Final

CAMU Sampling Work Plan
HWMU, Parcel 3

Fort Wingate Depot Activity
McKinley County, New Mexico

February 6, 2013

Contract No. W912QR-04-D-0025
Delivery Order No. DM01

Prepared for:

U.S. Department of the Army
Corps of Engineers –

Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, New Mexico 87109

Fort Worth District
819 Taylor Street
Fort Worth, Texas 76102

Prepared by:

URS
12120 Shamrock Plaza, Suite 300
Omaha, Nebraska 68154

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Paul Wilson
John Carson, PE
Sue Volkmer, CHMM

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URS Group, Inc.
12120 Shamrock Plaza, Suite 300
Omaha, NE 68154

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14. ABSTRACT
This document presents the sampling rational, procedures, analytes, and screening criteria for the corrective action management unit at FWDA. The work plan details sampling frequency, location, and type in order to be compliant with the FWDA RCRA Permit.

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Omaha, Nebraska 68154

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FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

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USACE SPA (Steve Carpenter)	0	1
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Notes:

EPA = Environmental Protection Agency

FWDA ARM = Fort Wingate Depot Activity Administrative Records Manager

FWDA BEC = Fort Wingate Depot Activity Base Realignment and Closure Environmental Coordinator

FWDA EIMS = Fort Wingate Depot Activity Environmental Information Management System

NMED = New Mexico Environment Department

USACE SPA = U. S. Army Corps of Engineers – Albuquerque District

USACE SWF = U. S. Army Corps of Engineers – Fort Worth District

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1 List of Acronyms

APPL	Agricultural & Priority Pollutants Laboratory, Inc.
BIA	Bureau of Indian Affairs
BRAC	Base Realignment and Closure
CAMU	Corrective Action Management Unit
CFR	Code of Federal Regulations
CoC	Chain of Custody
DoD	Department of Defense
DRO	diesel range organics
FWDA	Fort Wingate Depot Activity
IDW	investigation derived waste
lb	pound
LDR	land disposal regulations
MD	Munitions Debris
MDAS	Material Documented as Safe
MEC	Munitions and Explosives of Concern
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NEW	net explosive weight
NMAC	New Mexico Administrative Code
NMED	New Mexico Environmental Department
ORO	oil range organics
PCB	polychlorinated biphenyl
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RRD	Range Related Debris
RSL	Regional Screening Levels
SSL	Soil Screening Levels
SUXOS	Senior UXO Supervisor
SVOC	semi volatile organic compounds
SWMU	Solid Waste Management Unit
TAL	target analyte list
TCLP	Toxicity Characteristic Leaching Procedure
TEAD	Toole Army Depot
USACE	United States Army Corp of Engineers
USEPA	United States Environmental Protection Agency
UXO	Unexploded Ordnance
VOC	volatile organic compounds

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WMM	Waste Military Munitions
WP	Work Plan

This Work Plan (WP) has been prepared for the Corrective Action Management Unit (CAMU) to characterize wastes to be treated and the residues that are generated as a result of treatment of Waste Military Munitions (WMM) by open burn or open detonation at the CAMU at the Fort Wingate Depot Activity (FWDA). Waste analysis requirements are specified in 40 Code of Federal Regulations (CFR) 264.13, 270.14(b), and 268.7.

1.1 PURPOSE AND SCOPE

This WP is required to be completed under the terms of FWDA Resource Conservation and Recovery Act (RCRA) Permit Number NM6213820974 Section IX.L. This WP details the frequency of sampling and screening levels that will initiate interim measures to remove soils containing concentrations of contaminants that exceed the screening levels.

1.2 WORK PLAN ORGANIZATION

Descriptions of the document sections are provided below.

Section 1: Introduction. Provides a general history and description of FWDA and the site.

Section 2: CAMU Waste Streams. Identifies waste streams anticipated to be generated by CAMU operations.

Section 3: Waste Analysis Parameters. Identifies potential analysis required based on the anticipated waste streams to be generated at the site.

Section 4: Sampling of CAMU Treatment Residuals. Describes the sampling and analysis procedures to be utilized at the CAMU.

Section 5: Analytical Methods. Describes the testing and analytical methods to be utilized.

Section 6: References. Provides a list of references used to develop this WP.

1.3 PROJECT LOCATION

FWDA is located in northwestern New Mexico in McKinley County, approximately 8 miles east of Gallup, New Mexico. FWDA currently occupies approximately 24 square miles (15,273 acres) of land with facilities formerly used to operate a reserve storage facility providing for care, preservation, and minor maintenance of assigned commodities (primarily conventional military munitions) (**Figures 1-1 and 1-2**).

1.4 INSTALLATION DESCRIPTION AND HISTORY

FWDA is an inactive United States Army Depot whose active mission was to store, ship, and receive material and dispose of obsolete or deteriorated explosives and military munitions. FWDA operated from the mid-1940s to 1993, at which time the active mission ceased and the installation closed.

The installation was established as Fort Wingate in 1860. In 1941, Fort Wingate underwent major construction and expansion for the administration and igloo area. In 1971, the depot was placed in reserve status and renamed Fort Wingate Depot Activity (MKM Engineers, Inc. 2008). Since 1975, the installation has been under the administrative command of 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, 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; however, the BRAC office is conducting and administering the cleanup (TerranearPMC 2008).

FWDA is almost entirely surrounded by federally owned or administered lands, including both national forest and tribal lands. North and west of FWDA are Navajo tribal trust and allotted lands. The Bureau of Indian Affairs (BIA) administers the land east and south of Parcel 3 (Parcel 1). The land to the west is mostly undeveloped and is tribal trust and allotment land administered by the BIA, Navajo Nation, and individual Native American allottees (MKM Engineers, Inc. 2008).

1.5 SITE DESCRIPTION

The CAMU is located in Solid Waste Management Unit (SWMU) 14 near the Old Burning Ground and Demolition Landfill within Parcel 3 of FWDA **(Figures 1-2 and 1-3)**. The CAMU is designated to treat recovered WMM generated during corrective action activities conducted within FWDA. The CAMU occupies approximately four acres and contains one demolition pit and one burn pit for the disposal of WMM. Each pit consists of a 15 foot by 15 foot area surrounded on three sides by a containment berm and is excavated to a depth of four feet below ground surface.

The interior surface of the demolition pits are composed of compacted soil. Horseshoe-shaped earthen berms surround each of the demolition pits. The berms are constructed to a width of 35 feet and a height of 8 feet. The front entrance is approximately 25 feet wide for access to the interior of the pit. The burn pit will contain a burn pan, constructed of a fabricated steel structure that is approximately 4 feet wide, 8 feet long, and 1 foot deep.

A 200-foot buffer area surrounds the CAMU. Vegetation is prevented from growing in this area to provide fire containment during open burn activities. The buffer area also serves as a kickout area during open demolition activities (NMED 2011).

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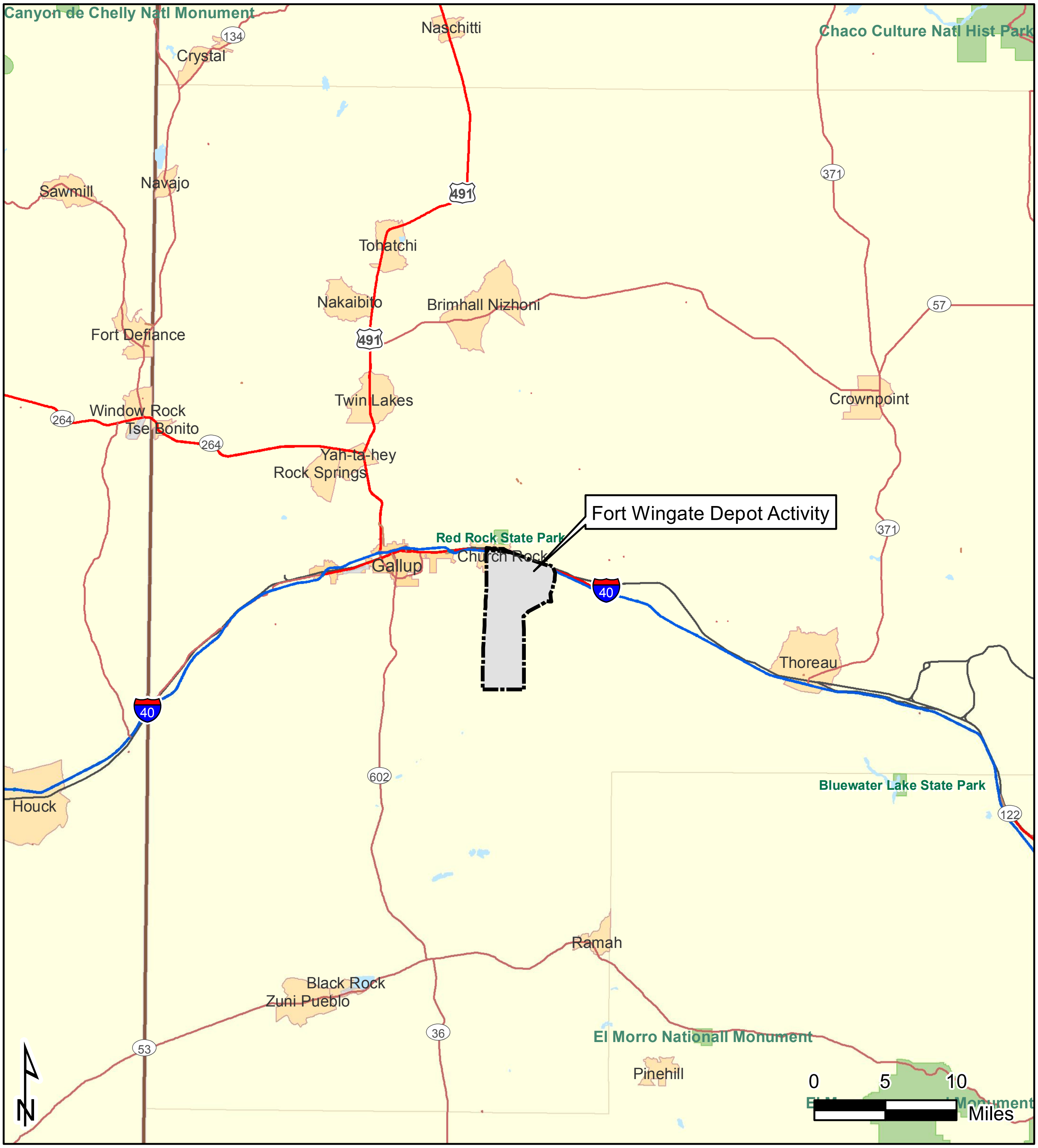

