1B-SS-M-SO	1	1
59		Z134-2	0 - 6"	16	16	SO	M	1616-Z134-2A-SS-M-SO	1	1
60		Z134-2	6 - 12"	16	16	SO	M	1616-Z134-2B-SS-M-SO	1	1
61		Z134-3	0 - 6"	16	16	SO	M	1616-Z134-3A-SS-M-SO	1	1
62		Z134-3	6 - 12"	16	16	SO	M	1616-Z134-3B-SS-M-SO	1	1
		Z134-3	6 - 12"	16	16	SO	M	1616-Z134-3B-SS-M-SO-Dup	1	1
63		Z134-4	0 - 6"	16	16	SO	M	1616-Z134-4A-SS-M-SO	1	1
64		Z134-4	6 - 12"	16	16	SO	M	1616-Z134-4B-SS-M-SO	1	1
65	Z135	Z135-1	0 - 6"	16	16	SO	M	1616-Z135-1A-SS-M-SO	1	1
66		Z135-1	6 - 12"	16	16	SO	M	1616-Z135-1B-SS-M-SO	1	1

Table 5-7. MI Sample Details for X- and Z- Open Storage Areas

Sample Count	Grid	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B
67		Z135-2	0 - 6"	16	16	SO	M	1616-Z135-2A-SS-M-SO	1	1
68		Z135-2	6 - 12"	16	16	SO	M	1616-Z135-2B-SS-M-SO	1	1
69		Z135-3	0 - 6"	16	16	SO	M	1616-Z135-3A-SS-M-SO	1	1
70		Z135-3	6 - 12"	16	16	SO	M	1616-Z135-3B-SS-M-SO	1	1
71		Z135-4	0 - 6"	16	16	SO	M	1616-Z135-4A-SS-M-SO	1	1
		Z135-4	0 - 6"	16	16	SO	M	1616-Z135-4A-SS-M-SO-Dup	1	1
72		Z135-4	6 - 12"	16	16	SO	M	1616-Z135-4B-SS-2-M-SO	1	1
73	Z136	Z136-1	0 - 6"	16	16	SO	M	1616-Z136-1A-SS-M-SO	1	1
74		Z136-1	6 - 12"	16	16	SO	M	1616-Z136-1B-SS-M-SO	1	1
75		Z136-2	0 - 6"	16	16	SO	M	1616-Z136-2A-SS-M-SO	1	1
76		Z136-2	6 - 12"	16	16	SO	M	1616-Z136-2B-SS-M-SO	1	1
		Z136-2	6 - 12"	16	16	SO	M	1616-Z136-2B-SS-M-SO-Dup	1	1
		Z136-2	6 - 12"	16	16	SO	M	1616-Z136-2B-SS-M-SO-MS/MSD	1	1
77		Z136-3	0 - 6"	16	16	SO	M	1616-Z136-3A-SS-M-SO	1	1
78		Z136-3	6 - 12"	16	16	SO	M	1616-Z136-3B-SS-M-SO	1	1
79		Z136-4	0 - 6"	16	16	SO	M	1616-Z136-4A-SS-M-SO	1	1
80		Z136-4	6 - 12”	16	16	SO	M	1616-Z136-4B-SS-M-SO	1	1
81	Z137	Z137-1	0 - 6"	16	16	SO	M	1616-Z137-1A-SS-M-SO	1	1
82		Z137-1	6 - 12”	16	16	SO	M	1616-Z137-1B-SS-M-SO	1	1
83		Z137-2	0 - 6”	16	16	SO	M	1616-Z137-2A-SS-M-SO	1	1
84		Z137-2	6 - 12"	16	16	SO	M	1616-Z137-2B-SS-M-SO	1	1
85		Z137-3	0 - 6”	16	16	SO	M	1616-Z137-3A-SS-M-SO	1	1
86		Z137-3	6 - 12"	16	16	SO	M	1616-Z137-3B-SS-M-SO	1	1
87		Z137-4	0 - 6”"	16	16	SO	M	1616-Z137-4A-SS-M-SO	1	1
88		Z137-4	6 - 12”	16	16	SO	M	1616-Z137-4B-SS-M-SO	1	1
89	Z138	Z138-1	0 - 6”	16	16	SO	M	1616-Z138-1A-SS-M-SO	1	1

Table 5-7. MI Sample Details for X- and Z- Open Storage Areas

Sample Count	Grid	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B
		Z138-1	0 - 6”	16	16	SO	M	1616-Z138-1A-SS-M-SO-Dup	1	1
90		Z138-1	6 - 12”	16	16	SO	M	1616-Z138-1B-SS-M-SO	1	1
91		Z138-2	0 - 6”	16	16	SO	M	1616-Z138-2A-SS-M-SO	1	1
92		Z138-2	6 - 12"	16	16	SO	M	1616-Z138-2B-SS-M-SO	1	1
93		Z138-3	0 - 6”	16	16	SO	M	1616-Z138-3A-SS-M-SO	1	1
94		Z138-3	6 - 12"	16	16	SO	M	1616-Z138-3B-SS-M-SO	1	1
95		Z138-4	0 - 6”	16	16	SO	M	1616-Z138-4A-SS-M-SO	1	1
96		Z138-4	6 - 12”	16	16	SO	M	1616-Z138-4B-SS-M-SO	1	1
97	Z139	Z139-1	0 - 6”	16	16	SO	M	1616-Z139-1A-SS-M-SO	1	1
98		Z139-1	6 - 12”	16	16	SO	M	1616-Z139-1B-SS-M-SO	1	1
99		Z139-2	0 - 6”	16	16	SO	M	1616-Z139-2A-SS-M-SO	1	1
100		Z139-2	6 - 12"	16	16	SO	M	1616-Z139-2B-SS-M-SO	1	1
101		Z139-3	0 - 6”	16	16	SO	M	1616-Z139-3A-SS-M-SO	1	1
102		Z139-3	6 - 12"	16	16	SO	M	1616-Z139-3B-SS-M-SO	1	1
103		Z139-4	0 - 6”	16	16	SO	M	1616-Z139-4A-SS-M-SO	1	1
104		Z139-4	6 - 12”	16	16	SO	M	1616-Z139-4B-SS-M-SO	1	1
		Z139-4	6 - 12”	16	16	SO	M	1616-Z139-4B-SS-M-SO-Dup	1	1
105	X6	X6-1	0 - 6”	16	16	SO	M	1616-X6-1A-SS-M-SO	1	1
106		X6-1	6 - 12”	16	16	SO	M	1616-X6-1B-SS-M-SO	1	1
107		X6-2	0 - 6”	16	16	SO	M	1616-X6-2A-SS-M-SO	1	1
108		X6-2	6 - 12"	16	16	SO	M	1616-X6-2B-SS-M-SO	1	1
109		X6-3	0 - 6”	16	16	SO	M	1616-X6-3A-SS-M-SO	1	1
110		X6-3	6 - 12"	16	16	SO	M	1616-X6-3B-SS-M-SO	1	1
111		X6-4	0 - 6”	16	16	SO	M	1616-X6-4A-SS-M-SO	1	1
		X6-4	0 - 6”	16	16	SO	M	1616-X6-4A-SS-M-SO-Dup	1	1
		X6-4	0 - 6”	16	16	SO	M	1616-X6-4A-SS-M-SO-MS/MSD	1	1

Table 5-7. MI Sample Details for X- and Z- Open Storage Areas

Sample Count	Grid	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B
112		X6-4	6 - 12”	16	16	SO	M	1616-X6-4B-SS-M-SO	1	1
113	X3	X3-1	0 - 6”	16	16	SO	M	1616-X3-1A-SS-M-SO	1	1
114		X3-1	6 - 12”	16	16	SO	M	1616-X3-1B-SS-M-SO	1	1
115		X3-2	0 - 6”	16	16	SO	M	1616-X3-2A-SS-M-SO	1	1
116		X3-2	6 - 12"	16	16	SO	M	1616-X3-2B-SS-M-SO	1	1
117		X3-3	0 - 6”	16	16	SO	M	1616-X3-3A-SS-M-SO	1	1
118		X3-3	6 - 12"	16	16	SO	M	1616-X3-3B-SS-M-SO	1	1
119		X3-4	0 - 6”	16	16	SO	M	1616-X3-4A-SS-M-SO	1	1
120		X3-4	6 - 12”	16	16	SO	M	1616-X3-4B-SS-M-SO	1	1
		ZX		16	16	W	D	1616-ZX- D-W-EB	1	1
		ZX		16	16	W	D	*1616-ZX- D-W-RIN1	**1**	**1**
								Total Samples	**140**	**140**

Sample Count	
120	M Samples
12	Dup Sample
6	MS/MSD Sample
1	Equipment Blank
1	*Rinsate
140	**Total Samples**

***One rinsate (RIN) sample will be taken each day of sampling and numbered sequentially as collected in the field.**

Sample Naming Convention

16	Parcel
16	SWMU
-	Separator
ZXXX-X or XX-X (A or B)	Grid ID for Z and X Grids with depth interval: A (0-6”) or B (6-12”)
-	Separator
SS	Surface Soil
-	Separator
M	Multi-incremental Sample
-	Separator
SO	Soil

Table/Sample Key

Dup	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
EB	Equipment Blank
RIN	Rinsate
W	Water
D	Discrete
A	0-6” Sample Depth
B	6-12” Sample Depth

1

5.4.4 Geophysical Anomaly Evaluation in SWMU 16

To identify and characterize the cause, lateral and vertical extent of the three anomalies depicted on the geophysical over flight data, two types of samples will be collected from the anomaly areas. First, a 50-increment MI sample will be collected from the surface soil following a meandering path similar to those shown in Figures 5-4 and 5-6. MI samples associated with the anomalies are discussed in Section 5.4.2, listed in Table 5-6 and on Figure 5.3 as FTR23-1, FTR23-2 and FTR23-3. After the GPS coordinates for the MI sample have been completed and the MI sample has been collected, heavy equipment will be used to excavate trenches in the areas shown in the geophysical data as elevated metal content areas. Figure 5-3 shows the proposed excavation locations in SWMU 16, but final determination of the locations will be made in the field. Table 5-8 shows the sampling details for the excavation samples to be collected. The general approach for the investigation of each anomaly is as follows:

- Prior to excavation, ensure that a UXO sweep of the excavation area has been properly conducted.
- Collect a 50-increment MI sample from the surface soil (0-6" in the snake-shaped anomaly and 0-6" and 6-12" in the corresponding Z open storage areas) using a meandering path.
- Using a backhoe excavate a 2-foot wide trench six to eight feet long within the investigation area, placing the surface soil to the side for re-use;
- Collect a soil sample from 6 to 12 inches;
- Continue excavating until a change in soil conditions is observed (buried debris, different color or consistency, or indication of human-generated activity);
- Inspect the changed soil condition and analyze in the field to determine the characteristics. Collect a soil sample from the changed soil (nominally designated 2 to 3 feet in Table 5-7).
- Remove changed soil from the trench and place on visqueen on the side of the excavation;
- Inspect the changed soil and any foreign material, characterize, photograph, and sample the material for waste determination analysis.
- Record geological subsurface conditions ;
- Continue excavating until either undisturbed soil is encountered or the trench reaches five feet in depth;
- Collect the third and final subsurface soil sample from the soil at the bottom of the excavation (nominally designated as 4 to 5 feet in Table 5-7).
- Analyze samples for explosives, SVOCs, perchlorate and RCRA 8 Metals.
- Backfill the excavation trench, compact the soil, and re-cover the trench with surface soil set aside for re-use.

- Collect GPS coordinates at the center and each end of the trench.

