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Calendar Year 2018

Annual Groundwater Monitoring Report

Prepared by
Sandia National Laboratories, Albuquerque, New Mexico

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

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Groundwater Monitoring Program

Sandia National Laboratories, New Mexico

June 2019

Prepared by:
Long-Term Stewardship in coordination with Environmental Restoration Operations

Long-Term Stewardship
Sandia National Laboratories, New Mexico
Albuquerque, New Mexico 87185-1103

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Acknowledgments

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Contributing Authors

Copland, John
Jackson, Tim
Mitchell, Michael
Skelly, Michael

Abstract

Sandia National Laboratories, New Mexico (SNL/NM) is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's (DOE) National Nuclear Security Administration (NNSA) under contract DE-NA0003525. The DOE/NNSA Sandia Field Office administers the contract and oversees contractor operations at the site.

This Annual Groundwater Monitoring Report summarizes data through December 31, 2018 from groundwater monitoring samples collected at the Chemical Waste Landfill, Mixed Waste Landfill, and Groundwater Monitoring Program locations, as well as the following SNL/NM Areas of Concern (AOCs): Burn Site Groundwater AOC, Technical Area-V Groundwater AOC, and the Tijeras Arroyo Groundwater AOC. Reporting the results of environmental monitoring and surveillance programs is required by the New Mexico Environment Department (NMED) and DOE Order 231.1B, *Environment, Safety, and Health Reporting*.

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Attachments

Chapter Tables

Chapter Tables (continued)

Chapter Tables (concluded)

Chapter Figures

Chapter Figures (concluded)

Tables

Plate

Abbreviations and Acronyms

ABCWUA	Albuquerque Bernalillo County Water Utility Authority
AGMR	Annual Groundwater Monitoring Report
AOC	Area of Concern
ARG	Ancestral Rio Grande
BFF	Bulk Fuels Facility
BGW	Balleau Groundwater, Inc.
BSG	Burn Site Groundwater
CAC	Corrective Action Complete
CCM	Current Conceptual Model
CFR	Code of Federal Regulations
CME	Corrective Measures Evaluation
CMI	Corrective Measures Implementation
CMS	Corrective Measures Study
COA	City of Albuquerque
COC	Constituent of concern
CSM	Conceptual Site Model
CWL	Chemical Waste Landfill
DI	deionized
DOE	U.S. Department of Energy
DP	Discharge Permit
DRO	Diesel range organics
EB	Equipment blank
EDMS	Environmental Data Management System
EHD	Environmental Health Department
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FB	Field blank
GEL	GEL Laboratories LLC
GMP	Groundwater Monitoring Program
GRO	Gasoline range organics
GWQB	Ground Water Quality Bureau
HE	High explosive
HWB	Hazardous Waste Bureau
IMWP	Interim Measures Work Plan
ISB	In-situ bioremediation
KABQ	National Weather Service Meteorological Station at the Albuquerque International Sunport
KAFB	Kirtland Air Force Base
LCS	Laboratory control sample
LWDS	Liquid Waste Disposal System
MAC	Maximum allowable concentrations
MCL	Maximum contaminant level
MDL	Method detection limit
MWL	Mixed Waste Landfill
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NMOSE	New Mexico Office of the State Engineer
NMWQCC	New Mexico Water Quality Control Commission
NNSA	National Nuclear Security Administration
NOD	Notices of Disapproval

Abbreviations and Acronyms (concluded)

NPN	Nitrate plus nitrite
NTU	Nephelometric turbidity units
OB	Oversight Bureau
ORP	Oxidation-reduction potential
PCCP	Post-Closure Care Permit
QC	Quality control
RCRA	Resource Conservation and Recovery Act
RFI	Recovery Act Facility Investigation
RPD	Relative percent difference
SAP	Sampling and analysis plans
SC	Specific conductivity
SFG	Santa Fe Group
SNL	Sandia National Laboratories
SMO	Sample Management Office
SWMU	Solid waste management units
TA	Technical Area
TAG	Tijeras Arroyo Groundwater
TAVG	Technical Area-V Groundwater (well designation only)
TB	Trip blank
TCE	trichloroethene
TSWP	Treatability Study Work Plan
USGS	U.S. Geological Survey
VA	Veteran's Administration
VCM	Voluntary corrective measures
VOC	Volatile organic compounds
WL	Water level
WQ	Water quality

Units

%	percent
% Sat	percent saturation
°C	degrees Celsius.
µg/L	micrograms per liter (equivalent to ppb)
µmhos/cm	micromhos per centimeter
AF/yr	acre-feet per year
CF/yr	cubic-feet per year
ft	foot (feet)
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
gal.	gallon(s)
gpm	gallons per minute
in/yr	inches per year
Ma	Mega Annum (million years)
Meq/L	milliequivalents per liter
mg/L	milligrams per liter (equivalent to ppm)
mrem/yr	millirems per year
mV	millivolts
NTU	nephelometric turbidity units
pCi/L	picocuries per liter
pH	potential of hydrogen (negative logarithm of the hydrogen ion concentration)
ppb	parts per billion
ppm	parts per million
rem	roentgen equivalent man
sq mi	square miles
SU	standard units
yr	years

Well Location Descriptions

ASL PD	Albuquerque Seismological Laboratory Production (well)
AVN-#	Area-V (North)
CCBA-#	Coyote Canyon Blast Area
CTF-#	Coyote Test Field
CWL-#	Chemical Waste Landfill
CYN-#	Lurance Canyon
EOD	Explosive Ordnance Disposal
EX	Well proposed for extraction purposes, but used for monitoring purposes only. This applies to the well number for ST105-EX01.
Ext	Extraction well used for remediating groundwater at the BFF and the KAFB Tijeras Arroyo Golf Course.
Greystone-#	Greystone
HERTF	High Energy Research Test Facility
IP	Isleta Pueblo
Inj	Injection well
ITRI	Inhalation Toxicology Research Institute
KAFB	Kirtland Air Force Base
LMF	Large Melt Facility
LWDS-#	Liquid Waste Disposal System
MP-#	Montessa Park
MRN-#	Magazine Road North
MVMW#	Mountain View Monitoring Well
MWL-#	Mixed Waste Landfill
NMED-#	New Mexico Environment Department
NWTA3-#	Northwest Technical Area-III
OBS-#	Old Burn Site
PGS-#	Parade Ground South
PL-#	Power Line Road, west
SFR-#	South Fence Road
STW-#	Solar Tower (West)
SWTA-#	Southwest Technical Area-III
TA1-W-#	Technical Area-I (Well)
TA2-NW-#	Technical Area-II (Northwest)
TA2-SW-#	Technical Area-II (Southwest)
TA2-W-#	Technical Area-II (Well)
TAV-#	Technical Area-V
TJA-#	Tijeras Arroyo
TRE-#	Thunder Road East
TRN-#	Target Road North
TRS-#	Target Road South
TSA-#	Transportation Safeguards Academy
WYO-#	Wyoming
VA	Veterans Administration
12AUP-#	ER Site 12A Underflow Piezometer

Meteorological Towers

SC1	School House
A-21	TA-I
A-36	TA-III and TA-V
KABQ	Albuquerque International Sunport (National Weather Service)

Annual Groundwater Monitoring Report

Executive Summary

This report presents the results of the 2018 groundwater characterization and groundwater surveillance monitoring program performed by Sandia National Laboratories, New Mexico (SNL/NM) personnel for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA). This Annual Groundwater Monitoring Report (AGMR) fulfills certain reporting requirements set forth in the Resource Conservation and Recovery Act (RCRA) Facility Operating Permit (RCRA Permit), the Compliance Order on Consent (the Consent Order) and various DOE Directives as detailed in Section 1.2.1. The SNL/NM facility is located on Kirtland Air Force Base (KAFB) in central New Mexico. Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International, Inc., for the DOE's NNSA under contract DE-NA-0003525.

This AGMR documents the results of the groundwater characterization and monitoring activities at SNL/NM for Calendar Year (CY) 2018. This report has been prepared to meet the environmental reporting requirements for the CY 2018 Annual Site Environmental Report, providing an annual update of groundwater data to regulators, stakeholders, and outside agencies. In addition, it serves as a valuable tool to inform the public about the groundwater quality at SNL/NM. This report includes both water quality sampling results and water level measurements.

Chapter 1.0 provides the general site description for the SNL/NM facility and describes the regulatory criteria and sample collection methods for both SNL/NM site-specific and site-wide groundwater monitoring tasks. The Regional Aquifer supplying the Albuquerque Bernalillo County Water Utility Authority, Veterans Administration, and KAFB water supply wells is located within the Albuquerque Basin. The Regional Aquifer is mostly contained within the upper unit and, to some extent, the middle unit of the Santa Fe Group. The edge of the basin on the east side is defined by the Sandia, Manzanita, and Manzano Mountains. KAFB straddles the east side of the basin and is divided approximately in half by basin-bounding faults. On KAFB, the basin is primarily defined by the north-south-trending Sandia Fault and the Hubbell Spring Fault. The Tijeras Fault, a strike-slip fault that trends northeast-southwest, intersects the Sandia and Hubbell Spring Faults forming a system of faults collectively referred to as the Tijeras Fault complex. The faults form a distinct hydrogeological boundary between the Regional Aquifer within the basin (approximately 500 feet below ground surface) and the more shallow bedrock aquifer systems within the uplifted areas (generally between 50 to 325 feet below ground surface).

The remaining chapters focus on the activities at each of the following monitoring networks maintained at SNL/NM: Groundwater Monitoring Program (GMP) site-wide surveillance (Chapter 2.0), Chemical Waste Landfill (CWL) (Chapter 3.0), Mixed Waste Landfill (MWL) (Chapter 4.0), Technical Area (TA)-V Groundwater (TAVG) Area of Concern (AOC) (Chapter 5.0), Tijeras Arroyo Groundwater (TAG) AOC (Chapter 6.0), and Burn Site Groundwater (BSG) AOC (Chapter 7.0).

At SNL/NM, Solid Waste Management Units (SWMUs) are regulated under the Resource Conservation and Recovery Act (RCRA) Facility Operating Permit (RCRA Permit). In the RCRA Permit, a SWMU is defined as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste." Monitoring and/or corrective action requirements generally are determined on a SWMU-specific basis following a site investigation. A Compliance Order on Consent (Consent Order) governs corrective actions for these sites and, accordingly, monitoring performed at the TAVG AOC, TAG AOC, and BSG AOC. The MWL is a SWMU that underwent corrective action in accordance with the Consent Order, and in March 2016, the New Mexico

Environment Department (NMED) Final Order became effective, granting Corrective Action Complete with Controls status to the MWL. Groundwater monitoring requirements for the MWL are defined in the Long-Term Monitoring and Maintenance Plan (LTMMP). The CWL is a closed, regulated unit undergoing post-closure care in accordance with the CWL Post-Closure Care Permit (PCCP) that became effective on June 2, 2011. The CWL PCCP Attachment 2, Groundwater Sampling and Analysis Plan details the groundwater monitoring requirements, procedures, and protocols.

Groundwater Quality Monitoring Activities and Results

During CY 2018, groundwater samples were collected from monitoring wells for six investigations. The analytical results for samples from all monitoring wells were compared with maximum contaminant levels (MCLs) established by the U.S. Environmental Protection Agency. The results for GMP monitoring wells were also compared with NMED maximum allowable concentrations (MACs) promulgated for groundwater by the State of New Mexico's Water Quality Control Commission. The activities and results are summarized for each location in the following sections, and the data are presented in the attachments following each chapter.

In this report, groundwater-monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/NNSA and SNL/NM personnel. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Consent Order, as specified in Section III.A of the Consent Order.

Groundwater Monitoring Program

Chapter 2.0 discusses the annual groundwater surveillance monitoring activities conducted during March 2018 at wells that are part of the SNL/NM GMP. The GMP is part of the site-wide Environmental Management System at SNL/NM. GMP well locations are scattered throughout and along the perimeter of the base in areas that are not specifically affiliated with SWMUs or AOCs. During CY 2018, groundwater elevations were measured in 217 wells and groundwater samples were collected from 12 monitoring wells (Greystone-MW2, MRN-2, MRN-3D, NWTA3-MW3D, PL-2, PL-4, SFR-2S, SFR-4T, SWTA3-MW2, SWTA3-MW3, SWTA3-MW4, and TRE-1), and one surface water sample from Coyote Springs. Groundwater samples were analyzed for Safe Drinking Water Act list of volatile organic compounds (VOCs), total organic halogens, total phenols, nitrate plus nitrite (NPN), general chemistry, Target Analyte List (TAL) metals plus total uranium, mercury, total cyanide, gross alpha/beta activity, radionuclides by gamma spectroscopy, radium-226, and radium-228. Additional samples were collected at selected monitoring wells for analysis of high explosive compounds and isotopic uranium. No analytes were detected at concentrations exceeding the associated MCLs or MACs, except for beryllium and fluoride. Beryllium was detected above the MCL of 0.004 milligrams per liter (mg/L) in the environmental surface water sample from Coyote Springs at a concentration of 0.00698 mg/L, which is similar to historical concentrations and is considered to be of natural origin. Fluoride was detected above the MAC of 1.6 mg/L in Coyote Springs and monitoring wells SFR-2S, SFR-4T, SWTA3-MW4, and TRE-1 samples at concentrations of 1.62 mg/L, 1.65 mg/L, 2.82 mg/L, 1.66 mg/L (1.68 mg/L, for the duplicate sample), and 1.71 mg/L, respectively. The results are similar to historical concentrations.

Water levels were measured at monitoring wells by SNL/NM personnel either quarterly or annually depending on the response characteristics of the groundwater system. The water levels were used to construct contours of the potentiometric surface. The contours display a pattern that reflects the impact of the groundwater withdrawal by water supply wells located in the northwestern portion of KAFB and within the city.

Chemical Waste Landfill

Chapter 3.0 discusses the semiannual groundwater monitoring activities conducted during January and July 2018 at the CWL. The site is a 1.9-acre former disposal site located in the southeastern corner of TA-III. The site was used for the disposal of chemical, radioactive, and solid waste generated by SNL/NM research activities from 1962 to 1985. Two voluntary corrective measures (VCMs) were performed to remediate the CWL: the Vapor Extraction VCM, and the Landfill Excavation VCM. Since June 2, 2011, the CWL is a remediated, closed, regulated unit undergoing post-closure care in accordance with the CWL PCCP. During CY 2018, groundwater elevations were measured and groundwater samples were collected from four monitoring wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11). Groundwater samples during the January sampling event were analyzed for trichloroethene (TCE), 1,1,2-trichloro-1,2,2-trifluoroethane, tetrachloroethene, 1,1-dichloroethene, chloroform, trichlorofluoromethane, nickel, and chromium; groundwater samples during the July sampling event were analyzed for TCE, nickel, and chromium. No analytes were detected at concentrations exceeding the associated MCLs, or PCCP-defined hazardous concentration limits in the CWL groundwater samples. The analytical results are comparable to historical values. Other activities conducted at the CWL during CY 2018 include site inspections, cover maintenance, and soil-vapor sampling.

Mixed Waste Landfill

Chapter 4.0 discusses the semiannual groundwater monitoring activities conducted in April-May and October 2018 at the MWL (SWMU 76). The 2.6-acre site is located in the north-central portion of TA-III and was operational from March 1959 through December 1988. The MWL consists of a classified area and an unclassified area that received low-level radioactive, hazardous, and mixed waste. The NMED selected a final remedy, an evapotranspirative vegetative soil cover with a biointrusion barrier, which was installed in 2009. Since January 2014, activities at this site are conducted in accordance with the requirements of the MWL LTMMP. On March 13, 2016, the February 2016 NMED Final Order became effective, granting Corrective Action Complete with Controls status to the MWL and incorporating the MWL LTMMP into the RCRA Permit. During CY 2018, groundwater elevations were measured in seven wells (MWL-BW2, MWL-MW4, MWL-MW5, MWL-MW6, MWL-MW7, MWL-MW8, and MWL-MW9), and groundwater samples were collected from the four compliance monitoring wells (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) and analyzed for VOCs, metals (cadmium, chromium, nickel, and total uranium), radionuclides by gamma spectroscopy, gross alpha/beta activity, tritium, and radon-222. No analytes were detected at concentrations exceeding the associated MCLs or MWL-specific trigger levels, and the analytical results are comparable to historical values. Other activities conducted at the MWL during CY 2018 include cover maintenance, soil-vapor sampling, inspections, and other monitoring required by the MWL LTMMP.

Technical Area-V Groundwater Area of Concern

Chapter 5.0 discusses the quarterly groundwater monitoring activities conducted during February 2018, May-June 2018, July-August-September 2018, and November 2018 at the TAVG AOC. The site is located at the northeast corner of TA-III. Three wastewater and sanitary waste facilities were used at the site from the 1960s to the early 1990s. Both TCE and nitrate have been identified as constituents of concern in Regional Aquifer at the TAVG AOC based on detections above the MCLs. Environmental activities at this AOC are regulated under the requirements of the Consent Order. During CY 2018, groundwater elevations were measured and groundwater samples were collected from 17 monitoring wells (AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW3, TAV-MW4, TAV-MW5, TAV-MW7, TAV-MW8, TAV-MW9, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW13, TAV-MW14, TAV-MW15, and TAV-MW16). Groundwater samples were analyzed for VOCs, NPN, alkalinity, anions (bromide, chloride, fluoride, and sulfate), metals (arsenic, iron, and manganese), TAL metals plus total uranium, gross alpha/beta activity, radionuclides by gamma spectroscopy, and tritium. No analytes were detected at concentrations exceeding the associated MCLs except for nitrate and TCE. Nitrate concentrations exceeded the MCL of 10 mg/L in samples from monitoring wells LWDS-MW1 and TAV-MW10 with a maximum concentration of 12.9

mg/L in the sample from monitoring well LWDS-MW1 collected in June. TCE concentrations exceeded the MCL of 5 micrograms per liter in samples from monitoring wells LWDS-MW1, TAV-MW10, TAV-MW12, and TAV-MW14 with a maximum concentration of 17.7 micrograms per liter in the environmental sample from monitoring well LWDS-MW1 collected in February. The analytical results of nitrate and TCE in the other monitoring wells are below the MCLs and are consistent with historical trends. Other activities conducted at the TAVG AOC during CY 2018 include beginning the Full-Scale Operation of the in-situ bioremediation Treatability Study with discharges of treatment solution to injection well TAV-INJ1 and the sampling of monitoring well TAV-MW6 that are reported to the NMED Ground Water Quality Bureau and the NMED Hazardous Waste Bureau.

Tijeras Arroyo Groundwater Area of Concern

Chapter 6.0 discusses the quarterly groundwater monitoring activities conducted during February-March, June, August-September, and November-December 2018. Two water-bearing units, the Perched Groundwater System and the Regional Aquifer, underlie the TAG AOC. This site is located in the north-central portion of KAFB and includes TA-I, TA-II, and TA-IV. Groundwater in the area has been impacted since the late 1940s and includes numerous potential SNL/NM and non-SNL/NM wastewater and septic-water sources. All SNL/NM discharges ceased in 1992. Activities at this AOC are regulated under the requirements of the Consent Order. During CY 2018, groundwater elevations were measured in 30 monitoring wells and groundwater samples were collected from 21 monitoring wells (TA1-W-01, TA1-W-02, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-08, TA2-NW1-595, TA2-W-01, TA2-W-19, TA2-W-24, TA2-W-25, TA2-W-26, TA2-W-27, TA2-W-28, TJA-2, TJA-3, TJA-4, TJA-5, TJA-6, TJA-7, and WYO-3). Groundwater samples were analyzed for VOCs, NPN, general chemistry, TAL metals plus total uranium, gross alpha/beta activity, radionuclides by gamma spectroscopy, and tritium. No analytes were detected at concentrations exceeding the associated MCLs except for nitrate. Nitrate concentrations exceeded the MCL of 10 mg/L in samples from monitoring wells TA2-W-19, TA2-W-28, TJA-2, TJA-4, TJA-5, and TJA-7, with a maximum concentration of 31.6 mg/L in the sample from monitoring well TJA-4 collected in March. Nitrate concentrations in monitoring wells TA2-W-28, TJA-4, and TJA-7 have generally exceeded the MCL for the life of the wells, whereas nitrate concentrations occasionally have exceeded the MCL in samples from monitoring wells TJA-2 and TA2-W-19. Recent nitrate concentrations across the monitoring well network were consistent with historical trends. Other activities conducted at the TAG AOC during CY 2018 include: video logging of four monitoring wells (TA1-W-03, TA2-W-24, TA2-W-25, and TJA-5); slug testing at replacement monitoring well TA2-W-28 to determine the hydraulic conductivity of the screened sediments; and mapping of KAFB production-well coordinates using ortho-rectified aerial photography.

Burn Site Groundwater Area of Concern

Chapter 7.0 discusses the semiannual groundwater monitoring activities conducted in April and October 2018 at the BSG AOC. This site is located around the active Lurance Canyon Burn Site facility in the far eastern portion of KAFB. The site was used from the 1960s through 1980s for explosives tests and burn tests, and groundwater investigations were initiated in 1997 at the request of the NMED after elevated nitrate levels were discovered in the Burn Site Water Supply Well. Activities at this AOC are regulated under the requirements of the Consent Order. During CY 2018, groundwater elevations were measured in 12 wells and groundwater samples were collected from 10 wells (CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15). Samples were analyzed for VOCs, high explosive compounds, total petroleum hydrocarbons -diesel range organics, total petroleum hydrocarbons -gasoline range organics, NPN, general chemistry, TAL metals plus total uranium, perchlorate (at CYN-MW15 only), gross alpha/beta activity, radionuclides by gamma spectroscopy, isotopic uranium, and tritium. No analytes were detected at concentrations exceeding the associated MCLs, except for nitrate. Nitrate concentrations exceeded the MCL of 10 mg/L in samples from 7 monitoring wells (CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15) with a maximum concentration of 35.4 mg/L in the environmental duplicate sample from monitoring well CYN-MW13, collected in October. The nitrate concentration trends in these wells are variable and have increased or decreased slightly over the past year. Other activities conducted at the BSG AOC include preparing a Monitoring Well Installation Work Plan for submittal to NMED Hazardous Waste Bureau.

Future Groundwater Monitoring Events

The groundwater monitoring events conducted on a site-wide basis as part of the SNL/NM GMP and at CWL, MWL, TAVG AOC, TAG AOC, and BSG AOC will continue during CY 2019, in accordance with regulatory requirements. The results for these monitoring events will be presented in the AGMR for CY 2019.

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1.0 Introduction

General groundwater surveillance monitoring is conducted for the U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) at Sandia National Laboratories, New Mexico (SNL/NM). The purpose of this document is to report to regulators and other stakeholders the results of the consolidated groundwater monitoring activities at SNL/NM for Calendar Year (CY) 2018.

Separate chapters focus on the investigation activities at each of the following monitoring networks maintained at SNL/NM:

- Groundwater Monitoring Program (GMP) (Chapter 2.0)
- Chemical Waste Landfill (CWL) (Chapter 3.0)
- Mixed Waste Landfill (MWL) (Chapter 4.0)
- Technical Area (TA)-V Groundwater (TAVG) Area of Concern (AOC) (Chapter 5.0)
- Tijeras Arroyo Groundwater (TAG) AOC (Chapter 6.0)
- Burn Site Groundwater (BSG) AOC (Chapter 7.0)

1.1 Site Description

The SNL/NM facility is located on Kirtland Air Force Base (KAFB), New Mexico. KAFB is a 51,559-acre (80.56 square miles [sq mi]) military installation that includes 20,486 acres withdrawn from the Cibola National Forest through an agreement with the U.S. Forest Service. Located at the foot of the Manzanita Mountains, KAFB has an average elevation of 5,384 feet (ft) above mean sea level. The range of elevations is 5,162 to 7,986 ft above mean sea level. KAFB and SNL/NM are located adjacent to the City of Albuquerque, which borders KAFB on its north and west boundaries (Figure 1-1).

1.1.1 Climate

The Albuquerque area is characterized by low precipitation and wide temperature extremes that are typical of high-altitude, dry, continental climates. The average annual precipitation measured at Albuquerque International Sunport (National Oceanic and Atmospheric Administration National Weather Service station) is 9.45 inches (Chapter 2.6.2.1). Most precipitation falls between July and October, mainly in the form of brief, heavy rain. The evaporation potential is high because of low humidity and generally warm temperatures.

1.1.2 Geologic Setting

SNL/NM is located near the east-central edge of the Albuquerque Basin. The Albuquerque Basin (also known as the Middle Rio Grande Basin) is one of a series of north-south trending basins that was formed during the extension of the Rio Grande Rift. The basin is approximately 3,000 sq mi. Rift formation initiated in the late Oligocene and continued into the early Pleistocene, with the primary period of extension occurring between 30 and 5 Mega Annum (Ma); or million years before present. Tectonic activity, which began uplifting the Sandia, Manzanita, and Manzano Mountains, was most prevalent from about 15 to 5 Ma (Thorn et al. 1993). The rift today extends from south central Colorado across New Mexico, and into northern Mexico. The vertical displacement between the rock units exposed at the top of Sandia Crest and the equivalent units located at the bottom of the buried Albuquerque Basin is more than 3 miles.

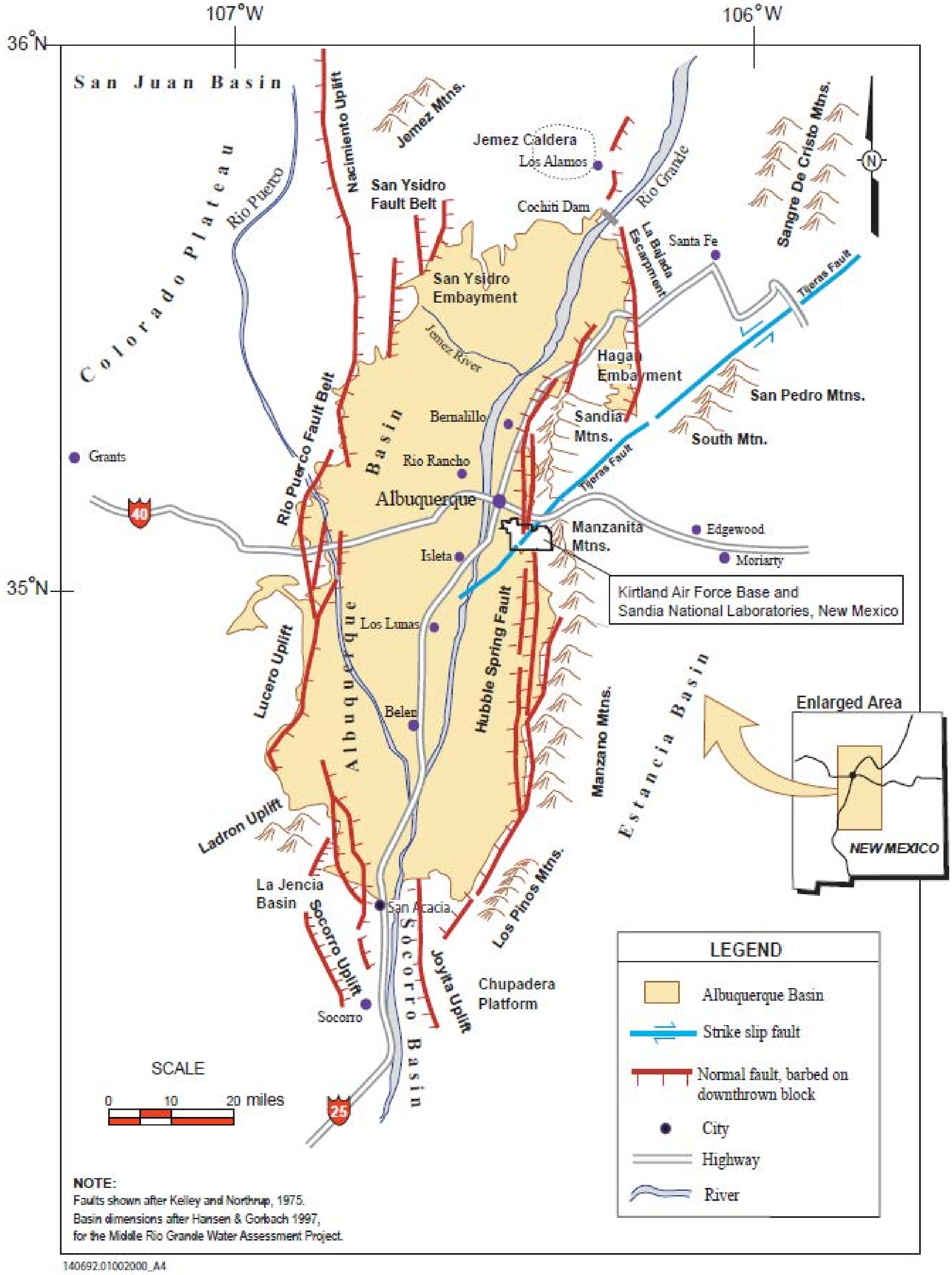

Figure 1-1. Albuquerque Basin, North-Central New Mexico

As shown on Figure 1-1, the structural boundaries of the Albuquerque Basin are as follows:

- Colorado Plateau on the west
- Nacimiento Uplift and the Jemez Mountains to the north
- La Bajada Escarpment to the northeast
- Sandia, Manzanita, Manzano, and Los Pinos Mountains to the east
- Joyita and Socorro uplifts to the south
- Ladron and Lucero uplifts to the southwest

As the Rio Grande Rift continued to expand, the Albuquerque Basin subsided. Over the last 30 Ma, the Ancestral Rio Grande meandered across the valley formed by the subsidence and deposited sediments in broad stream channels and floodplains derived from sources to the north. The basin also filled with aeolian deposits and alluvial materials shed from surrounding uplifts (Hawley and Haase 1992). This sequence of sediments is called the Santa Fe Group. The thickness of the Santa Fe Group is up to 16,400 ft at the deepest part of the basin (Lozinsky 1994). The entire sequence consists of unconsolidated sediments, which thin toward the edge of the basin and are truncated by normal faults at the basin-bounding uplifts. Units overlying the Santa Fe Group include Pliocene Ortiz gravel and Rio Grande fluvial deposits, which are interbedded with Tertiary and Quaternary basaltic and pyroclastic materials. Based on recent geophysical models, the Albuquerque Basin has been further divided into three, 2- to 4-mile deep, interconnected structural depressions from north to south: the Santo Domingo, Calabacillas, and Belen subbasins. KAFB lies near the intersection of the Calabacillas and Belen subbasins along a broad, northwest elongate structural high called the Mountainview prong that separates the two subbasins (Grauch and Connell 2013). These tectonic/sedimentation features contribute greatly to the complex structural setting described below.

Figures 1-2 and 1-3 show four primary faults on the east side of KAFB: (1) the Sandia Fault, (2) the West Sandia Fault, (3) the Hubbell Spring Fault (West, Central, and East fault segments), and (4) the Tijeras Fault. The Sandia Fault is thought to be the primary boundary between the Sandia Mountains and the Albuquerque Basin. The Hubbell Spring Fault extends northward from Socorro County and terminates on KAFB near the Tijeras Fault. The Sandia and the Hubbell Spring Faults are north-south trending, down to the west, en-echelon normal faults bounding the east side of the Albuquerque Basin.

The Tijeras Fault is an ancient strike-slip fault that developed in the Precambrian or early Paleozoic (approximately 600 Ma) and was reactivated in association with the Laramide Orogeny during the Cretaceous period (Kelley 1977). The fault also demonstrates Quaternary movement at locations northeast of KAFB (Kelson et al. September 1999, GRAM and Lettis December 1995). This fault has been traced as far north as Madrid, New Mexico and continues into the Sangre de Cristo Mountains as the Cañoncito Fault. Preferential erosion along the fault formed Tijeras Canyon, which divides the Sandia and Manzanita Mountains. The fault trends southwest from Tijeras Canyon, intersects the northeast boundary of KAFB, and crosses KAFB to the east and south of Manzano Base. Manzano Base occupies an uplift of four peaks defined by the Tijeras Fault on the east side and the Sandia Fault on the west side. The Sandia, Hubbell Spring, and Tijeras Faults converge near the southeast end of TA-III. This complicated system of faults, defining the east edge of the basin, is referred to collectively as the Tijeras Fault Complex.

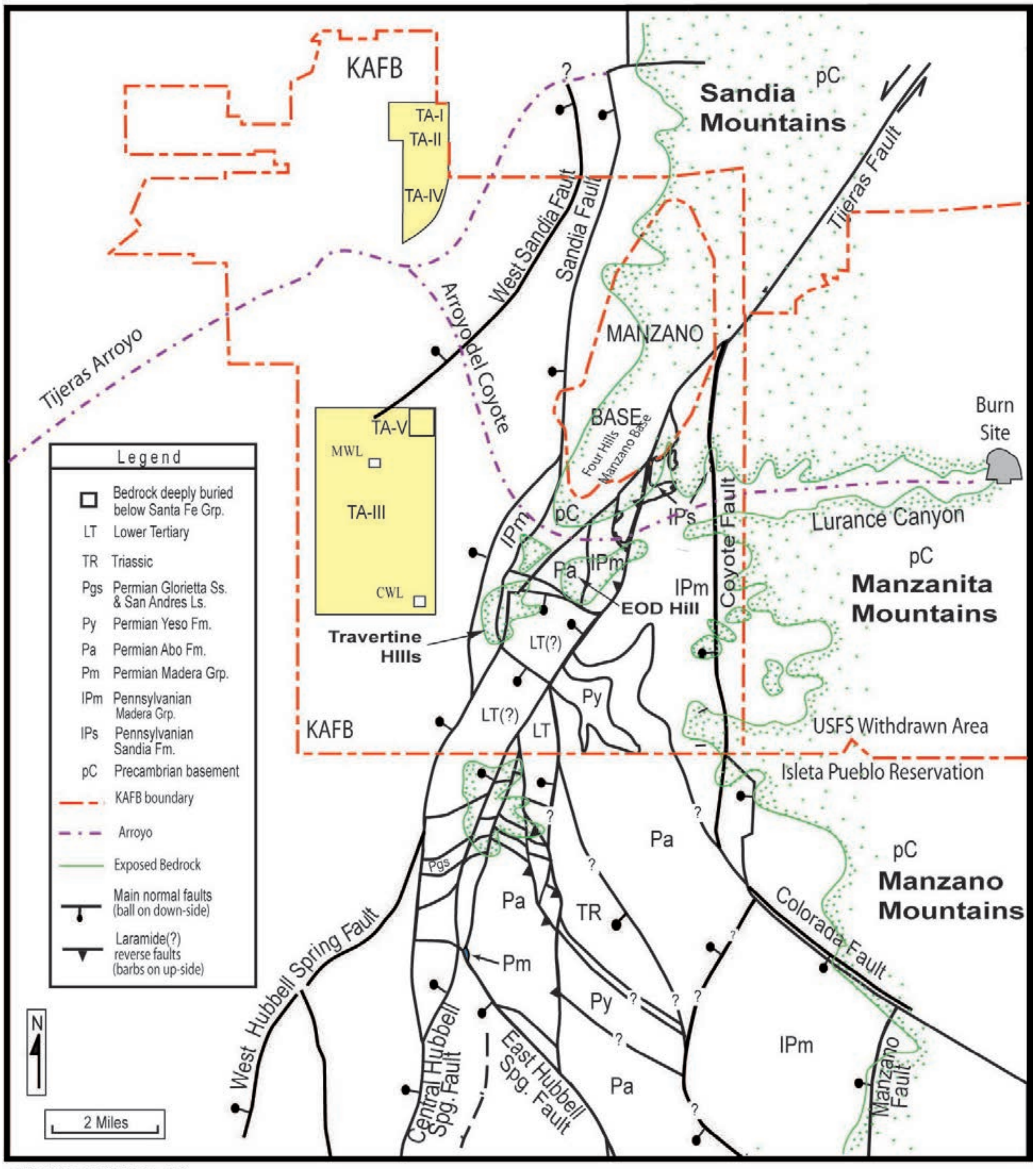

Figure 1-2. Generalized Geology in the Vicinity of SNL/NM and KAFB (Van Hart June 2003)

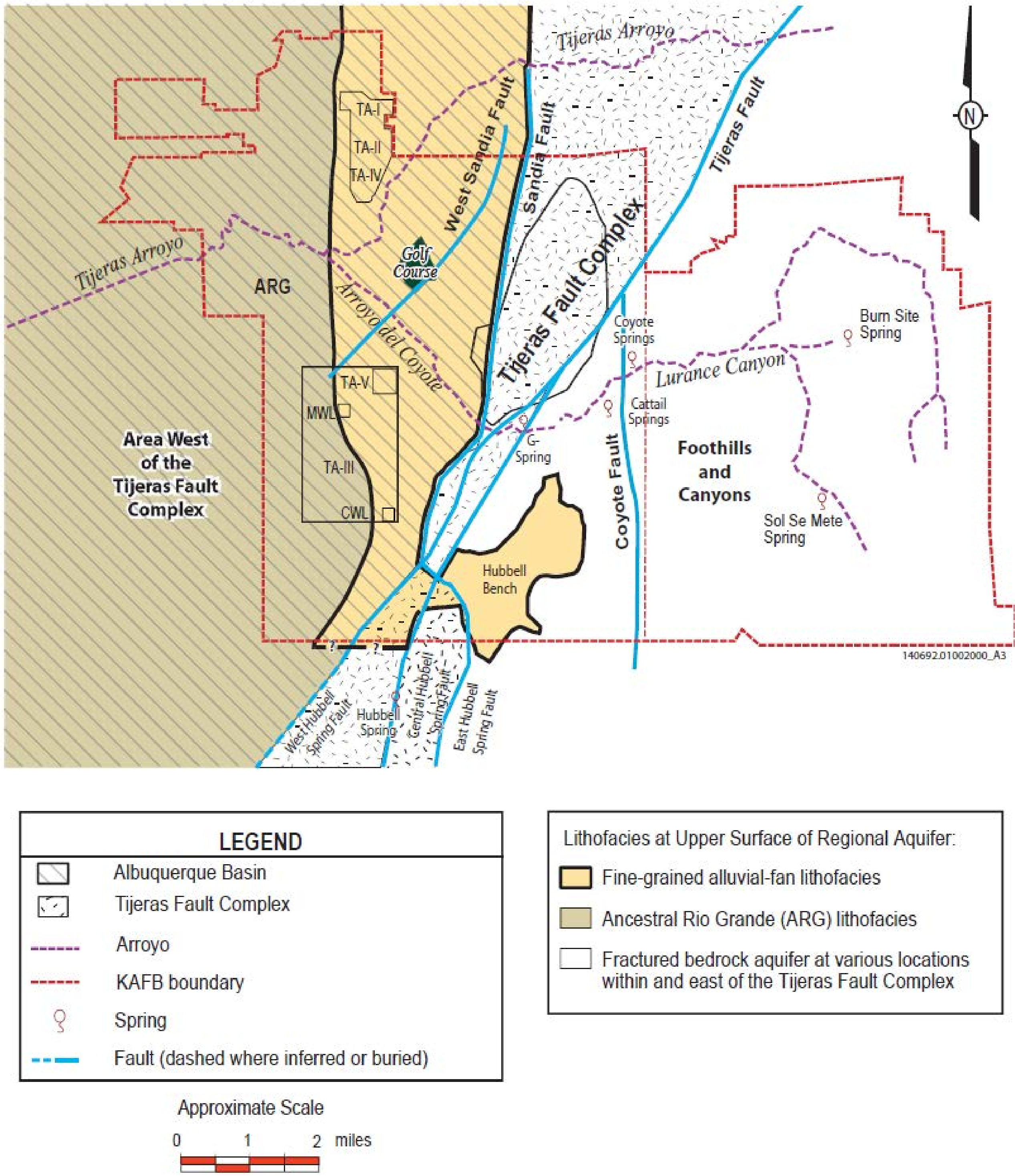

Figure 1-3. Hydrogeologically Distinct Areas Primarily Controlled by Faults (Modified from SNL March 1996)

1.1.3 Hydrogeology

Figure 1-3 shows three distinct hydrogeologic areas for the KAFB area: (1) the Albuquerque Basin, (2) the Tijeras Fault Complex, and (3) the foothills and canyons region. The primary division is between the east and west sides of the Tijeras Fault Complex, which is the transitional zone. This division marks the boundary between the Regional Aquifer and the fractured bedrock system. It is important to note that the boundaries shown on Figure 1-3 identify the approximate hydrologic settings. A deep aquifer is present within the Albuquerque Basin where the Regional Aquifer lies at approximately 500 ft below ground surface. A Perched Groundwater System lies above the Regional Aquifer near TA-I, TA-II, and TA-IV in the TAG AOC. Figure 1-3 does not show the Perched Groundwater System, but Chapter 6.0 discusses it in detail. The Perched Groundwater System extends east and southeastward from the former KAFB sewage lagoons to the Tijeras Arroyo Golf Course. The system crosses TA-I, TA-II, and TA-IV where the gradient averages approximately 0.01 feet per foot (ft/ft), feet of vertical change per foot of horizontal distance) in the sediments. Possible recharge sources for the Perched Groundwater System include the former lagoons, landscape watering, arroyo surface water, wastewater outfalls, buried septic systems, the golf course, and possible leakage from water-distribution and sewer lines (SNL February 2018).

East of the Tijeras Fault Complex, a thin layer of alluvium covers the bedrock. The hydrogeology in this area is poorly understood due to the complex geology created by the fault systems. On the east side of the Tijeras Fault Complex, the depth-to-groundwater ranges from about 45 to 325 ft below ground surface. Most non-potable water supply and monitoring wells east of the faults are completed in fractured bedrock at relatively shallow depths and produce modest yields of groundwater.

Groundwater in the fractured bedrock system on the east portion of KAFB generally flows west out of the canyons toward the Tijeras Fault Complex (Plate 1). The groundwater gradient for the bedrock aquifer is relatively steep, 0.03 ft/ft. From the mountain front to Wyoming Boulevard, the gradient averages approximately 0.005 ft/ft in the unconsolidated sediments, and west of Wyoming Boulevard the gradient flattens to an average of approximately 0.002 ft/ft in coarser-grained facies of the unconsolidated sediments.

The historic direction of regional groundwater flow within the basin was westward from the mountains toward the Rio Grande. However, due to groundwater pumping at KAFB, Veterans Administration, and Albuquerque Bernalillo County Water Utility Authority (ABCWUA) water supply wells, a depression in the Regional Aquifer has been created originating at the well fields near the northwest corner of KAFB. The impact of the seasonal variation in water production by both KAFB and ABCWUA wells can be observed as minor fluctuations in the groundwater elevations of some SNL/NM and KAFB monitoring wells as far to the southeast as TA-III.

1.1.4 Surface Water Hydrology

The Rio Grande, located approximately 3 miles west of KAFB, is the major surface hydrologic feature in central New Mexico. The Rio Grande originates in the San Juan Mountains of Colorado and terminates at the Gulf of Mexico, near Brownsville, Texas. The Rio Grande has a total length of 1,760 miles and is the third longest river system in North America. Surface water (with the exception of several springs) within the boundaries of KAFB is found only as ephemeral streams (arroyos) that flow for short periods from runoff after storm events, or during the spring melt of mountain snowpack. The primary surface water feature that drains the eastern foothills on KAFB is the Tijeras Arroyo. The Arroyo del Coyote intersects Tijeras Arroyo just south of TA-IV (about 1 mile west of the golf course [Figure 1-3]). Both Tijeras Arroyo and Arroyo del Coyote carry significant runoff after heavy thunderstorms that usually occur from June through August. The Tijeras Arroyo, above the confluence with Arroyo del Coyote, drains about 80 sq mi, while Arroyo del Coyote drains about 39 sq mi (U.S. Army Corps of Engineers [USACE] 1979). The total watershed for Tijeras Arroyo, which includes the Sandia and Manzanita Mountains and portions of KAFB, is approximately 126 sq mi. All active SNL/NM facilities are located outside the 100-year floodplains of both Tijeras Arroyo and Arroyo del Coyote.

Several springs on KAFB are associated with the uplifts in the Tijeras Fault Complex and in the Foothills and Canyons hydrogeologic areas (Figure 1-3): (1) Coyote Springs, Cattail Springs, and G Spring within Arroyo del Coyote, (2) Burn Site Spring in Lurance Canyon, and (3) Sol se Mete Spring within the Manzanita Mountains. Coyote Springs and Sol se Mete are perennial springs (continuously flowing), while the others are ephemeral springs. Hubbell Spring (a perennial spring) is located just south of KAFB on Isleta Pueblo. The wetland areas created by these springs, though very limited in extent, provide a unique ecological niche in an otherwise arid habitat.

Groundwater recharge near KAFB is primarily derived from the eastern mountain front and along the major arroyos. However, the amount of recharge occurring in the foothills and canyons is not well characterized. The estimated recharge for that portion of Tijeras Arroyo on KAFB is approximately 2.2 million cubic feet per year (50 acre-feet per year) (SNL February 1998). The best estimate for the groundwater recharge associated with Arroyo del Coyote is 0.4 million cubic feet per year (9.2 acre-feet per year). Infiltration studies conducted by the Site-Wide Hydrogeologic Characterization Project determined that recharge is negligible from direct precipitation due to the high rate of evapotranspiration for most other areas on KAFB, especially on alluvial-fan slopes and other relatively flat areas (SNL February 1998).

1.2 Groundwater Monitoring

Extensive groundwater monitoring is conducted on KAFB by two agencies (Department of Defense through Defense Environmental Restoration Program personnel and DOE through SNL/NM personnel). The Defense Environmental Restoration Program has a large monitoring well network associated with several closed landfills and a former sewage lagoon system. Additional KAFB wells are sited to monitor and characterize several nitrate plumes and an extensive KAFB aviation gasoline/jet fuel plume associated with the KAFB Bulk Fuels Facility. SNL/NM personnel monitor groundwater on KAFB at locations associated with DOE/NNSA-owned facilities and sites permitted by the U.S. Air Force for DOE/NNSA use. Groundwater monitoring is conducted by SNL/NM personnel on a site-wide and site-specific basis. Figure 1-4 illustrates the extensive monitoring well network at KAFB. Plate 1 more accurately portrays the monitoring well network and is presented after Chapter 7.0 of this Annual Groundwater Monitoring Report along with Table 1, which provides construction details for the groundwater monitoring, production, and remediation wells. Table 1-1 lists the CY 2018 sampling events conducted for groundwater quality monitoring at SNL/NM.

Table 1-2 summarizes the groundwater analytical results for monitoring activities. Table 1-3 lists detected analytes that exceed the U.S. Environmental Protection Agency (EPA) drinking water regulatory criteria (EPA May 2009) for samples collected by SNL/NM personnel during CY 2018.

In this report, groundwater monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides are provided voluntarily by the DOE/NNSA and SNL/NM personnel. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Compliance Order on Consent (Consent Order) as specified in Section III.A of the Consent Order (New Mexico Environment Department [NMED] April 2004).

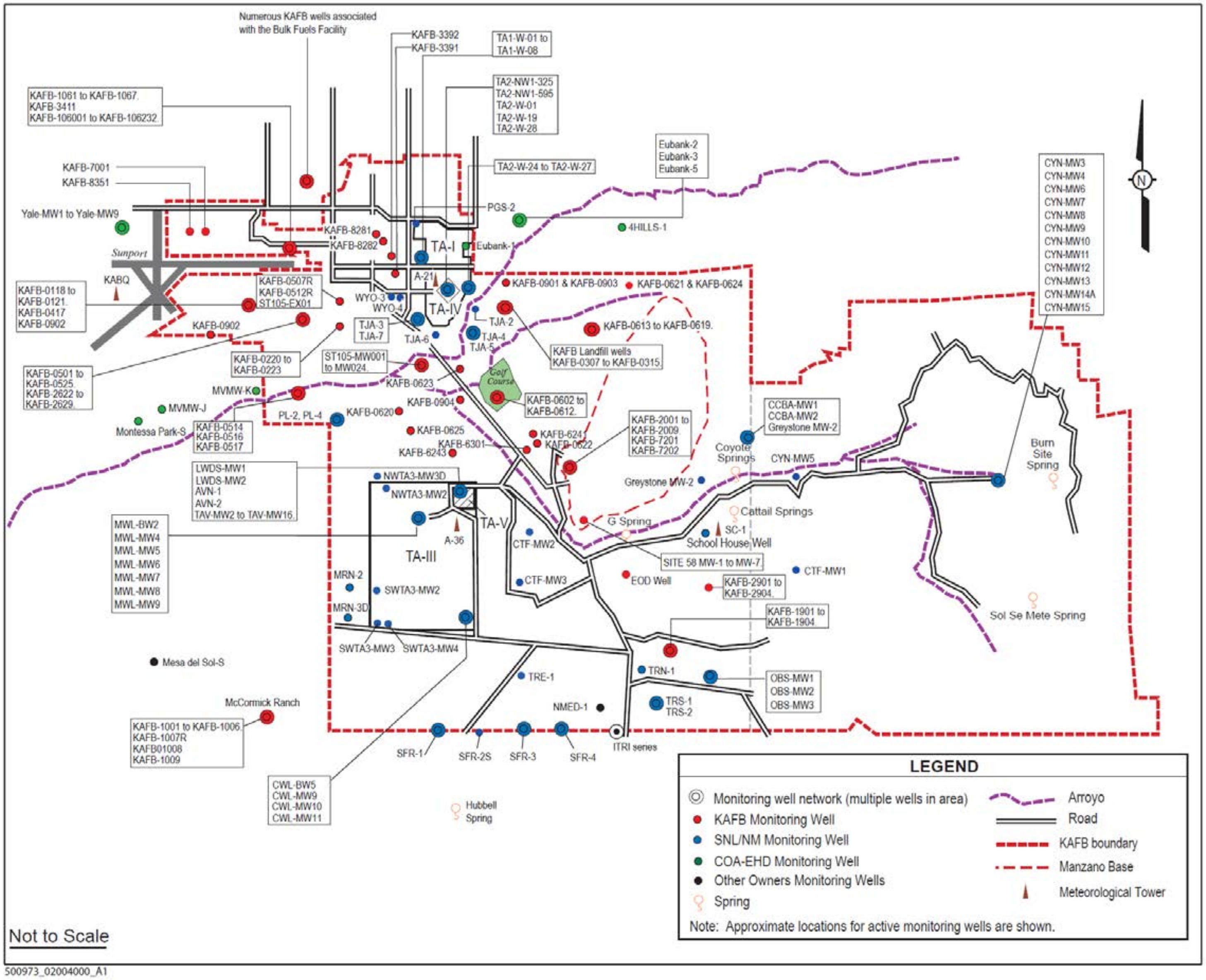

Figure 1-4. Wells and Springs within SNL/NM and KAFB

Table 1-1. Sample Collection Dates for Groundwater Quality Monitoring at SNL/NM for Calendar Year 2018

2018 Sampling Event	GMP	CWL	MWL	TAVG	TAG	BSG
January		√				
February				√	√	
March	√				√	
April			√			√
May			√	√		
June				√	√	
July		√		√		
August				√	√	
September				√	√	
October			√			√
November				√	√	
December					√	√

NOTES:

BSG = Burn Site Groundwater (Area of Concern).
CWL = Chemical Waste Landfill.
GMP = Groundwater Monitoring Program.
MWL = Mixed Waste Landfill.
SNL/NM = Sandia National Laboratories, New Mexico.
TAG = Tijeras Arroyo Groundwater (Area of Concern).
TAVG = Technical Area-V Groundwater (Area of Concern).

Table 1-2. Summary of SNL/NM Groundwater Monitoring Analytical Results for Calendar Year 2018

SNL/NM Groundwater Monitoring	
Number of Active Wells/Springs Monitored	69
Number of Analyses Performed	11,262
Percent of Non-detected Results	85 %

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Summary of Field Water Quality Parameters (units as indicated below)						
pH in SU	146	0	6.36	7.94	7.44	NE
Specific Conductivity in µmhos/cm	146	0	229.1	4000.77	771.9	NE
Temperature in °C	146	0	11.66	25.97	19.36	NE
Turbidity in NTU	146	0	0.10	15.8	1.08	NE
Detected Organic Compounds in µg/L						
Acetone	16	117	1.60	3.61	2.50	NE
Chloroform	8	146	0.300	0.960	0.728	NE
Dichloroethane, 1,1-	4	145	0.320	0.400	0.370	NE
Dichloroethene, 1,1-	2	152	0.820	0.830	0.825	7.0
Dichloroethene, cis-1,2-	38	111	0.310	3.88	0.965	70
Methylene Chloride	1	148	2.10	2.10	2.10	5.0
Tetrachloroethene	10	144	0.300	1.36	0.718	5.0
Toluene	2	147	0.330	0.470	0.400	1,000
Trichlorobenzene, 1,2,4-	1	138	0.300	0.300	0.300	70
Trichloroethene	72	87	0.310	18.0	4.169	5.0
Detected Metals in mg/L						
Aluminum	15	54	0.0202	0.193	0.0722	NE
Arsenic	80	46	0.00204	0.00633	0.00276	0.010
Barium	69	0	0.00857	0.222	0.06799	2.0
Beryllium	1	68	0.00698	0.00698	0.00698	0.004
Calcium	69	0	37.4	315	85.2	NE
Chromium	6	83	0.0032	0.0668	0.0176	0.100
Cobalt	4	65	0.00030	0.00894	0.00277	NE
Copper	34	35	0.000319	0.00646	0.000840	NE
Iron	29	97	0.0371	0.331	0.0693	NE
Magnesium	69	0	3.04	61.3	20.18	NE

Refer to footnotes on page 1-12.

Table 1-2. Summary of SNL/NM Groundwater Monitoring Results for Calendar Year 2018 *(Continued)*

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Detected Metals in mg/L						
Manganese	22	101	0.0012	1.35	0.0651	NE
Mercury	2	83	0.000077	0.000096	0.000087	0.002
Molybdenum	1	0	0.00160	0.00160	0.00160	NE
Nickel	22	67	0.00061	0.0224	0.00302	NE
Potassium	69	0	1.73	28.8	3.67	NE
Selenium	46	23	0.00203	0.0288	0.00525	0.050
Silver	1	68	0.00085	0.00085	0.00085	NE
Sodium	69	0	17.4	10801,080	64.8	NE
Thallium	1	68	0.00113	0.00113	0.00113	0.002
Uranium	68	1	0.00104	0.0165	0.00448	0.030
Vanadium	57	12	0.00331	0.0112	0.00605	NE
Zinc	26	43	0.00341	0.0400	0.01034	NE
Detected Inorganic Parameters in mg/L						
Nitrate plus nitrite, as N	157	0	0.131	35.4	8.679	10
Bromide	68	1	0.143	2.82	0.585	NE
Chloride	69	0	9.50	477	59.48	NE
Fluoride	69	0	0.143	2.82	0.894	4.0
Sulfate	69	0	16.6	19301,930	118.8	NE
Total Cyanide	1	15	0.00401	0.00401	0.00401	0.200
Total Organic Halogens	5	11	0.00418	0.0168	0.00808	NE
Total Phenols	2	14	0.00332	0.00561	0.00447	NE
Alkalinity as $CaCO_3$	69	0	84.2	10501,050	211.3	NE
Perchlorate	2	1	0.00404	0.00460	0.00432	NE

Refer to footnotes on page 1-12.

Table 1-2. Summary of SNL/NM Groundwater Monitoring Results for Calendar Year 2018 *(Concluded)*

Analyte	Number of Detects	Number of Non-Detects	Minimum Detected Value	Maximum Detected Value	Mean Detected Value	MCL
Detected Radiochemistry Activities in pCi/L (unless noted otherwise)						
Alpha, gross (corrected)	79	0	-12.00	13.76	3.00	15.0[a]
Beta, gross	74	5	2.11	26.2	5.29	4 mrem/yr
Potassium-40	5	70	45.4	83.8	57.2	NE
Radium-226	8	8	0.451	2.05	1.190	5.0[b]
Radium-228	3	13	0.514	0.730	0.609	5.0[b]
Radon-222	10	0	115	497	270	NE
Uranium-233/234	15	0	0.53	35.9	14.23	NE
Uranium-235/236	14	1	0.234	1.05	0.548	NE
Uranium-238	15	0	0.136	6.31	3.108	NE

NOTES:

[a]The 15.0 pCi/L MCL is for corrected gross alpha activity.

[b]The 5.0 pCi/L MCL is for combined Radium-226 and Radium-228.

°C	=	Degree Celsius.
%	=	Percent.
µg/L	=	Micrograms per liter.
µmhos/cm	=	Micromhos per centimeter.
4 mrem/yr	=	Any combination of beta- and/or gamma-emitting radionuclides (as dose rate).
$CaCO_3$	=	Calcium carbonate.
corrected	=	Gross alpha results reported as corrected values (uranium activities subtracted out).
MCL	=	Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Drinking Water Regulations (Title 40 Code of Federal Regulations § 141.11[b]), National Primary Drinking Water Standards (EPA May 2009).
mg/L	=	Milligrams per liter.
mrem/yr	=	Millirem per year.
NE	=	Not established.
NTU	=	Nephelometric turbidity units.
pCi/L	=	Picocuries per liter.
pH	=	Potential of hydrogen (negative logarithm of the hydrogen ion concentration).
rem	=	Roentgen equivalent man.
SNL/NM	=	Sandia National Laboratories, New Mexico.
SU	=	Standard units.

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells and Springs Sampled During Calendar Year 2018

Analyte	Well (Relevant Chapter)	Exceedance	Date
Beryllium MCL = 0.004 mg/L	Coyote Springs (Ch. 2)	0.00698 mg/L[a]	March 2018
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	CYN-MW9 (Ch. 7)	29.1 mg/L	April 2018
		32.2 mg/L	October 2018
	CYN-MW9 (Duplicate) (Ch. 7)	29.5 mg/L	April 2018
	CYN-MW10 (Ch. 7)	13.1 mg/L	April 2018
		10.2 mg/L	October 2018
	CYN-MW11 (Ch. 7)	15.1 mg/L	April 2018
		12.5 mg/L	October 2018
	CYN-MW12 (Ch. 7)	14.4 mg/L	April 2018
		15.2 mg/L	October 2018
	CYN-MW12 (Duplicate) (Ch. 7)	14.5 mg/L	April 2018
	CYN-MW13 (Ch. 7)	32.4 mg/L	April 2018
		34.8 mg/L	October 2018
	CYN-MW13 (Duplicate) (Ch. 7)	35.4 mg/L	October 2018
	CYN-MW14A (Ch. 7)	12.2 mg/L	April 2018
		12.7 mg/L	October 2018
	CYN-MW14A (Duplicate) (Ch. 7)	12.7 mg/L	October 2018
	CYN-MW15 (Ch. 7)	20.3 mg/L	April 2018
		20.7 mg/L	October 2018
	CYN-MW15 (Duplicate) (Ch. 7)	21.4 mg/L	October 2018
	LWDS-MW1 (Ch. 5)	12.1 mg/L	February 2018
		12.9 mg/L	June 2018
		12.0 mg/L	August 2018
		11.9 mg/L	November 2018
	LWDS-MW1 (Duplicate) (Ch. 5)	12.3 mg/L	February 2018
	TA2-W-19 (Ch. 6)	11.0 mg/L	March 2018
		10.6 mg/L	June 2018
		11.2 mg/L	September 2018
		12.8 mg/L	November 2018
	TA2-W-19 (Duplicate) (Ch. 6)	10.5 mg/L	June 2018
	TA2-W-28 (Ch. 6)	17.5 mg/L	March 2018
		16.4 mg/L	June 2018
		15.6 mg/L	September 2018
		17.1 mg/L	December 2018
	TAV-MW10 (Ch. 5)	11.4 mg/L	February 2018
		12.0 mg/L	June 2018
		11.3 mg/L	September 2018
		11.4 mg/L	November 2018
	TAV-MW10 (Duplicate) (Ch. 5)	10.8 mg/L	September 2018
	TJA-2 (Ch. 6)	11.5 mg/L	March 2018
		10.9 mg/L	June 2018
		11.0 mg/L	September 2018
		11.5 mg/L	December 2018
	TJA-2 (Duplicate) (Ch. 6)	11.5 mg/L	December 2018
	TJA-4 (Ch. 6)	31.6 mg/L	March 2018
		29.1 mg/L	June 2018
		30.7 mg/L	September 2018
		30.2 mg/L	December 2018

Refer to footnotes on page 1-14.

Table 1-3. Summary of Exceedances for SNL/NM Groundwater Monitoring Wells and Springs Sampled During Calendar Year 2018 *(Concluded)*

Analyte	Well (Relevant Chapter)	Exceedance	Date
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	TJA-5 (Ch. 6)	21.7 mg/L	June 2018
	TJA-7 (Ch. 6)	22.8 mg/L	March 2018
		21.1 mg/L	June 2018
		23.4 mg/L	September 2018
		22.9 mg/L	December 2018
	TJA-7 (Duplicate) (Ch. 6)	21.6 mg/L	June 2018
Trichloroethene MCL = 5.0 µg/L	LWDS-MW1 (Ch. 5)	17.7 µg/L	February 2018
		17.4 µg/L	June 2018
		15.7 µg/L	August 2018
		16.8 µg/L	November 2018
	LWDS-MW1 (Duplicate) (Ch. 5)	18.0 µg/L	February 2018
	TAV-MW10 (Ch. 5)	8.42 µg/L	February 2018
		9.71 µg/L	June 2018
		9.52 µg/L	September 2018
		9.72 µg/L	November 2018
	TAV-MW10 (Duplicate) (Ch. 5)	9.64 µg/L	September 2018
	TAV-MW12 (Ch. 5)	6.37 µg/L	February 2018
		5.66 µg/L	May 2018
	TAV-MW12 (Duplicate) (Ch. 5)	6.11 µg/L	February 2018
	TAV-MW14 (Ch. 5)	5.45 µg/L	June 2018

NOTES:

[a]Analytical result for filtered water sample. All other analytical results are for unfiltered water samples.

µg/L = Micrograms per liter.
Ch. = Chapter.
CYN = Canyons.
LWDS = Liquid Waste Disposal System.
MCL = Maximum contaminant level.
mg/L = Milligrams per liter.
MW = Monitoring well.
SNL/NM = Sandia National Laboratories, New Mexico.
TA2-W = Technical Area-II (Well) (monitoring well designation only).
TAV = Technical Area-V (monitoring well designation only).
TJA = Tijeras Arroyo (monitoring well designation only).

1.2.1 SNL/NM Groundwater Monitoring Requirements

Groundwater monitoring performed by SNL/NM personnel is directed based on three broad sets of requirements: the Resource Conservation and Recovery Act (RCRA) Facility Operating Permit (RCRA Permit), the Consent Order, and various DOE Directives.

Potential release sites at SNL/NM are identified, characterized, and remediated (if required) under the RCRA regulations. In 1984, RCRA was significantly amended by the Hazardous and Solid Waste Amendments, which specifically addressed remediation of legacy contamination, including groundwater at solid waste management units (SWMUs). In the RCRA Permit, a SWMU is defined as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste." At SNL/NM, SWMUs are regulated under the RCRA Permit (NMED January 2015). Monitoring and/or corrective action requirements generally are determined on a SWMU-specific basis following a site investigation.

The Consent Order became effective in 2004 and specified that corrective actions for releases of hazardous waste or hazardous constituents were to be conducted under the Consent Order rather than under the RCRA Permit, with the exception of new releases from operating units; closure and post-closure at operating units; implementation of controls for any SWMU on the Permit's "Corrective Action Complete with Controls" list; and any releases of hazardous waste or hazardous constituents that occur after the Consent Order is no longer effective.

The GMP sampling complies with the Consent Order requirement for Facility Investigation Background and Periodic Monitoring Reports. Groundwater monitoring results at all sites are compared with federal and state water quality standards and DOE drinking water guidelines, where established. Groundwater surveillance conducted at the GMP network also adheres to DOE Order 231.1B, *Environment, Safety, and Health Reporting* (DOE June 2011).

Closure of the CWL was approved by the NMED and the CWL Post-Closure Care Permit became effective on June 2, 2011 (Kieling June 2011). All groundwater monitoring at the CWL since June 2011 is performed in accordance with requirements specified in the Post-Closure Care Permit. Required monitoring (groundwater and soil-gas), inspections, and maintenance activities are comprehensively documented in annual Post-Closure Care Reports submitted to NMED by March 31st of each year.

The MWL is a SWMU that underwent corrective action in accordance with the Consent Order. As of March 13, 2016, the February 2016 NMED Final Order (Flynn February 2016) became effective, granting Corrective Action Complete with Controls status to the MWL. All controls required for the MWL, including groundwater monitoring, are defined in the MWL Long-Term Monitoring and Maintenance Plan (SNL March 2012) that was approved by NMED on January 8, 2014 (Blaine January 2014). The MWL Long-Term Monitoring and Maintenance Plan defines all long-term monitoring, inspection, maintenance/repair, and reporting requirements that are applicable to the MWL and is included in the RCRA Permit (Kieling February 2016). Ongoing monitoring, inspection, and maintenance/repair are comprehensively documented in MWL Annual Long-Term Monitoring and Maintenance Reports submitted to the NMED by June 30th of each year.

The three groundwater AOCs at SNL/NM (TAVG, TAG, and BSG) are undergoing corrective action in accordance with the Consent Order. Each AOC complies with requirements set forth in the Consent Order for site characterization and the development of a Corrective Measures Evaluation. The NMED is the regulatory agency responsible for enforcing the requirements identified in the Consent Order for each of the three AOCs (SNL June 2004, July 2004, and December 2004). The Consent Order also includes requirements for the placement and installation of new groundwater monitoring wells and decommissioning of obsolete monitoring wells at SNL/NM. Applicable well installation and well decommissioning permits are obtained from the New Mexico Office of the State Engineer.

In addition to groundwater monitoring requirements, the Consent Order has recommendations for public involvement for sites in the corrective action process, such as the BSG, TAG, and TAVG AOCs. Activities to inform the public about the status of these three AOCs in CY 2018 include presentations at semiannual DOE/NNSA public meetings held in April and October. In addition, information on the hydrogeologic setting of the BSG, TAG, and TAVG AOCs was presented at the following events/venues:

- Albuquerque Bernalillo County Water Protection Advisory Board
- New Mexico Chapter of the Air and Waste Management Association
- New Mexico Geological Society's 2018 Annual Meeting (Skelly, Copland, and Li April 2018)

1.3 Field Methods, Analytical Methods, and Quality Control Procedures

The monitoring procedures, as conducted by SNL/NM personnel, are consistent with procedures identified in the EPA's Technical Enforcement Guidance Document (EPA 1986a). This section discusses procedures that apply to all groundwater investigations. Chapters 2.0 through 7.0 present any site-specific variances from the procedures discussed in this section.

1.3.1 Field Methods and Measurements

The following sections provide an overview of the sampling and data collection procedures.

1.3.1.1 Groundwater Elevation

In CY 2018, water level measurements were obtained to determine groundwater flow directions, hydraulic gradients, and potentiometric surface elevations. Water levels are periodically measured in SNL/NM monitoring wells according to the instructions and requirements specified in SNL/NM Field Operating Procedure (FOP) 03-02, *Groundwater Level Data Acquisition and Management* (SNL April 2016a). Chapters 2.0 through 7.0 present the water level information used to create the potentiometric surface maps and hydrographs.

1.3.1.2 Well Purging and Water Quality Measurements

A portable Bennett™ groundwater sampling system was used to collect the groundwater samples from all wells. The minimum purge requirements for a portable piston pump are one saturated screen volume (including annulus). Field water quality parameters measured (Table 1-4) include temperature, specific conductivity (SC), oxidation-reduction potential (ORP), potential of hydrogen (pH), turbidity, and dissolved oxygen (DO). These were recorded for each well during purging and prior to collecting groundwater samples, according to SNL/NM FOP 05-01, *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements* (SNL January 2018a). Groundwater temperature, SC, ORP, pH, and DO were measured using an In-Situ Incorporated Aqua TROLL® 600 Multiparameter Water Quality Sonde. Turbidity was measured with a HACH™ Model 2100P turbidity meter.

Table 1-4. Field Water Quality Parameters Measured at Monitoring Wells

Field Parameter	Comments
Dissolved Oxygen	Percentage of saturation value and/or measured in mg/L.
Oxidation-Reduction Potential	Measured in mV.
pH	Stability measure: Four consecutive measures within 0.1 pH units.
Sample Flow Rate	Measured in gpm.
Specific Conductivity (µmhos/cm)	Stability measure: Four consecutive measurements within 5 percent.
Temperature (°C)	Stability measure: Four consecutive measures within 1°C.
Turbidity (NTU)	Stability measure: Four consecutive measurements within 10 percent or less than 5 NTU.

NOTES:
°C = Degrees Celsius.
µmhos/cm = Micromhos per centimeter.
gpm = Gallons per minute.
mg/L = Milligrams per liter.
mV = Millivolts.
NTU = Nephelometric turbidity units.
pH = Potential of hydrogen (negative logarithm of the hydrogen ion concentration).

The amount of water required to achieve stabilization of field parameters is fairly consistent for a particular monitoring well. However, the ability of the aquifer to produce water can vary greatly from well to well. In accordance with the site-specific Mini-Sampling and Analysis Plans (as identified in Chapters 2.0 through 7.0), purging continued until four stable measurements for temperature, SC, pH, and turbidity were obtained. Groundwater stability is considered acceptable (stable) when temperature is within 1.0 degree Celsius, SC is within 5 percent, pH is within 0.1 units, and turbidity measurements are less than 5 nephelometric turbidity units or within 10 percent for turbidity values greater than 5 nephelometric turbidity units. Associated field measurement logs documenting details of well purging and water quality measurements for each sampling event were submitted to the SNL/NM Customer Funded Record Center.

1.3.1.3 Pump Decontamination

The sampling pump and tubing bundle associated with the portable Bennett™ groundwater sampling system were decontaminated prior to installation into each monitoring well according to procedures described in SNL/NM FOP 05-03, *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination* (SNL January 2018b). An equipment blank (EB) is collected to verify the equipment decontamination process.

1.3.1.4 Sample Collection Sampling Procedures

Groundwater samples are collected using a nitrogen gas-powered portable piston pump (Bennett™) in accordance with SNL/NM FOP 05-01 (SNL January 2018a). Sample bottles are filled directly from the pump discharge line and water sampling manifold.

1.3.1.5 Sample Handling and Shipment

The SNL/NM Sample Management Office (SMO) processes environmental samples collected by SNL/NM personnel. The SMO staff obtains sample containers, issues sample control and tracking numbers, tracks the chain-of-custody forms, and reviews analytical data packages to determine method, contract, and regulatory project-specific compliance. All groundwater samples are analyzed by off-site laboratories using EPA-specified protocols. Analytical laboratories report associated quality control (QC) data that are reviewed against quality assurance requirements specified in the *Procedure for Completing the Contract*

Verification Review, SMO-05-03, Revision 06 (SNL April 2016b) and Administrative Operating Procedure (AOP) 00-03, *Data Validation Procedure for Chemical and Radiochemical Data, Revision 5* (SNL June 2017).

1.3.1.6 Waste Management

Purge and decontamination wastewater generated from sampling activities were placed into 55-gallon polyethylene drums and stored at the Environmental Resources Field Office waste accumulation area. All waste was managed in accordance with SNL/NM FOP 05-04, *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management* (SNL January 2018c). All wastewater was discharged to the sanitary sewer in accordance with ABCWUA and project-specific regulatory requirements after waste characterization data were compared to discharge limits.

1.3.2 Analytical Methods

The groundwater samples are analyzed by off-site laboratories using EPA-specified protocols. Groundwater samples were submitted to GEL Laboratories, LLC for analysis. Samples were analyzed in accordance with applicable EPA and DOE methods (Tables 1-5 and 1-6).

Table 1-5. Chemical Analytical Methods

Analyte	Analytical Method[a]
Alkalinity (total, bicarbonate, carbonate)	SM2320B
Anions	SW846-9056
Filtered Metals (including Cations)	SW846-6020/7470
HE compounds	SW846-8330
NPN	EPA 353.2
Perchlorate	EPA 314.0
Metals	SW846-6020/7470
Total Cyanide	SW846-9012B
Total Organic Halogens	SW846-9020B
TPH Diesel Range Organics	SW846-8015D
TPH Gasoline Range Organics	SW846-8015A/B
Total Phenol	SW846-9066
VOCs	SW846-8260B

NOTES:

[a]**Analytical Method References**

EPA 1999 (and updates), *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014, U.S. Environmental Protection Agency, Washington, D.C.

EPA 1986b (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, SW-846, 3rd ed., Rev. 1, U.S. Environmental Protection Agency, Washington, D.C.

EPA 1984, *Methods for Chemical Analysis of Water and Wastes,* EPA 600-4-79-020, U.S. Environmental Protection Agency, Washington, D.C.

Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, Washington, D.C.

EPA = U.S. Environmental Protection Agency.
HE = High explosives.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard Method.
SW = Solid Waste.
TPH = Total petroleum hydrocarbons.
VOC = Volatile organic compound.

Table 1-6. Radiochemical Analytical Methods

Analyte	Analytical Method[a]
Gamma Spectroscopy (short list[b])	EPA 901.1
Gross Alpha/Beta Activity	EPA 900.0
Isotopic Uranium	HASL-300
Radon-222	SM7500
Radium-226	EPA 903.1
Radium-228	EPA 904.0
Tritium	EPA 906.0

NOTES:

[a]**Analytical Method References**

DOE 1997, *EML [Environmental Measurements Laboratory] Procedures Manual,* 28th ed., Vol. 1, Rev. 0, HASL-300.

EPA 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., SM7500-Rn B Method, Washington, D.C.

[b]Gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40).

DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
HASL = Health and Safety Laboratory.
SM = Standard Method.

1.3.3 Quality Control Samples

Field and laboratory QC samples were prepared and analyzed along with the environmental samples to determine the accuracy and precision of the analytical methods, and to detect inadvertent sample contamination that may have occurred during the sampling and analysis process. Table 1-7 shows the types of QC samples that accompany groundwater quality samples in the sampling and analysis process. Upon receipt at SNL/NM, all chemical and radiochemical data are reviewed and qualified in accordance with AOP 00-03 (SNL June 2017). Although some minor analytical results were qualified during the data validation process, no significant data quality issues were noted. Data validation qualifiers are provided with the analytical results in the data tables attached to Chapters 2.0 through 7.0. The data validation report associated with each sampling event is retained per the SNL/NM Records Retention and Disposition Schedule.

Table 1-7. Quality Control Sample Types for Groundwater Sampling and Analysis

QC Sample Type	Description
Field QC	
Duplicate samples	Establish the precision of the sampling process.
Equipment blanks	Determine the effectiveness of the decontamination process of the sampling pump and system to ensure that cross-contamination did not occur between wells.
Field blanks	Assess whether contamination of the VOC samples had resulted from ambient field conditions.
Trip blanks	Determine whether VOC contamination occurred during sample handling, shipment, or storage by submitting deionized water samples along with the environmental samples for VOC analysis.
Laboratory QC	
Batch matrix spike and matrix spike duplicate samples	Measure the percent recovery and RPD of chemical spikes added to an existing sample to determine the sample matrix effect. (The matrix is groundwater.)
LCS	Monitor the accuracy and precision of the laboratory's analytical method using laboratory-prepared samples spiked with a known concentration of an analyte. These samples are analyzed in the same batch with the groundwater samples. LCS results are reported as a percent recovery.
Method blanks	Determine if contaminants were inadvertently introduced during the sample preparation and handling process in the laboratory.
Sample replicate	Used to determine precision for non-organic analyses.

NOTES:
LCS = Laboratory control sample.
QC = Quality control.
RPD = Relative percent difference.
VOC = Volatile organic compound.

1.3.4 Field Quality Control Samples

Field QC samples included duplicate environmental, EB, field blank (FB), and trip blank (TB) samples. The field QC samples were submitted for analysis with the groundwater samples in accordance with QC procedures specified in site-specific Mini- Sampling and Analysis Plans (Chapters 2.0 through 7.0).

1.3.4.1 Duplicate Environmental Samples

Duplicate environmental samples were analyzed to estimate the overall reproducibility of the sampling and analytical process. A duplicate environmental sample is collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The results for duplicate environmental sample analyses (for concentrations above detection limits only) are used to calculate relative percent difference values. The duplicate results are discussed in Chapters 2.0 through 7.0.

1.3.4.2 Equipment Blank Samples

The portable Bennett™ sampling pump and tubing bundle were decontaminated prior to installation into each monitoring well according to procedures described in SNL/NM FOP 05-03 (SNL January 2018b). An EB is collected to verify the effectiveness of the equipment decontamination process. The results for the EB analyses are discussed in Chapters 2.0 through 7.0.

1.3.4.3 Field Blank Samples

FB samples are submitted to assess whether any contamination of the samples could have resulted from ambient field conditions. FB samples are prepared by pouring deionized water into sample containers at the sample point (i.e., inside the sampling truck at each well location) to simulate the transfer of water from the sampling system to the sample container. The FB samples are contained in 40-milliliter glass vials and are commonly analyzed for VOC and gasoline range organics analyses. Chapters 2.0 through 7.0 discuss the results for FB analyses.

1.3.4.4 Trip Blank Samples

TB samples are submitted whenever samples are collected for VOC and gasoline range organics analyses. These samples are used to determine potential contamination during sampling, transportation, storage, and analysis. The TB samples consist of laboratory reagent-grade water with hydrochloric acid preservative contained in 40-milliliter glass vials. These containers are prepared by the analytical laboratory and accompany the empty sample containers supplied by the laboratory. TB samples accompanied each sample shipment. Chapters 2.0 through 7.0 discuss the TB analyses results.

1.3.5 Laboratory Quality Control Samples

Laboratory and method-required batch QC samples are prepared to determine potential contamination introduced by the laboratory processes. These are used to assist with data validation and data defensibility. These samples included laboratory control samples, replicates, matrix spikes, matrix spike duplicates, and surrogate spike samples. Internal laboratory QC samples were analyzed concurrently with all environmental samples. All chemical and radiochemical data are reviewed and qualified in accordance with AOP 00-03 (SNL June 2017). Laboratory data qualifiers are provided with the analytical results in the tables attached to Chapters 2.0 through 7.0.

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Chapter 1
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References

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Blaine January 2014 Blaine, T. (New Mexico Environment Department), January 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan, March 2012, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-12-007*. January 8, 2014.

DOE June 2011 U.S. Department of Energy (DOE), 2011. *Environment, Safety, and Health Reporting,* DOE Order 231.1B, U.S. Department of Energy, Washington, D.C., June 27, 2011.

DOE 1997 U.S. Department of Energy (DOE), 1997. *EML Procedures Manual,* 28th ed., Vol. 1, Rev. 0, HASL-300, Environmental Measurements Laboratory.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations*, EPA 816-F-09-0004, U.S. Environmental Protection Agency, Washington, D.C.

EPA 1999 U.S. Environmental Protection Agency (EPA), 1999. *Perchlorate in Drinking Water Using Ion Chromatography,* EPA 815/R-00-014, U.S. Environmental Protection Agency, Washington, D.C.

EPA 1986a U.S. Environmental Protection Agency (EPA), 1986. *RCRA Ground-Water Monitoring Technical Enforcement Guidance Document,* OSWER-9950.1. U.S. Environmental Protection Agency, Washington, D.C.