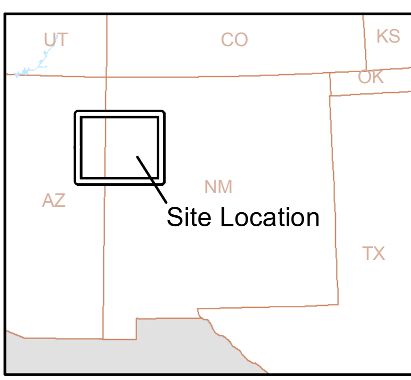

Legend

Installation Boundary

Regional Map
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By: JNC	Date: 10/30/2012	**Figure 1-1**
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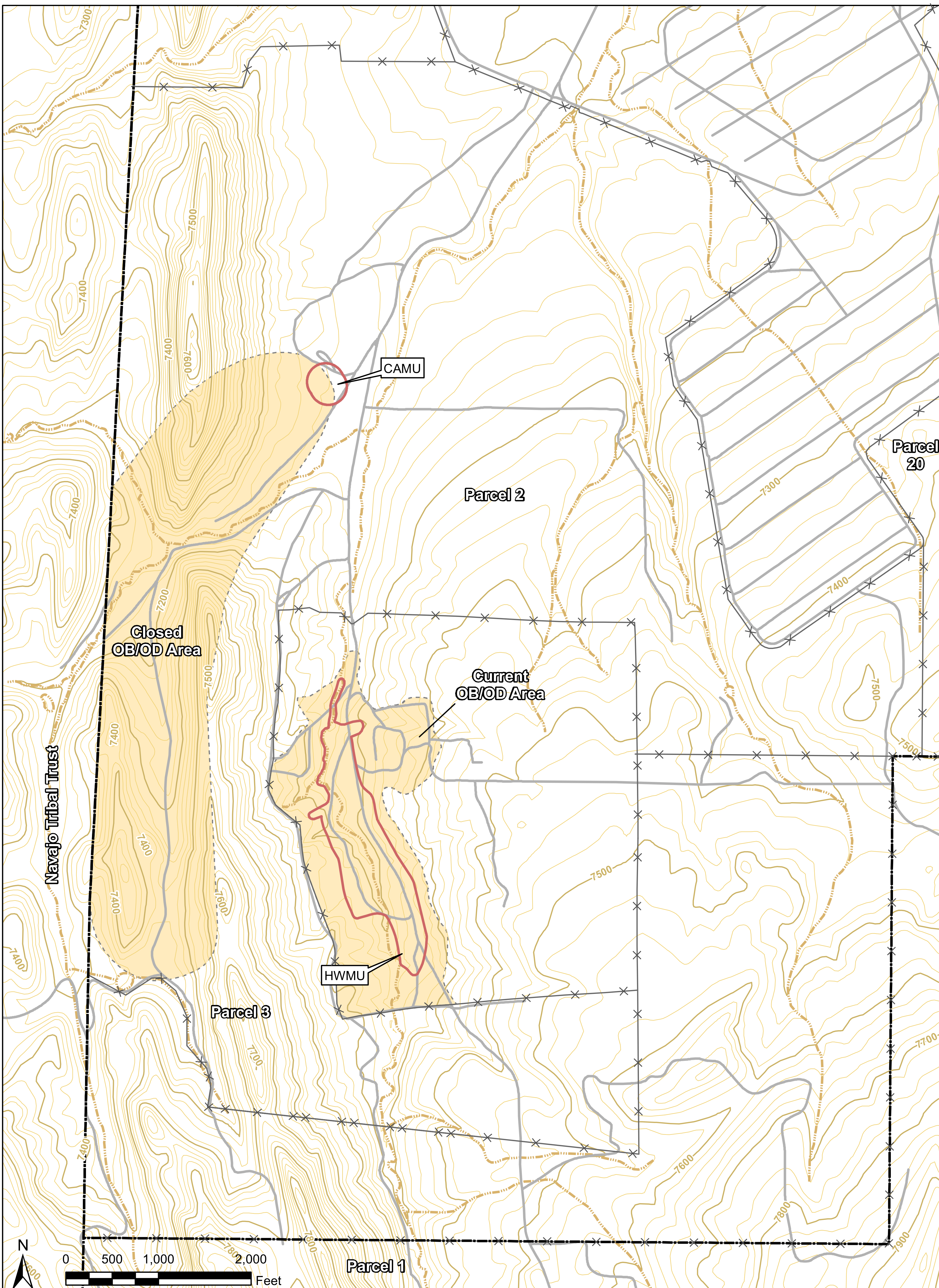
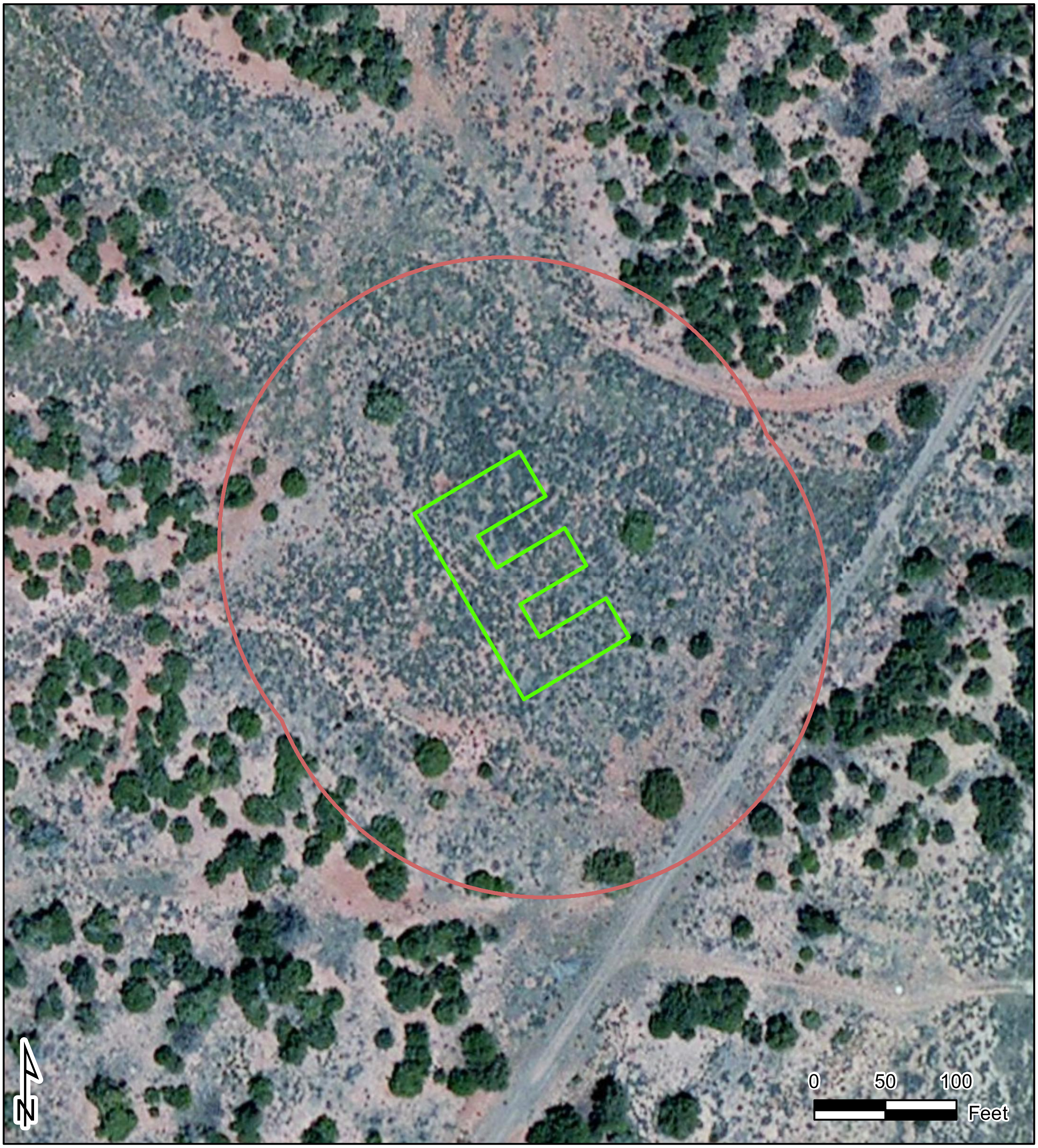


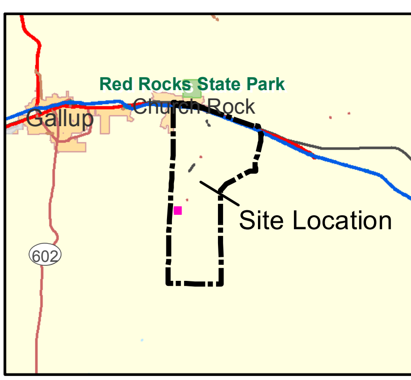
Legend

- Installation Boundary
- Site Boundary
- OB/OD Area
- Road
- Arroyo
- Fence
- 20' Topographic Contour
- 100' Topographic Contour

CAMU Location Map
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By: JNC	Date: 1/23/2013	**Figure 1-2**
Checked By: BP	Project No: 16170613	





Legend

- Installation Boundary
- Site Buffer (200')
- CAMU Footprint

CAMU Site Figure
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By: JNC	Date: 12/19/2012	**Figure 1-3**
Checked By: SM	Project No: 16170613	

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2.1 WASTE STREAMS TO BE TREATED AT CAMU

This section was developed in accordance with the FWDA RCRA Permit dated June 2011, Attachment 14, Paragraph 14.1.1.

