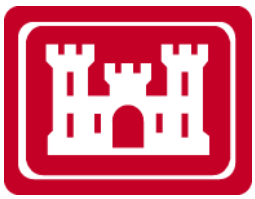
Final
Northern Area
Supplemental Soil, Sediment, and Surface Water Parameter Study Work Plan

Fort Wingate Depot Activity
McKinley County, New Mexico

August 28, 2026

Contract No.: W912PP22D0014
Task Order: W912PP23F0040

Prepared for:



U.S. Army Corps of Engineers,
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, NM 87109-3435

Prepared by:

Parsons
999 18th St., Suite 1555N
Denver, CO 80202

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Dr. Steve Rembish
Jeremy Fontaine
Elizabeth Kneebone

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Parsons Government Services, Inc.
999 18th St., Suite 1555N
Denver, CO 80202

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United States Army Corps of Engineers, Albuquerque District
4101 Jefferson Plaza NE
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Project Manager: Alan Soicher, PG (CESPA)

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Final Northern Area Supplemental Soil, Sediment, and Surface Water Parameter Study Work Plan

Fort Wingate Depot Activity, McKinley County, NM

40 CFR 270.11

August 2026

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Cheryl Frischkorn

Ms. Cheryl Frischkorn
Base Realignment and Closure (BRAC), Environmental Coordinator
Fort Wingate Depot Activity, BRAC Directorate

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Denver, CO 80202

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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
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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ACRONYMS AND ABBREVIATIONS

%	Percent
°C	Degree(s) Celsius
±	plus or minus
%R	percent recovery
amsl	above mean sea level
AEC	Anion Exchange Capacity
AOC	Area of Concern
APP	Accident Prevention Plan
ASTM	American Society for Testing and Materials
BIA	Bureau of Indian Affairs
BIA NRO	Bureau of Indian Affairs – Navajo Regional Office
BEC	BRAC Environmental Coordinator
BOD	Biological Oxygen Demand
BRAC	Base Realignment and Closure
BRACD	BRAC Division
bgs	Below ground surface
CEC	Cation Exchange Capacity
CFR	Code of Federal Regulations
COC	Chain of custody
D	Discrete
DL	Detection Limit
DO	Dissolved oxygen
DoD	United States Department of Defense
DOI	United States Department of the Interior
DPT	Direct push technology
EDD	Electronic data deliverable
EPA	Environmental Protection Agency
°F	Fahrenheit
Fe^{2+}	Ferrous iron
Fe^{3+}	Ferric iron
FWDA	Fort Wingate Depot Activity
GPS	Global Positioning System
HWB	Hazardous Waste Bureau
ID	Identification
IDW	Investigation-derived waste
LCS	Laboratory control sample
LOD	Limit of detection
LOQ	Limit of quantitation
mmhos/cm	Millimhos per centimeter
Mn^{2+}	Manganese(II)
MON	Monsoon
MS	Matrix spike
MSD	Matrix spike duplicate

ACRONYMS AND ABBREVIATIONS (CONTINUED)

N/A	Not applicable
NASP	Northern Area Supplemental Parameters
NM	New Mexico
NMED	New Mexico Environment Department
NN	Navajo Nation
NRCS	Natural Resources Conservation Service
OB/OD	Open Burning/Open Detonation
OH	Ohio
ORP	Oxidation reduction potential
OSHA	Occupational Safety and Health Administration
PDF	portable document format
Permit	RCRA Permit NM 6213820974 for the FWDA
PFAS	Per- and polyfluoroalkyl substances
PPE	Personal protective equipment
PRISM	Parameter-elevation Regressions on Independent Slopes Model
QA	Quality assurance
QC	Quality control
QSM	Quality Systems Manual
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive
RPD	Relative percent difference
SB	soil boring
SD	sediment
SEDD	Staged electronic data deliverable
SO	soil
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SW	Surface water
SWMU	Solid Waste Management Unit
TEAD	Tooele Army Depot
TNT	trinitrotoluene
TOC	Total organic carbon
U.S.	United States
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WSM	Winter Snow Melt

1.0 INTRODUCTION

This Northen Area Supplemental Soil, Sediment, and Surface Water Parameter Study Work Plan (herein referred to as the "Supplemental Parameter Study Work Plan") describes additional investigation activities to be completed in the northern portions of Fort Wingate Depot Activity (FWDA), in McKinley County, New Mexico. The results of the study are to be used to develop supplemental parameter values for various media to further support risk assessment and evaluation of contaminant fate and transport in the Northern Area.

This Work Plan has been prepared by the United States (U.S.) Army Corps of Engineers (USACE) Albuquerque District 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 New Mexico (NM) 6213820974 for the FWDA ("Permit"), which became effective December 31, 2005, and was most recently modified in February 2015 (NMED, 2015).

1.1 PURPOSE AND SCOPE

The purpose of this Supplemental Parameter Study Work Plan is to prepare an investigation to determine representative soil, sediment, and surface water parameters for the Northern Area to supplement future fate/transport evaluations and human health/ecological risk assessments. The purpose of this Work Plan is also to identify and describe the physical characteristics of soil, sediment, and surface water across the Northern Area and is not intended to characterize any chemicals of potential concern. The Work Plan includes field sampling and laboratory analytical methodologies for the study as well as the number, type, and location of samples to be collected.

The scope of the study includes the following:

- Identification of five dominant soil types found within the study area (including Parcels 6, 7, 11, 13, 21, 22, and 23) located in the Northern Area.
- Sampling and analysis of surface and subsurface soils at locations consistent with current (or known) areas of residual soil contamination outside of potential influence of Areas of Concern (AOCs) and Solid Waste Management Units (SWMUs) representative of dominant soil types in the Northern Area.
- Review of surface water drainage patterns and seasonal surface water accumulation areas to determine appropriate locations for sampling.
- Collection and analysis of sediment and surface water samples.
- Preparation of a Supplemental Parameter Study Report that presents the analytical results and assesses soil, sediment, and surface water characteristics. The report will present statistically viable parameter values for soil based on dominant soil types, and also for sediment and surface water.

1.2 FACILITY INFORMATION

FWDA is located eight miles east of Gallup in McKinley County, New Mexico. Access to FWDA is located south of Interstate 40 (**Figure 1.1**). The FWDA 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** shows the study area for this investigation.

1.3 REPORT ORGANIZATION

Section 1.0 is an introduction to this Work Plan, **Section 2.0** provides background information for the study area, **Section 3.0** describes the proposed sampling strategy, and **Section 4.0** provides details on the investigation methods, **Section 5.0** describes the data reporting, **Section 6.0** provides the schedule, and **Section 7.0** includes the references used in this Work Plan.

2.0 BACKGROUND

This section provides a general description of FWDA and site conditions.

2.1 SITE DESCRIPTION AND OPERATIONAL HISTORY

The FWDA 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 almost entirely surrounded by federally owned or administered lands, including both national forest and tribal lands. The installation can be divided into several sub areas based on their location and historical land use. The major land use areas of the FWDA installation 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 – encompassing approximately 700 acres to the 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 FWDA installation ("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 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.

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 U.S. DOI.

2.2 SITE CONDITIONS

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 semi-arid continental climate, and alternates seasonally and topographically from hot and dry, to cool and wet. The annual total precipitation (rainfall and melted snow) over the last twenty years (Parameter-elevation Regressions on Independent Slopes Model **[**PRISM] data is only available through 2025) has ranged from 6.62 inches to 13.9 inches (PRISM Group, Oregon State University, 2026). Most precipitation occurs during monsoon season from July through October, with minimal precipitation in the spring and late fall. The 30-year monthly normals (1991-2020) data shows precipitation peaking at 1.95 inches in August (PRISM Group, Oregon State University, 2026).

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 2025 was recorded in July as 87.2 degrees Fahrenheit (°F), with the lowest temperature recorded in January as 9.9°F (PRISM Group, Oregon State University, 2026). Temperature fluctuations within FWDA can also vary from sunrise to sunset as much as 20°F, particularly in the late winter to early spring months.

2.2.2 Topography and Surface Water

Topography and surface water features of the study area are shown on **Figure 2.1**. Topographically, FWDA may be divided into three areas: (1) the rugged north-to-south trending Hogback along the western and 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 into 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 (amsl) in the south to 6,660 feet amsl 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.

Surface runoff during rainfall/snowmelt events collects in arroyos or roadside ditches that flow only during precipitation events or pools locally in low areas where it evaporates or infiltrates. No perennial surface water bodies exist within the study area.

Lake Knudson, located within Parcel 13, historically held water following the construction of dams between 1948 and 1952 on the north side of the site to retain the runoff from arroyos carrying drainage from Igloo Blocks D, E, F, G, K, and the area east of Igloo Block J. Lake Knudson is slowly reverting to natural conditions which substantially reduces the inflow causing it to be dry most of the time. Lake Knudson may be dry for consecutive years. Ephemeral surface water is occasionally present during and immediately following heavy precipitation events.

2.2.3 Soil Types

The soils found on the installation are typical of those 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 either outcrops at the surface or is encountered at very shallow depths across more than 25 percent (%) of the installation area. A Soil Survey Map for the study area is presented on **Figure 2.2**. Soil types on **Figure 2.2** and in **Table 2.1** are identified by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Map Unit (e.g., 212) and Unit Name (e.g., Rehobeth Silty Clay Loam).

As shown in **Table 2.1**, the NRCS soil units found in the study area are the Aquima-Hawaikuh complex (Map Unit 225), the Rehobeth silty clay loam (Map Unit 212), the Nuffel-Venadito complex (Map Unit 336), the Evpark-Arabrab complex (Map Unit 332), the Breadsprings and Nahodish soils (Map Unit 240), the Bamac extremely gravelly sandy loam (Map Unit 566), the Rizno-Tekapo rock outcrop complex (Map Unit 355), the Toldohn-Vessilla rock outcrop complex (Map Unit 350), the Zia sandy loam (Map Unit 352), and the Celavar-Atarque complex (Map Unit 305).

The five dominant soil units considered for this study (**Table 2.1**) are the Aquima-Hawaikuh complex (Map Unit 225), the Rehobeth silty clay loam (Map Unit 212), the Nuffel-Venadito complex (Map Unit 336), the Evpark-Arabrab complex (Map Unit 332), and the Bamac extremely gravelly sandy loam (Map Unit 566). Each soil type considered for this study area is described fully in the following subsections.

2.2.3.1 Aquima-Hawaikuh Complex (Map Unit 225)

The Aquima-Hawaikuh complex is present throughout the study area (NRCS, 2005). The complex comprises native soils likely overlain by non-native fill material within the administration area of Parcel 11.

The Aquima-Hawaikuh complex is composed primarily of the Aquima and Hawaikuh soils (41% and 40%, respectively), and a variety of minor components (19%) including Venadito, Tintero, and Mido soils. Aquima soils occur in upland stream terraces and alluvial fans, and are a product of fan alluvium over stream alluvium derived from sandstone and shale. The typical profile associated with Aquima soils is:

- 0 to 11 inches: silt loam
- 11 to 17 inches: sandy clay loam

- 17 to 49 inches: silt loam
- 49 to 65 inches: gravelly clay loam

Aquima soils are well drained with low runoff and are classified as non-saline to very slightly saline (0.0 to 2.0 millimhos per centimeter [mmhos/cm]).

Hawaikuh soils occur in upland stream terraces and fan remnants, and like Aquima soils, are a product of fan alluvium over stream alluvium derived from sandstone and shale. The typical profile associated with Hawaikuh soils is:

- 0 to 3 inches: silt loam
- 3 to 12 inches: silty clay loam
- 12 to 29 inches: clay loam
- 29 to 39 inches: sandy clay loam
- 39 to 54 inches: sandy loam
- 54 to 65 inches: silty clay loam

Hawaikuh soils are well drained with medium runoff and are classified as non-saline to slightly saline (0.0 to 4.0 mmhos/cm).

2.2.3.2 Nuffel-Venadito Complex (Map Unit 336)

The Nuffel-Venadito complex is composed primarily of the Nuffel and Venadito soils (45% and 35%, respectively), and a variety of minor components (20%) including Aquima, Hawaikuh, Penistaja, and Escawetter soils. Nuffel soils occur in flood plains on valley floors, and are a product of stream alluvium derived from shale and siltstone (NRCS, 2005). The typical profile associated with Nuffel soils is:

- 0 to 2 inches: silt loam
- 2 to 10 inches: sandy loam
- 10 to 17 inches: silt loam
- 17 to 20 inches: loam
- 20 to 47 inches: silty clay loam
- 47 to 65 inches: silty clay

Nuffel soils are well drained with low runoff and are classified as non-saline to very slightly saline (0.0 to 2.0 mmhos/cm).

Venadito soils occur in uplands as swales, depressions, and flood plains on valley floors, and as alluvial fans on valley sides. They are a product of fan alluvium over stream alluvium derived from shale. The typical profile associated with Venadito soils is:

- 0 to 9 inches: clay
- 9 to 11 inches: silty clay
- 11 to 65 inches: clay

Venadito soils are well drained and belong to Hydrologic Soil Group D with very high runoff potential. They are classified as non-saline to slightly saline (0.0 to 4.0 mmhos/cm).

2.2.3.3 Rehobeth Silty Clay Loam (Map Unit 212)

The Rehobeth silty clay loam unit is composed primarily of Rehobeth soils (90%) and a variety of minor components (10%) including Nuffel, Zia, and Aquima soils. Rehobeth soils occur in valley flood plains and stream terraces, and are a product of stream alluvium derived from gypsum (NRCS, 2005). The typical profile associated with Rehobeth soils is:

- 0 to 5 inches: silty clay loam
- 5 to 80 inches: clay

Rehobeth soils are well drained and belong to Hydrologic Soil Group C with slow infiltration rates and higher run-off rates. They are classified as very slightly saline to moderately saline (2.0 to 8.0 mmhos/cm).