EPA 1986b U.S. Environmental Protection Agency (EPA), 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed., (and updates), Rev.1, U.S. Environmental Protection Agency, Washington, D.C.

EPA 1984 U.S. Environmental Protection Agency (EPA), 1984. *Methods for Chemical Analysis of Water and Wastes.* EPA 600-4-79-020, U.S. Environmental Protection Agency, Washington, D.C.

EPA 1980 U.S. Environmental Protection Agency (EPA), 1980. *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600-4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

Flynn February 2016 Flynn, R. (New Mexico Environment Department), February 2016. *Final Order, State of New Mexico Before the Secretary of the Environment in the Matter of Proposed Permit Modification for Sandia National Laboratories, EPA ID # 5890110518, To Determine Corrective Action Complete with Controls at the Mixed Waste Landfill, No. HWB 15-18(P)*, February 12, 2016.

GRAM and Lettis December 1995 GRAM and Lettis, December 1995. *Conceptual Geological Model of the Sandia National Laboratories and Kirtland Air Force Base,* prepared for Site Wide Hydrogeologic Characterization Project, Sandia National Laboratories, New Mexico, by GRAM, Inc., Albuquerque NM and William Lettis & Associates, Inc., Walnut Creek CA, 2 volumes.

Grauch and Connell 2013	Grauch, V.J.S., and Connell, S.D., 2013. *New perspectives on the geometry of the Albuquerque Basin, Rio Grande rift, New Mexico: Insights from geophysical models of rift-fill thickness*, in Hudson, M.R., and Grauch, V.J.S., eds., New Perspectives on Rio Grande Basins: From Tectonics to Groundwater: Geological Society of America Special Paper 494, p. 427-462.
Hansen and Gorbach 1997	Hansen, S., and C. Gorbach, 1997. *Middle Rio Grande Water Assessment, Final Report*. U.S. Bureau of Reclamation, Albuquerque Area Office, Albuquerque, New Mexico.
Hawley and Haase 1992	Hawley, J.W., and C.S. Haase, 1992. *Hydrogeologic Framework of the Northern Albuquerque Basin*, Open File Report 387, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.
Kelley 1977	Kelley, V.C., 1977. *Geology of Albuquerque Basin, New Mexico*, Memoir 33, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.
Kelley and Northrup 1975	Kelley, V. C., and S. A. Northrup, 1975. *Geology of Sandia Mountains and Vicinity, New Mexico*, Memoir 29, New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico.
Kelson et al. September 1999	Kelson, K.I., C.S. Hitchcock, and J.B.J. Harrison, 1999. *Paleoseismology of the Tijeras Fault Near Golden, New Mexico. Albuquerque Geology*, F.J. Pazzaglia and S. Lucas (eds.), *New Mexico Geological Society, Fiftieth Annual Field Conference*, New Mexico Geological Society, Socorro, New Mexico, September.
Kieling February 2016	Kieling, J.E. (New Mexico Environment Department), February 2016. Letter to J.P. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Final Decision on Proposal to Grant Corrective Action Complete with Controls Status for Mixed Waste Landfill, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-014*, February 18, 2016.
Kieling June 2011	Kieling, J.E. (New Mexico Environment Department), June 2011. Letter to P. Wagner (U.S. Department of Energy) and S.A. Orrell (Sandia Corporation), *Notice of Approval, Closure of Chemical Waste Landfill and Post-Closure Care Permit in Effect, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-10-013*, June 2.
Lozinsky 1994	Lozinsky, R.P., 1994. *Cenozoic stratigraphy, sandstone petrology, and depositional history of the Albuquerque basin, central New Mexico*, Geological Society of America, Special Paper 291, p. 73–82.
NMED January 2015	New Mexico Environment Department (NMED), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29.

Rice et al. 2012 Rice, E.W., R.B. Baird, A.D. Eaton, and L.S. Clesceri, 2012. *Standard Methods for the Examination of Water and Wastewater,* 22nd ed., Washington, D.C.

Skelly, Copland, and Li April 2018 Skelly, M.F., Copland, J.R., and Li, J., April 2018. *Hydrogeologic Characterization and Remediation at Three Groundwater Areas of Concern, Sandia National Laboratories, New Mexico [abstract]*. In: Proceedings of the New Mexico Geological Society 2018 Spring Meeting, April 13, 2018, Socorro, NM.

SNL February 2018 Sandia National Laboratories, New Mexico (SNL/NM), February 2018. *Revised Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, February 13, 2018.

SNL January 2018a Sandia National Laboratories, New Mexico (SNL/NM), January 2015. *Long-Term Environmental Stewardship Groundwater Monitoring Well Sampling and Field Analytical Measurements*, FOP 05-01, Revision 06, Sandia National Laboratories, Albuquerque, New Mexico, January 23, 2018.

SNL January 2018b Sandia National Laboratories, New Mexico (SNL/NM), January 2015. *Long-Term Environmental Stewardship Groundwater Sampling Equipment Decontamination,* FOP 05-03, Revision 06, Sandia National Laboratories, Albuquerque, New Mexico, January 23, 2018.

SNL January 2018c Sandia National Laboratories, New Mexico (SNL/NM), January 2015. *Long-Term Environmental Stewardship Groundwater Monitoring Waste Management,* FOP 05-04, Revision 06, Sandia National Laboratories, Albuquerque, New Mexico, January 23, 2018.

SNL June 2017 Sandia National Laboratories, New Mexico (SNL/NM), June 2017. *Data Validation Procedure for Chemical and Radiochemical Data*, AOP 00-03, Revision 5, Sample Management Office, Sandia National Laboratories, New Mexico, June 19, 2017.

SNL April 2016a Sandia National Laboratories, New Mexico (SNL/NM), April 2016. *Groundwater Level Data Acquisition and Management,* FOP 03-02, Rev. 06, Sandia National Laboratories, Albuquerque, New Mexico, April 1, 2016.

SNL April 2016b Sandia National Laboratories, New Mexico (SNL/NM), April 2016. *Procedure for Completing the Contract Verification Review, SMO-05-03, Revision 06,* Sandia National Laboratories, Albuquerque, New Mexico, April 22, 2016.

SNL March 2012 Sandia National Laboratories, New Mexico (SNL/NM), March 2012. *Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2004 Sandia National Laboratories, New Mexico (SNL/NM), 2004. *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater, Revision 0*, SAND Report SAND2004-6113, Sandia National Laboratories, Albuquerque, New Mexico, December.

SNL July 2004 Sandia National Laboratories, New Mexico (SNL/NM), 2004. *Corrective Measures Evaluation Work Plan, Tijeras Arroyo Groundwater*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, July.

SNL June 2004 Sandia National Laboratories, New Mexico (SNL/NM), 2004. *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, June.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), 1998. *Revised Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report, Revised February 1998*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, February.

SNL March 1996 Sandia National Laboratories, New Mexico (SNL/NM), 1996. *Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report*, Sandia National Laboratories, Albuquerque, New Mexico, March.

Thorn et al. 1993 Thorn, C.R., D.P. McAda, and J.M. Kernodle, 1993. *Geohydrologic Framework and Hydrologic Conditions in the Albuquerque Basin, Central New Mexico*, USGS Water Resources Investigation Report 93-4149, U.S. Geological Survey, Albuquerque, New Mexico.

USACE 1979 U.S. Army Corps of Engineers (USACE), 1979. *Special Flood Hazard Information: Tijeras Arroyo and Arroyo del Coyote, Kirtland AFB, New Mexico*, U.S. Army Corps of Engineers, Albuquerque District, Albuquerque, New Mexico.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico*, SAND Report SAND2003-1869, Sandia National Laboratories, Albuquerque, New Mexico.

2.0 Groundwater Monitoring Program

2.1 Introduction

This chapter documents the results for the calendar year (CY) 2018 monitoring activities conducted as part of the Sandia National Laboratories, New Mexico (SNL/NM) Groundwater Monitoring Program (GMP). The surveillance activities include the annual collection and analysis of groundwater samples from 12 monitoring wells and 1 surface water sample from a perennial spring. As part of the activities, SNL/NM personnel used groundwater elevation data from 217 monitoring wells. Groundwater elevation measurements were obtained either quarterly or annually depending on the response characteristics of the groundwater system at each well location due to climate, aquifer properties, pumping, or other stresses.

The purpose of monitoring the GMP network is:

- To protect groundwater resources at SNL/NM and the surrounding area.
- To establish background quality and understanding of the general hydrogeologic system beneath the facility.
- To identify potential sources of contamination.
- To work with other SNL/NM organizations to prevent groundwater contamination.
- To implement effective groundwater surveillance to detect contamination if it should occur.
- To initiate abatement or remedial action, where necessary.

To accomplish this mission, SNL/NM personnel perform the following tasks:

- Evaluate the potential effects of SNL/NM operations on groundwater through groundwater quality sampling and analysis, and groundwater elevation measurements.
- Record and maintain groundwater information in a digital database.
- Maintain documents and records, and ensure that necessary reports are submitted to the appropriate agencies in a timely manner.
- Prepare and maintain administrative and field operating procedures for groundwater monitoring activities.
- Provide assistance to well owners in the areas of well installation, well inspection and maintenance, and well plugging and abandonment.
- Establish requirements for well registration and well construction data tracking.
- Coordinate with the Surface Water Discharge Program to prevent groundwater contamination.

- Develop groundwater education and community outreach programs.

- Provide stakeholders an annual update of SNL/NM groundwater data through this Annual Groundwater Monitoring Report.

The groundwater monitoring involves completing the following objectives:

- Establish baseline water quality and groundwater flow information for the Regional Aquifer, the Perched Groundwater System, and the fractured bedrock system at SNL/NM.

- Determine the impact, if any, of operations at SNL/NM on the quality and quantity of groundwater.

- Demonstrate compliance with federal, state, and local groundwater requirements.

The GMP is responsible for tracking information for wells operated by SNL/NM personnel. The GMP Well Registry and Oversight Task was established to ensure that wells operated by SNL/NM personnel are properly constructed and maintained to protect groundwater resources in accordance with guidelines specified by the New Mexico Office of the State Engineer (NMOSE) in Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells (NMOSE August 2005). The GMP lead works with SNL/NM personnel to review new monitoring well installation plans, record construction information, track well ownership and maintenance records, perform annual well inspections, and consult with owners when plugging and abandoning or replacing a monitoring well is required. The goal is to provide full life-cycle management of monitoring wells and boreholes.

2.2 Regulatory Criteria

The following actions ensure implementation of a successful GMP that includes relevant elements of the Environmental Management System at the facility:

- Identify possible sources of current and future groundwater contamination and evaluate the potential for future contamination.

- Meet applicable federal, state, and U.S. Department of Energy (DOE) requirements.

- Establish appropriate groundwater protection goals for affected or potentially affected groundwater consistent with water quality, and current or likely future use.

- Develop strategies for predicting and preventing future contamination and for controlling existing contamination.

- Document the history of GMP activities for future site management.

- Document the quality of baseline groundwater and vadose zone conditions.

- Describe environmental monitoring with surveillance program elements for the groundwater and the vadose zone, including baseline subsurface conditions.

- Establish a systematic approach for the monitoring program that provides the information needed to predict and respond to potential contamination associated with significant site activities, and to achieve groundwater protection goals.

In April 2004, the Compliance Order on Consent (Consent Order) (New Mexico Environment Department [NMED] April 2004) became effective. Among other sampling requirements, the Consent Order includes a requirement to conduct four continuous quarters of sampling and analysis for perchlorate for newly constructed monitoring wells. The protocol establishes a screening level/method detection limit (MDL) of 4 micrograms per liter (µg/L). If the sampling results indicate the presence of perchlorate either at or greater than 4 µg/L, then DOE/National Nuclear Security Administration (NNSA) and SNL/NM personnel are required to assess the nature and extent of perchlorate contamination and incorporate the results of this assessment into a Corrective Measures Evaluation. Sampling and analysis at the noncompliant well will continue on a quarterly basis until at least four consecutive non-detections are obtained. Section VII.C of the Consent Order clarifies that the Corrective Measures Evaluation process will be initiated where there is a documented release to the environment, and where corrective measures are necessary to protect human health and the environment.

The NMED DOE Oversight Bureau (OB) splits a percentage of groundwater samples collected by the GMP. The samples are analyzed by laboratories under contract to the NMED DOE OB. The NMED DOE OB provides independent verification of environmental monitoring results obtained by SNL/NM personnel on behalf of the DOE/NNSA Sandia Field Office. Table 2-1 presents additional requirements associated with groundwater quality regulations.

Table 2-1. Groundwater Quality Regulations

Regulation/Requirements	Standards and Guides	Regulating Agency
National Primary Drinking Water Regulations (40 CFR 141)	MCL	EPA (EPA May 2009)
NMWQCC [a] Standards for Groundwater (20.6.2.3103A NMAC Human Health Standards)	MAC	NMED (NMWQCC December 2018)

NOTES:

[a] MACs for human health, domestic water supply, and irrigation standards are identified in the analytical results tables in Attachment 2A. Domestic water supply standards and standards for irrigation use are based on aesthetic considerations, not on the direct human health risks used for promulgating MCLs.

CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
MAC = Maximum allowable concentration.
MCL = Maximum contaminant level.
NMAC = New Mexico Administrative Code.
NMED = New Mexico Environment Department.
NMWQCC = New Mexico Water Quality Control Commission.

Although radionuclides (gamma spectroscopy and gross alpha/beta activity) are being monitored, the information related to radionuclides is provided voluntarily by the DOE/NNSA and SNL/NM personnel. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement, because such information falls wholly outside the requirements imposed by the NMED, as specified in Section III.A of the Consent Order.

2.3 Scope of Activities

Activities performed during CY 2018 include sampling at designated wells (Figure 2-1), sample analysis, groundwater level measurements, and construction of hydrographs and a potentiometric surface map (Plate 1).

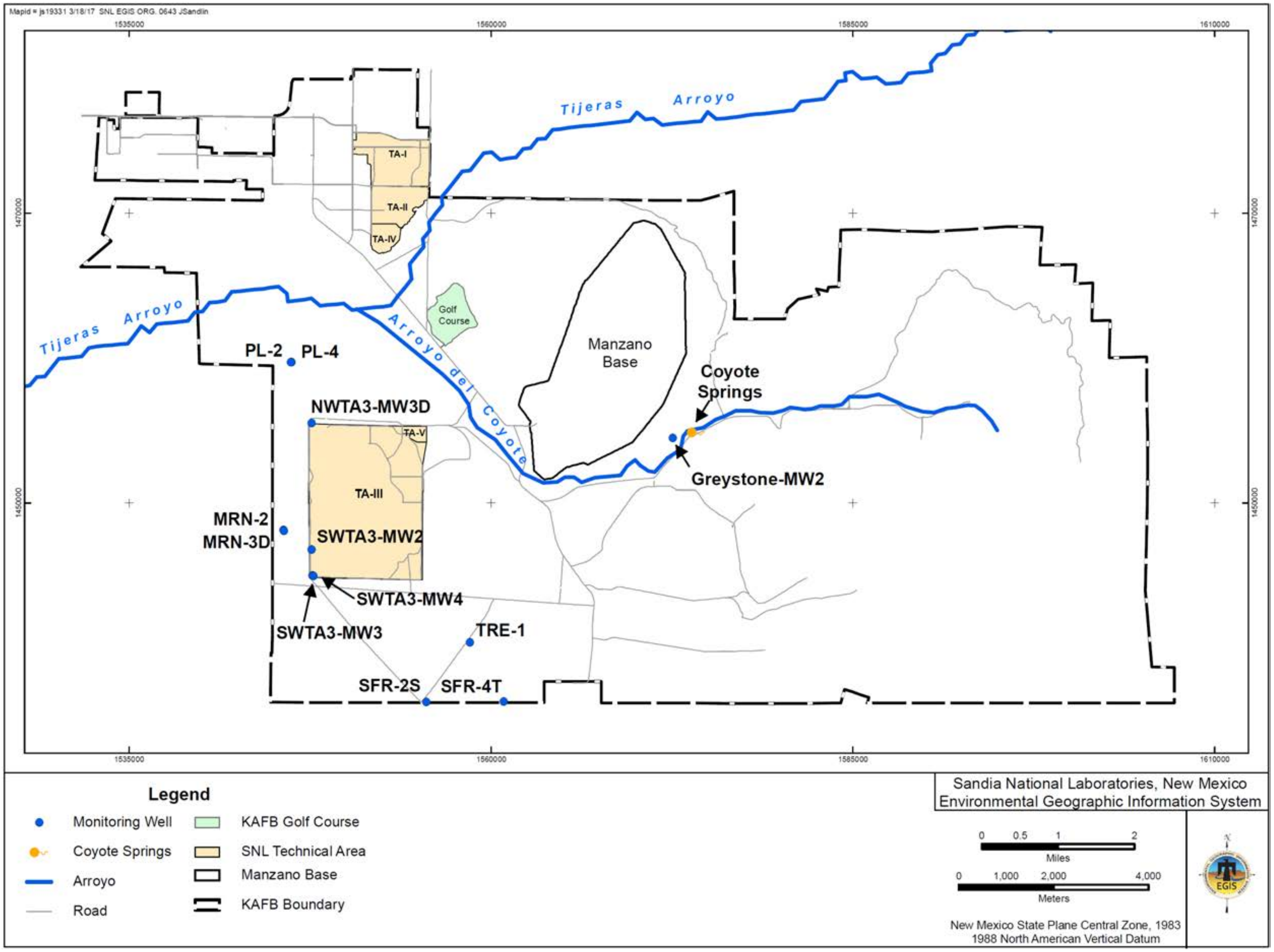

Figure 2-1. Groundwater Monitoring Program Water Quality Monitoring Network

2.3.1 Groundwater Quality Surveillance Monitoring

Annual sampling of groundwater was conducted during the period from March 9 to March 23, 2018. Samples were collected from 12 wells and 1 perennial spring. GMP well locations are scattered throughout and along the perimeter of Kirtland Air Force Base (KAFB) in areas that are not specifically affiliated with Solid Waste Management Units or Areas of Concern. Groundwater surveillance samples were collected from the following monitoring wells: Greystone-MW2, MRN-2, MRN-3D, NWTA3-MW3D, PL-2, PL-4, SFR-2S, SFR-4T, SWTA3-MW2, SWTA3-MW3, SWTA3-MW4, and TRE-1. A surface water sample was also collected from Coyote Springs using a portable peristaltic pump.

Samples collected from the 13 locations were analyzed for the following analytes:

- Safe Drinking Water Act list of volatile organic compounds (VOCs)
- Total organic halogens (TOX)
- Total phenols
- Total alkalinity
- Nitrate plus nitrite (NPN)
- Total cyanide
- High explosives (HE), select wells only
- Major anions (chloride, bromide, fluoride, and sulfate)
- Target Analyte List metals plus total uranium
- Mercury
- Gamma spectroscopy (short list: americium-241, cesium-137, cobalt-60, and potassium-40)
- Gross Alpha/Beta activity
- Radium-226 and radium-228
- Isotopic uranium (uranium-233/234, uranium-235/236, and uranium-238), select wells only

Samples were filtered at the sampling location using in-line filters of 0.45-micron pore size, except those for VOC, HE, and mercury fractions. Analysis for HE compounds was only conducted on the groundwater samples collected from monitoring wells SFR-2S, SFR-4T, SWTA3-MW2, SWTA3-MW3, SWTA3-MW4, and TRE-1. These wells are located in or downgradient of the Coyote Canyon Test Field and are associated with the Dynamic Explosives Test Site. Isotopic uranium samples were collected at Coyote Springs, Greystone-MW2, SFR-2S, SFR-4T, and TRE-1 (see discussion in Section 2.6.1). Environmental duplicate samples from monitoring wells MRN-3D, SWTA3-MW3, and SWTA3-MW4 were submitted for analyses.

Groundwater elevation monitoring is a means to assess the physical changes of the groundwater system over time. This includes changes in the potentiometric surface, gradients, the quantity of water available, as well as the direction and velocity of groundwater movement. The GMP gathers groundwater information from a large network of wells within and in the vicinity of KAFB. In addition to wells owned by the DOE/NNSA, data are solicited from the KAFB Environmental Compliance Program, City of Albuquerque (COA) Environmental Health Department (EHD), and U.S. Geological Survey (USGS) (Figure 1-4 and Plate 1). Groundwater elevations in wells were measured quarterly or annually during CY 2018, depending on the owner's requirements and the well characteristics. Plate 1 depicts groundwater elevations at the wells and presents a base-wide potentiometric surface map of the Regional Aquifer (see discussion in Section 2.6.2.2).

Groundwater pumped from KAFB, Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and Veterans Administration water supply wells represent the primary groundwater withdrawal from the Regional Aquifer. From the potentiometric surface map (Plate 1), groundwater flow directions are identified and horizontal gradients are determined. Precipitation measurements are used as an indirect estimate of potential groundwater recharge. Available precipitation also impacts the demand on groundwater withdrawal. Section 2.6.2 discusses the specific results for annual precipitation, water production, and the impact on the groundwater elevations.

2.3.2 Monitoring Well Installation

No new monitoring wells were installed by the GMP during CY 2018.

2.4 Field Methods and Measurements

Section 1.3 describes in detail the monitoring procedures conducted for GMP groundwater monitoring.

2.5 Analytical Methods

Section 1.3.2 describes U.S. Environmental Protection Agency (EPA) specified protocols utilized for groundwater samples analyzed by the off-site laboratories (Tables 1-5 and 1-6).

2.6 Summary of Monitoring Results

Results of the CY 2018 activities are discussed below and are presented in the following attachments. Attachment 2A, Tables 2A-1 through 2A-8, present the analytical results and water quality measurements for the groundwater samples. Attachment 2B, Figures 2B-1 through 2B-6, present the hydrographs that utilize the water level measurements collected, and Figures 2B-7 through 2B-11 present precipitation and water supply well data. Attachment 2C, Figures 2C-1 through 2C-6, present the time trend plots for specific parameters at Coyote Springs and for monitoring wells SFR-2S, SFR-4T, SWTA3-MW4, and TRE-1.

2.6.1 Analytical Results

Groundwater and surface water samples were submitted to GEL Laboratories LLC (GEL) for both chemical and radiological analysis. Samples submitted to GEL were analyzed in accordance with applicable EPA analytical methods. Groundwater sampling results are compared with EPA maximum contaminant levels (MCLs) for drinking water supplies (EPA May 2009) and NMED maximum allowable concentrations (MACs) for human health standards of groundwater as promulgated by the New Mexico Water Quality Control Commission (NMWQCC). Analytical reports from GEL, including certificates of analyses, analytical methods, MDLs, practical quantitation limits, minimum detectable activity values, and critical levels for radiochemistry analyses, dates of analyses, results of quality control (QC) analyses, and data validation findings are filed in the SNL/NM Customer Funded Record Center and are archived in the Environmental Data Management System (EDMS) electronic database. Analytical results, laboratory QC qualifiers, and third-party data validation qualifiers are also filed in the Customer Funded Record Center and archived in EDMS.

Table 2A-1 summarizes the detected VOC and HE compound results for groundwater samples collected in CY 2018. No HE compounds were detected above laboratory MDLs. No VOCs were detected at concentrations above established MCLs or MACs from any groundwater sample. The only VOCs detected above laboratory MDLs were chloroform and toluene. Chloroform was detected below the MAC of 100 μg/L in the TRE-1 environmental sample at a concentration of 0.690 μg/L. Toluene was detected below the MCL (1,000 μg/L) and MAC (1,000 μg/L) in monitoring well MRN-2 at 0.470 μg/L, and well SWTA3-MW4 duplicate sample at 0.330 μg/L. The toluene concentrations reported in SWTA3-MW3 environmental and environmental duplicate samples were qualified as not detected during data validation, because toluene was detected in the associated equipment blank (EB) sample at a similar concentration. Table 2A-2 lists the laboratory MDLs for VOC and HE compounds.

Table 2A-3 summarizes NPN results. NPN was detected in water samples above associated MDLs, and ranged from 0.225 milligrams per liter (mg/L) to 4.98 mg/L. NPN results are below the MCL/MAC of 10 mg/L.

Table 2A-4 summarizes alkalinity, major anions (as bromide, chloride, fluoride, and sulfate), TOX, total phenols, and total cyanide results. No analytes were detected above established MCLs or MACs, except for fluoride. Fluoride was detected above the MAC of 1.6 mg/L in Coyote Springs and monitoring wells SFR-2S, SFR-4T, SWTA3-MW4, and TRE-1 samples at concentrations of 1.62 mg/L, 1.65 mg/L, 2.82 mg/L, 1.66 mg/L, and 1.71 mg/L, respectively. Fluoride in groundwater is suspected to be naturally occurring (geogenic). Figures 2C-1 through 2C-5 present the time trend plots for fluoride for Coyote Springs, and monitoring wells SFR-2S, SFR-4T, SWTA3-MW4, and TRE-1.

Detected concentrations for alkalinity, major anions, TOX, and total phenols are consistent with historical GMP groundwater monitoring data. The following parameters were qualified as not detected during data validation due to associated blank contamination.

- Total cyanide was qualified as an estimated value in seven GMP samples during data validation, since total cyanide was detected in calibration blank samples and/or the initial calibration intercept were outside acceptance criteria.

- Total phenol was detected in calibration blank samples outside QC acceptance criteria in eleven GMP samples, and qualified as an estimated value during data validation.

TOX was detected in five of the samples from Coyote Springs or the 12 monitoring wells.

Mercury was analyzed using unfiltered samples and is reported as total mercury. Mercury was qualified as an estimated value during data validation in 10 groundwater samples, because 1) mercury was detected in associated calibration blank samples, or 2) the percent difference in the continuing calibration sample was outside acceptance criteria, or 3) the reporting limit verification percent recoveries were outside acceptance criteria (Table 2A-5).

Table 2A-6 summarizes dissolved Target Analyte List metals and total uranium results. No metal parameters, other than beryllium, were detected above established MCLs or MACs in any groundwater samples. Beryllium was detected above the MCL of 0.004 mg/L in the sample from Coyote Springs at a concentration of 0.00698 mg/L. Beryllium in groundwater at Coyote Springs is suspected to be naturally occurring (geogenic). Figure 2C-6 presents the trend plot for beryllium concentrations at Coyote Springs and demonstrates that the 2018 beryllium result is consistent with prior years. Arsenic, uranium, and vanadium were qualified as not detected in samples listed below during data validation:

- Arsenic was reported in the SWTA3-MW3 environmental and environmental duplicate samples and was qualified as not detected during data validation because arsenic was reported in the associated EB sample at a concentration less than five times the environmental samples.

- Uranium was reported in the SFR-4T samples at concentrations less than five times the associated initial and continuing calibration blank samples.

- Vanadium was reported in the MRN-3D environmental and environmental duplicate samples and was qualified as not detected during data validation because vanadium was reported in the associated EB sample at a concentration less than five times the environmental samples.

Table 2A-7 summarizes the radiological analyses results. This includes analyses for alpha- and beta-emitting radioisotopes (gross alpha/beta activities), radium-226, radium-228, isotopic uranium, and gamma spectroscopy results for short list gamma radiation-emitting radioisotopes (americium-241, cesium-137, cobalt-60, and potassium-40). Reported activities were below established MCLs or MACs. The analytical laboratory rejected the potassium-40 results for the MRN-2 sample and americium-241 in the SWTA3-MW2 sample because the peak did not meet the minimum peak identification criteria.

Isotopic uranium (uranium-233/234, uranium-235/236, and uranium-238) analyses were conducted on samples from wells that previously had high gross alpha activity, or are located where groundwater is in contact with bedrock that contains minerals high in naturally occurring radioisotopes. Isotopic uranium was collected at Coyote Springs and monitoring wells Greystone-MW2, SFR-2S, SFR-4T, and TRE-1 because groundwater contacts bedrock, which contains minerals high in naturally occurring uranium.

Gross alpha activity is measured as a radiological screening tool and in accordance with Title 40 of the Code of Federal Regulations Part 141. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements were corrected by subtracting the uranium activity. Radiological results were reviewed by an SNL/NM Health Physicist and were determined to be nonradioactive. The corrected gross alpha activity results were below the MCL of 15 picocuries per liter.

Table 2A-8 summarizes the field water quality measurements collected prior to sampling. These measurements are used to evaluate water chemistry stability and include turbidity, pH, temperature, specific conductivity, oxidation-reduction potential, and dissolved oxygen.

2.6.2 Groundwater Elevation Measurements

Table 1 lists construction details for monitoring wells located on or near KAFB. During CY 2018, SNL/NM personnel measured groundwater elevations in 102 SNL/NM monitoring wells (Table 2). The groundwater elevations were measured with an electric well sounder (water level meter). Data were also available for 115 additional monitoring wells owned by KAFB, COA EHD, USGS, and NMOSE. The groundwater elevation data are maintained in the corporate EDMS. Table 2 provides the groundwater elevation data for CY 2018. Table 2-2 provides the total number of wells listed by the respective organization.

2.6.2.1 Groundwater Recharge and Withdrawal

Factors influencing fluctuations in groundwater elevation primarily include potential recharge from precipitation and groundwater withdrawals by water supply wells.

Annual Precipitation

The Albuquerque Basin’s climate is semi-arid. Long-term average precipitation ranges from 9.45 inches per year (30-year norm based on 1981-2010 data) at Albuquerque International Sunport up to 35 inches per year at the crest of the Sandia Mountains. Most precipitation falls between July and October, mainly in the form of brief, heavy rain. For CY 2018, the wettest months were July and October.

Table 2-2. Groundwater Elevations Measured in Monitoring Wells by SNL/NM and Other Organizations during 2018

Total Wells	Measuring Agency	Well Owner	Location
102	SNL/NM GMP	DOE/NNSA	Site-wide surveillance network wells, BSG, CWL, MWL, TAG, and TAVG
108	KAFB	KAFB	ECP Long-term Monitoring Program
4	COA EHD	COA	Eubank Landfill north of KAFB and Yale Avenue Landfill west of KAFB
1	SNL/NM GMP	COA	Eubank-1, west of Eubank Landfill
1	USGS	NMOSE	Mesa Del Sol-S well
1	USGS	COA	Montessa Park-S well

NOTES:

BSG = Burn Site Groundwater.
COA = City of Albuquerque.
CWL = Chemical Waste Landfill.
DOE = U.S. Department of Energy.
ECP = Environmental Compliance Program.
EHD = Environmental Health Department.
GMP = Groundwater Monitoring Program.
KAFB = Kirtland Air Force Base.
MWL = Mixed Waste Landfill.
NMOSE = New Mexico Office of the State Engineer.
NNSA = National Nuclear Security Administration.
SNL/NM = Sandia National Laboratories, New Mexico.
TAG = Tijeras Arroyo Groundwater.
TAVG = Technical Area-V Groundwater.
USGS = U.S. Geological Survey.

Precipitation data relevant to the KAFB hydrogeologic setting are available from four rain gauge locations. Three on-site and one off-site meteorological towers are used to evaluate the precipitation pattern for KAFB:

- A21 tower located in Technical Area (TA)-II (Figure 1-4).
- A36 tower located in TA-III/V (Figure 1-4).
- SC1 tower located near the Schoolhouse Well in the foothills of the Manzanita Mountains (Figure 1-4).
- National Weather Service meteorological station “KABQ” at the Albuquerque International Sunport located at the northwest corner of KAFB.

Table 2-3 shows annual precipitation during CY 2018 at four locations. CY 2017 data are also presented for comparison. The differences in precipitation totals from the four locations show the isolated nature of rain showers in the Albuquerque area. The 8.72 inches of precipitation measured at KABQ during CY 2018 is 1.05 inches more than the corresponding period for the previous year; and it is 0.73 inches below the 30-year (1981-2010) norm of 9.45 inches. Figure 2B-7 shows monthly distribution of precipitation during CY 2018 at the four locations. Figure 2B-8 shows the annual distribution of precipitation at these four locations for the period from January 2008 to December 2018.

Table 2-3. Precipitation Data for Kirtland Air Force Base, Calendar Years 2017 and 2018

Year	Meteorological Station			
	A21	A36	SC1	KABQ
CY 2017	7.40	6.79	10.15	7.67
CY 2018	13.09	11.34	14.20	8.72

NOTES:
Data are in inches of rainfall.
A21 = SNL/NM meteorological station in Technical Area-II.
A36 = SNL/NM meteorological station in Technical Area-III/V.
CY = Calendar Year.
KABQ = National Weather Service meteorological station at the Albuquerque International Sunport.
SC1 = SNL/NM meteorological station in the foothills of the Manzanita Mountains.
SNL/NM = Sandia National Laboratories, New Mexico.

Groundwater Withdrawal

The KAFB water supply wells are screened over a depth from about 500 to 2,000 feet (ft) below ground surface and extract groundwater from the Regional Aquifer in the upper and middle unit of the Santa Fe Group. During CY 2018, KAFB pumped groundwater primarily from four water supply wells (KAFB-3, KAFB-4, KAFB-14, and KAFB-20) for consumptive use.

KAFB supplies the water for SNL/NM and other DOE/NNSA facilities located on KAFB. Figure 2B-9 shows the CY 2018 monthly totals for KAFB water supply wells. The highest level of production was in July at 99 million gallons; the lowest occurred in February at 36 million gallons. The variability in production is in response to demand as reflected in the cyclic fluctuation of groundwater elevations in monitoring wells and is evident on the hydrographs. Figure 2B-10 shows the CY 2018 monthly production for each KAFB water supply well. Figure 2B-11 shows the trend of total annual groundwater production at KAFB since 2008. Table 2-4 provides a comparison of water pumped during CY 2018 to the previous year.

Table 2-4. Total Kirtland Air Force Base Groundwater Well Production

Units	CY 2017	CY 2018
Million gallons	744	788
Acre-feet	2,285	2,417

NOTES:
Acre-feet = 325,851 gallons.
CY = Calendar Year.

2.6.2.2 Groundwater Elevations

Groundwater elevations were used for preparing the potentiometric surface maps and hydrographs.

Base-Wide Potentiometric Surface Map

Groundwater elevation data for monitoring wells installed by SNL/NM personnel, KAFB Defense Environmental Restoration Program, COA EHD, USGS, and NMOSE were used to construct the base-wide CY 2018 potentiometric surface map of the Regional Aquifer as shown on Plate 1. It should be noted that location adjustments were made to numerous KAFB water supply well locations on Plate 1 between the CY 2017 and CY 2018 versions based on an assessment of coordinates performed by SNL/NM personnel (Copland July 2018). Water level measurements for September and October 2018 were used for interpreting the groundwater elevation data and constructing the contours (Table 2). Even though various well owners measure water levels on differing schedules, the use of several months of data is considered temporally concordant because water levels are typically not seasonally affected across KAFB.

The base-wide map (Plate 1) represents the potentiometric surface of the Regional Aquifer and incorporates wells completed at the water table west of the Tijeras Fault Zone and wells completed in bedrock east of the fault zone (Figure 1-3). West of the Tijeras Fault Zone, the Regional Aquifer is under unconfined (water table) conditions and is present within the Santa Fe Group, which consists of a fine-grained alluvial-fan lithofacies and the coarser Ancestral Rio Grande lithofacies (Figure 1-3). Within and east of the Tijeras Fault Zone, the Regional Aquifer is typically under confined conditions (positive pressure head) and is primarily present within fractured Paleozoic bedrock (primarily limestone and sandstone) and Precambrian bedrock (primarily granite and metamorphic rocks). The fault zone partially restricts groundwater underflow from the bedrock recharging the unconsolidated basin-fill deposits (the Santa Fe Group) of the Albuquerque Basin.

In general, groundwater flows westward away from the Manzanita Mountains and toward the Rio Grande. An extensive trough in the water table along the western edge of KAFB is due to drawdowns created by KAFB and ABCWUA water supply wells near the northern boundary of KAFB. As a result, water levels across much of KAFB were steadily declining until 2008. Since 2008, hydrographs for Regional Aquifer wells in the northern part of KAFB show an increasing trend in groundwater elevations. Presumably, this is in response to the ABCWUA transitioning to surface water withdrawals for potable water supplies and decreasing dependence on ABCWUA water supply wells. The water table trough extends as far south as the Isleta Pueblo Reservation. The flat gradient in the middle of the trough is indicative of flow through the highly permeable sediments of the Ancestral Rio Grande fluvial deposits, which are the most productive aquifer material in the area.

Relatively steeper gradients in the eastern portion of KAFB are due to less permeable materials, higher ground surface elevations along the eastern mountain front of the Albuquerque Basin, and the presence of various faults (Plate 1).

Perched Groundwater System Potentiometric Surface Map

During the installation of monitoring wells for groundwater characterization at TA-II in 1993, a shallow water-bearing zone was encountered at a depth of 300 ft below ground surface. This was 200 ft above the Regional Aquifer. The installation of additional wells completed in this Perched Groundwater System defined the lateral extent of the system, which is approximately 4.4 square miles. The western edge trends along the west side of former KAFB sewage lagoons. The northern edge coincides with the northern boundary of TA-I. To the east, the Perched Groundwater System is defined using KAFB monitoring wells along the west side of the active KAFB Landfill; and the southern tip appears to be south of the Tijeras Arroyo Golf Course along the northeastern side of Pennsylvania Avenue. The area covered by the Perched Groundwater System comprises much of the Tijeras Arroyo Groundwater Area of Concern, and the elevation data for wells completed in the Perched Groundwater System were used to construct the potentiometric surface map that is presented and discussed in Chapter 6.0. Beryllium is suspected to be naturally occurring and this analytical result is consistent with prior years.

Monitoring Well Hydrographs

This section discusses historical and recent trends in groundwater elevations in the vicinity of SNL/NM, as demonstrated in the hydrographs for 12 GMP monitoring wells (Figures 2B-1 through 2B-6). Historical data from quarterly and annual groundwater elevation measurements through CY 2018 were used for plotting the hydrographs. With the exception of Greystone-MW2, the groundwater elevation data for these wells are considered to be representative of groundwater in the Regional Aquifer across KAFB. Specific information gleaned from the hydrographs includes the following:

- **Greystone-MW2 (Figure 2B-1)**—Overall declining trend of approximately 0.25 ft per year (ft/year) with superimposed seasonal effects of 1 to 2 ft that have a maximum water table elevation in the spring; the well is located in Lurance Canyon and has a shallow screen set in alluvium; there are no water supply wells in the area; however, the well is located 1,600 ft downgradient of the heavily vegetated Coyote Springs and the seasonal effects may reflect evapotranspiration impacts.

- **MRN-2 and MRN-3D (Figure 2B-2)**—Declining trend until early 2011; since then groundwater elevations have stabilized with an increasing trend of approximately 0.5 ft/year since 2014.

- **NWTA3-MW3D, PL-2, and PL-4 (Figure 2B-3)**—Declining trend until late 2010/early 2011; since then, groundwater elevations have stabilized and show an increasing trend of approximately 1 ft/year.

- **SFR-2S and TRE-1 (Figure 2B-4)**—Slightly declining trend of approximately 0.15 to 0.25 ft/year since 2004.

- **SFR-4T (Figure 2B-5)**—Cyclical pattern with yearly fluctuations of 20 to 30 ft since 2001; yearly minimum associated with SNL/NM sampling event and then 3 to 9 months of water level recovery; overall declining trend of peaks of approximately 0.25 ft/year.

- **SWTA3-MW2, SWTA3-MW3, and SWTA3-MW4 (Figure 2B-6)**—Moderate declining trend until late 2011; since then, groundwater elevations have stabilized for several years and show an increasing trend of approximately 0.6 ft/year since 2014.

2.7 Quality Control Results

The QC samples are collected in the field at the time of environmental sample collection. Field QC samples are described in Section 1.3 and include environmental duplicate sample, EB, trip blank (TB), and field blank (FB) samples.

Environmental duplicate samples were collected to estimate the overall reproducibility of the sampling and analytical process. Environmental duplicate samples from monitoring wells MRN-3D, SWTA3-MW3, and SWTA3-MW4 were analyzed for all parameters. Relative percent difference calculations of environmental samples and environmental duplicate samples were performed for detected chemical analytes only. The environmental duplicate sample results show good agreement (relative percent difference values less than 35 for inorganic analyses) for calculated parameters.

EB samples were collected prior to well purging and sampling at monitoring wells MRN-3D, SWTA3-MW3, and SWTA3-MW4 and submitted for all analyses. EB samples detected arsenic, chloride, toluene, total phenol, vanadium, and zinc. No corrective action was required for chloride, total phenol, or zinc because these parameters were not detected in associated environmental samples or were detected at concentrations greater than five times the EB result. Arsenic and toluene were detected in the EB sample associated with SWTA3-MW3, and vanadium in the MRN-3D EB sample. These parameters were qualified as not detected during data validation because arsenic, toluene, and vanadium were reported less than five times the associated environmental sample value.

Three FB samples were collected for VOCs to assess whether contamination of the samples resulted from ambient conditions during sample collection. FB samples were prepared by pouring deionized water into sample containers at the monitoring wells PL-2, SFR-2S, and SWTA3-MW2 sampling points to simulate the transfer of environmental samples from the sampling system to the sample container. No VOCs were detected above laboratory MDLs.

The TB samples were submitted whenever samples were collected for VOC analysis to assess whether contamination of the samples had occurred during shipment and storage. A total of 17 TBs were submitted with the CY 2018 samples. No VOCs were detected above associated laboratory MDLs in any TB sample, except for methylene chloride. Methylene chloride is a common laboratory contaminant.

QC samples are prepared at the laboratory to determine whether contaminant chemicals are introduced into laboratory processes and procedures. These include method blanks, laboratory control samples, matrix spike, matrix spike duplicate, and surrogate spike samples. Although some minor analytical results were qualified during the data validation process, the data were deemed acceptable except for americium-241 and potassium-40. The potassium-40 activity in the sample from MRN-2 and americium-241 from SWTA3-MW2 were qualified as unusable during data validation because GEL was unable to meet minimum peak identification criteria.

2.8 Variances and Nonconformances

No modifications or issues of field activities from requirements in the GMP Mini-Sampling and Analysis Plan (SNL February 2018) were identified during CY 2018 sampling activities.

2.9 Summary and Conclusions

The annual groundwater surveillance monitoring sampling event was conducted between March 9 and March 23, 2018. Groundwater samples were collected from 12 monitoring wells and 1 perennial spring. The analytical results for the groundwater samples are similar to the results reported for previous years:

- No VOCs or HE compounds were detected at concentrations above established MCLs or MACs in any groundwater sample.

- NPN was detected in well samples above associated MDLs, and ranged from 0.225 to 4.98 mg/L. NPN results are below the MCL/MAC of 10 mg/L.

- Fluoride was detected above the MAC of 1.6 mg/L (NMWQCC December 2018) in Coyote Springs and monitoring wells SFR-2S, SFR-4T, SWTA3-MW4, and TRE-1 samples at concentrations of 1.62 mg/L, 1.65 mg/L, 2.82 mg/L, 1.66 mg/L, and 1.71 mg/L, respectively. However, results did not exceed the MCL of 4.0 mg/L.

- No metals, other than beryllium, were detected above established MCLs or MACs in any groundwater sample. Beryllium was detected above the MCL of 0.004 mg/L in the sample from Coyote Springs at a concentration of 0.00698 mg/L.

Groundwater elevations were obtained during CY 2018 at 102 SNL/NM monitoring wells on a quarterly basis. Groundwater elevations from the SNL/NM wells and wells owned by other agencies (Table 2) were used to construct a base-wide potentiometric surface map of the Regional Aquifer (Plate 1). Overall, the contours display a pattern that reflects the impact of the groundwater withdrawal by water supply wells located in the northwestern portion of KAFB and adjacent parts of Albuquerque.

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Attachment 2A
Groundwater Monitoring Program
Analytical Results Tables

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Attachment 2A Tables

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Table 2A-1
Summary of Detected Volatile Organic Compounds and High Explosive Compounds, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL/MAC[d] (µg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-2 12-Mar-18	Toluene	0.470	0.300	1.00	1,000	1,000	J		104793-001	SW846-8260
SWTA3-MW3 09-Mar-18	Toluene	ND	0.300	1.00	1,000	1,000	J	1.0U	104784-001	SW846-8260
SWTA3-MW3 (Duplicate) 09-Mar-18	Toluene	ND	0.300	1.00	1,000	1,000	J	1.0U	104785-001	SW846-8260
SWTA3-MW4 (Duplicate) 23-Mar-18	Toluene	0.330	0.300	1.00	1,000	1,000	J		104834-001	SW846-8260
TRE-1 14-Mar-18	Chloroform	0.690	0.300	1.00	NE	100	J		104811-001	SW846-8260

Refer to footnotes on page 2A-35.

Table 2A-2
Method Detection Limits for Volatile Organic Compounds and High Explosive Compounds, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Analyte	MDL[b] (µg/L)	Analytical Method[g]	Analyte	MDL[b] (µg/L)	Analytical Method[g]
1,1,1,2-Tetrachloroethane	0.300	SW846 8260	Ethyl benzene	0.300	SW846 8260
1,1,1-Trichloroethane	0.300	SW846 8260	Hexachlorobutadiene	0.300	SW846 8260
1,1,2,2-Tetrachloroethane	0.300	SW846 8260	Isopropylbenzene	0.300	SW846 8260
1,1,2-Trichloroethane	0.300	SW846 8260	Methylene chloride	1.00	SW846 8260
1,1-Dichloroethane	0.300	SW846 8260	Naphthalene	0.300	SW846 8260
1,1-Dichloroethene	0.300	SW846 8260	Styrene	0.300	SW846 8260
1,1-Dichloropropene	0.300	SW846 8260	Tert-butyl methyl ether	0.300	SW846 8260
1,2,3-Trichlorobenzene	0.300	SW846 8260	Tetrachloroethene	0.300	SW846 8260
1,2,3-Trichloropropane	0.300	SW846 8260	Toluene	0.300	SW846 8260
1,2,4-Trichlorobenzene	0.300	SW846 8260	Trichloroethene	0.300	SW846 8260
1,2,4-Trimethylbenzene	0.300	SW846 8260	Trichlorofluoromethane	0.300	SW846 8260
1,2-Dibromo-3-chloropropane	0.500	SW846 8260	Vinyl chloride	0.300	SW846 8260
1,2-Dibromoethane	0.300	SW846 8260	cis-1,2-Dichloroethene	0.300	SW846 8260
1,2-Dichlorobenzene	0.300	SW846 8260	cis-1,3-Dichloropropene	0.300	SW846 8260
1,2-Dichloroethane	0.300	SW846 8260	m-, p-Xylene	0.300	SW846 8260
1,2-Dichloropropane	0.300	SW846 8260	n-Butylbenzene	0.300	SW846 8260
1,3,5-Trimethylbenzene	0.300	SW846 8260	n-Propylbenzene	0.300	SW846 8260
1,3-Dichlorobenzene	0.300	SW846 8260	o-Xylene	0.300	SW846 8260
1,3-Dichloropropane	0.300	SW846 8260	sec-Butylbenzene	0.300	SW846 8260
1,4-Dichlorobenzene	0.300	SW846 8260	tert-Butylbenzene	0.300	SW846 8260
2,2-Dichloropropane	0.300	SW846 8260	trans-1,2-Dichloroethene	0.300	SW846 8260
2-Chlorotoluene	0.300	SW846 8260	trans-1,3-Dichloropropene	0.300	SW846 8260
4-Chlorotoluene	0.300	SW846 8260	1,3,5-Trinitrobenzene	0.0851 – 0.0914	SW846 8321A
4-Isopropyltoluene	0.300	SW846 8260	1,3-Dinitrobenzene	0.0851 – 0.0914	SW846 8321A
Benzene	0.300	SW846 8260	2,4,6-Trinitrotoluene	0.0851 – 0.0914	SW846 8321A
Bromobenzene	0.300	SW846 8260	2,4-Dinitrotoluene	0.0851 – 0.0914	SW846 8321A
Bromochloromethane	0.300	SW846 8260	2,6-Dinitrotoluene	0.0851 – 0.0914	SW846 8321A
Bromodichloromethane	0.300	SW846 8260	2-Amino-4,6-dinitrotoluene	0.0851 – 0.0914	SW846 8321A
Bromoform	0.300	SW846 8260	2-Nitrotoluene	0.0872 – 0.0937	SW846 8321A
Carbon tetrachloride	0.300	SW846 8260	3-Nitrotoluene	0.0851 – 0.0914	SW846 8321A
Chlorobenzene	0.300	SW846 8260	4-Amino-2,6-dinitrotoluene	0.0851 – 0.0914	SW846 8321A
Chloroethane	0.300	SW846 8260	4-Nitrotoluene	0.106 – 0.171	SW846 8321A
Chloroform	0.300	SW846 8260	HMX	0.0851 – 0.0914	SW846 8321A
Chloromethane	0.300	SW846 8260	Nitro-benzene	0.0851 – 0.0914	SW846 8321A
Dibromochloromethane	0.300	SW846 8260	Pentaerythritol tetranitrate	0.106 – 0.114	SW846 8321A
Dibromomethane	0.300	SW846 8260	RDX	0.0851 – 0.0914	SW846 8321A
Dichlorodifluoromethane	0.300	SW846 8260	Tetryl	0.0851 – 0.0914	SW846 8321A

Refer to footnotes on page 2A-35.

Table 2A-3
Summary of Nitrate Plus Nitrite Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Springs 15-Mar-18	Nitrate plus nitrite	0.570	0.017	0.050	10.0			104814-005	EPA 353.2
Greystone-MW2 21-Mar-18	Nitrate plus nitrite	4.79	0.170	0.500	10.0		J	104827-005	EPA 353.2
MRN-2 12-Mar-18	Nitrate plus nitrite	3.88	0.085	0.250	10.0			104793-005	EPA 353.2
MRN-3D 13-Mar-18	Nitrate plus nitrite	3.10	0.085	0.250	10.0			104803-005	EPA 353.2
MRN-3D (Duplicate) 13-Mar-18	Nitrate plus nitrite	3.09	0.085	0.250	10.0			104804-005	EPA 353.2
NWTA3-MW3D 23-Mar-18	Nitrate plus nitrite	1.07	0.017	0.050	10.0			104838-005	EPA 353.2
PL-2 12-Mar-18	Nitrate plus nitrite	2.78	0.085	0.250	10.0			104800-005	EPA 353.2
PL-4 13-Mar-18	Nitrate plus nitrite	4.98	0.085	0.250	10.0			104808-005	EPA 353.2
SFR-2S 19-Mar-18	Nitrate plus nitrite	0.947	0.017	0.050	10.0			104818-006	EPA 353.2
SFR-4T 20-Mar-18	Nitrate plus nitrite	0.225	0.017	0.050	10.0			104824-006	EPA 353.2
SWTA3-MW2 22-Mar-18	Nitrate plus nitrite	0.947	0.017	0.050	10.0			104790-006	EPA 353.2
SWTA3-MW3 09-Mar-18	Nitrate plus nitrite	0.625	0.017	0.050	10.0			104784-006	EPA 353.2
SWTA3-MW3 (Duplicate) 09-Mar-18	Nitrate plus nitrite	0.631	0.017	0.050	10.0			104785-006	EPA 353.2
SWTA3-MW4 23-Mar-18	Nitrate plus nitrite	1.16	0.017	0.050	10.0			104833-006	EPA 353.2
SWTA3-MW4 (Duplicate) 23-Mar-18	Nitrate plus nitrite	1.16	0.017	0.050	10.0			104834-006	EPA 353.2
TRE-1 14-Mar-18	Nitrate plus nitrite	2.69	0.085	0.250	10.0			104811-006	EPA 353.2

Refer to footnotes on page 2A-35.

Table 2A-4
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Springs	Total Organic Halogens	0.00742	0.00333	0.010	NE	NE	J		104814-002	SW846 9020
15-Mar-18	Bromide	ND	0.067	0.200	NE	NE	U		104814-007	SW846 9056
	Chloride	477	6.70	20.0	NE	250		J	104814-007	SW846 9056
	Fluoride	**1.62**	0.033	0.100	4.0	1.60			104814-007	SW846 9056
	Sulfate	126	13.3	40.0	NE	600		J	104814-007	SW846 9056
	Alkalinity as CaCO3	1050	1.45	4.00	NE	NE		J	104814-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104814-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	104814-006	SW846 9012
Greystone-MW2	Total Organic Halogens	0.00418	0.00333	0.010	NE	NE	J		104827-002	SW846 9020
21-Mar-18	Bromide	0.608	0.067	0.200	NE	NE			104827-007	SW846 9056
	Chloride	116	1.34	4.00	NE	250			104827-007	SW846 9056
	Fluoride	0.858	0.033	0.100	4.0	1.60			104827-007	SW846 9056
	Sulfate	52.8	2.66	8.00	NE	600			104827-007	SW846 9056
	Alkalinity as CaCO3	448	1.45	4.00	NE	NE			104827-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104827-003	SW846 9066
	Total Cyanide	0.00401	0.00167	0.005	0.200	0.200	J	J-	104827-006	SW846 9012
MRN-2	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104793-002	SW846 9020
12-Mar-18	Bromide	0.182	0.067	0.200	NE	NE	J		104793-007	SW846 9056
	Chloride	12.9	0.268	0.800	NE	250			104793-007	SW846 9056
	Fluoride	0.646	0.033	0.100	4.0	1.60			104793-007	SW846 9056
	Sulfate	51.1	0.532	1.60	NE	600			104793-007	SW846 9056
	Alkalinity as CaCO3	154	1.45	4.00	NE	NE			104793-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104793-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104793-006	SW846 9012
MRN-3D	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104803-002	SW846 9020
13-Mar-18	Bromide	0.191	0.067	0.200	NE	NE	J		104803-007	SW846 9056
	Chloride	14.0	0.335	1.00	NE	250			104803-007	SW846 9056
	Fluoride	0.504	0.033	0.100	4.0	1.60			104803-007	SW846 9056
	Sulfate	71.8	0.665	2.00	NE	600			104803-007	SW846 9056
	Alkalinity as CaCO3	157	1.45	4.00	NE	NE			104803-004	SM2320B
	Total Phenol	0.00561	0.00167	0.005	NE	0.005		J-	104803-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104803-006	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-4 *(Continued)*
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-3D (Duplicate) 13-Mar-18	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104804-002	SW846 9020
	Bromide	0.199	0.067	0.200	NE	NE	J		104804-007	SW846 9056
	Chloride	14.1	0.335	1.00	NE	250			104804-007	SW846 9056
	Fluoride	0.438	0.033	0.100	4.0	1.60			104804-007	SW846 9056
	Sulfate	71.5	0.665	2.00	NE	600			104804-007	SW846 9056
	Alkalinity as CaCO3	157	1.45	4.00	NE	NE			104804-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104804-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104804-006	SW846 9012
NWTA3-MW3D 23-Mar-18	Total Organic Halogens	0.0052	0.00333	0.010	NE	NE	J		104838-002	SW846 9020
	Bromide	0.171	0.067	0.200	NE	NE	J		104838-007	SW846 9056
	Chloride	11.1	0.335	1.00	NE	250			104838-007	SW846 9056
	Fluoride	0.795	0.033	0.100	4.0	1.60			104838-007	SW846 9056
	Sulfate	52.7	0.665	2.00	NE	600			104838-007	SW846 9056
	Alkalinity as CaCO3	138	1.45	4.00	NE	NE			104838-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U		104838-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	104838-006	SW846 9012
PL-2 12-Mar-18	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104800-002	SW846 9020
	Bromide	0.196	0.067	0.200	NE	NE	J		104800-007	SW846 9056
	Chloride	14.4	0.335	1.00	NE	250			104800-007	SW846 9056
	Fluoride	0.550	0.033	0.100	4.0	1.60			104800-007	SW846 9056
	Sulfate	72.2	0.665	2.00	NE	600			104800-007	SW846 9056
	Alkalinity as CaCO3	149	1.45	4.00	NE	NE			104800-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104800-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104800-006	SW846 9012
PL-4 13-Mar-18	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104808-002	SW846 9020
	Bromide	0.221	0.067	0.200	NE	NE			104808-007	SW846 9056
	Chloride	15.8	0.335	1.00	NE	250			104808-007	SW846 9056
	Fluoride	0.421	0.033	0.100	4.0	1.60			104808-007	SW846 9056
	Sulfate	71.5	0.665	2.00	NE	600			104808-007	SW846 9056
	Alkalinity as CaCO3	165	1.45	4.00	NE	NE			104808-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104808-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104808-006	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-4 *(Continued)*
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-2S	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104818-003	SW846 9020
19-Mar-18	Bromide	0.663	0.067	0.200	NE	NE			104818-008	SW846 9056
	Chloride	127	1.34	4.00	NE	250			104818-008	SW846 9056
	Fluoride	**1.65**	0.033	0.100	4.0	1.60			104818-008	SW846 9056
	Sulfate	72.6	2.66	8.00	NE	600			104818-008	SW846 9056
	Alkalinity as CaCO3	401	1.45	4.00	NE	NE			104818-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104818-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	104818-007	SW846 9012
SFR-4T	Total Organic Halogens	0.0168	0.00333	0.010	NE	NE			104824-003	SW846 9020
20-Mar-18	Bromide	1.55	0.067	0.200	NE	NE			104824-008	SW846 9056
	Chloride	184	13.4	40.0	NE	250		J	104824-008	SW846 9056
	Fluoride	**2.82**	0.033	0.100	4.0	1.60			104824-008	SW846 9056
	Sulfate	1,930	26.6	80.0	NE	600		J	104824-008	SW846 9056
	Alkalinity as CaCO3	110	1.45	4.00	NE	NE			104824-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104824-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	104824-007	SW846 9012
SWTA3-MW2	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104790-003	SW846 9020
22-Mar-18	Bromide	0.182	0.067	0.200	NE	NE	J		104790-008	SW846 9056
	Chloride	16.6	0.335	1.00	NE	250			104790-008	SW846 9056
	Fluoride	1.10	0.033	0.100	4.0	1.60			104790-008	SW846 9056
	Sulfate	56.8	0.665	2.00	NE	600			104790-008	SW846 9056
	Alkalinity as CaCO3	167	1.45	4.00	NE	NE			104790-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104790-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104790-007	SW846 9012
SWTA3-MW3	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104784-003	SW846 9020
09-Mar-18	Bromide	0.173	0.067	0.200	NE	NE	J		104784-008	SW846 9056
	Chloride	13.6	0.335	1.00	NE	250			104784-008	SW846 9056
	Fluoride	1.34	0.033	0.100	4.0	1.60			104784-008	SW846 9056
	Sulfate	63.2	0.665	2.00	NE	600			104784-008	SW846 9056
	Alkalinity as CaCO3	165	1.45	4.00	NE	NE			104784-005	SM2320B
	Total Phenol	0.00332	0.00167	0.005	NE	0.005	J	J-	104784-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104784-007	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-4 *(Concluded)*
Summary of Alkalinity, Anion, Total Organic Halogens, Total Phenol, and Total Cyanide Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW3 (Duplicate)	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104785-003	SW846 9020
09-Mar-18	Bromide	0.189	0.067	0.200	NE	NE	J		104785-008	SW846 9056
	Chloride	13.7	0.335	1.00	NE	250			104785-008	SW846 9056
	Fluoride	1.34	0.033	0.100	4.0	1.60			104785-008	SW846 9056
	Sulfate	63.4	0.665	2.00	NE	600			104785-008	SW846 9056
	Alkalinity as CaCO3	165	1.45	4.00	NE	NE			104785-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104785-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		104785-007	SW846 9012
SWTA3-MW4	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104833-003	SW846 9020
23-Mar-18	Bromide	0.194	0.067	0.200	NE	NE	J		104833-008	SW846 9056
	Chloride	21.3	0.335	1.00	NE	250			104833-008	SW846 9056
	Fluoride	**1.66**	0.033	0.100	4.0	1.60			104833-008	SW846 9056
	Sulfate	49.2	0.665	2.00	NE	600			104833-008	SW846 9056
	Alkalinity as CaCO3	177	1.45	4.00	NE	NE			104833-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U		104833-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	104833-007	SW846 9012
SWTA3-MW4 (Duplicate)	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		104834-003	SW846 9020
23-Mar-18	Bromide	0.193	0.067	0.200	NE	NE	J		104834-008	SW846 9056
	Chloride	21.7	0.335	1.00	NE	250			104834-008	SW846 9056
	Fluoride	**1.68**	0.033	0.100	4.0	1.60			104834-008	SW846 9056
	Sulfate	50.1	0.665	2.00	NE	600			104834-008	SW846 9056
	Alkalinity as CaCO3	179	1.45	4.00	NE	NE			104834-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U		104834-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	104834-007	SW846 9012
TRE-1	Total Organic Halogens	0.00682	0.00333	0.010	NE	NE	J		104811-003	SW846 9020
14-Mar-18	Bromide	0.791	0.067	0.200	NE	NE			104811-008	SW846 9056
	Chloride	137	1.68	5.00	NE	250			104811-008	SW846 9056
	Fluoride	**1.71**	0.033	0.100	4.0	1.60			104811-008	SW846 9056
	Sulfate	107	3.33	10.0	NE	600			104811-008	SW846 9056
	Alkalinity as CaCO3	491	1.45	4.00	NE	NE		J	104811-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	0.005	U	0.005UJ	104811-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	104811-007	SW846 9012

Refer to footnotes on page 2A-35.

Table 2A-5
Summary of Mercury Results,
Groundwater Monitoring Program Groundwater Surveillance Task,
Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Springs 15-Mar-18	ND	0.000067	0.0002	0.002	U		104814-009	SW846 7470A
Greystone-MW2 21-Mar-18	ND	0.000067	0.0002	0.002	U		104827-009	SW846 7470A
MRN-2 12-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104793-009	SW846 7470A
MRN-3D 13-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104803-009	SW846 7470A
MRN-3D (Duplicate) 13-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104804-009	SW846 7470A
NWTA3-MW3D 23-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104838-009	SW846 7470A
PL-2 12-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104800-009	SW846 7470A
PL-4 13-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104808-009	SW846 7470A
SFR-2S 19-Mar-18	ND	0.000067	0.0002	0.002	U		104818-010	SW846 7470A
SFR-4T 20-Mar-18	ND	0.000067	0.0002	0.002	U		104824-010	SW846 7470A
SWTA3-MW2 22-Mar-18	ND	0.000067	0.0002	0.002	U		104790-010	SW846 7470A
SWTA3-MW3 09-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104784-010	SW846 7470A
SWTA3-MW3 (Duplicate) 09-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104785-010	SW846 7470A
SWTA3-MW4 23-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104833-010	SW846 7470A
SWTA3-MW4 (Duplicate) 23-Mar-18	ND	0.000067	0.0002	0.002	U	0.0002UJ	104834-010	SW846 7470A
TRE-1 14-Mar-18	ND	0.000067	0.0002	0.002	U		104811-010	SW846 7470A

Refer to footnotes on page 2A-35.

Table 2A-6
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Springs	Aluminum	0.193	0.0193	0.050	NE	5.0			104814-008	SW846 6020
15-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104814-008	SW846 6020
	Arsenic	0.00633	0.002	0.005	0.010	0.010			104814-008	SW846 6020
	Barium	0.0409	0.00067	0.002	2.00	2.00			104814-008	SW846 6020
	Beryllium	**0.00698**	0.0002	0.0005	0.004	0.004			104814-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104814-008	SW846 6020
	Calcium	257	1.60	4.00	NE	NE			104814-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104814-008	SW846 6020
	Cobalt	0.00894	0.0003	0.001	NE	0.05			104814-008	SW846 6020
	Copper	0.000888	0.0003	0.001	NE	1.0	J		104814-008	SW846 6020
	Iron	0.0493	0.033	0.100	NE	1.0	J		104814-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104814-008	SW846 6020
	Magnesium	61.3	0.200	0.600	NE	NE			104814-008	SW846 6020
	Manganese	1.35	0.020	0.100	NE	0.20		J	104814-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		104814-008	SW846 7470
	Nickel	0.0224	0.0006	0.002	NE	0.20			104814-008	SW846 6020
	Potassium	28.8	1.60	6.00	NE	NE		J	104814-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104814-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104814-008	SW846 6020
	Sodium	407	1.60	5.00	NE	NE			104814-008	SW846 6020
	Thallium	0.00113	0.0006	0.002	0.002	0.002	J		104814-008	SW846 6020
	Uranium	0.00666	0.000067	0.0002	0.03	0.03			104814-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		104814-008	SW846 6020
	Zinc	0.040	0.0033	0.010	NE	10.0			104814-008	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Greystone-MW2	Aluminum	ND	0.0193	0.050	NE	5.0	U		104827-008	SW846 6020
21-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104827-008	SW846 6020
	Arsenic	0.00453	0.002	0.005	0.010	0.010	J		104827-008	SW846 6020
	Barium	0.139	0.00067	0.002	2.00	2.00			104827-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104827-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104827-008	SW846 6020
	Calcium	139	0.800	2.00	NE	NE			104827-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104827-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104827-008	SW846 6020
	Copper	ND	0.0003	0.001	NE	1.0	U		104827-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.0	U		104827-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104827-008	SW846 6020
	Magnesium	27.2	0.010	0.030	NE	NE			104827-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104827-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		104827-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		104827-008	SW846 6020
	Potassium	4.87	0.080	0.300	NE	NE			104827-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104827-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104827-008	SW846 6020
	Sodium	85.7	0.800	2.50	NE	NE			104827-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104827-008	SW846 6020
	Uranium	0.00617	0.000067	0.0002	0.03	0.03			104827-008	SW846 6020
	Vanadium	0.00435	0.0033	0.010	NE	NE	J		104827-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		104827-008	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-2	Aluminum	ND	0.0193	0.050	NE	5.0	U		104793-008	SW846 6020
12-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104793-008	SW846 6020
	Arsenic	0.00262	0.002	0.005	0.010	0.010	J		104793-008	SW846 6020
	Barium	0.0567	0.00067	0.002	2.00	2.00			104793-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104793-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104793-008	SW846 6020
	Calcium	49.9	0.080	0.200	NE	NE			104793-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104793-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104793-008	SW846 6020
	Copper	0.000439	0.0003	0.001	NE	1.0	J	J+	104793-008	SW846 6020
	Iron	0.0457	0.033	0.100	NE	1.0	J		104793-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104793-008	SW846 6020
	Magnesium	15.1	0.010	0.030	NE	NE			104793-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104793-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104793-008	SW846 7470
	Nickel	0.000844	0.0006	0.002	NE	0.20	J		104793-008	SW846 6020
	Potassium	3.31	0.080	0.300	NE	NE			104793-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104793-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104793-008	SW846 6020
	Sodium	22.4	0.080	0.250	NE	NE			104793-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104793-008	SW846 6020
	Uranium	0.00334	0.000067	0.0002	0.03	0.03			104793-008	SW846 6020
	Vanadium	0.0101	0.0033	0.010	NE	NE			104793-008	SW846 6020
	Zinc	0.00389	0.0033	0.010	NE	10.0	J		104793-008	SW846 6020

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Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-3D	Aluminum	ND	0.0193	0.050	NE	5.0	U		104803-008	SW846 6020
13-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104803-008	SW846 6020
	Arsenic	0.00251	0.002	0.005	0.010	0.010	J		104803-008	SW846 6020
	Barium	0.113	0.00335	0.010	2.00	2.00			104803-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104803-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104803-008	SW846 6020
	Calcium	56.9	0.400	1.00	NE	NE			104803-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104803-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104803-008	SW846 6020
	Copper	0.000427	0.0003	0.001	NE	1.0	J	J+	104803-008	SW846 6020
	Iron	0.0569	0.033	0.100	NE	1.0	J		104803-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104803-008	SW846 6020
	Magnesium	13.0	0.010	0.030	NE	NE			104803-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104803-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104803-008	SW846 7470
	Nickel	0.000915	0.0006	0.002	NE	0.20	J		104803-008	SW846 6020
	Potassium	3.99	0.080	0.300	NE	NE			104803-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104803-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104803-008	SW846 6020
	Sodium	24.5	0.080	0.250	NE	NE			104803-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104803-008	SW846 6020
	Uranium	0.00375	0.000067	0.0002	0.03	0.03			104803-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	J	0.01U	104803-008	SW846 6020
	Zinc	0.0226	0.0033	0.010	NE	10.0			104803-008	SW846 6020

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Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-3D (Duplicate)	Aluminum	ND	0.0193	0.050	NE	5.0	U		104804-008	SW846 6020
13-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104804-008	SW846 6020
	Arsenic	0.0025	0.002	0.005	0.010	0.010	J		104804-008	SW846 6020
	Barium	0.111	0.00335	0.010	2.00	2.00			104804-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104804-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104804-008	SW846 6020
	Calcium	55.8	0.400	1.00	NE	NE			104804-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104804-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104804-008	SW846 6020
	Copper	0.00046	0.0003	0.001	NE	1.0	J	J+	104804-008	SW846 6020
	Iron	0.0556	0.033	0.100	NE	1.0	J		104804-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104804-008	SW846 6020
	Magnesium	13.3	0.010	0.030	NE	NE			104804-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104804-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104804-008	SW846 7470
	Nickel	0.000949	0.0006	0.002	NE	0.20	J		104804-008	SW846 6020
	Potassium	4.13	0.080	0.300	NE	NE			104804-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104804-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104804-008	SW846 6020
	Sodium	25.3	0.080	0.250	NE	NE			104804-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104804-008	SW846 6020
	Uranium	0.00383	0.000067	0.0002	0.03	0.03			104804-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	J	0.01U	104804-008	SW846 6020
	Zinc	0.023	0.0033	0.010	NE	10.0			104804-008	SW846 6020

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Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
NWTA3-MW3D	Aluminum	ND	0.0193	0.050	NE	5.0	U		104838-008	SW846 6020
23-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104838-008	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		104838-008	SW846 6020
	Barium	0.0848	0.00067	0.002	2.00	2.00			104838-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104838-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104838-008	SW846 6020
	Calcium	39.3	0.080	0.200	NE	NE			104838-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104838-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104838-008	SW846 6020
	Copper	0.000393	0.0003	0.001	NE	1.0	J		104838-008	SW846 6020
	Iron	0.0492	0.033	0.100	NE	1.0	J		104838-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104838-008	SW846 6020
	Magnesium	8.13	0.010	0.030	NE	NE			104838-008	SW846 6020
	Manganese	0.00122	0.001	0.005	NE	0.20	J		104838-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104838-008	SW846 7470
	Nickel	0.00081	0.0006	0.002	NE	0.20	J		104838-008	SW846 6020
	Potassium	3.56	0.080	0.300	NE	NE			104838-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104838-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104838-008	SW846 6020
	Sodium	37.1	0.080	0.250	NE	NE			104838-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104838-008	SW846 6020
	Uranium	0.00333	0.000067	0.0002	0.03	0.03			104838-008	SW846 6020
	Vanadium	0.0094	0.0033	0.010	NE	NE	J		104838-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		104838-008	SW846 6020

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Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-2	Aluminum	ND	0.0193	0.050	NE	5.0	U		104800-008	SW846 6020
12-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104800-008	SW846 6020
	Arsenic	0.00212	0.002	0.005	0.010	0.010	J		104800-008	SW846 6020
	Barium	0.0737	0.00067	0.002	2.00	2.00			104800-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104800-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104800-008	SW846 6020
	Calcium	60.7	0.400	1.00	NE	NE			104800-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104800-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104800-008	SW846 6020
	Copper	0.000595	0.0003	0.001	NE	1.0	J	J+	104800-008	SW846 6020
	Iron	0.0525	0.033	0.100	NE	1.0	J		104800-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104800-008	SW846 6020
	Magnesium	9.57	0.010	0.030	NE	NE			104800-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104800-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104800-008	SW846 7470
	Nickel	0.00318	0.0006	0.002	NE	0.20			104800-008	SW846 6020
	Potassium	3.50	0.080	0.300	NE	NE			104800-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104800-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104800-008	SW846 6020
	Sodium	27.4	0.080	0.250	NE	NE			104800-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104800-008	SW846 6020
	Uranium	0.00382	0.000067	0.0002	0.03	0.03			104800-008	SW846 6020
	Vanadium	0.00738	0.0033	0.010	NE	NE	J		104800-008	SW846 6020
	Zinc	0.0119	0.0033	0.010	NE	10.0			104800-008	SW846 6020

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Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-4	Aluminum	ND	0.0193	0.050	NE	5.0	U		104808-008	SW846 6020
13-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104808-008	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		104808-008	SW846 6020
	Barium	0.0658	0.00067	0.002	2.00	2.00			104808-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104808-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104808-008	SW846 6020
	Calcium	63.9	0.400	1.00	NE	NE			104808-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104808-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104808-008	SW846 6020
	Copper	0.000505	0.0003	0.001	NE	1.0	J	J+	104808-008	SW846 6020
	Iron	0.061	0.033	0.100	NE	1.0	J		104808-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104808-008	SW846 6020
	Magnesium	12.0	0.010	0.030	NE	NE			104808-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104808-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104808-008	SW846 7470
	Nickel	0.000921	0.0006	0.002	NE	0.20	J		104808-008	SW846 6020
	Potassium	4.85	0.080	0.300	NE	NE			104808-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104808-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104808-008	SW846 6020
	Sodium	23.1	0.080	0.250	NE	NE			104808-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104808-008	SW846 6020
	Uranium	0.00382	0.000067	0.0002	0.03	0.03			104808-008	SW846 6020
	Vanadium	0.00592	0.0033	0.010	NE	NE	J		104808-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		104808-008	SW846 6020

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Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-2S	Aluminum	ND	0.0193	0.050	NE	5.0	U		104818-009	SW846 6020
19-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104818-009	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		104818-009	SW846 6020
	Barium	0.0555	0.00067	0.002	2.00	2.00			104818-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104818-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104818-009	SW846 6020
	Calcium	128	0.800	2.00	NE	NE			104818-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104818-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104818-009	SW846 6020
	Copper	0.00646	0.0003	0.001	NE	1.0			104818-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.0	U		104818-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104818-009	SW846 6020
	Magnesium	36.8	0.010	0.030	NE	NE			104818-009	SW846 6020
	Manganese	0.00197	0.001	0.005	NE	0.20	J	J+	104818-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		104818-009	SW846 7470
	Nickel	0.00488	0.0006	0.002	NE	0.20			104818-009	SW846 6020
	Potassium	7.15	0.080	0.300	NE	NE			104818-009	SW846 6020
	Selenium	0.00205	0.002	0.005	0.050	0.050	J		104818-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104818-009	SW846 6020
	Sodium	78.2	0.800	2.50	NE	NE			104818-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104818-009	SW846 6020
	Uranium	0.0149	0.000067	0.0002	0.03	0.03			104818-009	SW846 6020
	Vanadium	0.004	0.0033	0.010	NE	NE	J		104818-009	SW846 6020
	Zinc	0.00674	0.0033	0.010	NE	10.0	J		104818-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-4T	Aluminum	ND	0.0193	0.050	NE	5.0	U		104824-009	SW846 6020
20-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104824-009	SW846 6020
	Arsenic	0.00208	0.002	0.005	0.010	0.010	J		104824-009	SW846 6020
	Barium	0.00857	0.00067	0.002	2.00	2.00			104824-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104824-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104824-009	SW846 6020
	Calcium	66.9	0.800	2.00	NE	NE			104824-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104824-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104824-009	SW846 6020
	Copper	ND	0.0003	0.001	NE	1.0	U		104824-009	SW846 6020
	Iron	0.0911	0.033	0.100	NE	1.0	J		104824-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104824-009	SW846 6020
	Magnesium	3.04	0.010	0.030	NE	NE			104824-009	SW846 6020
	Manganese	0.00646	0.001	0.005	NE	0.20			104824-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		104824-009	SW846 7470
	Nickel	0.00106	0.0006	0.002	NE	0.20	J		104824-009	SW846 6020
	Potassium	2.23	0.080	0.300	NE	NE			104824-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104824-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104824-009	SW846 6020
	Sodium	1,080	8.00	25.0	NE	NE		J	104824-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104824-009	SW846 6020
	Uranium	ND	0.000067	0.0002	0.03	0.03	J	0.0002U	104824-009	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		104824-009	SW846 6020
	Zinc	0.0151	0.0033	0.010	NE	10.0			104824-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW2	Aluminum	ND	0.0193	0.050	NE	5.0	U		104790-009	SW846 6020
22-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104790-009	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		104790-009	SW846 6020
	Barium	0.0721	0.00067	0.002	2.00	2.00			104790-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104790-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104790-009	SW846 6020
	Calcium	44.3	0.080	0.200	NE	NE		J	104790-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104790-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104790-009	SW846 6020
	Copper	ND	0.0003	0.001	NE	1.0	U		104790-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.0	U		104790-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104790-009	SW846 6020
	Magnesium	13.4	0.010	0.030	NE	NE			104790-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104790-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		104790-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		104790-009	SW846 6020
	Potassium	4.14	0.080	0.300	NE	NE			104790-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104790-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104790-009	SW846 6020
	Sodium	40.8	0.080	0.250	NE	NE		J	104790-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104790-009	SW846 6020
	Uranium	0.0029	0.000067	0.0002	0.03	0.03			104790-009	SW846 6020
	Vanadium	0.00714	0.0033	0.010	NE	NE	J		104790-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		104790-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW3	Aluminum	ND	0.0193	0.050	NE	5.0	U		104784-009	SW846 6020
09-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104784-009	SW846 6020
	Arsenic	0.00203	0.002	0.005	0.010	0.010	J	0.005U	104784-009	SW846 6020
	Barium	0.0592	0.00067	0.002	2.00	2.00			104784-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104784-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104784-009	SW846 6020
	Calcium	39.5	0.080	0.200	NE	NE			104784-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104784-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104784-009	SW846 6020
	Copper	0.000323	0.0003	0.001	NE	1.0	J	J+	104784-009	SW846 6020
	Iron	0.0371	0.033	0.100	NE	1.0	J		104784-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104784-009	SW846 6020
	Magnesium	10.9	0.010	0.030	NE	NE			104784-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104784-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104784-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		104784-009	SW846 6020
	Potassium	4.87	0.080	0.300	NE	NE			104784-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104784-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104784-009	SW846 6020
	Sodium	49.0	0.080	0.250	NE	NE			104784-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104784-009	SW846 6020
	Uranium	0.0026	0.000067	0.0002	0.03	0.03			104784-009	SW846 6020
	Vanadium	0.00992	0.0033	0.010	NE	NE	J		104784-009	SW846 6020
	Zinc	0.0144	0.0033	0.010	NE	10.0			104784-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW3 (Duplicate)	Aluminum	ND	0.0193	0.050	NE	5.0	U		104785-009	SW846 6020
09-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104785-009	SW846 6020
	Arsenic	0.0024	0.002	0.005	0.010	0.010	J	0.005U	104785-009	SW846 6020
	Barium	0.0583	0.00067	0.002	2.00	2.00			104785-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104785-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104785-009	SW846 6020
	Calcium	38.9	0.080	0.200	NE	NE			104785-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104785-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104785-009	SW846 6020
	Copper	0.000337	0.0003	0.001	NE	1.0	J	J+	104785-009	SW846 6020
	Iron	0.0388	0.033	0.100	NE	1.0	J		104785-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104785-009	SW846 6020
	Magnesium	10.8	0.010	0.030	NE	NE			104785-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104785-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104785-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		104785-009	SW846 6020
	Potassium	4.70	0.080	0.300	NE	NE			104785-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104785-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104785-009	SW846 6020
	Sodium	47.8	0.080	0.250	NE	NE			104785-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104785-009	SW846 6020
	Uranium	0.00257	0.000067	0.0002	0.03	0.03			104785-009	SW846 6020
	Vanadium	0.0112	0.0033	0.010	NE	NE			104785-009	SW846 6020
	Zinc	0.0146	0.0033	0.010	NE	10.0			104785-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW4	Aluminum	ND	0.0193	0.050	NE	5.0	U		104833-009	SW846 6020
23-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104833-009	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		104833-009	SW846 6020
	Barium	0.0522	0.00067	0.002	2.00	2.00			104833-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104833-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104833-009	SW846 6020
	Calcium	37.4	0.080	0.200	NE	NE			104833-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104833-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104833-009	SW846 6020
	Copper	ND	0.0003	0.001	NE	1.0	U		104833-009	SW846 6020
	Iron	0.0385	0.033	0.100	NE	1.0	J		104833-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104833-009	SW846 6020
	Magnesium	10.5	0.010	0.030	NE	NE			104833-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104833-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104833-009	SW846 7470
	Nickel	0.000615	0.0006	0.002	NE	0.20	J		104833-009	SW846 6020
	Potassium	4.22	0.080	0.300	NE	NE			104833-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104833-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104833-009	SW846 6020
	Sodium	57.4	0.400	1.25	NE	NE			104833-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104833-009	SW846 6020
	Uranium	0.00232	0.000067	0.0002	0.03	0.03			104833-009	SW846 6020
	Vanadium	0.0101	0.0033	0.010	NE	NE			104833-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		104833-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Continued)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW4 (Duplicate)	Aluminum	ND	0.0193	0.050	NE	5.0	U		104834-009	SW846 6020
23-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104834-009	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		104834-009	SW846 6020
	Barium	0.052	0.00067	0.002	2.00	2.00			104834-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104834-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104834-009	SW846 6020
	Calcium	37.6	0.080	0.200	NE	NE			104834-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104834-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104834-009	SW846 6020
	Copper	ND	0.0003	0.001	NE	1.0	U		104834-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.0	U		104834-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104834-009	SW846 6020
	Magnesium	10.7	0.010	0.030	NE	NE			104834-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104834-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	104834-009	SW846 7470
	Nickel	0.000649	0.0006	0.002	NE	0.20	J		104834-009	SW846 6020
	Potassium	4.31	0.080	0.300	NE	NE			104834-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		104834-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104834-009	SW846 6020
	Sodium	58.9	0.400	1.25	NE	NE			104834-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104834-009	SW846 6020
	Uranium	0.00228	0.000067	0.0002	0.03	0.03			104834-009	SW846 6020
	Vanadium	0.00999	0.0033	0.010	NE	NE	J		104834-009	SW846 6020
	Zinc	0.00444	0.0033	0.010	NE	10.0	J		104834-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-6 *(Concluded)*
Summary of Target Analyte List Metals and Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL/MAC[d] (mg/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TRE-1	Aluminum	ND	0.0193	0.050	NE	5.0	U		104811-009	SW846 6020
14-Mar-18	Antimony	ND	0.001	0.003	0.006	0.006	U		104811-009	SW846 6020
	Arsenic	0.00229	0.002	0.005	0.010	0.010	J		104811-009	SW846 6020
	Barium	0.0428	0.00067	0.002	2.00	2.00			104811-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		104811-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		104811-009	SW846 6020
	Calcium	156	1.60	4.00	NE	NE			104811-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		104811-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.05	U		104811-009	SW846 6020
	Copper	ND	0.0003	0.001	NE	1.0	U		104811-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.0	U		104811-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	0.015	U		104811-009	SW846 6020
	Magnesium	36.7	0.200	0.600	NE	NE			104811-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		104811-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		104811-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		104811-009	SW846 6020
	Potassium	6.44	0.080	0.300	NE	NE			104811-009	SW846 6020
	Selenium	0.00278	0.002	0.005	0.050	0.050	J		104811-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		104811-009	SW846 6020
	Sodium	104	1.60	5.00	NE	NE			104811-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		104811-009	SW846 6020
	Uranium	0.0165	0.000067	0.0002	0.03	0.03			104811-009	SW846 6020
	Vanadium	0.00549	0.0033	0.010	NE	NE	J		104811-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		104811-009	SW846 6020

Refer to footnotes on page 2A-35.