Waste permitted to be treated in the CAMU shall be limited to reactive and ignitable hazardous wastes, such as munitions and explosives of concern (MEC) (including damaged, defective, expired, and unserviceable munitions) and explosive-contaminated wastes generated during remediation activities. Hazardous wastes containing barium, cadmium, chromium, lead, mercury, and 2,4-dinitrotoluene may also be treated in the CAMU. Other waste that may be treated at the CAMU include waste which may be associated with propellants, bulk explosives, metal powders, detonators, and miscellaneous munitions constituents, and soils determined by field testing (e.g., visual inspection, burn test, EnSys®) to contain 10 percemt or greater explosives compounds. Disposition of the propellants, bulk explosives, metal powders, detonators, and miscellaneous munitions constituents shall be determined by the designated Unexploded Ordnance (UXO) Quality Control Specialist. Items may be treated in the CAMU only if the Senior UXO Supervisor (SUXOS) and UXO Quality Control Specialist determine the items are unsafe to transport off-site.

The wastes potentially treated at the CAMU are identified in **Table 2-1**. The amount of materials treated at the CAMU shall not exceed 200 pounds (lbs) net explosive weight (NEW) for cased explosives or a maximum of 200 lbs for uncased explosives in any treatment event. No more than 1,000 lbs of NEW may be treated in any seven day period. Each detonation will require approximately one hour to complete, which includes placing the charge, covering the munitions with soil (if warranted), detonating the munitions, inspecting the debris, and clearing the debris. The annual throughput of the CAMU is estimated at 52,000 lbs NEW. The debris can be inspected and cleaned no sooner than 24 hours after the burn is completed.

Munitions debris (MD) and range related debris (RRD), such as military munitions packaging and crating material, will be certified as Material Documented as Safe (MDAS) in accordance with Department of Defense (DoD) and United States Army Corp of Engineers (USACE) regulations and requirements and transported off-site for disposal. MD and RRD are prohibited from being treated at the CAMU. It is also prohibited to treat any waste that was not specifically generated at FWDA during clearance or other corrective action operations.

The placement of bulk or non-containerized liquid hazardous waste or free liquids contained in hazardous waste (whether or not sorbents have been added) in the CAMU is prohibited except where placement of such wastes facilitates the initiation of the treatment process [20.4.1.500 New Mexico Administrative Code (incorporating 40 CFR 264.552(a)(3)(i))].

TABLE 2-1: CAMU GENERAL UNIT AND WASTE DESCRIPTION
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Treatment Unit	Description of Treatment Unit	General Description of Hazardous Waste	Hazardous Waste No.	Maximum Quantity of Waste Allowed per Treatment Event
Open Burn	The burn pans, constructed of a fabricated steel structure that is approximately 4 feet wide, 8 feet long, and 1 foot deep.	MEC-Ignitable, Reactive, and Toxic Wastes.	D001, D003, D007, D008	200 lbs Net Explosive Weight for uncased explosives
Open Detonation	Each demolition pit will occupy a 15-foot-by-15-foot area and have a depth of 4 feet below ground surface. The interior surface of the demolitions pits will be composed of dirt. Horseshoe-shaped earthen berms will surround each of the demolition pits. The berms will be constructed to a width of 35 feet and a height of 8 feet. The front will have an entrance approximately 25 feet wide for access to the interior of the pit.	MEC-Ignitable, Reactive, and Toxic Wastes	D001, D003, D005, D006, D007, D008, D009, D030	200 lbs Net Explosive Weight for cased explosives

2.2 PRIMARY WASTE STREAMS

The primary waste streams to be generated at the CAMU are recyclable scrap and ash. Other materials and potentially impacted soil may also potentially be generated.

2.2.1 Recyclable Scrap and Material Documented as Safe (MDAS)

The end waste stream from the CAMU is scrap metal and MDAS that is deemed “safe to recycle” by the SUXOS and UXO Quality Control Specialist. All scrap metal and MDAS certified in accordance with the USACE procedures of Engineering Manual 1110-1-4009 will be sent to a smelter, licensed recycler, or appropriate permitted facility for final disposition.

2.2.2 Ash

Ash will be removed after each burn/treatment. The resulting ash shall be characterized and disposed at a permitted off-site facility in accordance with all applicable local, state, and federal regulations.

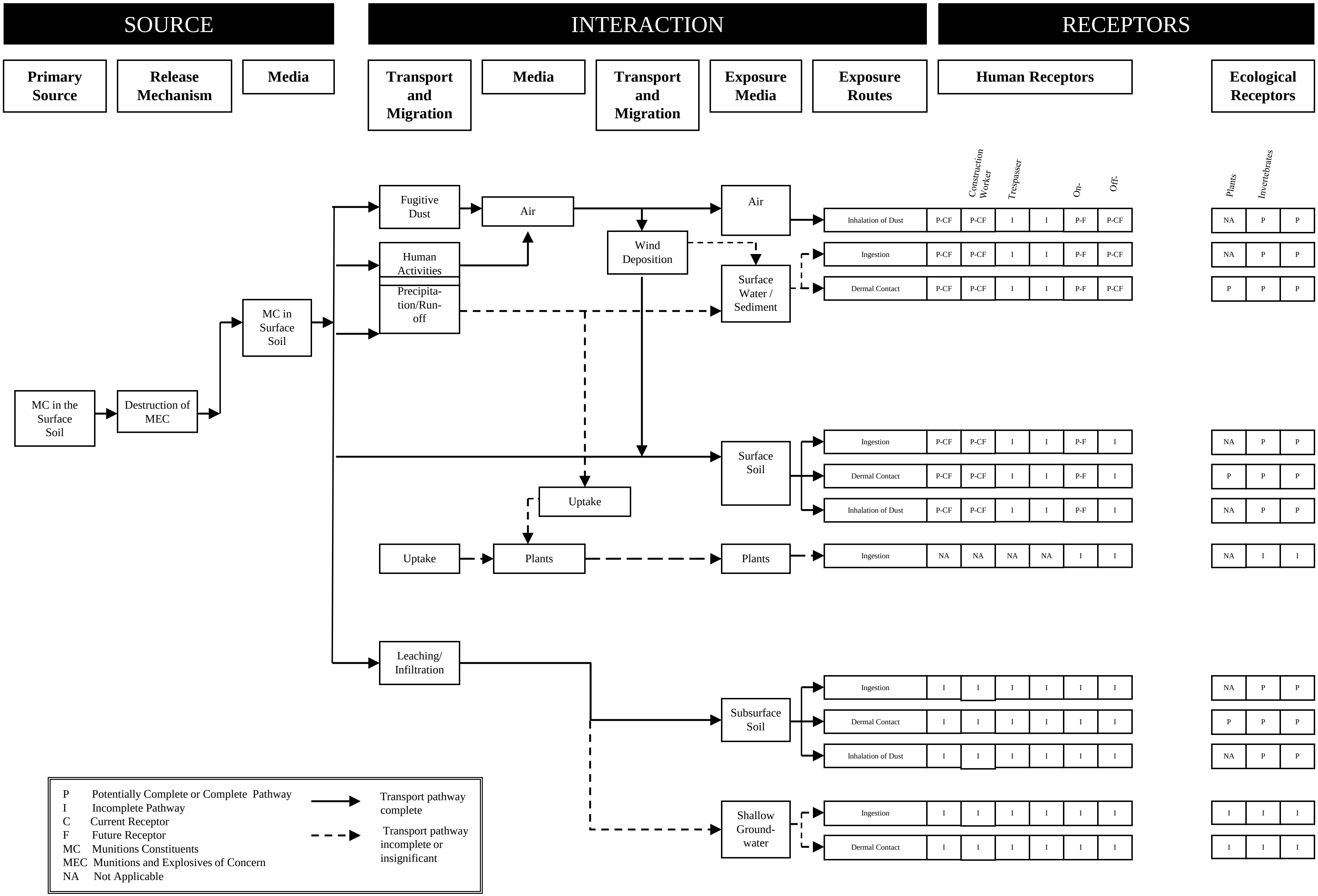
2.2.3 Munitions Debris and Range Related Debris

MD and RRD, such as military munitions packaging and crating material, will be certified as MDAS in accordance with DoD and USACE regulations and requirements and transported off-site for disposal. MD and RRD will not be treated with other WMM in the CAMU. If the MD or RRD is designated as unsafe to segregate from the WMM, these materials may also be treated in the CAMU. The waste stream generated will be ash.

2.2.4 Potentially Impacted Soil

A site conceptual model for the wastes is included as **Figure 2-1**. There is a potential for releases to soils to occur as a result of CAMU treatment processes. In accordance with Section IX.L of the RCRA permit, baseline soil sampling shall be collected from beneath the treatment units and from eight random locations within the 200-foot buffer area surrounding the CAMU to evaluate for the presence of contaminated soils. This sampling will be repeated every two years (biannually) while the CAMU is in operation.

