Final

2017 Interim Facility-wide Groundwater Monitoring Plan

Version 10

Fort Wingate Depot Activity

McKinley County, New Mexico

October 2017

Contract No. W912PP-17-C-0003

Prepared for:

U.S. Army Corps of Engineers®

U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza NE
Albuquerque, New Mexico 87109

Prepared by:

Sundance Consulting Inc.

8210 Louisiana Blvd. NE, Suite C
Albuquerque, New Mexico 87113

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)* 12-10-2017	**2. REPORT TYPE** Final Work Plan	**3. DATES COVERED** *(From - To)* April through December 2017
4. TITLE AND SUBTITLE 2017 Interim Facility-wide Groundwater Monitoring Plan Version 10 Fort Wingate Depot Activity McKinley County, New Mexico		**5a. CONTRACT NUMBER** W912PP-17-C-0003 **5b. GRANT NUMBER** **5c. PROGRAM ELEMENT NUMBER**
6. AUTHOR(S)		**5d. PROJECT NUMBER**
Clement, Paul Arrowood, Todd Moayyad, Ben		**5e. TASK NUMBER** 0001AE, Task 5
		5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)		**8. PERFORMING ORGANIZATION REPORT NUMBER**
Sundance Consulting Inc. 8210 Louisiana Blvd. NE, Suite C Albuquerque, New Mexico 87113	CH2M HILL, Inc. 3721 Rutledge Road, NE, Suite B1 Albuquerque, New Mexico 87109	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)		**10. SPONSOR/MONITOR'S ACRONYM(S)**
U.S. Army Corps of Engineers 4101 Jefferson Plaza NE Albuquerque, New Mexico 87109		USACE **11. SPONSOR/MONITOR'S REPORT NUMBER(S)**

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
This work plan was prepared for submittal to the New Mexico Environment Department-Hazardous Waste Bureau as required by *Resource Conservation and Recovery Act* Permit Number NM6213820974.

14. ABSTRACT
This work plan proposes the activities for periodic groundwater monitoring at Fort Wingate Depot Activity. This plan is a revision to the previous version 9 plan and addresses groundwater monitoring in the Northern Area and in the Open Burn/Open Detonation Area of the installation. The primary data quality objective is to monitor existing groundwater contaminant plumes. This plan presents field sampling methods, a revised monitoring schedule, laboratory analytical methods, and quality control procedures.

15. SUBJECT TERMS
Fort Wingate Depot Activity, groundwater, monitoring, nitrate, explosives, perchlorate, volatile organic compounds, semivolatile organic compounds, petroleum hydrocarbons, Solid Waste Management Unit, Area of Concern.

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON** Mark Patterson
a. REPORT UNCLASSIFIED	**b. ABSTRACT** UNCLASSIFIED	**c. THIS PAGE** UNCLASSIFIED	SAR	142 (plus appendices)	**19b. TELEPHONE NUMBER** *(include area code)* 330-358-7312

Placeholder for Regulatory Approval

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Sundance Consulting Inc.
8210 Louisiana Blvd. NE, Suite C
Albuquerque, New Mexico 87113
and
CH2M HILL, Inc.
3721 Rutledge Road NE, Suite B1
Albuquerque, New Mexico 87109

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NMED HWB = New Mexico Environment Department, Hazardous Waste Bureau
USEPA 6 = U.S. Environmental Protection Agency Region 6
FWDA BEC = Fort Wingate Depot Activity Base Realignment and Closure Environmental Coordinator
OH = Ohio
NM = New Mexico
BRACD = U.S. Army Base Realignment and Closure Division
POC = Point of Contact, Steve Smith
USACE SWF = U.S. Army Corps of Engineers Fort Worth District
USACE = U.S. Army Corps of Engineers
NN = Navajo Nation
POZ = Pueblo of Zuni
BIA - NRO = Bureau of Indian Affairs – Navajo Regional Office
BIA SW = Bureau of Indian Affairs, Southwest Region
DOI - BIA = Department of the Interior – Bureau of Indian Affairs

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°C	degrees centigrade
°F	degrees Fahrenheit
AOC	area of concern
Army	U.S. Department of the Army
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act* of 1980
CFR	*Code of Federal Regulations*
CH2M	CH2M HILL, Incorporated
COPC	contaminant of potential concern
COR	Contracting Officer’s Representative
CSM	conceptual site model
DL	detection limit
DOD	U.S. Department of Defense
DOI	U.S. Department of the Interior
DQE	data quality evaluation
DQO	data quality objective
DRO	diesel range organics
DTW	depth to water
EDMS	Electronic Data Management System
ELAP	Environmental Laboratory Accreditation Program
EPA	U.S. Environmental Protection Agency
FTR	functional test range
FWDA	Fort Wingate Depot Activity
GMP	Groundwater Monitoring Plan
gpm	gallons per minute
GRO	gasoline range organics
HWB	Hazardous Waste Bureau
HWMU	hazardous waste management unit
ID	identification
IDW	investigation-derived waste
LOQ	limit of quantitation
MCL	maximum contaminant level
µg/L	microgram(s) per liter
µS/cm	microsiemen(s) per centimeter
mg/L	milligram(s) per liter
MI	multi-incremental
MS	matrix spike
MSD	matrix spike duplicate
mS/cm	millisiemen(s) per centimeter
mV	millivolt(s)
N	nitrogen
N/A	not applicable
NA	not analyzed
NAVD88	North American Vertical Datum of 1988
ND	not detected
NE	not established

NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NM WQCC	New Mexico Water Quality Control Commission
No.	number
NTU	nephelometric turbidity unit
OB/OD	Open Burn/Open Detonation
ORO	oil range organics
ORP	oxidation reduction potential
OSE	Office of the State Engineer
PAH	polyaromatic hydrocarbons
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
PCB	polychlorinated biphenyl
PGMR	Periodic Groundwater Monitoring Report
pH	scale used to measure the concentration of hydrogen atoms (acidity) of a sample
PMC	Program Management Company
QA	quality assurance
QC	quality control
QSM	Quality Systems Manual
RCRA	*Resource Conservation and Recovery Act*
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI	*Resource Conservation and Recovery Act* Facility Investigation
RL	reporting limit
RPD	relative percentage difference
RSL	regional screening level
SOP	standard operating procedure
SSL	soil screening level
Sundance	Sundance Consulting, Incorporated
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TAL	target analyte list
TCL	target compound list
TestAmerica	TestAmerica Laboratories, Inc.
TNT	2,4,6-trinitrotoluene
TOC	top of casing
TPH	total petroleum hydrocarbon(s)s
TPL	, Inc.
TPMC	TerranearPMC
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
UST	underground storage tank
VOC	volatile organic compound

Executive Summary

The Fort Wingate Depot Activity (FWDA) currently occupies approximately 24 square miles (15,277 acres) of land in western New Mexico in McKinley County. The FWDA is located approximately 7 miles east of Gallup and 130 miles west of Albuquerque. The main entrance to the FWDA is on U.S. Highway 66, west from Exit 33 off Interstate 40. Features at FWDA include 732 earth-covered igloos located throughout the property, two former Open Burn/Open Detonation (OB/OD) Areas, a Workshop Area, and various mission-support service structures located in the Administration Area.

Historical activities at FWDA that may have contributed to soil and groundwater contamination include munitions storage, maintenance, and disposal; the use and storage of petroleum fuels; and equipment maintenance (TerranearPMC [TPMC], 2008). As part of the planned property transfer to the U.S. Department of the Interior, FWDA has been divided into reuse parcels, with each site being addressed on a parcel-by-parcel basis, as specified by the *Resource Conservation and Recovery Act* Permit Number (No.) NM6213820974 originally issued in 2005 (NMED, 2015).

This Interim Facility-wide Groundwater Monitoring Plan for FWDA describes the proposed groundwater monitoring to be conducted as part of the Environmental Restoration Program at FWDA. This document has been prepared for submission to the New Mexico Environment Department-Hazardous Waste Bureau (NMED-HWB), as required by Section V.A of RCRA Permit No. NM 6213820974, December 2005-latest revision February 2015 (herein referred to as the RCRA Permit) (NMED, 2015).

The objectives of performing interim groundwater monitoring prior to the completion of Parcel *RCRA* Facility Investigation and Corrective Measures Studies are to:

- Evaluate compliance with the RCRA Permit groundwater cleanup levels
- Monitor groundwater flow and water quality parameters that affect contaminant fate and transport
- Monitor groundwater for the presence of contaminants of potential concern (COPCs) from known contaminant releases.
- Monitor the migration of and changes to groundwater contaminant plumes

The groundwater monitoring program is designed to monitor each COPC from the point of release to the existing groundwater contaminant plume boundary. The design is based on known or suspected releases to groundwater. The numbers and locations of monitoring points are designated based on the size and extent of the groundwater contaminant plume. A semiannual monitoring frequency was designated for groundwater sampling and measurement of groundwater elevations based on seasonal variation of water levels and the current regulatory-approved monitoring program.

Sampling of the monitoring wells at FWDA involves a variety of purging and sampling methods. The use of a low-flow pump is the preferred sampling method at FWDA in accordance with the *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (NMED-HWB, 2001). In instances of insufficient well yield, some wells require borehole purging methods to ensure collection of representative samples. Groundwater will be sampled from the monitoring wells designated for each point of release by the decision rules established in the data quality objectives. The COPCs identified at the points of release to groundwater are explosives, nitrate and nitrite, perchlorate, metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and petroleum hydrocarbons in the gasoline and diesel ranges.

Currently, 117 groundwater monitoring wells have been installed to characterize the nature and extent of contamination from activities associated with the OB/OD Area and various Solid Waste Management Units (SWMUs) and Areas of Concern. Groundwater impacts have been demonstrated in the Northern Area and the OB/OD Area. The Northern Area of FWDA includes Parcels 6, 11, 21, and 22. Nitrate, explosives, perchlorate, and

VOC groundwater plumes have been delineated in the Northern Area. The OB/OD Area is located within Parcel 3. Explosives, metals, and VOC and SVOC impacts have been identified within and directly adjacent to munitions disposal sites in OB/OD Area. The known and suspected points of release to groundwater are as follows:

- The 2,4-6-Trinitrotoluene (TNT) Leaching Beds (SWMU 1, Parcel 21) and Building 528 Complex (SWMU 27, Parcel 22) had releases of nitrate, explosives, and metals due to historical munitions activities.
- The Building 528 Complex (SWMU 27, Parcel 22) had releases of perchlorate due to historical propellant use.
- The Building 6 Gas Station (SWMU 45, Parcel 11) and the former Underground Storage Tank (UST) 7 at Building 45 (SWMU 50, Parcel 11) had releases of gasoline range organics and VOCs and a suspected release of lead due to historical leaks from USTs.
- The Building 6 Gas Station (SWMU 45, Parcel 11) also had suspected releases of diesel range organics (DRO) and SVOCs from historical fueling and mechanical operations.
- The Fire Training Ground (SWMU 7, Parcel 21) had suspected releases of DRO due to historical firefighting operations.
- The Pesticide and Field Battery Workshop (SWMU 8, Parcel 6) had suspected releases of SVOCs.
- The OB/OD (Hazardous Waste Management Unit [HWMU]), Old Burning Ground and Demolition Landfill (SWMU 14), and Old Demolition Area (SWMU 15) had releases of nitrate, explosives, perchlorate, and metals related to the historical munitions activities.
- The OB/OD (HWMU) and Old Burning Ground and Demolition Landfill (SWMU 14) in the OB/OD Area are suspected of having VOC and SVOC releases due to the historical use of accelerants for burning operations and the use of petroleum hydrocarbons for equipment maintenance.

Groundwater monitoring will be performed in semiannual monitoring events for the COPCs identified in the conceptual site model. The field team will collect groundwater elevation measurements semiannually prior to purging and sampling of monitoring wells. Water level gauging will be performed at all accessible and viable groundwater monitoring locations. Semiannual sampling will be performed from sample locations designated to track plume migration and general range in concentrations over time. Groundwater analysis at a given sample location is determined by COPCs associated with the point of release and with previous groundwater analytical results.

Results of each semiannual monitoring event will be submitted in a semiannual report prepared in accordance with NMED guidance entitled *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites* (NMED, 2003). The Interim Measures Periodic Groundwater Monitoring Report (PGMR) will include tabulated field and analytical data. Analytical data will be screened against the FWDA cleanup levels established in the RCRA Permit and U.S. Environmental Protection Agency Regional Screening Levels for chemicals where cleanup levels are not established. A discussion of results and recommendations for future monitoring will also be included in the PGMR.

1.0 Introduction

This Interim Facility-wide Groundwater Monitoring Plan (GMP) provides guidance for the groundwater monitoring activities to be conducted during calendar year 2017 at Fort Wingate Depot Activity (FWDA or Facility) in McKinley County, New Mexico (Figure 1-1). (Tables and figures are presented at the end of each section.) If no changes to the GMP are necessary, then this guidance will also cover calendar year 2018. This GMP has been prepared in accordance with the Performance Work Statement (or Scope of Work) under Contract Number (No.) W912PP-17-C-0003.

This is Version 10 of the Interim Facility-Wide GMP, prepared in accordance with the *Resource Conservation and Recovery Act* (RCRA) Permit No. NM 6213820974 (the RCRA Permit) first issued in 2005 (NMED, 2005). The RCRA Permit became effective on December 31, 2005, and was most recently revised in February 2015 (NMED, 2015). Version 10 is a revision to the previous GMP, Version 9, Revision 2, submitted September 28, 2016. This GMP presents a revised conceptual site model (CSM), an assessment of data quality objectives (DQOs), and new decision making criteria in response to NMED's letter of April 12, 2017. The revised decision making criteria and CSM are used in the monitoring design presented in this GMP. Proposed monitoring includes semiannual water elevation measurements and semiannual sampling in the existing monitoring network. Responses to comments on Version 9 of the Interim Facility-wide GMP are presented in Appendix A.

1.1 Project Organization and Management

The periodic groundwater monitoring program at FWDA is managed by the U.S. Army Corps of Engineers (USACE) for the U.S. Department of the Army (Army), Base Realignment and Closure (BRAC) Division. The groundwater monitoring program for FWDA was established by the USACE. Stakeholders for the monitoring program include:

- Army, BRAC Division
- New Mexico Environment Department-Hazardous Waste Bureau (NMED-HWB)
- Navajo Nation
- Pueblo of Zuni

The USACE subcontracts periodic groundwater monitoring and manages the project with coordination and review by stakeholders on behalf of the Army. Sundance Consulting, Incorporated (Sundance) is the USACE subcontractor responsible for planning and implementing the project. Project plans and reports are submitted to stakeholders for review. The NMED-HWB is the regulating authority for the installation and has final approval of project documents. A project organization chart is provided as Figure 1-2.

1.2 Regulatory Background

Environmental restoration activities at FWDA began in 1989 under the *Comprehensive Environmental Response, Compensation, and Liability Act* of 1980 (CERCLA) guidelines, as part of the Installation Restoration Program. The one exception was the Open Burn/Open Detonation (OB/OD) Area, which was classified as a RCRA Interim Status, thermal treatment unit.

Since that time, the NMED has become the lead regulatory agency. In 2002, the NMED determined that the remediation pathway would be solely through a RCRA permit for post-closure care of the current OB/OD Area with a RCRA corrective action module attached to address requirements for other solid waste management units (SWMUs) and areas of concern (AOCs). The RCRA Permit was finalized in December 2005 and became effective December 31, 2005 (NMED, 2005). Since the original permit issuance, the RCRA Permit has been revised through NMED-issued modifications in 2011, 2014, and 2015. The NMED-HWB identified one hazardous waste management unit (HWMU) within the current OB/OD (Parcel 3) and a total of 93 SWMUs and AOCs in the RCRA Permit. The NMED-HWB is currently in the process of preparing a renewal of the FWDA RCRA Permit. Until the renewal process is completed, all environmental activities at the Facility will be conducted in accordance with the requirements of the 2015 revision of the RCRA Permit, which includes the original Permit and all subsequent modifications (NMED, 2015).

As required by Section V.A of the RCRA Permit, the Army developed and implemented a groundwater monitoring program. The Army prepared a GMP according to provisions of the RCRA Permit, Section VIII.B.1 (20 New Mexico Administrative Code [NMAC] § 4.1.500, incorporating Title 40 *Code of Federal Regulations* [CFR] 264.101) (TerranearTPMC [TPMC], 2008). NMED approved the initial GMP in March 2008. The GMP has been revised annually, with the revisions submitted to NMED from 2009 through 2016. Groundwater monitoring, sampling, and reporting activities are conducted in compliance with the RCRA Permit, applicable RCRA Permit attachments, and the most recently approved version of the GMP.

Attachment 7 of the RCRA Permit provides a hierarchy for the selection of cleanup level criteria applicable to the FWDA groundwater monitoring program (Figure 1-3). Groundwater analytical results are evaluated and compared to these cleanup levels. The following documents and regulations are used to determine whether the concentration of a particular hazardous constituent exceeds the RCRA Permit cleanup level (NMED, 2015):

1. New Mexico Water Quality Control Commission (NM WQCC) standards for the analytes listed in NMAC § 20.6.2.7.WW having the values listed in NMAC § 20.6.2.3103.
2. U.S. Environmental Protection Agency (EPA) drinking water maximum contaminant levels (MCLs) provided under 40 CFR 141 and 143.
3. If both an NM WQCC standard and an EPA MCL have been established for a COPC, the lowest value of (1) and (2) above will be selected.
4. If no NM WQCC standard or EPA MCL has been established for a carcinogenic hazardous constituent, values will be selected from the most recent version of the EPA Regional Screening Levels (RSLs) for Tap Water (currently dated June 2017), adjusted to a target excess cancer risk level of 1×10^{-5}.
5. If no NM WQCC standard or EPA MCL has been established for a noncarcinogenic hazardous constituent, values will be selected from the most recent version of the EPA RSLs for Tap Water (currently dated June 2017) with a target hazard index of 1.0.
6. No current NM WQCC or EPA MCL standard is published for perchlorate. The RCRA Permit directs the use of EPA Tap Water RSLs when no NM WQCC or EPA MCL is published, and thus the most recently published EPA Tap Water RSL for perchlorate is selected (currently dated June 2017) until an NM WQCC or EPA MCL is published.

For some analytes, screening levels are selected for a compound with RSLs listed for both carcinogenic risks and noncarcinogenic hazards. In accordance with the RCRA Permit, only the RSLs for carcinogens are adjusted to a cancer risk of 1×10^{-5}. Subsequent to this modification, the lower of the adjusted carcinogenic and the noncarcinogenic RSLs will be selected.

Reporting requirements are specified in the GMP in accordance with the RCRA Permit. A schedule of regulatory deliverables is included in the GMP. The RCRA Permit Section V.A.2 requires the format to be consistent with the NMED's *General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites* (NMED, 2003).

1.3 Purpose

The objectives of performing interim groundwater monitoring prior to the completion of site characterization and the issuance of decision documents are to:

- Evaluate compliance with the RCRA Permit groundwater cleanup levels, as identified in Section 7.1 of Attachment 7 to the RCRA Permit (NMED, 2015)
- Monitor groundwater flow and field water quality readings that affect contaminant fate and transport

- o Monitor groundwater for the presence of contaminants of potential concern (COPCs) from known contaminant releases
- o Monitor the migration of and changes to known groundwater contaminant plumes

Groundwater monitoring data also provide information in support of site characterization and future corrective measures evaluations.

1.4 Data Quality Objectives

DQOs are qualitative and quantitative statements that clarify the project objectives, specify the most appropriate types of data for project decisions, determine appropriate conditions from which to collect data, and specify tolerable limits on decision errors. DQOs are developed to satisfy specific project objectives in accordance with applicable USACE specifications and NMED and U.S. Environmental Protection Agency (EPA) guidance. The DQOs are based on the end uses of data determined through a seven-step process as described in EPA Guidance QA/G-4 (EPA, 2006).

The DQOs defined for this GMP along with CSM information are used to determine the decision logic and provide an effective sampling design. The DQOs assist in identifying the required type, quality, and quantity of data needed for interim groundwater monitoring to meet investigation goals and regulatory requirements. The project DQOs are defined according to the logic presented sequentially in the sections below.

Step 1 - State the Problem

Identified groundwater contaminant plumes will be monitored in accordance with the RCRA Permit and in support of site characterization and evaluation of potential corrective measures.

Step 2 - Identify the Decision

Principal Study Questions: Where are site-related COPCs present in FWDA groundwater at concentrations exceeding cleanup standards? What are the sources of theses groundwater contaminant plumes? How are contaminant plumes migrating? How are COPC concentrations changing over time?

General Intended use of Collected Data: The data will be used to monitor the nature and extent of COPCs in groundwater and evaluate temporal trends. Groundwater monitoring data will also be used to support site characterization and evaluate potential corrective measures.

Step 3 - Identify Inputs to the Decision

Inputs considered during development of this GMP include the following:

- o The RCRA Facility Investigations (RFIs) for each FWDA parcel are used to determine the points of contaminant release or suspected points of contaminant release to groundwater.
- o Lithologic information from previous boreholes and water elevations from existing groundwater monitoring wells provide data on hydrogeologic structural controls and groundwater flow.
- o Historical analytical data from the previous investigations provide information on site conditions.
- o Analytical results, field parameters, and groundwater elevations from ongoing interim monitoring are used to determine current site and groundwater contaminant plume conditions.
- o Cleanup criteria/project screening levels are used to evaluate groundwater analytical data.

This information is used to determine the decision rules in Step 5.

Step 4 - Define Boundaries of the Study

Spatial: The FWDA boundary is the study boundary for facility-wide monitoring (Figure 1-2). The current monitoring well network will be used to monitor groundwater contamination under the interim monitoring program. Final characterization as defined by RFIs for each parcel will be used to determine whether the monitoring network is sufficient to define the extent of groundwater contamination.

Temporal: The temporal boundaries of the investigation are long-term monitoring of groundwater contamination and groundwater flow patterns observable over 6-month intervals. Based on previous groundwater monitoring data from 2008 to 2016, the groundwater elevations are relatively stable and are not subject to wide seasonal fluctuations. Potential temporal contaminant concentration trends will be identified by collecting samples at a semiannual frequency. Groundwater elevation measurements will also be collected at a semiannual frequency.

Step 5 - Develop a Decision Rule

The purpose of this step is to integrate the output from the previous steps of the DQO process into statements that defines the decision logic for design of the interim measures groundwater monitoring program. The following decision rules have been designated:

Groundwater analytical results will be compared to the FWDA cleanup criteria/project screening levels to monitor extent and migration of COPCs. Monitoring results will be submitted in Periodic Groundwater Monitoring Reports (PGMRs). If migration of groundwater plumes outside of FWDA boundaries is indicated, corrective actions will be proposed.

Step 6 - Specify Limits on Decision Errors

Decision errors will be minimized through site visits, refinement of the CSM, and evaluation of current and historical analytical data.

Field measurements will be compared to quality criteria established by field standard operating procedures and by evaluation against previous measurements for representativeness.

Analytical data quality will be compared to the *Department of Defense* [DOD] *Quality Systems Manual for Environmental Laboratories* (QSM)*, Version 5.0* (DOD, 2013a) specifications for precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS).

The analytical methods will provide the lowest available analytical reporting limits using standard methods that allow the data to be screened against the FWDA cleanup criteria/project screening levels.

Step 7 - Optimize the Design

Sampling Design:

The interim groundwater monitoring included in this plan will:

- Evaluate compliance with the RCRA Permit groundwater cleanup levels
- Monitor groundwater flow and field water quality parameters that affect contaminant fate and transport
- Monitor groundwater for the presence of COPCs from known contaminant releases
- Monitor the migration of and changes to groundwater contaminant plumes

Groundwater monitoring will evaluate each groundwater contaminant plume from the point of release to the existing groundwater plume boundary and at sentinel locations along the property boundary. Each impacted groundwater zone (Northern Area alluvial, Northern Area bedrock, and OB/OD) will be assessed to determine where contaminants are present and to determine suitable locations for monitoring contaminant plumes. The groundwater flow direction will be evaluated to assure that data on potential downgradient migration of the plumes are captured. In addition, historical analytical data will be reviewed to select monitoring locations representative of the highest contaminant concentrations in each plume.

Wells designated to monitor a release will be analyzed for the COPCs associated with each specific point of release. Wells designated as upgradient and downgradient of a contaminant plume will be used to monitor plume boundaries and plume migration. Where no contaminant plume can be drawn, downgradient locations will be selected based on groundwater flow direction from the point of release. Sentinel wells will be designated to monitor potential offsite migration of contaminants. Background wells will be selected to be outside the influence of the release/plume. Some monitoring points will be monitored for multiple COPCs when they are designated for multiple points of release, or when a single point of release is associated with multiple COPCs. Details of well designation rationale are provided in Section 5.2.

Groundwater monitoring will continue at a semiannual frequency. The semiannual sampling frequency is consistent with the monitoring frequency performed from 2008 to date and with the previously approved work plans. To achieve consistency of sampling and groundwater elevation surveys, the frequency of water elevation surveys will be changed from quarterly to semiannually. Quarterly elevation measurements are not necessary due to stable groundwater flow patterns and minimal seasonal variability observed since 2008.

The most recently published versions of the NMED-requested analytical methods with FWDA project-specific reporting limits will be used to provide definitive, quantitative analytical data that will meet the FWDA RCRA Permit requirements. Laboratories performing the sample analyses will follow the current version of the DOD Environmental Field Sampling Handbook, Rev. 1.0 (DOD, 2013b) and the current version of the QSM (DOD, 2013a). All laboratory analysis will be performed by independent analytical laboratories that maintain DOD Environmental Laboratory Accreditation Program (ELAP) accreditation. In addition to DOD ELAP accreditation, the laboratory will hold current accreditation for all appropriate fields-of-testing in New Mexico. This is generally accomplished by the laboratory holding a current national ELAP accreditation for appropriate fields-of-testing. Documentation of current accreditation/certification for the applicable fields of testing is required prior to laboratory acceptance of samples. Analytical results will be validated in accordance with the current version of the QSM.

Optimization:

Recommendations for optimization will be made in an interim measures PGMR and carried forward in subsequent planning documents. Optimization will be approved in subsequent monitoring GMPs prior to implementation. Recommendations may include:

- Proposed installation or abandonment of monitoring locations
- Proposed changes to field or analytical methods
- Proposed changes to monitoring frequency and location

1.5 Document Organization

This 2017 Interim Facility-wide GMP is organized as follows:

Section 2 presents the available site history and general description of the FWDA and summarizes previous groundwater investigations.

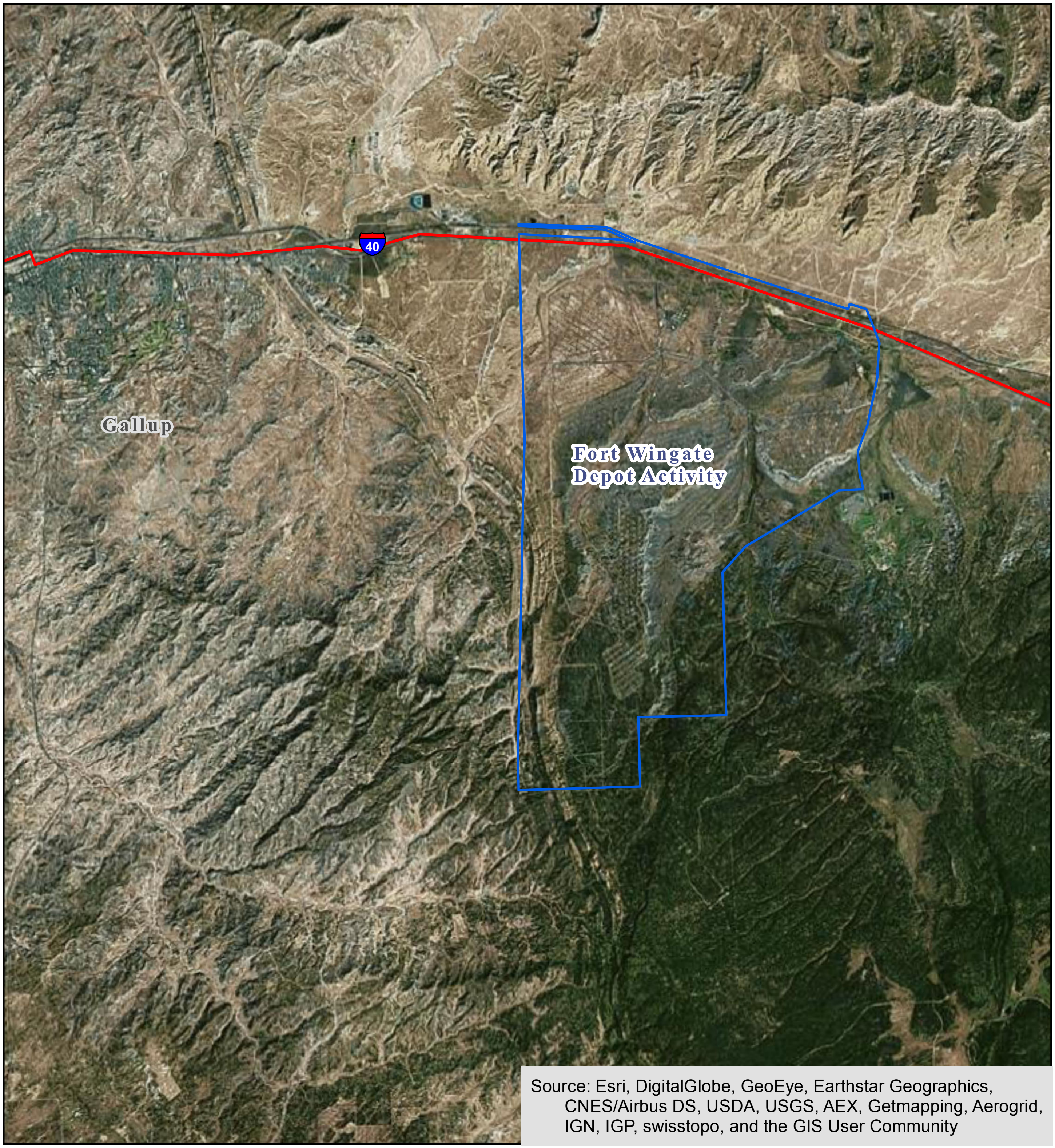
Section 3 presents the CSM with information about current site conditions and environmental setting of the FWDA.

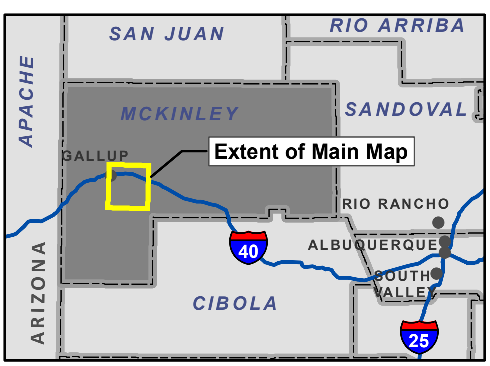
Section 4 describes the methods and procedures for groundwater sample collection, decontamination, quality assurance (QA), and investigation-derived waste (IDW) characterization and disposal.

Section 5 presents the groundwater monitoring program, and discusses data validation, data management, and reporting.

Section 6 provides the projected monitoring schedule for calendar year 2017.

Section 7 presents a list of the works cited in this GMP.





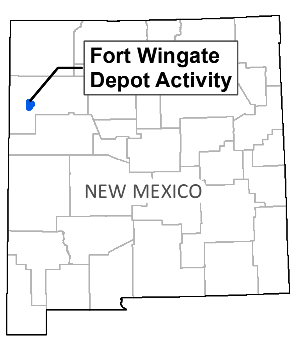


FIGURE 1-1
LOCATION MAP
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

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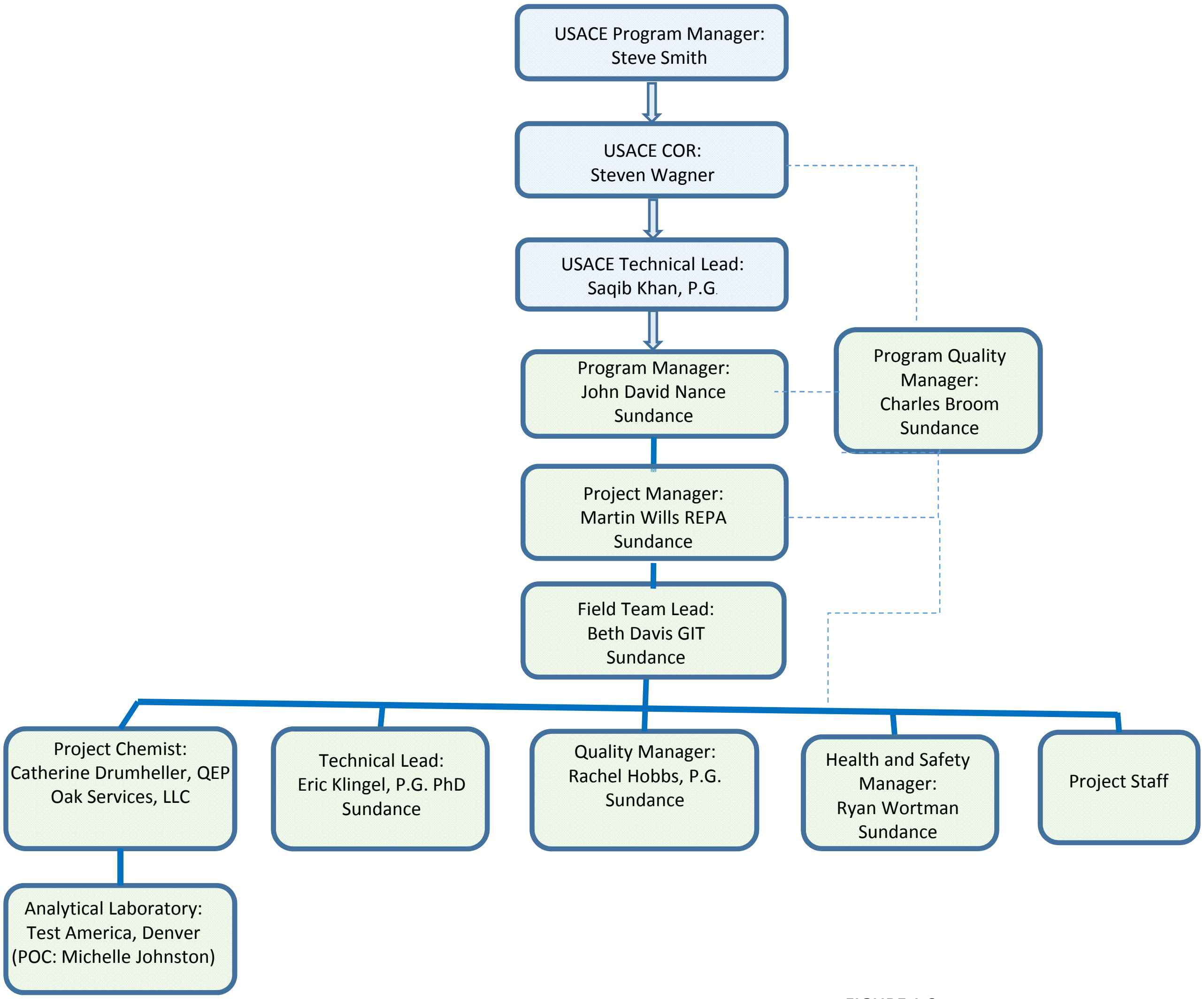
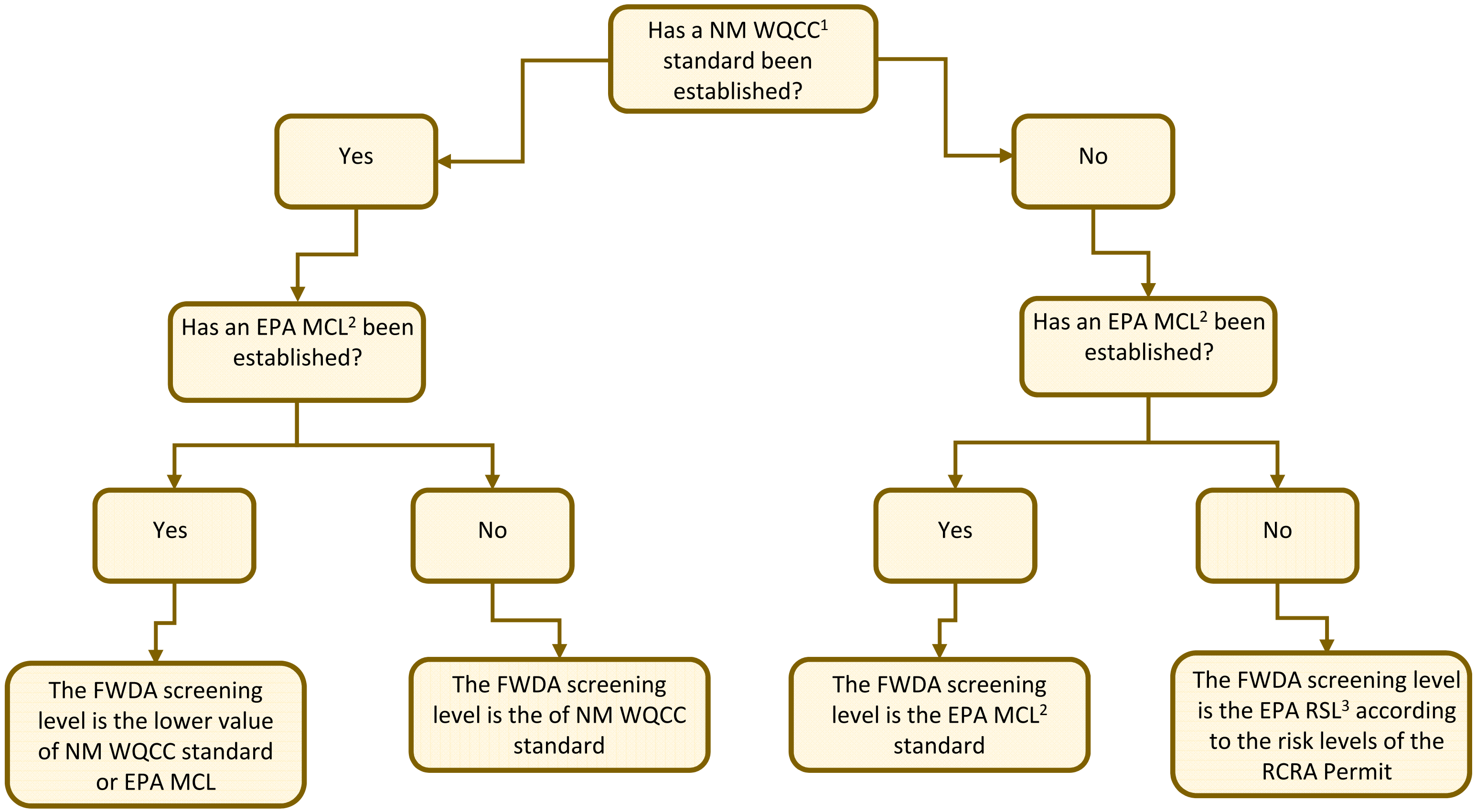


FIGURE 1-2
PROJECT ORGANIZATION CHART
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico



Notes:
[1] New Mexico Water Quality Control Commission (NM WQCC) standards in 20 New Mexico Administrative Code § 6.2.4103.
[2] U.S. Environmental Protection Agency (EPA) drinking water maximum contaminant level (MCL) under 40 Code of Federal Regulations Parts 141 and 143
[3] Pending the development and approval of cleanup criteria, the EPA Region 6 Regional Screening Levels (RSLs) based on a cancer risk of 10^{-5} and a non-cancer hazard index of 1.0 are used as temporary screening criteria in accordance with the risk criteria of the RCRA Permit. The lower of the cancer and non-cancer screening levels will be used. Perchlorate screening levels are selected from the noncancer RSL.

FIGURE 1-3
PROJECT SCREENING LEVEL DECISION CHART
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

2.0 Site History and Background

2.1 General Facility Description

The FWDA currently occupies approximately 24 square miles (15,277 acres) of land in western New Mexico in McKinley County (Figure 1-1). The FWDA is located approximately 7 miles east of Gallup and about 130 miles west of Albuquerque. The main entrance to the FWDA is on U.S. Highway 66, west from Exit 33 off Interstate 40. The FWDA is surrounded by tribal and federally owned lands, including national forests, Zuni tribal lands, and Navajo tribal lands. North and west of the FWDA are Navajo trust and Native American lands, to the east are lands that are administered by the Bureau of Indian Affairs, and to the south and southeast is the undeveloped Cibola National Forrest.

Originally founded in 1860 as a cavalry post, the Army established Fort Wingate as a munitions storage depot in 1918. The FWDA has had a number of missions from 1918 until 1993, including ordnance storage, testing, and demilitarization, as well as missile defense testing. The installation was closed in 1993 under the Defense Authorization Amendments and BRAC Act of 1988. In 2002, the Army reassigned many functions at FWDA to the BRAC Division, including property disposal, caretaker duties, management of caretaker staff, and performance of environmental restoration and compliance activities.

Approximately half of the FWDA is currently leased to the Missile Defense Agency and is used for operations related to missile testing. Missile testing activities occur in northeastern and central portions of FWDA, in Parcel 16 and Parcel 19. The remaining FWDA operations are focused on assessment and remediation of contamination prior to property transfer/reuse.

Historical activities at FWDA that may have contributed to soil and groundwater contamination include munitions storage, maintenance, and disposal; the use and storage of petroleum fuels; and equipment maintenance (TPMC, 2008). Efforts to remediate affected areas have concentrated on the removal of exploded and unexploded ordnance, in addition to characterizing soil across the installation and conducting semiannual groundwater monitoring. As part of the planned property transfer to the U.S. Department of the Interior (DOI), the installation has been divided into reuse parcels with each site being addressed on a parcel-by-parcel basis, as specified by the RCRA Permit (NMED, 2015). Parcels transferred to date are located near the southern and eastern boundaries of the Facility and consist of Parcels 1, 15, and 17.

Facilities at FWDA (Figure 2-1) include 732 earth-covered igloos located throughout the FWDA, two former OB/OD Areas, a Workshop Area, and various mission-support service structures located in the Administration Area. The installation can be divided into several areas based upon location and historical land use. These major land use areas include the following:

- **The Administration Area**—Located in the northern portion of the FWDA and encompasses approximately 800 acres; consists of former office facilities, housing, equipment maintenance facilities, warehouse buildings, and utility support facilities. Munitions storage and shipping, fuel storage and dispensary, and mechanical maintenance activities were performed in this area.
- **The Workshop Area**—Located to the south of the Administration Area and encompasses approximately 700 acres; consisted of an industrial area containing ammunition maintenance and renovation facilities, the trinitrotoluene (TNT) washout facility, and the TNT Leaching Beds Area (SWMU 1). The buildings and other structures were demolished in 2010.
- **The Magazine (Igloo) Area**—Located in the central portion of the FWDA and covers approximately 7,400 acres; consists of areas that encompass 10 Igloo Blocks (A through H, J, and K) that contain 732 earth-covered igloos and 241 earthen revetments previously used for munitions storage.

- **The OB/OD Area**—Located within the southwest and western portions of the installation; the OB/OD Area can be separated into two sub-areas based on period of operation:
    - Closed OB/OD Area—Inactive OB/OD SWMUs that were used to treat military munitions and explosive-contaminated waste from 1948 to 1955; includes the former Burning Ground, the Demolition Landfill Area, and the Old Demolition Area (Program Management Company [PMC], 1999).
    - Current OB/OD Area—Inactive OB/OD HWMU where burning and detonation operations were performed after 1955 until installation closure in 1993 (PMC, 1999); contains the active OB/OD corrective action management unit identified in the recent RCRA Permit updates.
- **Protection and Buffer Areas**—Located adjacent to the eastern, northern, and western boundaries of the installation and encompassing approximately 4,050 acres; consists of buffer zones surrounding the former magazine and demolition areas.

2.2 Previous Investigations

From 1980 through issuance of the RCRA Permit in December 2005 (revised February 2015), a number of environmental investigations were conducted by the Army and other parties (including EPA and the DOI) under CERCLA and RCRA guidance (BRAC, 2010). Generally, these investigations have been conducted with multiple phases to iteratively characterize groundwater at a single location over a period of time. The 2005 RCRA Permit identified one HWMU within the OB/OD Area (Parcel 3) and a total of 93 SWMUs and AOCs. To date, approximately 121 groundwater monitoring wells and 10 piezometers have been installed to characterize the nature and extent of contamination across FWDA. Currently, 91 monitoring wells and 10 piezometers are active and included in ongoing groundwater monitoring. Other wells have been abandoned in place, were removed as part of excavation activities, or are no longer accessible due to damage or burial during high-stage flows in drainages.

Groundwater investigation and characterization efforts have primarily focused on five areas:

- TNT Leaching Beds Area (SWMU 1 located in Parcel 21)
- Administration Area (multiple SWMUs and AOCs located in Parcels 6, 7, and 11)
- Eastern Landfill Area (SWMU 13 located in Parcel 18)
- Buildings 542 and 600 (SWMUs 11 and 4 located in Parcel 6)
- OB/OD Area (located in Parcel 3)

For discussion purposes related to groundwater sampling, these areas have been grouped within two major areas at FWDA: the OB/OD Area and the Northern Area. A map showing all existing monitoring well locations is included as Figure 2-2, and well construction information for all wells to date is included in Table 2-1. A DVD database of the groundwater analytical results through October 2016 is included as Appendix B along with summary tables of maximum groundwater sample results by well per detected analyte and recent analytical detections from 2015 and 2016.

The previous investigations are summarized below. The sampling results generated from these investigations are briefly discussed for each report, and conclusions are summarized in Table 2-2. Table 2-2 summarizes the soil sampling data at the analyte group level (for example, metals, explosives, and volatile organic compounds [VOCs]) as it pertains to known or potential groundwater impacts. Table 2-3 summarizes the groundwater detects and cleanup criteria/project screening level exceedances (historical through 2016) per analyte group. The monitoring wells in Table 2-3 are organized by point of release from Table 2-2. Together, the information in Tables 2-2 and 2-3 is used to develop the CSM presented in Section 3.0 and ultimately to provide a basis for the monitoring and sampling plan design presented in Section 5.0.

2.2.1 Environmental Survey of FWDA – 1981

In 1981, an environmental survey of FWDA (ESE, 1981) was conducted to determine the potential presence and extent of contamination caused by activities related to munitions storage, munitions recycling, and treatment. Groundwater monitoring activities are described below.

- Eleven monitoring wells (FW07, FW08, FW10, FW11, FW12, FW13, FW26, FW27, FW28, FW29, and FW35) were completed in the Northern Area during this assessment. However, groundwater was not encountered in the majority of the wells; therefore, most of these wells are considered dry and have been abandoned. Only well FW35 is currently active.
- One monitoring well (FW24), located at the far downstream end of the north-south arroyo in Parcel 3, was completed as part of the environmental survey of the OB/OD Area in 1981. Upon completion of the installation of FW24, the well had insufficient water for sampling and is dry and inactive.
- One background monitoring well, FW31 in Parcel 19, was completed east and south of any known potentially contaminated areas during the 1981 environmental survey. This well is not located within a mile of documented groundwater impact sites. This well is currently active.

Unfortunately, most of the wells completed during the 1981 environmental survey have historically lacked sufficient water for interim semiannual sampling as directed by the RCRA Permit. All of the FW monitoring wells have either been abandoned or removed except for wells FW24, FW31, and FW35.

2.2.2 Groundwater Investigations at Building 6 UST Area – 1993-1995

During January 1993, six underground storage tanks (USTs) were removed from Building 6 within the Administration Area (USACE, 1995a) (Parcel 11). During the removal, a fuel release was suspected, presumably from holes or cracks in the bottoms of several of the tanks or associated piping. This spill was discovered on January 19, 1993, and was reported to the NMED Petroleum Storage Tank Bureau (USACE, 1995a).

The USACE Albuquerque District conducted a site investigation for the Building 6 USTs. In 1993, 16 soil borings were advanced to an average depth of 60 feet below ground surface (bgs). In October and November 1994, six soil borings were advanced to a depth of 60 feet bgs, and five monitoring wells (MW-18S, MW-18D, MW-20, MW-22S, and MW-22D) were installed at three locations. Groundwater analytical data from MW-20, located south and west of the UST removal area, indicated benzene contamination in excess of the FWDA cleanup level, at a maximum of 110 µg/L. The monitoring wells were resampled in 1995, and results indicated that the benzene concentrations had decreased to below the FWDA cleanup level, with a maximum detection of 4.4 µg/L (USACE, 1995b).

With the decline in benzene concentrations, the USACE Albuquerque District approached the NMED to suspend the investigation and any further requirements to install additional monitoring wells at this site. The NMED agreed that installation of additional monitoring wells was not needed at that time; however, a 2-year quarterly groundwater monitoring program was required by the NMED and implemented by the Army (USACE, 1995b).

2.2.3 Remedial Investigation/Feasibility Study Report and RCRA Corrective Action Program Document – 1997

Environmental investigation activities across FWDA were implemented as part of base closure in the fall of 1992 to determine the environmental impact (if any) from previously identified SWMUs and AOCs and to identify areas requiring environmental restoration prior to property transfer to the DOI. Findings generated as a result of this effort were documented in the 1997 Remedial Investigation/Feasibility Study Report and RCRA Corrective Action Program Document (ERM PMC, 1997); groundwater activities and findings are summarized below.

- Four groundwater monitoring wells (TMW01 through TMW04) were completed during 1996 to further characterize groundwater contamination near the TNT Leaching Beds Area in the Northern Area. Monitoring well specifications are presented in Table 2-1.

- A single well (SMW01) was installed in 1996 to monitor potential impacts from the Sewage Treatment Plant, also in the Northern Area.
- A single well (FW38) was completed during November 1993 in an arroyo that drains the current OB/OD Area. This well was removed in 2017 as part of the munitions response excavations.

During this phase of investigation, explosives and nitrate were the primary constituents detected in the monitoring wells completed near the TNT Leaching Beds Area. Nitrate, pesticides, and metals were the primary constituents detected in the samples collected from SMW01 near the FWDA Sewage Treatment Plant. Explosives, nitrate/nitrite, and metals were the primary constituents detected in groundwater samples collected from FW38.

2.2.4 Minimum Site Assessment Report – 1998

The purpose of the Minimum Site Assessment (USACE, 1998) was to summarize the actions taken by the USACE Albuquerque District to identify the horizontal and vertical extent of soil contamination and to determine whether groundwater was impacted by potential fuel releases at the UST site adjacent to Building 45.

The Minimum Site Assessment was initiated in November 1996 with the completion of six soil borings (SB-1 through SB-6) and three shallow monitoring wells (MW01, MW02, and MW03) to determine the extent of hydrocarbon contamination. Analytical data from this assessment indicated that hydrocarbon contamination in the soil was limited to a small area. The area affected was restricted to a single soil boring at depths less than 40 feet bgs. Chemical characterization of underlying groundwater indicated minimal impact, with a single detection of benzene at a concentration below the FWDA cleanup level at MW01.

2.2.5 RCRA Interim Status Closure Plan – OB/OD Area Phase 1B Report – 1999

Environmental characterization efforts in support of closure at the OB/OD Area (Parcel 3) were conducted during 1996, 1997, 1998, and 1999. Overall, these efforts consisted of monitoring well installation and sampling, a seismic profile survey, groundwater elevation measurements, a well survey, geologic mapping, surface water sampling, and sediment sampling (PMC, 1999).

The objective of the 1996 investigation was to assess the presence and quality of shallow groundwater and to characterize the shallow hydrogeologic regime in the OB/OD Area. This investigation consisted of drilling and sampling multiple soil borings; completion of shallow and intermediate depth monitoring wells; performance of downhole video logging and slug tests on newly installed monitoring wells; and collection of groundwater, surface water, and sediment samples. Three groundwater monitoring wells (KMW09, KMW10, and KWM11) were installed in the Old OB/OD Area (SWMUs 14 and 15) and 11 groundwater monitoring wells (CMW02, CMW04, CMW06, CMW07, CMW10, CMW14, and CMW16 through CMW20) were installed in the OB/OD Area (HWMU). Explosive constituents were detected in wells located in both OB/OD Areas; however, the areal extent could not be defined by the 1996 investigation and required further characterization efforts.

In 1998, two groundwater monitoring wells (KMW12 and KMW13) were installed in the Old Detonation Area (SWMU 15), and four groundwater monitoring wells (CMW21, CMW22, CMW23, and CMW25) were installed north of monitoring well CMW16 located downgradient of the OB/OD Area (HWMU) to identify the northern extent of impacted groundwater within the unconsolidated and bedrock water-bearing zones. In addition, CMW24 was installed downgradient of the Old Burn Area and Demolition Landfill (SWMU 14) (PMC, 1999).

2.2.6 OB/OD Groundwater Monitoring – 1999-2005

Several quarterly sampling events have been completed in the OB/OD Area (Parcel 3) since the issuance of the 1999 RCRA Interim Status Closure Plan - Phase 1B Report (PMC, 1999). Quarterly groundwater monitoring events were conducted during 2000 (PMC, 2001a), 2001 (PMC, 2002a), and 2002 (PMC, 2003), and an additional sampling event was completed in August 2005 (TerranearPMC, 2005). These quarterly events were documented in quarterly letter reports and an annual inclusive report for each year.