Table 2A-7
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
Coyote Springs	Americium-241	-10.3 ± 15.5	22.5	10.9	NE	NE	U	BD	104814-010	EPA 901.1
15-Mar-18	Cesium-137	-0.758 ± 2.09	3.70	1.74	NE	NE	U	BD	104814-010	EPA 901.1
	Cobalt-60	0.667 ± 2.21	4.07	1.86	NE	NE	U	BD	104814-010	EPA 901.1
	Potassium-40	6.72 ± 53.4	59.9	28.2	NE	NE	U	BD	104814-010	EPA 901.1
	Gross Alpha	2.00	NA	NA	15 pCi/L	NE	NA	None	104814-011	EPA 900.0
	Gross Beta	26.2 ± 7.18	8.65	4.21	4 mrem/yr	NE		J	104814-011	EPA 900.0
	Uranium-233/234	10.8 ± 1.09	0.118	0.0545	NE	NE			104816-002	HASL-300
	Uranium-235/236	0.303 ± 0.0763	0.0558	0.0225	NE	NE			104816-002	HASL-300
	Uranium-238	2.50 ± 0.296	0.072	0.0317	NE	NE			104816-002	HASL-300
	Radium-226	0.00 ± 0.296	0.619	0.249	5 pCi/L	5 pCi/L	U	BD	104814-012	EPA 903.1
	Radium-228	0.730 ± 0.389	0.446	0.188	5 pCi/L	5 pCi/L		J	104816-001	EPA 904.0
Greystone-MW2	Americium-241	4.42 ± 4.68	7.40	3.63	NE	NE	U	BD	104827-010	EPA 901.1
21-Mar-18	Cesium-137	2.69 ± 3.23	4.87	2.32	NE	NE	U	BD	104827-010	EPA 901.1
	Cobalt-60	0.0656 ± 2.87	5.09	2.36	NE	NE	U	BD	104827-010	EPA 901.1
	Potassium-40	-11.3 ± 45.2	65.0	30.6	NE	NE	U	BD	104827-010	EPA 901.1
	Gross Alpha	0.70	NA	NA	15 pCi/L	NE	NA	None	104827-011	EPA 900.0
	Gross Beta	5.73 ± 1.71	1.98	0.947	4 mrem/yr	NE		J	104827-011	EPA 900.0
	Uranium-233/234	10.1 ± 1.02	0.113	0.0523	NE	NE			104829-002	HASL-300
	Uranium-235/236	0.286 ± 0.0726	0.0535	0.0216	NE	NE			104829-002	HASL-300
	Uranium-238	2.51 ± 0.294	0.069	0.0303	NE	NE			104829-002	HASL-300
	Radium-226	1.56 ± 0.503	0.288	0.099	5 pCi/L	5 pCi/L			104827-012	EPA 903.1
	Radium-228	0.296 ± 0.313	0.503	0.220	5 pCi/L	5 pCi/L	U	BD	104829-001	EPA 904.0
MRN-2	Americium-241	2.03 ± 6.25	10.4	5.04	NE	NE	U	BD	104793-010	EPA 901.1
12-Mar-18	Cesium-137	-1.08 ± 1.84	2.92	1.38	NE	NE	U	BD	104793-010	EPA 901.1
	Cobalt-60	1.04 ± 1.69	3.09	1.42	NE	NE	U	BD	104793-010	EPA 901.1
	Potassium-40	53.3 ± 47.6	27.0	12.32	NE	NE	X	R	104793-010	EPA 901.1
	Gross Alpha	1.65	NA	NA	15 pCi/L	NE	NA	None	104793-011	EPA 900.0
	Gross Beta	3.05 ± 0.916	1.00	0.465	4 mrem/yr	NE		J	104793-011	EPA 900.0
	Radium-226	1.03 ± 0.588	0.760	0.309	5 pCi/L	5 pCi/L		J	104793-012	EPA 903.1
	Radium-228	0.146 ± 0.273	0.478	0.207	5 pCi/L	5 pCi/L	U	BD	104795-001	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MRN-3D	Americium-241	-1.09 ± 2.98	4.79	2.33	NE	NE	U	BD	104803-010	EPA 901.1
13-Mar-18	Cesium-137	0.776 ± 2.07	3.60	1.70	NE	NE	U	BD	104803-010	EPA 901.1
	Cobalt-60	0.319 ± 2.26	4.05	1.88	NE	NE	U	BD	104803-010	EPA 901.1
	Potassium-40	-75.6 ± 53.0	53.9	25.5	NE	NE	U	BD	104803-010	EPA 901.1
	Gross Alpha	2.04	NA	NA	15 pCi/L	NE	NA	None	104803-011	EPA 900.0
	Gross Beta	4.22 ± 1.12	0.994	0.452	4 mrem/yr	NE		J	104803-011	EPA 900.0
	Radium-226	0.451 ± 0.289	0.287	0.0873	5 pCi/L	5 pCi/L		J	104803-012	EPA 903.1
	Radium-228	0.263 ± 0.293	0.476	0.215	5 pCi/L	5 pCi/L	U	BD	104806-001	EPA 904.0
MRN-3D (Duplicate)	Americium-241	0.0143 ± 8.68	15.2	7.34	NE	NE	U	BD	104804-010	EPA 901.1
13-Mar-18	Cesium-137	2.53 ± 2.02	2.64	1.24	NE	NE	U	BD	104804-010	EPA 901.1
	Cobalt-60	0.385 ± 1.96	3.38	1.56	NE	NE	U	BD	104804-010	EPA 901.1
	Potassium-40	18.5 ± 50.2	31.7	14.6	NE	NE	U	BD	104804-010	EPA 901.1
	Gross Alpha	2.15	NA	NA	15 pCi/L	NE	NA	None	104804-011	EPA 900.0
	Gross Beta	4.09 ± 1.06	0.991	0.460	4 mrem/yr	NE		J	104804-011	EPA 900.0
	Radium-226	0.257 ± 0.281	0.451	0.170	5 pCi/L	5 pCi/L	U	BD	104804-012	EPA 903.1
	Radium-228	0.110 ± 0.267	0.481	0.208	5 pCi/L	5 pCi/L	U	BD	104807-001	EPA 904.0
NWTA3-MW3D	Americium-241	6.23 ± 16.3	25.9	12.5	NE	NE	U	BD	104838-010	EPA 901.1
23-Mar-18	Cesium-137	-0.635 ± 1.78	3.03	1.42	NE	NE	U	BD	104838-010	EPA 901.1
	Cobalt-60	0.399 ± 1.55	3.00	1.36	NE	NE	U	BD	104838-010	EPA 901.1
	Potassium-40	-40.2 ± 40.3	46.9	22.0	NE	NE	U	BD	104838-010	EPA 901.1
	Gross Alpha	0.83	NA	NA	15 pCi/L	NE	NA	None	104838-011	EPA 900.0
	Gross Beta	3.16 ± 0.718	0.590	0.280	4 mrem/yr	NE			104838-011	EPA 900.0
	Radium-226	2.05 ± 0.754	0.568	0.225	5 pCi/L	5 pCi/L			104838-012	EPA 903.1
	Radium-228	0.309 ± 0.313	0.500	0.225	5 pCi/L	5 pCi/L	U	BD	104840-001	EPA 904.0
PL-2	Americium-241	4.81 ± 9.45	15.4	7.44	NE	NE	U	BD	104800-010	EPA 901.1
12-Mar-18	Cesium-137	1.07 ± 1.89	3.29	1.56	NE	NE	U	BD	104800-010	EPA 901.1
	Cobalt-60	-0.277 ± 1.79	3.20	1.46	NE	NE	U	BD	104800-010	EPA 901.1
	Potassium-40	-17.1 ± 35.9	48.0	22.7	NE	NE	U	BD	104800-010	EPA 901.1
	Gross Alpha	1.97	NA	NA	15 pCi/L	NE	NA	None	104800-011	EPA 900.0
	Gross Beta	4.07 ± 1.03	0.993	0.468	4 mrem/yr	NE		J	104800-011	EPA 900.0
	Radium-226	0.297 ± 0.278	0.378	0.115	5 pCi/L	5 pCi/L	U	BD	104800-012	EPA 903.1
	Radium-228	0.321 ± 0.318	0.502	0.218	5 pCi/L	5 pCi/L	U	BD	104802-001	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
PL-4	Americium-241	0.172 ± 12.1	21.1	10.2	NE	NE	U	BD	104808-010	EPA 901.1
13-Mar-18	Cesium-137	0.474 ± 1.75	3.12	1.47	NE	NE	U	BD	104808-010	EPA 901.1
	Cobalt-60	1.71 ± 1.94	3.57	1.65	NE	NE	U	BD	104808-010	EPA 901.1
	Potassium-40	-50.6 ± 45.0	46.0	21.6	NE	NE	U	BD	104808-010	EPA 901.1
	Gross Alpha	0.49	NA	NA	15 pCi/L	NE	NA	None	104808-011	EPA 900.0
	Gross Beta	4.63 ± 1.17	0.984	0.453	4 mrem/yr	NE		J	104808-011	EPA 900.0
	Radium-226	0.829 ± 0.513	0.637	0.241	5 pCi/L	5 pCi/L		J	104808-012	EPA 903.1
	Radium-228	-0.0244 ± 0.248	0.487	0.212	5 pCi/L	5 pCi/L	U	BD	104810-001	EPA 904.0
SFR-2S	Americium-241	0.921 ± 4.95	8.63	4.19	NE	NE	U	BD	104818-011	EPA 901.1
19-Mar-18	Cesium-137	-0.717 ± 1.73	2.84	1.35	NE	NE	U	BD	104818-011	EPA 901.1
	Cobalt-60	1.17 ± 1.82	3.28	1.53	NE	NE	U	BD	104818-011	EPA 901.1
	Potassium-40	8.44 ± 41.8	30.9	14.3	NE	NE	U	BD	104818-011	EPA 901.1
	Gross Alpha	10.75	NA	NA	15 pCi/L	NE	NA	None	104818-012	EPA 900.0
	Gross Beta	8.96 ± 2.06	1.57	0.747	4 mrem/yr	NE		J	104818-012	EPA 900.0
	Uranium-233/234	19.8 ± 1.88	0.0991	0.0459	NE	NE			104820-002	HASL-300
	Uranium-235/236	0.721 ± 0.118	0.047	0.019	NE	NE			104820-002	HASL-300
	Uranium-238	5.84 ± 0.591	0.0606	0.0266	NE	NE			104820-002	HASL-300
	Radium-226	1.43 ± 0.701	0.827	0.337	5 pCi/L	5 pCi/L		J	104818-013	EPA 903.1
	Radium-228	0.272 ± 0.304	0.495	0.225	5 pCi/L	5 pCi/L	U	BD	104820-001	EPA 904.0
SFR-4T	Americium-241	9.76 ± 15.8	24.9	12.0	NE	NE	U	BD	104824-011	EPA 901.1
20-Mar-18	Cesium-137	1.76 ± 1.75	3.00	1.41	NE	NE	U	BD	104824-011	EPA 901.1
	Cobalt-60	1.39 ± 1.81	3.42	1.57	NE	NE	U	BD	104824-011	EPA 901.1
	Potassium-40	-18.8 ± 35.6	46.7	21.9	NE	NE	U	BD	104824-011	EPA 901.1
	Gross Alpha	-11.43	NA	NA	15 pCi/L	NE	NA	None	104824-012	EPA 900.0
	Gross Beta	-1.36 ± 5.85	10.1	4.92	4 mrem/yr	NE	U	BD	104824-012	EPA 900.0
	Uranium-233/234	0.526 ± 0.0906	0.0977	0.0452	NE	NE			104826-002	HASL-300
	Uranium-235/236	0.033 ± 0.0276	0.0463	0.0187	NE	NE	U	BD	104826-002	HASL-300
	Uranium-238	0.136 ± 0.0434	0.0597	0.0263	NE	NE		J	104826-002	HASL-300
	Radium-226	0.369 ± 0.303	0.393	0.135	5 pCi/L	5 pCi/L	U	BD	104824-013	EPA 903.1
	Radium-228	0.514 ± 0.337	0.475	0.214	5 pCi/L	5 pCi/L		J	104826-001	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW2	Americium-241	33.7 ± 22.9	21.5	10.3	NE	NE	X	R	104790-011	EPA 901.1
22-Mar-18	Cesium-137	-0.374 ± 2.18	3.84	1.81	NE	NE	U	BD	104790-011	EPA 901.1
	Cobalt-60	-0.17 ± 2.12	3.85	1.75	NE	NE	U	BD	104790-011	EPA 901.1
	Potassium-40	-38.9 ± 58.1	55.7	26.1	NE	NE	U	BD	104790-011	EPA 901.1
	Gross Alpha	2.95	NA	NA	15 pCi/L	NE	NA	None	104790-012	EPA 900.0
	Gross Beta	3.10 ± 0.910	0.993	0.467	4 mrem/yr	NE		J	104790-012	EPA 900.0
	Radium-226	0.557 ± 0.421	0.600	0.244	5 pCi/L	5 pCi/L	U	BD	104790-013	EPA 903.1
	Radium-228	0.341 ± 0.323	0.504	0.221	5 pCi/L	5 pCi/L	U	BD	104792-001	EPA 904.0
SWTA3-MW3	Americium-241	2.34 ± 14.7	24.3	11.7	NE	NE	U	BD	104784-011	EPA 901.1
09-Mar-18	Cesium-137	0.245 ± 1.90	3.37	1.58	NE	NE	U	BD	104784-011	EPA 901.1
	Cobalt-60	-1.33 ± 2.13	3.47	1.57	NE	NE	U	BD	104784-011	EPA 901.1
	Potassium-40	11.4 ± 47.4	41.3	19.0	NE	NE	U	BD	104784-011	EPA 901.1
	Gross Alpha	0.68	NA	NA	15 pCi/L	NE	NA	None	104784-012	EPA 900.0
	Gross Beta	4.12 ± 1.02	0.999	0.476	4 mrem/yr	NE		J	104784-012	EPA 900.0
	Radium-226	0.410 ± 0.475	0.784	0.315	5 pCi/L	5 pCi/L	U	BD	104784-013	EPA 903.1
	Radium-228	0.0388 ± 0.269	0.505	0.221	5 pCi/L	5 pCi/L	U	BD	104787-001	EPA 904.0
SWTA3-MW3	Americium-241	8.60 ± 10.9	17.3	8.43	NE	NE	U	BD	104785-011	EPA 901.1
(Duplicate)	Cesium-137	2.06 ± 2.34	4.05	1.94	NE	NE	U	BD	104785-011	EPA 901.1
09-Mar-18	Cobalt-60	-1.27 ± 2.15	3.48	1.61	NE	NE	U	BD	104785-011	EPA 901.1
	Potassium-40	13.7 ± 50.2	30.5	13.9	NE	NE	U	BD	104785-011	EPA 901.1
	Gross Alpha	0.59	NA	NA	15 pCi/L	NE	NA	None	104785-012	EPA 900.0
	Gross Beta	4.33 ± 1.04	0.993	0.475	4 mrem/yr	NE		J	104785-012	EPA 900.0
	Radium-226	0.272 ± 0.354	0.594	0.239	5 pCi/L	5 pCi/L	U	BD	104785-013	EPA 903.1
	Radium-228	0.308 ± 0.303	0.474	0.202	5 pCi/L	5 pCi/L	U	BD	104788-001	EPA 904.0
SWTA3-MW4	Americium-241	1.42 ± 4.96	8.63	4.20	NE	NE	U	BD	104833-011	EPA 901.1
23-Mar-18	Cesium-137	1.24 ± 1.81	3.08	1.47	NE	NE	U	BD	104833-011	EPA 901.1
	Cobalt-60	0.217 ± 1.68	3.04	1.41	NE	NE	U	BD	104833-011	EPA 901.1
	Potassium-40	-8.21 ± 34.5	47.0	22.4	NE	NE	U	BD	104833-011	EPA 901.1
	Gross Alpha	1.90	NA	NA	15 pCi/L	NE	NA	None	104833-012	EPA 900.0
	Gross Beta	4.36 ± 0.997	0.833	0.396	4 mrem/yr	NE			104833-012	EPA 900.0
	Radium-226	0.271 ± 0.311	0.500	0.182	5 pCi/L	5 pCi/L	U	BD	104833-013	EPA 903.1
	Radium-228	0.583 ± 0.353	0.453	0.194	5 pCi/L	5 pCi/L		J	104836-001	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-7 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Radium, and Isotopic Uranium Results, Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL/MAC[d]		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW4	Americium-241	7.40 ± 9.36	14.8	7.14	NE	NE	U	BD	104834-011	EPA 901.1
(Duplicate)	Cesium-137	1.12 ± 1.66	2.90	1.37	NE	NE	U	BD	104834-011	EPA 901.1
23-Mar-18	Cobalt-60	-0.0395 ± 1.58	2.90	1.33	NE	NE	U	BD	104834-011	EPA 901.1
	Potassium-40	-39.3 ± 40.7	43.3	20.4	NE	NE	U	BD	104834-011	EPA 901.1
	Gross Alpha	3.12	NA	NA	15 pCi/L	NE	NA	None	104834-012	EPA 900.0
	Gross Beta	3.81 ± 1.01	1.12	0.540	4 mrem/yr	NE			104834-012	EPA 900.0
	Radium-226	0.811 ± 0.403	0.370	0.127	5 pCi/L	5 pCi/L		J	104834-013	EPA 903.1
	Radium-228	0.327 ± 0.299	0.465	0.205	5 pCi/L	5 pCi/L	U	BD	104837-001	EPA 904.0
TRE-1	Americium-241	3.12 ± 17.9	28.6	13.9	NE	NE	U	BD	104811-011	EPA 901.1
14-Mar-18	Cesium-137	-1.36 ± 2.12	3.39	1.62	NE	NE	U	BD	104811-011	EPA 901.1
	Cobalt-60	0.243 ± 1.98	3.65	1.70	NE	NE	U	BD	104811-011	EPA 901.1
	Potassium-40	54.5 ± 50.4	34.6	16.1	NE	NE		J	104811-011	EPA 901.1
	Gross Alpha	6.76	NA	NA	15 pCi/L	NE	NA	None	104811-012	EPA 900.0
	Gross Beta	7.96 ± 2.80	3.87	1.89	4 mrem/yr	NE		J	104811-012	EPA 900.0
	Uranium-233/234	24.2 ± 2.33	0.112	0.0518	NE	NE			104813-002	HASL-300
	Uranium-235/236	0.727 ± 0.124	0.053	0.0214	NE	NE			104813-002	HASL-300
	Uranium-238	6.31 ± 0.651	0.0684	0.0301	NE	NE			104813-002	HASL-300
	Radium-226	1.36 ± 0.539	0.281	0.0855	5 pCi/L	5 pCi/L			104811-013	EPA 903.1
	Radium-228	0.341 ± 0.311	0.479	0.208	5 pCi/L	5 pCi/L	U	BD	104813-001	EPA 904.0

Refer to footnotes on page 2A-35.

Table 2A-8
Summary of Field Water Quality Measurements[h], Groundwater Monitoring Program Groundwater Surveillance Task, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (μmhos/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
Coyote Springs	15-Mar-18	13.47	2303.11	221.65	6.36	0.37	13.92	1.18
Greystone-MW2	21-Mar-18	16.82	1501.30	248.53	7.14	1.95	85.36	6.79
MRN-2	12-Mar-18	15.79	384.17	233.46	7.20	0.20	81.81	6.52
MRN-3D	13-Mar-18	19.44	425.33	130.22	7.64	0.90	57.81	4.34
NWTA3-MW3D	23-Mar-18	19.60	253.01	125.60	7.94	0.90	56.96	4.20
PL-2	12-Mar-18	16.87	410.2	207.3	7.87	0.23	81.4	6.38
PL-4	13-Mar-18	17.93	423.8	234.6	7.58	0.43	88.6	6.79
SFR-2S	19-Mar-18	15.26	1020.25	193.20	6.89	5.10	91.99	7.56
SFR-4T	20-Mar-18	18.61	4000.77	-28.78	7.85	0.99	9.52	0.73
SWTA3-MW2	22-Mar-18	20.46	460.07	232.76	7.60	1.07	59.31	4.37
SWTA3-MW3	09-Mar-18	20.97	459.38	180.13	7.67	0.69	57.15	4.12
SWTA3-MW4	23-Mar-18	18.94	468.81	255.44	7.72	0.15	63.22	4.77
TRE-1	14-Mar-18	16.82	1250.09	225.52	6.94	0.49	87.93	6.90

Refer to footnotes on page 2A-35.

Footnotes for Groundwater Monitoring Program Groundwater Surveillance Task Analytical Results Tables

% = Percent.
CaCO3 = Calcium carbonate.
CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID = Identifier.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.
mrem/yr = Millirem per year.
No. = Number.
pCi/L = Picocuries per liter.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Tetryl = Methyl-2,4,6-trinitrophenylnitramine.

[a]Result or Activity

Result applies to Tables 2A-1 through 2A-6. Activity applies to Table 2A-7.

Activity = Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Part 141). Activities of zero or less are considered not detected.
Bold = Value exceeds the established MCL or MAC.
ND = Not detected (at method detection limit).

[b]MDL or MDA

The MDL applies to Tables 2A-1 through 2A-6. MDA applies to Table 2A-7.

MDA = The minimal detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.
MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix specific.
NA = Not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

The PQL applies to Tables 2A-1 through 2A-6. Critical Level applies to Table 2A-7.

Critical Level = The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix specific.
NA = Not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.
PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

[d]MCL or MAC

Regulatory limits: The MCL is listed first, followed by the MAC. A single value is listed when the MCL and MAC are equal (for example, nitrate plus nitrite). If no value exists, NE is used.

MAC = Maximum allowable concentration. MACs were established by the New Mexico Water Quality Control Commission (NMWQCC December 2018). MACs for human health, domestic water supply, and irrigation standards are identified in the analytical results tables.
MCL = Maximum contaminant level. MCLs were established by the EPA Office of Water, National Primary Water Standards (EPA May 2009).

The following are the MCLs for gross alpha particles and beta particles in community water systems:

- 15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Part 141).
- 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Groundwater Monitoring Program Groundwater Surveillance Task Analytical Results Tables (Concluded)

[e]Lab Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

J	= Estimated value; the analyte concentration fell above the effective MDL and below the effective PQL.
NA	= Not applicable.
U	= Analyte is absent or below the method detection limit.
X	= Data rejected due to peak not meeting identification criteria.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	= Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	= The associated value is an estimated quantity.
J+	= The associated numerical value is an estimated quantity with a suspected positive bias.
J-	= The associated numerical value is an estimated quantity with a suspected negative bias.
None	= No data validation for corrected gross alpha activity.
U	= The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
UJ	= The analyte was analyzed for, but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	= The data are unusable and resampling or reanalysis are necessary for verification.

[g]Analytical Method

Clesceri, Rice, Baird, and Eaton, 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C.

DOE, 1997, *EML [Environmental Measurements Laboratory] Procedures Manual,* 28th ed., Vol. 1, Rev. 0, HASL-300.

EPA, 1986 (and updates), *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,* SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1984, *Methods for Chemical Analysis of Water and Wastes.* EPA 600-4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA, 1980, *Prescribed Procedures for Measurement of Radioactivity in Drinking Water,* EPA-600-4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

DOE	= U.S. Department of Energy.
EPA	= U.S. Environmental Protection Agency.
HASL	= Health and Safety Laboratory.
SM	= Standard Method.
SW	= Solid Waste.

[h]Field Water Quality Measurements

Field measurements were collected prior to sampling.

°C	= Degrees Celsius.
% Sat	= Percent saturation.
μmhos/cm	= Micromhos per centimeter.
mg/L	= Milligrams per liter.
mV	= Millivolts.
NTU	= Nephelometric turbidity units.
pH	= Potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 2B
Groundwater Monitoring Program
Hydrographs and Charts

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Attachment 2B Hydrographs and Charts

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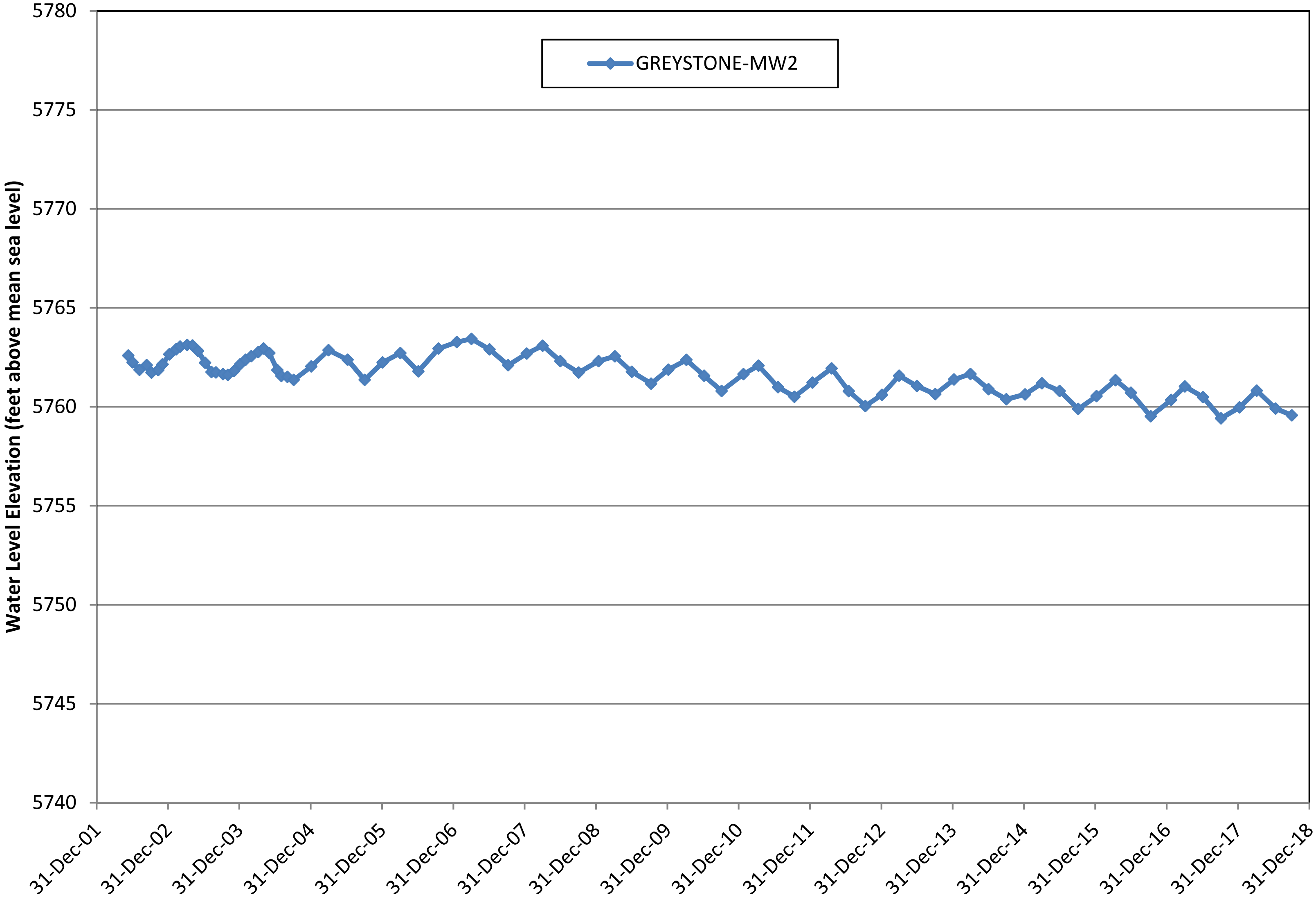

Figure 2B-1. GMP Study Wells (1 of 6)

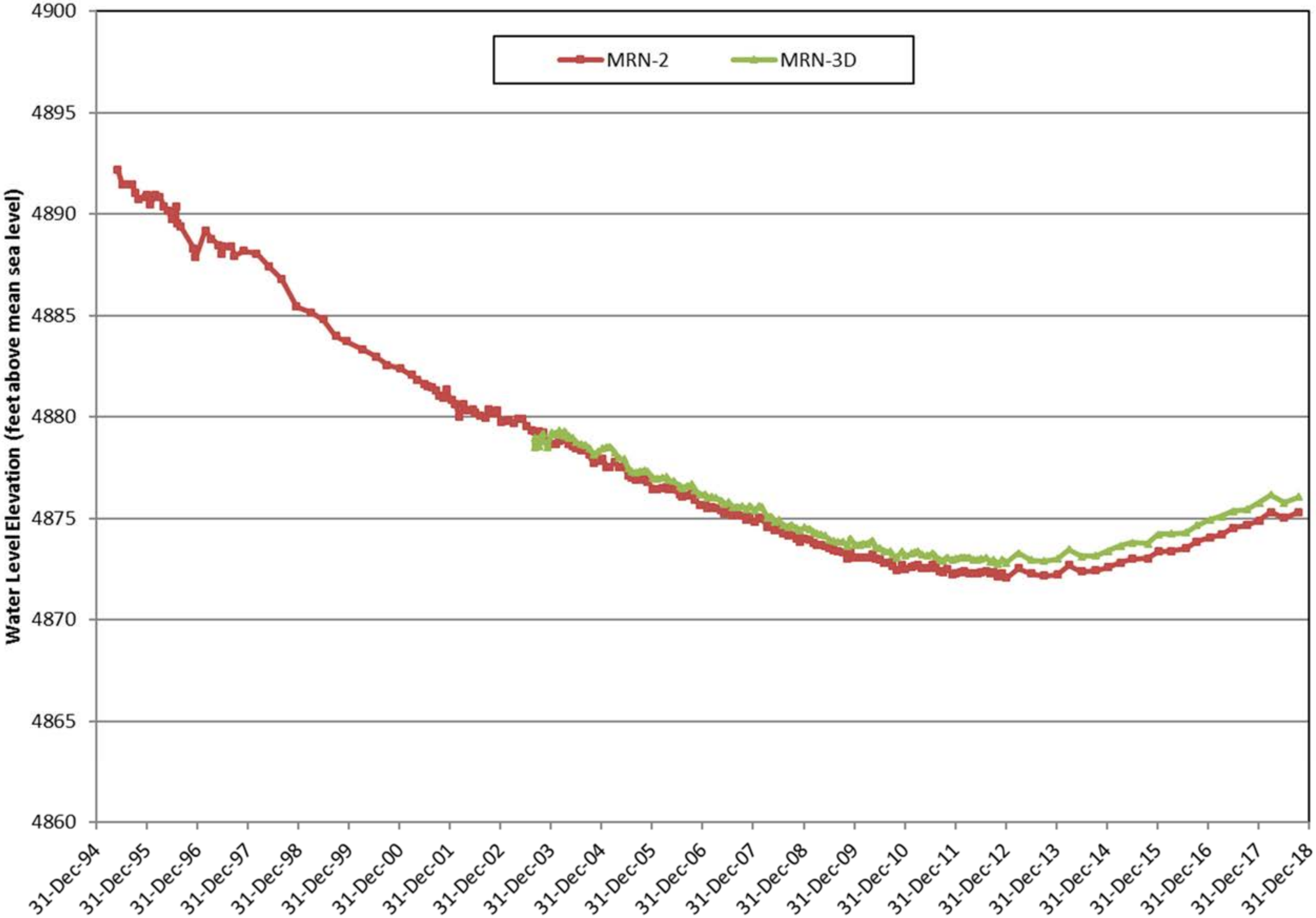

Figure 2B-2. GMP Study Wells (2 of 6)

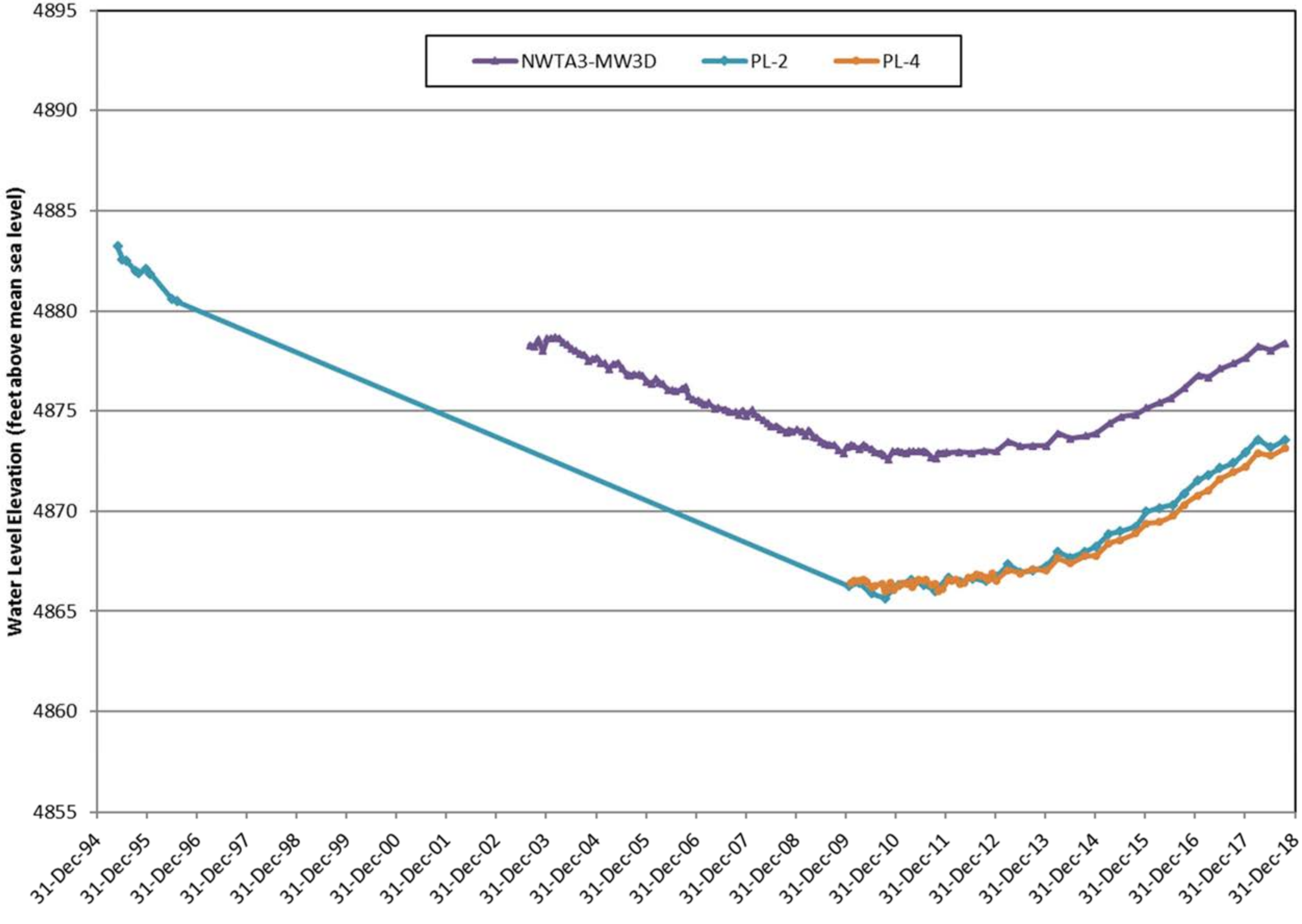

Figure 2B-3. GMP Study Wells (3 of 6)

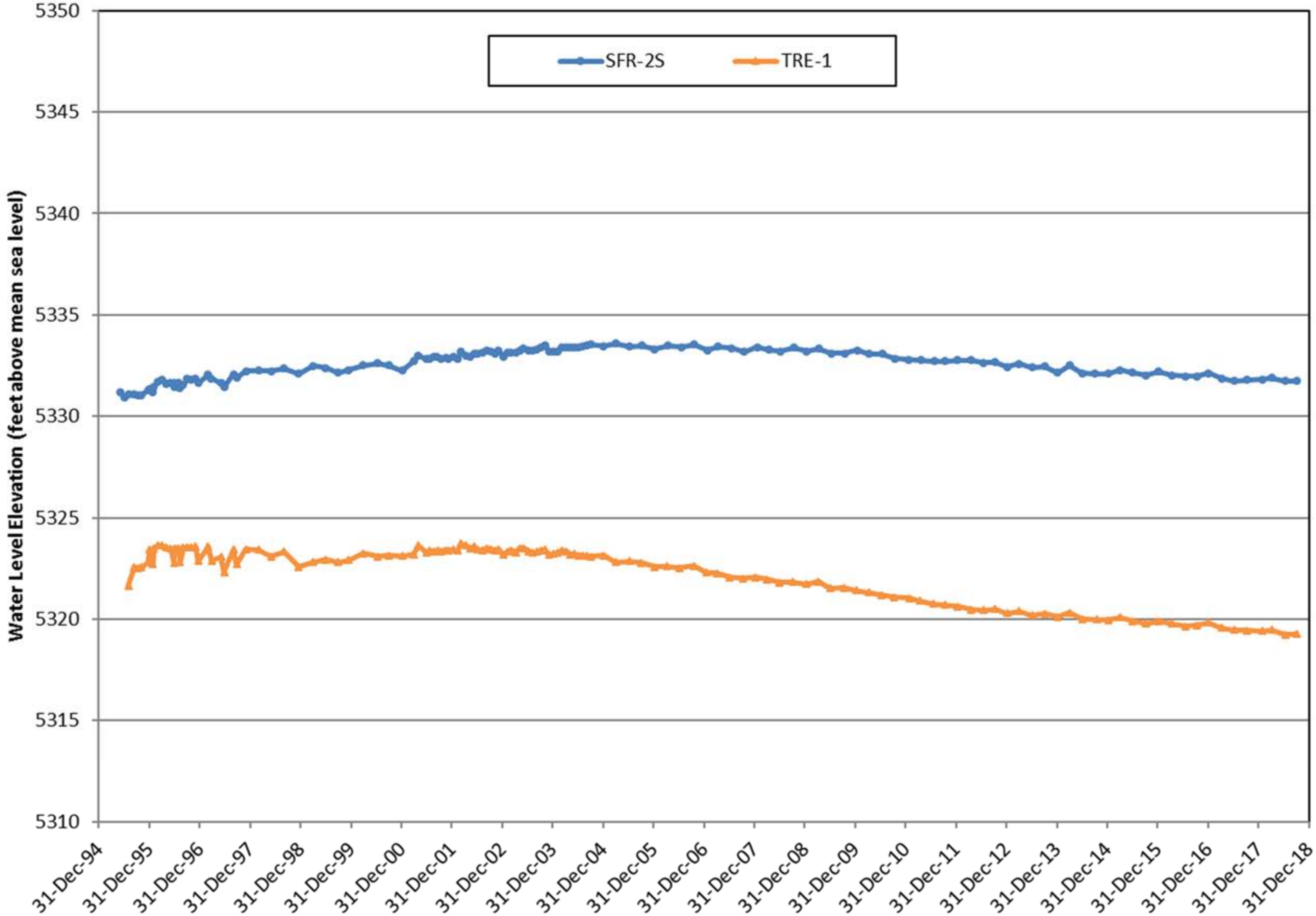

Figure 2B-4. GMP Study Wells (4 of 6)

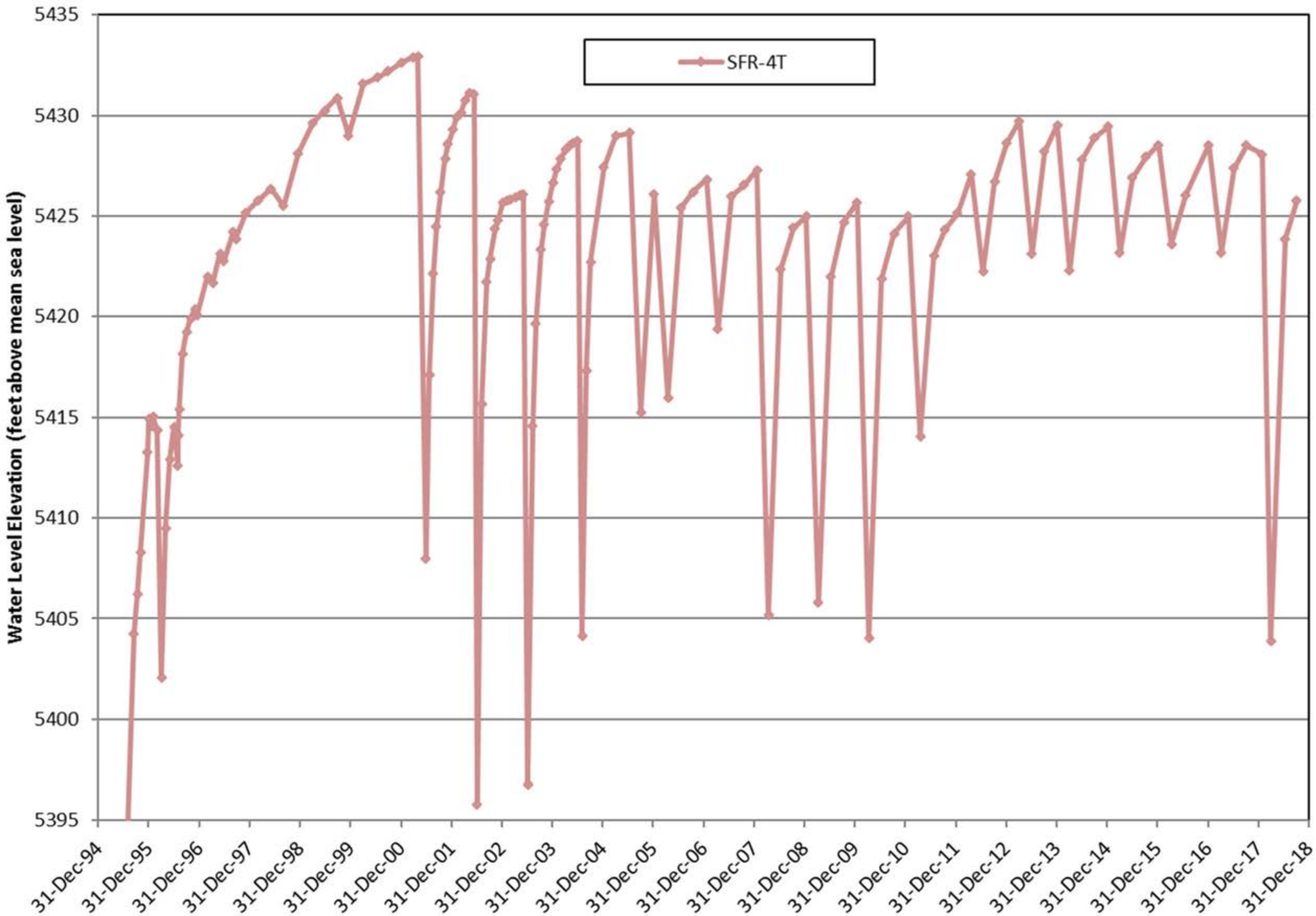

Figure 2B-5. GMP Study Wells (5 of 6)

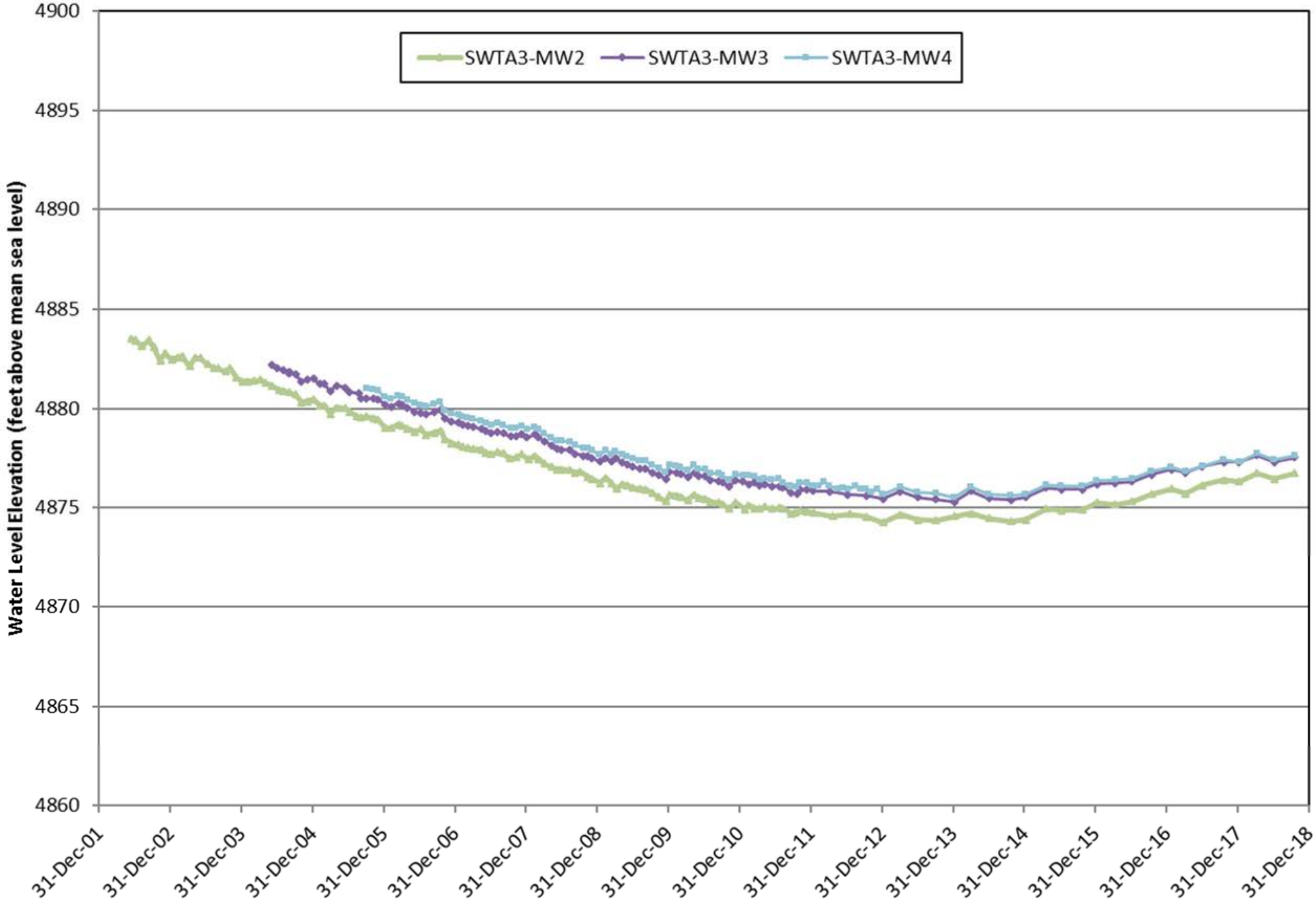

Figure 2B-6. GMP Study Wells (6 of 6)

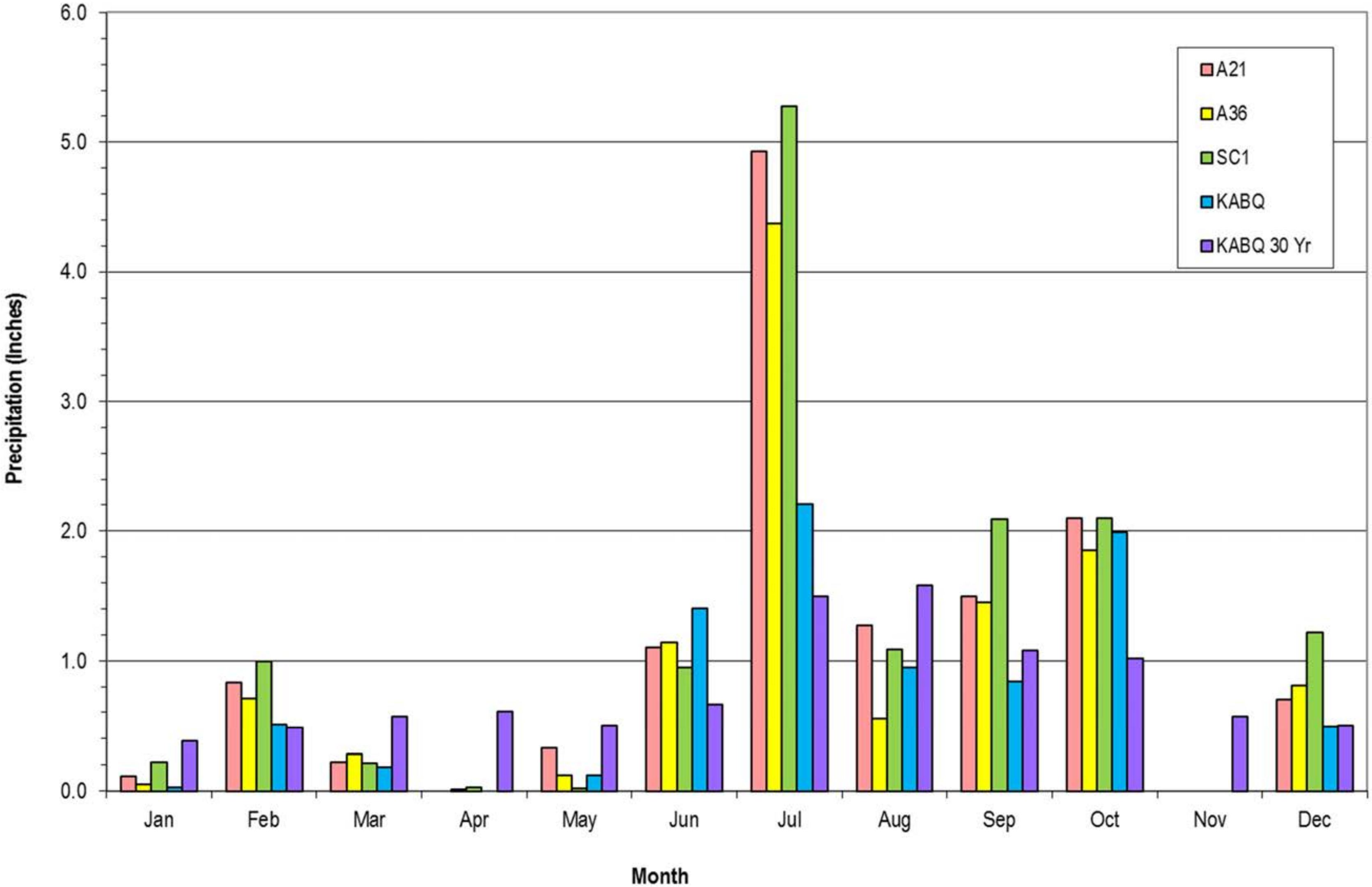

Figure 2B-7. Precipitation Data for SNL/NM, CY 2018

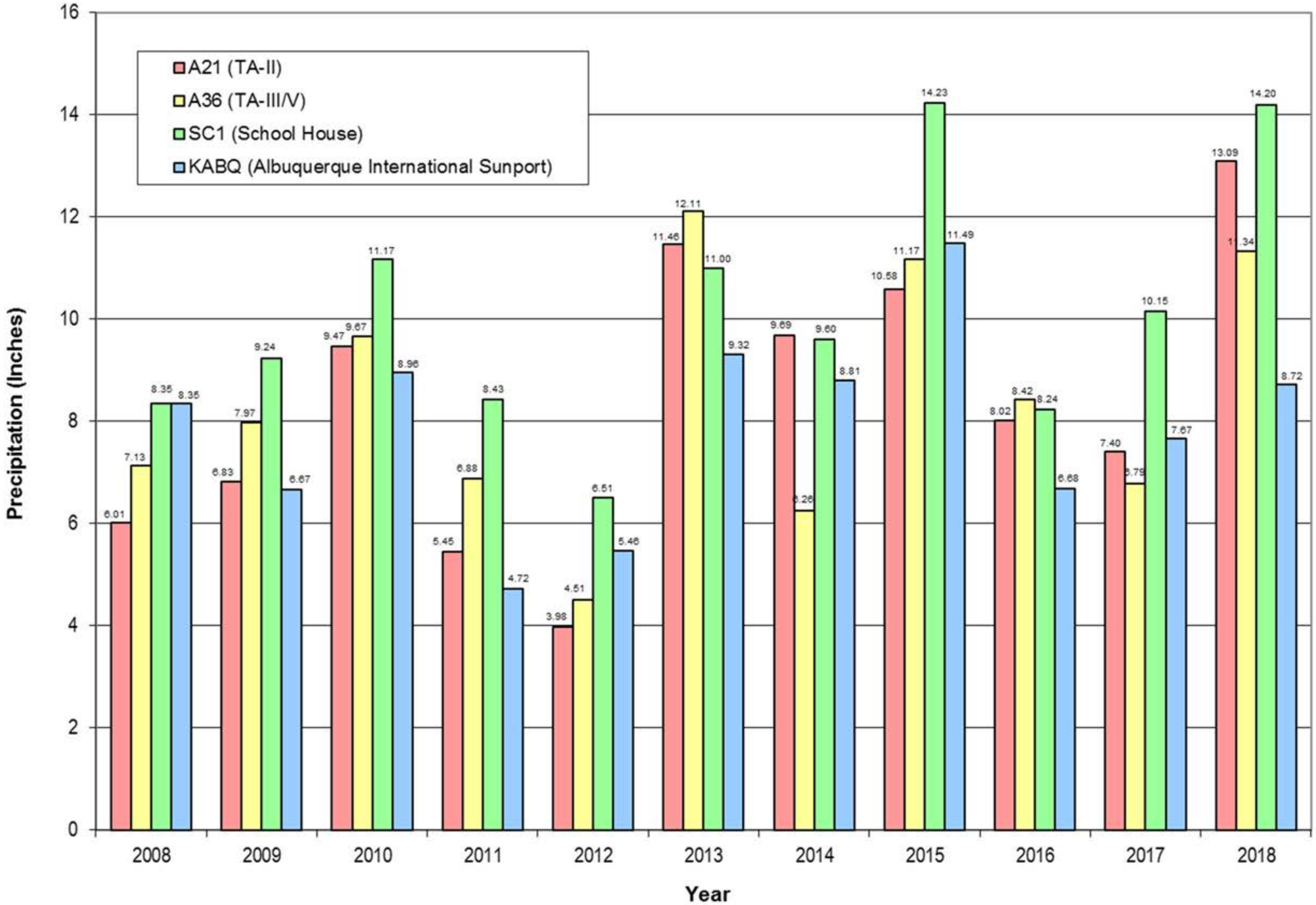

Figure 2B-8. Annual Precipitation Data for SNL/NM, January 2008 to December 2018

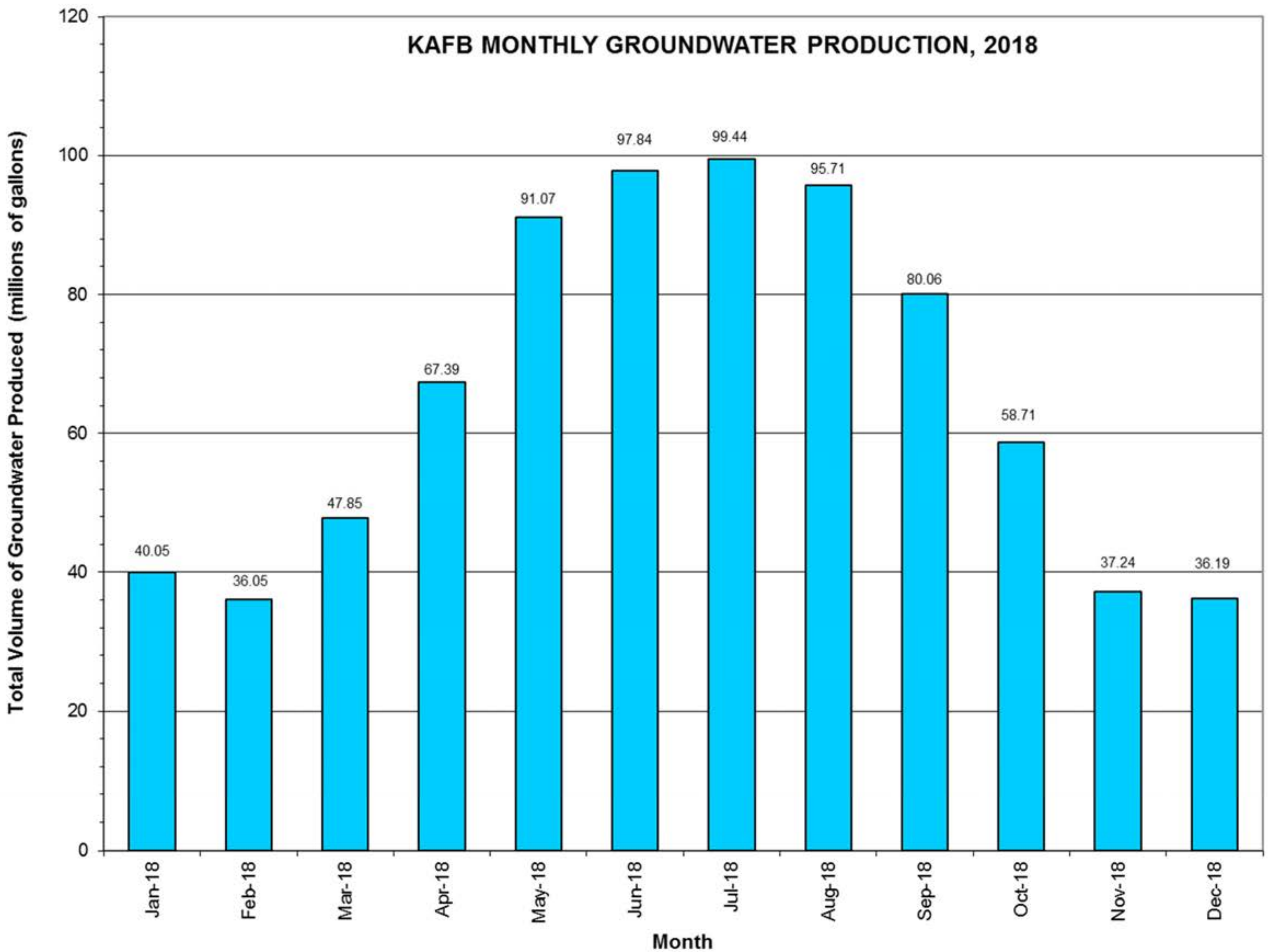

Figure 2B-9. Monthly Groundwater Pumped by KAFB Water Supply Wells, CY 2018

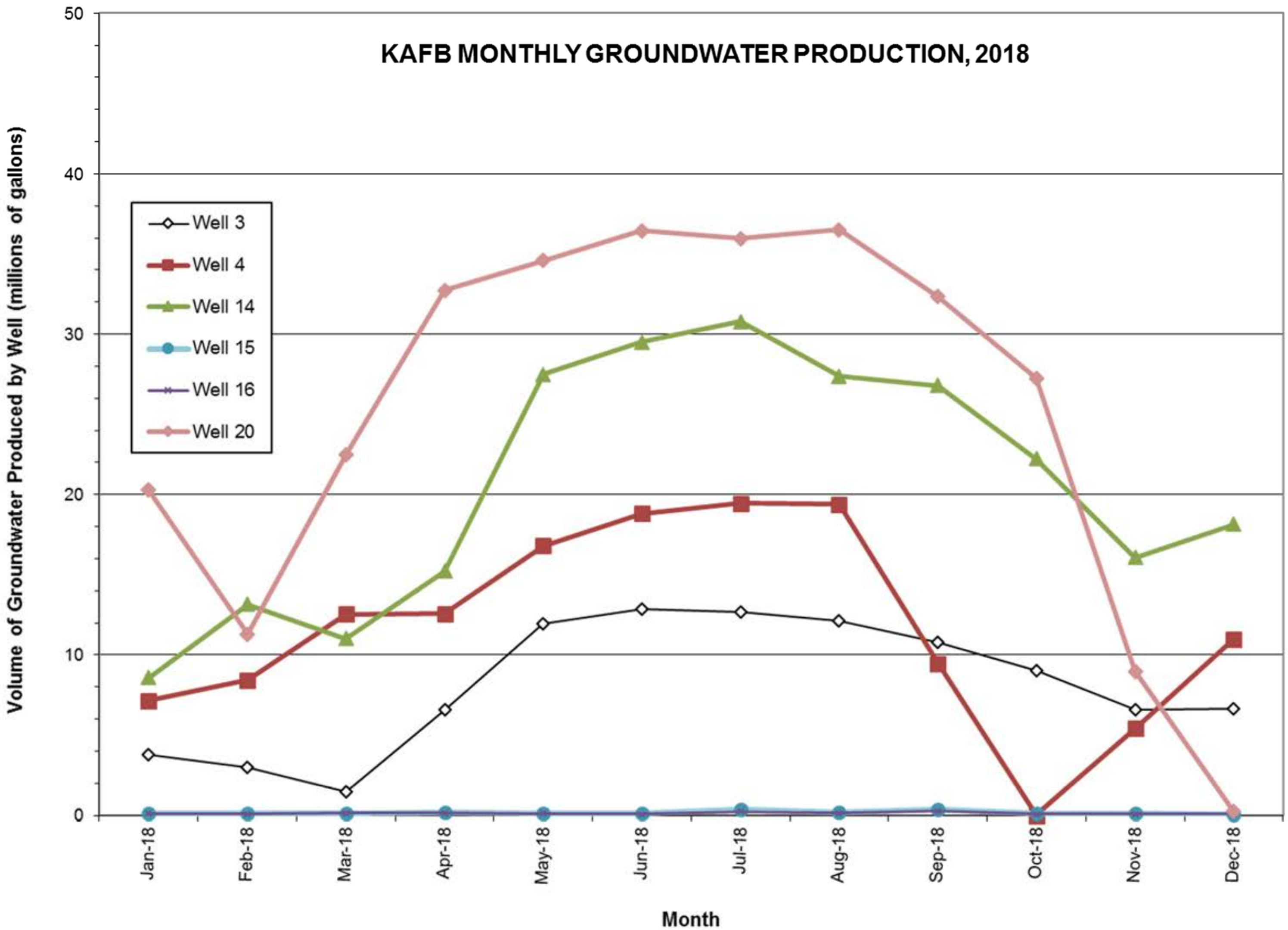

Figure 2B-10. Groundwater Pumped by KAFB Water Supply Wells, CY 2018

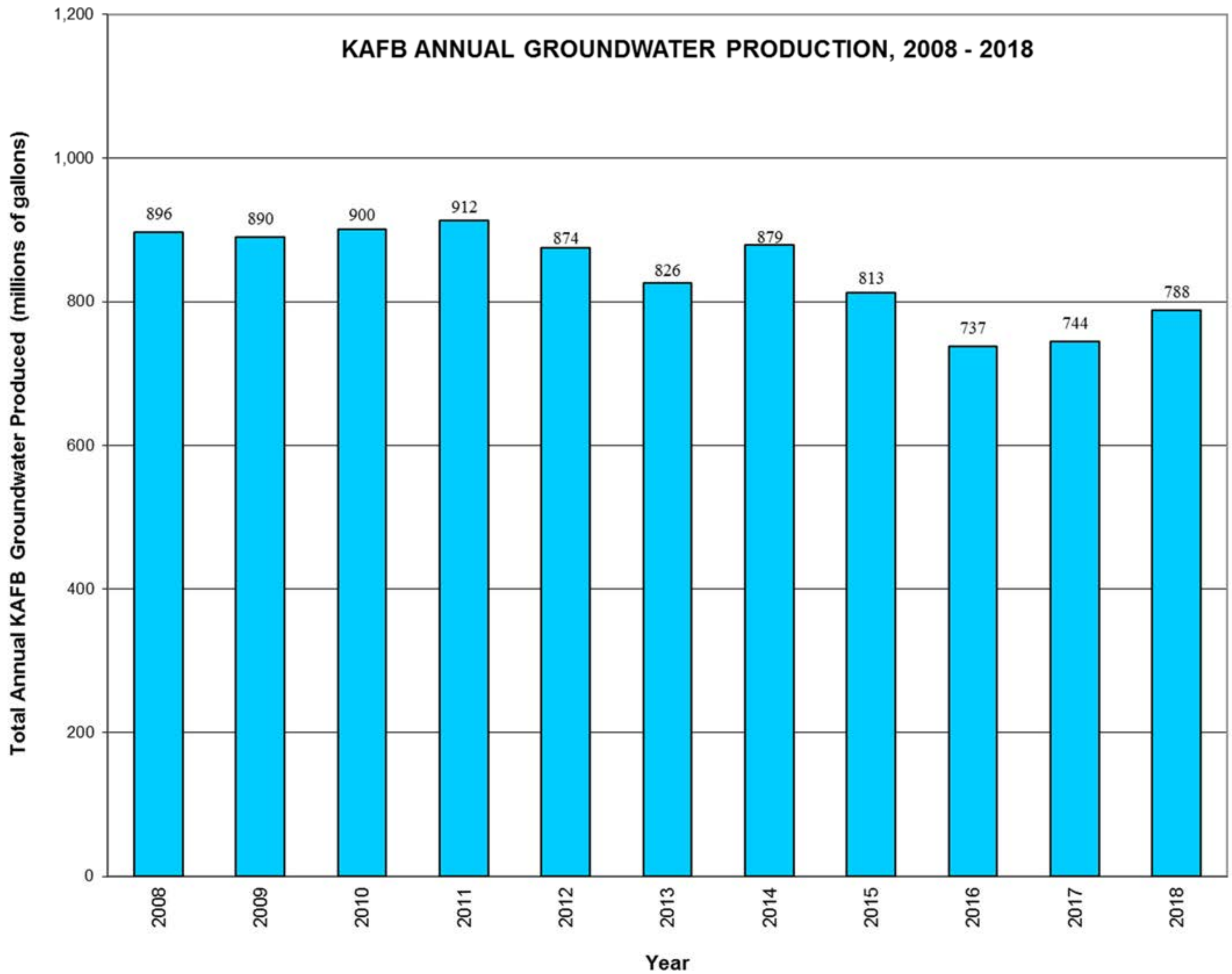

Figure 2B-11. Annual Groundwater Pumped by KAFB Water Supply Wells, 2008 to 2018

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Attachment 2C
Groundwater Monitoring Program
Plots

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Attachment 2C Plots

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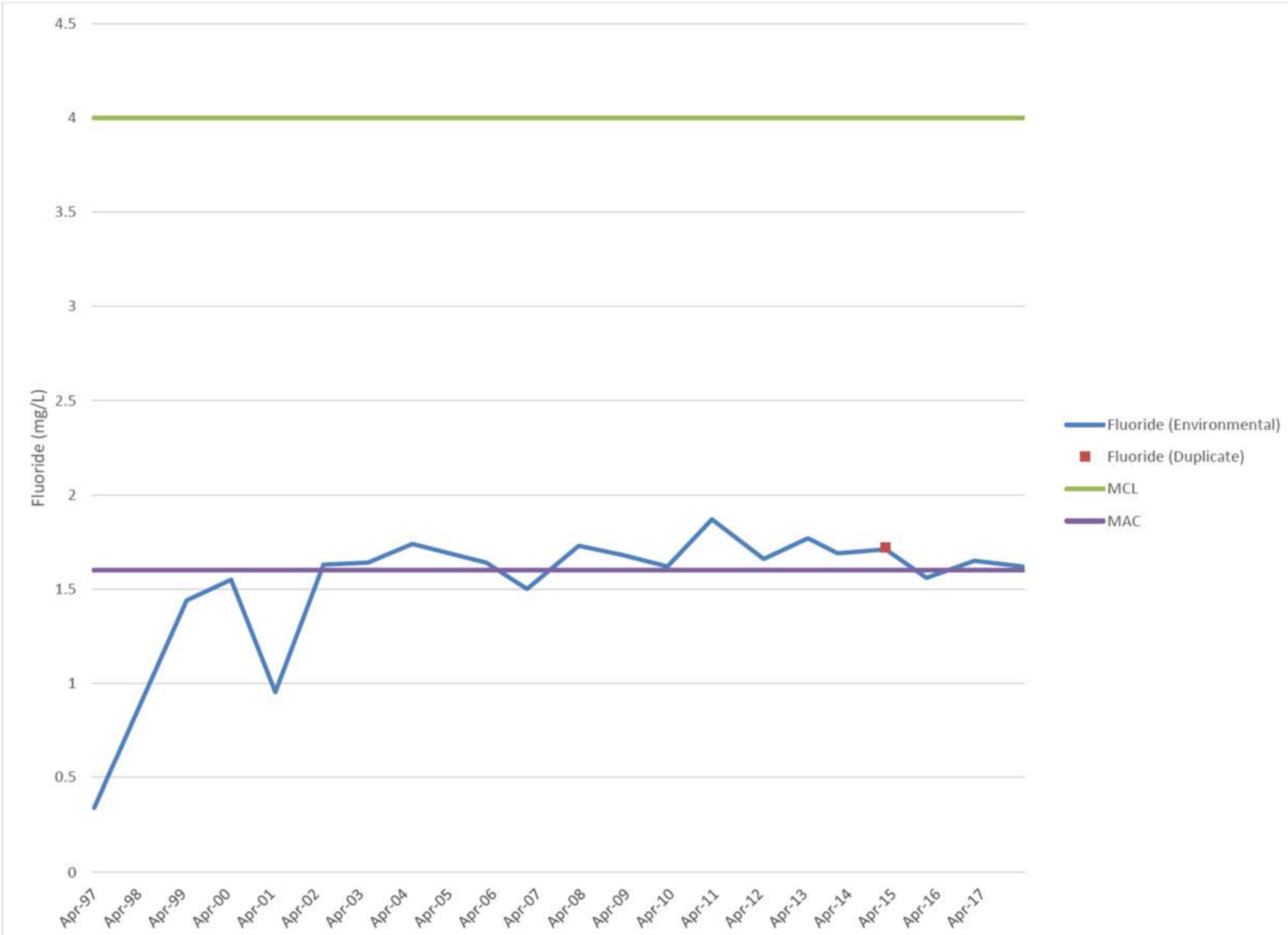