FIGURE 2-1
SITE CONCEPTUAL MODEL
FORT WINGATE DEPOT ACTIVITY, MCKINLEY COUNTY, NEW MEXICO



This section was developed as described in the FWDA RRA Permit dated June 2011, Attachment 14, Paragraph 14.2.

Characteristics of the wastes treated at the CAMU shall be identified using generator knowledge and written documentation about the wastes being treated. The anticipated WMM are standard military end items with well-defined physical and chemical characteristics. Military munitions are identifiable by their unique physical characteristics. The SUXOS and UXO Quality Control Specialist shall use the appropriate information sources to identify the type of munitions upon discovery. Sampling and analysis of WMM to be treated at the CAMU shall not be conducted as part of this WP because the composition is well-known and well-controlled, and the inherent health and safety risks outweigh the potential value of the data that would be obtained by testing the WMM (i.e., sampling and subsequent laboratory analysis would present unnecessary hazards to personnel). However, post-treatment inspection must be completed to ensure that the WMM are effectively treated and rendered non-hazardous, thereby, “safe to recycle” off-site.

Sampling and analysis shall be conducted for the characterization of certain wastes generated after the completion of the CAMU treatment process, such as ash and potentially impacted soil. Generator knowledge shall be used to characterize MD and RRD. Ash and potentially impacted soil generated by the treatment will undergo sampling and analysis of parameters identified in the following sections.

3.1 CRITERIA AND RATIONALE FOR PARAMETER SELECTION

Wastes shall be characterized for explosive related constituents. A list of analytical methods for waste analysis to be utilized in this WP is included in **Table 3-1**.

3.1.1 Ash

Based on knowledge of the WMM and MEC to be treated at the CAMU, the ash residue may contain the toxicity characteristic metals barium, cadmium, chromium, lead, and mercury and organic compounds such as 2,4-dinitrotoluene present in the original wastes. The ash residue shall be sampled and analyzed for target analyte list (TAL) metals, semi volatile organic compounds (SVOCs), dioxins, and furans using Toxicity Characteristic Leaching Procedure (TCLP) and total analysis methods. The ash residue will be sampled the first time a specific waste stream is treated to establish a profile for the ash that will be generated by that waste stream. If a specific waste stream’s characteristics change, additional ash sampling and analysis shall be conducted to establish a new profile.

3.1.2 Potentially Impacted Soil

Potentially impacted soils will be monitored by collecting baseline, biannual, and closure soil samples. Baseline and closure soil samples will be analyzed for TAL metals, explosive compounds, perchlorate, white phosphorus, nitrate, cyanide, polychlorinated biphenyls (PCBs), dioxins, furans, diesel range organics (DRO), oil range organics (ORO), volatile organic compounds (VOCs), and SVOCs in accordance with Section IX.L and Attachment 14 of the FWDA Permit Modification dated June 27, 2011. Biannual soil samples will be collected and analyzed for TAL metals, explosive compounds, perchlorate, DRO, and ORO in accordance with Section IX.L and Attachment 14 of the FWDA Permit Modification dated June 27, 2011. Soil from the CAMU will be sampled and analyzed for these parameters to comply with land disposal regulations (LDR) that may be applicable during the closure of the treatment unit.

TABLE 3-1: RESIDUAL WASTE TESTING CONSTITUENTS AND ANALYTICAL METHODS

FORT WINGATE DEPOT ACTIVITY MCKINLEY COUNTY, NEW MEXICO

Parameters	Method Number
TCLP	USEPA 1311*
TAL Metals	USEPA SW-846 6010 and 7471
VOCs	USEPA SW-846 8260B
SVOCs	USEPA SW-846 8270C
Explosives	USEPA SW-846 8330B
Perchlorate	USEPA SW-846 6850
White Phosphorus	USEPA SW-7-580
Nitrate	USEPA SW-846 9056A
Cyanide	USEPA SW-846 9014
PCBs	USEPA SW-846 8082
Dioxins and Furans	USEPA SW-846 8290
DRO and ORO	USEPA SW-846 8015B

*United States Environmental Protection Agency (USEPA) 1311 is utilized during TCLP analysis to characterize ash from treatment operations at the CAMU.

4.1 CAMU TREATMENT RESIDUALS

This section was developed in accordance with the FWDA RCRA Permit dated June 2011, Attachment 14, Section 14.3.1.

CAMU treatment operations may generate solid waste in the form of ash residue as well as impacted soils in the demolition pit(s). Prior to operation of the CAMU, a baseline soil analysis shall be collected from the CAMU. Following the commencement of treatment operations at the CAMU, soils shall be sampled every two years for periodic monitoring. Following the completion of all CAMU operations, the soils shall be sampled per site closure requirements identified in Section IX of the RCRA Permit dated June 27, 2011. The ash generated from treatment operations shall be sampled and characterized for disposal.

4.1.1 Ash

The ash residue generated from treatment operations shall be characterized by sampling and chemical analysis the first time a specific waste stream is treated to establish a waste profile. A waste profile for ash residue shall be established for each specific waste stream treated at the CAMU. The ash residue shall be sampled and analyzed for TAL metals, SVOCs, dioxins, and furans using TCLP and total analysis methods (See **Table 3-1**). Subsequently, ash residue resulting from treated waste in the CAMU shall be stored in an appropriate container (with a maximum size of 55 gallons) at a satellite accumulation point located near the CAMU. Once the storage container is filled to capacity, it will be moved to the 90-day storage area to await disposal.

4.1.2 Potentially Impacted Soil

Potentially contaminated soils shall be monitored by collecting baseline, bi-annual, and closure (upon completion of all operations) soil samples from the CAMU primary treatment pit(s) and the surrounding berm(s). Baseline and closure soil samples shall be analyzed for TAL metals, explosive compounds, perchlorate, white phosphorus, DRO, ORO, VOCs, SVOCs, nitrate, cyanide, PCBs, dioxins, and furans in accordance with Section IX.L and Attachment 14 of the FWDA Permit Modification dated June 27, 2011. Biannual samples shall be analyzed for TAL metals, explosive compounds, perchlorate, DRO, and ORO in accordance with Section IX.L and Attachment 14 of the FWDA RCRA Permit dated June 2011.

4.1.3 MD and RRD

MD and RRD, such as military munitions packaging and crating material, will be certified as MDAS in accordance with DoD and USACE regulations and requirements and transported off-site for disposal.

4.2 SAMPLING PROCEDURES

4.2.1 Sampling Equipment

Soil and ash samples shall be collected using a stainless steel spoon or trowel or disposable sampling equipment. Certified, pre-cleaned sample containers obtained from the laboratory shall be used to store the samples prior to laboratory analyses. Sample volumes, container types, and preservation requirements shall be followed per specific method requirements in accordance with United Stated Environmental Protection Agency (USEPA) SW-846.

4.2.2 Sample Identification

Each sample is identified by a unique code that indicates the parcel number, AOC/SWMU, site identifier, source of sample, type of sample, matrix, sample location identifier, and sample number. The sample locations will be numbered sequentially starting at number 001. The sample parcel number is **03,** the AOC/SWMU is **14**, and the site identifier is **CAMU**. A two digit identifier will be added to the end of the site identifier to indicate the area of the CAMU, and include the following:

- BA – Surface soil sample collected from the buffer area
- OB – Surface soil samples from open burn pit and berm
- OD – Surface soil samples form open detonation pit and berm

The source of the sample is **SS-XXX** (surface soil) where “XXX” indicated the sample increment number. The type of sample will be either **C** for composite or **D** for discrete. The matrix will be either **SO** for soil or **ASH** for ash.

An example of the sample identification for the first composite soil sample collected from the open burn pit would be: 0314CAMUOB-SS-001C-SO. An example of the sample identification for the first discrete soil sample collected from the buffer area would be: 0314CAMUBA-SS-001D-SO.

Matrix spikes/matrix spike duplicates (MS/MSD) samples are given the same sample ID as the analytical sample, but have “MS/MSD" written on the label. Field Duplicate samples are blind samples to the laboratory and are given a unique sample ID. CAMU soil samples will add 100 to the sample number to signify it is a duplicate location.

4.2.3 Field Decontamination

Disposable sampling equipment (e.g., plastic spoons and disposable buckets) does not require decontamination. If non-disposable soil sampling devices are used (e.g., stainless steel spoons), the devices shall be decontaminated prior to each use. The reusable devices shall be decontaminated by the following procedure:

1. Brush equipment with a wire or other suitable brush, if necessary or practicable, to remove large particulate matter;
2. Rinse with potable tap water;
3. Wash with nonphosphate detergent followed by a potable tap water rinse;
4. Rinse with 0.1 molar nitric acid (to remove trace metals, if necessary) followed by a potable tap water rinse;
5. Rinse with methanol (to remove organic compounds, if necessary) followed by a potable tap water rinse;
6. Rinse with potable tap water; and
7. Double rinse with deionized water.

Decontamination water and waste generated during decontamination shall be containerized for disposal as investigation derived waste (IDW). If decontamination water has no detected contaminant levels (other than naturally occurring metals), the water may be placed in the evaporation tank behind Former Building 542.

4.2.4 Soil Sample Collection

The following procedure should be used to collect surface excavation soil samples from the CAMU and surrounding buffer area.

4.2.4.1 Open Burn/Open Detonation Pits

One composite sample will be collected from the interior of each CAMU cell. Six subsamples will be collected from the floor of the cell and nine subsamples will be collected from the berm walls (three subsamples from each berm wall). The 15 subsamples shall be composited into one sample and analyzed for the constituents in **Table 3-1**. One discrete sample will be collected from each berm floor using a Terra Core® sampler and analyzed for VOCs.