During the initial sampling investigation, a subset of nine wells (CMW02, CMW16, CMW18, CMW21, CMW22, CMW25, KMW09, KMW12, and KMW13) was sampled during 2000 and the first half of 2001. Monitoring well CMW23 was added midway through 2001, and a subset of 10 wells was sampled until 2005.

2.2.7 RCRA Facility Investigation Report of the TNT Leaching Beds Area – 2001

From 1998 to 2001, additional groundwater investigations were completed in the TNT Leaching Beds Area (Parcel 21, SWMU 1) and the Administration Area (Parcel 11, Various SWMUs and AOCs) (PMC, 2001b). Seven groundwater monitoring wells (TMW05 through TMW08, TMW10, TMW11, and TMW13) were installed to further characterize the hydrogeologic setting and potential environmental impacts caused by the former operations. As a result of these investigations, groundwater was found to be impacted by explosives, metals, nitrate, and nitrite, which appear to emanate from the TNT Leaching Beds Area. In addition, groundwater was found to be impacted by VOCs, which appear to originate from the Administration Area.

Section 3 of this plan includes figures of the current distribution of nitrate and nitrite, explosives, and VOCs in both alluvial and bedrock groundwater in the vicinity of the TNT Leaching Beds.

2.2.8 Phase 1 RCRA Facility Investigation Report for Buildings 600 and 542 – 2002

In 2001, soil and groundwater were investigated to determine whether previous detections of explosives in TMW11 were the result of activities at Buildings 600 (Parcel 6, SWMU 4) and 542 (Parcel 6, SWMU 11) in the Workshop Area (PMC, 2002b). Soil and sediment samples were collected and were analyzed for explosives, VOCs, semivolatile organic compounds (SVOCs), and target analyte list (TAL) metals. For Building 600 (SWMU 4), all soil and sediment sample result concentrations were below applicable cleanup criteria/project screening levels. For Building 542 (SWMU 11) two polyaromatic hydrocarbons (PAHs) were detected in excess of NMED soil screening levels (SSLs) in surface soils.

Monitoring well TMW11, drilled in a location cross-gradient from the TNT Leaching Beds Area, was intended to provide groundwater chemical characterization data in an area thought to be unimpacted by historical operations. One explosive constituent, cyclotrimethylenetrinitramine (1,3,5-trinitro-1,3,5-triazinane or RDX), was detected at concentrations close to the laboratory reporting limit during five of six sampling events conducted between October 1998 and January 2000. These detections of RDX initiated an investigation to identify other potential sources of explosives in the area.

Six monitoring wells (TMW14A through TMW19) were completed near Buildings 542 and 600 (SWMU 4 and SWMU 11) to determine the source of the contamination at TMW11. Monitoring well TMW15 was completed in the unconsolidated aquifer, similar to TMW11. Monitoring wells TMW14A, TMW16, TMW17, TMW18, and TMW19 were completed in the deeper, sandstone bedrock aquifer. TMW14A was also installed as a potential background well. Fluoride was detected at concentrations exceeding cleanup criteria/project screening levels. One VOC, explosives, perchlorate, nitrate, nitrite, and a variety of metals were also detected.

2.2.9 Groundwater Investigation Report of the Eastern Landfill – 2005

The Eastern Landfill (Parcel 18, SWMU 13) is located approximately one-half mile east of the Northern Administration Area and is reported to have been used for the disposal of municipal waste and construction debris from the Administration Area. The area was also reportedly used for burning of other solid waste. In 1968, the landfill was closed and covered with a layer of soil. During the Remedial Investigation phase, the Eastern Landfill was located using a geophysical survey, and soil sampling and a soil gas survey were conducted. The soil analytical results indicated that lead, mercury, and barium were present at levels slightly above background levels. Pesticides, VOCs, and SVOCs were not detected. The results of the soil gas survey indicated that low levels of methane were present. In October 1999, Safe Environment, Inc. removed surface debris in the area of the Eastern Landfill, which consisted of metal ammunition lids, wire rope, I-beams, pipe, tires, wire fencing, concrete blocks, expended ammunition casings, scrap wood, and tree branches/trunks (TtNUS, 2005).

The primary objective of the 2005 groundwater investigation was to determine whether contaminants have impacted the groundwater beneath the Eastern Landfill (TtNUS, 2005). During the investigation, four bedrock wells (EMW01 through EMW04) were installed in 2004. Several explosives, metals, pesticides, VOCs, SVOCs, nitrate, and nitrite were detected in these samples collected from the sampling event after well installation, with RDX, pesticides, and dissolved metals detected above cleanup criteria/project screening levels.

The Eastern Landfill waste material was subsequently excavated and removed in 2013 followed by backfilling with soil from an onsite borrow source. Upon removal of all buried and surface waste materials, confirmation sampling was initiated to verify that all waste materials had been removed and that its former presence had not impacted the underlying soils. Confirmation sampling was conducted and results were provided to the NMED for approval. Upon review and approval of the confirmation results, a final round of sampling of the four groundwater monitoring wells (EMW01, EMW02, EMW03, and EMW04) was performed January 14 through 16, 2014. On March 3, 2014, the groundwater results were submitted to the NMED with a request for permission to abandon the wells in accordance with New Mexico Office of the State Engineer regulations. NMED granted the well abandonment request via email on March 26, 2014, and the wells were abandoned on April 29 and 30, 2014.

2.2.10 Administration and TNT Leaching Beds Areas Supplemental Groundwater Characterization Report – 2006

The purpose of the work described in this report (TerranearPMC, 2006) was to gather additional information during 2002 and 2003 to address comments and discussions by members of the FWDA BRAC Cleanup Team regarding information presented in the 2001 Final RFI Report for the TNT Leaching Beds Area (Parcel 21, SWMU 1) (PMC, 2001b). Additional monitoring wells were installed to evaluate Northern Area alluvial groundwater flow conditions. In addition, the groundwater analytical data presented in the TNT Leaching Beds Area RFI Report indicated that the leading edge of impacted groundwater (as indicated principally by detected nitrite/nitrate concentrations) had reached the edge of the permeable sediments of the Rio Puerco Valley. Because groundwater from these sediments is used for domestic water supply in the immediate vicinity of the FWDA, additional efforts (monitoring wells and groundwater samples) were warranted to determine the current groundwater quality within the Rio Puerco sediments in the northern areas of the FWDA.

Nine monitoring wells (TMW21 through TMW29) were installed in the alluvial aquifer of Parcel 11. Upon completion of the new wells, a groundwater sampling event of all wells in the Northern Area of FWDA was conducted during October 2002 and April 2003. The results of this event were similar to those of the 2001 RFI Report of the TNT Leaching Beds Area and provided further information about the leading edges of impacted groundwater.

2.2.11 Parcel 11 RFI Report – 2011

In November and December of 2009, the U.S. Geological Survey (USGS) conducted an RFI in Parcel 11. Parcel 11 contains the majority of buildings and structures that made up the Administration Area (Figure 2-1). The RCRA Permit lists 10 SWMUs and 9 AOCs in Parcel 11. The Army elected to include of the SWMU 40 sites (which overlap the Parcel 7 and Parcel 11 boundaries) in this RFI.

Three monitoring wells were installed in Parcel 11 (USGS, 2011a). Well TMW32 was installed near Building 5 (SWMU 5). Well TMW34 was installed west of Building 11, former Locomotive Shop (SWMU 6/AOC 47). TMW33 was installed downgradient of the Former Gas Station (SWMU 45). All three monitoring wells were constructed in the alluvium and screened across the water table.

The RFI investigation and sampling results for each SWMU and AOC are summarized below.

Fenced Storage Yard (SWMU 3): A total of 280 soil samples were collected in SWMU 3. Based on the results of the RFI soil investigation, PAHs, diesel range organics (DRO), and metals exceeded cleanup criteria/project screening levels in surface soils at SWMU 3. The Army attributed metals detections to naturally occurring conditions (USGS, 2011a).

Building 5, Regimental Garage (SWMU 5): Based on the results of the soil investigation, the Army concluded that no further action is needed for soil and sediment in storm sewers at SWMU 5 (USGS, 2011a). A groundwater monitoring well (TMW35) was installed and sampled. Samples were analyzed for VOCs, SVOCs, gasoline range organics (GRO), DRO, oil range organics (ORO), polychlorinated biphenyl (PCBs), herbicides, pesticides, nitrate, and total and dissolved TAL metals. Analysis of groundwater data collected from monitoring well TMW35 indicated that nitrate and metals were above cleanup criteria/project screening levels.

Building 11, Former Locomotive Shop (SWMU 6): A total of 56 soil samples were collected from locations within the locomotive service trenches of the western portion of Building 11 and at the western end of SWMU 6. Based on the soil sampling results, metals and DRO exceeded cleanup criteria/project screening levels. The Army concluded that the metals are naturally occurring. The depth of DRO contamination was not defined. Groundwater monitoring well TMW34 was installed and sampled. Groundwater samples were analyzed for VOCs, DRO, nitrate, total and dissolved metals, and perchlorate. Analysis of groundwater data collected from monitoring well TMW34 indicated that nitrate and metals were above cleanup criteria/project screening levels.

Sewage Treatment Plant (SWMU 10): A total of 18 soil samples were collected and analyzed for VOCs, SVOCs, explosives, PCBs, pesticides, herbicides, total petroleum hydrocarbons, and TAL metals. Based on the results of this soil sampling the Army concluded that no further action is needed to address soil contamination at SWMU 10 (USGS, 2011a).

Building 8, Paint Shop or Carpenter Shop and Building 7, Paint Shop and Paint Storage Warehouse (SWMU 23): A total of 29 soil samples were collected. Based on the results of the soil investigation, the Army concluded that PAHs, DRO, arsenic, and lead exceeded cleanup criteria/project screening levels in surface soils (USGS, 2011a).

Building 15, Garage and Storage Building (SWMU 24): A total of 52 soil samples were collected. Based on the results of the soil investigation, the Army concluded that DRO, PAHs, and metals exceeded cleanup criteria/project screening levels in shallow soils (USGS, 2011a). The PCB Aroclor 1262 was detected in two surface samples, and the PCB Aroclor 1268 was detected in two surface samples, but there are no cleanup criteria/project screening levels. The pesticide dieldrin was above the NMED SSL in one surface sample.

Building 9, Machine Shop and Signal Shop (SWMU 37): A total of 31 soil samples were collected. Based on the soil sampling results, the Army concluded that PAHs and metals exceeded cleanup criteria/project screening levels in drain sediments.

South Administration Area (SWMU 40): A total of 318 soil samples were collected during this RFI investigation. Based on soil sampling results, the Army concluded that:

- SVOC and PCB concentrations exceed NMED SSLs in surface soils around Buildings 12 and 13.
- DRO, SVOC, and metal concentrations exceed NMED SSLs in surface soils around Building 14.
- Metal concentrations exceed NMED SSLs in surface soils around Building 29.
- SVOC concentrations exceed NMED SSLs in surface soils around Buildings 36, T-33, and T-50.
- SVOC, DRO, and metal concentrations exceed NMED SSL in surface soils around Structures 57-60.

Building 6, Gas Station (SWMU 45) and Structure 35, Former UST 7 (SWMU 50): A total of 57 surface and subsurface soil samples were collected from locations near the former USTs and were analyzed for VOCs, SVOCs, GRO, DRO, and metals. Groundwater monitoring well TMW33 was installed downgradient of Building 6. The well was sampled, and the samples were analyzed for VOCs, SVOCs, GROs, DROs, and TAL metals.

Based on RFI soil sampling results, VOCs and DRO exceeded cleanup criteria/project screening levels in subsurface soils. GRO was detected in 6 of 21 samples from the area around Building 6; however, there are no cleanup criteria/project screening levels for GRO. In the groundwater sample at well TMW33, VOCs, SVOCs, and metals exceeded cleanup criteria/project screening levels (USGS, 2011a).

Building 34, Fire Station (AOC 48): A total of five sediment samples were collected in AOC 48 storm sewers and from sediment at the outfall. Based on the sampling results, the PCB Aroclor 1254 was detected. The Army concluded that the detected PCB was from a very small quantity of sediment at the bottom of a manhole and poses minimal risk to human health and the environment. Based on this and the non-detections at the outfall, the Army recommended no further action for AOC 48 (USGS, 2011a).

Structures 38 and 39, Loading Docks (AOC 49): Nine subsurface soil samples were collected from three soil borings. Based on the sampling results, the Army recommended no further action for AOC 49 (USGS, 2011a).

Buildings 79 and 80, Storage Vaults (AOC 52): A total of 16 soil samples were collected. Based on the sampling results, there were no significant exceedances of NMED SSLs (USGS, 2011a).

Electrical Transformers (AOC 75): Two samples each were collected from each transformer location. Based on the sampling results, the PCB Aroclor 1260 was detected in the sediment samples from the drains collected from Vaults A, B, and C, in concentrations exceeding the cleanup criteria/project screening level. The Army concluded that the extent of Aroclor 1260 contamination is confined to the small quantity of sediment in the floor drains. The floor drains are not connected to the storm sewer or sanitary sewer; therefore, migration potential is minimized. The Army proposes no additional investigation at AOC 75 in Parcel 11 (USGS, 2011a).

2.2.12 Parcel 22 RFI Report – 2011

FWDA operations in Parcel 22 ended with the closure of FWDA in January 1993. Tenant operations in Parcel 22 were conducted by TPL, Inc. (TPL), under various contracts from 1994 to 2007. TPL performed demilitarization of military munitions with an emphasis on resource recovery and reuse. Demilitarization operations ranged from simple mechanical separation of munitions into their components to chemical processes to further extract reusable materials (USGS, 2011b).

The RCRA Permit lists three SWMUs in Parcel 22. Additionally, this RFI Report contains information for four AOCs located in Parcel 22. Investigation activities for these locations are described below.

Building 535 and 536, Inspectors Workshop and Ammunition Renovation Depot (SWMU 12): Buildings 535 and 536 along with their foundations were demolished in 2010. A total of 42 soils and sediment samples were collected and analyzed for VOCs, SVOCs, explosives, PCBs, and metals. Soil samples did not have contamination in excess of NMED SSLs. Sediment samples from the sanitary sewer had concentrations of SVOCS and PCBs in excess of NMED SSLs. The Army recommended no further action for SWMU 12 (USGS, 2011b).

Building 528 Complex (SWMU 27, AOC 121, AOC 122, AOC 125, and AOC 126): All buildings along with their foundations were demolished in 2010. A total of 133 soil and sediment samples were collected. Based on the soil sampling results, benzo(a)pyrene, arsenic, and lead concentrations exceeded NMED SSLs in shallow soil (USGS, 2011b).

In November and December 2009, to investigate possible releases of perchlorate originating from TPL operations within SWMU 27, six groundwater monitoring wells (TMW30, TMW31S, TMW31D, TMW32, TMW36, and TMW37) were installed. Bedrock well TMW30 was a replacement monitoring well for TMW05 (dry since 2008). Bedrock monitoring well TMW37 was installed to delineate the east to west extent of contamination. Wells TMW31S and TMW31D were installed as a dual completion well, where one monitoring well was completed in the alluvial aquifer (TMW31S), and the second monitoring well was completed in the sandstone water-bearing unit (TMW31D). TMW31S was installed as a replacement monitoring well for FW10, which is also dry. TMW36 and TMW32, respectively, were installed to further delineate the bedrock potentiometric surface and contaminant distribution.

Groundwater samples were collected in April 2010 during the scheduled semiannual groundwater monitoring activities. Based on the groundwater sampling results from the newly installed wells, concentrations of nitrate, perchlorate, and bis(2-ethylhexyl)phthalate exceeded cleanup criteria/project screening levels in the alluvium. However, due to the widespread use of bis(2-ethylhexyl)phthalate as a plasticizer, bis(2-ethylhexyl)phthalate is regarded as a common laboratory and sampling contaminant, and the Army recommends no further action to address bis(2-ethylhexyl)phthalate. Groundwater samples taken from the newly installed bedrock wells had nitrate (in TMW30 and TMW31D) and perchlorate (in TMW30, TMW31D, and TMW32) concentrations exceeding the cleanup criteria/project screening levels (USGS, 2011b).

Disassembly Plant and TPL QA Test Area (SWMU 70): All buildings along with their foundations were demolished in 2010. Six soil samples were collected near the concrete blast shield (Building 520) and four soil samples were collected near the former fuel tank location (near Building 519) to evaluate potential releases. One soil sample was collected beneath the concrete floor of Building 519. Sixty multi-incremental (MI) samples were collected over one-quarter-acre exposure units and two discrete samples were collected, one from the culvert that drained the site and a second from the approximate location of the fuel tank. Based on the sampling results, none of the result concentrations exceeded applicable cleanup criteria/project screening levels, and the Army recommended no further action at SWMU 70 (USGS, 2011b).

Igloo Block D (**AOC 30**): All igloos remain and were sampled using the MI sampling approach. In addition, MI sampling was performed from the Open Storage Areas and the TPL Burn Sites. Based on the sampling results, mercury, lead, arsenic, and 2,4-dinitrotoluene concentrations exceeded cleanup criteria/project screening levels in surface soils. The Army recommended no further action at the Open Storage Area and TPL Burn Sites (USGS, 2011b).

Standard Magazine Buildings 301, 302, and 312, and Building 316, Field Lunch Room (AOC 69): All buildings remain. Thirty surface soil samples were collected along the railroad tracks located south of Buildings 301, 302, and 312. Twenty-four surface soil samples were collected around the exteriors of Buildings 301, 302, 312, and 316. Based on the sampling results, DRO and PAHs exceeded NMED SSLs in soil to 3 feet in depth. Arsenic concentrations in four soil samples exceeded cleanup criteria/project screening levels; however, the Army concludes that arsenic values in this range are not indicative of contamination but rather are natural levels for the area (USGS, 2011b).

Electrical Transformers (AOC 75): FWDA records show 65 transformers in 29 locations throughout FWDA. All electrical transformers were removed in 2010. Two soil samples were collected under the former location of transformers at Building 528. No PCBs were detected. Based on the results of the soil investigation, the Army recommends no further action at AOC 75 in Parcel 22 (USGS, 2011b).

Former Buildings or Structures and Disposal Areas (AOC 88): MI surface samples were collected in 12 MI soil sampling areas were established over one-quarter-acre exposure units at AOC 88A and 16 MI soil sampling areas were established over one-quarter-acre exposure units at AOC 88B. Also, eight discrete soil samples were collected from the MI areas in AOC 88A and 88B. Based on the sampling results, sample result concentrations did not exceed any cleanup criteria/project screening levels, and the Army recommended no further action at AOC 88 (USGS, 2011b).

Building 536, Inspectors Workshop and Ammunition Renovation Depot (SWMU 12): A total of 41 soil and/or sediment samples were collected for this investigation. Based on the sampling results, explosives, PAHs, and one PCB (Aroclor 1254) were detected in concentrations exceeding the NMED SSLs from sediment samples in the Building 536 septic system (USGS, 2011b).

2.2.13 Monitoring Well Installation and Abandonment Report – 2011-2012

During the fall and spring of 2011/2012 the USACE installed 18 monitoring wells and abandoned 10 monitoring/temporary wells. The purpose of the well installation was to delineate contaminant plumes and gather data to define background concentrations for metals in groundwater. Wells were identified for abandonment due to lack of groundwater and were abandoned in accordance with applicable state regulations.

Well Installation: Well construction details are presented in Table 2-1. Well installation activities are summarized below.

- Two sentinel alluvial monitoring wells (MW23 and MW24) were installed in June and July 2011 at the request of the NMED. These two wells are located in the northwest portion of the FWDA and were selected to monitor potential offsite migration of chemical constituents in groundwater. The sites were chosen based on their proximity to the Navajo Tribal Utility Authority alluvial water supply well NTUA 16T602 (USGS, 2011c).
- Four background alluvial monitoring wells (BGMW01, BGMW02, BGMW03, and BGMW04) were installed in February 2012 to determine the background concentrations of major and trace metals in the groundwater (USGS, 2011c).
- Three explosives' plume alluvial monitoring wells were installed in the Northern Area in February 2012 to monitor concentrations of RDX suspected of originating at the former TNT Leaching Beds. Monitoring wells TMW43 and TMW44 were installed between TMW03 and TMW23 to refine the concentration gradient in the center of the plume and allow for contaminant mass discharge estimates. These monitoring wells will also aid in defining the concentration gradient of nitrate in the alluvium, which commingles with the RDX plume. Monitoring well TMW45 was installed north of TMW23 to define the northern extent of the plume (USGS, 2011c).
- Two nitrate plume alluvial monitoring wells (TMW46 and TMW47) were installed in February 2012 to monitor nitrate concentrations in the alluvial groundwater underlying the Administration and Workshop Areas. The nitrate plume commingles with both the RDX plume and the perchlorate plume. Monitoring wells TMW46 and TMW47 provide chemical data to delineate the northwest and east boundaries of the alluvial nitrate plume (USGS, 2011c).
- Three alluvial monitoring wells (TMW39S, TMW40S, and TMW41) and five bedrock monitoring wells (TMW38, TMW39D, TMW40D, TMW48, and TMW49) were installed in July and September 2011 to further delineate the perchlorate plume in both the alluvial and bedrock groundwater between the former TNT Leaching Beds and the former Building 528. Because the alluvial perchlorate plume commingles with the nitrate plume, these perchlorate monitoring wells will also help define the alluvial nitrate plume (USGS, 2011c). Alluvial monitoring well TMW42 was drilled, but dry conditions were encountered. A second borehole (TMW42A) near the original location was drilled but was also dry.

These new monitoring wells were added to the facility-wide groundwater monitoring program and will be sampled for metals, anions and nitrate, VOCs, DRO, GRO, dioxins/furans, explosives, and perchlorate.

Well Abandonment: Ten groundwater monitoring wells were plugged and abandoned in the summer of 2011 because these wells historically lacked sufficient groundwater volumes required for groundwater sampling. These 10 wells (TMW05, FW07, FW08, FW10, FW11, FW12, FW13, FW27, FW28, and FW29) were all located in the Northern Area and were screened within the alluvium.

Up to 10 monitoring wells associated with the OB/OD Area in Parcel 3 will be abandoned in future efforts. These monitoring wells are either dry, buried, or too close to proposed ordnance clearing and excavation operations to remain in place. Monitoring wells CMW06, CMW16, and CMW21 are buried beneath arroyo sediments and are not usable, and FW38 and KWM13 are dry and not usable. Monitoring wells within the boundaries of the OB/OD Area will be damaged during ordnance clearing and excavation operations; therefore, abandonment of these wells will occur as clearing and excavation operations progress. Parcel 3 RFI work plans have been submitted to the NMED.

2.2.14 Final RCRA Facility Investigation Report Parcel 10B – 2012

This report summarizes investigations at AOC 44 and SWMU 26 that was done in accordance with the approved RFI Work Plan for Parcel 10B that was approved with direction by the NMED on September 9, 2010.

At AOC 44 and SWMU 26, it was concluded that there were no COPC detections greater than the screening limit, although there were some issues with the data quality. The Army recommended no further action for SVOCs, pesticides, or antimony (USACE, 2012a). The Army also recommended that arsenic values be reassessed when background levels are developed.

2.2.15 Approved Final RCRA Facility Investigation Parcel 21 – 2012

This RFI Report summarized the investigation and restoration activities at Parcel 21 conducted in accordance with the NMED approved with modifications RFI Work Plan for Parcel 21. The RFI addressed five SWMUs and nine AOCs. The report did not address AOC 71 or AOC 87 because NMED approved no further action for these locations. Additionally, AOC 60 was not addressed in the RFI because sample collection will be completed with scheduled demolition at a future date. The report findings are summarized below.

TNT Leaching Beds Area and Building 503 (**SWMU 1):** Building 503 has been demolished. Based on the sample results the explosives (TNT, RDX, and 2,4 dinitrotoluene) were detected at concentrations exceeding cleanup criteria/project screening levels in surface and subsurface soils. Detected concentrations of two metals, arsenic and iron, also exceeded cleanup criteria/project screening levels in four locations in the Post-1962 Leaching Beds (TPMC, 2012).

Building 515 (**SWMU 2):** MI surface soil sampling was performed for explosives, metals, SVOCs, and pesticides. Discrete soil samples were collected for VOC analysis. Based on the sampling results, metals concentrations exceeded NMED SSLs in surface soils of the Paint Debris Disposal Area and the west doorway of Building 515 (TPMC, 2012).

Fire Training Ground (SWMU 7): Nine surface and subsurface soil samples were collected. Based on the sampling results, DRO concentrations exceeded cleanup criteria/project screening levels in two samples from the beneath the western (fill) end of the pipe (TPMC, 2012).

Building 501, Workshop Area Boiler House (**SWMU 19):** Two MI soil sampling areas were established over one-eighth-acre exposure units and four MI samples were collected. Based on these sampling efforts, detected PCB concentrations in two composite samples collected on the east and west sides of the Building 501 exceeded the cleanup criteria/project screening levels. However, the Army concluded that the previous building demolition and removal project was sufficient to address environmental concerns at SWMU 19, and the Army proposed no further action (TPMC, 2012).

Building 530, Former Deactivation Furnace (SWMU 72): A total of six soil samples were collected from native soil underneath pipe joints along the pipe that drained the sump pit. Based on the MI and previous sampling results, the Army proposed no further action for iron at Building 530 (TPMC, 2012).

Building 508, Smokeless Powder Magazine (AOC 62): An MI soil sampling area was established over a one-quarter-acre exposure unit surrounding Building 508 and two MI soil samples were collected. Based on the MI and previous sample results, the Army proposes no further action for soil at AOC 62 (TPMC, 2012).

Building 509, Primary Collector Barricade (AOC 63), and Building 510 Vacuum Producer Building (AOC 64): Two MI soil sampling areas were established over one-quarter-acre exposure units surrounding Buildings 509 and 510 and under the overhead vacuum lines and total of four MI soil samples were collected. Ten discrete sample locations surrounding the buildings and five discrete sample locations under the vacuum lines were also sampled at two different depths. Based on the RFI and previous sampling results, the explosive 2,4-dinitrotoluene and the PCB Aroclor 1254 exceed NMED SSLs in surface soils (TPMC, 2012).

Building 511 (AOC 65), Building 512(AOC 66), and Building 513 (AOC 67): Three MI soil sampling areas were established over one-quarter-acre exposure units surrounding Buildings 511, 512, and 513 and a total of six MI soil samples were collected. Eighteen discrete sample locations were sampled surrounding the entrance door to each building, with samples collected at two different depths. Based on the sampling results, there were no exceedances of cleanup criteria/project screening levels, and the Army proposes no further action for soil at AOCs 65, 66, and 67 (TPMC, 2012).

Building 514, Deboostering Barricade (AOC 68): One MI soil sampling area was established over a one-quarter-acre exposure unit surrounding Building 514 and Structure 545 and two MI soil samples were collected. Seven discrete sample locations surrounding the approach to and the operational area of the building were also sampled at two different depths. Based on the MI and previous sample results, only the explosive RDX was detected in excess of the cleanup criteria/project screening level in one surface sample location (TPMC, 2012).

Former Electrical Transformer near Building 501 and Building 515 (AOC 75): Two soil samples were collected from beneath the pad within the former electrical substation north of Building 501. One MI soil sampling area was established over a one-eighth-acre exposure unit around the fenced concrete pad (former electrical substation) north of Building 501 and a total of four MI samples were collected. Based on the sampling results, no PCBs were detected in soil samples at concentrations exceeding cleanup criteria/project screening levels. Therefore, the Army proposed that no further action is necessary for this portion of AOC 75 in Parcel 21 (TPMC, 2012).

Feature 15 on 1973 aerial photo in 1995 Archive Search Report 34 (AOC 86): Four MI soil sampling areas were established over 1-acre exposure units covering AOC 86 and total of eight MI soil samples were collected. Additionally, 64 discrete samples from each sub-unit and each depth interval were collected for VOC analysis at selected sample sites collocated with the MI sampling sites. Based on the sampling results, no detected concentrations exceeded cleanup criteria/project screening levels, and the Army proposed no further action for this AOC (TPMC, 2012).

2.2.16 Final RCRA Facility Investigation Parcel 6 – 2012

This RFI Report summarized the investigation and restoration activities at Parcel 6 conducted in accordance with the NMED approved with modifications RFI Work Plan for Parcel 6. The RFI addressed 4 SWMUs and 10 AOCs:

Building 600 (SWMU 4): The Army proposed no further action and removal from the RCRA Permit (USACE, 2012b).

Building 537 (SWMU 8): The Army recommended no additional characterization. A Corrective Measures work plan to address NMED SSL exceedances for PAHS and PCBs was later submitted and indicated no depth was defined for soil contamination (USACE, 2012b; Amec Foster Wheeler, 2015).

Buildings 541 and 542 (SWMU 11): The Army proposed no further action and removal from the RCRA Permit (USACE, 2012b).

Western Landfill (SWMU 20): The Army recommended no further characterization due to lack of contamination in excess of NMED SSLs (USACE, 2012b). A Corrective Measures work plan to address debris removal was later submitted to NMED (Amec Foster Wheeler, 2015).

Igloo Block B (AOC 28): Lead was detected in excess of NMED SSLs in surface soils directly adjacent to drain pipes and was determined to result from the historical application of lead-based paint to drain pipes direct (USACE, 2012b). A Corrective Measures work plan to address surface soil contamination was submitted to the NMED (Amec Foster Wheeler, 2015).

Building 507 (AOC 61) and Building 516 (AOC 42): The Army proposed no further action and removal from the RCRA Permit (USACE, 2012b).

Electrical Transformers (AOC 75): The Army proposed no further action and removal from the RCRA Permit (USACE, 2012b).

Feature 2 (AOC 79): The NMED concurred in a Notice of Disapproval for the RFI Work Plan for Parcel 6 that AOC 79 required no further characterization. The Army recommended removal from the RCRA Permit.

Feature 9 (AOC 80), Feature 11 (AOC 81), Feature 12 (AOC 84), Feature 18 (AOC 78 and AOC 82), and Feature 22 (AOC 83): The Army proposed no further action and removal from the RCRA Permit (USACE, 2012b).

2.2.17 Final RCRA Facility Investigation Parcel 23 – 2012

At Parcel 23, soil field investigations were conducted at SWMU 21 (Central Landfill) and AOC 73 (Former Buildings and Structures along Road C3). Results of the RFI at SWMU 21 indicated that PAHs and arsenic were detected above cleanup criteria/project screening levels in subsurface soils from boring SB08 at the 17- to 18-foot depth. The depth of contamination was defined with samples collected at the 22- to 23-foot depth. The Army concluded contamination is defined vertically at SB08 and horizontally at SB09 to the south (USGS, 2015a). The Army proposed additional borings in the area of SB08 to delineate SVOC concentrations in the soil at SWMU 21. Results of RFI at AOC 73 did not indicate contamination was present (USGS, 2015a). The Army concluded the arsenic concentrations detected at SWMU 21 and AOC 73 were within a naturally occurring range.

2.2.18 Final Release Assessment Report Parcel 4A Revision 2.0 – 2012

The Army conducted surface soil investigations for Igloo Block C and electrical transformers as part of the Parcel 4A release assessment. Results indicate metals and PCB COPCs are present in surface soils at concentrations exceeding screening criteria. The Army proposes additional characterization and source removal activities for igloo drain pipes drains at C-1105, C-1109, and C-1128, surface soil at C-1124, and transformer I-25. The final extent of COPCs has not been determined (USACE, 2012c).

2.2.19 Final Phase 2 Soil Background Report – 2013

This report was approved by NMED in an approval letter dated July 23, 2013. The purpose of this report was to conduct an additional background study to the 2010 initial background study conducted at the site. Samples were collected in 2012. This background study focused on arsenic and antimony because the Army believes that many arsenic exceedances across the site were due to natural concentrations.

Antimony background results are mostly non-detect and fairly uniform among the various soil units sampled. The 2012 antimony sample results did not provide substantive changes for stakeholders to consider. Arsenic results from 2012 provide additional information to consider. Arsenic concentrations vary from unit to unit and several values exceeded the 95th upper threshold limit from the 2009 data set and the NMED Residential SSL. The 2012 arsenic sample results confirmed that naturally occurring arsenic concentrations varied significantly from soil unit to soil unit. The report concluded that soils containing arsenic in the higher elevations of the southern area may be transported to the lower elevations in the northern area through natural weathering and erosion (USACE, 2013).

2.2.20 Final Release Assessment Report Parcel 24 – 2014

The Release Assessment Report for Parcel 24 included AOC 18 and former World War 1 era magazines. To complete the Release Assessment report, previous sampling data were reviewed. The results of the release assessment indicate that metal COPCs were present at AOC 18 at concentrations exceeding cleanup criteria/project screening levels. The Army proposed a future Permittee initiated interim action to address the removal of soil and igloo drain pipes. The Army does not believe there were any significant releases of explosives from the World War 1 era magazines. It is not suspected that there were any transformers in existence at Parcel 24.

2.2.21 Final Revision 1 RCRA Facility Investigation Report Parcel 16 – 2014

The final report was approved with modification on January 24, 2014, the modifications were made, and the report was reissued May 9, 2014 (Toeroek and pH7, 2014). This RFI Report summarizes soil sampling activities at SWMU 16, AOC 41, and World War I magazines. These results are summarized below.

Functional Test Range (FTR) 2 and FTR 3 (SWMU 16): Surface soil samples were collected and analyzed for explosives, RCRA 8 metals, perchlorate, and SVOCs. Geophysical surveys were performed and anomalies were trenched and sampled for the same COPCs. Based on the sampling results, no exceedances were found, and the Army recommended no further action (Toeroek and pH7, 2014).

X and Z Open Storage Areas (SWMU 16): Surface soil samples were collected and analyzed for explosives, RCRA 8 metals, perchlorate, and SVOCs. The explosive TNT was detected above the screening level in one quadrant of open storage pad Z135. The Army recommended more sampling for explosives and a clearance/removal action if necessary (Toeroek and pH7, 2014).

Area K Igloo Block (AOC 41): Surface soils were sampled at the igloo drains in the revetments for RCRA 8 metals, perchlorate, or SVOCs. Metals were detected at concentrations exceeding the SSLs in surface soils. The Army recommended pipe and soil removal and more sampling at drain outfalls but no further action for igloo drainages and revetment areas (Toeroek and pH7, 2014).

World War I Magazine Sites: During and after World War I, up to 28 magazines in Parcel 16 were built and used to store explosives. These magazine areas are dispersed in both SWMU 16 and AOC 41. Two magazine areas located in Parcel 16, but not in AOC 41 or SWMU 16, were sampled in 2007 and are therefore not included in the current investigation. During field investigation, six of the remaining 26 magazines were found to be obliterated and therefore were not sampled; the remaining 20 magazine areas were sampled during this effort. No exceedances were found for explosives at any of the World War I sample locations, and the Army recommended no further action (Toeroek and pH7, 2014).

2.2.22 Approved Final Investigation and Remediation Completion Report Parcel 18, SWMU 13 – 2014

The report summarized the results of the investigation and remediation conducted at SWMU 13, the Eastern Landfill. The investigation included waste delineation, source removal, and confirmatory sampling. The investigation was conducted from August 6 to August 9, 2013; waste removal of approximately 13,000 cubic yards of nonhazardous waste occurred from October 1 to November 13, 2013, and December 19, 2013. Waste was disposed of at the Waste Management San Juan Landfill. The Eastern Landfill was backfilled after confirmation sample results were approved. The data indicated that no additional corrective action was required for the Eastern Landfill. The report was approved in February 2015 in letter HWB-FWDA-14-009 giving permission to request change of status to corrective action complete without controls.

On March 3, 2014, a request to the NMED was submitted to abandon the wells EMW01, EMW02, EMW03, and EMW04. Permission was granted March 26, 2014, and the wells were abandoned from April 29 to April 30, 2014 (USACE, 2014).

2.2.23 Final Permittee-initiated Interim Measures Report Parcel 4A, Area of Concern 29 – 2014

In October 2013, AMEC Environment & Infrastructure, Inc., completed multiple activities at AOC 29, Block C of Parcel 4A. The interim measures were outlined in a notification dated September 10, 2013, and approved by NMED in an email correspondence dated September 24, 2013. The interim measures completed include the following:

- Removal of igloo drain pipes on Block C igloos
- Excavation of soil and drain pipes (Igloos C-1105, C-1109, C-1128, and C-1124) due to the presence of lead. Confirmation sampling was completed after removal activities.
- Drain pipes and associated subsurface concrete were removed from Igloos C-1551 and C-1552.
- Due to the proximity, soil sampling was conducted near the former location of transformer I-25 located in Parcel 2 (AOC 75). Results and a visual inspection indicated no evidence of leakage or impacts to the soil.

Confirmation sampling analysis indicated that no further investigation or corrective measures would be required in Parcel 4A, AOC 29, with one exception: the igloo interiors. The status of igloo interiors will be addressed at a later date as decided in discussions between the Army and the NMED. The report recommended no further investigation or corrective action for the soils with C-Block/AOC 29. It was also recommended that no further investigation was needed for the portion of AOC 75 due to presence of a transformer.

2.2.24 Approval of Well Abandonment Letter FWDA-14-MISC – 2014

This letter, dated April 18, 2014, approved the abandonment of monitoring wells Wingate 89, Wingate 90, Wingate 91, and FW26 due to being unproductive or dry for several years. The letter directed that the wells be abandoned in accordance with 19.27.4 NMAC. It also directed that a summary of the well abandonment be included in the monitoring plan.

The New Mexico Office of the State Engineer approved the well plugging plan of operations on November 7, 2014. The four monitoring wells were abandoned on June 24-25, 2015, by Geomechanics Southwest, Inc., well driller license number WD-1522. Wells were plugged with Portland Cement Type I/II with 3 percent bentonite.

2.2.25 Final Revision I Technical Memorandum Groundwater Background Evaluation – 2015

The purpose of this technical memorandum was to develop background threshold values for naturally occurring chemical constituents in the groundwater (alluvial and bedrock). Approved background monitoring wells were used as the data sources. The ProUCL Technical Guide was the methodology used for the chemical evaluation. The groundwater background data evaluation included the following:

- Trend evaluation to determine whether concentrations were stable at the background wells
- Outlier evaluation to protect a defensible background data set
- Development of background threshold values for dissolved metals, total metals, perchlorate, nitrate, nitrite, and PAHs

This technical memorandum has not yet been accepted by the NMED. The Army is currently collecting additional data in response to NMED comments.

2.2.26 Final Revision 2.0 RCRA Facility Investigation Report Parcel 22 – 2015

The RCRA Permit lists three SWMUs in Parcel 22. This report summarized the investigation activities at SWMU 12, SWMU 70, SWMU 27, AOC 30, AOC 69, AOC 75, and AOC 88, which are summarized below.

Building 535, Inspectors 1 Workshop and Building 536, Ammunition Renovation Depot (SWMU 12): Buildings 535 and 536 along with their foundations were demolished in 2010. A total of 31 soil and sediment samples were collected and analyzed for VOCs, SVOCs, explosives, PCBs, perchlorate, and metals. Based on the results of the investigation, SVOCs and PCBs were detected in excess of NMED SSLs in sediment samples from the Building 536 septic system (USGS, 2015b).

Building 528 Complex (SWMU 27, AOC 121, AOC 122, AOC 125, and AOC 126): All buildings along with their foundations were demolished in 2010. A total of 46 discrete and a MI sample were collected and analyzed for SVOCs, explosives, metals, and perchlorate. Based on the soil sampling results, benzo(a)pyrene, arsenic, and lead concentrations exceeded the NMED SSLs in shallow soil (USGS, 2015b).

Buildings 517 to 521 and Structure 547, Disassembly Plant and TPL QA Test Area (SWMU 70): All buildings along with their foundations were demolished in 2010. Four soil borings and 30 MI soil sampling areas were established over one-quarter-acre exposure units. Based on the sampling results, the Army concluded that no constituents were detected above the cleanup criteria/project screening levels (USGS, 2015b).

Igloo Block D (AOC 30): Surface soil sampling was conducted at all 53 Igloo Block D igloos in Parcel 22, 13 Igloo Block D open storage sites located in Parcel 22, and at each of the two reported locations where TPL may have performed open burning of unstable propellant. MI samples were analyzed for explosives, SVOC, perchlorate, and metals. Based on the sampling results, metals concentrations exceeded the NMED SSLs in surface soils (USGS, 2015b). The explosive 2,4-dinitrotoluene exceeded the cleanup criteria/project screening level in one sample (USGS, 2015b).

Standard Magazine Buildings 301, 302, and 312, and Building 316, Field Lunch Room (AOC 69): All buildings remain. Thirty surface soil samples were collected along the railroad tracks located south of Buildings 301, 302, and 312. Twenty-four surface soil samples were collected around the exteriors of Buildings 301, 302, 312, and 316. Based on the sampling results, DRO and PAHs exceeded NMED SSLs in soil to 3 feet in depth. Arsenic concentrations in four soil samples exceeded cleanup criteria/project screening levels; however, the Army concludes that arsenic values in this range are not indicative of contamination but rather are natural levels for the area. (USGS, 2015b).

Electrical Transformers in Parcel 22 (AOC 75): All electrical transformers were removed in 2010. Two soil samples were collected from beneath the location of the former transformers at Building 528. Based on the sampling results, no soil samples collected in AOC 75 had detectable concentrations of PCBs and the Army recommends no further action (USGS, 2015b).

Former Buildings or Structures and Disposal Areas (AOC 88): Four additional MI exposure units were added to both AOC 88A and AOC 88B and 38 MI soil samples were collected. Also, eight discrete soil samples were collected from the MI areas in AOC 88A and AOC 88B. Based on the sampling results, no soil samples collected in AOC 88 had detectable concentrations that exceeded cleanup criteria/project screening levels (USGS, 2015b).

2.2.27 Final Groundwater Supplemental RCRA Facility Investigation Work Plan, Revision 1 – 2016

This RFI work plan was generated to examine the horizontal and vertical extent of six identified groundwater contaminant plumes within the northern area of FWDA. The investigation will also attempt to locate and identify the source locations for the contaminant plumes and gather information to conduct a Corrective Measures Study for each plume. The investigation will include a soil gas survey, installation of groundwater monitoring wells, and collection of soil samples. A revised document is currently being prepared.

2.3 Semiannual RCRA Groundwater Monitoring Reports and Updated Groundwater Monitoring Plans – Ongoing

Since 2008, groundwater sampling has been conducted semiannually (April and October), and each event documented in PGMR. The Interim Facility-wide GMP is updated annually. Section 5.0 provides the proposed changes to the interim monitoring program.

A database of the groundwater analytical results generated from the monitoring program for 1992 through October 2016 is included as Appendix B. The database includes a table of current cleanup criteria/project screening levels for comparison to the analytical results. Also included in Appendix B is a table of maximum groundwater analytical results and exceedances for active monitoring locations. Based on the groundwater sampling results provided in Appendix B, the following analytes were detected in groundwater samples at concentrations that exceed current cleanup criteria/project screening levels in one or more samples:

- Anions (chloride, fluoride, nitrate, nitrite, sulfate, and phosphate)
- Perchlorate
- Explosives (1,3-dinitrobenzene, 2-nitrotoluene, 3-nitrotoluene, nitrobenzene, nitroglycerin, and RDX),
- VOCs (1,2-dichloroethane, carbon disulfide, 1,4-dioxane, toluene, and vinyl chloride)
- SVOCs (1,2-diphenylhydrazine, 2,4-dinitrophenol, 2,6-dinitrotoluene, benzo(a)pyrene, bis(2-ethylhexyl)phthalate, p-chloroaniline, n-nitrosodimethylamine, n-nitroso-di-n-propylamine, and phenol)
- Metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silica, silver, sodium, thallium, tin, vanadium, and zinc)

Cyanide, DRO, pesticides, and dioxins/furans were detected in samples from multiple locations, but detected concentrations did not exceed cleanup criteria/project screening levels. GRO was detected in samples from multiple locations, but there are no cleanup criteria/project screening levels for comparison. Herbicides and PCBs were not detected in any groundwater samples.

An extensive alluvial groundwater nitrate plume is present in the Northern Area. Exceedances of nitrate also occur consistently in select wells of the Northern Area bedrock and OB/OD groundwater zones. Nitrite is also detected at concentrations exceeding cleanup levels, but these detections are primarily associated with the existing nitrate plume. Detected concentrations of other anions fluoride, sulfate, chloride and phosphate are associated with hard water and brackish groundwater conditions observed at FWDA.

Perchlorate has many detections and up to 19 cleanup criteria/project screening levels exceedances in numerous alluvial and bedrock monitoring wells located in the vicinity of and north of the TNT Leaching Beds Area (SWMU 1) and the Building 528 Complex (SWMU 27). Therefore, perchlorate exceedances represent a significant groundwater impact in the Northern Area. Detected concentrations at OB/OD Area wells indicate releases have occurred at lower concentrations in that area.

RDX was the most frequently detected explosive with up to 30 cleanup criteria/project screening level exceedances in monitoring wells in the OB/OD Area and in several alluvial wells located north of the TNT Leaching Beds Area (SWMU 1). Therefore, RDX exceedances represent a significant groundwater impact that can be mapped and should continue to be monitored. The explosives 1,3-dinitrobenzene, 2-nitrotoluene, and 3-nitrotoluene, each had one or two cleanup criteria/project screening level exceedances in several monitoring wells in the OB/OD Area and several alluvial monitoring wells north of the TNT Leaching Beds Area. Nitrobenzene had up to five cleanup criteria/project screening level exceedances in several alluvial wells located north of the TNT Leaching Beds Area (SWMU 1) and one bedrock well downgradient of the TNT Leaching Beds Area (SWMU 1) and the Building 528 Complex (SWMU 27).

The VOC 1,2-dichloroethane has as many as 22 cleanup criteria/project screening level exceedances in alluvial wells MW2, MW18D, MW20, MW22D, MW22S, and TMW33, which are all located in the Administration Area and downgradient of the Building 11, former Locomotive Shop (SWMU 6), and Building 6, Gas Station (SWMU 45). The VOC 1,2-dichloroethane is the predominant detected VOC that exceeds cleanup criteria/project screening levels and is therefore a significant groundwater impact that can be mapped and should continue to be monitored. Toluene had two cleanup criteria/project screening level exceedances and benzene had one exceedance historically. Toluene and benzene may have been associated with previous fuel releases and are now detected infrequently and at concentrations less than cleanup levels. Other VOCs, carbon disulfide, 1,4-dioxane, and vinyl chloride each had only one cleanup criteria/project screening level exceedance at one or more locations. The other VOC detections are not persistent and/or widespread enough to indicate a significant groundwater impact and/or represent a groundwater contaminant plume that can be mapped.

The SVOC 2,4-dinitrophenol had 16 detections and eight cleanup criteria/project screening level exceedances all from samples collected at alluvial monitoring well TMW03 which is located just north of the TNT Leaching Beds Area (SWMU 1). The SVOC 2,4-dinitrophenol is associated with degradation of explosives compounds in the presence of organic compounds (from UST 7 at SWMU 50 in the vicinity of TMW03). The SVOCs 1,2-diphenylhydrazine, 2,6-dinitrotoluene, benzo(a)pyrene, p-chloroaniline, n-nitrosodimethylamine, and n-nitroso-di-n-propylamine each had only one cleanup criteria/project screening level exceedance at one or two locations. The SVOC phenol had one cleanup criteria/project screening level exceedance in three scattered monitoring wells and up to three exceedances in bedrock monitoring wells TMW18 and TMW19, which are located in the Workshop Area. Bis(2-ethylhexyl)phthalate was detected more frequently with up to level exceedances at multiple locations. However, bis(2-ethylhexyl)phthalate is a common sampling and laboratory contaminant and should not be considered as a groundwater contaminant unless there is a plausible source.

Metals cleanup criteria/project screening level exceedances are numerous and widespread. Because background groundwater concentrations have not been accepted for FWDA, it cannot clearly be demonstrated whether the detected concentrations are a result of natural conditions or anthropogenic sources of contamination.

Table 2-3 further summarizes these groundwater analytical results by summarizing the groundwater detects and cleanup criteria/project screening level exceedances (1992 through 2016) per analyte group, per well, and by point of release. Table 2-3 is presented by wells associated with points of release to groundwater listed in Table 2-2. Together, the information in Tables 2-2 and 2-3 was used to develop the CSM presented in Section 3.0 and ultimately to provide a basis for the monitoring and sampling plan design presented in Section 5.0.