2.2.3.4 Evpark-Arabrab Complex (Map Unit 332)

The Evpark-Arabrab complex is a shallow soil complex composed primarily of the Evpark and Arabrab soils (50% and 40%, respectively), with two minor components (10%) – the Parkelei and Highdye soils (NRCS, 2005). Evpark soils occur on upland cuestas and mesas, and the parent materials are the mudstones, siltstones and minor interbedded sandstones of the underlying Triassic Painted Desert Member of the Petrified Forest Formation (Chinle Group) (Anderson et al., 2003). The typical profile associated with Evpark soils is:

- 0 to 2 inches: fine sandy loam
- 2 to 9 inches: loam
- 9 to 36 inches: clay loam
- 36 to 40 inches: bedrock

Evpark soils are shallow and well drained with moderately high runoff potential.

Arabrab soils, like Evpark soils, occur on upland cuestas and mesas, but are a product of eolian deposits and slope alluvium over residuum weathered from sandstone. The typical profile associated with Arabrab soils is as follows:

- 0 to 2 inches: gravelly fine sandy loam
- 2 to 7 inches: sandy clay loam
- 7 to 12 inches: clay loam
- 12 to 17 inches: gravelly clay loam
- 17 to 20 inches: bedrock

Arabrab soils are very shallow and well drained with high runoff potential and are classified as non-saline to very slightly saline (0.0 to 2.0 mmhos/cm).

2.2.3.5 Bamac Extremely Gravelly Sandy Loam (Map Unit 566)

The Bamac extremely gravelly sandy loam unit is composed primarily of Bamac soils (90%), with two minor components (10%) – the Royosa and Plumasano soils (NRCS, 2005). Bamac soils occur in upland ridges and hills, and the parent material is predominantly from the minor interbedded

sandstones of the underlying Triassic Painted Desert Member of the Petrified Forest Formation (Chinle Group) (Anderson et al., 2003). The typical profile associated with Bamac soils is as follows:

- 0 to 2 inches: extremely gravelly sandy loam
- 2 to 8 inches: gravelly sandy loam
- 8 to 30 inches: extremely gravelly coarse sand
- 30 to 63 inches: very cobbly coarse sand

Bamac soils are excessively drained with high infiltration rates and low runoff potential. They are classified as non-saline to very slightly saline (0.0 to 2.0 mmhos/cm).

3.0 PROPOSED SAMPLING STRATEGY

The five dominant soil types encountered in the Northern Area will be sampled as part of this study; these are the Aquima-Hawaikuh complex (Map Unit 225), the Rehobeth silty clay loam (Map Unit 212), the Nuffel-Venadito complex (Map Unit 336), the Evpark-Arabrab complex (Map Unit 332), and the Bamac extremely gravelly sandy loam (Map Unit 556). Co-located surface water and sediment samples will be collected as well.

In order to obtain an accurate representation of naturally occurring conditions, soil sampling locations are restricted to areas outside of known contamination (AOCs, SWMUs) and their immediate vicinity. In addition, sampling locations were conservatively selected to avoid areas within the mapped extent of nitrate, perchlorate, Royal Demolition Explosive (RDX), and volatile organic compound (VOCs) contamination in alluvial groundwater, as indicated by the plume contours on **Figure 3.1**. While shallow soils (0 to 10 feet) are unlikely to be impacted by deeper groundwater contamination, this approach ensures that the resulting dataset is broadly accepted as representative of background conditions and is not subject to questions regarding potential influence from site-related releases.

The soil types of the proposed samples will match the soil types of nearby SWMUs/AOCs, when possible, such that the data can be correlated to the SWMUs/AOCs. If soils or sediments show staining, odor, or debris indicating potential contamination impacts, the sample location will be adjusted to the next nearest undisturbed area, and the location deviation will be documented in the Supplemental Parameter Study Report.

Co-located surface water and sediment samples will be collected along the arroyos and in Lake Knudson, located in Parcel 13.

Analytical methods and any applicable sample containers, preservation, and holding times are listed in **Table 3.1**.

3.1 SOIL SAMPLES

To properly classify soils present in known areas of contamination, the five dominant soil units found within the study area (USDA NRCS Soil Map Units 212, 225, 332, 336, and 566, as described in **Section 2.2.3**) will be sampled and analyzed as outlined below. A total of 120 discrete soil samples will be collected at the following depth intervals:

- 0.0 to 1.0 foot below ground surface (bgs),
- 1.0 to 2.0 feet bgs,
- 4.0 to 5.0 feet bgs, and
- 9.0 to 10.0 feet bgs.

As described in **Section 4.9**, the location of each sample collected will be surveyed using a Global Positioning System (GPS). Soil samples will be analyzed for the following parameters:

- pH (via SW9045D),
- Fe^{2+} (Ferrous iron) (via SM3500_FE_B) and Fe^{3+} (Ferric iron) (via SM3500_FE_D),
- Anion Exchange Capacity (AEC, via SW9056A),

- Cation Exchange Capacity (CEC, via SW9081),
- Total Organic Carbon (TOC, via SW9060A),
- Biological Oxygen Demand (BOD, via SM5210B), and
- Grain size (via American Society for Testing and Materials [ASTM] D6913, D7928-17, or equivalent method: 3/8", 3/4", 1.0", 1.5", 2.0", 3.0", #4, #10, #20, #40, #60, #80, #100, #200 sieves and a 151H hydrometer).

Grain size is proposed for a reduced number of samples (**Table 3.2**). The proposed sample identifications (IDs), Map Unit/Soil Type, and required analyses for all soil boring samples are presented in **Table 3.2**. Proposed soil sampling locations are presented in **Figure 3.1**.

3.2 SURFACE WATER SAMPLES

Surface water samples will be retrieved from Lake Knudson and from arroyos throughout the Northern Area. Sampling will be conducted during both the summer monsoon season (25 samples) and the winter snow melt season (25 samples). The monsoon season typically occurs between early July and September, with peak activity between July and August (National Weather Service, 2026). The summer monsoon season samples will be collected during the months of July through September following a rain event. The winter snow melt samples will be collected during the spring when the accumulated snow begins to melt.

At each sample location, grab surface water samples will be collected at the water's edge. Sampling will be performed deliberately and methodically to minimize disturbance of bottom sediments, and as quickly as possible to ensure a representative sample is collected. As described in **Section 4.9**, the location of each sample collected will be surveyed using a GPS.

Surface water samples will be analyzed for the following parameters:

- pH (via SW9040C),
- Hardness (via SM2340C),
- Major Anions (Bromide, Chloride, Fluoride, Nitrate and Nitrate as N, Sulfate, Orthophosphate as P, via SW9056A),
- Fe^{2+} (using a Hach field test kit FerroVer® Iron Reagent, via Hach Method 8008) and Mn^{2+} (ManganeseII) (using a Hach field test kit Manganese Reagent Set High Range, via Hach Method 8034),
- Alkalinity (via SM2320B),
- Total dissolved solids (via SM2540C),
- Total dissolved organic carbon (via SW9060A), and
- Total suspended solids (via SM2540D).

Additional water quality parameters, including oxidation reduction potential (ORP), pH, conductivity, temperature, dissolved oxygen (DO), and turbidity will be measured in the field as described in **Section 4.3.1**.

The proposed sample IDs and required analyses for the two surface water sampling events are presented in **Table 3.3**. Proposed surface water sampling locations across the study area for the monsoon and winter snow melt seasons are presented in **Figure 3.2**.

3.3 SEDIMENT SAMPLES

Sediment grab samples shall be co-located with the surface water samples. Sampling will be spread over two events; the summer monsoon season (25 samples), and the winter snow melt season (25 samples). Sediment samples will be collected from a nominal 0 to 6-inch depth interval with a decontaminated stainless-steel or disposable spoon/trowel/scoop or sediment corer per **Section 4.4.1**. Co-located surface water/sediment sample locations may be shifted in the field to near the water edge.

Sediment samples will be analyzed for:

- pH (via SW9045D),
- Fe^{2+} (via SM3500_FE_B) and Fe^{3+} (via SM3500_FE_D),
- AEC (via SW9056A),
- CEC (via SW9081),
- TOC (via SW9060A),
- BOD (via SM5210B), and
- Grain size (via ASTM D6913, D7928-17, or equivalent method: 3/8", 3/4", 1.0", 1.5", 2.0", 3.0", #4, #10, #20, #40, #60, #80, #100, #200 sieves and a 151H hydrometer).

The proposed sample IDs and required analyses for the sediment sampling locations co-located with the surface water sampling locations are presented in **Table 3.4**. Proposed sediment sampling locations across the study area for the monsoon and winter snow melt seasons are also presented in **Figure 3.2**.

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4.0 DESCRIPTION OF INVESTIGATION ACTIVITIES

This section provides general information regarding the planned field activities to be completed as part of this Work Plan.

4.1 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 sampling activities 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 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 Activity Hazard Analyses 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. A dedicated Site Safety and Health Officer (SSHO) will be on site during all field activities associated with implementation of this Work Plan. The SSHO will be responsible for conducting site-specific training, daily tailgate safety meetings, and periodic safety inspections.

The SSHO will also be responsible for ensuring site monitoring, worker training, and effective selection and use of PPE. The SSHO will have completed the Occupational Safety and Health Administration (OSHA) 30-hour Construction Safety Course prior to being tasked to fill the position.

4.2 SOIL SAMPLING AND ANALYSIS

4.2.1 Surface Soil Sampling

Surficial soil samples from the 0.0 to 1.0 foot depth interval may be collected using a decontaminated stainless-steel spoon or hand auger, or disposable plastic trowel.

The field team will transfer the sample from the spoon, auger bucket, or trowel into a new, clean plastic bag and mix the combined soil thoroughly to ensure a representative sample. The field team will collect suitable quantities with the approved sampling tool and transfer directly into the laboratory supplied clean containers with a moisture-tight lid (or a re-sealable plastic bag for grain size samples).

4.2.2 Subsurface Soil Sampling

The condition of all drilling, sampling, and support equipment used for subsurface soil sampling associated with the investigation and the equipment cleaning procedures will be the same as defined in **Section 4.2.3**. Shallow subsurface samples (1.0 to 2.0 feet) may be collected using a decontaminated hand auger. Deeper subsurface samples will be collected using direct-push technology (DPT) or hollow-stem auger equipment utilizing decontaminated split spoons or

continuous samplers, as appropriate. All boreholes will have a complete record of borehole information as described in **Section 4.7.3**.

4.2.2.1 Direct Push or Hand Auger Method for Subsurface Soil

This section provides procedures for subsurface soil sampling using a DPT type rig (e.g., Geoprobe®) or hand auger. If a DPT rig is used, it shall be operated by a driller with a New Mexico Well Drilling license.

To collect soil samples, the following procedure will be used:

1. Spread clean plastic sheeting on the ground or on a table at each sampling location to keep sampling equipment clean and prevent cross-contamination.
2. Advance the hand auger or DPT tool to the desired sample depth.
3. Collect the sample using an approved sampling tool (e.g., stainless-steel or disposable spoon, trowel, or scoop) and scoop the soil from the auger bucket, plastic sheeting, or acetate liner from the DPT rig at the required depth range. For hand auguring, use a new, clean auger bucket or piece of plastic sheeting once the top of each sampling depth is reached.
4. Transfer the sample from the spoon or trowel into a new plastic bag and mix the combined soil thoroughly to ensure a representative sample. Remove roots and vegetation.
5. Collect suitable quantities with the approved sampling tool and transfer directly into the laboratory supplied clean containers with a moisture-tight lid (or a re-sealable plastic bag for grain size samples).
6. Repeat these steps as necessary to obtain sufficient sample volume.
7. When sample containers are filled, secure the caps tightly on the containers. Labels or custody seals will seal lids to prevent tampering.
8. The sample containers will then be placed into a cooler with ice and cooled to less than or equal to 6 degrees Celsius (°C) (if required by sample preservation method).
9. After sampling is completed, backfill the borehole with remaining soil and hydrated bentonite chips to grade.

4.2.2.2 Hollow-Stem Auger Method for Subsurface Soil

If DPT rigs are not available, or cannot achieve the desired drilling depths, the hollow-stem auger method will be used. Soil drilling using the hollow-stem auger method will be accomplished using an auger rig of sufficient size and power to advance augers to the required drilling depth. The auger rig will be operated by a driller with a New Mexico Well Drilling license.

The Sampling Team shall complete the following steps to collect soil samples:

1. Spread clean plastic sheeting on the ground or table at each sampling location to keep sampling equipment clean and prevent cross-contamination.
2. When drilling investigation boreholes, the lead hollow-stem auger will be advanced to the top of the soil interval to be sampled.

3. The selected soil sampling device then will be inserted into the auger string and advanced to the bottom of the soil interval. When using a split-spoon sampler, this device will be advanced to the required depth using a 63.5-kilogram (140-pound) hammer or continuously advanced with the auger string. When using a split-barrel sampler, this device will be hydraulically pushed to the required depth. Samplers used in non-cohesive soils may require the use of a decontaminated catch basket inserted into the shoe of the sampler to obtain recovery. A clean sampling device will be used to collect soil core from each sampled interval of the investigation boreholes.
4. Upon retrieval of the sampling device, the percentage of recovery will be recorded and the contained soil core will be split in half, lengthwise, using a stainless-steel knife. Samples designated for laboratory analysis will be collected from the core using a stainless-steel scoop.
5. Immediately after discrete samples are collected and bottles are labeled, each sample container will be placed into a sealable plastic bag and then placed into an ice-filled cooler to ensure preservation (if required by sample preservation method).
6. After soil samples are collected (to preserve sample integrity), the remaining lithologic samples will be fully described. Log the soils from the soil core on a soil boring log, noting soil recovery, soil characteristics, and visual or olfactory signs of contamination. After the contents of the sampler are measured, sampled, and described, the core will be discarded and handled as investigation-derived waste (IDW) as described in **Section 4.12**.
7. All borings will be abandoned by pouring grout into the boring until grout flows from the boring at ground surface. Grout will be composed of 20 parts cement (Portland cement, Type II or V), up to one part bentonite, and a maximum of 8 gallons of approved water per 94-pound bag of cement.