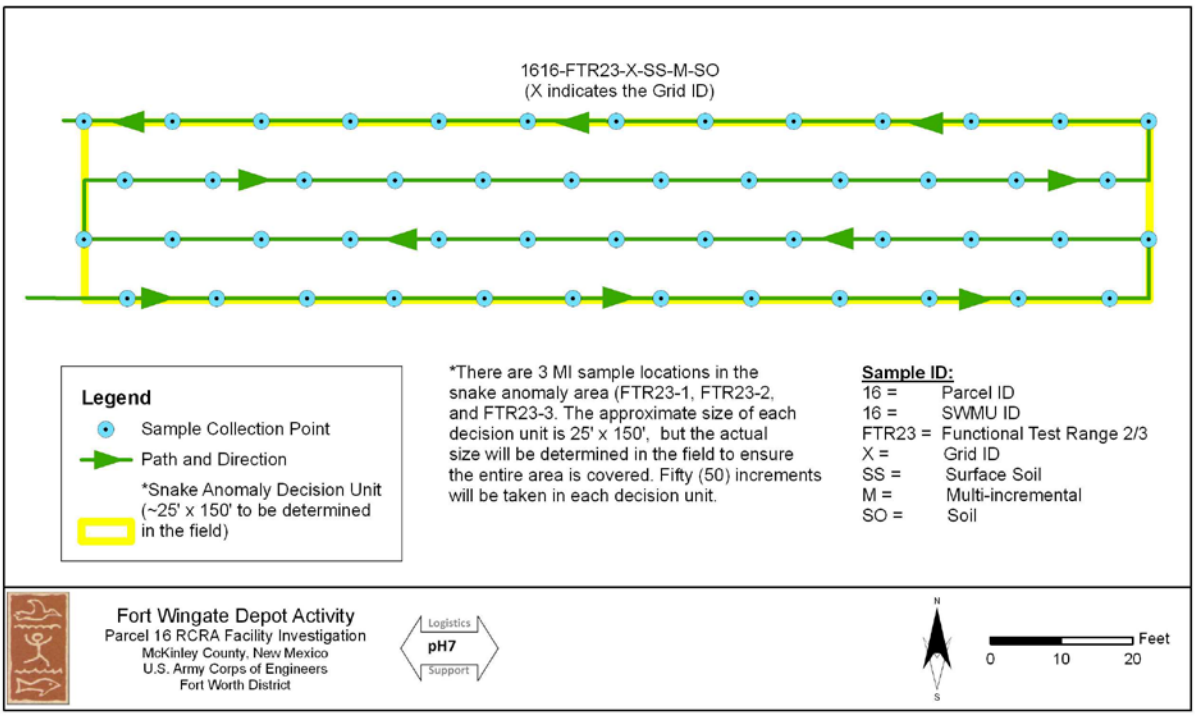

Figure 5-6. Systematic Random 50-Increment Sampling Pattern for "Snake" Area Anomaly Samples

Table 5-8. Geophysical Anomaly Sample Detail for SWMU 16

Sample Count	Grid	Grid ID	Sample Depth	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives SW846 8330B	RCRA 8 Metals SW846 7000B	Perchlorate SW 846 6850	SVOC SW 846 8270D
1	TP1	TP1-1	6 - 12"	16	16	SO	Trenching	1616-TP1-TR-1-D-SO	1	1	1	1
		TP1-1	6 - 12"	16	16	SO	Trenching	1616-TP1-TR-1-D-SO-Dup	1	1	1	1
2		TP1-2	2' - 3'	16	16	SO	Trenching	1616-TP1-TR-2-D-SO	1	1	1	1
3		TP1-3	4' - 5’	16	16	SO	Trenching	1616-TP1-TR-3-D-SO	1	1	1	1
4	TP2	TP2-1	6 - 12"	16	16	SO	Trenching	1616-TP2-TR-1-D-SO	1	1	1	1
		TP2-1	6 - 12"	16	16	SO	Trenching	1616-TP2-TR-1-D-SO-MS/MSD	1	1	1	1
5		TP2-2	2' - 3'	16	16	SO	Trenching	1616-TP2-TR-2-D-SO	1	1	1	1
6		TP2-3	4' - 5’	16	16	SO	Trenching	1616-TP2-TR-3-D-SO	1	1	1	1
7	TP3	TP3-1	6 - 12"	16	16	SO	Trenching	1616-TP3-TR-1-D-SO	1	1	1	1
8		TP3-2	2' - 3'	16	16	SO	Trenching	1616-TP3-TR-2-D-SO	1	1	1	1
9		TP3-3	4' - 5’	16	16	SO	Trenching	1616-TP3-TR-3-D-SO	1	1	1	1
10	TP4	TP4-1	6 - 12"	16	16	SO	Trenching	1616-TP4-TR-1-D-SO	1	1	1	1
11		TP4-2	2' - 3'	16	16	SO	Trenching	1616-TP4-TR-2-D-SO	1	1	1	1
12		TP4-3	4' - 5’	16	16	SO	Trenching	1616-TP4-TR-3-D-SO	1	1	1	1
13	TP5	TP5-1	6 - 12"	16	16	SO	Trenching	1616-TP5-TR-1-D-SO	1	1	1	1
		TP5-1	6 - 12"	16	16	SO	Trenching	1616-TP5-TR-1-D-SO-Dup	1	1	1	1
14		TP5-2	2' - 3'	16	16	SO	Trenching	1616-TP5-TR-2-D-SO	1	1	1	1
15		TP5-3	4’ 5’	16	16	SO	Trenching	1616-TP5-TR-3-D-SO	1	1	1	1
16	TP6	TP6-1	6 - 12"	16	16	SO	Trenching	1616-TP6-TR-1-D-SO	1	1	1	1
17		TP6-2	2' - 3'	16	16	SO	Trenching	1616-TP6-TR-2-D-SO	1	1	1	1
18		TP6-3	4' - 5’	16	16	SO	Trenching	1616-TP6-TR-3-D-SO	1	1	1	1
	TP			16	16	W	D	1616-TP D-W-EB	1	1	1	1
	TP			16	16	W	D	*1616-TP D-W-RIN1	1	1	1	1
								Total Samples	23	23	23	23

***One rinsate (RIN) sample will be taken each day of sampling and numbered sequentially as collected in the field.**

Table 5-8. Geophysical Anomaly Sample Detail for SWMU 16

# of Pits	Sample locations
3	Trench Pits, Snake like feature
2	Z Pad 135
1	Z Pad 123
Sample Count	
18	Samples
2	Dup Samples
1	MS/MSD Sample
1	EB Sample
1	RIN Sample
23	**Total Samples**

Sample Naming Convention	
16	Parcel
XX	16 for SWMU 16/00 for test pits not in SWMU or AOC
TPX-X	Grid ID
-	Separator
X	Sample Depth
-	Separator
D	Discrete
-	Separator
SO	Soil

Sample Depth	
1	6 - 12"
2	2' - 3'
3	2' - 3'
4	Sequential numbers will be used for additional depths

Table/Sample Key	
TP	Test Pit
TR	Trench
Dup	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
EB	Equipment Blank
RIN	Rinsate
SVOCs	Semivolatiles

6.0 AOC 41 – AREA K-BLOCK IGLOOS

6.1 Background

Most of the central portion of FWDA property is occupied by magazine facilities for storing ammunition. The magazine/igloo (igloo) area is approximately 7,400 acres or about 1/3 of the installation's land. Figure 6-1 shows the location of the igloos and the Area K-Block igloos.

There are 732 earth-covered concrete igloos in 10 clusters across FWDA designated Blocks A – H, J and K. The igloos vary in size; however, each is an earth-covered concrete structure with a door. The igloo areas are served by a network of roads and railroads. Block K was historically referred to as "I" Area but was later renamed K Block. K Block has 27 earth covered igloos reported to be 60-feet long and originally covered with two feet of rock and soil. The igloo construction is concrete floor, walls, and vaulted ceilings, and the original construction included interior floor drains sloped to drain outlets in the head wall on each side of the door. The igloos were vented and had a grounding system for lightning strikes. Area K was used to store mines, 155-mm and 8-inch HE projectiles.

The stored explosives were containerized. No records were found to indicate that loose powder has ever been stored in the Magazine /Igloo Area or that any of the individual magazine units have had explosions or releases of explosives to the environment. No information has been found to suggest that other types of hazardous materials have been stored in these facilities.

The NMED has requested the Army to sample the interior of every igloo on FWDA and has specified sample requirements in review comments on RFI Work Plans on Parcels 4, 6, and 22. In a letter dated October 1, 2010 the NMED provided sample protocols at the request of the Army. The letter also stated NMED will use industrial cleanup levels as a benchmark, however NMED specified cleanup levels must be determined based on anticipated future land use which is a tribal decision. The BIA will be the future administrator of the property once the parcels containing igloos are transferred from the Army and prior to transfer of the parcels into tribal trust. Furthermore, NMED requires the Army to consult with the Navajo Nation and Pueblo of Zuni to determine anticipated future use of the igloos. The Army BRAC Division is developing a response to NMED's request.

6.1.1 Description

As shown in Figure 6-1, AOC 41 (K-Block) is an area of approximately 276 acres and contains 27 earth-covered concrete igloo munitions storage magazines with concrete or hard packed driveways. K-Block has four main roads running northeast to southwest, and one shorter road on the south end of K-block intersects roads that connect all the roads into a loop area. The igloos are evenly spaced along the four main roads. The shorter road to the south serves access to five bermed revetment areas only. There are also 24 open spaced bermed revetment areas in between the igloos. These revetments were used for high demand open storage when covered space inside the igloos was not available.

6.1.2 Surface Soils

As shown in Figure 3-2 the primary soil type in most of the AOC 41 is Rehobeth silty clay loam (1 to 10 percent slopes), with the Evpark-Arabrab complex (2 to 6 percent slopes) to the south, the Rizno-Tekapo Rock outcrop complex to the northwest (8 to 35 percent slopes), and Celavar-Atarque complex (1 to 8 percent slopes) on the northwestern edge of AOC 41.