TABLE 2-1

Groundwater Well Construction Details (Page 1 of 3)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	FWDA Parcel	Date Installed	Drilling Method	Northing[a]	Easting[a]	Ground Elevation (ft amsl)[b]	Point Elevation (ft amsl)[b]	Well Depth (ft bgs)	Boring Diameter (in)	Casing Diameter (in)	Casing/ Screen Type	Screen Length (ft)	Screened Interval (ft bgs)	Screened Interval (ft amsl)	Status	Screened Formation	Description
										OB/OD Area							
BGMW05	3	winter 2017	AR	1612699.57	2491941.20	7567	7569.46	61.00	6.00	2.00	PVC	20.0	36-56	7533.46-7513.46	Active	Sonsela Member	Sandstone
BGMW06	3	winter 2017	AR	1612753.64	2486955.92	7346	7347.15	131.00	6.00	2.00	PVC	20.0	110-130	7237.15-7217.15	Active	Dakota Formation	Sandstone
CMW02	3	08/15/1996	HSA/AR	1612193.23	2489293.13	7256.32	7258.00	43.00	8.00	2.00	PVC	10.0	25.0 - 35.0	7230.39-7220.39	Active	Alluvium	Silty Clay
CMW04	3	08/15/1996	AR	1612755.29	2489317.38	7249.08	7251.15	136.60	8.00	2.00	PVC	20.0	115.0 - 135.0	7133.30-7113.30	Active	Alluvium	Silty Clay
CMW06[d]	3	08/12/1996	HSA	1613477.48	2489087.84	7214.13	7216.05	18.60	4.00	2.00	PVC	10.0	8.3 - 18.3	7204.95-7194.95	***Buried***	Alluvium	Silty Clay/Silty Sand
CMW07[d]	3	10/01/1996	HSA/AR	1613481.11	2488966.19	7233.04	7235.16	65.80	8.00	2.00	PVC	20.0	44.0 - 64.0	7188.90-7168.90	***Removed 2017***	Painted Desert Member	Sandstone
CMW10	3	09/30/1996	HSA/AR	1614801.68	2488525.71	7177.40	7179.31	70.85	8.00	2.00	PVC	20.0	50.5 - 70.5	7126.49-7106.49	Active	Painted Desert Member	Silty Claystone
CMW14[d]	3	09/06/1996	HSA/AR	1615835.54	2488638.31	7151.34	7153.06	94.55	9.00	2.00	PVC	10.0	84.2 - 94.2	7066.82-7056.82	***Removed 2017***	Painted Desert Member	Silty Claystone
CMW16[d]	3	08/17/1996	HSA/AR	1618788.98	2488995.95	7082.17	7084.23	31.80	8.00	2.00	PVC	10.0	20.0 - 30.0	7061.51-7051.51	***Buried***	Painted Desert Member	Sandstone
CMW17[d]	3	08/21/1996	HSA/AR	1615860.63	2488582.47	7143.72	7145.18	53.00	8.00	2.00	PVC	20.0	32.0 - 52.0	7111.15-7091.15	***Removed 2017***	Painted Desert Member	Silty Claystone
CMW18[d]	3	09/28/1996	HSA/AR	1615886.04	2488504.59	7156.24	7158.24	53.00	8.00	2.00	PVC	20.0	32.0 - 52.0	7124.48-7104.48	***Removed 2017***	Painted Desert Member	Silty Claystone
CMW19	3	10/05/1996	HSA/AR	1616766.18	2488680.46	7128.11	7129.85	52.80	8.00	2.00	PVC	15.0	33.5 - 48.5	7093.89-7078.89	Active	Painted Desert Member	Silty Claystone
CMW20[d]	3	08/12/1998	HSA	1613921.71	2489020.26	7193.14	7194.68	5.80	4.00	2.00	PVC	3.0	2.5 - 5.5	7189.83-7186.83	***Damaged***	Painted Desert Member	Clayey Sandstone
CMW21[d]	3	08/10/1998	HSA/AR	1618931.48	2488996.15	7192.70	7088.19	74.50	6.00	2.00	PVC	10.0	57.0-67.0	7025.72-7015.72	***Buried***	Sonsela Member	Silty Sandstone
CMW22	3	09/04/1998	HSA/AR	1619789.75	2489133.42	7080.50	7081.94	122.00	5.50	2.00	PVC	20.0	96.5-116.5	7029.68-7009.68	Active	Painted Desert Member	Sandstone/Siltstone
CMW23	3	07/31/1998	HSA/AR	1621477.51	2490357.19	7033.41	7035.58	112.00	5.50	2.00	PVC	20.0	84.0-104.0	6945.82-6925.82	Active	Sonsela Member	Sandstone
CMW24	3	09/15/1998	HSA/AR	1618994.34	2488773.81	7098.27	7099.68	262.00	6.30	2.00	PVC	30.0	230.0-260.0	6864.33-6834.33	Active	Sonsela Member	Sandstone
CMW25	3	09/28/1996	HSA/AR	1622764.90	2490166.62	7005.24	7007.52	97.00	8.75	2.00	PVC	25.0	71.0-96.0	6930.74-6905.74	Active	Painted Desert Member	Sandstone
CMW26	3	winter 2017	AR	1622418.10	2490627.00	7033	7033.98	85.00	6.00	2.00	PVC	20.0	64-84	6969.98-6949.98	Active	Painted Desert Member	Claystone/Sandstone
CMW27B	3	winter 2017	AR	1621168.40	2489575.35	7072	7072.85	94.00	6.00	2.00	PVC	30.0	63-93	7009.85-6979.85	Active	Painted Desert Member	Claystone/Sandstone
CMW28B	3	winter 2017	AR	1616836.27	2488752.11	7136	7137.65	81.50	6.00	2.00	PVC	20.0	60-80	7077.65-7057.65	Active	Alluvium/Painted Desert	Silt/Sandstone
CMW31B	3	winter 2017	AR	1615894.68	2486695.87	7223	7225.06	110.00	6.00	2.00	PVC	30.0	78-108	7147.06-7117.06	Active	Dakota Formation	Sandstone
CMW32	3	winter 2017	AR	1611753.83	2490527.72	7434	7435.71	116.50	6.00	2.00	PVC	10.0	95-105	7340.71-7330.71	Active	Sonsela Member	Sandstone
CMW33B	3	winter 2017	AR	1614122.30	2488606.09	7231	7231.49	155.00	6.00	2.00	PVC	20.0	135-155	7096.49-7076.49	Active	Sonsela Member	Sandstone
CMW35	3	winter 2017	AR	1612717.43	2489728.78	7289	7290.57	126.50	6.00	2.00	PVC	30.0	95-125	7195.57-7165.57	Active	Sonsela Member	Sandstone
CMW36A	3	winter 2017	AR	1612582.68	2489172.05	7246	7247.79	66.50	6.00	2.00	PVC	20.0	45-65	7202.79-7182.79	Active	Alluvium/Painted Desert	Sand/Sandstone
CMW36B	3	winter 2017	AR	1612576.47	2489162.13	7246	7247.99	118.50	6.00	2.00	PVC	30.0	87-117	7160.99-7130.99	Active	Sonsela Member	Claystone/Sandstone
FW24[d]	3	11/14/1980	HSA	1622425.99	2491311.06	6997.49	6999.19	25.00	8.00	4.00	PVC	15.0	33.5-48.5	6984.56-6969.56	***Dry***	Alluvium	Clay
FW38[d]	3	11/19/1993	HSA	1614875.40	2488533.75	7169.43	7172.02	7.50	3.00	2.00	PVC	no information		no information	***Removed 2017***	Alluvium	ND
KMW09[d]	3	09/27/1996	HSA/AR	1616771.44	2486173.70	7186.02	7187.93	80.40	9.00	2.00	PVC	10.0	60.0 - 70.0	7125.48-7115.48	Active	Mancos Formation	Silty Claystone/Silty Sandstone
KMW10	3	08/06/1996	HSA/AR	1618066.89	2487827.76	7129.35	7131.38	168.45	8.00	2.00	PVC	10.0	158.0 - 168.0	6970.71-6960.71	Active	Unknown	Siltstone/Sandstone
KMW11	3	09/02/1998	HSA	1618649.14	2488515.19	7106.97	7108.78	63.00	9.00	2.00	PVC	20.0	35.0 - 55.0	7071.60-7051.60	Active	Painted Desert Member	Silty Claystone
KMW12	3	08/17/1998	HSA/AR	1616476.04	2486128.81	7191.70	7193.08	75.00	8.75	2.00	PVC	20.0	53.0-73.0	7134.74-7114.74	Active	Mancos Formation	Claystone
KMW13	3	11/13/1998	HSA/AR	1617203.45	2486607.14	7167.06	7168.46	52.50	8.75	2.00	PVC	20.0	32.0-52.0	7131.79-7111.79	Active	Dakota Formation	Sandstone
KMW15B	3	winter 2017	AR	1618061.00	2488390.00	7151.5	7152.63	210.00	6.00	2.00	PVC	20.0	189-209	6963.63-6943.63	Active	Sonsela Member	Sandstone
KMW16	3	winter 2017	AR	1617818.00	2487800.00	7135	7137.11	201.00	7.00	2.00	PVC	40.0	159-199	6978.11-6938.11	Active	Painted Desert Member	Claystone/Sandstone
										Northern Area							
BGMW01	14	02/06/2012	HSA	1645977.85	2501983.61	6690.28	6692.68	33.00	8.00	2.50	PVC	20.0	12.5-32.5	6677.78-6657.78	Active	Alluvium	Sandy Silt
BGMW02	14	02/09/2012	HSA	1646314.67	2501276.54	6689.20	6691.99	34.00	8.00	2.50	PVC	20.0	13.5-33.5	6675.70-6655.70	Active	Alluvium	Silt/Sand/Clay
BGMW03	12	02/05/2012	HSA	1647012.12	2499392.83	6677.79	6680.57	29.00	8.00	2.50	PVC	20.0	8.5-28.5	6669.29-6649.29	Active	Alluvium	Clay
EMW01[d]	18	07/14/2004	HSA	1643655.61	2502045.53	6716.06	6718.38	120.70	7.80	2.00	PVC	15.0	105.0-120.0	6610.16-6595.16	**Abandoned**	Abandoned	Siltstone/Claystone
EMW02[d]	18	07/19/2004	HSA/AR	1643391.22	2502476.99	6699.94	6702.49	120.00	6.00	2.00	PVC	15.0	93.0-108.0	6606.14-6591.14	**Abandoned**	Abandoned	Siltstone/Claystone
EMW03[d]	18	07/21/2004	HSA/AR	1643687.88	2502800.30	6698.63	6701.09	100.00	6.00	2.00	PVC	15.0	78.0-93.0	6619.69-6604.69	**Abandoned**	Abandoned	Siltstone
EMW04[d]	18	07/23/2004	HSA/AR	1643815.18	2502419.30	6705.68	6708.30	120.0	6.00	2.00	PVC	15.0	100.0-115.0	6604.84-6589.84	**Abandoned**	Abandoned	Claystone
FW07[d]	21	11/22/1980	HSA	1640839.18	2498075.06	6713.00	6714.90	30.50	8.00	4.00	PVC	20.5	10.0-30.5	6700.03-6684.03	**Abandoned**	Alluvium	Silty Sand
FW08[d]	21	11/21/1980	HSA/AR	1640572.50	2498132.47	6713.00	6714.90	51.00	8.00	4.00	PVC	40.0	9.0-49.0	6707.16-6667.16	**Abandoned**	Alluvium	Silty Sand/Sand/Clay

TABLE 2-1
Groundwater Well Construction Details (Page 2 of 3)
Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	FWDA Parcel	Date Installed	Drilling Method	Northing[a]	Easting[a]	Ground Elevation (ft amsl)[b]	Point Elevation (ft amsl)[b]	Well Depth (ft bgs)	Boring Diameter (in)	Casing Diameter (in)	Casing/ Screen Type	Screen Length (ft)	Screened Interval (ft bgs)	Screened Interval (ft amsl)	Status	Screened Formation	Description
Northern Area (Continued)																	
FW10 [d]	21	11/20/1980	HSA	1640848.95	2498936.89	6706.76	6708.38	51.50	10.00	4.00	PVC	40.0	9.0-49.0	6698.02-6658.02	**Abandoned**	Alluvium	Silty Sand/Silty Clay
FW11 [d]	21	11/21/1980	HSA	1641334.02	2499124.16	6701.20	6703.50	28.00	8.00	4.00	PVC	20.0	8.0-28.0	6692.78-6672.78	**Abandoned**	Alluvium	Clayey Sand
FW12 [d]	21	11/22/1980	HSA	1641609.82	2499038.13	6700.00	6702.00	29.00	8.00	4.00	PVC	20.0	9.0-29.0	6690.79-6670.79	**Abandoned**	Alluvium	Clayey Sand
FW13 [d]	21	11/22/1980	HSA	1641688.39	2498830.01	6701.20	6702.30	30.50	8.00	4.00	PVC	20.0	10.5-30.5	6689.99-6669.99	**Abandoned**	Alluvium	Clay
FW26 [d]	7	11/19/1980	HSA	1643853.34	2497067.39	6672.20	6674.40	31.00	8.00	4.00	PVC	20.0	11.0-31.0	6664.00-6644.00	**Abandoned**	Alluvium	Silt/Sand/Clay
FW27 [d]	9	11/17/1980	HSA	1646461.42	2494395.93	6657.75	6656.49	32.00	8.00	4.00	PVC	20.0	10.0-30.0	6645.39-6625.39	**Abandoned**	Alluvium	Silty Sand/Silty Clay/Clay
FW28 [d]	9	11/18/1980	HSA	1646584.14	2493050.57	6656.53	6657.50	33.00	8.00	4.00	PVC	23.0	10.0-33.0	6645.97-6622.97	**Abandoned**	Alluvium	Silt/Clay
FW29 [d]	11	11/16/1980	HSA	1645804.02	2497681.98	6669.17	6670.96	32.00	8.00	4.00	PVC	20.0	10.0-30.0	6659.69-6639.69	**Abandoned**	Alluvium	Gravel/Clay
FW31	19	11/19/1980	HSA	1631192.98	2505201.31	6830.72	6832.49	50.00	8.00	4.00	PVC	40.0	10.0-50.0	6815.71-6775.71	Active	Alluvium	Clay
FW35	13	11/15/1980	HSA	1641888.44	2503025.94	6709.17	6711.11	30.00	8.00	4.00	PVC	20.0	10.0-30.0	6699.26-6679.26	Active	Alluvium	Clay
MW01	11	11/22/1996	HSA	1643726.78	2498748.62	6686.03	6685.94	55.00	10.50	2.00	PVC	20.0	33.6-53.6	6651.99-6631.99	Active	Alluvium	Sand/Silty Clay
MW02	11	11/25/1996	HSA	1643783.35	2498712.23	6685.78	6685.22	48.00	10.50	2.00	PVC	10.0	37.0-47.0	6645.76-6635.76	Active	Alluvium	Clayey Sand/Clay
MW03	11	11/26/1996	HSA	1643644.43	2498801.96	6687.50	6689.53	53.00	10.50	2.00	PVC	10.0	43.0-53.0	6644.42-6634.42	Active	Alluvium	Silty Sand/Clay
MW18D	11	11/01/1994	HSA	1643947.99	2498331.32	6684.94	6686.32	59.90	8.00	2.00	PVC	10.0	47.0-57.0	6637.04-6627.04	Active	Alluvium	ND
MW18S [d]	11	11/01/1994	HSA	1643948.08	2498331.62	6684.67	6686.61	39.04	8.00	2.00	PVC	10.0	27.0-37.0	6658.17-6648.17	**Dry**	Alluvium	ND
MW20	11	11/01/1994	HSA	1643922.12	2498193.80	6685.34	6687.67	59.40	8.00	2.00	PVC	10.0	47.0-57.0	6638.79-6628.79	Active	Alluvium	ND
MW22D	11	11/01/1994	HSA	1644178.39	2498343.15	6682.69	6684.55	58.62	8.00	2.00	PVC	10.0	47.0-57.0	6636.55-6626.55	Active	Alluvium	ND
MW22S	11	11/01/1994	HSA	1644178.59	2498343.06	6682.69	6684.69	43.54	8.00	2.00	PVC	10.0	31.0-41.0	6651.57-6641.57	Active	Alluvium	ND
MW23	25	06/30/2011	HSA	1648792.02	2493767.75	6652.46	6654.50	134.0	8.00	2.50	PVC	70.0	63.5-133.5	6588.96-6518.96	Active	Alluvium	Sand/Clay
MW24	25	07/02/2011	HSA	1648746.52	2494518.24	6655.09	6657.08	66.50	8.00	2.50	PVC	50.0	16.0-66.0	6638.09-6588.09	Active	Alluvium	Sand/Clay
SMW01	11	07/29/1996	HSA	1645908.54	2497392.99	6668.41	6669.94	50.21	8.00	2.00	PVC	20.0	29.9 - 49.9	6637.86-6617.86	Active	Alluvium	Silty Sand/Sandy Clay
TMW01	21	07/31/1996	HSA	1640504.34	2498872.04	6709.79	6711.84	60.00	8.00	2.00	PVC	15.0	44.0 - 59.0	6666.18-6651.18	Active	Alluvium	Clay with Sand Layer
TMW02	21	07/31/1996	HSA	1641503.03	2498583.97	6703.34	6705.35	85.00	8.00	2.00	PVC	14.0	67.9 - 81.9	6636.06-6622.06	Active	Painted Desert Member	Sandstone
TMW03	21	07/25/1996	HSA	1641773.65	2498883.04	6700.37	6702.43	70.10	8.00	2.00	PVC	20.0	49.8 - 69.8	6650.86-6630.86	Active	Alluvium	Silty Clay/Clayey Sand
TMW04	21	07/26/1996	HSA	1641690.11	2499095.25	6699.00	6700.86	70.50	8.00	2.00	PVC	20.0	50.0 - 70.0	6649.08-6629.08	Active	Alluvium	Upper Sand/Lower Clay
TMW05 [d]	22	07/23/1998	HSA/AR	1639949.83	2498884.78	6712.64	6714.67	37.40	5.50	2.00	PVC	10.0	25.0-35.0	6687.69-6677.69	**Abandoned**	Painted Desert Member	Sandstone/Siltstone
TMW06	11	08/27/1998	HSA	1643285.82	2498783.81	6689.08	6690.63	57.00	8.80	2.00	PVC	10.0	45.0-55.0	6643.85-6633.85	Active	Alluvium	Sandy Silt
TMW07	11	07/24/1998	HSA/AR	1643289.14	2498772.33	6689.08	6690.47	76.00	5.50	2.00	PVC	10.0	65.0-75.0	6633.74-6623.74	Active	Alluvium	Sandy Silt
TMW08	11	08/29/1998	HSA	1644255.04	2498930.01	6678.55	6680.31	62.00	8.80	2.00	PVC	30.0	30.0-60.0	6648.43-6618.43	Active	Alluvium	Silty Sand/Clay
TMW10	11	08/20/1998	HSA	1644455.63	2498459.83	6677.74	6680.04	65.00	8.80	2.00	PVC	30.0	28.0-58.0	6648.86-6618.86	Active	Alluvium	Silty Sand/Clay
TMW11	6	09/09/1998	HSA	1640758.33	2497201.28	6716.16	6718.28	82.00	8.75	2.00	PVC	25.0	55.0-80.0	6661.24-6636.24	Active	Alluvium	Silty Gravel/Sand
TMW13	21	08/11/1998	HSA	1641150.12	2498112.40	6705.42	6707.49	72.50	8.80	2.00	PVC	10.0	60.7-70.7	6644.35-6634.35	Active	Alluvium	Sandy Clay/Silt
TMW14A	21	01/25/2001	AR	1640105.58	2497489.30	6721.08	6723.54	110.00	6.00	2.00	PVC	15.0	94.25-109.25	6627.34-6612.34	Active	Painted Desert Member	Sandstone
TMW15	21	12/09/2001	AR	1640779.84	2497787.12	6710.80	6713.89	82.00	6.00	2.00	PVC	15.0	56.0-71.0	6652.88-6637.88	Active	Alluvium	Silty Gravel/Sand
TMW16	6	12/05/2001	AR	1640687.46	2496941.08	6711.65	6714.15	142.00	6.00	2.00	PVC	15.0	123.0-138.0	6587.59-6572.95	Active	Painted Desert Member	Sandstone
TMW17	6	12/13/2001	AR	1640639.74	2497193.66	6717.40	6719.89	152.00	6.00	2.00	PVC	15.0	112.0-127.0	6605.49-6590.49	Active	Painted Desert Member	Sandstone
TMW18	6	12/14/2001	AR	1641437.52	2497083.23	6710.14	6713.49	220.00	6.00	2.00	PVC	10.0	150.0-160.0	6563.66-6553.66	Active	Painted Desert Member	Sandstone
TMW19	6	12/03/2001	AR	1641357.45	2496433.25	6697.57	6700.52	187.00	6.00	2.00	PVC	15.0	169.0-184.0	6528.57-6513.57	Active	Painted Desert Member	Sandstone
TMW21	21	08/09/2002	HSA	1642714.59	2498128.03	6692.75	6695.14	72.00	8.00	2.00	PVC	10.0	48.0-58.0	6644.76-6634.76	Active	Alluvium	Sand/Silt/Clay
TMW22	21	08/08/2002	HSA	1642741.03	2499552.37	6689.80	6691.74	77.00	8.00	2.00	PVC	10.0	52.0-62.0	6637.13-6627.13	Active	Alluvium	Sand/Silt/Clay
TMW23	11	08/06/2002	HSA	1643402.27	2499309.65	6685.37	6687.66	72.00	8.00	2.00	PVC	10.0	46.0-56.0	6638.81-6628.81	Active	Alluvium	Clay/Sand
TMW24	11	08/03/2003	HSA	1644192.07	2499766.39	6678.52	6680.42	75.00	8.00	2.00	PVC	10.0	44.0-54.0	6633.30-6623.30	Active	Alluvium	Silty Sand/Silt/Sand
TMW25	7	08/01/2002	HSA	1643599.42	2496775.99	6671.09	6672.88	74.00	8.00	2.00	PVC	10.0	42.5-52.5	6627.72-6617.72	Active	Alluvium	Silty Sand/Clay
TMW26	11	07/30/2002	HSA	1645294.52	2498581.83	6674.88	6677.71	64.80	8.00	2.00	PVC	10.0	45.0-55.0	6629.97-6619.97	Active	Alluvium	Silt/Sand/Clay
TMW27	9	07/26/2002	HSA	1646400.43	2496126.29	6665.45	6668.13	102.20	8.00	2.00	PVC	10.0	60.0-70.0	6605.37-6595.37	Active	Alluvium	Sandy Clay/Silt
TMW28	14	07/24/2002	HSA	1645827.16	2501250.48	6686.77	6689.17	72.50	8.00	2.00	PVC	10.0	37.0-47.0	6649.79-6639.79	Active	Alluvium	Silty Sand/Sand/Clay

TABLE 2-1

Groundwater Well Construction Details (Page 3 of 3)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	FWDA Parcel	Date Installed	Drilling Method	Northing[a]	Easting[a]	Ground Elevation (ft amsl)[b]	Point Elevation (ft amsl)[b]	Well Depth (ft bgs)	Boring Diameter (in)	Casing Diameter (in)	Casing/ Screen Type	Screen Length (ft)	Screened Interval (ft bgs)	Screened Interval (ft amsl)	Status	Screened Formation	Description
Northern Area (Concluded)																	
TMW29	21	08/19/2002	HSA	1641786.37	2498235.92	6700.31	6702.88	69.00	8.00	2.00	PVC	10.0	49.0-59.0	6652.32-6642.32	Active	Alluvium	Sand/Sandy Clay
TMW30	21	11/15/2009	HSA/AR	1639957.87	2498898.99	6712.35	6714.59	51.50	6.00	2.00	PVC	10.0	35.0-45.0	6677.31-6667.31	Active	Painted Desert Member	Sandstone
TMW31D	21	11/16/2009	HSA/AR	1640689.53	2498931.95	6708.53	6710.44	111.50	6.00	2.00	PVC	30.0	77.0 - 107.0	6631.98-6601.98	Active	Painted Desert Member	Sandstone
TMW31S	21	11/17/2009	HSA/AR	1640689.53	2498931.95	6708.53	6710.20	61.00	6.00	2.00	PVC	10.0	50.0-60.0	6658.98-6648.98	Active	Alluvium	Silty Sand/Sand/Clay
TMW32	21	11/18/2009	HSA	1641059.71	2498559.18	6707.09	6709.31	139.10	6.00	2.00	PVC	20.0	117.0-137.0	6590.89-6570.89	Active	Painted Desert Member	Sandstone
TMW33	11	11/19/2009	HSA	1644035.48	2498303.75	6684.09	6686.60	60.40	6.00	2.00	PVC	20.0	37.0-57.0	6646.78-6626.78	Active	Alluvium	Silty Sand/Sand/Clay
TMW34	11	11/20/2009	HSA	1643993.95	2498014.09	6684.32	6687.29	57.25	6.00	2.00	PVC	20.0	37.0-57.0	6650.32-6630.32	Active	Alluvium	Silty Sand/Sand/Clay
TMW35	11	11/21/2009	HSA/AR	1644050.75	2498442.31	6684.14	6686.52	55.00	6.00	2.00	PVC	20.0	35.0-55.0	6649.26-6629.26	Active	Alluvium	Silty Sand/Sand/Clay
TMW36	21	11/22/2009	HSA/AR	1641645.74	2499049.17	6697.33	6699.04	157.00	6.00	2.00	PVC	20.0	132.0-152.0	6567.32-6547.32	Active	Painted Desert Member	Sandstone
TMW37	21	11/23/2009	HSA/AR	1640648.14	2498397.74	6710.51	6713.09	111.00	6.00	2.00	PVC	20.0	88.0-108.0	6622.88-6602.88	Active	Painted Desert Member	Sandstone
TMW38	21	09/03/2011	HSA	1641400.80	2498219.52	6704.41	6706.79	159.50	8.00	2.50	PVC	40.0	118.9-158.9	6585.41-6545.41	Active	Sandstone	Sandstone
TMW39S	13	07/05/2011	HSA	1640745.21	2499279.83	6706.53	6708.61	53.00	8.00	2.50	PVC	20.0	32.5-52.5	6674.03-6654.03	Active	Alluvium	Clay
TMW39D	13	09/07/2011	HSA	1640745.21	2499279.83	6706.53	6708.61	100.50	8.00	2.50	PVC	30.0	70.0-100.0	6636.53-6606.53	Active	Sandstone	Sandstone
TMW40S	21	09/20/2011	HSA	1641487.06	2498603.50	6703.81	6706.40	60.50	8.00	2.50	PVC	10.0	50.0-60.0	6653.81-6643.81	Active	Alluvium	Silt/Sand/Clay
TMW40D	21	09/20/2011	HSA	1641487.06	2498603.50	6703.81	6706.15	155.50	8.00	2.50	PVC	20.0	135.0-155.0	6568.81-6548.81	Active	Sandstone	Sandstone
TMW41	21	07/01/2011	HSA	1641113.86	2499058.48	6703.48	6705.21	66.00	8.00	2.50	PVC	10.0	55.5-65.5	6647.48-6637.48	Active	Alluvium	Clay with Gravel
TMW43	21	02/03/2012	HSA	1642171.46	2498570.92	6695.63	6698.63	78.5	8.00	2.50	PVC	20.0	58.0-78.0	6637.8-6617.8	Active	Alluvium	Sand with Gravel
TMW44	21	02/04/2012	HSA	1642323.41	2499212.51	6694.81	6697.31	64.0	8.00	2.50	PVC	20.0	43.5-63.5	6651.5-6631.5	Active	Alluvium	Silty Clay/Sand
TMW45	11	02/08/2012	HSA	1643187.53	2499597.72	6686.50	6689.00	59.0	8.00	2.50	PVC	20.0	38.5-58.5	6648.2-6628.2	Active	Alluvium	Sand/Clay
TMW46	11	02/05/2012	HSA	1644326.04	2497404.70	6678.69	6680.98	59.0	8.00	2.50	PVC	20.0	38.5-58.5	6640.19-6620.19	Active	Alluvium	Sandy Clay with Gravel
TMW47	13	02/01/2012	HSA	1641475.95	2499610.93	6699.32	6701.88	103.0	8.00	2.50	PVC	20.0	82.5-102.5	6616.82-6596.82	Active	Alluvium	Clay/Silt
TMW48	13	09/15/2011	HSA	1640515.53	2499131.31	6707.80	6709.80	91.5	8.00	2.50	PVC	20.0	71.0-91.0	6636.80-6616.80	Active	Alluvium	Sand
TMW49	21	09/09/2011	HSA	1639979.77	2498578.38	6712.20	6714.70	60.0	8.00	2.50	PVC	20.0	40.0-60.0	6672.20-6652.20	Active	Alluvium	Sand
PZ01[c]	12	fall 2012	HSA	1645310.72	2499236.22	6674.71	6677.29	45.7	ND	1.00	PVC	20	25.7-45.7	6700.40-6720.40	Active	Alluvium	Undifferentiated CL/S/ML
PZ02[c]	12	fall 2012	HSA	1645426.78	2499258.64	6672.50	6674.95	52.7	ND	1.00	PVC	20	32.7-53.7	6705.23-6725.23	Active	Alluvium	Undifferentiated CL/S/ML
PZ03[c]	12	fall 2012	HSA	1645502.88	2499288.54	6676.86	6679.44	49.3	ND	1.00	PVC	20	29.3-49.3	6706.13-6726.13	Active	Alluvium	Undifferentiated CL/S/ML
PZ04[c]	12	fall 2012	HSA	1645288.26	2498592.56	6674.17	6676.68	49.3	ND	1.00	PVC	20	29.3-49.3	6703.44-6723.44	Active	Alluvium	Undifferentiated CL/S/ML
PZ05[c]	12	fall 2012	HSA	1646574.66	2498263.13	6671.53	6674.15	48.7	ND	1.00	PVC	20	28.7-48.7	6700-19-6720.19	Active	Alluvium	Undifferentiated CL/S/ML
PZ06[c]	12	fall 2012	HSA	1646327.75	2498718.95	6673.29	6676.04	49.2	ND	1.00	PVC	20	29.2-49.2	6702.52-6722.52	Active	Alluvium	Undifferentiated CL/S/ML
PZ07[c]	12	fall 2012	HSA	1645600.75	2500958.18	6682.38	6684.53	32.8	ND	1.00	PVC	20	12.8-32-8	6695.16-6715.16	Active	Alluvium	Undifferentiated CL/S/ML
PZ08[c]	12	fall 2012	HSA	1645511.30	2500744.34	6684.11	6686.81	49.0	ND	1.00	PVC	20	29-49	6713.16-6733.16	Active	Alluvium	Undifferentiated CL/S/ML
PZ09[c]	12	fall 2012	HSA	1648138.17	2495520.51	6651.12	6653.61	35.6	ND	1.00	PVC	15	20.6-35.6	6671.75-6686.75	Active	Alluvium	Undifferentiated CL/S/ML
PZ10[c]	12	fall 2012	HSA	1648008.28	2495406.66	6654.83	6657.27	48.5	ND	1.00	PVC	15	33.5-48.5	6688.32-6703.32	Active	Alluvium	Undifferentiated CL/S/ML
Wingate 89[d]	10B	01/01/1963	ND	1647927.73	2496972.14	6663.20	6663.70	ND	ND	8.00	PVC	ND	ND	ND	**Abandoned**	Alluvium	ND
Wingate 90[d]	10B	01/02/1963	ND	1648335.14	2495646.34	6655.30	6656.50	102.0	ND	8.00	PVC	ND	ND	ND	**Abandoned**	Alluvium	ND
Wingate 91[d]	10B	01/03/1963	ND	1648705.22	2494863.70	6658.80	6659.70	ND	ND	8.00	PVC	ND	ND	ND	**Abandoned**	Alluvium	ND

[a] Horizontal Coordinate System: NM NAD83 State Plane Central

[b] Vertical Coordinate System: NAVD88

[c] Indicates the well is used for water level measurements only and is not sampled

[d] *italic* s indicates a well is no longer usable for monitoring purposes

amsl = above mean sea level

AR = air rotary drilling method

bgs = below ground surface

CL = lean clay

ft = feet

FWDA = Fort Wingate Depot Activity

HSA = hollow stem auger drilling method

ID = identification

in = Inches

ML = silt

NA = not applicable

NAD83 = North American Datum of 1983

NAVD88 = North American Vertical Datum of 1988 ND = No data available

ND = not documented

NM = New Mexico

PVC = polyvinyl chloride

S = sand

TABLE 2-2

Contaminants of Potential Concern by Site and Point of Release (Page 1 of 4)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Parcel	SWMU or AOC Site	Soil Investigation Results Soil COPCs	Release to Soil explosives exceeding SSL	Groundwater Release[1,2]	Proposed Interim Groundwater Monitoring Retain as Groundwater COPC[3]	Area and Aquifer Zone
1	None. Parcel transferred to U.S. Department of Interior	- -	- -	- -	- -	- -
2	SWMU 17 (Western Rifle Range)	Metals	RFI to determine	No	No, pending Parcel 2 RFI[1]	None
	SWMU 22 (Group C Landfill, Removed)	explosives, metals, VOC, SVOC, PCB, pesticides, TPH	No	No	No, pending Parcel 2 RFI[1]	None
	AOC 35 (Igloo Block H)	explosives, metals	RFI to determine	No	No, pending Parcel 2 RFI[1]	None
	AOC 36 (Igloo Block J)	explosives, metals	RFI to determine	No	No, pending Parcel 2 RFI[1]	None
	AOC 76 (Feature 19 on 1973 aerial photo)	explosives, metals, pesticides	RFI to determine	No	No, pending Parcel 2 RFI[1]	None
	AOC 77 (Feature 20 on 1973 aerial photo)	explosives, metals, pesticides	RFI to determine	No	No, pending Parcel 2 RFI[1]	None
3	HWMU (Open Burn Open Detonation Area)	explosives, metals, WP, perchlorate, VOC, SVOC, dioxins/furans	munitions response team to determine	Yes	explosives, metals, perchlorate, nitrate, VOC, SVOC	Groundwater north of HWMU along north-south drainage
	CAMU (permitted demilitarization unit)	explosives, metals, perchlorate, WP	munitions response team to determine	No	No, pending munitions response team	None
	SWMU 14 (Old Burning Ground and Demolition Landfill Area)	explosives, metals, perchlorate, WP, SVOC, dioxins/furans	munitions response team to determine	Yes	explosives, metals, perchlorate, nitrate, VOC, SVOC	Groundwater northwest of SWMU drainages
	SWMU 15 (Old Demolition Area)	explosives, metals, perchlorate, WP	munitions response team to determine	Yes	explosives, metals, perchlorate, nitrate	Groundwater northwest of SWMU drainages
	SWMU 33 (Waste Pile KP1)	explosives, metals, perchlorate, WP	munitions response team to determine	No	No, pending munitions response team[1]	None
	SWMU 74 (Area of Site 16, Proposed Burning Ground)	explosives, metals, perchlorate, WP, SVOC, dioxins/furans	munitions response team to determine	No	No, pending munitions response team[1]	None
	AOC 89 (Feature 30 and 34 on 1973 aerial photo)	explosives, metals, perchlorate, WP	munitions response team to determine	No	No, pending munitions response team[1]	None
	AOC 90 (Feature 36 on 1973 aerial photo)	explosives, metals, perchlorate, WP	munitions response team to determine	No	No, pending munitions response team[1]	None
	AOC 91 (Feature 41 on 1973 aerial photo, and Feature 27 on 1978 aerial photo)	explosives, metals, perchlorate, WP	munitions response team to determine	No	No, pending munitions response team[1]	None
	AOC 92 (Feature 31 on 1973 aerial photo, and Feature 21 on 1978 aerial photo)	explosives, metals, perchlorate, WP	munitions response team to determine	No	No, pending munitions response team[1]	None
4A	AOC 29 (Igloo Block C)	explosives, metals, pesticides, PCB	Removed	No	No per Interim Measures Report	None
4B	None - pending transfer to U.S. Department of Interior	- -	- -	- -	- -	- -
5A	AOC 78 (Feature 18 on 1973 aerial photo)	explosives, metals, PCB	RA to determine	No	No, pending RA[1]	None
5B	None, pending transfer to U.S. Department of Interior	- -	- -	- -	- -	- -
6	SWMU 4 (Building 600, Ammunition Workshop)	explosives, metals, VOC, SVOC	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	SWMU 8 (Building 537, removed)	PCB, PAH	PAH and PCB in soil to greater than 5 foot depth	No	SVOC pending ICM[1]	Bedrock groundwater north of SWMU
	SWMU 11 (Buildings 541 and 542)	explosives, metals, VOC, SVOC	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	SWMU 20 (Feature 4, locomotive near Building 542)	metals, SVOC, PCB, oils, grease	No, per Parcel 6 RFI	No	No, pending ICM[1]	None
	AOC 28 (Igloo Block B)	explosives, metals	Sampling to determine	No	No, pending metals sampling in ICM[1]	None
	AOC 42 (Building 516)	None	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	AOC 61 (Building 507)	None	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	AOC 75 (Electrical Transformers, removed)	None	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	AOC 80 (Feature 9 on 1962 aerial photo)	None	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	AOC 81 (Feature 11 on 1962 aerial photo)	None	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	AOC 83 (Feature 22 on 1973 aerial photo)	None	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
	AOC 84 (Feature 12 on 1962 aerial photo)	None	No, per Parcel 6 RFI	No	No, NFA proposed under RFI	None
7	SWMU 9 (POL Waste Discharge Area)	TPH, VOC, SVOC, PCB, metals	Lead in soil to 1 foot, per Parcel 7 RFI	No	No, pending ICM[1]	None
	SWMU 25 (Trash Burning Ground Property Disposal Office, and Feature 1, 2, and 5 on 1962 aerial photo)	pesticides, VOC, SVOC, PCB, metals	No, per Parcel 7 RFI	No	None	None
	AOC 43 (Railroad Classification Yard)	Dioxins/Furans	Yes, one surface sample	No	None	None
	AOC 75 (Electrical Transformers, removed)	None	No, per Parcel 7 RFI	No	None	None

TABLE 2-2

Contaminants of Potential Concern by Site and Point of Release (Page 2 of 4)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Parcel	SWMU or AOC Site	Soil Investigation Results Soil COPCs	Release to Soil explosives exceeding SSL	Groundwater Release[1,2]	Proposed Interim Groundwater Monitoring Retain as Groundwater COPC[3]	Area and Aquifer Zone
8	None, pending transfer to U.S. Department of Interior	- -	- -	- -	- -	- -
9	AOC 18 (Igloo Block A)	explosives, metals	RFI to determine	No	No, pending Parcel 9 RFI[1]	None
	AOC 85 (Feature 11-1 on 1962 aerial photo and Feature 1 on 1973 aerial photo)	explosives, metals	RFI to determine	No	No, pending Parcel 9 RFI[1]	None
10A	SWMU 26 (Suspected POL Area)	TPH, VOC, SVOC, PCB, metals	No, per Parcel 10 RFI	No	None	None
	AOC 44 (Former Administration and Utilities Area)	pesticides, VOC, SVOC, metals	No, per Parcel 10 RFI	No	None	None
10B	None, pending transfer to U.S. Department of Interior	- -	- -	- -	- -	- -
11	SWMU 3 (Fenced Storage Yard)	DRO, PAH, metals	PAH and DRO in soil to 1 foot depth	No	No, pending Parcel 11 Phase 2 RFI[1]	None
	SWMU 5 (Building 5, Regimental Garage)	None	No, per Parcel 11 RFI	No	None	None
	SWMU 6 (Building 11, Former Locomotive Shop)	DRO, SVOC, PCB	Yes, DRO in soil. Depth not defined.	No	DRO, SVOC	Alluvial groundwater west of SWMU
	SWMU 10 (Sewage Treatment Plan, Bldgs. 22, T-37, 63, 69 through 74d, 82, 83, document incinerator)	MEC, explosives, VOC, SVOC, nitrate, pesticides	No per Phase 1 RFI, Phase 2 RFI planned	No	No, pending Parcel 11 Phase 2 RFI[1]	None
	SWMU 23 (Buildings 7 and 9, Paint and Carpenter Shops)	DRO, SVOC, metals	PAH and metals in soil to 1 foot depth	No	No, pending Parcel 11 Phase 2 RFI[1]	None
	SWMU 24 (Buildings 15 Garage and Storage Shop)	VOC, SVOC, DRO, PCB, pesticides, metals	PAH, pesticides and metals in soil to 2 foot depth	No	No, pending Parcel 11 Phase 2 RFI[1]	None
	SWMU 37 (Buildings 9 Machine and Signal Shop)	VOC, SVOC, PCB, metals	PAH and metals in drain sediments	No	No	None
	SWMU 40 (South Administration Area, Coal Tar Storage Tanks 58-60)	VOC, SVOC, PCB, DRO, GRO, pesticides, herbicides, metals	DRO, PAH, metals, and PCB in soil to 1 foot depth	No	No, pending Parcel 11 Phase 2 RFI[1]	None
	SWMU 45 (Building 6 Gas Station)	DRO, GRO, VOC, metals	DRO, GRO, VOC	Yes	DRO GRO, VOC, SVOC, metals	Alluvial groundwater west of SWMU
	SWMU 48 (Buildings 10)	metals	No, per Parcel 11 RFI	No	No	None
	SWMU 49 (Buildings 12)	SVOC, PCB, metals	PAH and metals in soil to 1 foot depth	No	No	None
	SWMU 50 (Structure 35, UST 7)	GRO, DRO, VOC, metals	VOC to undetermined depth	Yes	VOC, metals	Alluvial groundwater west of SWMU
	SWMU 51 (Buildings 29)	SVOC, PCB, metals	metals in soil to 1 foot depth	No	No	None
	SWMU 52 (Buildings T-33)	SVOC, PCB, metals	PAH and metals in soil to 1 foot depth	No	No	None
	SWMU 53 (Buildings 36)	SVOC, PCB, metals	PAH and metals in soil to 1 foot depth	No	No	None
	SWMU 54 (UST 5)	DRO, heating oil	No	No	No	No
	AOC 46 (AST near Bog. 11)	DRO	No, per Parcel 11 RFI	No	No	None
	AOC 47 (spill of photoflash powder west of Bldg.. 11)	Nitrate, perchlorate	No, per Parcel 11 RFI	No	No	None
	AOC 48 (Building 34, Fire Station)	VOC, SVOC, PCB, DRO, metals	No, per Parcel 11 RFI.	No	No	None
	AOC 49 (Structures 38, 39, Loading Docks)	VOC, SVOC, PCB, metals	No	No	No	No
	AOC 51 (Structure 64, UST)	GRO, DRO, VOC, metals	No, per Parcel 11 RFI. ICM planned	No	No, pending ICM[1]	None
	AOC 52 (Buildings 79, 80, Storage Vaults)	VOC, SVOC, PCB, pesticides, Herbicides, metals	No, per Parcel 11 RFI. ICM planned	No	No, pending ICM[1]	None
	AOC 55 (Structure T-49)	SVOC, PCB, metals	PAH and metals in soil to 1 foot depth	No	No	None
	AOC 56 (Structure T-50)	SVOC, PCB, metals	No	No	No	No
	AOC 57 (Building 14)	VOC, SVOC, PCB, pesticides, Herbicides, metals	SVOC and metals in soil to 1 foot depth	No	No, pending ICM[1]	None
	AOC 75 (Electrical Transformers)	PCBs	No, per Parcel 11 RFI.	No	No, NFA proposed under RFI	No
	AOC 83 (Structure 63)	GRO, DRO, VOC, metals	DRO and metals in soil to 1 foot depth	No	No, pending ICM[1]	None
	AOC 87 (Structure 57)	DRO, SVOC, metals	DRO in soil to 1 foot depth	No	No	None
12	None, pending transfer to U.S. Department of Interior	- -	- -	- -	- -	- -

TABLE 2-2

Contaminants of Potential Concern by Site and Point of Release (Page 3 of 4)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Parcel	SWMU or AOC Site	Soil Investigation Results Soil COPCs	Release to Soil explosives exceeding SSL	Groundwater Release[1,2]	Proposed Interim Groundwater Monitoring Retain as Groundwater COPC[3]	Area and Aquifer Zone
13	AOC 53 (Lake Knudson)	explosives, VOC, SVOC, pesticides, perchlorate, metals	No, per Parcel 13 RFI	No	No	None
	AOC 54 and AOC 57 (Buildings 306 to 311, Standard Magazines)	explosives, perchlorate, VOC, SVOC, PCB, pesticides, metals	PAHs and metals in soil to 1 foot depth	No	No	None
	AOC 55 (Structure 506, TNT Storage Barricade)	explosives, metals	No, per Parcel 13 RFI	No	No	None
	AOC 56 (Structure 533, explosives exceeding Barricade)	explosives, metals	No, per Parcel 13 RFI	No	No	None
14	None, pending transfer to U.S. Department of Interior	- -	- -	- -	- -	- -
15	None, transferred to U.S. Department of Interior	- -	- -	- -	- -	- -
16	SWMU 16 (Functional Test Range 2/3)	explosives, metals, asbestos, perchlorate, SVOC	explosives and asbestos in soil to 1 foot depth	No	No, pending ICM[1]	None
	AOC 41 (Igloo Block K)	explosives, metals	Metals in soil to 1 foot depth	No	No, pending ICM[1]	None
	AOC 57 (Buildings 306-310, Standard Magazines)	explosives, metals	No	No	No	None
17	None, transferred to U.S. Department of Interior	- -	- -	- -	- -	- -
18	SWMU 13 (Eastern Landfill, Removed)	None	Removed	No	No	None
19	SWMU 39 (Pistol Range)	lead	RFI to determine	No	No, pending Parcel 19 RFI[1]	None
	AOC 30 (Igloo Block D)	explosives, metals	RFI to determine	No	No, pending Parcel 19 RFI[1]	None
	AOC 31 (Igloo Block E)	explosives, metals	RFI to determine	No	No, pending Parcel 19 RFI[1]	None
	AOC 32 (Igloo Block F)	explosives, metals	RFI to determine	No	No, pending Parcel 19 RFI[1]	None
	AOC 34 (Igloo Block G)	explosives, metals	RFI to determine	No	No, pending Parcel 19 RFI[1]	None
	AOC 58 (Buildings 303, 304, Standard Magazines; Building 320, Field Dunnage)	explosives, asbestos, VOC, SVOC, PCB, metals	RFI to determine	No	No, pending Parcel 19 RFI[1]	None
	AOC 59 (Building T-422, Normal Maintenance, Bomb and Shell Paint)	explosives, VOC, SVOC, PCB, metals	RFI to determine	No	No, pending Parcel 19 RFI[1]	None
20	SWMU 38 (Functional Test Range 1)	MEC, explosives, SVOC, perchlorate, metals	RFI to determine	No	No, pending Parcel 20 RFI[1]	None
21	SWMU 1 (TNT Leaching Beds and Building 503)	explosives, VOC, SVOC, pesticides, herbicides, PCB, perchlorate, metals	explosives and metals to depth of water table	Yes	explosives, nitrate, metals	Alluvial groundwater north and west of SWMU. Suspected bedrock to southwest.
	SWMU 2 (Building 515, Painting and Acid Washout and Acid Holding Pond)	VOC, SVOC, PCB, pesticides, metals	metals in soil to 1 foot depth	No	No, pending ICM[1]	None
	SWMU 7 (Fire Training Ground)	VOC, SVOC, metals	DRO in soil to undefined depth	No	DRO, pending ICM[1]	Alluvial groundwater north and west of Building 31
	SWMU 19 (Building 501, Former Boiler House and Heating Plant 7)	VOC, SVOC, DRO, PCB, pesticides, metals	No, per Parcel 21 RFI	No	No, NFA proposed under RFI	None
	SWMU 72 (Deactivation Furnace and Acid Pits)	MEC, VOC, SVOC, DRO, metals	No, per Parcel 21 RFI	No	No, NFA proposed under RFI	None
	AOC 60 (Building 522 Ammunition Receiving)	MEC, VOC, SVOC, DRO, metals	No, per Parcel 21 RFI	No	No	None
	AOC 61 (Building 507, Smokeless Powder Magazine)	explosives, metals	No, per Parcel 21 RFI	No	No	None
	AOC 62 (Building 508, Smokeless Powder Magazine)	explosives, SVOC, nitrate, perchlorate, metals	No, per Parcel 21 RFI	No	No, NFA proposed under RFI	None
	AOC 63 (Building 509, Primary Collector Barricade or Propellant Baghouse)	explosives, SVOC, nitrate, PCB, metals	explosives in soil to 1 foot depth	No	No, pending ICM[1]	None
	AOC 64 (Building 510, Vacuum Producer Building)	explosives, SVOC, nitrate, PCB, metals	explosives, PCB in soil to 1 foot depth	No	No, pending ICM[1]	None
	AOC 65 (Building 511, Service Magazine)	explosives, SVOC, PCB, metals	No, per Parcel 21 RFI	No	No, NFA proposed under RFI	None
	AOC 66 (Building 512, Service Magazine)	explosives, SVOC, PCB, metals	No, per Parcel 21 RFI	No	No, NFA proposed under RFI	None
	AOC 67 (Building 513, Service Magazine)	explosives, SVOC, PCB, metals	No, per Parcel 21 RFI	No	No, NFA proposed under RFI	None
	AOC 68 (Structures 514 and 545, Deboostering Barricade, and Earthen Barricade)	explosives, SVOC, nitrate, PCB, metals	explosives in soil to 1 foot depth		No, pending ICM[1]	None
	AOC 75 (Electrical Transformers)	PCB	No, per Parcel 21 RFI	No	No, NFA proposed under RFI	None
	AOC 86 (Feature 15 on 1973 aerial photo)	None	No	No	No, NFA proposed under RFI	None
	AOC 87 (Feature 18 on 1962 aerial photo, and Feature 23 on 1972 aerial photo)	None	No	No	No, NFA proposed under RFI	None

TABLE 2-2

Contaminants of Potential Concern by Site and Point of Release (Page 4 of 4)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Parcel	SWMU or AOC Site	Soil Investigation Results Soil COPCs	Release to Soil explosives exceeding SSL	Groundwater Release[1,2]	Proposed Interim Groundwater Monitoring Retain as Groundwater COPC[3]	Area and Aquifer Zone
22	SWMU 12 (Building 536, Inspectors Workshop, Am-munition Renovation Depot, one PCB transformer)	explosives, VOC, SVOC, pesticides, PCB, metals	explosives, PAH, PCB, metals in manhole sediment	No	No, pending munitions response team1	None
	SWMU 27 (Building 528 Complex)	explosives, perchlorate, VOC, SVOC, PCB, metals	PAH in soil to 1 foot depth	Yes	perchlorate, explosives, nitrate, metals	Alluvial and bedrock groundwater north and west of SWMU
	SWMU 70 (Buildings 517-520, Disassembly Plant and Test Area)	explosives, SVOC, PCB, metals	No, per Parcel 22 RFI	No	No, NFA proposed under RFI	None
	AOC 30 (Igloo Block D)	explosives, SVOC, metals	explosives, metals in soil to 1 foot depth	No	No, pending ICM[1]	None
	AOC 69 (Buildings 301, 302, 312, Standard Magazines; Building 316, Field Lunch Room)	explosives, VOC, SVOC, DRO, nitrate, PCB, metals	DRO, PAH, and metals in soil to 3 foot depth	No	No, pending ICM[1]	None
	AOC 71 (Former rectangular structure near TMW-5 and north of Bldg. 528)	explosives, VOC, SVOC, nitrate, PCB, metals	No, per Parcel 22 RFI	No	No	None
	AOC 75 (Electrical Transformers)	PCB	No, per Parcel 22 RFI	No	No, NFA proposed under RFI	None
	AOC 88 (Former buildings south of Bldg. 528)	explosives, VOC, SVOC pesticides, PCB, metals	No, per Parcel 22 RFI	No	No, NFA proposed under RFI	None
	AOC 121 (Building 528B, temporary storage igloo)	explosives, perchlorate, VOC, SVOC, PCB, metals	No, per Parcel 22 RFI	No	No	None
	AOC 122 (Building 529)	explosives, perchlorate, VOC, SVOC, PCB, metals	No, per Parcel 22 RFI	No	No	None
	AOC 125 (Building 550, vacuum collector barricade)	explosives, perchlorate, VOC, SVOC, PCB, metals	No, per Parcel 22 RFI	No	No	None
23	SWMU 21 (Central Landfill, Removed)	explosives, pesticides, Herbicide, VOC, SVOC, PCB, metals	Removed. Residual PAH, metals to 18 foot depth	No	No, pending additional ICM[1]	None
	AOC 73 (Former structures along Road C-3)	explosives, SVOC, metals	No, per Parcel 23 RFI	No	No	None
24	AOC 18 (Igloo Block A)	explosives, SVOC, metals	Metals in soil to 1 foot depth	No	No, pending ICM[1]	None
25	None, pending transfer to U.S. Department of Interior	- -	- -	- -	- -	- -

Notes

[1] For the purposes of interim measures planning, there is no release to groundwater considered without investigation data documenting impacts in the groundwater media.

[2] A pathway for transport of contaminants to groundwater is known when the contaminants are detected in groundwater in excess of screening levels. A pathway is suspected when releases of soluble contaminants exceeding soil screening levels are not vertically delineated in subsurface soils.

[3] According to communications from Tammy Diaz of the NMED on 19 September 2009, polychlorinated byphenyls, white phosphorous, dioxins and furans, and herbicides are no longer required under the interim monitoring due to lack of detections or lack of detections in explosives in excess of screening levels.