4.2.3 Soil Sampling Equipment Decontamination Procedures

Core barrels will be decontaminated before each sample is collected using potable or distilled water and per- and polyfluoroalkyl substances (PFAS)-free detergent followed by a deionized water rinse. Prior to advancing each borehole, drill tooling including rods, drive casing, and core barrels will be decontaminated using a high-pressure power washer. Water generated during decontamination of drill tooling and sampling equipment will be managed as IDW, as described in **Section 4.12**. Stainless-steel spoons will be decontaminated using PFAS-free detergent and potable or distilled water followed by a rinse with deionized water before each sample is collected.

4.3 SURFACE WATER SAMPLING AND ANALYSIS

This section provides general information regarding the methods that will be employed for surface water sampling activities to be completed during site activities. The analytical methods, sample containers, preservatives, and holding times are summarized in **Table 3.1**. The following subsections provide details regarding sample collection and management.

4.3.1 Surface Water Sampling

Surface water sampling will be performed beginning at downstream locations and proceeding to upstream locations to avoid potentially contaminating subsequent samples. At each sampling location, grab surface water samples will be collected at the water's edge from outside of the

waterbody, either by directly dipping sample containers wherever practical (e.g., at the edge of Lake Knudson) or by using a standard dipping pole and cup wherever direct dipping is impractical (e.g., from the bank of an arroyo). Due to safety concerns, field personnel will not enter either waterbody to collect surface water samples for this study. Sampling will be performed deliberately and methodically to minimize disturbance of bottom sediments, and as quickly as possible to ensure a representative sample is collected. After the surface water sample is collected, a Hach field test kit will be used, followed by collection of water quality parameters, including ORP, pH, conductivity, temperature, DO, and turbidity using a water quality meter (e.g., YSI 556 and separate turbidity meter such as a Hach 2100 or LaMotte 2020 handheld or similar equipment); these results will be recorded in the field logbook or sampling form. Physical characteristics of the sampling locations (e.g., water depth, presence of sheen) will be documented. Additionally, a photograph will be taken at each location.

The Sampling Team shall complete the following steps to collect surface water samples:

1. Surface water samples will be collected either:
   A. At locations where direct dipping of sample containers is practical and safe (e.g., at the edge of Lake Knudson):
      - With minimal surface disturbance, submerge an empty, unpreserved sample container into the middle of the water column and fill the container. If all sample containers in a set happen to be unpreserved, simply repeat this step until all containers are filled. Otherwise, samples should be transferred from the unpreserved container to preserved containers until all containers are filled. Preserved sample containers should not be filled by directly dipping them in the water.

   B. At locations where direct dipping of sample containers is impractical or unsafe (e.g., from the bank of an arroyo):
      - Use a standard sampling dipper cup or ladle equipped with an extension pole or handle. With minimal surface disturbance, submerge the dipper into the water and fill the sample cup. Carefully fill each sample container directly from the dipper cup.

2. Care will be taken not to disturb bottom sediments. Allow the sample container or dipper cup to fill slowly and continuously. If disturbed, wait until the sediment settles.
3. When sample containers are filled, secure the caps tightly on the containers and place them on ice as soon as possible (if required by sample preservation method).
4. Once the sample has been collected, perform the Hach field test kit, and then collect the water quality parameters via a water quality meter. Depending on the depth of the surface water, either:
   - Fill the water quality meter sample cup with surface water, insert the meter bulbs into the cup, and record stabilized parameters, or

- Submerge a water quality meter in the water at the sample location and record the water parameters including ORP, pH, conductivity, temperature, DO, and turbidity.

The following steps shall be completed once surface water sample collection is complete:

1. The Field Team Leader or designee shall label each sample container with the unique Sample ID, date, time, analysis, and other information required on the sample label.
2. The Field Team Leader or designee will confirm the required samples were collected, including necessary quality control (QC) and equipment blank samples.
3. The Field Team Leader or designee shall record the approximate distance from the edge of the water the sample was collected, the approximate depth of the water column at the sample location, and the approximate sample location with GPS coordinates on field sampling forms and in field notebooks.
4. The Sampling Team will decontaminate reusable sampling equipment as described in **Section 4.3.2**.
5. The Field Team Leader or designee shall complete the chain-of-custody (COC) and other required documentation and prepare the sample for shipment.

4.3.2 Surface Water Equipment Decontamination Procedures

Sampling equipment should be thoroughly decontaminated before mobilization to each investigation area and between sample locations at each investigation area. Field sampling equipment and other nondedicated equipment used at each sample location require cleaning between uses.

The following steps must be followed when decontaminating this equipment:

1. Set up a decontamination line on plastic sheeting. The decontamination line should progress from contaminated to clean and end with an area for drying decontaminated equipment. At a minimum, clean plastic sheeting must be used to cover the ground, tables, or other surfaces on which decontaminated equipment is to be placed.
2. Don gloves, boots, goggles, and any other PPE.
3. Wash the item thoroughly in a 5-gallon bucket of phosphate-free and PFAS-free detergent. If possible, disassemble any items that might trap contaminants internally before washing. Do not reassemble until decontamination is complete.
4. Rinse the item in a 5-gallon bucket of potable or distilled water. Rinse water should be replaced as needed, generally when cloudy.
5. Rinse with deionized water.
6. If necessary, wrap clean sampling equipment in plastic or use other protective material, as feasible, to ensure that it does not become contaminated prior to next use.
7. Record the decontamination protocol and the date and time of decontamination in the field logbook.

4.4 SEDIMENT SAMPLING AND ANALYSIS

4.4.1 Sediment Sampling

At each surface water sample location, corresponding sediment samples will be collected from the 0 to 6-inch depth interval using a stainless-steel sediment corer or Petite Ponar grab sampler. Sediment samples may be collected using either method, depending on the depth of water above the sediment and the type of sediment being collected.

4.4.1.1 Hand Corer Method for Sediment

The hand corer method is best suited for the collection of firm and heavily rooted sediment samples (e.g., stiff clays containing significant vegetation) in shallower sample areas. The preferred sampling tool for this method is a stainless-steel sediment corer. Using these corers in conjunction with disposable acetate sleeves is preferred because this facilitates removal of the sample from the corer, though use of the sleeve is not required.

The Sampling Team shall complete the following steps to collect sediment samples using the hand corer method:

1. Gently push the corer into the sediment with a smooth continuous motion to a depth of approximately 6 inches.
2. Twist the corer to detach the sample and then withdraw the corer in a single smooth motion.
3. Remove the top of the corer and slowly decant excess water; however, take care to avoid the loss of collected fine sediment.
4. Remove the nosepiece and deposit the sample into a new clean plastic bag.
5. Decant again, if necessary, again taking care to avoid the loss of collected fine sediment.
6. Log or describe the sediment sample prior to homogenization.
7. Homogenize the sample.
8. Transfer the sample from the plastic bag into sample containers. Excess root/vegetation will be removed from the plastic bag prior to placement into the sample containers.
9. When sample containers are filled, secure the caps tightly on the containers, ensure that sample labels are completed, and place samples on ice as soon as possible (if required by sample preservation method).

4.4.1.2 Petite Ponar Grab Method for Sediment

The Petite Ponar grab method is a suitable alternative for collecting softer or looser sediments (e.g., silts or sands) with little vegetation, particularly in deeper sample areas.

The Sampling Team shall complete the following steps to collect sediment samples using the Petite Ponar grab method:

1. Prepare the Petite Ponar grab sampler by removing the safety pin lock and inserting the pinch pin. Just before lowering the grab into the water, and with the line taut, remove the safety pin and firmly push the pinch pin in its place. (As long as the line is taut the pinch-pin will stay in place; when the line becomes slack, the pinch-pin spring will pop out of the lever arm holes, allowing the scoops to close.)

2. Slowly lower the grab sampler into the water. When the sampler reaches the sediment, the line slackens and the pinch-pin pops out, allowing the scoops to close.
3. Collect the sediment sample. When the sampler reaches the bottom, allow a moment for it to sink into the sediments. Let the cable go slack, which will release tension on the upper bar and allow the horizontal locking bar to drop out of the locking notch. Now pull up on the cable to exert a closing motion. Maintaining tension on the cable, carefully raise the sampler back to the surface with a steady, relatively slow lift. (Closing should occur over 90% of the time. If it does not, inspect all moving parts for cleanliness and ease of movement. Clean and adjust as necessary.)
4. Remove the sample. When the sampler reaches the surface, lift it clear to a position over a clean tub, bucket, or other container placed to receive the sample. Open the sampler and discharge the sample into the container.
5. Log or describe the sediment sample prior to homogenization.
6. Homogenize the sample.
7. Transfer the sample from the holding container into sample containers. Excess root/vegetation will be removed prior to placement into the sample containers.
8. When sample containers are filled, secure the caps tightly on the containers, ensure that sample labels are completed, and place samples on ice as soon as possible (if required by sample preservation method).

4.4.2 Sediment Sampling Equipment Decontamination Procedures

Non-dedicated sediment sampling equipment will be decontaminated using PFAS-free detergent and potable or distilled water followed by a rinse with deionized water before each sample is collected. Water generated during decontamination of sampling equipment will be managed as IDW as described in **Section 4.12**.

4.5 CHAIN OF CUSTODY

COC forms will be completed for each sample and will accompany each sample at all times. Data on the COC form will include the ID (as described in **Section 4.10**), depth interval, date sampled, time sampled, requested analysis, project name, project number, and signatures of those in possession of the sample. The COC forms will accompany those samples shipped to the designated laboratory so that sample possession information can be maintained. The field team will retain a separate copy of the COC form at the field office. Additionally, the sample ID, date and time collected, collection location, and analysis requested will be documented in the field logbook.

4.6 PACKAGING AND SHIPPING PROCEDURES

Corresponding COC forms will be placed in waterproof bags and taped to the inside of the cooler lids. All coolers will be taped shut and a custody seal will be placed over the tape to prevent tampering.

All samples will be shipped by overnight air freight to the laboratory or hand delivered. Unless otherwise indicated, samples will be treated as environmental samples, shipped in heavy duty coolers, packed in materials to prevent breakage, and preserved with ice in sealed plastic bags.

Each shipment will include the appropriate field QC samples (i.e., duplicates and rinsates) which are listed in **Table 4.1**.

4.7 SAMPLE DOCUMENTATION

4.7.1 Field Logbook

All information pertinent to on-site environmental task activities, including field instrument (i.e., water quality meter) calibration data, will be recorded in field logbooks or on field forms. Some portions of the field logging will be recorded digitally in real-time via data logging software (e.g., Forms on Fire, OpenGround).

All logbooks and field forms will be completed in accordance with instruction defined in Part 6.2.1.1 of the Permit (NMED, 2015). The logbooks will be bound, and the pages will be consecutively numbered. Field forms, which are a project-specific collection of forms, will be bound by a three-ring binder, comb-binding or equivalent, or contained in electronic format (i.e., field sheet on a tablet computer) and will capture specific field data, similar to a field logbook. Logbooks and field forms should be produced on waterproof paper when possible. Entries in the logbooks or forms will be made in black waterproof ink and must be clear, objective, and legible. Entries will include, at a minimum, a description of each day's activities, individuals involved in environmental task activities, date and time of drilling or sampling, weather conditions, any problems encountered, significant events, and all field measurements. Dates are recorded in the month/day/year format; time is recorded in the 24-hour military clock format. Changes will be made by striking through the original entry in a manner that does not obliterate the original entry. The person making the change will initial and date the change.

Calibration logs will include the instrument name, serial number, calibration data, and date of calibration. Lot numbers, manufacturer name, and expiration dates of standard solutions used for field instrument (i.e., water quality meter) calibration will also be recorded. The manufacturer's name and address for the equipment used will also be recorded.

Sufficient information will be recorded in the logbooks to permit reconstruction of all environmental task activities conducted. Information recorded on other project documents (e.g., boring logs, electronic records) will not be repeated in the logbooks except in summary form where determined necessary. All field logbooks will be kept in the possession of field personnel responsible for completing the logbooks, or in a secure place when not being used during fieldwork. All electronic forms of data collection will be backed-up a minimum of once per day. All logbooks will have a distinct project identification number and an inventory will be maintained. Upon completion of the field activities, all logbooks will become part of the project evidence file. The title page of each logbook or field form will be labeled with the following information:

- Logbook title,
- Project name,
- Logbook inventory identification number,
- USACE, Albuquerque District/other Army contract number and project delivery order number,
- Start date for field activities, and
- End date for field activities.

Logbook and field form entries will be a compilation of relevant, factual events as they occur. Entries recorded in logbooks can include, but not be limited to, the following information:

- Name and title of author, date, and times of arrival at and departure from the work site,
- Purpose of the drilling, sampling and/or remedial activity,
- Name and contact information of the field manager,
- Names and responsibilities of field crew members,
- Names and titles of any visitors,
- Weather and site conditions,
- Field observations,
- Sample collection or task accomplishment method,
- Amount and type of materials used or removed,
- Number and volume of sample(s) collected,
- Sample identification number(s),
- Date and time of sample collection, and name of collector,
- Sampling type and methodology,
- Information regarding drilling decisions not recorded on the boring log,
- Types of field instruments used and the purpose of use, including calibration methods and results,
- Any field measurements made (e.g., pH, conductivity, and static water level),
- Decontamination procedures,
- Type, matrix, and containerization method for IDW generated,
- IDW documentation information, including:
    - Types of containers/drums,
    - Contents, type, and approximate volume of waste,
    - Type of contamination and predicted level of contamination based on available information (i.e., generator knowledge), and
    - Weekly visual inspection information.
- Summary of daily task (including costs where appropriate) and documentation on any cost or scope or work changes required by field conditions,
- Information regarding sampling changes, scheduling modifications, and change orders,
- Information regarding access agreements, if applicable,
- Signature and date of personnel responsible for recorded observations, and
- Signature and date of personnel responsible for verifying the QC review of the logbook and/or field form, including but not limited to, accuracy, completeness, legibility, consistency, and clarity.