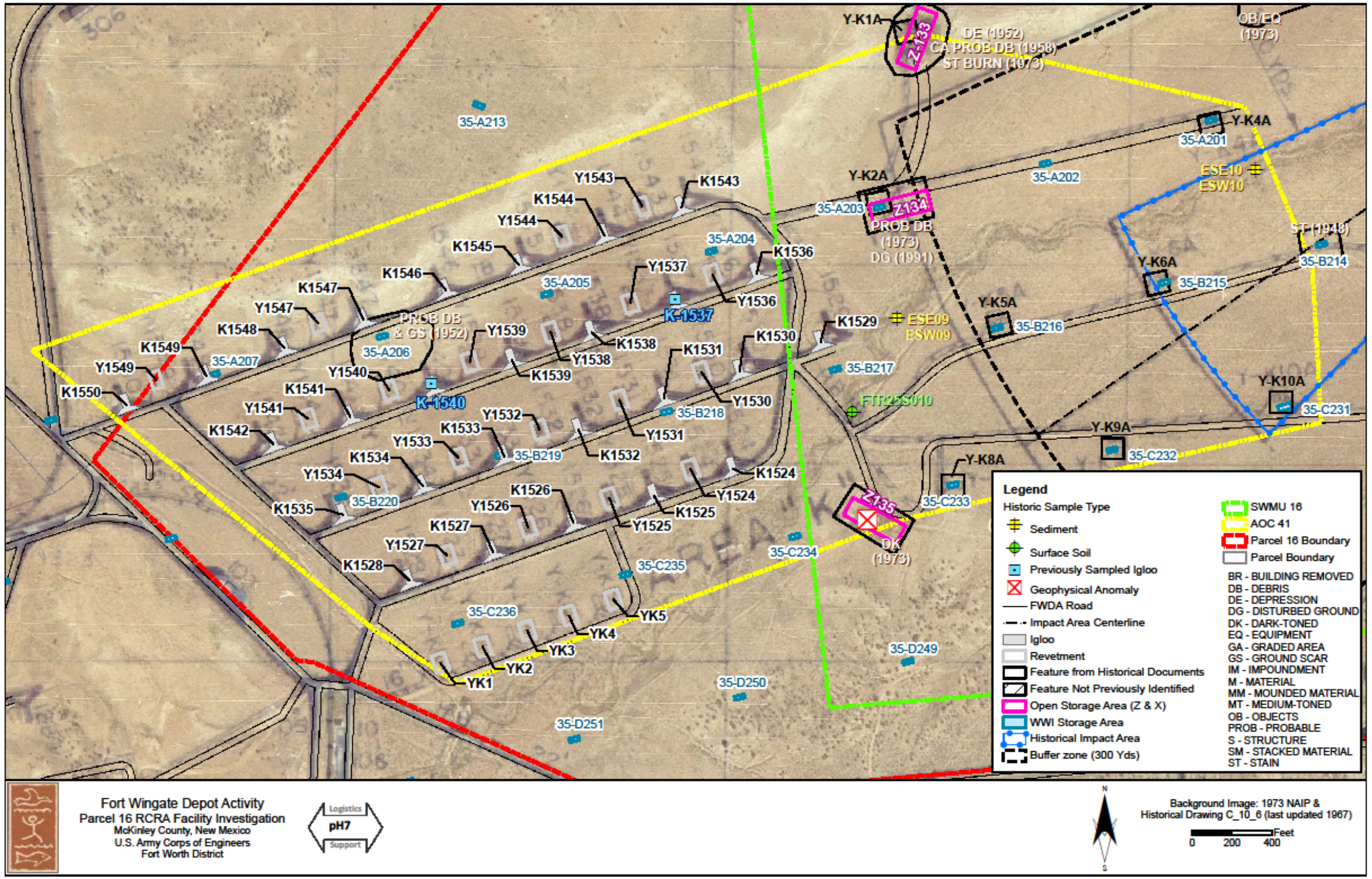

Figure 6-1. Historical Drawing Showing Igloo Locations in Igloo Block K, AOC 41, Parcel 16

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6.1.3 Subsurface Geological Conditions

The FWDA site can be geologically divided into two parts: an alluvial plain created by the South Fork of the Puerco River in the north and a drainage basin between two bedrock ridges in the south. The northern area, which contains AOC 41, is primarily composed of alluvial deposits of a combination of clay, silt, sand, and gravel underlain by the Chinle Group of Triassic age.

Figure 3-3 shows the geological formations in AOC 41. The majority of this area, as previously stated is alluvial deposits, flanked to the north and south by areas of Petrified Forest Formation, Painted Desert Members.

6.2 Evaluation of Existing Data for AOC 41

6.2.1 Environmental Assessments and Investigations.

Twelve environmental assessment or investigation reports were reviewed that were dated from January 1980 to March 2010. AOC 41 was included in each of those documents, but only four of the twelve contained information specific to AOC 41. Table 6-1 below contains a summary of those four reports that contained information about Area K-Block igloos, the recommendations or findings and the status of those recommendations.

6.2.2 Evaluation of Existing Environmental Characterization Data.

Two sediment samples, two discrete soil samples, six wipe samples from the interior of igloos, six paint chip samples for the interior of igloos, and one surface soil sample were collected in AOC 41 during the 1997 site-wide RI/FS. These sample locations are shown on Figure 6-1. All of these samples were collected in and around igloos K1537 and K1540. The samples collected during the RI/FS were consistent with the Master Environmental Plan (USATHMA, 1990).

AOC 41 Analytical results

The RI/FS included sampling and analysis of surface soil and interior wipe samples of igloo areas. The sampling locations are shown on Figure 6-1.

Surface Soil Sampling

153 surface soil samples were collected in the Areas D, E, F, G, H, J and K and analyzed for explosives, nitrate/nitrite, and total phosphorus. Two samples were collected in Area K.

Surface Soil Sample Explosives Results

No explosives were detected in surface soil samples from igloos located in Blocks D, E, F, G, H, or J. In Block K, however, one sample (K1540SO01) contained three explosive compounds, two at concentrations above screening levels. The compounds detected were 2,4-DNT at 510 µg/g, 2,6-dinitrotoluene (2,6-DNT) at 20.5 µg/g, and 2,4,6-TNT at 1.78 µg/g. When compared with current screening levels for RSL and SSL, only the 2,4-DNT result was above the current screening thresholds of 1.6 and 15.7 µg/g.

Surface Soil Sample Nitrate/Nitrite Results

Nitrate was found at a concentration (110 µg/g) above the background level of 30.0 µg/g in one surface sample (K1540SO02) in Igloo Block K.

Wipe Samples

One hundred twenty nine wipe samples were collected from interior walls of igloos at FWDA; two igloos were sampled in K-Block (K1537 and K1540). One K-block wipe sample tested positive for explosives: 2,4,6-TNT was detected at 0.020 µg/cm^2 in Igloo K1537 (K1537-I).

The sampling in the RI/FS confirmed the presence of explosive residues in K-block both on the interior surface of the igloo and in the soil in the drainage area; however, the extent of contamination is not known.

The results of the surface soil and wipe samples collected during the 1997 RI/FS are shown in Table 6-2.

Table 6-1. Historical Document Summary and Status for K-Block

Document	Summary of Report	Recommendations	Status
Fort Wingate Depot Activity, NM6213820974, Gallup, New Mexico. RCRA Facility Assessment Report,1990	Review of historical use of the igloos in Area K.	None	N/A
Master Environmental Plan: Fort Wingate Depot Activity, Gallup, New Mexico 1990	K-Block Igloos	-Prior to release for other uses; thoroughly sample chip samples from floors. -Surface soil sampling (6 -12 inches deep) from stained areas. -Analysis for explosives. If results show elevated readings, in-depth sampling should be implemented; soil borings, concrete borings, analyzed for explosives.	Implemented – RI/FS 1997, collected exterior surface soil samples and interior wipe and chip samples; analyzed for explosives, nitrates/nitrites and phosphorus.
Fort Wingate Depot Activity, Gallup, New Mexico, Final Remedial Investigation /Feasibility Study & RCRA Corrective Action Program Document, 1997	Igloos data gathering activity and results were: -6 wipe samples collected in K-Block igloos and analyzed for TCL PCBs, TCL pesticides, TCL herbicides; one sample was detected with explosives. -6 chip samples were collected from the interior of K-Block igloos and analyzed for explosives; one sample was detected for explosives. -1 surface soil sample was collected in K-Block, analyzed for explosives, nitrate/nitrite, and total phosphorus. Two explosives results detected above screening levels; one sample exceeded nitrate/nitrite above background.	Determine Human Health Risk.	Detection results exceed background, exceeded screening levels. Human Health screening required.
Aerial Photographic Site Analysis, Fort Wingate Depot Activity, 2006	12 aerial photographs of FWDA; the photographs show the use of FWDA between from 1935 to 1997.	None	N/A

Documents without recommendations or findings relevant to K-Block were not included in this table.

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Table 6-2. Historic Surface Soil and Wipe Sample Results Igloo Block K, AOC41, Parcel 16

Soil Samples

Sample ID			K1537S001	K1537S002	K1537S003	K1540S001	K1540S002	K1540S002	K1540S003	Historical		Current	
Sample Type			Plug	Plug	Plug	Plug	Plug	Plug	Plug	**BKG**	**Screening**	**Nov, 2010**	**Dec, 2009**
Date Sampled	CAS #	Units	1/15/1993	1/15/1993	1/15/1993	1/15/1993	1/15/1993	1/15/1993	1/15/1993			**RSL**	**NMSSL**
Inorganic													
Nitrite, Nitrate	NA	µg/g	< 1.00	4.44	< 1.00	2.62	110	76	1.84	30	27000	130,000	125,143
Phosphorus	NA	µg/g	365	437	183	418	400	387	218	659	NA		
Explosive													
1,3,5-Trinitrobenzene	99-35-4	µg/g	< 1.21	< 1.21	< 1.21	< 1.21	< 1.21	< 1.21	< 1.21			2,200	NA
1,3-Dinitrobenzene	99-65-0	µg/g	< 0.389	< 0.389	< 0.389	< 0.389	< 0.389	< 0.389	< 0.389			6.1	NA
2,4,6-Trinitrotoluene	118-96-7	µg/g	< 0.924	< 0.924	< 0.924	1.78 (C)	< 0.924	< 0.924	< 0.924	NA	21.3	19	35.9
2,4-Dinitrotoluene	121-14-2	µg/g	< 0.371	< 0.371	< 0.371	510 (C)	< 0.371	< 0.371	< 0.371	NA	0.941176	1.6	15.7
2,6-Dinitrotoluene	606-20-2	µg/g	< 0.815	< 0.815	< 0.815	20.5 (C)	< 0.815	< 0.815	< 0.815	NA	0.941176	61	61.2
Cyclotetramethylenetetranitramine (HMX)	2691-41-0	µg/g	< 1.02	< 1.02	< 1.02	< 1.02	< 1.02	< 1.02	< 1.02			3,800	3,060
Nitrobenzene	98-95-3	µg/g	< 0.357	< 0.357	< 0.357	< 0.357	< 0.357	< 0.357	< 0.357			4.8	49.4
Cyclonite/Hexahydro-1,3,5-trinitro-1,3,4- triazine (RDX)	121-82-4	µg/g	< 1.13	< 1.13	< 1.13	< 1.13	< 1.13	< 1.13	< 1.13			5.5	44.2
Nitramine/N-Methyl-N,2,4,6-tetranitroaniline (TETRYL)	479-45-8	µg/g	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51	<1.51			240	244

Wipe Samples

Sample ID			K1537-1	K1537-2	K1537-3	K1540-1	K1540-2	K1540-3	K1540-3	Historical		Current	
Sample Type			Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	Wipe	**BKG**	**Screening**	**Nov, 2010**	**Dec, 2009**
Date Sampled	CAS #	Units	12/20/1992	12/20/1992	12/20/1992	12/20/1992	12/20/1992	12/20/1992	12/20/1992			**RSL**	**NMSSL**
Explosive													
1,3,5-Trinitrobenzene	99-35-4	µg/cm^2	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*		NA	NA	NA
1,3-Dinitrobenzene	99-65-0	µg/cm^2	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*		NA	NA	NA
2,4,6-Trinitrotoluene	118-96-7	µg/cm^2	0.020 (C)	0.060*	0.060*	0.060*	0.060*	0.060*	0.060*		NA	NA	NA
2,4-Dinitrotoluene	121-14-2	µg/cm^2	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*		NA	NA	NA
2,6-Dinitrotoluene	606-20-2	µg/cm^2	0.060*	0.060*	0.060*	0.060*	0.060*	0.060*	0.060*		NA	NA	NA
Cyclotetramethylenetetranitramine (HMX)	2691-41-0	µg/cm^2	0.060*	0.060*	0.060*	0.060*	0.060*	0.060*	0.060*		NA	NA	NA
Nitrobenzene	98-95-3	µg/cm^2	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*	0.030*		NA	NA	NA
Cyclonite/Hexahydro-1,3,5-trinitro-1,3,4- triazine (RDX)	121-82-4	µg/cm^2	0.060*	0.060*	0.060*	0.060*	0.060*	0.060*	0.060*		NA	NA	NA
Nitramine/N-Methyl-N,2,4,6-tetranitroaniline (TETRYL)	479-45-8	µg/cm^2	0.090*	0.090*	0.090*	0.090*	0.090*	0.090*	0.090*		NA	NA	NA

Data Qualifiers

(C) Data confirmed

* - Not Detected

Samples exceeding screening or background, 1997 RI/FS

BKG - Background

RSL - Residential Screening Level

NMSSL - New Mexico Soil Screening Level

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6.2.3 Evaluation of Other AOC 41 Data

Other AOC 41 data include historic files or studies, aerial photographs, historic site maps, and geophysical surveys. This section summarizes the findings from each of those sources.