Blue highlight = point of groundwater release

AOC = Area of Concern

Bldg. = building

CAMU = corrective action management unit

COPC = contaminants of potential concern

DRO = diesel range organics

GRO = gasoline range organics

HWMU = Hazardous Waste Management Unit

ICM = interim corrective measures

NFA = no further action

PAH = polyaeromatic hydrocarbons

POL = petroleum, oil, and lubricants

PCB = polychlorinated biphenols

RA = release assessment

RFI = Resource Conservation and Recovery Act facility investigation

SVOC = semivolatile organic compounds

VOC = volatile organic compounds

WP = white phosphorous

SWMU = solid waste management unit

TABLE 2-3

Groundwater Sampling Analyte Groups with Screening Level Exceedances (Page 1 of 3)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Associated Wells	Zone	Contaminants of Potential Concern Analyzed For	Contaminants Detected	Groups With Cleanup Level/ Screening Level Exceedances	Analyte Groups Retained for Monitoring
Parcel 3 HWMU					
BGMW05	Not available	Not available	Not available	Not available	Explosives, Metals, Anions, Perchlorate, SVOC, VOC
BGMW06	Not available	Not available	Not available	Not available	
CMW02	Alluvium	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Metals, Anions, Perchlorate, VOC, Pesticides	Metals	
CMW04	Alluvium	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, VOC	Explosives, Metals, Anions, VOC	
CMW06	Alluvium	Explosives, Metals	Explosives, Metals	Metals	
CMW07	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Metals, Anions, VOC	Metals, VOC	
CMW10	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Metals, Anions, SVOC	
CMW14	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Explosives, Metals, Anions, SVOC	
CMW17	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, VOC	Metals, VOC	
CMW18	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Explosives, Metals, Anions, Perchlorate, VOC	
CMW19	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, VOC	
CMW23	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, VOC	Metals, Anions, VOC	
CMW25	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, VOC, Pesticides	Metals	
CMW26	Bedrock	Not available	Not available	Not available	
CMW27B	Bedrock	Not available	Not available	Not available	
CMW28B	Bedrock	Not available	Not available	Not available	
CMW32	Bedrock	Not available	Not available	Not available	
CMW33B	Bedrock	Not available	Not available	Not available	
CMW35	Bedrock	Not available	Not available	Not available	
CMW36A	Bedrock	Not available	Not available	Not available	
CMW36B	Bedrock	Not available	Not available	Not available	
FW38	Alluvium	Explosives, Metals, Anions, VOC	Explosives, Metals, Anions	Metals	
Parcel 3 SWMU 14					
BGMW05	Not available	Not available	Not available	Not available	Explosives, Metals, Perchlorate, Anions, VOC, SVOC
BGMW06	Not available	Not available	Not available	Not available	
CMW22	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, VOC	Explosives, Metals	
CMW24	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, SVOC, VOC, Pesticides	Explosives, Metals, Anions	
CMW26	Not available	Not available	Not available	Not available	
CMW31B	Not available	Not available	Not available	Not available	
KMW11	Bedrock	Explosives, Metals, Anions, Perchlorate, White phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, VOC	Metals, Anions, VOC	
KMW15B	Not available	Not available	Not available	Not available	
KMW16	Not available	Not available	Not available	Not available	
Parcel 3 SWMU 15					
BGMW06	Not available	Not available	Not available	Not available	Explosives, Metals, Perchlorate, Anions
CMW31B	Not available	Not available	Not available	Not available	
KMW09	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Explosives, Metals, Anions, Perchlorate, VOC	Explosives, Metals, Anions	
KMW12	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, PCB	Metals, Anions, VOC	Metals, Anions	
KMW13	Bedrock	Explosives, Metals, Anions, Perchlorate	Explosives, Metals, Anions	Metals, Anions	
Parcel 6 SWMU 8					
TMW14A	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, SVOC, VOC	Metals, Anions, SVOC, VOC	Explosives, Metals, Anions, Perchlorate, SVOC, VOC
TMW16	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Perchlorate, SVOC, VOC	Metals	
TMW17	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Metals, Anions, Perchlorate, VOC	Metals	
TMW18	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Metals, SVOC, VOC	
TMW36	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, Tph, VOC, Pesticides	Metals, SVOC, VOC	
TMW37	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, Tph, VOC, Pesticides	Metals, Perchlorate, VOC	
TMW38	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, SVOC	
TWM19	Not available	Not available	Not available	Not available	

TABLE 2-3

Groundwater Sampling Analyte Groups with Screening Level Exceedances (Page 2 of 3)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Associated Wells	Zone	Contaminants of Potential Concern Analyzed For	Contaminants Detected	Groups With Cleanup Level/ Screening Level Exceedances	Analyte Groups Retained for Monitoring
Parcel 11 SWMU 45					
BGMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, SVOC, VOC	Metals	Explosives, Metals, Anions, SVOC, VOC, TPH
BGMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
MW18D	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, Tph, VOC, Pesticides	Explosives, Metals, Anions, VOC	
p	Alluvium	Not available	Not available	Not available	
MW20	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Metals, Anions, Perchlorate, SVOC, TPH, VOC, Pesticides	Metals, Anions, SVOC, VOC	
MW22D	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Metals, Anions, Perchlorate, SVOC, TPH, VOC, Pesticides	Metals, Anions, SVOC, VOC	
MW22S	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, Tph, VOC, Pesticides	Metals, Anions, VOC	
MW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	
MW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	Metals	
TMW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions	
TMW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC, Pesticides	Metals	
Parcel 11 SWMU 50					
BGMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, SVOC, VOC	Metals	Metals, Anions, SVOC, VOC, TPH
BGMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
MW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC, Pesticides	Metals, Anions, VOC	
MW02	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC	Metals, VOC	
MW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, TPH, VOC	Metals, Anions, VOC	
MW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	
MW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	Metals	
TMW08	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Metals, Anions, SVOC, TPH, VOC, Pesticides	Metals, Anions, VOC	
TMW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC, Pesticides	Metals	
TMW45	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
Parcel 11 SWMU 6					
BGMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, SVOC, VOC	Metals	Metals, Anions, SVOC, VOC, TPH
BGMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
MW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	
MW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	Metals	
TMW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC, Pesticides	Metals	
TMW25	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC	Metals	
TMW26	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Explosives, Metals, Anions, Perchlorate, VOC, Pesticides	Metals, VOC	
TMW28	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC	Metals, VOC	
TMW34	Alluvium	Metals, Anions, Perchlorate, VOC, TPH	Metals, Anions, Perchlorate, Tph, VOC	Metals, Anions	
TMW46	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC	Metals, Anions	
Parcel 21 SWMU 1					
BGMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, SVOC, VOC	Metals	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, TPH
BGMW02	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals, Anions	
BGMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
MW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, Tph, VOC	Metals, Anions, VOC	
MW22D	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Metals, Anions, Perchlorate, SVOC, Tph, VOC, Pesticides	Metals, Anions, SVOC, VOC	
MW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	
MW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	Metals	
SMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Metals, Anions, SVOC	
TMW02	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, VOC	Explosives, Metals, Anions, Perchlorate	
TMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Explosives, Metals, Anions, SVOC	
TMW04	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Explosives, Metals, Anions	
TMW06	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, SVOC, VOC	Metals, Anions	
TMW07	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, SVOC, VOC	Metals, Anions, SVOC	
TMW08	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Metals, Anions, SVOC, TPH, VOC, Pesticides	Metals, Anions, VOC	
TMW10	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, PCB, TPH	Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions	
TMW11	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, VOC	Metals, Anions, VOC	
TMW13	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, PCB	Metals, Anions, Perchlorate, VOC	Metals, Anions, VOC	
TMW14A	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, SVOC, VOC	Metals, Anions, SVOC, VOC	
TMW15	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Metals, VOC	
TMW16	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Perchlorate, SVOC, VOC	Metals	
TMW17	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Metals, Anions, Perchlorate, VOC	Metals	
TMW18	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Metals, SVOC, VOC	
TMW19	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Perchlorate, SVOC, VOC	Metals, SVOC	
TMW21	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, VOC	Metals, Anions	
TMW22	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Metals, Anions	
TMW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions	
TMW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC, Pesticides	Metals	
TMW25	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC	Metals	
TMW26	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Explosives, Metals, Anions, Perchlorate, VOC, Pesticides	Metals, VOC	
TMW27	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Perchlorate, VOC	Metals	
TMW28	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC	Metals, VOC	
TMW29	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Metals, Anions, Perchlorate, VOC	Metals, Anions, VOC	

TABLE 2-3

Groundwater Sampling Analyte Groups with Screening Level Exceedances (Page 3 of 3)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Associated Wells	Zone	Contaminants of Potential Concern Analyzed For	Contaminants Detected	Groups With Cleanup Level/ Screening Level Exceedances	Analyte Groups Retained for Monitoring
Parcel 21 SWMU 1 (Continued)					
TMW31S	Alluvium	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC	Metals, Anions, Perchlorate, SVOC	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, TPH
TMW34	Alluvium	Metals, Anions, Perchlorate, VOC, TPH	Metals, Anions, Perchlorate, TPH, VOC	Metals, Anions	
TMW36	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC, Pesticides	Metals, SVOC, VOC	
TMW37	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC, Pesticides	Metals, Perchlorate, VOC	
TMW38	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, SVOC	
TMW40	Not available	Not available	Not available	Not available	
TMW40S	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate	
TMW41	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals	
TMW43	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, SVOC, VOC	Metals	
TMW44	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC	Explosives, Metals, Anions	
TMW45	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
TMW46	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC	Metals, Anions	
TMW47	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, VOC, Pesticides	Anions	
TMW49	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Perchlorate	
Parcel 21 SWMU 7					
BGMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, SVOC, VOC	Metals	Metals, Anions, SVOC, VOC
BGMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
MW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	
MW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	Metals	
TMW21	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, VOC	Metals, Anions	
TMW25	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Metals, Anions, VOC	Metals	
TMW45	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
Parcel 22 SWMU 27					
BGMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, SVOC, VOC	Metals	Explosives, Metals, Anions, Perchlorate, SVOC, VOC
BGMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC	Metals	
MW23	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	
MW24	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, SVOC, VOC	Metals	
TMW01	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, VOC	Metals, Anions, Perchlorate, VOC	
TMW02	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, VOC	Explosives, Metals, Anions, Perchlorate	
TMW03	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Explosives, Metals, Anions, SVOC	
TMW11	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, Perchlorate, VOC	Metals, Anions, VOC	
TMW13	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, PCB	Metals, Anions, Perchlorate, VOC	Metals, Anions, VOC	
TMW14A	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans	Explosives, Metals, Anions, SVOC, VOC	Metals, Anions, SVOC, VOC	
TMW15	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Dioxins/Furans, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Metals, VOC	
TMW30	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC, Pesticides	Metals, Anions, Perchlorate	
TMW31D	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, VOC	Anions, Perchlorate	
TMW31S	Alluvium	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC	Metals, Anions, Perchlorate, SVOC	
TMW32	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC	Metals, Anions, Perchlorate	
TMW36	Bedrock	Explosives, Metals, Anions, Perchlorate, Phosphorus, SVOC, VOC, Cyanide, Dioxins/Furans, Herbicides, Pesticides, TPH	Explosives, Metals, Anions, Perchlorate, SVOC, TPH, VOC, Pesticides	Metals, SVOC, VOC	
TMW38	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, SVOC	
TMW39D	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC	Metals, Perchlorate	
TMW39S	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Perchlorate, SVOC, VOC	
TMW40D	Bedrock	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate	Metals, Anions, Perchlorate	
TMW40S	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate	
TMW41	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals	
TMW47	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, VOC, Pesticides	Anions	
TMW48	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Explosives, Metals, Anions, Perchlorate, SVOC	Metals, Anions, Perchlorate	
TMW49	Alluvium	Explosives, Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Anions, Perchlorate, SVOC, VOC, Pesticides	Metals, Perchlorate	

Notes:

Wells CMW06, CMW07, CMW14, CMW17, CMW18, FW38 are being removed as part of HWMU munition response activities.

AOC = Area of Concern

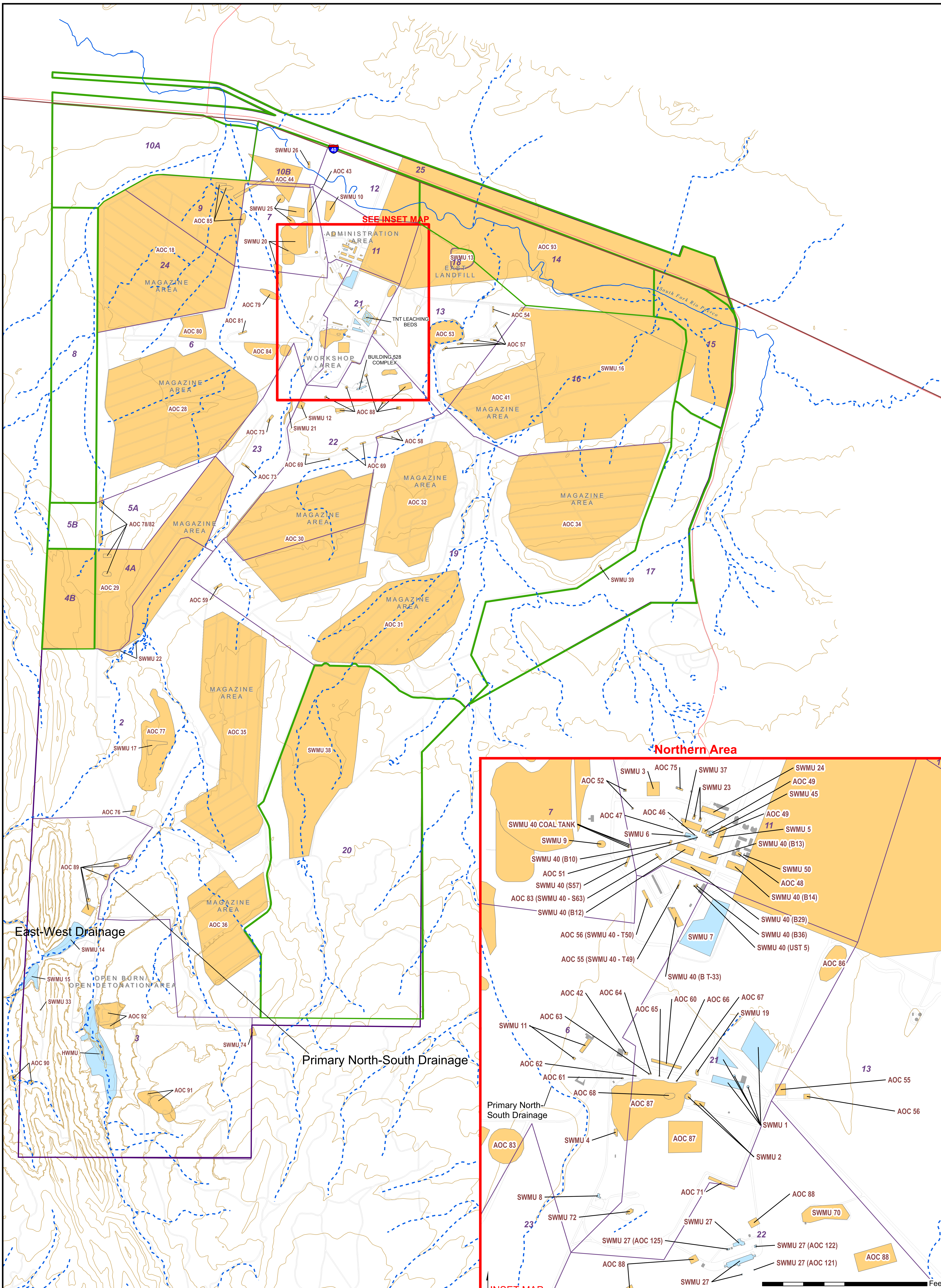
HWMU = Hazardous Waste Magement Unit

PCB = polychlorinated biphenyl

SVOC = semivolatile organic compounds

TPH = Total Petroleum Hydrocarbons

VOC = volatile organic compounds



Legend

- Arroyo
- Stream
- Fort Wingate Installation Boundary
- Buffer Parcels
- Topographic Contour (100 foot Interval)
- Fort Wingate Road
- Points of Release to Soil
- Points of Release to Groundwater

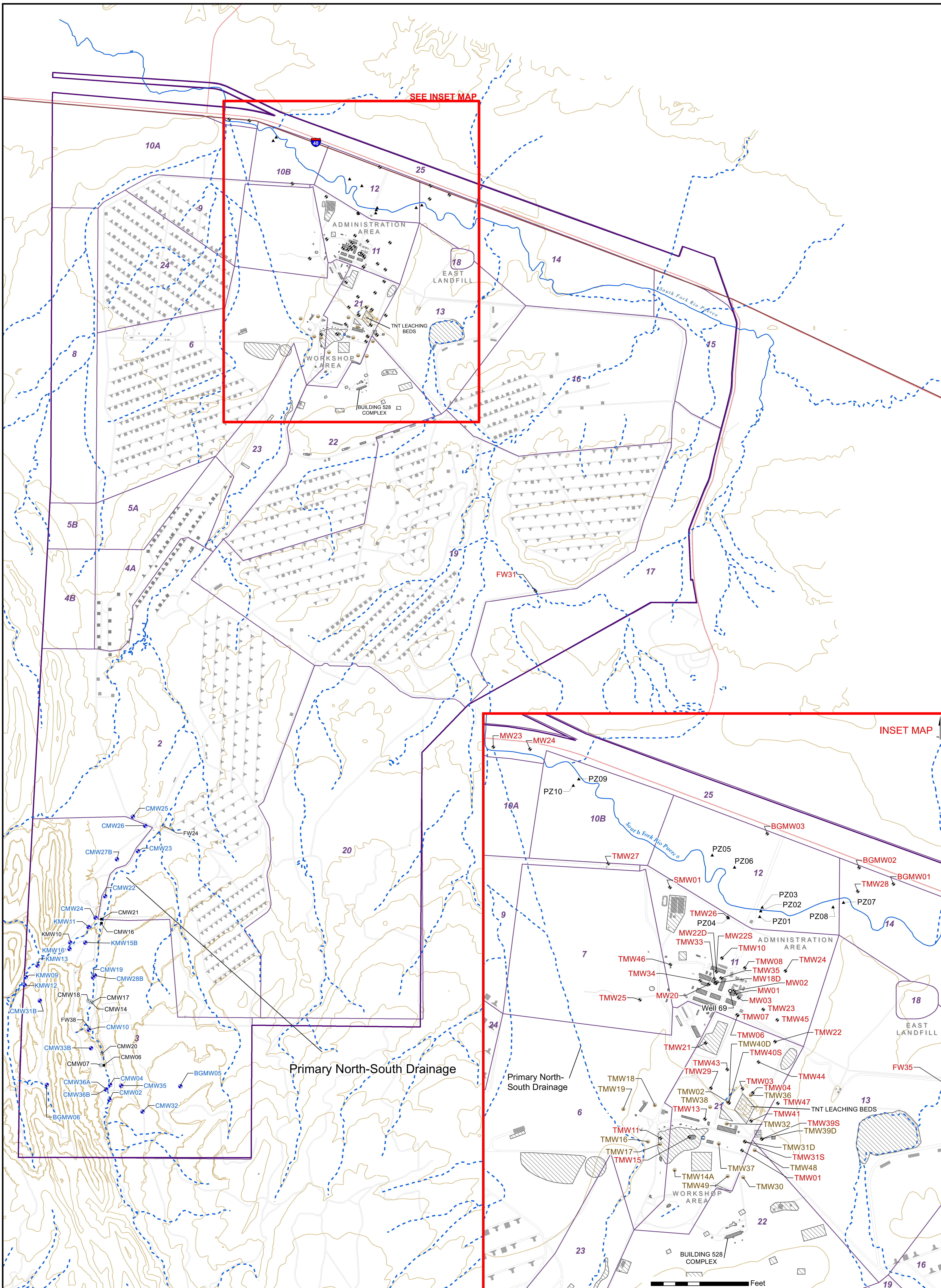
Notes:
AOC = Area of Concern
OB/OD = Open Burn/Open Detonation
SWMU = Solid Waste Management Unit

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

FIGURE 2-1
SITE FEATURES

Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

1:20,000
0 2,500 5,000 7,500 10,000 Feet
0 500 1,000 1,500 2,000 2,500 3,000 Meters



Legend

- ▲ Piezometers
- OB/OD Monitoring Well
- Alluvial Monitoring Well
- Bedrock Monitoring Well
- Dry or Damaged Well
- Removed
- ■ Buried Well
- ○ Water Supply Well 69
- Arroyo
- Stream
- AOC and SWMU
- Building
- Fort Wingate Installation Boundary
- Topographic Contour (100 foot Interval)
- Fort Wingate Road

Notes:
AOC = Area of Concern
OB/OD = Open Burn/Open Detonation
SWMU = Solid Waste Management Unit

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

FIGURE 2-2
Well Location Map

Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

1:20,000

0 2,500 5,000 7,500 10,000 Feet

0 500 1,000 1,500 2,000 2,500 3,000 Meters

3.0 Conceptual Site Model

This section summarizes the site conditions at the FWDA. Specific information including historical land use, natural and manmade features, ecological setting, fate and transport information, and detailed surface and subsurface characterization will be included in site-specific documents including RFI work plans, RFI reports, and release assessment reports prepared for the individual parcels as specified in the RCRA Permit.

3.1 Climate

Northwestern New Mexico is characterized by a semi-arid, continental climate with most precipitation occurring from June through September as localized, heavy, and brief monsoon storms. The climate for the FWDA area varies with elevation but is generally mild during the summer with temperatures ranging between 65 and 95 degrees Fahrenheit (°F), and cold during the winter with average daily temperatures ranging between 30 and 35°F. The warmest month is July, with an average maximum temperature of 89°F, while the coldest month is December, with an average minimum temperature of 11°F. Daily temperature variations can be considerable during the summer, with an average temperature difference of approximately 35°F.

Mean annual rainfall for the area ranges between 10 and 16 inches, while the recorded average annual precipitation for the FWDA is approximately 11 inches. The wettest month is August, with an average rainfall of approximately 2 inches. Most precipitation occurs as rain or hail during violent summer thunderstorms. The remainder of annual precipitation occurs as winter snow. Accumulated snow at higher elevations produces a slow release of snowmelt in the spring, which provides higher infiltration compared to the intense monsoon thunderstorms (Anderson et al., 2003).

The area has generally sunny weather with average relative humidity varying from 15 to 50 percent during dry seasons and the wet summer monsoon season, respectively. During spring, the area experiences very strong winds originating from the west and southwest with an average wind speed of approximately 12 miles per hour and maximum gust speeds approaching 65 miles per hour. These strong winds, high temperatures, and low relative humidities contribute to high evapotranspiration rates at the FWDA.

3.2 Surface Conditions

3.2.1 Topography

Topographically, FWDA can be divided into three areas: (1) the rugged north-south trending Nutria Monocline (commonly referred to as the Hogback) along the western and the southwestern boundaries; (2) the hill slopes of the Zuni Mountain Range in the southern portion; and (3) the alluvial plains marked by bedrock mesas in the northern portion. The elevation of FWDA ranges from approximately 8,200 feet above mean sea level in the south to 6,660 feet above mean sea level in the north.

3.2.2 Vegetation

Ground cover ranges from exposed bedrock and lithic soils to montane forest. Forest is present at higher elevations where more precipitation occurs. Mixed ponderosa pine and fir forest are present at elevations above 7,500 feet. Piñon and juniper vegetation is present at elevations from 6,800 to 7,500 feet. Shrubs and grasses are present at elevations below 6,800 feet. Some areas with steep slopes and rocky ground lack vegetation.

3.2.3 Soil

The FWDA soil types range from a mixture of sand, silt, and clay. Alluvium most commonly found in arroyos is permeable sand and sandy loam clay mixtures that contain varying amounts of silt, gravel, and rock fragments; however, most soil across FWDA is composed of low-permeability sandy clay. Soil types at the FWDA are primarily alluvial materials with the exception of the Hogback along the western border and the northern hill slopes of the Zuni Mountain Range in the southern portion. The alluvial materials do not typically have distinct soil horizons because they are relatively shallow and undeveloped. Organic soils have developed in some streambank deposits along major arroyos. The parent bedrock is either at or near the surface within more than a quarter of the installation.

High winds and water cause extensive soil erosion, especially where the vegetation cover is absent. The more permeable, sandy soil typically found in arroyos accounts for the majority of local surface water infiltration. The thickness of the soil varies across the installation. In the OB/OD Area and at the eastern and southern perimeter of the Northern Area, the soil thickness is a thin veneer with parent bedrock at or near the surface. However, in the majority of the Northern Area, the flat alluvial plains are dominant with thick soil overlying deeper, steeply dipping bedrock. In the Administration Area, alluvium can be up to 70 feet thick and is even thicker near the Rio Puerco.

3.3 Geology

3.3.1 Regional Geology Tectonic Setting and Site-Specific Structure

The FWDA is located in an erosional basin within the Navajo section of the Colorado Plateau Physiographic Province and lies on the northwest apex of the Zuni Uplift. This basin is regionally bounded by the Gallup Sag to the west, the Acoma Sag and McCarty's Syncline to the east, and the Chaco Slope to the north. The Zuni Uplift is an elongated north-northwest trending structural uplift that is primarily a result of vertical upward displacement followed by deformation resulting from horizontal compressive stress associated with the Laramide Orogeny of Cretaceous age. The uplift has exposed tilted Mesozoic sedimentary strata within the southwestern portion of the installation, a majority of which are Triassic mudstones and sandstones.

Specifically, the dominant topographic structural feature located on the southwest margin of the Zuni Uplift is the Nutria Monocline or Hogback. This steep structural feature is a monoclinal belt with dips ranging from 30 to 45 degrees near FWDA. Dips commonly exceed 60 degrees in the southern extension of the monocline, south of FWDA. The northern segment of the Nutria Monocline is exposed in the western portion of the FWDA, where westerly dipping Mesozoic strata are exposed to form a long, sharp-crested, north-to-south trending ridge. In areas east of the Hogback, the bedrock generally dips to the northwest.

3.3.2 Stratigraphy

The geologic units exposed at FWDA were largely deposited in the Mesozoic Era and have been significantly modified by more recent erosion and redeposition. The lithified stratigraphic units are Triassic to Cretaceous in age with uplift and deformation occurring in the Cretaceous during the Laramide orogeny series of mountain-building events in western North America (McCraw et al., 2009). Quaternary alluvial and colluvial deposits unconformably overlie the Mesozoic bedrock in the lower elevation and northern portions of FWDA (Anderson et al., 2003).

In the northern portion of the FWDA, the surface is covered by either remnants of the Triassic Chinle Group or Quaternary alluvial deposits. Figure 3-1 shows the surface distribution of alluvial deposits and bedrock in the Northern Area. Alluvial deposits are present in the Northern Area in lowland areas between bedrock remnants. Alluvial deposits are also present along intermittent streams draining the Hogback and Zuni Mountains, which flow downgradient through the northern portion of the installation before joining the South Fork of the Puerco River. The alluvium ranges in grain size from clay to gravel, typical of braided stream deposits (Malcolm Pirnie, Inc., 2000). Because the alluvium was generally deposited by braided streams and arroyos, the texture and internal structure are characterized by lateral and vertical heterogeneity. Information obtained from records of previously installed wells indicates that the alluvial deposits are thickest near major drainages, such as the South Fork of the Rio Puerco, where alluvial deposits can be up to 150 feet thick. Near Fort Wingate High School (located east of the installation), the alluvial deposits are approximately 75 feet thick, whereas in the Administration Area, deposit thickness is variable, with average thickness varying from 30 to 70 feet within a relatively small spatial area.

The majority of FWDA is underlain by the Triassic-age Chinle Group, which is predominantly non-marine, red-bed siliciclastics. Figure 3-2 and Figure 3-3 show the surface distribution of alluvial deposits and bedrock in the Northern Area and the OB/OD Area, respectively. The Chinle Group consists of the Shinarump, Bluewater Creek, Petrified Forest, and Owl Rock Formations (Anderson et al., 2003). The Petrified Forest Formation directly underlies the majority of the installation and is subdivided into three members: the Blue Mesa, Sonsela, and Painted Desert. All three members of the Petrified Forest Formation outcrop in various locations across the installation. The Blue Mesa, Sonsela, and Painted Desert lithologies are green-gray smectitic mudstone, light-gray to yellowish-brown cross-bedded sandstone, and reddish-brown and grayish-red smectitic mudstone, respectively (McCraw et al., 2009). In the eastern portion of FWDA, the older Bluewater Creek and Shinarump Formations outcrop intermittently between layers of Quaternary alluvium (McCraw et al., 2009).

The Chinle Group is underlain by the older San Andres Limestone and Glorieta Sandstone, both Permian in age. The San Andres Limestone generally consists of fossiliferous limestone that intertongues the Glorieta Sandstone (Anderson et al., 2003). These two formations do not outcrop within the boundaries of FWDA; however, the Glorieta Sandstone Formation does outcrop south of the installation where a thrust fault juxtaposes Permian strata against the Cretaceous Dakota Sandstone. These two formations comprise the San Andres-Glorieta aquifer, which is the principal source of drinking water in the area (Malcolm Pirnie, Inc., 2000; Cooper and John, 1968).

3.4 Surface Water

3.4.1 Regional Surface Water

Streams are ephemeral and fed by rain and snowmelt from the Zuni Mountain Range and the Nutria Monocline. All drainages in the FWDA area are intermittent with flow only occurring during and after heavy rainfall events (summer) or snowmelt (spring). These streams transport sediment to low-lying areas in the northern portion of the installation, thus creating thick and extensive alluvial deposits among remnants of Triassic strata of the Petrified Forest Formation. Main drainages at the FWDA generally follow the dominant topography, flowing from south to north and discharging into the South Fork of the Rio Puerco in the northern portion of the installation. Because of the nature of brief and heavy precipitation in this semi-arid region, the surface drainage is relatively shallow near headwaters. Downward erosion intensifies as the water moves downstream, thus resulting in a well-developed, steep-walled system of arroyos in Quaternary alluvium.

3.4.2 Site-specific Surface Water

The three major drainage systems at the FWDA can be identified as follows: (1) eastern drainage system in Parcels 5 through 12 and Parcels 21 through 23; (2) western drainage system in Parcels 14 through 20; and (3) southwestern corner drainage system in Parcels 2 and 3 (Figure 2-2). These drainage systems are divided by either bedrock ridges or bedrock remnants. In the northwest portion of the site, two artificial channels are present that were constructed during the 1940s to divert water away from Igloo Blocks A and B and the Administration Area (U.S. Department of Energy, 1990).

The eastern drainage system consists of washes that run in northwestern and northeastern directions off the slopes of the Zuni Mountains. Alluvial fans form in basins at the front of the slope as well as between bedrock remnants. In the northeast section of the installation, the drainage flows around bedrock remnants before joining the South Fork of the Puerco River. The western drainage system (except for the southwest corner) consists primarily of two main drainages covering the western portion of the FWDA. Tributaries of the western drainage system pass the demolition area, cross the Hogback, and then join, flowing north depositing alluvium along the bedrock remnants (Herndon Solutions Group, 2011). The southwestern corner drainage system flows southwest and joins the Bread Springs Wash on the western side of the Hogback. Because the southwestern corner drainage system is hydrogeologically isolated from the other parts of the site, and installation activities have apparently not occurred in this area, the drainage system is of less environmental concern (U.S. Department of Energy, 1990).

3.5 Hydrogeology

Groundwater is present in several of the rock units underlying FWDA. Examination of these units and records of wells in the area indicates that the only formations at FWDA capable of yielding more than a few gallons per minute (gpm) are the Quaternary Quatowam Alluvium and the Permian San Andres Limestone and Glorieta Sandstone. However, minor amounts of groundwater are present in bedrock underlying the shallow alluvial aquifer and are composed of Triassic-age members of the Chinle Group: the Painted Desert Mudstone/Claystone, the Shinarump Conglomerate, and the Sonsella Sandstone.

The regional groundwater aquifer in the vicinity of FWDA is present in the Permian San Andres Limestone and Glorieta Sandstone Formations (Cooper and John, 1968; Summers, 1972). The San Andres-Glorieta aquifer was the previous drinking water source for the FWDA and outcrops near its southern boundary, dipping to the north. The top of the San Andres-Glorieta aquifer is approximately 1,100 feet bgs near the Administration Area. At this location, the San Andres-Glorieta aquifer is about 200 feet thick and under artesian pressure. Local variations in aquifer permeability can be large and unpredictable, with hydraulic conductivity values ranging from 0.05 to 150 feet per day and yields that are highly variable from one location to another (Herndon Solutions Group, 2011). Groundwater flow in the San Andres-Glorieta aquifer is to the north beneath FWDA and is separated from the shallow groundwater units by shales and claystones across much of FWDA (Anderson et al., 2003).

Shallow groundwater is present in the unconsolidated alluvium and the Mesozoic-age bedrock overlying the San Andres Limestone and Glorieta Sandstone Formations. The Quaternary alluvial aquifer, which includes deposits in the Rio Puerco Valley along the northern edge of the installation, is composed of gravel, sand, silt, and clay derived from Triassic and Jurassic age strata that border the valley. Along the northern border of the installation, hydraulic communication exists between the groundwater and the Rio Puerco during periods of active stream flow. Groundwater flow in the alluvium occurs primarily in discontinuous, stream-deposited sand and gravel units. Significant thicknesses of alluvium are not present in the OB/OD Area, and shallow groundwater typically occurs in the bedrock units in these areas. However, water-bearing zones are occasionally identified in variable thicknesses of alluvium present in arroyo bottoms. Water yields from the bedrock units Shinarump and Sonsella Members generally yield 5 to 50 gpm, and the water quality is considered fair to poor. The depth to water (DTW) under FWDA is generally between 10 and 100 feet bgs. Groundwater is present at shallow depths in the alluvium along drainages, including the Rio Puerco, with DTW ranging from 15 to 68 feet bgs in Northern Area alluvial wells. Groundwater in the Northern Area bedrock aquifer wells is also shallow, with DTW ranging from 29 to 65 feet bgs in the bedrock monitoring wells (Sundance and CH2M, 2017a).

Very little precipitation infiltrates through unsaturated soil to recharge FWDA groundwater. Instead, the regional aquifer and shallow groundwater units are primarily recharged through precipitation and snowmelt runoff infiltration through exposed bedrock uplands and faults south of FWDA. The Quaternary alluvial aquifer is primarily recharged from surface runoff, although some deposits in the southern part of the installation are recharged by springs from underlying bedrock aquifers. Recharge of groundwater within the alluvium occurs mainly during the wet seasons, specifically with the spring snowmelt.

Shallow groundwater in the Northern Area is present in both unconsolidated alluvium and bedrock, and the hydraulic properties differ between these two groundwater-bearing units. Therefore, the groundwater elevation data are presented and discussed separately below. The Northern Area alluvial and bedrock groundwater elevation contours from the April 2017 semiannual monitoring event are shown as Figures 3-1 and 3-2, respectively. The OB/OD Area groundwater elevation contours from the April 2017 semiannual monitoring event are shown as Figure 3-3. The groundwater elevation contours presented as Figures 3-1 through 3-3 are taken from the forthcoming *Interim Measures Facility-wide, Periodic Groundwater Monitoring Report, January to June 2017* (Sundance and CH2M, 2017b). Flow directions are interpreted based on groundwater contours and surface topography for infiltration pathways. Contaminant concentration variability has not been attributed to seasonal changes in groundwater elevations or in association with stream flow in previous PGMRs (Sundance and CH2M, 2017a; 2016a, 2016b, 2015)

General groundwater conditions at FWDA depend on the formation and distance from recharge source. Groundwater located adjacent to recharge sources such as exposed bedrock uplands, or surface water drainage systems, tend to have water with lower salinity and a higher dissolved oxygen content. General water parameters collected from field measurements during interim measure monitoring provide information on the general groundwater conditions. The 2016 calculated median values for total dissolved solids in the alluvial and bedrock units are 2,300 and 1,900 milligrams per liter (mg/L), respectively (Sundance and CH2M, 2017a). The 2016 total dissolved solids measurements range from 600 to more than 10,000 mg/L (Sundance and CH2M, 2017a; Sundance and CH2M 2013). Dissolved oxygen and calculated redox potential values indicate a mixture of reducing and aerobic conditions are present. Dissolved oxygen readings from 2016 range from 0.0 to 11.7 mg/L with median values below 2 (Sundance and CH2M, 2017a). Reducing conditions are indicated where dissolved oxygen is less than 1.0 mg/L and are persistent in bedrock units and in some alluvial units. Reducing conditions are attributed to natural conditions present in formations with high organic matter content, such as clays and shales.

3.5.1 Northern Area Alluvial Groundwater System

The groundwater flow direction in the alluvium is from potentiometric highs in the east, north, and south toward a potentiometric low west of the Administration Area (Figure 3-1). From the Administration Area, the groundwater flow direction is generally to the west. These groundwater flow directions are consistent with recent historical data. A small groundwater mound is present in the Administration Area near monitoring wells MW01, MW02, and MW03. This feature has been previously attributed to a leaking water storage cistern (USACE, 2011a). The cistern was no longer in service by late 2013; however, groundwater elevations at monitoring well MW02 are still approximately 1.1 feet higher than elevations at MW01 and MW03. This may be the result of leakage from the installation water supply well or borehole.

There is a widespread aquitard between the alluvial and bedrock groundwater units across much of the Northern Area. According to lithologic information from the historical investigations, approximately 20 to 60 feet of mudstone are encountered between the saturated alluvial groundwater zone and the permeable bedrock groundwater units. This information indicates that communication between the alluvial and bedrock groundwater systems is limited to the upland recharge areas present in the southern portions of the Workshop Area (Figure 3-2) and potentially east and south of the Northern Area monitoring network.

3.5.2 Northern Area Bedrock Groundwater System

The bedrock aquifer is present in the Northern Area as north-dipping sandstone units between thick shales. Bedrock sandstones outcrop in the Workshop Area where impacts have been demonstrated by previous investigations (Parcels 6, 21 and 22). Groundwater flow in the shallow bedrock is generally to the north and west in the Workshop Area (Figure 3-2). Steep horizontal gradients from east to west (in particular, between monitoring wells TMW38 and TMW40D and between monitoring wells TMW17 and TMW37) indicate that a geologic structural feature impedes groundwater flow. Vertical offset of the sandstone layers in the bedrock aquifer by a fault or fracture zones may be present in this area and may impede groundwater flow. Contaminant transport of perchlorate to the north (rather than to the west) also provides evidence supporting the CSM of a structural impediment to westerly groundwater flow in bedrock beneath the Workshop Area.

Groundwater in the bedrock appears to flow radially to a potentiometric low south of TMW32 in the eastern portion of the Workshop Area and to the west in the western portion of the Workshop Area. Water-level elevation data from monitoring well TMW02 were not used in the generation of the groundwater elevation contour map because the well is completed in a different water-bearing zone than the other bedrock monitoring wells. Two water-bearing sandstone layers or units of the Painted Desert Member of the Petrified Forest Formation are known to exist in the Workshop Area. The upper sandstone unit is monitored by monitoring well TMW02. The remaining bedrock monitoring wells are completed in the lower sandstone unit. Since January 2013, groundwater elevations in most of the bedrock monitoring wells have declined approximately 1 foot, with the exception of monitoring wells TMW02 and TMW30, which have relatively stable water levels. Groundwater elevation in the bedrock aquifer is slightly higher than in the alluvial groundwater aquifer and is under hydraulically confined conditions in most of the Northern Area. The confining unit for the bedrock groundwater aquifer is missing in the vicinity of monitoring wells TMW30 and TMW48. The current CSM includes a structural feature that impedes flow to the west in the Workshop Area (Figure 3-2).

Survey errors may affect the interpretation of bedrock aquifer groundwater flow directions. Because the bedrock monitoring wells were installed and surveyed during several different field events, errors may have been introduced in the well survey data set. The bedrock aquifer groundwater flow directions shown on Figure 3-2 conflict with the observed distribution of the nitrate and perchlorate groundwater contamination in the aquifer. A re-survey of Northern Area bedrock and alluvial monitoring wells is planned by the Army.

3.5.3 OB/OD Area Groundwater System

Groundwater monitoring wells in the OB/OD Area are located along two distinct drainage features: a southwest-oriented drainage and a north-south-oriented central drainage (Figure 3-3). A structurally controlled groundwater divide is present in the steeply dipping geologic strata of the Nutria Monocline in the southwestern-most portion of the FWDA. This groundwater divide coincides with the surface drainage divide. West of the divide, groundwater flows southwest into the Bread Springs Wash drainage and off the installation. Thus, groundwater in the geologic formations of the Nutria Monocline (also known as the Hogback) is not hydraulically connected to the groundwater present the central drainage feature.

Monitoring wells KMW09, KMW10, KMW11, KMW12, and KMW13 are installed in the Cretaceous or Jurassic formations associated with the Hogback (PMC, 1999). The bedding planes of these formations dip steeply (between 42 degrees and 64 degrees) to the west and contain mudstone and shale beds, which potentially prevent horizontal groundwater flow (Anderson et al., 2003).

It is assumed that groundwater flow in the OB/OD Area occurs primarily within the bedrock units, since the alluvium is typically thin and sporadically saturated across the area. Bedrock folding, fractures, and faults control site topography and have a dominant effect on bedrock groundwater flow patterns. Bedrock groundwater flow may occur in preferential flow paths through fracture networks. Significant thicknesses of alluvium have been encountered within the current OB/OD (HWMU); however, thickness and saturation of this material is highly variable by location. The groundwater-elevation contours presented on Figure 3-3 show groundwater-elevation data collected from wells along the north-south-oriented central drainage feature. The groundwater flow direction in the bedrock of the central drainage feature is to the north. Groundwater and seasonal surface water flow appear to be hydraulically connected in the OB/OD Area. Groundwater concentrations of COPCs do not appear to vary with changes in groundwater elevation (Sundance CH2M, 2017b).

3.6 Nature and Extent of Groundwater Contamination

Groundwater contamination from known sources is detected in persistent groundwater contaminant plumes in the Northern Area in both alluvial and bedrock aquifers. In recent years, interim groundwater monitoring has been focused on these areas of known groundwater impact. Nitrate, perchlorate, explosives, one VOC, and metals are consistently detected in groundwater samples at concentrations above the cleanup criteria/project screening levels (Sundance and CH2M, 2017a). Six groundwater contaminant plumes have been identified: two nitrate plumes, one in the alluvial aquifer and one in the bedrock aquifer; two perchlorate plumes, one in the alluvial aquifer and one in the bedrock aquifer; an explosives plume in the alluvial groundwater unit; and a 1,2-dichloroethane plume in the alluvial aquifer (Sundance and CH2M, 2017a). While metals are consistently detected in groundwater samples at concentrations above the cleanup criteria/project screening levels, background groundwater concentrations have not been accepted for FWDA and it cannot be demonstrated whether the detected concentrations are a result of natural conditions or anthropogenic sources of contamination. Therefore, the metals concentrations have not been mapped as contaminant plumes. SVOCs, DRO, and GRO are more sporadically detected with occasional or historical exceedances of cleanup criteria/project screening levels for SVOCs and DRO (there are no screening levels for GRO), but the number of exceedances is too limited for these contaminants to be mapped as contaminant plumes. Wells designated to monitor each point of release are listed in Table 3-1.

Figures 3-4 through 3-18 present the existing alluvial and bedrock monitoring well networks, groundwater flowlines generated from the water levels measured during April 2017 monitoring event, plume boundaries (defined by isoconcentration contour at the contaminant cleanup criteria/project screening level concentration) generated from the October 2016 monitoring event (for those plumes with contaminant concentrations that can be contoured), and the proposed monitoring network for each plume for future semiannual monitoring events. Figures 3-4 through 3-11 cover the Northern Area alluvial groundwater contaminant plumes and Figures 3-12 through 3-14 cover the Northern Area bedrock groundwater contaminant plumes. Figures 3-15 through 3-16 cover the OB/OD Area groundwater contaminant plumes. All contaminant plumes depicted in figures are taken from the most recently published PGMR (Sundance and CH2M, 2017a). Analytical results corresponding to the contaminant plumes are presented in Appendix B. The proposed monitoring network presented on each figure is subdivided into sentinel, background, downgradient, and upgradient wells.

The highest concentrations of nitrate contamination occur in alluvial groundwater units of the Northern Area (Figure 3-4). The nitrate plume in the alluvial aquifer appears to originate from the TNT Leaching Beds Area (SWMU 1) and extends downgradient to the Administration Area. Other sources of nitrate groundwater contamination in the Administration Area are currently being evaluated by the Army as part of a Supplemental RFI (work plan in revision). The downgradient extent of the alluvial nitrate plume is not defined west of the Administration Area. The bedrock nitrate plume is also present at the TNT Leaching Beds Area (SWMU 1) but extends upgradient to the south (Figure 3-12). A portion of the bedrock nitrate plume is collocated with the bedrock perchlorate plume (Figure 3-13). The collocated perchlorate and nitrate plumes appear to have a common source at the Building 528 Complex (SWMU 27).

RDX is the primary explosive compound of interest. This compound is consistently detected in groundwater at concentrations above the cleanup criteria/project screening level in the Workshop and eastern Administration Areas (Figure 3-5). The widespread detection of RDX allows this compound to serve as an indicator compound for explosives compounds across FWDA. The explosives plume in the alluvial groundwater aquifer appears to originate from the TNT Leaching Beds Area (SWMU 1) in the Workshop Area. Groundwater concentrations of explosive compounds (primarily RDX) attenuate to levels below the screening criteria within 2,500 feet downgradient of the TNT Leaching Beds Area (SWMU 1). The explosives plume in bedrock is not mappable, but it has the same potential source areas as nitrate and metals, which are the TNT Leaching Beds Area (SWMU 1) and SWMU 27 (Building 528 Complex) (Table 2-2, Figure 3-12).

The highest perchlorate concentrations are detected in groundwater samples from the bedrock aquifer in the Workshop Area (Sundance and CH2M, 2017a) (Figure 3-13). The northern boundary of the bedrock perchlorate plume has not been fully defined. The alluvial perchlorate plume is located in the same vicinity as the bedrock perchlorate plume (Figure 3-6). Historical releases of perchlorate-containing materials at the Building 528 Complex (SWMU 27) are believed to be the common source of both perchlorate plumes in the alluvial and bedrock aquifers.

One VOC was detected in groundwater samples at concentrations exceeding cleanup criteria/project screening levels. The compound 1,2-dichloroethane was historically used as a gasoline additive and degreasing solvent. The 1,2-dichloroethane plume in the alluvial aquifer (Figure 3-8) is limited to a group of wells near a former fueling facility (SWMU 45, Building 6 Gas Station) and SWMU 50 (Structure 35, UST 7) in the Administration Area (Sundance and CH2M, 2017a) (Table 2-2). No other VOCs are consistently detected above screening levels (Sundance and CH2M, 2017a; 2016a, 2016b, 2015). The VOC 1,2-dichloroethane was not detected in the bedrock aquifer.

Some SVOCs, such as 2,4-dinitrophenol are periodically detected at concentrations above the cleanup criteria/project screening levels and are associated with degradation of explosives compounds. Some SVOCs, such as PAHs, are associated with petroleum products used in industrial operations and are also periodically detected. Detections of some SVOC compounds, such as bis(2-ethylhexyl) phthalate, have been attributed to sampling and laboratory contamination (Sundance and CH2M, 2017a). SVOCs were released to soil at SWMU 6 (Building 11, Former Locomotive Shop) and SWMU 45 (Building 6 Gas Station) (Table 2-2, Figure 3-9 and Figure 3-14).

Metals such as dissolved aluminum, arsenic, iron, lead, manganese, and selenium were detected above cleanup criteria/project screening levels in multiple groundwater samples. Because background groundwater concentrations have not been accepted for FWDA, it cannot clearly be demonstrated whether the detected concentrations are a result of natural conditions or anthropogenic sources of contamination. Therefore, the metals concentrations are not contoured; however, a proposed alluvial monitoring network is presented as Figure 3-7 and a bedrock monitoring network is presented as Figure 3-12.

Petroleum hydrocarbons such as DRO and GRO have been sporadically detected in multiple groundwater samples. No exceedances of DRO screening levels are currently detected in either alluvial or bedrock groundwater. There are no screening levels for GRO. However, DRO was released to soil at SWMU 6 (Building 11, former Locomotive Shop), SWMU 7 (Fire Training Ground), SWMU 45 (Building 6 Gas Station), and SWMU 50 (Structure 35, UST 7) (Table 2-2, Figure 3-10). GRO was released to soil at SWMU 45 (Building 6 Gas Station) and SWMU 50 (Structure 35, UST 7) (Table 2-2, Figure 3-11).

Dioxins, furans, herbicides, white phosphorous, pesticides, and PCBs have not been detected in excess of cleanup criteria/project screening levels since interim measure groundwater monitoring began in 2008. Pesticides are not typically detected, and there have been only three detections of pesticides (from 184 samples) since 2012 (CH2M and Sundance, 2016a). These detections were attributed to wind contamination of samples from historic surface pesticide application (Innovar, 2016). No points of release to groundwater were identified for dioxins, furans, herbicides, pesticides, white phosphorous, or PCBs. Therefore, these compound groups are not considered primary groundwater COPCs and are not proposed for interim monitoring according to the decision criteria established in Section 1.4.

A Groundwater Supplemental RCRA Facility Investigation Work Plan (Sundance, 2017) will be submitted to NMED to address contaminant plume data gaps. The RFI Work Plan proposes additional monitoring wells to define the extent of nitrate and perchlorate groundwater contamination and to refine the extent of other groundwater plumes in the Northern Area.

Groundwater contamination is also detected in excess of cleanup criteria/project screening levels in the OB/OD Area; however, concentrations of contaminants have been less consistent and exceedances less widespread (Figures 3-16 to 3-18). Exceedances have typically been observed in monitoring wells within or directly adjacent to the current OB/OD Area (HWMU), the former Burning Ground Area and Demolition Landfill (SWMU 14), and the former Demolition Area (SWMU 15). These exceedances typically occur for explosives compounds (RDX, nitrotoluene compounds, and nitrobenzene) and are not typically mappable over several monitoring locations (Sundance and CH2M, 2013). Nitrate has periodically exceeded the MCL in some monitoring wells. Perchlorate is detected at concentrations less than the EPA RSL screening level. Exceedances of metals have been widespread; however, a background evaluation will need to be performed to determine whether metals detections are a result of site releases, or are related to natural conditions. VOC and SVOC detections in the OB/OD Area are inconsistent, with sporadic cleanup criteria/project screening level exceedances historically (Sundance and CH2M, 2013). Some detections are attributed to sampling and laboratory contaminants (Sundance and CH2M, 2013). The ongoing RFI in the OB/OD Area may determine whether VOC and SVOC detections represent contamination at concentrations that impacts human health or ecological receptors. Ongoing munitions response activities at the OB/OD Area are being performed to address explosives, metals, and perchlorate contamination.

3.7 Fate and Transport of Contamination in Groundwater

Groundwater contamination has been identified in the northern Administration Area and Workshop Area and at the OB/OD Area in alluvial and bedrock aquifers. The known and suspected points of release to groundwater are as follows:

- The TNT Leaching Beds Area (SWMU 1, Parcel 21) and Building 28 Complex (SWMU 27, Parcel 22) in the Workshop Area had releases of nitrate, explosives, and metals due to historical munitions activities (Sections 2.2.7, 2.2.10, 2.2.12, 2.2.15, 2.2.26, and 2.3).
- The Building 28 Complex (SWMU 27, Parcel 22) in the Workshop Area had releases of perchlorate due to demilitarization of and recycling of munitions (Sections 2.2.12, 2.2.26, and 2.3).
- The Building 6, Gas Station (SWMU 45, Parcel 11) and the former UST 7 at Building 45 (SWMU 50, Parcel 11) in the Administration Area had releases of GRO and VOCs, and suspected release of lead due to historical leaks from USTs (Sections 2.2.11 and 2.3).
- The Building 6, Gas Station (SWMU 45, Parcel 11) had suspected releases of DRO and SVOCs from historical fueling and mechanical operations (Sections 2.2.11 and 2.3).
- The Fire Training Ground (SWMU 7, Parcel 21) had suspected releases of DRO due to historical fire-fighting operations (Sections 2.2.15).
- The Pesticide and Field Battery Workshop (SWMU 8, Parcel 6) had suspected release of SVOCs (Sections 2.2.16).
- The OB/OD Area (HWMU), Old Burning Ground and Demolition Landfill (SWMU 14), and Old Demolition Area (SWMU 15) in the OB/OD Area had releases of nitrate, explosives, perchlorate, and metals due to historical munitions activities (Sections 2.2.5, 2.2.6, 2.3).
- The OB/OD Area (HWMU) and Old Burning Ground and Demolition Landfill (SWMU 14) in the OB/OD Area are suspected of having VOC and SVOC releases due to historical use of accelerants for burning operations and the use of petroleum hydrocarbons for equipment maintenance (Sections 2.2.5, 2.2.6, 2.3).

All of the above-listed points of release were to surface or shallow subsurface soils. Additional potential sources of groundwater contamination may be present at FWDA and may be added to interim monitoring as they are confirmed during RFIs. For the purposes of periodic groundwater monitoring, points of releases are defined as known sources of groundwater impact identified from RFIs. Suspected sources are also included if gross subsurface soil contamination has been identified for soluble contaminants and no depth has been defined based on soil concentrations screened against NMED SSLs. The full list of RCRA sites for FWDA are listed in Table 2-2 and are plotted on Figure 2-1. Groundwater exceedances are listed in Table 2-3 by point of release.

The primary transport mechanism to groundwater is leaching from shallow soils. In some sites, releases to soils were accompanied by liquid releases that contributed to migration of contaminants to groundwater in a manner atypical of arid regions. There are few impediments to leaching of soluble contaminants to alluvial groundwater in much of the affected areas. Depth to groundwater at most of the impacted areas is less than 50 feet. Although low permeable clays and silts are commonly observed, there are sufficient permeable pathways to allow infiltration to reach the water table across much of the Northern Area. Highly insoluble compounds, such as PCBs, may be bound to soil materials rather than leach to groundwater. Vapor phase transport is more readily impeded in areas that lack large contiguous permeable sands.

Once contamination has reached alluvial groundwater, migration is largely controlled by the groundwater flow direction. In the Northern Area, alluvial groundwater flow is generally to the west and is controlled by the bedrock structural features. Alluvial groundwater in the Northern Administration and Workshop Areas is present in a depression formed by the downward dip of largely impermeable claystone bedrock. Communication between the bedrock and alluvial aquifers is generally limited to the areas where thin sandstone units outcrop to the southeast of the Workshop Area. In these areas, leaching of soil contaminants has a direct pathway to bedrock groundwater. In a majority of the Northern Area, alluvium comes into contact with claystone aquitards rather than the permeable sandstone units.

In the OB/OD Area, leaching of contaminants follows drainage patterns in the steep terrain and is believed to enter the groundwater system along the primary drainages. In this area, groundwater is present primarily in bedrock and there is greater degree of communication between the alluvial and bedrock groundwater units.

Groundwater flow across much of the FWDA is believed to be slow due to the low hydraulic conductivity of the alluvial and bedrock units encountered in much of shallow groundwater. In addition, structural barriers, such as faulting and folding of bedrock units may greatly impede the flow of shallow groundwater from one valley to another. Groundwater monitoring from 2008 to present indicates that groundwater contaminant plume positions are relatively stable which further confirms that groundwater flow across much of the FWDA is slow.

Natural degradation may be occurring for some groundwater contaminants. Mineralization, volatilization, chemical degradation, and biological degradation are potential mechanisms for contaminant degradation. Aerobic degradation and volatilization may be acting on some organic COPCs, such as VOCs and SVOCs. However, aerobic conditions do not predominate in many groundwater units, and this degradation pathway is believed to be limited to small areas of shallow alluvial groundwater. Reductive chemical and chemical degradation may be acting on some COPCs such as nitrate, perchlorate, and explosives. However, such degradation of COPCs has yet to be demonstrated. Natural attenuation by diffusion, dispersion, and mineralization are believed to occur at FWDA.

Natural attenuation processes are not sufficient to reduce groundwater contaminant plume concentrations where there is still an active source. Source characterization and removal activities are being performed under interim measures at various locations across FWDA. Interim groundwater monitoring will continue pending final characterization and selection of an appropriate remedy.

3.8 Exposure Pathways for Human and Ecological Receptors

The pathways for human exposure are assessed where groundwater contamination has been detected in excess of screening criteria. Exposure pathways are assessed based on current conditions and expected future land use.

There are no current exposure pathways for human and ecological receptors in the Northern Area. Groundwater does not discharge to surface water in the northern area, and the top of the San Andres-Glorieta aquifer is approximately 1,100 feet bgs and separated from the shallow groundwater units by shales and claystones. Groundwater contaminant plumes have not been identified in areas where groundwater is less than 20 feet bgs. Use of local groundwater resources at the FWDA has ceased. All potable water used at FWDA is imported.

There are potential dermal and ingestion exposure pathways for future human receptors in the Northern Area. Groundwater resources may be used for human consumption if the property is transferred and used for residential purposes. As such, groundwater discharged from possible future drinking water wells would be the pathway for human exposure.

There are no current exposure pathways for human receptors in the OB/OD Area. Use of local groundwater resources by humans has not been documented. There are no buildings in the area. Groundwater may discharge to ephemeral streams; however, there is no human industrial, recreational, or consumptive use of water from ephemeral drainage.

There are potential dermal exposure pathways for future human receptors in the OB/OD Area. If the property is transferred and used as forestry and wilderness area, recreational users may come into contact with ephemeral surface water. The Army does not find the OB/OD Area suitable for residential or industrial uses.

Discharge of groundwater to ephemeral streams may present an ecological exposure pathway; however, contamination in surface waters has not been demonstrated. Soil corrective actions are currently being performed to address contamination present within the drainages of the OB/OD Area.

3.9 Cultural Resources

Traditional Cultural Properties and other cultural resources have been documented within FWDA boundaries. Existing groundwater monitoring wells and access routes are not located within identified archaeological sites. Because groundwater sampling activities are non-intrusive and confined to a small area immediately surrounding a given well, cultural resource monitoring will not be required during proposed sampling activities at existing wells.

Maps showing the locations of Traditional Cultural Properties relative to existing monitoring well locations will not be included in this Interim Facility-wide GMP, which will be a public document when final.