4.2.4.2 Buffer Area Sampling

The CAMU is surrounded by a 200-foot buffer area. Three sample locations will be placed within the drainage swales running through the buffer area as shown on **Figure 4-1**. The remaining five sample locations will be randomly placed in the buffer area as shown on **Figure 4-1**. One discrete sample will be collected from each of the eight sample locations and analyzed for the constituents in **Table 3-1**.

4.2.4.3 Sampling Procedure

1. Decontaminate sampling equipment according to **Section 4.2.3**.
2. Record the sample location in the field logbook.
3. Don a clean pair of nitrile gloves.

4. Using a decontaminated spoon or trowel, remove 1-2 inches of soil from the surface of the sampling location.
5. For buffer area discrete samples locations, place a sufficient volume of soil into a decontaminated stainless steel bowl using a stainless steel or disposable spoon. Fill the appropriate jars for the analysis specified in **Table 3-1**. Collect the discrete soil sample for VOCs analysis using the Terra Core® sampler. Fill 40 milliliter VOAs with 5-gram plugs.
6. For CAMU cell sample locations, place roughly the same volume of soil from each of the 15 subsample locations into a decontaminated stainless steel bowl using a decontaminated stainless-steel or disposable spoon. Homogenize the sample volume and fill the appropriate jars for the analysis specified in **Table 3-1.** Collect a discrete soil sample for VOCs from one of the composite subsample locations in the CAMU cell floor using a Terra Core® sampler. Fill 40 milliliter VOAs with 5-gram plugs.
7. Label, store and document sample
8. Record applicable information on the Sample Collection Field Sheet.

4.2.5 Sample Preservation and Storage

In the field, each sample container shall be marked with the sample identification number, sampling location, date, time of sample collection and the sampler's initials. Sample containers for chemical analysis shall be placed in ice-filled coolers immediately following collection, and stored at 4° Celsius prior to and during shipment. Sample containers shall be packaged to avoid breakage during transportation. Chain of Custody (CoC) shall be followed in accordance with USEPA SW-846.

For each sample to be submitted to the analytical laboratory for analysis, an entry shall be made on a CoC form supplied by the laboratory. One CoC form shall be completed for each cooler for each day of sampling. The information recorded on the CoC form includes the sampling date and time, sample identification number, requested analyses and methods, and sampler's name.

CoC forms shall be placed in a sealed plastic bag and placed inside of the cooler with the samples. Upon receipt of the sample cooler, the laboratory will verify custody and condition of the samples. Non-conformances in sample receipt (e.g., broken sample containers, samples received out of temperature) shall be documented on the sample receipt form and communicated to the project team immediately.

4.2.6 Quality Assurance/Quality Control

Field Quality Assurance (QA)/Quality Control (QC) samples are designed to help identify potential sources of external sample contamination and to evaluate potential error introduced by sample collection and handling. All QA/QC samples are labeled with QA/QC identification numbers and sent to the laboratory with the other samples for analyses.

4.2.6.1 Duplicate Samples

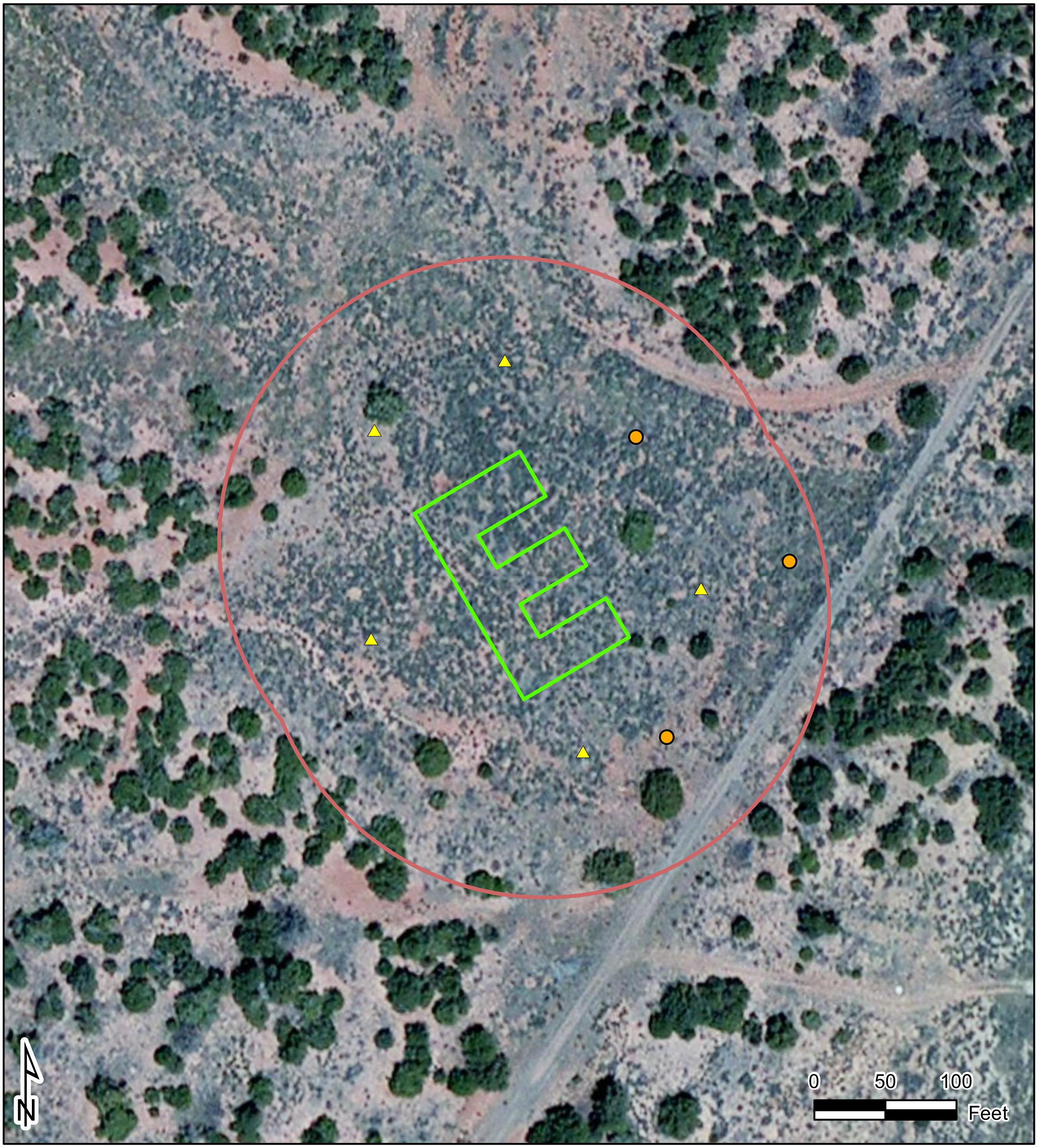
Duplicate samples are samples collected to assess precision of sampling and analysis. A duplicate sample will be collected at the same time as the initial sample from ten percent of the total sample locations. The initial sample containers for a particular parameter or set of parameters will be filled first, then the duplicate sample containers for the same parameter(s), and so on until all necessary sample bottles for both the initial sample and the duplicate sample have been filled. The duplicate soil containers will be handled in the same manner as the primary sample. The duplicate sample will be assigned a QA/QC identification number, stored in an iced cooler, and shipped to the laboratory on the day it is collected. Duplicate samples will be collected for all parameters. The soil will be divided evenly and then homogenized separately. Duplicate samples will be blind to the laboratory.

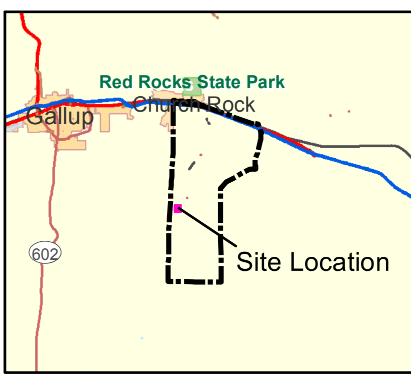
4.2.6.2 Matrix Spikes and Matrix Spike Duplicates

MS/MSD are used to assess the potential for matrix effects. Samples will be designated for MS/MSD analysis on the chain of custody form and on the bottles. It may be necessary to increase the sample volume for samples where this designation is to be made. MS/MSD samples will be collected from five percent of the total sample locations.

4.3 LABORATORY SELECTION

Agricultural & Priority Pollutants Laboratory, Inc. (APPL) is a National Environmental Laboratory Accreditation Conference certified analytical laboratory that was selected to perform the laboratory analysis. The laboratory will maintain a comprehensive QA/QC program, technical analytical expertise, and an effective information management system.





Legend

- Installation Boundary
- Site Buffer (200')
- CAMU Footprint
- Randomly Placed Sample Locations
- Samples Located Within Drainage Swales

CAMU Buffer Area
Sample Locations
Fort Wingate Depot Activity
McKinley County, New Mexico

Drawn By: JNC	Date: 12/19/2012	**Figure 4-1**
Checked By: SM	Project No: 16170613	

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5.1 SURFACE SOIL SCREENING

A baseline assessment of the surface soil conditions at the CAMU will be collected prior to operating the CAMU. Surface soils will be collected as described in **Section 4** and analyzed for contaminants presented in **Table 3-1**. The analytical results will undergo a risk-based and qualitative screen.

5.1.1 Risk Based Screening

Site-specific risk-based soil screening values (SSLs) were calculated using the USEPA's Online Calculator found at http://epa-prgs.ornl.gov/cgi-bin/chemicals/csl_search. SSLs were calculated using the outdoor worker default parameters for soil with the following exceptions:

- An exposure frequency of 128 days per year was used instead of the default value of 225 days. The 128 days is based on the assumption of the worker being at the site 4 days per week for 8 months per year. Winter shutdowns occur from December through March.
- An exposure duration of 2 years was used instead of the default value of 25 years. Since remedial projects at FWDA are being completed by numerous contractors, with rotating field staffs, an exposure duration beyond two years is not expected. Subchronic toxicity factors were used where available.
- An exposure time of 2 hours per day was used instead of the default value of 8 hours per day. Work at the CAMU will be intermittent and occur for approximately 2 hours at a time.
- Target Risk was assumed to 1 x 10-5 as per NMED Guidance (NMED 2012).

