# Final
# MEC Investigation Work Plan
# Parcel 11

# Fort Wingate Depot Activity
# McKinley County, New Mexico

**October 15, 2024**

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**Task Order: W912PP23F0040**

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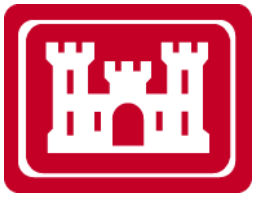

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This MEC Investigation Work Plan describes additional investigation activities within Parcel 11 at Fort Wingate Depot Activity, McKinley County, New Mexico. This document has been prepared for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), as required by Section VII.F.1 of the Resource Conservation and Recovery Act (RCRA) Permit, No. NM6213820974

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**Fort Wingate Depot Activity, McKinley County, NM**

**40 CFR 270.11**

**October 2024**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

George H. Cushman IV

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**Notes:**

| | | |
|---|---|---|
| BIA | = | Bureau of Indian Affairs |
| BIA-NRO | = | Bureau of Indian Affairs – Navajo Regional Office |
| BRAC | = | U.S. Army Base Realignment and Closure Division |
| COR | = | Contracting Officer's Representative |
| EPA | = | U.S. Environmental Protection Agency |
| FWDA BEC | = | Fort Wingate Depot Activity Base Realignment and Closure Environmental Coordinator |
| NM | = | New Mexico |
| NMED HWB | = | New Mexico Environment Department, Hazardous Waste Bureau |
| NN | = | Navajo Nation |
| OH | = | Ohio |
| USACE | = | U.S. Army Corps of Engineers |

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# EXECUTIVE SUMMARY

## ES.1 EXECUTIVE SUMMARY INTRODUCTION

This Munitions and Explosives of Concern (MEC) Investigation Work Plan was prepared by the Army for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), as required by Section VII.H.1.a of Resource Conservation and Recovery Act (RCRA) permit NM 6213820974 for the Fort Wingate Depot Activity (FWDA) (Permit) effective December 1, 2005, and last revised February 2015 (NMED, 2015).

## ES.2 PURPOSE AND SCOPE

This MEC Investigation Work Plan contains investigative information for two solid waste management units (SWMUs) and adjacent areas in Parcel 11:

- SWMU 10 – Sewage Treatment Plant (approximately 17.5 acres), and
- SWMU 40 – South Administration Area (approximately 3.5 acres).

The purpose of this MEC Investigation Work Plan is to describe the procedures to be followed to conduct a MEC investigation in Parcel 11 as recommended by the U.S. Army (the Army) in the Parcel 11 RCRA Facility Investigation (RFI) Report (USACE, 2014). The purpose and scope of the planned MEC investigation are to:

1. Confirm the presence of MEC within SWMU 10, define the vertical extent of contamination, and confirm that MEC contaminated areas have been fully surveyed;
2. Determine the presence/absence of MEC within SWMU 40 and define the vertical extent of contamination, if present;
3. Assess potential risks to human health from MEC;
4. Determine the necessity of future remedial action; and
5. Provide a dig list to be used in a future remedial action if action is deemed necessary.

## ES.3 PROPOSED INVESTIGATIONS

Thousands of munitions debris (MD) items have been recovered from SWMU 10 and the surrounding area during previous investigations, and two MD items were found in an area adjacent to the buildings/structures that comprise SMWU 40. Following the MD recoveries, geophysical investigations were performed in and/or adjacent to both SWMUs in 2009, and numerous geophysical anomalies representing subsurface metal were identified in the collected data. None of the identified anomalies were investigated to determine their sources.

The 2009 surveys are now approximately 15 years old and were collected using an EM61-MK2 time domain metal detector (EM61), which was a standard sensor used for MEC surveys at the time. In addition to the limited applicability of data collected in 2009 for identifying targets for potential remedial actions over 15 years later, sensors developed since 2009 are more capable than

the EM61 for resolving precise locations of subsurface sources, especially in high anomaly density areas. Newer sensors can also be used to classify subsurface sources as potential MEC or as non-hazardous clutter. Additionally, large geophysical anomalies potentially indicative of subsurface MEC appear to extend outside of the existing EM61 dataset at SWMU 10. New geophysical data will be collected using an advanced geophysical classification (AGC) sensor, the UltraTEM Portable Classifier (UltraTEM), over the previous EM61 survey areas and over an additional area in and adjacent to SWMU 10 where digital geophysical data has not been collected yet. Because the boundary of the 2009 surveys near SWMU 40 were limited to areas adjacent to building and loading dock locations, the SWMU 40 survey will cover the same areas surveyed in 2009.

UltraTEM data will be evaluated to identify locations of subsurface sources potentially representing MEC and dig lists will be compiled for the SWMU 10 and 40 surveys based on anomaly locations and classification decisions (i.e., potential MEC vs non-hazardous clutter). A subset of the recommended digs will be intrusively investigated to confirm the presence of MEC in and adjacent to SWMU 10 and to determine the presence/absence of MEC in the survey areas near SMWU 40. Because saturated response areas (SRAs; anomalies with areal extents > 10 square meters [$m^2$]) appear to extend past the boundary of the EM61 data collected adjacent to SWMU 10, the collected UltraTEM data will be evaluated to confirm that these areas are fully delineated by the new data. If SRAs extend past the added buffer area, the project team will determine the necessity of expanding the survey outside of the currently planned boundary. Because the limits of potential contamination have already been defined near SWMU 40, the geophysical data will only be evaluated to identify anomaly locations.

The Army will conduct the RFI activities in accordance with this RFI Work Plan once approved by NMED and reflected in the RCRA permit (NMED, 2015). The RFI is divided into the following nine sections:

- **Section 1** is an introduction to this MEC Investigation Work Plan.
- **Section 2** provides background information for Parcel 11.
- **Sections 3 and 4** provide details from data obtained during previous investigations and summarize the proposed investigation activities for each SWMU.
- **Section 5** describes the investigation methods.
- **Section 6** describes the risk assessment process for the MEC Investigation Report.
- **Section 7** provides the Waste Management Plan
- **Section 8** provides the schedule.
- **Section 9** provides references for the documents cited in the text.

## ES.4 RISK EVALUATION AND REPORTING

The results of the intrusive investigations will be used to perform a qualitative MEC exposure pathway risk assessment evaluating explosive hazards to human receptors. This baseline risk assessment will be performed consistent with the Office of the Secretary of Defense Memorandum dated 14 July 2023 and titled, *Military Munitions Response Program Risk Management Methodology*.

A MEC Investigation Report will be developed to document the findings of the MEC investigation, including the nature and extent of MEC contamination (or lack thereof) in SMWUs 10 and 40 and

overall investigation conclusions. If MEC or significant quantities of MD are found, recommendations will be provided for additional activities to be conducted in the next phase of work. While intrusive investigation during this investigation will be limited relative to the number of expected anomalies, the locations of all anomalies representing potential subsurface MEC items within both survey areas will be available for any necessary subsequent investigation.

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| °F | Degrees Fahrenheit |
| µV/A | Microvolts per ampere |
| AGC | Advanced geophysical classification |
| AHA | Activity Hazard Analysis |
| AOC | Area of concern |
| APP | Accident Prevention Plan |
| Army | U.S. Army |
| BEC | (FWDA) Base Realignment and Closure Environmental Coordinator |
| BIA | Bureau of Indian Affairs |
| BIA-NRO | Bureau of Indian Affairs – Navajo Regional Office |
| BRAC | Defense Base Realignment and Closure Act |
| BRACD | BRAC Division |
| CA | Corrective action |
| CAMU | Corrective Action Management Unit |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| cm | Centimeter(s) |
| cm bgs | Centimeter(s) below ground surface |
| COR | Contracting Officer's Representative |
| CSM | Conceptual site model |
| DDESB | Department of Defense Explosives Safety Board |
| DGM | Digital geophysical mapping |
| DMM | Discarded military munitions |
| DoD | Department of Defense |
| DOI | U.S. Department of the Interior |
| DQO | Data quality objective |
| DUA | Data usability assessment |
| EM61 | EM61-MK2 time domain metal detector |
| ESP | Explosives Site Plan |
| FWDA | Fort Wingate Depot Activity |
| ft | Foot/feet |
| GIS | Geographic information system |
| GPS | Global Positioning System |
| HE | High explosive |
| HWB | Hazardous Waste Bureau |
| ID | Identification (number) |
| ITS | Instrument test strip |
| ISO | Industry standard object |
| IVS | Instrument Verification Strip |
| m | Meter(s) |
| $m^2$ | square meter(s) |
| m/s | Meters per second |
| MD | Munitions debris |
| MDAS | Material documented as safe |
| MEC | Munitions and Explosives of Concern |

## ACRONYMS AND ABBREVIATIONS (Continued)

| | |
|---|---|
| MGFD | Munition with the greatest fragmentation distance |
| mm | Millimeter |
| MPC | Measurement performance criteria |
| MPPEH | Material potentially presenting an explosive hazard |
| MQO | Measurement quality objective |
| MSD | Minimum separation distance |
| MSL | Mean Sea level |
| mV | Millivolt(s) |
| NEU | No evidence of use |
| NM | New Mexico |
| NMED | New Mexico Environment Department |
| NN | Navajo Nation |
| NRCS | Natural Resources Conservation Service |
| OB/OD | Open Burning/Open Detonation (Area) |
| OH | Ohio |
| OESS | Ordnance and Explosives Safety Expert |
| OSD | Office of the Secretary of Defense |
| OSHA | Occupational Safety and Health Administration |
| Permit | RCRA Permit NM 6213820974, effective December 1, 2005, Revised February 2015 |
| PPE | Personal protective equipment |
| QA | Quality assurance |
| QC | Quality control |
| RCA | Root cause analysis |
| RCRA | Resource Conservation and Recovery Act |
| RFI | RCRA Facility Investigation |
| RMM | Risk management methodology |
| RRD | Range-related debris |
| RTK | Real-time kinematic |
| SLAM | Simultaneous localization and mapping |
| SRA | Saturated response area |
| SRHI | Summary Report of Historical Information |
| SSHP | Site Safety and Health Plan |
| STP | Sewage Treatment Plant |
| SUXOS | Senior UXO Supervisor |
| SWMU | Solid waste management unit |
| TEAD | Tooele Army Depot |
| TNT | Trinitrotoluene |
| TOI | Target of interest |
| TPMC | TerranearPMC |
| TP-T | Target practice – tracer |
| TSD | Team separation distance |
| UltraTEM | UltraTEM Portable Classifier |
| U.S. | United States |

## ACRONYMS AND ABBREVIATIONS (Continued)

| | |
|---|---|
| USACE | U.S. Army Corps of Engineers |
| USEPA | U.S. Environmental Protection Agency |
| UST | Underground storage tank |
| UXO | Unexploded ordnance |
| UXOSO/SSHO | UXO Safety Officer/Site Safety and Health Officer |

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# 1.0 INTRODUCTION

This Munitions and Explosives of Concern (MEC) Investigation Work Plan describes investigation activities to be completed within Parcel 11 at Fort Wingate Depot Activity (FWDA), in McKinley County, New Mexico (**Figures 1.1 and 1.2**).

This MEC Investigation Work Plan has been prepared by the United States (U.S.) Army for submission to the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), as required by Section VII.H.1.a of the Resource Conservation and Recovery Act (RCRA) Permit (Permit) (NM 6213820974) for the FWDA, which became effective December 31, 2005, and was most recently modified in February 2015 (NMED, 2015).

This MEC Investigation Work Plan summarizes previous MEC investigations performed in Parcel 11 and describes the MEC investigation to be completed to determine the nature and extent of MEC contamination within the Parcel as recommended in the *Final RCRA Facility Investigation Report Parcel 11, Revision* 2.0, dated May 23, 2014 (U.S. Army Corps of Engineers [USACE], 2014).

## 1.1 PURPOSE AND SCOPE

The purpose of this MEC Investigation Work Plan is to describe the procedures to be followed to conduct a MEC investigation in and/or adjacent to Solid Waste Management Units (SWMUs) 10 and 40 in Parcel 11 as recommended by the Army in the Parcel 11 RCRA Facility Investigation (RFI) Report (USACE, 2014). Thousands of munitions debris (MD) items have been recovered in and adjacent to SWMU 10 during previous investigations, and two MD items were found adjacent to the buildings/structures that comprise SMWU 40. Following the MD recoveries, geophysical investigations were performed in and/or adjacent to both SWMUs in 2009, and numerous geophysical anomalies representing subsurface metal were present in the collected data. None of the identified anomalies were investigated to determine their sources.

The 2009 surveys were performed using an EM61-MK2 time domain metal detector (EM61), which was a standard sensor used for MEC surveys at the time. However, sensors developed since 2009 are more capable of resolving precise locations of subsurface sources, especially in high anomaly density areas, and can be used to classify subsurface sources as potential MEC or as non-hazardous clutter. For this reason, they are referred to as advanced geophysical classification (AGC) sensors. Following any necessary vegetation clearance and a surface sweep, an AGC sensor, the UltraTEM Portable Classifier (UltraTEM), will be used to perform geophysical surveys in and/or adjacent to SMWUs 10 and 40 to update the geophysical record using a more advanced sensor than was used in 2009. Because areas of high anomaly density seemingly extended outside of the EM61 survey boundary in 2009, the SWMU 10 survey will cover a larger area than the 2009 survey to confirm that all saturated response areas (SRAs; anomalies with areal extents > 10 square meters [$m^2$]) that appear to be present in the 2009 data are fully delineated by the new data (see **Figure 3.1**). If SRAs extend past the added buffer area, the project team will determine the necessity of expanding the survey outside of the currently planned boundary. The boundaries of the 2009 surveys adjacent to the SWMU 40 buildings/structures were based on proximity to specific buildings or structures. MEC contamination is not expected outside of these areas. Therefore, the SWMU 40 surveys will cover the same areas surveyed in 2009 (see **Figure 4.1**).

**Tables 1.1 and 1.2** include the list of known and suspected munitions for the SWMU 10 and SWMU 40 investigation areas, respectively. These are based on munitions recovered during previous investigations at SWMU 10 and during utility trenching adjacent to one of the SWMU 40 buildings in 1998. **Tables 1.1 and 1.2** also contain the UltraTEM expected detection depths for each munition listed.

Collected AGC data will be evaluated to identify the locations of subsurface sources potentially representing MEC. Dig lists will be compiled for SWMUs 10 and 40 in Parcel 11. A total of 400 digs was proposed for the MEC investigation with the intent to split digs between Parcel 11 and Parcel 22 as necessary to accomplish site characterization. It was determined that approximately 200 digs at each Parcel would be sufficient to determine the nature and extent of contamination. Items included on the dig list may include classified TOI, inconclusive sources, and sources representing potential MD that would be indicative of the types of munitions present.

A MEC Investigation Report will be developed to document the findings of the MEC investigation, including the nature and extent of MEC contamination (or lack thereof) in SMWUs 10 and 40, and overall investigation conclusions. If MEC is found, recommendations will be provided for additional activities to be conducted in the next phase of work. While intrusive investigation during this investigation will be limited relative to the number of expected anomalies, the locations of anomalies representing potential subsurface MEC items within both survey areas will be available for any necessary subsequent investigation.

To summarize, the purpose and scope of this MEC Investigation Work Plan are to:

- Describe the procedures to be followed to conduct a MEC investigation in Parcel 11 as recommended by the Army in the Parcel 11 RFI Report (USACE, 2014),
- Determine the presence/absence of MEC within Parcel 11 and define the horizontal and vertical extent of contamination, if present,
- Assess potential risks to human health,
- Determine the necessity of future remedial action, and
- Provide a dig list to be used in any necessary future remedial action.

## 1.2 PARCEL 11 BACKGROUND INFORMATION

Complete background information regarding FWDA and Parcel 11 is provided in numerous documents previously submitted to NMED, including the following:

- *Summary Report of Historical Information (SRHI), Parcel 11, Fort Wingate Depot Activity* (TerranearPMC [TPMC], 2009a), which serves as a companion to the RFI Work Plan (TPMC, 2009b),
- *RCRA Facility Investigation Work Plan, Parcel 11, Final, Fort Wingate Depot Activity* (hereafter referred to as the RFI Work Plan, TPMC, 2009b),
- RFI Report, Revision 2.0 (USACE, 2014), and
- *Final RFI Phase 2 Work Plan for MEC, Parcel 11 SWMU 40 and SWMU 10 MEC Removal Action* (PIKA, 2016).

The SRHI provides a listing of site surveys, data compilation efforts, operational history, site or facility drawings, and environmental investigations that have been contained in previously completed reports and are pertinent to sites now considered to be within Parcel 11. Additionally, the SRHI summarizes findings and conclusions from the relevant historical site investigation efforts.

The FWDA installation has been divided into reuse parcels as part of the planned property transfer to the U.S. Department of the Interior (DOI). **Figure 1.2** presents a Parcel Location Map showing the location of Parcel 11, which contains the majority of buildings and structures that made up the Administration Area (see **Figure 1.3**). The Permit lists 10 SWMUs and seven areas of concern (AOCs) within Parcel 11, although only two of these are associated with known or potential MEC contamination. These are:

1. SWMU 10 – Sewage Treatment Plant (STP) (includes Buildings/Structures 22, T37, 63, 69, 70, 71, 72, 73, 74a, 74b, 74c, 74d, 82, 83, and 745, the document incinerator, drainage ditch, and septic system at the STP), and
2. SWMU 40 – South Administration Area (Building 10, Building 12, Building 13, Building 14, Former Building 29, Structure 63, Building T-33, Building 36, Former Underground Storage Tank [UST] No. 5, Building T-49, Building T-50, and Structures 57, 58, 59, and 60).

Although Parcel 11 only contains six of the 15 sub-sites included in SWMU 40 – South Administration Area (i.e., Building 10, Building 12, Building 13, Building 14, Former Building 29, and Structure 63), all of the planned survey areas adjacent to the buildings/structures that comprise SWMU 40 are within Parcel 11.

Characterization activities for the RFI were conducted in 2009 and 2010 in accordance with the NMED approved RFI Work Plan (TPMC, 2009b). Activities for the RFI were detailed in the RFI Report (USACE, 2014), which was approved with modifications in 2013. The MEC investigation activities described in this MEC Investigation Work Plan have been developed to address the Army recommendations contained in the RFI Report (USACE, 2014) as well as the comments received from NMED.

Based on the RFI Report (USACE, 2014), additional MEC investigation is required in areas in and adjacent to two SWMUs:

- SWMU 10 – Sewage Treatment Plant, and
- SWMU 40 – South Administration Area.

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# 2.0 BACKGROUND

This section summarizes historical information and previous investigations at Parcel 11 as documented in the approved *RCRA Facility Investigation Work Plan, Parcel 11, Final* (TPMC, 2009b), *Summary Report of Historical Information, Parcel 11* (TPMC, 2009a), and the *Final RCRA Facility Investigation Report, Parcel 11, Revision 2.0* (USACE, 2014).

## 2.1 GENERAL DESCRIPTION

The FWDA installation (the installation) is located approximately eight miles east of Gallup, New Mexico, and currently occupies approximately 15,277 acres of land in McKinley County, New Mexico. **Figure 1.1** presents a regional map showing the location of FWDA. The installation is mostly surrounded by federally owned or administered lands, including national forest and tribal lands. The installation can be divided into several sub areas based on location and historical land use. The major land use areas include the following:

- The Administration Area – encompassing approximately 800 acres in the northern portion of the installation, which contains former office facilities, housing, equipment maintenance facilities, warehouse buildings, and utility support facilities.
- The Workshop Area – which encompasses approximately 700 acres south of the Administration Area, consisted of an industrial area containing ammunition maintenance and renovation facilities, the trinitrotoluene (TNT) washout facility, and the TNT leach beds area. The buildings and other structures were demolished in 2010.
- Ten Munitions Storage Areas (Igloo Blocks A through H, J, and K) – encompassing approximately 7,400 acres in the central portion of the installation. This area has 732 earth-covered magazines (igloos), and 241 earthen revetments previously used for the storage of munitions.
- The Open Burning/Open Detonation (OB/OD) Area – encompassing approximately 1,800 acres in the west-central portion of the installation, which is separated into two sub areas based on the period of operation: the Closed OB/OD Area and the Current OB/OD Area (which is subject to active remediation).
- Protection and Buffer Areas – encompassing approximately 4,050 acres located adjacent to the eastern, western, and northern installation boundaries, which consists of buffer zones surrounding the former magazine and demolition areas.

The installation was originally established by the U.S. Army in 1862 at the southern edge of the Navajo territory. In 1918, the mission of FWDA changed from tribal activities to World War I related activities. Beginning in 1940, FWDA's mission was primarily to receive, store, maintain, and ship explosives and military munitions, as well as to disassemble and dispose of unserviceable or obsolete explosives and military munitions. In 1975, the installation came under the administrative command of Tooele Army Depot (TEAD), located near Salt Lake City, Utah.

In January 1993, the active mission of FWDA was ceased, and the installation was closed as a result of the Defense Base Realignment and Closure Act of 1990 (BRAC). Beginning in 2002, the Army reassigned many FWDA functions to the BRAC Division (BRACD), including caretaker

duties, property transfer, and performance of environmental compliance and remediation activities. Command and control responsibilities were retained by TEAD until January 31, 2008, when these responsibilities were transferred to White Sands Missile Range (TPMC, 2009a).

The installation is currently undergoing environmental characterization and remediation activities prior to final property transfer and reuse. Since the 1980s, when FWDA became subject to Permit requirements, it has transferred 8,351 acres to the DOI.

## 2.2 SITE CONDITIONS

Site conditions described below are primarily obtained from the 2014 RFI Report (USACE, 2014).

### 2.2.1 Climate

FWDA is located within the southern portion of the Colorado Plateau, in the Northwestern Plateau climate division of New Mexico. This region overall has a semiarid continental climate, and alternates seasonally and topographically from hot and dry, to cool and wet. Average annual precipitation for Gallup, New Mexico, and the surrounding area is approximately 12 inches of rainfall; the average snowfall amount is 35 inches. According to U.S. climate data accessed in 2019, most precipitation occurs during monsoon season from July through October, with minimal precipitation in the spring and late fall.