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TABLE 3-1

Monitoring Network by Site and Point of Release (Page 1 of 5)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

COPC	Point of Release/ Parcel Number	Release Type	Primary Downgradient Well	Upgradient Well	Background Well	Sentinel Well
Nitrate	**HWMU/Parcel 3**	Small	CMW10	CMW02	BGMW05	
			CMW19	CMW32	BGMW06	
			CMW23			
			CMW26			
			CMW28B			
	Note that wells CMW06, CMW07, CMW14, CMW17, CMW18, FW38 are being removed as part of HWMU munition response activities.					
	SWMU 14/Parcel 3	Small	KMW11	CMW02	BGMW05	
			KMW16	CMW32	BGMW06	
			CMW24			
			CMW26			
	SWMU 15/Parcel 3	Small	KMW09	CMW31B	BGMW06	KMW12
			KMW13			
	SWMU 1/Parcel 21	Alluvial = Large	MW03	BGMW02	BGMW01	MW23
			MW22D	TMW24	BGMW03	MW24
			SMW01	TMW47		
			TMW03			
			TMW10			
			TMW21			
			TMW22			
			TMW23			
			TMW25			
			TMW34			
			TMW40S			
			TMW43			
			TMW45			
			TMW46			
		Bedrock = Suspected	TMW02	None, dry	TMW18	none
			TMW36		TMW19	
			TMW38			
			TMW40D			
	SWMU 27/Parcel 22	Bedrock = Large	TMW02	None, dry	TMW18	none
			TMW30		TMW19	
			TMW31D			
			TMW32			
			TMW39D			
			TMW48			
		Alluvial = Suspected	TMW01	None, dry	BGMW01	MW23
			TMW13		BGMW03	MW24
			TMW31S			
			TMW41			

TABLE 3-1

Monitoring Network by Site and Point of Release (Page 2 of 5)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

COPC	Point of Release/ Parcel Number	Release Type	Primary Downgradient Well	Upgradient Well	Background Well	Sentinel Well
Explosives	**HWMU/Parcel 3**	Small	CMW10	CMW02	BGMW05	
			CMW19	CMW32	BGMW06	
			CMW23			
			CMW26			
			CMW28B			
	Note that wells CMW06, CMW07, CMW14, CMW17, CMW18, FW38 are being removed as part of HWMU munition response activities.					
	SWMU 14/Parcel 3	Small	KMW11	CMW02	BGMW05	
			KMW16	CMW32	BGMW06	
			CMW24			
			CMW26			
	SWMU 15/Parcel 3	Small	KMW09	CMW31B	BGMW06	KMW12
			KMW13			
	SWMU 1/Parcel 21	Alluvial = Large	MW03	BGMW02	BGMW01	MW23
			TMW03	TMW47	BGMW03	MW24
			TMW06			
			TMW22			
			TMW23			
			TMW40S			
			TMW43			
			TMW45			
		Bedrock = Suspected	TMW02	None, dry	TMW18	none
			TMW36		TMW19	
			TMW38			
			TMW40D			
	SWMU 27/Parcel 22	Bedrock = Large	TMW02	None, dry	TMW18	none
			TMW30		TMW19	
			TMW31D			
			TMW32			
			TMW39D			
			TMW48			
		Alluvial = Suspected	TMW01	None, dry	BGMW01	MW23
			TMW13		BGMW03	MW24
			TMW31S			
			TMW41			
Perchlorate	**HWMU/Parcel 3**	Small	CMW10	CMW02	BGMW05	
			CMW19	CMW32	BGMW06	
			CMW23			
			CMW26			
			CMW28B			
	Note that wells CMW06, CMW07, CMW14, CMW17, CMW18, FW38 are being removed as part of HWMU munition response activities.					
	SWMU 14/Parcel 3	Small	KMW11	CMW02	BGMW05	
			KMW16	CMW32	BGMW06	
			CMW24			
			CMW26			
	SWMU 15/Parcel 3	Small	KMW09	CMW31B	BGMW06	KMW12
			KMW13			

TABLE 3-1

Monitoring Network by Site and Point of Release (Page 3 of 5)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

COPC	Point of Release/ Parcel Number	Release Type	Primary Downgradient Well	Upgradient Well	Background Well	Sentinel Well
Perchlorate (continued)	**SWMU 27/Parcel 22**	Bedrock = Large	TMW02	None, dry	TMW18	none
			TMW30		TMW19	
			TMW31D			
			TMW32			
			TMW36			
			TMW38			
			TMW39D			
			TMW40D			
			TMW48			
		Alluvial = Large	TMW01	None, dry	BGMW01	MW23
			TMW03		BGMW03	MW24
			TMW13			
			TMW31S			
			TMW39S			
			TMW41			
Metals	**HWMU/Parcel 3**	Suspected	CMW10	CMW02	BGMW05	
			CMW19	CMW32	BGMW06	
			CMW23			
			CMW26			
			CMW28B			
	Note that wells CMW06, CMW07, CMW14, CMW17, CMW18, FW38 are being removed as part of HWMU munition response activities.					
	SWMU 14/Parcel 3	Suspected	KMW11	CMW02	BGMW05	
			KMW16	CMW32	BGMW06	
			CMW24			
			CMW26			
	SWMU 15/Parcel 3	Suspected	KMW09	CMW31B	BGMW06	KMW12
			KMW13			
	SWMU 45/Parcel 11	Suspected	MW18D	TMW24	BGMW01	MW23
			TMW33		BGMW03	MW24
			TMW34			
	SWMU 50/Parcel 11	Suspected	MW01	TMW24	BGMW01	MW23
			MW18D		BGMW03	MW24
	SWMU 1/Parcel 21	Alluvial = Large	TMW10	BGMW02	BGMW01	MW23
			TMW21	TMW24	BGMW03	MW24
			TMW23	TMW47		
			TMW25			
			TMW27			
			TMW34			
			TMW40S			
			TMW44			
			TMW46			
		Bedrock = Suspected	TMW02	None, dry	TMW18	
			TMW36		TMW19	
			TMW38			
			TMW40D			

TABLE 3-1

Monitoring Network by Site and Point of Release (Page 4 of 5)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

COPC	Point of Release/ Parcel Number	Release Type	Primary Downgradient Well	Upgradient Well	Background Well	Sentinel Well
Metals (Continued)	**SWMU 27/Parcel 22**	Bedrock = Large	TMW02	None, dry	TMW18	none
			TMW30		TMW19	
			TMW31D			
			TMW32			
			TMW36			
			TMW39D			
			TMW48			
		Alluvial = Suspected	TMW01	None, dry	BGMW01	MW23
			TMW13		BGMW03	MW24
			TMW31S			
			TMW41			
VOC	**HWMU/Parcel 3**	Small	CMW10	CMW02	BGMW05	
			CMW19	CMW32	BGMW06	
			CMW23			
			CMW26			
			CMW28B			
	Note that wells CMW06, CMW07, CMW14, CMW17, CMW18, FW38 are being removed as part of HWMU munition response activities.					
	SWMU 14/Parcel 3	Small	KMW11	CMW02	BGMW05	KMW12
			KMW16	CMW32	BGMW06	
			CMW24			
			CMW26			
	SWMU 45/Parcel 11	Small[3]	MW18D	TMW24	BGMW01	MW23
			MW20	TMW45	BGMW03	MW24
			MW22D			
			TMW33			
			TMW46			
	SWMU 50/Parcel 11	Small	MW01	TMW24	BGMW01	MW23
			MW02	TMW45	BGMW03	MW24
			MW03			
SVOC	**HWMU/Parcel 3**	Small	CMW10	CMW02	BGMW05	
			CMW19	CMW32	BGMW06	
			CMW23			
			CMW26			
			CMW28B			
	Note that wells CMW06, CMW07, CMW14, CMW17, CMW18, FW38 are being removed as part of HWMU munition response activities.					
	SWMU 14/Parcel 3	Small	KMW11	CMW02	BGMW05	KMW12
			KMW16	CMW32	BGMW06	
			CMW24			
			CMW26			
	SWMU 8/Parcel 6	Suspected	TMW14A	None, dry	TMW18	none
			TMW16		TMW19	
			TMW17			
	SWMU 6/Parcel 11	Suspected	TMW34	TMW24	BGMW01	MW23
			TMW46		BGMW03	MW24
	SWMU 45/Parcel 11	Small	MW18D	TMW24	BGMW01	MW23
			MW20		BGMW03	MW24
			MW22D			
			TMW33			

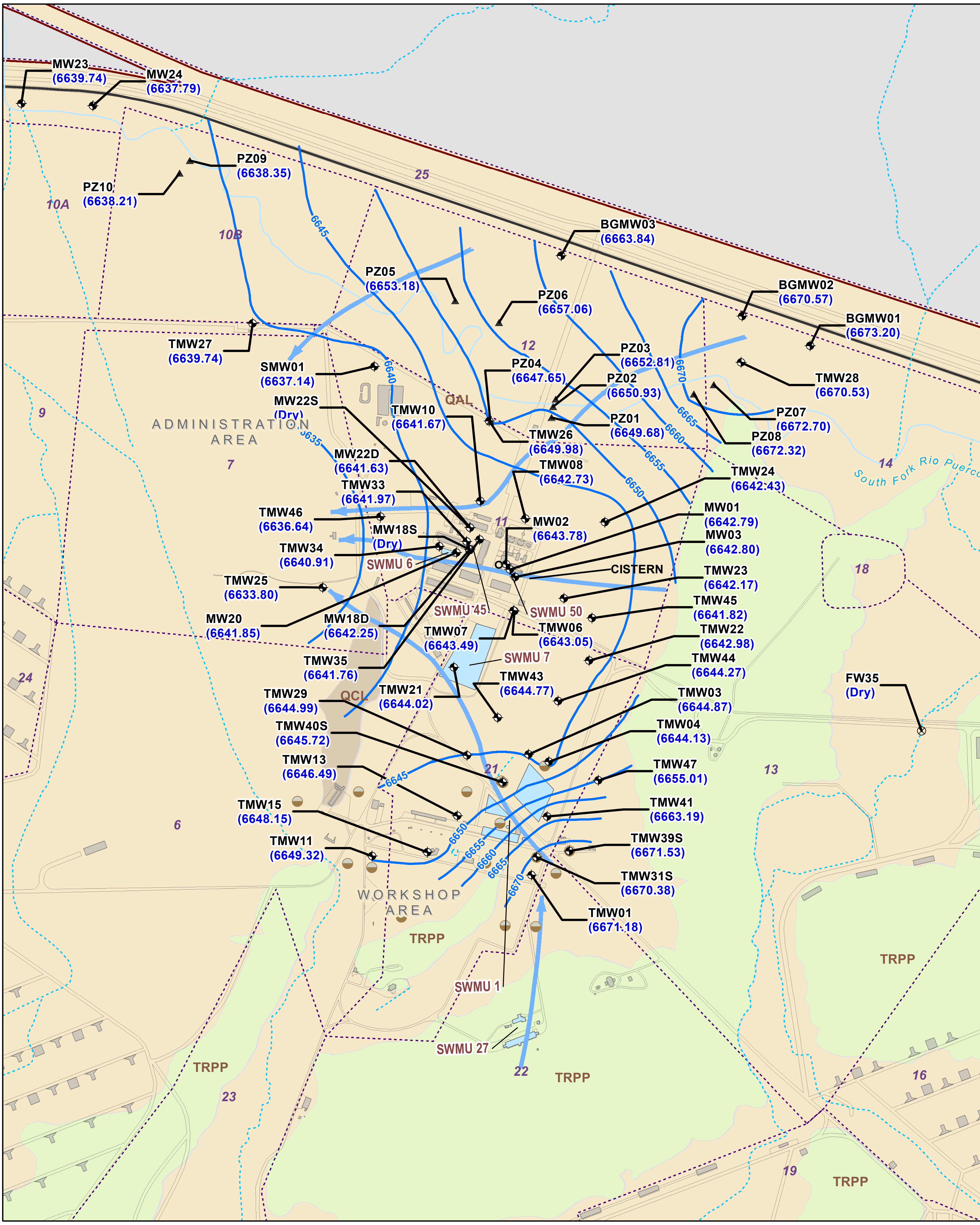
TABLE 3-1

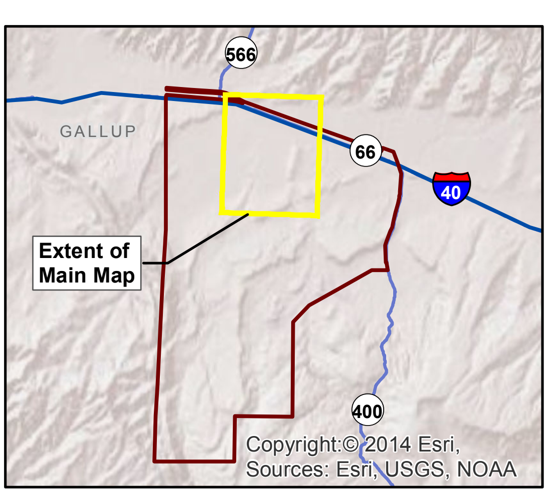
Monitoring Network by Site and Point of Release (Page 5 of 5)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

COPC	Point of Release/ Parcel Number	Release Type	Primary Downgradient Well	Upgradient Well	Background Well	Sentinel Well
DRO	**SWMU 6/Parcel 11**	Suspected	MW18D TMW25 TMW34 TMW46	TMW24	BGMW01 BGMW03	MW23 MW24
	SWMU 7/Parcel 21	Suspected	TMW21 TMW25	TMW45	BGMW01 BGMW03	MW23 MW24
	SWMU 45/Parcel 11	Small	MW18D MW20 MW22D TMW33	TMW24	BGMW01 BGMW03	MW23 MW24
GRO	**SWMU 45/Parcel 11**	Small	MW18D MW20 MW22D TMW33	TMW24	BGMW01 BGMW03	MW23 MW24
	SWMU 50/Parcel 11	Small	MW01 MW02 MW03 TMW46	TMW24 TMW45	BGMW01 BGMW03	MW23 MW24

Notes:
Dry, damaged, or removed wells FW24, FW38, CMW06, CMW07, CMW14, CMW16, CMW17, CMW18, CMW20, CMW21, KMW10 not designated for any monitoring purposes in this table.
AOC = Area of Concern
Bldg. = building
COPC = contaminants of potential concern
DRO = diesel range organics
GRO = gasoline range organics
HWMU = Hazardous Waste Management Unit
Large = contaminant plume greater than 500 feet in any dimention
PAH = polyaeromatic hydrocarbons
POL = petroleum, oil, and lubricants
PCB = polychlorinated biphenols
RFI = Resource Conservation and Recovery Act facility investigation
Small = contaminant plume less than 500 feet in longest dimention
Suspected = contaminant plume not delineated historically
SVOC = semivolatile organic compounds
VOC = volatile organic compounds





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Alluvial Monitoring Well
- Bedrock Monitoring Well
- Piezometer
- Dry Well
- Water Supply Well 69
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary
- TMW11 Well Label = Well ID
- SWUM 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

Surface Geology

- QAL QAL - Quaternary Alluvial Deposits
- QCL QCL - Quaternary Colluvial and Gravel Deposits
- TRPP TRPP - Petrified Forest Formation, Painted Desert Member
- 6635 Alluvial Groundwater Contours, April 2017
- Alluvial Groundwater Flowlines

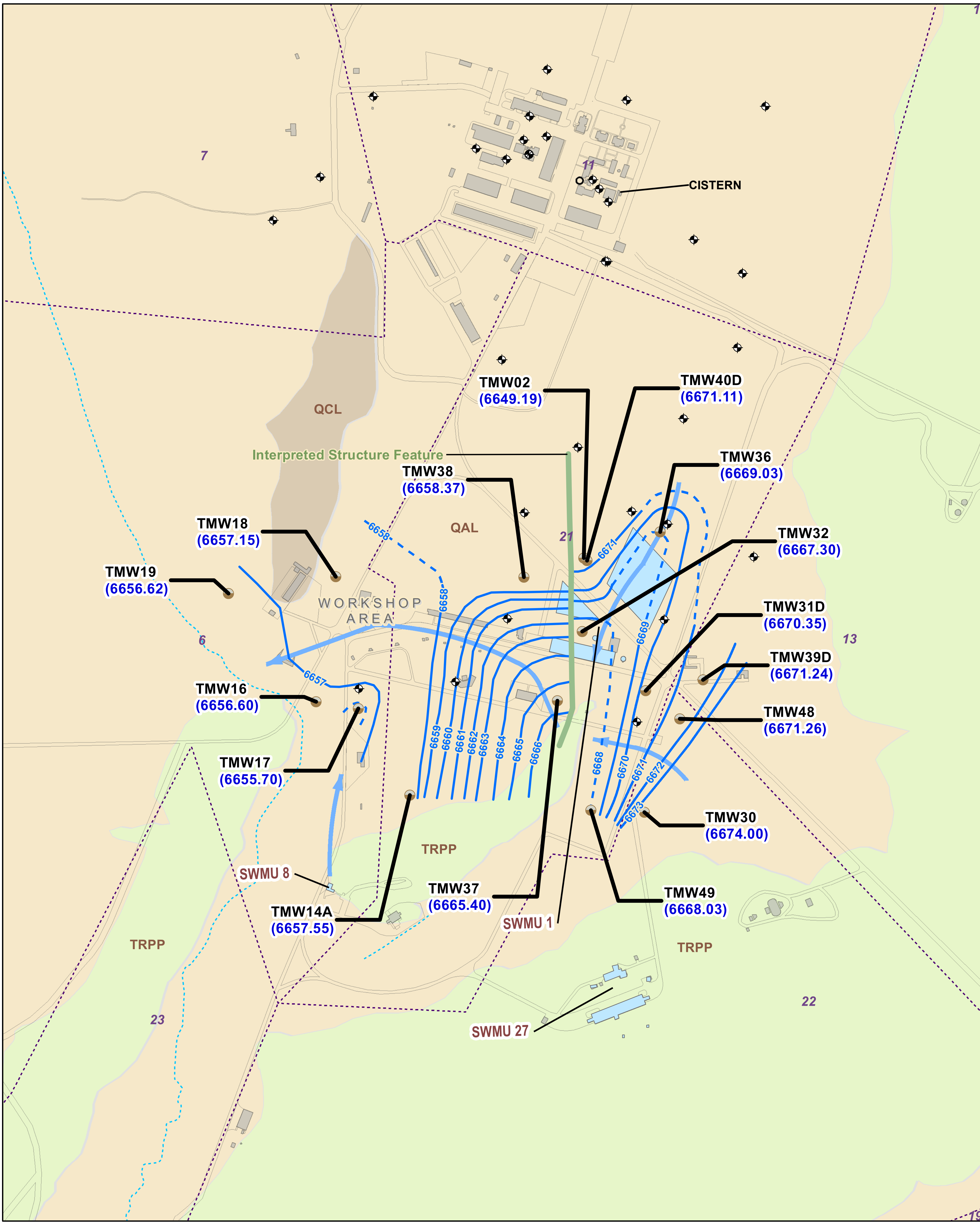
FIGURE 3-1
Northern Area Alluvial Hydrogeology and Groundwater Flow Pattern
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

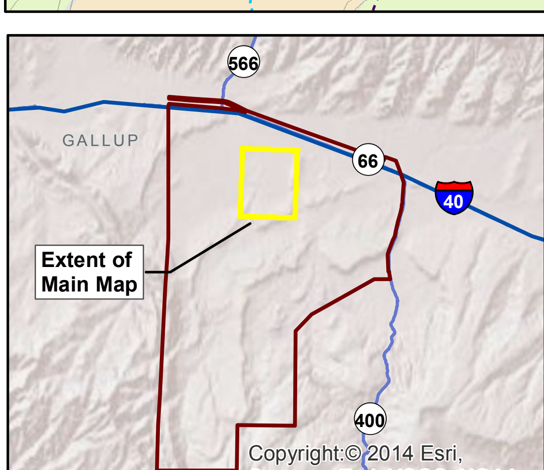
Notes:
AOC = Area of Concern
ID= Identification
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-1_ALLUVIALWELLNETWORK.MXD TARROWOO 8/4/2017 12:26:06 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Alluvial Monitoring Well
- Bedrock Monitoring Well
- Dry Well
- Water Supply Well 69
- Building
- Point of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - QAL - Quaternary Alluvial
- QCL - QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - TRPP - Petrified Forest Formation, Painted Desert Member
- 6660 Bedrock Groundwater Contours, April 2017 (Dashed where inferred)
- Bedrock Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Road

FIGURE 3-2
Northern Area Bedrock Hydrogeology and Groundwater Flow Pattern

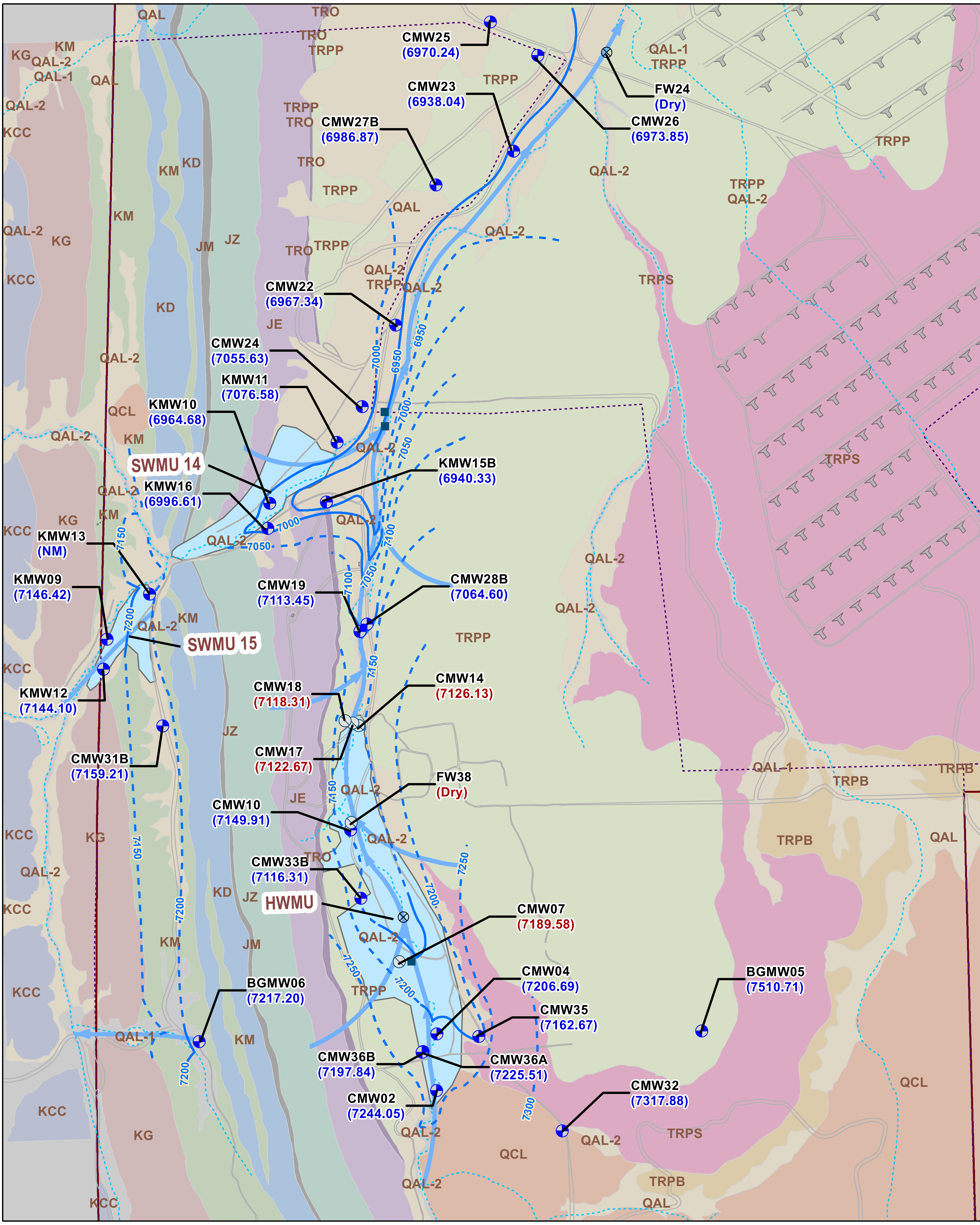
Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

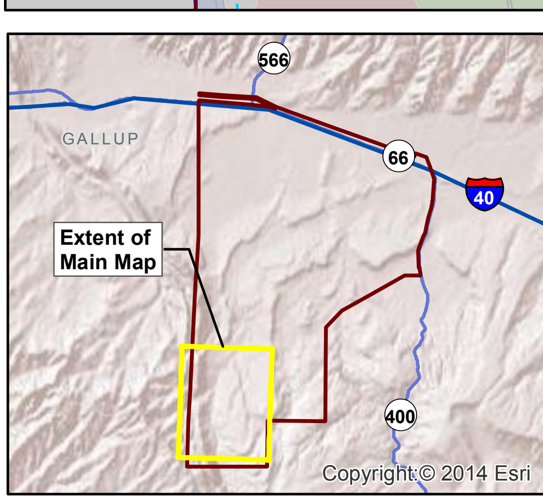
Notes:
AOC = Area of Concern
ID= Identification
SWMU = Solid Waste Management Unit
Elevation data from well TMW02 is not used to generate contours. Well screens for this well are not consistent with adjacent bedrock monitoring wells resulting in anomalous low water elevations.

0 375 750 1,125 1,500 ft
0 80 160 240 320 400 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-2_BEDROCKWELLNETWORK.MXD TARROWOO 8/4/2017 12:23:21 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- OB/OD Monitoring Well
- Buried Well
- Dry Well
- Removed Well
- 6660 OB/OD Groundwater Contours, April 2017 (Dashed where inferred)
- OB/OD Groundwater Flowlines
- Building
- Point of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary
- Arroyo
- Roads

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial Deposits
- KCC - Crevasse Canyon Formation
- KG - Gallup Sandstone
- KM - Mancos Shale
- KD - Dakota Sandstone
- JM - Morrison Formation
- JZ - Zuni Sandstone
- JE - Entrada Sandstone
- TRO - Owl Rock Formation
- TRPP - Petrified Forest Formation - Painted Desert Member
- TRPS - Petrified Forest Formation - Sonsela Sandstone Member
- TRPB - Petrified Forest Formation - Blue Mesa Member

FIGURE 3-3
OB/OD Area Hydrogeology and Groundwater Flow Pattern
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

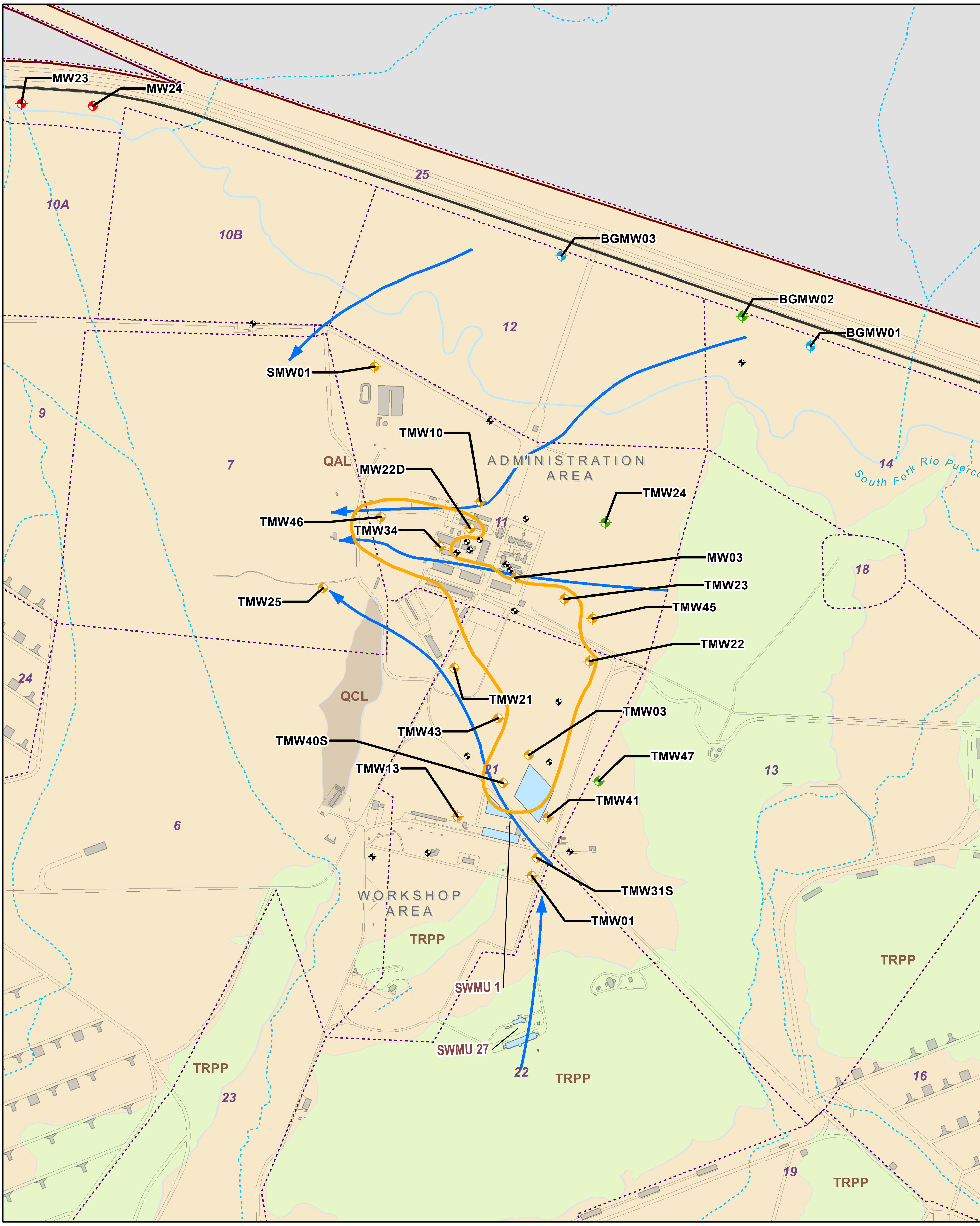
Notes:
1. Groundwater elevations in red indicate monitoring well was removed in May 2017.
HWMU = Hazardous Waste Management Unit
ID= Identification
OB/OD = Open Burn/Open Detonation
SWMU = Solid Waste Management Unit

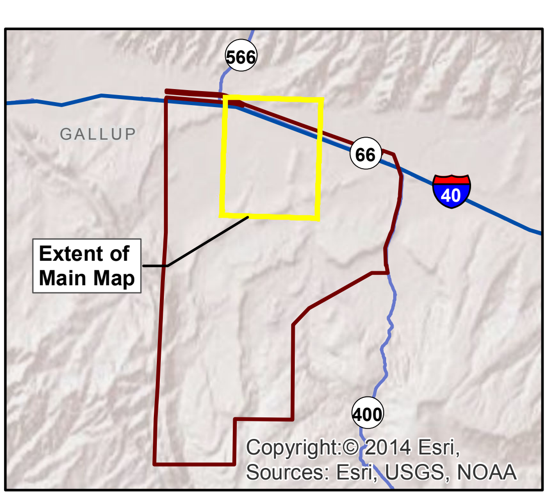
0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\timon\groups\CulturalResources\GISData\461153FortWingate\MapFiles

FW-2013-016a





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Nitrate - Sentinel Well
- Nitrate - Background Well
- Nitrate - Downgradient Well
- Nitrate - Upgradient Well
- Other Alluvial Monitoring Wells

October 2016 Isoconcentration Contour

- Nitrate (10 mg/L)
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL QAL - Quaternary Alluvial Deposits
- QCL QCL - Quaternary Colluvial and Gravel Deposits
- TRPP TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

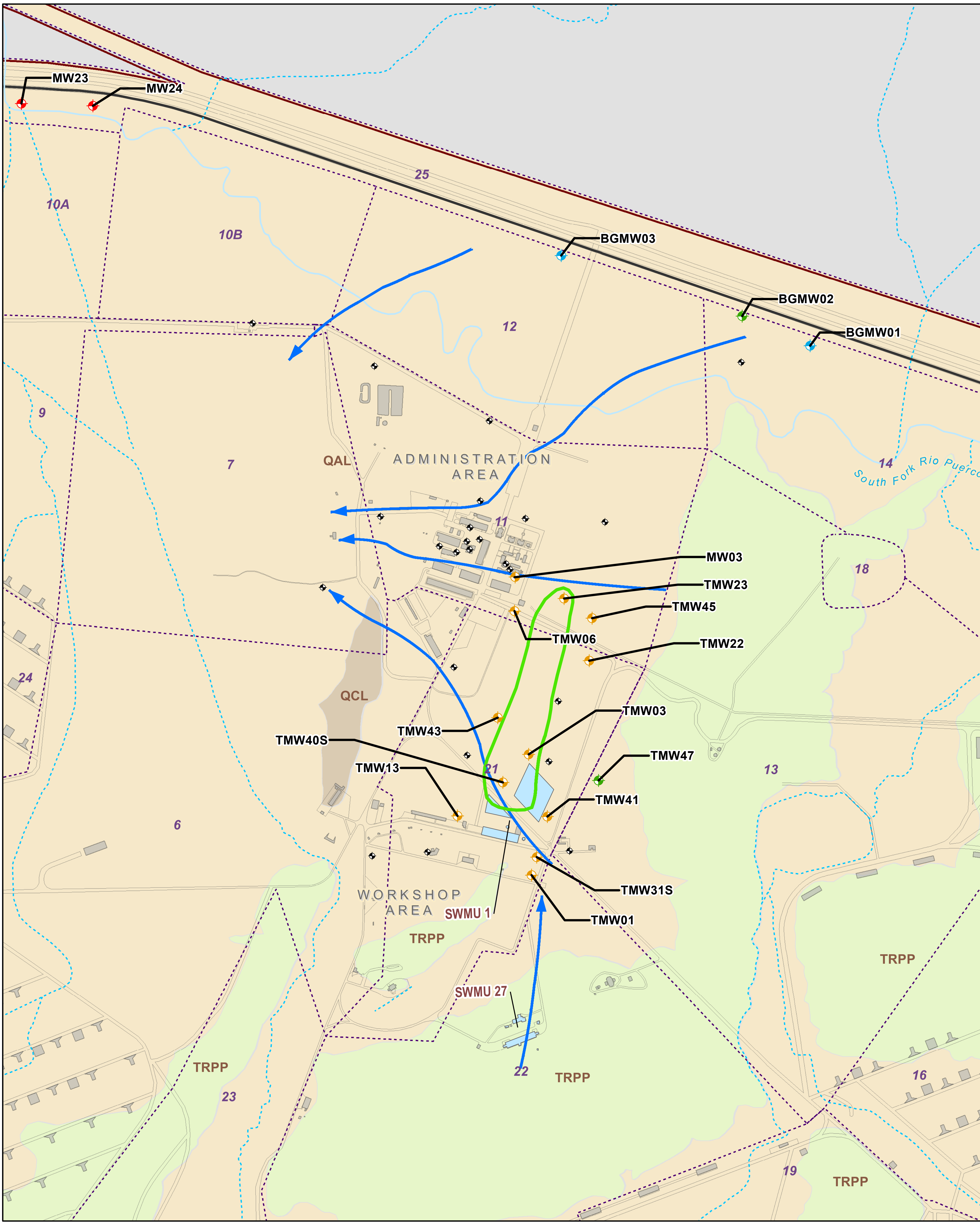
FIGURE 3-4
Northern Area Alluvial Groundwater Monitoring for Nitrate
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

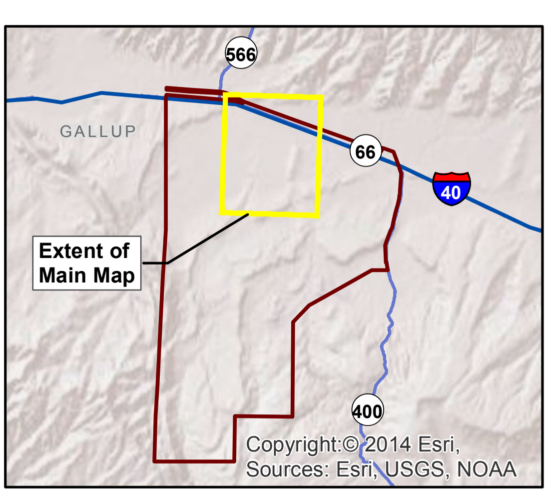
Notes:
AOC = Area of Concern
ID= Identification
mg/L = Milligrams per Liter
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-4_ALLUVIALWELLNETWORK_NITRATE.MXD TARROWOO 8/16/2017 2:32:01 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Explosives - Sentinel Well
- Explosives - Background Well
- Explosives - Downgradient Well
- Explosives - Upgradient Well
- Other Alluvial Monitoring Wells

October 2016 Isoconcentration Contour

- RDX (7 µg/L)
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

FIGURE 3-5
Northern Area Alluvial Groundwater Monitoring for Explosives
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

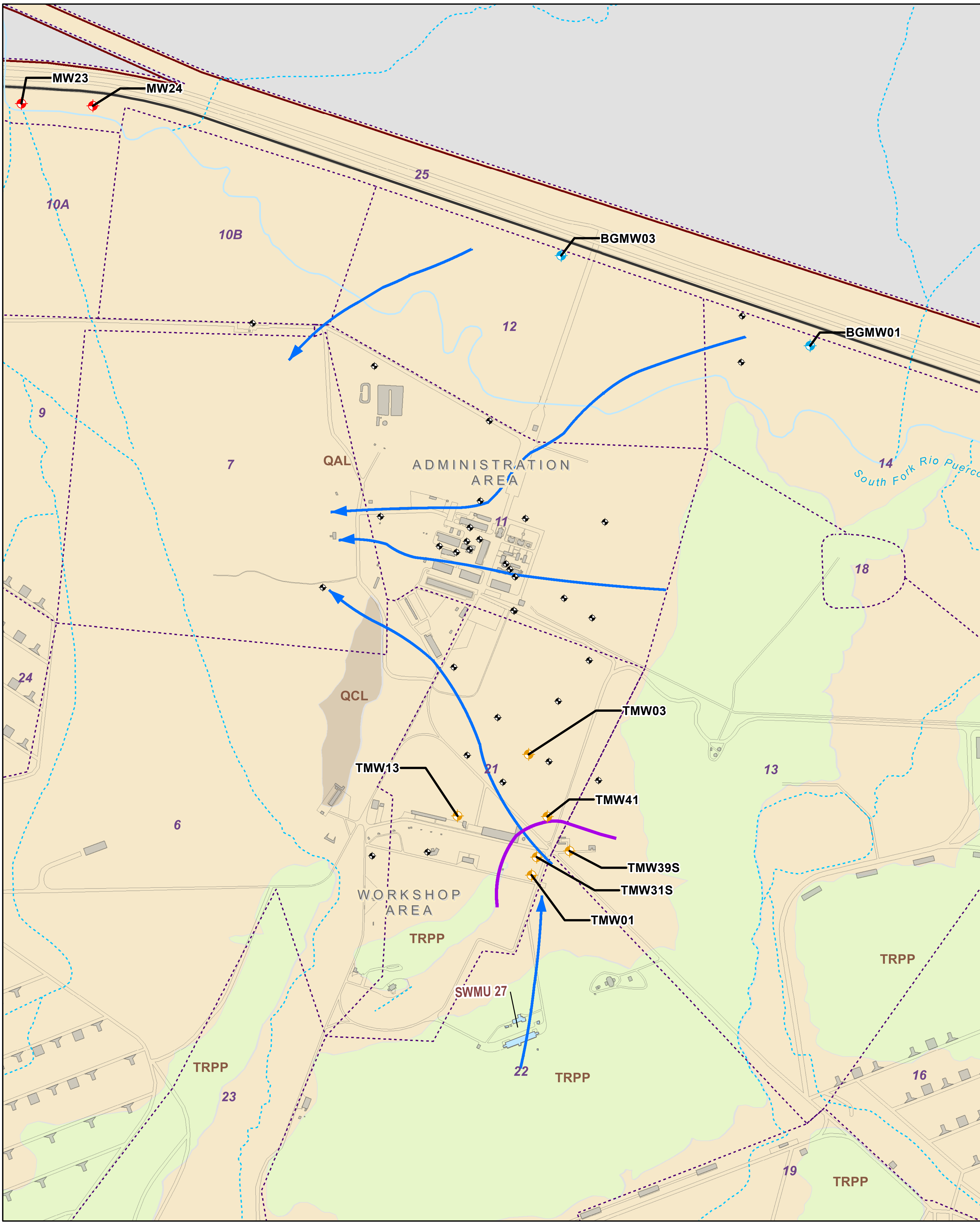
Notes:
AOC = Area of Concern
ID= Identification
µg/L = Micrograms per Liter
SWMU = Solid Waste Management Unit

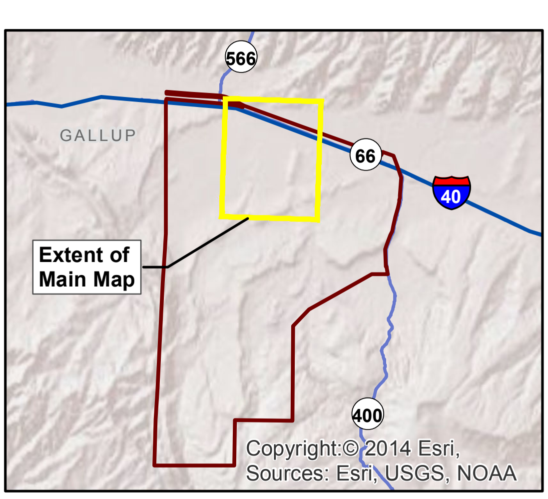
0 500 1,000 1,500 2,000 ft

0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-5_ALLUVIALWELLNETWORK_EXPLOSIVES.MXD TARROWOO 6/30/2017 6:02:46 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Perchlorate - Sentinel Well
- Perchlorate - Background Well
- Perchlorate - Downgradient Well
- Other Alluvial Monitoring Wells

October 2016 Isoconcentration Contour

- Perchlorate (14 µg/L)
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL QAL - Quaternary Alluvial Deposits
- QCL QCL - Quaternary Colluvial and Gravel Deposits
- TRPP TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

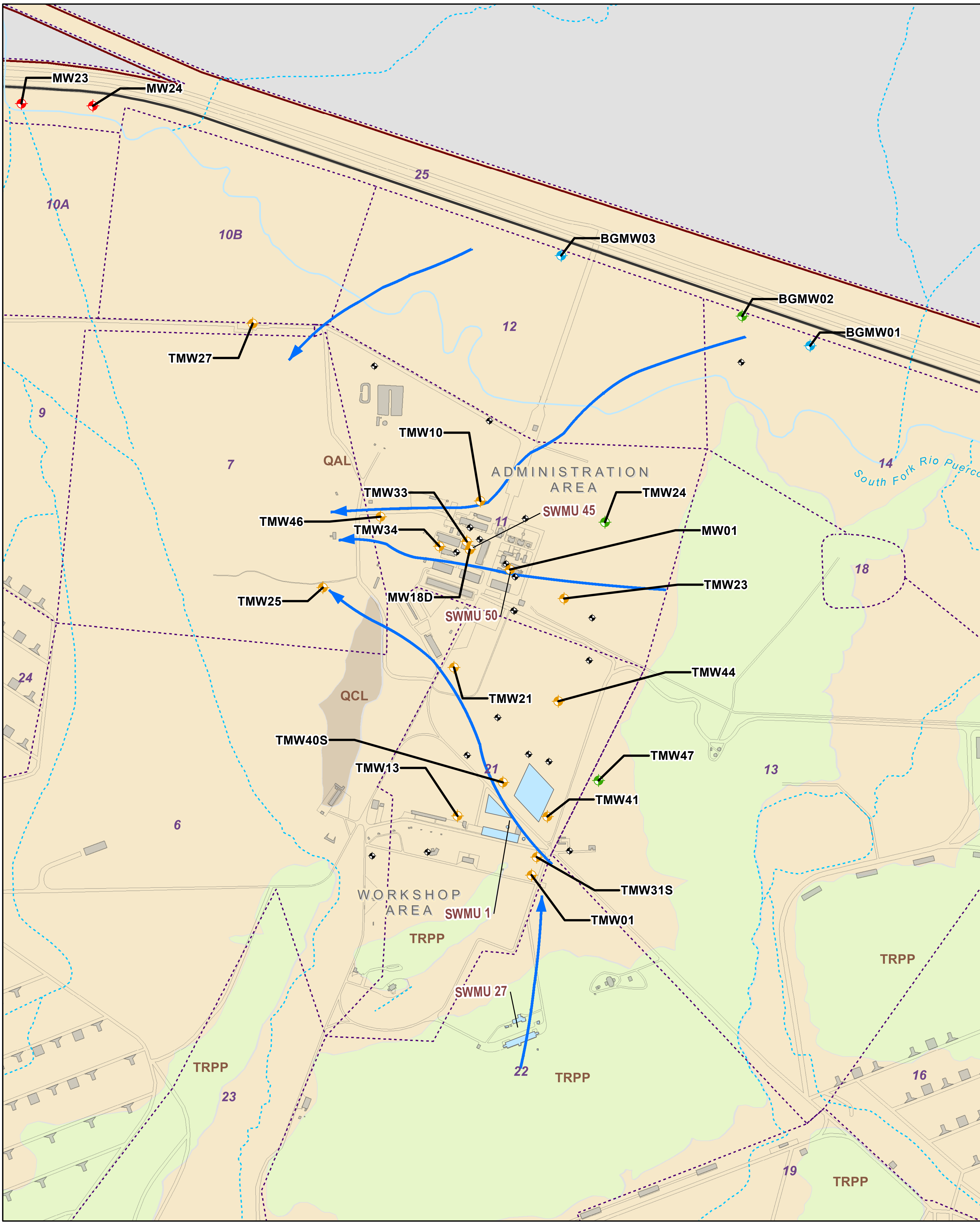
FIGURE 3-6
Northern Area Alluvial Groundwater Monitoring for Perchlorate
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

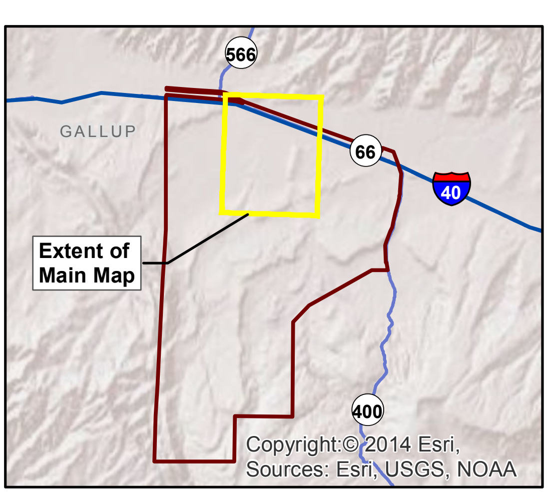
Notes:
AOC = Area of Concern
ID= Identification
µg/L = Micrograms per Liter
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-6_ALLUVIALWELLNETWORK_PERCHLORATE.MXD TARROWOO 6/30/2017 6:03:24 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Metals - Sentinel Well
- Metals - Background Well
- Metals - Downgradient Well
- Metals - Upgradient Well
- Other Alluvial Monitoring Wells
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

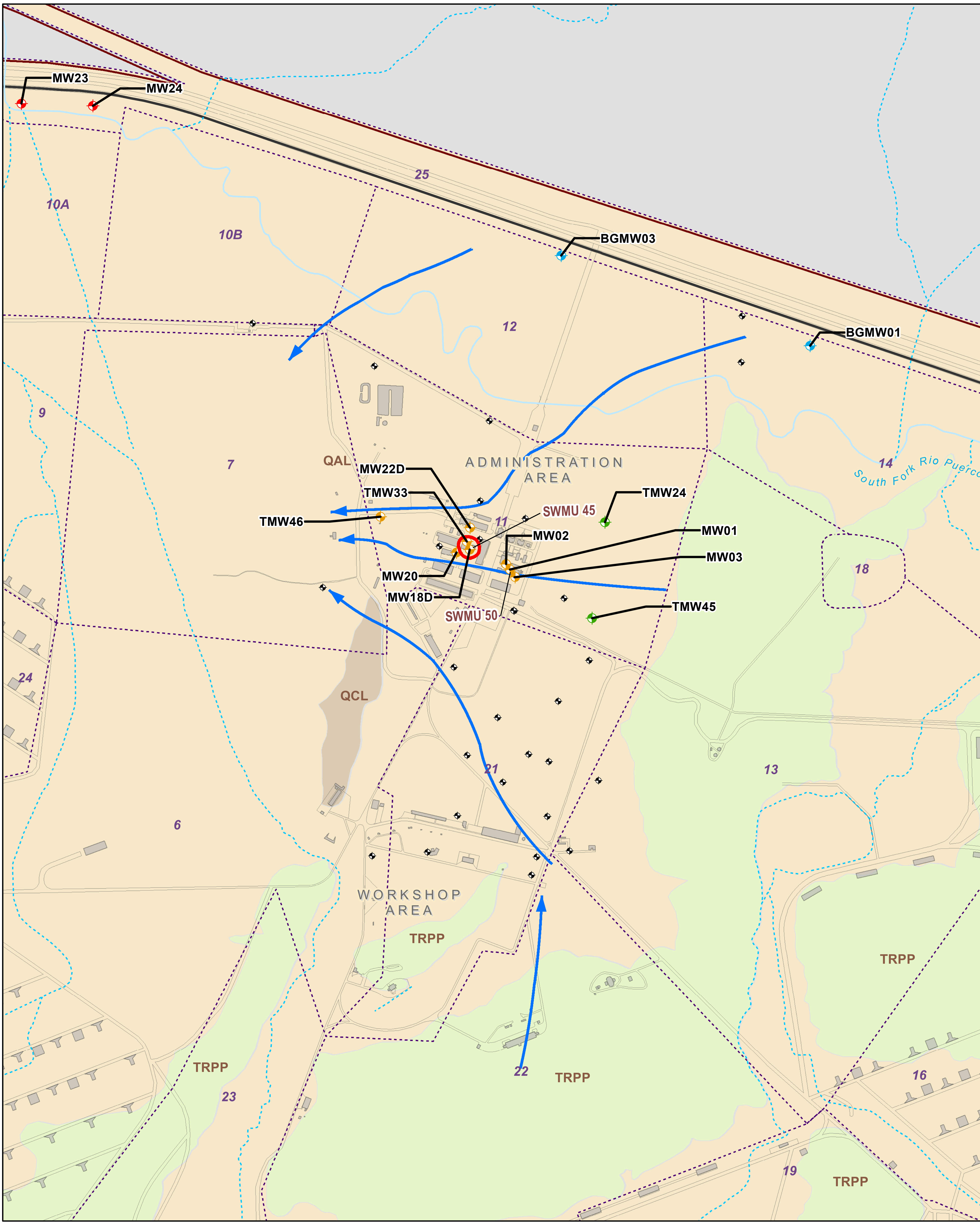
FIGURE 3-7
Northern Area Alluvial Groundwater Monitoring for Metals
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

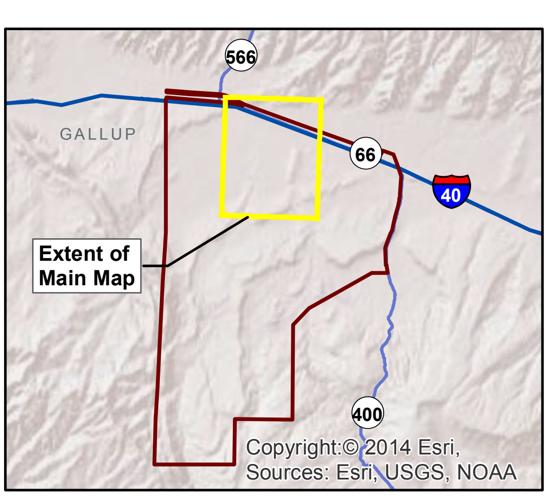
Notes:
AOC = Area of Concern
ID= Identification
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-7_ALLUVIALWELLNETWORK_METALS.MXD TARROWOO 6/30/2017 6:07:41 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- VOC - Sentinel Well
- VOC - Background Well
- VOC - Downgradient Well
- VOC - Upgradient Well
- Other Alluvial Monitoring Wells

Octotber 2016 Isoconcentration Contour

- 1,2-DCA (5 µg/L)
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

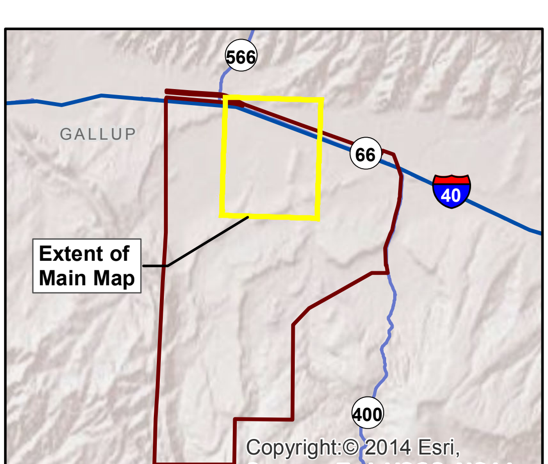
FIGURE 3-8
Northern Area Alluvial Groundwater Monitoring for VOCs
Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

Notes:
AOC = Area of Concern
ID= Identification
µg/L = Micrograms per Liter
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-8_ALLUVIALWELLNETWORK_VOCS.MXD TARROWOO 6/30/2017 6:08:06 PM



State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- SVOC - Sentinel Well
- SVOC - Background Well
- SVOC - Downgradient Well
- SVOC - Upgradient Well
- Other Alluvial Monitoring Wells
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL QAL - Quaternary Alluvial Deposits
- QCL QCL - Quaternary Colluvial and Gravel Deposits
- TRPP TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