The exposure parameters are shown in **Table 5-1**. The site-specific calculated SSLs are presented in **Table 5-2**. For chemicals without toxicity factors, a surrogate compound was identified and is noted in the table. Additionally, essential nutrients, such as calcium, magnesium, potassium, and sodium were not included in the list of chemicals. These compounds do not have toxicity factors and generally are not considered toxic, even at high levels, in a healthy adult. Although iron has a toxicity value, it is considered an essential nutrient and will not be evaluated as part of this site.

Dioxans/furans will be evaluated based on 2,3,7,8-TCDD. Concentrations of dioxans/furans detected in confirmation samples will be adjusted by their toxicity equivalency factors. The adjusted concentrations will then be summed to provide a 2,3,7,8-TCDD toxic equivalent concentration. This concentration will then be compared to the 2,3,7,8-TCDD screening value provided in **Table 5-2**.

An SSL was also calculated for lead using the adult lead model and assuming an exposure frequency of 128 days per year. This value is presented in **Table 5-1**. The calculations and explanation of the methodology is presented in **Attachment 1**.

Diesel range organics (DRO) and oil range organics (ORO) values are from NMED Risk Assessment Guidance for Investigations and Remediation (NMED 2012) and are shown in **Table 5-2.** The DRO value is based on the Diesel #2/crankcase oil value for industrial direct exposure from Table 6-3 in the NMED guidance. The ORO value is based on the waste oil value for industrial direct exposure from Table 6-3 in the NMED guidance. These values are considered to be conservative for this site because groundwater is deeper than 15 feet and no buildings are located on the site.

The analytical results of the baseline and biannual sampling results will be compared to the background levels identified in the New Mexico Environmental Department (NMED) approved Soil Background Study and Data Evaluation Report (Shaw 2010) and the risk-derived soil screening levels presented in **Table 5-2**. When the background concentrations of a constituent exceed the screening value, then the background concentration for that constituent will be used as the screening value. The Army prepared a Phase 2 Soil Background Report, which will be submitted to NMED in early 2013. Under this study, the soil unit in which the CAMU lies (unit 555) was sampled. The Army proposes using the 95th upper tolerance limit value of unit 555 from this study (6.0 mg/kg arsenic) as the background level pending approval of the Background Report by NMED.

If the results of a constituent exceed the screening value for that constituent then implementation of an interim action may be required as described in **Section 5.2**.

5.1.2 Qualitative Screening

The biannual analytical sampling results will be qualitatively compared to the baseline or previous biannual sampling results in order to document relative changes in contaminant accumulation in site soils. If the analytical results for a constituent increase an order of magnitude from the previous sampling round, this may suggest the constituent is accumulating rapidly in soil.

If the analytical results of a constituent increase an order of magnitude for two consecutive sampling rounds (i.e. two orders of magnitude), then an interim action may be implemented as described in **Section 5.2**.

5.2 INTERIM ACTIONS

During the operation of the CAMU, exceedances of the risk derived screening levels in **Table 5-1** or relative increases of constituents in soil as described in **Section 5.1.2** will be used as an action level to prompt a discussion with NMED as to whether interim actions are necessary to either reduce contaminant concentrations in soils or mitigate risk to site workers. Interim actions that may be applicable to the site include, but are not necessarily limited to:

- Revising worker schedules to reduce exposure to site soils
- Upgrading personal protective equipment to reduce worker exposure

- Cordoning off areas that exceed screening levels with a visible barrier to eliminate worker contact to those areas
- Hot spot removal action

TABLE 5-1
SITE-SPECIFIC OUTDOOR WORKER EQUATION INPUTS FOR SOIL
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Variable	Value
TR (target cancer risk) unitless	0.00001
THQ (target hazard quotient) unitless	1
ATow (averaging time)	365
EFow (exposure frequency) d/yr	128
EDow (exposure duration) yr	2
ETow (exposure time) hr	2
LT (lifetime) yr	70
BWow (body weight)	70
IRow (soil ingestion rate) mg/day	100
SAow (surface area) cm2/day	3300
AFow (skin adherence factor) mg/cm2	0.2
City (Climate Zone) PEF Selection	Albuquerque, NM
As (acres) PEF Selection	0.5
Q/Cwp (g/m2-s per kg/m3) PEF Selection	81.84859
PEF (particulate emission factor) m3/kg	6609630595
A (PEF Dispersion Constant)	14.9421
B (PEF Dispersion Constant)	17.9869
C (PEF Dispersion Constant)	205.1782
V (fraction of vegetative cover) unitless	0.5
Um (mean annual wind speed) m/s	4.02
Ut (equivalent threshold value)	11.32
F(x) (function dependant on Um/Ut) unitless	0.0553
City (Climate Zone) VF Selection	Albuquerque, NM
As (acres) VF Selection	0.5
Q/Cwp (g/m2-s per kg/m3) VF Selection	81.84859
foc (fraction organic carbon in soil) g/g	0.006
ρb (dry soil bulk density) g/cm3	1.5
ρs (soil particle density) g/cm3	2.65
θw (water-filled soil porosity) Lwater/Lsoil	0.15
T (exposure interval) s	950000000
A (VF Dispersion Constant)	14.9421
B (VF Dispersion Constant)	17.9869
C (VF Dispersion Constant)	205.1782

Notes:

Values for exposure frequency, exposure duration, and exposure times have been modified for site-specific estimates of exposure. All other parameters are the default USEPA values.

Target Risk is 1 x 10^{-5} as per NMED Guidance (NMED 2012).

TABLE 5-2
CALCUATED RISK-BASED SOIL SCREENING LEVELS
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Chemical	Laboratory Detection Limits (mg/kg)	Site-Specific Screening Level (mg/kg)	Residential Value (mg/kg)	Background Value (mg/kg)
Acenaphthene	5.38E-02	2.15E+05 (s)	3.44E+03	
Acenaphthylene	5.31E-02	2.15E+05	1.72E+03	
Acetone	2.80E-03	3.29E+06 (s)	6.66E+04	
Aluminum	1.98E+00	1.99E+06	7.80E+04	2.33E+04
2-Amino-4,6-Dinitrotoluene	7.50E-02	3.84E+03	1.50E+02	
4-Amino-2,6-Dinitrotoluene	7.50E-02	3.77E+03	1.50E+02	
Anthracene	6.13E-02	1.07E+06 (s)	1.72E+04	
Antimony (metallic)	1.80E-01	7.98E+02 (s)	3.13E+01	2.20E-01
Arsenic, Inorganic	2.50E-01	3.89E+02	3.90E+00	6.00E+00
Barium	7.50E-02	3.99E+05	1.56E+04	4.82E+02
Benzene	6.30E-04	4.52E+03	1.54E+01	
Benzoic Acid	2.96E-02	4.76E+06	2.40E+05	
Benzo[a]anthracene	5.80E-02	5.15E+02	1.48E+00	
Benzo[a]pyrene	5.07E-02	5.15E+01	1.48E-01	
Benzo[b]fluoranthene	6.00E-02	5.15E+02	1.48E+00	
Benzo[g,h,i]perylene	5.52E-02	2.15E+05	1.72E+03	
Benzo[k]fluoranthene	6.10E-02	5.15E+03	1.48E+01	
Benzyl Alcohol	5.58E-02	3.61E+05 (s)	6.10E+03	
Beryllium	4.40E-02	9.96E+03 (s)	1.56E+02	1.49E+00
Bis(2-chloroethoxy)methane	4.99E-02	3.61E+04	1.80E+02	
Bis(2-chloroethyl)ether	5.00E-02	4.82E+02	2.68E+00	
Bis(2chloroisopropyl) ether	4.73E-02	4.82E+02	9.15E+01	
Bis(2-ethylhexyl)phthalate	6.16E-02	3.01E+04	3.47E+02	
Bromobenzene	7.60E-04	2.59E+04	3.00E+02	
Bromochloromethane	8.10E-04	1.58E+04	1.60E+02	
Bromodichloromethane	6.90E-04	1.45E+03	5.41E+00	
Bromoform (Tribromomethane)	8.00E-04	3.61E+04 (s)	6.16E+02	
Bromomethane	1.60E-03	3.82E+03 (s)	1.65E+01	
4-Bromophenyl phenyl ether	5.66E-02	NA	NA	
2-Butanone (Methyl Ethyl Ketone)	7.10E-04	4.75E+05 (s)	3.71E+04	
Butylbenzene, n-	5.20E-04	2.00E+05	3.90E+03	
Butylbenzene, sec-	9.30E-04	2.00E+05	3.90E+03	
Butylbenzene, tert-	4.50E-04	2.00E+05	3.90E+03	
Butyl Benzyl Phthlate	5.55E-02	2.22E+05 (s)	2.60E+03	
tert-Butyl Methyl Ether (MTBE)	8.90E-04	1.67E+05	9.01E+02	
Cadmium (Diet)	5.10E-02	1.58E+03	7.03E+01	2.24E-01
Carbazole	8.16E-02	NA	NA	