Average seasonal temperatures vary by elevation and topographic features, with the hottest temperatures occurring in the lower elevations (northern area) in the spring and summer months, and the lowest temperatures occurring in the higher elevations in the winter. The maximum temperature in 2019 was recorded in August as 97 degrees Fahrenheit (°F), and the lowest temperature recorded in February as -12.8°F, giving an overall range across the year of 109.8°F. Temperature fluctuations within FWDA can also vary as much as 20°F from sunrise to sunset, particularly in the late winter to early spring months.

### 2.2.2 Topography

Topography and surface water features facility-wide are shown in **Figure 2.1**. Parcel 11 topography is shown in **Figure 2.2.**

Topographically, FWDA may be divided into three areas: (1) the rugged north-to-south trending Hogback along the western and the southwestern boundaries; (2) the northern hillslopes of the Zuni Mountain Range in the southern portion; and (3) the alluvial plains marked by bedrock remnants in the northern portion of the installation. 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.

As shown in **Figure 2.2**, Parcel 11 is relatively flat. Surface runoff during rainfall /snowmelt events generally enters the Administration Area stormwater system and discharges via ditches to the Rio Puerco River located to the north of Parcel 11 or pools and infiltrates or evaporates in other areas. No surface water bodies or intermittent stream channels exist within Parcel 11.

### 2.2.3 Vegetation/Habitat

The vegetation cover types for Parcel 11 include moderate grasslands and sagebrush. Parcel 11 provides habitat for antelope, prairie dogs, rattlesnakes, field mice, various other insects, and animals, and occasionally mountain lions, elk, and bear. Wetland environments and aquatic habitats do not occur in Parcel 11.

### 2.2.4 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. Natural Resources Conservation Service (NRCS) soils mapping for Parcel 11 was provided in the RFI Report (USACE, 2014) and is shown in **Figure 2.3**.

As shown in **Figure 2.3**, the primary soil type in the southern portion of Parcel 11 is the Aquima-Hawaikuh silt loams (soil map unit 225; 1 to 5 % slopes), and the primary soil type in the northern portion of Parcel 11 is the Rehobeth silty clay loam (soil map unit 212; 0 to 1 % slopes) (USACE, 2014). A small area of Zia sandy loam (soil map unit 352; 1 to 5 % slopes) is present in the western portion of the parcel, and a small area of Bamac extremely gravelly sandy loam (soil map unit 566; 5 to 50 % slopes) is present on the eastern portion of the parcel (USACE, 2014).

### 2.2.5 Geologic Summary

FWDA is underlain primarily by Triassic mudstone and sandstone layers that dip gently to the northwest. In the western and southern portions of the installation, however, Jurassic and Cretaceous sandstone and claystone layers are exposed along the Nutria Monocline (the Hogback), which is a steeply west dipping, north trending monoclinal fold. None of the referenced rock types are particularly iron rich, which would be the primary geologic concern for the proposed geophysical surveys. Additional detail on site-specific geology (stratigraphy, structural geology, and hydrogeologic conditions) can be found in the 2014 RFI Report (USACE, 2014).

## 2.3 PREVIOUS INVESTIGATION SUMMARY

The environmental remediation process has been underway for more than 30 years at FWDA. In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) guidelines began to guide environmental remediation activities at FWDA other than those in the OB/OD Area, with the U.S. Environmental Protection Agency (USEPA) Region 6 as the lead regulatory agency. In 1996, the NMED was granted regulatory authority under RCRA and became the lead regulatory agency for the facility. Activities are currently performed under the Permit issued in 2005 and revised in February 2015 (NMED, 2015).

Available historical information from prior investigations for FWDA sites that lie within what is now identified as Parcel 11 have been compiled and summarized in an SRHI (TPMC, 2009a) that serves as a companion to the approved RFI Work Plan (TPMC, 2009b). The SRHI provides a listing of site surveys, data compilation efforts, operational history, site or facility drawings, and environmental investigations that have been contained in previously completed reports and that are pertinent to sites now considered to be within Parcel 11. Additionally, the SRHI summarizes findings and conclusions from the relevant historical site investigation efforts. Summaries of prior environmental investigations pertinent to the Parcel 11 sites are also provided in the individual sections for the Parcel 11 SWMUs and AOCs within the RFI Report (USACE, 2014).

The RFI field work began on October 12, 2009, and concluded on July 16, 2010, in accordance with the RFI Work Plan (TPMC, 2009b). The RFI Work Plan was approved by NMED in an Approval with Modifications dated August 28, 2009. The results were documented in the RFI Report (USACE, 2014).

The RFI Phase 2 Work Plan for MEC for Parcel 11 (PIKA, 2016) was prepared and submitted to NMED on May 26, 2016. The main scope of the proposed work was the intrusive investigation of geophysical anomalies identified in EM61 geophysical data collected in 2009. Although the work plan was approved, the proposed work was not completed. The Parcel 11 EM61 Geophysics Report is included in the Parcel 11 RFI Report (USACE, 2014) as Appendix L. However, the geophysical data itself is not available, and the locations of the anomalies that were to be excavated during the MEC investigation proposed in the 2016 Work Plan for MEC are also not available. The EM61 data collected in 2009 is now approximately 15 years old. Even if the data was available, it would not be considered acceptable for guiding a removal action in 2024. Finally, the 2009 EM61 data does not fully cover areas potentially containing subsurface MEC in and adjacent to SWMU 10. The fieldwork proposed under this MEC Investigation Work Plan uses a newer, more advanced geophysical sensor for data collection and will cover areas in SWMU 10 that are outside the previous survey boundary.

Site-specific information for previous investigations at SWMU 10 and SWMU 40 within Parcel 11 is provided in **Section 3** and **Section 4**, respectively.

# 3.0 SWMU 10 – SEWAGE TREATMENT PLANT

## 3.1 BACKGROUND

To the northwest of the Administration Area, within the STP area, is an incinerator reportedly used to destroy small munitions. During previous removal actions, 20 millimeter (mm), 37mm, and 40mm projectiles have been recovered adjacent to the incinerator. A geophysical survey performed on a 7-acre area east of the incinerator in 2009 indicated the presence of subsurface metal, with areas of relatively high anomaly density present on the edges of the survey area, indicating that the 2009 survey was not large enough. The intent of this current investigation is to refine the locations of subsurface sources potentially representing MEC items in and adjacent to SWMU 10, including delineating the outer edges of the high anomaly density areas apparent in the 2009 results. A subset of the subsurface sources identified will be excavated to help determine the presence/absence of MEC.

### 3.1.1 Location, Description, and Operational History

SWMU 10 is the FWDA STP. SWMU 10 and its current structures are shown in **Figure 3.1**. The list of facilities associated with SWMU 10 given in Permit Attachment 8 includes Building/Structures 22, T-37, 63, 69, 70, 71, 72, 73, 74a, 74b, 74c, 74d, 82, 83, 745, the document incinerator, drainage ditch, and septic system at the STP.

The document incinerator, Building 21, is located within the fenced portion of the STP, and is the only STP building/structure believed to be associated with MEC contamination. The designed use of this incinerator is unknown, but it was likely intended to be used to incinerate dried sewage sludge. It has also reportedly been used to incinerate classified documents and based on MEC survey and clearance efforts; it was also used to incinerate military munitions containing tracer elements. The last date the incinerator was used is unknown; it was listed as inactive in 1961 (TPMC, 2009a [Appendix E]).

### 3.1.2 Surface and Subsurface Conditions

SWMU 10 is characterized by a flat lying ground surface with several bermed settling ponds. The ground surface is generally gravel or soil covered. Remaining STP features, including buildings, settling ponds, and fences are present and will affect geophysical survey coverage as well as data collected near metallic features.

Geologically, the site conditions for geophysical investigations are good. Geophysical data collected during previous investigation efforts have not indicated unusual geophysical conditions or an unusual quantity of ferromagnetic rocks. No obvious subsurface utilities were identified in the 2009 geophysical survey, although some may be present west of the 2009 survey area within the STP fence.

### 3.1.3 Preliminary MEC Conceptual Site Model

The MEC conceptual site model (CSM) for SMWU 10 is presented in **Table 3.1**. **Figure 3.1** shows the proposed geophysical survey boundary, which is considered “the site” for the purposes of the MEC investigation.

## 3.2 PREVIOUS INVESTIGATIONS

According to the RFI Report for Parcel 11 (USACE, 2014), prior to 1993, the area around the incinerator was littered with munitions items that had apparently been burned to set off the tracer elements. A total of 7,930 20mm and 40mm target practice – tracer (TP-T) projectiles were reportedly removed from the ground surface around the incinerator as part of an unexploded ordnance (UXO) clearance in 1993. Another ordnance and explosive clearance was conducted to a reported depth of 4 feet in 1996, covering approximately 9 acres in and around the incinerator and STP. Additional 20mm and 37mm TP-T projectiles were recovered during this operation. No MEC was reported recovered during either the 1993 or 1996 operations. All recovered items were classified as scrap and disposed/recycled off-site. It is assumed that all the clearance operations performed in 1993 and 1996 were conducted using analog sensors. There is no available record showing any digital data or the specific locations of any recovered MD. The approximate boundary of the 1993 and 1996 clearance operations is shown in **Figure 3.1**.

In 2009, a digital geophysical mapping (DGM) survey was performed outside of the STP fence line immediately to the east of the STP, the incinerator, and most of the area covered by the 1993 and 1996 clearance projects. This survey was performed using an EM61 and covered approximately 7 acres. The EM61 survey boundary is shown in **Figure 3.1**. As shown in the figure, the southwest corner of the EM61 survey area covers the southeast corner of the 1993/1996 clearance area where there is a relatively large anomalous area in the EM61 data that appears to extend outside of the 2009 survey boundary (PIKA, 2016 [Figure 5-2]). Additionally, high anomaly density areas appear to be present in the northwest corner of the survey area, the southeast corner of the survey area, and along the eastern edge. While the anomalous area in the southwest corner appears to be real and caused by subsurface metal, the other higher anomaly density areas are less clear. It is possible that these anomalies may be related to sensor or external noise rather than subsurface metal, but the actual data is unavailable for review.

The last version of the Parcel 11 Phase 2 RFI Work Plan for MEC (PIKA, 2016) indicated that a surface and subsurface removal would be performed for metallic debris the size of a 20mm projectile or larger based on the EM61 survey (7 milliVolt [mV] or higher response on EM61 channel 2). If MEC items were recovered in the large anomalous area in the southwest corner of the EM61 survey, additional excavation would be performed to locate the boundary of this anomalous area and remove any associated MEC items. The proposed intrusive investigation was never performed.

## 3.3 DATA QUALITY OBJECTIVES

### 3.3.1 Step 1: State the Problem

Evidence from previous investigations suggests that MEC that poses a threat to human health may be present in Parcel 11 SWMU 10 based on the parcel's previous use for the destruction of munitions. Prior investigations determined that MD is present in the SWMU. A geophysical investigation was performed in the field east of the SWMU boundary in 2009 to identify the locations of subsurface metal with the potential to be MEC. The SWMU 10 survey was performed using an EM61, a standard DGM sensor still used for some munitions work. In addition to the prior geophysical data being over a decade old, the EM61 has generally been replaced for removal actions by newer, more advanced geophysical sensors. The newer sensors locate subsurface sources with greater accuracy and can be used to classify subsurface sources as potential MEC or

non-hazardous clutter depending on the configuration of those sources. Classification is possible for full rounds and larger components such as fuzes or rocket warheads/motors but is generally not possible for smaller components that comprise munition warheads (e.g., primers, burster tubes, booster cups).

Because there is still potential unacceptable risk adjacent to SWMU 10, further study is needed to:

- Characterize the type, nature, and distribution (horizontal and vertical) of remaining MEC;
- Assess baseline MEC risk; and
- Collect data to support a remedial action, if necessary.

Depending on the types and distribution of MEC potentially remaining at the property, remedial action may be required to mitigate risks to current or reasonably anticipated future receptors. Results of the investigation will be used to assess baseline risks and identify potential remediation goals.

### 3.3.2 Step 2: Identify the Project Goals

#### 3.3.2.1 Principal Study Question for MEC

The following are the principal study questions:

- What is the nature and horizontal and vertical extent of potential explosive hazards from MEC at the site?
- What current and potential future threats may be posed to human health by MEC remaining at the site?
- Is a remedial action warranted?
- If a remedial action is warranted, are there remaining data gaps that would prevent full implementation of the remedial action using existing data?

#### 3.3.2.2 How Data Will Be Used

The project team will collect geophysical data and conduct intrusive investigations to answer the following questions:

1. Have the horizontal boundaries of each area potentially contaminated with subsurface MEC been confirmed/defined?
2. Within the areas potentially contaminated with subsurface MEC, answer the following questions:
    a. What is the horizontal distribution of anomalies?
    b. What is the vertical distribution of sources?
3. What types of MEC, MD, and other metallic debris are/may be present in each area potentially contaminated with subsurface MEC?
4. For MEC potentially remaining at the site, what is the sensitivity, potential severity, and likelihood of reaction by explosives (e.g., detonation, deflagration, or burning)?

5. What is the nature, density, and condition of munitions and/or MD?
6. Has soil movement (e.g., scraping, filling, digging, or natural processes) occurred or will future soil movement occur naturally or be required in association with future use? If previous soil movement has occurred, what were the volume, methods, and fate?
7. How is land within the subject SWMU currently being used? What are the reasonably anticipated future land uses (if known)?
8. Who are the current and future potential receptors, where are they located, and what activities are they, or would they be, performing within the SMWU?
9. What access restrictions are present?
10. Are there access-challenged areas that may require innovative or alternative work processes, technologies, and/or safety measures to maximize MEC removal?
11. What endangered species, sensitive habitats, and/or historical/cultural resources are present?

#### 3.3.2.3 Evaluate the Results of the MEC Investigation

The presence of MD has been previously confirmed adjacent to SWMU 10, and potential remedial action boundaries will be limited to the planned geophysical investigation boundaries unless SRAs potentially representative of burial pits or disposal areas are not fully defined by the completed surveys. The project team will conduct a site-specific MEC baseline risk assessment for the SWMU to evaluate whether potentially complete exposure pathways exist, and if so, to characterize the current and potential future threats to human health due to MEC. The two potential outcomes of the risk assessment are:

1. There is no unacceptable risk.
2. There is unacceptable risk, and a remedial action will be recommended to mitigate the unacceptable risk. If a remedial action is recommended, data from the MEC investigation and previous investigations, if applicable, will be reviewed to determine if the necessary remedial action could be completed using existing data (primarily the MEC investigation geophysical data), or if there are data gaps that would need to be filled prior to initiation of the remedial action.

### 3.3.3 Step 3: Identify Information Inputs

#### 3.3.3.1 Information Needed to Establish Presence/Absence of MEC and Characterize the Potential Hazard

- Mapped inaccessible and obstructed areas (e.g., buildings, structures, paved roads, topography)
- Results of the surface sweep documented in the Surface Sweep Technical Memorandum
- Anticipated depth of reliable detection for munitions suspected to be present
- Geophysical data and analysis results:
    - Digital maps of areas covered

- Single point anomaly locations, responses, and identification numbers (IDs)
- Classification results, if applicable
- SRA boundaries and IDs
- Quality control (QC) results
- Quality assurance (QA) results
- Usability assessments

- Types of munitions on the site:
  - UXO vs discarded military munitions (DMM)
  - Caliber and type (e.g., mortars, bombs, projectiles)
  - Nature of explosive hazard (i.e., sensitivity of fuzing and ordnance)
  - Associated hazardous components

#### 3.3.3.2 Additional Information to Establish Exposure

- Current and reasonably anticipated future land use
- Current and reasonably anticipated future receptors
- Potential exposure scenarios based upon current/future land use activities and receptors

#### 3.3.3.3 Information Needed to Support a Remedial Action, if Necessary

- GIS database
  - MEC investigation boundaries
  - Identification and mapping of access limitations within the project area
  - Site characteristics
  - Land use
- Intrusive Results
  - Depth of recovery
  - Recovery depth vs reliable detection depth
  - Verified modeled and recovery depths (predicted vs actual)
  - Classification performance, if applicable (predicted vs actual and stop-dig threshold)
- Recommended dig lists following analysis of intrusive results and AGC data
  - Single point anomaly locations, responses, and IDs
  - SRA boundaries and IDs
- Final Data Usability Assessment (DUA)
  - Was the sampling design as implemented consistent with project objectives?
  - Did the data collected for the MEC investigation satisfy the data quality objectives (DQOs) and measurement performance criteria (MPCs)?

- Was the data considered usable for its intended purpose (i.e., determining the nature and extent of MEC contamination and development of a target list for a potential remedial action)?

### 3.3.4 Step 4: Define the Boundaries of the Project

#### 3.3.4.1 Target Population

Several previous munitions-related investigations have been completed in and adjacent to SWMU 10, and extensive subsurface investigation has indicated that the only munitions potentially present are 20mm, 37mm, and 40mm projectiles. **Table 1.1** includes the list of known and suspected munitions, with expected maximum reliable detection depths for the UltraTEM to be used for geophysical data collection. This list is considered complete, and the expected detection depths are considered accurate based on modeling for a site with relatively benign background response. All the suspected munitions are included in the Department of Defense (DoD) classification library.

#### 3.3.4.2 Spatial and Temporal Boundaries

This study is designed to detect targets of interest (TOI) exceeding the detection threshold and meeting measurement criteria within the established horizontal and vertical boundaries for the project. The detection threshold will be based on response five times the site-specific background noise. The project/field geophysicist will evaluate geophysical data to ensure the project DQOs are being achieved. Geophysical data deliverables will be submitted weekly during the project, with task specific memoranda (e.g., Instrument Verification Strip [IVS] Memorandum, Classification Memorandum, DUAs) submitted as they are completed.

Spatial boundary considerations also include any areas that will be inaccessible to investigation for any reason (e.g., geophysical instrument interference caused by buildings or other structures, fence lines, overhead powerlines, steep slopes, sensitive habitats, cultural resources, or vegetation).

#### 3.3.4.3 Horizontal Boundaries

The horizontal boundaries of the project are defined by the previous survey boundaries (including analog clearances performed prior to the geophysical surveys in 2009) plus a buffer added to ensure that SRAs noted in the previous surveys were completely covered by the MEC investigation survey. The buffer is a minimum of 75 feet from previous survey boundaries.

#### 3.3.4.4 Vertical Boundaries

The vertical boundary for each confirmed or suspected munition that may be present is the munition-specific maximum reliable depth of detection based on the detection threshold discussed above and included in **Table 1.1**.

#### 3.3.4.5 Temporal Boundaries

The temporal boundary for the project is the time it takes to conduct the detection and subsurface investigation. While weather/climate are not hard temporal limits on the project, the project team will adjust the project schedule to accommodate these conditions and conduct fieldwork accordingly (i.e., schedules will be adjusted to avoid monsoon rains and snow). Activities will be considered complete upon QA acceptance, which verifies the SWMU has been investigated.

### 3.3.5 Step 5: Develop the Project Data Collection and Analysis Approach

#### 3.3.5.1 AGC Survey

A 100% coverage single-pass AGC survey will be performed across the SWMU 10 investigation area. Because the expected munitions are well known and there are numerous examples in the DoD classification library for the munitions potentially present, the sources identified in the dynamic AGC data will be classified to separate potential TOI from non-hazardous clutter. A subset of the sources considered to potentially be TOI will be excavated to determine the nature and vertical extent of contamination in the SWMU.

Parameters of interest: Geophysical anomalies exceeding the project-specific detection threshold and sources classified as either potential TOI or inconclusive.

Assumptions: The buffer added to the 2009 EM61 survey boundary will be sufficient to fully delineate MEC associated with SWMU 10.

Type of inference:

- Anomalies with areal extents > 10 $m^2$ will be considered SRAs where classification results are considered unreliable due to sensor limitations (i.e., the ability of the sensor to resolve all the sources present). If a remedial action is required, additional action (e.g., analog clearance) would need to be performed before resurvey to ensure adequate remediation of all potential MEC.
- The AGC results will be used to develop a dig list for SWMU 10 and the adjacent area. A subset of the dig list will be excavated as part of the MEC investigation, with the sources investigated to be determined in consultation with the project team. The remainder of the targets on the dig list will serve as the basis for a remedial action, if necessary.

Decision rules:

- If no SRAs extend past the survey area boundary, the survey area will be considered adequate to identify MEC potentially present at the site to the depths listed in **Table 1.1**.
- If SRAs are not fully delineated in the surveyed data and cannot be attributed to a known source (e.g., utility line, above-ground source), the project team will discuss the necessity of expanding the survey area.
- If AGC analyses meet any of the following criteria, the associated source will be placed on an ordered dig list: a) the polarizability decay curve matches that of an item in the site-specific TOI library, as defined in the Classification Technical Memorandum, b) estimates of the size, shape, symmetry, and wall thickness indicate the item is long, cylindrical or spherical, and thick-walled, c) there is a group (cluster) of unknown anomalies having similar polarizability decay curves that, after investigation, are discovered to be TOI, or d) the source is classified as inconclusive. The procedures for designating a cluster are described in **Section 5.1.6.4**.
- The horizontal boundaries of all SRAs that cannot be attributed to a known source will be defined for clearance as part of a remedial action, if necessary.

#### 3.3.5.2 Baseline Risk Assessment

The project team will update the CSM using the MEC investigation results and conduct a baseline risk assessment in compliance with the Office of the Secretary of Defense (OSD) Memorandum dated 14 July 2023 and titled, *Military Munitions Response Program Risk Management Methodology* (2023). The risk assessment will consider the amount and type of MEC, likelihood a receptor will encounter MEC, likelihood a receptor will interact with MEC, and the risk of a harmful incident upon interaction.