Figure 2C-1. Fluoride Concentrations, Coyote Springs

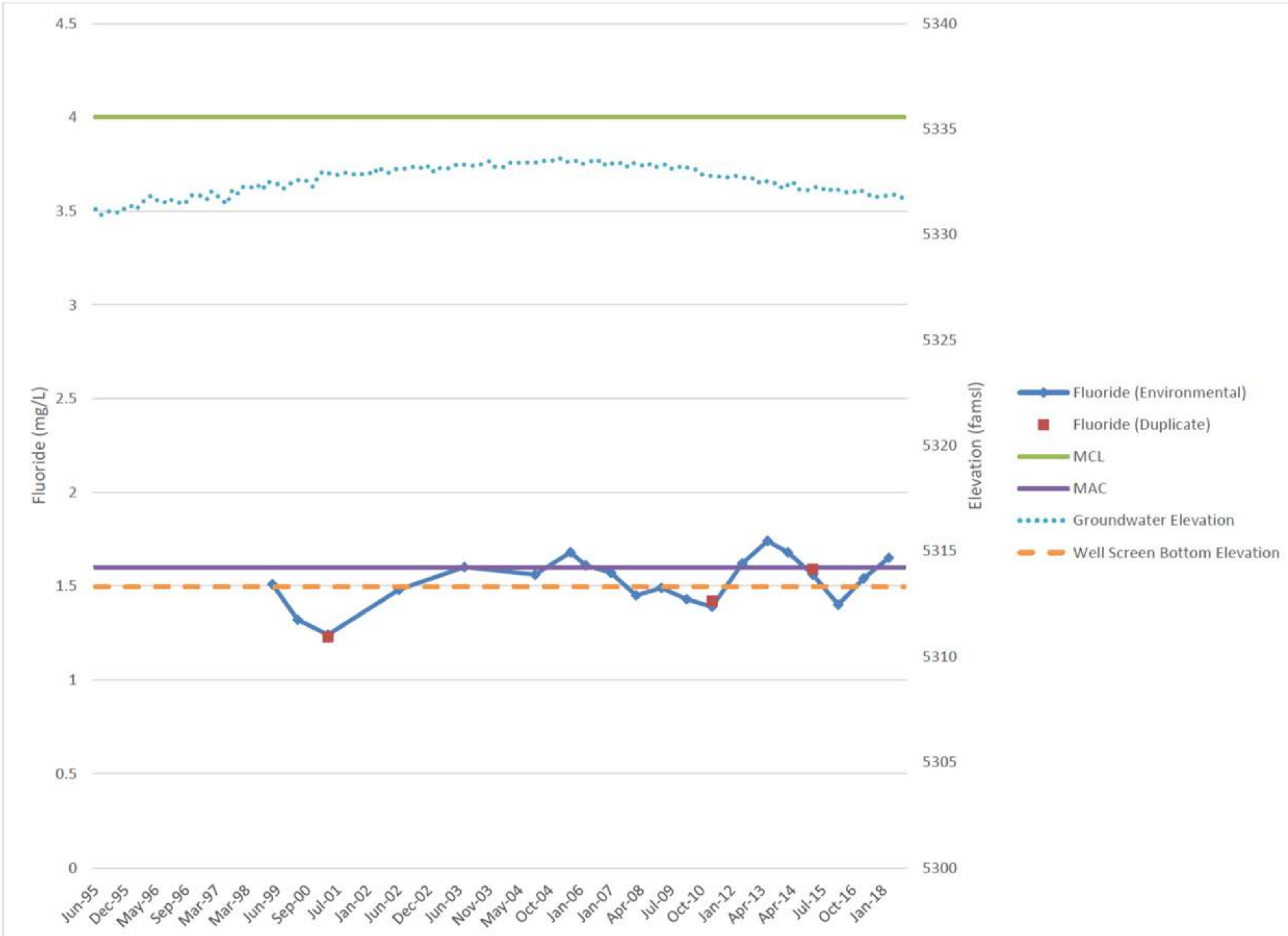

Figure 2C-2. Fluoride Concentrations, SFR-2S

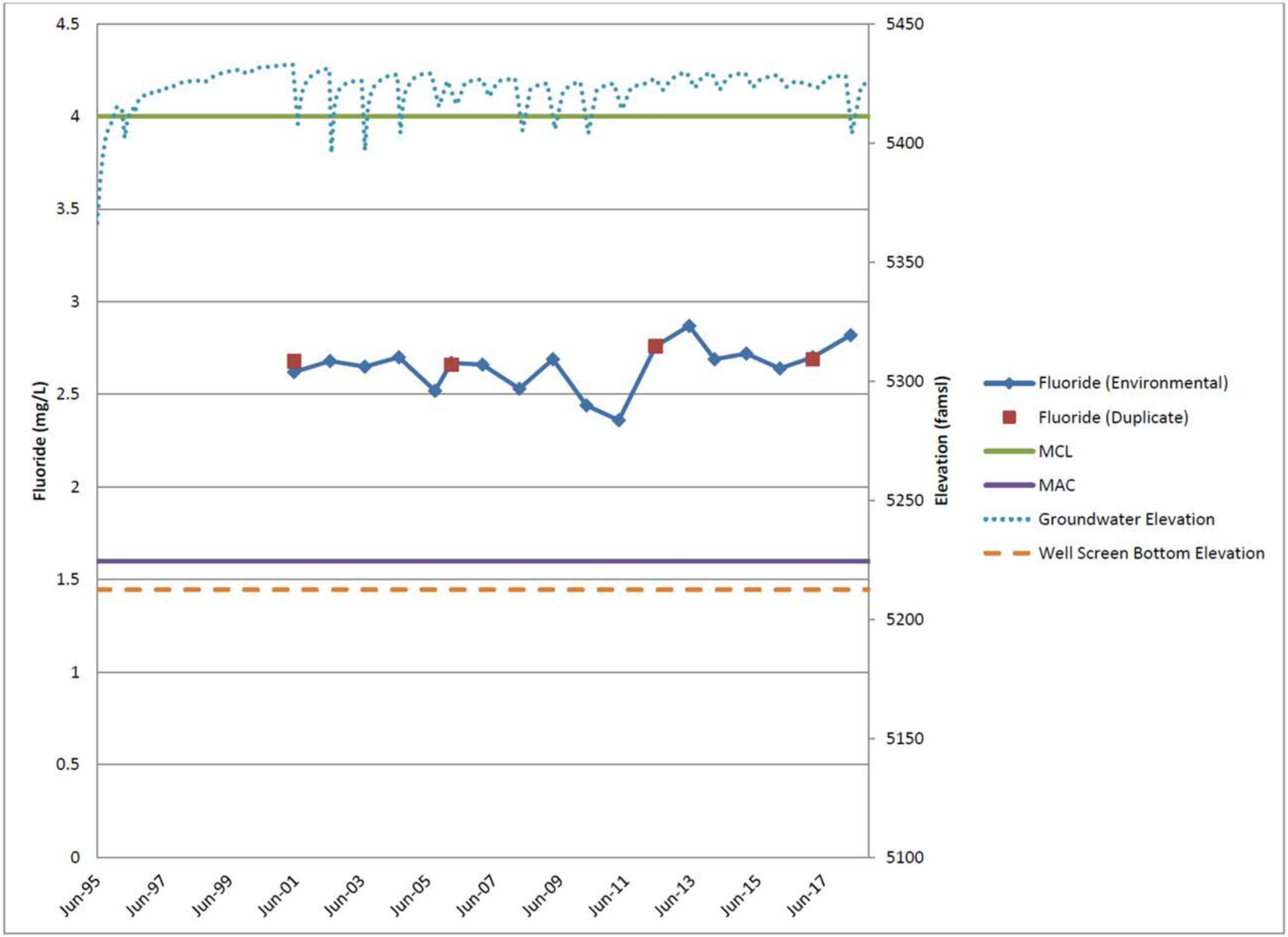

Figure 2C-3. Fluoride Concentrations, SFR-4T

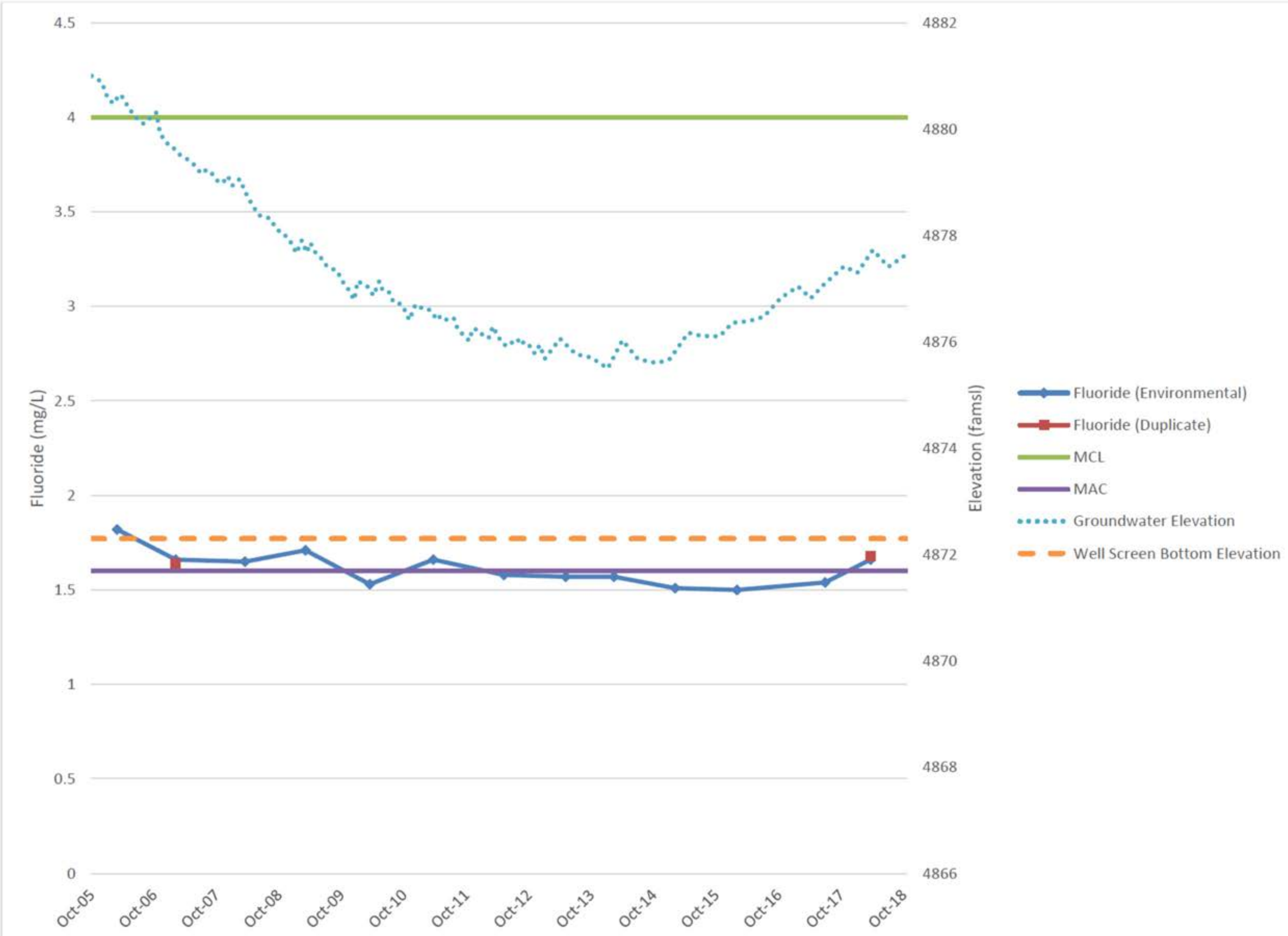

Figure 2C-4. Fluoride Concentrations, SWTA3-MW4

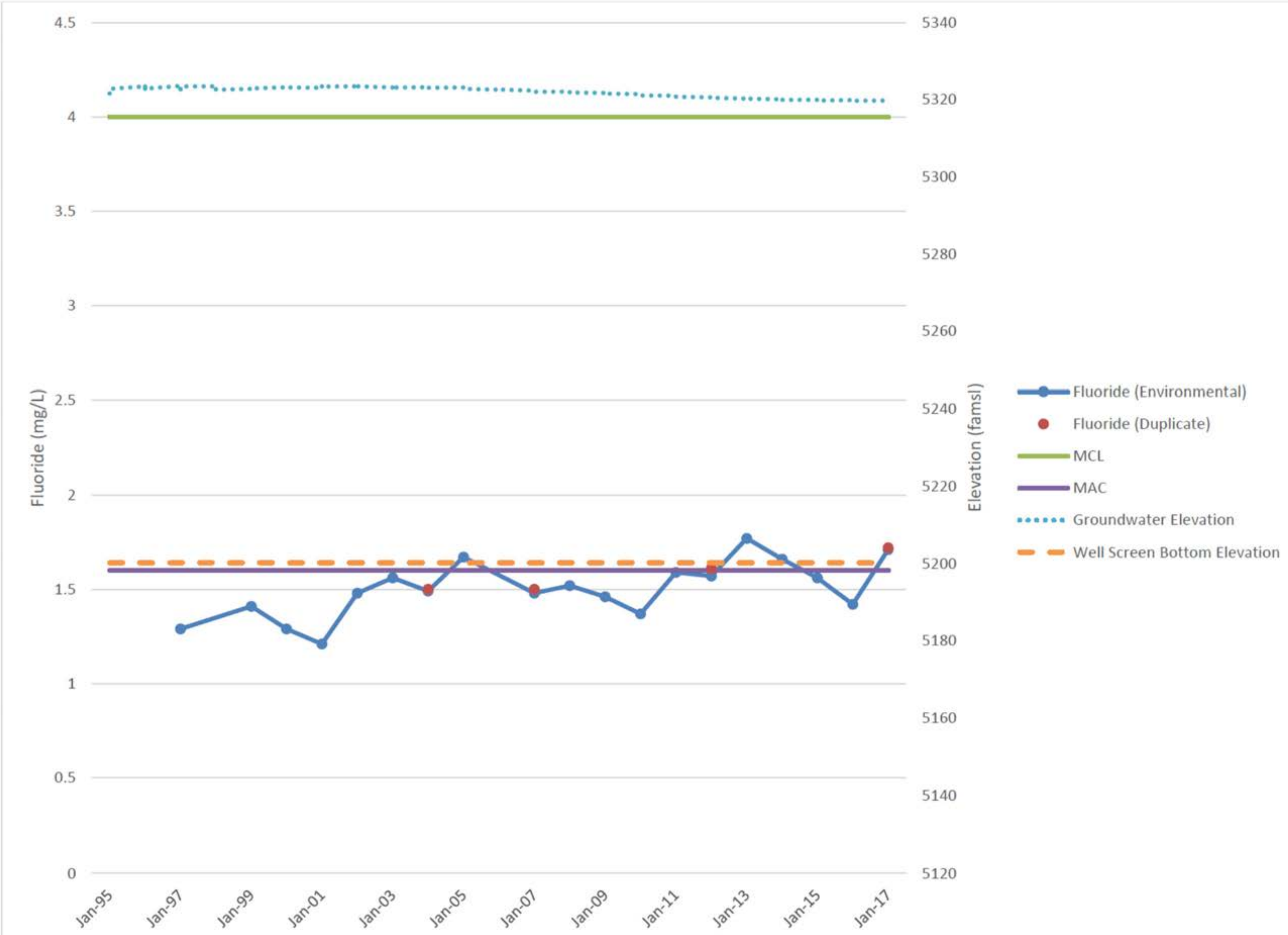

Figure 2C-5. Fluoride Concentrations, TRE-1

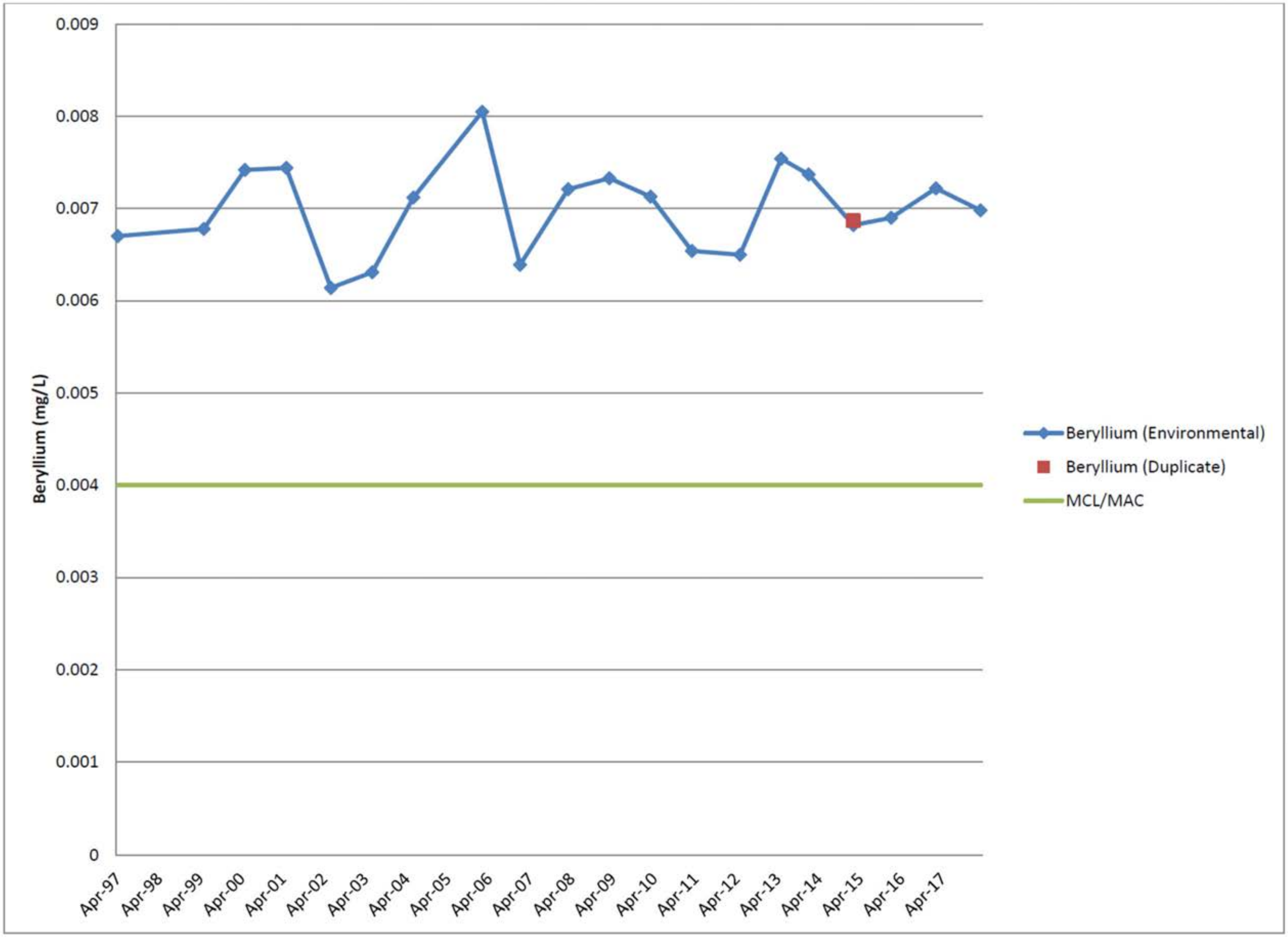

Figure 2C-6. Beryllium Concentrations, Coyote Springs

Chapter 2
Groundwater Monitoring Program
References

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40 CFR 141 Code of Federal Regulations, Title 40 - Protection of the Environment, Part 141 - National Primary Drinking Water Regulations.

Copland July 2018 Copland, J.R., July 2018. Sandia National Laboratories, New Mexico internal memorandum to S. Collins, *Assessment and Revision of Coordinates for KAFB Production Wells.* Sandia National Laboratories, Albuquerque, New Mexico, July 27, 2018.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. National Primary Drinking Water Regulations, EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

NMOSE August 2005 New Mexico Office of the State Engineer (NMOSE), August 2005. Rules and Regulations Governing Well Driller Licensing; Construction, Repair and Plugging of Wells, Office of the State Engineer, Santa Fe, New Mexico, August 31, 2005.

NMWQCC December 2018 New Mexico Water Quality Control Commission (NMWQCC), December 2018. Environmental Protection, Water Quality, Ground and Surface Water Protection Regulations, Section 20.6.2 of the New Mexico Administrative Code, Santa Fe, New Mexico, December 21, 2018.

SNL February 2018 Sandia National Laboratories, New Mexico (SNL/NM), February 2018. *LTS Consolidated Groundwater Monitoring Program Mini-SAP for FY18 Groundwater Surveillance Task*, Sandia National Laboratories, Albuquerque, New Mexico.

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3.0 Chemical Waste Landfill

3.1 Introduction

The Chemical Waste Landfill (CWL) is a 1.9-acre former disposal site located in the southeastern corner of Technical Area-III at Sandia National Laboratories, New Mexico (SNL/NM) (Figure 3-1). From 1962 until 1981, the CWL was used for the disposal of chemical, radioactive, and solid waste generated by SNL/NM research activities. From 1982 through 1985, only solid waste was disposed of at the CWL. Additionally, the CWL was used as an above ground, hazardous waste drum storage facility from 1981 to 1989.

In 1990, trichloroethene (TCE) was identified in groundwater at a concentration exceeding the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) of 5 micrograms per liter (µg/L). This finding led to the development and incorporation of a corrective action program into the *Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application*, hereafter referred to as the *Final Closure Plan* (SNL December 1992). The SNL/NM Environmental Restoration Project implemented two voluntary corrective measures (VCMs); the Vapor Extraction and the Landfill Excavation VCMs. As part of the Vapor Extraction VCM conducted from 1996 through 1998, the volatile organic compound (VOC) soil-gas plume was reduced and controlled, further degradation of groundwater beneath the CWL was prevented, and TCE concentrations in groundwater were reduced to levels below the MCL. As part of the Landfill Excavation VCM, the CWL was excavated from September 1998 through February 2002. The removal of all former disposal areas was confirmed by geophysical surveys and the results of final verification soil samples demonstrated that end-state conditions met industrial risk-based standards approved by the New Mexico Environment Department (NMED). More than 52,000 cubic yards of contaminated soil and debris were removed from this former disposal area (SNL April 2003).

In April 2004 after completion of backfilling activities, the U.S. Department of Energy/National Nuclear Security Administration and SNL/NM personnel requested approval to install an at-grade vegetative soil cover as an interim measure (Wagner April 2004) while NMED comments on the May 2003 CWL Corrective Measures Study (CMS) Report (SNL December 2004) were being resolved. In September 2004, the NMED approved this request (Kieling September 2004) and construction of the at-grade evapotranspirative cover (i.e., vegetative soil cover) was completed in September 2005.

In May 2007, the NMED issued a Notice of Public Comment Period (Kieling May 2007) for three documents: the CWL CMS Report, the Draft Post-Closure Care Permit (PCCP) (NMED May 2007), and the Closure Plan Amendment (SNL February 2006). In 2009, the NMED issued the final CWL PCCP (NMED October 2009a), approved the CWL CMS Report, and approved the Closure Plan Amendment (NMED October 2009b).

In 2010, monitoring wells CWL-MW4, CWL-MW5L, CWL-MW5U, CWL-MW6L, CWL-MW6U, and CWL-BW4A were decommissioned, and new monitoring wells CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11 were installed. The new monitoring wells became the groundwater monitoring network for the CWL in accordance with the approved Closure Plan Amendment. The *Chemical Waste Landfill Final Resource Conservation and Recovery Act Closure Report* (SNL September 2010) documenting closure in accordance with all CWL Closure Plan requirements was submitted to the NMED after completion of well installation and decommissioning activities.

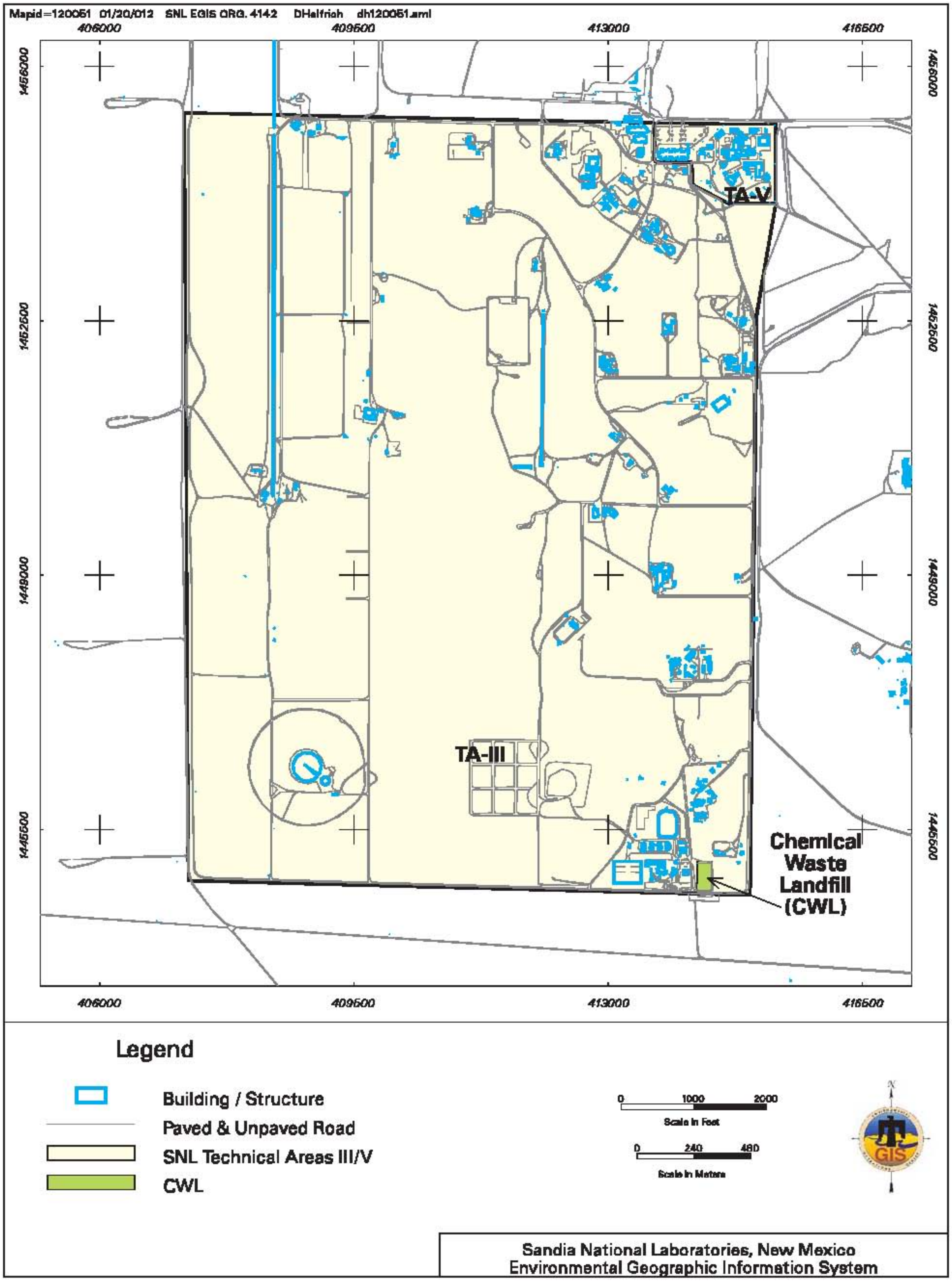

Figure 3-1. Location of the Chemical Waste Landfill within Technical Area-III

Upon NMED approval of CWL closure (Kieling June 2011), the CWL PCCP became the enforceable regulatory document. All groundwater monitoring activities at the CWL since June 2011 are performed in accordance with requirements specified in the CWL PCCP. Required monitoring (groundwater and soil-gas), inspections, and maintenance activities are comprehensively documented in annual Post-Closure Care Reports submitted to NMED in March of each year. During Calendar Year (CY) 2018, the *Chemical Waste Landfill Annual Post-Closure Care Report for Calendar Year 2017* (SNL March 2018) was submitted to NMED and approved (Kieling March 2018). The *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2018* will be submitted to NMED in March 2019.

As stipulated in the CWL PCCP, the only regulatory standards that apply to CWL groundwater monitoring results are the PCCP-defined hazardous concentration limits. These NMED-defined regulatory standards apply only to a statistical evaluation of the constituent data set from a given monitoring well (i.e., the 95th percentile lower confidence limit of the mean for a particular constituent), not to individual results. The *Chemical Waste Landfill Annual Post-Closure Care Report for Calendar Year 2018* will present a comprehensive statistical evaluation of CWL CY 2018 groundwater monitoring results.

3.1.1 Monitoring History

Groundwater monitoring began in 1985 at the CWL (IT December 1985) as required by Section 20.4.1.600 of the New Mexico Administrative Code, incorporating Title 40, Code of Federal Regulations, Part 265, Subpart F. Monitoring under the *Final Closure Plan* was conducted until June 2, 2011; since then, groundwater monitoring has been performed in accordance with the CWL PCCP.

3.1.2 Monitoring Network

The CWL compliance groundwater monitoring network includes monitoring wells CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11. These four wells are listed in Table 3-1 and shown on Figure 3-2.

Table 3-1. Chemical Waste Landfill Post-Closure Care Permit Monitoring Well Network and Calendar Year 2018 Compliance Activities

Well ID	WQ	WL	Comment
CWL-BW5	✓	✓	Upgradient well, sampled semiannually
CWL-MW9	✓	✓	Downgradient well, sampled semiannually
CWL-MW10	✓	✓	Downgradient well, sampled semiannually
CWL-MW11	✓	✓	Downgradient well, sampled semiannually

NOTES:

Check marks indicate WQ sampling and WL measurements were completed.

BW = Background Well.
CWL = Chemical Waste Landfill.
ID = Identifier.
MW = Monitoring Well.
WL = Water level.
WQ = Water quality.

3.1.3 Conceptual Site Model

The constituents of concern in groundwater at the CWL are TCE, chromium, and nickel. A detailed Conceptual Site Model (CSM) is provided in Annex E of the CWL CMS Report. The current CSM is summarized as follows.

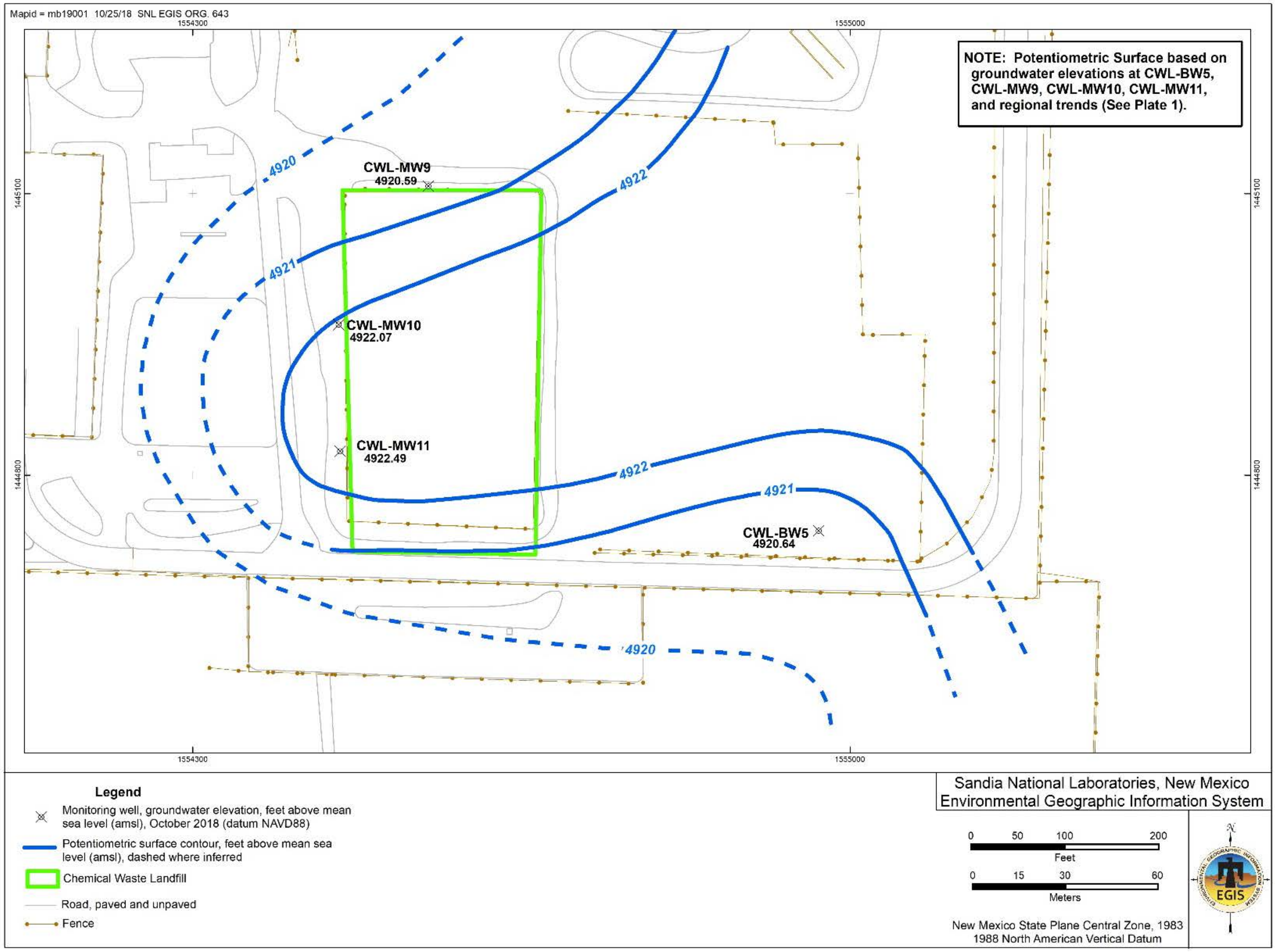

Figure 3-2. Localized Potentiometric Surface of the Regional Aquifer at the Chemical Waste Landfill, October 2018

The upper surface of the Regional Aquifer (i.e., water table) beneath the CWL occurs within unconsolidated Santa Fe Group deposits (i.e., fine-grained alluvial-fan deposits). The depth to water is approximately 500 feet below ground surface. Groundwater flows generally westward, away from the Manzanita Mountains and toward the Rio Grande. Several water supply wells operated by Kirtland Air Force Base (KAFB)/U.S. Air Force and the Albuquerque Bernalillo County Water Utility Authority have profoundly modified the natural groundwater flow regime to the west and north of the CWL by creating a trough in the water table in the western and northern portions of KAFB. As a result, water levels at the CWL have been steadily declining since monitoring began in 1985.

In Attachment 3A, Figure 3A-1 (hydrographs) shows the rate of groundwater elevation decline from 2009 to 2018 at the existing CWL monitoring wells. Since groundwater monitoring began at the CWL in 1985, the average rate of water table decline has been somewhat variable, but typically in the range of 0.4 to 0.8 feet per year. The groundwater elevation decline between October 2017 and October 2018 ranged from 0.59 (CWL-MW11) to 1.23 (CWL-MW10) feet. The average rate of decline at the four monitoring wells was 0.81 feet. This rate of decline was greater than the average change from 2016 to 2017, which was 0.26 feet. Recharge from the infiltration of direct precipitation at the CWL is negligible due to high evapotranspiration, low precipitation, the thick sequence of unsaturated Santa Fe Group deposits above the water table, and the evapotranspirative cover that was installed in 2005. Groundwater recharge of the Regional Aquifer primarily occurs by the infiltration of precipitation in the Manzanita Mountains located approximately 5 miles to the east.

Table 3-2 presents the data used to construct the October 2018 potentiometric surface map shown in Figure 3-2 for the CWL groundwater monitoring network.

Table 3-2. Groundwater Elevations Measured in October 2018 at Monitoring Wells Completed in the Regional Aquifer at the Chemical Waste Landfill

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)
CWL-BW5	5,434.79	2-Oct-2018	514.15	4,920.64
CWL-MW9	5,426.12	2-Oct-2018	505.53	4,920.59
CWL-MW10	5,424.58	2-Oct-2018	502.51	4,922.07
CWL-MW11	5,423.24	2-Oct-2018	500.75	4,922.49

NOTES:
amsl = Above mean sea level.
btoc = Below top of casing.
BW = Background Well.
CWL = Chemical Waste Landfill.
ID = Identifier.
MW = Monitoring Well.
NAVD 88 = North American Vertical Datum of 1988.

Figure 3-2 is consistent with the CSM and the base-wide potentiometric surface map (Plate 1). As shown on Plate 1, the potentiometric surface contours beneath Technical Area-III generally trend north to south with the inferred groundwater flow direction being generally westward. The westward deflection of the potentiometric surface is a localized salient (i.e., a very gentle ridge or localized high) of the Regional Aquifer beneath the CWL (Figure 3-2) that reflects site-specific geologic controls. These controls are related to lateral and vertical changes in the hydraulic conductivity of the saturated, anisotropic, Santa Fe Group alluvial-fan sediments that were predominantly deposited in an east to west direction. The nearest water supply well, KAFB-4, is located approximately 4.3 miles north-northwest of the CWL.

Measured orthogonally from the potentiometric surface contours, the horizontal gradient at the CWL was approximately 0.013 feet per foot in October 2018. Groundwater velocities in the alluvial-fan sediments were calculated using the current potentiometric surface gradient, the hydraulic conductivity range (i.e., high and low values) from slug tests conducted in 2012 on the four groundwater monitoring wells, and a porosity of 29 percent as determined from the laboratory analyses of CWL sediment samples (SNL October 1995). The 2018 calculated velocities ranged from approximately 1.8×10^{-4} to 2.8×10^{-3} feet per day. This is equivalent to approximately 0.07 to 1.02 feet per year. These very low values are consistent with previous estimates for horizontal groundwater flow at the water table in the CWL vicinity. Estimated groundwater travel times from the CWL to the KAFB/U.S. Air Force and Albuquerque Bernalillo County Water Utility Authority water supply wells are on the order of hundreds to thousands of years (SNL February 2001).

3.2 Regulatory Criteria

The CWL is a remediated, closed, regulated unit undergoing post-closure care in accordance with the CWL PCCP that became effective on June 2, 2011. Groundwater monitoring requirements, procedures, and protocols are detailed in the CWL PCCP, Attachment 1, Section 1.8.1 and Attachment 2, Groundwater Sampling and Analysis Plan.

3.3 Scope of Activities

Semiannual groundwater sampling activities were conducted in January and July 2018 at the CWL in accordance with Attachment 2 of the CWL PCCP. In January, groundwater samples were analyzed for the enhanced list of VOCs, chromium, and nickel. The enhanced list of VOCs includes 1,1-dichloroethene; 1,1,2-trichloro-1,2,2-trifluoroethane; chloroform; tetrachloroethene; TCE; and trichlorofluoromethane. In July, groundwater samples were analyzed for TCE, chromium, and nickel.

Table 3-3 lists the analytical parameters and CWL monitoring wells sampled. Attachment 3B contains the analytical results (Tables 3B-1 and 3B-2). In January and July, groundwater sampling activities were conducted in accordance with the CWL PCCP and procedures outlined in the *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2018, 2nd Quarter Sampling* (SNL December 2017) and the *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2018, 4th Quarter Sampling* (SNL June 2018).

The CWL groundwater samples were submitted for analysis to GEL Laboratories, LLC in Charleston, South Carolina. All groundwater sampling results are compared with EPA MCLs for drinking water (EPA May 2009).

Field and laboratory quality control (QC) samples are discussed in Section 1.3.3. Field QC samples included environmental duplicate, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Laboratory QC samples included method blank, laboratory control, matrix spike, matrix spike duplicate, and surrogate spike samples.

Table 3-3. Analytical Parameters for the Chemical Waste Landfill Monitoring Wells, Calendar Year 2018

Parameters	Semiannual Event	Monitoring Wells
VOCs: TCE 1,1,2-Trichloro-1,2,2-trifluoroethane Tetrachloroethene 1,1-Dichloroethene Chloroform Trichlorofluoromethane	January	CWL-BW5 CWL-MW9 CWL-MW9 duplicate CWL-MW10 CWL-MW11
Metals: Chromium Nickel		
VOCs: TCE	July	CWL-BW5 CWL-BW5 duplicate CWL-MW9 CWL-MW10 CWL-MW11
Metals: Chromium Nickel		

NOTES:
BW = Background Well.
CWL = Chemical Waste Landfill.
MW = Monitoring Well.
TCE = Trichloroethene.
VOC = Volatile organic compound.

3.4 Field Methods and Measurements

Groundwater sampling and depth-to-groundwater measurements were conducted in accordance with the CWL PCCP and procedures specified in the *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plans*, which are consistent with the methods described in Section 1.3. Water quality parameters measured in the field during the January purging process included temperature, specific conductivity, oxidation-reduction potential, pH, and dissolved oxygen using an YSI™ EXO1 Water Quality Meter. These same parameters were measured in July using an In-Situ Incorporated Aqua TROLL® 600 Multiparameter Water Quality Sonde. Turbidity measurements for both sampling events were made with a HACH™ Model 2100Q turbidity meter. Attachment 3B, Table 3B-3 presents field water quality parameters and Attachment 3A, Figure 3A-1 (hydrographs) presents groundwater elevation measurements at the CWL monitoring wells.

As specified in CWL PCCP Attachment 2, Section 2.12, purging requirements at the CWL include specifications for making a "best faith effort" to decrease flow rates such that low yield wells do not purge dry. These specifications include equipping the portable Bennett™ groundwater sampling system with small diameter tubing and a flow meter valve located along the discharge line. In addition, during the purging process at wells prone to purging dry, the flow rate is continually adjusted to achieve as low a flow rate as possible without causing the pump to be damaged or fail due to overheating. This represents a "best faith effort" to purge the wells at the slowest rate possible given equipment limitations.

The minimum purging volume requirement was satisfied at three of the four monitoring wells (CWL-BW5, CWL-MW9, and CWL-MW11). Monitoring well CWL-MW10 purged dry prior to removal of the minimum volume. This well was purged to dryness during both the January and July monitoring events, allowed to recover, and then sampled to collect the most representative groundwater sample possible given the low yield of this well. During January, approximately 15 gallons were purged from CWL-MW10 prior to the well going dry (purge volume requirement was approximately 26 gallons). The average flow rate for the entire purging event was 0.093 gallons per minute (gpm), and the estimated flow rate during the final three gallons was 0.15 gpm (equivalent to 0.35 and 0.57 liters per minute, respectively). During July, approximately 14.7 gallons were purged from CWL-MW10 prior to the well going dry (purge volume requirement was approximately 25 gallons). The average flow rate for the entire purging event was 0.11 gpm, and the estimated flow rate during the final three gallons was 0.16 gpm (equivalent to 0.42 and 0.60 liters per minute, respectively).

3.5 Analytical Methods

All groundwater samples were analyzed by the off-site laboratory using EPA-specified protocols described in Section 1.3.2.

3.6 Summary of Analytical Results

The analytical results and water quality parameters are presented in Tables 3B-1 through 3B-3. Data qualifiers assigned by the analytical laboratory and the data validation process (SNL June 2017) are presented with the associated results in Tables 3B-1 and 3B-2.

For the purposes of this report, the CY 2018 analytical results were compared with established EPA MCLs where applicable. No detected constituents exceeded the respective MCLs or the PCCP-defined hazardous concentration limits. The analytical results are discussed in detail in the following sections.

3.6.1 Volatile Organic Compounds

Table 3B-1 summarizes the CY 2018 analytical results for the enhanced list of VOCs (January) and TCE (July). TCE was detected above the method detection limit (MDL) in the samples from monitoring well CWL-MW10 at concentrations of 0.350 µg/L (January) and 0.550 µg/L (July). These results are below the practical quantitation limit of 1.0 µg/L (J-qualified) and the MCL of 5.0 µg/L. No other VOCs were detected above the MDL.

3.6.2 Metals

Table 3B-2 summarizes the CY 2018 analytical results for chromium and nickel. Chromium was not detected above the MDL in any of the CY 2018 samples. Nickel was detected in the January samples at concentrations ranging from 0.0011 mg/L to 0.00861 mg/L. There were no nickel detections above the MDL in the July samples. There is no established MCL for nickel.

3.6.3 Water Quality Parameters

Table 3B-3 lists the water quality parameters measured immediately prior to sample collection at each well. These field parameters consist of temperature, specific conductivity, oxidation-reduction potential, pH, turbidity, and dissolved oxygen.

3.7 Quality Control Results

Section 1.3.3 presents the purpose of each field and laboratory QC sample type. Field and laboratory QC sample results for the CWL are discussed in the following sections.

3.7.1 Field Quality Control Samples

Field QC samples included environmental duplicate samples, EBs, FBs, and TBs. The following sections discuss the analytical results for each QC sample type.

3.7.1.1 Environmental Duplicate Samples

One environmental duplicate sample was collected from monitoring well CWL-MW9 in January and one environmental duplicate sample was collected from monitoring well CWL-BW5 in July. The results were compared to the results for the corresponding environmental samples and relative percent difference (RPD) values were calculated for the detected parameters. For the sample pair (environmental sample and environmental duplicate sample) collected at CWL-MW9 in January, the RPD value for nickel showed good correlation, with an RPD value of 8. This value is within the acceptable range of less than or equal to 35 for metals, as defined in Attachment 2 of the CWL PCCP. No constituents were detected in the sample pair collected at CWL-BW5 in July.

3.7.1.2 Equipment Blank Samples

Two EB samples were collected in January; the first was analyzed for the enhanced list of VOCs, chromium, and nickel and the second was analyzed for VOCs only. One EB sample was collected in July and analyzed for TCE, chromium, and nickel. Chloroform was detected in the second January EB sample and nickel was detected in the July EB sample. No corrective action was necessary since these constituents were not detected in the associated environmental samples.

3.7.1.3 Field Blank Samples

Three FB samples were collected in January and analyzed for the enhanced list of VOCs. Three FB samples were collected in July and analyzed for TCE only. There were no detections in the FB samples.

3.7.1.4 Trip Blank Samples

Seven TB samples were submitted with the January samples and analyzed for the enhanced list of VOCs, and five TB samples were submitted with the July samples and analyzed for TCE. No VOCs were detected in the TB samples.

3.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples were analyzed concurrently with the groundwater samples and included method blanks, laboratory control samples, matrix spike and matrix spike duplicate samples, and surrogate spike samples. There were no significant issues identified with the laboratory QC sample results associated with the January and July sampling events; all results met the laboratory control sample requirements in Attachment 2 of the CWL PCCP.

3.8 Variances and Nonconformances

All analytical and field methods were performed according to the requirements specified in the CWL PCCP and associated *Mini-Sampling and Analysis Plans*. Variances and nonconformances are defined in the CWL PCCP Attachment 2, Section 2.22 for groundwater monitoring. There were no variances or nonconformances during the CY 2018 sampling activities.

All environmental sample, field QC sample, and laboratory QC sample results were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL June 2017). The data were in compliance with analytical methods and laboratory procedures.

3.9 Summary and Conclusions

During CY 2018, groundwater samples were collected from the four CWL monitoring wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11) in January and July and analyzed for TCE, 1,1,2-trichloro-1,2,2-trifluoroethane, tetrachloroethene, 1,1-dichloroethene, chloroform, trichlorofluoromethane, nickel, and chromium (January), and TCE, nickel, and chromium (July). Based on field and laboratory QC sample and data validation results, the CY 2018 groundwater monitoring data meet data quality objectives and are in compliance with analytical methods and laboratory procedures. No analytes were detected at concentrations exceeding established MCLs or the CWL PCCP hazardous concentration limits.

3.10 Summary of Future Activities

As defined in the CWL PCCP, the post-closure care period for the CWL is 30 years and the compliance period for which the groundwater protection standard applies is 47 years; both periods began on June 2, 2011 when NMED approved closure. The NMED may shorten or extend the post-closure care period under 20.4.1.500 New Mexico Administrative Code, incorporating Title 40, Code of Federal Regulations, Part 264.117(a)(2).

In accordance with the CWL PCCP, groundwater monitoring will continue on a semiannual basis. Results will be documented in both the comprehensive CWL Annual Post-Closure Care Reports (submitted to NMED in March of each year) and in future Annual Groundwater Monitoring Reports.

Attachment 3A
Chemical Waste Landfill
Hydrographs

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Attachment 3A Hydrographs

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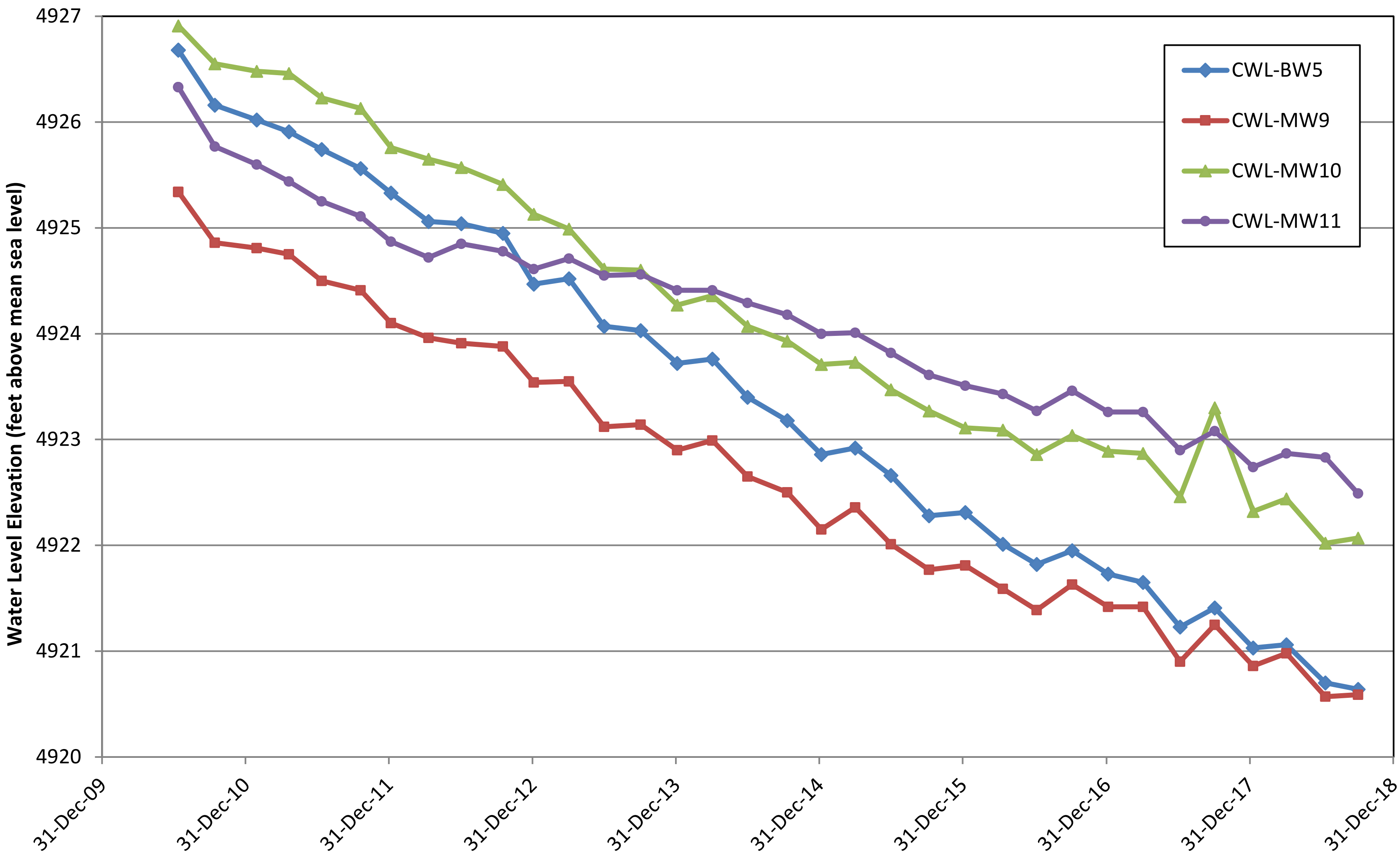

Figure 3A-1. CWL Groundwater Monitoring Wells

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Attachment 3B
Chemical Waste Landfill
Analytical Results Tables

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Attachment 3B Tables

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Table 3B-1
Summary of Volatile Organic Compound Results,
Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CWL-BW5	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		104382-001	SW846-8260
15-Jan-18	Chloroform	ND	0.300	1.00	NE	U		104382-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		104382-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		104382-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		104382-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		104382-001	SW846-8260
CWL-MW9	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		104388-001	SW846-8260
17-Jan-18	Chloroform	ND	0.300	1.00	NE	U		104388-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		104388-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		104388-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		104388-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		104388-001	SW846-8260
CWL-MW9 (Duplicate)	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		104389-001	SW846-8260
17-Jan-18	Chloroform	ND	0.300	1.00	NE	U		104389-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		104389-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		104389-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		104389-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		104389-001	SW846-8260
CWL-MW10	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		104392-001	SW846-8260
22-Jan-18	Chloroform	ND	0.300	1.00	NE	U		104392-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		104392-001	SW846-8260
	Trichloroethene	0.350	0.300	1.00	5.00	J		104392-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		104392-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		104392-001	SW846-8260
CWL-MW11	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		104395-001	SW846-8260
18-Jan-18	Chloroform	ND	0.300	1.00	NE	U		104395-001	SW846-8260
	Tetrachloroethene	ND	0.300	1.00	5.00	U		104395-001	SW846-8260
	Trichloroethene	ND	0.300	1.00	5.00	U		104395-001	SW846-8260
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		104395-001	SW846-8260
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		104395-001	SW846-8260

Refer to footnotes on page 3B-9.

Table 3B-1 *(Concluded)*
Summary of Volatile Organic Compound Results,
Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CWL-BW5 17-Jul-18	Trichloroethene	ND	0.300	1.00	5.00	U		105709-001	SW846-8260
CWL-BW5 (Duplicate) 17-Jul-18	Trichloroethene	ND	0.300	1.00	5.00	U		105710-001	SW846-8260
CWL-MW9 18-Jul-18	Trichloroethene	ND	0.300	1.00	5.00	U		105713-001	SW846-8260
CWL-MW10 23-Jul-18	Trichloroethene	0.550	0.300	1.00	5.00	J		105715-001	SW846-8260
CWL-MW11 19-Jul-18	Trichloroethene	ND	0.300	1.00	5.00	U		105718-001	SW846-8260

Refer to footnotes on page 3B-9.

Table 3B-2
Summary of Chromium and Nickel Results, Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CWL-BW5	Chromium	ND	0.003	0.010	0.100	U		104382-002	SW846-6020
15-Jan-18	Nickel	0.00861	0.0006	0.002	NE			104382-002	SW846-6020
CWL-MW9	Chromium	ND	0.003	0.010	0.100	U		104388-002	SW846-6020
17-Jan-18	Nickel	0.00207	0.0006	0.002	NE			104388-002	SW846-6020
CWL-MW9 (Duplicate)	Chromium	ND	0.003	0.010	0.100	U		104389-002	SW846-6020
17-Jan-18	Nickel	0.00192	0.0006	0.002	NE	J		104389-002	SW846-6020
CWL-MW10	Chromium	ND	0.003	0.010	0.100	U		104392-002	SW846-6020
22-Jan-18	Nickel	0.0011	0.0006	0.002	NE	J		104392-002	SW846-6020
CWL-MW11	Chromium	ND	0.003	0.010	0.100	U		104395-002	SW846-6020
18-Jan-18	Nickel	0.00183	0.0006	0.002	NE	J		104395-002	SW846-6020
CWL-BW5	Chromium	ND	0.003	0.010	0.100	U		105709-002	SW846-6020
17-Jul-18	Nickel	ND	0.0006	0.002	NE	U		105709-002	SW846-6020
CWL-BW5 (Duplicate)	Chromium	ND	0.003	0.010	0.100	U		105710-002	SW846-6020
17-Jul-18	Nickel	ND	0.0006	0.002	NE	U		105710-002	SW846-6020
CWL-MW9	Chromium	ND	0.003	0.010	0.100	U		105713-002	SW846-6020
18-Jul-18	Nickel	ND	0.0006	0.002	NE	U		105713-002	SW846-6020
CWL-MW10	Chromium	ND	0.003	0.010	0.100	U		105715-002	SW846-6020
23-Jul-18	Nickel	ND	0.0006	0.002	NE	U		105715-002	SW846-6020
CWL-MW11	Chromium	ND	0.003	0.010	0.100	U		105718-002	SW846-6020
19-Jul-18	Nickel	ND	0.0006	0.002	NE	U		105718-002	SW846-6020

Refer to footnotes on page 3B-9.

Table 3B-3
Summary of Field Water Quality Measurements[h],
Chemical Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CWL-BW5	15-Jan-18	17.00	953.9	137.9	6.92	0.30	72.5	6.99
CWL-MW9	17-Jan-18	17.81	989.6	197.8	7.05	0.28	44.5	4.24
CWL-MW10	22-Jan-18	11.66	874.2	20.6	7.06	2.74	20.5	2.22
CWL-MW11	18-Jan-18	18.12	948.1	169.8	7.03	0.36	57.4	5.39
CWL-BW5	17-Jul-18	22.12	1186.0	150.3	6.95	0.42	87.9	6.21
CWL-MW9	18-Jul-18	22.9	1188.6	147.9	7.03	0.39	55.2	3.84
CWL-MW10	23-Jul-18	25.41	1238.5	-21.8	6.94	2.85	20.4	1.40
CWL-MW11	19-Jul-18	25.97	1345.9	60.2	6.98	2.03	74.2	4.69

Refer to footnotes on page 3B-9.

Footnotes for Chemical Waste Landfill Groundwater Analytical Results Tables

%	= Percent.
EPA	= U.S. Environmental Protection Agency.
ID	= Identifier.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
No.	= Number.

[a]Result

ND = Not detected (at method detection limit).

[b]MDL

MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix specific.

[c]PQL

PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

[d]MCL

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).

NE = Not established.

[e]Lab Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

U = Analyte is absent or below the method detection limit.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

[g]Analytical Method

EPA, 1986, (and updates), “Test Methods for Evaluating Solid Waste, Physical/Chemical Methods,” SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

[h]Field Water Quality Measurements

Field measurements collected prior to sampling.

°C	= degrees Celsius
% Sat	= percent saturation
µmhos/cm	= micromhos per centimeter
mg/L	= milligrams per liter
mV	= millivolts
NTU	= nephelometric turbidity units
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration)

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Chapter 3
Chemical Waste Landfill
References

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EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations*, EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

IT December 1985 IT Corporation (IT), December 1985. *RCRA Interim Status Groundwater Monitoring Plan, Chemical Waste Landfill*, IT Corporation, Albuquerque, New Mexico prepared for Environmental Impacts and Restoration Division, Sandia National Laboratories, New Mexico.

Kieling March 2018 Kieling, J.E. (New Mexico Environment Department), March 2018. Letter to J. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and J. Moya (National Technology & Engineering Solutions of Sandia, LLC), *Approval, Chemical Waste Landfill Post-Closure Care Report, Calendar Year 2017, March 2018, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-18-003*, March 29, 2018.

Kieling June 2011 Kieling, J.E. (New Mexico Environment Department), June 2011. Letter to P. Wagner (U.S. Department of Energy NNSA/Sandia Field Office) and S.A. Orrell (Sandia Corporation), *Notice of Approval, Closure of Chemical Waste Landfill and Post-Closure Care Permit in Effect, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-10-013*, June 2, 2011.

Kieling May 2007 Kieling, J.E. (New Mexico Environment Department), May 2007. *Notice of Public Comment Period and Opportunity to Request a Public Hearing on a Closure Plan Amendment, Corrective Measures Study, and Draft Post-Closure Care Permit for the Chemical Waste Landfill at Sandia National Laboratories*, May 21, 2007.

Kieling September 2004 Kieling, J.E. (New Mexico Environment Department), September 2004. Letter to P. Wagner (U.S. Department of Energy) and P.B. Davies (Sandia Corporation), *Approval with Conditions of the Landfill Cover Interim Measure at the Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890110518, HWB-SNL-04-027*, September 22, 2004.

NMED October 2009a New Mexico Environment Department (NMED), October 2009. *Final Permit Decision and Response to Comments, Post-Closure Care Permit for the Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890110518, SNL-06-002*, New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico, October 15, 2009.

NMED October 2009b New Mexico Environment Department (NMED), October 2009. *Notice of Approval, Final Remedy and Closure Plan Amendment, Chemical Waste Landfill, Sandia National Laboratories, EPA ID No. NM5890110518, NMED-HWB-05-016*, New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico, October 16, 2009.

NMED May 2007 New Mexico Environment Department (NMED), May 2007. *Resource Conservation and Recovery Act, Post-Closure Care Operating Permit, EPA ID No. NM5890110518, to the U.S. Department of Energy/Sandia Corporation, for the Sandia National Laboratories Chemical Waste Landfill*, New Mexico Environment Department Hazardous Waste Bureau, Santa Fe, New Mexico, May 21, 2007.

SNL June 2018 Sandia National Laboratories, New Mexico (SNL/NM), June 2018. *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2018, 4th Quarter Sampling*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2018 Sandia National Laboratories, New Mexico (SNL/NM), March 2018. *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2017,* Sandia National Laboratories, Albuquerque, New Mexico, March 2018.

SNL December 2017 Sandia National Laboratories, New Mexico (SNL/NM), December 2017. *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2018, 2nd Quarter Sampling,* Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2017 Sandia National Laboratories, New Mexico (SNL/NM), June 2017. *Data Validation Procedure for Chemical and Radiochemical Data*, AOP 00-03, Revision 5, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2010 Sandia National Laboratories, New Mexico (SNL/NM), September 2010. *Chemical Waste Landfill Final Resource Conservation and Recovery Act Closure Report*, Sandia National Laboratories, Albuquerque, New Mexico, September 27, 2010.

SNL February 2006 Sandia National Laboratories, New Mexico (SNL/NM), February 2006. *Chemical Waste Landfill Final Closure Plan – Chapter 12 Revision*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2004 Sandia National Laboratories, New Mexico (SNL/NM), December 2004. *Chemical Waste Landfill Corrective Measures Study Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2003 Sandia National Laboratories, New Mexico (SNL/NM), April 2003. *Chemical Waste Landfill – Landfill Excavation Voluntary Corrective Measure – Final Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2001 Sandia National Laboratories, New Mexico (SNL/NM), February 2001. *Draft Long-Term Monitoring Strategy for Groundwater*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 1995 Sandia National Laboratories, New Mexico (SNL/NM), October 1995. *Chemical Waste Landfill Groundwater Assessment Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 1992 Sandia National Laboratories, New Mexico (SNL/NM), December 1992. *Chemical Waste Landfill Final Closure Plan and Postclosure Permit Application*, Sandia National Laboratories, Albuquerque, New Mexico, amended January 2003.

Wagner April 2004 Wagner, P. (U.S. Department of Energy), April 2004. Letter to J. Kieling (New Mexico Environment Department), *Request for Approval of an Interim Measure (Cover) at the Chemical Waste Landfill*, April 19, 2004.

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4.0 Mixed Waste Landfill

4.1 Introduction

The Mixed Waste Landfill (MWL) is a 2.6-acre Solid Waste Management Unit in the north-central portion of Technical Area-III at Sandia National Laboratories, New Mexico (SNL/NM) (Figure 4-1). The MWL consists of two distinct disposal areas: the classified area (occupying 0.6 acres) and the unclassified area (occupying 2.0 acres). Low-level radioactive, hazardous, and mixed waste was disposed in the MWL from March 1959 through December 1988.

The Phase 1 Resource Conservation and Recovery Act Facility Investigation (RFI) was completed in 1990 (SNL September 1990), and the Phase 2 RFI was completed in 1995 (Peace et al. 2002). The Phase 2 RFI confirmed tritium as the primary constituent of concern at the MWL. As directed by the New Mexico Environment Department (NMED), the MWL Corrective Measures Study (SNL May 2003) was submitted to the NMED. The NMED Secretary selected a vegetative cover with a biointrusion barrier (i.e., evapotranspirative [ET] cover) as the final remedy (NMED May 2005) and required a Corrective Measures Implementation (CMI) Plan (SNL November 2005). The MWL CMI Plan was approved by the NMED (Bearzi December 2008) and construction of the MWL ET cover was completed in 2009. The MWL CMI Report documenting cover construction in accordance with the CMI Plan was submitted to the NMED (SNL January 2010) and approved (Bearzi October 2011).

As required by the NMED Final Order (NMED May 2005), the MWL Long-Term Monitoring and Maintenance Plan (LTMMP) (SNL March 2012) was submitted to the NMED and approved (Blaine January 2014). All LTMMP monitoring, maintenance, and reporting requirements were implemented upon NMED approval, including the installation of three multi-port soil-vapor monitoring wells (SNL January 2014) required to complete the LTMMP monitoring systems. After the Soil-Vapor Monitoring Well Installation Report (SNL September 2014) was approved by NMED (Kieling September 2014), the U.S. Department of Energy (DOE) and SNL/NM personnel requested a Certification of Completion for the MWL (Beausoleil September 2014) that was granted by the NMED (Cobrain October 2014).

In October 2014, DOE and SNL/NM personnel submitted a request to NMED for a Class 3 Permit Modification for Corrective Action Complete (CAC) with Controls at the MWL (Beausoleil October 2014). The associated regulatory process included two public comment periods, a public meeting held by DOE and SNL/NM personnel in November 2014, and a four-day public hearing held by NMED in July 2015. On March 13, 2016, the February 2016 NMED Final Order became effective (NMED February 2016; Kieling February 2016), granting CAC with Controls status to the MWL and incorporating the MWL LTMMP into the Resource Conservation and Recovery Act Facility Operating Permit ([Permit], NMED January 2015). All controls required for the MWL, including groundwater monitoring, are defined in the MWL LTMMP and are comprehensively documented in MWL Annual Long-Term Monitoring and Maintenance (LTMM) Reports submitted to the NMED in June of each year. In Calendar Year (CY) 2018, the fifth MWL Annual LTMM Report (SNL June 2018) was submitted to the NMED.

MWL groundwater monitoring results are directly compared to trigger levels defined in Table 5.2.4-1 of the MWL LTMMP, and subject to the trigger evaluation process defined in Figure 5.1-1 of the MWL LTMMP. The evaluation of MWL CY 2018 groundwater monitoring results will be presented in the *Mixed Waste Landfill Annual LTMM Report, April 2018 – March 2019*, which will be submitted to the NMED in June 2019.

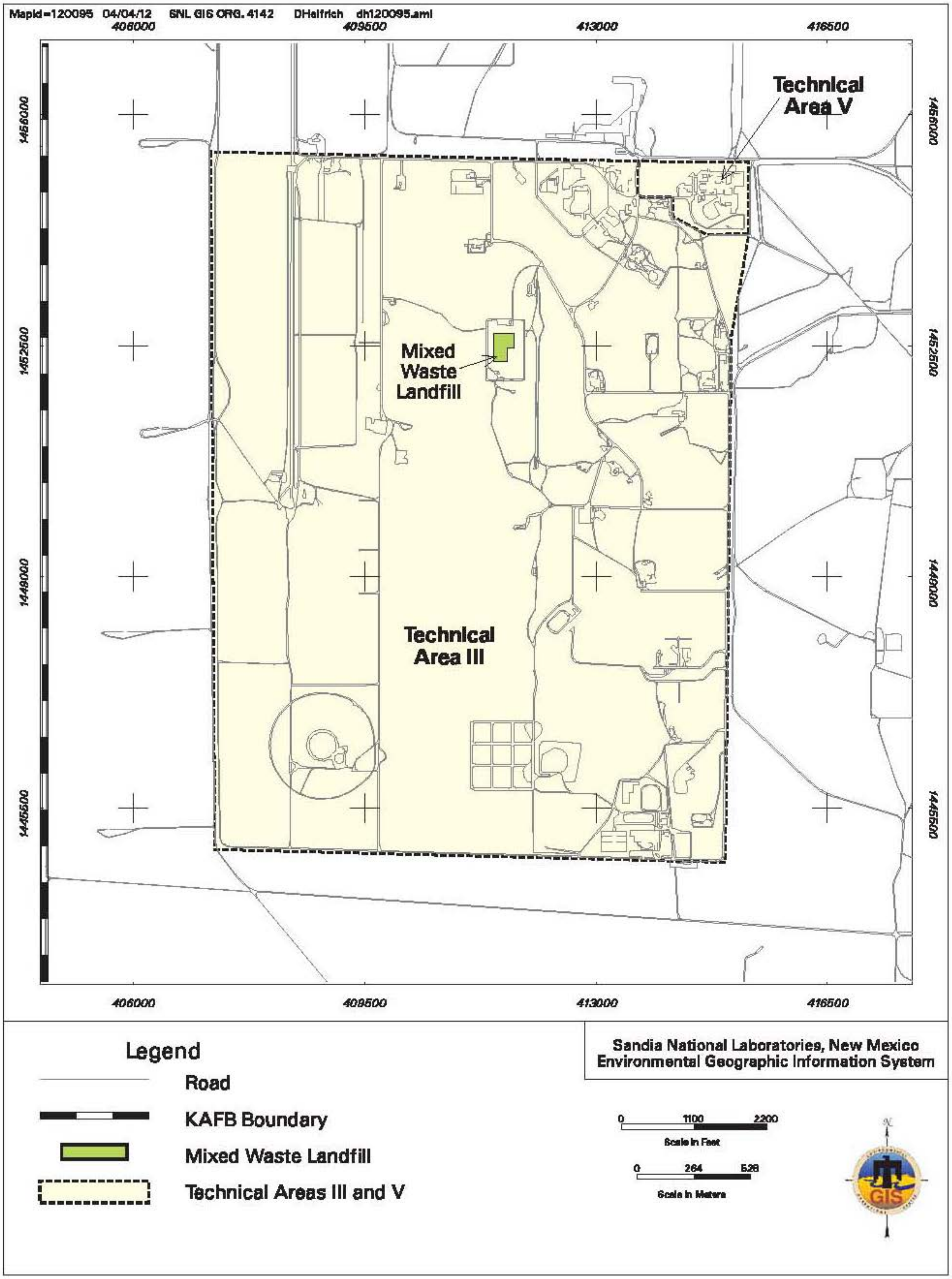

Figure 4-1. Location of the Mixed Waste Landfill within Technical Area-III

4.1.1 Monitoring History

Groundwater monitoring has been conducted at the MWL since 1990. The original MWL groundwater monitoring network was modified in 2008 due to the declining water table and corrosion of stainless steel well screens. Four original monitoring wells were plugged and abandoned (MWL-BW1, MWL-MW1, MWL-MW2, and MWL-MW3), and four monitoring wells were installed (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9). The 2008 wells were constructed with Schedule 80 polyvinyl chloride screens set across the water table of the Regional Aquifer and represent the NMED-approved groundwater monitoring network under the MWL LTMMP. Well MWL-MW4 was part of the original monitoring network, was completed at an angle of six degrees from vertical, and has two discrete screened intervals isolated by an inflatable packer. Wells MWL-MW5 and MWL-MW6 were also part of the original monitoring well network; their screen intervals are below the top of the Regional Aquifer.

Groundwater at the MWL has been extensively characterized and monitored for major ion chemistry, volatile organic compounds (VOCs), semivolatile organic compounds, nitrate, metals, radionuclides, and perchlorate. More than 25 years of analytical data indicate that groundwater has not been contaminated by the MWL.

4.1.2 Monitoring Network

The current groundwater monitoring network at the MWL consists of seven wells listed in Table 4-1 and shown on Figure 4-2. In accordance with the MWL LTMMP, four of these wells comprise the MWL compliance groundwater monitoring network for the uppermost part of the Regional Aquifer (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9), and are sampled semiannually for various constituents. The remaining groundwater monitoring wells (MWL-MW4, MWL-MW5, and MWL-MW6) are retained for monitoring groundwater elevations; sampling of these deeper wells is not required under the MWL LTMMP.

Table 4-1. Mixed Waste Landfill Monitoring Well Network and Calendar Year 2018 Compliance Activities

Well ID	Installation Year	WQ[a]	WL[a]	Comment[b]
MWL-BW2	2008	✓	✓	Compliance well, sampled semiannually
MWL-MW4 [c]	1993		✓	Groundwater elevation only
MWL-MW5	2000		✓	Groundwater elevation only
MWL-MW6	2000		✓	Groundwater elevation only
MWL-MW7	2008	✓	✓	Compliance well, sampled semiannually
MWL-MW8	2008	✓	✓	Compliance well, sampled semiannually
MWL-MW9	2008	✓	✓	Compliance well, sampled semiannually

NOTES:

[a]Check marks indicate WQ sampling and WL measurements were completed.

[b]Requirements defined in the MWL LTMMP (SNL March 2012). Semiannual groundwater monitoring of compliance wells was conducted in April and October.

[c]Upper screen of monitoring well MWL-MW4 is monitored and represents uppermost portion of Regional Aquifer.

BW = Background Well.
ID = Identifier.
LTMMP = Long-Term Monitoring and Maintenance Plan.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
SNL = Sandia National Laboratories.
WL = Water level.
WQ = Water quality.

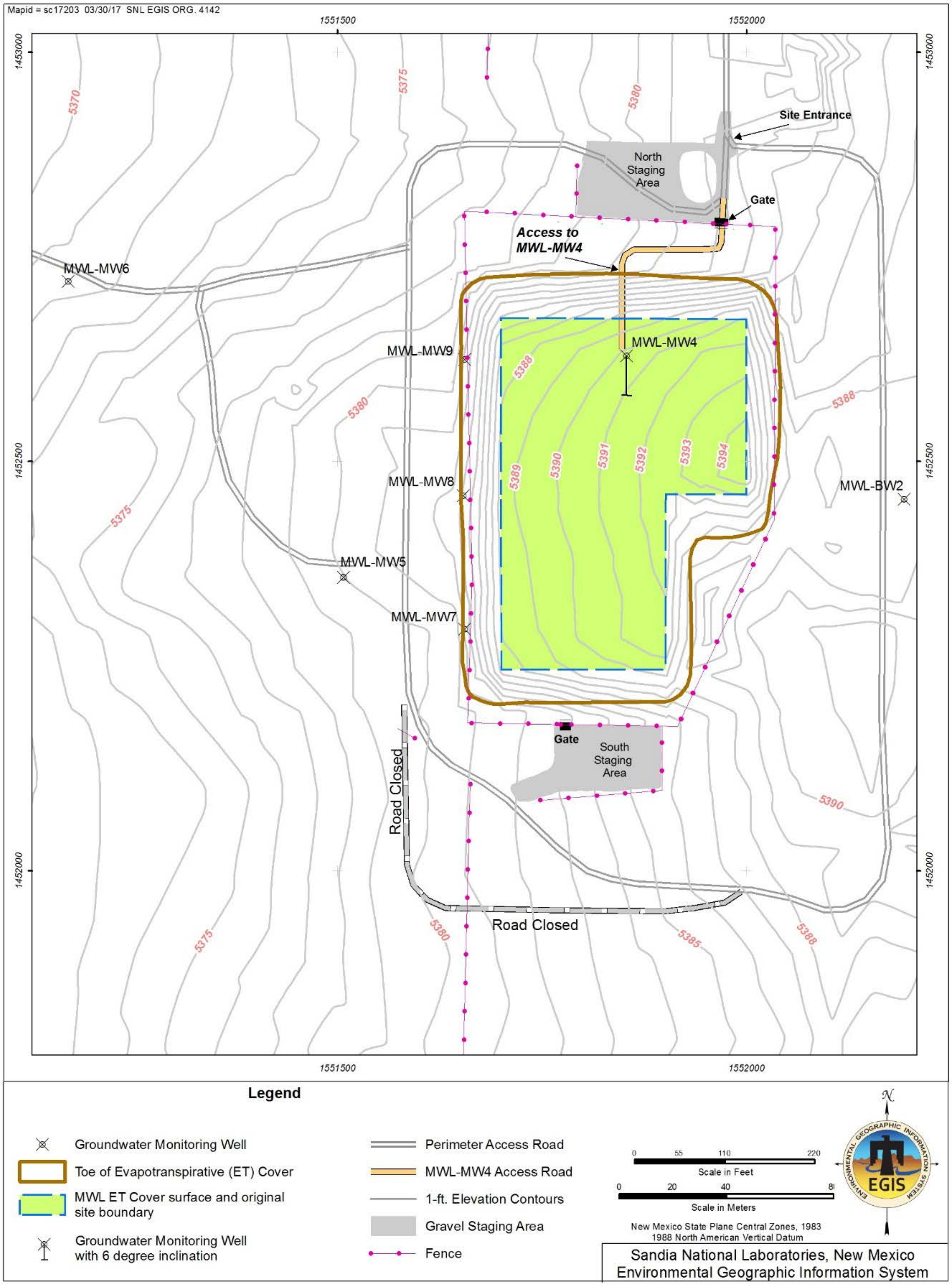

Figure 4-2. Location of Groundwater Monitoring Wells at the Mixed Waste Landfill

4.1.3 Conceptual Site Model

A detailed Conceptual Site Model is provided in the MWL Phase 2 RFI Report (Peace et al. 2002) and the *Mixed Waste Landfill Groundwater Report, 1990 through 2001* (Goering et al. 2002). An update to the Conceptual Site Model integrating the findings from the four monitoring wells installed in 2008 is presented in the *Mixed Waste Landfill Annual Groundwater Monitoring Report, Calendar Year 2009* (SNL June 2010).

The upper surface of the Regional Aquifer (i.e., water table) at the MWL is contained within the interfingering, unconsolidated, fine-grained alluvial-fan deposits of the Santa Fe Group. The depth to water is approximately 500 feet below ground surface. The more transmissive, coarser-grained Ancestral Rio Grande sediments underlie the fine-grained alluvial deposits beneath the MWL.

In Attachment 4A, Figures 4A-1 and 4A-2 (hydrographs) show the rate of groundwater elevation decline at the existing MWL monitoring wells. Over the past two years the rate of decline has significantly slowed, and between 2015 and 2017, wells located west of the MWL showed a small increase ranging from 0.11 to 0.53 feet. From October 2017 to October 2018, the groundwater elevation declined in the four compliance monitoring wells. The range was 0.23 (MWL-MW9) to 0.48 feet (MWL-BW2) and the average rate of decline at the four compliance monitoring wells was 0.34 feet. Recharge from infiltration of direct precipitation at the MWL is negligible due to high evapotranspiration, low precipitation, the thick sequence of unsaturated Santa Fe Group deposits above the water table, and the presence of the MWL ET Cover. Groundwater recharge of the Regional Aquifer occurs by the infiltration of precipitation in the Manzanita Mountains located approximately 5 miles to the east.

Table 4-2 presents the data used to construct the October 2018 potentiometric surface map shown in Figure 4-3 for the MWL groundwater monitoring network. The groundwater elevation used for monitoring well MWL-MW4 is measured within the upper screen interval.

Table 4-2. Groundwater Elevations Measured in October 2018 at Monitoring Wells Completed in the Regional Aquifer at the Mixed Waste Landfill

Well ID	Measurement Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)
MWL-BW2	5,391.02	2-Oct-2018	481.51	4,909.51
MWL-MW4[a]	5,391.70	2-Oct-2018	502.07	4,892.38[b]
MWL-MW5[c]	5,382.56	2-Oct-2018	493.71	4,888.85
MWL-MW6[c]	5,375.31	2-Oct-2018	487.30	4,888.01
MWL-MW7	5,383.30	2-Oct-2018	490.45	4,892.85
MWL-MW8	5,384.67	2-Oct-2018	492.01	4,892.66
MWL-MW9	5,381.91	2-Oct-2018	492.11	4,889.80

NOTES:

[a]Upper screen of monitoring well MWL-MW4 is monitored and represents the uppermost portion of Regional Aquifer.
[b]The groundwater elevation is calculated using a correction for the 6-degree angle of the well casing.
[c]MWL-MW5 and MWL-MW6 are screened below the water table and are not used for contouring.

amsl = Above mean sea level.
btoc = Below top of casing.
BW = Background Well.
ID = Identifier.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
NAVD = North American Vertical Datum of 1988.

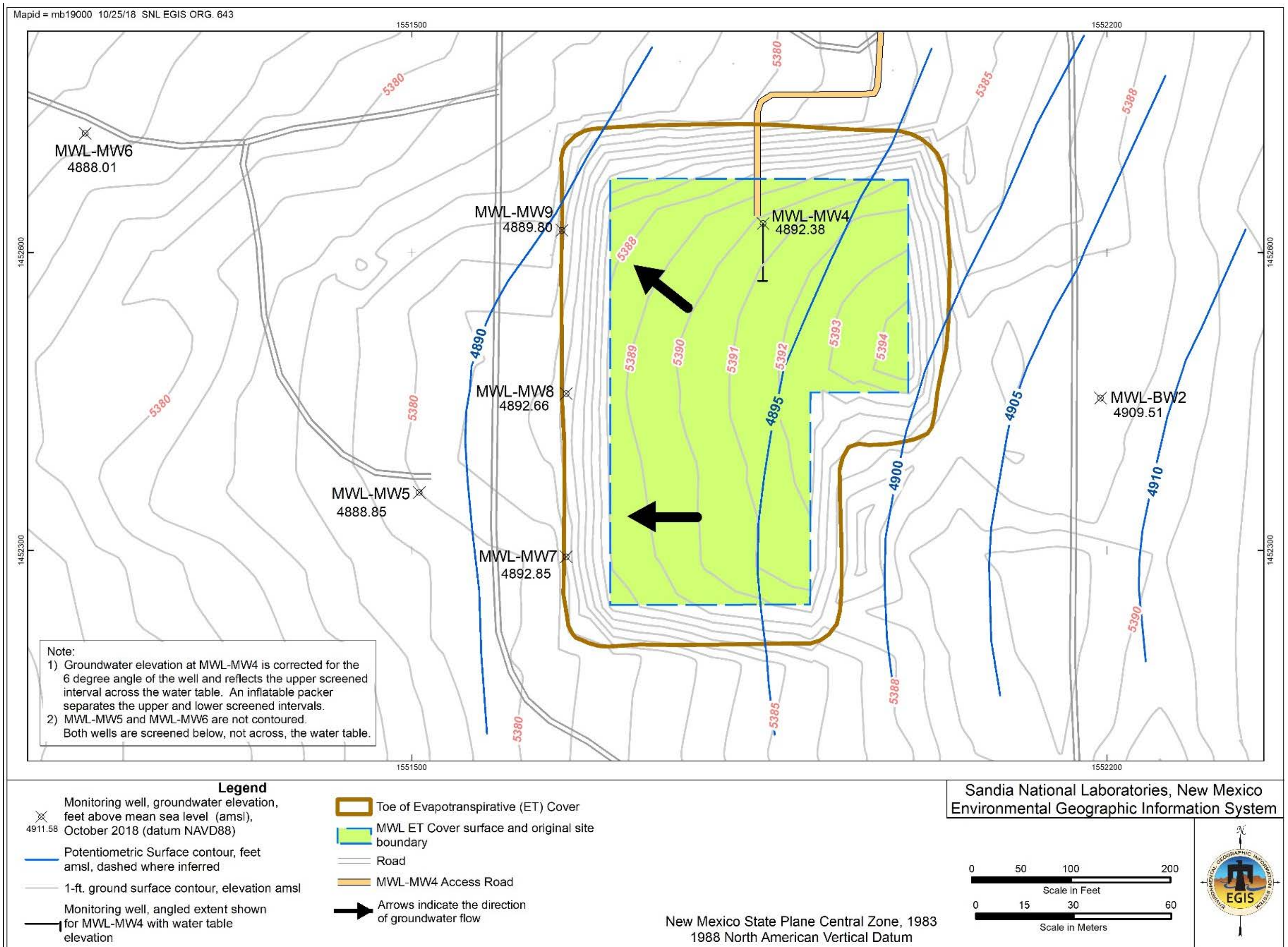

Figure 4-3. Localized Potentiometric Surface of the Regional Aquifer at the Mixed Waste Landfill, October 2018

The general direction of groundwater flow beneath the MWL is to the west and northwest, towards the Rio Grande and away from the Manzanita Mountains. Figure 4-3 is consistent with the base-wide potentiometric surface map (Plate 1), which shows the potentiometric surface contours beneath Technical Area-III generally trend north to south with the inferred groundwater flow direction being generally westward. Several water supply wells operated by Kirtland Air Force Base (KAFB)/U.S. Air Force and the Albuquerque Bernalillo County Water Utility Authority have profoundly modified the natural groundwater flow regime near the MWL by creating a trough in the water table in the western and northern portions of KAFB (Plate 1). As a result, water levels at the MWL have historically declined as shown in Attachment 4A, Figures 4A-1 and 4A-2. The nearest water supply well, KAFB-4, is located approximately 3 miles north-northwest of the MWL.