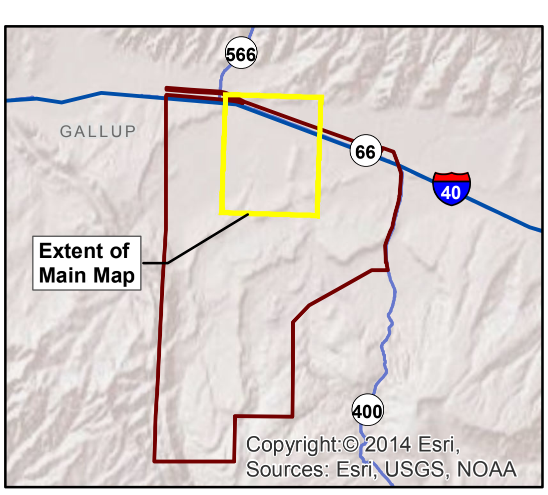
FIGURE 3-9
Northern Area Alluvial Groundwater Monitoring for SVOCs
Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

Notes:
AOC = Area of Concern
ID= Identification
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-9_ALLUVIALWELLNETWORK_SVOCS.MXD TARROWOO 6/30/2017 6:08:31 PM



State Plane Coordinate System, New Mexico West,
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North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- DRO - Sentinel Well
- DRO - Background Well
- DRO - Downgradient Well
- DRO - Upgradient Well
- Other Alluvial Monitoring Wells
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

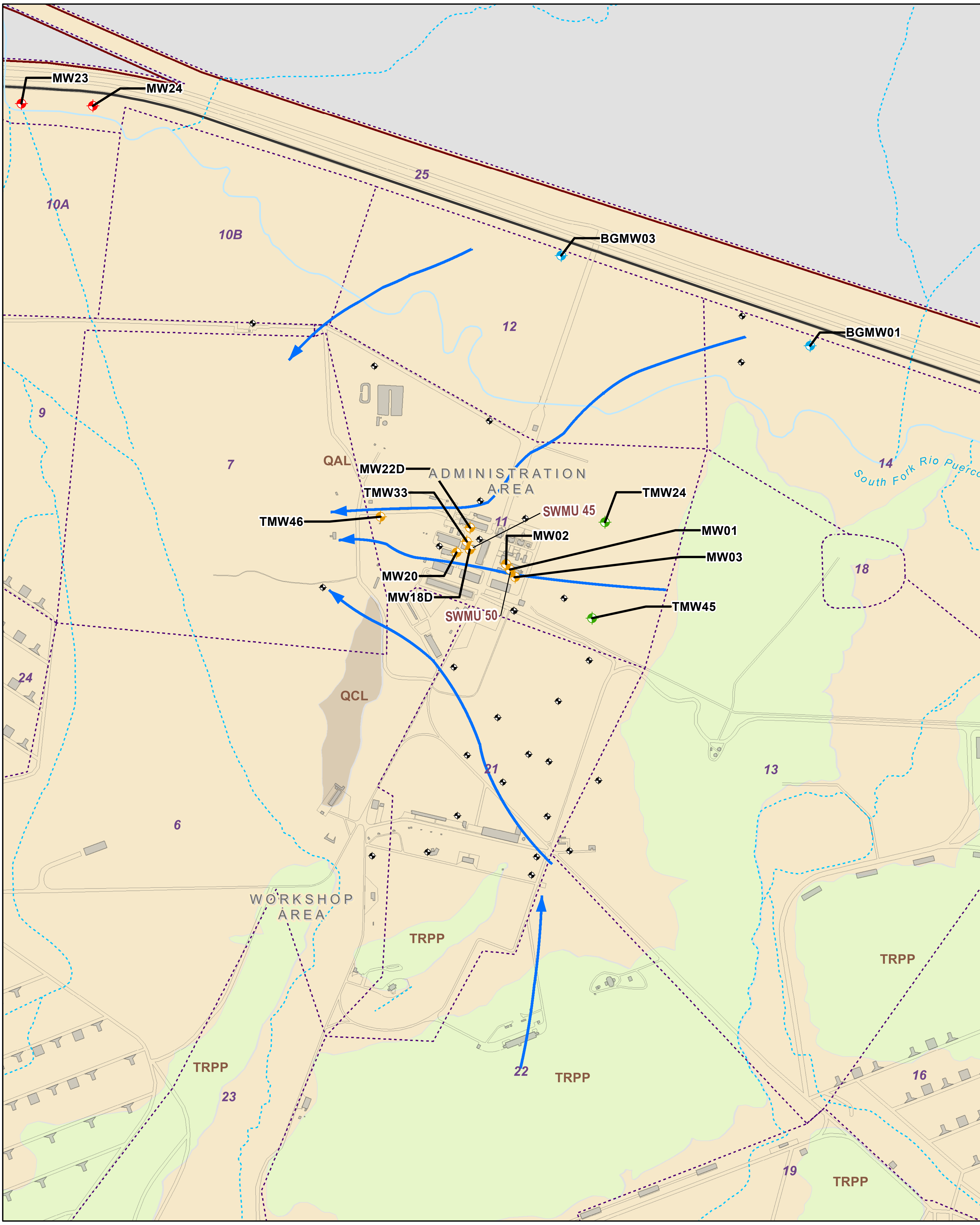
FIGURE 3-10
Northern Area Alluvial Groundwater Monitoring for DRO
Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

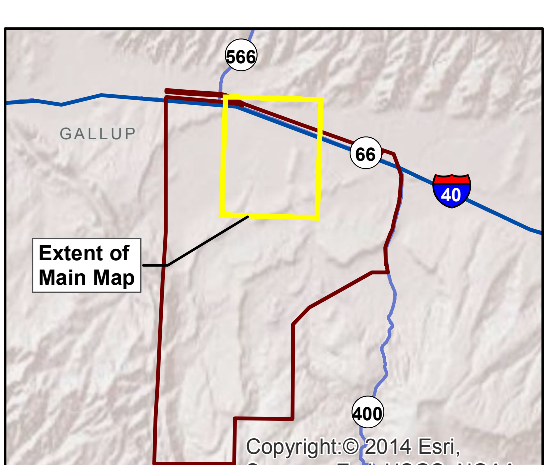
Notes:
AOC = Area of Concern
ID= Identification
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-10_ALLUVIALWELLNETWORK_DRO.MXD TARROWOO 6/30/2017 5:52:55 PM





State Plane Coordinate System, New Mexico West,
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North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- GRO - Sentinel Well
- GRO - Background Well
- GRO - Downgradient Well
- GRO - Upgradient Well
- Other Alluvial Monitoring Wells
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Stream
- Road

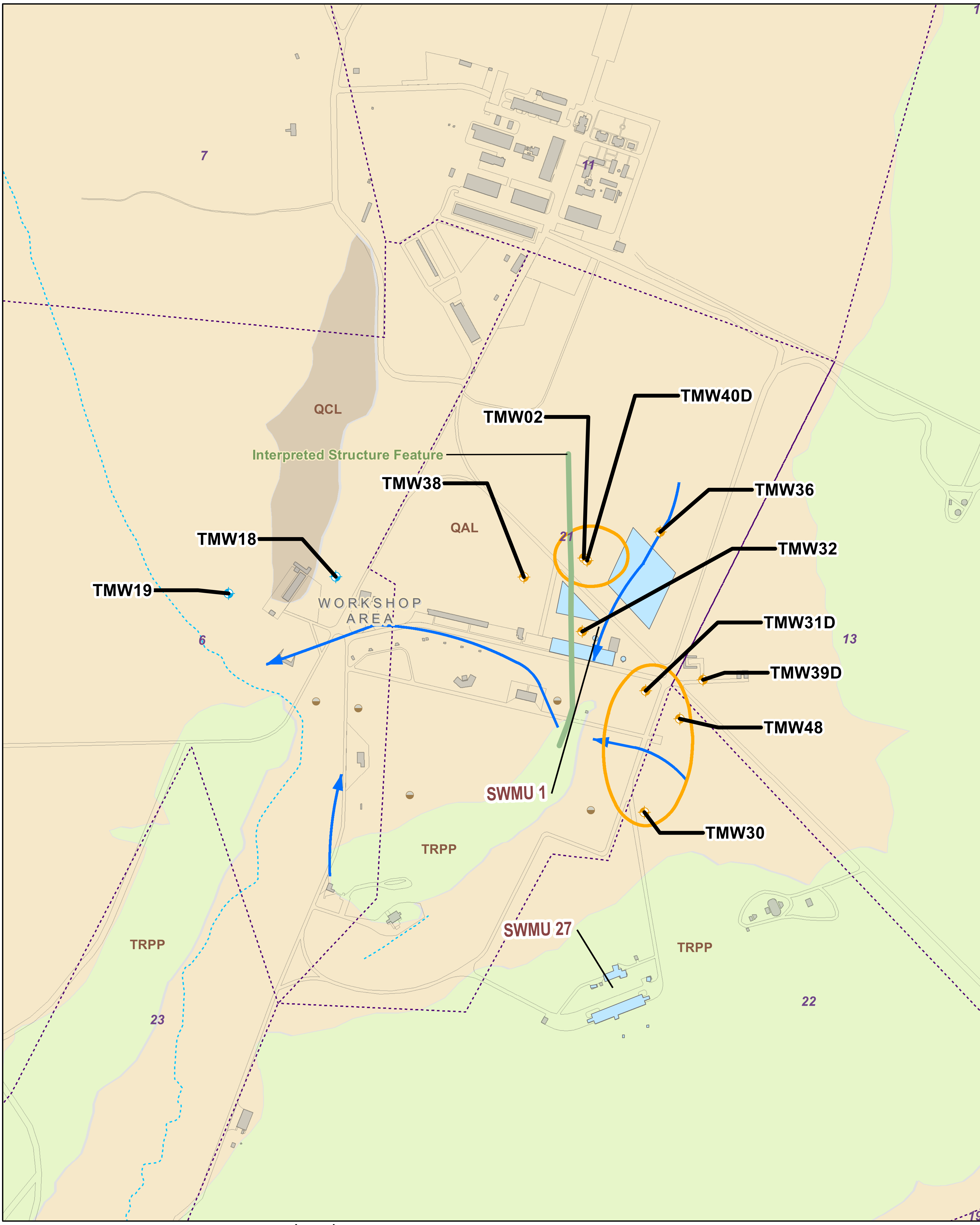
FIGURE 3-11
Northern Area Alluvial Groundwater Monitoring for GRO
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

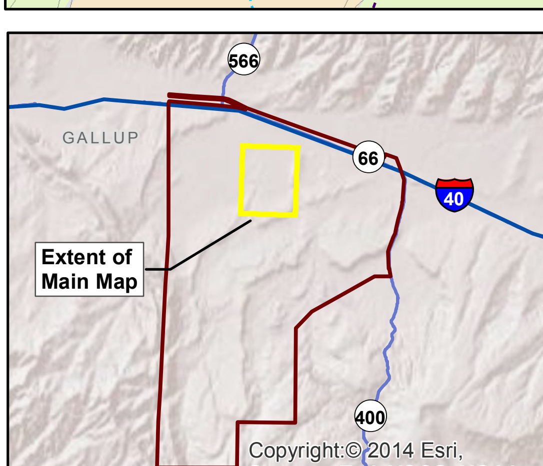
Notes:
AOC = Area of Concern
ID= Identification
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-11_ALLUVIALWELLNETWORK_GRO.MXD TARROWOO 7/3/2017 10:38:28 AM





State Plane Coordinate System, New Mexico West,
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North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Nitrate - Background Well
- Downgradient Well
- Upgradient Well
- Other Bedrock Monitoring Wells

October 2016 Isoconcentration Contours

- Nitrate (10 mg/L)
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - QAL - Quaternary Alluvial Deposits
- QCL - QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - TRPP - Petrified Forest Formation, Painted Desert Member
- Bedrock Groundwater Flowlines

- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Road
- Arroyo

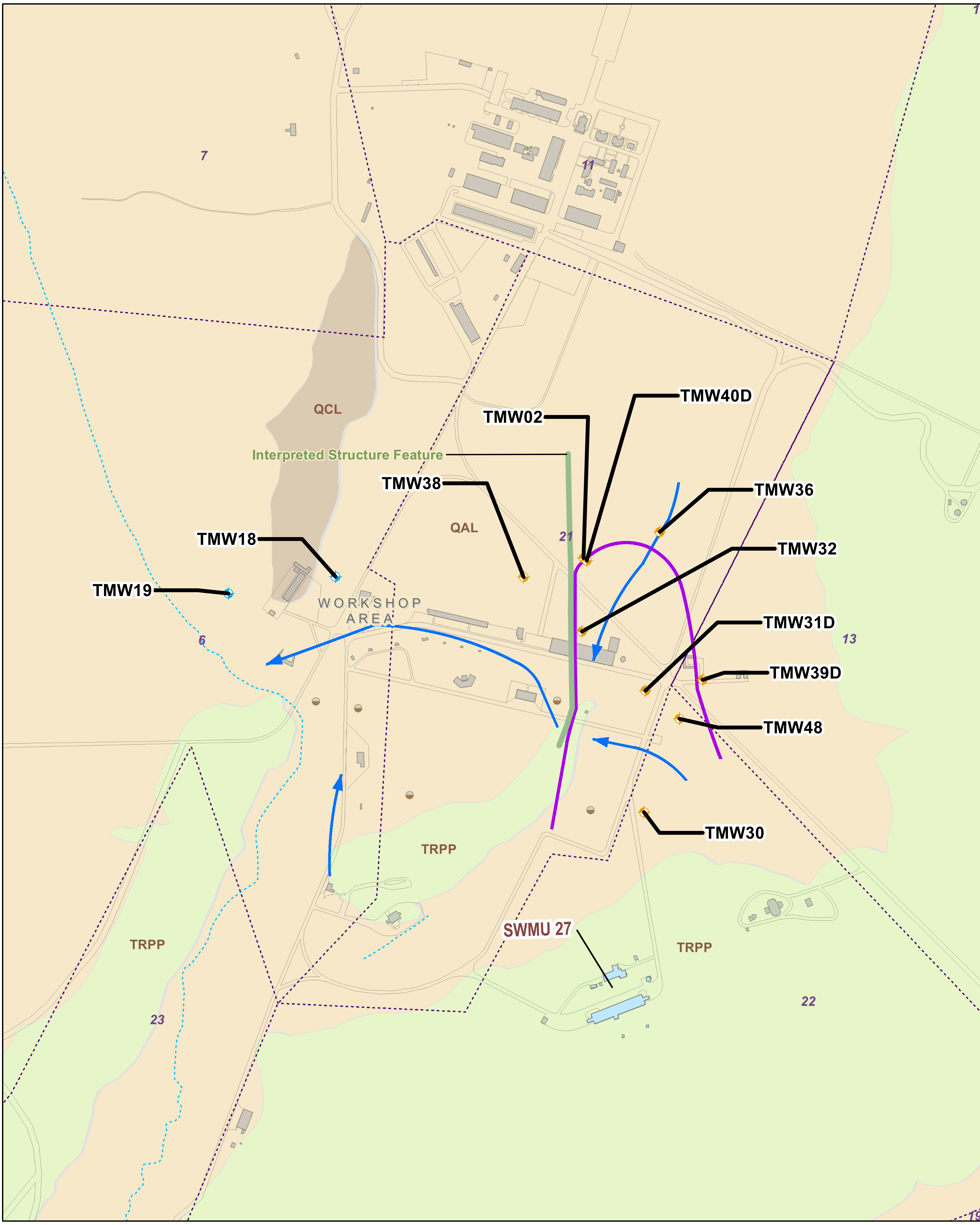
FIGURE 3-12
Northern Area Bedrock Groundwater Monitoring for Nitrate, Explosives, and Metals
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

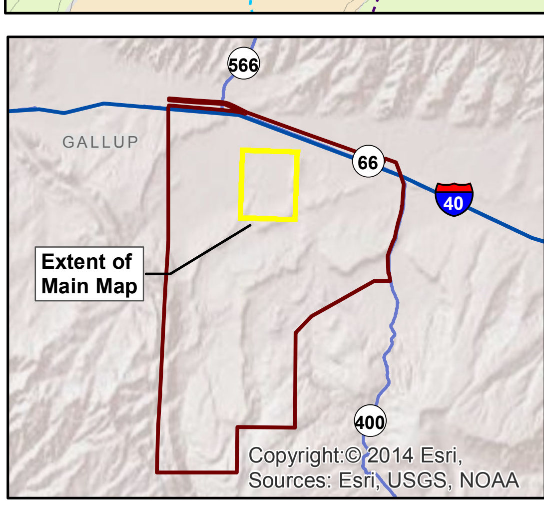
Notes:
AOC = Area of Concern
ID= Identification
mg/L = Milligrams per Liter
SWMU = Solid Waste Management Unit

0 375 750 1,125 1,500 ft
0 80 160 240 320 400 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-12_BEDROCKWELLNETWORK_NEM.MXD TARROWOO 6/30/2017 5:54:25 PM





State Plane Coordinate System, New Mexico West,
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North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Perchlorate - Background Well
- Perchlorate - Downgradient Well
- Other Bedrock Monitoring Wells
- October 2017 Isoconcentration Contour
- Perchlorate 14 (µg/L)
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary

Surface Geology

- QAL - Quaternary Alluvial
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Bedrock Groundwater Flowlines

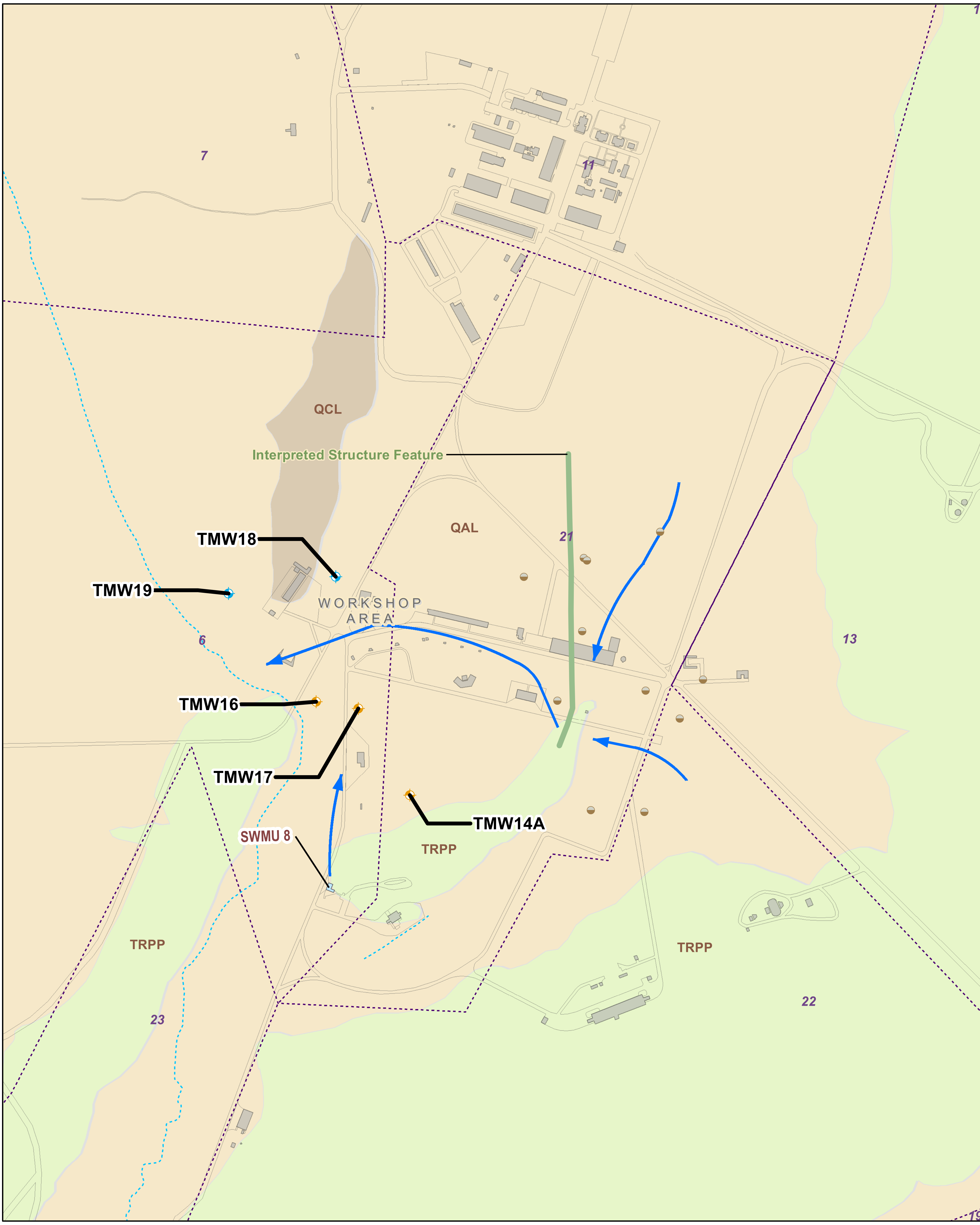
- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Road

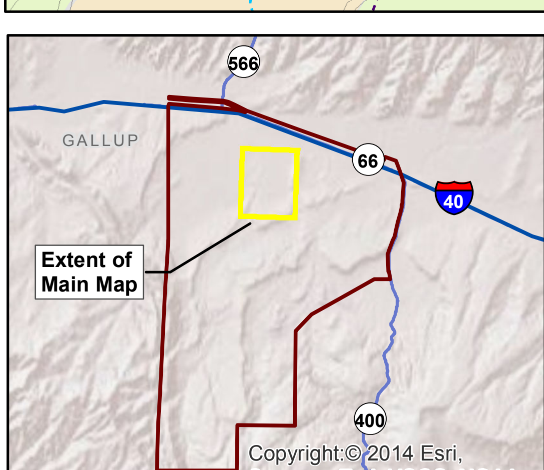
FIGURE 3-13
Northern Area Bedrock Groundwater Monitoring for Perchlorate
Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

Notes:
AOC = Area of Concern
ID= Identification
µg/L = Micrograms per Liter
SWMU = Solid Waste Management Unit

0 375 750 1,125 1,500 ft
0 80 160 240 320 400 m
N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-13_BEDROCKWELLNETWORK_PERCHLORATE.MXD TARROWOO 6/30/2017 5:55:06 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- SVOC - Background Well
- SVOC - Downgradient Well
- SVOC - Upgradient Well
- Other Bedrock Monitoring Wells
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary
- TMW11 Well Label = Well ID
- SWMU 8 SWMU Label = SWMU ID
- Arroyo
- Road

Surface Geology

- QAL - Quaternary Alluvial
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Bedrock Groundwater Flowlines

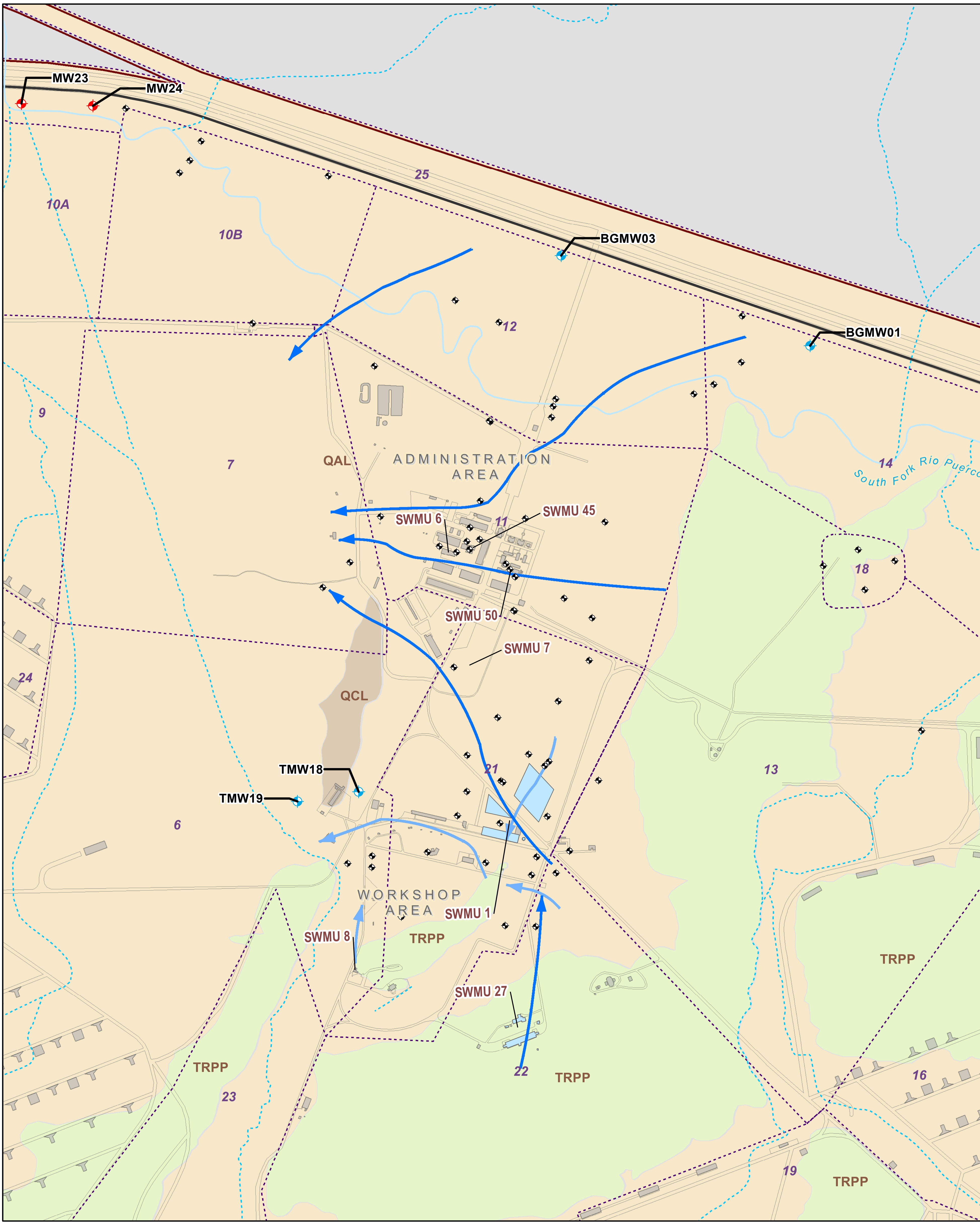
FIGURE 3-14
Northern Area Bedrock Groundwater Monitoring for SVOC
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

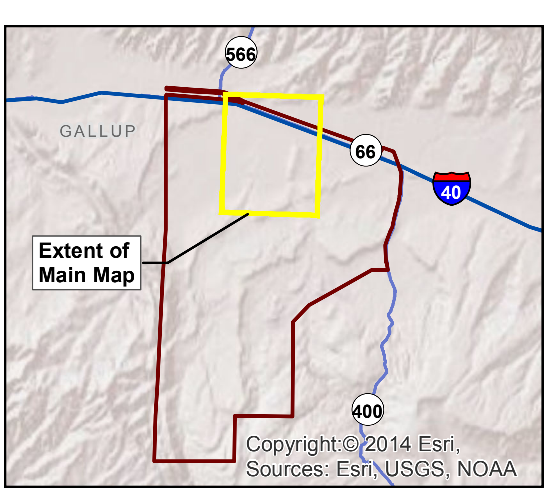
Notes:
AOC = Area of Concern
ID= Identification
SWMU = Solid Waste Management Unit

0 375 750 1,125 1,500 ft
0 80 160 240 320 400 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-14_BEDROCKWELLNETWORK_SVOC.MXD TARROWOO 6/30/2017 5:56:36 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.
North American Vertical Datum 1988, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Sentinel Well
- Background Well
- Other Alluvial Monitoring Wells
- SWMU 8 SWMU Label = SWMU ID
- TMW11 Well Label = Well ID
- Building
- Points of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary
- Arroyo
- Stream
- Road

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial and Gravel Deposits
- TRPP - Petrified Forest Formation, Painted Desert Member
- Alluvial Groundwater Flowlines
- Bedrock Groundwater Flowlines

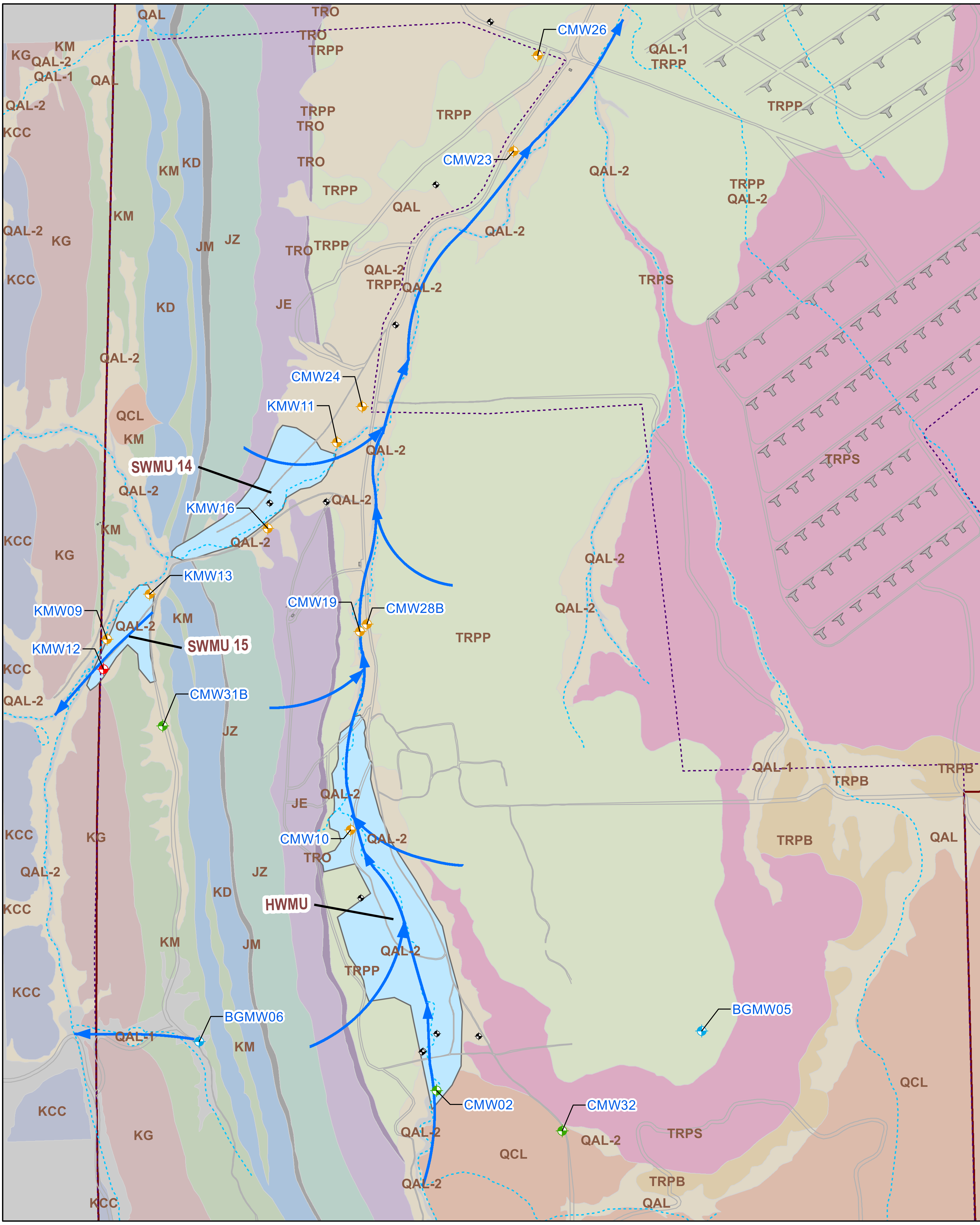
FIGURE 3-15
Northern Area Alluvial and Bedrock Groundwater Sentinel and Background Monitoring Wells
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

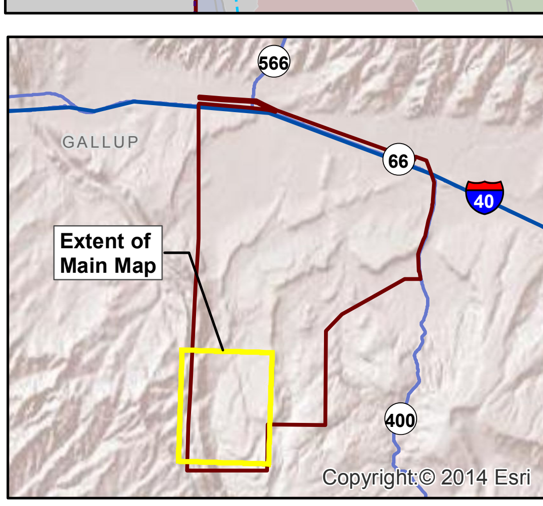
Notes:
AOC = Area of Concern
ID= Identification
µg/L = Micrograms per Liter
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\ROSWELL\ARCINFO\AV_PROJ\FTWINGATE\692769FORTWINGATETO5\MAPFILES\MAY_2017\WORKPLAN\FIGURE3-15_SENTINEL_BACKGROUND_ALBED.MXD TARROWOO 6/30/2017 5:57:33 PM





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Sentinel Well
- Background Well
- Downgradient Well
- Upgradient Well
- Other OB/OD Monitoring Wells
- OB/OD Groundwater Flowlines
- Building
- Point of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary
- Arroyo
- Roads

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial Deposits
- KCC - Crevasse Canyon Formation
- KG - Gallup Sandstone
- KM - Mancos Shale
- KD - Dakota Sandstone
- JM - Morrison Formation
- JZ - Zuni Sandstone
- JE - Entrada Sandstone
- TRO - Owl Rock Formation
- TRPP - Petrified Forest Formation - Painted Desert Member
- TRPS - Petrified Forest Formation - Sonsela Sandstone Member
- TRPB - Petrified Forest Formation - Blue Mesa Member

FIGURE 3-16
OB/OD Area Groundwater Monitoring for Nitrate, Explosives, Perchlorate, and Metals
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

Notes:
HWMU = Hazardous Waste Management Unit
ID= Identification
OB/OD = Open Burn/Open Detonation
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

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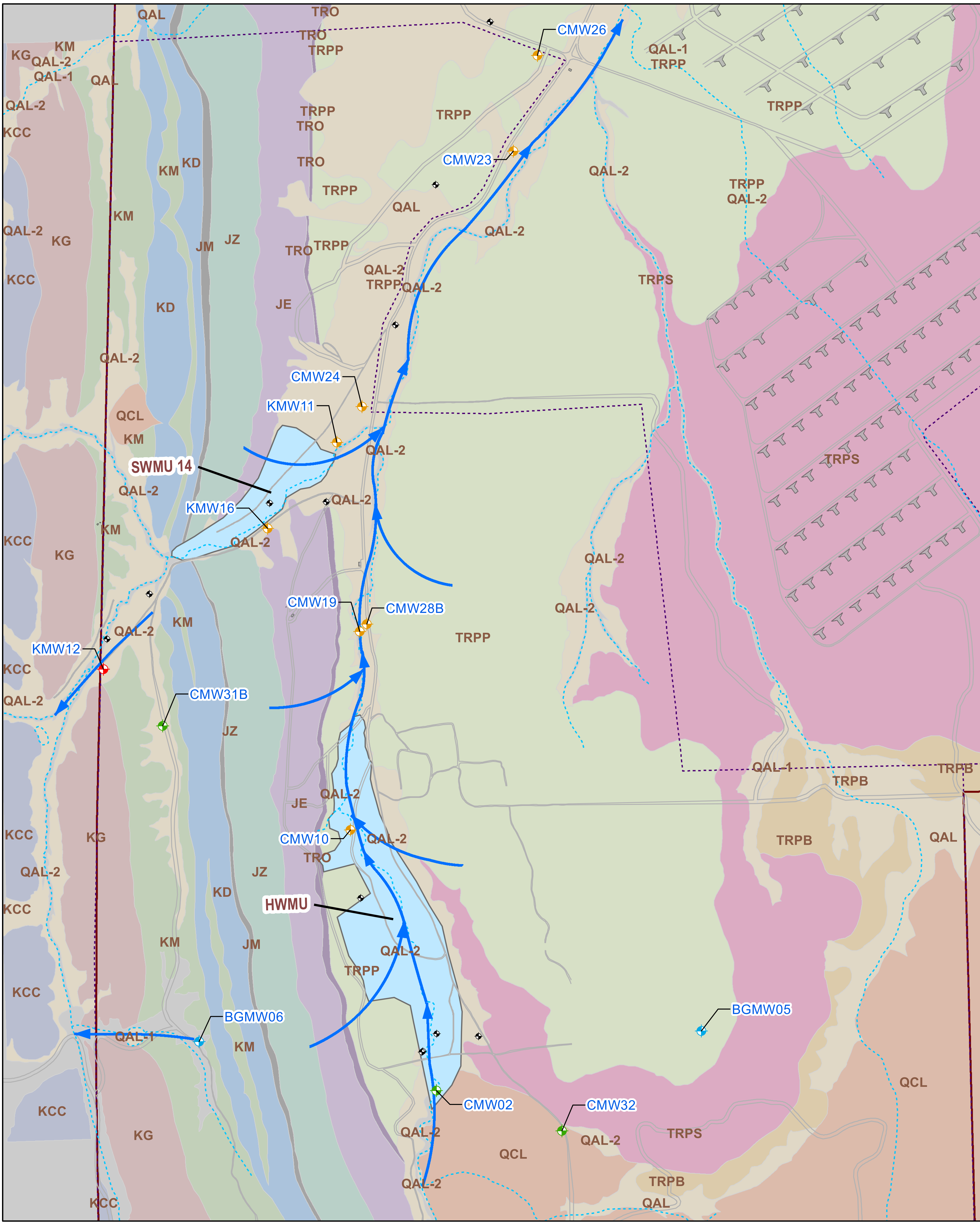
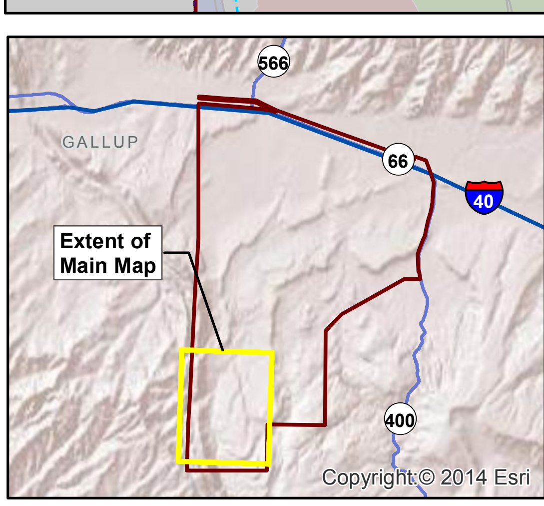
FW-2013-016a





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Sentinel Well
- Background Well
- Downgradient Well
- Upgradient Well
- OB/OD Monitoring Well
- OB/OD Groundwater Flowlines
- Building
- Point of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary
- Arroyo
- Roads

Surface Geology

- QAL - Quaternary Alluvial Deposits
- QCL - Quaternary Colluvial Deposits
- KCC - Crevasse Canyon Formation
- KG - Gallup Sandstone
- KM - Mancos Shale
- KD - Dakota Sandstone
- JM - Morrison Formation
- JZ - Zuni Sandstone
- JE - Entrada Sandstone
- TRO - Owl Rock Formation
- TRPP - Petrified Forest Formation - Painted Desert Member
- TRPS - Petrified Forest Formation - Sonsela Sandstone Member
- TRPB - Petrified Forest Formation - Blue Mesa Member

FIGURE 3-17
OB/OD Area Groundwater Monitoring for VOCs and SVOCs
Interim Facility-wide Groundwater Monitoring Plan
Fort Wingate Depot Activity, McKinley County, New Mexico

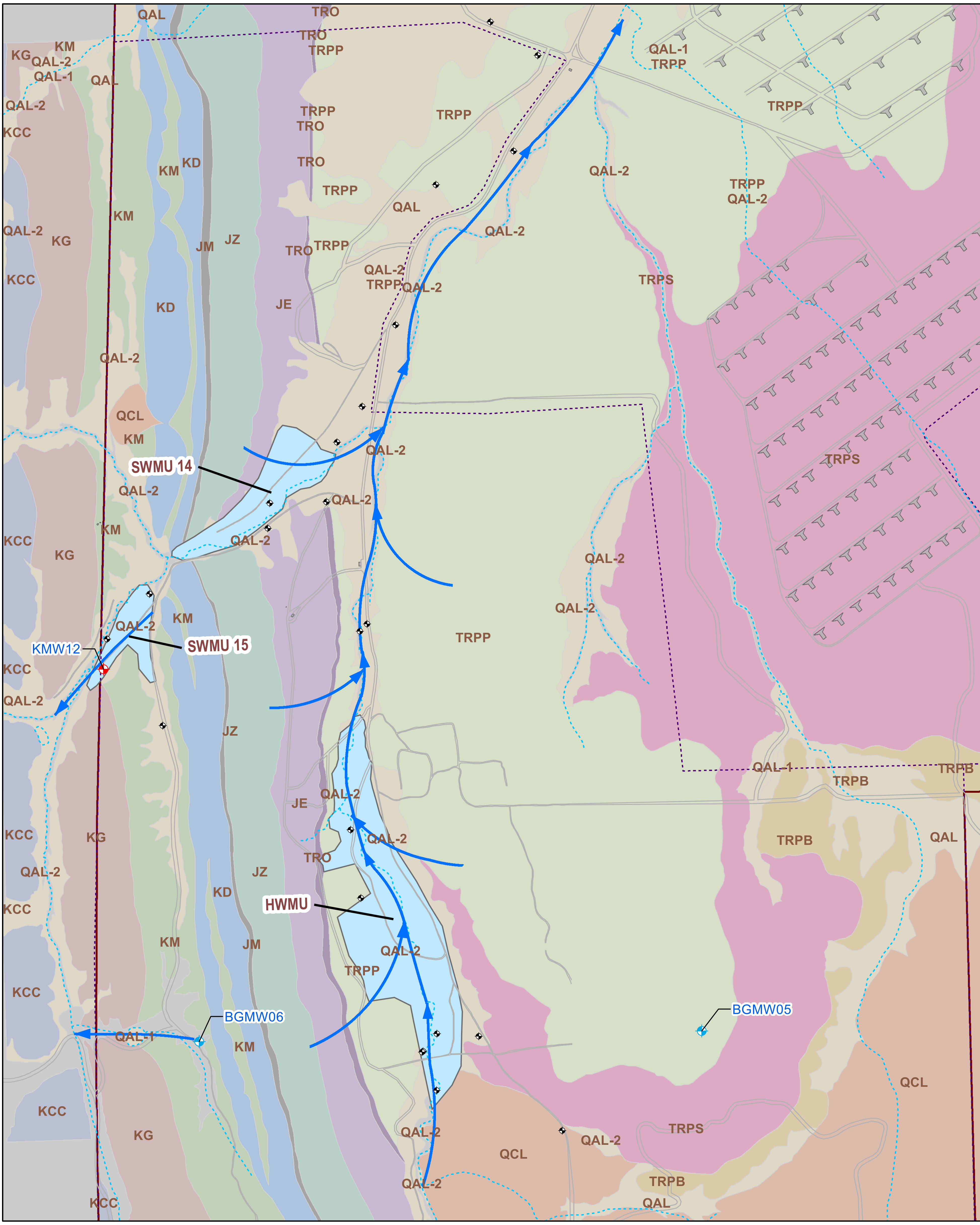
Notes:
HWMU = Hazardous Waste Management Unit
ID= Identification
OB/OD = Open Burn/Open Detonation
SWMU = Solid Waste Management Unit

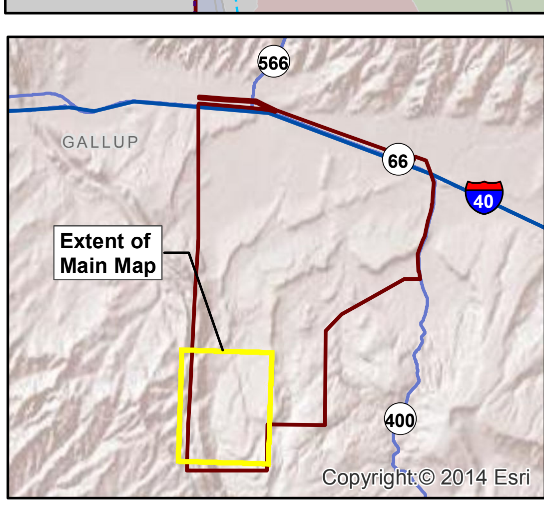
0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

\\timon\groups\CulturalResources\GISData\461153FortWingate\MapFiles

FW-2013-016a





State Plane Coordinate System, New Mexico West,
North American Datum 1983, US Feet.

Data Sources:
Roads, Railroad: Tele Atlas GDT-Dynamap, 2008;
Populated Places: ESRI 2005;
Fort Wingate Environmental Restoration Detail: USACE.

Legend

- Sentinel Well
- Background Well
- Other OB/OD Monitoring Wells
- OB/OD Groundwater Flowlines
- Building
- Point of Release to Groundwater
- 10A Property Transfer Parcel
- Fort Wingate Installation Boundary
- Arroyo
- Roads

Surface Geology

- QAL QAL - Quaternary Alluvial Deposits
- QCL QCL - Quaternary Colluvial Deposits
- KCC KCC - Crevasse Canyon Formation
- KG KG - Gallup Sandstone
- KM KM - Mancos Shale
- KD KD - Dakota Sandstone
- JM JM - Morrison Formation
- JZ JZ - Zuni Sandstone
- JE JE - Entrada Sandstone
- TRO TRO - Owl Rock Formation
- TRPP TRPP - Petrified Forest Formation - Painted Desert Member
- TRPS TRPS - Petrified Forest Formation - Sonsela Sandstone Member
- TRPB TRPB - Petrified Forest Formation - Blue Mesa Member

FIGURE 3-18
OB/OD Area Sentinel and Background Groundwater Monitoring Wells
Interim Facility-wide
Groundwater Monitoring Plan
Fort Wingate Depot Activity,
McKinley County, New Mexico

Notes:
HWMU = Hazardous Waste Management Unit
ID= Identification
OB/OD = Open Burn/Open Detonation
SWMU = Solid Waste Management Unit

0 500 1,000 1,500 2,000 ft
0 100 200 300 400 500 m

N

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FW-2013-016a

4.0 Field Monitoring and Sampling Methods

Field activities proposed under this Interim Facility-wide GMP include groundwater elevation surveys and collection of groundwater samples from the monitoring wells at FWDA. The various types of purge methods required for sampling are identified in Table 4-1 and described in the sections below. Field equipment required for the field activities is listed in Table 4-2. The Site Safety and Health Plan for this investigation is provided under separate cover.

4.1 Groundwater Elevation Survey

Groundwater elevations will be measured in the existing wells listed in Table 4-1 at a semiannual frequency. The groundwater elevation data are used to calculate hydraulic gradients and determine groundwater flow directions. All groundwater measurements will be collected during a 48-hour period within any specific groundwater zone (Northern Area alluvium, Northern Area bedrock, OB/OD) to assure accuracy. Static water elevation data will be collected prior to well purging activities to provide representative data. Current measurements will be compared to recently collected measurements and assessed for accuracy.

Depth to groundwater will be measured with an electronic water-level meter as follows:

- Lower the probe of the water-level meter down into the well casing until the indicator lights or chimes.
- The DTW measurement will be compared to the previous DTW reading. If the measurement differs from the previous measurement by more than 1.0 foot, the measurement will be performed a second time.
- Record measurement to the nearest 0.01 foot to the top-of-casing reference notch and document in field logbook.
- Remove water level probe from the well casing and decontaminate with non-phosphate detergent and deionized water as described in Section 4.4.

4.2 Groundwater Sampling

Sampling of the monitoring wells at FWDA involves a variety of purging and sampling methods. Use of a low-flow pump is the preferred method at FWDA according to the NMED guidance document on low-flow sampling, *Use of Low-Flow and Other Non-Traditional Sampling Techniques for RCRA Compliant Groundwater Monitoring* (NMED-HWB, 2001). Field sample methods, equipment, and sample handling information are presented in Table 4-2 and Table 4-3. Field procedures for sample collection and handling are outlined in Section 4.3. All water generated during purging activities, as well as the excess groundwater from sampling, will be collected in designated containers with sealing lids or caps and managed as IDW following procedures described in Section 4.5.

Table 2-1 contains well construction data, including top-of-casing and ground surface elevation data, for calculation of well volumes. Monitoring wells that do not contain more than 6 inches of water saturation in the well screen are identified as dry.

4.2.1 Preliminary Site Activities

4.2.1.1 Initial Inspection

Upon arrival at each monitoring well, the field team will inspect wellhead and exposed casing for evidence of tampering or other damage. The field team will record observations in the field logbook, and will notify the USACE Contracting Officer's Representative (COR) of any vandalism or damage. Once initial inspection is complete, the field team will implement preventative measures to reduce risk of contamination. Plastic sheeting or other materials such as absorbent pads will be placed around each wellhead to prevent contamination of sampling equipment and/or ground surface. A staging area will be designated for equipment decontamination to include non-phosphate detergent cleaning solutions, reusable dedicated decontamination buckets and brushes, and plastic sheeting or absorbent pads, as appropriate. Field personnel will wear disposable nitrile (or comparable) gloves for all activities when in contact with purge water, equipment used for purging, or sample bottles and their preservatives.

4.2.1.2 Measure Initial Water Level and Calculate Well Volume

Prior to purging and sampling, the field team will measure depth to groundwater from the top-of-casing reference notch and record the measurement to the nearest 0.01 foot by following the procedure described in Section 4.1. The well volume will be calculated using the measured groundwater level and casing dimensions as follows:

Borehole Volume = Saturated Casing Volume + Saturated Filter Pack Volume

Where:

Saturated Casing Volume = $\pi \times WR^2 \times (TD - DTW)$

Saturated Filter Pack Volume = $((\pi \times BR^2 \times SFPL) - (\pi \times WR^2 \times SFPL)) \times 0.2$ and

WR = well screen radius

TD = total well depth

DTW = depth to water

BR = borehole radius

SFPL = saturated filter pack length.

Groundwater elevation and well volume calculations will be recorded in the field logbook and/or on the Low-Flow Sampling Data Form (Appendix C) as appropriate.

4.2.2 Low-flow Pump Purging

Low-flow purging at FWDA is performed using dedicated pneumatic pumps for wells designated as low-flow in Table 4-1. Blatypus model pumps manufactured by BESST products are currently in use but may be replaced by comparable equipment. The low-flow equipment currently installed consists of a flow control system connected to the wellhead, which applies pneumatic pressure to a dedicated simple spring-loaded valve placed in the well screen. Dedicated pumps and associated tubing are constructed of stainless steel, Teflon lined, and polyethylene. This low-flow pump system is powered by pressurized nitrogen gas cylinders.

Pumps and gas control devices are operated and maintained in accordance with manufacturer specifications. Pneumatic power is applied by compressed gas cylinders. Nitrogen gas is selected because of its inert properties and because it contains fewer impurities (as compared to compressed air). Electrical power is provided by a marine battery.

The dedicated low-flow pumps are operated to produce water flow rates at which minimal drawdown is observed. These methods comply with low-flow guidance (NMED-HWB, 2001). Well purging and stabilization at these locations is performed in accordance with standard practice and site-specific methods implemented by USACE. Water quality parameters and DTW measurements are used to assure representative samples are collected.

Low hydraulic conductivity conditions exist in many monitoring locations and result in poor well yield. In some deeper wells, a modified system was used to maintain the general low-flow methodology. In these locations, a ZIST model packer system manufactured by BESST product was installed. The packer system creates a seal above the well screen to minimize drawdown and allow for production of water directly from the aquifer formation. The pump intake is locked into the packers prior to purging operations and is unsealed after sample collection to allow for representative measurement of groundwater elevations. Otherwise, the purging, field reading, and sampling procedures are the same as low-flow techniques described in this GMP.

Because the low-flow pumps are dedicated (traditional and ZIST) and will remain in place between sampling events, the volume of water in the dedicated tubing and pump will be purged to clear any stagnant water prior to initiation of water quality readings.