Parameters of interest: Current and reasonably anticipated future land use, current and future receptors, site accessibility, MEC types, MEC density and distribution, and MEC characteristics.

Type of inference: Within each survey area, the presence of remaining MEC, material potentially presenting an explosive hazard (MPPEH), or significant MD will indicate a potential need for further action. Because significant quantities of MD have previously been identified in SWMU 10, no evidence of use (NEU) will not be considered. A decision will be made between the need for further action or no further action, which will be determined based on the risk scenarios identified through risk management methodology (RMM).

Decision rules:

RMM tables will be updated based on the results of the MEC investigation. The output of the RMM will be captured in Matrix 3, with two possible outcomes:

- There is no unacceptable risk at the site, in which case, the site will not be recommended for a future MEC removal; or
- There is unacceptable risk at the site, and the site will be recommended for a future MEC removal.

### 3.3.6 Step 6: Specify Project-specific Measurement Performance Criteria

Geophysical and intrusive investigations shall achieve applicable MPCs as stated in **Section 5.2** and confirmed/modified by the IVS Technical Memorandum, unless MPC failures can be adequately explained or justified. Failure to achieve the MPCs may have an impact on end uses of the data, which will be addressed in the DUA.

### 3.3.7 Step 7: Survey Design and Project Workflow

The MPCs established during Step 6 of the DQO process (documented in **Section 5.2**) were used to develop the sample design, which is described in general in **Section 5.1** and more specifically for SWMU 10 below.

## 3.4 INVESTIGATION METHODS

General investigation methods for the vegetation removal, surface clearance, blind seeding, geophysical survey and data processing, intrusive investigation, and MPPEH handling are described in detail in **Section 5.1**. The QC procedures for the MEC investigation are described in detail in **Section 5.2**.

## 3.5 SCOPE OF PROPOSED INVESTIGATION

The proposed UltraTEM survey area at SWMU 10 is shown in **Figure 3.1** As indicated in the figure, the survey area covers approximately 17 acres and includes all areas within the STP fence line and the field to the east of the fence that was covered by the 2009 EM61 survey. To ensure that the large anomalous area in the southwest corner of the 2009 EM61 survey (PIKA, 2016 [Figure 5-2]) is delineated sufficiently, a buffer of a minimum of 75 feet from the EM61 survey boundary has been added in the proposed survey area. However, if the boundary of this SRA or any of the other SRA not attributable to a known source are not adequately delineated, the project team will discuss the need to expand the survey area to define the SRA boundaries.

Dig lists will be compiled for the SWMU 10 and 40 investigations, and a total of approximately 200 sources will be identified for intrusive investigation, split between the two SWMUs. The sources will be selected from the list of potential TOI (and possibly inconclusive) targets in SWMU 10 and from the full source lists in SWMU 40. The list of sources to be investigated will be developed in consultation with the project team. Therefore, the exact number of sources to be investigated in SWMU 10 is to be determined.

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# 4.0 SWMU 40 – BUILDINGS 12, 13, AND FORMER BUILDING 29 (INERT STORAGE WAREHOUSES)

## 4.1 BACKGROUND

The buildings and former buildings comprising SWMU 40 are in the Southern Administration Area. There are 14 Permit-listed buildings and structures associated with the SWMU, consisting primarily of storage and warehouse type facilities. MD was recovered adjacent to the northwest corner of Building 12 during utilities trenching in 1998. It is unknown how deep the munitions were when they were found or why they were buried, if intentionally buried, but it was assumed that they were related to munitions transport between the storage yard to the west of Building 10 and a loading dock northeast of Building 10 where railcars were loaded with scrap from the storage yard. The intent of this investigation is to refine the locations of subsurface sources potentially representing MEC items in two areas in which could possibly contain MEC. These areas are defined by the boundaries of the 2009 geophysical survey. A subset of the subsurface sources identified will be excavated to help determine the presence/absence and vertical extent of MEC.

### 4.1.1 Location, Description, and Operational History

SWMU 40 is the Southern Administration Area. SWMU 40 as listed in the Permit includes 14 buildings or structures, six of which are within Parcel 11 (**Figure 4.1)**. The SWMU 40 structures related to the MEC investigation, all of which are within Parcel 11, include Buildings 12 and 13, former Building 29, and Structure 63. These structures are described below:

- Building 10, the Salvage and Coal Test Building, is a single-story concrete block structure built in 1953, and is approximately 20 feet (ft) wide and 50 ft long. The building was used as a coal testing facility and was used as an office for the adjacent storage yard. Currently the building is unused. The storage yard was reportedly used to store munitions prior to transport.
- Structure 63 is a loading dock within the storage yard associated with Building 10. Based on historical aerials and drawings, the loading dock was built sometime after 1966 and appears to have been used for loading railcars and trucks at the storage yard.
- Buildings 12 and 13, Inert Storage Warehouses, are single-story brick structures built in 1941, and are approximately 68 ft wide and 202 ft long. These buildings feature elevated floors with exterior docks for both truck and railcar loading and unloading. Several potential MEC items (scrap 37 mm armor-piercing projectiles and scrap 75 mm projectiles) were unearthed near the northwest corner of Building 12 during installation of buried utilities in 1998. Because the items were scrap and located in an area where railcars were loaded with scrap from the storage yard, it is believed that these items were associated with operations at Building 10 and the storage yard rather than operations at Building 12.
- Former Building 29, Inert Storage Warehouse, was a single-story brick structure built in 1943, and was approximately 60 ft wide and 500 ft long. According to the 1961 Facilities Data report, Building 29 was originally the Ammunition, Linking, Belting, and Clipping Building. Herbicides and pesticides were stored in Building 29 for an unknown length of time prior to FWDA closure in 1993. Building 29 was demolished in 1999.

### 4.1.2 Surface and Subsurface Conditions

The area adjacent to the SWMU 40 buildings/structures is characterized by a flat lying ground surface. The ground surface is generally gravel or soil covered. Remaining features, including buildings and railroad tracks will affect geophysical data collected near metallic features.

Geologically, the site conditions for geophysical investigations are good. Geophysical data collected during previous investigation efforts have not indicated unusual geophysical conditions or an unusual quantity of ferromagnetic rocks. However, the results of the 2009 geophysical surveys indicate that subsurface utilities are likely present in some of the survey areas. The survey area south of former Building 29 also contains large areas of saturated response in the EM61 data, suggesting that the demolition of the building resulted in a significant amount of subsurface debris.

### 4.1.3 Preliminary MEC Conceptual Site Model

The MEC CSM for SMWU 40 is presented in **Table 4.1**. **Figure 4.1** shows the proposed geophysical survey boundaries, which are considered "the site" for the purposes of the MEC investigation.

## 4.2 PREVIOUS INVESTIGATIONS

MD 37mm and 75mm projectiles were reportedly recovered near the northwest corner of Building 12 during utility installation work in 1998. They were near an area where railcars were loaded with scrap from the storage yard via a loading dock to the northeast of Building 10. In addition to the 37mm and 75mm projectiles recovered, 3.5-inch rocket and 155mm projectile parts and shipping containers have been observed in the storage yard. Approximately 3.5 acres of EM61 data were collected to the north/and west of Buildings 12 and 13 and to the south of Former Building 29 in 2009 to evaluate the potential presence of MEC (PIKA, 2016 [Figure 6-2]). The boundaries of the EM61 surveys are shown in **Figure 4.1**. Numerous geophysical anomalies large enough to represent potential MEC items were identified in the EM61 data.

The most recent version of the Parcel 11 Phase 2 RFI Work Plan for MEC (PIKA, 2016) indicated that a subsurface removal would be performed for a subset of the anomalies identified in the EM61 data to statistically prove that 95% of the anomalies were not related to MEC with +/- 5% sampling error. It was determined that this would require the excavation of 254 of the 748 anomalies identified in the EM61 data (7 mV or higher response on EM61 channel 2). The proposed intrusive investigation was never performed.

## 4.3 DATA QUALITY OBJECTIVES

### 4.3.1 Step 1: State the Problem

Evidence from previous investigations suggests that MEC that poses a threat to human health may be present in areas adjacent to several of the SWMU 40 buildings/structures based previous transport of munitions through these areas. MD in the form of 37mm and 75mm projectiles has previously been recovered at the site. Geophysical investigations were performed in 2009 to identify the locations of subsurface metal with the potential to be MEC. The surveys were performed using an EM61, a standard DGM sensor still used for some munitions work. In addition to the prior geophysical data being over a decade old, the EM61 has generally been replaced for removal actions by newer, more advanced geophysical sensors. The newer sensors locate

subsurface sources with greater accuracy and can be used to classify subsurface sources as potential MEC or non-hazardous clutter depending on the configuration of those sources. Classification is possible for full rounds and larger components such as fuzes or rocket warheads/motors but is generally not possible for smaller components that comprise munition warheads (e.g., primers, burster tubes, booster cups, etc.).

Because there is still potential unacceptable risk in SWMU 40, further study is needed to:

- Characterize the type, nature, and distribution (horizontal and vertical) of remaining MEC;
- Assess baseline MEC risk; and
- Collect data to support a remedial action, if necessary.

Depending on the types and distribution of MEC potentially remaining at the property, remedial action may be required to mitigate risks to current or reasonably anticipated future receptors. Results of the investigation will be used to assess baseline risks and identify potential remediation goals.

### 4.3.2 Step 2: Identify the Project Goals

#### 4.3.2.1 Principal Study Question for MEC

The following are the principal study questions:

- What are the nature and vertical extent of potential explosive hazards from MEC at the site?
- What current and potential future threats may be posed to human health by MEC remaining at the site?
- Is a remedial action warranted?
- If a remedial action is warranted, are there any remaining data gaps that would prevent full implementation of the remedial action using existing data?

#### 4.3.2.2 How Data Will Be Used

The project team will collect geophysical data and conduct intrusive investigations to answer the following questions:

1. Have the horizontal boundaries of each area potentially contaminated with subsurface MEC been confirmed/defined?
2. Within the areas potentially contaminated with subsurface MEC, answer the following questions:
    a. What is the horizontal distribution of anomalies?
    b. What is the vertical distribution of sources?
3. What types of MEC, MD, and other metallic debris are/may be present in each area potentially contaminated with subsurface MEC?
4. For MEC potentially remaining at the site, what is the sensitivity, potential severity, and likelihood of reaction by explosives (e.g., detonation, deflagration, or burning)?

5. What is the nature, density, and condition of munitions and/or MD?
6. Has soil movement (e.g., scraping, filling, digging, or natural processes) occurred or will future soil movement occur naturally or be required in association with future use? If previous soil movement has occurred, what were the volume, methods, and fate?
7. How is land within the site currently being used? What are the reasonably anticipated future land uses (if known)?
8. Who are the current and future potential receptors, where are they located, and what activities are they, or would they be, performing within the site?
9. What access restrictions are present?
10. Are there access-challenged areas that may require innovative or alternative work processes, technologies, and/or safety measures to maximize MEC removal?
11. What endangered species, sensitive habitats, and/or historical/cultural resources are present?

#### 4.3.2.3 Evaluate the Results of the MEC Investigation

The presence of MD has been confirmed in the SWMU, and potential remedial action boundaries will be limited to the planned geophysical investigation boundaries unless SRAs potentially representative of burial pits or disposal areas are not fully defined by the completed surveys. The project team will conduct a site-specific MEC baseline risk assessment to evaluate whether potentially complete exposure pathways exist, and if so, to characterize the current and potential future threats to human health due to MEC. The two potential outcomes of the risk assessment are:

1. There is no unacceptable risk.
2. There is unacceptable risk, and a remedial action will be recommended to mitigate the unacceptable risk. If a remedial action is recommended, data from the MEC investigation and previous investigations, if applicable, will be reviewed to determine if the necessary remedial action could be completed using existing data (primarily the MEC investigation geophysical data), or if there are data gaps that would need to be filled prior to initiation of the remedial action.

### 4.3.3 Step 3: Identify Information Inputs

#### 4.3.3.1 Information Needed to Establish Presence/Absence of MEC and Characterize the Potential Hazard

- Mapped inaccessible and obstructed areas (e.g., buildings, structures, paved roads, topography)
- Results of the surface sweep documented in the *Surface Sweep Technical Memorandum*
- Anticipated depth of reliable detection for munitions suspected to be present
- Geophysical data and analysis results:
    - Digital maps of areas covered
    - Single point anomaly locations, responses, and IDs

- Classification results, if applicable
- SRA boundaries and IDs
- QC results
- QA results
- Usability assessments

- Types of munitions on the site:
  - UXO vs DMM
  - Caliber and type (e.g., mortars, bombs, projectiles)
  - Nature of explosive hazard (i.e., sensitivity of fuzing and ordnance)
  - Associated hazardous components

#### 4.3.3.2 Additional Information to Establish Exposure

- Current and reasonably anticipated future land use
- Current and reasonably anticipated future receptors
- Potential exposure scenarios based upon current/future land use activities and receptors

#### 4.3.3.3 Information Needed to Support a Remedial Action, if Necessary

- GIS database
  - MEC investigation boundaries
  - Identification and mapping of all limitations within the project area
  - Site characteristics
  - Land use
- Intrusive Results
  - Depth of recovery
  - Recovery depth vs reliable detection depth
  - Verified modeled and recovery depths (predicted vs actual)
  - Classification performance, if applicable (predicted vs actual and stop-dig threshold)
- Recommended dig lists following analysis of intrusive results and AGC data
  - Single point anomaly locations, responses, and IDs
  - SRA boundaries and IDs
- Final DUA
  - Was the sampling design as implemented consistent with project objectives?
  - Did the data collected for the MEC investigation satisfy the DQOs and MPCs?
  - Was the data considered usable for its intended purpose (i.e., determining the nature and extent of MEC contamination and development of a target list for a potential remedial action)?

### 4.3.4 Step 4: Define the Boundaries of the Project

#### 4.3.4.1 Target Population

The investigation in SWMU 40 area is based on the recovery of 37mm and 75mm projectiles during utility trenching in 1998. There is concern that any munition, or partial munition, stored in the adjacent storage yard and transported or loaded/unloaded in this area may have ended up on the ground and been buried in the same manner as the projectiles recovered in 1998. **Table 1.2** contains the list of the MD recovered adjacent to SWMU 40 Building 12.

The target populations also include MD, which serves as an indicator of potential MEC hazards.

#### 4.3.4.2 Spatial and Temporal Boundaries

This study is designed to detect TOI exceeding the detection threshold and meeting measurement criteria within the established horizontal and vertical boundaries for the project. The detection threshold will be based on response five times the site-specific background noise. The project/field geophysicist will evaluate all geophysical data to ensure the project DQOs are being achieved. Geophysical data deliverables will be submitted weekly during the project, with task specific memoranda (e.g., IVS Memorandum, Classification Memorandum, DUAs) submitted as they are completed.

Spatial boundary considerations also include any areas that will be inaccessible to investigation for any reason (e.g., geophysical instrument interference caused by buildings or other structures, railroad tracks, fence lines, overhead powerlines, steep slopes, sensitive habitats, cultural resources, or vegetation).

#### 4.3.4.3 Horizontal Boundaries

The horizontal boundaries of the project are defined by the previous survey boundaries. Because the MEC investigation area is adjacent to several buildings in the Administration Area and former Building 29, which was demolished in 1999, anomalies identified in the previous geophysical survey and other subsurface sources throughout the Administration Area are more likely to be related to cultural or Building 29 debris than they are munitions. Without an obvious reason to extend the survey boundaries, no buffer was added to the previous SWMU 40 investigation boundary.

#### 4.3.4.4 Vertical Boundaries

The vertical boundary for each confirmed or suspected munition that may be present is the munition-specific maximum reliable depth of detection based on the detection threshold discussed above. **Table 1.2** contains a list of munitions previously recovered adjacent to the SWMU 40 buildings but should not be considered a full list of the munitions or munitions components potentially present at the site.

#### 4.3.4.5 Temporal Boundaries

The temporal boundary for the project is the time it takes to conduct the detection and subsurface investigation. While weather/climate are not hard temporal limits on the project, the project team will adjust the project schedule to accommodate these conditions and conduct fieldwork accordingly (i.e., field schedules will be adjusted to avoid monsoon rains and snow). Activities

will be considered complete upon QA acceptance, which verifies the specified SWMU has been investigated.

### 4.3.5 Step 5: Develop the Project Data Collection and Analysis Approach

#### 4.3.5.1 AGC Survey

A 100% coverage single-pass AGC survey will be performed across the SWMU 40 investigation area. In the SWMU 40 investigation area, where the full list of munitions potentially present is not well defined and where munitions components not included in the DoD classification library could be present, modeled sources will be compared to the full DoD classification library, but no library match threshold will be applied to separate potential TOI from non-TOI. All sources identified using the project detection threshold of five times site-specific background will be considered potential TOI unless they are confirmed to be caused by a non-TOI source (e.g., surface source, utility line). A subset of the sources considered to potentially be TOI will be excavated to determine the nature and vertical extent of contamination in each SWMU.

Parameters of interest: Geophysical anomalies exceeding the project-specific detection threshold; sources with high matches to DoD library munitions to guide the intrusive investigation.

Assumptions: The extent of the 2009 Parcel 11 SWMU 40 EM61 survey was sufficient to cover the area of potential contamination.

Type of inference:

- Anomalies with areal extents > 10 $m^2$ will be considered SRAs where classification results are considered unreliable. If a remedial action is required, additional action (e.g., analog clearance) would need to be performed before resurvey to ensure adequate remediation of all potential MEC.
- The AGC results will be used to develop a dig list for SWMU 40. A subset of targets on the dig lists will be excavated as part of the MEC investigation, with the exact sources investigated to be determined in consultation with the project team. The remainder of the targets on the dig list will serve as the basis for any remedial actions determined to be necessary.

Decision rules:

- If no SRAs extend past the survey area boundary, the survey area will be considered adequate to identify all MEC potentially present at the site to the depths listed in **Table 1.1**.
- If SRAs are not fully delineated in the surveyed data and cannot be attributed to a known source (e.g., utility line, above ground source), the project team will discuss the necessity of expanding the survey area.
- Dynamic survey anomalies with response amplitude greater than five times site-specific background will be considered potential MEC. Source locations for these anomalies will be modeled, and the modeled source locations will be added to the dig list.
- The horizontal boundaries of all SRAs that cannot be attributed to a known source will be defined for clearance as part of a remedial action, if necessary.

#### 4.3.5.2 Baseline Risk Assessment

The project team will update the CSM using the MEC investigation results and conduct a baseline risk assessment in compliance with the OSD Memorandum dated 14 July 2023 and titled, *Military Munitions Response Program Risk Management Methodology*. The risk assessment will consider the amount and type of MEC, likelihood a receptor will encounter MEC, likelihood a receptor will interact with MEC, and the risk of a harmful incident upon interaction.

Parameters of interest: Current and reasonably anticipated future land use, current and future receptors, site accessibility, MEC types, MEC density and distribution, and MEC characteristics.

Type of inference: Within each survey area, the presence of MEC, MPPEH or significant MD will indicate a potential need for further action. Because MD has previously been identified in SWMU 40, it is considered unlikely that NEU will be considered, although this option may be considered if no evidence of munitions use is identified during the surface sweep or intrusive investigation. The more likely decision will be between the need for further action or no further action, which will be determined based on the risk scenarios identified through RMM.

Decision rules:

RMM tables will be updated based on the results of the MEC investigation. The output of the RMM will be captured in Matrix 3, with two possible outcomes:

- There is no unacceptable risk in the SWMU, in which case, the site will not be recommended for a future MEC removal; or
- There is unacceptable risk in the SWMU, and the site will be recommended for a future MEC removal.

As discussed above, if NEU is identified, then the SWMU will be presumed to have no unacceptable risk and will not be evaluated using the RMM.

### 4.3.6 Step 6: Specify Project-specific Measurement Performance Criteria

Geophysical and intrusive investigations shall achieve applicable MPCs as stated in **Section 5.2** and confirmed/modified by the IVS Technical Memorandum, unless MPC failures can be adequately explained or justified. Failure to achieve the MPCs may have an impact on end uses of the data, which will be addressed in the DUA.

### 4.3.7 Step 7: Survey Design and Project Workflow

The MPCs established during Step 6 of the DQO process (documented in **Section 5.2**) were used to develop the sample design, which is described in general in **Section 5.1** and more specifically for SWMU 40 below.

## 4.4 INVESTIGATION METHODS

General investigation methods for the vegetation removal, surface clearance, blind seeding, geophysical survey and data processing, intrusive investigation, and MPPEH handling are described in detail in **Section 5.1**. The QC procedures for the MEC investigation are described in detail in **Section 5.2**.

## 4.5 SCOPE OF PROPOSED INVESTIGATION

The proposed UltraTEM survey areas adjacent to the SWMU 40 buildings/structures are shown in **Figure 4.1**. As indicated in the figure, the survey areas cover the same areas as the 2009 EM61 surveys and include a total of approximately 3.5 acres. The original survey area was based on the location of the 37mm and 75mm projectiles recovered during utility work and the location of a loading dock relative to the storage yard to the west of Building 10. Although geophysical anomalies extend to the edges of the survey boundaries, there is no historical evidence indicating MEC burial, dumping, or other means of disposal in this area. Therefore, there is no reason to extend the survey areas past the original EM61 survey boundaries. The UltraTEM AGC sensor should refine anomaly locations to a greater extent than the EM61 and will identify changes in anomaly locations over the past 15 years.

Dig lists will be compiled for the SWMU 10 and 40 investigations as described in **Section 3.5**. The SWMU 40 dig list will likely be compiled from sources with the best library matches to items in the full DoD library because these will present the best opportunity to determine the presence/absence of MEC in SWMU 40. The list of sources to be investigated will be developed in consultation with the project team. Therefore, the exact number of sources to be investigated in SWMU 40 is to be determined.

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# 5.0 DESCRIPTION OF INVESTIGATION METHODS

This section provides general information regarding the planned field activities to be completed as part of this MEC Investigation Work Plan. Information specific to individual SWMUs is presented in **Section 3** and **Section 4**.