Copies of the field logbooks and field forms will be included in the final report.

4.7.2 Photographs

Representative photographs will be taken of the investigative activities, soil borings, water samples, and any significant observations made during the field effort. Photographs of soil cores or samples should include a legible scale (e.g., engineering ruler), the location, interval, and/or sample ID, date and time (written on paper, a whiteboard, sheeting, etc.) and should not be obscured by glare or shadow. Photographs taken will be saved with unique identifiable names and will be included in the final report.

4.7.3 Boring Logs

Each borehole log generated during the investigation will fully describe the subsurface environment and the procedures used to gain that description. Guidance on field logging of soil and rock may be found in ASTM D5434-09, Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock (ASTM, 2009). Original borehole logs will be of sufficient legibility and contrast to provide comparable quality in reproduction and will be recorded directly in the field without transcribing from a field book or other document. Final boring logs reviewed by a licensed Professional Geologist will be included in the final report.

All borehole logs generated during the investigation will contain the following:

- Unique borehole ID and location denoted on a sketch map as part of the log,
- Depths recorded in feet and decimal fractions thereof (tenths of feet),
- Field estimates of soil classification (Unified Soil Classification System) in accordance with ASTM D2488-17e1, Standard Practice for Description and Identification of Soils (Visual Manual Procedures) (ASTM, 2017) prepared in the field at the time of sampling by the Site Geologist,
- Full description of each soil sample collected, including, at a minimum, soil type/texture, density/consistency, color, and moisture.
- Visual numeric estimates of secondary soil constituents and quantitative definitions of description terms (e.g., trace, little, some) recorded on the log,
- Full description, to the greatest extent practical, of bedrock material encountered,
- Description of disturbed samples (if used to supplement subsurface description) in terms of the appropriate soil/rock parameter, to the extent practical. At a minimum, classification along with a description of drill action for the corresponding depth will be recorded. Notations will be made on the log that these descriptions are based on observations of disturbed material rather than intact samples,
- Description of drilling equipment, including such information as auger size (inner and outer diameter), bit types, compressor type, rig manufacturer, and model,
- Sequence of drilling activities,
- Any special problems encountered during drilling and their resolution,
- Dates and times for the start and completion of the borehole along with notation by depth for drill crew shifts and individual days,

- Each sequential boundary between various soil types and individual lithologies,
- Intervals of lost core,
- Interval by depth for each sample collected, including the length of sampled interval, length of sample recovery, blow counts (only if hollow-stem auger method is used), and the sampler type and size (diameter and length),
- Total depth of drilling and sampling, and
- Definition of any special abbreviations used at the first occurrence.

4.8 FIELD INSTRUMENT CALIBRATION

All field instruments (i.e., water quality meter) will be calibrated following manufacturer recommended calibration procedures and frequencies. Field instrument calibrations will be recorded on calibration forms at the time of the calibration. Adverse trends in instrument calibration behavior will be corrected by repair or replacement of the instrument.

4.9 SURVEY OF SAMPLE LOCATIONS

The location of each sample collected will be surveyed using appropriate instrumentation and procedures to obtain horizontal accuracy of less than 0.1 foot. A Trimble Total Station GPS, Trimble Static GPS, or equivalent, will be used to document each soil sample location. A North American Datum 1983 Northing and Easting in U.S. Survey Feet will be established for all surveyed points and recorded in a dedicated field notebook. Survey data will be reported in New Mexico State Plane and Universal Transverse Mercator Index coordinates.

4.10 SAMPLE IDENTIFICATION

During sampling, unique sample ID numbers will be assigned to each sample or subsample. Generally, each sample ID number will consist of a combination of the Site Identifier, source or type of sample, boring number and depth of sample (where applicable), and type of sample collection in accordance with the latest version of the FWDA *Environmental Information Management Plan* (USACE, 2007). The following are example sample IDs and descriptions of the ID components to be used during implementation of this Work Plan.

Example Sample IDs:

For soil: NASP-212-SB01-4.0-5.0-D-SO

Site Identifier: in this case, NASP-212 (Northern Area Supplemental Parameter, Map Unit 212, Rehobeth silty clay loam)

Source of Sample: in this case, SB (soil boring)

Increment Number: samples collected for each soil type will be assigned sequential 2-digit or 3-digit numbers (in this case, 01)

Depth Range: the depth interval of soil samples in feet bgs (in this case, 4.0 to 5.0 feet)

Type of Sample: D (discrete)

Matrix: Soil (SO)

For surface water: NASP-WSM-SW01

Site Identifier: in this case, NASP

Season: Winter Snow Melt (WSM) or Monsoon (MON)

Matrix: Surface Water (SW)

Increment Number: samples will be assigned sequential 2-digit or 3-digit numbers (in this case, 01)

For sediment: NASP-WSM-SD01

Site Identifier: in this case, NASP (Northern Area Supplemental Parameter)

Season: Winter Snow Melt (WSM) or Monsoon (MON)

Matrix: Sediment (SD)

Increment Number: samples will be assigned sequential 2-digit or 3-digit numbers (in this case, 01)

Quality assurance/quality control (QA/QC) samples for this study include field duplicate samples, matrix spike/matrix spike duplicate sample pairs, and equipment rinsate blanks.

Field duplicate sample IDs will carry the Site Identifier (i.e., NASP) and include the sample type designator "FDUP" followed by a two-digit sample sequence number "XX".

Example Field Duplicate Sample ID: NASP-FDUP-01

Equipment blank sample IDs will carry the Site Identifier (i.e., NASP) and include the sample type designator "EB" followed by a two-digit sample sequence number "XX".

Example Equipment Blank Sample ID: NASP-EB-01

Key information associated with each blank sample (e.g., sample location, source, associated parent sample) will be thoroughly documented on field sampling forms and in field notebooks, but omitted from all laboratory submissions.

Samples designated for laboratory matrix spike/matrix spike duplicate analysis will be documented accordingly on laboratory Chain of Custody records (e.g., by selecting "Y" under "Perform MS/MSD?" or by indicating so in the notes section). Samplers should account for single, duplicate, or triplicate sample volumes where applicable and ensure accurate sample container counts are reflected on Chain of Custody records. Samples designated for laboratory MS/MSD analysis should not be given unique sample IDs (e.g., a suffix of -MS or -MSD) as part of this study.

No trip blank samples or field blank samples are required for this study.

4.11 QUALITY CONTROL

In order to attain data of sufficient quality to support project objectives, specific procedures are required to allow evaluation of data quality. The quality assurance/quality control (QA/QC) procedures and requirements for their evaluation will comply with the U.S. Department of Defense (DoD) Quality Systems Manual (QSM), Version 6.0 (U.S. DoD, 2023).

4.11.1 Daily Progress Report

The Field Lead will be responsible for ensuring that all field activities are conducted in compliance with all work plans and requirements. The Field Lead will be on site during critical and complex field activities.

The Field Lead, with input from the Project Manager, will prepare Daily Progress Reports during field activities. Daily Progress Reports shall be submitted to the Government Project Manager the workday after the period covered by the report. The Daily Progress Report will contain the following information:

- Date(s) of work that the report covers,
- Contract number and task order number,
- Summary of weather conditions,
- List of personnel on site and duties,
- Equipment on site,
- Location and description of work performed,
- Subcontractor personnel on site and duties,
- Subcontractor equipment on site,
- Location and description of work performed by subcontractors,
- Summary of QC inspections that took place and reference to QC reports, and
- Deviations or issues encountered.

Daily progress reports will be included in the final report.

4.11.2 Field and Laboratory Quality Control Samples

Evaluation of field sampling procedures and laboratory equipment accuracy and precision requires the collection and evaluation of field and laboratory QC samples. **Table 4.1** summarizes the planned QC samples for this project. A description of each QC sample type is provided in the following sections.

4.11.2.1 Quality Control Analyses Originated by the Field Team

Field QC samples will be collected to determine the accuracy and precision of the analytical results. The QC sample frequencies are stated in the following sections.

Equipment Blank

Equipment blanks will be collected to monitor the cleanliness of sampling equipment and the effectiveness of decontamination procedures. Contamination from the sampling equipment can bias the analytical results high or lead to false positive results being reported. An equipment blank

is not applicable for samples collected with disposable or dedicated equipment. Equipment blanks will be prepared by filling sample containers with laboratory-grade contaminant free water that has been passed through a decontaminated or unused disposable sampling device. The required QC limits for equipment blank concentrations are to be less than the method's reporting limit.

Equipment blanks will be collected at a frequency of 10% per nondedicated sampling apparatus. Samples associated with equipment blanks that have detected target compounds will be assessed during the data validation process. The usability of the associated analytical data will be documented and affected data will be appropriately qualified. Field corrective action to improve equipment decontamination procedures may also be implemented by the Field Lead at the request of the project chemist.

Field Duplicate

Field duplicates are collected in the field from a single aliquot of the sample to determine the precision and accuracy of the field team's sampling procedures. Field duplicates will be collected and analyzed at a frequency of 10% (i.e., one field duplicate sample will be collected for every 10 samples collected); a minimum of one field duplicate sample will be collected per medium sampled.

4.11.2.2 Quality Control Analyses/Parameters Originated by the Laboratory

Method Blank

Method blanks are used to monitor each preparation or analytical batch for interference and/or contamination from glassware, reagents, and other potential sources within the laboratory. A method blank is a contaminant-free matrix (laboratory reagent water for aqueous samples or Ottawa sand, sodium sulfate, or glass beads for soil samples) to which all reagents are added in the same amount or proportions as are added to the samples. It is processed through the entire sample preparation and analytical procedures along with the samples in the batch.

There will be at least one method blank per preparation or analytical batch if required by the analytical method. If a target compound is found at a concentration that exceeds one-half the reporting limit, corrective action must be performed in an attempt to identify and, if possible, eliminate the contamination source. If sufficient sample volume remains in the sample container, samples associated with the blank contamination should be reprocessed and reanalyzed after the contamination source has been eliminated. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.

Laboratory Control Sample

The laboratory control sample (LCS), if required by the analytical method, will consist of a contaminant-free matrix such as laboratory reagent water for aqueous samples or Ottawa sand, sodium sulfate, or glass beads for soil samples spiked with known amounts of compounds that come from a source different than that used for calibration standards. Target compounds will be spiked into the LCS. The spike levels will be less than or equal to the midpoint of the calibration range. If LCS results are outside the specified control limits, corrective action must be taken, including sample re-preparation and re-analysis, if appropriate. If more than one LCS is analyzed in a preparation or analytical batch, the results for each LCS must be reported. Any LCS recovery outside QC limits affects the accuracy for the entire batch and requires corrective action. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.

Matrix Spike/Matrix Spike Duplicate

A sample matrix fortified with known quantities of specific compounds is called a matrix spike (MS). It is subjected to the same preparation and analytical procedures as the native sample. All target compounds will be spiked into the MS sample. Sample MS recoveries are used to evaluate the effect of the sample matrix on the recovery of the analytes of interest. A matrix spike duplicate (MSD) is a second aliquot of the MS sample, fortified at the same concentration as the MS. The relative percent difference (RPD) between the results of the MS duplicates measures the precision of sample results.

Project-specific samples will be used by the laboratory for the MS/MSD samples, which will be designated on the COC form. The spike levels will be less than or equal to the midpoint of the calibration range. Pairs of MS/MSDs will be collected at a frequency of 5%. MS/MSDs are required in every analytical batch regardless of the rate of collection and how samples are received at the laboratory.

4.11.3 Data Precision, Accuracy, Representativeness, Comparability and Completeness

Field QA/QC samples and laboratory internal QA/QC samples are collected and analyzed to assess the data's quality and usability. The following sections discuss the parameters that are used to assess the data quality.

Precision

The precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD and laboratory duplicate samples. The precision of the field sampling procedures will be assessed by reviewing field duplicate sample results. The RPD will be calculated for the duplicate samples using the equation:

$$\%RPD = \{(S - D)/[(S + D)/2]\} \times 100$$

where:

S = first sample value (original value)
D = second sample value (duplicate value)

The precision criteria for the duplicate samples will be plus or minus (±) 50% in soil samples.

Accuracy

Accuracy of laboratory results will be assessed for compliance with the established QC criteria using the analytical results of method blanks, reagent/preparation blanks, LCS and MS/MSD samples and surrogate results, where applicable. Laboratory accuracy will be assessed for compliance with the established QC criteria listed in Appendix C of the QSM (U.S. DoD, 2023). The percent recovery (%R) of LCSs will be calculated using the equation:

$$\%R = (A/B) \times 100$$

where:

A = the analyte concentration determined experimentally from the LCS

B = the known amount of concentration in the sample

Completeness

The data completeness of laboratory analyses results will be assessed for compliance with the amount of data required for decision making. Complete data are data that are not rejected. Data with qualifiers such as "J" or "UJ" are deemed acceptable and can be used to make project decisions as qualified. The completeness of the analytical data is calculated using the equation:

%Completeness = [(complete data obtained)/(total data planned)] x 100

The percent completeness goal for this sampling event is 90% for each analytical method.

Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent site conditions and is dependent on sampling and analytical variability and the variability of environmental media at the site. Representativeness is a qualitative "measure" of data quality.

Achieving representative data in the field starts with a properly designed and executed sampling program that carefully considers the project's overall objectives. Proper location controls and sample handling are critical to obtaining representative samples.

The goal of achieving representative data in the laboratory is measured by assessing accuracy and precision. The laboratory will provide representative data when the analytical systems are in control. Therefore, representativeness is a redundant objective for laboratory systems if sample COC records and sample preservation are properly documented, analytical procedures are followed and holding times are met.

Comparability

Comparability is the degree of confidence to which one data set can be compared to another. Comparability is a qualitative "measure" of data quality.