Measured orthogonally from the potentiometric surface contours, the horizontal gradient for October 2018 ranges from approximately 0.03 to 0.08 feet per foot. Groundwater velocities in the alluvial-fan sediments were calculated using the current potentiometric surface gradient, the average hydraulic conductivity obtained from slug testing of the four compliance monitoring wells, and an effective porosity of 25 percent. The calculated 2018 groundwater velocity ranges from 0.02 to 0.06 feet per day; the average is 0.04 feet per day. These very low values and the general position of the groundwater elevation contours have not changed over the past four years, and are consistent with previous estimates for horizontal groundwater flow at the water table in the MWL vicinity.

4.2 Regulatory Criteria

The MWL is regulated as Solid Waste Management Unit 76 under the Permit, and corrective action at the MWL has been performed in accordance with the Compliance Order on Consent ([Consent Order] NMED April 2004), NMED Final Order on remedy selection (NMED May 2005), and New Mexico Administrative Code (NMAC), Title 20, Chapter 4, Part 1, Section 600 (20.4.1.600 NMAC) incorporating Title 40 of the Code of Federal Regulations (CFR), Part 264.101 (40 CFR 264.101). On March 13, 2016, the MWL corrective action process under the Consent Order was completed (i.e., the February 2016 NMED Final Order granting CAC with Controls status to the MWL became effective). All controls applicable to the MWL, including groundwater monitoring, are documented in the MWL LTMMP of the Permit.

Although radionuclides are being monitored and screened at the MWL, the information related to radionuclides is provided voluntarily by the DOE/National Nuclear Security Administration and SNL/NM personnel. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements imposed by the NMED, as specified in Section III.A of the Consent Order.

4.3 Scope of Activities

Semiannual groundwater sampling was conducted in April-May and October 2018 at the MWL. Groundwater samples were collected from four monitoring wells (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) and analyzed for VOCs; metals including cadmium, chromium, nickel, and total uranium; specific radionuclides by gamma spectroscopy; gross alpha and gross beta activities; tritium; and radon-222.

Table 4-3 lists the analytical parameters and the MWL monitoring wells sampled. The CY 2018 sampling was conducted in accordance with MWL LTMMP requirements and procedures outlined in the *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2018, 3rd Quarter Sampling* (SNL March 2018) and the *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2019, 1st Quarter Sampling* (SNL September 2018).

Table 4-3. Analytical Parameters for the Mixed Waste Landfill Monitoring Wells, Calendar Year 2018

Analytical Parameter	Semiannual Event	
	April-May	October
VOCs Metals: Cadmium Chromium Nickel Uranium, total Radionuclides: Gamma Spectroscopy (short list[a]) Gross Alpha/Beta Activity Tritium Radon-222	MWL-BW2 MWL-BW2 (duplicate) MWL-MW7 MWL-MW8 MWL-MW9	MWL-BW2 MWL-MW7 MWL-MW7 (duplicate) MWL-MW8 MWL-MW9

NOTES:
[a]Gamma spectroscopy short list includes americium-241, cesium-137, and cobalt-60.
BW = Background Well.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
VOC = Volatile organic compound.

The MWL groundwater samples were submitted for analysis to GEL Laboratories, LLC in Charleston, South Carolina. All groundwater sampling results are compared with U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs) for drinking water (EPA May 2009).

Field and laboratory quality control (QC) samples are discussed in Section 1.3.3. Field QC samples included duplicate environmental, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Laboratory QC analyses included method blank, laboratory control sample, matrix spike, matrix spike duplicate, and surrogate spike analyses.

4.4 Field Methods and Measurements

Groundwater sampling and depth-to-groundwater measurements were conducted in accordance with the MWL LTMMP and procedures specified in the *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plans* (SNL March 2018 and SNL September 2018), which are consistent with the methods described in Section 1.3. Water quality parameters measured in the field during the purging process include temperature, specific conductivity, oxidation-reduction potential (ORP), pH, and dissolved oxygen using an In-Situ Incorporated Aqua TROLL® 600 Multiparameter Water Quality Sonde. Turbidity was measured with a Hach™ Model 2100Q turbidity meter. Attachment 4B, Table 4B-5 presents field water quality parameters and Attachment 4A, Figures 4A-1 and 4A-2 (hydrographs) present groundwater elevation measurements at the MWL monitoring wells.

As specified in MWL LTMMP, Appendix F, Section 3.4, purging requirements at the MWL include specifications for making a "best faith effort" to decrease flow rates such that low yield wells do not purge dry. These specifications include equipping the portable Bennett™ groundwater sampling system with small diameter tubing and a flow meter valve located along the discharge line. In addition, during the purging process at wells prone to purging dry, the flow rate is continually adjusted to achieve as low a flow rate as possible without causing the pump to be damaged or fail due to overheating. The purging volume requirement was achieved for all monitoring wells during CY 2018 sampling activities; no wells purged dry.

4.5 Analytical Methods

All groundwater samples were analyzed by the off-site laboratory using EPA-specified protocols as described in Section 1.3.2.

4.6 Summary of Analytical Results

Tables 4B-1, 4B-3, and 4B-4, present the analytical results for VOCs, metals, and radiological constituents, respectively. Table 4B-2 presents the laboratory method detection limits (MDLs) for the VOCs. Field water quality measurements are presented in Table 4B-5. Data qualifiers assigned by the analytical laboratory and the data validation process (SNL June 2017) are presented with the associated results in Tables 4B-1, 4B-3, and 4B-4.

For the purposes of this report, the CY 2018 analytical results were compared with established EPA MCLs where applicable. No detected constituents exceeded the respective EPA MCLs. In addition, no results exceeded respective MWL trigger levels defined in Table 5.2.4-1 of the MWL LTMMP. The analytical results are discussed in detail in the following sections.

4.6.1 Volatile Organic Compounds

Table 4B-1 summarizes the CY 2018 analytical results for VOCs. Toluene (April-May) and acetone (October) were the only VOCs detected above the MDL in any of the groundwater samples. These results were qualified as not detected during data validation since these common laboratory contaminants were also detected in the associated field QC samples. Table 4B-2 presents the laboratory MDLs for VOCs.

4.6.2 Metals

Table 4B-3 summarizes the CY 2018 analytical results for cadmium, chromium, nickel, and total uranium. No metal concentrations were reported above established EPA MCLs and all results are consistent with historical ranges.

4.6.3 Radiological Parameters

Table 4B-4 summarizes the CY 2018 analytical results for gamma-emitting radionuclides, gross alpha/beta activity, tritium, and radon-222. No radiological activities were reported above established EPA MCLs and all results are consistent with historical ranges.

Gross alpha activity is measured in accordance with 40 CFR Part 141 and used as a radiological screening tool. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements are corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. MWL radiological results are further reviewed by an SNL/NM health physicist to screen results for radiological anomalies that could indicate potential contamination and to confirm the samples are nonradioactive prior to shipment. Corrected gross alpha activity results are below the EPA MCL of 15 picocuries per liter. Gross beta results are used as a radiological screening tool; results do not indicate the presence of a beta-emitting radionuclide that would exceed the established EPA MCL of 4 millirems per year. Tritium and gamma spectroscopy radionuclide activities were below the laboratory minimum detectable activity levels in all groundwater samples. All samples were determined as nonradioactive.

4.6.4 Water Quality Parameters

Table 4B-5 presents the field water quality parameters measured immediately before sampling at each well. These field parameters consist of temperature, specific conductivity, ORP, pH, turbidity, and dissolved oxygen.

4.7 Quality Control Results

Section 1.3.3 presents the purpose of each field and laboratory QC sample type. Field and laboratory QC sample results for MWL wells are discussed in the following sections.

4.7.1 Field Quality Control Samples

The QC samples collected in the field included environmental duplicate, EB, FB, and TB samples. Analytical results are discussed for each QC sample type in the following sections.

4.7.1.1 Environmental Duplicate Samples

Environmental duplicate samples were collected from monitoring wells MWL-BW2 (April-May) and MWL-MW7 (October) and analyzed for all constituents. The results for the environmental sample were compared to the results for the corresponding environmental duplicate sample. The relative percent difference (RPD) was calculated for constituents that were detected above the laboratory MDL in both samples.

CY 2018 sample pair (environmental sample and environmental duplicate sample) results show good correlation, with calculated RPD values ranging from <1 to 7. Total uranium was the only constituent detected above the laboratory MDL in both sample pairs. Calculated RPD values are within the acceptable range of less than or equal to 35 for metals as defined in Appendix F of the MWL LTMMP.

4.7.1.2 Equipment Blank Samples

One EB sample (also referred to as a rinsate blank) associated with monitoring well MWL-BW2 (April-May) and one EB sample associated with monitoring well MWL-MW7 (October) were collected during the CY 2018 sampling events and submitted for all analyses.

Acetone and toluene were detected above laboratory MDLs in the April-May EB sample. No corrective action was necessary for acetone since this compound was not detected in the associated environmental sample. Toluene was detected in the EB sample at a concentration greater than the associated environmental and environmental duplicate samples. As a result, toluene was qualified as not detected during data validation in environmental samples from MWL-BW2. Acetone was detected in the October EB sample at a concentration comparable to associated environmental and environmental duplicate samples. As a result, acetone was qualified as not detected during data validation in environmental samples from MWL-MW7 and MWL-MW9. Both acetone and toluene are common laboratory contaminants.

4.7.1.3 Field Blank Samples

Ten FB samples (five in April-May, five in October) were collected during the CY 2018 sampling events and submitted for VOC analysis. No VOCs were detected in the April-May FB samples. For the October FB samples, acetone was reported in all FB samples at concentrations ranging from 1.76 to 2.63 micrograms per liter. Acetone was qualified as not detected during data validation in the MWL-MW7 environmental and duplicate environmental samples and the MWL-MW9 environmental sample since acetone was reported in these samples at similar concentrations.

4.7.1.4 Trip Blank Samples

Twelve TB samples (six in April-May, six in October) were submitted with the CY 2018 samples for analysis of VOCs. Toluene was detected in one April-May TB sample; no corrective action was necessary since toluene was not detected in the associated environmental sample. No VOCs were detected in the October TB samples.

4.7.2 Laboratory Quality Control Samples

Internal laboratory QC samples, including laboratory control samples, replicates, matrix spikes, matrix spike duplicates, and surrogate spike samples were analyzed concurrently with the groundwater samples. There were no significant data quality issues identified with the laboratory QC sample results associated with the April-May and October sampling events; internal laboratory QC sample results were within laboratory and analytical method acceptance limits.

4.8 Variances and Nonconformances

All analytical and field methods were performed according to the requirements specified in the MWL LTMMP and associated Mini-Sampling and Analysis Plans. There were no variances and/or nonconformances from requirements during CY 2018 sampling activities as defined in the MWL LTMMP, Appendix F, Section 6.

All environmental sample, field QC sample, and laboratory QC sample results were reviewed and qualified in accordance with AOP 00-03, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL June 2017). All data were in compliance with analytical methods and laboratory procedures.

4.9 Summary and Conclusions

During CY 2018, groundwater samples were collected from the MWL compliance monitoring wells (MWL-BW2, MWL-MW7, MWL-MW8, and MWL-MW9) in April-May and October in accordance with the MWL LTMMP. Groundwater samples were analyzed for VOCs; metals including cadmium, chromium, nickel, and total uranium; specific radionuclides by gamma spectroscopy; gross alpha and gross beta activities; tritium; and radon-222. Based on the field and laboratory QC sample and data validation results, the CY 2018 groundwater monitoring data meet data quality objectives and are in compliance with analytical methods and laboratory procedures. No analytes were detected at concentrations exceeding established EPA MCLs or MWL trigger levels defined in Table 5.2.4-1 of the MWL LTMMP.

4.10 Summary of Future Activities

All monitoring, inspection, and maintenance requirements will continue to be performed and documented as required by the MWL LTMMP. Groundwater monitoring of the four compliance monitoring wells will continue on a semiannual basis and results will be documented in both comprehensive MWL Annual LTMM Reports (submitted to NMED in June of each year) and in future Annual Groundwater Monitoring Reports.

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Attachment 4A
Mixed Waste Landfill
Hydrographs

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Attachment 4A Hydrographs

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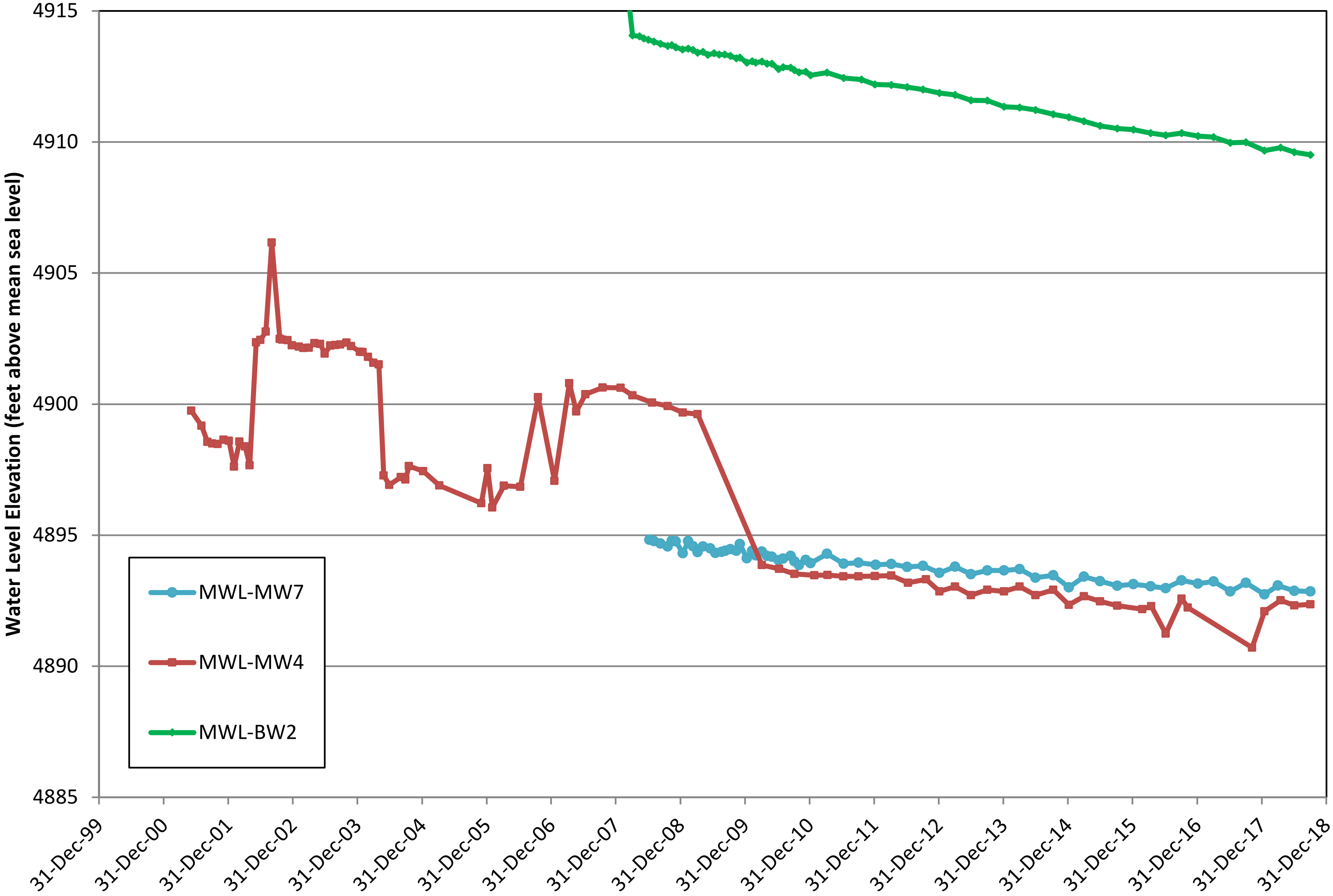

Note: GW Elevation corrected for 6°angle for MWL-MW4

Figure 4A-1. MWL Groundwater Monitoring Wells (1 of 2)

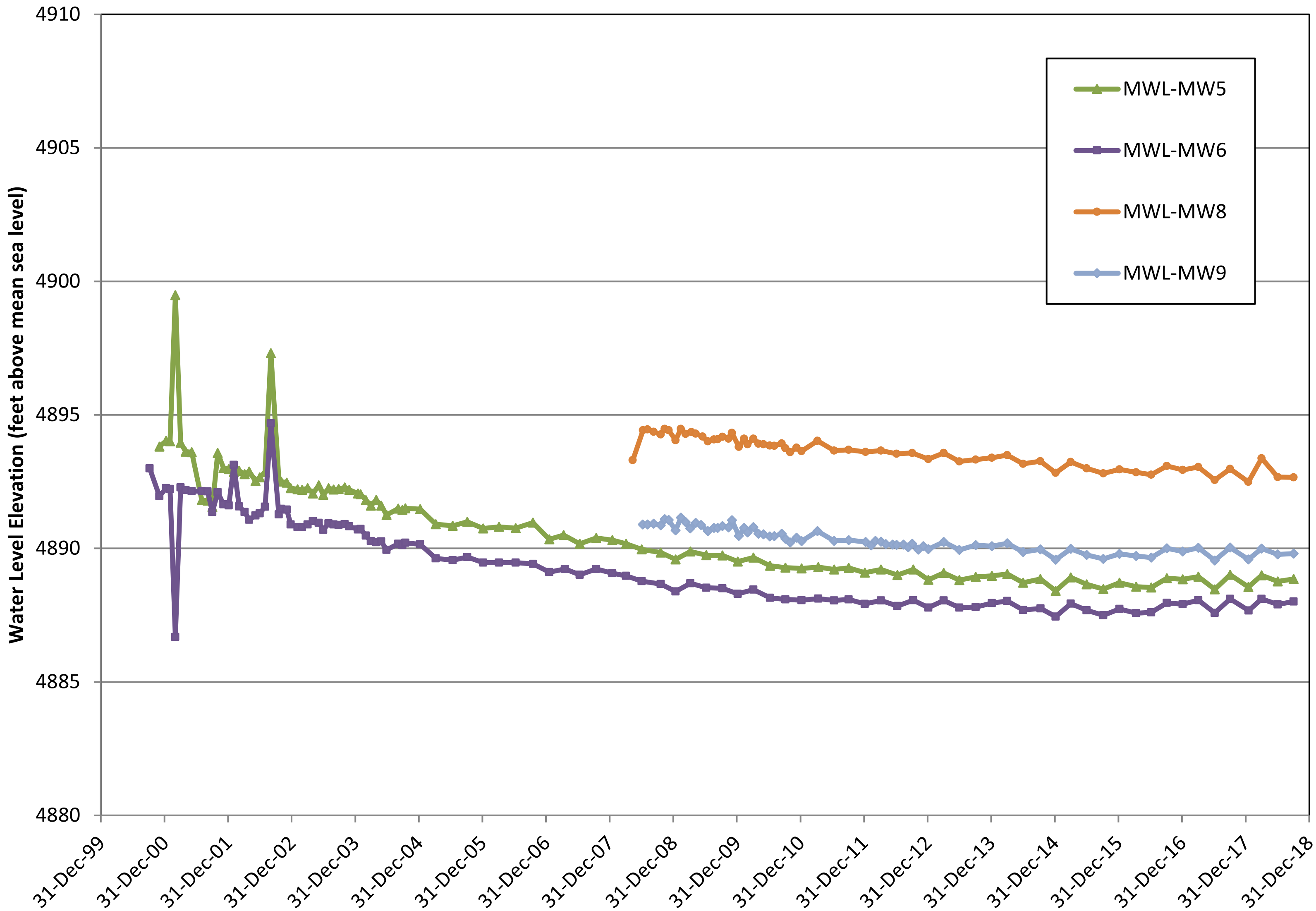

Figure 4A-2. MWL Groundwater Monitoring Wells (2 of 2)

Attachment 4B
Mixed Waste Landfill
Analytical Results Tables

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Attachment 4B Tables

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Table 4B-1
Summary of Detected Volatile Organic Compounds, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2 30-Apr-18	Toluene	ND	0.300	1.00	NE	J	1.0U	105180-001	SW846-8260B
MWL-BW2 (Duplicate) 30-Apr-18	Toluene	ND	0.300	1.00	NE	J	1.0U	105181-001	SW846-8260B
MWL-MW7 25-Oct-18	Acetone	ND	1.5	10.0	NE	J	10UJ	106564-001	SW846-8260B
MWL-MW7 (Duplicate) 25-Oct-18	Acetone	ND	1.5	10.0	NE	J	10UJ	106565-001	SW846-8260B
MWL-MW9 24-Oct-18	Acetone	ND	1.5	10.0	NE	J, N	10UJ	106559-001	SW846-8260B

Refer to footnotes on page 4B-13.

Table 4B-2
Method Detection Limits for Volatile Organic Compounds (Method[g] SW846-8260B), Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300
1,1,2,2-Tetrachloroethane	0.300
1,1,2-Trichloroethane	0.300
1,1-Dichloroethane	0.300
1,1-Dichloroethene	0.300
1,2-Dichloroethane	0.300
1,2-Dichloropropane	0.300
2-Butanone	1.50
2-Hexanone	1.50
4-methyl-, 2-Pentanone	1.50
Acetone	1.50
Benzene	0.300
Bromodichloromethane	0.300
Bromoform	0.300
Bromomethane	0.300
Carbon disulfide	1.50
Carbon tetrachloride	0.300
Chlorobenzene	0.300
Chloroethane	0.300
Chloroform	0.300
Chloromethane	0.300
Dibromochloromethane	0.300
Dichlorodifluoromethane	0.300
Ethyl benzene	0.300
Methylene chloride	1.00
Styrene	0.300
Tetrachloroethene	0.300
Toluene	0.300
Trichloroethene	0.300
Vinyl acetate	1.50
Vinyl chloride	0.300
Xylene	0.300
cis-1,2-Dichloroethene	0.300
cis-1,3-Dichloropropene	0.300
trans-1,2-Dichloroethene	0.300
trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 4B-13.

Table 4B-3
Summary of Cadmium, Chromium, Nickel, and Uranium Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2	Cadmium	ND	0.0003	0.001	0.005	U		105180-002	SW846-6020
30-Apr-18	Chromium	ND	0.003	0.010	0.10	U		105180-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	B, J	0.002U	105180-002	SW846-6020
	Uranium	0.00663	0.000067	0.0002	0.030			105180-002	SW846-6020
MWL-BW2 (Duplicate)	Cadmium	ND	0.0003	0.001	0.005	U		105181-002	SW846-6020
30-Apr-18	Chromium	ND	0.003	0.010	0.10	U		105181-002	SW846-6020
	Nickel	0.00298	0.0006	0.002	NE	B	J+	105181-002	SW846-6020
	Uranium	0.00664	0.000067	0.0002	0.030			105181-002	SW846-6020
MWL-MW7	Cadmium	ND	0.0003	0.001	0.005	U		105174-002	SW846-6020
02-May-18	Chromium	ND	0.003	0.010	0.10	U		105174-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	B, J	0.002U	105174-002	SW846-6020
	Uranium	0.00744	0.000067	0.0002	0.030			105174-002	SW846-6020
MWL-MW8	Cadmium	ND	0.0003	0.001	0.005	U		105177-002	SW846-6020
03-May-18	Chromium	ND	0.003	0.010	0.10	U		105177-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	B, J	0.002U	105177-002	SW846-6020
	Uranium	0.00739	0.000067	0.0002	0.030			105177-002	SW846-6020
MWL-MW9	Cadmium	ND	0.0003	0.001	0.005	U		105184-002	SW846-6020
01-May-18	Chromium	ND	0.003	0.010	0.10	U		105184-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	B, J	0.002U	105184-002	SW846-6020
	Uranium	0.00894	0.000067	0.0002	0.030			105184-002	SW846-6020
MWL-BW2	Cadmium	ND	0.0003	0.001	0.005	U		106554-002	SW846-6020
23-Oct-18	Chromium	ND	0.003	0.010	0.10	U		106554-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		106554-002	SW846-6020
	Uranium	0.00704	0.000067	0.0002	0.030			106554-002	SW846-6020
MWL-MW7	Cadmium	ND	0.0003	0.001	0.005	U		106564-002	SW846-6020
25-Oct-18	Chromium	ND	0.003	0.010	0.10	U		106564-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		106564-002	SW846-6020
	Uranium	0.00775	0.000067	0.0002	0.030			106564-002	SW846-6020
MWL-MW7 (Duplicate)	Cadmium	ND	0.0003	0.001	0.005	U		106565-002	SW846-6020
25-Oct-18	Chromium	ND	0.003	0.010	0.10	U		106565-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		106565-002	SW846-6020
	Uranium	0.00835	0.000067	0.0002	0.030			106565-002	SW846-6020

Refer to footnotes on page 4B-13.

Table 4B-3 *(Concluded)*
Summary of Cadmium, Chromium, Nickel, and Uranium Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW8	Cadmium	ND	0.0003	0.001	0.005	U		106568-002	SW846-6020
29-Oct-18	Chromium	ND	0.003	0.010	0.10	U		106568-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		106568-002	SW846-6020
	Uranium	0.00765	0.000067	0.0002	0.030			106568-002	SW846-6020
MWL-MW9	Cadmium	ND	0.0003	0.001	0.005	U		106559-002	SW846-6020
24-Oct-18	Chromium	ND	0.003	0.010	0.10	U		106559-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		106559-002	SW846-6020
	Uranium	0.00923	0.000067	0.0002	0.030			106559-002	SW846-6020

Refer to footnotes on page 4B-13.

Table 4B-4
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Tritium, and Radon Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-BW2	Americium-241	7.38 ± 14.2	22.5	10.9	NE	U	BD	105180-003	EPA 901.1
30-Apr-18	Cesium-137	1.25 ± 2.00	3.66	1.73	NE	U	BD	105180-003	EPA 901.1
	Cobalt-60	0.170 ± 2.49	4.41	2.04	NE	U	BD	105180-003	EPA 901.1
	Potassium-40	12.0 ± 55.3	38.9	17.8	NE	U	BD	105180-003	EPA 901.1
	Gross Alpha	8.56	NA	NA	15 pCi/L	NA	None	105180-004	EPA 900.0
	Gross Beta	4.95 ± 1.36	2.06	1.00	4 mrem/yr		J	105180-004	EPA 900.0
	Tritium	-41.1 ± 71.3	133	62.4	4 mrem/yr	U	BD	105180-005	EPA 906.0
	Radon-222	375 ± 92.3	50.3	24.1	1,000 pCi/L			105180-006	SM7500 Rn B
MWL-BW2 (Duplicate)	Americium-241	3.68 ± 7.66	12.5	6.08	NE	U	BD	105181-003	EPA 901.1
30-Apr-18	Cesium-137	0.494 ± 3.19	4.22	2.03	NE	U	BD	105181-003	EPA 901.1
	Cobalt-60	-1.65 ± 1.94	2.96	1.35	NE	U	BD	105181-003	EPA 901.1
	Potassium-40	-28 ± 38.2	43.7	20.5	NE	U	BD	105181-003	EPA 901.1
	Gross Alpha	5.20	NA	NA	15 pCi/L	NA	None	105181-004	EPA 900.0
	Gross Beta	6.53 ± 1.32	1.87	0.905	4 mrem/yr			105181-004	EPA 900.0
	Tritium	-35.1 ± 72.6	135	63.1	4 mrem/yr	U	BD	105181-005	EPA 906.0
	Radon-222	387 ± 94.8	50.5	24.2	1,000 pCi/L			105181-006	SM7500 Rn B
MWL-MW7	Americium-241	6.53 ± 8.65	14.0	6.73	NE	U	BD	105174-003	EPA 901.1
02-May-18	Cesium-137	-0.357 ± 1.73	3.00	1.41	NE	U	BD	105174-003	EPA 901.1
	Cobalt-60	0.865 ± 1.62	3.12	1.42	NE	U	BD	105174-003	EPA 901.1
	Potassium-40	17.2 ± 39.3	32.8	15.0	NE	U	BD	105174-003	EPA 901.1
	Gross Alpha	3.14	NA	NA	15 pCi/L	NA	None	105174-004	EPA 900.0
	Gross Beta	6.34 ± 1.25	1.80	0.872	4 mrem/yr			105174-004	EPA 900.0
	Tritium	-50.9 ± 65.7	124	58.2	4 mrem/yr	U	BD	105174-005	EPA 906.0
	Radon-222	143 ± 40.7	35.6	17.1	1,000 pCi/L			105174-006	SM7500 Rn B
MWL-MW8	Americium-241	-4.34 ± 9.13	14.2	6.86	NE	U	BD	105177-003	EPA 901.1
03-May-18	Cesium-137	2.55 ± 2.07	2.90	1.36	NE	U	BD	105177-003	EPA 901.1
	Cobalt-60	-1.45 ± 2.00	3.14	1.44	NE	U	BD	105177-003	EPA 901.1
	Potassium-40	54.8 ± 39.1	32.9	15.1	NE		J	105177-003	EPA 901.1
	Gross Alpha	5.45	NA	NA	15 pCi/L	NA	None	105177-004	EPA 900.0
	Gross Beta	6.58 ± 1.25	1.75	0.847	4 mrem/yr			105177-004	EPA 900.0
	Tritium	-44.9 ± 69.5	130	61.1	4 mrem/yr	U	BD	105177-005	EPA 906.0
	Radon-222	183 ± 55.1	49.1	23.1	1,000 pCi/L			105177-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

Table 4B-4 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Tritium, and Radon Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW9	Americium-241	5.57 ± 16.3	28.7	14.1	NE	U	BD	105184-003	EPA 901.1
01-May-18	Cesium-137	-0.739 ± 2.10	3.22	1.54	NE	U	BD	105184-003	EPA 901.1
	Cobalt-60	-0.715 ± 2.05	3.49	1.64	NE	U	BD	105184-003	EPA 901.1
	Potassium-40	-5.63 ± 41.9	42.5	20.2	NE	U	BD	105184-003	EPA 901.1
	Gross Alpha	1.81	NA	NA	15 pCi/L	NA	None	105184-004	EPA 900.0
	Gross Beta	4.29 ± 2.77	4.18	1.84	4 mrem/yr		J	105184-004	EPA 900.0
	Tritium	-57.4 ± 70.5	134	62.7	4 mrem/yr	U	BD	105184-005	EPA 906.0
	Radon-222	409 ± 97.2	42.4	20.3	1,000 pCi/L			105184-006	SM7500 Rn B
MWL-BW2	Americium-241	-3.9 ± 15.3	22.9	11.1	NE	U	BD	106554-003	EPA 901.1
23-Oct-18	Cesium-137	0.121 ± 2.1	3.7	1.74	NE	U	BD	106554-003	EPA 901.1
	Cobalt-60	-1.16 ± 2.14	3.67	1.67	NE	U	BD	106554-003	EPA 901.1
	Potassium-40	24.7 ± 46	37.9	17.2	NE	U	BD	106554-003	EPA 901.1
	Gross Alpha	11.48	NA	NA	15 pCi/L	NA	None	106554-004	EPA 900.0
	Gross Beta	4.49 ± 1.5	2.29	1.11	4 mrem/yr		J	106554-004	EPA 900.0
	Tritium	41.1 ± 78.9	135	63.6	4 mrem/yr	U	BD	106554-005	EPA 906.0
	Radon-222	323 ± 87.4	62.1	29.3	1,000 pCi/L			106554-006	SM7500 Rn B
MWL-MW7	Americium-241	6.4 ± 9.59	14.4	7	NE	U	BD	106564-003	EPA 901.1
25-Oct-18	Cesium-137	0.851 ± 3.31	3.31	1.59	NE	U	BD	106564-003	EPA 901.1
	Cobalt-60	0,871 ± 1,82	3.29	1.54	NE	U	BD	106564-003	EPA 901.1
	Potassium-40	-28.3 ± 41.4	44.6	21.3	NE	U	BD	106564-003	EPA 901.1
	Gross Alpha	5.61	NA	NA	15 pCi/L	NA	None	106564-004	EPA 900.0
	Gross Beta	5.19 ± 0.843	1.13	0.546	4 mrem/yr			106564-004	EPA 900.0
	Tritium	-33 ± 75.8	140	65.6	4 mrem/yr	U	BD	106564-005	EPA 906.0
	Radon-222	115 ± 43.1	50.6	23.9	1,000 pCi/L		J	106564-006	SM7500 Rn B
MWL-MW7 (Duplicate)	Americium-241	2.91 ± 5.67	8.76	4.26	NE	U	BD	106565-003	EPA 901.1
25-Oct-18	Cesium-137	-0.127 ± 1.51	2.58	1.23	NE	U	BD	106565-003	EPA 901.1
	Cobalt-60	3.34 ± 2.38	3.34	1.36	NE	U	BD	106565-003	EPA 901.1
	Potassium-40	-8.0 ± 32.1	37.8	17.9	NE	U	BD	106565-003	EPA 901.1
	Gross Alpha	5.91	NA	NA	15 pCi/L	NA	None	106565-004	EPA 900.0
	Gross Beta	7.62 ± 0.972	1.26	0.612	4 mrem/yr			106565-004	EPA 900.0
	Tritium	-35.9 ± 72.5	134	63	4 mrem/yr	U	BD	106565-005	EPA 906.0
	Radon-222	123 ± 44.4	50.7	23.9	1,000 pCi/L		J	106565-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

Table 4B-4 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Tritium, and Radon Results, Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
MWL-MW8	Americium-241	-4.77 ± 13.7	13.7	23.7	NE	U	BD	106568-003	EPA 901.1
29-Oct-18	Cesium-137	-1.33 ± 2.19	2.19	3.49	NE	U	BD	106568-003	EPA 901.1
	Cobalt-60	-0.398 ± 2.34	2.34	4.15	NE	U	BD	106568-003	EPA 901.1
	Potassium-40	17.3 ± 58.5	38.6	17.6	NE	U	BD	106568-003	EPA 901.1
	Gross Alpha	3.63	NA	NA	15 pCi/L	NA	None	106568-004	EPA 900.0
	Gross Beta	5.91 ± 0.765	0.873	0.42	4 mrem/yr			106568-004	EPA 900.0
	Tritium	32.6 ± 70.1	121	56.5	4 mrem/yr	U	BD	106568-005	EPA 906.0
	Radon-222	145 ± 63.2	81.6	38.3	1,000 pCi/L		J	106568-006	SM7500 Rn B
MWL-MW9	Americium-241	3.86 ± 13.4	22.3	10.8	NE	U	BD	106559-003	EPA 901.1
24-Oct-18	Cesium-137	-1.29 ± 1.94	3.08	1.45	NE	U	BD	106559-003	EPA 901.1
	Cobalt-60	0.494 ± 1.93	3.66	1.69	NE	U	BD	106559-003	EPA 901.1
	Potassium-40	7.02 ± 46.7	34.4	15.7	NE	U	BD	106559-003	EPA 901.1
	Gross Alpha	6.32	NA	NA	15 pCi/L	NA	None	106559-004	EPA 900.0
	Gross Beta	5.77 ± 0.799	0.971	0.464	4 mrem/yr			106559-004	EPA 900.0
	Tritium	-33.2 ± 73.6	135	63.5	4 mrem/yr	U	BD	106559-005	EPA 906.0
	Radon-222	497 ± 120	52	24.5	1,000 pCi/L			106559-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

Table 4B-5
Summary of Field Water Quality Measurements[h], Mixed Waste Landfill Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
MWL-BW2	30-Apr-18	21.21	738.7	162.7	7.38	3.07	29.9	2.20
MWL-MW7	02-May-18	19.40	587.1	203.6	7.60	0.25	84.8	6.34
MWL-MW8	03-May-18	18.77	570.8	178.9	7.49	0.28	35.8	2.71
MWL-MW9	01-May-18	21.83	744.1	53.5	7.65	0.71	15.8	1.13
MWL-BW2	23-Oct-18	19.87	719.09	125.8	7.40	1.81	51.49	3.85
MWL-MW7	25-Oct-18	18.61	628.76	175.4	7.56	0.29	85.59	6.50
MWL-MW8	29-Oct-18	19.97	631.40	163.3	7.49	0.33	45.30	3.43
MWL-MW9	24-Oct-18	13.97	569.31	127.6	7.47	1.18	14.83	1.25

Refer to footnotes on page 4B-13.

Footnotes for Mixed Waste Landfill Groundwater Analytical Results Tables

% = Percent.
BW = Background well.
CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
ID = Identifier.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.
mrem/yr = Millirem per year.
MW = Monitoring well.
MWL = Mixed Waste Landfill.
NMED = New Mexico Environment Department.
No. = Number.
pCi/L = Picocuries per liter.

[a]Result
Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table 1-4).

Bold = Value exceed the established MCL.
ND = not detected (at method detection limit).
Activities of zero or less are considered to be not detected.

[b]MDL or MDA
The MDL applies to Table 4A-1 through 4A-3. MDA applies to Table 4A-4.

MDA = The minimal detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.
MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.
NA = Not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level
The PQL applies to Table 4A-1 through 4A-3. Critical Level applies to Table 4A-4.

Critical Level = The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.
PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.
NA = Not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).
The following are the MCLs for gross alpha particles and beta particles in community water systems:
- 15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table 1-4).
- 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Mixed Waste Landfill Groundwater Analytical Results Tables (Concluded)

[e]Lab Qualifier
If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

B	= The analyte was found in the blank above the effective MDL.
J	= Estimated value, the analyte concentration is below the practical quantitation limit (PQL).
N	= Results associated with a spike analysis that was outside control limits.
NA	= Not applicable.
U	= Analyte is absent or below the method detection limit.

[f]Validation Qualifier
If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	= Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	= The associated value is an estimated quantity.
J+	= The associated numerical value is an estimated quantity with a suspected positive bias.
None	= No data validation for corrected gross alpha activity.
U	= The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	= The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

[g]Analytical Method
Standard Methods for the Examination of Water and Wastewater, SM7500-Rn B Method, 22nd Edition, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C., 1988.

EPA, 1986, (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed. Rev.1, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1980, "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

SM	= Standard Method.
SW	= Solid Waste.

[h]Field Water Quality Measurements
Field measurements collected prior to sampling.

^{O}C	= Degrees Celsius.
% Sat	= Percent saturation.
µmhos/cm	= Micromhos per centimeter.
mg/L	= Milligrams per liter.
mV	= Millivolts.
NTU	= Nephelometric turbidity units.
pH	= Potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Chapter 4
Mixed Waste Landfill
References

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Bearzi October 2011 Bearzi, J.P. (New Mexico Environment Department), October 2011. Letter to P. Wagner (U.S. Department of Energy NNSA/Sandia Site Office) and S.A. Orrell (Sandia National Laboratories, New Mexico), *Notice of Approval, Mixed Waste Landfill Corrective Measures Implementation Report, January 2010, Sandia National Laboratories, EPA ID# NM5890110518, SNL-10-005,* October 14, 2011.

Bearzi December 2008 Bearzi, J.P. (New Mexico Environment Department), December 2008. Letter to K. Davis (U.S. Department of Energy) and F. Nimick (Sandia Corporation), *Conditional Approval, Mixed Waste Landfill Corrective Measures Implementation Plan, November 2005, Sandia National Laboratories NM5890110518, SNL-05-025,* December 22, 2008.

Beausoleil October 2014 Beausoleil, G. L. (U.S. Department of Energy), October 2014. Letter to J.E. Kieling (New Mexico Environment Department Hazardous Waste Bureau), *Request for Class 3 Modification to Module IV of Hazardous Waste Permit for Sandia National Laboratories/New Mexico, EPA ID NM5890110518, New Mexico*, October 17, 2014.

Beausoleil September 2014 Beausoleil, G. L. (U.S. Department of Energy), September 2014. Letter to J.E. Kieling (New Mexico Environment Department Hazardous Waste Bureau), *Department of Energy/National Nuclear Security Administration Sandia Corporation Request for Certificate of Completion for the Mixed Waste Landfill at Sandia National Laboratories, New Mexico,* September 25, 2014.

Blaine January 2014 Blaine, T. (New Mexico Environment Department), January 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan, March 2012, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-12-007,* January 8, 2014.

Cobrain October 2014 Cobrain, D. (New Mexico Environment Department), October 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and S.A. Orrell (Sandia National Laboratories, New Mexico), *Certificate of Completion for the Mixed Waste Landfill, September 25, 2014, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-MISC,* October 8, 2014.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations*, EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

Goering et al. 2002 Goering, T.J., G.M. Haggerty, D. Van Hart, and J.L. Peace, 2002. *Mixed Waste Landfill Groundwater Report, 1990 through 2001, Sandia National Laboratories, Albuquerque, New Mexico,* SAND2002-4098, Sandia National Laboratories, Albuquerque, New Mexico.

Kieling February 2016 Kieling, J.E. (New Mexico Environment Department), February 2016. Letter to J.P. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Final Decision on Proposal to Grant Corrective Action Complete with Controls Status for Mixed Waste Landfill, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-014*, February 18, 2016.

Kieling September 2014 Kieling, J.E. (New Mexico Environment Department), September 2014. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Site Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval, Installation of Three FLUTe™ Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill, September 2014, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-14-012*, September 25, 2014.

NMED February 2016 New Mexico Environment Department (NMED), February 2016. *Final Order, State of New Mexico Before the Secretary of the Environment in the Matter of Proposed Permit Modification for Sandia National Laboratories, EPA ID # 5890110518, To Determine Corrective Action Complete with Controls at the Mixed Waste Landfill, No. HWB 15-18(P)*, February 12, 2016.

NMED January 2015 New Mexico Environment Department (NMED), January 2015. *Resource Conservation and Recovery Act Facility Operating Permit EPA ID Number NM5890110518 Issued to the U.S. Department of Energy/Sandia Corporation for the Sandia National Laboratories Hazardous and Mixed Waste Treatment and Storage Units and Post-Closure Care of the Corrective Action Management Unit*, New Mexico Environment Department, Santa Fe, New Mexico, January 27, 2015.

NMED May 2005 New Mexico Environment Department (NMED), May 2005. *Final Order, State of New Mexico Before the Secretary of the Environment in the Matter of Request for a Class 3 Permit Modification for Corrective Measures for the Mixed Waste Landfill, Sandia National Laboratories, Bernalillo County, New Mexico, EPA ID #5890110518,* New Mexico Environment Department, Santa Fe, New Mexico, May 26, 2005.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

Peace et al. 2002 Peace, J.L., T.J. Goering, and M.D. McVey, 2002. *Report of the Mixed Waste Landfill Phase 2 RCRA Facility Investigation, Sandia National Laboratories, Albuquerque, New Mexico,* SAND Report SAND2002-2997, prepared by Sandia National Laboratories, Albuquerque, New Mexico for the U.S. Department of Energy under Contract DE-AC04-94AL85000, September.

SNL September 2018 Sandia National Laboratories, New Mexico (SNL/NM), September 2018. *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2019, 1st Quarter Sampling*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2018 Sandia National Laboratories, New Mexico (SNL/NM), June 2018. *Mixed Waste Landfill Annual Long-Term Monitoring and Maintenance Report, April 2017 – March 2018,* Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2018 Sandia National Laboratories, New Mexico (SNL/NM), March 2018. *Mixed Waste Landfill Groundwater Monitoring Mini-Sampling and Analysis Plan for Fiscal Year 2018, 3rd Quarter Sampling*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2017 Sandia National Laboratories, New Mexico (SNL/NM), June 2017. *Data Validation Procedure for Chemical and Radiochemical Data,* AOP 00-03, Revision 5, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2014 Sandia National Laboratories, New Mexico (SNL/NM), September 2014. *Installation of Three FLUTe™ Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2014 Sandia National Laboratories, New Mexico (SNL/NM), January 2014. *Work Plan for the Installation of Three Soil-Vapor Monitoring Wells (MWL-SV03, MWL-SV04, and MWL-SV05) at the Mixed Waste Landfill*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2012 Sandia National Laboratories/New Mexico (SNL/NM), March 2012. *Mixed Waste Landfill Long-Term Monitoring and Maintenance Plan,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2010 Sandia National Laboratories, New Mexico (SNL/NM), June 2010. *Mixed Waste Landfill Annual Groundwater Monitoring Report, Calendar Year 2009*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2010 Sandia National Laboratories, New Mexico (SNL/NM), January 2010, Revision 1. *Mixed Waste Landfill Corrective Measures Implementation Report*, Environmental Restoration Project, Sandia National Laboratories, New Mexico.

SNL November 2005 Sandia National Laboratories, New Mexico (SNL/NM), November 2005. *Mixed Waste Landfill Corrective Measures Implementation Plan*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL May 2003 Sandia National Laboratories, New Mexico (SNL/NM), May 2003. *Mixed Waste Landfill Corrective Measures Study*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, May 21, 2003.

SNL September 1990 Sandia National Laboratories, New Mexico (SNL/NM), September 1990. *Report of the Phase 1 RCRA Facility Investigation of the Mixed Waste Landfill*, Environmental Impact and Restoration Division, Sandia National Laboratories, Albuquerque, New Mexico.

5.0 Technical Area-V Groundwater Area of Concern

5.1 Introduction

Trichloroethene (TCE) and nitrate have been identified as constituents of concern (COCs) in groundwater at the Technical Area (TA)-V Groundwater (TAVG) Area of Concern (AOC) based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs). Low concentrations of TCE and nitrate have consistently been detected in the Regional Aquifer that is present at approximately 500 feet (ft) below ground surface (bgs). The EPA MCLs and State of New Mexico drinking water standards for TCE and nitrate (as nitrogen) are 5 micrograms per liter (µg/L) and 10 milligrams per liter (mg/L), respectively. Since 1993, the maximum concentrations detected in groundwater at the TAVG AOC have been 26 µg/L of TCE and 19 mg/L of nitrate (as nitrogen). In 2017, a Treatability Study of in-situ bioremediation (ISB) was implemented to evaluate the effectiveness of using ISB as a potential technology to treat the groundwater contamination at TAVG AOC (Section 5.1.7).

5.1.1 Location

TA-V is located in the west-central portion of Kirtland Air Force Base (KAFB), south of the City of Albuquerque (Figure 5-1 and Plate 1). TA-V occupies approximately 35 acres at the northeast corner of TA-III at Sandia National Laboratories, New Mexico (SNL/NM).

The vadose zone at TA-V is approximately 500 ft thick and consists of heterogeneous, lenticular, coarse- to fine-grained deposits. The underlying aquifer consists of unconsolidated fine-grained, clay-rich, alluvial fan sediments. Groundwater flows predominantly from east to west. To the west of TA-V, groundwater flow becomes more northerly in response to pumping from the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) water supply wells located north of KAFB, and from the KAFB water supply wells located in the northern portion of KAFB.

5.1.2 Site History

TA-V was established in 1961 to test radiation effects on components and has hosted multiple generations of research reactors, the Gamma Irradiation Facility, the Low-Dose-Rate Irradiation Facility, and the Hot Cell Facilities. Historically, wastewater derived from TA-V facilities was disposed at the Liquid Waste Disposal System (LWDS) Drain Field, the two unlined LWDS Surface Impoundments, and the TA-V Seepage Pits. Since the discovery of groundwater contamination in 1992, SNL/NM Environmental Restoration (ER) Operations personnel have conducted numerous investigations in the TAVG AOC (Attachment 5A, Table 5A-1). Many of these investigations (soil and soil-vapor) were site-specific and were conducted for supporting various Solid Waste Management Unit (SWMU) assessments. Early groundwater investigations relevant to the TAVG AOC were typically regional in scope and were conducted by the SNL/NM Site-Wide Hydrogeologic Characterization Project (SNL February 1998).

5.1.3 Monitoring History

Since 1992, SNL/NM ER Operations has conducted numerous environmental and groundwater investigations in the TAVG AOC. The historic timeline (Attachment 5A, Table 5A-1) lists the field investigations concerning groundwater quality.

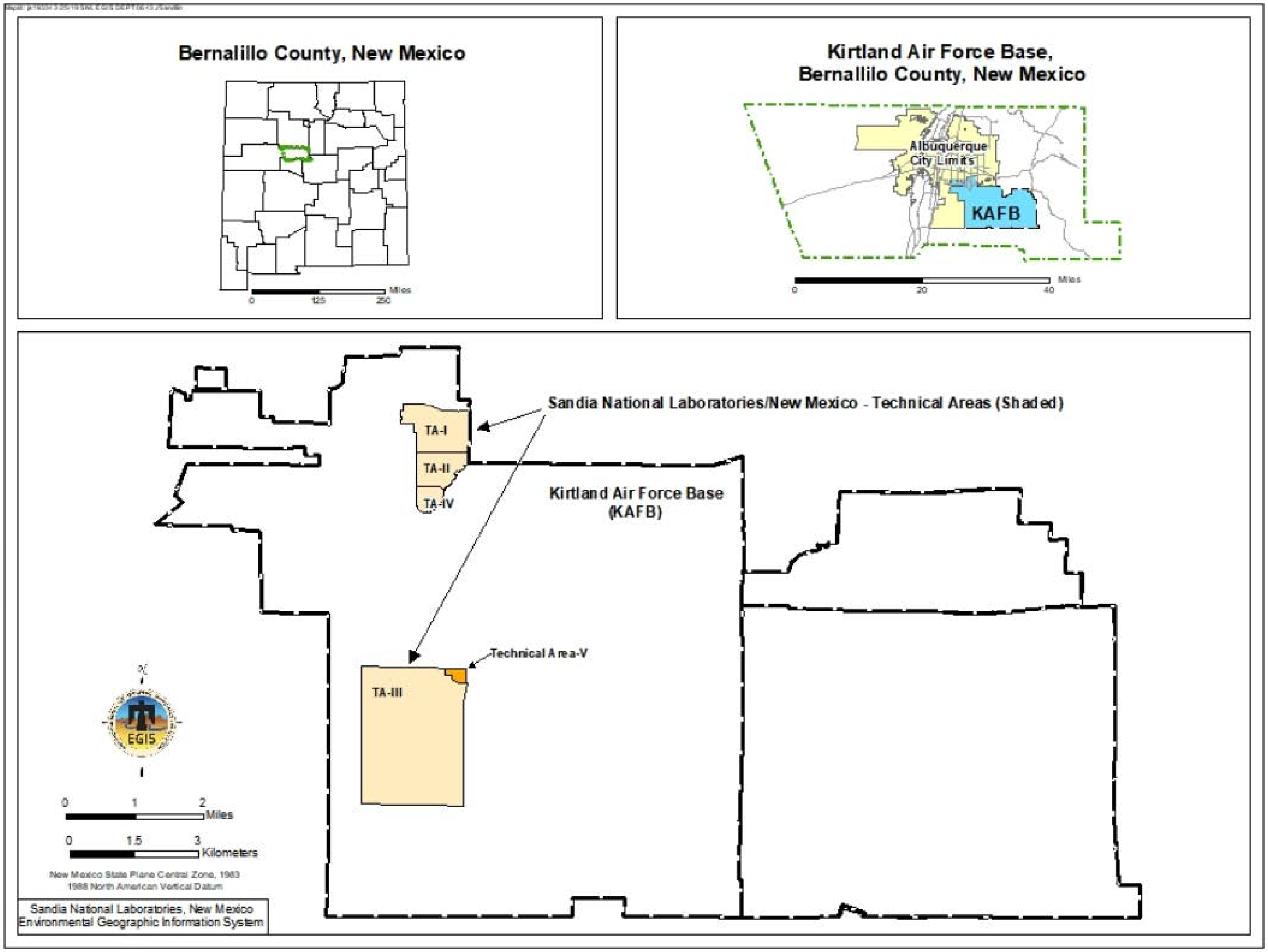


Figure 5-1. Location of SNL/NM and TA-V

The majority of the SWMU investigations involved shallow soil contamination. Where required, contaminated soil was excavated and removed. The New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) has granted Corrective Action Complete status to all 21-soil site SWMUs in the TAVG AOC (SNL September 2015). Only the groundwater issue remains.

Groundwater monitoring at TA-V began in October 1992. TCE was first detected in monitoring well LWDS-MW1 in November 1993 and first detected above the MCL of 5 µg/L in the same well in September 1995. Since then, low concentrations of TCE have been consistently detected at several monitoring wells. Nitrate was first detected above the MCL of 10 mg/L in monitoring well LWDS-MW1 in December 1995. Since the discoveries of TCE and elevated nitrate concentrations in groundwater, numerous characterization activities have been conducted at the TAVG AOC.

The monitoring network at TAVG AOC has been expanded to 18 groundwater monitoring wells and three soil-vapor monitoring wells. Soil-vapor samples were collected from the three soil-vapor monitoring wells (TAV-SV01, TAV-SV02, and TAV-SV03) for eight consecutive quarters starting in May 2011 and concluding in March 2013. Samples were analyzed for volatile organic compounds (VOCs), including TCE. The analytical results were reported in Attachment 5D of the Calendar Year (CY) 2013 Annual Groundwater Monitoring Report (SNL June 2014) and the results are summarized in Section 5.1.6.5. Groundwater monitoring results for the TAVG AOC monitoring network continue to be summarized in the Annual Groundwater Monitoring Reports.

5.1.4 Current Monitoring Network

In CY 2018, 18 monitoring wells in the TAVG AOC were sampled for site-characterization purposes and measured for water levels (Figure 5-2; Table 5-1). Table XI-1 of the Compliance Order on Consent (Consent Order) specified a quarterly sampling frequency for groundwater monitoring at TA-V (NMED April 2004). However, the sampling frequency was revised in accordance with the Revised Treatability Study Work Plan (TSWP) (Department of Energy [DOE] March 2016a) as approved by NMED HWB (NMED HWB May 2016a). The new sampling protocol was previously implemented in CY 2017. Details are provided in Section 5.3.

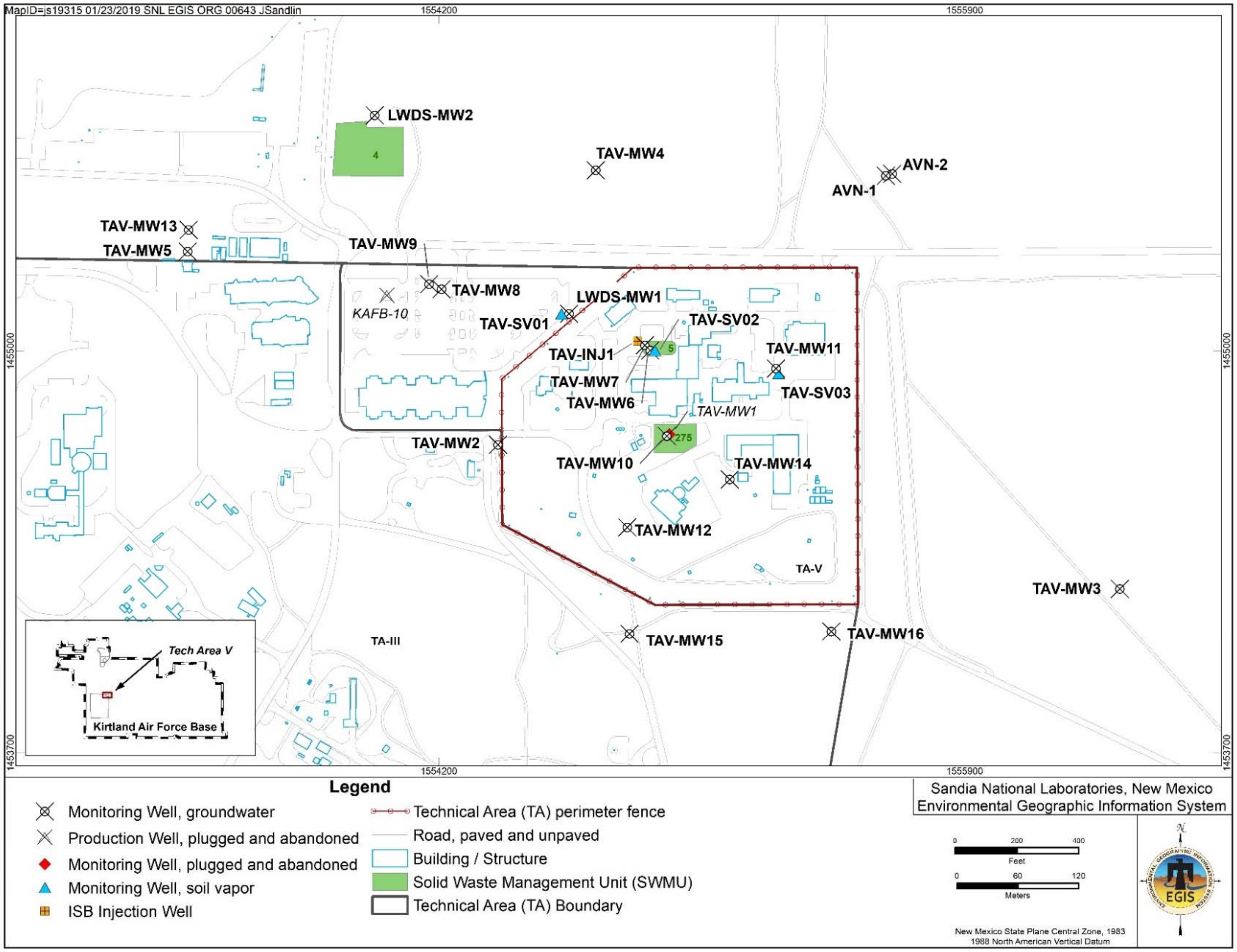


Figure 5-2. TAVG AOC Monitoring Well Locations

Table 5-1. Groundwater Monitoring and Injection Wells Screened in the Regional Aquifer at the TAVG AOC

Well ID	Installation Year	WQ	WL	Comments
AVN-1	1995	√	√	Deeper completion (570–590 ft bgs)
AVN-2	1995	NA	NA	Water table completion (492-515 ft bgs), dry since April 2008
LWDS-MW1	1993	√	√	Water table completion (495-515 ft bgs)
LWDS-MW2	1992	√	√	Water table completion (506-526 ft bgs)
TAV-INJ1	2017	√*	√	Water table completion (509-539 ft bgs)
TAV-MW1	1995	NA	NA	Water table completion (489.5-509.5 ft bgs), P&A in February 2008
TAV-MW2	1995	√	√	Water table completion (497-513.5 ft bgs)
TAV-MW3	1997	√	√	Water table completion (532-552 ft bgs)
TAV-MW4	1997	√	√	Water table completion (495-515 ft bgs)
TAV-MW5	1997	√	√	Water table completion (487-507 ft bgs)
TAV-MW6	2001	√*	√	Water table completion (507-527 ft bgs)
TAV-MW7	2001	√	√	Deeper completion (597–617 ft bgs)
TAV-MW8	2001	√	√	Water table completion (491-511 ft bgs)
TAV-MW9	2001	√	√	Deeper completion (582–602 ft bgs)
TAV-MW10	2008	√	√	Water table completion (508-528 ft bgs), replaced TAV-MW1
TAV-MW11	2010	√	√	Water table completion (512-532 ft bgs)
TAV-MW12	2010	√	√	Water table completion (507-527 ft bgs)
TAV-MW13	2010	√	√	Deeper completion (525–545 ft bgs)
TAV-MW14	2010	√	√	Water table completion (512-532 ft bgs)
TAV-MW15	2017	√	√	Water table completion (516-541ft bgs)
TAV-MW16	2017	√	√	Water table completion (527-552 ft bgs)
Total	NA	17	19	Total for AGMR reporting

NOTES:

(1) Check marks (√) indicate WQ sampling and WL measurements were obtained during this reporting period. Check marks with an asterisk (√*) indicate that sampling results are solely presented in the Discharge Permit 1845 quarterly reports.

(2) Injection well TAV-INJ1 has two screens installed in a single borehole. The 5-inch-diameter monitoring screen extends from 509 to 539 ft bgs. The 1.5-inch diameter injection screen extends from 519 to 539 ft bgs). The primary sandpack (2-millimeter SilLibeads®) extends from 504 to 544.5 ft bgs.

AOC = Area of Concern.
AVN = Area-V (North).
bgs = Below ground surface.
ft = Foot (feet).
ID = Identifier.
INJ = Injection Well
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
NA = Not applicable.
P&A = Plugged and abandoned (decommissioned)
TAV = Technical Area-V (monitoring well designation).
TAVG = Technical Area-V Groundwater.
WL = Water level.
WQ = Water quality.

5.1.5 Summary of Calendar Year 2018 Activities

The following activities were conducted for the TAVG AOC during CY 2018:

- Obtained quarterly water level measurements.

- Prepared sampling and analysis plans using a combination of quarterly and annual frequencies. The sampling events were conducted in February 2018, May/June 2018, July/August/September 2018, and November 2018.

- Prepared a set of summary tables for the analytical results (Attachment 5B), concentration versus time plots (Attachment 5C), and hydrographs (Attachment 5D).

- Began full-scale operation of the Treatability System in October 2018 with the first injection of treatment solution occurring on November 1, 2018. Through the end of CY 2018, a series of 26 injections totaling 137,573 gallons of treatment solution were discharged to the Regional Aquifer using injection well TAV-INJ1.

- Collected water samples for Discharge Permit (DP) 1845 (DP-1845) compliance activities involving the DP-specific analytes. The corresponding analyses are reported in the DP-1845 Quarterly Reports that are submitted to the NMED Ground Water Quality Bureau (GWQB). The DP is discussed below in Section 5.1.7.

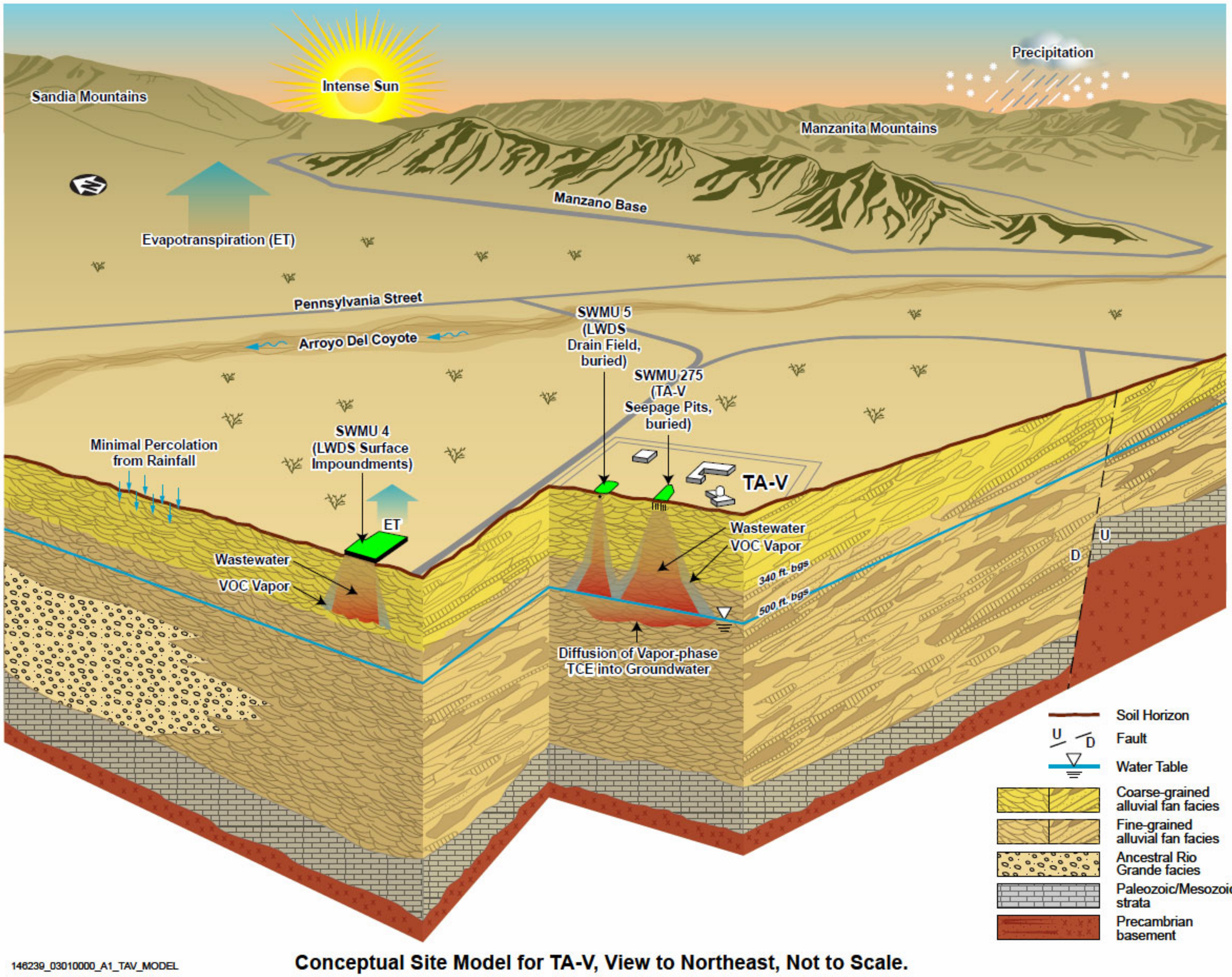
5.1.6 Conceptual Site Model

This section summarizes the Conceptual Site Model (CSM) for the TAVG AOC (Figure 5-3). The CSM was updated in 2015 and illustrates the geological and hydrogeological framework, contaminant sources, and the distribution and migration paths of contaminants in the subsurface at TA-V (SNL September 2015).

5.1.6.1 Regional Hydrogeologic Conditions

TA-V is located within the Albuquerque Basin of the Rio Grande Rift in north-central New Mexico. The Rio Grande Rift is marked by a series of sediment-filled structural basins and adjoining uplifted mountain ranges. One of these basins, the Albuquerque Basin (also known as the Middle Rio Grande Basin), covers about 3,060 square miles in central New Mexico and extends from Cochiti Reservoir on the north to San Acacia, New Mexico on the south. The Albuquerque Basin includes TA-V and the western portion of KAFB.

The sedimentary deposits of the Santa Fe Group and overlying alluvium that fill the Albuquerque Basin contain the regional Santa Fe Group aquifer system. This aquifer system provides the primary source of municipal, domestic, and industrial water in the Albuquerque area. The structure of the aquifer system within the Middle Rio Grande Basin is complex (Bartolino and Cole 2002). The major hydrostratigraphic units in the aquifer are tabular and wedge-shaped bodies that are truncated and displaced by numerous faults. Few of the major units are present continuously throughout the basin, and most "pinch out" against the subsurface basement blocks. These major units are hundreds to thousands of feet thick, extend over tens of square miles, and primarily consist of unconsolidated and partially cemented deposits that interfinger in complex arrangements.



Conceptual Site Model for TA-V, View to Northeast, Not to Scale.

Figure 5-3. Conceptual Site Model for the TAVG AOC (SNL September 2015)

TA-V is largely underlain by a thick section of alluvial fan deposits. The alluvial fan lithofacies are subdivided into lower and upper sections. The lower section consists of a fine-grained, clay-rich unit. This unit has been identified as low-energy piedmont deposits derived from upland soil that developed during a preglacial humid climate. The upper section consists of relatively coarse-grained sediments deposited in a higher-energy environment. The total thickness of the alluvial fan deposits are typically thousands of feet thick. The water table of the Santa Fe Group aquifer is located in the fine-grained lower unit of alluvial fan deposits. The post-Santa Fe Group alluvial fan deposits blanket the area around TA-V and compose the upper few tens of feet of the vadose zone. These deposits were derived primarily from alluvial fans that developed from Coyote Canyon to the east.

Prior to development of water resources in the Albuquerque area, the groundwater flow direction in the Albuquerque Basin was generally from the north to the south, with a westward component of flow from recharge areas along mountain-front boundaries to the east (Bartolino and Cole 2002). As the Santa Fe Group – Regional Aquifer was developed as a source for municipal and industrial water supplies, groundwater flow directions were altered toward water supply wells to the north of TA-V. A minor amount of discharge occurs as groundwater moves out of the Albuquerque Basin into downgradient basins along the Rio Grande Rift as underflow or through discharge to the Rio Grande.

5.1.6.2 Hydrologic Conditions at the TAVG AOC

Average annual precipitation is approximately 9.45 inches for the Albuquerque area (Chapter 2.6.2.1). Most precipitation falls between July and October, mainly in the form of brief, heavy rains associated with thunderstorms. Potential evapotranspiration in the Albuquerque area greatly exceeds precipitation. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall. Precipitation as a source of aquifer recharge is considered minimal and is unlikely to be a mechanism for transporting contaminants through the approximately 500-ft thick vadose zone.

Tijeras Arroyo and Arroyo del Coyote are located to the north and northeast of TA-V, respectively. The flow of surface water in the arroyos consists of brief ephemeral flows from mountainous drainages located to the east. Part of the recharge derived from infiltration of these flows is returned to the atmosphere through evapotranspiration. Some water that infiltrates the arroyo channels may move past the root zone and provide some local recharge. However, the distance between these ephemeral channels and TA-V precludes a significant effect on the local groundwater flow and contaminant transport. The active channels for Tijeras Arroyo and Arroyo del Coyote are located approximately 1.7 and 0.6 miles, respectively, from TA-V.

The vadose zone, consisting of approximately 500 ft of unconsolidated to semiconsolidated alluvial fan sediments, forms the potential pathway for COC transport from surface and shallow subsurface contaminant sources to the aquifer. The upper section of the alluvial fan sediments is relatively coarse-grained, becoming fine-grained and clay-rich at depths ranging from approximately 320 to 360 ft bgs across TA-V. The hydraulic properties of the vadose zone are highly variable and anisotropic because of the heterogeneous textures, lenticularity, layering, and variations in carbonate cementation. Disposal of large volumes of wastewater from the LWDS Drain Field (SWMU 5), the LWDS Surface Impoundments (SWMU 4), and the TA-V Seepage Pits (SWMU 275) may have occurred along preferential pathways through the thick vadose zone to the aquifer. Vertical flow through the discontinuous, layered, lenticular sediments in the vadose zone was most likely attenuated or diverted at horizons of varying hydraulic properties.

No evidence of groundwater perching above the Regional Aquifer has been observed at TA-V. Based on moisture content measurements of vadose zone sediment samples, minimal moisture remains in the vadose zone from historical wastewater disposal at TA-V (SNL September 2015).

Values of horizontal hydraulic conductivity for the alluvial fan sediments were determined using aquifer pumping tests and slug tests. Aquifer pumping (and recovery) data were collected at two monitoring wells, AVN-1 and TAV-MW2, and the hydraulic conductivities were 38.3 and 0.09 feet per day (ft/day), respectively. Slug tests were conducted at the 18 monitoring wells that were installed prior to 2017. The estimates of horizontal hydraulic conductivities ranged from 0.04 to 30.82 ft/day. The wide range of hydraulic conductivities is attributed to the textural heterogeneities associated with the alluvial fan lithofacies. To reduce the bias of a few higher values, a geometric mean was calculated using the data from all 18 wells. The geometric mean hydraulic conductivity was 1.25 ft/day (SNL September 2015). Vertical hydraulic conductivity is typically estimated to be one-tenth to one-hundredth the horizontal hydraulic conductivity.

The geochemical signatures for groundwater samples collected at all of the TA-V monitoring wells are similar indicating that the wells are screened in the same hydrostratigraphic interval and are therefore in direct hydraulic communication with each other (SNL September 2015). The groundwater is classified as a calcium-bicarbonate type.

For the TA-V CCM, vertical hydraulic gradients were calculated using three well pairs (SNL/NM September 2015). Between monitoring well pairs TAV-MW5 and TAV-MW13, the hydraulic gradient was downward at 0.12 feet per foot (ft/ft). Between TAV-MW6 and TAV-MW7, the hydraulic gradient was downward at 0.04 ft/ft. Between TAV-MW8 and TAV-MW9, the hydraulic gradient was similarly downward at 0.05 ft/ft.

5.1.6.3 Direction of Groundwater Flow

Table 5-2 lists the water levels measured in the current network of 18 monitoring wells that were used to construct the 2018 potentiometric surface for the TAVG AOC (Figure 5-4). The general orientation of the localized potentiometric surface contours shown on Figure 5-4 is consistent with the base-wide potentiometric surface map (Plate 1). The potentiometric surface indicates that the groundwater flow at TA-V is generally to the west, with localized flow to the south and southwest. The Regional Aquifer exhibits unconfined conditions. The horizontal gradient ranges from approximately 0.004 to 0.01 ft/ft. The horizontal groundwater flow velocity at TA-V was calculated from the range of horizontal hydraulic conductivities (0.04 to 30.8 ft/day), a representative horizontal hydraulic gradient of 0.005 ft/ft, and an assumed effective porosity of 0.25. The estimates for linear groundwater flow velocity range greatly (approximately three orders of magnitude) from 0.29 to 225 feet per year (ft/yr) (SNL/NM September 2015).

A subtle mound in the water table near monitoring wells LWDS-MW2 and TAV-MW8 is evident on Figure 5-4. This mounding of approximately 0.5 to 0.8 ft has persisted for several years. The groundwater mound is most likely an artifact of laterally variable water-level declines within the heterogeneous and anisotropic aquifer that is undergoing regional drainage due to the combined effect of pumping at the KAFB and ABCWUA water supply wells. Mounding occurs where the sediments have lesser degrees of hydraulic conductivity than the surroundings and thus drain relatively slower.

Figures 5D-1 through 5D-3 (Attachment 5D) present the groundwater level fluctuations on a series of hydrographs for the 18 monitoring wells in the TA-V monitoring network. Groundwater elevations have steadily declined at all TAVG monitoring wells. The declines are due to the combined pumping of the Regional Aquifer by the KAFB and ABCWUA water supply wells. The rates of decline range from 0.51 to 0.88 ft/yr with an average decline rate of 0.75 ft/yr. In general, the rates of decline are higher to the east than to the west, with the groundwater elevation declining fastest in monitoring well TAV-MW3 and slowest in monitoring well TAV-MW5. The dewatering of the aquifer is expected to continue as long as pumping of water supply wells in the region continues.

Since late 2008, groundwater levels for Regional Aquifer wells in the northern part of KAFB have shown an increasing trend. Presumably, this is in response to the ABCWUA transitioning to surface water for potable water supplies and the decreased dependence on water supply wells immediately north of KAFB. However, this trend has not been seen as far south as TA-V.

Table 5-2. Groundwater Elevations Measured in September/October 2018 at TAVG AOC

Well ID	Measuring Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)
AVN-1	5443.00	3-Oct-2018	527.04	4915.96
LWDS-MW1	5423.83	3-Oct-2018	505.15	4918.68
LWDS-MW2	5412.41	3-Oct-2018	493.88	4918.53
TAV-INJ1	5429.70	26-Sep-2018	511.76	4917.94
TAV-MW2	5427.33	3-Oct-2018	509.44	4917.89
TAV-MW3	5464.30	3-Oct-2018	547.86	4916.44
TAV-MW4	5427.89	3-Oct-2018	509.45	4918.44
TAV-MW5	5408.71	3-Oct-2018	492.64	4916.07
TAV-MW6	5431.17	25-Sep-2018	513.09	4918.08
TAV-MW7	5430.40	24-Sep-2018	515.44	4914.96
TAV-MW8	5417.00	3-Oct-2018	498.00	4919.00
TAV-MW9	5416.27	3-Oct-2018	501.42	4914.85
TAV-MW10	5437.03	4-Oct-2018	519.17	4917.86
TAV-MW11	5440.12	4-Oct-2018	522.07	4918.05
TAV-MW12	5435.72	4-Oct-2018	518.58	4917.14
TAV-MW13	5409.02	3-Oct-2018	497.62	4911.40
TAV-MW14	5441.52	4-Oct-2018	525.71	4915.81
TAV-MW15	5437.32	3-Oct-2018	520.56	4916.76
TAV-MW16	5448.34	3-Oct-2018	532.10	4916.24

NOTES:

amsl = Above mean sea level.
AOC = Area of Concern.
AVN = Area-V (North).
btoc = Below top of casing (the measuring point).
ID = Identifier.
INJ = Injection well.
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
NAVD 88 = North American Vertical Datum of 1988.
TAV = Technical Area-V.
TAVG = Technical Area-V Groundwater.

5.1.6.4 Contaminant Sources

Contaminant migration in the subsurface is primarily controlled by infiltration of wastewater historically disposed of at TA-V and by the low permeability of the sedimentary units in the vadose zone and the Regional Aquifer. Limited amounts of natural recharge are a minor factor, with possible sources including precipitation and ephemeral flows in nearby arroyos.

Prior to 1993, the majority of wastewater disposed at TA-V occurred at SWMUs 4, 5, and 275 (Figure 5-2 and 5-4). Table 5-3 lists the dates of disposal and the estimated volumes. Small volumes of TCE and other organic solvents were presumably present in wastewater that was disposed to the LWDS Drain Field (SWMU 5) from 1962 to 1967, to the LWDS Surface Impoundments (SWMU 4) from 1967 to 1972, and to the TA-V Seepage Pits (SWMU 275) from the 1960s until the early 1980s, when disposal practices were modified to protect the environment. Wastewater continued to be disposed at the seepage pits from the early 1980s until 1992 but contained no organic solvents such as TCE. This continued discharge of wastewater likely flushed residual contaminants to the aquifer. After 1992, the sanitary waste and wastewater piping were connected to the ABCWUA sanitary sewer system. Upon cessation of wastewater disposal to the subsurface, vertical pathways to the aquifer were drained by gravity.

Table 5-3 presents the disposal periods, estimated disposal volumes, types of wastewater, and design characteristics for the three high-discharge SWMUs. The total discharge volume is estimated to range from 48.5 to 68.5 million gallons. SWMU 275 had the greatest discharge volume, accounting for up to 73 percent of the total discharge at TA-V. The average disposal rate for the three SWMUs ranged from approximately 1 to 2.4 million gallons per year. The types of wastewater consisted of reactor cooling water, industrial water (from sinks and drains in radiochemistry laboratories and assembly shops), and septic (sanitary sewer) water.

Table 5-3. Wastewater and Septic Water Disposal History at TA-V

Disposal Site	Dates	Estimated Volume (Gal.)	Percentage of the Estimated Total Volume[a]	Average Disposal Volume in Million Gal. per Year	Primary Types of Wastewater	Design Characteristics
SWMU 4 - LWDS Surface Impoundments	1967–1972	12 million	18 – 25	2.4	Reactor cooling water and industrial water	Two unlined impoundments, total 0.4 acres
SWMU 5 - LWDS Drain Field	1962–1967	6.5 million	9 – 13	1.3	Reactor cooling water and industrial water	One buried, perforated horizontal pipe, 60-ft long, 36-ft deep, 3-ft diameter
SWMU 275 - TA-V Seepage Pits	1960s–1992	30 to 50 million[b]	62 – 73	1 to 1.6[c]	Septic water and industrial water	Six buried, open-bottomed cylinders, 20-ft deep, 6.5-ft diameter
Total Range for Three Sites	1962–1992	48.5 to 68.5 million				

[a] Percentage calculated using the range of volumes for total discharge (48.5 to 68.5 million gallons).