TABLE 5-2
CALCUATED RISK-BASED SOIL SCREENING LEVELS
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Chemical	Laboratory Detection Limits (mg/kg)	Site-Specific Screening Level (mg/kg)	Residential Value (mg/kg)	Background Value (mg/kg)
Carbon Disulfide	1.08E-03	3.06E+04	1.53E+03	
Carbon Tetrachloride	8.00E-04	2.78E+03 (s)	1.08E+01	
Chlorophenol, 2-	4.43E-02	1.60E+04 (s)	3.91+02	
Chloroaniline, p-	1.65E-02	6.01E+02	2.40E+01	
Chloro-3-methylphenol, 4- (p-chloro-m-cresol)	5.88E-02	1.20E+05	6.10E+03	
Chlorophenyl phenyl ether, 4-	6.07E-02	NA	NA	
Chlorobenzene	4.90E-04	7.06E+04 (s)	3.76E+02	
Chloroform	1.55E-03	1.64E+03	5.86E+00	
Chloromethane	1.43E-03	1.56E+05	2.75E+02	
Chloronaphthalene, Beta-	5.24E-02	3.99E+05	6.26E+03	
Chlorotoluene, o-	9.90E-04	3.50E+04 (s)	1.56E+03	
Chlorotoluene, p-	1.05E-03	3.99E+05	1.60E+03	
Chromium(III), Insoluble Salts	1.40E-01	2.99E+06 (s)	1.17E+05	1.87E+01
Chrysene	6.06E-02	5.15E+04	1.48E+02	
Cobalt	6.30E-02	5.98E+03	2.30E+01	6.82E+00
Copper	9.40E-02	2.00E+04	3.13E+03	1.84E+01
Cumene	1.11E-03	2.40E+04 (s)	2.34E+03	
Cyanide (CN-)	2.80E-01	1.58E+03	4.69E+01	
DRO (diesel range organics)	1.00E+01	3.00E+03		
Dibenz[a,h]anthracene	5.94E-02	5.15E+01	1.48E-01	
Dibenzofuran	5.73E-02	7.98E+03	7.80E+01	
Dibromochloromethane	6.50E-04	2.39E+03 (s)	1.21E+01	
Dibromo-3-chloropropane, 1,2-	2.19E-03	7.54E+01	1.86E+00	
Dibromoethane, 1,2-	6.00E-04	1.36E+02	5.88E-01	
Dichlorobenzene, 1,2-	9.50E-04	5.55E+05 (s)	2.31E+03	
Dichlorobenzene, 1,3-	6.00E-04	3.99E+04	3.17E+01	
Dichlorobenzene, 1,4-	6.70E-04	1.32E+04 (s)	3.17E+01	
Dichlorobenzidine, 3,3'-	5.63E-02	9.35E+02	1.08+01	
Dichlorodifluoromethane	8.30E-04	2.71E+04 (s)	1.68E+02	
Dichloroethane, 1,1-	1.13E-03	1.73E+04 (s)	6.45E+01	
Dichloroethane, 1,2-	7.20E-04	2.01E+03	7.89E+00	
Dichloroethylene, 1,1-	7.90E-04	3.31E+03	4.49E+02	
Dichloroethylene, 1,2-cis-	1.82E-03	3.99E+04	1.56E+02	
Dichloroethylene, 1,2-trans-	1.35E-03	7.21E+04	2.70E+02	
Dichlorophenol, 2,4-	5.05E-02	2.40E+04	1.83E+02	
Dichloropropane, 1,2-	6.20E-04	4.50E+03 (s)	1.52E+01	
Dichloropropane, 1,3-	6.50E-04	3.99E+05	1.60E+03	
Dichloropropane, 2,2-	6.70E-04	3.99E+05	1.52E+01	

TABLE 5-2
CALCUATED RISK-BASED SOIL SCREENING LEVELS
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Chemical	Laboratory Detection Limits (mg/kg)	Site-Specific Screening Level (mg/kg)	Residential Value (mg/kg)	Background Value (mg/kg)
Dichloropropene, 1,1-	5.50E-04	4.63E+03	3.37E+01	
Dichloropropene, 1,3-	6.70E-04	4.63E+03 (s)	3.37E+01	
Dichloropropene, cis-1,3-	1.07E-03	4.63E+03 (s)	3.37E+01	
Dichloropropene, trans-1,3-	4.30E-04	4.63E+03 (s)	3.37E+01	
Diethyl Phthalate	6.21E-02	7.21E+06 (s)	4.89E+04	
Dimethylphthalate	6.33E-02	7.21E+06	6.11E+05	
Dibutyl Phthalate	6.59E-02	1.20E+06	6.11E+03	
Di-n-octyl phthalate	5.84E-02	1.20E+06	3.47E+02	
Dimethylphenol, 2,4-	4.39E-02	6.01E+04 (s)	1.22E+03	
Dinitrobenzene, 1,3-	6.34E-02	6.01E+02 (s)	6.10E+00	
Dinitro-o-cresol, 4,6-	5.64E-02	9.62E+02	4.89E+00	
Dinitrophenol, 2,4-	5.37E-02	2.40E+04	1.22E+02	
Dinitrotoluene, 2,4-	8.30E-02	1.35E+03	1.57E+01	
Dinitrotoluene, 2,6-	8.30E-02	1.21E+04 (s)	6.11E+01	
Ethylbenzene	6.40E-04	2.26R+04 (s)	6.84E+01	
Ethyl Chloride	8.50E-04	1.07E+05	2.98E+04	
Fluoranthene	6.54E-02	1.07E+05 (s)	2.29E+03	
Fluorene	6.13E-02	4.30E+05 (s)	2.29E+03	
Hexanone, 2-	1.60E-04	6.37E+03	2.10E+02	
Hexachlorobenzene	6.03E-02	1.20E+01 (s)	3.04E+00	
Hexachlorobutadiene	6.00E-04	1.20E+03 (s)	6.11E+01	
Hexachloroethane	4.99E-02	1.05E+04 (s)	4.28E+01	
HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetra)	8.00E-02	9.60E+04	3.91E+03	
Indeno[1,2,3-cd]pyrene	6.04E-02	5.15E+02	1.48E+00	
Isophorone	5.70E-02	4.43E+05 (s)	5.12E+03	
Isopropyltoluene, p-	4.50E-04	5.95E+05	2.34E+03	
Lead	1.60E-01	1.92E+03	4.00E+02	1.24E+01
Manganese (Non-diet)	1.30E-04	4.77E+04	1.86E+03	1.06E+03
Mercury (elemental)	1.00E-02	4.00E+02	1.56E+01	3.00E-02
Methylnaphthalene, 2-	5.04E-02	4.30E+03	2.30E+02	
2-Methylphenol (Cresol, o-)	4.52E-02	6.01E+05	3.10E+03	
Methylene Bromide (Dibromomethane)	4.70E-04	6.42E+03	5.16E+01	
Methylene Chloride	4.58E-03	5.48E+04	4.09E+02	
Methyl Isobutyl Ketone (4-methyl-2-pentanone)	9.30E-04	3.03E+05 (s)	5.30E+03	
Naphthalene	4.10E-04	6.09E+03	4.30E+01	
Nickel Soluble Salts	6.80E-02	3.99E+04	1.56E+03	1.95E+01

TABLE 5-2
CALCUATED RISK-BASED SOIL SCREENING LEVELS
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Chemical	Laboratory Detection Limits (mg/kg)	Site-Specific Screening Level (mg/kg)	Residential Value (mg/kg)	Background Value (mg/kg)
Nitrate	1.24E+00	3.19E+06	1.25E+05	
Nitroaniline, 2-	6.24E-02	1.20E+05	6.10E+02	
Nitroaniline, 3-	6.11E-02	1.20E+03	2.40E+02	
Nitroaniline, 4-	7.28E-02	1.20E+04	2.40E+02	
Nitrobenzene	7.50E-02	8.65E+03 (s)	5.35E+01	
Nitrophenol, 2-	4.78E-02	2.65E+03	NA	
Nitrophenol, 4-	5.98E-02	2.65E+03	NA	
Nitroso-di-N-propylamine, N-	8.74E-02	6.01E+01	6.90E-01	
Nitrosodimethylamine, N-	5.49E-02	8.25E+00	2.26E-02	
Nitrosodiphenylamine, N-	5.06E-02	8.59E+04	9.93E+02	
Nitrotoluene, m-	7.10E-02	1.20E+03 (s)	7.82E+00	
Nitrotoluene, o-	6.60E-02	3.18E+03 (s)	2.91E+01	
Nitrotoluene, p-	8.00E-02	4.81E+03 (s)	2.44E+02	
ORO (oil range organics)	1.00E+01	5.00E+03		
Pentachlorophenol	5.87E-02	6.59E+02	8.94E+00	
Perchlorate and Perchlorate Salts	2.00E-03	1.40E+03	5.48E+01	
Phenanthrene	5.82E-02	2.15E+05	1.83E+03	
Phenol	4.30E-02	7.21E+05	1.83E+04	
Polychlorinatedbiphenyls (PCBs)				
Aroclor 1016	9.80E-03	7.26E+01	3.93E+00	
Aroclor 1221	5.50E-03	1.68E+02	1.49E+00	
Aroclor 1232	3.60E-03	1.68E+02	1.49E+00	
Aroclor 1242	3.60E-03	1.82E+02	2.22E+00	
Aroclor 1248	3.60E-03	1.82E+02	2.22E+00	
Aroclor 1254	3.60E-03	3.11E+01 (s)	1.12E+00	
Aroclor 1260	3.60E-03	1.82E+02	2.22E+00	
Propyl benzene	4.20E-04	8.66E+04	3.40E+03	
Pyrene	5.41E-02	3.22E+05	1.72E+03	
RDX (Hexahydro-1,3,5-trinitro-1,3,5-triazine)	8.00E-02	5.78E+03	5.82E+01	
Selenium	3.70E-01	9.98E+03	3.91E+02	5.13E-01
Silver	3.60E-02	9.98E+03	3.91E+02	1.30E-01
Styrene	6.90E-04	3.02E+05	7.28E+03	
TCDD, 2,3,7,8-	5.00E-06	4.49E-03	4.50E-05	
Tetrachloroethane, 1,1,1,2-	6.90E-04	8.23E+03	2.91E+01	
Tetrachloroethane, 1,1,2,2-	1.24E-03	1.87E+03	8.02E+00	
Tetrachloroethylene	5.40E-04	4.07E+03 (s)	7.02E+00	
Tetryl (Trinitrophenylmethylnitramine)	9.10E-02	1.20E+04	2.44E+02	