Achieving comparable data in the field starts with a properly designed and executed sampling program that carefully considers the project's overall objectives. Proper location controls and sample handling are critical to obtaining comparable samples.

The goal of achieving comparable data in the laboratory is measured by assessing accuracy and precision. The laboratory will provide comparable data when analytical systems are in control. Therefore, comparability is a redundant QC objective for laboratory systems if proper analytical procedures are followed and holding times are met.

Sensitivity

Sensitivity is the ability of the method or instrument to detect the contaminant of concern and other target compounds at the level of interest. Appropriate sampling and analytical methods will be selected that have QC acceptance limits that support the achievement of established performance criteria. Elevated sensitivities due to dilutions caused by matrix interference will be communicated in the case narrative of the laboratory report.

Assessment of analytical sensitivity will require thorough data validation. Limits of quantitation (LOQs), limits of detection (LODs), and detection limits (DLs) are listed in **Tables 4.2** and **4.3** for surface water and soil/sediment, respectively. Non-detected results will be reported at the LOQ. Limits for accuracy and precision have been based on requirements of the latest version of the

Quality Systems Manual (DoD, 2023). Soil, sediment, and surface water analytical data will be considered suitable for final decision-making.

4.11.4 Data Verification and Data Review Procedures

Personnel involved in data validation will be independent of any data generation effort. The project chemist will be responsible for the oversight of data verification, review, and validation. Data verification and review will be performed when the data packages are received from the laboratory. Verification will be performed on an analytical-batch basis using the summary results of calibration and laboratory QC, as well as those of the associated field samples. There are five stages of review defined in the DoD General Data Validation Guidelines (DoD, 2019):

1. Stage 1: Verification and validation based only on completeness and compliance of sample receipt condition checks.
2. Stage 2A: Verification and validation based on completeness and compliance checks of sample receipt conditions and ONLY sample-related QC results.
3. Stage 2B: Verification and validation based on completeness and compliance checks of sample receipt conditions and BOTH sample-related and instrument-related QC results.
4. Stage 3: Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, AND recalculation checks.
5. Stage 4: Verification and validation based on completeness and compliance checks of sample receipt conditions, both sample-related and instrument-related QC results, recalculation checks, AND the review of actual instrument outputs.

For this project, 100% of the data packages will undergo data verification and data review, 100% to Stage 2B in accordance with DoD General Data Validation Guidelines and DoD published data validation modules. Data validation will be performed by Parsons using automated data review software and/or manual data validation. The laboratory will submit the following data deliverables: 1) a Stage 4 data package in portable document format (PDF) format as described in the DoD General Data Validation Guidelines and 2) an electronic data deliverable (EDD) using the Staged Electronic Data Deliverables (SEDD) format in accordance with the most recently published version (SEDD Specification Document 5.2, Revision 1.1, October 2019).

Stage 2 analytical laboratory reports in a digital format with searchable electronic data tables will be included in the Supplemental Parameter Study Report.

4.11.5 Data Assessment

Limitations on data usability will be assigned by the project team, if appropriate, as a result of the validation process described above. The results of the data validation will be discussed in a separate report so that overall data quality can be verified through the precision, accuracy, representativeness, comparability, and completeness of sample results.

4.12 INVESTIGATION-DERIVED WASTE

Three types of IDW may be generated during the sampling of environmental media during the field activities: residual soil/sediment volume, decontamination fluids, and disposable sampling

equipment/PPE. Proper management of this IDW is required to ensure compliance with federal, state, and Army regulations applicable to the collection, storage, transport, and disposal of potentially hazardous materials. Required IDW management measures for FWDA investigations or remedial activities will be waste segregation, containerization and labeling, temporary storage, waste characterization, and disposal. Periodically, decontamination liquid containment will be inspected, and residuals will be containerized for off-site disposal based on the waste profile for the associated solids. Decontamination fluids will be transported and disposed of at the evaporation tank.

5.0 DATA REPORTING

Supplemental parameter data will be collected to determine how natural site conditions impact contaminant fate and transport and exposure pathways. The results of the study will be used to develop supplemental parameter values for various media to further support risk assessment and contaminant evaluation of fate and transport installation-wide. The supplemental parameter data will provide information for lines of evidence for risk evaluations in ongoing RCRA Facility Investigations across the Northern Area at FWDA.

The supplemental parameter data collected under this Work Plan will be presented in a Supplemental Parameter Study Report that assesses soil, sediment, and surface water characteristics. The Supplemental Parameter Study Report will present statistically viable parameter values for soil (based on dominant soil types) and surface water features. The evaluation will determine appropriate parameters to use for soils based on dominant soil types and textures and surface water drainages.

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6.0 SCHEDULE

The approximate schedule for conducting the investigation for the Northern Area Supplemental Parameter Study is summarized below.

1. Work Plan delivered to NMED – August 28, 2026.
2. Fieldwork – initiates 90 days subsequent to NMED approval of the work plan.
3. Final Supplemental Parameter Study Report to NMED – provided to NMED 120 days subsequent to completion of investigation activities including laboratory reporting, data validation, waste disposal, and site restoration.

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7.0 REFERENCES

Anderson, O.J., Maxwell, C.H., and Lucas, S.G., 2003. *Geology of the Fort Wingate Quadrangle, McKinley County, New Mexico*. Open-file Report 473. September 2003.

ASTM, 2009. D5434-09, *Standard Guide for Field Logging of Subsurface Explorations of Soil and Rock*.

ASTM, 2017. D2488-17e1, *Standard Practice for Description and Identification of Soils (Visual-Manual Procedures*).

NMED, 2015. Resource Conservation and Recovery Act Permit, United States Environmental Protection Agency (USEPA) ID No. NM 6213820974. New Mexico Environment Department Hazardous Waste Bureau, December 1, 2005, revised February 2015.

NRCS, 2005. *Soil Survey of McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties.* https://websoilsurvey.nrcs.usda.gov/app/

National Weather Service, 2026. Climate and Past Weather – Albuquerque, NM. National Oceanic and Atmospheric Administration. https://www.weather.gov/wrh/Climate?wfo=abq. Accessed May 11, 2026.

Parameter-elevation Regressions on Independent Slopes Model [PRISM] Group, Oregon State University, 2026. *PRISM Climate Group, Oregon State University. Data Explorer: Time Series Values for Individual Locations.* https://prism.oregonstate.edu/explorer/. Accessed May 11, 2026.

SEDD Specification Document 5.2, Revision 1.1, October 2019.

USACE, 2007. *Environmental Information Management Plan, Fort Wingate Depot Activity*. U.S. Army Corps of Engineers. December 21, 2007.

U.S. Department of Defense (DoD), 2019. General Data Validation Guidelines. November 2019.

U.S. DoD, 2023. DoD Quality Systems Manual Version 6.0.

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TABLES

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Table 2.1 – SUSDA NRCS Soil Types in the Study Area

Map Unit [1]	USDA NRCS Soil Type Unit Name [2]	Acreage [3]	Percent Coverage	Evaluated?	Rationale
225	Aquima-Hawaikuh complex	996	31%	**Yes**	Associated with numerous SWMUs/AOCs
212	Rehobeth silty clay loam	617	19%	**Yes**	Associated with numerous SWMUs/AOCs
336	Nuffel-Venadito complex	447	14%	**Yes**	Associated with numerous SWMUs/AOCs
332	Evpark-Arabrab complex	302	9%	**Yes**	Associated with numerous SWMUs/AOCs. Weathered bedrock.
240	Breadsprings and Nahodish soils	267	8%	No	Not associated with many SWMUs/AOCs.
566	Bamac extremely gravelly sandy loam	261	8%	**Yes**	Associated with numerous SWMUs/AOCs
355	Rizno-Tekapo rock outcrop complex	150	5%	No	Not associated with many SWMUs/AOCs. Weathered bedrock.
350	Toldohn-Vessilla rock outcrop complex	135	4%	No	Not associated with many SWMUs/AOCs.
352	Zia sandy loam	32	1%	No	Not associated with many SWMUs/AOCs.
0	Lake Knudson	24	1%	No	Not associated with many SWMUs/AOCs.
305	Celavar-Atarque complex	24	1%	No	Not associated with many SWMUs/AOCs.
	Total:	3,255			

Notes:

1. Soil types are identified by a Map Unit (e.g., 212) and Unit Name (e.g., Rehobeth Silty Clay Loam).

2. United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Soil Survey of McKinley County Area, New Mexico (NRCS, 2005).

3. Contains acreage for soils within the Study Area (Parcels 6, 7, 11, 13, 21, 22, and 23).

Acronyms and Abbreviations:

AOC = Area of Concern
NRCS =Natural Resources Conservation Service
SWMU = Solid Waste Management Unit
USDA = United States Department of Agriculture

Table 3.1 – Summary of Analytical Methods, Sample Containers, Preservation, and Holding Times

Analysis	Matrix	Analytical Method	Sample Volume/Container	Preservative	Max. Hold Time (until extraction / until analysis)
pH	Soil / Sediment	SW9045D	1 x 4oz. or 8oz. glass jar	Cool, 0-6ºC	immediate
Anion Exchange Capacity (AEC)	Soil / Sediment	N/A	4 oz Amber Glass Soil Jar	Cool, 0-6ºC	6 Months
Cation Exchange Capacity (CEC)	Soil / Sediment	SW9081	4 oz Amber Glass Soil Jar	NA	180 Days
Total Organic Carbon (TOC)	Soil / Sediment	SW9060A	4 oz Amber Glass Soil Jar	Cool, 0-6ºC	28 Days
Biological Oxygen Demand (BOD)	Soil / Sediment	SM5210B	4 oz Glass Soil Jar	Cool, 0-6ºC	48 Hours
Grain Size (sieve and hydrometer)	Soil / Sediment	ASTM D6913, D7928-17, or equivalent method	16oz glass jar (must be dedicated for grain size only)	Cool, 0-6ºC	NA
Ferrous Iron (Fe2+), Ferric Iron (Fe3+)	Soil / Sediment	SM3500-Fe B, SM3500-Fe D	4 oz Glass Soil Jar	Cool, 0-6ºC	immediate
pH (include a field test)	Surface Water	SW9040C	1 x 100 mL or 250 mL HDPE	Cool, 0-6ºC	immediate
Eh (Redox State)	Surface Water	field	NA	NA	NA
Hardness	Surface Water	SM2340C	NA	NA	NA
Major Anions	Surface Water	SW9056A	250 mL, HDPE	Cool, 0-6ºC	48 Hours (NO2, NO3, & o-PO4) / 28 Days (F, Cl, Br, SO4)
Fe2+ and Mn2+	Surface Water	Hach Field Test Kit, via Hach Method 8008 and Method 8034	NA	NA	NA
Alkalinity	Surface Water	SM2320B	250 mL HDPE Bottle	Cool, 0-6ºC	14 Days
Total Dissolved Solids	Surface Water	SM2540C	1 L HDPE Bottle	Cool, 0-6ºC	7 Days
Total Suspended Solids	Surface Water	SM2540D	1 L HDPE Bottle	Cool, 0-6ºC	7 Days
Total Dissolved Organic Carbon	Surface Water	SW9060A	250 mL Amber Glass Bottle	field filter using 0.45um filter; H2SO4, pH < 2; Cool, 0-6 °C	28 Days

Table 3.2 – Proposed Soil Boring Locations and Analyses

Sample Identification Number	Map Unit[1] - Soil Type[2]	Sample Analyses
NASP-212-SB01-0.0-1.0-D-SO *	212 - Rehobeth silty clay loam	pH (SW9045D), Fe2+ (Ferrous iron) (via SM3500_FE_B), Fe3+ (Ferric iron) (via SM3500_FE_D), Anion Exchange Capacity (AEC) (SW9056A), Cation Exchange Capacity (CEC) (SW9081), Biological Oxygen Demand (BOD) (SM5210B), Total Organic Carbon (TOC) (SW9060A), Grain Size (ASTM D6913, D7928-17) (Multiple sieve sizes) (151H Hydrometer)
NASP-212-SB01-1.0-2.0-D-SO *		
NASP-212-SB01-4.0-5.0-D-SO *		
NASP-212-SB01-9.0-10.0-D-SO *		
NASP-212-SB02-0.0-1.0-D-SO		
NASP-212-SB02-1.0-2.0-D-SO		
NASP-212-SB02-4.0-5.0-D-SO		
NASP-212-SB02-9.0-10.0-D-SO		
NASP-212-SB03-0.0-1.0-D-SO		
NASP-212-SB03-1.0-2.0-D-SO		
NASP-212-SB03-4.0-5.0-D-SO		
NASP-212-SB03-9.0-10.0-D-SO		
NASP-212-SB04-0.0-1.0-D-SO *		
NASP-212-SB04-1.0-2.0-D-SO *		
NASP-212-SB04-4.0-5.0-D-SO *		
NASP-212-SB04-9.0-10.0-D-SO *		
NASP-212-SB05-0.0-1.0-D-SO		
NASP-212-SB05-1.0-2.0-D-SO		
NASP-212-SB05-4.0-5.0-D-SO		
NASP-212-SB05-9.0-10.0-D-SO		
NASP-212-SB06-0.0-1.0-D-SO		
NASP-212-SB06-1.0-2.0-D-SO		
NASP-212-SB06-4.0-5.0-D-SO		
NASP-212-SB06-9.0-10.0-D-SO		
NASP-225-SB01-0.0-1.0-D-SO *	225 - Aquima-Hawaikuh complex	
NASP-225-SB01-1.0-2.0-D-SO *		
NASP-225-SB01-4.0-5.0-D-SO *		
NASP-225-SB01-9.0-10.0-D-SO *		
NASP-225-SB02-0.0-1.0-D-SO		
NASP-225-SB02-1.0-2.0-D-SO		
NASP-225-SB02-4.0-5.0-D-SO		
NASP-225-SB02-9.0-10.0-D-SO		