[b] Assumes 30 years of discharge at seepage pits.

[c] Seepage pits were used intermittently for discharge of local surface water runoff and wastewater from sinks and floor drains until 1992. The unmonitored volume is assumed to be negligible.

ft = Foot or feet.
Gal. = Gallon.
LWDS = Liquid Waste Disposal System.
SWMU = Solid Waste Management Unit.
TA-V = Technical Area-V.

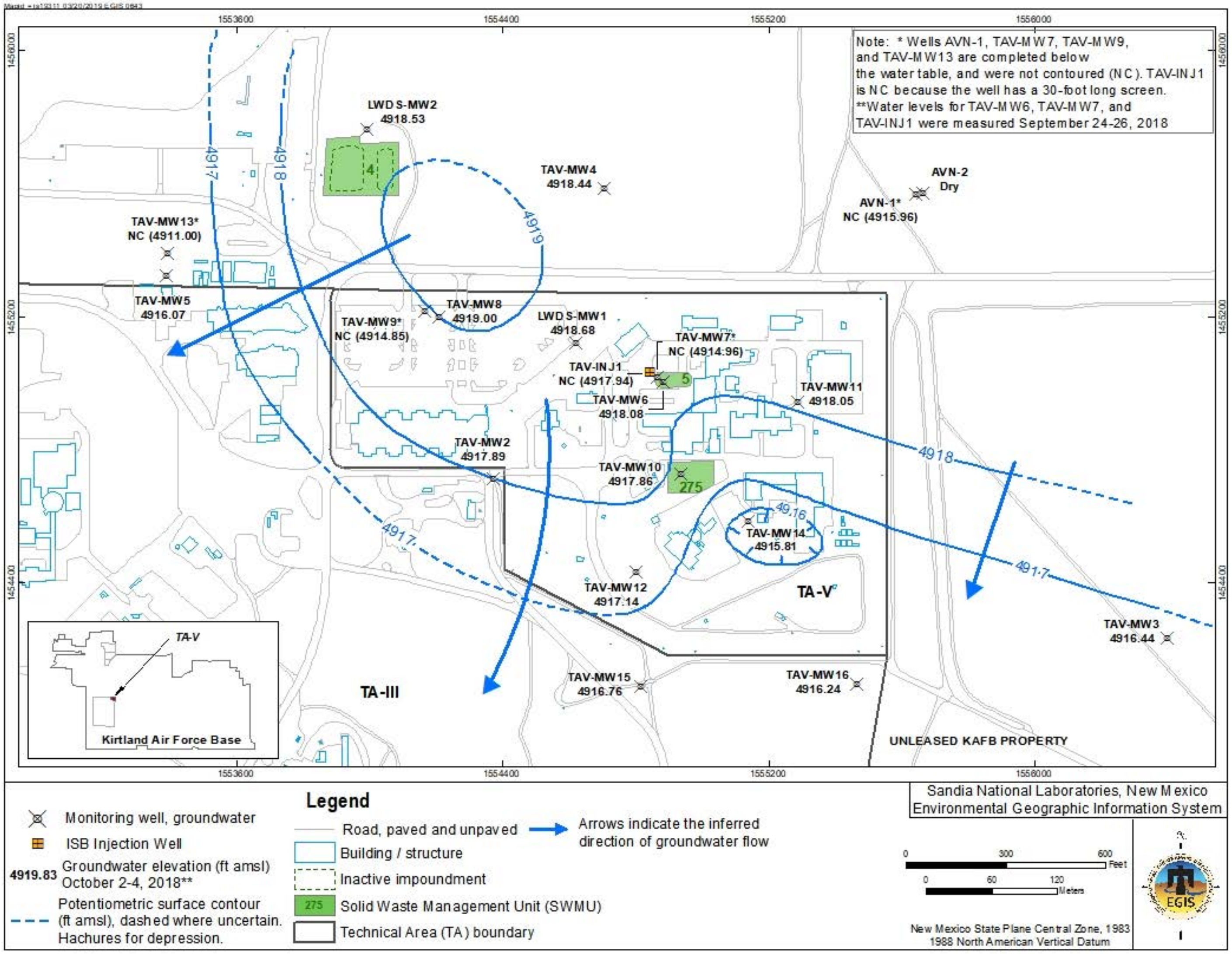


Figure 5-4. Potentiometric Surface of the Regional Aquifer at the TAVG AOC (September/October 2018)

The large surface area of the impoundments (approximately 0.4 acres) could have facilitated significant evaporation of wastewater and VOCs. This likely minimized the depth of percolation. Also, the volume of water disposed of at SWMU 4 was relatively minor consisting of approximately 10 percent of the total TA-V volume. Historical groundwater sampling results from monitoring well LWDS-MW2, located to the immediate north of the surface impoundments, indicate that wastewater disposed at the surface impoundments did not impact groundwater. TCE has never been detected in groundwater samples from monitoring well LWDS-MW2, and nitrate concentrations have never exceeded the MCL.

Elevated nitrate concentrations in groundwater at TA-V are likely derived from sanitary waste disposals to the subsurface. Sanitary waste disposals continued until 1992 when the disposals were routed to the ABCWUA sanitary sewer system. Nitrate is considered a conservative constituent with regard to transport because it is highly soluble in water, is not typically sorbed to sediments, and is not biotransformed under the aerobic groundwater conditions like those exhibited at TA-V. Therefore, any locally derived, elevated concentrations of nitrate were most likely transported through the vadose zone along with the wastewater and sanitary discharges.

Nitrate concentrations that may be naturally higher than the NMED-specified background (4 mg/L) have been reported for two monitoring wells located upgradient of TA-V. Monitoring wells AVN-1 and AVN-2 are co-located approximately 310 ft northeast of TA-V. The wells have historically showed similar nitrate plus nitrite (NPN) (reported as nitrogen) concentrations. The maximum NPN concentration for well AVN-1 was 11.8 mg/L in June 2009. The maximum NPN concentration for well AVN-2 was 10.7 mg/L in December 2004. Monitoring well AVN-2 has been dry since April 2008 and has a screen approximately 75 ft shallower than well AVN-2. Elevated nitrate concentrations at these two wells may be related to the leaching of naturally occurring nitrate in the vadose zone by the infiltration of surface water through nitrate-bearing soils along Arroyo del Coyote. Examples of such occurrences have been documented at several locations in the arid southwest United States (Walvoord et al., November 2003).

5.1.6.5 Contaminant Distribution and Transport in Groundwater

The distribution and transport of COCs in groundwater are discussed in this section. Vapor migration of VOCs in the vadose zone is also a possible transport mechanism. As discussed below, the concentrations of nitrate and TCE in groundwater are detected at the locations where approximately 90 percent of the TA-V wastewater and sanitary waste was disposed. This percentage was disposed at SWMUs 5 and 275.

Within the LWDS Drain Field (SWMU 5), trace quantities of TCE, tetrachloroethene, and benzene were detected in shallow soil-vapor samples collected during 1994 (SNL March 1999). The possibility of vadose zone contamination was further investigated with the installation of groundwater monitoring wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 in March and April 2001. The results of soil-core and soil-vapor samples collected during well installation showed no significant residual VOCs in the vadose zone. Also, there was no evidence of excessive moisture in the vadose zone sediments; therefore, no significant residual wastewater was present in the vadose zone beneath the LWDS Drain Field (SNL October 2001). In the vicinity of the TA-V Seepage Pits (SWMU 275), trace quantities of TCE, tetrachloroethene, benzene, toluene, and total xylene were detected in soil-vapor samples collected during passive, surficial characterization studies conducted in 1994 and 1995 (SNL March 1999).

To characterize the vertical extent of VOCs in the vadose zone at SWMUs 5 and 275, three soil-vapor monitoring wells (TAV-SV01, TAV-SV02, and TAV-SV03) were installed in 2010 (Figure 5-2). Each well was constructed with a series of ten 1-foot long stainless-steel screens set at 50-ft intervals from 50 to 500 ft bgs. The three soil-vapor wells were sampled for eight consecutive quarters (May 2011 through March 2013). The samples were analyzed for VOCs, including TCE. The analytical results were previously reported in the CY 2013 Annual Groundwater Monitoring Report (SNL June 2014). TCE was the most prevalent VOC in the vadose zone. Trend analysis for the eight quarters strongly indicates that soil-vapor concentrations have stabilized in the vadose zone (SNL September 2015). Without an active driving force (such as wastewater disposal), it is unlikely for the TCE in the vadose zone to act as an ongoing contaminant source to groundwater. TCE is hydrophobic with a water solubility of 1,100 mg/L at 20 degrees Celsius. Some TCE will be retained in the vadose zone due to sorption to fine-grained materials, as well as dissolution in pore water.

Variability in hydraulic conductivities has likely affected the historical distribution of TCE and NPN in groundwater. The roughly northwest-southeast orientation of the two plumes is approximately perpendicular to the direction of groundwater flow. Using a representative horizontal hydraulic gradient of 0.005 ft/ft and an assumed effective porosity of 0.25, the linear groundwater flow velocities were calculated to be 0.29, 8.3, and 30 ft/yr in the vicinity of monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10, respectively. The plume orientations are due to a combined effect of variable hydraulic conductivities, stratigraphic variations, and multiple contaminant release sites.

Contaminant transport mechanisms in groundwater potentially include advection, dispersion, diffusion, biodegradation, and sorption (SNL September 2015). Groundwater monitoring results over the past two decades indicate that advection is not the main force driving contamination migration, most likely because of the low localized groundwater flow velocities. With limited advection, dispersion and diffusion become important transport mechanisms. While nitrate does not tend to sorb to sediments, TCE is a hydrophobic organic compound and sorbs to the organic matter in the aquifer matrix. Sorption is also a reversible process. As the dissolved contaminant concentration in groundwater decreases due to advection (although limited), the initial sorbed TCE portion will tend to desorb and reenter groundwater through equilibration processes. The comparatively stable TCE concentration contours over the last several years can be attributed to the relatively slow processes of dispersion and diffusion, and the reversible sorption process.

TCE has been consistently detected above the MCL of 5 µg/L at four monitoring wells: LWDS-MW1, TAV-MW6, TAV-MW10, and TAV-MW12 (SNL July 2018). TCE has also been detected near or below the MCL at six other monitoring wells (TAV-MW2, TAV-MW4, TAV-MW8, TAV-MW11, TAV-MW14, and TAV-MW16). TCE has never been detected in the remaining eight monitoring wells. The analytical results for CY 2018 are discussed below in Section 5.6.

5.1.6.6 Biodegradation and Stable Isotope Studies

The potential for natural (intrinsic) biodegradation to occur at TA-V was evaluated in two assessments (SNL July 2004 and SNL April 2005). The anaerobic biodegradation assessment involved the collection of groundwater samples from 10 monitoring wells and analyses for dissolved gases and dechlorination products (SNL July 2004; Appendix E in SNL September 2015). The assessment quantitatively scored 18 parameters and concluded that anaerobic reductive dechlorination was not a significant process contributing to the natural attenuation of VOCs. Nitrate was qualitatively assessed; biologically mediated transformation of nitrate was not likely to occur. To summarize, natural attenuation was not viable for the anaerobic degradation of TCE nor for the denitrification of TA-V groundwater.

The second assessment evaluated aerobic biodegradation. Groundwater samples were collected from 10 monitoring wells (SNL April 2005; Appendix G in SNL September 2015). The study coupled enzymatic probes with DNA analyses of the native groundwater. Aerobic TCE cometabolism by the indigenous microbial population was determined to be an existing mechanism for natural attenuation at TA-V. Denitrification was not evaluated in this study.

A study of denitrification parameters and isotopic signatures was conducted in 2013. Groundwater samples were collected from eight monitoring wells (LWDS-MW1, TAV-MW2, TAV-MW5, TAV-MW6, TAV-MW7, TAV-MW8, TAV-MW9, and TAV-MW10) and analyzed for stable isotopes (nitrogen-14 / nitrogen-15 and oxygen-16 / oxygen-18), dissolved gases (nitrogen and argon), and total organic carbon. The study concluded that natural denitrification was not apparent in TA-V groundwater (Madrid et al. June 2013; Appendix F in SNL September 2015).

5.1.6.7 Potential Receptors of TA-V Groundwater Contamination

The potential for groundwater to reach receptor wells was evaluated in the TA-V Current Conceptual Model (CCM) Report (SNL September 2015). Water supply wells completed in the Regional Aquifer are the only potential exposure points for the COCs in TA-V groundwater to reach human receptors. However, no consumptive use of groundwater currently occurs within 2.8 miles of TA-V. Water supply well KAFB-4, the nearest downgradient water supply well, is located approximately 2.8 miles north-northwest of TA-V. Additional water supply wells are located farther north near the northern boundary of KAFB and are operated by KAFB, the Veterans Administration, and the ABCWUA. The results of MODFLOW modeling (SNL/NM July 2005) demonstrated that contaminants in TA-V groundwater do not pose a threat to those water supply wells. The proposed Mesa del Sol well field, located approximately 3 miles west of TA-V, is unlikely to be a receptor in the foreseeable future. It is improbable that KAFB and ABCWUA pumping will be discontinued and the groundwater flow path would revert to a westward direction.

In summary, the potential for adverse impacts on human health or environmental receptors is considered very low from the groundwater contamination currently present at the TAVG AOC. There is no current or anticipated use of groundwater in the immediate vicinity of TA-V. Thus, there is no foreseeable risk to human health or a threat to the beneficial use of groundwater downgradient of TA-V.

5.1.7 Treatability Study of In-Situ Bioremediation

In 2015, personnel from the DOE/National Nuclear Security Administration (NNSA), DOE Headquarters Office of Environmental Management, SNL/NM, and NMED HWB worked together to address the groundwater contamination at TAVG AOC. All parties agreed on a two-phase Treatability Study to evaluate the effectiveness of ISB as a potential technology to treat groundwater contamination at the TAVG AOC.

5.1.7.1 In-Situ Bioremediation

The technical approach for the Treatability Study is to induce biodegradation of TCE and nitrate by gravity injecting a nutrient-amended treatment solution containing biodegradation bacteria into the Regional Aquifer. Aquifer conditions near the injection well are modified from aerobic to anaerobic conditions so that biodegradation is enhanced. The intent of this action is to reduce nitrate concentrations through denitrification followed by reductive dechlorination of TCE that is dissolved in groundwater and sorbed to solids (primarily the clay fractions). Biodegradation will ultimately convert these contaminants into innocuous breakdown products.

5.1.7.2 Treatability Study Work Plan

DOE/NNSA and SNL/NM personnel submitted a TSWP to NMED HWB on October 20, 2015 (DOE October 2015) but it was disapproved on December 3, 2015 (NMED HWB December 2015). A Revised TSWP and response to the disapproval letter was submitted to NMED HWB in March 2016 (DOE March 2016a). NMED HWB approved the Revised TSWP on May 20, 2016 (NMED HWB May 2016b).

Per the revised TSWP, up to three injection wells (TAV-INJ1, TAV-INJ2, and TAV-INJ3) would be installed in the vicinity of monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10, respectively, where the highest contaminant concentrations in groundwater have been detected. A treatment solution containing essential food and nutrients for biostimulation would be prepared in aboveground tanks and gravity-injected into the Regional Aquifer via the injection wells.

The Treatability Study would be conducted in two phases. Phase I includes a pilot test followed by full-scale operation at the first injection well (TAV-INJ1) for a period of approximately six months followed by two years of performance monitoring. Phase II involves the installation of two additional injection wells (TAV-INJ2 and TAV-INJ3) and conducting additional full-scale operations. The Phase I injection well (TAV-INJ1) was installed in October 2017. A decision to install the Phase II injection wells is dependent upon the findings of the Phase I full-scale operation. Approximately 530,000 gallons of treatment solution would be discharged at each injection well during full-scale operations. The 530,000-gallon goal was selected to treat a cylindrical position of the aquifer that is 15 ft thick and has a radius of 60 ft; assuming homogeneous aquifer properties.

The treatment solution is designed to enhance the degradation of nitrate and TCE. The mixing ratio for the treatment solution consists of approximately 99.85 percent potable water and 0.15 percent amendments by weight. The amendments consist of:

- Potassium Bicarbonate (pH buffer),
- Sodium Sulfite (deoxygenator),
- Accelerite®, (blend of yeast and nutrients),
- Diammonium Phosphate (nutrient and pH buffer),
- Sodium Bromide (inert tracer),
- Ethyl Lactate (electron donor substrate), and
- SiREM KB-1 (the bioaugmentation culture *dehalococcoides).*

5.1.7.3 Discharge Permit

The NMED GWQB required a DP for SNL/NM personnel to install and operate the TA-V Treatability Study injection wells (NMED GWQB June 2016). The DP Application was submitted in July 2016 (DOE July 2016a). NMED GWQB approved the DP Application in May 2017 and assigned the permit number DP-1845 (NMED GWQB May 2017). The DP-1845 term started on May 30, 2017 and ends on May 30, 2022. In accordance with the permit, DP reports are submitted to the NMED GWQB on a quarterly schedule.

5.1.7.4 Treatability Study Pilot Test

The pilot test for the Treatability Study started in November 2017 at injection well TAV-INJ1 with performance monitoring of two nearby wells, TAV-MW6 and TAV-MW7. Two injections of approximately 4,500 gallons each were discharged to injection well TAV-INJ1. The first injection consisted of treatment solution without the dechlorinating bacteria; the second injection consisted of treatment solution combined with six liters of bioaugmentation culture. Performance monitoring involved the measurement of in-situ water quality parameters using down-hole sondes and the collection of groundwater samples at wells TAV-INJ1, TAV-MW6, and TAV-MW7 in 2018.

The pilot test started after the fourth quarter 2017 TAVG monitoring network sampling activities were conducted (Section 5.3). Initially, two wells (TAV-MW6 and TAV-MW7) were categorized as performance monitoring wells for the Treatability Study and were subject to the DP-1845 requirements (sampled at higher frequency than quarterly and with unique analytes) as described in the Revised TSWP (DOE March 2016a). In the fourth quarter of 2018, well TAV-MW7 was recategorized and returned to the standard list of TA-V monitoring wells (Section 5.3). A summary of the pilot test operation activities and analytical results are provided in Section III of the October 2018 ER Operations quarterly report (SNL October 2018a). Groundwater sampling results of the unique analytes for wells TAV-INJ1, TAV-MW6, and TAV-MW7 are provided in DP-1845 quarterly reports that are submitted to NMED GWQB.

5.1.7.5 Treatability Study Full-Scale Operation

Following the pilot test, DOE/NNSA and SNL/NM personnel submitted the decision to proceed to full-scale operation, along with several modifications to the full-scale operation based on the pilot test results in July 2018 (DOE July 2018). The NMED HWB approved the modifications for full-scale operation and concurred with the decision to proceed with the full-scale operation at injection well TAV-INJ1 in August 2018 (NMED HWB August 2018).

Full-scale operation of the Phase 1 Treatability Study began in October 2018. By the end of 2018, 29 injections totaling 137,573 gallons of treatment solution were discharged to injection well TAV-INJ1. This was equivalent to approximately 26 percent of the planned total injection volume of 530,000 gallons. The average volume of treatment solution per injection was approximately 4,744 gallons. Full-scale operation is scheduled to resume in January 2019 with injections being expected to conclude in about mid-2019. Full-scale operation activities and analytical results will be presented in the ER Operations Quarterly Reports that are submitted to the NMED HWB. Meanwhile, analytical results for DP-specific requirements are presented in DP Quarterly Reports that are submitted to the NMED GWQB. For consistency, this Annual Groundwater Monitoring Report continues to discuss the standard list of analytes for the TAVG AOC monitoring network.

5.2 Regulatory Criteria

The NMED HWB provides regulatory oversight of SNL/NM ER Operations, as well as implements and enforces regulatory standards mandated by the Resource Conservation and Recovery Act (RCRA). All SWMUs and AOCs are listed in the *RCRA Facility Operating Permit, NM5890110518* (NMED January 2015a).

In April 2004, the Consent Order became effective (NMED April 2004). The Consent Order transferred regulatory authority for corrective action requirements from the SNL/NM RCRA Permit to the Consent Order. The Consent Order identified TA-V as a groundwater AOC. The TAVG AOC investigation must comply with requirements set forth in the Consent Order for site characterization and development of a Corrective Measures Evaluation (CME) report.

DOE/NNSA and SNL/NM personnel submitted the CCM and the CME Work Plan to the NMED HWB in April 2004 (SNL April 2004a and April 2004b). After fulfilling the requirements of the CME Work Plan, a CME Report was submitted to the NMED HWB in July 2005 (SNL July 2005). NMED HWB subsequently issued three Notices of Disapproval (NODs) for the CME Report in July 2008, August 2009, and December 2009, respectively (NMED HWB July 2008, August 2009, and December 2009). Responses were submitted to the three NODs in April 2009, November 2009, and February 2010, respectively (SNL April 2009, November 2009, and February 2010). These NOD responses contained an attachment entitled "Technical Area-V Groundwater Investigation Work Plan," which proposed the installation of four additional groundwater monitoring wells and three soil-vapor monitoring wells to meet NMED HWB's characterization requirements (see Section 5.1.3). In May 2010, the NMED HWB issued a notice of conditional approval for the TA-V Groundwater Investigation Work Plan (NMED HWB May 2010).

Since the 2005 CME Report, a substantial body of information has become available with more groundwater monitoring wells and soil-vapor monitoring wells being installed. Accordingly, in 2013 DOE/NNSA and SNL/NM personnel requested that the 2005 CME Report be withdrawn from review and replaced with an updated CCM and CME Report (DOE December 2013). NMED HWB approved the request (NMED HWB December 2013). Thereafter, a Treatability Study of ISB to address the groundwater contamination at TA-V was agreed upon (see Section 5.1.7). In order to allow development of the technical approach and preparation of the associated work plan, a two-year extension of the due date for the CME Report and CCM were requested (DOE November 2014a). NMED HWB approved the request (NMED HWB January 2015b). An updated CCM was submitted to NMED HWB on October 20, 2015 (DOE October 2015) and was approved by NMED HWB on November 30, 2015 (NMED HWB November 2015).

Following the approval of the Revised TSWP in May 2016, DOE/NNSA and SNL/NM personnel requested, and NMED HWB subsequently agreed to a milestone extension for the CME Report (DOE March 2016b; NMED HWB April 2016). The results of the Treatability Study will be used to refine the CCM and CME reports for TAVG AOC, which are due by May 20, 2022 to NMED HWB and are intended to replace all previous CCM and CME reports.

DOE/NNSA and SNL/NM personnel continue to present the TAVG monitoring data, along with data from other groundwater sites, in this SNL/NM Annual Groundwater Monitoring Report. The outline of this chapter is based on the required elements of a "Periodic Monitoring Report" described in Section X.D. of the Consent Order.

In this report, TAVG monitoring data are presented for both hazardous and radioactive constituents; however, the analytical data for radionuclides (gamma spectroscopy short list, gross alpha, gross beta, and tritium) are provided voluntarily by the DOE/NNSA and SNL/NM personnel. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Consent Order. Additional information on radionuclides and the scope of the Consent Order is available in Section III.A of the Consent Order.

5.3 Scope of Activities

Section 5.1.5 describes the activities for the TAVG monitoring in CY 2018, including plans and reports. The field activities included groundwater level measurements and groundwater sampling. Table 5-4 summarizes the CY 2018 groundwater sampling events. Table 5-5 lists the analytes and parameters for each well in each of the sampling events. Tables 5-4 and 5-5 are consistent with the sampling protocol specified in the Revised TSWP (DOE March 2016a).

Quality control (QC) samples are collected in the field at the time of sample collection. Field QC samples are used to monitor the sampling process and include duplicate, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Section 1.3.4 discusses the methodology for the QC samples.

5.4 Field Methods and Measurements

Section 1.3 details the monitoring procedures conducted for TAVG groundwater monitoring. The water level measurements obtained in CY 2018 were used to develop the potentiometric surface map presented in Figure 5-4 and the hydrographs presented in Figures 5D-1 through 5D-3 (Attachment 5D).

5.5 Analytical Methods

Section 1.3.2 (Tables 1-5 and 1-6) describes the EPA-specified protocols used by the off-site laboratories for the groundwater samples.

5.6 Summary of Analytical Results for CY 2018

This section discusses the CY 2018 monitoring results, exceedance of standards, and pertinent trends in COC concentrations for the TAVG AOC. Tables 5B-1 through 5B-8 (Attachment 5B) present the analytical results and field measurements for all TAVG sampling events. Figures 5C-1 through 5C-8 (Attachment 5C) present concentration trend plots for the two COCs (TCE and nitrate) that exceeded the corresponding MCLs. As shown in Table 5-4, the second quarter of CY 2018 was the most comprehensive sampling event for the TAVG AOC.

Table 5-4. Groundwater Monitoring Well Network and Sampling Dates for the TAVG AOC, Calendar Year 2018

Date of Sampling Event	Wells Sampled	SAP
February 2018	LWDS-MW1, TAV-MW2, TAV-MW4, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for Second Quarter, Fiscal Year 2018* (SNL January 2018)
May/June 2018	AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW3, TAV-MW4, TAV-MW5, TAV-MW8, TAV-MW9, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW13, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for Third Quarter, Fiscal Year 2018* (SNL April 2018)
July/August/September 2018	LWDS-MW1, TAV-MW2, TAV-MW4, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for Fourth Quarter, Fiscal Year 2018* (SNL June 2018a)
November 2018	LWDS-MW1, TAV-MW2, TAV-MW4, TAV-MW7, TAV-MW8, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW14, TAV-MW15, and TAV-MW16	*TA-V Groundwater Monitoring Mini-SAP for First Quarter, Fiscal Year 2019* (SNL October 2018b)

NOTES:
AOC = Area of Concern.
AVN = Area-V (North).
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
TA-V = Technical Area-V.
TAV = Technical Area-V (monitoring well designation).
TAVG = Technical Area-V Groundwater.

Table 5-5. Analytes and Parameters for TAVG Monitoring Wells for Each Sampling Event, Calendar Year 2018

February 2018		**May/June 2018**	
Parameter	**Well ID**	**Parameter**	**Well ID**
Alkalinity[a]	LWDS-MW1	Alkalinity[a]	AVN-1
Anions (Bromide, Chloride,	LWDS-MW1 (duplicate)	Anions (Bromide, Chloride,	AVN-1 (duplicate)
Fluoride, Sulfate)[a]	TAV-MW2	Fluoride, Sulfate)[a]	LWDS-MW1
Arsenic, dissolved	TAV-MW4	Arsenic, dissolved	LWDS-MW2
Gamma Spectroscopy (short list[b])	TAV-MW8	Gamma Spectroscopy (short list[b])	TAV-MW2
Gross Alpha/Beta Activity[a]	TAV-MW10	Gross Alpha/Beta Activity[a]	TAV-MW3
Iron, dissolved	TAV-MW11	Iron, dissolved	TAV-MW4
Manganese, dissolved	TAV-MW12	Manganese, dissolved	TAV-MW5
NPN	TAV-MW12 (duplicate)	NPN	TAV-MW5 (duplicate)
TAL Metals plus Total Uranium[a]	TAV-MW14	TAL Metals plus Total Uranium	TAV-MW8
Tritium[a]	TAV-MW15	Tritium	TAV-MW9
VOCs	TAV-MW16	VOCs	TAV-MW10
			TAV-MW11
			TAV-MW12
			TAV-MW13
			TAV-MW13 (duplicate)
			TAV-MW14
			TAV-MW15
			TAV-MW16
July/August/September 2018		**November 2018**	
Parameter	**Well ID**	**Parameter**	**Well ID**
Alkalinity[a]	LWDS-MW1	Alkalinity[a]	LWDS-MW1
Anions (Bromide, Chloride,	TAV-MW2	Anions (Bromide, Chloride,	TAV-MW2
Fluoride, Sulfate)[a]	TAV-MW4	Fluoride, Sulfate)[a]	TAV-MW2 (duplicate)
Arsenic, dissolved	TAV-MW4 (duplicate)	Arsenic, dissolved	TAV-MW4
Gamma Spectroscopy (short list[b])	TAV-MW8	Gamma Spectroscopy (short list[b])	TAV-MW7
Gross Alpha/Beta Activity[a]	TAV-MW10	Gross Alpha/Beta Activity[a]	TAV-MW8
Iron, dissolved	TAV-MW10 (duplicate)	Iron, dissolved	TAV-MW10
Manganese, dissolved	TAV-MW11	Manganese, dissolved	TAV-MW11
NPN	TAV-MW12	NPN	TAV-MW12
TAL Metals plus Total Uranium[a]	TAV-MW14	TAL Metals plus Total Uranium[a]	TAV-MW14
Tritium[a]	TAV-MW15	Tritium[a]	TAV-MW14 (duplicate)
VOCs	TAV-MW15 (duplicate)	VOCs	TAV-MW15
	TAV-MW16		TAV-MW16
			TAV-MW16 (duplicate)

NOTES:

[a]Analyses performed on monitoring wells TAV-MW15 and TAV-MW16 only for waste characterization purposes.
[b]Gamma spectroscopy short list includes americium-241, cesium-137, cobalt-60, and potassium-40.

AVN = Area-V (North).
ID = Identifier.
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
NPN = Nitrate plus nitrite (reported as nitrogen).
TAL = Target Analyte List.
TAV = Technical Area-V (monitoring well designation).
TAVG = Technical Area-V Groundwater.
VOC = Volatile organic compound.

Table 5B-1, Attachment 5B presents a summary of the detected-VOC results and Table 5B-2 lists the method detection limits (MDLs). Five VOCs were detected at concentrations above the MDLs in groundwater samples from TAVG AOC monitoring wells in CY 2018:

- Acetone,
- Chloroform,
- cis-1,2-Dichloroethene,
- Methylene Chloride, and
- TCE.

Figure 5-5 shows the TCE isoconcentration contours for second quarter CY 2018. TCE was the only VOC that exceeded an MCL (Table 5B-1, Attachment 5B). TCE was detected above the MCL (5 µg/L) in samples from four monitoring wells in CY 2018: LWDS-MW1, TAV-MW10, TAV-MW12, and TAV-MW14. The maximum TCE concentration was 17.7 µg/L in the sample collected from monitoring well LWDS-MW1 in February 2018. The corresponding environmental duplicate sample had a TCE concentration of 18.0 µg/L. Historically, the highest TCE concentrations at TA-V have been consistently detected at monitoring well LWDS-MW1. In Attachment 5C, Figures 5C-1 through 5C-4 present the TCE concentration trend plots for monitoring wells LWDS-MW1, TAV-MW10, TAV-MW12, and TAV-MW14.

For the last five years (since January 2014), the TCE trends for the environmental samples are:

- LWDS-MW1 (Figure 5C-1, Attachment 5C). TCE concentrations have ranged from 22.4 µg/L (March 2014) to 10.2 µg/L (June 2017). In CY 2018, the maximum TCE concentration was 17.7 µg/L (February 2018). The corresponding environmental duplicate sample had a TCE concentration of 18.0 µg/L. This well shows the widest range of fluctuations per quarter for the four wells. However, the overall TCE trend is stable at well LWDS-MW1. For the last five years, the water level has consistently declined at approximately 0.67 ft/yr.

- TAV-MW10 (Figure 5C-2, Attachment 5C). TCE concentrations have ranged from 16.8 µg/L (March 2014) to 7.48 µg/L (November 2017). In CY 2018, the maximum TCE concentration was 9.72 µg/L (November 2018). The overall trend shows decreasing TCE concentrations while the water level consistently declined at approximately 0.69 ft/yr.

- TAV-MW12 (Figure 5C-3, Attachment 5C). TCE concentrations have ranged from 11.9 µg/L (March 2014) to 3.87 µg/L (November 2018). In CY 2018, the maximum TCE concentration was 6.37 µg/L (February 2018). The overall trend shows decreasing TCE concentrations while the water level consistently declined at approximately 0.68 ft/yr.

- TAV-MW14 (Figure 5C-4, Attachment 5C). TCE concentrations have ranged from 8.43 µg/L (March 2014) to 3.71 µg/L (November 2016). In CY 2018, the maximum TCE concentration was 5.45 µg/L (June 2018). The overall TCE trend shows decreasing concentrations while the water level consistently declined at approximately 0.77 ft/yr.

Three well pairs with ongoing utility have been installed at TA-V (SNL September 2015). Monitoring wells TAV-MW7 and TAV-MW9 are co-located with TAV-MW6 and TAV-MW8, respectively, but are screened approximately 90 ft deeper based on the mid-point of the screens. TCE has not been detected in these two deeper wells (TAV-MW7 and TAV-MW9). The lack of deep detections near the contaminant sources (SWMUs 5 and 275) strongly indicates that VOCs have not migrated significantly deeper into the Regional Aquifer. Farther west, well TAV-MW5 is co-located with well TAV-MW13. Well TAV-MW5 is screened approximately 40 ft deeper than well TAV-MW13. TCE has not been detected at either well.

In Attachment 5B, Table 5B-3 presents the analytical results for NPN (reported as nitrogen) for CY 2018. NPN exceeded the MCL (10 mg/L) in samples from two monitoring wells (LWDS-MW1 and TAV-MW10). The maximum NPN concentration was 12.9 mg/L in the sample collected from monitoring well LWDS-MW1 in June 2018. Figures 5C-5 and 5C-6 (Attachment 5C) present NPN concentration trend plots for monitoring wells LWDS-MW1 and TAV-MW10. The NPN concentrations in monitoring wells LWDS-MW1 and TAV-MW10 have typically exceeded the MCL.

For the last five years (since January 2014), the NPN trends are:

- LWDS-MW1 (Figure 5C-5, Attachment 5C). NPN concentrations have ranged from 10.9 mg/L (February 2016) to 12.3 mg/L (March 2014). In CY 2018, the maximum NPN concentration was 12.9 mg/L (June 2018). The overall NPN trend is stable.

- TAV-MW10 (Figure 5C-6, Attachment 5C). NPN concentrations have ranged from 11.3 mg/L (September 2018) to 15.2 mg/L (May 2016). In CY 2018, the maximum NPN concentration was 12.0 mg/L (June 2018). Overall, the NPN concentrations appear to show a decreasing trend.

- TAV-MW12 (Figure 5C-7, Attachment 5C). NPN concentrations have ranged from 6.05 mg/L (November 2016) to 9.77 mg/L (February 2016). In CY 2018, the maximum NPN concentration was 8.64 mg/L (February 2018), which is below the MCL of 10 mg/L. Overall, the NPN concentrations appear to show a stable trend.

- TAV-MW14 (Figure 5C-8, Attachment 5C). NPN concentrations have ranged from 7.60 mg/L (September 2018) to 11.8 mg/L (February 2016). In CY 2018, the maximum NPN concentration was 8.60 mg/L (June 2018), which is below the MCL of 10 mg/L. Overall, the NPN concentrations appear to show a decreasing trend.

Figure 5-6 shows the NPN isoconcentration contour for second quarter CY 2018. The general location of the 10 mg/L NPN contour has not changed significantly over the past several years and typically encloses wells LWDS-MW1 and TAV-MW10. NPN is reported at low concentrations at each of the monitoring wells at TA-V, generally at concentrations ranging from less than 5 mg/L to slightly more than the 10 mg/L MCL. Historically, nitrate concentrations have exceeded the MCL in samples from monitoring wells AVN-1, AVN-2 (dry since April 2008), LWDS-MW1, TAV-MW6, TAV-MW10, and TAV-MW14. Nitrate was also detected once above the MCL at well TAV-MW5 in a split sample collected in November 1998 (soon after well installation) and has not been detected above the MCL since then. As discussed earlier, historical NPN detections above the NMED-specified background (4 mg/L) and the MCL (10 mg/L) at wells AVN-1 and AVN-2 are interpreted as not being associated with TA-V operations.

The TCE and NPN plumes for CY 2018 are shown on Figures 5-5 and 5-6, respectively. The plumes are roughly co-located with a generally northwest to southeast orientation. The contaminants are present at low concentrations in the Regional Aquifer in the vicinity of the LWDS Drain Field (SWMU 5) and the TA-V Seepage Pits (SWMU 275). The maximum concentrations of TCE and NPN at well LWDS-MW1 are slightly offset from SWMU 5, suggesting that localized stratigraphic controls influence contaminant migration in the 500-ft thick vadose zone above the water table. The variability in hydraulic conductivities in saturated sediments has also likely influenced the distribution of contaminants in groundwater. The hydraulic conductivities measured by slug tests at monitoring wells TAV-MW6 and TAV-MW10 were 1.14 and 4.12 ft/day, respectively. The lowest hydraulic conductivity (0.04 ft/day) was measured at monitoring well LWDS-MW1, where the highest contaminant concentrations were detected in groundwater. It is possible that a localized low conductivity zone near well LWDS-MW1 has acted as a barrier for contaminant migration.

Table 5B-4 (Attachment 5B) presents the analytical results for three filtered metals (arsenic, iron, and manganese). None of the metals exceeded respective MCLs.

Table 5B-5 (Attachment 5B) presents the analytical results for anions (bromide, chloride, fluoride, and sulfate) and for alkalinity (bicarbonate and carbonate). Fluoride is the only analyte with an established MCL. None of the fluoride results exceeded the MCL.

Table 5B-6 (Attachment 5B) presents the analytical results for the 23 Target Analyte List metals and uranium. None of these analytes exceeded the MCLs.

Table 5B-7 (Attachment 5B) presents the gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40), gross alpha, gross beta, and tritium results; all radionuclide results were below established MCLs. Gross alpha activity is measured as a radiological screening tool in accordance with 40 Code of Federal Regulations Part 141. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements are corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. Radiological results are further reviewed by an SNL/NM Health Physicist to assure that the samples are nonradioactive.

Table 5B-8 (Attachment 5B) presents the water quality parameters that were measured in the field during the purging of each monitoring well immediately prior to sampling. These parameters consist of temperature, specific conductivity, oxidation-reduction potential, pH, turbidity, and dissolved oxygen. The parameters were measured for evaluating stabilization and determining that representative water samples could be collected.

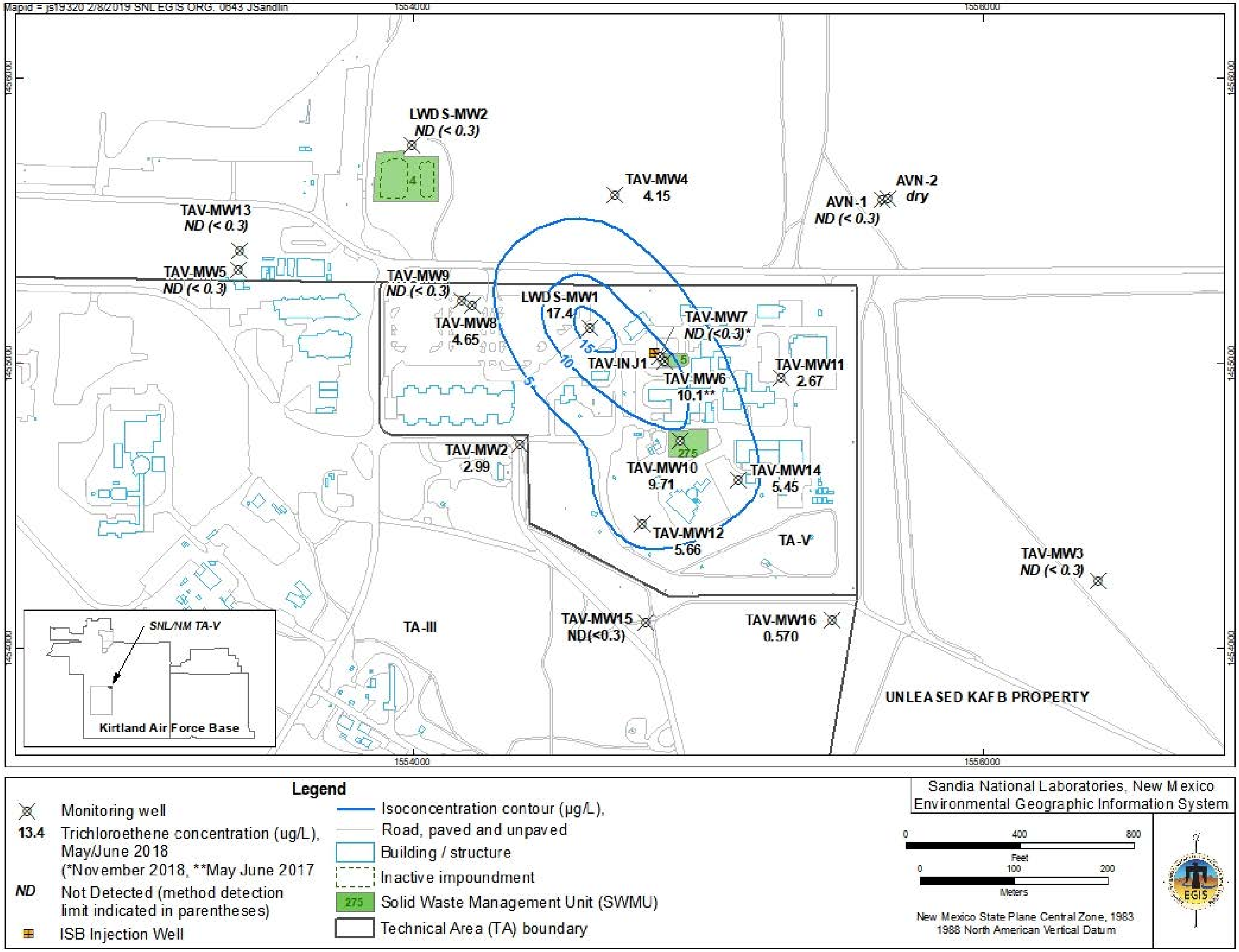


Figure 5-5. Distribution of TCE in Groundwater at TAVG AOC, May/June 2018

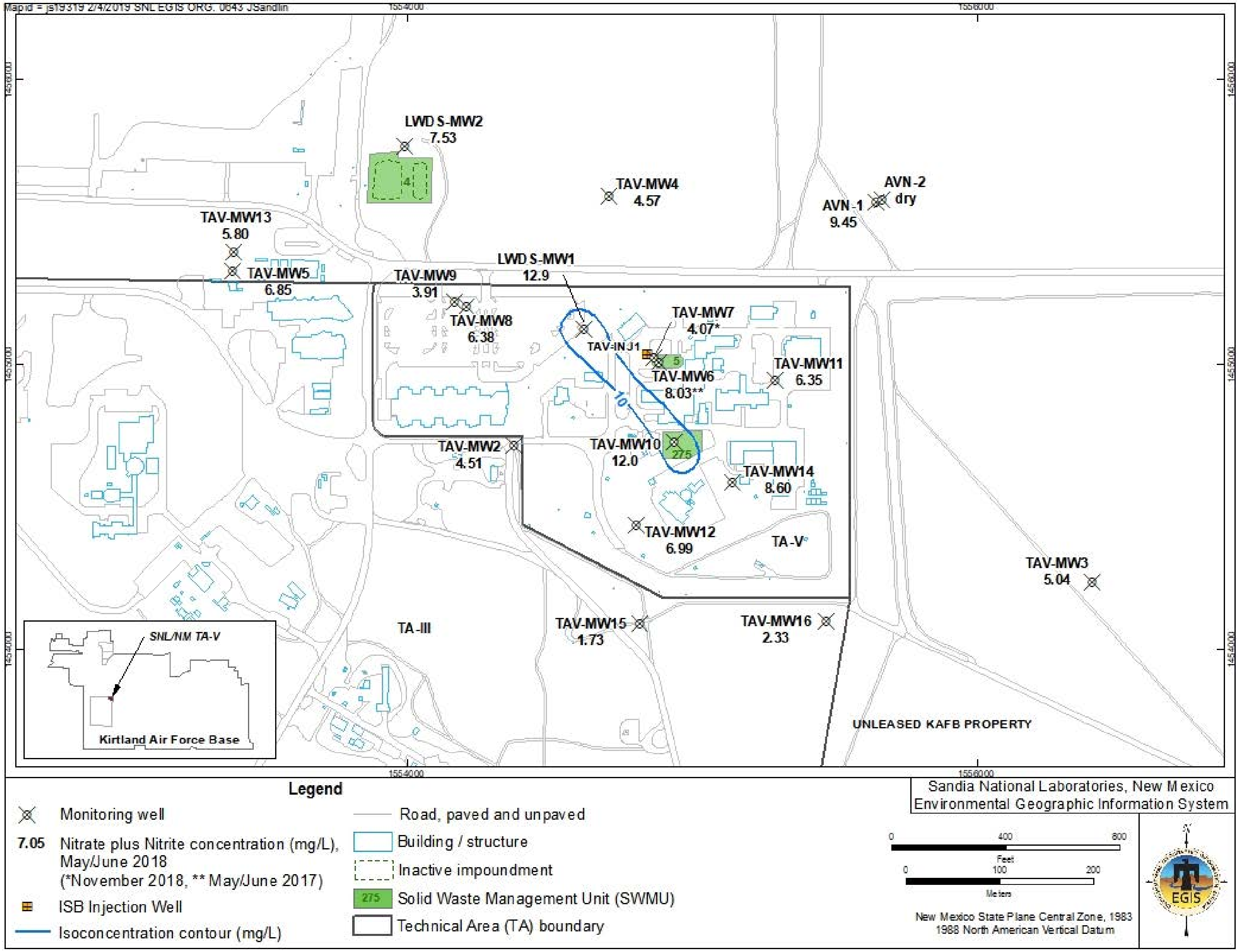


Figure 5-6. Distribution of Nitrate plus Nitrite in Groundwater at TAVG AOC, May/June 2018

5.7 Quality Control Results

Section 1.3.3 describes how field and laboratory QC samples were collected and prepared. Tables 5B-1 through 5B-8 (Attachment 5B) presents data validation qualifiers along with the analytical results for the TAVG AOC. The following paragraphs discuss the results of the QC samples (duplicates, EB samples, FB samples, and TB samples) and their impact on data quality for the sampling events.

For the CY 2018 environmental samples listed in Table 5-5, the corresponding environmental duplicate samples showed good correlation based upon the relative percent difference (RPD) calculations. RPDs are unit-less values calculated for constituents that were detected above the laboratory MDL in both samples (environmental versus environmental duplicate). The RPD values for NPN ranged from <1 to 9. These RPD values are within the acceptable range of less than or equal to the RPD goal of 35. The calculated RPD values for the TCE sample pairs ranged from <1 to 12; thus, are less than the RPD goal of 20. Specific RPD values per quarter are as follows:

- **February 2018 Sampling Event—**Environmental duplicate samples were collected from monitoring wells LWDS-MW1 and TAV-MW12. The NPN RPD values were 2 and 1, respectively. The TCE RPD values were 2 and 4, respectively.

- **May/June 2018 Sampling Event—**Environmental duplicate samples were collected from three monitoring wells (AVN-1, TAV-MW5, and TAV-MW13). The NPN RPD values were 1, 1, and <1, respectively. TCE was not detected in any of the samples.

- **July/August/September 2018 Sampling Event—**Environmental duplicate samples were collected from three monitoring wells (TAV-MW4, TAV-MW10, and TAV-MW15). The NPN RPD values ranged from <1 to 9. The TCE RPD values for wells TAV-MW4 and TAV-MW10 were both 1. TCE was not detected at well TAV-MW15.

- **November 2018 Sampling Event—**Environmental duplicate samples were collected from three monitoring wells (TAV-MW2, TAV-MW14, and TAV-MW16). The NPN RPD values were 1, 2, and 1, respectively. The TCE RPD values were 3, <1, and 12, respectively.

The results for the EB analyses are as follows:

- **February 2018 Sampling Event—**EB samples were collected prior to sampling monitoring wells LWDS-MW1 and TAV-MW12. Acetone and 2-butanone were reported in both EB samples. Acetone was reported at a concentration greater than the associated TAV-MW12 environmental sample. As a result, acetone was qualified as not detected during data validation for the environmental sample. No corrective action was necessary for 2-butanone since this compound was not detected in the associated environmental samples.

- **May/June 2018 Sampling Event—**EB samples were collected prior to sampling three monitoring wells (AVN-1, TAV-MW5, and TAV-MW13). Acetone, 2-butanone, chloride, and zinc were detected above laboratory MDLs. No corrective action was necessary for these three analytes because none were detected above associated MDLs or detected in environmental samples at concentrations greater than five times the associated EB result. Zinc in TAV-MW5 and TAV-MW13 environmental samples were qualified as not detected during data validation, since zinc was reported at similar concentrations in the associated EB sample.

- **July/August/September 2018 Sampling Event**—EB samples were collected prior to sampling three monitoring wells (TAV-MW4, TAV-MW10 and TAV-MW15). Acetone and 2-butanone were reported in EB samples. No corrective action was necessary since these two compounds were not detected in the associated environmental samples.

- **November 2018 Sampling Event**—EB samples were collected prior to sampling three monitoring wells (TAV-MW2, TAV-MW14 and TAV-MW16). No VOCs, NPN, or metals were detected above the MDLs in any of the EB samples.

The results for the FB analyses are as follows:

- **February 2018 Sampling Event**—FB samples were collected at three monitoring wells (TAV-MW2, TAV-MW11, and TAV-MW16). No VOCs were detected in the FB samples, except for acetone. Acetone was reported in two FB samples but was qualified as not detected due to associated laboratory method blank contamination.

- **May/June 2018 Sampling Event**—FB samples were collected at three monitoring wells (TAV-MW2, TAV-MW3, and TAV-MW15). Acetone and methylene chloride were detected at concentrations less than the practical quantitation limit. Environmental samples were reported at concentrations less than 10 times the FB and were therefore qualified as not detected during data validation.

- **July/August/September 2018 Sampling Event**—FB samples were collected at three monitoring wells (TAV-MW8, TAV-MW14, and TAV-MW16). No VOCs were detected in FB samples, except for acetone. Acetone was reported in two FB samples, but no corrective action was required because this compound was not detected in the associated environmental samples.

- **November 2018 Sampling Event**—FB samples were collected at monitoring wells LWDS-MW1 and TAV-MW10. Acetone was reported in the FB sample associated with TAV-MW10. The TAV-MW10 environmental sample was qualified as not detected during data validation because acetone was reported at a concentration less than ten times the FB result.

The results for the TB analyses are as follows:

- **February 2018 Sampling Event**—Eleven TB samples were submitted with the environmental samples for VOC analysis. No VOCs were detected above associated laboratory MDLs, except for acetone. Acetone was reported in nine TB samples. Environmental samples reported at concentrations less than 10 times the TB samples were qualified as not detected during data validation.

- **May/June 2018 Sampling Event**—Sixteen TB samples were submitted with the environmental samples. No VOCs were detected above associated laboratory MDLs except for methylene chloride. Methylene chloride was detected in the TB sample associated with well TAV-MW15. The methylene chloride concentration in the environmental sample was less than 10 times the TB and was therefore qualified as not detected during data validation.

- **July/August/September 2018 Sampling Event**—Thirteen TB samples were submitted with the environmental samples. No VOCs were detected above associated laboratory MDLs, except acetone and methylene chloride. Acetone was detected in two TB samples and methylene chloride was detected in three TB samples. The environmental samples were qualified as not detected during data validation because the environmental sample concentrations were less than 10 times the TB results.

- **November 2018 Sampling Event**—Fourteen TB samples were submitted with the environmental samples. No VOCs were detected above the MDLs.

5.8 Variances and Nonconformances

No variances or nonconformances from requirements specified in the TAVG mini-Sampling and Analysis Plans were identified for the CY 2018 sampling activities. However, the following observations and activities associated with these sampling events were noted:

- **February 2018 Sampling Event**—Monitoring well TAV-MW12 was purged to dryness (at 17 gallons) prior to reaching minimum purge volume requirements. The well was allowed to recharge and was sampled on the following day. This was the first dry-out variance for this well.

- **May/June 2018 Sampling Event**—During the initial purging of monitoring well AVN-1, rust colored water was observed. However, purging requirements were subsequently achieved for sampling purposes.

- **July/August/September 2018 Sampling Event**—None.

- **November 2018 Sampling Event**—An additional seven gallons was purged from monitoring well TAV-MW2 for achieving the stability requirements for turbidity.

5.9 Summary and Conclusions

The CSM demonstrates that contaminant releases involving TCE occurred from two primary sources (SWMUs 5 and 275). Wastewater containing the contaminants migrated downward through the vadose zone and into the Regional Aquifer. TCE was present in wastewater that was disposed at the underground LWDS Drain Field (SWMU 5) during the period from 1962 to 1967, and to the buried TA-V Seepage Pits (SWMU 275) from the 1960s until the early 1980s.

Wastewater devoid of TCE continued to flush through the vadose zone beneath the seepage pits until 1992, which most likely removed a significant portion of a potential secondary contaminant source. Upon cessation of wastewater disposal, drainage diminished through vertical pathways in the vadose zone. Low concentrations of TCE present in the Regional Aquifer today represent the wastewater releases before 1992. Sanitary waste containing nitrate was also released at SWMU 275.

The combined effect of several wastewater release locations, various wastewater volumes, variable aquifer lithology, low groundwater velocities, dispersion, diffusion, and sorption are likely responsible for the current distribution of TCE and nitrate in the Regional Aquifer.

TCE results in groundwater samples from four monitoring wells (LWDS-MW1, TAV-MW10, TAV-MW12, and TAV-MW14) exceeded the MCL of 5 μg/L in CY 2018. The maximum TCE concentration was 17.7 μg/L and corresponded to the environmental sample collected from monitoring well LWDS-MW1 in February 2018. The corresponding environmental duplicate sample had a TCE concentration of 18.0 μg/L.

NPN results in groundwater samples from two monitoring wells (LWDS-MW1 and TAV-MW10) exceeded the MCL of 10 mg/L in CY 2018. The maximum NPN concentration was 12.9 mg/L and corresponded to the sample collected from monitoring well LWDS-MW1 in February 2018.

The analytical results for CY 2018 are consistent with historical values. The following conclusions are based on a comprehensive review of available information on current groundwater contamination in the TAVG AOC:

- The COCs for the TAVG AOC are TCE and nitrate.

- The primary sources of TCE and nitrate in the TAVG AOC consist of two wastewater disposal systems; the LWDS Drain Field (SWMU 5) and the TA-V Seepage Pits (SWMU 275).

- Based on historical use and disposal of organic solvents at TA-V, the extent of TCE in the Regional Aquifer is attributed to wastewater releases containing TCE and the subsequent transport of TCE through the vadose zone to groundwater.

- The distribution of low concentrations of TCE in the Regional Aquifer has remained relatively stable which is attributed to the combined effect of fine-grained aquifer lithology, low groundwater flow velocities, dispersion, diffusion, and sorption.

- The distribution of nitrate concentrations is laterally widespread in the area, both inside and outside the TA-V boundary. The extent of the 10 mg/L NPN concentration contour has remained relatively stable. An upgradient source and/or elevated background may contribute to the nitrate concentration at monitoring well AVN-1 well, which is located northeast of TA-V.

Ongoing groundwater monitoring activities of the TAVG AOC include the following:

- Continue obtaining periodic measurements of groundwater elevations at active TAVG monitoring wells.

- Continue collecting groundwater samples at all TAVG monitoring wells not involved with the Treatability Study.

- Continue reporting the TAVG monitoring results in future SNL/NM Annual Groundwater Monitoring Reports for submittal to the NMED HWB.

- Continue implementing the Treatability Study for the purpose of degrading the groundwater contaminants at the TAVG AOC.

- Provide summaries of the Treatability Study results in ER Operations Quarterly Reports for submittal to NMED HWB. Corresponding results for DP-1845 Quarterly Reports will be submitted to NMED GWQB with courtesy copies being sent to NMED HWB.

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Attachment 5A
Historical Timeline of the Technical Area-V Groundwater Area of Concern

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Table 5A-1. Historical Timeline of the Technical Area-V Groundwater Area of Concern

Month	Year	Event	Reference
May	1959	Water supply well KAFB-10 is installed for fire suppression purposes. Water pumped occasionally for maintenance testing.	NMOSE May 1959
	1961	Research buildings are constructed at TA-V.	DOE September 1987
	1962	Discharge of wastewater to the vadose zone begins.	DOE September 1987
	1984	DOE created the CEARP to evaluate potential release sites at SNL/NM.	DOE September 1987
	1988	The SNL/NM ER Project was created and begins conducting investigations using the CEARP list of sites.	SNL March 1999
	1992	Wastewater discharges to the vadose zone cease after the KAFB sanitary sewer system was extended to TA-V.	SNL March 1999
April	1992	The LWDS RFI Work Plan (SWMUs 4, 5, and 52) is submitted.	SNL March 1993
October	1992	Groundwater monitoring well LWDS-MW2 is installed at TA-V for the Liquid Waste Disposal System (LWDS) investigation.	SNL March 1993
May	1993	Groundwater monitoring well LWDS-MW1 is installed.	SNL September 1995
November	1993	LWDS-MW1 and LWDS-MW2 are sampled. The first sampling event of LWDS-MW1 reveals TCE exceeding the MCL of 5 μg/L.	SNL March 1995
June	1994	Submit notification letter from DOE to EPA regarding TCE detection in well LWDS-MW1.	DOE June 1994
June	1995	Wells AVN-1 and AVN-2 are installed.	SNL 1995
April	1995	Wells TAV-MW1 and TAV-MW2 are installed.	SNL March 1996
	1995	The LWDS RFI report is completed.	SNL September 1995
March	1996	Submit letter to the NMED HWB with notification of elevated nitrate detection for well LWDS-MW1. The result is 10.1 mg/L, exceeding the MCL of 10 mg/L.	DOE March 1996
April	1996	KAFB-10 was plugged and abandoned due to the potential for the annulus of this water supply well to act as a conduit.	SNL April 1996
April	1997	Wells TAV-MW3, TAV-MW4, and TAV-MW5 are installed.	SNL March 1999
September	1997	NMED HWB issues an RSI stating that additional characterization is needed for each of the LWDS sites (SWMUs 4, 5, and 52).	NMED HWB September 1997
January	1998	RSI Response submitted to the NMED HWB. .	SNL January 1998
October	1998	Provide cross sections to NMED HWB for the LWDS as required in the September 1997 RSI.	DOE October 1998
March	1999	Submit a summary report detailing groundwater conditions for the TA-III/V area that includes sites from OU 1306 (TA-III) and OU 1307 (LWDS).	SNL March 1999
May	2001	Wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 are installed.	SNL October 2001
June	2003	Subsurface geology at KAFB, including the TAVG monitoring area, is updated.	Van Hart June 2003
April	2004	The NMED issues the Consent Order to the DOE/Sandia, which identified the TAVG as an AOC with groundwater contamination requiring a CME and a CCM.	NMED April 2004
May	2004	Submitted the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V*.	SNL April 2004a
May	2004	Submitted the *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwate*r.	SNL April 2004b
July	2004	The potential for natural (intrinsic) anaerobic biodegradation of TCE and nitrate to occur in TA-V groundwater was evaluated.	SNL July 2004
October	2004	The NMED HWB issued an approval with modifications to the TA-V CME Work Plan and the CCM of Groundwater Flow and Contaminant Transport.	NMED HWB October 2004

Table 5A-1. Historical Timeline of the Technical Area-V Groundwater Area of Concern *(continued)*

Month	Year	Event	Reference
December	2004	Submitted responses to the NMED HWB approval with modifications of October 2004. The responses are included in the revised *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater, Revision 0*.	SNL December 2004
April	2005	The potential for natural (intrinsic) aerobic biodegradation of TCE to occur in TA-V groundwater was evaluated.	SNL April 2005
July	2005	Submitted the *Corrective Measures Evaluation Report for Technical Area-V Groundwater*. The report details the selection of a preferred remedial alternative, cleanup goals, and the Corrective Measures Implementation Plan.	SNL July 2005
October	2005	Submitted request to NMED HWB for change in sampling frequency for TAVG monitoring wells.	DOE October 2005
March	2006	Requested the removal of well AVN-2 from the TAVG monitoring network due to insufficient water for sampling caused by regional water level declines.	DOE March 2006
March	2008	Well TAV-MW1 plugged and abandoned. Well TAV-MW10 installed as replacement for TAV-MW1.	SNL June 2008
July	2008	NMED HWB issued a NOD on the July 2005 CME Report for TAVG AOC.	NMED HWB July 2008
September	2008	The 13 TAVG monitoring wells are resurveyed to establish new northing and easting coordinates and elevations for each well.	SNL October 2008
April	2009	NMED HWB required characterization of perchlorate in groundwater in one well (LWDS-MW1) at TA-V.	NMED HWB April 2009
April	2009	Submitted a response to the NOD on the July 2005 CME Report for TAVG AOC.	SNL April 2009
August	2009	NMED HWB issued a second NOD on the July 2005 CME Report for TAVG AOC.	NMED HWB August 2009
November	2009	Submitted a response to the second NOD on the July 2005 CME Report for TAVG AOC.	SNL November 2009
December	2009	NMED HWB issued a third NOD on the July 2005 CME Report for TAVG AOC.	NMED HWB December 2009
February	2010	Submitted a response to the third NOD on the July 2005 CME Report for TAVG AOC.	SNL February 2010
May	2010	NMED HWB issued a notice of conditional approval for the TA-V Groundwater Investigation Work Plan associated with the NOD responses.	NMED HWB May 2010
November	2010	Completed installation of groundwater monitoring wells TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14.	SNL June 2011
November	2010	Submitted a report to the NMED HWB for the geophysical logging and slug test results for the new TAVG monitoring wells.	SNL November 2010
December	2010	NMED HWB issued approval for the modification of soil-vapor monitoring well design.	NMED HWB December 2010
March	2011	Completed installation of soil-vapor monitoring wells TAV-SV01, TAV-SV02, and TAV-SV03.	SNL June 2011
June	2011	Submitted a *Summary Report for TA-V Groundwater and Soil-Vapor Monitoring Well Installation*.	SNL June 2011
July	2011	DOE/NNSA and SNL personnel meet with NMED HWB to discuss the results from the first quarter of groundwater and soil-vapor monitoring.	SNL July 2011
June	2013	A study of denitrification parameters and isotopic signatures was conducted.	Madrid et al. June 2013
September	2013	NMED HWB approved the *Summary Report for TA-V Groundwater and Soil-Vapor Monitoring Well Installation.*	NMED HWB September 2013
December	2013	Requested that the 2005 CME Report be withdrawn and replaced with an updated CCM and CME Report.	DOE December 2013

Table 5A-1. Historical Timeline of the Technical Area-V Groundwater Area of Concern *(continued)*

Month	Year	Event	Reference
December	2013	NMED HWB approved the extension request for an updated CCM and CME report to be submitted by November 21, 2014.	NMED HWB December 2013
September	2014	DOE Office of Environmental Management issued a memorandum to DOE/NNSA Sandia Field Office providing the IRR team's comments and recommendations on the proposed corrective measures for TAVG AOC based on a multi-agency meeting with NMED HWB on July 17, 2014.	DOE September 2014
November	2014	Submitted a two-year extension request for the CCM and CME Report.	DOE November 2014a
November	2014	DOE/NNSA shared the IRR memorandum that had been submitted to the Deputy Assistant Secretary of the Office of Environmental Compliance regarding the IRR team's recommendations for TAVG AOC.	DOE November 2014b
January	2015	NMED HWB approved the extension request for an updated CCM and CME report. Due date revised to November 30, 2016.	NMED HWB January 2015b
October	2015	Submitted the CCM and a Treatability Study Work Plan (TSWP for In Situ Bioremediation at TAVG AOC. Two phases are proposed in the TSWP. One injection well would be installed and operated in phase one. Dependent of the findings of phase one, two more injection wells would be installed and operated in phase two.	DOE October 2015
November	2015	NMED HWB approved the CCM for TAVG AOC.	NMED HWB November 2015
December	2015	NMED HWB disapproved the TSWP and requests a revised TSWP and a response letter that addresses the disapproval comments by January 29, 2016.	NMED HWB December 2015
January	2016	Requested a two-month extension request for the revised TSWP and the response letter to NMED HWB disapproval letter.	DOE January 2016
March	2016	Submitted the revised TSWP and the response to the NMED HWB disapproval letter.	DOE March 2016a
March	2016	Requested an extension to update the CCM and CME reports.	DOE March 2016b
April	2016	NMED HWB stated the new due date for the CCM and CME reports for TAVG are May 20, 2022.	NMED HWB April 2016
May	2016	NMED HWB approved the Revised TSWP.	NMED HWB May 2016a
May	2016	Submitted the Notice of Intent to Discharge for TA-V Treatability Study injection wells.	DOE May 2016
May	2016	NMED HWB stated the TA-V Geophysical Logging and Slug Test Results (SNL November 2010) will be superseded by the updated CCM and CME reports.	NMED HWB May 2016b
May	2016	NMED HWB approved the Revised TSWP.	NMED HWB May 2016a
May	2016	Submitted the Notice of Intent to Discharge for TA-V Treatability Study injection wells.	DOE May 2016
May	2016	NMED HWB stated the TA-V Geophysical Logging and Slug Test Results (SNL November 2010) will be superseded by the updated CCM and CME reports.	NMED HWB May 2016b
June	2016	NMED GWQB states that a Discharge Permit will be required for the TA-V Treatability Study injection wells.	NMED HWB June 2016
July	2016	Submitted the Discharge Permit Application for the TA-V Treatability Study injection wells.	DOE July 2016a
May	2016	NMED HWB approved the Revised TSWP.	NMED HWB May 2016a
May	2016	Submitted the Notice of Intent to Discharge for TA-V Treatability Study injection wells.	DOE May 2016
May	2016	NMED HWB stated the TA-V Geophysical Logging and Slug Test Results (SNL November 2010) will be superseded by the updated CCM and CME reports.	NMED HWB May 2016b

Table 5A-1. Historical Timeline of the Technical Area-V Groundwater Area of Concern *(continued)*

Month	Year	Event	Reference
June	2016	NMED GWQB states that a Discharge Permit will be required for the TA-V Treatability Study injection wells.	NMED HWB June 2016
July	2016	Submitted the Discharge Permit Application for the TA-V Treatability Study injection wells.	DOE July 2016a
July	2016	Submitted the Permit to Drill applications for installing two groundwater monitoring wells, TAV-MW15 and TAV-MW16, and one injection well TAV-INJ1.	DOE July 2016b
August	2016	NMOSE approved the Permit to Drill applications for wells TAV-MW15, TAV-MW16, and TAV-INJ1.	NMOSE August 2016
September	2016	NMED GWQB determined the Discharge Permit Application is administratively complete.	NMED GWQB September 2016
November	2016	Completed the public notice requirements for the Discharge Permit application.	DOE November 2016
January	2017	Completed installation and development of monitoring wells TAV-MW15 and TAV-MW16.	SNL July 2017a
January	2017	Completed the redevelopment of monitoring wells AVN-1, LWDS-MW2, TAV-MW2, TAV-MW9, TAV-MW11, and TAV-MW12.	Lum May 2017
August	2016	NMOSE approved the Permit to Drill applications for wells TAV-MW15, TAV-MW16, and TAV-INJ1.	NMOSE August 2016
September	2016	NMED GWQB determined the Discharge Permit Application is administratively complete.	NMED GWQB September 2016
November	2016	Completed the public notice requirements for the Discharge Permit application.	DOE November 2016
January	2017	Completed installation and development of monitoring wells TAV-MW15 and TAV-MW16.	SNL July 2017a
January	2017	Completed the redevelopment of monitoring wells AVN-1, LWDS-MW2, TAV-MW2, TAV-MW9, TAV-MW11, and TAV-MW12.	Lum May 2017
February	2017	Implemented new quarterly sampling requirements per the NMED HWB-approved Revised Treatability Study Work Plan.	DOE March 2016a NMED HWB May 2016b
May	2017	NMED GWQB issued Discharge Permit, DP-1845, for the TA-V Treatability Study injection wells.	NMED GWQB May 2017
July	2017	Submitted a well installation report for monitoring wells TAV-MW15 and TAV-MW16.	SNL July 2017a
August	2017	NMED HWB approved the well installation report for monitoring wells TAV-MW15 and TAV-MW16.	NMED HWB August 2017
November	2017	Installed injection well TAV-INJ1 for phase one of the TSWP.	SNL June 2018
February	2017	Implemented new quarterly sampling requirements per the NMED HWB-approved Revised Treatability Study Work Plan.	NMED HWB May 2016b
May	2017	NMED GWQB issued Discharge Permit, DP-1845, for the TA-V Treatability Study injection wells.	NMED GWQB May 2017
July	2017	Submitted a well installation report for monitoring wells TAV-MW15 and TAV-MW16.	SNL July 2017a
August	2017	NMED HWB approved the well installation report for monitoring wells TAV-MW15 and TAV-MW16.	NMED HWB August 2017
November	2017	Installed injection well TAV-INJ1 for phase one of the TSWP.	SNL June 2018
November	2017	Pilot Study for TSWP phase one conducted. Two injections are discharged at injection well TAV-INJ1.	DOE November 2017
July	2018	Notification to proceed to and modifications of full-scale operation at well TAV-INJ1.	DOE July 2018
August	2018	NMED HWB approved the modifications and concurred with the decision to proceed to full-scale operation at well TAV-INJ1.	NMED HWB August 2018

Table 5A-1. Historical Timeline of the Technical Area-V Groundwater Area of Concern *(concluded)*

Month	Year	Event	Reference
October	2018	Submitted the summary of the Treatability Study pilot test operation and results.	SNL October 2018a
October	2018	Full-scale operation of Treatment System started at injection well TAV-INJ1.	This AGMR
November	2018	Discharge begins at injection well TAV-INJ1.	This AGMR
December	2018	Full-scale operation continues at injection well TAV-INJ1.	This AGMR

Refer to footnotes on page 5A-7.

NOTES:

AOC	= Area of concern.
AVN	= Area-V (North).
CEARP	= Comprehensive Environmental Assessment and Response Program.
CCM	= Current Conceptual Model.
CME	= Corrective Measures Evaluation.
Consent Order	= Compliance Order on Consent.
DOE	= U.S. Department of Energy.
EPA	= U.S. Environmental Protection Agency.
ER	= Environmental Restoration.
GWQB	= Ground Water Quality Bureau.
HWB	= Hazardous Waste Bureau.
INJ	= Injection well.
IRR	= Internal Remedy Review.
KAFB	= Kirtland Air Force Base.
LWDS	= Liquid Waste Disposal System.
MCL	= Maximum Contaminant Level.
µg/L	= Microgram(s) per liter.
mg/L	= Milligram(s) per liter.
MW	= Monitoring well.
NMED	= New Mexico Environment Department.
NMOSE	= New Mexico Office of the State Engineer.
NNSA	= National Nuclear Security Administration.
NOD	= Notice of Disapproval.
OU	= Operable Unit.
RCRA	= Resource Conservation and Recovery Act.
RFI	= RCRA Facility Investigation.
RSI	= Request for Supplemental Information.
Sandia	= Sandia Corporation.
SNL	= Sandia National Laboratories.
SNL/NM	= Sandia National Laboratories, New Mexico.
SV	= Soil vapor.
SWMU	= Solid Waste Management Unit.
TA	= Technical Area.
TAV	= Technical Area-V (monitoring well designation).
TAVG	= Technical Area-V Groundwater.
TCE	= Trichloroethene.
TSWP	= Treatability Study Work Plan.

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Attachment 5B
Technical Area-V
Analytical Results Tables

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Attachment 5B Tables

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Table 5B-1
Summary of Detected Volatile Organic Compounds
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW1	Trichloroethene	**17.7**	0.300	1.00	5.00			104517-001	SW846-8260
19-Feb-18	cis-1,2-Dichloroethene	3.41	0.300	1.00	70.0			104517-001	SW846-8260
LWDS-MW1 (Duplicate)	Trichloroethene	**18.0**	0.300	1.00	5.00			104518-001	SW846-8260
19-Feb-18	cis-1,2-Dichloroethene	3.58	0.300	1.00	70.0			104518-001	SW846-8260
TAV-MW2	Acetone	ND	1.50	10.0	NE	J	10U	104521-001	SW846-8260
05-Feb-18	Trichloroethene	3.10	0.300	1.00	5.00			104521-001	SW846-8260
TAV-MW4	Acetone	ND	1.50	10.0	NE	J	10U	104523-001	SW846-8260
07-Feb-18	Chloroform	0.960	0.300	1.00	NE	J		104523-001	SW846-8260
	Trichloroethene	4.29	0.300	1.00	5.00			104523-001	SW846-8260
	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		104523-001	SW846-8260
TAV-MW8	Trichloroethene	4.22	0.300	1.00	5.00			104525-001	SW846-8260
08-Feb-18	cis-1,2-Dichloroethene	0.370	0.300	1.00	70.0	J		104525-001	SW846-8260
TAV-MW10	Trichloroethene	**8.42**	0.300	1.00	5.00			104527-001	SW846-8260
15-Feb-18	cis-1,2-Dichloroethene	1.35	0.300	1.00	70.0			104527-001	SW846-8260
TAV-MW11	Trichloroethene	3.06	0.300	1.00	5.00			104530-001	SW846-8260
06-Feb-18	cis-1,2-Dichloroethene	0.330	0.300	1.00	70.0	J		104530-001	SW846-8260
TAV-MW12	Acetone	ND	1.50	10.0	NE	J	10UJ	104532-001	SW846-8260
13-Feb-18	Trichloroethene	**6.37**	0.300	1.00	5.00			104532-001	SW846-8260
	cis-1,2-Dichloroethene	0.500	0.300	1.00	70.0	J		104532-001	SW846-8260
TAV-MW12 (Duplicate)	Trichloroethene	**6.11**	0.300	1.00	5.00			104533-001	SW846-8260
13-Feb-18	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		104533-001	SW846-8260
TAV-MW14	Trichloroethene	4.57	0.300	1.00	5.00			104535-001	SW846-8260
14-Feb-18	cis-1,2-Dichloroethene	0.500	0.300	1.00	70.0	J		104535-001	SW846-8260
TAV-MW16 02-Feb-18	Trichloroethene	0.530	0.300	1.00	5.00	J		104577-001	SW846-8260
LWDS-MW1	Trichloroethene	**17.4**	0.300	1.00	5.00			105346-001	SW846-8260
04-Jun-18	cis-1,2-Dichloroethene	3.57	0.300	1.00	70.0			105346-001	SW846-8260
LWDS-MW2 14-May-18	Acetone	1.64	1.50	10.0	NE	J	J+	105331-001	SW846-8260
TAV-MW2	Acetone	ND	1.50	10.0	NE	J	10UJ	105334-001	SW846-8260
17-May-18	Trichloroethene	2.99	0.300	1.00	5.00			105334-001	SW846-8260
TAV-MW3 11-May-18	Acetone	ND	1.50	10.0	NE	J	10UJ	105329-001	SW846-8260

Refer to footnotes on page 5B-52.

Table 5B-1 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW4 24-May-18	Acetone	1.61	1.50	10.0	NE	J	J	105342-001	SW846-8260
	Chloroform	0.930	0.300	1.00	NE	J		105342-001	SW846-8260
	Trichloroethene	4.15	0.300	1.00	5.00			105342-001	SW846-8260
	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		105342-001	SW846-8260
TAV-MW8 29-May-18	Acetone	1.88	1.50	10.0	NE	J	J	105344-001	SW846-8260
	Trichloroethene	4.65	0.300	1.00	5.00			105344-001	SW846-8260
	cis-1,2-Dichloroethene	0.410	0.300	1.00	70.0	J		105344-001	SW846-8260
TAV-MW9 10-May-18	Acetone	1.86	1.50	10.0	NE	J	J+	105317-001	SW846-8260
TAV-MW10 06-Jun-18	Trichloroethene	**9.71**	0.300	1.00	5.00			105354-001	SW846-8260
	cis-1,2-Dichloroethene	1.46	0.300	1.00	70.0			105354-001	SW846-8260
TAV-MW11 23-May-18	Trichloroethene	2.67	0.300	1.00	5.00			105340-001	SW846-8260
TAV-MW12 31-May-18	Acetone	2.40	1.50	10.0	NE	J	J	105348-001	SW846-8260
	Trichloroethene	**5.66**	0.300	1.00	5.00			105348-001	SW846-8260
	cis-1,2-Dichloroethene	0.420	0.300	1.00	70.0	J		105348-001	SW846-8260
TAV-MW14 05-Jun-18	Trichloroethene	**5.45**	0.300	1.00	5.00			105350-001	SW846-8260
	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		105350-001	SW846-8260
TAV-MW15 15-May-18	Acetone	ND	1.50	10.0	NE	J	10UJ	105357-001	SW846-8260
	Methylene chloride	ND	1.00	10.0	5.00	J	10UJ	105357-001	SW846-8260
TAV-MW16 16-May-18	Acetone	2.47	1.50	10.0	NE	J	J+	105359-001	SW846-8260
	Trichloroethene	0.570	0.300	1.00	5.00	J		105359-001	SW846-8260
LWDS-MW1 06-Aug-18	Trichloroethene	**15.7**	0.300	1.00	5.00			105837-001	SW846-8260
	cis-1,2-Dichloroethene	3.88	0.300	1.00	70.0			105837-001	SW846-8260
TAV-MW2 30-Jul-18	Trichloroethene	3.11	0.300	1.00	5.00			105823-001	SW846-8260
TAV-MW4 01-Aug-18	Chloroform	0.880	0.300	1.00	NE	J		105831-001	SW846-8260
	Trichloroethene	3.96	0.300	1.00	5.00			105831-001	SW846-8260
	cis-1,2-Dichloroethene	0.350	0.300	1.00	70.0	J		105831-001	SW846-8260
TAV-MW4 (Duplicate) 01-Aug-18	Chloroform	0.870	0.300	1.00	NE	J		105832-001	SW846-8260
	Trichloroethene	3.99	0.300	1.00	5.00			105832-001	SW846-8260
	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		105832-001	SW846-8260

Refer to footnotes on page 5B-52.