## 5.1 PLANNED ACTIVITIES

### 5.1.1 Site Safety and Awareness

All work will be accomplished in accordance with Army safety measures. A project-specific Accident Prevention Plan (APP)/Site Safety and Health Plan (SSHP) has been developed for the MEC investigations at FWDA. The APP/SSHP defines the roles and responsibilities of site personnel, establishes proper levels of personal protective equipment (PPE), and describes emergency response and contingency procedures. The associated Activity Hazard Analyses (AHAs) define hazards associated with each type of work activity and how those hazards will be mitigated. The APP/SSHP will be reviewed by site personnel prior to performing any site work. In addition, task-specific AHAs will be reviewed before any new tasks are performed and periodically during daily tailgate safety meetings.

All work will be completed by a supervisor, operators, and technicians that have successfully completed 40-hour Hazardous Waste Operations and Emergency Response training in accordance with 29 U.S. Code of Federal Regulations 1910.120. An Unexploded Ordnance Safety Officer (UXOSO)/Site Safety and Health Officer (SSHO) will be on site for all field operations. The UXOSO/SSHO will be responsible for conducting site-specific training, daily tailgate safety meetings, and periodic safety inspections. The UXOSO/SSHO will also be responsible for ensuring site monitoring, worker training, and effective selection and use of PPE. The UXOSO/SSHO will have completed the Occupational Safety and Health Administration (OSHA) 30-hour Construction Safety Course prior to being tasked to fill the position.

### 5.1.2 Geophysical Surveys and Intrusive Investigation

This section provides general information regarding the methods that will be employed to accomplish the geophysical surveys and intrusive investigations in Parcel 11. The following sections provide details regarding vegetation clearance, surface clearance, blind seeding, geophysical survey, intrusive investigation, and QC.

### 5.1.3 Vegetation Removal

UXO Technicians will perform vegetation removal prior to the surface clearance, as necessary, to allow for access to the investigation areas by both the surface clearance and geophysical data collection teams. The vegetation removal team will use either a brush hog or hand tools to clear vegetation to a height of no higher than six inches above the ground surface. The UXOSO/SSHO will perform an instrument-aided surface sweep ahead of any mechanized brush cutting equipment using analog ML-3 or Schonstedt metal detectors to confirm that the areas intended for clearance are free of surface MEC. Any identified surface MEC or MD identified by the UXOSO/SSHO or any other team member during vegetation removal will be dealt with as described in **Section 5.1.8**. Root systems will not be disturbed as part of the vegetation removal operation. Cut vegetation will be removed from the immediate work area, placed outside of the area, and allowed to degrade

naturally at the project site. The UXOSO/SSHO will coordinate with FWDA personnel to determine the optimal location(s) to place the vegetation removed from the clearance areas.

### 5.1.4 Surface Clearance

A visual and analog detector-aided surface clearance will be conducted across the geophysical survey areas to remove metallic surface items measuring at least two inches in any one dimension. The surface clearance will be completed by five UXO Technicians, including a UXO Technician III Team Lead, two UXO Technician IIs, and two UXO Technician Is. A Senior UXO Supervisor (SUXOS) and the UXOSO will also be present on site during the surface clearance.

Handheld sensors and operators will be tested daily to determine functionality. An instrument test strip (ITS) will be constructed for daily analog sensor QC, with three small ISOs buried horizontally at 30 cm depth in the cross-track orientation. Each team member will be responsible for performing tests on the ITS to verify their sensor is in proper working condition at least each morning and evening and any other time the instrument is turned on.

Grids will be established across each area to be surface cleared using a real-time kinematic (RTK) Global Positioning System (GPS) capable of sub-centimeter level accuracy. All location data for geophysical surveys will be in World Geodetic System 1984, Universal Transverse Mercator Zone 12 North, meters (m). Grids will be at most 200 ft by 200 ft, although they may be smaller depending on the shape of the survey area. The team leader will assemble team members in a line at approximately 5-ft intervals. The "open" end of the line will be marked by placing pin flags or other visual markers at intervals along the way. The team will work systematically to travel through the grid, ensuring no areas are uninvestigated. Team members will locate and remove surface metallic items as necessary to reduce interference with the geophysical surveys. Metallic items recovered in each grid will be laid out and photographed to maintain a record of recovered items, particularly MEC or identifiable MD items. The total weight of recovered objects grouped by type (e.g., MD, other debris) will also be recorded. The locations of MEC items recovered will be recorded using RTK GPS. All recovered MEC or MD will be dealt with as described in **Section 5.1.8** and the Waste Management Plan (**Section 7**).

### 5.1.5 Blind Seeding

Blind seed items will be placed within the geophysical survey areas in SWMUs 10 and 40 to test the ongoing functionality of the UltraTEM and positioning sensors used for data collection, the data collection procedures employed by the collection team, and the procedures employed during data processing and analysis. The seeds will be bolts or pipe sections, referred to as industry standard objects (ISOs), that have been identified as having a similar geophysical response to some relatively common munitions items (e.g., 20mm projectiles, 37mm projectiles, 60/81mm mortars, and 105mm projectiles). Blind seed items will be selected to represent the munitions potentially present in each survey area and will be placed within the expected depth range for those munitions.

The QC Geophysicist will prepare a QC Seed Plan that will describe the type, frequency, and distribution of blind seeds to be placed in the geophysical survey areas. While the specific number of seed items to be placed will only be described in the QC Seed Plan, seeds will be placed at a rate of one to three seeds per system per expected day of geophysical survey in each SWMU. The QC Seed Plan will be submitted to the Army to review conformance with Munitions Response Quality Assurance Project Plan Toolkit Module 1 (Intergovernmental Data Quality Task Force,

2020) and Engineering Manual 200-1-15 (Department of the Army, 2018). It will contain a list of the seeds to be buried, including ID, type, and proposed location, depth, and orientation.

Following approval of the QC Seed Plan, a seed team will place seeds within geophysical survey areas as described in the plan. Members of the designated seed team will not be involved in production data collection or excavation of anomalies. The seed team will include a UXO Escort, who will check a 1-m radius around each proposed seed location for the presence of subsurface anomalies using an analog metal detector. The seed team may move seeds as necessary to avoid placement within 1 m of existing anomalies. The UXO Escort will dig a hole to the appropriate depth to bury the seed item as described on the list provided by the QC Geophysicist. While the seed team has latitude to change the location of the seed items to avoid preexisting anomalies, they will attempt to bury the items described on the list at the intended depth and orientation. If an excavation encounters bedrock or another condition precluding further excavation, the hole will be used for placing a shallower-planned seed item. If all shallower seed item burials have been completed, the item will be placed at the achieved depth, or another location will be excavated to place the seed item at the depth proposed in the QC Seed Plan. After a seed item has been placed in the hole, the Seed Team Leader will record the location of the center of the seed item using RTK GPS, measure the depth to the seed item center of mass from a straight edge placed over the open hole, and photograph the seed in the hole. After the required information has been recorded, the UXO Escort will replace the dirt in the hole as completely as possible. They will level the location and, if possible, replace any grass or vegetation plug over the burial location to restore the location to its original appearance to the extent practical.

QC seed item information will be delivered in the Production Area QC Seeding Report. The QC Geophysicist will compare the AGC dig lists and intrusive results to the known locations of blind seeds to confirm that the work meets the expected measurement performance criteria MPCs and measurement quality objectives (MQOs) listed in **Section 5.2.1**. In addition to evaluating the final dig lists and intrusive results, the QC Geophysicist will also evaluate daily datasets promptly to identify seed item detection problems quickly.

### 5.1.6 Geophysical Surveys

#### 5.1.6.1 Instrument Verification Strip

In addition to the blind seeds described in **Section 5.1.5**, an IVS will be used to test the daily functionality of the UltraTEM and positioning sensors used for geophysical data collection. It is expected that one IVS will be constructed in Parcel 11, although multiple IVSs may be constructed if multiple locations are more expedient that one relatively central location. A background survey will be performed with the UltraTEM in an area that is easily accessible, not prone to flooding and other weather-related phenomena, and is expected to be relatively free of subsurface metal objects. The data from the background survey will be processed and evaluated before test items are buried to confirm that there are few existing anomalies in the area and to ensure that IVS test items are not buried near existing anomalies. Data processing will be performed as described in **Section 5.1.6.4.**

The IVS(s) will include a seed line containing one small schedule 80 ISO and one medium schedule 40 ISO and a noise line containing no seeds. The noise line will be used to confirm that unexpected UltraTEM response is not present in data that should be noise-free on a day-to-day basis. IVS seeds will be emplaced using shovels to dig holes to the appropriate depths of burial.

MEC avoidance will be performed as necessary based on the location of the IVS (i.e. inside or outside the hazard area[s]) and the results of the background survey. Both ISOs will be buried at approximately five times their inner diameters (i.e., 15 centimeters [cm] for the small ISO and 25 cm for the medium ISO) in horizontal orientations, with depth measurements made to the center of mass of each item. Items in the IVS will be separated by at least 3 m and from any preexisting anomalies by at least 1.5 m. Holes will be backfilled once the appropriate data have been recorded.

#### 5.1.6.2 Instrument Assembly and Initial IVS Testing

The UltraTEM will be assembled per manufacturer instructions. To test the UltraTEM and verify that it is functioning correctly, initial IVS surveys will be performed, to include an initial function test of the UltraTEM and the RTK GPS and simultaneous localization and mapping (SLAM) sensors to be used for positioning (SLAM only as necessary) and survey of the IVS seeded and noise lines. The initial function test involves data collection using a standard test object to confirm that the UltraTEM response to that object is within 20% of the expected response, which is a known value for the test object. Survey of the IVS seed line will confirm that the two buried seeds are detectable and classifiable and that the positing system (i.e., RTK GPS or SLAM) is correctly locating the UltraTEM data. Survey of the noise line will establish a baseline value of expected response for this location during the project (standard deviation of response over the line). The response threshold for the project may also be based on five times the site-specific noise measured over the IVS noise line, unless modified based on site conditions (e.g., if data collected in the survey areas at SWMUs 10 and 40 exhibit significantly higher noise levels than the location selected for the IVS). IVS data processing will be performed as described in **Section 5.1.6.4.**

After performance of the initial IVS testing, an IVS Technical Memorandum will be prepared detailing the IVS setup, surveys, and results, including documentation of compliance with the initial IVS MQOs provided in **Section 5.2.1**. The IVS Technical Memorandum will be provided to the project team for review and concurrence.

#### 5.1.6.3 Conduct AGC Surveys

AGC data will be collected using a person portable UltraTEM in litter mode with positioning information provided by a RTK GPS or a SLAM sensor if overhead canopy or structures limit the effectiveness of the GPS. Data collection will be performed at 1.6-m line spacing across 100% of the specified survey areas except for areas obstructed by buildings or other cultural features preventing access to the sensor (e.g., fence lines, debris piles, uncut vegetation). The 1.6-m line spacing is intended to provide overlap between adjacent lines using the 1.8-m wide UltraTEM to reduce the necessity of gap fills for minor drift between adjacent lines. Care will be taken to maintain a constant speed and to avoid sharp turns. The ideal collection speed for the UltraTEM is 0.75 meters per second (m/s) and speed should be maintained below 1.25 m/s. Circling obstructions and deviating from a straight path to avoid obstructions is acceptable. All avoided obstacles will be recorded in the project geographic information system (GIS) database for comparison with areas where 100% coverage was not achieved. During data processing (**Section 5.1.6.4**), the analyst will identify gaps within the collected geophysical data. If these are not in areas identified as obstacles, the data analyst will supply the UltraTEM team with a file containing the locations of gaps that must be filled before the AGC survey in each SWMU is considered complete.

Surface MEC or MD observed while performing AGC surveys will be recorded. Specifically, coordinates for MEC will be recorded with a GPS and photographs taken of the item(s) by the UXO Escort (prior to arrangements for disposition). Locations of significant MD (or surface metal or other interference sources) will also be recorded with GPS and photographed to assist with interpretation of the AGC data.

#### 5.1.6.4 Process AGC Data, Pick Targets, Perform Classification, and Data Validation

UltraTEM data will be imported into BTField for processing. Upon import, the data analyst will assess it against the data collection MPCs and MQOs provided in **Section 5.2.1** (i.e., daily IVS results, transmit current, in-line measurement spacing, coverage, spacing between sensors). A median or equivalent filter will be applied to the raw data to derive an estimate of the background model, then that model will be subtracted from the raw data to provide a background removed or 'leveled' data set. The leveled response amplitude data will then be evaluated by gridding and mapping the Z-component data for the data channel to be used for target selection, which will be discussed in the Target Selection Technical Memorandum. Complete coverage of each survey area, or subset area for which target selection will be performed, will be confirmed before target selection is performed.

UltraTEM targets will be selected using a response threshold based on five times the site-specific noise measured at the IVS, unless modified based on site conditions. Response amplitude targets may be screened based on measured geophysical size and/or decay to reject sources too small or too quickly decaying to be a potential TOI from the target list. Final target selection criteria, including any screening performed, will be detailed in the Target Selection Technical Memorandum.

Once targets have been selected, BTField will be used to perform 1-, 2-, and 3-dipole inversions to determine extrinsic (location and orientation) and intrinsic parameters (principal axis polarizabilities) for the source(s) causing the UltraTEM anomaly at each target location. The intrinsic parameters, otherwise known as polarizabilities, are related to the size, shape, and wall thickness of the source object(s) and are consistent for similar sources (e.g., munitions items). A library of known polarizabilities for standard munitions items is maintained by the DoD, and modeled polarizabilities can be compared to the polarizabilities in the DoD library to determine the degree of match between the in-ground source and munitions in the library. BTField uses a misfit metric to determine the degree of match, with a lower number indicative of a better match.

For the SWMU 10 investigation, the types of munitions potentially present (**Table 1.1**) are well defined, the munitions list is limited, and there are examples of each of the potential munitions in the DoD TOI library. Sources modeled using the SMWU 10 AGC data will be compared to a site-specific TOI library to generate a potential TOI list. Prior to AGC data collection, the Project Geophysicist will prepare the site-specific TOI library for the SWMU 10 investigation based on the DoD TOI library (single source models only). The site-specific library will be sub-selected from the DoD TOI library to contain only the confirmed or suspected MEC items listed in **Table 1.1** and ISOs that will be used for seeding. The preliminary site-specific library will be provided to the UXOQCS and Ordnance and Explosives Safety Expert (OESS) for review. The UXOQCS and OESS will verify that the expected items listed in **Table 1.1** are included in the site-specific library, or that items similar in size and shape are included. The Project Geophysicist will provide the site-specific library to the QA Geophysicist prior to beginning UltraTEM data collection. The SWMU 10 site-specific library may be modified during the project if unexpected items are found

on the surface or if AGC data or intrusive results indicate items should be added to or removed from the library.

UltraTEM data collected in and adjacent to SWMU 10 will be inverted to identify potential anomaly sources and the polarizabilities of those sources. Polarizabilities for each potential anomaly source will be compared to the site-specific library to develop a misfit metric based on the degree of match between the inverted polarizabilities and the best library match. A threshold (to be detailed in the Classification Technical Memorandum) will be applied to the calculated decision statistic, and sources with a decision metric above the threshold will be classified as potential TOI. Sources not classified as TOI will be classified as either inconclusive (i.e., potentially poor data) or likely clutter (non-TOI).

While the DoD classification library that is typically sub-selected to generate a site-specific library does contain some examples of munitions components, mostly warheads and fuzes, it does not contain examples of others such as primers, burster tubes, or booster cups. Without definitive knowledge about the munitions potentially present in the MEC investigation areas adjacent to SWMU 40, it is possible that complete munitions or munitions components for which there are no examples in the DoD library may be present. Sources modeled from the UltraTEM data collected near SWMU 40 will be compared to the full list of munitions in the DoD library. While this comparison will be performed, it is not necessarily expected to successfully classify all TOI correctly. Although they will not be usable as the basis for a final dig list, the classification results will be used to determine the shapes (e.g., cylindrical, plate-like, spherical, etc.) and relative sizes (e.g., smaller than a 20mm projectile, larger than 5-in rocket) of subsurface sources. They may also be used to guide the selection of sources for excavation (e.g., digging a subset of the best matches to munitions in the library) and comparisons between AGC-predicted sources and items recovered during the intrusive investigation.

Cluster analysis, which groups anomalies with similar polarizabilities will also be performed following inversion. Any group of four or more self-similar sources will be examined by the analyst. For each identified cluster, a representative sample may be included on the dig list at the discretion of the analyst to determine if the group of similar polarizabilities are MEC related. Clusters will generally not be investigated if the sources in the cluster are identified as noise or background by the analyst. The polarizabilities for cluster dig sources that are confirmed to be TOI will be added to the site-specific library and classification re-run following the library update.

Parameters and criteria used for classification will be documented in the Classification Technical Memorandum. The Classification Technical Memorandum will be revised, as necessary, if site conditions require modifications to the classification process, parameters, or criteria. Following target selection and classification, a full list of results for the UltraTEM data will be compiled for the SWMUs 10 and 40 investigations. A dig list containing approximately 200 intrusive locations, to be split between SWMUs 10 and 40, will be developed in consultation with the project team. Items included on the dig list may include classified TOI, inconclusive sources, and sources representing potential MD that would be indicative of the types of munitions present. It is assumed that the SWMU 10 dig list will trend toward classified TOI because the expected munitions are well known (i.e., 20mm, 37mm, and 40mm projectiles). Given the uncertainty regarding munitions expected in the SWMU 40 survey areas, the dig list may contain a mix of sources matching munitions in the full DoD library and potential MD sources that are not necessarily TOI-level matches to library munitions. Investigation of inconclusive sources is expected to be limited in both SWMUs.

### 5.1.7 Intrusive Investigation

AGC sources identified for excavation will be reacquired (i.e., located) and marked in the field using either RTK GPS or SLAM, dependent on overhead canopy or buildings restricting GPS coverage. Intrusive investigations will be performed using an EM61 for excavation clearance, and an RTK GPS or SLAM for source location. An analog metal detector may be used to pinpoint source locations within open holes.

The minimum separation distances (MSDs) presented in the approved Explosives Site Plan (ESP, PIKA-Pirnie Joint Venture, LLC [PIKA-Pirnie], 2015) will be enforced during intrusive MEC operations. If multiple teams are working in proximity to one another, the team separation distance (TSD) specified in the approved ESP will be maintained during intrusive activities. MSDs will be based on the appropriate munition with the greatest fragmentation distance (MGFD), which is also presented in the approved ESP.

It is anticipated that selected sources will be intrusively investigated by UXO-qualified personnel using hand digging. Although not expected, if warranted, mechanical methods (e.g., mini excavator) may be used to access large or deep anomalies. Personnel excavating an anomaly will initially remove approximately 6 inches of soil at the anomaly location. Excavations using heavy equipment will be conducted offset laterally from the suspected MEC item or anomaly being investigated. Following initial excavation, the excavation team will conduct a visual and instrument-assisted examination of the excavation. This process will be repeated until the audible signal from the handheld magnetometer indicates the anomaly source is close to the current floor of the excavation. Once this determination has been made, additional soil will be removed using hand tools or by hand until the anomaly is located.

Dig lists provided to the intrusive team will include the AGC-determined best match from either the site-specific library (SMWU 10) or the full DoD library (SWMU 40) and the misfit metric associated with that match. The type of match (e.g., 20mm projectile, 60mm mortar, 105mm projectile) will provide a relative size for the expected source, and the misfit metric will be an indication of the likelihood that the source will be the same general shape as the library munition/seed item. Excavations will be continued until the anomaly source is resolved, both with regard to the degree of match with the AGC-predicted source and remaining response per the EM61. The source of any remaining EM61 response unrelated to the source (e.g., above-ground structure, adjacent anomaly not on the dig list) will be noted by the dig team.

For each recovered source, the Team Leader will record the location using RTK GPS or SLAM, depth, length, and a brief description if the item can be identified (e.g., 4.2-inch mortar base plate, aluminum can, large bolt, nail). A whiteboard photograph will be taken of all sources recovered at each dig location, to include a scale to show the item(s) dimensions. MPPEH, MEC, and DMM encountered during intrusive activities will be handled and disposed of as described in **Section 5.1.8** and the Waste Management Plan (**Section 7**). Once the source of an anomaly has been identified and necessary MEC operations have been completed, the excavation will be filled in and tamped to the approximate consistency and grade of the surrounding soil. To the extent possible, the excavation site will be restored to its original condition.

The Project Geophysicist will review intrusive investigation dig results. The comparison will include an evaluation of position, depth, approximate size, and item shape. Significant mismatches between the predicted and actual item location (horizontal and/or vertical) or size will require re-analysis of the advanced sensor data. The Project Geophysicist or their designated representative

will review polarizability curves for mismatches. If that review indicates the mismatch was possibly caused by the intrusive team not properly clearing the dig location, it will be marked to be rechecked. If a review of the polarizability curves indicates the mismatch was caused by geophysical noise or geologic response matching a library object, the mismatch will be considered acceptable. For any other mismatch between prediction and observations the Project Geophysicist will examine the anomaly location, the analysis, or both and use professional judgment to determine the cause of the mismatch.

### 5.1.8 Handle, Certify and Dispose of MPPEH/MEC

#### 5.1.8.1 MPPEH/MEC Identification

If the source of an excavated anomaly is MPPEH, it will be uncovered sufficiently to obtain a positive identification of the item. It will be inspected by a UXO Technician II or higher, who will determine if it is MEC, material documented as safe (MDAS), or range-related debris (RRD). The item will then be shown to the Team Leader (UXO Technician III), who will verify the classification, and immediately report the condition of the item(s) to the SUXOS and UXOSO. No MPPEH/MEC will be moved without positive identification of the item(s) and an evaluation of its condition by the SUXOS and UXOSO. MPPEH that cannot be verified to be free of explosive hazards or is suspected to present an explosive hazard, will be handled as MEC (see below).