TABLE 5-2
CALCUATED RISK-BASED SOIL SCREENING LEVELS
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Chemical	Laboratory Detection Limits (mg/kg)	Site-Specific Screening Level (mg/kg)	Residential Value (mg/kg)	Background Value (mg/kg)
Thallium (Soluble Salts)	2.06E-01	7.98E+01 (s)	7.82E-01	2.13E-01
Toluene	6.50E-04	5.59E+05 (s)	5.27E+03	
Trichlorobenzene, 1,2,3-	2.80E-04	9.62E+03	4.90E+01	
Trichlorobenzene, 1,2,4-	5.20E-04	2.31E+04	7.30E+01	
Trichloroethane, 1,1,1-	8.10E-04	3.55E+05	1.56E+04	
Trichloroethane, 1,1,2-	4.80E-04	5.91E+02 (s)	2.81E+00	
Trichloroethylene	7.10E-04	9.79E+02	8.77E+00	
Trichlorofluoromethane	1.26E-03	4.43E+04 (s)	1.41E+03	
Trichlorophenol, 2,4,5-	6.01E-02	3.61E+05 (s)	6.11E+03	
Trichlorophenol, 2,4,6-	4.83E-02	1.20E+03	6.11E+01	
Trichloropropane, 1,2,3-	1.24E-03	2.33E+01 (s)	4.97E-02	
Trimethylbenzene, 1,2,4-	1.18E-03	2.45E+04	6.20E+01	
Trimethylbenzene, 1,3,5-	9.70E-04	2.88E+03	7.80E+02	
Trinitrobenzene, 1,3,5-	7.90E-02	8.87E+02 (s)	2.20E+03	
Trinitrotoluene, 2,4,6-	8.30E-02	8.24E+02	3.91E+01	
Vanadium	1.00E-01	1.01E+04	3.91E+02	2.72E+01
Vinyl Chloride	1.68E-03	7.53E+02	7.28E-01	
White Phosphorus	4.69E-04		1.60E+00	
Xylene, m-	4.30E-04	2.28E+04 (s)	7.74E+02	
Xylene, o-	6.10E-04	2.28E+04 (s)	8.98E+02	
Zinc and Compounds	1.15E+00	5.99E+05	2.35E+04	4.92E+01

Notes:

Acenaphthene was used as a surrogate for benzo(g,h,i)perylene, acenaphthylene, and phenanthrene.

Bis(2-chloroethyl) ether was used as a surrogate for bis(2-chloroisopropyl) ether.

n-Butylbenzene was used as a surrogate for sec-butylbenzene and tert-butylbenzene.

1,3-Dichloropropene was used as a surrogate for cis-and trans-1,3-dichloropropene and 1,1-dichloropropene.

1,3-Dichloropropane was used as a surrogate for 2,2-dichloropropane.

Dibutyl phthalate was used as a surrogate for di-n-octylphthalate.

Diethylphthalate was used as a surrogate for dimethylphthalate.

2-Nitrophenol was used as a surrogate for 4-nitrophenol.

Toluene was used as a surrogate for p-isopropyltoluene.

No surrogates were identified for carbazole, 4-bromophenyl phenyl ether, and 4-chlorophenyl phenyl ether.

DRO and ORO are from NMED (2012). See Section 5.1.1.

Lead value was calculated using USEPA's Adult Lead Model. See Attachment 1.

Antimony and arsenic background values are the proposed values in the Phase 2 Soil Background Study Report to be submitted to NMED in January 2013.

(s) indicates the site-specific screening level for that chemical is a subchronic value.

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USEPA's Adult Lead Model (ALM) (USEPA 2009) was used to calculate SSLs for lead in soil. **Table A-1** in **Attachment A** show the input parameters used in the model. The parameters are discussed below.

The baseline blood lead concentration input parameter of the ALM represents the geometric mean blood lead concentration in women of child-bearing age (PbB0) and the geometric standard deviation (GSD) input parameter is a measure of the inter-individual variability in these concentrations. Updated USEPA (2009) default ALM values were used for individual blood lead geometric standard deviation (GSDi) and baseline blood lead concentration (PbB0).

A default fetal blood lead level of 10 µg/dL (USEPA 1996) was used to calculate the site-specific RCL for lead in soil

There is high uncertainty in soil ingestion rates for adults due to sparse empirical data on adult soil ingestion rates. There are data available from two studies (Calabrese et al., 1990; Calabrese et al., 1997), each conducted concurrently with a study of childhood soil ingestion rates, but neither study group targeted a population expected to engage in frequent contact with soil, such as outdoor workers. The purpose of the studies was to verify the tracer mass balance methodology used in the child studies. Despite their limitations, these studies provide an estimate of the amount of soil ingested by adults.

The Technical Review Workgroup (TRW) recommends 50 mg/day as the default ingestion rate for indoor workers. This value is cited in the ALM guidance (Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil, December 1996), and the Exposure Factors Handbook (USEPA 1997). A reasonable default value that has been commonly used as a central tendency estimate for contact-intensive adult scenarios (such as an agricultural or construction worker) is 100 mg/day. The value of 50 mg/day represents a reasonable central tendency estimate of adult soil ingestion based on available data and is the recommended mean value. The value of 100 mg/day is equal to the recommended mean soil ingestion rate for young children, whose daily ingestion rates are expected to exceed that of adults (USEPA 1997). For construction workers and other soil contact-intensive occupations, Office of Solid Waste and Emergency Response (OSWER) guidance recommends an upper bound value for IRs of 330 mg/day based on Stanek et al. (1997) (as cited by USEPA's Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, 2001). The basis of the default ingestion rate is the 95th percentile value (330 mg/day). In this study, Stanek et al. (1997) also report the median, 75th percentile, and mean values as one, 49, and 10 mg/day (SD = 94), respectively. The coefficient of variation value of 9.4 is indicative of significant uncertainties in these estimates. Because central tendency values are recommended as inputs to the ALM, a more plausible range for a soil lead ingestion rate is 50 to 200 mg/day for adult contact-intense soil exposures (USEPA 2003b). Thus, there is reasonable support for use of 100 mg/day as a soil ingestion rate for the contact-intense worker scenario in the ALM. Therefore, the site worker scenario used an ingestion rate of 100 mg/day.

The value for exposure frequency (EF) was the site-specific value of 128 days/year. The exposure frequency of 128 days per year was used instead of the default value of 219 days. The 128 days is based on the assumption of the worker being at the site 4 days per week for 8 months per year.

The actual extent and rate of oral absorption of lead in humans is influenced by physiological states of the exposed individuals (e.g., age, fasting, nutritional status), physiochemical characteristics of the medium and type of lead ingested (e.g., type of medium, particle size, mineralogy, lead solubility and species), and lead dose (ATSDR 1999). A number of factors may reduce oral bioavailability of lead in soil relative to that for soluble forms of lead (Chaney et al. 1989), including:

- The presence of lead in discrete mineral phases in soil
- Encapsulation of lead inside of insoluble particles in soil
- Larger particle sizes of lead in soil

The absolute bioavailability of soluble lead in pregnant women of 20 percent derived in USEPA's ALM was calculated based on an estimate of meal-weighted bioavailability of lead ingested in food and water by adults (USEPA 2003b). This bioavailability value of 20 percent was multiplied by 0.60 to account for decreased bioavailability of soluble lead in soil, which results in the EPA default value for lead bioavailability in the Adult Lead Exposure Model of 12 percent (USEPA 2003b).

Using the equations shown below and the parameters discussed above and provided in **Table A-1**, SSLs were calculated for the site worker scenarios, respectively.

$$\text{PbBcentral, goal} = \frac{\text{PbB}_{\text{fetal, 0.95 goal}}}{\text{GSD}_{\text{i}}^{1.645}}$$

$$\frac{(\text{PbB}_{\text{central, goal}} - \text{PbB}_0) * \text{AT}}{(\text{BKSF} * \text{IR} * \text{AF} * \text{EF})} = \text{SS}L$$

The outdoor site worker SSL for lead is 1,196 mg/kg. This value can be compared to individual sample results to determine if lead is a contaminant of potential concern for surface soil at the site.

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TABLE A-1
LEAD CLEANUP LEVEL IN SOIL FOR THE SITE WORKER SCENARIO
FORT WINGATE DEPOT ACTIVITY
MCKINLEY COUNTY, NEW MEXICO

Variable	Description of Variable	Units	Input Paremeters[1]
$PbB_{fetal, 0.95}$	95th percentile PbB in fetus	ug/dL	10
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9
BKSF	Biokinetic Slope Factor	ug/dL per ug/day	0.4
GSD_i	Geometric standard deviation PbB	--	1.8
PbB_0	Baseline PbB	ug/dL	1.0
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100
$AF_{S, D}$	Absorption fraction (same for soil and dust)	--	0.12
$EF_{S, D}$	Exposure frequency (same for soil and dust)	days/yr	128
$AT_{S, D}$	Averaging time (same for soil and dust)	days/yr	365
SSL		**mg/kg**	**1,916**

Notes:

[1]Analysis from National Health and Nutrition Examination Survey (NHANES) 1999-2004 (USEPA 2002a)

μg/dL = micrograms per deciliter

g/day = grams per day

days/yr = days per year

μg/day = micrograms per day