Table 3.2 – Proposed Soil Boring Locations and Analyses

Sample Identification Number	Map Unit[1] - Soil Type[2]	Sample Analyses
NASP-225-SB03-0.0-1.0-D-SO	225 - Aquima-Hawaikuh complex (Continued)	pH (SW9045D), Fe2+ (Ferrous iron) (via SM3500_FE_B), Fe3+ (Ferric iron) (via SM3500_FE_D), Anion Exchange Capacity (AEC) (SW9056A), Cation Exchange Capacity (CEC) (SW9081), Biological Oxygen Demand (BOD) (SM5210B), Total Organic Carbon (TOC) (SW9060A), Grain Size (ASTM D6913, D7928-17) (Multiple sieve sizes) (151H Hydrometer)
NASP-225-SB03-1.0-2.0-D-SO		
NASP-225-SB03-4.0-5.0-D-SO		
NASP-225-SB03-9.0-10.0-D-SO		
NASP-225-SB04-0.0-1.0-D-SO	225 - Aquima-Hawaikuh complex	
NASP-225-SB04-1.0-2.0-D-SO		
NASP-225-SB04-4.0-5.0-D-SO		
NASP-225-SB04-9.0-10.0-D-SO		
NASP-225-SB05-0.0-1.0-D-SO *		
NASP-225-SB05-1.0-2.0-D-SO *		
NASP-225-SB05-4.0-5.0-D-SO *		
NASP-225-SB05-9.0-10.0-D-SO *		
NASP-225-SB06-0.0-1.0-D-SO		
NASP-225-SB06-1.0-2.0-D-SO		
NASP-225-SB06-4.0-5.0-D-SO		
NASP-225-SB06-9.0-10.0-D-SO		
NASP-225-SB07-0.0-1.0-D-SO	225 - Aquima-Hawaikuh complex	
NASP-225-SB07-1.0-2.0-D-SO		
NASP-225-SB07-4.0-5.0-D-SO		
NASP-225-SB07-9.0-10.0-D-SO		
NASP-225-SB08-0.0-1.0-D-SO		
NASP-225-SB08-1.0-2.0-D-SO		
NASP-225-SB08-4.0-5.0-D-SO		
NASP-225-SB08-9.0-10.0-D-SO		
NASP-225-SB09-0.0-1.0-D-SO		
NASP-225-SB09-1.0-2.0-D-SO		
NASP-225-SB09-4.0-5.0-D-SO		
NASP-225-SB09-9.0-10.0-D-SO		
NASP-225-SB10-0.0-1.0-D-SO *		
NASP-225-SB10-1.0-2.0-D-SO *		
NASP-225-SB10-4.0-5.0-D-SO *		
NASP-225-SB10-9.0-10.0-D-SO *		

Table 3.2 – Proposed Soil Boring Locations and Analyses

Sample Identification Number	Map Unit[1] - Soil Type[2]	Sample Analyses
NASP-332-SB01-0.0-1.0-D-SO *	332 - Evpark-Arabrab complex	pH (SW9045D), Fe2+ (Ferrous iron) (via SM3500_FE_B), Fe3+ (Ferric iron) (via SM3500_FE_D), Anion Exchange Capacity (AEC) (SW9056A), Cation Exchange Capacity (CEC) (SW9081), Biological Oxygen Demand (BOD) (SM5210B), Total Organic Carbon (TOC) (SW9060A), Grain Size (ASTM D6913, D7928-17) (Multiple sieve sizes) (151H Hydrometer)
NASP-332-SB01-1.0-2.0-D-SO *		
NASP-332-SB01-4.0-5.0-D-SO *		
NASP-332-SB01-9.0-10.0-D-SO *		
NASP-332-SB02-0.0-1.0-D-SO		
NASP-332-SB02-1.0-2.0-D-SO		
NASP-332-SB02-4.0-5.0-D-SO		
NASP-332-SB02-9.0-10.0-D-SO		
NASP-332-SB03-0.0-1.0-D-SO		
NASP-332-SB03-1.0-2.0-D-SO		
NASP-332-SB03-4.0-5.0-D-SO		
NASP-332-SB03-9.0-10.0-D-SO		
NASP-332-SB04-0.0-1.0-D-SO *		
NASP-332-SB04-1.0-2.0-D-SO *		
NASP-332-SB04-4.0-5.0-D-SO *		
NASP-332-SB04-9.0-10.0-D-SO *		
NASP-332-SB05-0.0-1.0-D-SO		
NASP-332-SB05-1.0-2.0-D-SO		
NASP-332-SB05-4.0-5.0-D-SO		
NASP-332-SB05-9.0-10.0-D-SO		
NASP-336-SB01-0.0-1.0-D-SO *	336 - Nuffel-Venadito complex	
NASP-336-SB01-1.0-2.0-D-SO *		
NASP-336-SB01-4.0-5.0-D-SO *		
NASP-336-SB01-9.0-10.0-D-SO *		
NASP-336-SB02-0.0-1.0-D-SO		
NASP-336-SB02-1.0-2.0-D-SO		
NASP-336-SB02-4.0-5.0-D-SO		
NASP-336-SB02-9.0-10.0-D-SO		
NASP-336-SB03-0.0-1.0-D-SO		
NASP-336-SB03-1.0-2.0-D-SO		
NASP-336-SB03-4.0-5.0-D-SO		
NASP-336-SB03-9.0-10.0-D-SO		

Table 3.2 – Proposed Soil Boring Locations and Analyses

Sample Identification Number	Map Unit[1] - Soil Type[2]	Sample Analyses
NASP-336-SB04-0.0-1.0-D-SO *	336 - Nuffel-Venadito complex (Continued)	pH (SW9045D), Fe2+ (Ferrous iron) (via SM3500_FE_B), Fe3+ (Ferric iron) (via SM3500_FE_D), Anion Exchange Capacity (AEC) (SW9056A), Cation Exchange Capacity (CEC) (SW9081), Biological Oxygen Demand (BOD) (SM5210B), Total Organic Carbon (TOC) (SW9060A), Grain Size (ASTM D6913, D7928-17) (Multiple sieve sizes) (151H Hydrometer)
NASP-336-SB04-1.0-2.0-D-SO *		
NASP-336-SB04-4.0-5.0-D-SO *		
NASP-336-SB04-9.0-10.0-D-SO *		
NASP-336-SB05-0.0-1.0-D-SO		
NASP-336-SB05-1.0-2.0-D-SO		
NASP-336-SB05-4.0-5.0-D-SO		
NASP-336-SB05-9.0-10.0-D-SO		
NASP-336-SB06-0.0-1.0-D-SO		
NASP-336-SB06-1.0-2.0-D-SO		
NASP-336-SB06-4.0-5.0-D-SO		
NASP-336-SB06-9.0-10.0-D-SO		
NASP-566-SB01-0.0-1.0-D-SO *	566 - Bamac extremely gravelly sandy loam	
NASP-566-SB01-1.0-2.0-D-SO *		
NASP-566-SB01-4.0-5.0-D-SO *		
NASP-566-SB01-9.0-10.0-D-SO *		
NASP-566-SB02-0.0-1.0-D-SO		
NASP-566-SB02-1.0-2.0-D-SO		
NASP-566-SB02-4.0-5.0-D-SO		
NASP-566-SB02-9.0-10.0-D-SO		
NASP-566-SB03-0.0-1.0-D-SO		
NASP-566-SB03-1.0-2.0-D-SO		
NASP-566-SB03-4.0-5.0-D-SO		
NASP-566-SB03-9.0-10.0-D-SO		

Notes:

1. Soil types are identified by a Map Unit (e.g., 212) and Unit Name (e.g., Rehobeth silty clay loam).
2. Soil types are determined by the United States Department of Agriculture (USDA) National Resources Conservation Service (NRCS) Soil Survey of McKinley County Area, New Mexico (NRCS, 2005).

* Grain size is proposed for a reduced number of samples.

Table 3.3 – Proposed Surface Water Sample Locations and Analyses

Sample Identification Number		Sample Analyses
Monsoon Season	**Winter Snow Melt Season**	
NASP-MON-SW01	NASP-WSM-SW01	pH (SW9040C), Hardness (SM2340C), Major Anions (SW9056A), Fe2+ and Mn2+ (Hach field tests), Alkalinity (SM2320B), Total Dissolved Solids (SM2540C), Total Suspended Solids (SM2540D), Total Dissolved Organic Carbon (SW9060A)
NASP-MON-SW02	NASP-WSM-SW02	
NASP-MON-SW03	NASP-WSM-SW03	
NASP-MON-SW04	NASP-WSM-SW04	
NASP-MON-SW05	NASP-WSM-SW05	
NASP-MON-SW06	NASP-WSM-SW06	
NASP-MON-SW07	NASP-WSM-SW07	
NASP-MON-SW08	NASP-WSM-SW08	
NASP-MON-SW09	NASP-WSM-SW09	
NASP-MON-SW10	NASP-WSM-SW10	
NASP-MON-SW11	NASP-WSM-SW11	
NASP-MON-SW12	NASP-WSM-SW12	
NASP-MON-SW13	NASP-WSM-SW13	
NASP-MON-SW14	NASP-WSM-SW14	
NASP-MON-SW15	NASP-WSM-SW15	
NASP-MON-SW16	NASP-WSM-SW16	
NASP-MON-SW17	NASP-WSM-SW17	
NASP-MON-SW18	NASP-WSM-SW18	
NASP-MON-SW19	NASP-WSM-SW19	
NASP-MON-SW20	NASP-WSM-SW20	
NASP-MON-SW21	NASP-WSM-SW21	
NASP-MON-SW22	NASP-WSM-SW22	
NASP-MON-SW23	NASP-WSM-SW23	
NASP-MON-SW24	NASP-WSM-SW24	
NASP-MON-SW25	NASP-WSM-SW25	

Table 3.4 – Proposed Sediment Sample Locations and Analyses

Sample Identification Number		Sample Analyses
Monsoon Season	**Winter Snow Melt Season**	
NASP-MON-SD01-D-SO	NASP-WSM-SD01-D-SO	pH (SW9045D), Fe2+ (Ferrous iron) (via SM3500_FE_B), Fe3+ (Ferric iron) (via SM3500_FE_D), Anion Exchange Capacity (AEC) (SW9056A), Cation Exchange Capacity (CEC) (SW9081), Biological Oxygen Demand (BOD) (SM5210B), Total Organic Carbon (TOC) (SW9060A), Grain Size (ASTM D6913, D7928-17) (Multiple sieve sizes) (151H Hydrometer)
NASP-MON-SD02-D-SO	NASP-WSM-SD02-D-SO	
NASP-MON-SD03-D-SO	NASP-WSM-SD03-D-SO	
NASP-MON-SD04-D-SO	NASP-WSM-SD04-D-SO	
NASP-MON-SD05-D-SO	NASP-WSM-SD05-D-SO	
NASP-MON-SD06-D-SO	NASP-WSM-SD06-D-SO	
NASP-MON-SD07-D-SO	NASP-WSM-SD07-D-SO	
NASP-MON-SD08-D-SO	NASP-WSM-SD08-D-SO	
NASP-MON-SD09-D-SO	NASP-WSM-SD09-D-SO	
NASP-MON-SD10-D-SO	NASP-WSM-SD10-D-SO	
NASP-MON-SD11-D-SO	NASP-WSM-SD11-D-SO	
NASP-MON-SD12-D-SO	NASP-WSM-SD12-D-SO	
NASP-MON-SD13-D-SO	NASP-WSM-SD13-D-SO	
NASP-MON-SD14-D-SO	NASP-WSM-SD14-D-SO	
NASP-MON-SD15-D-SO	NASP-WSM-SD15-D-SO	
NASP-MON-SD16-D-SO	NASP-WSM-SD16-D-SO	
NASP-MON-SD17-D-SO	NASP-WSM-SD17-D-SO	
NASP-MON-SD18-D-SO	NASP-WSM-SD18-D-SO	
NASP-MON-SD19-D-SO	NASP-WSM-SD19-D-SO	
NASP-MON-SD20-D-SO	NASP-WSM-SD20-D-SO	
NASP-MON-SD21-D-SO	NASP-WSM-SD21-D-SO	
NASP-MON-SD22-D-SO	NASP-WSM-SD22-D-SO	
NASP-MON-SD23-D-SO	NASP-WSM-SD23-D-SO	
NASP-MON-SD24-D-SO	NASP-WSM-SD24-D-SO	
NASP-MON-SD25-D-SO	NASP-WSM-SD25-D-SO	

Table 4.1 – Summary of Samples

Soil Samples	
Number of Primary Samples	120
Number of MS/MSD Samples (5%)	6
Number of Field Duplicate Samples (10%)	12
Surface Water Samples - Monsoon	
Number of Primary Samples	25
Number of MS/MSD Samples (5%)	2
Number of Field Duplicate Samples (10%)	3
Sediment Samples - Monsoon	
Number of Primary Samples	25
Number of MS/MSD Samples (5%)	2
Number of Field Duplicate Samples (10%)	3
Surface Water Samples - Winter Snow Melt	
Number of Primary Samples	25
Number of MS/MSD Samples (5%)	2
Number of Field Duplicate Samples (10%)	3
Sediment Samples - Winter Snow Melt	
Number of Primary Samples	25
Number of MS/MSD Samples (5%)	2
Number of Field Duplicate Samples (10%)	3