The aerial photographs show that the Parcel 16 areas have been used for many years for materials storage. Many of these areas appear in the aerial photographs as discolored surface soil as a result of that use. Table 6-3 provides a summary of the aerial photograph review.

Historical building drawings depict areas designated as storage areas in and around Parcel 16. Table 6-4 provides a summary of the historical building review.

Table 6-3. Summary Table of Parcel 16 Aerial Photographs for AOC 41

Year	Summary Analysis Findings	Specific Details of Analysis of AOC 41
1935	AOC 41 and area that was to become FTR 2/3 has evenly spaced storage areas	No Area K
1948	AOC 41 is depicted	None
1952	AOC 41 is depicted	None
1958	AOC 41 is depicted	None
1962	AOC 41 is depicted	None
1966	AOC 41 is depicted	None
1973	AOC 41 is depicted	- South end near road, "dark material, probably debris" - Southern road, south side "dark" area.
1978	AOC 41 is depicted	-East of K-block – "disturbed ground"
1985	AOC 41 is depicted	None
1991	AOC 41 is depicted	East of K-block – "disturbed ground", same area as 1978
1993	AOC 41 is depicted	None
1997	AOC 41 is depicted	-The impoundment or pond remains -East of K-block – "disturbed ground", same area as 1978

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Table 6-4. Summary Table of Parcel 16 Historical Drawings for K-Block

Drawing and Date	Area "K"
A-1-12, General Layout Plan, 1943	Depicts 27 Igloos (numbered I-1524 to I-1550), and a Safety shelter (numbered 224) located in the center of the area between I-1538 and I-1539
C-9-30, General Site and Building Use Map, 1963	Shows Area "K", identifies three types of structures - 27 Underground igloos (numbered 1524 to 1550) with concrete fork lift truck loading aprons in asphalt surface aprons. -19 four-sided barricaded outside storage sites numbered Y1524 to Y1549) with unimproved loading apron. -5 four-sided barricaded outside storage sites (numbered Y-K1 to Y-K5) in igloo magazine area with gravel surfaced loading aprons. These are located to the south of Area "K" - 8 four-sided barricaded outside storage sites (numbered Y-K1A to Y-K10A; Y-K3A and Y-K7A are not shown) in igloo magazine area with gravel surfaced loading aprons. These structures extend into the firing fan and buffer area of FTR 2/3.
C-10-4, Index & Open Storage Plan, 1966	Shows Area "K", identifies three types of structures - 27 Buildings or structures, Permanent. (numbered K-1524 to K-1550) -19 Buildings or structures, Temporary (numbered Y1524 to Y1549). -5 Buildings or structures, Temporary (numbered Y-K1 to Y-K5) These are located to the south of Area "K" - 8 Buildings or structures, Temporary (numbered Y-K1A to Y-K10A, Y-K3A and 7A are not shown) These structures extend into the firing fan and buffer area of FTR 2/3 -14 Open storage sites (numbered Z-120 – Z-123; Z126 – Z128, and Z133 to Z139)
A-2-7, General Site Map, 1986	Depicts 27 Underground magazines (numbered I-1524 to I-1550), -19 Buildings or structures, Temporary (numbered Y1524 to Y1549). -8 Buildings or structures, Temporary (numbered Y-K1A to Y-K10A, Y-K3A and 7A are not shown) These structures extend in the firing fan and buffer area of FTR 2/3.
C-10-15 Master Building and Structure Numbering Plan, 1970 (Same drawing as 1963 above, amended in 1970)	Same as above, with text added "K 1524 – K1550 Igloos" Legend – K1524 – K1550 Northeast 60' igloo magazines.

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6.3 Data Gap Analysis

The environmental sampling data collected within AOC 41 indicated the presence of explosive residues, both inside the igloos and in the surface soils. Additional surface soil samples are needed to identify the extent of explosive residue contamination in each igloo drainage area. Although no subsurface soil characterization has been completed, most explosive residue contamination is found in the top 2-3 cm of surface soil (USACE, 2007).

In addition to the igloos, there is no characterization data about the outside bermed revetment storage areas around AOC 41. The 1935 aerial photographs show munitions storage areas or structures. These aerial photographs show pre-WWII storage areas, and none of these areas were described or characterized in historical reports. Field confirmation is needed to define the exact number and locations of revetments, igloos, and pre-WWII structures (if any) in AOC 41.

6.3.1 Data Gap Remedies

Three data gathering activities are recommended to address the data gaps identified above and to characterize the soil areas around the K-block igloos.

6.3.1.1 Characterize soil at igloo drainage outlets

In order to characterize soil potentially impacted by the drainage outlets of each igloo, collect discrete surface soil samples at the outfall point of each drainage pipe. Typical discrete soil sample locations for an igloo are shown in Figure 6-2.

6.3.1.2 Characterize soil in igloo drain areas

To characterize surface soil in the drain area of each igloo in K-Block, conduct MI sampling in each igloo drainage area of each igloo drain. The configuration of the typical DU for each igloo drainage MI sample is shown in Figure 6-2.

6.3.1.3 Characterize soil in K-Block revetments

Lastly, to characterize surface soil in each K-Block revetment, conduct MI sampling of the surface area within each revetment to determine the impacts of the open storage, handling and management of munitions on the surface soil inside the area. These samples will provide the data needed to define the potential lateral extent of contamination in these revetments. The configuration of the typical DU for each revetment MI sample is shown on Figure 6-3. Figure 6-4 shows the locations of the discrete samples, MI drainage samples, and MI revetment samples.

6.4 Scope of Activities

The following section provides the data gathering activities that will be conducted to characterize the surface and subsurface soils within AOC 41 that may have been impacted during the mission of the FWDA.

6.4.1 Contaminants of Potential Concern

The COPCs are developed based on the previous sampling data combined with the activity of storage and handling of munitions and high explosives in this area. The relevant COPC's are:

- Explosives by method EPA 8330 for the use, storage, or disposal of HE, and
- RCRA 8 metals by method 6010/7000 analysis that includes; Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium & Silver; for the use and storage of HE.