The field team will use drawdown and final pump cycle setting information from previous sampling event(s) from a well prior to initiating purging at that location. The extraction rate of the previous sampling event(s) will be duplicated to the extent practical and modified to assure minimal drawdown and optimal flow rates. The following steps will be performed for purging with traditional low-flow pumps:

1. Start pump at the lowest speed setting and slowly increase until discharge occurs.
2. Measure the water level again.
3. Adjust pump speed until there is little or no water level drawdown. Make any necessary adjustments to pumping rates within the first 15 minutes of purging. Reduce pumping rates as needed. If the static water level is above the well screen, avoid lowering the water level into the screen if possible. Once water quality readings are stabilized (Step 9), the established water level drawdown must not be more than 4 inches/0.33 foot from stabilization until the end of sample collection.
4. Begin purging well to previously determined volume. The calculation of purge water volumes is presented in Section 4.2.1.2
5. Monitor and record water level, purge volume, purging rate, and the following field parameters approximately every 2 to 5 minutes during purging depending on flow rate on the Low-Flow Sampling Data Form (Appendix C). Each measurement should allow the flow-through cell to completely evacuate the purge water from the previous reading:
    a. Turbidity
    b. Temperature
    c. Specific conductivity
    d. Hydrogen ion activity (pH)
    e. Dissolved oxygen
    f. Oxygen reduction potential
6. Record all adjustments to pumping rate (both time and flow rate).
7. Purging is considered complete and sampling will begin when the field parameters have stabilized or three borehole volumes have been purged. Stabilization has occurred when three consecutive readings are within the following limits:
    a. Temperature ± 10 percent (%) in degrees centigrade (°C)
    b. pH ± 0.5 standard units
    c. Specific conductivity ± 10% in millisiemens per centimeter
    d. Dissolved oxygen ± 10% or less than 1.0 mg/L
    e. Turbidity ± 10% or less than 1 nephelometric turbidity unit
    f. Oxygen reduction potential ± 10 millivolt
    g. Water Level = 0.00 to 0.33 foot (or 4 inches) or less drawdown during the stabilized water quality readings

All measurements will be obtained using a field parameter monitoring instrument with a transparent flow-through cell that prevents air bubble entrapment in the cell. Extraction rates from the initial pump setup are located on sample collection logs from previous sampling events and will be duplicated to the extent practical. The steps that will be performed for purging with ZIST low-flow pumps are the same as the traditional low-flow pumps with the following differences:

1. Prior to pumping, lower the pump into the packer.
2. During water level measurements assure drawdown of the water column does not occur. If drawdown occurs, the mechanical packer system was not sealed properly and has failed. The pump must then be reset or the ZIST will need to be removed, inspected, and repaired before continuing.

4.2.3 Groundwater Sample Collection by Low-Flow Pump

Following stabilization of field parameters, groundwater samples will be collected in accordance with the following steps:

1. During sampling activities, maintain the pump at approximately the same flow rate during purging and stabilization of field parameters.
2. Disconnect the water quality sensor flow-through cell and collect samples directly from the pump discharge by allowing the discharge to flow gently down the inside of the sample container to minimize turbulence.
3. Continue to monitor DTW to assure that the water level does not drop more than 0.33 foot from the established pumping level during sampling.
4. Fill sample containers. Reduce pressure to avoid splash in VOC containers if necessary.
5. To field filter groundwater samples for dissolved metals analysis, use a 0.45-micron filter attached to the end of the discharge tubing.
6. To field filter groundwater samples for perchlorate analysis, use a 0.20-micron filter. A 0.45-micron filter may be used to filter water prior to use of the 0.20-micron filter for wells with high turbidity. Fill the perchlorate container only to between half and two thirds volume to allow proper headspace for sample.
7. After filling each sample container, immediately seal, label, and place container into an iced cooler in accordance with the sample management procedures discussed in Section 4.3.
8. Manage all liquid and solid IDW as described in Section 4.5.

4.2.4 Alternative Groundwater Purging and Sampling Procedures

Some wells at FWDA require alternative methods of purging and sampling due to extremely low-yield/low-water levels. For these wells, purging and sampling are performed by hand bailing with disposable bailers, a submersible pump, or a dedicated pump. The methods required for purging and sampling are identified for each well in Table 4-1 and the type of equipment used is identified in Table 4-2. The sampling method used for each well will be recorded on the individual sample log for each well.

These procedures emphasize the need to remove a sufficient volume of water from each well to assure that the sampled groundwater is representative of the surrounding formation. Removal of a quantity of water equal to three borehole volumes will be completed wherever possible. If yield does not allow for three borehole volumes to be purged, then the well will be purged dry. The well will then be allowed to recharge a minimum of 12 hours, and groundwater sample collection will begin the following day. Samples must be collected within 24 hours of purging well dry unless well is purged dry again during sampling. See Section 4.2.1.2 for calculation of the well purge volume.

Field parameters will be monitored at a time interval determined by the purge rate, and values will be recorded on the sample collection form (Appendix C). Assure that a minimum of three field parameter readings have been collected. Purging is considered complete, and sampling will occur after the evacuation of three well volumes or when the well is emptied due to very slow water level recovery and is considered dry.

4.2.4.1 Disposable Bailers

The following steps describe purging and collecting groundwater samples with disposable bailers:

1. Attach bailing string to bailer and lower into the monitoring well; allow bailer to fill with groundwater.
2. Raise bailer out of the monitoring well and empty purge water into a reusable bucket or storage containers designated for IDW.
3. Repeat process until the calculated volume of groundwater has been purged from the monitoring well (three times the well volume) or the well is dry. Collect water quality measurements from water evacuated from the bailer. A minimum of three measurements will be collected.
4. Use a new bailer for sample collection if the well was bailed dry.
5. Collect samples with the disposable bailer in the same manner as low-flow purging described in Section 4.2.3.
6. To filter groundwater samples for dissolved metals and/or perchlorates analysis, use a hand pump filter or run water through a peristaltic pump with dedicated tubing and in-line filter. Sample filtering and preservation will be performed in accordance with laboratory and method requirements as listed in Table 4-3.

4.2.4.2 Reusable Submersible Pump

For wells that cannot support low-flow pumping, but that contain more water than can be efficiently bailed, a submersible pump may be used to purge the well. The field team will assess these conditions based on current water level conditions. Procedures for purging and collection of groundwater samples using a submersible pump are as follows:

1. Attach clean unused tubing to the pump and secure the tubing to pump.
2. Lower the pump into the well to approximately 6 inches from the bottom of the well.
3. Secure the tubing and lead line, then attach tubing to flow-through cell and lead line to control box, and then secure the control box to the power source.
4. Begin purge at a flow rate of between 0.5 to 2 gpm until well has been purged dry. During well purging, monitor and record a minimum of three field parameter readings.
5. After purging, remove pump and tubing. Allow water levels to recharge and collect samples via a disposable bailer.
6. Decontaminate the pump after purging is complete as described in Section 4.4.
7. Remove and dispose of tubing after completion of purging at each monitoring well. Manage all liquid and solid IDW as described in Section 4.5.

4.2.4.3 Dedicated Bennett Pump

The Bennett Sample Pump system consists of a piston activated with pressurized nitrogen gas through a tube, a second tube that returns groundwater to the surface, and a third tube for gas exhaust. Bennett pumps have been installed in deep wells with poor yields that have borehole volumes in excess of 15 gallons. Monitoring wells at FWDA equipped with Bennett pumps are identified in Table 4-1. The Bennett pump intake was placed approximately 2 feet from the bottom of each monitoring well. Procedures for using a Bennett pump to purge and collect groundwater samples are as follows:

1. Connect the air intake tubing from the dedicated pump to the pressurized nitrogen cylinder. Connect the discharge tubing to the flow-through cell.
2. Turn on gas flow from the nitrogen cylinder. Use initial pumping rates previously established for borehole volume purging based on specific well yield.

3. Monitor and record all adjustments to pumping rate. Collect a minimum of three field parameters at a rate of between one per 3 minutes to one per 15 minutes depending on the purge volume.
4. When well is purged dry, allow for recharge. Collect samples using the methods described in Section 4.2.3.

4.2.4.4 Dedicated Waterra Inertial Pump

The Waterra Inertial pump system consists of lever pump or a hydrolift system that raises and lowers dedicated tubing with a check valve on the bottom and a pump to slowly bring water to the surface. Monitoring wells at FWDA equipped with Bennett pumps are identified in Table 4-1 and may be converted to the Waterra Inertial pump system in the future. The Waterra intake is placed approximately 2 feet from the bottom of the monitoring well. Procedures for using a Waterra pump system to purge and collect groundwater samples are as follows:

1. Connect dedicated tubing from the well to the lever or hydrolift clamp. Connect non-dedicated discharge tubing to the top of the dedicated tubing and to the flow-through cell.
2. Connect the pump to the power sources and turn on pump using the settings from the previous sampling event.
3. Monitor and record all adjustments to pumping rate and field parameters as described in Section 4.2.2.1.
4. When well is purged dry, allow for recharge. Collect samples using the methods described in Section 4.2.3.

4.3 Sample Management and Sample Handling

Proper sample handling, shipment, and maintenance of chain-of-custody documentation are key components of the quality system designed to obtain data that can be used to make project decisions. To be successful, all sample handling protocols and chain-of-custody requirements must be followed completely, accurately, and consistently. All samples shipped to a laboratory must be accompanied by a properly completed chain-of-custody form.

The unique sample identifiers and descriptive information (for example, sample location, date, and collection time) will be listed on the chain-of-custody form. Individuals relinquishing or receiving possession of samples will sign and note the time on the chain-of-custody form in the “relinquished by” or “received by” boxes, respectively. The signed chain-of-custody forms (Appendix C) demonstrate the transfer of sample custody from the sampler to the laboratory.

4.3.1 Sample Handling Procedures

After filling each sample container, immediately seal, label, and place container into an iced cooler for the remainder of the day’s sampling activities before packing the samples. Samples may also be transported and stored at a predetermined holding location in coolers with ice or in a sample holding refrigerator. Samples will be shipped daily for any methods with sample holding times less than three days. If a sample is collected after sample packing and shipment is completed for the day, it may be held overnight in the sample holding refrigerator pending the samples’ laboratory holding time. Sample containers, preservation, and holding times are presented in Table 4-3 by analytical method.

Check container lids to verify they are tight and will not leak during transport. Seal analytical samples in individual re-sealable plastic bags and position them within the cooler to prevent damage and to maintain sample integrity. Containers may be wrapped in bubble wrap as necessary.

Ship samples in hard plastic coolers or ice chests. Coolers or ice chests will be lined with contractor-provided trash bags; all bagged samples will be placed inside the trash bag, and ice will be placed outside the inner trash bag in sealed containment to prevent leakage (such as secondary trash bag or re-sealable plastic bags). When ice and samples are packed in the cooler or ice chest, the contractor-provided trash bag will be sealed to prevent leakage outside of the cooler or ice chest.

4.3.2 Chain-of-custody Requirements

The following information will be included on the TestAmerica Laboratories, Inc., chain-of-custody forms (Appendix C). The information will either be printed clearly and legibly or typed on an electronic chain-of-custody form:

- Site name and project name or number
- Each sample identification code, date sample was collected, sampling times (in military format)
- Total number of containers for each sample, the analyses, and associated number of sample bottles for each analysis
- Signature of the sample team leader or sample collector
- Carrier service (such as FedEx or UPS), air bill number, and custody seal number, if applicable
- Signature, date, and time in the “relinquished by” section

The signed chain-of-custody form will be placed in a plastic bag and taped to the inside of the lid in each cooler or ice chest. If more than one cooler or ice chest is being used, each will have its own documentation. The cooler or ice chest will be closed and secured with strapping tape and custody seals. Custody seals will be placed so that if the cooler or ice chest is opened, the custody seal will be broken. Clear tape will be placed over the custody seal to prevent damage to the seal.

The completed and signed chain-of-custody forms will become part of the project record.

4.3.3 Sample Shipping

Samples will be analyzed at TestAmerica. If requested by USACE, a second laboratory (chosen by USACE) will be used to analyze triplicate samples.

All samples, with the exception to VOC samples, will be packed and shipped daily to TestAmerica in Arvada, Colorado. VOC samples will be shipped separately to the TestAmerica laboratory in St. Louis, Missouri.

4.3.4 Analytical Methods

Sample analysis will be performed by TestAmerica, the DOD ELAP-certified laboratory. Reference limits for analytical methods are provided in Table 4-3. Analytical methods are selected in accordance with the most recent methods consistent with the QSM (DOD, 2013a) and consistent with RCRA regulations. The most recent EPA SW846 solid waste methods were determined to be appropriate methods to meet DQOs as well as conform to RCRA regulations and DOD guidance. The selected TestAmerica laboratory can support the volume of samples to be generated and provide high-quality results with the overall lowest available analytical reporting levels.

4.4 Decontamination

Non-dedicated measurement and sampling equipment such as water-level meters and submersible pumps will be decontaminated before and after each use. Water-level meters will be decontaminated during extraction from monitoring wells using deionized water and a non-phosphate detergent cleaning solution. Submersible pumps will be decontaminated using the following procedure:

1. If necessary, remove particulate matter or debris using a brush or hand-held sprayer filled with deionized water.
2. Scrub the surfaces of the equipment using deionized water and a non-phosphate detergent cleaning solution and reusable dedicated decontamination brushes.
3. Rinse the equipment thoroughly with deionized water.
4. Place the equipment on a clean surface and allow to air dry.

5. Containerize all decontamination liquids and manage as IDW, as described in Section 4.5.
6. After decontamination operations, handle equipment so as to prevent re-contamination. The area where the equipment is stored prior to re-use will be free of contaminants.

Sampling equipment dedicated for use at specific wells will not require decontamination prior to use. Disposable sampling equipment that is used once and then disposed of will not require decontamination prior to use, provided it is wrapped in the manufacturer’s packaging or otherwise protected from inadvertent contamination prior to use.

4.5 Waste Management Procedures

Three types of groundwater IDW may be generated during the groundwater sampling events at FWDA: purge water and excess sample water from monitoring wells, decontamination liquids (non-hazardous soap and water), and solid waste (disposable sampling equipment and personal protective equipment).

Purge water, decontamination water, and other non-hazardous liquid IDW will be containerized at the sample site in liquid waste containers, such as buckets with a watertight lid, or polyethylene drums with a sealing bung. Depending on the volumes generated, water from multiple wells may be consolidated into one or more containers. At the end of the sampling day, the liquid IDW containers will be emptied into one of two low-density polyethylene-lined evaporation tanks. The evaporation tanks are located at the former Building 542 in Parcel 6.

All solid waste such as disposable sampling equipment, personal protective equipment, and general refuse will be placed in plastic trash bags. Small quantities of waste will be disposed of in trash containers (dumpsters) located in the Administration Area; large quantities of waste material will be transported offsite for disposal as municipal waste.

4.6 Quality Assurance Procedures

4.6.1 Field Equipment Calibration and Preventative Maintenance

Field instruments will be calibrated, operated, and maintained in accordance with the manufacturer’s instructions. Daily onsite field instrument calibrations will be performed before and during each day’s use by trained technicians using certified standards. Instrument calibrations will be recorded in bound logbooks dedicated to calibration data and will include field instrument identification, date of calibration, standards used, and calibration results.

If an individual suspects an equipment malfunction, the meter will be removed from service and tagged so that it is not used inadvertently, and a substitute piece of equipment will be used. Additionally, equipment that fails calibration or becomes inoperable during use will be removed from service and tagged. Such equipment will be repaired and satisfactorily re-calibrated. The results of activities performed using equipment that has failed re-calibration will be evaluated. If the results are adversely affected, the outcome of the evaluation will be documented, and the USACE COR will be notified. Equipment that cannot be repaired will be replaced. Back-up equipment will be available in the field for use in case of a malfunction.

Preventative maintenance procedures for the field instruments will be carried out in accordance with procedures outlined by the manufacturer’s equipment manuals. All records of inspection and maintenance will be dated and documented in the appropriate field logbook. Critical spare parts for field instruments will be included in the sampling kits to minimize downtime. In addition, back-up meters will be available, if needed. Spare parts will be purchased from accepted vendors. Daily inspections of field equipment will be conducted to assure that equipment is functioning properly. If inspection results indicate that a piece of field equipment is deemed faulty or not usable, replacement equipment will be cleaned, calibrated if necessary, and used in place of the faulty equipment. The faulty equipment will then be shipped back to the vendor for repair.

4.6.2 Sample Collection Quality Assurance

Several types of field quality control (QC) samples will be submitted to the analytical laboratory to assess the quality of the data resulting from the field sampling program in compliance with the QSM (DOD, 2013a). The QSM Version 5 is included in Appendix D. These samples will include field duplicate samples, trip blanks, equipment rinsate blanks, field blanks, and matrix spike (MS) and matrix spike duplicate (MSD) samples.

Field duplicate samples will be collected at a frequency of one per 10 environmental samples. The MS/MSD samples will be collected at a frequency of one per 20 environmental and field duplicate samples. QA split samples may be completed at the government's discretion to check the contractor's laboratory quality performance. Field equipment rinsate blanks are collected at the beginning of the sample event, once per 20 environmental samples, and/or one at the end of the sample event (minimum of 2 samples per event), on non-dedicated equipment.

Each shipment that contains samples for VOC or GRO analyses will contain a trip blank. The trip blank will be placed in a cooler containing VOC or GRO samples and will stay with the cooler until the cooler is returned to the analytical laboratory. Additional volume will be collected at specified sample locations so that one MS/MSD pair will be submitted to the laboratory for every 20 environmental samples.

4.6.3 Documentation Quality Assurance

Field documentation will consist of one or more job- or area-specific field logbooks, field forms, sample chain-of-custody forms, and sample logs/labels. Photographic documentation is not required.

4.6.3.1 Logbooks

Site and field logbooks provide a daily handwritten record of all field activities. All logbooks will be permanently bound and have a hard cover. Logbooks will be ruled, or ruled and gridded, with sequentially numbered pages. All entries into field logbooks will be made with indelible ink. Field logbooks are detailed daily records that are kept in real time and are assigned to specific activities, positions, or areas within the site. Separate logbooks will be used for each sampling and field team.

Documentation in field notebooks will include the following (as necessary):

- Location
- Date and time
- Names of field crew
- Names of subcontractors
- Weather conditions during field activity
- Sample type and sampling method
- Location of sample
- Sample identification number
- Decontamination and health and safety procedures
- Sampling notes (such as well condition, unexpected maintenance, work stoppage, etc.)

A separate logbook dedicated to calibration records will be maintained to include the following information:

- Equipment make, model, and serial number (or other unique identifier)
- Date and time
- Calibration results
- Adverse trends in instrument calibration behavior
- Field instrument identification, date of calibration, and standards used

If entries in the field notebooks must be corrected or changed, corrections will be made by crossing out mistakes with a single line, writing the corrections, and initialing and dating the entry. The use of correction fluid is not permitted. At the conclusion of each field day, the sampling team leader will review each page of the logbook for errors and omissions. The sampling team leader will then date and sign each reviewed page.

4.6.3.2 Field Data Record Forms

In addition to the field notebooks, purging and sampling forms are used to document field efforts (Appendix C). These forms assure that all required data and observations are recorded in a consistent manner. No blank spaces will be left; all non-applicable items will be marked “not applicable.” Forms that will be used include well sampling forms and chain-of-custody forms.

4.6.3.3 Final Evidence File Documentation

All evidential file documentation will be maintained under an internal project file system. The USACE COR will assure that all project documentation and QA records are properly stored and retrievable.

TABLE 4-1

Groundwater Purge Method (Page 1 of 2)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	Casing Diameter (in)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Screen Length (in)	Dedicated Pump?	Low Flow?	Purge Method
Open Burn Open Detonation Area							
BGMW05	2.00	61.00	36-56	20.0	No	No	Hand Bail
BGMW06	2.00	131.00	110-130	20.0	No	No	Hand Bail
CMW02	2.00	43.0	25.0-35.0	10.0	Yes	Yes	ZIST Low Flow
CMW10	2.00	70.9	50.5-70.5	20.0	No	No	Hand Bail
CMW19	2.00	52.8	33.5-48.5	15.0	Yes	No	Waterra Pump
CMW23	2.00	112.0	84.0-104.0	20.0	No	No	Hand Bail
CMW24	2.00	262.0	230.0-260.0	30.0	No	No	Submersible Pump
CMW26	2.00	85.00	64-84	20.0	No	No	Submersible Pump
CMW28B	2.00	81.50	60-80	20.0	No	No	Hand Bail
CMW31B	2.00	110.00	78-108	30.0	Yes	No	Waterra Pump
CMW32	2.00	116.50	95-105	10.0	No	No	Hand Bail
KMW09	2.00	80.4	60.0-70.0	10.0	Yes	Yes	ZIST Low Flow
KMW11	2.00	63.0	35.0-55.0	20.0	Yes	Yes	Traditional Low Flow
KMW12	2.00	75.0	53.0-73.0	20.0	Yes	No	Bennett Pump
KMW13	2.00	52.5	32.0-52.0	20.0	No	No	Hand Bail
KMW16	2.00	201.00	159-199	40.0	No	No	Hand Bail
Northern Area							
BGMW01	2.50	33.0	12.5-32.5	20.0	Yes	Yes	Traditional Low Flow
BGMW02	2.50	34.0	13.5-33.5	20.0	Yes	Yes	Traditional Low Flow
BGMW03	2.50	29.0	8.5-28.5	20.0	Yes	Yes	Submersible Pump
MW01	2.00	55.0	33.6-53.6	20.0	No	No	Hand Bail
MW02	2.00	48.0	37.0-47.0	10.0	No	No	Hand Bail
MW03	2.00	53.0	43.0-53.0	10.0	Yes	Yes	Traditional Low Flow
MW18D	2.00	59.9	47.0-57.0	10.0	Yes	Yes	Submersible Pump
MW20	2.00	59.4	47.0-57.0	10.0	Yes	Yes	Traditional Low Flow
MW22D	2.00	58.6	47.0-57.0	10.0	Yes	Yes	Traditional Low Flow
MW23	2.50	134.0	63.5-133.5	70.0	Yes	No	Bennett Pump
MW24	2.50	66.5	16.0-66.0	50.0	Yes	No	Bennett Pump
SMW01	2.00	50.2	29.9-49.9	20.0	Yes	Yes	Traditional Low Flow
TMW01	2.00	60.0	44.0-59.0	15.0	Yes	Yes	Traditional Low Flow
TMW02	2.00	85.0	67.9-81.9	14.0	Yes	Yes	Traditional Low Flow
TMW03	2.00	70.1	49.8-69.8	20.0	Yes	Yes	Traditional Low Flow
TMW06	2.00	57.0	45.0-55.0	10.0	Yes	Yes	Traditional Low Flow
TMW10	2.00	65.0	28.0-58.0	30.0	Yes	Yes	Hand Bail
TMW13	2.00	72.5	60.7-70.7	10.0	Yes	Yes	Traditional Low Flow
TMW14A	2.00	110.0	94.25-109.25	15.0	Yes	Yes	ZIST Low Flow
TMW16	2.00	142.0	123.0-138.0	15.0	Yes	No	Bennett Pump
TMW17	2.00	152.0	112.0-127.0	15.0	Yes	Yes	ZIST Low Flow
TMW21	2.00	72.0	48.0-58.0	10.0	Yes	Yes	Submersible Pump
TMW22	2.00	77.0	52.0-62.0	10.0	No	No	Submersible Pump
TMW23	2.00	72.0	46.0-56.0	10.0	No	No	Submersible Pump
TMW24	2.00	75.0	44.0-54.0	10.0	Yes	Yes	Traditional Low Flow
TMW25	2.00	74.0	42.5-52.5	10.0	Yes	Yes	Traditional Low Flow
TMW27	2.00	102.2	60.0-70.0	10.0	Yes	Yes	Traditional Low Flow
TMW30	2.00	51.5	35.0-45.0	10.0	No	No	Submersible Pump
TMW31D	2.00	111.5	77.0-107.0	30.0	Yes	Yes	Traditional Low Flow
TMW31S	2.00	61.0	50.0-60.0	10.0	No	No	Submersible Pump
TMW32	2.00	139.1	117.0-137.0	20.0	Yes	Yes	Traditional Low Flow
TMW33	2.00	60.4	37.0-57.0	20.0	No	No	Submersible Pump
TMW34	2.00	57.25	37.0-57.0	20.0	Yes	Yes	Traditional Low Flow

TABLE 4-1

Groundwater Purge Method (Page 2 of 2)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	Casing Diameter (in)	Well Depth (ft bgs)	Screened Interval (ft bgs)	Screen Length (in)	Dedicated Pump?	Low Flow?	Purge Method
TMW36	2.00	157.0	132.0-152.0	20.0	Yes	No	Bennett Pump
Northern Area (Continued)							
TMW38	2.50	159.5	118.9-158.9	40.0	Yes	Yes	Traditional Low Flow
TMW39S	2.50	53.0	32.5-52.5	20.0	No	No	Submersible Pump
TMW39D	2.50	100.5	70.0-100.0	30.0	Yes	Yes	Traditional Low Flow
TMW40D	2.50	155.5	135.0-155.0	20.0	Yes	Yes	Traditional Low Flow
TMW41	2.50	66.0	55.5-65.5	10.0	No	No	Submersible Pump
TMW43	2.50	78.5	58.0-78.0	20.0	Yes	Yes	Traditional Low Flow
TMW45	2.50	59.0	38.5-58.5	20.0	Yes	Yes	Traditional Low Flow
TMW46	2.50	59.0	38.5-58.5	20.0	No	No	Submersible Pump
TMW47	2.50	103.0	82.5-102.5	20.0	Yes	Yes	Traditional Low Flow
TMW48	2.50	91.5	71.0-91.0	20.0	Yes	Yes	Traditional Low Flow

ft bgs = feet below ground surface

ID = Identification

in = Inches

ZIST = Zone Isolation System Technology

TABLE 4-2

Field Equipment and Materials

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Equipment and Materials	**Elevation Survey**	**Traditional Low-Flow**	**ZIST Low- Flow**	**Hand Bail**	**Submersible Pump**	**Bennett Pump**	**Waterra Pump**
Electronic water level meter, capable of measuring to 0.01 feet accuracy	X	X	X	X	X	X	X
Power source (generator, portable rechargeable battery, and connectors)[a]		X	X		X		X
Nitrogen Tanks with airline hoses and pressure regulator		X	X			X	
Reusable submersible pump setup (control boxes, flow regulator, pump assembly, pump cable, power supply)					X		
Reusable Waterra pump setup							X
Power Inverter		X	X				
Indicator field parameter monitoring instruments		X	X	X	X	X	X
Flow measurement supplies (graduated cylinder and stopwatch)		X	X	X	X	X	X
Extra tubing		X	X		X	X	X
Bailers and bailing string				X			
Clamp or connector		X	X	X	X	X	X
Reusable buckets or storage containers for purge water		X	X	X	X	X	X
Reusable large portable water tanks (250 gallon or greater)						X	
Decontamination supplies (including non-phosphate detergent, distilled water, brushes, and dedicated decontamination buckets)	X	X	X	X	X	X	X
Plastic sheeting or absorbent pads	X	X	X	X	X	X	X
Disposable latex or nitrite gloves	X	X	X	X	X	X	X
Safety glasses	X	X	X	X	X	X	X
Trash bags	X	X	X	X	X	X	X
Sample bottles and sample labels		X	X	X	X	X	X
Shipping supplies (including coolers, resealable bags, tape, cushioning material , shipping forms)		X	X	X	X	X	X
Logbook and sampling forms	X	X	X	X	X	X	X
Well construction data, location map, field data from last sampling event	X	X	X	X	X	X	X
Well keys	X	X	X	X	X	X	X

Notes:

*If a gasoline generator is used, it will be located downwind and at least 15 feet from the well so that the exhaust fumes do not contaminate the samples

ZIST = Zone Isolation Sampling Technology

TABLE 4-3

Sample Containers, Preservation, and Holding Time by Analytical Method

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Analytical Group	Analytical Method	Container (Number, Size, and Type)	Preservation	Holding Time
TCL VOCs	SW8260C	(3) - 40 mL VOC glass vials	No headspace; Cool <6°C, HCL to pH<2	14 days preserved
TCL SVOCs	SW8270D	(2) - 1-L amber bottle	Cool <6°C	7 days to extraction, 40 days to analysis
TPH-GRO	SW8015C	(3) - 40 mL VOC glass vials	No headspace; Cool <6°C, HCL to pH<2	14 days preserved
TPH-DRO	SW8015C	(2) - 1-L amber bottle	Cool <6°C	7 days to extraction, 40 days to analysis
Explosives	SW8330B	(2) - 1-L amber bottles	Cool <6°C	7 days to extraction, 40 days to analysis
Nitrate/Nitrite	SW9056A	(1) - 250-mL poly	Cool <6°C	48 hours
Perchlorate	SW6860	(1) - 250-mL poly bottle, field filtered	One third bottle headspace; Cool <6°C	28 days
TAL Total Metals and Mercury (unfiltered)	SW6010C/6020 A/ 7470A	(1) - 250-mL poly bottle, field filtered	Cool <6°C, HNO3 to pH<2	28 days
TAL Dissolved Metals and Mercury (filtered)	SW6010C/6020 A/ 7470A	(1) - 1-L poly bottle	Cool <6°C, HNO3 to pH<2	28 days

Notes:

°C = degrees Celsius

DRO = diesel range organics

GRO = gasoline range organics

HCL = hydrochloric acid

HNO3 = nitric acid

L = liter

mL = milliliter

poly = polyethylene

SVOCs = semivolatile organic compounds

TAL = total analyte list

TPH = total petroleum hydrocarbons

VOCs = volatile organic compounds

5.0 Monitoring and Sampling Program

Interim groundwater monitoring at FWDA is being performed to track contaminant plume concentration and migration at sites with previously identified groundwater impacts. The current monitoring well network has been designed based on the current understanding of site conditions. The monitoring plan will be updated as new information is obtained from interim monitoring, from RFIs, or other definitive groundwater investigations.

5.1 Interim Groundwater Monitoring Analytical Program

The Army has identified COPCs for interim groundwater monitoring based on existing groundwater data and point of release assessments discussed in Section 3.7 and Section 3.8. Sample analytical methods were selected based upon the COPCs and the DQOs. The groundwater analytical program complies with the RCRA Permit (NMED, 2015) and the QSM requirements (DOD, 2013a). Figure 5-1 shows how cleanup criteria/project screening level criteria are determined according to the RCRA Permit. TestAmerica is the contracted DOD ELAP-certified laboratory selected for sample analysis. The team chemist and project manager will coordinate with the TestAmerica point of contact, Michelle Johnston to schedule sample analysis, receive laboratory containers and supplies, resolve sample issues, and report results.

Analytical methods have been selected, and an analytical laboratory has been contracted with laboratory detection limits (DLs) sufficient to meet DQOs for cleanup criteria (MCLs or NM WQCC standards). The limit of quantitation is less than the final screening level objective for all compounds except for vinyl chloride, benzo (a) pyrene, bis(2-ethylhexyl) phthalate, hexachlorobenzene, pentachlorophenol, and phenol. For vinyl chloride, bis(2-ethylhexyl) phthalate, and phenol, the DL is sufficient to accurately assess potential contaminant concentrations. For hexachlorobenzene, the DL is sufficient to assess potential contaminant concentrations. Pentachlorophenol is not of concern because it is not a compound associated with historical site activities and has not been detected in groundwater at FWDA. Benzo(a)pyrene has been detected in soil but has not been detected in groundwater during interim monitoring.

Some analytes included in interim groundwater monitoring have no established cleanup criteria. Where no cleanup criteria have been determined, the EPA Region 6 RSLs have been listed as screening criteria. The conservative RSL screening values for some VOC and SVOC compounds are not achievable by current EPA laboratory methods. The list of analytes, along with cleanup criteria and contracted laboratory limits, are presented in Table 5-1.

5.2 Monitoring Location and Frequency

The groundwater monitoring plan was designed for each point of release in accordance with the DQOs and decision criteria described in Section 1.4. The monitoring wells included in the program and the associated analyses are presented in Table 5-2 and Table 5-3. Groundwater monitoring activities consist of water-level elevation measurements and groundwater sample collection.

The Army proposes that semiannual groundwater elevation monitoring is sufficient to meet the project DQOs. Water-level elevation measurements were previously collected on a quarterly frequency from all monitoring locations. Based on review of the historical data, annual seasonal changes in groundwater level elevations are typically less than one foot in most locations (Table 5-2). These observed changes were not sufficient to significantly alter groundwater flow directions and gradients contaminant plume areas (Sundance and CH2M, 2017a, 2016a, 2016b, 2012). Therefore, semiannual measurement of water-level elevations is sufficient to monitor groundwater flow direction and gradient.

The Army proposes to continue groundwater sampling activities on a semiannual basis consistent with the current groundwater monitoring program at FWDA. Review of groundwater monitoring data from 2008 to 2016 identified relatively stable groundwater contaminant plume shapes and stable groundwater flow directions and gradients.

All designated monitoring locations will be sampled at a semiannual frequency. Monitoring locations are designated as downgradient, upgradient, and background to the points of release described in the CSM (Table 3-1, Figures 3-4 to 3-18). Sentinel wells are designated as locations that monitor potential offsite migration of contamination. Sample analyses for upgradient and downgradient locations were selected based on the wells association with COPC points of release in accordance with the DQO decision logic. Locations designated as background and sentinel wells will be sampled for COPCs associated with the corresponding aquifer unit. As described in Section 3.6, no groundwater releases have been identified for dioxins/furans, cyanide, herbicides, pesticides, white phosphorous, or PCBs.

The Army does not propose to optimize the interim groundwater monitoring program at this time. Characterization under several RFIs is ongoing at FWDA (see Section 2.2). Once the RFIs have been completed, the findings will be used to revise the CSM and update the monitoring program design. An assessment of groundwater metals contamination cannot be completed without a statistically valid background evaluation and regulatory approval of groundwater background concentrations. A sufficient number of background monitoring well locations and their associated analyses exist for the Northern Area alluvial aquifer to support a background evaluation. However, additional background monitoring well locations and analyses are needed for the Northern Area bedrock aquifer to prepare a statistically valid background evaluation. Once additional bedrock aquifer background monitoring locations are installed, interim monitoring will be performed to collect additional data in support of background evaluations.

5.2.1 Northern Area Alluvial Groundwater Monitoring Design

Nitrate and Nitrite Plume

The points of release for the groundwater nitrate/nitrite plume in the Northern Area are SWMU 1 (TNT Leaching Beds Area) and SWMU 27 (Building 528 Complex). One extensive commingled plume extends across the Workshop and Administration Areas. To monitor suspected releases from SWMU 27 (Building 528 Complex), wells TMW01, TMW13, TMW31S, and TMW41 are designated as downgradient wells. These four wells are hydraulically upgradient of SWMU 1, but downgradient of SWMU 27 (Table 3-1, Figure 3-4). To monitor the shape and migration of the nitrate plume originating from SWMU 1 (TNT Leaching Beds Area), MW03, MW22D, TMW10, TMW21, TMW22, TMW23, TMW25, TMW43, and TMW45 are designated as downgradient wells (Figure 3-4). In addition, wells TMW03, TMW34, TMW40S, and TMW46 have historically had the highest nitrate concentrations within the plume and are designated as downgradient wells to monitor nitrate plume concentrations over time (Sundance and CH2M, 2017a). Upgradient monitoring locations designated for the alluvial aquifer nitrate plume are BGMW02, TMW24, and TMW47 based on the groundwater flow direction (Figure 3-4).

Explosives Plume

The points of release for the groundwater explosives plume in the Northern Area are SWMU 1 (TNT Leaching Beds Area) and SWMU 27 (Building 528 Complex). The alluvial aquifer explosives plume extends across the Workshop Area along a preferential groundwater flow channel. To monitor suspected releases from SWMU 27 (Building 528 Complex), wells TMW01, TMW13, TMW31S, and TMW41 are designated as downgradient wells. These four wells are hydraulically upgradient of SWMU 1, but downgradient of SWMU 27 (Table 3-1, Figure 3-5). To monitor the shape and migration of the explosives plume originating from SWMU 1 (TNT Leaching Beds Area), MW03, TMW06, TMW22, TMW23, TMW43, and TMW45 are designated as downgradient wells (Figure 3-1). In addition, wells TMW03 and TMW40S have historically had the highest groundwater RDX concentrations within the plume and are designated as downgradient wells to monitor plume concentrations over time (Sundance and CH2M, 2017a). Upgradient monitoring locations for the explosives plume are designated as BGMW02 and TMW47 according to the groundwater flow direction (Figure 3-5).

Perchlorate Plume

The point of release for the groundwater perchlorate plume in the Northern Area is SWMU 27 (Building 528 Complex). To monitor plume migration along the downgradient boundary of the plume, TMW03, TMW13, and

TMW41 are designated as downgradient wells (Table 3-1, Figure 3-6). No monitoring wells are designated as upgradient locations because the alluvial aquifer is dry upgradient of SWMU 27. Groundwater samples from wells TMW01, TMW31S, and TMW39S have historically had the highest perchlorate concentrations within the plume and are designated as downgradient wells to monitor perchlorate plume concentrations over time (Sundance and CH2M, 2017a).

Metals Monitoring

The points of release for metals in the Northern Area are SWMU 1 (TNT Leaching Beds Area), SWMU 27 (Building 528 Complex), and SWMU 50 (UST 7 at Building 45). No groundwater metals plumes have been identified at FWDA pending determination of groundwater background concentrations. Therefore, monitoring locations along the outside edges of the monitoring network are selected to provide data that could be used to monitor potential contaminant migration. The boundary wells MW01, TMW01, TMW10, TMW13, TMW21, TMW23, TMW25, TMW27, TMW31S, TMW41, and TMW46 are designated as downgradient wells (Table 3-1, Figure 3-7). In addition, groundwater samples from locations MW18D, TMW33, TMW34, TMW40S, and TMW44 have the highest concentrations of metals in excess of MCLs are also designated as downgradient wells (Sundance and CH2M, 2017a). Locations BGMW02, TMW24, and TWM47 are identified as upgradient monitoring wells for metals points of release based on the groundwater flow direction (Figure 3-7).

Other Organics Monitoring

The points of release for the groundwater VOC plume in the Northern Area are SWMU 45 (Building 6 Gasoline Station) and SWMU 50 (UST 7 at Building 45). The 1,2-dichloroethane plume is present directly adjacent to SWMU 45. Historically, exceedances of 1,2-dichloroethane were also observed downgradient of SWMU 50. Locations MW01, MW02, and MW03 are designated as downgradient wells for SWMU 50 (UST 7 at Building 45). These three wells are hydraulically upgradient of SWMU 45 but downgradient of SWMU 50 (Table 3-1, Figure 3-8). Locations MW18D, MW20, MW22D, TMW33, and TMW46 are designated as downgradient wells for SWMU 45 (Figure 3-8). Groundwater samples from these wells have the highest concentrations of 1,2-dichloroethane and have historically had groundwater benzene concentrations greater than the MCL (Sundance and CH2M, 2017a). Upgradient monitoring locations for the VOC plume are designated as TMW24 and TMW45 according to the groundwater flow direction (Figure 3-8).

The points of release for the SVOCs in the Northern Area are SWMU 6 (Building 11, former Locomotive Shop) and SWMU 45 (Building 6 Gasoline Station). There are no groundwater SVOC plumes identified at FWDA; however, monitoring is planned for the suspected releases of petroleum fuels at SWMU 6 and known releases of fuels at SWMU 45. Locations MW18D, MW20, MW22D, TMW33, TMW34, and TMW-46 are designated as downgradient wells (Table 3-1, Figure 3-9). The upgradient monitoring location for the SVOC points of release in the alluvial aquifer is designated as TMW24 (Figure 3-9).

The points of release for the DRO in the Northern Area are SWMU 6 (Building 11, former Locomotive Shop), SWMU 45 (Former Gas Station), and SWMU 7 (Fire Training Ground). Locations MW18D, MW20, MW22D, TMW21, TMW25, TMW33, TMW34, and TMW46 are designated as downgradient wells (Table 3-1, Figure 3-10). The designated downgradient monitoring locations include those with highest historical DRO detections (Appendix B). Upgradient alluvial aquifer monitoring locations for the DRO points of release are TMW24 and TMW45 (Figure 3-10).

The points of release for the GRO in the Northern Area are SWMU 45 (Building 6 Gasoline Station) and SWMU 50 (Structure 35, UST 7). The VOC releases are believed to be associated with GRO releases; therefore, the same monitoring locations may be applied to both COPCs. Locations MW01, MW02, MW03, MW18D, MW20, MW22D, TMW33, and TMW46 are designated as downgradient wells (Table 3-1, Figure 3-11). The designated downgradient monitoring locations include those with highest historical GRO detections (Appendix B). Upgradient monitoring locations for the GRO points of release in the alluvial aquifer are designated as TMW24 and TMW45 (Figure 3-11).

Background and Sentinel Wells

The monitoring locations designated as alluvial aquifer background and sentinel wells will be monitored for all Northern Area COPCs. In the Northern Area, alluvial groundwater zones BGMW01 and BGMW03 are selected as background wells (Figure 3-15). Monitoring well BGMW02 is not designated as a background location due to suspected impacts from offsite sources; however, BGMW02 but will continue to be monitored (Sundance and CH2M, 2017a). In the Northern Area, alluvial groundwater zone wells MW23 and MW24 are designated as sentinel wells (Figure 3-15).

5.2.2 Northern Area Bedrock Groundwater Monitoring Design

Nitrate and Nitrite Plume and Explosives and Metals Monitoring

The points of release for the bedrock aquifer nitrate/nitrite and explosives plumes explosives and suspected metals releases in the Northern Area are SWMU 1 (TNT Leaching Beds Area) and SWMU 27 (Building 528 Complex). Two nitrate plumes are present in the bedrock aquifer across the Workshop Area. To monitor known and suspected releases from SWMU 27 (Building 528 Complex) wells TMW30, TMW31D, TMW32, TMW39D, and TMW48 are designated as downgradient wells. These four wells are hydraulically upgradient of SWMU 1, but downgradient of SWMU 27 (Table 3-1, Figure 3-12). To monitor known and suspected releases from SWMU 1 (TNT Leaching Beds Area), TMW02, TMW36, TMW38, and TMW40D are designated as downgradient wells (Figure 3-12). These downgradient locations also include the wells where the highest concentrations of nitrate, RDX, and metals have been historically detected (Sundance and CH2M, 2017a). No upgradient monitoring locations are designated because dry and impermeable shale bedrock is present upgradient of the points of release, and no wells have been installed in this area.

Perchlorate Plume

The point of release for the bedrock groundwater perchlorate plume in the Northern Area is SWMU 27 (Building 528 Complex). The perchlorate plume is present across the eastern half of the Workshop Area. To monitor the plume boundary wells, TMW02, TMW32, TMW36, TMW38, TMW39D, and TMW40D are designated as downgradient wells (Table 3-1, Figure 3-13). In addition, locations TMW30, TMW31D, and TMW48 have historically had the highest groundwater perchlorate concentrations and are designated as downgradient wells to monitor overall plume concentrations over time (Sundance and CH2M, 2017a).

Other Organic COPCs Monitoring

The suspected point of release for SVOCs in bedrock aquifer of the Northern Area is SWMU 8 (Building 537, removed). There are no identified groundwater SVOC plumes at FWDA and no site-related SVOC concentrations in excess of cleanup levels in groundwater samples that are attributable to historical site activities (Sundance and CH2M, 2017a). However, the suspected release will be monitored at downgradient locations in the western portion of the Workshop Area. Locations TMW14A, TMW16, and TMW17 are designated as downgradient wells (Table 3-1, Figure 3-14). No upgradient monitoring locations are designated because dry and impermeable shale bedrock is present upgradient of the points of release, and no wells have been installed in this area.

Background and Sentinel Wells

The monitoring locations designated as bedrock aquifer background and sentinel wells will be monitored for all Northern Area COPCs. In the Northern Area bedrock groundwater zone, no current bedrock monitoring wells are selected as background wells according to the groundwater flow direction (Figure 3-15). Four bedrock background monitoring wells are currently proposed to be installed upgradient of known source areas. The groundwater flow direction in the bedrock aquifer does not indicate plumes will migrate offsite and there are no sentinel wells for the bedrock aquifer.

5.2.3 OB/OD Area Groundwater Monitoring Design

The points of release for nitrate/nitrite, explosives, perchlorate, and metals in the OB/OD Area are the HWMU (OB/OD), SWMU 14 (Old Burning Ground and Demolition Landfill), and SWMU 15 (Old Demolition Area). Contaminant plumes are not mapped over multiple wells in the OB/OD Area; however, contamination has been detected in excess of cleanup levels/screening levels within and directly downgradient of the points of release. To monitor known and suspected releases from HWMU (OB/OD) and SWMU 14 (Old Burning Ground and Demolition Landfill), wells CMW10, CMW19, CMW23, CMW24, CMW26, CMW28B, KMW11, and KMW16 are designated as downgradient wells (Table 3-1, Figure 3-16). These eight wells include locations at which the highest groundwater nitrate, explosives, perchlorate, and metals concentrations have been detected in the OB/OD Area (Sundance and CH2M, 2017a). Other locations with historical exceedances for nitrate and RDX have been removed as part of ongoing munitions remedial activities and are no longer available for sampling. To monitor known and suspected releases from SWMU 15 (Old Demolition Area), wells KMW09, and KMW13 are designated as downgradient wells (Table 3-1, Figure 3-16). Upgradient locations are designated as CMW02 and CMW32 according to the groundwater flow direction.

The points of release for the VOCs and SVOCs in the OB/OD Area are HWMU (OB/OD) and SWMU 14 (Old Burning Ground and Demolition Landfill). VOCs and SVOCs associated with historical burning operations have been sporadically detected within and directly downgradient of the points of release. To monitor known and suspected releases from HWMU (OB/OD) and SWMU 14 (Old Burning Ground and Demolition Landfill), wells CMW10, CMW19, CMW23, CMW24, CMW26, CMW28B, KMW11, and KMW16 are designated as downgradient wells (Table 3-1, Figure 3-17). The upgradient location is designated as CMW31B according to the groundwater flow direction.

In the OB/OD Area, BGMW05 and BGMW06 are selected as background wells (Figure 3-18). Well KMW12 is designated as a sentinel well (Figure 3-18). These locations will be monitored for all OB/OD Area COPCs.

5.3 Data Quality Evaluation

The data quality evaluation (DQE) process is instituted to assure the suitability of the data to meet DQOs. The DQE process consists of three steps. Step I is verification, when the data obtained from project activities are reviewed for completeness. Step II is validation, where the field and analytical procedures are assessed relative to contract and work plan requirements. Step III is the usability assessment, where data are either determined to be of suitable quality to meet DQOs or are rejected.

Field data are assessed by the project team through a series of internal reviews. The field team leader is the first quality reviewer and is responsible for verification of completeness and validation of correct field procedures used to collect data. Contractor and USACE management and senior technical review staff assure that field data is complete, field procedures are appropriate, and data quality is suitable for use in groundwater monitoring. Any rejected data will be qualified or removed from the database.

Laboratory analytical DQEs follow a rigorous and specific process that is defined by the current version of the QSM (DOD, 2013a)(Appendix D) and Engineering Manual 200-1-10 (USACE, 2005). Laboratories performing sample analyses will hold current DOD ELAP accreditation and State of New Mexico accreditation/National ELAP accreditation for all appropriate fields of testing. Laboratories will also meet NMED and EPA standards, as required. Laboratories will submit accreditation certificates to the USACE COR.

5.3.1 General Data Quality Requirements

DQEs for the all project data and deliverables will consist of the following:

- Verification that the data produced matches data scope of work (completeness check)
- Verification of the procedures/methods used
- Verification that documentation/deliverables are complete

- o Verification that hard copy and electronic versions of the data are identical
- o Verification that the data seem reasonable based on analytical methodologies
- o Evaluation and qualification of laboratory analytical results based on sample receipt (sample temperature and preservation) and holding-time compliance
- o Evaluation and qualification of laboratory results based on precision and accuracy
- o Verification that analytical instrument calibration is in accordance with required instrument and method criteria
- o Evaluation and qualification of analytical results based on field and laboratory QA/QC of sample results

5.3.2 Analytical Data Quality Requirements

Analytical data generated for FWDA will be subjected to 100 percent Stage 2a validation with 10 percent subjected to Stage 4 validation. Data qualifiers will be used to indicate: (1) blank contamination, (2) sample-analytical anomalies associated with a constituent, (3) analytical results that fall between the DL and the limit of quantitation (LOQ), (4) data qualified because of an exceedance of method-specific holding times, high cooler temperatures, or other significant QA/QC data deficiencies, and (5) data results that exceed the upper calibration curve limit for that constituent and associated analytical instrument. The data quality indicators include parameters of precision, accuracy and bias, representativeness, comparability, completeness, and sensitivity. These indicators are described below. The validation process ensures a completeness of 95 percent in QA/QC reporting and 100 percent in sample result reporting.

Precision

Precision is the degree to which a set of measurements, obtained under similar conditions, conforms to itself. Precision data indicate the consistency and reproducibility of field sampling and/or analytical processes. Precision is usually expressed as a percentage difference or standard deviation, in either absolute or relative terms. Overall project precision is measured by the analysis of field sample/duplicate pairs and MS/MSD pairs. The relative percentage difference of field duplicates, laboratory duplicates, and MS/MSD pairs will be calculated and evaluated with the limits included in Table 5-1.

Accuracy and Bias

Accuracy is the degree of agreement between a sample result and a reference value. Bias refers to the systematic inaccuracy associated with a measurement process. Analytical accuracy is determined by adding a known concentration of target analyte(s) or surrogate analyte(s) (those with properties that mimic analytes of interest, but unlikely to be found in environmental samples) to a standard reference material or a laboratory control sample consisting of an analyte-free matrix, and performing the prescribed method on the reference material or laboratory control sample.

Bias introduced by the sample matrix is determined by adding a known concentration of target analyte(s) or surrogate analyte(s) to an aliquot of field sample, referred to as an MS sample, and performing the prescribed method on the spiked sample aliquot. The percentage recovery of laboratory control samples and MS samples will be evaluated with the percentage limits in Table 5-1.

Representativeness

Representativeness is a qualitative measure of the degree to which a sampling and analysis program reflects the conditions of a site. Representativeness describes the adequacy of the sample collection process and the analysis process, as determined by sample matrix homogeneity and the consistency with which analytical procedures are performed. Method blank results will meet acceptance criteria if no analytes are detected at concentrations greater than half of the LOQ, or 10 percent of sample results. Representativeness of normal analytical samples will be assessed by the technical lead based on previous detections and the CSM.

Comparability

Comparability is the degree to which separate data sets can be represented as similar. The documentation and use of standardized operating procedures in the field and laboratory will help assure the comparability of measurements. Also, field triplicate samples may be collected if directed by USACE, sent to a different laboratory (to be determined), and results compared to the field results. Data will be considered in disagreement if detections are greater than two times each other. If one result is greater than three times the reporting limit, the data will be considered in disagreement, and if one result is greater than five times the DL, the data will be considered in disagreement.

Completeness

Completeness is a measure of the amount of valid data collected compared to the expected amount of total data. Overall completeness will be inferred from a records review and documented data validation. Sampling completeness is assessed through an evaluation of the total number of samples proposed for collection compared to the actual number of samples collected and analyzed. Analytical completeness is evaluated by comparing the number of usable data points collected compared to the total number of data points generated for each analyte and sample.

Sensitivity

Sensitivity refers to the ability of an analytical method or instrument to detect target analytes at a specified concentration. The QSM (DOD, 2013a) has defined the following terms associated with the analysis and reporting of environmental data:

- DL – The smallest amount or concentration of a substance that can be demonstrated to be different from zero or a blank concentration with 99 percent confidence. At the DL, the false positive rate (Type I error) is 1 percent. A DL may be used as the lowest concentration for reliably reporting a detection of a specific analyte in a specific matrix with a specific method with 99 percent confidence.
- LOQ – The smallest concentration that produces a quantitative result with known and recorded precision and bias. For DOD/Department of Energy projects, the LOQ will be set at or above the concentration of the lowest initial calibration standard and within calibration range.
- Reporting limit – The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

The LOQ/ DLs will be used to evaluate sensitivity requirements. The applicable groundwater standard for the chemical is presented in Table 5-1.

5.4 Environmental Data Management

After review and approval, the analytical and field data will be loaded into the FWDA Electronic Data Management System (EDMS) database. An EDMS (or comparable) database is maintained for all interim groundwater monitoring results from 2008 to present. The sample result electronic data deliverables will be loaded into the Automated Data Review software for data validation. After validation, data output files from the Automated Data Review (or comparable) software will be exported to the FWDA database. The FWDA database will be used to prepare the validated data table output presented in reporting documents.

5.5 Data Evaluation

Groundwater monitoring results will be assessed to evaluate groundwater contaminant plumes. The data evaluation will determine groundwater contaminant plume size and migration as well as general groundwater flow conditions. As described in Sections 1.2 and 1.3, groundwater data generated during ground water monitoring will be evaluated with respect to cleanup levels described in Attachment 7 of the RCRA Permit (NMED, 2015). The cleanup criteria/project screening level decision process is presented in Figure 5-1.

5.6 Reporting

Analytical results will be submitted in a semiannual report prepared in accordance with NMED guidance entitled General Reporting Requirements for Routine Groundwater Monitoring at RCRA Sites (NMED, 2003). The Interim Measures PGMR will be submitted to NMED not more than 120 calendar days subsequent to the end of the semiannual monitoring period.

The PGMR will describe the activities performed and present findings of the investigation. The PGMR will include the following components:

- Description of field monitoring and maintenance activities performed
- Deviations from work plan
- Evaluation of monitoring results
- DQE results
- Recommendations for subsequent monitoring
- Tabulated results of field data
- Tabulated results of analytical data
- Groundwater elevation maps
- Groundwater contaminant plume maps

A DQE report will evaluate usability of the data with respect to the project objectives. The project chemist will describe variances, describe rejected data, and present final data qualifiers in the DQE report.