Acronyms and Abbreviations:
MS = Matrix spike
MSD = Matrix spike duplicate

Table 4.2 – Laboratory Limits for Analytes in Surface Water

Analytical Method	Analyte	CASRN	Units	Achievable Laboratory Limits		
				Limit of Quantitation (LOQ)	Limit of Detection (LOD)	Detection Limit (DL)
Anions						
9056A	Nitrate as N	14797-55-8	µg/L	500	250	100
9056A	Nitrite as N	14797-65-0	µg/L	500	250	100
9056A	Fluoride	16984-48-8	µg/L	500	400	200
9056A	Chloride	16887-00-6	µg/L	3000	2500	1300
9056A	Sulfate	14808-79-8	µg/L	3000	2500	1300
365.1	Orthophosphate as P	7778-77-0	µg/L	100	70	35
9056A	Bromide	24959-67-9	µg/L	500	400	200
Dissolved Organic Carbon (DOC)						
9060A	Dissolved Organic Carbon (DOC)	7440-44-0	mg/L	1	0.8	0.4
Hardness						
SM2340C	Hardness	N/A	mg/L	4	3	2.2
Alkalinity (Total)						
SM2320B	Alkalinity (Total)	N/A	mg/L	10	8	7
Total Dissolved Soilds (TDS)						
SM2540C	Total Dissolved Soilds (TDS)	N/A	mg/L	10	8	6
Total Suspended Solids (TSS)						
SM2540D	Total Suspended Solids (TSS)	N/A	mg/L	4	3	1.5

Acronyms and Abbreviations:
CASRN = Chemical Abstracts Service Registry Number
µg/L = micrograms per liter
mg/L = milligrams per liter

Table 4.3 – Laboratory Limits for Analytes in Soil/Sediment

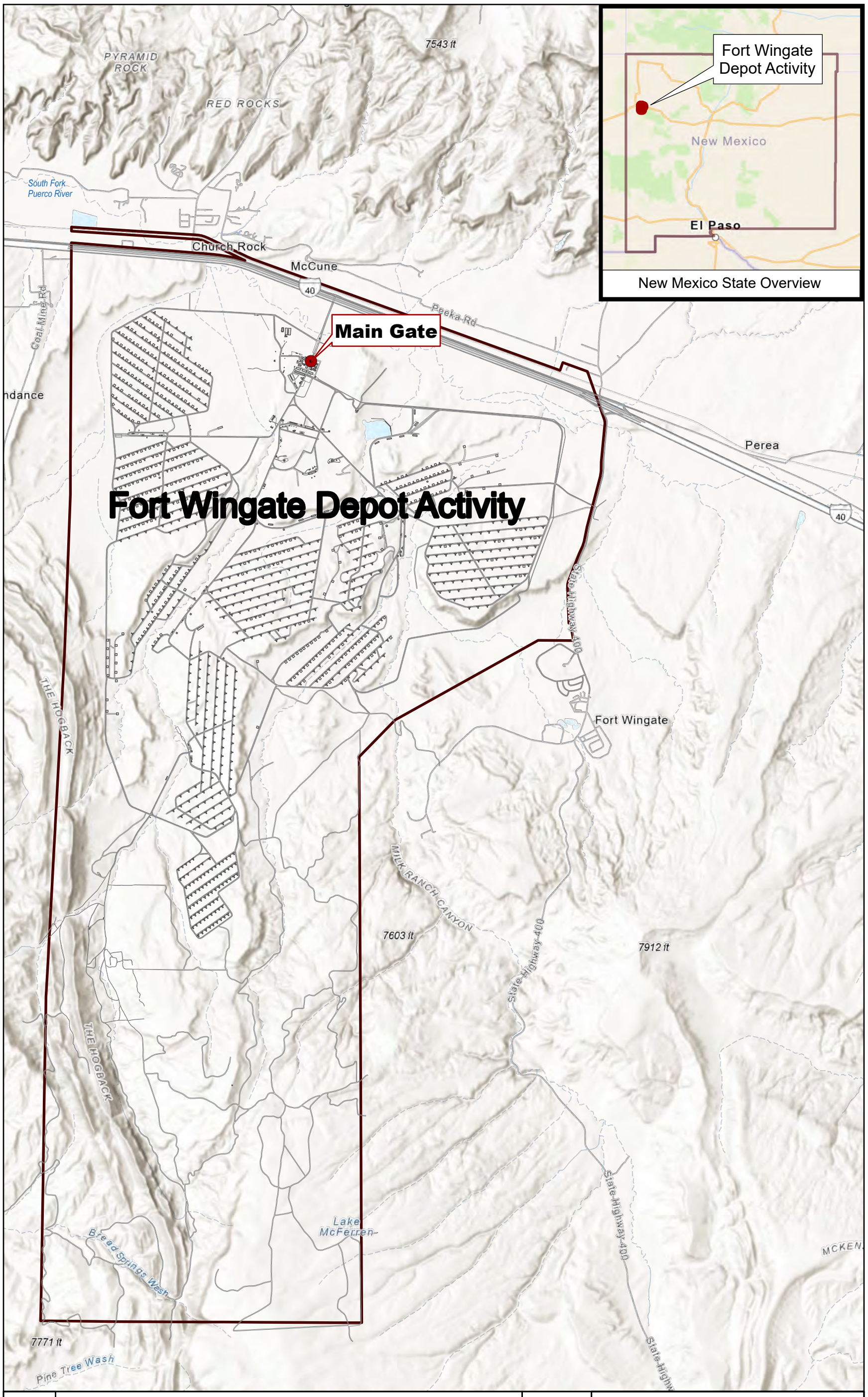
Analytical Method	Analyte	CASRN	Units	Achievable Laboratory Limits		
				Limit of Quantitation (LOQ)	Limit of Detection (LOD)	Detection Limit (DL)
Anions						
SW9056A	Nitrate as N	14797-55-8	mg/kg	5	4	1
SW9056A	Nitrite as N	14797-65-0	mg/kg	5	4	1
SW9056A	Bromide	24959-67-9	mg/kg	2	1.5	1
SW9056A	Chloride	16887-00-6	mg/kg	30	20	7.5
SW9056A	Fluoride	16984-48-8	mg/kg	10	7.5	2.5
SW9056A	Sulfate	14808-79-8	mg/kg	50	40	15
EPA 365.1	Total Phosphorus as PO4	7778-77-0	mg/kg	76.5	61.4	30.7
Anion Exchange Capacity (AEC)						
N/A	AEC	N/A	cmole/Kg	0.1	0.1	0.1
Cation Exchange Capacity (CEC)						
SW9081	CEC	N/A	meq/100gm	5	5	5
Total Organic Carbon (TOC)						
SW9060A	TOC	N/A	mg/kg	4000	3000	2500
Biological Oxygen Demand (BOD)						
SW5210B	BOD	N/A	mg/kg	750	750	750
Ferrous and Ferric Iron						
SM3500_FE_B	Ferrous Iron	15438-31-0	mg/kg	2	1.5	0.5
SM3500_FE_D	Ferric Iron	N/A	mg/kg	0.1	0.08	0.075

Acronyms and Abbreviations:
CASRN = Chemical Abstracts Service Registry Number
mg/kg = milligrams per kilogram

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FIGURES

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New Mexico State Overview

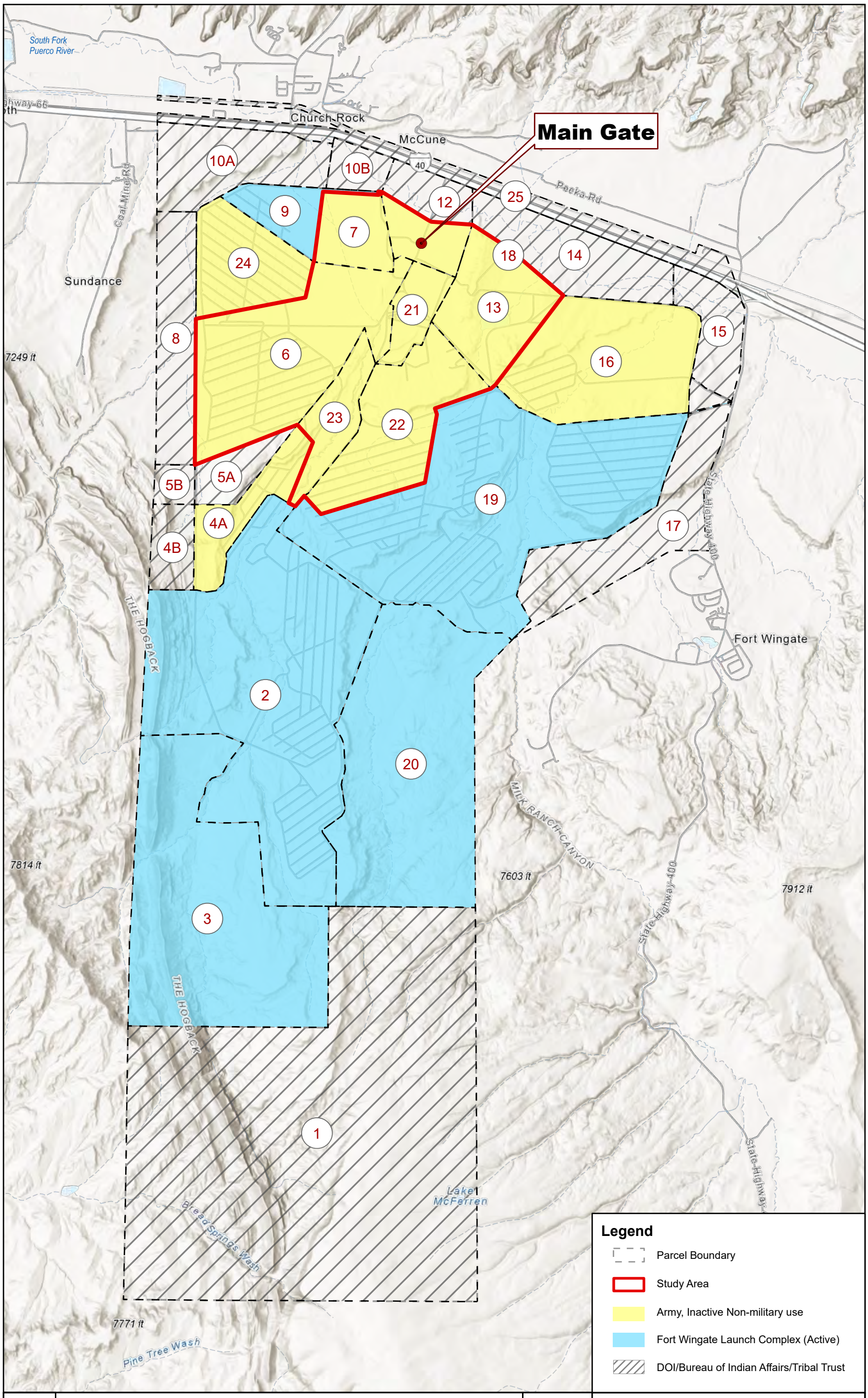
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Notes	Northern Area Supplemental Soil, Sediment, and Surface Water Parameter Study, Fort Wingate Depot Activity, McKinley County, NM			
Revised	5/14/2026	GIS by	DB	5/14/2026
Scale	1:55,000	Checked by	CL	5/14/2026
Basemap: Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Sources:		PM	CR	5/14/2026

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FIGURE 1.1

Facility Location Map

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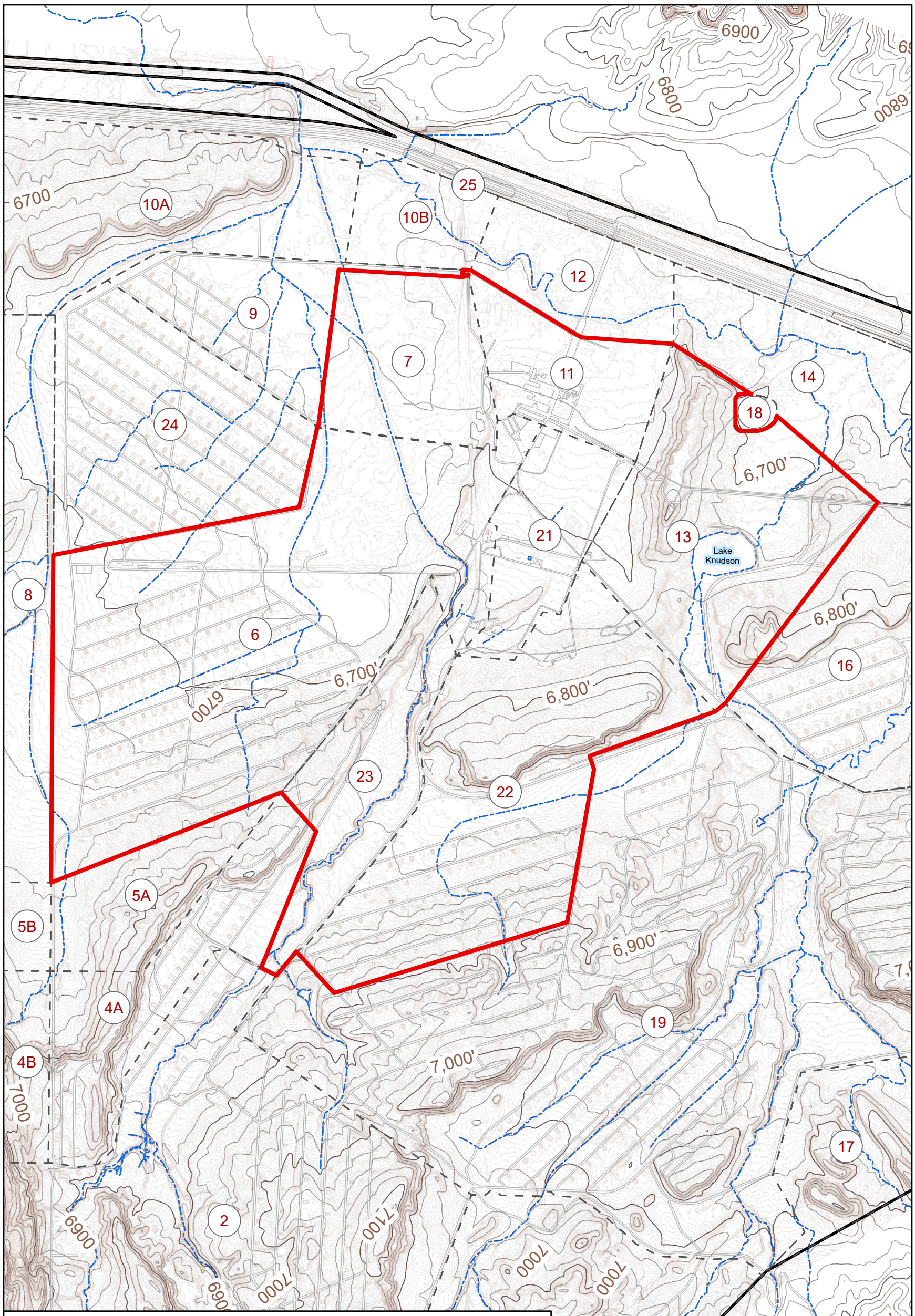
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Notes	Northern Area Supplemental Soil, Sediment, and Surface Water Parameter Study, Fort Wingate Depot Activity, McKinley County, NM			
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Basemap: Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community		CR	CR	5/14/2026