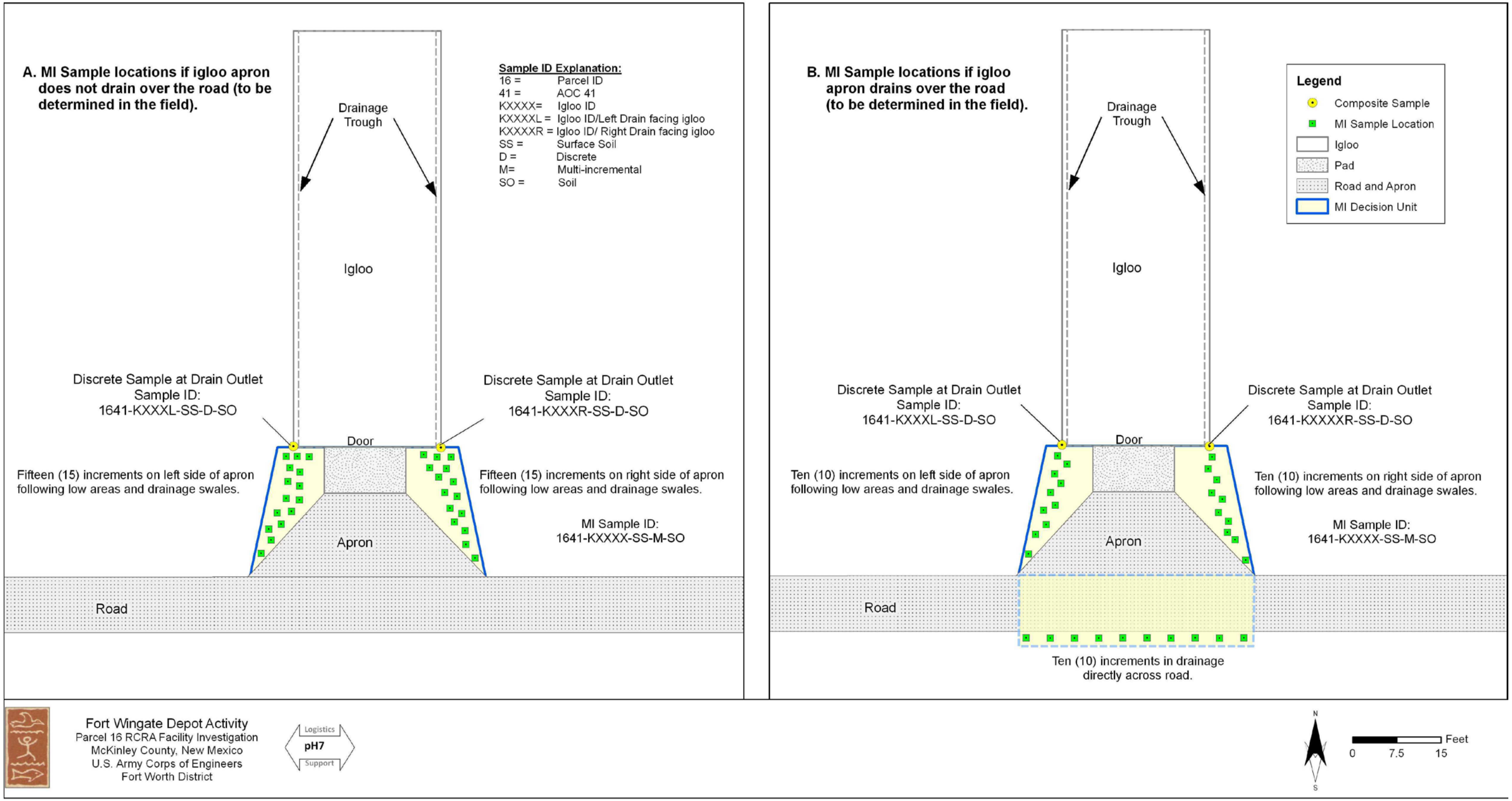

Figure 6-2. Discrete and Multi-incremental Sample Locations for Igloos

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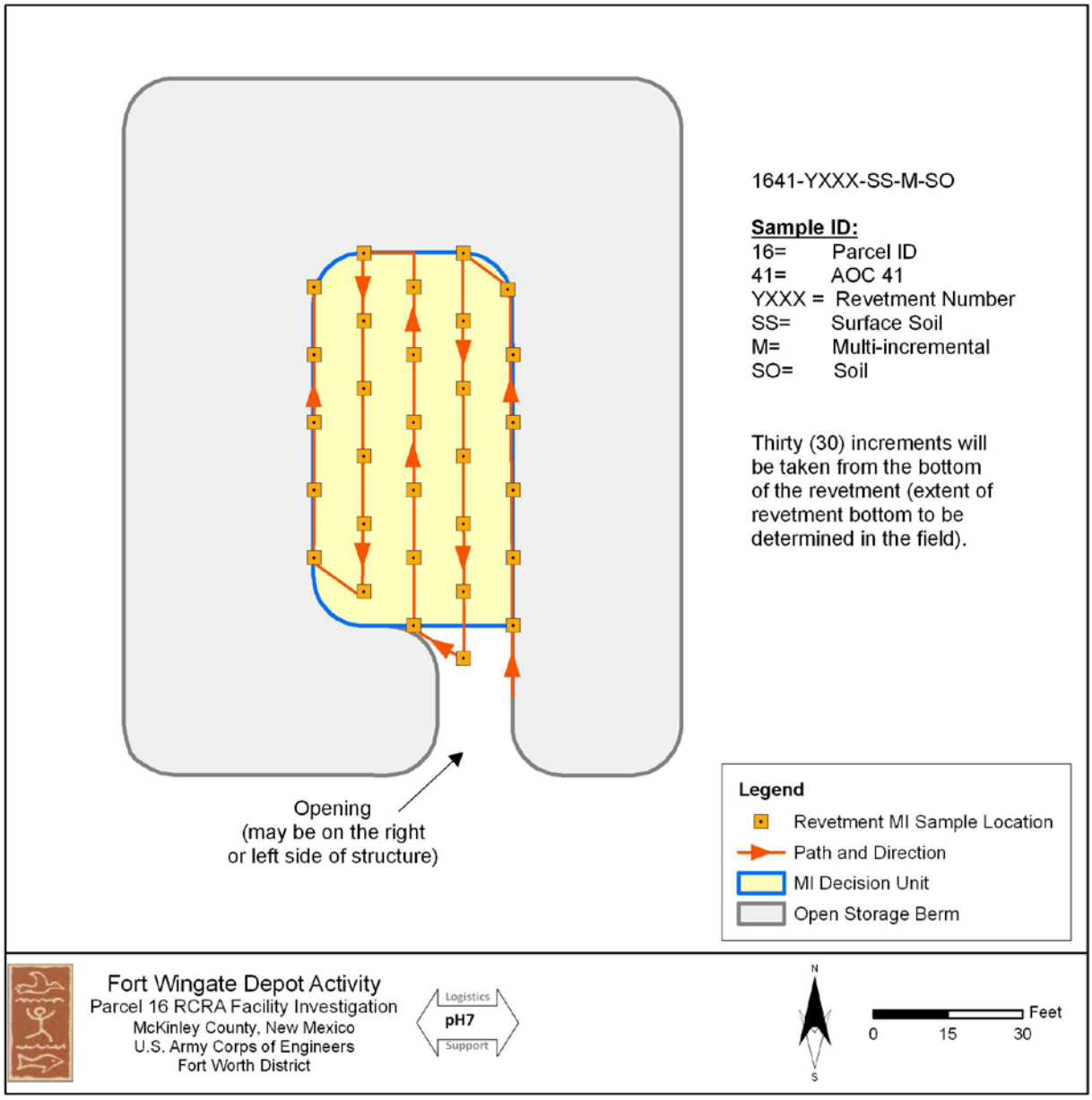

Figure 6-3. Sampling Location for Open Storage Revetments

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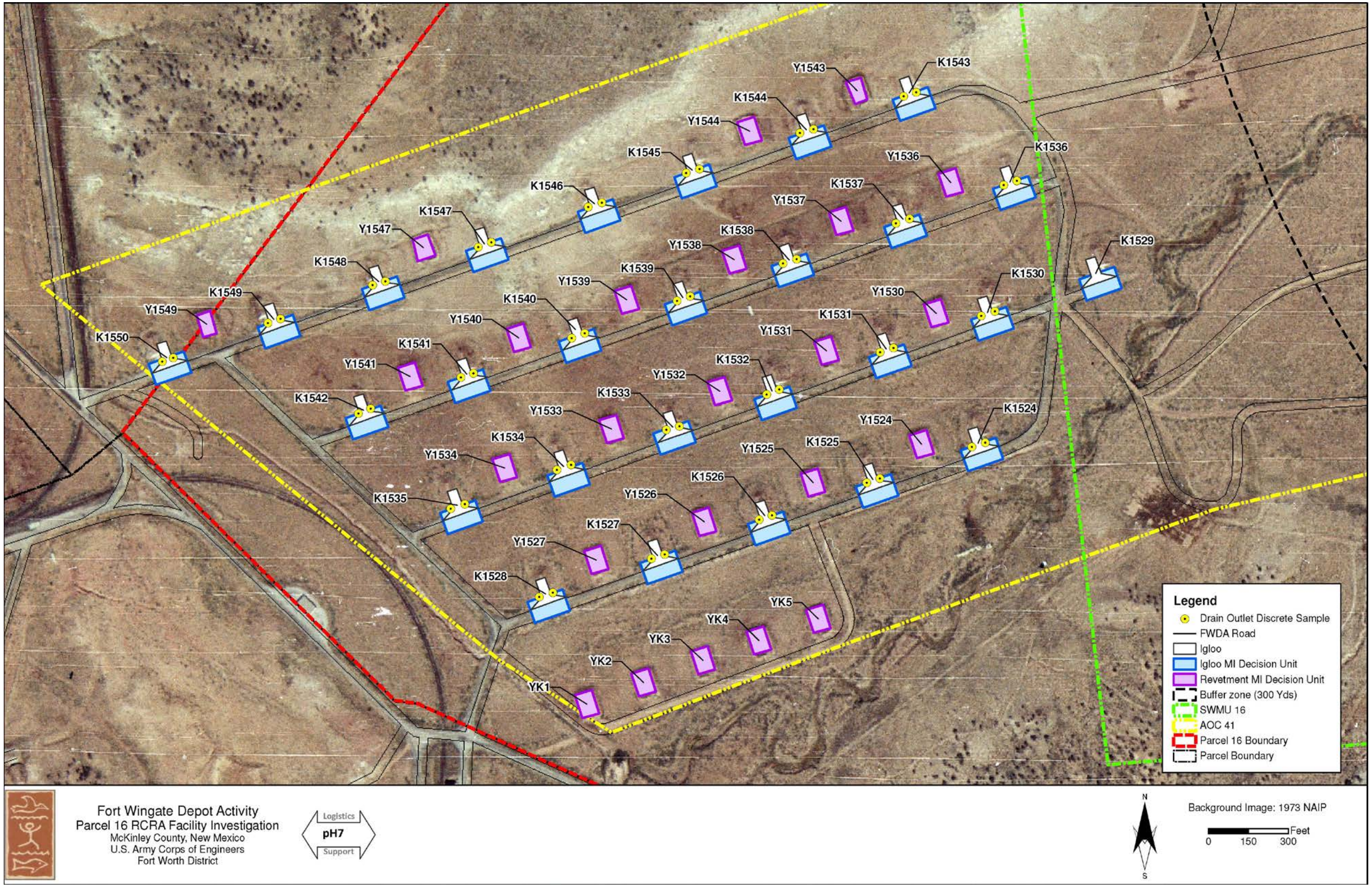

Figure 6-4. Sampling Locations for Igloos, Drain Outlets, and Open Storage Revetments

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Table 6-5 below provides the sample analysis specifications for the samples to be collected.

Table 6-5. Soil Sample Analysis Specifications

Analysis	Method	Container	Handling	Extraction & Analysis Times
Explosives	SW846 8330B	1-4 OZ glass, wide mouth	Cool to 4 degrees C	14 days to extraction / 40 days to analysis
RCRA 8 Metals	SW846 6010C/7000	1-4 OZ glass, wide mouth w/Teflon-lined lid	Cool to 4 degrees C	6 months until extraction / analysis within 28 days

6.4.2 Discrete Soil Samples of Igloo Drains

There are 27 igloos in Area K-Block; each igloo has a drainage outlet on each side of the igloo. To characterize the discharge from each igloo, one discrete soil sample will be collected directly below each of the drainage outfalls. If necessary, the soil that may have accumulated above the drain will be removed so the sample can be collected from the soil directly under the drain from the surface to 3 inches. This will provide characterization data at the point of potentially the highest concentration of discharge if contaminate was discharged from the igloos. The typical sampling locations of each igloo are shown in Figure 6-2. The samples will be collected using a clean or new sampling tool; the sample will be placed directly into a new clean sample container. The sample container will be labeled, logged onto the chain of custody form, placed into a plastic zip lock bag, and placed into a cooler with ice. Table 6-6 contains the sample details of the discrete and MI samples to be collected at each igloo.

6.4.3 Multi-incremental Sampling Surface Soil Igloo Drainage Areas

Multi-incremental DUs for each igloo will include the drainage areas for each drain at each igloo. The drainage areas are in the unpaved areas indicated in Figure 6-2. Thirty increments will be collected from the lowest areas or points in the drainage swales of each side of the igloo drains and from the drainage directly across the road from the apron if indicated by field observation. If the access road acts as a drainage divide and no water from the apron runs over it, then the sample will be 15 increments on each side of the apron beginning at the drain outfall and roughly equally spaced to the ditch at the road. If water runs across the road from the apron, then ten increments will be taken evenly spaced from each drain to the ditch and 10 increments across the road in a line between the ends of the igloo wing walls. Each increment will be collected at a depth of 0-6 inches. The increments will be placed in a clean sampling container and the entire sample shipped to the laboratory for analysis. The analytes for these samples will be explosives and RCRA 8 Metals. Figure 6-4 shows the MI sampling locations at each Igloo in AOC 41. Table 6.5 contains the sample details of the discrete and MI samples collected at each igloo.

6.4.4 Multi-incremental Sampling Surface Soil Inside Bermed Revetment Areas

The MI DUs inside each revetment are the area of the revetment bottom and will be determined in the field. Thirty increments will be collected from within that area. Each revetment will be evaluated in the field to determine the degree of berm erosion and "wash in" to the revetment area. If it appears that the original grade of the revetment has been covered by wash-in material, the wash-in material will be removed with a power auger, and the revetment increment will be taken from the original grade soil. Thirty increments will be collected from 0-to 6-inches deep using a 7/8-inch diameter slotted push probe. The increments will be collected in a random meandering path traversing an area similar to that shown in Figure 6-3. The increments will be placed in a clean sampling container and the entire sample shipped to the laboratory for analysis. These samples will be analyzed for explosives and RCRA 8 metals. Figure 6-3 shows the typical MI sampling DU area at each revetment area in AOC 41. Table 6-7 contains the sample collection details for MI sampling in the AOC 41 revetments.