TABLE 5-1

Groundwater Screeening Levels, Detection Levels, and Control Limits (Page 1 of 6)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Method	Analyte	CAS	Units	EPA MCL[1]	NM WQCC GW[2]	EPA RSL Cancer Tap Water[3]	EPA RSL Noncancer Tap Water[3]	Final Selected SL[4]	Final Selected SL Reference	Risk Endpoint c/nc	DL (µg/L or mg/L)	LOD (µg/L or mg/L)	LOQ (µg/L or mg/L)	LCS MS MSD LCL (%)	LCS MS MSD UCL (%)	RPD (%)
6010C	Aluminum	7429-90-5	µg/L	--	5,000	--	20000	5,000	MCL	nc	18	70	300	86	115	20
6010C	Calcium	7440-70-2	µg/L	--	--	--	--	--	--	-	34.5	135	1,000	87	113	20
6010C	Iron	7439-89-6	µg/L	300	1,000	--	14000	300	MCL	nc	22	85	100	87	115	20
6010C	Magnesium	7439-95-4	µg/L	--	--	--	--	--	--	-	10.7	40	500	85	113	20
6010C	Potassium	7440-09-7	µg/L	--	--	--	--	--	--	-	237	940	3,000	86	114	20
6010C	Sodium	7440-23-5	µg/L	--	--	--	--	--	--	-	117	350	5,000	87	115	20
6020A	Antimony	7440-36-0	µg/L	6	--	--	7.8	6	MCL	nc	0.4	1	6	85	117	20
6020A	Arsenic	7440-38-2	µg/L	10	100	0.52	6	10	MCL	c	0.33	1	5	84	116	20
6020A	Barium	7440-39-3	µg/L	2,000	1,000	--	3800	1,000	WQCC	nc	0.29	0.95	3	86	114	20
6020A	Beryllium	7440-41-7	µg/L	4	--	--	25	4	MCL	nc	0.08	0.3	1	83	121	20
6020A	Cadmium	7440-43-9	µg/L	5	10	--	9.2	5	MCL	nc	0.265	1	1	87	115	20
6020A	Chromium	7440-47-3	µg/L	100	50	--	--	50	WQCC	-	0.5	1.8	10	85	116	20
6020A	Cobalt	7440-48-4	µg/L	--	50	--	6	50	WQCC	nc	0.054	0.2	1	86	115	20
6020A	Copper	7440-50-8	µg/L	1,000	1,000	--	800	1,000	WQCC	nc	0.56	1.8	2	85	118	20
6020A	Lead	7439-92-1	µg/L	--	50	--	15	50	WQCC	nc	0.18	0.7	3	88	115	20
6020A	Manganese	7439-96-5	µg/L	50	200	--	430	50	MCL	nc	0.31	0.95	3.5	87	115	20
6020A	Nickel	7440-02-0	µg/L	--	200	--	390	200	WQCC	nc	0.3	1	3	85	117	20
6020A	Selenium	7782-49-2	µg/L	50	50	--	100	50	WQCC	nc	0.7	2	5	80	120	20
6020A	Silver	7440-22-4	µg/L	100	50	--	94	50	WQCC	nc	0.033	0.1	5	85	116	20
6020A	Thallium	7440-28-0	µg/L	2	--	--	0.2	2	MCL	nc	0.05	0.2	1	82	116	20
6020A	Vanadium	7440-62-2	µg/L	--	--	--	86	86	RSL	nc	0.5	2	6	86	115	20
6020A	Zinc	7440-66-6	µg/L	5000	10,000	--	6000	5000	MCL	nc	2	8	20	83	119	20
6860	Perchlorate	14797-73-0	µg/L	--	--	--	14	14	RSL	nc	0.004	0.01	0.05	84	119	20
7470A	Mercury	7439-97-6	µg/L	2	2	--	0.63	2	WQCC	nc	0.027	0.08	0.2	82	119	20
8015C	Diesel Range Organics (DRO) [C10-C28]	STL00143	mg/L	--	--	--	--	--	--	-	0.0326	0.12	0.25	36	132	30
8015C	o-Terphenyl (Surrogate)	84-15-1	%	--	--	--	--	--	--	-	--	--	--	56	125	--
8015C	Gasoline Range Organics (GRO) [C6-C10]	8006-61-9	µg/L	--	--	--	--	--	--	-	10	25	25	78	122	30
8015C	a,a,a-Trifluorotoluene (Surrogate)	98-08-8	%	--	--	--	--	--	--	-	--	--	--	82	110	--
8260C	1,1,1,2-Tetrachloroethane	630-20-6	µg/L	--	--	5.7	480	5.7	RSL	c	0.117	0.25	1	78	124	20
8260C	1,1,1-Trichloroethane	71-55-6	µg/L	200	60	--	8000	60	WQCC	nc	0.171	0.25	1	74	131	20
8260C	1,1,2,2-Tetrachloroethane	79-34-5	µg/L	--	10	0.76	360	10	WQCC	c	0.1	0.25	1	71	121	20
8260C	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	µg/L	--	--	--	10000	10,000	RSL	nc	0.1	0.25	1	70	136	20
8260C	1,1,2-Trichloroethane	79-00-5	µg/L	5	10	2.8	0.41	5	MCL	nc	0.132	0.25	1	80	119	20
8260C	1,1-Dichloroethane	75-34-3	µg/L	--	25	28	3800	25	WQCC	c	0.07	0.25	1	77	125	20
8260C	1,1-Dichloroethene	75-35-4	µg/L	7	5	--	280	5	WQCC	nc	0.1	0.25	1	71	131	20
8260C	1,1-Dichloropropene (surrogate dichloropropene, 1,3-)	563-58-6	µg/L	--	--	4.7	39	4.7	RSL	c	0.104	0.25	1	79	125	20
8260C	1,2,3-Trichlorobenzene	87-61-6	µg/L	--	--	--	7	7	RSL	nc	0.174	0.25	2	69	129	20
8260C	1,2,3-Trichloropropane	96-18-4	µg/L	--	--	0.0075	0.62	0.0075	RSL	c	0.183	0.25	1	73	122	20
8260C	1,2,4-Trichlorobenzene	120-82-1	µg/L	70	--	12	4	70	MCL	nc	0.1	0.25	5	69	130	20
8260C	1,2,4-Trimethylbenzene	95-63-6	µg/L	--	--	--	56	56	RSL	nc	0.17	0.25	1	76	124	20
8260C	1,2-Dibromo-3-Chloropropane	96-12-8	µg/L	0.2	--	0.0033	0.37	0.2	MCL	c	0.41	0.5	1	62	128	20
8260C	1,2-Dibromoethane	106-93-4	µg/L	0.05	0.1	0.075	17	0.05	MCL	c	0.13	0.5	1	80	120	20
8260C	1,2-Dichlorobenzene	95-50-1	µg/L	600	--	--	300	600	MCL	nc	0.1	0.25	1	80	119	20
8260C	1,2-Dichloroethane	107-06-2	µg/L	5	10	1.7	13	5	MCL	c	0.215	0.25	1	73	128	20
8260C	1,3,5-Trimethylbenzene	108-67-8	µg/L	--	--	--	60	60	RSL	nc	0.163	0.25	1	75	124	20

TABLE 5-1

Groundwater Screeening Levels, Detection Levels, and Control Limits (Page 2 of 6)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Method	Analyte	CAS	Units	EPA MCL[1]	NM WQCC GW[2]	EPA RSL Cancer Tap Water[3]	EPA RSL Noncancer Tap Water[3]	Final Selected SL[4]	Final Selected SL Reference	Risk Endpoint c/nc	DL (µg/L or mg/L)	LOD (µg/L or mg/L)	LOQ (µg/L or mg/L)	LCS MS MSD LCL (%)	LCS MS MSD UCL (%)	RPD (%)
8260C	1,3-Dichlorobenzene (surrogate dichlorobenzene, 1,4-)	541-73-1	µg/L	75	--	4.8	570	75	MCL	c	0.106	0.25	1	80	119	20
8260C	1,3-Dichloropropane	142-28-9	µg/L	--	--	--	370	370	RSL	nc	0.1	0.25	1	80	119	20
8260C	1,4-Dichlorobenzene	106-46-7	µg/L	75	--	4.8	570	75	MCL	c	0.1	0.25	1	79	118	20
8260C	2,2-Dichloropropane (surrogate dichloropropane, 1,2-)	594-20-7	µg/L	5	--	1.4	8.2	5	MCL	c	0.177	0.25	1	60	139	20
8260C	2-Butanone (MEK)	78-93-3	µg/L	--	--	--	5600	5,600	RSL	nc	0.469	1	5	56	143	20
8260C	2-Chlorotoluene	95-49-8	µg/L	--	--	--	240	240	RSL	nc	0.153	0.25	1	79	122	20
8260C	2-Hexanone	591-78-6	µg/L	--	--	--	38	38	RSL	nc	0.248	0.5	5	57	139	20
8260C	4-Chlorotoluene	106-43-4	µg/L	--	--	--	250	250	RSL	nc	0.154	0.25	1	78	122	20
8260C	4-Methyl-2-pentanone (MIBK)	108-10-1	µg/L	--	--	--	6300	6,300	RSL	nc	0.216	0.5	5	67	130	20
8260C	Acetone	67-64-1	µg/L	--	--	--	14000	14,000	RSL	nc	0.554	1	2	39	160	20
8260C	Benzene	71-43-2	µg/L	5	10	4.6	33	5	MCL	c	0.1	0.25	1	79	120	20
8260C	Bromobenzene	108-86-1	µg/L	--	--	--	62	62	RSL	nc	0.119	0.25	1	80	120	20
8260C	Bromochloromethane	74-97-5	µg/L	--	--	--	83	83	RSL	nc	0.143	0.5	1	78	123	20
8260C	Bromodichloromethane	75-27-4	µg/L	80	--	1.3	380	80	MCL	c	0.138	0.25	1	79	125	20
8260C	Bromoform	75-25-2	µg/L	80	--	33	380	80	MCL	c	0.17	0.25	1	66	130	20
8260C	Bromomethane	74-83-9	µg/L	--	--	--	7.5	7.5	RSL	nc	0.25	0.5	2	53	141	20
8260C	Carbon disulfide	75-15-0	µg/L	--	--	--	810	810	RSL	nc	0.1	0.25	2	64	133	20
8260C	Carbon tetrachloride	56-23-5	µg/L	5	10	4.6	49	5	MCL	c	0.181	0.25	1	72	136	20
8260C	Chlorobenzene	108-90-7	µg/L	100	--	--	78	100	MCL	nc	0.109	0.25	2	82	118	20
8260C	Chloroethane	75-00-3	µg/L	--	--	--	21000	21000	RSL	nc	0.163	0.25	2	60	138	20
8260C	Chloroform	67-66-3	µg/L	80	100	2.2	97	80	MCL	c	0.1	0.25	1	79	124	20
8260C	Chloromethane	74-87-3	µg/L	--	--	--	190	190	RSL	nc	0.102	0.25	2	50	139	20
8260C	cis-1,2-Dichloroethene	156-59-2	µg/L	70	--	--	36	70	MCL	nc	0.1	0.25	1	78	123	20
8260C	cis-1,3-Dichloropropene (surrogate dichloropropene, 1,3-)	10061-01-5	µg/L	--	--	4.7	39	4.7	RSL	c	0.158	0.25	1	75	124	20
8260C	Dibromochloromethane	124-48-1	µg/L	80	--	8.7	380	80	MCL	c	0.143	0.25	1	74	126	20
8260C	Dibromomethane	74-95-3	µg/L	--	--	--	8.3	8.3	RSL	nc	0.21	0.5	2	79	123	20
8260C	Dichlorodifluoromethane	75-71-8	µg/L	--	--	--	200	200	RSL	nc	0.138	0.25	2	32	152	20
8260C	Ethylbenzene	100-41-4	µg/L	700	750	15	810	700	MCL	c	0.122	0.25	1	79	121	20
8260C	Hexachlorobutadiene	87-68-3	µg/L	--	--	1.4	6.5	1.4	RSL	c	0.1	0.25	1	66	134	20
8260C	Isopropylbenzene	98-82-8	µg/L	--	--	--	450	450	RSL	nc	0.167	0.25	1	72	131	20
8260C	Methyl acetate	79-20-9	µg/L	--	--	--	20000	20,000	RSL	nc	0.755	1	25	56	136	20
8260C	Methyl tert-butyl ether	1634-04-4	µg/L	--	--	140	6300	140	RSL	c	0.146	0.25	2	71	124	20
8260C	Methylcyclohexane	108-87-2	µg/L	--	--	--	--	--	--	-	0.158	0.5	4	72	132	20
8260C	Methylene Chloride	75-09-2	µg/L	5	100	110	110	5	MCL	nc	0.27	0.5	1	74	124	20
8260C	m-Xylene & p-Xylene	179601-23-1	µg/L	--	--	--	--	--	--	-	0.148	0.5	2	80	121	20
8260C	Naphthalene	91-20-3	µg/L	--	30	1.7	6.1	30	WQCC	c	0.208	0.25	5	61	128	20
8260C	n-Butylbenzene	104-51-8	µg/L	--	--	--	1000	1,000	RSL	nc	0.181	0.5	1	75	128	20
8260C	N-Propylbenzene	103-65-1	µg/L	--	--	--	660	660	RSL	nc	0.164	0.25	1	76	126	20
8260C	o-Xylene	95-47-6	µg/L	--	--	--	190	190	RSL	nc	0.126	0.25	1	78	122	20
8260C	p-Isopropyltoluene	99-87-6	µg/L	--	--	--	--	--	--	-	0.171	0.25	1	77	127	20
8260C	sec-Butylbenzene	135-98-8	µg/L	--	--	--	2000	2,000	RSL	nc	0.164	0.25	1	77	126	20
8260C	Styrene	100-42-5	µg/L	100	--	--	1200	100	MCL	nc	0.134	0.25	1	78	123	20
8260C	tert-Butylbenzene	98-06-6	µg/L	--	--	--	690	690	RSL	nc	0.181	0.25	1	78	124	20

TABLE 5-1

Groundwater Screeening Levels, Detection Levels, and Control Limits (Page 3 of 6)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Method	Analyte	CAS	Units	EPA MCL[1]	NM WQCC GW[2]	EPA RSL Cancer Tap Water[3]	EPA RSL Noncancer Tap Water[3]	Final Selected SL[4]	Final Selected SL Reference	Risk Endpoint c/nc	DL (µg/L or mg/L)	LOD (µg/L or mg/L)	LOQ (µg/L or mg/L)	LCS MS MSD LCL (%)	LCS MS MSD UCL (%)	RPD (%)
8260C	Toluene	108-88-3	µg/L	1,000	750	--	1100	750	WQCC	nc	0.14	0.25	1	80	121	20
8260C	trans-1,2-Dichloroethene	156-60-5	µg/L	100	--	--	360	100	MCL	nc	0.103	0.25	1	75	124	20
8260C	trans-1,3-Dichloropropene (surrogate dichloropropene, 1,3-)	10061-02-6	µg/L	--	--	4.7	39	4.7	RSL	c	0.1	0.25	1	73	127	20
8260C	Trichloroethene	79-01-6	µg/L	5	100	4.9	2.8	5	MCL	nc	0.25	0.5	1	79	123	20
8260C	Trichlorofluoromethane	75-69-4	µg/L	--	--	--	5200	5200	RSL	nc	0.11	0.25	1	65	141	20
8260C	Vinyl chloride	75-01-4	µg/L	2	1	0.19	44	1	WQCC	c	0.194	0.25	2	58	137	20
8260C	1,2-Dichloroethane-d4 (Surrogate)	17060-07-0	%	--	--	--	--	--	--	-	--	--	--	81	118	--
8260C	Toluene-d8 (Surrogate)	2037-26-5	%	--	--	--	--	--	--	-	--	--	--	89	112	--
8260C	Dibromofluoromethane (Surrogate)	1868-53-7	%	--	--	--	--	--	--	-	--	--	--	80	119	--
8260C	4-Bromofluorobenzene (Surrogate)	460-00-4	%	--	--	--	--	--	--	-	--	--	--	85	114	--
8270D	1,2,4,5-Tetrachlorobenzene	95-94-3	µg/L	--	--	--	1.7	1.7	RSL	nc	1.73	4.4	10	35	121	20
8270D	1,2,4-Trichlorobenzene	120-82-1	µg/L	70	--	12	4	70	MCL	nc	0.28	1	10	29	116	20
8270D	1,2-Dichlorobenzene	95-50-1	µg/L	600	--	--	300	600	MCL	nc	0.23	0.5	10	32	111	20
8270D	1,2-Diphenylhydrazine	122-66-7	µg/L	--	--	0.78		0.78	RSL	c	0.23	0.505	10	49	122	20
8270D	1,3-Dichlorobenzene (surrogate dichlorobenzene, 1,4-)	541-73-1	µg/L	75	--	4.8	570	75	MCL	c	0.3	1	10	28	110	20
8270D	1,4-Dichlorobenzene	106-46-7	µg/L	75	--	4.8	570	75	MCL	c	0.32	1	10	29	112	20
8270D	2,2'-oxybis[1-chloropropane]	108-60-1	µg/L	--	--	--	710	710	RSL	nc	0.28	1	10	37	130	20
8270D	2,3,4,6-Tetrachlorophenol	58-90-2	µg/L	--	--	--	240	240	RSL	nc	2	4.4	50	50	128	20
8270D	2,4,5-Trichlorophenol	95-95-4	µg/L	--	--	--	1200	1,200	RSL	nc	0.45	1	20	53	123	20
8270D	2,4,6-Trichlorophenol	88-06-2	µg/L	--	--	41	12	12	RSL	nc	0.29	1	20	50	125	20
8270D	2,4-Dichlorophenol	120-83-2	µg/L	--	--	--	46	46	RSL	nc	0.64	2	10	47	121	20
8270D	2,4-Dimethylphenol	105-67-9	µg/L	--	--	--	360	360	RSL	nc	0.58	2	10	31	124	20
8270D	2,4-Dinitrophenol	51-28-5	µg/L	--	--	--	39	39	RSL	nc	10	30	80	23	143	20
8270D	2,4-Dinitrotoluene	121-14-2	µg/L	--	--	2.4	38	2.4	RSL	c	1.66	4.4	20	57	128	20
8270D	2,6-Dichlorophenol (surrogate dichlorophenol, 2,4-)	87-65-0	µg/L	--	--		46	46	RSL	nc	1.35	4	10	50	118	20

TABLE 5-1

Groundwater Screeening Levels, Detection Levels, and Control Limits (Page 4 of 6)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Method	Analyte	CAS	Units	EPA MCL[1]	NM WQCC GW[2]	EPA RSL Cancer Tap Water[3]	EPA RSL Noncancer Tap Water[3]	Final Selected SL[4]	Final Selected SL Reference	Risk Endpoint c/nc	DL (µg/L or mg/L)	LOD (µg/L or mg/L)	LOQ (µg/L or mg/L)	LCS MS MSD LCL (%)	LCS MS MSD UCL (%)	RPD (%)
8270D	2,6-Dinitrotoluene	606-20-2	µg/L	--	--	0.49	5.7	0.49	RSL	c	1.89	4.4	20	57	124	20
8270D	2-Chloronaphthalene	91-58-7	µg/L	--	--	--	750	750	RSL	nc	0.26	1	10	40	116	20
8270D	2-Chlorophenol	95-57-8	µg/L	--	--	--	91	91	RSL	nc	2	4.4	10	38	117	20
8270D	2-Methylnaphthalene	91-57-6	µg/L	--	30	--	36	30	WQCC	nc	0.29	1	10	40	121	20
8270D	2-Methylphenol	95-48-7	µg/L	--	--	--	930	930	RSL	nc	0.98	2	10	30	117	20
8270D	2-Nitroaniline	88-74-4	µg/L	--	--	--	190	190	RSL	nc	1.73	4.4	50	55	127	20
8270D	2-Nitrophenol	88-75-5	µg/L	--	--	--	--	--	--	-	0.39	1	20	47	123	20
8270D	3 & 4 Methylphenol	15831-10-4	µg/L	--	--	--	--	--	--	-	0.25	0.5	20	29	110	20
8270D	3,3'-Dichlorobenzidine	91-94-1	µg/L	--	--	1.3		1.3	RSL	c	2	4.4	50	27	129	20
8270D	3-Nitroaniline (surrogate nitroaniline, 4-)	99-09-2	µg/L	--	--	38	78	38	RSL	c	2	4.4	50	41	128	20
8270D	4,6-Dinitro-2-methylphenol	534-52-1	µg/L	--	--	--	1.5	1.5	RSL	nc	4	8.8	80	44	137	20
8270D	4-Bromophenyl phenyl ether	101-55-3	µg/L	--	--	--	--	--	--	-	0.43	1	10	55	124	20
8270D	4-Chloro-3-methylphenol	59-50-7	µg/L	--	--	--	1400	1,400	RSL	nc	2.41	5	20	52	119	20
8270D	4-Chloroaniline	106-47-8	µg/L	--	--	3.7	76	3.7	RSL	c	2.14	4.4	25	33	117	20
8270D	4-Chlorophenyl phenyl ether	7005-72-3	µg/L	--	--	--	--	--	--	-	1.66	4.4	10	53	121	20
8270D	4-Nitroaniline	100-01-6	µg/L	--	--	38	78	38	RSL	c	2	4.4	50	70	120	20
8270D	4-Nitrophenol	100-02-7	µg/L	--	--	--	--	--	--	-	1.23	4	50	59	129	20
8270D	Acenaphthene	83-32-9	µg/L	--	--	--	530	530	RSL	nc	0.28	1	10	47	122	20
8270D	Acenaphthylene	208-96-8	µg/L	--	--	--	--	--	--	-	0.49	1	10	41	130	20
8270D	Anthracene	120-12-7	µg/L	--	--	--	1800	1800	RSL	nc	0.42	1	10	57	123	20
8270D	Benzaldehyde	100-52-7	µg/L	--	--	190	1900	190	RSL	c	2	2	10	20	150	50
8270D	Benzidine	92-87-5	µg/L	--	--	0.0011	59	0.0011	RSL	c	50	100	200	27	150	20
8270D	Benzo[a]anthracene	56-55-3	µg/L	--	--	0.3		0.3	RSL	c	0.35	1	10	58	125	20
8270D	Benzo[a]pyrene	50-32-8	µg/L	0.2	0.7	0.25	6	0.2	MCL	c	0.31	1	10	54	128	20
8270D	Benzo[b]fluoranthene	205-99-2	µg/L	--	--	2.5		2.5	RSL	c	0.531	2	10	53	131	20
8270D	Benzo[g,h,i]perylene	191-24-2	µg/L	--	--	--	--	--	--	-	0.5	1	10	50	134	20
8270D	Benzo[k]fluoranthene	207-08-9	µg/L	--	--	25		25	RSL	c	0.46	1	10	57	129	20
8270D	Benzoic acid	65-85-0	µg/L	--	--	--	75000	75,000	RSL	nc	10	30	80	41	120	20
8270D	Benzyl alcohol	100-51-6	µg/L	--	--	--	2000	2,000	RSL	nc	0.23	0.5	25	31	112	20
8270D	Bis(2-chloroethoxy)methane	111-91-1	µg/L	--	--	--	59	59	RSL	nc	0.97	2	10	48	120	20
8270D	Bis(2-chloroethyl)ether	111-44-4	µg/L	--	--	0.14		0.14	RSL	c	0.41	1	20	43	118	20
8270D	Bis(2-ethylhexyl) phthalate	117-81-7	µg/L	6	--	56	400	6	MCL	c	0.56	2	10	55	135	20
8270D	Butyl benzyl phthalate	85-68-7	µg/L	--	--	160	1700	160	RSL	c	1	2	20	53	134	20
8270D	Caprolactam	105-60-2	µg/L	--	--	--	9900	9,900	RSL	nc	2.5	5	5	46	143	30
8270D	Carbazole (surrogate fluorene)	86-74-8	µg/L	--	--		290	290	RSL	nc	0.43	1	10	60	122	20
8270D	Chrysene	218-01-9	µg/L	--	--	250		250	RSL	c	0.54	2	10	59	123	20
8270D	Dibenz(a,h)anthracene	53-70-3	µg/L	--	--	0.25		0.25	RSL	c	0.51	2	10	51	134	20
8270D	Dibenzofuran	132-64-9	µg/L	--	--	--	7.9	7.9	RSL	nc	0.29	1	10	53	118	20
8270D	Diethyl phthalate	84-66-2	µg/L	--	--	--	15000	15,000	RSL	nc	0.38	1	20	56	125	20
8270D	Dimethyl phthalate	131-11-3	µg/L	--	--	--	--	--	--	-	0.21	0.5	20	45	127	20

TABLE 5-1

Groundwater Screeening Levels, Detection Levels, and Control Limits (Page 5 of 6)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Method	Analyte	CAS	Units	EPA MCL[1]	NM WQCC GW[2]	EPA RSL Cancer Tap Water[3]	EPA RSL Noncancer Tap Water[3]	Final Selected SL[4]	Final Selected SL Reference	Risk Endpoint c/nc	DL (µg/L or mg/L)	LOD (µg/L or mg/L)	LOQ (µg/L or mg/L)	LCS MS MSD LCL (%)	LCS MS MSD UCL (%)	RPD (%)
8270D	Di-n-butyl phthalate	84-74-2	µg/L	--	--	--	900	900	RSL	nc	1.16	4.4	20	59	127	20
8270D	Di-n-octyl phthalate	117-84-0	µg/L	--	--	--	200	200	RSL	nc	0.35	1	20	51	140	20
8270D	Fluoranthene	206-44-0	µg/L	--	--	--	800	800	RSL	nc	0.2	0.5	20	57	128	20
8270D	Fluorene	86-73-7	µg/L	--	--	--	290	290	RSL	nc	0.31	1	10	52	124	20
8270D	Hexachlorobenzene	118-74-1	µg/L	1	--	0.098	16	1	MCL	c	0.66	2	10	53	125	20
8270D	Hexachlorobutadiene	87-68-3	µg/L	--	--	1.4	6.5	1.4	RSL	c	3.3	10	30	22	124	20
8270D	Hexachlorocyclopentadiene	77-47-4	µg/L	50	--	--	0.41	50	MCL	nc	10	30	50	10	120	20
8270D	Hexachloroethane	67-72-1	µg/L	--	--	3.3	6.2	3.3	RSL	c	2.1	4.4	10	21	115	20
8270D	Indeno[1,2,3-cd]pyrene	193-39-5	µg/L	--	--	2.5		2.5	RSL	c	0.65	2	10	52	134	20
8270D	Isophorone	78-59-1	µg/L	--	--	780	3800	780	RSL	c	0.21	0.5	10	42	124	20
8270D	Naphthalene	91-20-3	µg/L	--	30	1.7	6.1	30	WQCC	c	0.29	1	10	40	121	20
8270D	Nitrobenzene	98-95-3	µg/L	--	--	1.4	13	1.4	RSL	c	0.81	2	20	45	121	20
8270D	N-Nitrosodimethylamine	62-75-9	µg/L	--	--	0.0011	0.055	0.0011	RSL	c	0.29	1	10	56	120	20
8270D	N-Nitrosodi-n-propylamine	621-64-7	µg/L	--	--	0.11		0.11	RSL	c	0.35	1	20	49	119	20
8270D	N-Nitrosodiphenylamine	86-30-6	µg/L	--	--	120		120	RSL	c	0.44	1	10	51	123	20
8270D	Pentachlorophenol	87-86-5	µg/L	1	--	0.41	23	1	MCL	c	20	60	80	35	138	20
8270D	Phenanthrene	85-01-8	µg/L	--	--	--	--	--	--	-	0.26	1	10	59	120	20
8270D	Phenol	108-95-2	µg/L	--	5	--	5800	5	WQCC	nc	2	4.4	10	61	120	20
8270D	Pyrene	129-00-0	µg/L	--	--	--	120	120	RSL	nc	0.37	1	10	57	126	20
8270D	2,4,6-Tribromophenol (Surrogate)	118-79-6	%	--	--	--	120	--	--	nc	--	--	--	43	140	--
8270D	2-Fluorobiphenyl (Surrogate)	321-60-8	%	--	--	--	--	--	--	-	--	--	--	44	119	--
8270D	2-Fluorophenol (Surrogate)	367-12-4	%	--	--	--	--	--	--	-	--	--	--	19	119	--
8270D	Nitrobenzene-d5 (Surrogate)	4165-60-0	%	--	--	--	--	--	--	-	--	--	--	44	120	--
8270D	Terphenyl-d14 (Surrogate)	1718-51-0	%	--	--	--	--	--	--	-	--	--	--	50	134	--
8330B	1,3,5-Trinitrobenzene	99-35-4	µg/L	--	--	--	590	590	RSL	nc	0.2	0.4	1	73	125	20
8330B	1,3-Dinitrobenzene	99-65-0	µg/L	--	--	--	2	2	RSL	nc	0.0887	0.2	0.4	78	120	20
8330B	2,4,6-Trinitrotoluene	118-96-7	µg/L	--	--	25	9.8	9.8	RSL	nc	0.0724	0.2	0.4	71	123	20
8330B	2,4-Dinitrotoluene	121-14-2	µg/L	--	--	2.4	38	2.4	RSL	c	0.0838	0.2	0.4	78	120	20
8330B	2,6-Dinitrotoluene	606-20-2	µg/L	--	--	0.49	5.7	0.49	RSL	c	0.0645	0.2	0.2	77	127	20
8330B	2-Amino-4,6-dinitrotoluene	35572-78-2	µg/L	--	--	--	39	39	RSL	nc	0.0507	0.12	0.2	79	120	20
8330B	3,5-Dinitroaniline	618-87-1	µg/L	--	--	--	--	--	--	-	0.132	0.3	0.4	71	117	20
8330B	4-Amino-2,6-dinitrotoluene	19406-51-0	µg/L	--	--	--	39	39	RSL	nc	0.0577	0.12	0.2	76	125	20
8330B	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	µg/L	--	--	--	1000	1,000	RSL	nc	0.0876	0.2	0.4	65	135	20
8330B	m-Nitrotoluene	99-08-1	µg/L	--	--	--	1.7	1.7	RSL	nc	0.0834	0.2	0.4	73	125	20
8330B	Nitrobenzene	98-95-3	µg/L	--	--	1.4	13	1.4	RSL	c	0.091	0.2	0.4	65	134	20
8330B	Nitroglycerin	55-63-0	µg/L	--	--	45	2	2	RSL	nc	0.921	2	3	74	127	20
8330B	o-Nitrotoluene	88-72-2	µg/L	--	--	3.1	16	3.1	RSL	c	0.0855	0.2	0.4	70	127	20
8330B	Pentaerythritol tetranitrate (PETN)	78-11-5	µg/L	--	--	190	39	39	RSL	nc	0.416	1.2	2	73	127	20
8330B	p-Nitrotoluene	99-99-0	µg/L	--	--	43	71	43	RSL	c	0.2	0.4	1	71	127	20
8330B	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	µg/L	--	--	7	60	7	RSL	c	0.0523	0.12	0.2	68	130	20

TABLE 5-1

Groundwater Screeening Levels, Detection Levels, and Control Limits (Page 6 of 6)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Method	Analyte	CAS	Units	EPA MCL[1]	NM WQCC GW[2]	EPA RSL Cancer Tap Water[3]	EPA RSL Noncancer Tap Water[3]	Final Selected SL[4]	Final Selected SL Reference	Risk Endpoint c/nc	DL (µg/L or mg/L)	LOD (µg/L or mg/L)	LOQ (µg/L or mg/L)	LCS MS MSD LCL (%)	LCS MS MSD UCL (%)	RPD (%)
8330B	Trinitrophenylmethylnitramine (Tetryl)	479-45-8	µg/L	--	--	--	39	39	RSL	nc	0.0793	0.2	0.24	64	128	20
8330B	1,2-Dinitrobenzene (Surrogate)	528-29-0	%	--	--	--	1.9	--	--	nc	--	--	--	83	119	--
9056A	Nitrate as N	14797-55-8	mg/L	10	10	--	32	10	WQCC	nc	0.042	0.1	0.5	88	111	10
9056A	Nitrite as N	14797-65-0	mg/L	1	--	--	2	1	MCL	nc	0.049	0.1	0.5	87	111	10

Notes:

[1] Fort Wingate Depot Activity (FWDA) Cleanup Standard by U.S. Environmental Protection Agency (EPA) Drinking Water Primary Maximum Contaminant Limit (MCL) per 40 Code of Federal Regulations Sections 141 and 143

[2] FWDA Cleanup Standard by New Mexico Water Quality Control Commission (NM WQCC) standards per 20 New Mexico Administrative Code § 6.2.4103

[3] Interim screening level for FWDA by EPA Regional Screening Level (RSL) Tap water, updated June 2017

[4] Final selected screening level was based on the lowest of the NM WQCC and the EPA R6 SSL MCL. If none then EPA RSL Tap Water was selected.

% = percent

c = U.S. Environmental Protection Agency Regional Screening Level Tapwater screening level carcinogenic risk endpoint with cancer risk adjusted to 1X10-5

CAS = Chemical Abstract Service registry number

DL = detection limit

LOD = limit of detection

LOQ = limit of quantitation

LCL = lower confidence limit

µg/L = micrograms per liter

MCL = U.S. Environmental Protection Agency Maximum Contaminant Level (Primary or Secondary)

mg/L = milligrams per Liter

MS = matrix spike

MSD = matrix spike duplicate

nc = U.S. Environmental Protection Agency Regional Screening Level Tapwater screening level non-carcinogenic risk endpoint for Hazard Quotient of 1.0

NA = not applicable. VOCs that can be run by SW8011 for lower detection limits. Past sample collections by SW8011 have eliminated these targets as compounds of concern and the SW8011 method is no longer used.

RPD = relative percent difference

RSL = U.S. Environmental Protection Agency Regional Screening Level Tapwater screening level

SL = Screening Level

UCL = upper confidence limit

WQCC = New Mexico Water Quality Control Commission standard

TABLE 5-2
Water Level Measurements by Groundwater Zone (Page 1 of 2)
Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	Groundwater Zone	Screened Interval (ft bgs)	MPE (ft amsl)	Average DTW 2012 to 2016 (ft btoc)	Minimum DTW 2012 to 2016 (ft btoc)	Maximum DTW 2012 to 2017 (ft btoc)	Average Seasonal Fluctuation (ft)	Used to Monitor Gradients in Existing Plume	Water Level Monitoring Frequency
BGMW01	Northern Alluvial	12.5-32.5	6692.68	19.17	18.32	19.99	< 1	Yes	semiannual
BGMW02	Northern Alluvial	13.5-33.5	6691.99	21.23	20.42	22.16	< 1	Yes	semiannual
BGMW03	Northern Alluvial	8.5-28.5	6680.57	16.62	15.25	17.88	1 to 2	Yes	semiannual
FW31	Northern Alluvial	10.0-50.0	6832.49	42.40	41.88	42.92	< 1	No	semiannual
FW35	Northern Alluvial	10.0-30.0	6711.11	27.53	22.39	Dry	2 to 4	No	semiannual
MW01	Northern Alluvial	33.6-53.6	6685.94	42.59	41.91	43.19	< 1	Yes	semiannual
MW02	Northern Alluvial	37.0-47.0	6685.22	40.38	38.98	41.44	< 1	Yes	semiannual
MW03	Northern Alluvial	43.0-53.0	6689.53	46.36	45.86	46.87	< 1	Yes	semiannual
MW18D	Northern Alluvial	47.0-57.0	6686.32	43.50	42.82	44.07	< 1	Yes	semiannual
MW18S	Northern Alluvial	27.0-37.0	6686.50	**DRY**				No	no longer viable
MW20	Northern Alluvial	47.0-57.0	6687.67	45.38	44.81	45.93	< 1	Yes	semiannual
MW22D	Northern Alluvial	47.0-57.0	6684.55	42.33	41.63	42.93	< 1	Yes	semiannual
MW22S	Northern Alluvial	31.0-41.0	6684.69	42.20	41.55	42.86	< 1	Yes	semiannual
MW23	Northern Alluvial	63.5-133.5	6654.50	15.09	14.39	15.63	< 1	Yes	semiannual
MW24	Northern Alluvial	16.0-66.0	6657.08	19.72	18.58	21.53	1 to 2	Yes	semiannual
SMW01	Northern Alluvial	29.9-49.9	6669.94	30.76	28.11	32.80	1 to 2	Yes	semiannual
TMW01	Northern Alluvial	44.0-59.0	6711.84	38.83	36.83	40.66	1 to 2	Yes	semiannual
TMW03	Northern Alluvial	49.8-69.8	6702.43	57.21	56.85	57.56	< 1	Yes	semiannual
TMW04	Northern Alluvial	50.0-70.0	6700.86	56.54	56.31	57.49	< 1	Yes	semiannual
TMW06	Northern Alluvial	45.0-55.0	6690.63	47.22	46.87	47.58	< 1	Yes	semiannual
TMW07	Northern Alluvial	65.0-75.0	6690.47	47.15	46.76	47.61	< 1	Yes	semiannual
TMW08	Northern Alluvial	30.0-60.0	6680.31	37.04	36.48	37.58	< 1	Yes	semiannual
TMW10	Northern Alluvial	28.0-58.0	6680.04	37.81	36.31	38.50	< 1	Yes	semiannual
TMW11	Northern Alluvial	55.0-80.0	6718.28	67.69	66.31	68.96	< 1	Yes	semiannual
TMW13	Northern Alluvial	60.7-70.7	6707.49	60.43	59.81	61.00	< 1	Yes	semiannual
TMW15	Northern Alluvial	56.0-71.0	6713.89	64.98	64.01	65.74	< 1	Yes	semiannual
TMW21	Northern Alluvial	48.0-58.0	6695.14	50.84	50.51	51.19	< 1	Yes	semiannual
TMW22	Northern Alluvial	52.0-62.0	6691.74	48.67	48.39	48.86	< 1	Yes	semiannual
TMW23	Northern Alluvial	46.0-56.0	6687.66	45.44	45.10	45.63	< 1	Yes	semiannual
TMW24	Northern Alluvial	44.0-54.0	6680.42	38.30	37.65	38.76	< 1	Yes	semiannual
TMW25	Northern Alluvial	42.5-52.5	6672.88	38.97	38.25	39.25	< 1	Yes	semiannual
TMW26	Northern Alluvial	45.0-55.0	6677.71	27.02	25.43	28.11	1 to 2	Yes	semiannual
TMW27	Northern Alluvial	60.0-70.0	6668.13	28.20	27.66	28.74	< 1	Yes	semiannual
TMW28	Northern Alluvial	37.0-47.0	6689.17	19.07	18.11	20.31	1 to 2	Yes	semiannual
TMW29	Northern Alluvial	49.0-59.0	6702.88	57.51	57.11	57.89	< 1	Yes	semiannual
TMW31S	Northern Alluvial	50.0-60.0	6710.20	37.98	35.98	39.82	1 to 2	Yes	semiannual
TMW33	Northern Alluvial	37.0-57.0	6686.60	44.03	43.32	44.63	< 1	Yes	semiannual
TMW34	Northern Alluvial	37.0-57.0	6687.29	45.97	45.47	46.48	< 1	Yes	semiannual
TMW35	Northern Alluvial	35.0-55.0	6686.52	44.15	43.42	44.80	< 1	Yes	semiannual
TMW39S	Northern Alluvial	32.5-52.5	6708.61	35.85	34.88	37.08	< 1	Yes	semiannual
TMW40S	Northern Alluvial	50.0-60.0	6706.40	60.39	60.12	60.96	< 1	Yes	semiannual
TMW41	Northern Alluvial	55.5-65.5	6705.21	41.04	40.02	42.02	< 1	Yes	semiannual
TMW43	Northern Alluvial	58.0-78.0	6698.63	53.54	53.21	53.86	< 1	Yes	semiannual
TMW44	Northern Alluvial	43.5-63.5	6697.31	52.76	52.48	53.04	< 1	Yes	semiannual
TMW45	Northern Alluvial	38.5-58.5	6689.00	47.46	46.88	47.84	< 1	Yes	semiannual
TMW46	Northern Alluvial	38.5-58.5	6680.98	44.29	43.95	44.59	< 1	Yes	semiannual
TMW47	Northern Alluvial	82.5-102.5	6701.88	46.41	46.07	46.88	< 1	Yes	semiannual
PZ01	Northern Alluvial	No Data	6677.29	26.99	26.56	27.61	< 1	No	semiannual
PZ02	Northern Alluvial	No Data	6674.95	23.43	22.82	24.27	< 1	No	semiannual
PZ03	Northern Alluvial	No Data	6679.44	26.37	25.85	27.02	< 1	No	semiannual
PZ04	Northern Alluvial	No Data	6676.68	28.30	27.30	29.07	< 1	No	semiannual
PZ05	Northern Alluvial	No Data	6674.15	20.72	19.72	22.06	1 to 2	No	semiannual
PZ06	Northern Alluvial	No Data	6676.04	19.46	18.12	21.13	1 to 2	No	semiannual
PZ07	Northern Alluvial	No Data	6684.53	14.60	10.34	16.99	2 to 5	No	semiannual
PZ08	Northern Alluvial	No Data	6686.81	18.15	14.49	20.49	2 to 4	No	semiannual
PZ09	Northern Alluvial	No Data	6653.61	15.63	14.46	16.82	1 to 2	No	semiannual
PZ10	Northern Alluvial	No Data	6657.27	19.45	18.31	20.64	1 to 2	No	semiannual
TMW02	Northern Bedrock	67.9-81.9	6705.35	55.78	55.37	56.76	< 1	Yes	semiannual
TMW14A	Northern Bedrock	94.25-109.25	6723.54	64.77	63.36	65.99	< 1	Yes	semiannual
TMW16	Northern Bedrock	123.0-138.0	6714.15	56.65	55.47	57.56	< 1	Yes	semiannual
TMW17	Northern Bedrock	112.0-127.0	6719.89	63.22	62.02	64.21	< 1	Yes	semiannual
TMW18	Northern Bedrock	150.0-160.0	6713.49	55.48	54.48	56.34	< 1	Yes	semiannual
TMW19	Northern Bedrock	169.0-184.0	6700.52	43.15	42.21	44.03	< 1	Yes	semiannual
TMW30	Northern Bedrock	35.0-45.0	6714.59	40.32	39.66	40.60	< 1	Yes	semiannual
TMW31D	Northern Bedrock	77.0-107.0	6710.44	38.27	36.24	40.34	1 to 2	Yes	semiannual
TMW32	Northern Bedrock	117.0-137.0	6709.31	40.36	38.58	42.01	< 1	Yes	semiannual
TMW36	Northern Bedrock	132.0-152.0	6699.04	28.13	26.13	30.01	1 to 2	Yes	semiannual
TMW37	Northern Bedrock	88.0-108.0	6713.09	46.45	44.85	49.45	< 1	Yes	semiannual
TMW38	Northern Bedrock	118.9-158.9	6706.79	47.40	46.20	48.42	< 1	Yes	semiannual
TMW39D	Northern Bedrock	70.0-100.0	6708.61	35.53	33.50	37.37	< 1	Yes	semiannual
TMW40D	Northern Bedrock	135.0-155.0	6706.15	33.21	31.17	35.04	1 to 2	Yes	semiannual
TMW48	Northern Bedrock	71.0-91.0	6709.84	36.72	34.69	38.58	< 1	Yes	semiannual
TMW49	Northern Bedrock	40.0-60.0	6714.71	44.82	42.84	46.68	< 1	Yes	semiannual

TABLE 5-2

Water Level Measurements by Groundwater Zone (Page 2 of 2)

Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	Groundwater Zone	Screened Interval (ft bgs)	MPE (ft amsl)	Average DTW 2012 to 2016 (ft btoc)	Minimum DTW 2012 to 2016 (ft btoc)	Maximum DTW 2012 to 2017 (ft btoc)	Average Seasonal Fluctuation (ft)	Used to Monitor Gradients in Existing Plume	Water Level Monitoring Frequency
BGMW05	OB/OD	36-56	7569.46	**Installed February 2017**				Yes	semiannual[a]
BGMW06	OB/OD	110-130	7347.15	**Installed February 2017**				Yes	semiannual[a]
CMW02	OB/OD	25.0-35.0	7258.00	16.02	13.96	19.20	2 to 4	Yes	semiannual[a]
CMW04	OB/OD	115.0-135.0	7251.15	46.19	44.28	47.32	1 to 2	Yes	semiannual[a]
CMW06	OB/OD	8.3-18.3		**BURIED**				No	no longer available
CMW07	OB/OD	44.0-64.0	7235.16	Removed in 2017 as part of munitions response actions				No	no longer available
CMW10	OB/OD	50.5-70.5	7179.31	58.31	29.57	66.05	drainage re-routed	Yes	semiannual[a]
CMW14	OB/OD	84.2-94.2	7153.06	31.70	26.32	34.32	1 to 2	Yes	semiannual[a]
CMW16	OB/OD	20.0-30.0		**BURIED**				No	no longer available
CMW17	OB/OD	32.0-52.0	7145.18	22.46	19.95	23.82	1 to 2	Yes	semiannual[a]
CMW18	OB/OD	32.0-52.0	7158.24	41.80	39.41	43.17	1 to 2	Yes	semiannual[a]
CMW19	OB/OD	33.5-48.5	7129.85	25.02	16.08	28.80	2 to 4	Yes	semiannual[a]
CMW20	OB/OD	2.5-5.5	7194.68	**DAMAGED**				No	no longer available
CMW21	OB/OD	57.0-67.0	7088.19	**BURIED**				No	no longer available
CMW22	OB/OD	96.5-116.5	7081.94	114.61	114.51	114.83	< 1	Yes	semiannual[a]
CMW23	OB/OD	84.0-104.0	7035.58	97.50	97.35	97.86	< 1	Yes	semiannual[a]
CMW24	OB/OD	230.0-260.0	7099.68	45.13	44.17	45.42	< 1	Yes	semiannual[a]
CMW25	OB/OD	71.0-96.0	7007.52	37.38	37.19	37.58	< 1	Yes	semiannual[a]
CMW26	OB/OD	64-84	7033.98	**Installed February 2017**				Yes	semiannual[a]
CMW27B	OB/OD	63-93	7072.85	**Installed February 2017**				Yes	semiannual[a]
CMW28B	OB/OD	60-80	7137.65	**Installed February 2017**				Yes	semiannual[a]
CMW31B	OB/OD	78-108	7225.06	**Installed February 2017**				Yes	semiannual[a]
CMW32	OB/OD	95-105	7435.71	**Installed February 2017**				Yes	semiannual[a]
CMW33B	OB/OD	135-155	7231.49	**Installed February 2017**				Yes	semiannual[a]
CMW35	OB/OD	95-125	7290.57	**Installed February 2017**				Yes	semiannual[a]
CMW36A	OB/OD	45-65	7247.79	**Installed February 2017**				Yes	semiannual[a]
CMW36B	OB/OD	87-117	7247.99	**Installed February 2017**				Yes	semiannual[a]
FW24	OB/OD	33.5-48.5	6999.19	**DRY**				Yes	no longer viable
FW38	OB/OD	no data	7172.02	**Removed in 2017 as part of munitions response actions**				No	no longer available
KMW09	OB/OD	60.0-70.0	7187.93	41.03	40.69	41.52	< 1	Yes	semiannual[a]
KMW10	OB/OD	158.0-168.0	7131.38	166.76	166.67	166.99	< 1	Yes	semiannual[a]
KMW11	OB/OD	35.0-55.0	7108.78	32.82	32.37	33.45	< 1	Yes	semiannual[a]
KMW12	OB/OD	53.0-73.0	7193.08	49.30	49.12	49.57	< 1	Yes	semiannual[a]
KMW13	OB/OD	32.0-52.0	7168.46	52.18	Dry	52.18	< 1	Yes	semiannual[a]
KMW15B	OB/OD	189-209	7152.625	**Installed February 2017**				Yes	semiannual[a]
KMW16	OB/OD	159-199	7137.108	**Installed February 2017**				Yes	semiannual[a]

Notes:

[a] Monitoring frequency subject to accessibility during munitions response activities.

amsl = above mean sea level
bgs = below ground surface
btoc- below top of casing
DTW = depth to water
ft = feet
MPE = measuring point elevation
OB/OD = open burn/open detonation
TOC = top of casing

TABLE 5-3
Groundwater Sampling Matrix
Interim Facility-wide Groundwater Monitoring Plan, Fort Wingate Depot Activity

Well ID	Sample ID	Nitrate/Nitrite Method 9056A	Explosives Method 8330B	Perchlorate Method 6860	TAL Metals (Dissolved and Total) Methods 6010C/6020A/7470A	VOC Method 8260C	SVOC Method 8270D	TPH-DRO Method 8015C	TPH-GRO Method 8015C
Northern Area Alluvial Monitoring Wells									
BGMW01	BGMW01MMYYYY	X	X	X	X	X	X	X	X
BGMW02	BGMW02MMYYYY	X	X		X				
BGMW03	BGMW03MMYYYY	X	X	X	X	X	X	X	X
MW01	MW01MMYYYY				X	X			X
MW02	MW02MMYYYY					X			X
MW03	MW03MMYYYY	X	X			X			X
MW18D	MW18DMMYYYY				X	X	X	X	X
MW20	MW20MMYYYY					X	X	X	X
MW22D	MW22DMMYYYY	X				X	X	X	X
MW23	MW23MMYYYY	X	X	X	X	X	X	X	X
MW24	MW24MMYYYY	X	X	X	X	X	X	X	X
SMW01	SMW01MMYYYY	X							
TMW01	TMW01MMYYYY	X	X	X	X				
TMW03	TMW03MMYYYY	X	X	X					
TMW06	TMW06MMYYYY		X						
TMW10	TMW10MMYYYY	X			X				
TMW13	TMW13MMYYYY	X	X	X	X				
TMW21	TMW21MMYYYY	X			X			X	
TMW22	TMW22MMYYYY	X	X						
TMW23	TMW23MMYYYY	X	X		X				
TMW24	TMW24MMYYYY	X			X	X	X	X	X
TMW25	TMW25MMYYYY	X			X			X	
TMW27	TMW27MMYYYY				X				
TMW31S	TMW31SMMYYYY	X	X	X	X				
TMW33	TMW33MMYYYY				X	X	X		X
TMW34	TMW34MMYYYY	X			X		X	X	
TMW39S	TMW39SMMYYYY			X					
TMW40S	TMW40SMMYYYY	X	X		X				
TMW41	TMW41MMYYYY	X	X	X	X				
TMW43	TMW43MMYYYY	X	X						
TMW44	TMW44MMYYYY				X				
TMW45	TMW45MMYYYY	X	X			X		X	X
TMW46	TMW46MMYYYY	X			X	X	X	X	X
TMW47	TMW47MMYYYY	X	X		X				
Northern Area Bedrock Monitoring Wells									
TMW02	TMW02MMYYYY	X	X	X	X				
TMW14A	TMW14AMMYYYY						X		
TMW16	TMW16MMYYYY						X		
TMW17	TMW17MMYYYY						X		
TMW18	TMW18MMYYYY	X	X	X	X		X		
TMW19	TMW19MMYYYY	X	X	X	X		X		
TMW30	TMW30MMYYYY	X	X	X	X				
TMW31D	TMW31DMMYYYY	X	X	X	X				
TMW32	TMW32MMYYYY	X	X	X	X				
TMW36	TMW36MMYYYY	X	X	X	X				
TMW38	TMW38MMYYYY	X	X	X	X				
TMW39D	TMW39DMMYYYY	X	X	X	X				
TMW40D	TMW40DMMYYYY	X	X	X	X				
TMW48	TMW48MMYYYY	X	X	X	X				
Open Burn Open Detonation Area Monitoring Wells									
BGMW05	BGMW05MMYYYY	X	X	X	X	X	X		
BGMW06	BGMW06MMYYYY	X	X	X	X	X	X		
CMW02	CMW02MMYYYY	X	X	X	X	X	X		
CMW10	CMW10MMYYYY	X	X	X	X	X	X		
CMW19	CMW19MMYYYY	X	X	X	X	X	X		
CMW23	CMW23MMYYYY	X	X	X	X	X	X		
CMW24	CMW24MMYYYY	X	X	X	X	X	X		
CMW26	CMW26MMYYYY	X	X	X	X	X	X		
CMW28B	CMW28BMMYYYY	X	X	X	X	X	X		
CMW31B	CMW31BMMYYYY	X	X	X	X	X	X		
CMW32	CMW32MMYYYY	X	X	X	X	X	X		
KMW09	KMW09MMYYYY	X	X	X	X				
KMW11	KMW11MMYYYY	X	X	X	X	X	X		
KMW12	KMW12MMYYYY	X	X	X	X	X	X		
KMW13	KMW13MMYYYY	X	X	X	X				
KMW16	KMW12MMYYYY	X	X	X	X	X	X		

Notes
DRO = diesel range organics
GRO = gasoline range organics
ID = identification
SVOC = semivolatile organic compound
TAL = total analyte list
TPH = total petroleum hydrocarbons
VOC = volatile organic compound
X = sample is analyzed for the specified method

6.0 Schedule

The first sample collection under this Interim Facility-wide GMP took place in April 2008 and has continued each April and October to date. The schedule of planned groundwater sampling will be consistent with the ongoing interim measure schedule.

Groundwater elevation data will be collected on a semiannual basis in April and October. Groundwater sampling is scheduled on a semiannual basis, subsequent to the measurement of groundwater elevations (Tables 3-2 and 3-3). Access to the OB/OD Area is currently restricted to munitions clearance activities due to explosive safety regulations. Groundwater sampling will resume when this restriction is lifted.

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APPENDIX A

Response to NMED comments on Version 9 GMP

(Provided as a separate file on the DVD included with this document)

APPENDIX B

Summary of Previous Investigation Analytical Results

(Provided as a separate file on the DVD included with this document)

APPENDIX C

Field Forms

(Provided as a separate file on the DVD included with this document)

APPENDIX D

Department of Defense Quality Systems Manual for Environmental Laboratories, Version 5.0.

(Provided as a separate file on the DVD included with this document)

APPENDIX E

Unified Federal Policy-Quality Assurance Project Plan

(Provided as a separate file on the DVD included with this document)