MEC encountered during the project will be clearly marked and its position will be recorded by GPS. Data regarding such factors as type, size, depth, condition, and location of MEC located during the MEC investigation will be recorded, and all MEC encountered will be photographed.

#### 5.1.8.2 Storage and Disposal of MEC/MPPEH

##### *5.1.8.2.1 MEC/MPPEH Storage*

If an item is identified as MEC or if a determination cannot be made, it will subsequently be decided as to whether that item is acceptable to move. MEC/MPPEH deemed acceptable to move may, in accordance with the approved ESP (PIKA-Pirnie, 2015), be moved for consolidation. Acceptable to move MEC/MPPEH items will be stored in an earth covered magazine in Explosive Storage Block B for later consolidated disposal in the Corrective Action Management Unit (CAMU).

##### *5.1.8.2.2 MEC/MPPEH Disposal*

Acceptable to move items will be disposed of by Parsons in the CAMU in accordance with the ESP and the CAMU Management Plan. Items that cannot be moved will ideally be blown in place the day they are discovered in accordance with the ESP. If an unacceptable to move MEC item cannot be detonated on the day it is found, the item will be guarded until the item(s) can be detonated. If a MEC item cannot be safely blown in place under the existing conditions, the PM, SUXOS, and UXOSO will be notified, and a determination will be made how to resolve the situation safely.

#### 5.1.8.3 Material Documented as Safe

MPPEH that is inspected, verified, and certified to be free of explosive hazards will be classified as MDAS. MDAS generated during the project will be stored in a secure area inside locked

containers. Once the field investigation is complete, the sealed containers will be shipped off-site for proper disposal in accordance with the Waste Management Plan (**Section 7**).

#### 5.1.8.4 Other

If munitions are recovered during the investigation that are not addressed in the approved ESP (PIKA-Pirnie, 2015) and/or the above sections on MEC disposal, the SUXOS shall inform the USACE OESS, and the Parsons and USACE PMs so appropriate measures can be discussed, developed, and implemented for dealing with those item(s).

## 5.2 QUALITY CONTROL

### 5.2.1 Measurement Performance Criteria and Measurement Quality Objectives

In order to attain data of sufficient quality to support DQOs (**Section 3.3 and Section 4.3**), specific procedures are required to allow evaluation of data quality. MPCs and MQOs have been developed for the project per the requirements in the Munitions Response Quality Assurance Project Plan Toolkit Module 1 (Intergovernmental Data Quality Task Force, 2020) and Engineering Manual 200-1-15 (Department of the Army, 2018). The MPCs (**Table 5.1**) are the minimum performance specifications that the investigation must meet to ensure that collected data will satisfy the DQOs. The MQOs (**Tables 5.2 through 5.4)** include procedures for testing, inspection, and quality control for all field data activities. MQO failures may be acceptable, but the failure response must include a root cause analysis (RCA) to determine the appropriate corrective action (CA) for the failure. Corrective actions will be applied, as necessary, before the data will be considered acceptable.

MQO results will be tracked via a Microsoft Access QC database that will be delivered to the USACE weekly during field operations. The MPCs are more general requirements that do not require daily evaluation, so applicable MPCs will be evaluated at the conclusion of the two major stages of the field project (i.e., following AGC data collection, processing, and submittal of the digs list and following the intrusive investigation). An MPC and MQO Results Report will be generated for each stage of the project and delivered with the final QC database to detail the results of the MPC/MQO evaluation.

### 5.2.2 Data Usability Assessments

A DUA is an evaluation based on the results of data verification and validation in the context of the overall project decisions or objectives. The assessment determines whether the project execution and resulting data meet the project DQOs (**Sections 3.3 and 4.3**) and MPCs (**Table 5.1**). All types of data (e.g., surface sweep, AGC, intrusive) will be considered with the goal of assessing whether the final, qualified results support the decisions to be made with the data. The process determines whether the collected data are of the right type, quality, and quantity to support the environmental decision-making for the project and describes how data quality issues will be addressed and how limitations of the use of the data will be handled.

Data gaps may be present if: (1) data are not collected, (2) data are not evaluated with regard to the necessary parameters, or (3) data are determined to be unusable. The need for further investigation or corrective action will be determined on a case-by-case basis, depending on whether data can be recovered, extrapolated from other data, and/or whether the missing data are needed based on the results of other recorded data. The project-specific DQOs (**Sections 3.3 and**

**4.3**), MPCs (**Table 5.1**), and MQOs (**Tables 5.2 through 5.4**) for MEC-related tasks define the various standards project data must achieve to ultimately be considered usable.

DUAs will be completed at two stages during the project: (1) following the dynamic survey and (2) following the completion of the intrusive investigation. DUAs may be completed for batches of data (i.e., more than one DUA for dynamic data may be completed). The completed DUAs will be included in the final report.

Each DUA will follow a four-step process:

1. Review the project objectives and sampling design:
    a. Review the DQOs. Are underlying assumptions still valid?
    b. Review the sampling design as implemented for consistency with stated objectives. Were assumptions representative of actual site conditions? Consider sources of uncertainty.
    c. Summarize any deviations from the planned sampling design and describe their impacts on DQOs.
2. Review the data verification/validation outputs and evaluate conformance to the MPCs:
    a. Review available QA/QC results. Evaluate the implications of unacceptable results. For any non-conformances, was the RCA/CA effective? Summarize the impacts of non-conformances on data usability.
    b. Evaluate conformance to the MPCs.
    c. Evaluate data completeness, identify data gaps, and summarize their impacts on the DQOs.
3. Document data usability, update the CSM, and draw conclusions:
    a. Assess the performance of the sampling design and identify any limitations on data use. Considering the implications of any deviations and data gaps, can the data be used as intended? Are the data sufficient to answer the study questions?
    b. Apply decision rules and draw conclusions.
    c. Update the CSM.
4. Document lessons learned and made recommendations:
    a. Summarize lessons learned.
5. Make recommendations for changes to the DQOs or sampling design for future delivery units.

# 6.0 RISK ASSESSMENT AND REPORTING

A qualitative risk assessment will be conducted to evaluate explosive hazards to human receptors. The purpose of the risk assessment is to determine the potential hazards associated with interaction with MEC present in environmental media. A MEC hazard assessment is a procedure used to qualitatively evaluate the potential explosive hazards presented to human receptors associated with complete MEC exposure pathways at a site. The qualitative risk assessment technique presented here follows the OSD Memorandum dated 14 July 2023 and titled, *Military Munitions Response Program Risk Management Methodology* (OSD, 2023). RMM is a tool used to assess risks at MEC contaminated sites and can serve as the baseline risk assessment and facilitate communication about risk. A baseline risk assessment is prepared and serves as the basis for evaluating risk posed from exposure to contamination if no remediation or institutional controls are applied.

## 6.1 EXPLOSIVE HAZARDS AND RISK ASSESSMENT

Explosive hazards exist at a site if there is a potentially complete MEC exposure pathway, consisting of a receptor that can come near or into contact with MEC and interact with the item in a manner that might result in its detonation. For this reason, the potential hazard depends upon the presence of three critical elements, all of which must be present for explosive hazards to exist (i.e., there is no risk if any one of these three elements are absent). These three critical elements are:

- *A source* of MEC (i.e., an explosively hazardous item);
- *A receptor* (i.e., a person); and
- *The potential for harmful interaction between the MEC source and the receptor* (i.e., the possibility a receptor encounters the MEC item and causes energy to be imparted on it resulting in an unintentional detonation).

The RMM provides an assessment of the explosive hazards associated with MEC at a site by evaluating site-specific conditions and human issues that affect the likelihood that a MEC accident will occur. The method uses input data based on historical documentation, field observations, and results of previous studies and removal actions. Most importantly, the RMM provides a means to evaluate site-specific factors regarding explosive hazards at a site and differentiate acceptable versus unacceptable conditions.

The risk assessment will be conducted to evaluate the baseline conditions for the Parcel 11 sites regarding explosive hazards. This baseline risk assessment will determine whether further action is necessary to address unacceptable explosive hazards and provides the basis for the evaluation and implementation of effective management response alternatives for mitigating unacceptable risks. The risk assessment also supports hazard communication among stakeholders by organizing site information in a consistent manner for the hazard management decision-making process.

## 6.2 ADDRESSING MULTIPLE RISK SCENARIOS

The RMM will be applied to SWMUs surveyed as part of the MEC investigation. There are two SWMUs to be investigated at Parcel 11, SWMUs 10 and 40. The MEC-related characteristics of discrete SWMUs may differ regarding the munitions types and quantities, land uses, receptors, and other factors. If these factors differ significantly, the qualitative explosive hazards in the discrete areas are also likely to vary. For example, the incinerator in Parcel 11 SWMU 10 was

confirmed to be used for MEC disposal, and a significant quantity of MD was recovered during previous investigations, while Parcel 11 SWMU 40 is in the former Administration Area, and the only potential MEC/MD source was the transport of MEC/MD through the area. Additionally, the current and future conditions for each SWMU may differ, which might also affect the qualitative risks associated with explosive hazards. Finally, different levels of risk may also result in different response alternatives being appropriate for these discrete areas. Therefore, RMM will be applied to each SMWU individually.

The SWMUs included in the MEC investigation are relatively small. Therefore, it is considered unlikely that there will be multiple risk scenarios (e.g., different munition types, significantly different munition quantities, or differing present/future conditions) present in any of them. However, if multiple possible risk scenarios are identified within a single SWMU during the field investigation, it may be appropriate to evaluate them separately. In these cases, two or more distinct risk scenarios may be identified, each of which will be the subject of a separate application of the RMM.

## 6.3 OVERVIEW OF INPUT FACTORS FOR DECISION LOGIC TO ASSESS RISKS FROM EXPLOSIVE HAZARDS

The RMM (OSD, 2023) uses three matrices (Matrices 1 through 3) to support the assessment of each risk scenario. To complete the baseline risk assessment for explosive hazards under each risk scenario, input factors for the three matrices are reviewed and suitable categories are selected based on historical documentation and the results of the MEC investigation. These matrices are related to the three critical elements noted previously and are:

- **Matrix 1: Likelihood of Encounter**, which is based on the input factors:
  - *Likelihood of MEC Presence* (i.e., how much MEC is there at the site?)
  - *Extent of Exposure* (i.e., what is the degree to which receptors traverse or conduct activities on the assessment area annually?)
- **Matrix 2: Likelihood of Interaction**, which is based on the input factors:
  - *Likelihood of Encounter* (see first bullet above; output of Matrix 1)
  - *Frequency of Activities in the Interaction Zone* (i.e., how often do receptors spend in the interaction zone for each identified risk scenario?)
- **Matrix 3: Risk of Harmful Incident**, which is based on the input factors:
  - *Likelihood of Interaction* (see second bullet above; output of Matrix 2)
  - *Munition MEC Code* (selected from DoD-developed list that contains "MEC Codes" for most common munitions items)

The output of Matrix 3 is a determination of either acceptable or unacceptable risk.

The three risk matrices and the input factors required to complete the risk assessment are described below, though more complete details and explanations are provided in the RMM (OSD, 2023).

***Matrix 1, Likelihood of Encounter*:** This is dependent on two input factors, the *likelihood of MEC presence* known or suspected to exist, and *extent of exposure* (e.g., accessibility and frequency of use). "Amount of MEC" is determined using site specific characterization data or anticipated or completed results of a remedial action. Although the scale emphasizes the results of distribution,

the selection may also include consideration of available historical information, such as former uses. "Extent of Exposure" are selected based on considerations of the access and frequency of use for the MRS. The selection considers the degree to which receptors traverse and/or conduct activities within the assessment area annually. Matrix 1 is shown in **Table 6.1**.

***Matrix 2, Likelihood of Interaction*:** This factor relates "Likelihood of Encounter" from Matrix 1 (**Table 6.1**) to the frequency of activities in the interaction zone. An interaction is defined as the receptor imparting energy to a MEC item, either intentionally or unintentionally, upon an encounter. Matrix 2 is shown in **Table 6.2**.

***Matrix 3, Risk of Harmful Incident*:** This factor is to help the project team evaluate the likelihood of an explosive incident and relates the "Likelihood of Interaction" from Matrix 2 (**Table 6.2**) to a "MEC Code" developed by the DoD. An *explosive incident* occurs when a receptor interacts with a MEC item and causes it to function or otherwise release energy, resulting in harm to one of more receptors. The MEC Codes were developed for most common munitions and are generally based on the likelihood of an interaction causing an explosive incident and harm the incident may cause to the receptor. Factors considered in the MEC Codes include the fuzing, size, and filler of the MEC items. Matrix 3 is shown in **Table 6.3**. If a munition is not included in the MEC Codes, the following are the general criteria for each MEC Code:

- **MEC Code 3** – MEC that will likely cause the death of one or more individuals if they function because of an interaction. *Example: Most munitions with high explosive (HE) fill*.
- **MEC Code 2** – MEC that will likely cause major injury to, and in extreme cases could cause the death of, one or more individuals if they function because of an interaction. *Example: Most pyrotechnics and propellants*.
- **MEC Code 1** – MEC that will likely cause minor injury to, and in extreme cases could cause major injury to or the death of, one or more individuals if they function because of an interaction. *Example: Most practice munitions*.
- **MEC Code 0** – Munitions that present no explosive hazard.

At the end of characterization, the result from Matrix 3 is used to differentiate unacceptable from acceptable risk conditions for each exposure scenario. If an acceptable risk scenario is identified and concurred by the project team and stakeholders, then it may be possible to recommend no further action. Where an unacceptable risk scenario is identified, a remedial response is required to address risks from explosive hazards. In these situations, the matrices can be used to identify remedial responses that will ultimately achieve acceptable conditions.

## 6.4 SITE-SPECIFIC BASELINE MUNITIONS AND EXPLOSIVES OF CONCERN HAZARD EVALUATIONS

A qualitative baseline risk assessment of potential explosive hazards will be developed for each exposure scenario. The qualitative baseline evaluation will be conducted by reviewing each of the input factors for the RMM described in **Section 6.3** above and determining results appropriately. **Tables 6.4 and 6.5** list the matrix categories based on the current known land use. The risk evaluation will also comply with the requirements of Section 7.2 of Attachment 7 of the RCRA permit (NMED, 2015), which includes evaluating residential land use. Therefore, **Tables 6.6 and 6.7** list the matrix categories based on potential future residential land use. The data collected

during the field investigation and the historical data available from prior surveys will be used to determine the appropriate categories for each of the remaining input factors or to adjust the assumptions in the CSM as new information is gained. Finally, the outputs from Matrices 1 through 3 will be used to evaluate whether conditions are considered acceptable or unacceptable with respect to risks from explosive hazards. This process and the justification(s) for the selection of each factor and the final result will be documented and explained in the MEC RFI Report for Parcel 11.

Parsons will prepare and submit a MEC Investigation Report for Parcel 11 documenting the activities performed and summarizing the results. The MEC Investigation Report will include analysis and summary of the investigations conducted within each SWMU and their results, including photographs, and maps depicting relevant features including selected anomaly locations, classified TOI, as applicable, intrusive investigation locations and the types and extents of munitions related contamination identified.

# 7.0 WASTE MANAGEMENT PLAN

## 7.1 INTRODUCTION

This Waste Management Plan has been developed for the management of wastes generated during the MEC investigation. Other than MDAS, minimal waste is expected to be generated during the course of this project. Waste that could be generated is limited to MDAS and non-hazardous solid waste (i.e., general trash). All waste disposal operations shall be conducted in accordance with the Waste Management Plan.

## 7.2 MATERIAL DOCUMENTED AS SAFE

### 7.2.1 Recovered Item Processing

Prior to items being loaded onto a vehicle for transport to the debris processing/storage area, the senior UXO technician present, a minimum of a UXO Technician III, will re-inspect each item as it is placed on the vehicle, maintaining segregation between MEC, MDAS, and RRD, to ensure that no items were improperly identified or co-mingled with another material type. Those items that are either considered hazardous or undetermined will be turned over to the Army and disposed of in accordance with established policies and procedures. Those items considered non-hazardous will be transported to the debris processing/storage area.

Upon arrival at the debris processing/storage area, the items will be inspected for a for hazardous components again and then segregated by debris type: MDAS and MD in one container and RRD and other debris in another. Items may be further segregated by metal type if there is a large volume of material. The most common metal types are steel, aluminum, copper, brass, and mixed metals. In some instances, the volume of recovered items does not support segregation; therefore, all the recovered items would be placed in the same container. If a hazardous item is encountered, it will be placed in a predetermined, secure location within the processing/storage and turned over to the Army.

### 7.2.2 Debris Containerization

Non-MEC recovered items will be placed in either segregated metal lockable containers or all-metals lockable containers. Container choice will be based on the volume and variety of metals and the handling capabilities of the site and end recipient. The only constant is the requirement to be able to lock and/or seal the container to ensure chain-of-custody from initial inspection to final disposition. Regardless of the type of container selected, the container will be closed and locked and/or sealed when not in use. If the container is not capable of being locked, a seal can be used as long as it will be broken in the act of opening the container. If a lock is used, the UXOQCS will be responsible for securing the key(s) and ensuring the container(s) are properly locked and/or sealed prior to departing the site after the day's activities. In addition, the UXOQCS will inspect the container(s) each workday morning to ensure their integrity. If a seal is used either in conjunction with a lock or separately, the number on the seal, or other form of identification, of the container(s), will be recorded or checked as above. If one of the containers has been tampered with, or the seal numbers don't match the log, it will be immediately reported to the site manager/SUXOS. The UXOQCS, in conjunction with the Government onsite safety representative, will determine if it will be necessary to re-inspect the entire contents of the container(s).

Containers will be clearly labeled outside with a unique identification number and the following information: USACE district, installation or site name, Parsons, unique identification number commencing with 0001, seal identification number; and material type (e.g., mixed metals, steel, aluminum, etc.).

### 7.2.3 Documentation

All shipments of debris, other than other debris, shall have a DD Form 1348-1A completed as the certification/verification document. It must clearly show the typed or printed names of the certifier (Site manager/SUXOS) and verifier (UXOQCS or a similarly trained individual). In addition, the DD Form 1348-1A shall indicate the following: basic material content (brass, copper, steel etc.), estimated weight, unique identification of the containers, location where contents were recovered, and seal identification number relating to the container identification.

Each DD Form 1348-1A will also contain ONE of the following statements (depending on whether the form is addressing MD only, or MD and RRD) and be signed by the certifying and verifying individuals:

- For a DD Form 1348-1A addressing MD only: *"The material listed on this form has been inspected, processed by DoD Explosives Safety Board (DDESB)-approved means, or undergone the application of expert knowledge, in compliance with DoD policy, and to the best of my knowledge and belief, does not pose an explosive hazard."*
- For a DD Form 1348-1A addressing both MD and RRD: *"This certifies and verifies that the material listed has been 100% properly inspected and, to the best of our knowledge and belief, is free of explosives hazards, engine fluids, illuminating dials and other visible liquid HTRW materials."*

### 7.2.4 MDAS Seal Log

The UXOQCS, with support from the SUXOS, shall maintain an MDAS Seal Log for the project. The MDAS Seal Log will include the following information: barrel number, seal number, date, and material type (e.g., mixed metals, steel, aluminum, etc.).

### 7.2.5 Chain-of-Custody

Throughout the debris handling process, a chain-of-custody procedure will be used to ensure that there is no accidental or deliberate cross contamination of the containers. While the material remains onsite, it is the responsibility of the site manager/SUXOS and the UXOQCS to maintain control of the containers. When the containers are being shipped to a receiving facility, the driver, regardless of his affiliation, will sign for the containers and will likewise obtain the signature of the receiving individual at each delivery location. Signed copies of the DD Form 1348-1A and the chain-of-custody form shall be included in the final report.

If the chain of custody is broken while the material is still under DoD control, the explosives-safety-status documentation is no longer valid, and the affected material is subsequently considered MPPEH. To re-establish the explosives safety status as MDAS, the affected material must be re-inspected (i.e., a 100 percent visual inspection and an independent 100 percent re-inspection), re-processed using a DDESB-approved method with appropriate post-processing inspection, or DoD component-approved expert knowledge must be re-applied.

### 7.2.6 Transportation

The transport of the certified/verified containers does not require any special permits, placards, or precautions since the contents are classified as scrap metal. Likewise, the transport of the debris to the processing yard does not require any special transport requirements since it has been inspected twice prior to being loaded onto a vehicle.

### 7.2.7 Final Disposition

Upon receipt of the containers by the recipient(s), they will prepare a statement on company letterhead stating: "*the contents of these sealed containers will not be sold, traded, or otherwise given to another party until the contents have been melted, smelted, cut, or deformed and are only identifiable by their basic content*" This statement will also be included in the final report.

## 7.3 DISPOSABLE SAMPLING EQUIPMENT

No sampling will be performed as part of the MEC investigation.

## 7.4 SOIL

All soil moved during the intrusive investigation will be used as backfill and returned to the original location.

## 7.5 DECONTAMINATION WATER

No equipment or personal protective equipment decontamination is expected to be necessary during the project; therefore, there is no potential for decontamination water to be generated.

## 7.6 OTHER SOLID WASTE

Non-hazardous solid waste (e.g., plastic water bottles, paper trash, food trash, etc.) will be consolidated and containerized onsite for daily disposal at an authorized offsite location (e.g., municipal dumpster or landfill). No generation of hazardous waste is anticipated during this project.

## 7.7 WASTE MINIMIZATION

The objective of waste minimization is to reduce the amount of waste generated during project activities, including minimizing the amount of paper used during preparation of plans and reports, minimizing the amount of municipal solid waste generated during field work, reusing wooden stakes and pin flags to the extent practical, field staff use of reusable water/liquid containers versus single use water bottles when practical, and optimizing the recycling of materials throughout project tasks.

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# 8.0 SCHEDULE

The approximate schedule for conducting the investigation activities at Parcel 11 is summarized below. **Table 8.1** contains a list of deliverables for the project and the schedule for delivery.