1

Table 6-6. Sample Details for Discrete and MI Igloo Samples at Igloo Block K, AOC41, Parcel 16

Sample Count	Igloo Number	Location ID	Description	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives	RCRA 8 Metals
1	K1524	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1524R-SS-D-SO	1	1
		R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1524R-SS-D-SO-Dup	1	1
2		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1524L-SS-D-SO	1	1
3			Igloo Drainage	16	AOC 41	SO	M	1641-K1524-SS-M-SO	1	1
4	K1525	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1525R-SS-D-SO	1	1
5		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1525L-SS-D-SO	1	1
6			Igloo Drainage	16	AOC 41	SO	M	1641-K1525-SS-M-SO	1	1
7	K1526	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1526R-SS-D-SO	1	1
8		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1526L-SS-D-SO	1	1
9			Igloo Drainage	16	AOC 41	SO	M	1641-K1526-SS-M-SO	1	1
10	K1527	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1527R-SS-D-SO	1	1
11		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1527L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1527L-SS-D-SO-Dup	1	1
12			Igloo Drainage	16	AOC 41	SO	M	1641-K1527-SS-M-SO	1	1
13	K1528	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1528R-SS-D-SO	1	1
14		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1528L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1528L-SS-D-SO-MS/MSD	1	1
15			Igloo Drainage	16	AOC 41	SO	M	1641-K1528-SS-M-SO	1	1
16	K1529	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1529R-SS-D-SO	1	1
17		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1529L-SS-D-SO	1	1
18			Igloo Drainage	16	AOC 41	SO	M	1641-K1529-SS-M-SO	1	1
19	K1530	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1530R-SS-D-SO	1	1
20		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1530L-SS-D-SO	1	1
21			Igloo Drainage	16	AOC 41	SO	M	1641-K1530-SS-M-SO	1	1
22	K1531	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1531R-SS-D-SO	1	1
		R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1531R-SS-D-SO-Dup	1	1
23		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1531L-SS-D-SO	1	1
24			Igloo Drainage	16	AOC 41	SO	M	1641-K1531-SS-M-SO	1	1
25	K1532	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1532R-SS-D-SO	1	1
26		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1532L-SS-D-SO	1	1

Table 6-6. Sample Details for Discrete and MI Igloo Samples at Igloo Block K, AOC41, Parcel 16

Sample Count	Igloo Number	Sample ID	Description	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives	RCRA 8 Metals
27			Igloo Drainage	16	AOC 41	SO	M	1641-K1532-SS-M-SO	1	1
28	K1533	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1533R-SS-D-SO	1	1
29		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1533L-SS-D-SO	1	1
30			Igloo Drainage	16	AOC 41	SO	M	1641-K1533-SS-M-SO	1	1
31	K1534	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1534R-SS-D-SO	1	1
		R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1534R-SS-D-SO-Dup	1	1
32		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1534L-SS-D-SO	1	1
33			Igloo Drainage	16	AOC 41	SO	M	1641-K1534-SS-M-SO	1	1
34	K1535	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1535R-SS-D-SO	1	1
35		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1535L-SS-D-SO	1	1
36			Igloo Drainage	16	AOC 41	SO	M	1641-K1535-SS-M-SO	1	1
37	K1536	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1536R-SS-D-SO	1	1
38		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1536L-SS-D-SO	1	1
39			Igloo Drainage	16	AOC 41	SO	M	1641-K1536-SS-M-SO	1	1
40	K1537	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1537R-SS-D-SO	1	1
41		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1537L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1537L-SS-D-SO-Dup	1	1
42			Igloo Drainage	16	AOC 41	SO	M	1641-K1537-SS-M-SO	1	1
43	K1538	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1538R-SS-D-SO	1	1
44		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1538L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1538L-SS-D-SO-MS/MSD	1	1
45			Igloo Drainage	16	AOC 41	SO	M	1641-K1538-SS-M-SO	1	1
46	K1539	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1539R-SS-D-SO	1	1
47		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1539L-SS-D-SO	1	1
48			Igloo Drainage	16	AOC 41	SO	M	1641-K1539-SS-M-SO	1	1
49	K1540	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1540R-SS-D-SO	1	1
50		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1540L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1540L-SS-D-SO- Dup	1	1
51			Igloo Drainage	16	AOC 41	SO	M	1641-K1540-SS-M-SO	1	1
52	K1541	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1541R-SS-D-SO	1	1

Table 6-6. Sample Details for Discrete and MI Igloo Samples at Igloo Block K, AOC41, Parcel 16

Sample Count	Igloo Number	Sample ID	Description	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives	RCRA 8 Metals
53		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1541L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1541L-SS-D-SO-MS/MSD	1	1
54			Igloo Drainage	16	AOC 41	SO	M	1641-K1541-SS-M-SO	1	1
55	K1542	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1542R-SS-D-SO	1	1
56		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1542L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1542L-SS-D-SO-Dup	1	1
57			Igloo Drainage	16	AOC 41	SO	M	1641-K1542-SS-M-SO	1	1
58	K1543	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1543R-SS-D-SO	1	1
59		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1543L-SS-D-SO	1	1
60			Igloo Drainage	16	AOC 41	SO	M	1641-K1543-SS-M-SO	1	1
61	K1544	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1544R-SS-D-SO	1	1
62		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1544L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1544L-SS-D-SO-Dup	1	1
63			Igloo Drainage	16	AOC 41	SO	M	1641-K1544-SS-M-SO	1	1
64	K1545	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1545R-SS-D-SO	1	1
65		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1545L-SS-D-SO	1	1
		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1545L-SS-D-SO-MS/MSD	1	1
66			Igloo Drainage	16	AOC 41	SO	M	1641-K1545-SS-M-SO	1	1
67	K1546	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1546R-SS-D-SO	1	1
68		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1546L-SS-D-SO	1	1
69			Igloo Drainage	16	AOC 41	SO	M	1641-K1546-SS-M-SO	1	1
70	K1547	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1547R-SS-D-SO	1	1
		R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1547R-SS-D-SO-Dup	1	1
71		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1547L-SS-D-SO	1	1
72			Igloo Drainage	16	AOC 41	SO	M	1641-K1547-SS-M-SO	1	1
73	K1548	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1548R-SS-D-SO	1	1
		R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1548R-SS-D-SO-MS/MSD	1	1
74		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1548L-SS-D-SO	1	1
75			Igloo Drainage	16	AOC 41	SO	M	1641-K1548-SS-M-SO	1	1
76	K1549	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1549R-SS-D-SO	1	1
77		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1549L-SS-D-SO	1	1
78			Igloo Drainage	16	AOC 41	SO	M	1641-K1549-SS-M-SO	1	1

Table 6-6. Sample Details for Discrete and MI Igloo Samples at Igloo Block K, AOC41, Parcel 16

Sample Count	Igloo Number	Sample ID	Description	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives	RCRA 8 Metals
79	K1550	R	Igloo Right Side Drain	16	AOC 41	SO	D	1641-K1550R-SS-D-SO	1	1
80		L	Igloo Left side Drain	16	AOC 41	SO	D	1641-K1550L-SS-D-SO	1	1
81			Igloo Drainage	16	AOC 41	SO	M	1641-K1550-SS-M-SO	1	1
	K		Equipment Blank	16	AOC 41	W	D	1641-K-D-W-EB	1	1
	K		Rinsate	16	AOC 41	W	D	*1641-K- D-W-RIN1	1	1
								Total Samples	**97**	**97**

***One rinsate (RIN) sample will be taken each day of sampling and numbered sequentially as collected in the field.**

Sample Count	
81	Samples
9	Duplicate Samples
5	MS/MSD Samples
1	EB Sample
1	RIN Sample
97	**Total Samples**

Table/Sample Key	
Dup	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
L	Left drain facing igloo
R	Right drain facing igloo
EB	Equipment Blank
RIN	Rinsate

Sample Naming Convention	
16	Parcel
41	AOC
K-XXX	Igloo Number
L or R	Left or Right side facing igloo for igloo drains only
-	Separator
SS	Surface Soil
-	Separator
D or M	Discrete or Multi-incremental
-	Separator
SO	Soil

1

2

Table 6-7. Sample Details for Discrete and MI Revetment Samples at Igloo Block K, AOC41, Parcel 16

Sample Count	Revetment Number	Description	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives	RCRA 8 Metals
1	YK1	Revetment Bottom	16	AOC 41	SO	M	1641-YK1-SS-M-SO	1	1
	YK1	Revetment Bottom	16	AOC 41	SO	M	1641-YK1-SS-M-SO-Dup	1	1
2	YK2	Revetment Bottom	16	AOC 41	SO	M	1641-YK2-SS-M-SO	1	1
3	YK3	Revetment Bottom	16	AOC 41	SO	M	1641-YK3-SS-M-SO	1	1
4	YK4	Revetment Bottom	16	AOC 41	SO	M	1641-YK4-SS-M-SO	1	1
5	YK5	Revetment Bottom	16	AOC 41	SO	M	1641-YK5-SS-M-SO	1	1
6	Y1524	Revetment Bottom	16	AOC 41	SO	M	1641-Y1524-SS-M-SO	1	1
7	Y1525	Revetment Bottom	16	AOC 41	SO	M	1641-Y1525-SS-M-SO	1	1
	Y1525	Revetment Bottom	16	AOC 41	SO	M	1641-Y1525-SS-M-SO-Dup	1	1
8	Y1526	Revetment Bottom	16	AOC 41	SO	M	1641-Y1526-SS-M-SO	1	1
9	Y1527	Revetment Bottom	16	AOC 41	SO	M	1641-Y1527-SS-M-SO	1	1
10	Y1530	Revetment Bottom	16	AOC 41	SO	M	1641-Y1530-SS-M-SO	1	1
11	Y1531	Revetment Bottom	16	AOC 41	SO	M	1641-Y1531-SS-M-SO	1	1
12	Y1532	Revetment Bottom	16	AOC 41	SO	M	1641-Y1532-SS-M-SO	1	1
	Y1532	Revetment Bottom	16	AOC 41	SO	M	1641-Y1532-SS-M-SO-MS/MSD	1	1
13	Y1533	Revetment Bottom	16	AOC 41	SO	M	1641-Y1533-SS-M-SO	1	1
14	Y1534	Revetment Bottom	16	AOC 41	SO	M	1641-Y1534-SS-M-SO	1	1
15	Y1536	Revetment Bottom	16	AOC 41	SO	M	1641-Y1536-SS-M-SO	1	1
16	Y1537	Revetment Bottom	16	AOC 41	SO	M	1641-Y1537-SS-M-SO	1	1
	Y1537	Revetment Bottom	16	AOC 41	SO	M	1641-Y1537-SS-M-SO-Dup	1	1
17	Y1538	Revetment Bottom	16	AOC 41	SO	M	1641-Y1538-SS-M-SO	1	1
18	Y1539	Revetment Bottom	16	AOC 41	SO	M	1641-Y1539-SS-M-SO	1	1
19	Y1540	Revetment Bottom	16	AOC 41	SO	M	1641-Y1540-SS-M-SO	1	1
20	Y1541	Revetment Bottom	16	AOC 41	SO	M	1641-Y1541-SS-M-SO	1	1
	Y1541	Revetment Bottom	16	AOC 41	SO	M	1641-Y1541-SS-M-SO-MS/MSD	1	1
21	Y1543	Revetment Bottom	16	AOC 41	SO	M	1641-Y1543-SS-M-SO	1	1
22	Y1544	Revetment Bottom	16	AOC 41	SO	M	1641-Y1544-SS-M-SO	1	1
23	Y1547	Revetment Bottom	16	AOC 41	SO	M	1641-Y1547-SS-M-SO	1	1
24	Y1549	Revetment Bottom	16	AOC 41	SO	M	1641-Y1550-SS-M-SO	1	1
	Y	Revetments	16	AOC 41	W	D	1641-Y-D-W-EB		
	Y	Revetments	16	AOC 41	W	D	*1641-Y- D-W -RIN1		
							Total	31	31

Table 6-7. Sample Details for Discrete and MI Revetment Samples at Igloo Block K, AOC41, Parcel 16

***One rinsate (RIN) sample will be taken each day of sampling and numbered sequentially as collected in the field.**

Sample Count	
24	Total Samples
3	Dup Sample
2	MS/MSD Samples
1	EB
1	RIN
31	**Total Samples**

Sample Naming Convention	
16	Parcel
41	AOC
-	Separator
YXXX	Revetment Number
-	Separator
SS	Surface Soil
-	Separator
M	Multi-incremental
-	Separator
SO	Soil

Table/Sample Key	
Dup	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
	Equipment
EB	Blank
RIN	Rinsate
W	Water
D	Discrete

1

7.0 WWI INVESTIGATION AREA

7.1 Background

Prior to the construction of the current Area K-Block igloos, areas within Parcel 16 were reportedly used for munitions storage. The exact historic uses of WWI storage areas are unknown, however, the presumed uses can be linked to Fort Wingate's history which is summarized in the *Archives Search Report*: "…In 1916, Fort Wingate was renamed the Wingate Ordnance Depot and became a storage facility for high explosives, primarily TNT. In 1919, a magazine area was established and construction commenced on storage buildings and magazines (the 1919 general map indicates that over 160 magazines measuring 20' by 56' had been constructed on the site). The mission of Fort Wingate changed from inactive storage to that of repacking and shipping explosives in 1928. Early in 1941, with the advent of WW II, an extensive building and reconstruction program was completed to meet the needs of shipping foreign aid and supplying armies overseas"…(USACE, 1995).