Table 5B-1 *(Continued)*
Summary of Detected Volatile Organic Compounds
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Trichloroethene	3.63	0.300	1.00	5.00			105835-001	SW846-8260
02-Aug-18	cis-1,2-Dichloroethene	0.370	0.300	1.00	70.0	J		105835-001	SW846-8260
TAV-MW10	Methylene chloride	ND	1.00	10.0	5.00	J	10U	105846-001	SW846-8260
20-Sep-18	Trichloroethene	**9.52**	0.300	1.00	5.00			105846-001	SW846-8260
	cis-1,2-Dichloroethene	1.53	0.300	1.00	70.0			105846-001	SW846-8260
TAV-MW10 (Duplicate)	Methylene chloride	ND	1.00	10.0	5.00	J	10U	105847-001	SW846-8260
20-Sep-18	Trichloroethene	**9.64**	0.300	1.00	5.00			105847-001	SW846-8260
	cis-1,2-Dichloroethene	1.56	0.300	1.00	70.0			105847-001	SW846-8260
TAV-MW11	Acetone	3.34	1.50	10.0	NE	J	J-	105825-001	SW846-8260
31-Jul-18	Trichloroethene	2.94	0.300	1.00	5.00			105825-001	SW846-8260
	cis-1,2-Dichloroethene	0.330	0.300	1.00	70.0	J		105825-001	SW846-8260
TAV-MW12	Trichloroethene	4.69	0.300	1.00	5.00			105839-001	SW846-8260
18-Sep-18	cis-1,2-Dichloroethene	0.360	0.300	1.00	70.0	J		105839-001	SW846-8260
TAV-MW14	Trichloroethene	4.64	0.300	1.00	5.00			105842-001	SW846-8260
19-Sep-18	cis-1,2-Dichloroethene	0.460	0.300	1.00	70.0	J		105842-001	SW846-8260
TAV-MW15 25-Jul-18	Acetone	ND	1.50	10.0	NE	J	10UJ	105817-001	SW846-8260
TAV-MW15 (Duplicate) 25-Jul-18	Acetone	ND	1.50	10.0	NE	J	10UJ	105818-001	SW846-8260
TAV-MW16 26-Jul-18	Trichloroethene	0.500	0.300	1.00	5.00	J		105821-001	SW846-8260
LWDS-MW1	Acetone	3.61	1.50	10.0	NE	J		106682-001	SW846-8260
19-Nov-18	Trichloroethene	**16.8**	0.300	1.00	5.00			106682-001	SW846-8260
	cis-1,2-Dichloroethene	3.47	0.300	1.00	70.0			106682-001	SW846-8260
TAV-MW2 06-Nov-18	Trichloroethene	3.18	0.300	1.00	5.00			106665-001	SW846-8260
TAV-MW2 (Duplicate) 06-Nov-18	Trichloroethene	3.27	0.300	1.00	5.00			106666-001	SW846-8260
TAV-MW4	Acetone	1.60	1.50	10.0	NE	J, N	J-	106670-001	SW846-8260
08-Nov-18	Chloroform	0.870	0.300	1.00	NE	J		106670-001	SW846-8260
	Trichloroethene	4.54	0.300	1.00	5.00			106670-001	SW846-8260
	cis-1,2-Dichloroethene	0.350	0.300	1.00	70.0	J		106670-001	SW846-8260
TAV-MW7 05-Nov-18	Acetone	3.02	1.50	10.0	NE	J, N	J-	106659-001	SW846-8260

Refer to footnotes on page 5B-52.

Table 5B-1 *(Concluded)*
Summary of Detected Volatile Organic Compounds
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Trichloroethene	4.80	0.300	1.00	5.00			106672-001	SW846-8260
09-Nov-18	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		106672-001	SW846-8260
TAV-MW10	Acetone	ND	1.50	10.0	NE	J	10UJ	106685-001	SW846-8260
26-Nov-18	Trichloroethene	**9.72**	0.300	1.00	5.00			106685-001	SW846-8260
	cis-1,2-Dichloroethene	1.59	0.300	1.00	70.0			106685-001	SW846-8260
TAV-MW11	Trichloroethene	3.33	0.300	1.00	5.00			106668-001	SW846-8260
07-Nov-18	cis-1,2-Dichloroethene	0.340	0.300	1.00	70.0	J		106668-001	SW846-8260
TAV-MW12	Acetone	2.97	1.50	10.0	NE	J		106674-001	SW846-8260
13-Nov-18	Trichloroethene	3.87	0.300	1.00	5.00			106674-001	SW846-8260
TAV-MW14	Trichloroethene	4.59	0.300	1.00	5.00			106678-001	SW846-8260
14-Nov-18	cis-1,2-Dichloroethene	0.420	0.300	1.00	70.0	J		106678-001	SW846-8260
TAV-MW14 (Duplicate)	Acetone	3.24	1.50	10.0	NE	J		106679-001	SW846-8260
14-Nov-18	Trichloroethene	4.57	0.300	1.00	5.00			106679-001	SW846-8260
	cis-1,2-Dichloroethene	0.410	0.300	1.00	70.0	J		106679-001	SW846-8260
TAV-MW16 02-Nov-18	Trichloroethene	0.620	0.300	1.00	5.00	J		106650-001	SW846-8260
TAV-MW16 (Duplicate)	Acetone	1.82	1.50	10.0	NE	J, N	J-	106651-001	SW846-8260
02-Nov-18	Trichloroethene	0.550	0.300	1.00	5.00	J		106651-001	SW846-8260

Refer to footnotes on page 5B-52.

Table 5B-2
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] SW846-8260)
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Analyte	MDL[b] (µg/L)	Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300	Chlorobenzene	0.300
1,1,2,2-Tetrachloroethane	0.300	Chloroethane	0.300
1,1,2-Trichloroethane	0.300	Chloroform	0.300
1,1-Dichloroethane	0.300	Chloromethane	0.300
1,1-Dichloroethene	0.300	Cyclohexane	0.300
1,2,3-Trichlorobenzene	0.300	Dibromochloromethane	0.300
1,2,4-Trichlorobenzene	0.300	Dichlorodifluoromethane	0.300
1,2-Dibromo-3-chloropropane	0.500	Ethylbenzene	0.300
1,2-Dibromoethane	0.300	Isopropylbenzene	0.300
1,2-Dichlorobenzene	0.300	Methyl acetate	1.50
1,2-Dichloroethane	0.300	Methylcyclohexane	0.300
1,2-Dichloropropane	0.300	Methylene chloride	1.00
1,3-Dichlorobenzene	0.300	Styrene	0.300
1,4-Dichlorobenzene	0.300	Tert-butyl methyl ether	0.300
2,2-trifluoroethane, 1,1,2-Trichloro-1	2.00	Tetrachloroethene	0.300
2-Butanone	1.50	Toluene	0.300
2-Hexanone	1.50	Trichloroethene	0.300
4-methyl-, 2-Pentanone	1.50	Trichlorofluoromethane	0.300
Acetone	1.50	Vinyl chloride	0.300
Benzene	0.300	Xylene	0.300
Bromochloromethane	0.300	cis-1,2-Dichloroethene	0.300
Bromodichloromethane	0.300	cis-1,3-Dichloropropene	0.300
Bromoform	0.300	m-, p-Xylene	0.300
Bromomethane	0.300	o-Xylene	0.300
Carbon disulfide	1.50	trans-1,2-Dichloroethene	0.300
Carbon tetrachloride	0.300	trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 5B-52.

Table 5B-3
Summary of Nitrate Plus Nitrite Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW1 19-Feb-18	Nitrate plus nitrite	**12.1**	0.425	1.25	10.0			104517-002	EPA 353.2
LWDS-MW1 (Duplicate) 19-Feb-18	Nitrate plus nitrite	**12.3**	0.425	1.25	10.0			104518-002	EPA 353.2
TAV-MW2 05-Feb-18	Nitrate plus nitrite	4.59	0.170	0.500	10.0			104521-002	EPA 353.2
TAV-MW4 07-Feb-18	Nitrate plus nitrite	4.70	0.170	0.500	10.0			104523-002	EPA 353.2
TAV-MW8 08-Feb-18	Nitrate plus nitrite	6.53	0.170	0.500	10.0			104525-002	EPA 353.2
TAV-MW10 15-Feb-18	Nitrate plus nitrite	**11.4**	0.425	1.25	10.0			104527-002	EPA 353.2
TAV-MW11 06-Feb-18	Nitrate plus nitrite	6.54	0.170	0.500	10.0			104530-002	EPA 353.2
TAV-MW12 13-Feb-18	Nitrate plus nitrite	8.64	0.170	0.500	10.0			104532-002	EPA 353.2
TAV-MW12 (Duplicate) 13-Feb-18	Nitrate plus nitrite	8.58	0.170	0.500	10.0			104533-002	EPA 353.2
TAV-MW14 14-Feb-18	Nitrate plus nitrite	8.17	0.170	0.500	10.0			104535-002	EPA 353.2
TAV-MW15 01-Feb-18	Nitrate plus nitrite	1.66	0.085	0.250	10.0			104574-002	EPA 353.2
TAV-MW16 02-Feb-18	Nitrate plus nitrite	2.28	0.085	0.250	10.0			104577-002	EPA 353.2
AVN-1 18-May-18	Nitrate plus nitrite	9.45	0.170	0.500	10.0			105306-002	EPA 353.2
AVN-1 (Duplicate) 18-May-18	Nitrate plus nitrite	9.39	0.170	0.500	10.0			105307-002	EPA 353.2
LWDS-MW1 04-Jun-18	Nitrate plus nitrite	**12.9**	0.425	1.25	10.0			105346-002	EPA 353.2
LWDS-MW2 14-May-18	Nitrate plus nitrite	7.53	0.425	1.25	10.0			105331-002	EPA 353.2
TAV-MW2 17-May-18	Nitrate plus nitrite	4.51	0.170	0.500	10.0			105334-002	EPA 353.2

Refer to footnotes on page 5B-52

Table 5B-3 *(Continued)*
Summary of Nitrate Plus Nitrite Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW3 11-May-18	Nitrate plus nitrite	5.04	0.170	0.500	10.0			105329-002	EPA 353.2
TAV-MW4 24-May-18	Nitrate plus nitrite	4.57	0.085	0.250	10.0			105342-002	EPA 353.2
TAV-MW5 09-May-18	Nitrate plus nitrite	6.85	0.425	1.25	10.0			105314-002	EPA 353.2
TAV-MW5 (Duplicate) 09-May-18	Nitrate plus nitrite	6.90	0.425	1.25	10.0			105315-002	EPA 353.2
TAV-MW8 29-May-18	Nitrate plus nitrite	6.38	0.170	0.500	10.0			105344-002	EPA 353.2
TAV-MW9 10-May-18	Nitrate plus nitrite	3.91	0.170	0.500	10.0			105317-002	EPA 353.2
TAV-MW10 06-Jun-18	Nitrate plus nitrite	**12.0**	0.425	1.25	10.0			105354-002	EPA 353.2
TAV-MW11 23-May-18	Nitrate plus nitrite	6.35	0.085	0.250	10.0			105340-002	EPA 353.2
TAV-MW12 31-May-18	Nitrate plus nitrite	6.99	0.170	0.500	10.0			105348-002	EPA 353.2
TAV-MW13 08-May-18	Nitrate plus nitrite	5.80	0.170	0.500	10.0			105309-002	EPA 353.2
TAV-MW13 (Duplicate) 08-May-18	Nitrate plus nitrite	5.80	0.170	0.500	10.0			105310-002	EPA 353.2
TAV-MW14 05-Jun-18	Nitrate plus nitrite	8.60	0.170	0.500	10.0			105350-002	EPA 353.2
TAV-MW15 15-May-18	Nitrate plus nitrite	1.73	0.085	0.250	10.0			105357-002	EPA 353.2
TAV-MW16 16-May-18	Nitrate plus nitrite	2.33	0.085	0.250	10.0			105359-002	EPA 353.2
LWDS-MW1 06-Aug-18	Nitrate plus nitrite	**12.0**	0.425	1.25	10.0			105837-002	EPA 353.2
TAV-MW2 30-Jul-18	Nitrate plus nitrite	4.73	0.085	0.250	10.0			105823-002	EPA 353.2
TAV-MW4 01-Aug-18	Nitrate plus nitrite	4.61	0.085	0.250	10.0			105831-002	EPA 353.2

Refer to footnotes on page 5B-52.

Table 5B-3 *(Continued)*
Summary of Nitrate Plus Nitrite Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW4 (Duplicate) 01-Aug-18	Nitrate plus nitrite	4.62	0.085	0.250	10.0			105832-002	EPA 353.2
TAV-MW8 02-Aug-18	Nitrate plus nitrite	6.53	0.170	0.500	10.0			105835-002	EPA 353.2
TAV-MW10 20-Sep-18	Nitrate plus nitrite	**11.3**	0.425	1.25	10.0			105846-002	EPA 353.2
TAV-MW10 (Duplicate) 20-Sep-18	Nitrate plus nitrite	**10.8**	0.170	0.500	10.0			105847-002	EPA 353.2
TAV-MW11 31-Jul-18	Nitrate plus nitrite	6.55	0.085	0.250	10.0			105825-002	EPA 353.2
TAV-MW12 18-Sep-18	Nitrate plus nitrite	6.69	0.170	0.500	10.0			105839-002	EPA 353.2
TAV-MW14 19-Sep-18	Nitrate plus nitrite	7.60	0.170	0.500	10.0			105842-002	EPA 353.2
TAV-MW15 25-Jul-18	Nitrate plus nitrite	1.81	0.085	0.250	10.0			105817-002	EPA 353.2
TAV-MW15 (Duplicate) 25-Jul-18	Nitrate plus nitrite	1.98	0.085	0.250	10.0			105818-002	EPA 353.2
TAV-MW16 26-Jul-18	Nitrate plus nitrite	2.29	0.170	0.500	10.0			105821-002	EPA 353.2
LWDS-MW1 19-Nov-18	Nitrate plus nitrite	**11.9**	0.170	0.500	10.0			106682-002	EPA 353.2
TAV-MW2 06-Nov-18	Nitrate plus nitrite	4.78	0.085	0.250	10.0			106665-002	EPA 353.2
TAV-MW2 (Duplicate) 06-Nov-18	Nitrate plus nitrite	4.71	0.085	0.250	10.0			106666-002	EPA 353.2
TAV-MW4 08-Nov-18	Nitrate plus nitrite	4.67	0.085	0.250	10.0			106670-002	EPA 353.2
TAV-MW7 05-Nov-18	Nitrate plus nitrite	4.07	0.170	0.500	10.0			106659-002	EPA 353.2
TAV-MW8 09-Nov-18	Nitrate plus nitrite	6.36	0.170	0.500	10.0			106672-002	EPA 353.2
TAV-MW10 26-Nov-18	Nitrate plus nitrite	**11.4**	0.170	0.500	10.0			106685-002	EPA 353.2

Refer to footnotes on page 5B-52.

Table 5B-3 *(Concluded)*
Summary of Nitrate Plus Nitrite Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11 07-Nov-18	Nitrate plus nitrite	6.67	0.170	0.500	10.0			106668-002	EPA 353.2
TAV-MW12 13-Nov-18	Nitrate plus nitrite	6.58	0.170	0.500	10.0			106674-002	EPA 353.2
TAV-MW14 14-Nov-18	Nitrate plus nitrite	7.91	0.170	0.500	10.0			106678-002	EPA 353.2
TAV-MW14 (Duplicate) 14-Nov-18	Nitrate plus nitrite	7.76	0.170	0.500	10.0			106679-002	EPA 353.2
TAV-MW15 01-Nov-18	Nitrate plus nitrite	1.94	0.085	0.250	10.0			106645-002	EPA 353.2
TAV-MW16 02-Nov-18	Nitrate plus nitrite	2.33	0.085	0.250	10.0			106650-002	EPA 353.2
TAV-MW16 (Duplicate) 02-Nov-18	Nitrate plus nitrite	2.36	0.085	0.250	10.0			106650-002	EPA 353.2

Refer to footnotes on page 5B-52.

Table 5B-4
Summary of Filtered Metal Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW1	Arsenic	ND	0.002	0.005	0.010	U	0.005UJ	104517-003	SW846 6020
19-Feb-18	Iron	0.0704	0.033	0.100	NE	J	J	104517-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U	0.005UJ	104517-003	SW846 6020
LWDS-MW1 (Duplicate)	Arsenic	0.00239	0.002	0.005	0.010	J	J	104518-003	SW846 6020
19-Feb-18	Iron	0.0587	0.033	0.100	NE	J	J	104518-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U	0.005UJ	104518-003	SW846 6020
TAV-MW2	Arsenic	ND	0.002	0.005	0.010	U		104521-003	SW846 6020
05-Feb-18	Iron	ND	0.033	0.100	NE	U		104521-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104521-003	SW846 6020
TAV-MW4	Arsenic	0.00229	0.002	0.005	0.010	J		104523-003	SW846 6020
07-Feb-18	Iron	ND	0.033	0.100	NE	U		104523-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104523-003	SW846 6020
TAV-MW8	Arsenic	0.0025	0.002	0.005	0.010	J		104525-003	SW846 6020
08-Feb-18	Iron	ND	0.033	0.100	NE	U		104525-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104525-003	SW846 6020
TAV-MW10	Arsenic	ND	0.002	0.005	0.010	U		104527-003	SW846 6020
15-Feb-18	Iron	0.0574	0.033	0.100	NE	J		104527-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104527-003	SW846 6020
TAV-MW11	Arsenic	0.00242	0.002	0.005	0.010	J		104530-003	SW846 6020
06-Feb-18	Iron	ND	0.033	0.100	NE	U		104530-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104530-003	SW846 6020
TAV-MW12	Arsenic	ND	0.002	0.005	0.010	U		104532-003	SW846 6020
13-Feb-18	Iron	ND	0.033	0.100	NE	B, J	0.10U	104532-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104532-003	SW846 6020
TAV-MW12 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		104533-003	SW846 6020
13-**Feb-18**	Iron	ND	0.033	0.100	NE	B, J	0.10U	104533-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104533-003	SW846 6020
TAV-MW14	Arsenic	ND	0.002	0.005	0.010	U		104535-003	SW846 6020
14-Feb-18	Iron	0.0635	0.033	0.100	NE	J		104535-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104535-003	SW846 6020
TAV-MW15	Arsenic	ND	0.002	0.005	0.010	U		104574-004	SW846 6020
01-Feb-18	Iron	ND	0.033	0.100	NE	U		104574-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104574-004	SW846 6020
TAV-MW16	Arsenic	0.00215	0.002	0.005	0.010	J		104577-004	SW846 6020
02-Feb-18	Iron	0.045	0.033	0.100	NE	J		104577-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104577-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-4 *(Continued)*
Summary of Filtered Metal Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Arsenic	0.00261	0.002	0.005	0.010	J		105306-003	SW846 6020
18-May-18	Iron	ND	0.033	0.100	NE	U		105306-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105306-003	SW846 6020
AVN-1 (Duplicate)	Arsenic	0.00274	0.002	0.005	0.010	J		105307-003	SW846 6020
18-May-18	Iron	ND	0.033	0.100	NE	U		105307-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105307-003	SW846 6020
LWDS-MW1	Arsenic	0.00358	0.002	0.005	0.010	J		105346-003	SW846 6020
04-Jun-18	Iron	ND	0.033	0.100	NE	U		105346-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105346-003	SW846 6020
LWDS-MW2	Arsenic	ND	0.002	0.005	0.010	U		105331-003	SW846 6020
14-May-18	Iron	ND	0.033	0.100	NE	U		105331-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105331-003	SW846 6020
TAV-MW2	Arsenic	ND	0.002	0.005	0.010	U		105334-003	SW846 6020
17-May-18	Iron	ND	0.033	0.100	NE	U		105334-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105334-003	SW846 6020
TAV-MW3	Arsenic	ND	0.002	0.005	0.010	U		105329-003	SW846 6020
11-May-18	Iron	ND	0.033	0.100	NE	U		105329-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105329-003	SW846 6020
TAV-MW4	Arsenic	0.00258	0.002	0.005	0.010	J		105342-003	SW846 6020
24-May-18	Iron	ND	0.033	0.100	NE	U		105342-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105342-003	SW846 6020
TAV-MW5	Arsenic	0.00241	0.002	0.005	0.010	J		105314-003	SW846 6020
09-May-18	Iron	ND	0.033	0.100	NE	U		105314-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105314-003	SW846 6020
TAV-MW5 (Duplicate)	Arsenic	0.00232	0.002	0.005	0.010	J		105315-003	SW846 6020
09-May-18	Iron	ND	0.033	0.100	NE	U		105315-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105315-003	SW846 6020
TAV-MW8	Arsenic	0.00279	0.002	0.005	0.010	J		105344-003	SW846 6020
29-May-18	Iron	ND	0.033	0.100	NE	U		105344-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105344-003	SW846 6020
TAV-MW9	Arsenic	0.00269	0.002	0.005	0.010	J		105317-003	SW846 6020
10-May-18	Iron	ND	0.033	0.100	NE	U		105317-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105317-003	SW846 6020
TAV-MW10	Arsenic	0.00252	0.002	0.005	0.010	J		105354-003	SW846 6020
06-Jun-18	Iron	ND	0.033	0.100	NE	U		105354-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105354-003	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-4 *(Continued))*
Summary of Filtered Metal Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Arsenic	0.00263	0.002	0.005	0.010	J		105340-003	SW846 6020
23-May-18	Iron	ND	0.033	0.100	NE	U		105340-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105340-003	SW846 6020
TAV-MW12	Arsenic	ND	0.002	0.005	0.010	U		105348-003	SW846 6020
31-May-18	Iron	ND	0.033	0.100	NE	U		105348-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105348-003	SW846 6020
TAV-MW13	Arsenic	0.00245	0.002	0.005	0.010	J		105309-003	SW846 6020
08-May-18	Iron	ND	0.033	0.100	NE	U		105309-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105309-003	SW846 6020
TAV-MW13 (Duplicate)	Arsenic	0.00244	0.002	0.005	0.010	J		105310-003	SW846 6020
08-May-18	Iron	ND	0.033	0.100	NE	U		105310-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105310-003	SW846 6020
TAV-MW14	Arsenic	0.00219	0.002	0.005	0.010	J		105350-003	SW846 6020
05-Jun-18	Iron	ND	0.033	0.100	NE	U		105350-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105350-003	SW846 6020
TAV-MW15	Arsenic	ND	0.002	0.005	0.010	U		105357-003	SW846 6020
15-May-18	Iron	ND	0.033	0.100	NE	U		105357-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105357-003	SW846 6020
TAV-MW16	Arsenic	ND	0.002	0.005	0.010	U		105359-003	SW846 6020
16-May-18	Iron	ND	0.033	0.100	NE	U		105359-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105359-003	SW846 6020
LWDS-MW1	Arsenic	0.00383	0.002	0.005	0.010	J		105837-003	SW846 6020
06-Aug-18	Iron	ND	0.033	0.100	NE	U		105837-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105837-003	SW846 6020
TAV-MW2	Arsenic	ND	0.002	0.005	0.010	U		105823-003	SW846 6020
30-Jul-18	Iron	ND	0.033	0.100	NE	U		105823-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105823-003	SW846 6020
TAV-MW4	Arsenic	ND	0.002	0.005	0.010	U		105831-003	SW846 6020
01-Aug-18	Iron	ND	0.033	0.100	NE	U		105831-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105831-003	SW846 6020
TAV-MW4 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		105832-003	SW846 6020
01-Aug-18	Iron	ND	0.033	0.100	NE	U		105832-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105832-003	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-4 *(Continued)*
Summary of Filtered Metal Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Arsenic	ND	0.002	0.005	0.010	U		105835-003	SW846 6020
02-Aug-18	Iron	ND	0.033	0.100	NE	U		105835-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105835-003	SW846 6020
TAV-MW10	Arsenic	0.00267	0.002	0.005	0.010	J		105846-003	SW846 6020
20-Sep-18	Iron	ND	0.033	0.100	NE	U		105846-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105846-003	SW846 6020
TAV-MW10 (Duplicate)	Arsenic	0.00254	0.002	0.005	0.010	J		105847-003	SW846 6020
20-Sep-18	Iron	ND	0.033	0.100	NE	U		105847-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105847-003	SW846 6020
TAV-MW11	Arsenic	0.00207	0.002	0.005	0.010	J		105825-003	SW846 6020
31-Jul-18	Iron	ND	0.033	0.100	NE	U		105825-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105825-003	SW846 6020
TAV-MW12	Arsenic	0.00218	0.002	0.005	0.010	J		105839-003	SW846 6020
18-Sep-18	Iron	ND	0.033	0.100	NE	U		105839-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105839-003	SW846 6020
TAV-MW14	Arsenic	0.00249	0.002	0.005	0.010	J		105842-003	SW846 6020
19-Sep-18	Iron	ND	0.033	0.100	NE	U		105842-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105842-003	SW846 6020
TAV-MW15	Arsenic	0.00234	0.002	0.005	0.010	J		105817-004	SW846 6020
25-Jul-18	Iron	ND	0.033	0.100	NE	U		105817-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105817-004	SW846 6020
TAV-MW15 (Duplicate)	Arsenic	0.00261	0.002	0.005	0.010	J		105818-004	SW846 6020
25-Jul-18	Iron	ND	0.033	0.100	NE	U		105818-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105818-004	SW846 6020
TAV-MW16	Arsenic	ND	0.002	0.005	0.010	U		105821-004	SW846 6020
26-Jul-18	Iron	ND	0.033	0.100	NE	U		105821-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105821-004	SW846 6020
LWDS-MW1	Arsenic	0.00412	0.002	0.005	0.010	J		106682-003	SW846 6020
19-Nov-18	Iron	ND	0.033	0.100	NE	U		106682-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106682-003	SW846 6020
TAV-MW2	Arsenic	0.00301	0.002	0.005	0.010	J		106665-003	SW846 6020
06-Nov-18	Iron	ND	0.033	0.100	NE	U		106665-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106665-003	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-4 *(Concluded)*
Summary of Filtered Metal Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW2 (Duplicate)	Arsenic	0.00327	0.002	0.005	0.010	J		106666-003	SW846 6020
06-Nov-18	Iron	ND	0.033	0.100	NE	U		106666-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106666-003	SW846 6020
TAV-MW4	Arsenic	0.00316	0.002	0.005	0.010	J		106670-003	SW846 6020
08-Nov-18	Iron	ND	0.033	0.100	NE	U		106670-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106670-003	SW846 6020
TAV-MW7	Arsenic	0.00319	0.002	0.005	0.010	J		106659-003	SW846 6020
05-Nov-18	Iron	ND	0.033	0.100	NE	U		106659-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106659-003	SW846 6020
TAV-MW8	Arsenic	0.00289	0.002	0.005	0.010	J		106672-003	SW846 6020
09-Nov-18	Iron	ND	0.033	0.100	NE	U		106672-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106672-003	SW846 6020
TAV-MW10	Arsenic	0.00297	0.002	0.005	0.010	J		106685-003	SW846 6020
26-Nov-18	Iron	0.0442	0.033	0.100	NE	J		106685-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106685-003	SW846 6020
TAV-MW11	Arsenic	0.00287	0.002	0.005	0.010	J		106668-003	SW846 6020
07-Nov-18	Iron	ND	0.033	0.100	NE	U		106668-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106668-003	SW846 6020
TAV-MW12	Arsenic	0.0025	0.002	0.005	0.010	J		106674-003	SW846 6020
13-Nov-18	Iron	ND	0.033	0.100	NE	U		106674-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106674-003	SW846 6020
TAV-MW14	Arsenic	0.0027	0.002	0.005	0.010	J		106678-003	SW846 6020
14-Nov-18	Iron	ND	0.033	0.100	NE	U		106678-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106678-003	SW846 6020
TAV-MW14 (Duplicate)	Arsenic	0.00279	0.002	0.005	0.010	J		106679-003	SW846 6020
14-Nov-18	Iron	ND	0.033	0.100	NE	U		106679-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106679-003	SW846 6020
TAV-MW15	Arsenic	0.00287	0.002	0.005	0.010	J		106645-003	SW846 6020
01-Nov-18	Iron	ND	0.033	0.100	NE	U		106645-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106645-003	SW846 6020
TAV-MW16	Arsenic	0.00253	0.002	0.005	0.010	J		106650-003	SW846 6020
02-Nov-18	Iron	ND	0.033	0.100	NE	U		106650-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106650-003	SW846 6020
TAV-MW16 (Duplicate)	Arsenic	0.00294	0.002	0.005	0.010	J		106651-003	SW846 6020
02-Nov-18	Iron	ND	0.033	0.100	NE	U		106651-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106651-003	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-5
Summary of Anions and Alkalinity Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Bromide	0.416	0.067	0.200	NE			104574-005	SW846 9056
01-Feb-18	Chloride	69.2	1.34	4.00	NE			104574-005	SW846 9056
	Fluoride	0.926	0.033	0.100	4.0			104574-005	SW846 9056
	Sulfate	55.7	2.66	8.00	NE			104574-005	SW846 9056
	Bicarbonate Alkalinity	263	1.45	4.00	NE			104574-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		104574-006	SM 2320B
TAV-MW16	Bromide	0.448	0.067	0.200	NE			104577-005	SW846 9056
02-Feb-18	Chloride	81.9	1.34	4.00	NE			104577-005	SW846 9056
	Fluoride	0.838	0.033	0.100	4.0			104577-005	SW846 9056
	Sulfate	56.3	2.66	8.00	NE			104577-005	SW846 9056
	Bicarbonate Alkalinity	284	1.45	4.00	NE			104577-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		104577-006	SM 2320B
AVN-1	Bromide	0.143	0.067	0.200	NE	J		105306-004	SW846 9056
18-May-18	Chloride	9.50	0.134	0.400	NE			105306-004	SW846 9056
	Fluoride	1.18	0.033	0.100	4.0			105306-004	SW846 9056
	Sulfate	30.7	0.266	0.800	NE			105306-004	SW846 9056
	Bicarbonate Alkalinity	155	1.45	4.00	NE			105306-005	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105306-005	SM 2320B
LWDS-MW1	Bromide	0.831	0.067	0.200	NE			105346-005	SW846 9056
04-Jun-18	Chloride	77.2	1.34	4.00	NE			105346-005	SW846 9056
	Fluoride	0.580	0.033	0.100	4.0			105346-005	SW846 9056
	Sulfate	38.1	2.66	8.00	NE			105346-005	SW846 9056
	Bicarbonate Alkalinity	208	1.45	4.00	NE			105346-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105346-006	SM 2320B
LWDS-MW2	Bromide	0.155	0.067	0.200	NE	J		105331-005	SW846 9056
14-May-18	Chloride	11.7	0.268	0.800	NE			105331-005	SW846 9056
	Fluoride	1.40	0.033	0.100	4.0			105331-005	SW846 9056
	Sulfate	38.9	0.532	1.60	NE			105331-005	SW846 9056
	Bicarbonate Alkalinity	178	1.45	4.00	NE			105331-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105331-006	SM 2320B
TAV-MW2	Bromide	0.343	0.067	0.200	NE			105334-005	SW846 9056
17-May-18	Chloride	51.8	0.670	2.00	NE			105334-005	SW846 9056
	Fluoride	0.933	0.033	0.100	4.0			105334-005	SW846 9056
	Sulfate	56.0	1.33	4.00	NE			105334-005	SW846 9056
	Bicarbonate Alkalinity	252	1.45	4.00	NE			105334-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105334-006	SM 2320B

Refer to footnotes on page 5B-52.

Table 5B-5 *(Continued)*
Summary of Anions and Alkalinity Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW3	Bromide	0.244	0.067	0.200	NE			105329-005	SW846 9056
11-May-18	Chloride	26.7	0.268	0.800	NE			105329-005	SW846 9056
	Fluoride	1.63	0.033	0.100	4.0			105329-005	SW846 9056
	Sulfate	67.2	0.532	1.60	NE			105329-005	SW846 9056
	Bicarbonate Alkalinity	204	1.45	4.00	NE			105329-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105329-006	SM 2320B
TAV-MW4	Bromide	0.408	0.067	0.200	NE			105342-005	SW846 9056
24-May-18	Chloride	39.3	0.335	1.00	NE			105342-005	SW846 9056
	Fluoride	1.12	0.033	0.100	4.0			105342-005	SW846 9056
	Sulfate	33.3	0.665	2.00	NE			105342-005	SW846 9056
	Bicarbonate Alkalinity	178	1.45	4.00	NE			105342-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105342-006	SM 2320B
TAV-MW5	Bromide	0.191	0.067	0.200	NE	J		105314-005	SW846 9056
09-May-18	Chloride	17.7	0.268	0.800	NE			105314-005	SW846 9056
	Fluoride	1.33	0.033	0.100	4.0			105314-005	SW846 9056
	Sulfate	42.2	0.532	1.60	NE			105314-005	SW846 9056
	Bicarbonate Alkalinity	189	1.45	4.00	NE			105314-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105314-006	SM 2320B
TAV-MW8	Bromide	0.363	0.067	0.200	NE			105344-005	SW846 9056
29-May-18	Chloride	44.9	0.670	2.00	NE			105344-005	SW846 9056
	Fluoride	1.38	0.033	0.100	4.0			105344-005	SW846 9056
	Sulfate	51.6	1.33	4.00	NE			105344-005	SW846 9056
	Bicarbonate Alkalinity	199	1.45	4.00	NE			105344-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105344-006	SM 2320B
TAV-MW9	Bromide	0.281	0.067	0.200	NE			105317-005	SW846 9056
10-May-18	Chloride	36.0	0.335	1.00	NE			105317-005	SW846 9056
	Fluoride	1.07	0.033	0.100	4.0			105317-005	SW846 9056
	Sulfate	64.8	0.665	2.00	NE			105317-005	SW846 9056
	Bicarbonate Alkalinity	253	1.45	4.00	NE			105317-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105317-006	SM 2320B
TAV-MW10	Bromide	0.379	0.067	0.200	NE			105354-005	SW846 9056
06-Jun-18	Chloride	48.5	0.670	2.00	NE			105354-005	SW846 9056
	Fluoride	1.50	0.033	0.100	4.0			105354-005	SW846 9056
	Sulfate	45.7	1.33	4.00	NE			105354-005	SW846 9056
	Bicarbonate Alkalinity	175	1.45	4.00	NE			105354-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105354-006	SM 2320B

Refer to footnotes on page 5B-52.

Table 5B-5 *(Continued)*
Summary of Anions and Alkalinity Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Bromide	0.537	0.067	0.200	NE			105340-005	SW846 9056
23-May-18	Chloride	51.3	0.670	2.00	NE			105340-005	SW846 9056
	Fluoride	1.36	0.033	0.100	4.0			105340-005	SW846 9056
	Sulfate	41.1	1.33	4.00	NE			105340-005	SW846 9056
	Bicarbonate Alkalinity	173	1.45	4.00	NE			105340-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105340-006	SM 2320B
TAV-MW12	Bromide	0.251	0.067	0.200	NE			105348-005	SW846 9056
31-May-18	Chloride	39.4	0.670	2.00	NE			105348-005	SW846 9056
	Fluoride	1.39	0.033	0.100	4.0			105348-005	SW846 9056
	Sulfate	48.3	1.33	4.00	NE			105348-005	SW846 9056
	Bicarbonate Alkalinity	201	1.45	4.00	NE			105348-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105348-006	SM 2320B
TAV-MW13	Bromide	0.193	0.067	0.200	NE	J		105309-005	SW846 9056
08-May-18	Chloride	18.7	0.268	0.800	NE			105309-005	SW846 9056
	Fluoride	1.27	0.033	0.100	4.0			105309-005	SW846 9056
	Sulfate	49.6	0.532	1.60	NE			105309-005	SW846 9056
	Bicarbonate Alkalinity	195	1.45	4.00	NE			105309-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105309-006	SM 2320B
TAV-MW14	Bromide	0.346	0.067	0.200	NE			105350-005	SW846 9056
05-Jun-18	Chloride	51.1	0.670	2.00	NE			105350-005	SW846 9056
	Fluoride	1.38	0.033	0.100	4.0			105350-005	SW846 9056
	Sulfate	53.6	1.33	4.00	NE			105350-005	SW846 9056
	Bicarbonate Alkalinity	204	1.45	4.00	NE			105350-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105350-006	SM 2320B
TAV-MW15	Bromide	0.422	0.067	0.200	NE			105357-005	SW846 9056
15-May-18	Chloride	70.3	1.34	4.00	NE			105357-005	SW846 9056
	Fluoride	0.853	0.033	0.100	4.0			105357-005	SW846 9056
	Sulfate	56.0	2.66	8.00	NE			105357-005	SW846 9056
	Bicarbonate Alkalinity	265	1.45	4.00	NE			105357-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105357-006	SM 2320B
TAV-MW16	Bromide	0.467	0.067	0.200	NE			105359-005	SW846 9056
16-May-18	Chloride	81.4	1.34	4.00	NE			105359-005	SW846 9056
	Fluoride	0.841	0.033	0.100	4.0			105359-005	SW846 9056
	Sulfate	58.8	2.66	8.00	NE			105359-005	SW846 9056
	Bicarbonate Alkalinity	283	1.45	4.00	NE			105359-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105359-006	SM 2320B

Refer to footnotes on page 5B-52.

Table 5B-5 *(Concluded)*
Summary of Anions and Alkalinity Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Bromide	0.407	0.067	0.200	NE			105817-005	SW846 9056
25-Jul-18	Chloride	76.7	1.34	4.00	NE			105817-005	SW846 9056
	Fluoride	1.08	0.033	0.100	4.0			105817-005	SW846 9056
	Sulfate	58.2	2.66	8.00	NE			105817-005	SW846 9056
	Bicarbonate Alkalinity	271	1.45	4.00	NE			105817-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105817-006	SM 2320B
TAV-MW16	Bromide	0.460	0.067	0.200	NE			105821-005	SW846 9056
26-Jul-18	Chloride	86.8	1.34	4.00	NE			105821-005	SW846 9056
	Fluoride	1.07	0.033	0.100	4.0			105821-005	SW846 9056
	Sulfate	59.8	2.66	8.00	NE			105821-005	SW846 9056
	Bicarbonate Alkalinity	198	1.45	4.00	NE			105821-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105821-006	SM 2320B
TAV-MW15	Bromide	0.427	0.067	0.200	NE			106645-004	SW846 9056
01-Nov-18	Chloride	74.4	1.34	4.00	NE			106645-004	SW846 9056
	Fluoride	1.06	0.033	0.100	4.0			106645-004	SW846 9056
	Sulfate	58.0	2.66	8.00	NE			106645-004	SW846 9056
	Bicarbonate Alkalinity	264	1.45	4.00	NE			106645-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		106645-006	SM 2320B
TAV-MW16	Bromide	0.421	0.067	0.200	NE			106650-004	SW846 9056
02-Nov-18	Chloride	83.1	1.34	4.00	NE			106650-004	SW846 9056
	Fluoride	0.819	0.033	0.100	4.0			106650-004	SW846 9056
	Sulfate	55.8	2.66	8.00	NE			106650-004	SW846 9056
	Bicarbonate Alkalinity	287	1.45	4.00	NE			106650-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		106650-006	SM 2320B

Refer to footnotes on page 5B-52.

Table 5B-6
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Aluminum	0.0289	0.0193	0.050	NE	J		104574-003	SW846 6020
01-Feb-18	Antimony	ND	0.001	0.003	0.006	U		104574-003	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		104574-003	SW846 6020
	Barium	0.0747	0.00067	0.002	2.00			104574-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		104574-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		104574-003	SW846 6020
	Calcium	74.1	0.400	1.00	NE			104574-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		104574-003	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		104574-003	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		104574-003	SW846 6020
	Iron	0.0548	0.033	0.100	NE	J		104574-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		104574-003	SW846 6020
	Magnesium	28.0	0.010	0.030	NE		J	104574-003	SW846 6020
	Manganese	0.00171	0.001	0.005	NE	J		104574-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		104574-003	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		104574-003	SW846 6020
	Potassium	4.39	0.080	0.300	NE			104574-003	SW846 6020
	Selenium	0.00243	0.002	0.005	0.050	J		104574-003	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		104574-003	SW846 6020
	Sodium	68.9	0.800	2.50	NE			104574-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		104574-003	SW846 6020
	Uranium	0.00724	0.000067	0.0002	0.030			104574-003	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		104574-003	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		104574-003	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW16	Aluminum	ND	0.0193	0.050	NE	U		104577-003	SW846 6020
02-Feb-18	Antimony	ND	0.001	0.003	0.006	U		104577-003	SW846 6020
	Arsenic	0.00206	0.002	0.005	0.010	J		104577-003	SW846 6020
	Barium	0.0644	0.00067	0.002	2.00			104577-003	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		104577-003	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		104577-003	SW846 6020
	Calcium	79.9	0.800	2.00	NE			104577-003	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		104577-003	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		104577-003	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		104577-003	SW846 6020
	Iron	ND	0.033	0.100	NE	U		104577-003	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		104577-003	SW846 6020
	Magnesium	27.5	0.010	0.030	NE			104577-003	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		104577-003	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		104577-003	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		104577-003	SW846 6020
	Potassium	4.46	0.080	0.300	NE			104577-003	SW846 6020
	Selenium	0.00232	0.002	0.005	0.050	J		104577-003	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		104577-003	SW846 6020
	Sodium	71.5	0.800	2.50	NE			104577-003	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		104577-003	SW846 6020
	Uranium	0.00632	0.000067	0.0002	0.030			104577-003	SW846 6020
	Vanadium	0.00549	0.0033	0.010	NE	J		104577-003	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		104577-003	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
AVN-1	Aluminum	0.0718	0.0193	0.050	NE			105306-008	SW846 6020
18-May-18	Antimony	ND	0.001	0.003	0.006	U		105306-008	SW846 6020
	Arsenic	0.00284	0.002	0.005	0.010	J		105306-008	SW846 6020
	Barium	0.0835	0.00067	0.002	2.00			105306-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105306-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105306-008	SW846 6020
	Calcium	43.5	0.080	0.200	NE			105306-008	SW846 6020
	Chromium	0.0668	0.003	0.010	0.100			105306-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105306-008	SW846 6020
	Copper	0.00111	0.0003	0.001	NE			105306-008	SW846 6020
	Iron	0.331	0.033	0.100	NE			105306-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105306-008	SW846 6020
	Magnesium	10.7	0.010	0.030	NE			105306-008	SW846 6020
	Manganese	0.00238	0.001	0.005	NE	J		105306-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105306-008	SW846 7470
	Nickel	0.00633	0.0006	0.002	NE			105306-008	SW846 6020
	Potassium	3.19	0.080	0.300	NE			105306-008	SW846 6020
	Selenium	0.00209	0.002	0.005	0.050	J		105306-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105306-008	SW846 6020
	Sodium	40.5	0.080	0.250	NE			105306-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105306-008	SW846 6020
	Uranium	0.00228	0.000067	0.0002	0.030			105306-008	SW846 6020
	Vanadium	0.00812	0.0033	0.010	NE	J		105306-008	SW846 6020
	Zinc	0.00681	0.0033	0.010	NE	J		105306-008	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW1	Aluminum	ND	0.0193	0.050	NE	U		105346-004	SW846 6020
04-Jun-18	Antimony	ND	0.001	0.003	0.006	U		105346-004	SW846 6020
	Arsenic	0.00355	0.002	0.005	0.010	J		105346-004	SW846 6020
	Barium	0.0887	0.00067	0.002	2.00			105346-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105346-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105346-004	SW846 6020
	Calcium	67.4	0.800	2.00	NE			105346-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105346-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105346-004	SW846 6020
	Copper	0.000327	0.0003	0.001	NE	J		105346-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105346-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105346-004	SW846 6020
	Magnesium	22.0	0.010	0.030	NE			105346-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105346-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105346-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105346-004	SW846 6020
	Potassium	3.20	0.080	0.300	NE			105346-004	SW846 6020
	Selenium	0.00601	0.002	0.005	0.050			105346-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105346-004	SW846 6020
	Sodium	70.5	0.800	2.50	NE			105346-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105346-004	SW846 6020
	Uranium	0.00269	0.000067	0.0002	0.030			105346-004	SW846 6020
	Vanadium	0.00591	0.0033	0.010	NE	J		105346-004	SW846 6020
	Zinc	0.00564	0.0033	0.010	NE	J		105346-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW2	Aluminum	0.119	0.0193	0.050	NE			105331-004	SW846 6020
14-May-18	Antimony	ND	0.001	0.003	0.006	U		105331-004	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105331-004	SW846 6020
	Barium	0.0666	0.00067	0.002	2.00			105331-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105331-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105331-004	SW846 6020
	Calcium	40.9	0.080	0.200	NE			105331-004	SW846 6020
	Chromium	0.00321	0.003	0.010	0.100	J		105331-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105331-004	SW846 6020
	Copper	0.000575	0.0003	0.001	NE	J		105331-004	SW846 6020
	Iron	0.123	0.033	0.100	NE			105331-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105331-004	SW846 6020
	Magnesium	11.8	0.010	0.030	NE			105331-004	SW846 6020
	Manganese	0.00204	0.001	0.005	NE	J		105331-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105331-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105331-004	SW846 6020
	Potassium	2.50	0.080	0.300	NE			105331-004	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105331-004	SW846 6020
	Silver	0.00085	0.0003	0.001	NE	J		105331-004	SW846 6020
	Sodium	36.5	0.080	0.250	NE			105331-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105331-004	SW846 6020
	Uranium	0.00272	0.000067	0.0002	0.030			105331-004	SW846 6020
	Vanadium	0.00694	0.0033	0.010	NE	J		105331-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	B, J	0.01U	105331-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW2	Aluminum	0.115	0.0193	0.050	NE			105334-004	SW846 6020
17-May-18	Antimony	ND	0.001	0.003	0.006	U		105334-004	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105334-004	SW846 6020
	Barium	0.0627	0.00067	0.002	2.00			105334-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105334-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105334-004	SW846 6020
	Calcium	71.3	0.800	2.00	NE			105334-004	SW846 6020
	Chromium	0.00473	0.003	0.010	0.100	J		105334-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105334-004	SW846 6020
	Copper	0.00124	0.0003	0.001	NE			105334-004	SW846 6020
	Iron	0.124	0.033	0.100	NE			105334-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105334-004	SW846 6020
	Magnesium	21.3	0.010	0.030	NE			105334-004	SW846 6020
	Manganese	0.00291	0.001	0.005	NE	J		105334-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105334-004	SW846 7470
	Nickel	0.00183	0.0006	0.002	NE	J		105334-004	SW846 6020
	Potassium	3.65	0.080	0.300	NE			105334-004	SW846 6020
	Selenium	0.00239	0.002	0.005	0.050	J		105334-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105334-004	SW846 6020
	Sodium	62.8	0.800	2.50	NE			105334-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105334-004	SW846 6020
	Uranium	0.00552	0.000067	0.0002	0.030			105334-004	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	B, J	0.01U	105334-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	B, J	0.01U	105334-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW3	Aluminum	0.0631	0.0193	0.050	NE			105329-004	SW846 6020
11-May-18	Antimony	ND	0.001	0.003	0.006	U		105329-004	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105329-004	SW846 6020
	Barium	0.0467	0.00067	0.002	2.00			105329-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105329-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105329-004	SW846 6020
	Calcium	51.5	0.800	2.00	NE		J	105329-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105329-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105329-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105329-004	SW846 6020
	Iron	0.0588	0.033	0.100	NE	J		105329-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105329-004	SW846 6020
	Magnesium	13.8	0.010	0.030	NE			105329-004	SW846 6020
	Manganese	0.00355	0.001	0.005	NE	J		105329-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105329-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105329-004	SW846 6020
	Potassium	4.21	0.080	0.300	NE			105329-004	SW846 6020
	Selenium	0.00227	0.002	0.005	0.050	J		105329-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105329-004	SW846 6020
	Sodium	47.8	0.080	0.250	NE			105329-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105329-004	SW846 6020
	Uranium	0.00322	0.000067	0.0002	0.030			105329-004	SW846 6020
	Vanadium	0.00533	0.0033	0.010	NE	J		105329-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105329-004	SW846 6020

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Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW4	Aluminum	0.0343	0.0193	0.050	NE	J		105342-004	SW846 6020
24-May-18	Antimony	ND	0.001	0.003	0.006	U		105342-004	SW846 6020
	Arsenic	0.00246	0.002	0.005	0.010	J		105342-004	SW846 6020
	Barium	0.0829	0.00067	0.002	2.00			105342-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105342-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105342-004	SW846 6020
	Calcium	47.2	0.080	0.200	NE			105342-004	SW846 6020
	Chromium	0.0235	0.003	0.010	0.100			105342-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105342-004	SW846 6020
	Copper	0.000357	0.0003	0.001	NE	J		105342-004	SW846 6020
	Iron	0.0454	0.033	0.100	NE	J		105342-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105342-004	SW846 6020
	Magnesium	14.9	0.010	0.030	NE			105342-004	SW846 6020
	Manganese	0.00122	0.001	0.005	NE	J		105342-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105342-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105342-004	SW846 6020
	Potassium	2.64	0.080	0.300	NE			105342-004	SW846 6020
	Selenium	0.00381	0.002	0.005	0.050	J		105342-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105342-004	SW846 6020
	Sodium	44.7	0.080	0.250	NE			105342-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105342-004	SW846 6020
	Uranium	0.00307	0.000067	0.0002	0.030			105342-004	SW846 6020
	Vanadium	0.00709	0.0033	0.010	NE	J		105342-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105342-004	SW846 6020

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Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW5	Aluminum	ND	0.0193	0.050	NE	U		105314-004	SW846 6020
09-May-18	Antimony	ND	0.001	0.003	0.006	U		105314-004	SW846 6020
	Arsenic	0.00237	0.002	0.005	0.010	J		105314-004	SW846 6020
	Barium	0.0612	0.00067	0.002	2.00			105314-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105314-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105314-004	SW846 6020
	Calcium	45.1	0.080	0.200	NE		J	105314-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105314-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105314-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105314-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105314-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105314-004	SW846 6020
	Magnesium	12.7	0.010	0.030	NE			105314-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105314-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105314-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105314-004	SW846 6020
	Potassium	2.78	0.080	0.300	NE			105314-004	SW846 6020
	Selenium	0.00254	0.002	0.005	0.050	J		105314-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105314-004	SW846 6020
	Sodium	44.7	0.080	0.250	NE		J	105314-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105314-004	SW846 6020
	Uranium	0.00317	0.000067	0.0002	0.030			105314-004	SW846 6020
	Vanadium	0.0078	0.0033	0.010	NE	J		105314-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	J	0.01U	105314-004	SW846 6020

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Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Aluminum	ND	0.0193	0.050	NE	U		105344-004	SW846 6020
29-May-18	Antimony	ND	0.001	0.003	0.006	U		105344-004	SW846 6020
	Arsenic	0.00247	0.002	0.005	0.010	J		105344-004	SW846 6020
	Barium	0.0591	0.00067	0.002	2.00			105344-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105344-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105344-004	SW846 6020
	Calcium	57.9	0.800	2.00	NE			105344-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105344-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105344-004	SW846 6020
	Copper	0.00141	0.0003	0.001	NE			105344-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105344-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105344-004	SW846 6020
	Magnesium	16.7	0.010	0.030	NE			105344-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105344-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105344-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105344-004	SW846 6020
	Potassium	3.78	0.080	0.300	NE			105344-004	SW846 6020
	Selenium	0.00354	0.002	0.005	0.050	J		105344-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105344-004	SW846 6020
	Sodium	59.4	0.800	2.50	NE			105344-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105344-004	SW846 6020
	Uranium	0.0032	0.000067	0.0002	0.030			105344-004	SW846 6020
	Vanadium	0.00649	0.0033	0.010	NE	J		105344-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105344-004	SW846 6020

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Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW9	Aluminum	ND	0.0193	0.050	NE	U		105317-004	SW846 6020
10-May-18	Antimony	ND	0.001	0.003	0.006	U		105317-004	SW846 6020
	Arsenic	0.00243	0.002	0.005	0.010	J		105317-004	SW846 6020
	Barium	0.0683	0.00067	0.002	2.00			105317-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105317-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105317-004	SW846 6020
	Calcium	64.7	0.800	2.00	NE			105317-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105317-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105317-004	SW846 6020
	Copper	0.00076	0.0003	0.001	NE	J		105317-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105317-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105317-004	SW846 6020
	Magnesium	19.6	0.010	0.030	NE			105317-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105317-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105317-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105317-004	SW846 6020
	Potassium	4.26	0.080	0.300	NE			105317-004	SW846 6020
	Selenium	0.0025	0.002	0.005	0.050	J		105317-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105317-004	SW846 6020
	Sodium	60.5	0.800	2.50	NE			105317-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105317-004	SW846 6020
	Uranium	0.00569	0.000067	0.0002	0.030			105317-004	SW846 6020
	Vanadium	0.0082	0.0033	0.010	NE	J		105317-004	SW846 6020
	Zinc	0.00489	0.0033	0.010	NE	J		105317-004	SW846 6020

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Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW10	Aluminum	ND	0.0193	0.050	NE	U		105354-004	SW846 6020
06-Jun-18	Antimony	ND	0.001	0.003	0.006	U		105354-004	SW846 6020
	Arsenic	0.00247	0.002	0.005	0.010	J		105354-004	SW846 6020
	Barium	0.0572	0.00067	0.002	2.00			105354-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105354-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105354-004	SW846 6020
	Calcium	54.4	0.800	2.00	NE			105354-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105354-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105354-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105354-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105354-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105354-004	SW846 6020
	Magnesium	16.8	0.010	0.030	NE			105354-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105354-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105354-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105354-004	SW846 6020
	Potassium	4.00	0.080	0.300	NE			105354-004	SW846 6020
	Selenium	0.00319	0.002	0.005	0.050	J		105354-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105354-004	SW846 6020
	Sodium	58.8	0.800	2.50	NE			105354-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105354-004	SW846 6020
	Uranium	0.0029	0.000067	0.0002	0.030			105354-004	SW846 6020
	Vanadium	0.00666	0.0033	0.010	NE	J		105354-004	SW846 6020
	Zinc	0.00433	0.0033	0.010	NE	J		105354-004	SW846 6020

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Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW11	Aluminum	ND	0.0193	0.050	NE	U		105340-004	SW846 6020
23-May-18	Antimony	ND	0.001	0.003	0.006	U		105340-004	SW846 6020
	Arsenic	0.00292	0.002	0.005	0.010	J		105340-004	SW846 6020
	Barium	0.0664	0.00067	0.002	2.00			105340-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105340-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105340-004	SW846 6020
	Calcium	49.6	0.080	0.200	NE			105340-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105340-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105340-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105340-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105340-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105340-004	SW846 6020
	Magnesium	16.1	0.010	0.030	NE			105340-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105340-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105340-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105340-004	SW846 6020
	Potassium	3.30	0.080	0.300	NE			105340-004	SW846 6020
	Selenium	0.00351	0.002	0.005	0.050	J		105340-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105340-004	SW846 6020
	Sodium	51.2	0.800	2.50	NE		J	105340-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105340-004	SW846 6020
	Uranium	0.0029	0.000067	0.0002	0.030			105340-004	SW846 6020
	Vanadium	0.00711	0.0033	0.010	NE	J		105340-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105340-004	SW846 6020

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Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW12	Aluminum	0.062	0.0193	0.050	NE			105348-004	SW846 6020
31-May-18	Antimony	ND	0.001	0.003	0.006	U		105348-004	SW846 6020
	Arsenic	0.00236	0.002	0.005	0.010	J		105348-004	SW846 6020
	Barium	0.0678	0.00067	0.002	2.00			105348-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105348-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105348-004	SW846 6020
	Calcium	55.2	0.800	2.00	NE			105348-004	SW846 6020
	Chromium	0.00357	0.003	0.010	0.100	J		105348-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105348-004	SW846 6020
	Copper	0.00032	0.0003	0.001	NE	J		105348-004	SW846 6020
	Iron	0.0604	0.033	0.100	NE	J		105348-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105348-004	SW846 6020
	Magnesium	18.5	0.010	0.030	NE			105348-004	SW846 6020
	Manganese	0.00189	0.001	0.005	NE	J		105348-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105348-004	SW846 7470
	Nickel	0.000803	0.0006	0.002	NE	J		105348-004	SW846 6020
	Potassium	3.72	0.080	0.300	NE			105348-004	SW846 6020
	Selenium	0.00266	0.002	0.005	0.050	J		105348-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105348-004	SW846 6020
	Sodium	58.3	0.800	2.50	NE			105348-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105348-004	SW846 6020
	Uranium	0.00408	0.000067	0.0002	0.030			105348-004	SW846 6020
	Vanadium	0.00541	0.0033	0.010	NE	J		105348-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105348-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW13	Aluminum	ND	0.0193	0.050	NE	U		105309-004	SW846 6020
08-May-18	Antimony	ND	0.001	0.003	0.006	U		105309-004	SW846 6020
	Arsenic	0.00259	0.002	0.005	0.010	J		105309-004	SW846 6020
	Barium	0.0608	0.00067	0.002	2.00			105309-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105309-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105309-004	SW846 6020
	Calcium	55.0	0.800	2.00	NE			105309-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105309-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105309-004	SW846 6020
	Copper	0.000414	0.0003	0.001	NE	J		105309-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105309-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105309-004	SW846 6020
	Magnesium	14.6	0.010	0.030	NE			105309-004	SW846 6020
	Manganese	0.00203	0.001	0.005	NE	J		105309-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105309-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105309-004	SW846 6020
	Potassium	3.54	0.080	0.300	NE			105309-004	SW846 6020
	Selenium	0.00233	0.002	0.005	0.050	J		105309-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105309-004	SW846 6020
	Sodium	51.5	0.800	2.50	NE			105309-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105309-004	SW846 6020
	Uranium	0.00365	0.000067	0.0002	0.030			105309-004	SW846 6020
	Vanadium	0.00764	0.0033	0.010	NE	J		105309-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	J	0.01U	105309-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW14	Aluminum	0.0535	0.0193	0.050	NE			105350-004	SW846 6020
05-Jun-18	Antimony	ND	0.001	0.003	0.006	U		105350-004	SW846 6020
	Arsenic	0.00228	0.002	0.005	0.010	J		105350-004	SW846 6020
	Barium	0.0599	0.00067	0.002	2.00			105350-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105350-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105350-004	SW846 6020
	Calcium	57.5	0.800	2.00	NE			105350-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105350-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105350-004	SW846 6020
	Copper	0.00035	0.0003	0.001	NE	J		105350-004	SW846 6020
	Iron	0.0521	0.033	0.100	NE	J		105350-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105350-004	SW846 6020
	Magnesium	19.7	0.010	0.030	NE			105350-004	SW846 6020
	Manganese	0.00195	0.001	0.005	NE	J		105350-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105350-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105350-004	SW846 6020
	Potassium	4.15	0.080	0.300	NE			105350-004	SW846 6020
	Selenium	0.00285	0.002	0.005	0.050	J		105350-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105350-004	SW846 6020
	Sodium	60.2	0.800	2.50	NE			105350-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105350-004	SW846 6020
	Uranium	0.00412	0.000067	0.0002	0.030			105350-004	SW846 6020
	Vanadium	0.00579	0.0033	0.010	NE	J		105350-004	SW846 6020
	Zinc	0.00388	0.0033	0.010	NE	J		105350-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Aluminum	ND	0.0193	0.050	NE	U		105357-004	SW846 6020
15-May-18	Antimony	ND	0.001	0.003	0.006	U		105357-004	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105357-004	SW846 6020
	Barium	0.0708	0.00067	0.002	2.00			105357-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105357-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105357-004	SW846 6020
	Calcium	70.4	0.800	2.00	NE			105357-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105357-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105357-004	SW846 6020
	Copper	0.000319	0.0003	0.001	NE	J		105357-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105357-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105357-004	SW846 6020
	Magnesium	25.0	0.010	0.030	NE	N		105357-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105357-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105357-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105357-004	SW846 6020
	Potassium	4.09	0.080	0.300	NE			105357-004	SW846 6020
	Selenium	0.00233	0.002	0.005	0.050	J		105357-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105357-004	SW846 6020
	Sodium	64.3	0.800	2.50	NE			105357-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105357-004	SW846 6020
	Uranium	0.00685	0.000067	0.0002	0.030			105357-004	SW846 6020
	Vanadium	0.00331	0.0033	0.010	NE	J		105357-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105357-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW16	Aluminum	ND	0.0193	0.050	NE	U		105359-004	SW846 6020
16-May-18	Antimony	ND	0.001	0.003	0.006	U		105359-004	SW846 6020
	Arsenic	0.00206	0.002	0.005	0.010	J		105359-004	SW846 6020
	Barium	0.0665	0.00067	0.002	2.00			105359-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105359-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105359-004	SW846 6020
	Calcium	75.0	0.800	2.00	NE			105359-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105359-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105359-004	SW846 6020
	Copper	0.000336	0.0003	0.001	NE	J		105359-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105359-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105359-004	SW846 6020
	Magnesium	26.7	0.010	0.030	NE	N		105359-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105359-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105359-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105359-004	SW846 6020
	Potassium	4.43	0.080	0.300	NE			105359-004	SW846 6020
	Selenium	0.00227	0.002	0.005	0.050	J		105359-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105359-004	SW846 6020
	Sodium	66.6	0.800	2.50	NE			105359-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105359-004	SW846 6020
	Uranium	0.00635	0.000067	0.0002	0.030			105359-004	SW846 6020
	Vanadium	0.0057	0.0033	0.010	NE	J		105359-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105359-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Aluminum	0.0289	0.0193	0.050	NE	J		105817-004	SW846 6020
25-Jul-18	Antimony	ND	0.001	0.003	0.006	U		105817-004	SW846 6020
	Arsenic	0.00218	0.002	0.005	0.010	J		105817-004	SW846 6020
	Barium	0.0736	0.00067	0.002	2.00			105817-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105817-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105817-004	SW846 6020
	Calcium	79.1	0.800	2.00	NE			105817-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105817-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105817-004	SW846 6020
	Copper	0.000346	0.0003	0.001	NE	J		105817-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105817-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105817-004	SW846 6020
	Magnesium	26.2	0.100	0.300	NE			105817-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105817-004	SW846 6020
	Mercury	0.000077	0.000067	0.0002	0.002	J		105817-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105817-004	SW846 6020
	Potassium	4.19	0.080	0.300	NE			105817-004	SW846 6020
	Selenium	0.00236	0.002	0.005	0.050	J	J+	105817-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105817-004	SW846 6020
	Sodium	73.9	0.800	2.50	NE			105817-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105817-004	SW846 6020
	Uranium	0.00718	0.000067	0.0002	0.030			105817-004	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	B, J	0.010U	105817-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	B, J	0.010U	105817-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW16	Aluminum	ND	0.0193	0.050	NE	U		105821-004	SW846 6020
26-Jul-18	Antimony	ND	0.001	0.003	0.006	U		105821-004	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105821-004	SW846 6020
	Barium	0.0704	0.00067	0.002	2.00			105821-004	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105821-004	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105821-004	SW846 6020
	Calcium	80.8	0.800	2.00	NE			105821-004	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105821-004	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105821-004	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105821-004	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105821-004	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105821-004	SW846 6020
	Magnesium	29.2	0.010	0.030	NE			105821-004	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105821-004	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105821-004	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105821-004	SW846 6020
	Potassium	4.63	0.080	0.300	NE			105821-004	SW846 6020
	Selenium	0.00214	0.002	0.005	0.050	J		105821-004	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105821-004	SW846 6020
	Sodium	72.5	0.400	1.25	NE			105821-004	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105821-004	SW846 6020
	Uranium	0.00695	0.000067	0.0002	0.030			105821-004	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	B, J	0.010U	105821-004	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105821-004	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Continued)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Aluminum	ND	0.0193	0.050	NE	U		106645-005	SW846 6020
01-Nov-18	Antimony	ND	0.001	0.003	0.006	U		106645-005	SW846 6020
	Arsenic	0.00289	0.002	0.005	0.010	J		106645-005	SW846 6020
	Barium	0.0676	0.00067	0.002	2.00			106645-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		106645-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		106645-005	SW846 6020
	Calcium	77.7	0.800	2.00	NE			106645-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		106645-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		106645-005	SW846 6020
	Copper	0.00117	0.0003	0.001	NE			106645-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		106645-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		106645-005	SW846 6020
	Magnesium	25.6	0.010	0.030	NE			106645-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		106645-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		106645-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		106645-005	SW846 6020
	Potassium	3.85	0.080	0.300	NE			106645-005	SW846 6020
	Selenium	0.00208	0.002	0.005	0.050	J		106645-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		106645-005	SW846 6020
	Sodium	71.6	0.800	2.50	NE		J	106645-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		106645-005	SW846 6020
	Uranium	0.00653	0.000067	0.0002	0.030			106645-005	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	B, J	0.01U	106645-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		106645-005	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-6 *(Concluded)*
Summary of TAL Metals plus Uranium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW16	Aluminum	ND	0.0193	0.050	NE	U		106650-005	SW846 6020
02-Nov-18	Antimony	ND	0.001	0.003	0.006	U		106650-005	SW846 6020
	Arsenic	0.00269	0.002	0.005	0.010	J		106650-005	SW846 6020
	Barium	0.0653	0.00067	0.002	2.00			106650-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		106650-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		106650-005	SW846 6020
	Calcium	77.7	0.800	2.00	NE			106650-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		106650-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		106650-005	SW846 6020
	Copper	0.00167	0.0003	0.001	NE			106650-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		106650-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		106650-005	SW846 6020
	Magnesium	29.3	0.010	0.030	NE		J	106650-005	SW846 6020
	Manganese	0.00175	0.001	0.005	NE	J		106650-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		106650-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		106650-005	SW846 6020
	Potassium	4.40	0.080	0.300	NE			106650-005	SW846 6020
	Selenium	0.00255	0.002	0.005	0.050	J		106650-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		106650-005	SW846 6020
	Sodium	73.6	0.800	2.50	NE			106650-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		106650-005	SW846 6020
	Uranium	0.00666	0.000067	0.0002	0.030			106650-005	SW846 6020
	Vanadium	0.00711	0.0033	0.010	NE	J		106650-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		106650-005	SW846 6020

Refer to footnotes on page 5B-52.

Table 5B-7
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Americium-241	5.24 ± 6.61	9.82	4.77	NE	U	BD	104574-007	EPA 901.1
01-Feb-18	Cesium-137	0.0888 ± 1.73	2.99	1.41	NE	U	BD	104574-007	EPA 901.1
	Cobalt-60	0.155 ± 1.73	3.18	1.47	NE	U	BD	104574-007	EPA 901.1
	Potassium-40	13.5 ± 36.9	28.5	13.0	NE	U	BD	104574-007	EPA 901.1
	Gross Alpha	7.05	NA	NA	15 pCi/L	NA	None	104574-008	EPA 900.0
	Gross Beta	5.86 ± 1.57	1.80	0.873	4 mrem/yr			104574-008	EPA 900.0
	Tritium	21.3 ± 65.5	115	53.4	NE	U	BD	104574-009	EPA 906.0
TAV-MW16	Americium-241	-5.12 ± 6.22	9.22	4.47	NE	U	BD	104577-007	EPA 901.1
02-Feb-18	Cesium-137	-1.28 ± 1.79	2.76	1.30	NE	U	BD	104577-007	EPA 901.1
	Cobalt-60	-0.413 ± 1.81	3.21	1.48	NE	U	BD	104577-007	EPA 901.1
	Potassium-40	35.2 ± 33.8	25.1	11.3	NE	X	R	104577-007	EPA 901.1
	Gross Alpha	5.46	NA	NA	15 pCi/L	NA	None	104577-008	EPA 900.0
	Gross Beta	5.99 ± 1.59	1.82	0.883	4 mrem/yr			104577-008	EPA 900.0
	Tritium	39.0 ± 66.0	113	52.4	NE	U	BD	104577-009	EPA 906.0
AVN-1	Americium-241	7.35 ± 15.1	23.8	11.5	NE	U	BD	105306-006	EPA 901.1
18-May-18	Cesium-137	0.437 ± 2.22	3.43	1.62	NE	U	BD	105306-006	EPA 901.1
	Cobalt-60	-1.0 ± 2.25	3.77	1.73	NE	U	BD	105306-006	EPA 901.1
	Potassium-40	8.29 ± 52.0	33.1	15.0	NE	U	BD	105306-006	EPA 901.1
	Gross Alpha	2.96	NA	NA	15 pCi/L	NA	None	105306-007	EPA 900.0
	Gross Beta	3.12 ± 0.696	0.951	0.453	4 mrem/yr			105306-007	EPA 900.0
	Tritium	-82.6 ± 98.4	176	85.2	NE	U	BD	105306-009	EPA 906.0
LWDS-MW1	Americium-241	2.76 ± 15.1	23.2	11.2	NE	U	BD	105346-007	EPA 901.1
04-Jun-18	Cesium-137	-1.43 ± 2.15	3.41	1.60	NE	U	BD	105346-007	EPA 901.1
	Cobalt-60	-1.96 ± 2.35	3.72	1.69	NE	U	BD	105346-007	EPA 901.1
	Potassium-40	4.24 ± 53.8	37.0	16.8	NE	U	BD	105346-007	EPA 901.1
	Gross Alpha	4.18	NA	NA	15 pCi/L	NA	None	105346-008	EPA 900.0
	Gross Beta	5.98 ± 1.25	1.81	0.880	4 mrem/yr			105346-008	EPA 900.0
	Tritium	62.0 ± 88.5	150	67.9	NE	U	BD	105346-009	EPA 906.0

Refer to footnotes on page 5B-52.

Table 5B-7 *(Continued)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
LWDS-MW2	Americium-241	6.08 ± 10.8	18.1	8.72	NE	U	BD	105331-007	EPA 901.1
14-May-18	Cesium-137	1.65 ± 2.88	5.18	2.43	NE	U	BD	105331-007	EPA 901.1
	Cobalt-60	-0.233 ± 2.77	5.13	2.32	NE	U	BD	105331-007	EPA 901.1
	Potassium-40	26.1 ± 69.6	45.8	20.4	NE	U	BD	105331-007	EPA 901.1
	Gross Alpha	3.40	NA	NA	15 pCi/L	NA	None	105331-008	EPA 900.0
	Gross Beta	4.11 ± 0.748	0.976	0.466	4 mrem/yr			105331-008	EPA 900.0
	Tritium	-116 ± 114	207	100	NE	U	BD	105331-009	EPA 906.0
TAV-MW2	Americium-241	1.71 ± 10.6	17.6	8.58	NE	U	BD	105334-007	EPA 901.1
17-May-18	Cesium-137	3.13 ± 2.80	4.20	2.01	NE	U	BD	105334-007	EPA 901.1
	Cobalt-60	1.35 ± 1.95	3.59	1.65	NE	U	BD	105334-007	EPA 901.1
	Potassium-40	-23 ± 35.6	47.9	22.6	NE	U	BD	105334-007	EPA 901.1
	Gross Alpha	5.95	NA	NA	15 pCi/L	NA	None	105334-008	EPA 900.0
	Gross Beta	4.74 ± 0.945	1.22	0.580	4 mrem/yr			105334-008	EPA 900.0
	Tritium	-28.5 ± 94.5	166	80.1	NE	U	BD	105334-009	EPA 906.0
TAV-MW3	Americium-241	-6.9 ± 13.7	22.2	10.7	NE	U	BD	105329-007	EPA 901.1
11-May-18	Cesium-137	0.695 ± 1.92	3.55	1.68	NE	U	BD	105329-007	EPA 901.1
	Cobalt-60	1.61 ± 2.24	4.20	1.94	NE	U	BD	105329-007	EPA 901.1
	Potassium-40	-9.45 ± 42.4	54.9	25.8	NE	U	BD	105329-007	EPA 901.1
	Gross Alpha	4.14	NA	NA	15 pCi/L	NA	None	105329-008	EPA 900.0
	Gross Beta	6.16 ± 1.24	1.77	0.857	4 mrem/yr			105329-008	EPA 900.0
	Tritium	-99.4 ± 119	213	103	NE	U	BD	105329-009	EPA 906.0
TAV-MW4	Americium-241	5.39 ± 6.26	9.25	4.48	NE	U	BD	105342-007	EPA 901.1
24-May-18	Cesium-137	1.55 ± 1.78	3.00	1.42	NE	U	BD	105342-007	EPA 901.1
	Cobalt-60	5.19 ± 5.12	5.19	1.73	NE	U	BD	105342-007	EPA 901.1
	Potassium-40	43.6 ± 29.1	43.6	20.5	NE	U	BD	105342-007	EPA 901.1
	Gross Alpha	2.43	NA	NA	15 pCi/L	NA	None	105342-008	EPA 900.0
	Gross Beta	4.20 ± 0.637	0.763	0.366	4 mrem/yr		J	105342-008	EPA 900.0
	Tritium	-40.4 ± 101	179	86.4	NE	U	BD	105342-009	EPA 906.0
TAV-MW5	Americium-241	3.87 ± 10.7	16.5	8.01	NE	U	BD	105314-007	EPA 901.1
09-May-18	Cesium-137	-0.905 ± 1.94	3.35	1.59	NE	U	BD	105314-007	EPA 901.1
	Cobalt-60	2.46 ± 2.27	3.87	1.81	NE	U	BD	105314-007	EPA 901.1
	Potassium-40	27.0 ± 42.1	33.6	15.6	NE	U	BD	105314-007	EPA 901.1
	Gross Alpha	3.96	NA	NA	15 pCi/L	NA	None	105314-008	EPA 900.0
	Gross Beta	3.27 ± 1.10	1.69	0.815	4 mrem/yr		J	105314-008	EPA 900.0
	Tritium	-64.9 ± 113	201	97.1	NE	U	BD	105314-009	EPA 906.0

Refer to footnotes on page 5B-52.

Table 5B-7 *(Continued)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW8	Americium-241	-17.7 ± 16.7	17.2	8.25	NE	U	BD	105344-007	EPA 901.1
29-May-18	Cesium-137	0.410 ± 2.24	3.65	1.70	NE	U	BD	105344-007	EPA 901.1
	Cobalt-60	-1.41 ± 2.00	3.23	1.41	NE	U	BD	105344-007	EPA 901.1
	Potassium-40	-41.6 ± 47.0	61.6	28.8	NE	U	BD	105344-007	EPA 901.1
	Gross Alpha	2.30	NA	NA	15 pCi/L	NA	None	105344-008	EPA 900.0
	Gross Beta	5.85 ± 1.17	1.69	0.822	4 mrem/yr			105344-008	EPA 900.0
	Tritium	48.0 ± 91.6	159	72.5	NE	U	BD	105344-009	EPA 906.0
TAV-MW9	Americium-241	-6.59 ± 16.4	25.0	12.1	NE	U	BD	105317-007	EPA 901.1
10-May-18	Cesium-137	0.00954 ± 1.66	2.93	1.38	NE	U	BD	105317-007	EPA 901.1
	Cobalt-60	-0.282 ± 1.69	3.08	1.41	NE	U	BD	105317-007	EPA 901.1
	Potassium-40	-45.4 ± 45.0	45.1	21.2	NE	U	BD	105317-007	EPA 901.1
	Gross Alpha	5.85	NA	NA	15 pCi/L	NA	None	105317-008	EPA 900.0
	Gross Beta	4.03 ± 1.11	1.66	0.800	4 mrem/yr		J	105317-008	EPA 900.0
	Tritium	-70.8 ± 117	209	101	NE	U	BD	105317-009	EPA 906.0
TAV-MW10	Americium-241	13.9 ± 17.5	27.2	13.2	NE	U	BD	105354-007	EPA 901.1
06-Jun-18	Cesium-137	-0.00141 ± 1.84	3.38	1.59	NE	U	BD	105354-007	EPA 901.1
	Cobalt-60	0.216 ± 2.02	3.69	1.70	NE	U	BD	105354-007	EPA 901.1
	Potassium-40	13.2 ± 47.1	36.4	16.7	NE	U	BD	105354-007	EPA 901.1
	Gross Alpha	4.13	NA	NA	15 pCi/L	NA	None	105354-008	EPA 900.0
	Gross Beta	5.98 ± 0.986	1.36	0.657	4 mrem/yr			105354-008	EPA 900.0
	Tritium	67.4 ± 89.8	151	68.3	NE	U	BD	105354-009	EPA 906.0
TAV-MW11	Americium-241	4.15 ± 10.8	16.7	8.09	NE	U	BD	105340-007	EPA 901.1
23-May-18	Cesium-137	-1.39 ± 2.95	3.58	1.70	NE	U	BD	105340-007	EPA 901.1
	Cobalt-60	-0.454 ± 1.99	3.47	1.60	NE	U	BD	105340-007	EPA 901.1
	Potassium-40	12.8 ± 54.3	33.0	15.2	NE	U	BD	105340-007	EPA 901.1
	Gross Alpha	3.24	NA	NA	15 pCi/L	NA	None	105340-008	EPA 900.0
	Gross Beta	5.34 ± 1.15	1.65	0.793	4 mrem/yr			105340-008	EPA 900.0
	Tritium	-93.9 ± 92.6	167	80.6	NE	U	BD	105340-009	EPA 906.0
TAV-MW12	Americium-241	-2.11 ± 10.8	17.5	8.39	NE	U	BD	105348-007	EPA 901.1
31-May-18	Cesium-137	-0.943 ± 2.08	3.44	1.60	NE	U	BD	105348-007	EPA 901.1
	Cobalt-60	0.548 ± 2.41	4.03	1.82	NE	U	BD	105348-007	EPA 901.1
	Potassium-40	48.8 ± 49.8	36.2	16.2	NE	X	R	105348-007	EPA 901.1
	Gross Alpha	5.04	NA	NA	15 pCi/L	NA	None	105348-008	EPA 900.0
	Gross Beta	7.94 ± 1.23	1.72	0.837	4 mrem/yr			105348-008	EPA 900.0
	Tritium	30.5 ± 89.0	158	72.0	NE	U	BD	105348-009	EPA 906.0

Refer to footnotes on page 5B-52.

Table 5B-7 *(Continued)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW13	Americium-241	2.29 ± 3.52	5.58	2.70	NE	U	BD	105309-007	EPA 901.1
08-May-18	Cesium-137	0.200 ± 2.75	4.26	1.99	NE	U	BD	105309-007	EPA 901.1
	Cobalt-60	1.67 ± 2.71	4.66	2.10	NE	U	BD	105309-007	EPA 901.1
	Potassium-40	-14 ± 47.8	64.9	30.2	NE	U	BD	105309-007	EPA 901.1
	Gross Alpha	4.31	NA	NA	15 pCi/L	NA	None	105309-008	EPA 900.0
	Gross Beta	5.32 ± 1.17	1.69	0.814	4 mrem/yr			105309-008	EPA 900.0
	Tritium	-23.6 ± 118	207	99.9	NE	U	BD	105309-009	EPA 906.0
TAV-MW14	Americium-241	-3.29 ± 15.2	25.6	12.4	NE	U	BD	105350-007	EPA 901.1
05-Jun-18	Cesium-137	0.297 ± 2.00	3.45	1.63	NE	U	BD	105350-007	EPA 901.1
	Cobalt-60	-0.254 ± 2.57	3.95	1.82	NE	U	BD	105350-007	EPA 901.1
	Potassium-40	32.9 ± 37.4	36.2	16.6	NE	U	BD	105350-007	EPA 901.1
	Gross Alpha	5.22	NA	NA	15 pCi/L	NA	None	105350-008	EPA 900.0
	Gross Beta	10.6 ± 1.20	1.48	0.715	4 mrem/yr			105350-008	EPA 900.0
	Tritium	-21.8 ± 78.4	150	67.9	NE	U	BD	105350-009	EPA 906.0
TAV-MW15	Americium-241	-4.19 ± 9.77	14.4	7.01	NE	U	BD	105357-007	EPA 901.1
15-May-18	Cesium-137	0.0672 ± 1.69	3.06	1.47	NE	U	BD	105357-007	EPA 901.1
	Cobalt-60	0.520 ± 1.84	3.28	1.54	NE	U	BD	105357-007	EPA 901.1
	Potassium-40	7.68 ± 43.0	30.1	14.1	NE	U	BD	105357-007	EPA 901.1
	Gross Alpha	4.71	NA	NA	15 pCi/L	NA	None	105357-008	EPA 900.0
	Gross Beta	3.58 ± 1.21	1.88	0.908	4 mrem/yr		J	105357-008	EPA 900.0
	Tritium	12.0 ± 100	173	83.6	NE	U	BD	105357-009	EPA 906.0
TAV-MW16	Americium-241	2.93 ± 6.21	9.35	4.57	NE	U	BD	105359-007	EPA 901.1
16-May-18	Cesium-137	-0.514 ± 1.58	2.61	1.25	NE	U	BD	105359-007	EPA 901.1
	Cobalt-60	1.62 ± 1.75	3.05	1.43	NE	U	BD	105359-007	EPA 901.1
	Potassium-40	-18.7 ± 31.6	35.6	16.9	NE	U	BD	105359-007	EPA 901.1
	Gross Alpha	11.85	NA	NA	15 pCi/L	NA	None	105359-008	EPA 900.0
	Gross Beta	6.78 ± 1.48	2.21	1.07	4 mrem/yr			105359-008	EPA 900.0
	Tritium	3.37 ± 101	175	84.9	NE	U	BD	105359-009	EPA 906.0

Refer to footnotes on page 5A-48.