1. MEC Investigation Work Plan delivered to NMED – October 15, 2024
2. Field Work – initiates 90 days subsequent to NMED approval of the MEC Investigation Work Plan
3. Final MEC Investigation Report to NMED – provided to NMED 120 days subsequent to completion of investigation activities including acceptance of the Final DUA

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# 9.0 REFERENCES

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# TABLES

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**Table 1.1 – Target Population and Estimated Detection Depths – SWMU 10**

| Confirmed/Suspected Munition (1) | Item Dimensions (approximate width x length) | Estimated UltraTEM Detection/Classification Depth (cm bgs) (2) |
|---|---|---|
| 20mm projectile, M55A3B1 TP | 20mm x 75mm | 15 |
| 37mm projectile, M74 AP-T | 37mm x 115mm | 40 |
| 40mm projectile, M918 TP | 40mm x 86mm | 45 |

**Notes:**

(1) Specific munition listed is the least detectable variant (i.e., shallowest detection depth) included in the DoD classification library. It is not necessarily present on site, or if present, is not the only variant potentially present on site.

(2) Detection depths listed above are for intact items in worst-case orientation and maximum horizontal offset from sensor. Items closer to the sensor and in vertical orientations will be detectable deeper than the listed depths. These are conservative detection depths and assume the background noise level will be ≤ 1.0 microvolts per ampere (µV/A) for the sum of all time gates between 0.25 and 0.5 millisecond (ms) (i.e., 1/5th of the expected selection threshold for the UltraTEM). cm bgs = centimeters below ground surface

**Table 1.2 – Target Population and Estimated Detection Depths – SWMU 40**

| Confirmed/Suspected Munition (1) | Item Dimensions (approximate width x length) | Estimated UltraTEM Detection/Classification Depth (cm bgs) (2) |
|---|---|---|
| 37mm projectile, M74 AP-T | 37mm x 115mm | 40 |
| 75mm projectile, Mk I shrapnel | 75mm x 211mm | 100 |
| 155mm projectile, M71 AT | 155mm x 602mm | 160 |
| 3.5-in rocket, M301A1 WP | 89mm x 340mm (warhead only) | 100 |

**Notes:**

(1) Specific munition listed is the least detectable variant (i.e., shallowest detection depth) included in the DoD classification library. It is not necessarily present on site, or if present, is not the only variant potentially present on site. Confirmed/Suspected Munitions are not considered a complete list of the munitions potentially present in the SWMU 40 investigation area, as definitive records regarding exactly which munitions or munitions components were transported through SMWU 40 are unavailable.

(2) Detection depths listed are for intact items in worst-case orientation and maximum horizontal offset from sensor. Items closer to the sensor and in vertical orientations will be detectable deeper than the listed depths. These are conservative detection depths based on UltraTEM modeling and assume the background noise level will be ≤ 1.0 µV/A for the sum of all time gates between 0.25 and 0.5 ms (i.e., 1/5th of the expected selection threshold for the UltraTEM).

**Table 3.1 – Overview of Preliminary MEC Conceptual Site Model, SWMU 10**

| Site Details | Potential/Suspected Location and Distribution of MEC | Known/ Suspected Munitions | Exposure Medium | Current and Future Receptors | Exposure Pathways |
|---|---|---|---|---|---|
| **Name:**<br>SWMU 10<br><br>**Boundaries and acreage:**<br>17.5-acre survey area, see Figure 3.1 for boundary<br><br>**Known/suspected past DoD activities (release mechanisms):**<br>STP, includes incinerator used to demilitarize small projectiles<br><br>**Current land use:**<br>FWDA is in BRAC caretaker status undergoing environmental investigation and remediation<br><br>**Future land use:**<br>After environmental remediation, the land will be transferred to Department of the Interior for further transfer to the Navajo Nation and/or the Zuni Tribe | MD has reportedly been found throughout SWMU 10 during previous investigations and clearances. Because several clearances have been performed, the remaining distribution of subsurface sources is unknown. At least one SRA appears to be present in the southwest portion of the 2009 EM61 data. This SRA appears to extend outside of the 2009 survey area | Projectile, 20mm<br>Projectile, 37mm<br>Projectile, 40mm | Surface soil and subsurface soil | - Commercial/ industrial workers<br>- Construction workers<br>- Residents | Potentially complete exposure to surface and/or subsurface MEC |

**Table 4.1 – Overview of Preliminary MEC Conceptual Site Model, SWMU 40**

| Site Details | Potential/Suspected Location and Distribution of MEC | Known/Suspected Munitions | Exposure Medium | Current and Future Receptors | Exposure Pathways |
|---|---|---|---|---|---|
| **Name:**<br>SWMU 40<br>**Boundaries and acreage:**<br>Total of 3.5 acres of survey area, see Figure 4.1 for boundaries<br>**Known/suspected past DoD activities (release mechanisms):**<br>Munitions and/or MD stored in adjacent storage yard (not included in MEC investigation); munitions transported through/from SWMU 40<br>**Current land use:**<br>FWDA is in BRAC caretaker status undergoing environmental investigation and remediation<br>**Future land use:**<br>After environmental remediation, the land will be transferred to Department of the Interior for further transfer to the Navajo Nation and/or the Zuni Tribe | MD was found near the northeast corner of Building 12 during utility trenching in 1998. There are many obvious anomalies in the 2009 geophysical data, which covers the entirety of the MEC investigation area. Most are likely caused by sources associated with the Administration Area, including utility lines and debris from the demolition of Building 29 | Projectile, 37mm<br>Projectile, 75mm<br>Projectile, 155mm<br>Rocket, 3.5-in<br>The full list of munitions and munitions components transported through SWMU 40 is unknown, and this list is not considered comprehensive | Surface soil and subsurface soil | - Commercial/ industrial workers<br>- Construction workers<br>- Residents | Potentially complete exposure to surface and/or subsurface MEC |

**Table 5.1 – Measurement Performance Criteria for MEC-Related Tasks**

| Measurement | Data Quality Indicator | Specification | Activity Used to Assess Performance |
|---|---|---|---|
| **Site Preparation** | | | |
| 1. Accessibility | Completeness | All areas inaccessible to investigation or inaccessible to use of proposed geophysical systems are identified in a GIS or the geophysical database | Lead organization will visually inspect the site and/or review the GIS/geophysical database |
| **Sampling Design** | | | |
| 2. Detection threshold | Sensitivity | A detection threshold of 5 times background noise will be used for the UltraTEM Portable Classifier | 1) Review of sampling design<br>2) Initial verification at IVS<br>3) Background analysis prior to VSP analysis<br>4) Target Selection Technical Memorandum describes all thresholds to be used and criteria for use |
| **Data Acquisition** | | | |
| 3. Positioning requirement (full coverage grid mapping and reacquisition) | Accuracy | Recorded measurement positions must be within 0.1m of actual positions | Review of sampling design<br>Initial verification at IVS |
| 4. Survey Coverage | Accuracy/ Completeness | 100% of specified acreage is sampled at a line spacing of ≤ 1.8 m | Data validation |
| 5. QC seeding (AGC) | Accuracy/ Completeness | Contractors will place blind QC seeds at the rate of 1-3 seeds/system/day. Planning documents must describe the blind seed firewall | Lead agency verifies all QC seed failures are explained and corrective action implemented |

**Table 5.1 – Measurement Performance Criteria for MEC-Related Tasks**

| Measurement | Data Quality Indicator | Specification | Activity Used to Assess Performance |
|---|---|---|---|
| **Anomaly Resolution/Classification** | | | |
| 6. Anomaly resolution (AGC sensor) | Completeness | All items within 0.25m laterally must be recovered for each flag | QC Geophysicist (or designee) verifies |
| 7. Anomaly resolution (AGC sensor) | Accuracy/ Representative-ness | Excavation of anomalies will be performed where necessary to fill data gaps in the CSM. Inversion results correctly predict one or more physical properties (e.g., size, symmetry, or wall thickness) of the recovered items | Qualitative examination and documentation of recovered items |
| 8. Anomaly classification (AGC sensor with classification) | Completeness/ Comparability | Library must include signatures for all items considered by the project team to be TOI, as listed in the CSM, or the classifier must include a method for correctly classifying any munitions not included in the library | Verification of site-specific library |
| 9. Anomaly classification (AGC sensor with classification) | Completeness | All detected anomalies classified as:<br>1. TOI<br>2. Non-TOI<br>3. Inconclusive | Data verification |
| 10. Anomaly classification (AGC sensor with classification) | Accuracy | 100% of predicted non-TOI that are intrusively investigated are confirmed to be non-TOI | Visual inspection of recovered items from classification validation |
| **NEU Confirmation** | | | |
| 11. NEU Confirmation | Representative-ness/ Completeness | Well-developed CSM, confirmed by survey results, showing no evidence of munitions use | DUA |

**Table 5.2 – Site Preparation Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Vegetation clearance verification | Once, following vegetation clearance in each SWMU | SUXOS/ Surface Sweep Technical Memorandum/ Lead Organization | All vegetation removed to height not exceeding 15 cm; all trees less than 6" diameter at breast height are removed; no obstacles (e.g., felled trees or limbs) remain | RCA/CA; Re-verify |
| Vegetation clearance (mechanized): verify correct assembly (1 of 2) | Once following assembly | SUXOS/ Instrument Assembly Checklist/ Lead Organization | As specified in Assembly Checklist | RCA/CA; Make necessary adjustments and re-verify |
| Vegetation clearance (mechanized) verify correct deployment (2 of 2) | Daily, prior to operations | SUXOS/ Daily QC Report/ Lead Organization | Deck height is set to 15 cm | RCA/CA; Make necessary adjustments and re-verify |
| Construct IVS: Verify as-built IVS against design plan (UltraTEM) | Once, following IVS construction | Project Geophysicist/ IVS Technical Memorandum/ Lead Organization | Seeds buried as described in **Section 5.1.5** | RCA/CA; Make necessary changes to seeded items and re-verify |

**Table 5.2 – Site Preparation Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Construct ITS:<br>Verify as-built ITS against design plan<br>(Analog sensors) | Once, following ITS construction | Project Geophysicist/<br>IVS Technical Memorandum/<br>Lead Organization | Small ISO seed items for analog methods buried at 30 cm. All seeds buried horizontally in the cross-track orientation | RCA/CA; Make necessary changes to seeded items and re-verify |
| Initial geodetic equipment function test<br>(RTK GPS and SLAM) | Once, prior to start of data acquisition | Field Team Leader and Project Geophysicist/<br>IVS Technical Memorandum /<br>QC Geophysicist | Measured position of control point within 10cm of ground truth | RCA/CA; document questionable information in database |
| IVS SLAM georeferencing accuracy | Evaluated for IVS initial base map | Field Team Leader and Project Geophysicist /<br>IVS Technical Memorandum/<br>QC Geophysicist | Georeferenced point cloud position of control point within 8cm of ground truth | CA assumption: Re-do affected work unless initial base map can be re-processed to achieve required accuracy |
| Verify correct assembly<br>(UltraTEM) | Once, following assembly | Field Geophysicist/<br>Instrument Assembly Checklist/<br>Project Geophysicist | Assembled as specified in Assembly Checklist | RCA/CA: Make necessary adjustments and re-verify |

**Table 5.2 – Site Preparation Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Initial instrument function test (UltraTEM) | Once, following assembly | Field Geophysicist/ Initial IVS Memorandum/ Project Geophysicist | For all channels tested, the response (mean static spike minus mean static background) is within 25% of predicted response | RCA/CA: Make necessary adjustments, and re-verify |
| Initial instrument function test (Analog) | Once, upon arrival at project site | Field Geophysicist or UXO Team Lead/ Initial IVS Memorandum/ Project Geophysicist or designee | Audible response consistent with expected change in tone in presence of a standard object | RCA/CA: Make necessary adjustments, and re-verify |
| Initial dynamic survey positioning accuracy (IVS) (UltraTEM) | Once, prior to start of data acquisition | Project Geophysicist/ IVS Memorandum/ QC Geophysicist | Derived positions of IVS target(s) are within 25cm of the ground truth locations | RCA/CA: Make necessary adjustments, and re-verify |
| Initial dynamic survey Check for interference surrounding seed response (IVS) (UltraTEM) | Once, prior to start of data acquisition | Project Geophysicist/ IVS Memorandum/ QC Geophysicist | All seeds placed in locations that are free of detected anomalies within a radius of ≥1.5m | RCA/CA; and re-verify MQO |

**Table 5.2 – Site Preparation Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Initial derived polarizabilities match for IVS Items (IVS) (UltraTEM) | Once prior to start of data acquisition | Project Geophysicist/ IVS Memorandum/ QC Geophysicist | Library match metric ≥ 0.9 for each set of inverted polarizabilities | RCA/CA |

**Table 5.3 – Dynamic Survey Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Surface Sweep: Documenting recovered surface MEC and debris | Daily | UXOQC/ GIS data recorded/ Project/QC Geophysicist or designee | All metallic debris collected is counted and documented in the project database for the following attributes: designation as UXO, MD, RRD, or other debris; UXO and MD described by type, wight, and as TOI or non-TOI. Photos displaying all MD recovered (individual MD photos not necessary), and photos showing all surfaces of each MEC/TOI are recorded | RCA/CA; document questionable information in database; justify safety concerns |
| Geodetic equipment function test (RTK GPS and SLAM) | Daily | Field Team Leader and Project Geophysicist/ Running QC Summary/ QC Geophysicist | Measured position of control point within 10cm of ground truth | RCA/CA; document questionable information in database |
| SLAM georeferencing accuracy | Evaluated for each initial base map | Project Geophysicist/ Running QC Summary/ QC Geophysicist | Georeferenced point cloud position of control point within 8cm of ground truth | CA assumption: Re-do affected work unless initial base map can be re-processed to achieve required accuracy |
| Geodetic accuracy (Confirm valid position) | Evaluated for each measurement | Field Team Leader and Project Geophysicist/ Running QC Summary/ | RTK GPS: status flag indicates RTK fix. | RTK GPS CA: Interpolate positions for minor (<3 m) GPS fluctuations |

**Table 5.3 – Dynamic Survey Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| | | QC Geophysicist | SLAM: initial localization achieves confidence quality indicator > 50,000 before moving; confidence values < 50,000 within datasets will be reviewed by the data analyst, if possible, based on recorded data (1) | along straight lines, longer out-of-spec data rejected.<br>SLAM CA: New recording and re-localize if initial confidence > 50,000 cannot be achieved; low confidence locations within datasets will be rejected if the position appears incorrect |
| Ongoing instrument function test (UltraTEM) | Beginning and end of each day and each time instrument is turned on | Project Geophysicist/ Running QC Summary/ QC Geophysicist | For all channels tested, the response (mean static spike minus mean static background) is within 25% of predicted response | RCA/CA: Make necessary repairs and re-verify |
| Ongoing instrument function test (Analog) | Beginning and end of each day and each time instrument is turned on | Field Team Leader/ Running QC Summary/ Project or QC Geophysicist or designee | Audible response consistent with expected change in tone in presence of object with documented response | RCA/CA |
| Ongoing derived target position precision (IVS) (UltraTEM) | Beginning and end of each day | Project Geophysicist/ Running QC Summary/ QC Geophysicist | All IVS items' fit locations within 25cm of ground truth locations | RCA/CA |
| Ongoing derived polarizabilities | Beginning and end of each day | Project Geophysicist/ Running QC Summary/ | Library match metric ≥ 0.9 for each set of inverted polarizabilities | RCA/CA |

**Table 5.3 – Dynamic Survey Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| match for IVS Items (IVS) (UltraTEM) | | QC Geophysicist | | |
| In-line measurement spacing (UltraTEM) | Verified for each survey area using BTField coverage tools | Project Geophysicist/ Running QC Summary/ QC Geophysicist | 98% ≤ 0.2m between successive measurements Mean ≤ 0.1m | RCA/CA: Coverage gaps are filled or adequately explained (e.g., unsafe terrain) |
| Coverage | Verified for each survey area using BTField coverage tools | Project Geophysicist/ Running QC Summary/ QC Geophysicist | 100% at ≤ 0.3m cross-track measurement spacing between outer cubes on adjacent passes | RCA/CA: Collect additional data to increase coverage percentage to meet acceptance criteria or adequately explained (e.g., unsafe terrain) |
| Transmit current levels (UltraTEM) | Evaluated for each sensor measurement | Project Geophysicist/ Running QC Summary/ QC Geophysicist | Current must be ≥ 15A | CA: Reject failing data files; stop data acquisition activities until condition corrected |
| Confirm adequate spacing between units (All sensors) | Evaluated at start of each day (or area) | Field Team Leader/ Field Logbook/ Project Geophysicist | Minimum separation of 50m | RCA/CA: Recollect all coincident measurements |

**Table 5.3 – Dynamic Survey Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Confirm inversion model supports classification (UltraTEM, 1 of 3) | Evaluated for all models derived from a measurement (i.e., single item and multi-item models) | Project Geophysicist/ BTField/ QC Geophysicist | Derived model response must fit the observed data with a fit coherence ≥ 0.8 | Item classified as 'cannot analyze' unless analyst determines target pick is a result of noise, background response, etc. |
| Confirm inversion model supports classification (UltraTEM, 2 of 3) | Evaluated for each derived source | Project Geophysicist/ BTField / QC Geophysicist | Fit location estimate of item ≤ 1.0m from picked target location | Source not considered for classification as potential TOI |
| Confirm inversion model supports classification (UltraTEM, 3 of 3) | Evaluated for all seeds | QC Geophysicist/ Running QC Summary/ Lead Organization QA Geophysicist | 100% of predicted seed positions ≤ 25cm radially from known position and ≤ 15cm vertically | RCA/CA |
| Classification performance | Evaluated for all seeds | QC Geophysicist/ Seed Tracking Log/ USACE QA Geophysicist | 100% of QC seeds classified as TOI | RCA/CA |

**Table 5.4 – Intrusive Investigation Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Geodetic equipment function test<br>(RTK GPS and SLAM) | Daily | Field Team Leader and Project Geophysicist/<br>Running QC Summary/<br>QC Geophysicist | Measured position of control point within 10cm of ground truth | RCA/CA; document questionable information in database |
| Geodetic accuracy (Confirm valid position) | Evaluated for each measurement | Field Team Leader and Project Geophysicist/<br>Running QC Summary/<br>QC Geophysicist | RTK GPS: status flag indicates RTK fix (field team leader confirms sensor will not collect static point without fix)<br>SLAM: initial localization achieves confidence quality indicator > 50,000 before moving; operator confirms confidence > 50,000 prior to collection of each source location | RTK GPS CA: Interpolate positions for minor (<3 m) GPS fluctuations along straight lines, longer out-of-spec data rejected.<br>SLAM CA: New recording and re-localize if initial confidence > 50,000 cannot be achieved or if confidence of 50,000+ cannot be achieved at intended data collection point. |

**Table 5.4 – Intrusive Investigation Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Ongoing instrument function test (EM61) | Beginning and end of each day and each time instrument is turned on | Field Team Leader and Project Geophysicist/ Running QC Summary/ QC Geophysicist | Response (mean static spike minus mean static background) within 20% of predicted response | RCA/CA: Make necessary repairs and reverify |
| Documenting recovered sources | Daily | UXOQC/ GIS data recorded/ QC Geophysicist | All metallic debris collected is documented for the following attributes: Designation as UXO, MD, RRD or other debris; UXO and MD described by type, weight, depth. Photos displaying all recovered items for AGC. Individual photos of non-MEC are not necessary for non-AGC. Photos showing all surfaces of each MEC are recorded | RCA/CA; document questionable information in database |

**Table 5.4 – Intrusive Investigation Measurement Quality Objectives**

| Measurement Quality Objective | Frequency | Responsible Person/ Report Method/ Verified by | Acceptance Criteria | Failure Response |
|---|---|---|---|---|
| Confirm derived features match ground truth (UltraTEM, 1 of 2) | Evaluated for all recovered items | Project Geophysicist/ Running QC Summary or Intrusive Database/ QC Geophysicist | 100% of recovered item positions (excluding inconclusive category) ≤ 25cm from predicted position (x, y); recovered item depths are recorded within 15cm of predicted | RCA/CA |
| Confirm derived features match ground truth (UltraTEM, 2 of 2) | Evaluated for all recovered items including seeds | Project Geophysicist/ Dig List and Intrusive Database/ Project or QC Geophysicist | Data analysis shows 100% of seeds & recovered items have at least one physical characteristic (e.g., size, shape/symmetry, or wall thickness) consistent with polarizability parameters | RCA/CA |

**Table 6.1 – RMM, Matrix 1: Likelihood of Encounter**

| **LIKELIHOOD OF ENCOUNTER** (Likelihood of MEC Presence vs. Exposure) | | **EXTENT OF EXPOSURE** | | | |
|---|---|---|---|---|---|
| | | **Full** (>90% coverage) | **Partial** (50 - 90% coverage) | **Limited** (10 - 50% coverage) | **Minimal** (<10% coverage) |
| **Likelihood of MEC Presence** | **HUA**: likelihood of MEC is **HIGH** | 5 | 5 | 5 | 5 |
| | **HUA**: likelihood of MEC is **MODERATE** | 5 | 5 | 4 | 4 |
| | **LUA**: likelihood of MEC is **LOW** | 3 | 2 | 2 | 1 |
| | **LUA**: likelihood of MEC is **VERY LOW** | 2 | 2 | 1 | 1 |
| | No evidence MEC remain | 1 | 1 | 1 | 1 |
| | **NEU**: no evidence of munitions use | | | | |

**Table 6.2 – RMM, Matrix 2: Likelihood of Interaction**

| **LIKELIHOOD OF INTERACTION (Likelihood of Activities in the Interaction Zone vs. Likelihood of Encounter)** | | **LIKELIHOOD OF ENCOUNTER (FROM MATRIX 1)** | | | | |
|---|---|---|---|---|---|---|
| | | **5 (highest)** | **4** | **3** | **2** | **1 (lowest)** |
| **Frequency of Activities in the Interaction Zone** | **Frequent** activities occur in the interaction zone that may result in an interaction with munitions | A | A | B | B | D |
| | **Occasional** activities occur in the interaction zone that may result in an interaction with munitions | A | B | B | B | D |
| | **Infrequent** activities occur in the interaction zone that may result in an interaction with munitions | B | B | B | C | E |
| | **Unlikely** that activities occur in the interaction zone that may result in an interaction with munitions | B | C | C | C | E |