For this investigation, it is presumed that the magazines defined on the 1919 general map represent all of the WWI magazine locations in Parcel 16. In the 1935 aerial photograph, many of the WWI magazine sites appear to be open pads or revetment areas. A few of the 1919 magazine sites in Parcel 16 were not evident in the 1935 aerial photograph. Figure 7-1 shows the location of the WWI magazine sites as taken from the 1919 general map.

7.2 Description

These magazine sites are equally dispersed across both SWMU 16 and AOC 41, and as a result the site descriptions and figures in Section 5.1.1-5.1.3 and 6.1.1-6.1.3 accurately reflect the history, soils, and geology of the WWI magazine sites.

7.3 Evaluation of Existing Data for the WWI Magazine Sites

Numerous information sources were reviewed to determine if they described activities at the WWI magazine sites, including environmental assessments or investigations, aerial photographs, historic site maps, geophysical surveys and other background data. Historical drawings showed the locations of the WWI magazine sites, and historical aerials confirmed the locations.

7.3.1 Environmental Assessments or Investigations.

Twelve environmental assessment or investigation reports were reviewed that were dated from January 1980 to March 2010. With the exception of the citation in Section 7.1 above, the WWI magazine sites are not mentioned in any of these reports. The 2007 USACE Report of Investigation identified 49 WW1 sites in the 1919 general map and 1935 aerial photograph that were not incorporated into any AOC or SWMU. Two of these were in Parcel 16 (D-250 and D-251).

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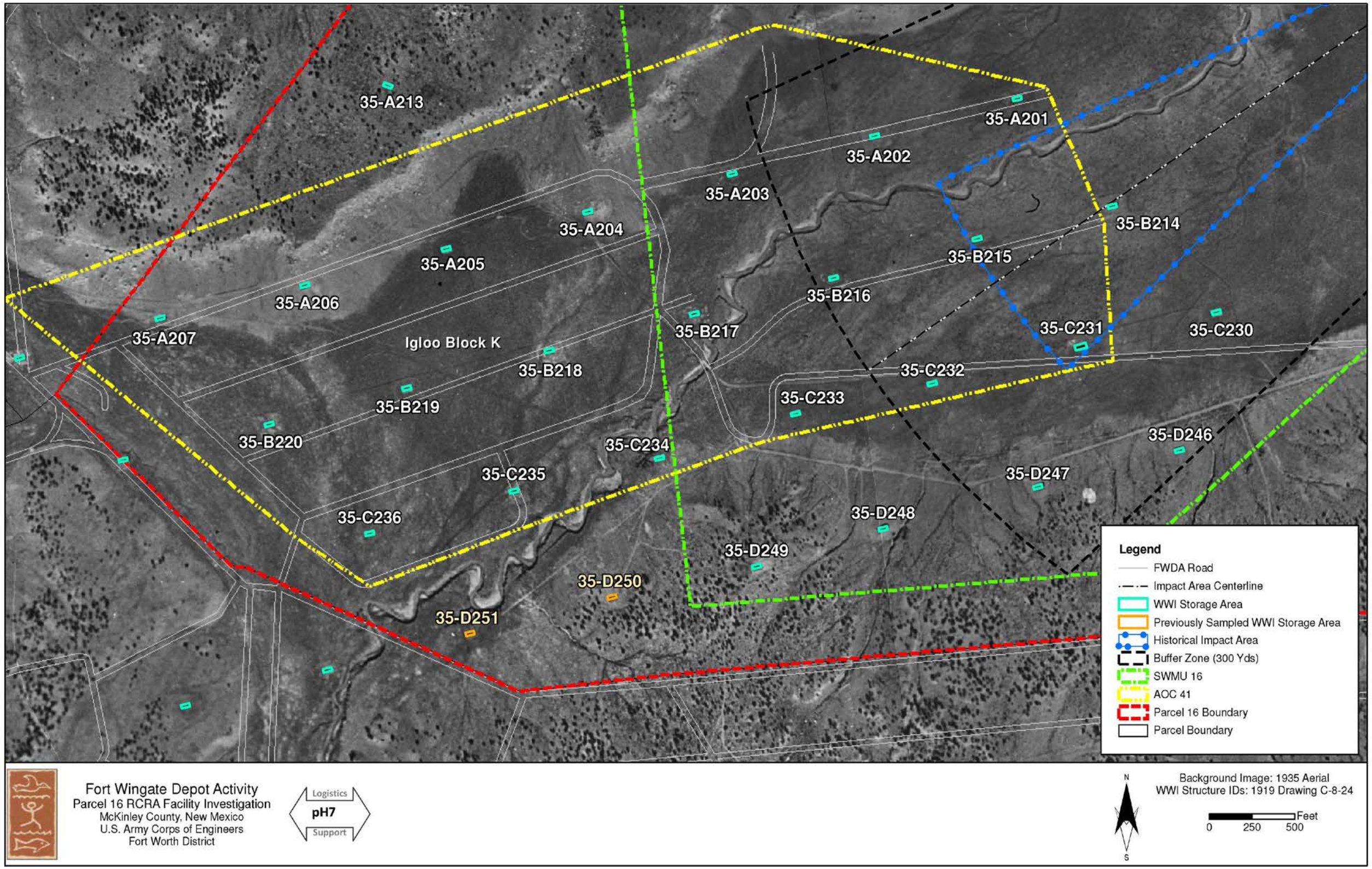

Figure 7-1. Locations of WWI Magazine Sites

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7.3.2 Evaluation of Existing Environmental Characterization Data

WWI magazine sites that were not in an AOC/SWMU were sampled throughout FWDA (USACE, 2007). Two of the previously sampled sites, D-250 and D-251, are located in the southwest corner of Parcel 16, but are not within the boundaries of SWMU 16 or AOC 41. The sites were sampled and tested for explosives; no explosive residues were detected in the samples.

7.3.3 Evaluation of Other Parcel 16 Data

In reviewing historic files or studies such as aerial photographs, historic site maps, geophysical survey and other background data, the only information found was:

- The 1919 general map showing 28 magazine sites in Parcel 16, with each magazine measuring 20' by 56'.
- The 1935 aerial photographs showing the presence of open storage areas dispersed across what is currently Parcel 16.

Table 7-1. Summary Table Parcel 16 Aerial Photographs, 1935 to 1997

Year	Summary Analysis Findings	Specific Details of Analysis	Other Areas of Investigation
1935	AOC 41 and area that was to become FTR 2/3 has evenly spaced storage areas	Storage areas determined primarily by discoloration	Storage areas are shown across the area that is now Parcel 16

7.4 Data Gap Analysis

Fort Wingate's historical use as a military installation since the late 1800's and the earliest aerial photograph available depicts areas that have been cleared and perhaps bermed (typical for open storage of munitions). The 1919 general map indicated that there were twenty-eight 20 foot by 56 foot magazines in Parcel 16, but only 24 are evident in the 1935 aerial photograph. TNT storage in magazines would have primarily been in wooden boxes during the time the magazines were in existence. The data gaps for the WWI munitions magazine sites are:

- The exact location of WWI magazine sites is not completely defined.
- There are no surface soil characterization data for the WWI munitions magazine sites within AOC 41 and SWMU 16.

7.4.1 Data Gap Remedies

Two data gathering activities have been defined to address the data gaps identified above and to characterize the soil of the WWI magazine sites.

- Conduct field activities to identify, locate, and inventory the number and location of these areas.

- If a WWI site is found to have been obliterated from activities following WWI storage use, then the site either will not be sampled (road crosses or structure on top); or if a WWI site was later re-used as another generation of open storage, that area will be sampled in accordance with its later use.

- Characterize surface soil in each WWI munitions storage location. Conduct MI sampling to characterize surface areas to determine the impacts of the storage, handling and management of munitions on the surface soil inside the area. These samples will provide the data needed to determine if a release has occurred at each WWI site. The locations of the WWI magazine MI DUs are shown on Figure 7-2 and the configuration of the typical MI DU for a WWI magazine site is shown on Figure 7-3.

7.5 Scope of Activities

The following section provides the data gathering activities that will be conducted to characterize the surface soils areas inside the magazine sites that may have been impacted during the mission of the FWDA. All sample-handling procedures, data management, field procedures and other details of collecting the samples below will be conducted as detailed in Sections 5 and 6.

7.5.1 Contaminants of Potential Concern

The COPCs are developed based on the previous use and reported materials being stored at the time of use, which was reported to be storage of TNT; as a result the COPCs would be explosives as detected in method EPA 8330.

Table 7-2 below provides the sample analysis specifications for the samples to be collected.

Table 7-2. Soil Sample Analysis Specifications

Analysis	Method	Container	Handling	Extraction & Analysis times
Explosives	SW846 8330B	double bag	Cool to 4 degree C	14 days to extraction / 40 days to analysis

7.5.2 Locating the WWI Magazine Sites

Prior to conducting field work, the 1935 aerial photograph and 1919 map will be used to create a GPS coordinate for each WWI magazine site. The field team will use these GPS coordinates to locate the area, document current field conditions, and create a GPS coordinate for the four corners of each area. In the event the area is not visibly distinguishable, the GPS coordinate generated will be used as the center point for the MI DU. If there are roads, structures, or other impediments at the GPS coordinate, the sample will not be collected.

7.5.3 Multi-incremental Sampling Surface Soil inside Magazine Sites

Data Gathering Activity: Collect one MI sample from the surface soil of each WWI magazine site. Prior to collecting samples, UXO personnel will sweep the sampling area using hand held metal detection equipment to search for potential munitions debris. During the sweep the UXO

technician will use GPS in tracking mode to provide traverse data of the area surveyed. The MI DUs for each magazine site are estimated to be approximately 30 feet by 60 feet, and inside the DU 30 increments will be collected. Thirty 0 to 6 inch deep increments will be taken from each DU using a 7/8-inch diameter slotted push probe. The increments will be collected in a random meandering path traversing the area (see Figure 7-3). The increments will be placed in a clean sampling container and the entire sample shipped to the laboratory for analysis. The analysis of these samples will be for explosives.

Table 7-3 contains the sample collection details for MI sampling in the WWI magazine sites.