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FIGURE 1.2

Study Area

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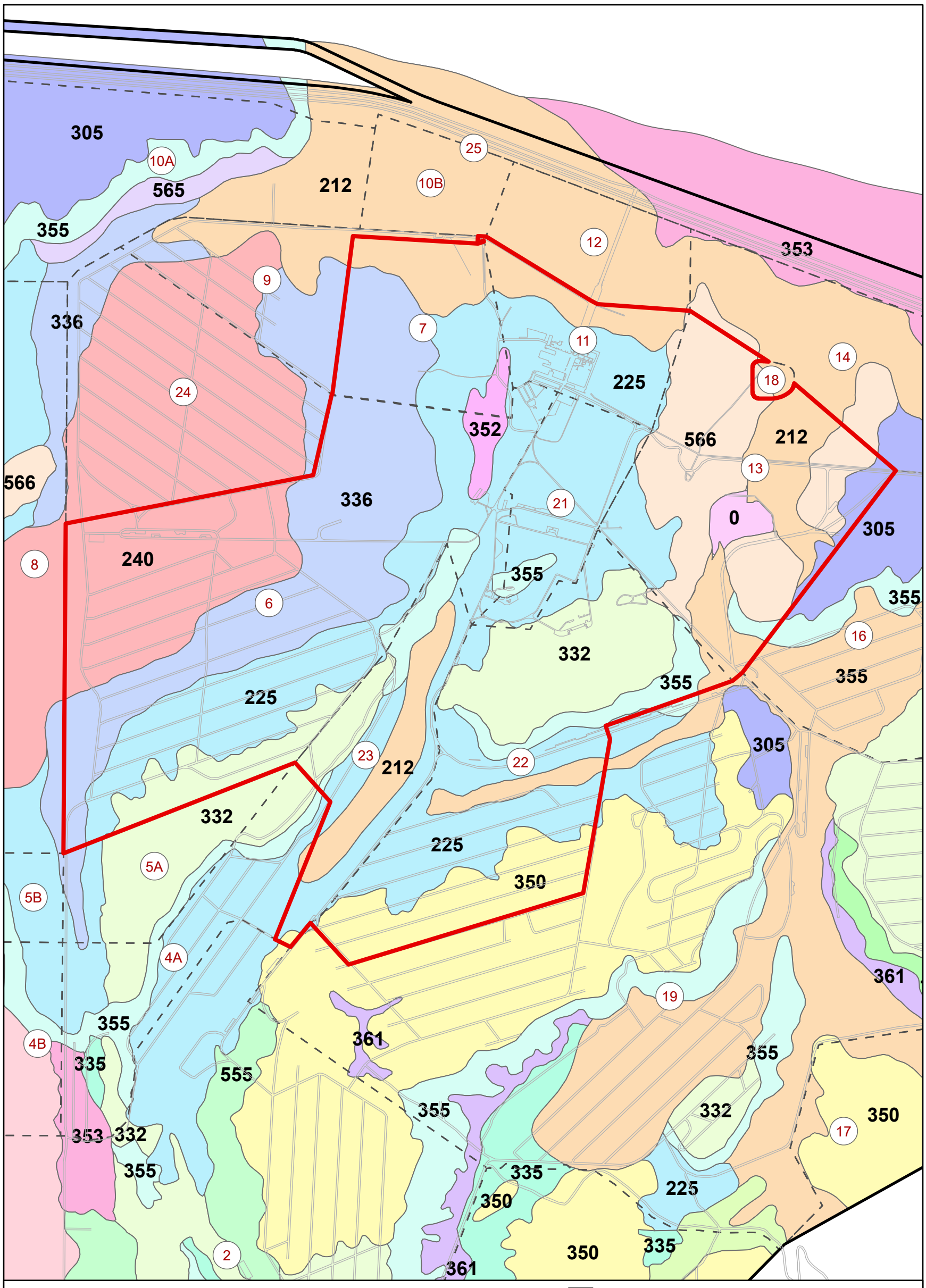
Client	USACE, Albuquerque District			
Notes	Northern Area Supplemental Soil, Sediment, and Surface Water Parameter Study, Fort Wingate Depot Activity, McKinley County, NM			
Revised	5/14/2026	GIS by	DB	5/14/2026
Scale	1:23,500	Checked by	CL	5/14/2026
Source: Amec Foster Wheeler, 2018		PM	CR	5/14/2026

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FIGURE 2.1

Topographic Map of Study Area

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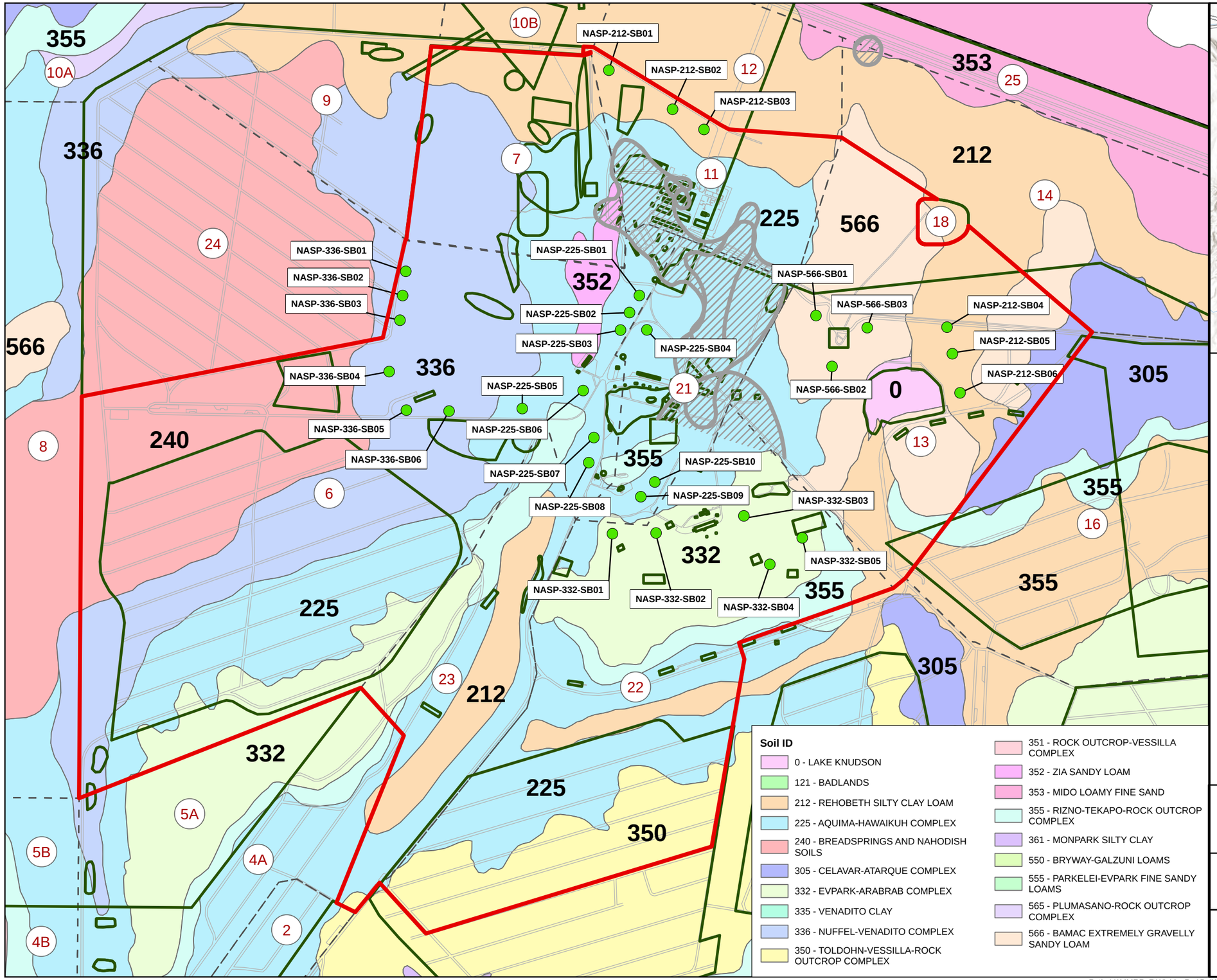
Client	USACE, Albuquerque District			
Notes	Northern Area Supplemental Soil, Sediment, and Surface Water Parameter Study, Fort Wingate Depot Activity, McKinley County, NM			
Revised	5/14/2026	GIS by	DB	5/14/2026
Scale	1:23,618	Checked by	CL	5/14/2026
Source: Amec Foster Wheeler, 2018		PM	CR	5/14/2026

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FIGURE 2.2

USDA NRCS Soil Survey Map

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Northern Area Supplemental Soil, Sediment, and Surface Water Parameter Study
Fort Wingate Depot Activity,
McKinley County, NM

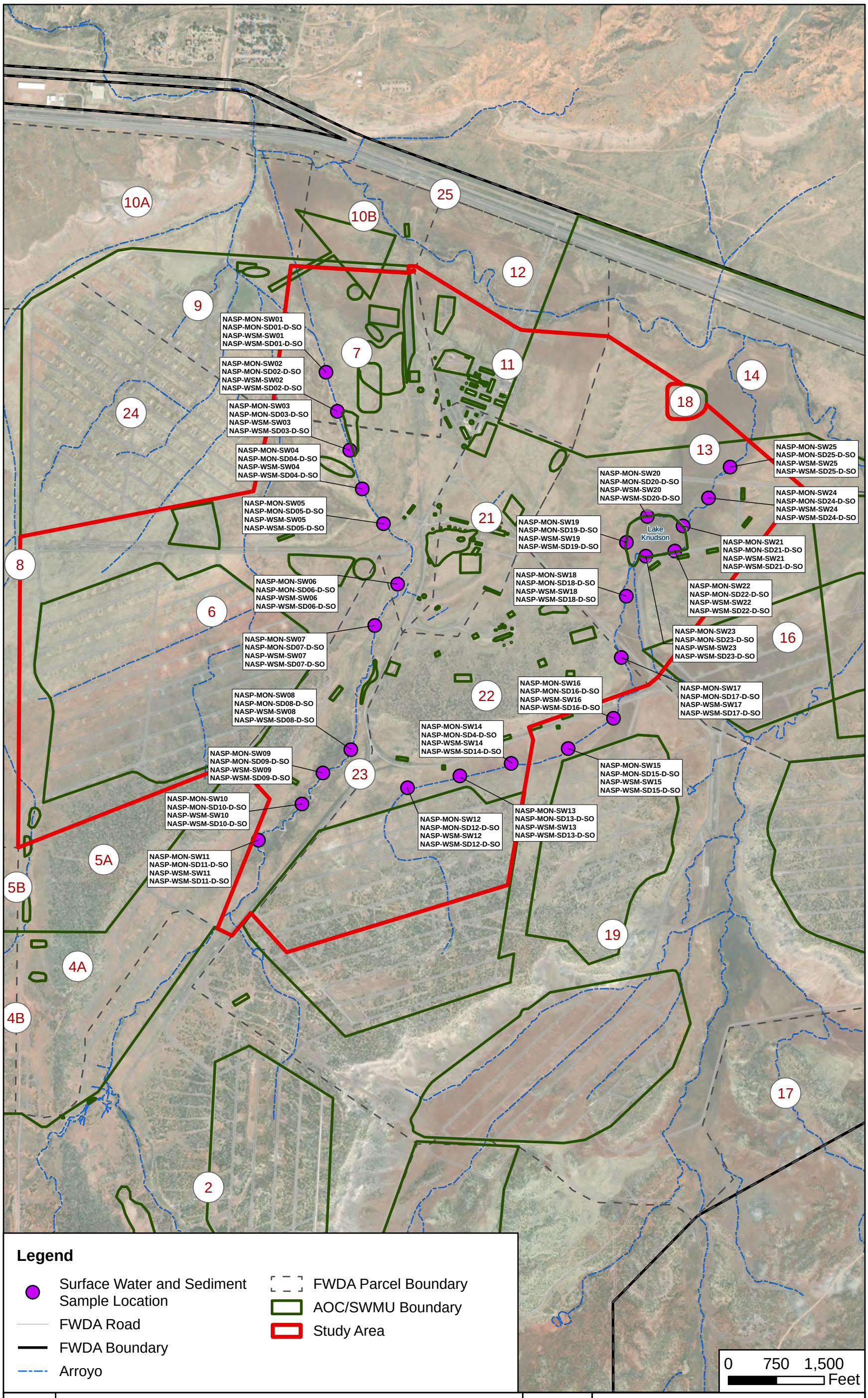
FIGURE 3.1

Proposed Soil Sampling Locations

Client	USACE, Albuquerque District	GIS by	DB	5/15/2026
		Checked by	CL	5/15/2026
		PM	CR	5/15/2026

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Client	USACE, Albuquerque District			
Notes	Northern Area Supplemental Soil, Sediment, and Surface Water Parameter Study, Fort Wingate Depot Activity, McKinley County, NM			
Revised	5/15/2026	GIS by	DB	5/15/2026
Scale	1:23,500	Checked by	CL	5/15/2026
Source: Amec Foster Wheeler, 2018		PM	CR	5/15/2026

FIGURE 3.2

Proposed Surface Water and Sediment Sampling Locations

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