**Table 6.3 – RMM, Matrix 3: Risk of Harmful Incident**

| **RISK OF HARMFUL INCIDENT** (MEC Code vs. Likelihood of Interaction) | | **LIKELIHOOD OF INTERACTION (FROM MATRIX 2)** | | | | |
|---|---|---|---|---|---|---|
| | | **A** | **B** | **C** | **D** | **E** |
| **MEC Code** | **High (MEC Code 3)** | **Unacceptable** | **Unacceptable** | **Unacceptable** | **Unacceptable** | Acceptable |
| | **Moderate (MEC Code 2)** | **Unacceptable** | **Unacceptable** | **Unacceptable** | Acceptable | Acceptable |
| | **Low (MEC Code 1)** | **Unacceptable** | **Unacceptable** | Acceptable | Acceptable | Acceptable |
| | **Presents No Explosive Hazard (MEC Code 0)** | Acceptable | Acceptable | Acceptable | Acceptable | Acceptable |
| | **No Evidence MEC Remain** | | | | | |
| | **NEU** | | | | | |

**Table 6.4 – RMM, Pre-MEC Investigation Matrix Selections, SMWU 10, Current Land Use**

| Input Factor | Data Source | Anticipated Selection |
|---|---|---|
| **Matrix 1: Likelihood of Encounter** | | |
| **Likelihood of MEC Presence** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on reported past recovery of numerous 20mm, 37mm, and 40mm projectiles. 2009 geophysical survey results indicate remaining areas of unexplained high anomaly density<br>Likelihood of MEC is **HIGH** |
| **Extent of Exposure** | CSM | Anticipated based on CSM<br>**Full Coverage** – One or more receptors traverse and/or conduct activities on greater than or equal to 90% of the assessment area annually |
| **Matrix 2: Likelihood of Interaction** | | |
| **Frequency of Activities in the Interaction Zone** | CSM | Anticipated based on CSM<br>**Infrequent** activities occur in the interaction zone that may result in an interaction with munitions |
| **Matrix 3: Risk of Harmful Incident** | | |
| **MEC Code** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on reported past recovery of 20mm, 37mm, and 40mm projectiles. However, any projectiles burned in the incinerator are unlikely to have been fuzed<br>**High (MEC Code 3; HE munitions)** |

**Table 6.5 – RMM, Pre-MEC Investigation Matrix Selections, SMWU 40, Current Land Use**

| Input Factor | Data Source | Anticipated Selection |
|---|---|---|
| **Matrix 1: Likelihood of Encounter** | | |
| **Likelihood of MEC Presence** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on recovery of a 37mm projectile and 75mm projectile during utility installation. Despite recovery, this SWMU is within the Administration Area, where the presence of munitions is considered unlikely<br>Likelihood of MEC is **LOW** |
| **Extent of Exposure** | CSM | Anticipated based on CSM.<br>**Full Coverage** – One or more receptors traverse and/or conduct activities on greater than or equal to 90% of the assessment area annually |
| **Matrix 2: Likelihood of Interaction** | | |
| **Frequency of Activities in the Interaction Zone** | CSM | Anticipated based on CSM.<br>**Infrequent** activities occur in the interaction zone that may result in an interaction with munitions |
| **Matrix 3: Risk of Harmful Incident** | | |
| **MEC Code** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on reported past recovery of 37mm and 75mm projectiles. However, any projectiles being moved between the storage yard and rail cars are unlikely to have been fuzed.<br>**High (MEC Code 3; HE munitions)** |

**Table 6.6 – RMM, Pre-MEC Investigation Matrix Selections, SMWU 10, Potential Future Residential Use**

| Input Factor | Data Source | Anticipated Selection |
|---|---|---|
| **Matrix 1: Likelihood of Encounter** | | |
| **Likelihood of MEC Presence** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on reported past recovery of numerous 20mm, 37mm, and 40mm projectiles. 2009 geophysical survey results indicate remaining areas of unexplained high anomaly density<br>Likelihood of MEC is **HIGH** |
| **Extent of Exposure** | CSM | Anticipated based on CSM<br>**Full Coverage** – One or more receptors traverse and/or conduct activities on greater than or equal to 90% of the assessment area annually |
| **Matrix 2: Likelihood of Interaction** | | |
| **Frequency of Activities in the Interaction Zone** | CSM | Anticipated based on CSM<br>**Frequent** activities occur in the interaction zone that may result in an interaction with munitions |
| **Matrix 3: Risk of Harmful Incident** | | |
| **MEC Code** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on reported past recovery of 20mm, 37mm, and 40mm projectiles. However, any projectiles burned in the incinerator are unlikely to have been fuzed<br>**High (MEC Code 3; HE munitions)** |

**Table 6.7 – RMM, Pre-MEC Investigation Matrix Selections, SMWU 40, Potential Future Residential Use**

| Input Factor | Data Source | Anticipated Selection |
|---|---|---|
| **Matrix 1: Likelihood of Encounter** | | |
| **Likelihood of MEC Presence** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on recovery of a 37mm projectile and 75mm projectile during utility installation. Despite recovery, this SWMU is within the Administration Area, where the presence of munitions is considered unlikely<br>Likelihood of MEC is **LOW** |
| **Extent of Exposure** | CSM | Anticipated based on CSM<br>**Full Coverage** – One or more receptors traverse and/or conduct activities on greater than or equal to 90% of the assessment area annually |
| **Matrix 2: Likelihood of Interaction** | | |
| **Frequency of Activities in the Interaction Zone** | CSM | Anticipated based on CSM<br>**Frequent** activities occur in the interaction zone that may result in an interaction with munitions |
| **Matrix 3: Risk of Harmful Incident** | | |
| **MEC Code** | CSM<br>Previous Investigations<br>MEC Investigation Results | Anticipated based on reported past recovery of 37mm and 75mm projectiles. However, any projectiles being moved between the storage yard and rail cars are unlikely to have been fuzed<br>**High (MEC Code 3; HE munitions)** |

**Table 8.1 – Deliverable Schedule**

| Document/Record | Purpose | Completion/ Update Frequency |
|---|---|---|
| QC Seed Plan | Describes intended seed types and locations for QC seeds to be placed | Once, prior to seeding |
| Blind Seed Firewall Plan | Describes methods used to limit QC seed information to Parsons QC personnel and validation seed information to Seed Team Lead | Once, prior to seeding |
| Verification and Validation Plan | Describes process for selected verification and validation targets to be selected from classified non-TOI | Draft with Final UFP-QAPP, updates as necessary throughout project |
| Daily Status Reports | Report notable events to project team | Daily while in field |
| Weekly Status Reports | Report notable events to project team | Weekly while in field |
| Daily QC Report | Report QC events to project team | Daily, when in field |
| Weekly Geophysical QC Report | Report of DGM QC results | Weekly while in field |
| Field Change Request Form | Record non-critical (i.e., minor) deviations from the UFP-QAPP ("non-critical" deviations are defined as those that will not impact project objectives) | As needed |
| Root Cause Analysis/ Nonconformance Report | Document MPC failures and causes, as well as CAs taken, actions taken to prevent recurrence, and actions taken to monitor effectiveness of CA | If MPC/MQO failures are noted |
| Production Area QC Seeding Report | Documents seed types, depths, locations, and orientations | Once, following completion of seeding |
| IVS Technical Memorandum | Documents the results of the initial IVS tests | Once per geophysical method, following initial IVS test |
| Target Selection Memorandum | Documents the target selection criteria. | Twice, once for DGM methods and once for AGC methods |

**Table 8.1 – Deliverable Schedule**

| Document/Record | Purpose | Completion/ Update Frequency |
|---|---|---|
| Classification Memorandum | Documents the anomaly classification criteria | Once, following AGC survey |
| Seed Tracking Log | Document seed placement and record recovery | As seeds are detected/recovered |
| Data Usability Assessments (AGC, Intrusive, and Final) | Document the results of AGC survey and intrusive investigation with regard to DQOs | Once after completion of AGC survey, once after completion of intrusive investigation, and once after field investigation complete |
| Intrusive Investigation Results | Record results of intrusive investigation, including anomaly source description, characteristics, and coordinates | Weekly during intrusive investigation of AGC sources |
| Anomaly Resolution Results | Record results of anomaly resolution QC checks | During source resolution QC checks |
| AGC Data Deliverable | Document the results of geophysical surveys | Weekly during AGC data collection |
| AGC QC Deliverable (Includes QC Database) | Documents QC metrics for geophysical surveys | At least weekly during AGC collection |
| Supporting Classification Images | Summarize modeling and library match information for each UltraTEM target | Weekly during UltraTEM data collection |
| Verification and Validation Report | Summarize results of the validation digs and comparison between AGC predictions and intrusive results. | Once following completion of intrusive investigation |
| DD Form 1348-1A | Certify MPPEH as MDAS; maintain Chain of Custody for MDAS | As required for batches of MPPEH |
| MDAS disposal documentation | To certify that MDAS has been disposed of in accordance with project requirements | After each shipment of MDAS off site |
| Explosives Usage Record (if applicable) | To record quantities of explosives used | Each demolition operation |

**Table 8.1 – Deliverable Schedule**

| Document/Record | Purpose | Completion/ Update Frequency |
|---|---|---|
| Demolition Shot Record (if applicable) | To document the item(s) destroyed and the explosives used during demolition shots | Each demolition operation |
| Final MRS Characterization Technical Memorandum | Summary of the preliminary and high-density area characterization investigation results | Once, 21 days after completion of HD area characterization |
| MEC Investigation Report | To document the completion of the MEC investigation and describe the process | Once after completion of field work and Final DUA Report |
| Project GIS | Maintain and manage all project geospatial data in GIS format | Project milestones including UFP-QAPP, field work completion, MEC Investigation Report, and project closeout |

# FIGURES

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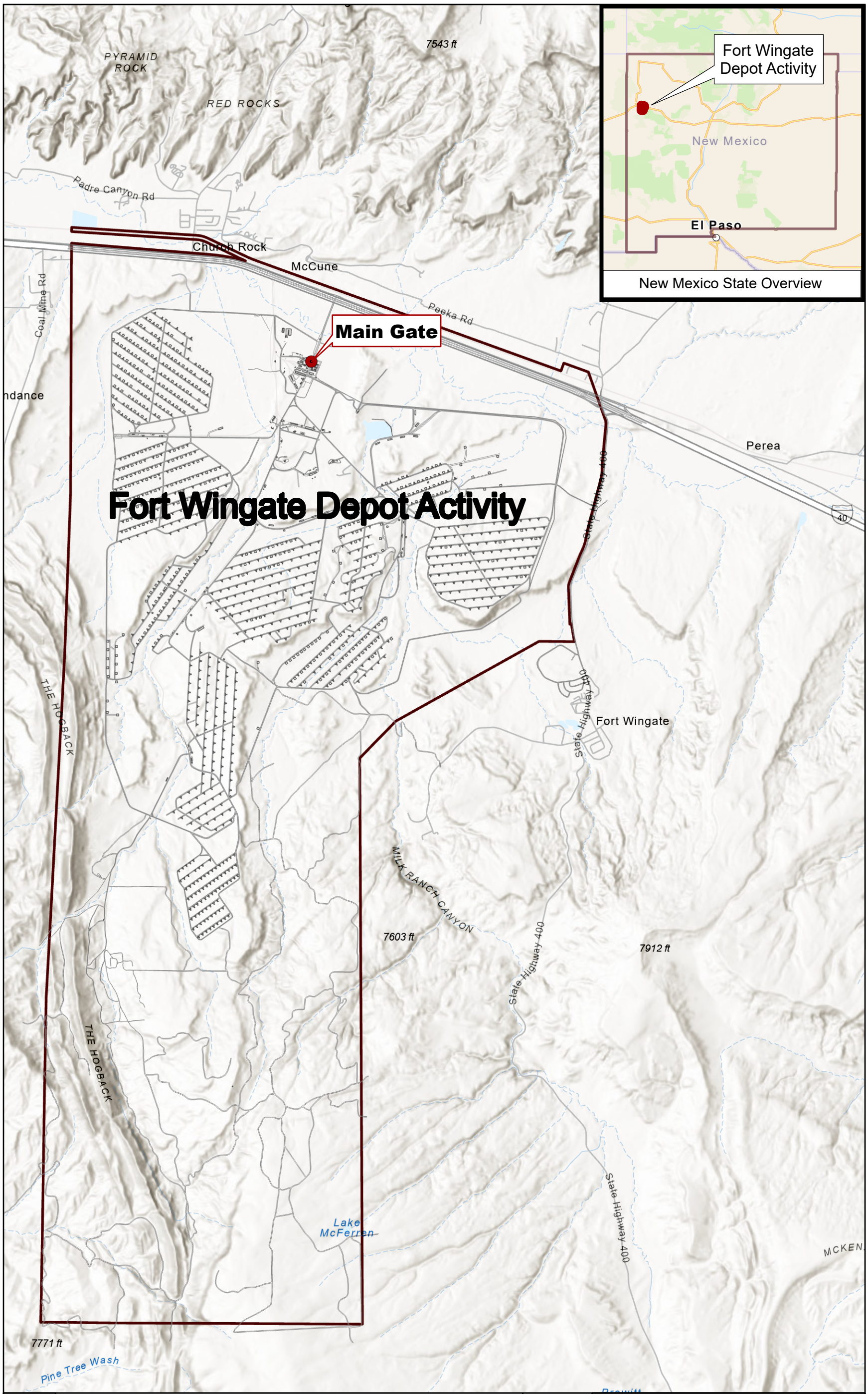


| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | | | |
| Notes | MEC Investigation Work Plan, Parcel 11, Fort Wingate Depot Activity, McKinley County, New Mexico | | | |
| Revised | 5/8/2024 | GIS by | AM | 5/8/2024 |
| Scale | 1:55,000 | Checked by | JB | 5/8/2024 |
| Basemap: Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, | | PM | CR | 5/8/2024 |

N

FIGURE 1.1

Facility Location Map

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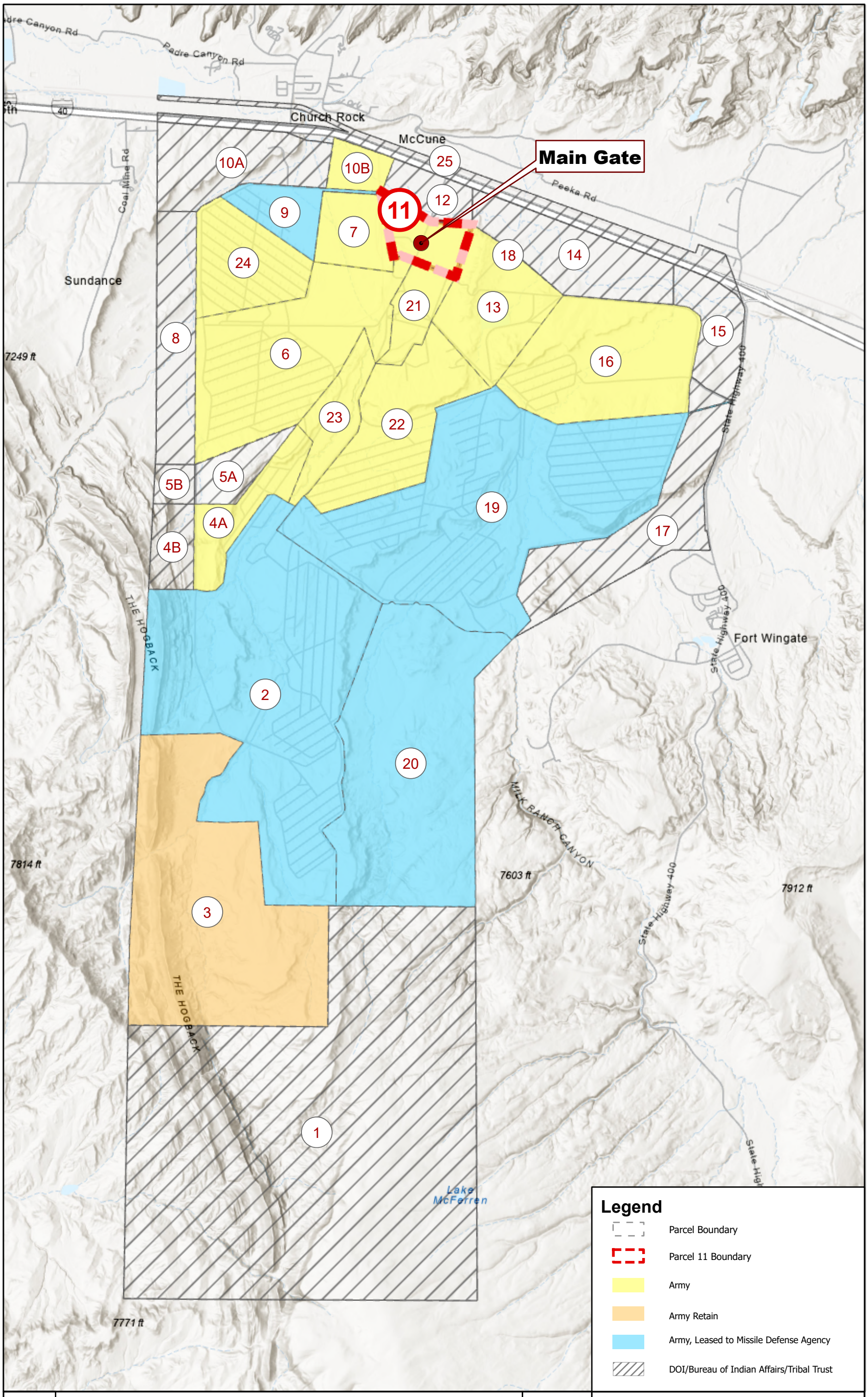


| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | | | |
| Notes | MEC Investigation Work Plan, Parcel 11, Fort Wingate Depot Activity, McKinley County, New Mexico | | | |
| Revised | 5/13/2024 | GIS by | AM | 5/13/2024 |
| Scale | 1:50,000 | Checked by | JB | 5/13/2024 |
| Basemap: Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, | | CR | CR | 5/13/2024 |

FIGURE 1.2

# Parcel Map

Path: C:\Users\p002696f\Projects\US_Army\Maps\Working\US_Army_MMRP_Parcel11_ForMEC_.aprx

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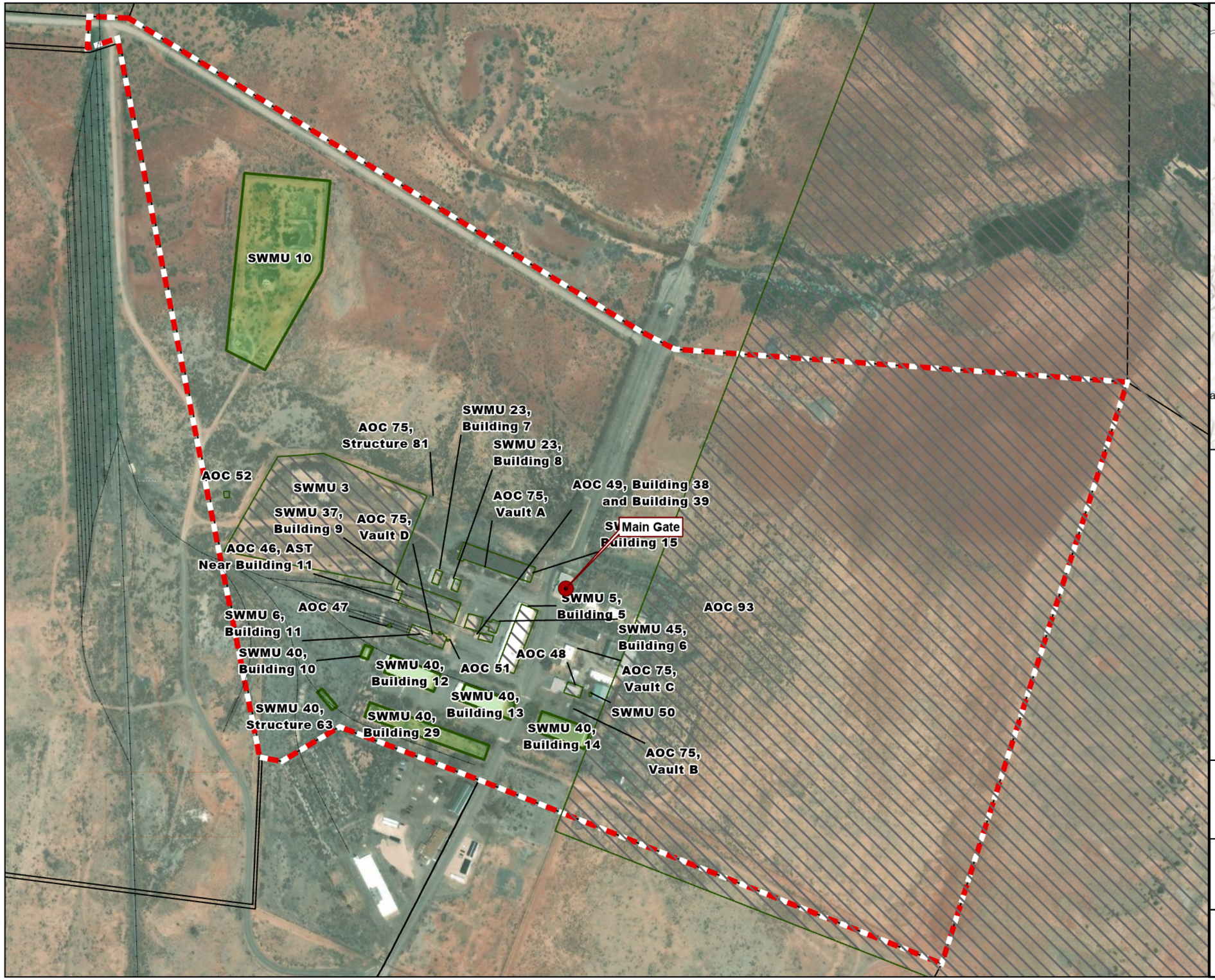