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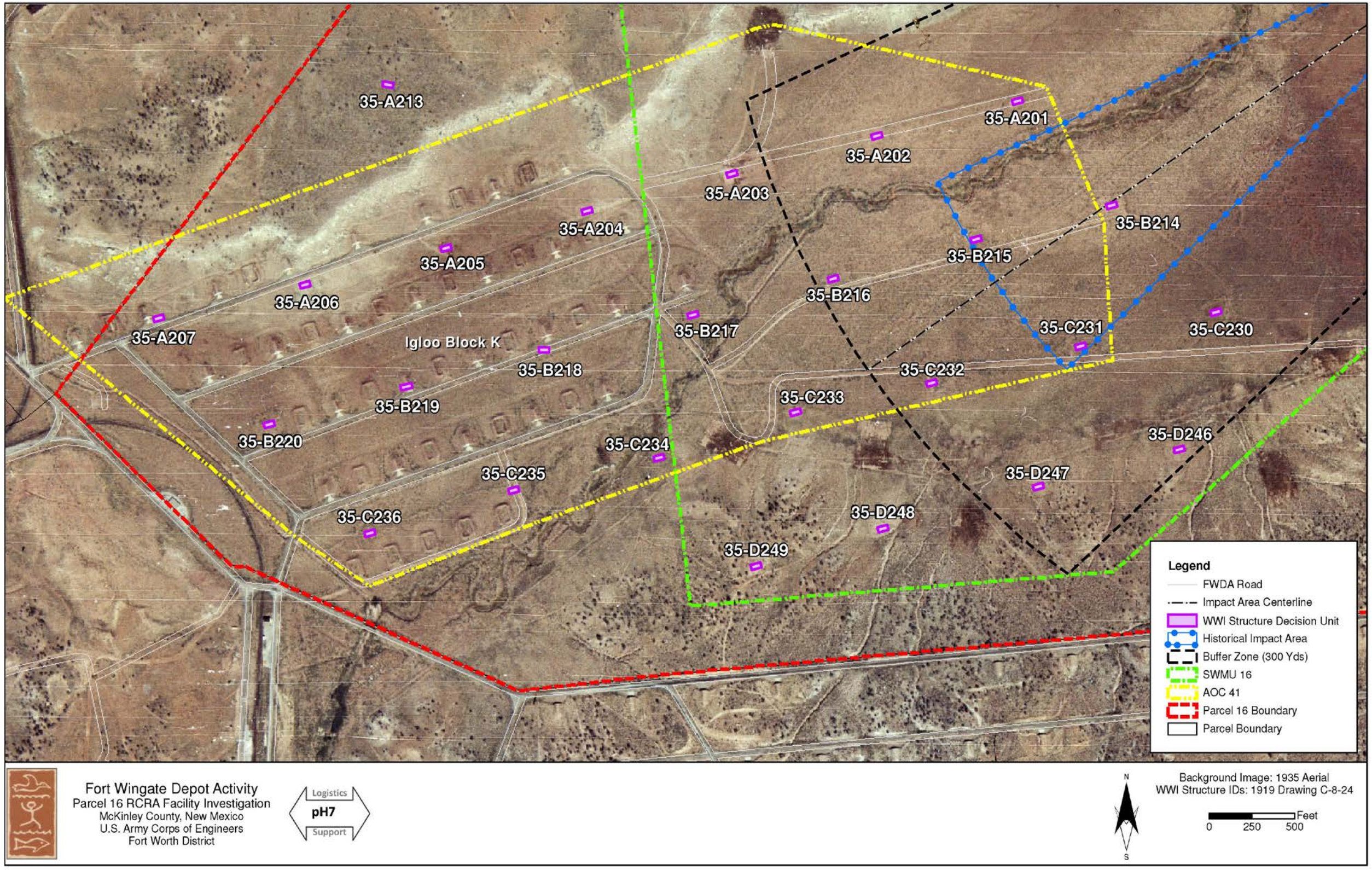

Figure 7-2. Locations of WWI Structure MI Decision Units

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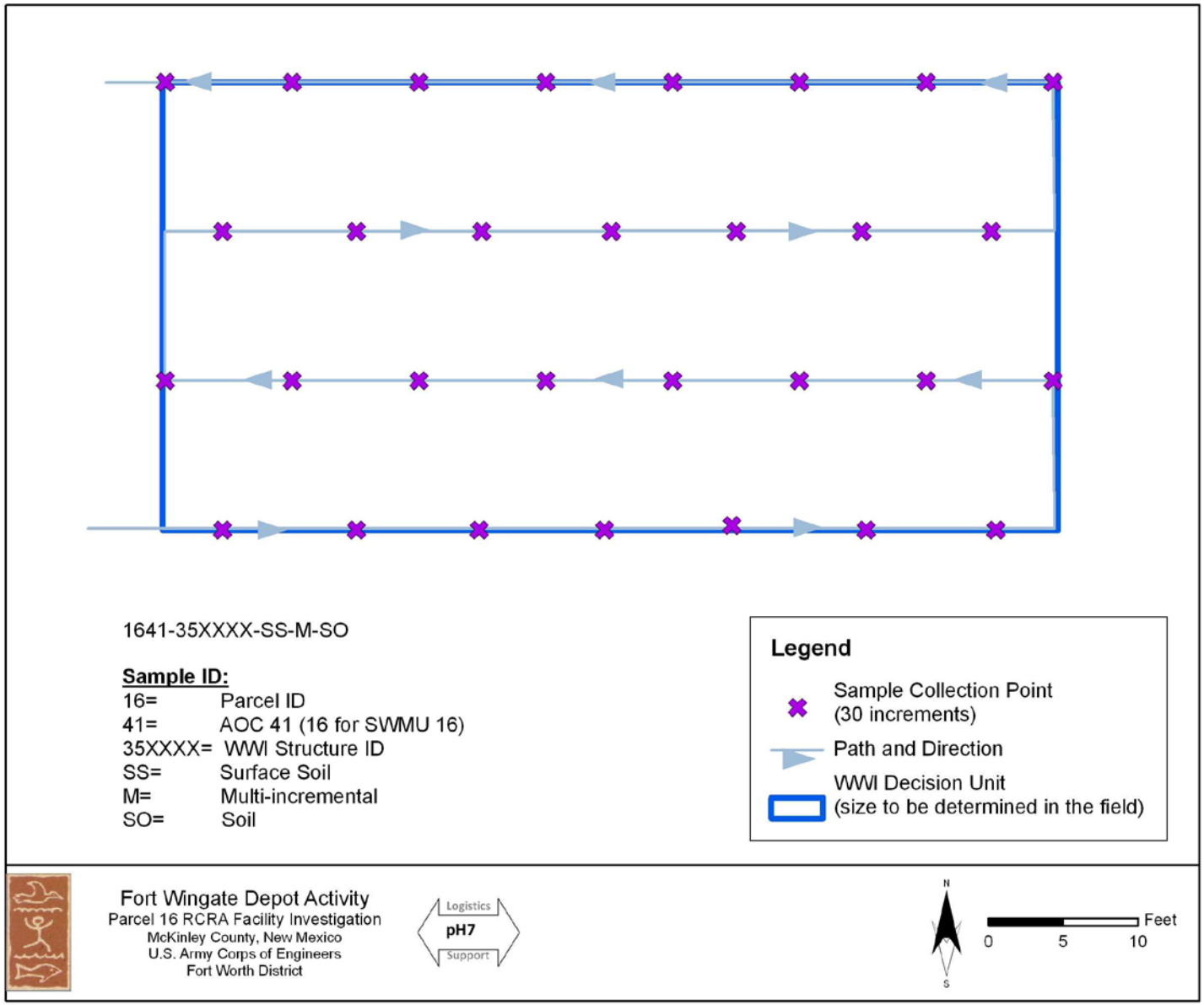

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2 **Figure 7-3. MI Decision Unit and Sub-Sample Locations for WWI Magazine Sites**

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Table 7-3. Sample Details for WWI MI Decision Units

Sample Count	WWI Magazine ID	Parcel	SMWU or AOC	Media	Sample Method	Sample Number	Explosives
1	35-A201	16	SWMU 16	SO	M	1616-35A201-SS-M-SO	1
	35-A201	16	SWMU 16	SO	M	1616-35A201-SS-M-SO-Dup	1
2	35-A202	16	SWMU 16	SO	M	1616-35A202-SS-M-SO	1
3	35-A203	16	SWMU 16	SO	M	1616-35A203-SS-M-SO	1
4	35-A204	16	AOC 41	SO	M	1641-35A204-SS-M-SO	1
5	35-A205	16	AOC 41	SO	M	1641-35A205-SS-M-SO	1
6	35-A206	16	AOC 41	SO	M	1641-35A206-SS-M-SO	1
7	35-A207	16	AOC 41	SO	M	1641-35A207-SS-M-SO	1
8	35-A213	16	AOC 41	SO	M	1641-35A207-SS-M-SO	
9	35-B214	16	SWMU 16	SO	M	1616-35B214-SS-M-SO	1
10	35-B215	16	SWMU 16	SO	M	1616-35B215-SS-M-SO	1
11	35-B216	16	SWMU 16	SO	M	1616-35B216-SS-M-SO	1
12	35-B217	16	SWMU 16	SO	M	1616-35B217-SS-M-SO	1
	35-B217	16	SWMU 16	SO	M	1616-35B217-SS-M-SO-Dup	1
13	35-B218	16	AOC 41	SO	M	1641-35B218-SS-M-SO	1
14	35-B219	16	AOC 41	SO	M	1641-35B219-SS-M-SO	1
15	35-B220	16	AOC 41	SO	M	1641-35B220-SS-M-SO	1
	35-B220	16	AOC 41	SO	M	1641-35B220-SS-M-SO-MS/MSD	1
16	35-C230	16	SWMU 16	SO	M	1616-35C230-SS-M-SO	1
17	35-C231	16	SWMU 16	SO	M	1616-35C231-SS-M-SO	1
18	35-C232	16	SWMU 16	SO	M	1616-35C232-SS-M-SO	1
19	35-C233	16	SWMU 16	SO	M	1616-35C233-SS-M-SO	1
	35-C233	17	SWMU 16	SO	M	1616-35C233-SS-M-SO-MS/MSD	1
20	35-C234	16	AOC 41	SO	M	1641-35C234-SS-M-SO	1
21	35-C235	16	AOC 41	SO	M	1641-35C235-SS-M-SO	1
22	35-C236	16	AOC 41	SO	M	1641-35C236-SS-M-SO	1
23	35-D246	16	SWMU 16	SO	M	1616-35D246-SS-M-SO	1
	35-D246	16	SWMU 16	SO	M	1616-35D246-SS-M-SO-Dup	1
24	35-D247	16	SWMU 16	SO	M	1616-35D247-SS-M-SO	1
25	35-D248	16	SWMU 16	SO	M	1616-35D248-SS-M-SO	1
26	35-D249	16	SWMU 16	SO	M	1616-35D249-SS-M-SO	1
	WWI	16	SWMU 16	W	D	1616-WWI-D-W-EB	1

WWI	16	SWMU 16	W	D	*1616-WWI-D-W-RIN1	1
					Total	**33**

Table 7-3. Sample Details for WWI MI Decision Units

***One rinsate (RIN) sample will be taken each day of sampling and numbered sequentially as collected in the field.**

Sample Count	
26	Samples
3	Duplicate Samples
2	MS/MSD Sample
1	EB
1	RIN
33	**Total Samples**

Table/Sample Key	
Dup	Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
EB	Equipment Blank
RIN	Rinsate
D	Discrete
W	Water

Sample Naming Convention	
16	Parcel
16 or 14	SWMU 16 or AOC 41
AXXX	WWI Magazine ID (prefix may be A, B, C, or D)
-	Separator
SS	Surface Soil
-	Separator
M	Multi-incremental
-	Separator
SO	Soil

8.0 PROJECT MANAGEMENT

8.1 Project Scheduling and Reporting Requirements

The projected schedule for conducting the RFI activities at Parcel 16 is as follows:

RFI Field Activities	Start 90 days after receipt of NMED approval of Work Plan, weather permitting. Field work, data analysis, and evaluation will take approximately 180 days.
Submittal of Draft RFI Report	Submitted 60 days following the receipt of validated laboratory data.
Submittal of Tribal Draft RFI Report	Submitted 20 days after receipt and resolution of USACE comments on Draft RFI report.
Submittal of Final RFI Report	Submitted 30 days after receipt and resolution of comments on RFI report from tribes.

8.2 Quality Assurance Project Plan

A site-specific QAPP (Appendix B) was prepared to describe the QA/QC procedures to be followed during the RFI Work Plan field activities.

8.3 Health and Safety Plan

A site-specific Health and Safety Plan (HSP) has been prepared for the field investigation activities proposed in this RFI Work Plan for Parcel 16. It will be delivered to the USACE as a stand-alone document prior to the start of field activities.

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