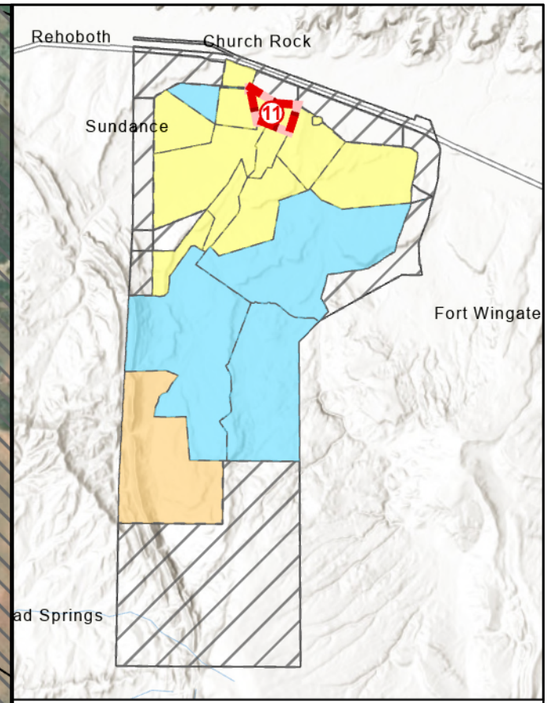


## Legend

- AOC/SWMU Boundary
- AOC/SWMU Boundary (not addressed in this Parcel 11 Phase 2 Work Plan)
- Parcel 11 Boundary

0 250 500 Feet

N

MEC Investigation Work Plan, Parcel 11,
Fort Wingate Depot Activity,
McKinley County, New Mexico

# FIGURE 1.3

**AOC/SWMU Boundaries**

| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | GIS by | AM | 10/8/2024 |
| | | Checked by | JB | 10/8/2024 |
| | | PM | CR | 10/8/2024 |

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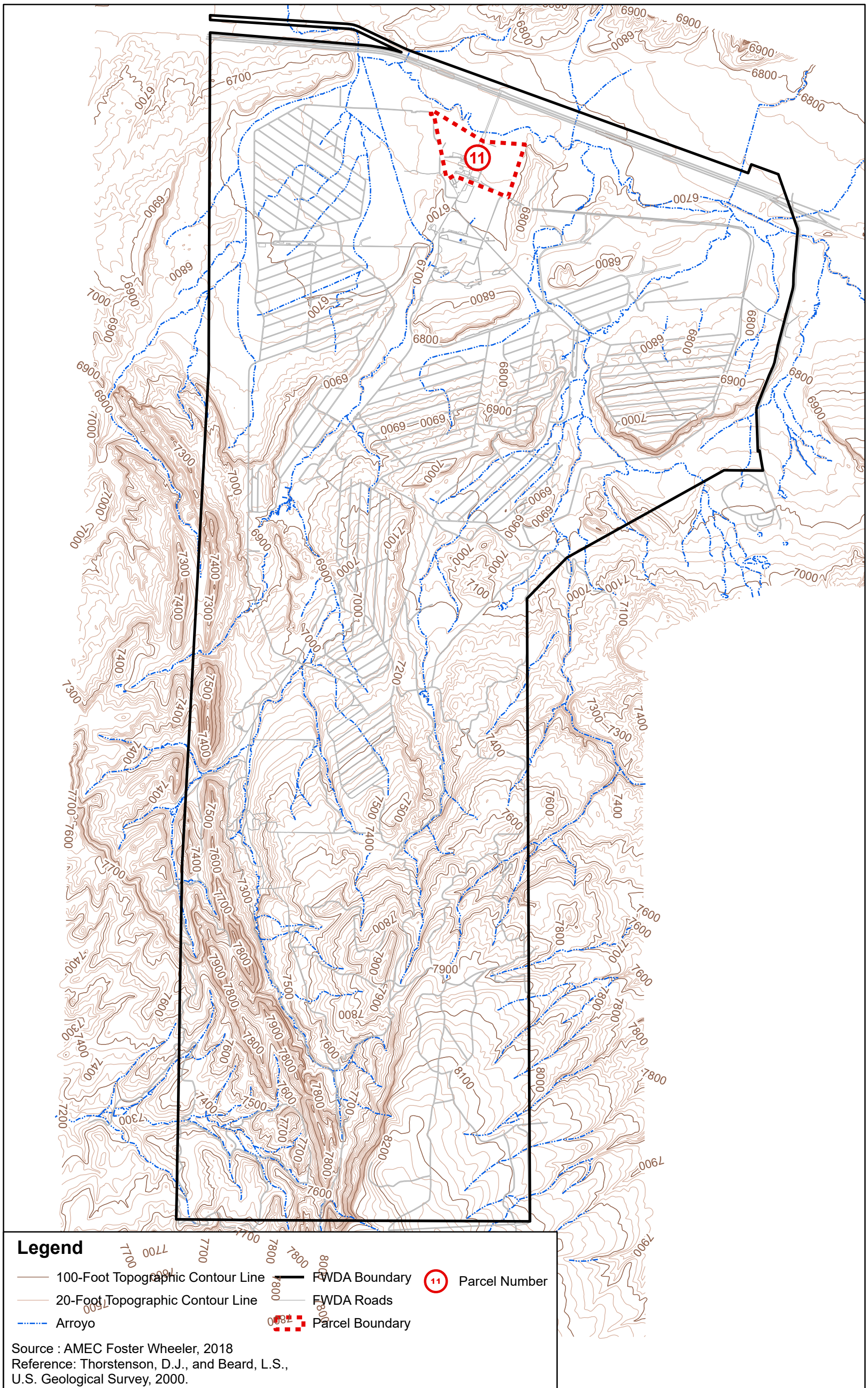


| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | | | |
| Notes | MEC Investigation Work Plan, Parcel 11, Fort Wingate Depot Activity, McKinley County, New Mexico | | | |
| Revised | 4/8/2024 | GIS by | AM | 4/8/2024 |
| Scale | 1:50,000 | Checked by | LR | 4/8/2024 |
| Source: Amec Foster Wheeler, 2018 | | PM | CR | 4/8/2024 |

N

# FIGURE 2.1

## Facility-Wide Topographic Map

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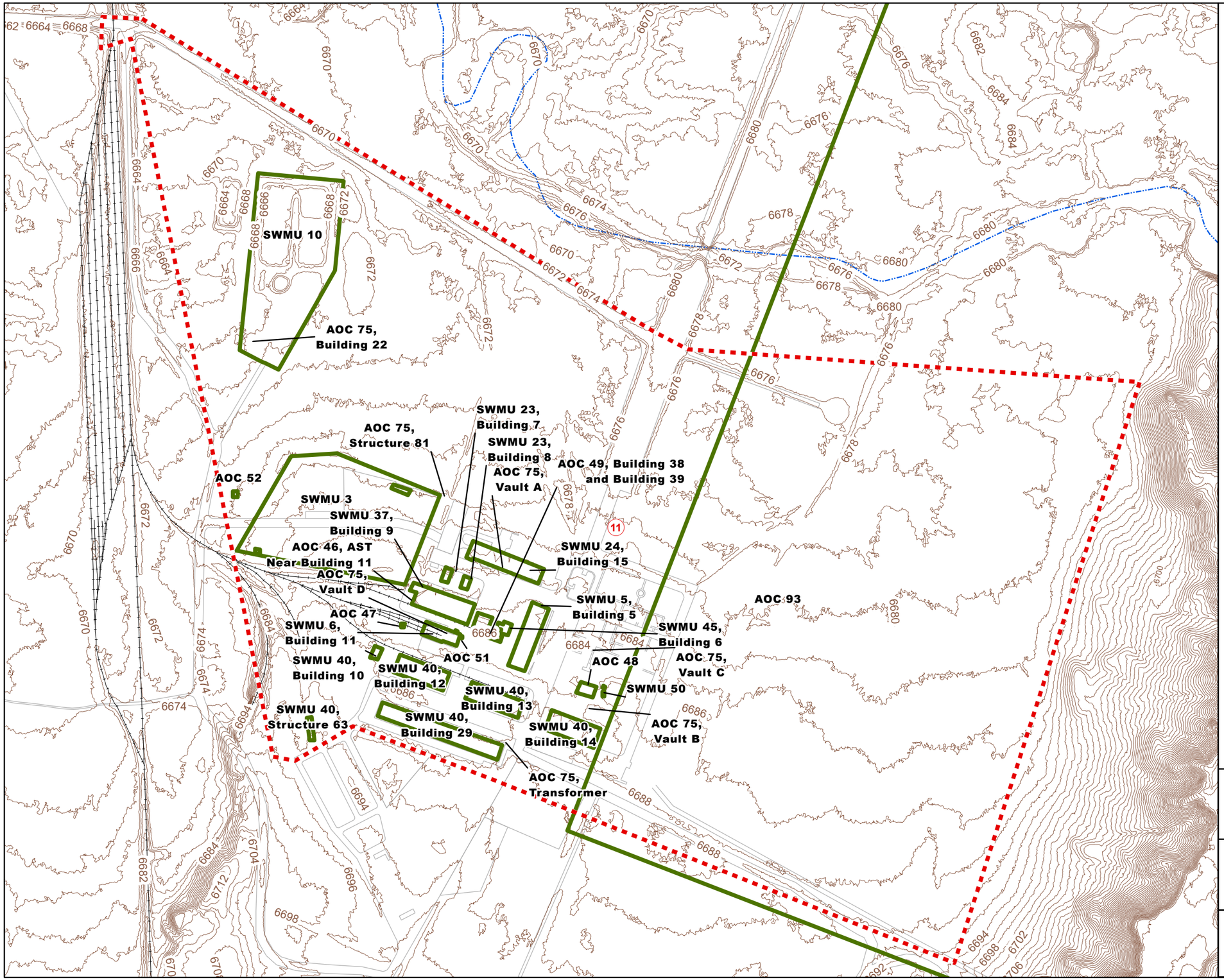


## Legend

- FWDA Railroad
- FWDA Boundary
- 2-Foot Topographic Contour Line
- FWDA Roads
- Arroyo
- Parcel Number
- Parcel 11 Boundary
- AOC/SWMU Boundary

Notes:

AOC= Area of Concern
SWMU = Solid Waste Management Unit

Source : AMEC Foster Wheeler, 2018
Reference: Thorstenson, D.J., and Beard, L.S., U.S. Geological Survey, 2000.

N

0 125 250 Feet

MEC Investigation Work Plan, Parcel 11,
Fort Wingate Depot Activity,
McKinley County, New Mexico

# Figure 2.2

**Parcel 11**
**Topographic Map**

| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | GIS by | AM | 5/13/2024 |
| | | Checked by | JB | 5/13/2024 |
| | | PM | CR | 5/13/2024 |

Path: C:\Users\p002696f\Projects\US_Army\Maps\Working\US_Army_MMRP_Parcel11_NativeFiles.aprx

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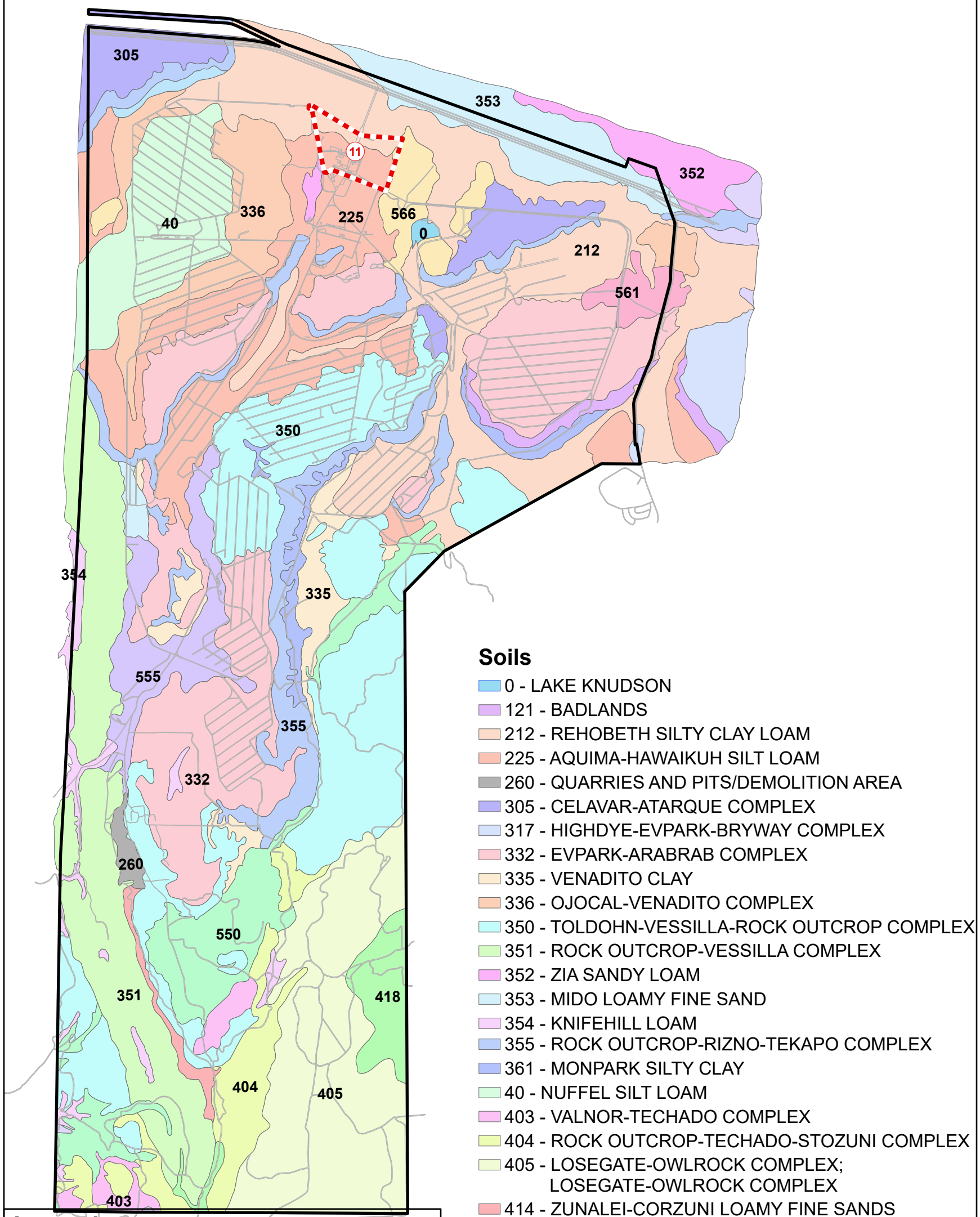


| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | | | |
| Notes | MEC Investigation Work Plan, Parcel 11, Fort Wingate Depot Activity, McKinley County, New Mexico | | | |
| Revised | 4/8/2024 | GIS by | AM | 4/8/2024 |
| Scale | 1:56,560 | Checked by | LR | 4/8/2024 |
| Source: Amec Foster Wheeler, 2018 | | PM | CR | 4/8/2024 |

N

# FIGURE 2.3

## Facility-Wide Soils Map

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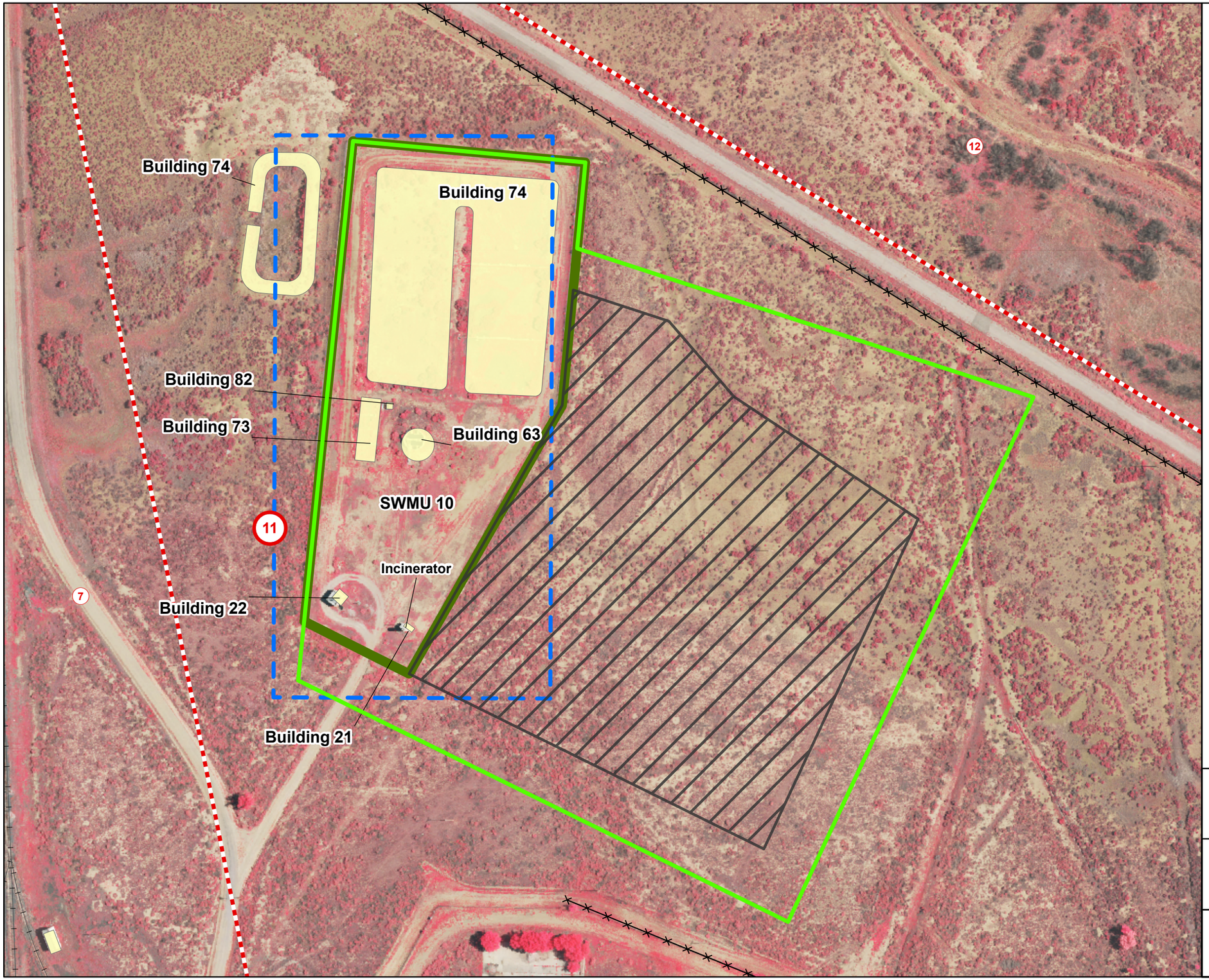


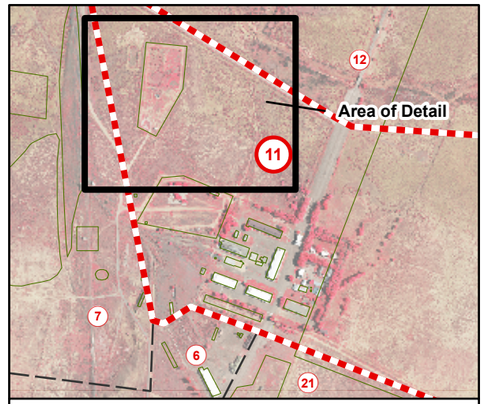


Parcel 11 Detail

**Legend**

- Structure
- 1993 and 1996 Document Incinerator Clearances (Approximate)
- 2009 EM61 Survey Boundary
- Proposed Investigation Area
- SWMU 10 (coincident with STP fence line)
- Parcel 11 Boundary
- Parcel Boundary
- Railroad
- FWDA Fence

Note:

SWMU = Solid Waste Management Unit

0 125 250 Feet

N

MEC Investigation Work Plan, Parcel 11,
Fort Wingate Depot Activity,
McKinley County, New Mexico

Figure 3.1

**SWMU 10 Previous and Proposed Investigation Boundaries**

| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | GIS by | AM | 5/13/2024 |
| | | Checked by | JB | 5/13/2024 |
| | | PM | CR | 5/13/2024 |

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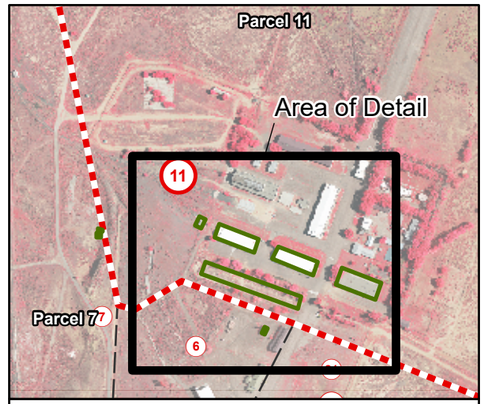


**SWMU 40 Overview**

**Legend**

- Structure
- Proposed Investigation Area
- Previous Investigation Area
- SWMU 40
- Parcel 11 Boundary
- Parcel Boundary
- Railroad

Note:

SWMU = Solid Waste Management Unit

0 100 200 Feet

N

MEC Investigation Work Plan, Parcel 11,
Fort Wingate Depot Activity,
McKinley County, New Mexico

# Figure 4.1

**SWMU 40 Structures**

| | | | | |
|---|---|---|---|---|
| Client | USACE, Albuquerque District | GIS by | AM | 5/13/2024 |
| | | Checked by | LR | 5/13/2024 |
| | | PM | CR | 5/13/2024 |

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