Table 5B-7 *(Concluded)*
Summary of Gross Alpha, Gross Beta, Gamma Spectroscopy, and Tritium Results
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TAV-MW15	Americium-241	0.310 ± 8.13	13.3	6.46	NE	U	BD	105817-007	EPA 901.1
25-Jul-18	Cesium-137	-1.14 ± 1.69	2.36	1.12	NE	U	BD	105817-007	EPA 901.1
	Cobalt-60	-0.562 ± 1.51	2.61	1.21	NE	U	BD	105817-007	EPA 901.1
	Potassium-40	-45.7 ± 38.4	38.5	18.3	NE	U	BD	105817-007	EPA 901.1
	Gross Alpha	5.15	NA	NA	15 pCi/L	NA	None	105817-008	EPA 900.0
	Gross Beta	5.66 ± 1.20	1.73	0.838	4 mrem/yr			105817-008	EPA 900.0
	Tritium	32.6 ± 79.7	141	63.5	NE	U	BD	105817-009	EPA 906.0
TAV-MW16	Americium-241	-5.96 ± 9.14	13.0	6.32	NE	U	BD	105821-007	EPA 901.1
26-Jul-18	Cesium-137	1.50 ± 2.46	2.90	1.39	NE	U	BD	105821-007	EPA 901.1
	Cobalt-60	0.781 ± 1.68	3.03	1.42	NE	U	BD	105821-007	EPA 901.1
	Potassium-40	-18.2 ± 47.7	40.6	19.3	NE	U	BD	105821-007	EPA 901.1
	Gross Alpha	7.64	NA	NA	15 pCi/L	NA	None	105821-008	EPA 900.0
	Gross Beta	6.56 ± 1.59	2.37	1.15	4 mrem/yr		J	105821-008	EPA 900.0
	Tritium	-7.92 ± 69.5	132	59.1	NE	U	BD	105821-009	EPA 906.0
TAV-MW15	Americium-241	5.24 ± 12.6	20.6	9.92	NE	U	BD	106645-007	EPA 901.1
01-Nov-18	Cesium-137	0.366 ± 1.72	3.06	1.44	NE	U	BD	106645-007	EPA 901.1
	Cobalt-60	0.00211 ± 1.80	3.32	1.52	NE	U	BD	106645-007	EPA 901.1
	Potassium-40	-4.31 ± 38.3	49.7	23.5	NE	U	BD	106645-007	EPA 901.1
	Gross Alpha	7.92	NA	NA	15 pCi/L	NA	None	106645-008	EPA 900.0
	Gross Beta	5.38 ± 1.27	1.85	0.893	4 mrem/yr	*	J	106645-008	EPA 900.0
	Tritium	-54.5 ± 71.9	135	63.5	NE	U	BD	106645-009	EPA 906.0
TAV-MW16	Americium-241	-13.4 ± 11.8	15.7	7.54	NE	U	BD	106650-007	EPA 901.1
02-Nov-18	Cesium-137	-0.855 ± 1.96	3.25	1.52	NE	U	BD	106650-007	EPA 901.1
	Cobalt-60	0.988 ± 2.75	4.03	1.85	NE	U	BD	106650-007	EPA 901.1
	Potassium-40	-21 ± 45.2	52.7	24.7	NE	U	BD	106650-007	EPA 901.1
	Gross Alpha	10.14	NA	NA	15 pCi/L	NA	None	106650-008	EPA 900.0
	Gross Beta	4.38 ± 1.34	2.06	0.988	4 mrem/yr	*	J	106650-008	EPA 900.0
	Tritium	-62.3 ± 71.6	136	63.8	NE	U	BD	106650-009	EPA 906.0

Refer to footnotes on page 5B-52.

Table 5B-8
Summary of Field Water Quality Measurements[h]
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (^0C)	Specific Conductivity (µmhos/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
LWDS-MW1	19-Feb-18	17.64	676.2	236.0	7.51	0.82	93.2	7.38
TAV-MW2	05-Feb-18	19.50	878.0	32.0	7.48	2.23	81.2	6.12
TAV-MW4	07-Feb-18	17.90	594.6	41.6	7.46	0.73	89.0	6.91
TAV-MW8	08-Feb-18	19.39	734.9	34.4	7.43	8.71	88.4	6.68
TAV-MW10	15-Feb-18	18.35	557.1	261.1	7.71	0.36	89.2	6.95
TAV-MW11	06-Feb-18	19.89	626.4	70.9	7.46	0.26	97.1	7.25
TAV-MW12	13-Feb-18	19.62	606.3	264.6	7.63	3.70	85.2	6.34
TAV-MW14	14-Feb-18	18.95	631.5	256.9	7.56	3.11	88.7	6.84
TAV-MW15	01-Feb-18	20.87	999.5	57.4	7.37	1.48	93.6	6.87
TAV-MW16	02-Feb-18	19.97	1029.1	63.8	7.31	0.34	56.2	4.19
AVN-1	18-May-18	22.12	506.5	276.9	7.67	1.59	49.3	3.56
LWDS-MW1	04-Jun-18	21.36	840.0	233.5	7.45	0.38	99.2	6.99
LWDS-MW2	14-May-18	21.28	517.8	249.1	7.62	1.82	63.6	4.59
TAV-MW2	17-May-18	22.33	785.0	281.7	7.31	3.73	80.6	5.67
TAV-MW3	11-May-18	22.82	613.4	296.0	7.62	1.83	82.0	5.73
TAV-MW4	24-May-18	21.97	587.9	297.3	7.52	0.72	91.9	6.69
TAV-MW5	09-May-18	21.79	586.5	-56.3	7.55	0.13	73.7	5.25
TAV-MW8	29-May-18	23.35	705.0	-81.9	7.53	0.58	94.9	6.57
TAV-MW9	10-May-18	21.65	749.5	-125.1	7.35	0.34	16.4	1.17
TAV-MW10	06-Jun-18	22.53	885.9	234.7	7.60	0.33	95.3	6.94
TAV-MW11	23-May-18	21.73	656.7	274.7	7.50	0.37	92.9	6.87
TAV-MW12	31-May-18	21.13	718.3	292.2	7.53	1.51	84.5	6.33
TAV-MW13	08-May-18	21.48	546.0	45.9	7.66	0.27	32.6	2.33
TAV-MW14	05-Jun-18	22.97	963.2	277.7	7.44	2.77	94.2	6.82
TAV-MW15	15-May-18	22.74	828.6	258.0	7.28	0.43	93.5	6.54
TAV-MW16	16-May-18	22.40	955.8	301.1	7.20	0.22	57.4	4.04

Refer to footnotes on page 5B-52.

Table 5B-8 *(Concluded)*
Summary of Field Water Quality Measurements[h]
Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (ºC)	Specific Conductivity (µmhos/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
LWDS-MW1	06-Aug-18	24.51	875.6	67.6	7.46	0.47	102.1	6.99
TAV-MW2	30-Jul-18	21.62	781.0	186.4	7.44	15.8	81.3	5.81
TAV-MW4	01-Aug-18	22.38	598.5	198.7	7.63	0.58	91.6	6.49
TAV-MW8	02-Aug-18	23.02	695.7	55.4	7.48	1.29	87.1	6.18
TAV-MW10	20-Sep-18	19.84	633.6	181.7	7.55	0.38	97.4	7.47
TAV-MW11	31-Jul-18	21.93	690.0	190.6	7.59	0.41	96.0	6.82
TAV-MW12	18-Sep-18	22.37	678.8	148.1	7.55	1.36	93.4	6.81
TAV-MW14	19-Sep-18	21.85	714.9	185.8	7.49	1.59	97.6	7.19
TAV-MW15	25-Jul-18	22.78	880.8	119.2	7.27	0.61	83.9	6.01
TAV-MW16	26-Jul-18	21.64	907.1	139.0	7.24	0.32	51.8	3.79
LWDS-MW1	19-Nov-18	15.79	666.7	142.5	7.20	1.07	97.1	8.72
TAV-MW2	06-Nov-18	19.06	718.6	175.1	7.32	2.29	77.9	6.20
TAV-MW4	08-Nov-18	20.11	553.0	155.6	7.53	0.30	88.9	7.02
TAV-MW7	05-Nov-18	20.26	631.3	149.7	7.39	3.25	3.01	0.22
TAV-MW8	09-Nov-18	18.68	634.5	122.7	7.47	1.74	83.9	6.86
TAV-MW10	26-Nov-18	19.06	651.2	84.1	7.59	0.47	88.9	7.48
TAV-MW11	07-Nov-18	20.78	630.0	105.8	7.51	0.54	89.3	6.97
TAV-MW12	13-Nov-18	14.77	575.3	210.1	7.61	1.02	82.4	7.34
TAV-MW14	14-Nov-18	19.71	698.7	88.4	7.52	2.17	88.1	7.15
TAV-MW15	01-Nov-18	19.37	788.8	177.0	7.28	0.65	83.1	6.41
TAV-MW16	02-Nov-18	20.16	875.3	114.0	7.25	0.59	55.9	4.24

Refer to footnotes on page 5B-52.

Footnotes for Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico Analytical Results Tables

% = Percent.
CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
ID = Identifier.
MCL = Maximum contaminant level.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.
mrem/yr = Millirem per year.
No. = Number.
pCi/L = Picocuries per liter.

[a]Result

Result applies to Table 5B-1 through 5B-6. Activity applies to Table 5B-7.

Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table 1-4).

Bold = Value exceed the established MCL. Activities of zero or less are considered to be not detected.

ND = not detected (at method detection limit).

[b]MDL or MDA

The MDL applies to Tables 5B-1 through 5B-6. MDA applies to Table 5B-7.

MDA = The minimal detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.

MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

NA = Not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

The PQL applies to Tables 5B-1 through 5B-6. Critical Level applies to Table 5B-7.

Critical Level = The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.

PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

NA = Not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).

The following are the MCLs for gross alpha particles and beta particles in community water systems:

- 15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table 1-4).
- 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).
- NE = Not established.

Footnotes for Technical Area V Groundwater Monitoring, Sandia National Laboratories/New Mexico Analytical Results Tables (Concluded)

[e]Lab Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

B = The analyte was found in the blank above the effective MDL.

J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.

N = Results associated with a spike analysis that was outside control limits.

NA = Not applicable.

U = Analyte is absent or below the MDL.

X = Uncertain identification for gamma spectroscopy.

* = Recovery or relative percent difference (RPD) not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where the concentration falls below the effective PQL.

[f]Validation Qualifier
If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.
BD = Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J = The associated value is an estimated quantity.
J+ = The associated numerical value is an estimated quantity with a suspected positive bias.
J- = The associated numerical value is an estimated quantity with a suspected negative bias.
None = No data validation for corrected gross alpha activity.
U = The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ = The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R = The data are unusable, and resampling or reanalysis are necessary for verification.

[g]Analytical Method
Clesceri, Rice, Baird, and Eaton, 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C.
DOE, 1997, "EML [Environmental Measurements Laboratory] Procedures Manual," 28th ed., Vol. 1, Rev.0, HASL-300.
EPA, 1986, (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.
EPA, 1984, "Methods for Chemical Analysis of Water and Wastes." EPA 600-4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.
EPA, 1980, "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.
DOE = U.S. Department of Energy.
EPA = U.S. Environmental Protection Agency.
HASL = Health and Safety Laboratory.
SM = Standard Method.
SW = Solid Waste.

[h]Field Water Quality Measurements
Field measurements collected prior to sampling.
^{O}C = degrees Celsius
% Sat = percent saturation
µmhos/cm = micromhos per centimeter
mg/L = milligrams per liter
mV = millivolts
NTU = nephelometric turbidity units
pH = potential of hydrogen (negative logarithm of the hydrogen ion concentration)

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Attachment 5C
Technical Area-V
Plots

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Attachment 5C Plots

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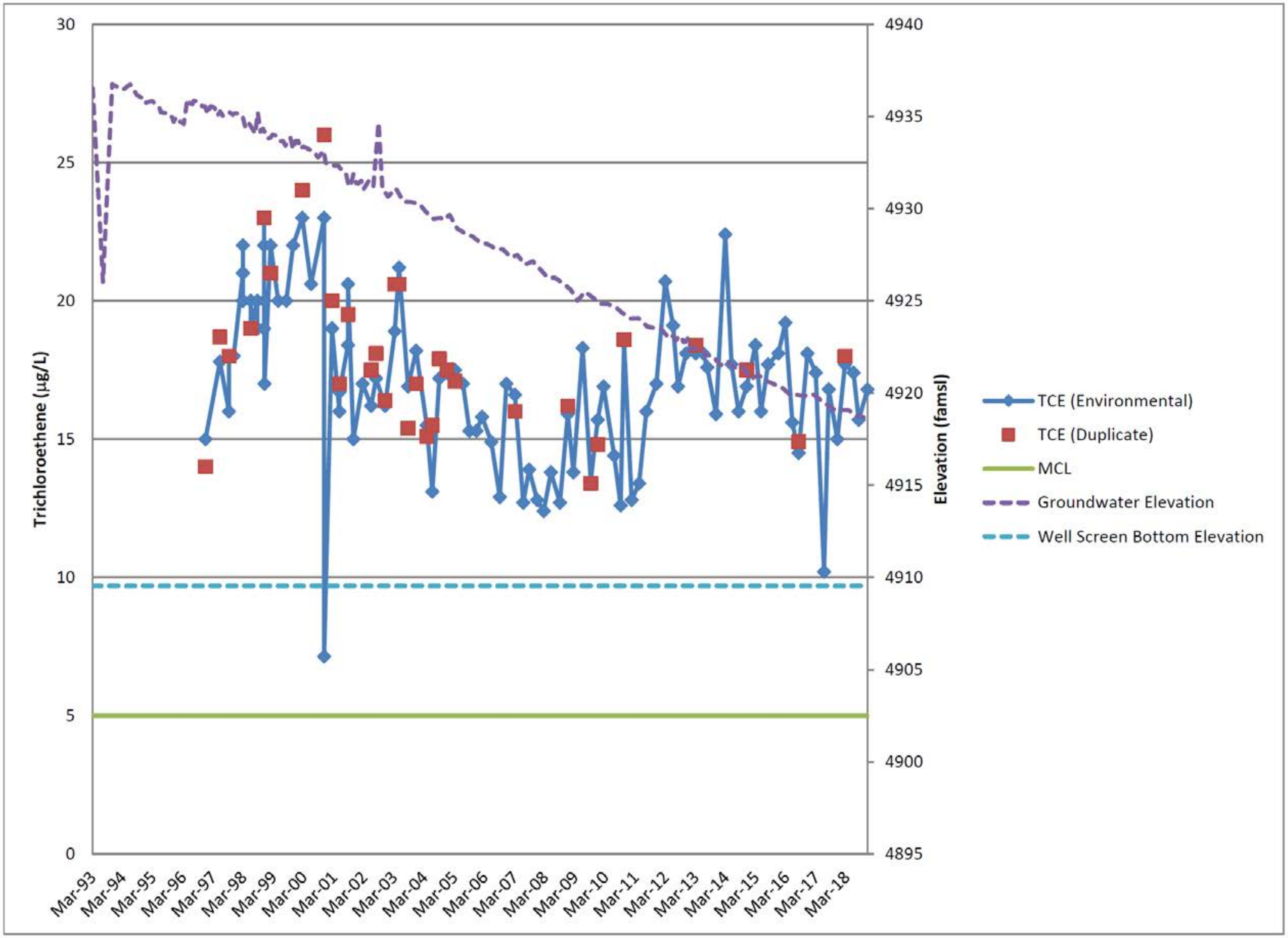

Figure 5C-1.Trichloroethene Concentrations, LWDS-MW1

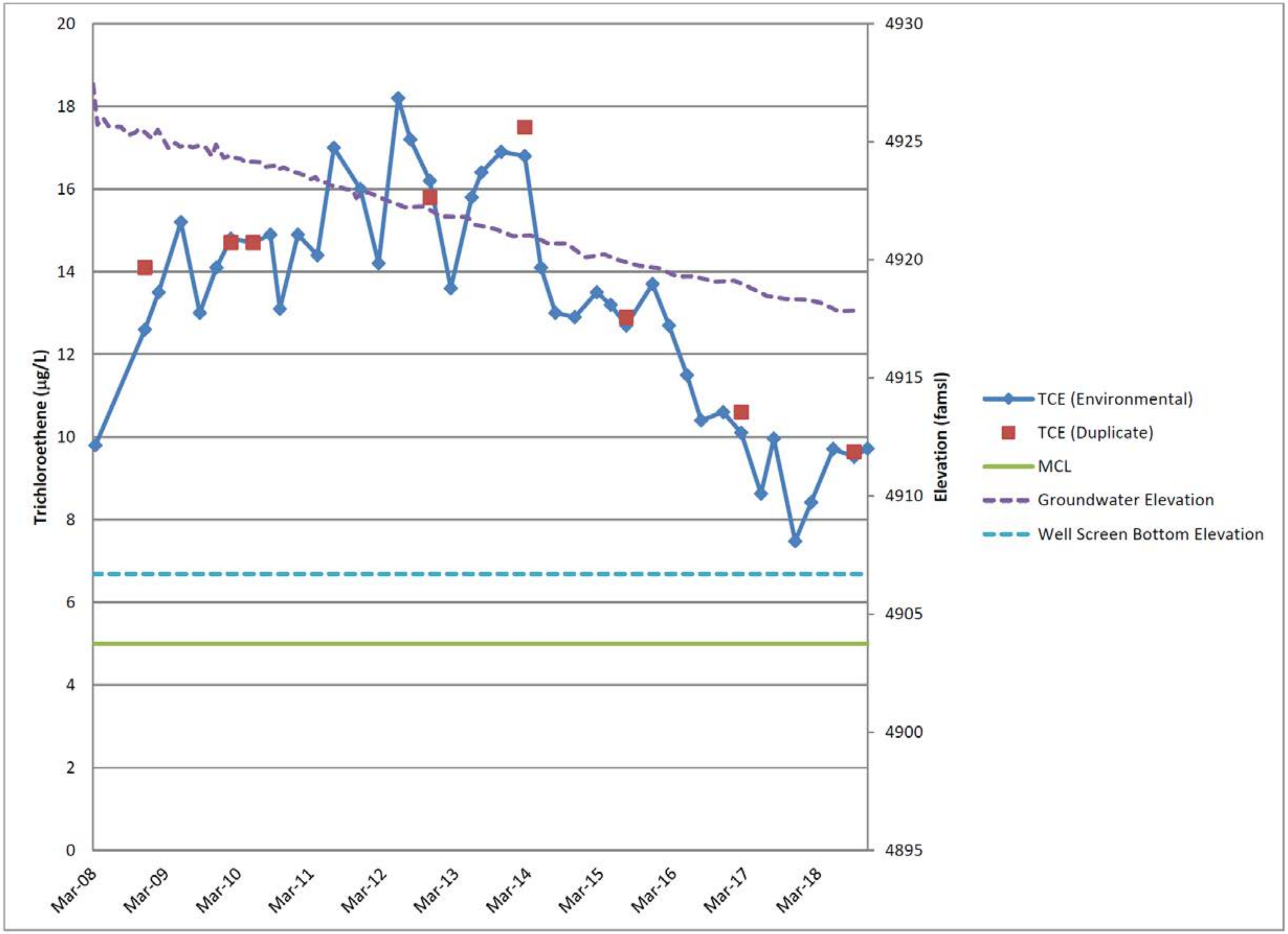

Figure 5C-2. Trichloroethene Concentrations, TAV-MW10

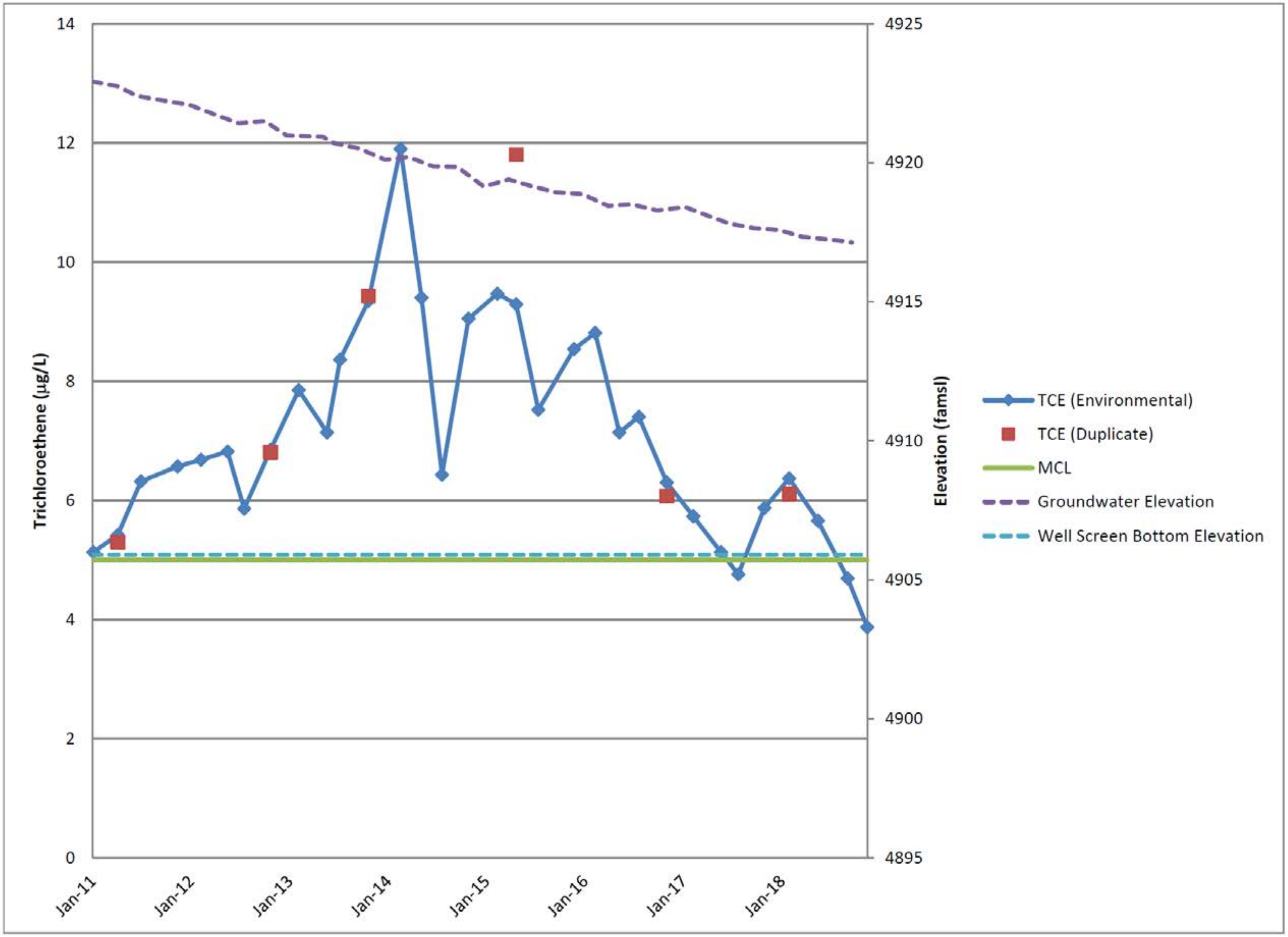

Figure 5C-3. Trichloroethene Concentrations, TAV-MW12

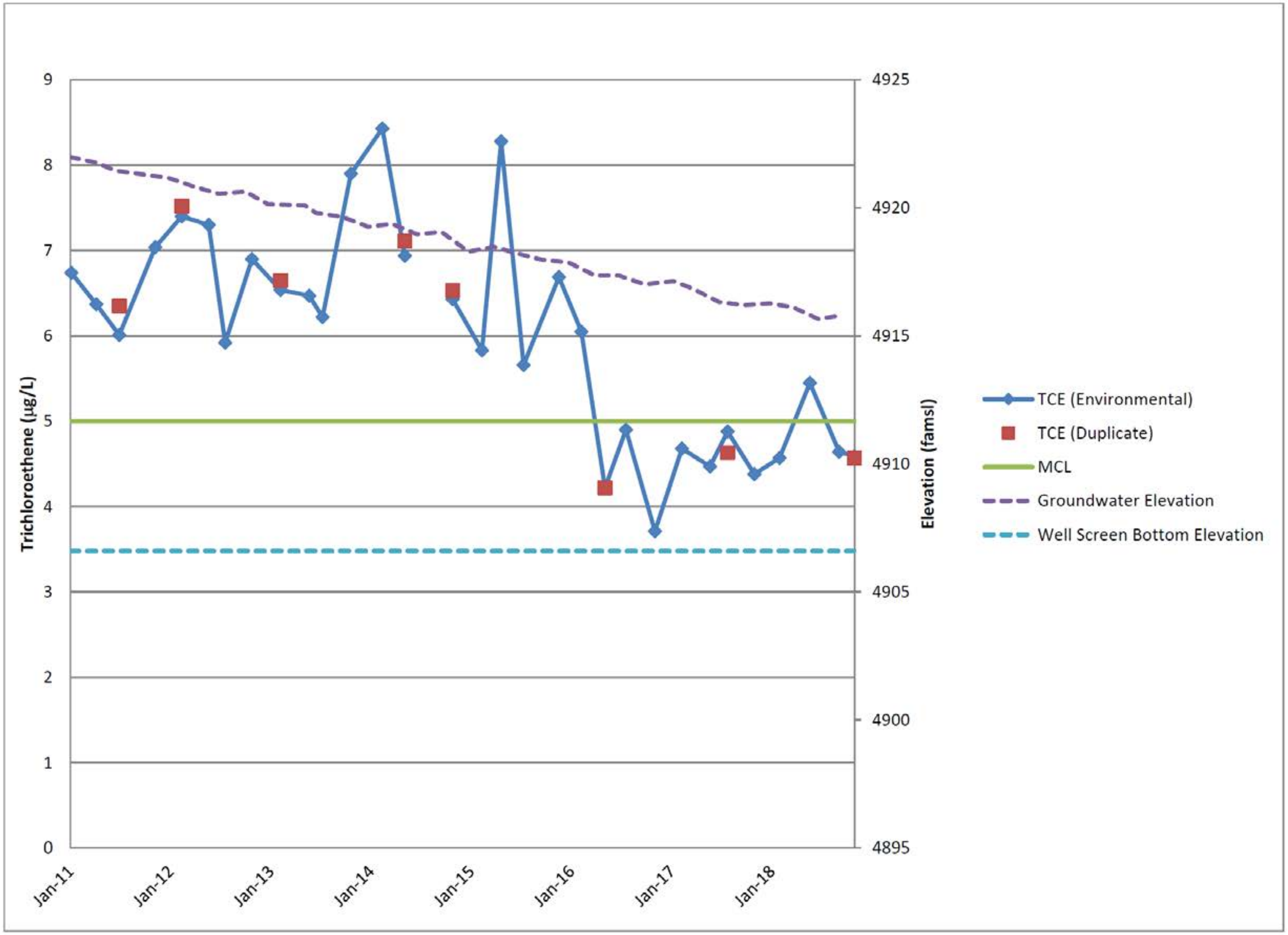

Figure 5C-4. Trichloroethene Concentrations, TAV-MW14

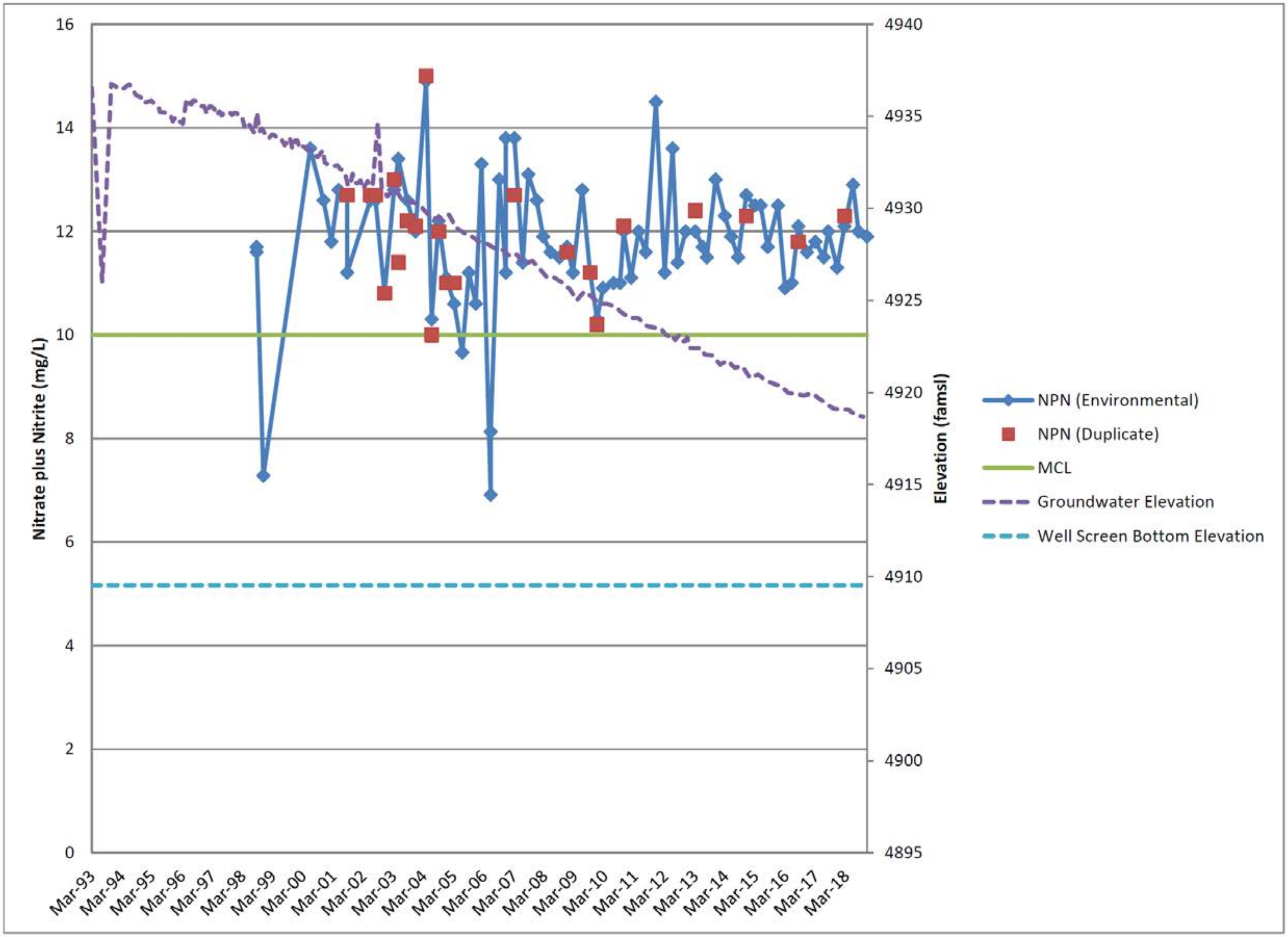

Figure 5C-5. Nitrate Plus Nitrite Concentrations, LWDS-MW1

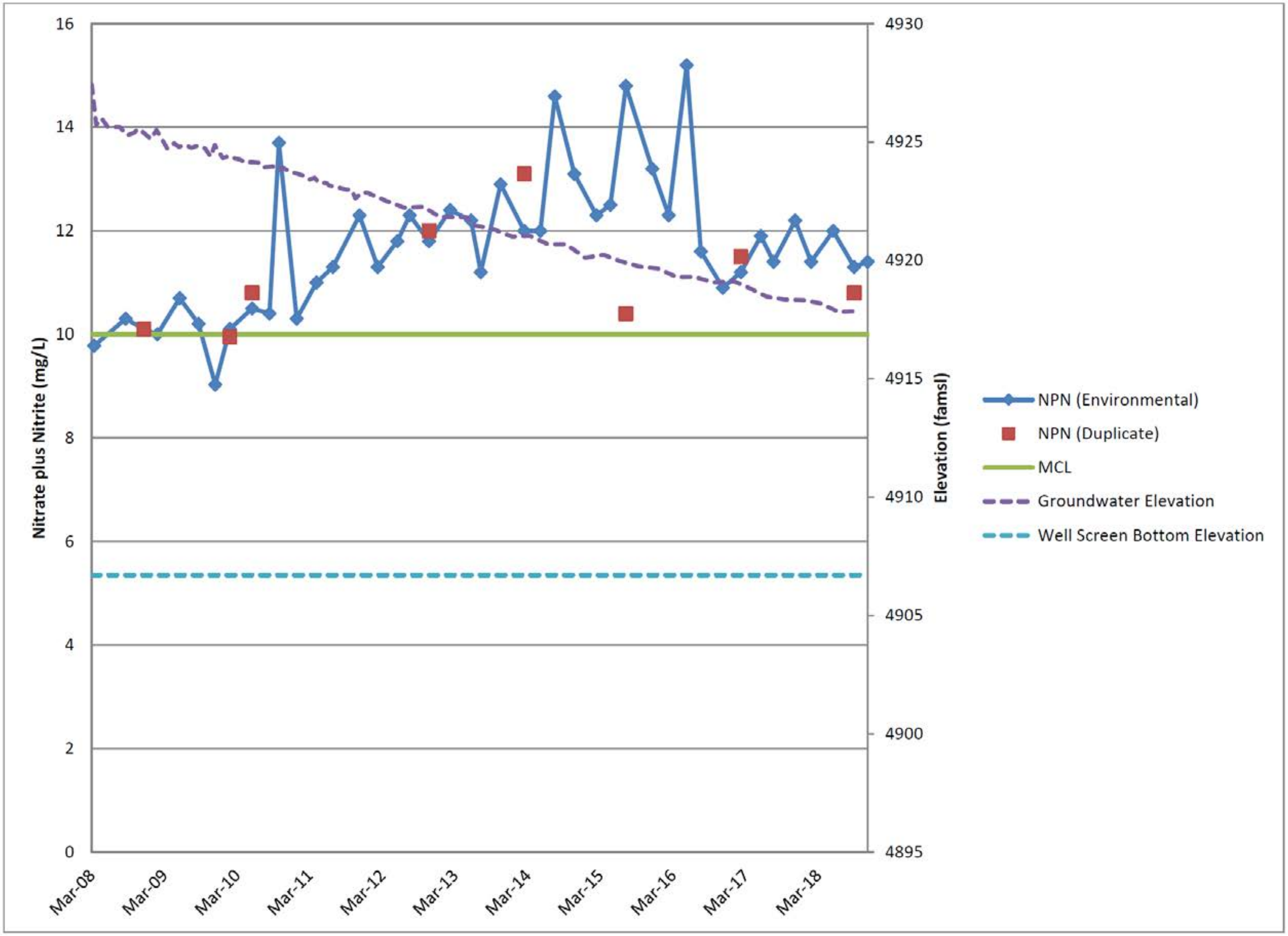

Figure 5C-6. Nitrate Plus Nitrite Concentrations, TAV-MW10

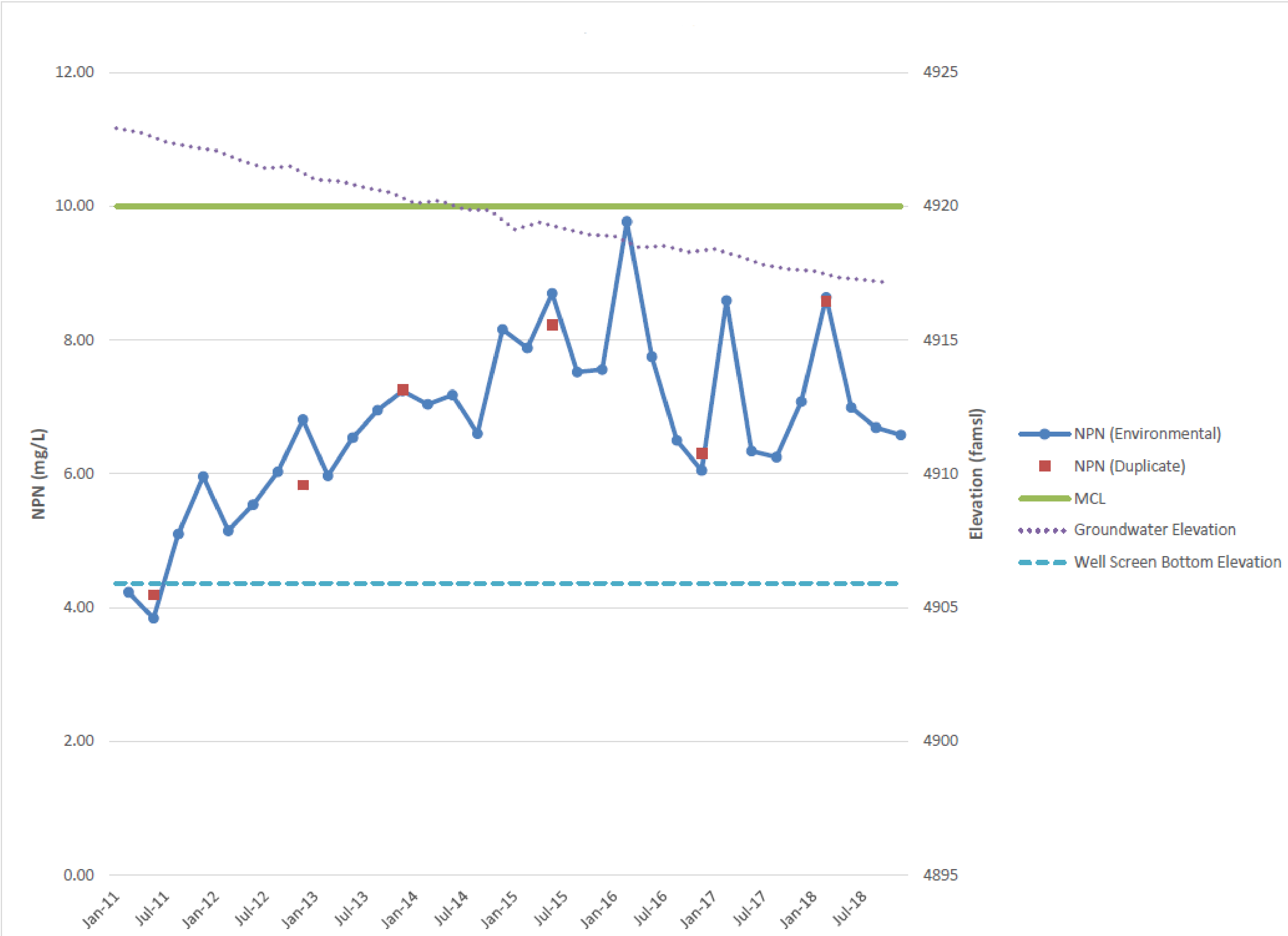

Figure 5C-7. Nitrate Plus Nitrite Concentrations, TAV-MW12

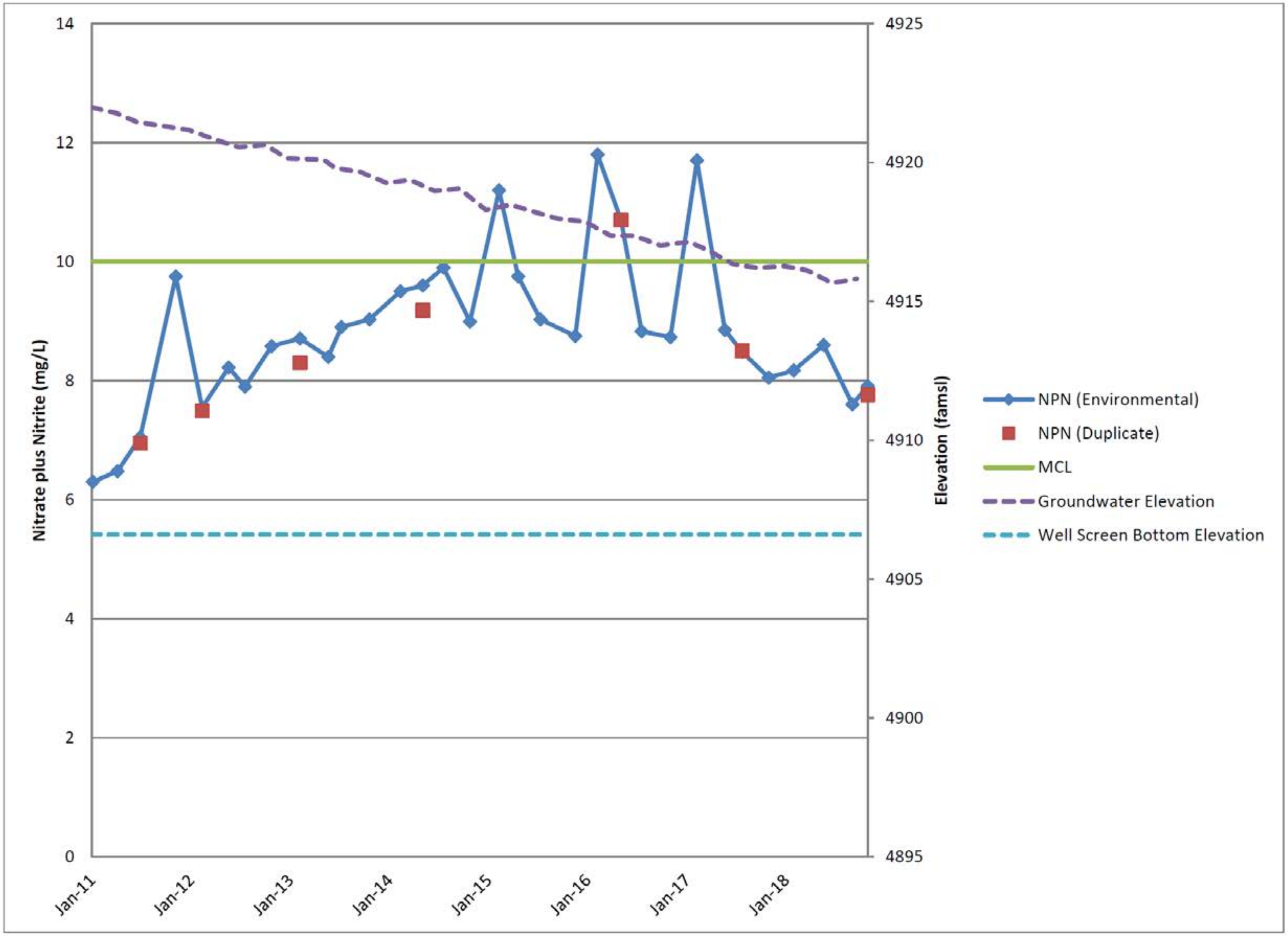

Figure 5C-8. Nitrate Plus Nitrite Concentrations, TAV-MW14

Attachment 5D
Technical Area-V
Hydrographs

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Attachment 5D Hydrographs

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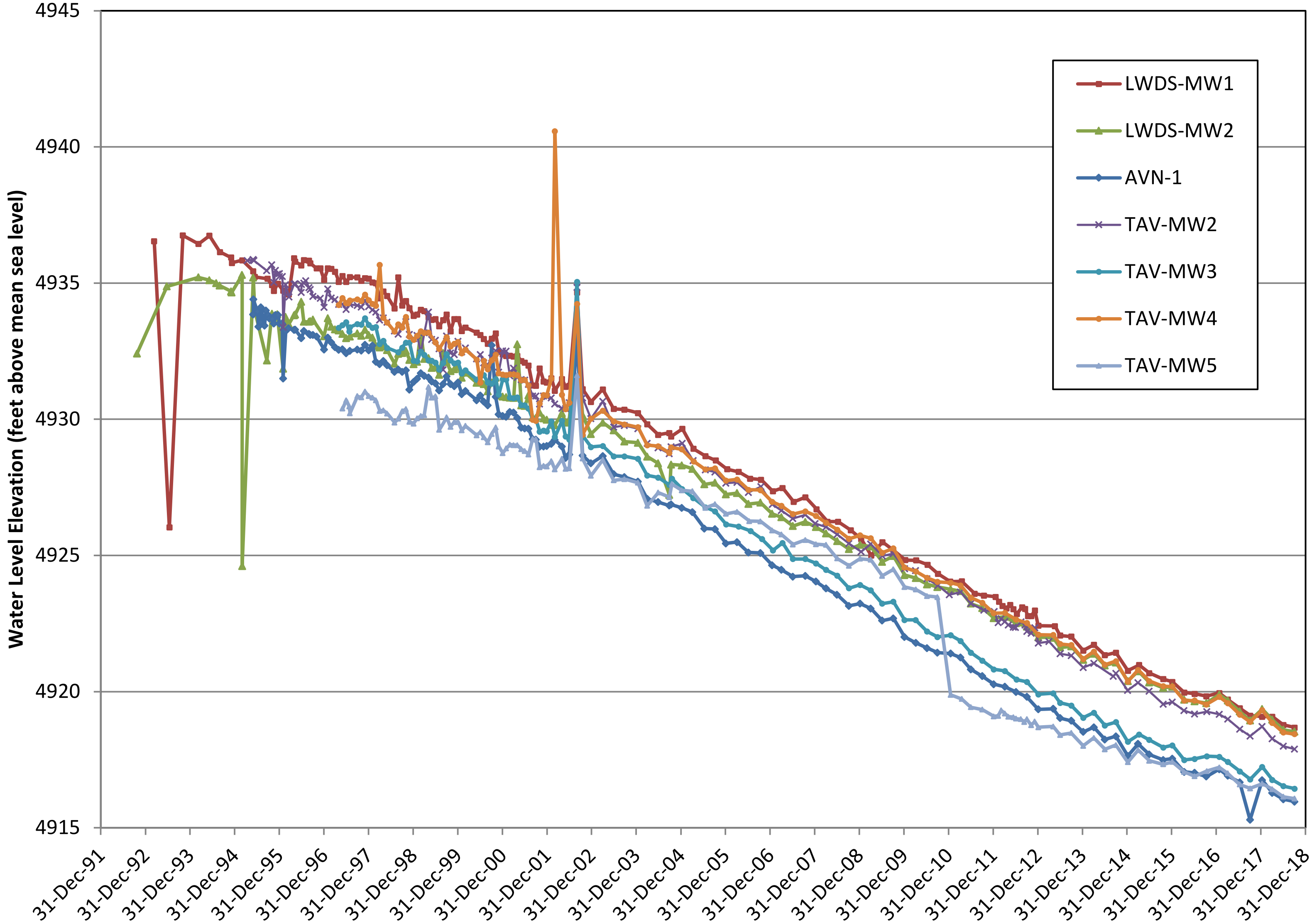

Figure 5D-1. TAVG AOC Wells (1 of 3)

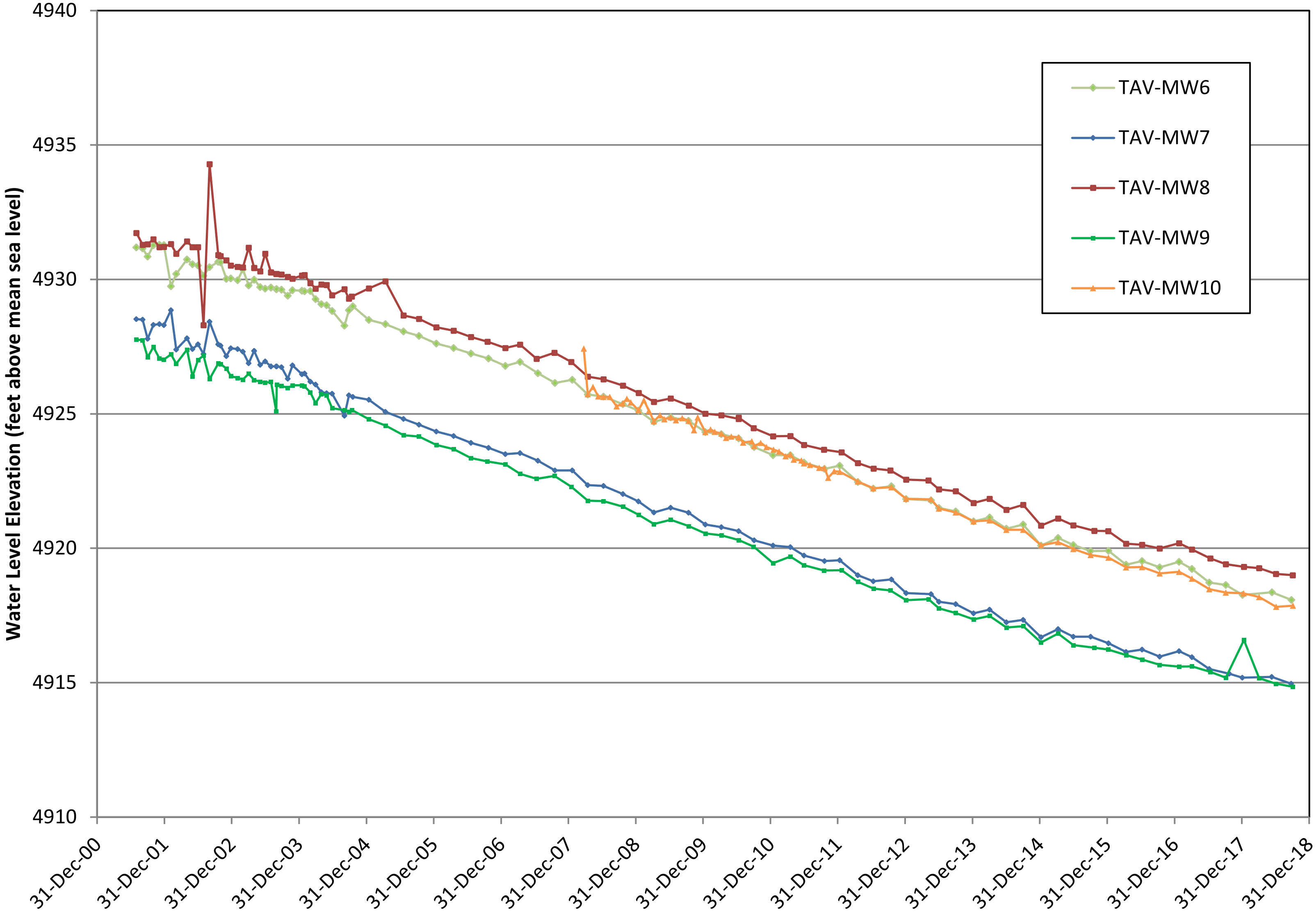

Figure 5D-2. TAVG AOC Wells (2 of 3)

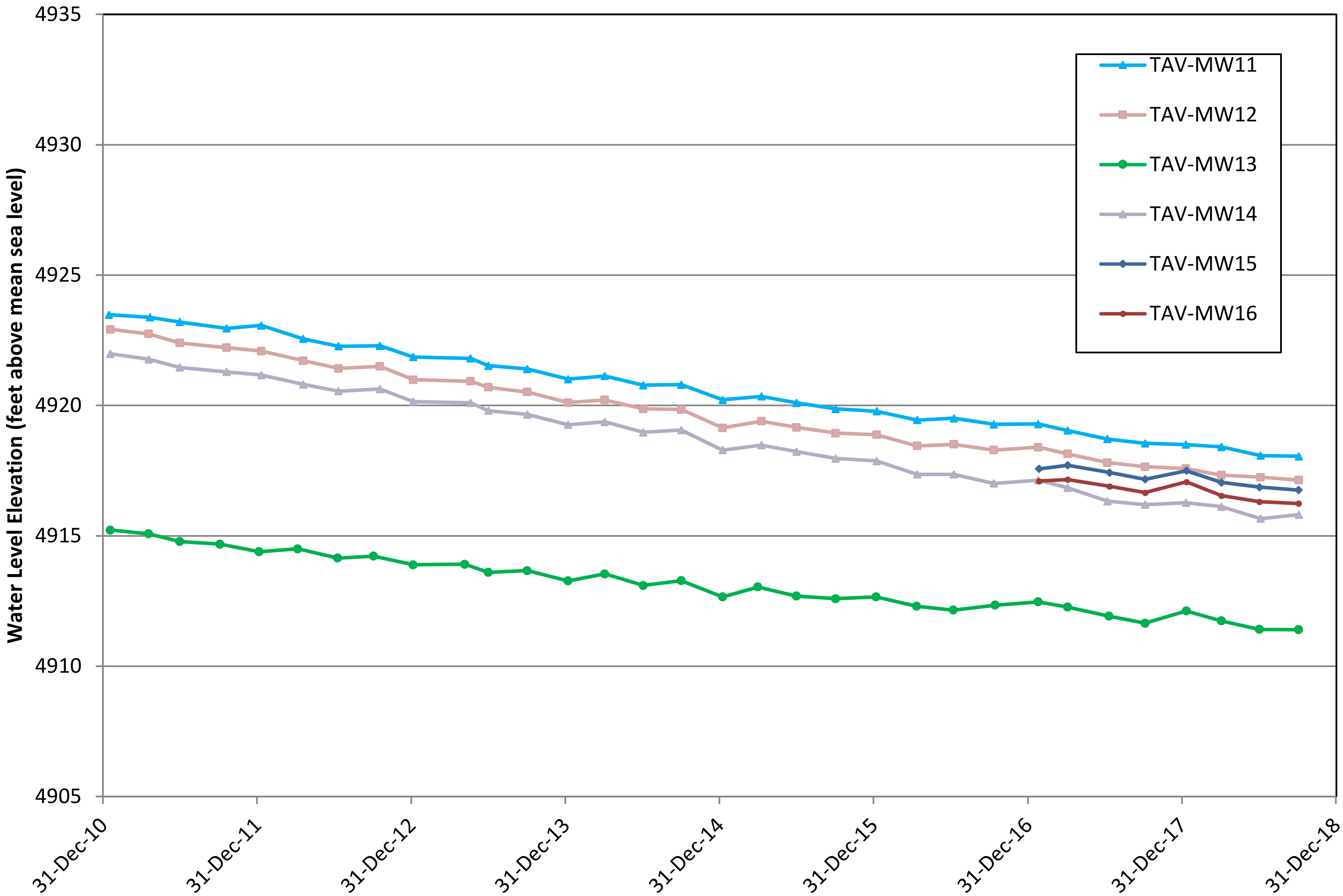

Figure 5D-3. TAVG AOC Wells (3 of 3)

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Chapter 5
Technical Area-V
References

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Bartolino and Cole 2002

Bartolino, J.R., and J.C. Cole, 2002. *Groundwater Resources of the Middle Rio Grande Basin*, U.S. Geological Survey, Circular 1222, http://water.usgs.gov/pubs/circ/2002/circ1222/.

Dinwiddie September 1997

Dinwiddie, R.S., September 1997. Letter to M.J. Zamorski (U.S. Department of Energy, Kirtland Area Office), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB," New Mexico Environment Department, Hazardous & Radioactive Materials Bureau, Santa Fe, New Mexico, September 24, 1997.

DOE July 2018

U.S. Department of Energy (DOE), July 2018. Letter to J. E. Kieling (New Mexico Environment Department), *Technical Area-V (TA-V) Treatability Study Notification of Full-Scale Operation at Well TAV-INJ1*, July 20, 2018.

DOE November 2017

U.S. Department of Energy (DOE), November 2017. Letter to K. Jones (New Mexico Environment Department), *Aboveground Injection System Mechanical Integrity Test Results and Proposed Date to Commence Discharge under Discharge Permit-1845,* U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 15, 2017.

DOE November 2016

U.S. Department of Energy (DOE), November 2016. *DP-1845, Technical Area-V Treatability Study Injection Wells Affidavit of Public Notice Completion*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 16, 2016.

DOE July 2016a

U.S. Department of Energy (DOE), July 2016. *Discharge Permit Application for Sandia National Laboratories/New Mexico Technical Area-V Treatability Study Injection Wells, DP-1845*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, July 25, 2016.

DOE July 2016b

U.S. Department of Energy (DOE), July 2016. Letter to W. Canon (New Mexico Office of the State Engineer), "New Mexico Office of the State Engineer Permit Applications for the Installation of Groundwater Monitoring Wells TAV-MW15 and TAV-MW16, and Groundwater Injection Well TAV-INJ1 at Sandia National Laboratories/New Mexico," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, July 15, 2016.

DOE May 2016

U.S. Department of Energy (DOE), May 2016. Letter to S. Huddleson (New Mexico Environment Department), "Notice of Intent to Discharge for Sandia National Laboratories/New Mexico Technical Area-V Groundwater Remediation Treatability Study Injection Wells," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, May 16, 2016.

DOE March 2016a U.S. Department of Energy (DOE), March 2016. *Response to NMED HWB Disapproval Letter, HWB-SNL-15-020, Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, September 2015, Sandia National Laboratories, EPA ID NM5890110518, dated December 3, 2015, and Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, March 18, 2016.

DOE March 2016b U.S. Department of Energy (DOE), March 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, March 30, 2016.

DOE January 2016 U.S. Department of Energy (DOE), January 2016. Letter to J.E. Keiling (New Mexico Environment Department), "Request for Extension for Submittal of Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern and Response to the Notice of Disapproval dated December 3, 2015," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, January 15, 2016.

DOE October 2015 U.S. Department of Energy (DOE), October 2015. *Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, and Current Conceptual Model for Technical Area-V Groundwater Area of Concern at Sandia National Laboratories, New Mexico*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, October 20, 2015.

DOE November 2014a U.S. Department of Energy (DOE), November 2014. *Request for Extension for Submittal of the Technical Area-V Groundwater Corrective Measures Evaluation Report and the Current Conceptual Model, Sandia National Laboratories, EPA ID# NM5890110518*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 24, 2014.

DOE November 2014b U.S. Department of Energy (DOE), November 2014. *Internal Remedy Review Team Recommendations regarding the Burn Site and Technical Area-V Groundwater Areas of Concern, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Management Internal Remedy Reviews, Office of Environmental Compliance, to Mark Gilbertson, Deputy Assistant Secretary, Office of Environmental Compliance, Washington DC, November 18, 2014.

DOE September 2014 U.S. Department of Energy (DOE), September 2014. *Internal Remedy Review of the Technical Area-V Groundwater Study Site, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Management Internal Remedy Reviews, Office of Environmental Compliance, to Geoffrey Beausoleil, Manager, National Nuclear Security Administration, Sandia Field Office, Washington DC, September 11, 2014.

DOE December 2013 U.S. Department of Energy (DOE), December 2013. *Notification on the Status of the Technical Area-V Groundwater Corrective Measures Evaluation Report and the Current Conceptual Model, Sandia National Laboratories, EPA ID# NM5890110518*, U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, December 5, 2013.

DOE March 2006 U.S. Department of Energy (DOE), March 2006. Letter to the New Mexico Environment Department requesting permission to remove well AVN-2 from the TA-V monitoring well network, U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, March 26, 2006.

DOE October 2005 U.S. Department of Energy (DOE), October 2005. Letter to the New Mexico Environment Department requesting change of sampling frequency for TA-V groundwater monitoring wells, U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, October 28, 2005.

DOE October 1998 U.S. Department of Energy (DOE), October 1998. *Liquid Waste Disposal System Cross Sections in Response to the NMED HWB September 1997 LWDS Request for Supplemental Information*, U.S. Department of Energy, Albuquerque Operations Office, Kirtland Area Office, Albuquerque, New Mexico.

DOE March 1996 U.S. Department of Energy (DOE), March 1996. Letter to the New Mexico Environment Department regarding detection of nitrate in well LWDS-MW1, U.S. Department of Energy, Albuquerque Operations Office, Kirtland Area Office, Albuquerque, New Mexico.

DOE June 1994 U.S. Department of Energy (DOE), June 1994. Letter to the U.S. Environmental Protection Agency regarding detection of trichloroethylene in well LWDS-MW1, U.S. Department of Energy, Albuquerque Operations Office, Kirtland Area Office, Albuquerque, New Mexico, June 10, 1994.

DOE September 1987 U.S. Department of Energy (DOE), September 1987. *Draft Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment, Sandia National Laboratories, Albuquerque,* U.S. Department of Energy, Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, Albuquerque, New Mexico.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations,* EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

Lum May 2017 Lum, C. May 2017. *Redevelopment of Technical Area V Groundwater Monitoring Wells ANV-1, LWDS-MW2, TAV-MW2, TAV-MW9, TAV-MW11, and TAV-MW12,* internal memorandum to S. Sanborn, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, May 11, 2017.

Madrid et al. June 2013	Madrid, V., M.J. Singleton, A. Visser, and B.K. Esser, June 2013. *Summary of Isotopic Data and Preliminary Interpretation of Denitrification and Age-dating for Groundwater Samples from Three Sites at Sandia National Laboratories, New Mexico*, a report to Sandia National Laboratories, New Mexico, Lawrence Livermore National Laboratory, LLNL-SR-636381.
NMED GWQB September 2016	New Mexico Environment Department (NMED), September 2016. *Administrative Completeness Determination and Applicant's Public Notice Requirements, DP-1845, Sandia National Laboratories/New Mexico, Technical Area-V Treatability Study Injection Wells*, New Mexico Environment Department Ground Water Quality Bureau, Santa Fe, New Mexico, September 27, 2016.
NMED GWQB June 2016	New Mexico Environment Department (NMED), June 2016. *Discharge Permit Required for Sandia National Laboratories, Technical Area-V Groundwater Remediation Treatability Study Injection Wells, DP-1845,* New Mexico Environment Department Ground Water Quality Bureau, Santa Fe, New Mexico, June 29, 2016.
NMED GWQB May 2017	New Mexico Environment Department (NMED HWB), May 2017. *Discharge Permit, DP-1845, Sandia National Laboratories/New Mexico*, New Mexico Environment Department Ground Water Quality Bureau, Santa Fe, New Mexico, May 26, 2017.
NMED GWQB September 2016	New Mexico Environment Department (NMED), September 2016. *Administrative Completeness Determination and Applicant's Public Notice Requirements, DP-1845, Sandia National Laboratories/New Mexico, Technical Area-V Treatability Study Injection Wells,* New Mexico Environment Department Ground Water Quality Bureau, Santa Fe, New Mexico, September 27, 2016.
NMED GWQB June 2016	New Mexico Environment Department (NMED), June 2016. *Discharge Permit Required for Sandia National Laboratories, Technical Area-V Groundwater Remediation Treatability Study Injection Wells, DP-1845,* New Mexico Environment Department Ground Water Quality Bureau, Santa Fe, New Mexico, June 29, 2016.
NMED HWB August 2018	New Mexico Environment Department (NMED HWB), August 2018. Letter to J.P. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and R.O. Griffith (Sandia National Laboratories), *Approval: Technical Area-V (TA-V) Treatability Study Notification of Full-Scale Operation at Well TAV-INJ1, Sandia National Laboratory, EPA ID#NM5890110518, HWB-SNL-15-020*, August 13, 2018.
NMED HWB August 2017	New Mexico Environment Department (NMED HWB), August 2017. *Approval: Installation of Groundwater Monitoring Wells TAV-MW15 and TAV-MW16, May 2017, Sandia National Laboratory, EPA ID#NM5890110518, HWB-SNL-17-012,* New Mexico Environment Department, Santa Fe, New Mexico, August 29, 2017.

NMED HWB May 2016b New Mexico Environment Department (NMED HWB), May 2016a. Letter to J.P. Harrell (U.S. Department of Energy, NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), *Approval: Environmental Operations Consolidated Quarterly Report, October-December 2015, April 2016*, *Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-16-008*, NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, May 20, 2016.

NMED HWB May 2016a New Mexico Environment Department (NMED HWB), May 2016b. *Approval Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, Sandia National Laboratories, EPA ID# NM5890110518, HWB SNL-15-020,* New Mexico Environment Department, Santa Fe, New Mexico, May 10, 2016.

NMED HWB April 2016 New Mexico Environment Department (NMED HWB), April 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015, March 30, 2016, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-16-MISC,* New Mexico Environment Department, Santa Fe, New Mexico, April 14, 2016.

NMED HWB December 2015 New Mexico Environment Department (NMED HWB), December 2015. *Disapproval Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, September 2015, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-15-020,* New Mexico Environment Department, Santa Fe, New Mexico, December 3, 2015.

NMED HWB November 2015 New Mexico Environment Department (NMED HWB), November 2015. *Approval Current Conceptual Model for Technical Area-V Groundwater Area of Concern at Sandia National Laboratories, September 2015, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-15-021,* New Mexico Environment Department, Santa Fe, New Mexico, November 30, 2015.

NMED HWB January 2015a New Mexico Environment Department (NMED HWB), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED HWB January 2015b New Mexico Environment Department (NMED HWB), January 2015. *Approval Request for Extension to Submit the Technical Area-V Groundwater Corrective Measures Evaluation Report and the Current Conceptual Model, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-05-027,* New Mexico Environment Department, Santa Fe, New Mexico, January 12, 2015.

NMED HWB December 2013 New Mexico Environment Department (NMED HWB), December 2013. *Technical Area-V Groundwater Corrective Measures Evaluation Report and Current Conceptual Model, Letter of December 5, 2013, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, December 17, 2013.

NMED HWB September 2013 New Mexico Environment Department (NMED HWB), September 2013. *Notice of Approval: Summary Report for Technical Area-V Installation of Groundwater Monitoring Wells TAV-MW11, TAV-MW12, TAV-MW13, and TAV-MW14 and Installation of Soil Vapor Monitoring Wells TAV-SV01, TAV-SV02, and TAV-SV03, June 2011*, New Mexico Environment Department, Santa Fe, New Mexico, September 3, 2013.

NMED HWB December 2010 New Mexico Environment Department (NMED HWB), December 2010. *Notice of Approval, Modification of Soil-Vapor Monitoring Well Design, TA-V Groundwater Investigation Work Plan*, *February 2010*, *Sandia National Laboratories EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, December 23, 2010.

NMED HWB May 2010 New Mexico Environment Department (NMED HWB), May 2010. *Notice of Conditional Approval, SNL Responses to NMED HWB December 2009 NOD issued for TA-V Groundwater Investigation Work Plan Associated with TA-V Groundwater CME Report, July 2005, Sandia National Laboratories EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED HWB December 2009 New Mexico Environment Department (NMED HWB), December 2009. *Notice of Disapproval: Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005–November 2009 Response to Notice of Deficiency, Sandia National Laboratories EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, December 22, 2009.

NMED HWB August 2009 New Mexico Environment Department (NMED HWB), August 2009. *Notice of Disapproval: DOE/Sandia Responses to NMED HWB's Notice of Disapproval for Corrective Measures Evaluation Report for Technical Area-V Groundwater*, *July 2005*, *Sandia National Laboratories EPA ID# NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, August 12, 2009.

NMED HWB April 2009 New Mexico Environment Department (NMED HWB), April 2009. *RE: Perchlorate Contamination in Groundwater, Sandia National Laboratories, EPA ID#NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico. April 30, 2009.

NMED HWB July 2008 New Mexico Environment Department (NMED HWB), July 2008. *Notice of Disapproval: Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005, Sandia National Laboratories NM5890110518, HWB-SNL-05-027*, New Mexico Environment Department, Santa Fe, New Mexico, July 28, 2008.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

NMED HWB September 1997	New Mexico Environment Department (NMED HWB), September 1997. *Request for Supplemental Information, Liquid Waste Disposal System RFI Report, Sandia National Laboratories, March 1996*, New Mexico Environment Department, Santa Fe, New Mexico.
NMOSE August 2016	New Mexico Office of the State Engineer (NMOSE), August 2016. Permit to Explore/ Remediate (Permit Number RG-90065), POD# 126, 127, 128 for well ID# TAV-MW15, TAV-MW16, and TAV-INJ1, respectively. NMOSE, Albuquerque, New Mexico, August 2, 2016.
NMOSE May 1959	New Mexico Office of the State Engineer (NMOSE), May 1959. State Engineer Office Well Record for Well KAFB-10, drilled for the U.S. Atomic Energy Commission at Sandia National Laboratories, Albuquerque, New Mexico.
SNL October 2018a	Sandia National Laboratories, New Mexico (SNL/NM), October 2018. *Environmental Restoration Operations Consolidated Quarterly Report April – June 2018,* Sandia National Laboratories, Albuquerque, New Mexico.
SNL October 2018b	Sandia National Laboratories, New Mexico (SNL/NM), October 2018. *TA-V Groundwater Monitoring Mini-SAP for First Quarter, Fiscal Year 2019*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.
SNL June 2018a	Sandia National Laboratories, New Mexico (SNL/NM), June 2018. *TA-V Groundwater Monitoring Mini-SAP for Fourth Quarter, Fiscal Year 2018*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.
SNL June 2018b	*Installation of Injection Well TAV-INJ1 at the Technical Area-V Groundwater Area of Concern. Sandia National Laboratories, Albuquerque, New Mexico.*
SNL June 2018c	Sandia National Laboratories, New Mexico (SNL/NM), June 2018. *Annual Groundwater Monitoring Report, Calendar Year 2017, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship and Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.
SNL April 2018	Sandia National Laboratories, New Mexico (SNL/NM), April 2018. *TA-V Groundwater Monitoring Mini-SAP for Third Quarter, Fiscal Year 2018*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.
SNL January 2018	Sandia National Laboratories, New Mexico (SNL/NM), January 2018. *TA-V Groundwater Monitoring Mini-SAP for Second Quarter, Fiscal Year 2018*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2017 Sandia National Laboratories, New Mexico (SNL/NM), July 2017. *Installation of Groundwater Monitoring Wells TAV-MW16 and TAV-MW16*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, July 13, 2017.

SNL September 2015 Sandia National Laboratories, New Mexico (SNL/NM), September 2015. *Current Conceptual Model for Technical Area-V Groundwater Area of Concern at Sandia National Laboratories*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2014 Sandia National Laboratories, New Mexico (SNL/NM), June 2014. *Annual Groundwater Monitoring Report, Calendar Year 2013, Long-Term Stewardship Consolidated Groundwater Monitoring Program*, Long-Term Stewardship and Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2011 Sandia National Laboratories, New Mexico (SNL/NM), July 2011. *Meeting Notes from Technical Discussions with the New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB), July 6, 2011, 9:00 – 10:30 at NMED Region 1 Office*. Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, July 6, 2011.

SNL June 2011 Sandia National Laboratories, New Mexico (SNL/NM), June 2011. *Summary Report for Technical Area-V Groundwater and Soil-Vapor Monitoring Well Installation*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, June 30, 2011.

SNL November 2010 Sandia National Laboratories, New Mexico (SNL/NM), November 2010. *Slug Test Results and Geophysical Logs for the Four New Technical Area-V (TA-V) Ground Water Monitoring Wells*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, November 24, 2010.

SNL February 2010 Sandia National Laboratories, New Mexico (SNL/NM), February 2010. *DOE/Sandia Responses to NMED HWB's comments in Notice of Disapproval: Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005—November 2009 Response to Notice of Deficiency, Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, February 22, 2010.

SNL November 2009 Sandia National Laboratories, New Mexico (SNL/NM), November 2009. *DOE/Sandia Responses to NMED HWB's Notice of Disapproval: DOE/Sandia Responses to NMED HWB's Notice of Disapproval for Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, November 16, 2009.

SNL April 2009 Sandia National Laboratories, New Mexico (SNL/NM), April 2009. *DOE/Sandia Responses to NMED HWB's Notice of Disapproval for Corrective Measures Evaluation Report for Technical Area-V Groundwater, July 2005 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-05-027*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, April 14, 2009.

SNL October 2008 Sandia National Laboratories, New Mexico (SNL/NM), October 2008. Memo from M. Sanders (GRAM, Inc.) to T. Jackson and S. Ricketson (GRAM, Inc.), *Subject: TA-V Groundwater Monitor Well Re-Survey*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, October 22, 2008.

SNL June 2008 Sandia National Laboratories, New Mexico (SNL/NM), June 2008. *Summary Report for Technical Area-V Monitoring Well Plug and Abandonment and Installation, Decommissioning Monitoring Well TAV-MW1, Installation of Groundwater Monitoring Well TAV-MW10*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2005 Sandia National Laboratories, New Mexico (SNL/NM), July 2005. *Corrective Measures Evaluation Report for Technical Area-V Groundwater*, SAND Report SAND2005-4492, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2004 Sandia National Laboratories, New Mexico (SNL/NM), December 2004. *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater, Revision 0*, SAND Report SAND2004-6113, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2005 Sandia National Laboratories, New Mexico (SNL/NM), April 2004. *Evaluation of an Intrinsic Aerobic Degradation Mechanism, Technical Area-V Groundwater at Sandia National, Laboratories/New Mexico*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2004 Sandia National Laboratories, New Mexico (SNL/NM), July 2004. *Investigation of Intrinsic Anaerobic Biodegradation in Technical Area-V Groundwater at Sandia National Laboratories/New Mexico*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2004a Sandia National Laboratories, New Mexico (SNL/NM), April 2004. *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V*, SAND Report SAND2004-1470, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2004b Sandia National Laboratories, New Mexico (SNL/NM), April 2004. *Corrective Measures Evaluation Work Plan, Technical Area-V Groundwater*, SAND Report SAND2004-1471, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2001 Sandia National Laboratories, New Mexico (SNL/NM), October 2001. *Summary of Monitoring Well Drilling Activities, TA-V Groundwater Investigation*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1999 Sandia National Laboratories, New Mexico (SNL/NM), March 1999. *Summary Report of Groundwater Investigations at Technical Area-V Operable Units 1306 and 1307 (2 Volumes)*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), February 1998. *Revised Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 1998 Sandia National Laboratories, New Mexico (SNL/NM), January 1998. *Response to the NMED HWB Request for Supplemental Information Liquid Waste Disposal System RFI Report, Sandia National Laboratories March 1996*, Sandia National Laboratories, Environmental Restoration Project, Albuquerque, New Mexico, January 15, 1998.

SNL April 1996 Sandia National Laboratories, New Mexico (SNL/NM), April 1996. *Site-Wide Hydrogeologic Characterization Project, KAFB-10 Well Abandonment Plan*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1996 Sandia National Laboratories, New Mexico (SNL/NM), March 1996. *Groundwater Protection Program, Calendar Year 1995 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 1995 Sandia National Laboratories, New Mexico (SNL/NM), September 1995. *Results of The Liquid Waste Disposal System RCRA Facility Investigation, Sandia National Laboratories Albuquerque New Mexico*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1995 Sandia National Laboratories, New Mexico (SNL/NM), March 1995. *Groundwater Protection Program, Calendar Year 1994 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL 1995 Sandia National Laboratories, New Mexico (SNL/NM), 1995. *Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1993 Sandia National Laboratories, New Mexico (SNL/NM), March 1993. *RCRA Facility Investigation Work Plan for the Liquid Waste Disposal System (LWDS), ER Program Sites 4, 5 and 52*, Environmental Impact and Restoration Division, Sandia National Laboratories, Albuquerque, New Mexico.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico*, SAND Report SAND2003-1869, Sandia National Laboratories, Albuquerque, New Mexico.

Walvoord et al., November 2003 Walvoord, M.A., F.M. Phillips, D.A. Stonestrom, R.D. Evans, P.C. Hartsough, B.D. Newman, and R.G. Striegl, November 2003. "A Reservoir of Nitrate Beneath Desert Soils," *Science*, Vol. 302. November 7, 2003.

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6.0 Tijeras Arroyo Groundwater Area of Concern

6.1 Introduction

The Tijeras Arroyo Groundwater (TAG) Area of Concern (AOC) was identified by the New Mexico Environment Department (NMED) in the Compliance Order on Consent (Consent Order) (NMED April 2004) because two chemicals, nitrate and trichloroethene (TCE), had groundwater concentrations that exceeded the respective U.S. Environmental Protection Agency (EPA) maximum contaminant levels (MCLs). Groundwater monitoring in the TAG AOC has been conducted since 1992. Figure 6-1 shows the TAG AOC at Sandia National Laboratories, New Mexico (SNL/NM). When the Consent Order was issued, nitrate and TCE were specified as constituents of concern (COCs) because (1) the Perched Groundwater System contained concentrations of nitrate and TCE that exceeded the corresponding MCLs, and (2) the Regional Aquifer contained nitrate concentrations that exceeded the MCL. TCE did not exceed the MCL in the Regional Aquifer.

In the TAG AOC, the historical maximum nitrate concentration has been 38.4 milligrams per liter (mg/L) and the maximum TCE concentration has been 9.6 micrograms per liter (µg/L). The EPA MCLs and State of New Mexico drinking water standards for nitrate (as nitrogen) and TCE are 10 mg/L and 5 µg/L, respectively. In Calendar Year (CY) 2018, the maximum nitrate concentration in the Perched Groundwater System was 23.4 mg/L. The maximum nitrate concentration in the Regional Aquifer exclusive of the merging zone was 3.90 mg/L. In the merging zone above the Regional Aquifer, the maximum nitrate concentration was 31.6 mg/L. TCE concentrations in the Perched Groundwater System have been below the MCL since October 2007. TCE concentrations in the Regional Aquifer have never exceeded the MCL.

In response to the Consent Order, the TAG Corrective Measures Evaluation (CME) Work Plan was submitted to the NMED Hazardous Waste Bureau (HWB) in July 2004 (SNL July 2004). In April 2005, U.S. Department of Energy (DOE) and SNL/NM personnel submitted a CME Report, but the NMED HWB did not finalize its review of that document. In December 2016, DOE and SNL/NM personnel submitted a combined TAG Current Conceptual Model (CCM) and CME Report, referred hereafter as the TAG CCM/CME Report. NMED HWB issued a disapproval letter in May 2017 that included comments on the December 2016 TAG CCM/CME Report. In August 2017, a meeting was held between NMED HWB, DOE, and SNL/NM personnel to discuss and clarify the outstanding issues for preparing a report revision. The Revised TAG CCM/CME Report was submitted to NMED HWB in February 2018 (SNL February 2018). The revised report addresses (1) the issues presented in the NMED HWB May 2017 disapproval letter and (2) findings from the August 2017 meeting.

6.1.1 Location

The TAG AOC covers approximately 1.82 square miles (sq mi) and three Technical Areas (TAs) (TA-I, TA-II, and TA-IV). The TAG AOC is analogous with the previously used term TAG Area of Responsibility as discussed in the CME Work Plan (SNL August 2005). Figure 6-1 shows the surrounding TAG Study Area of approximately 40 sq mi that is situated in the north-central portion of Kirtland Air Force Base (KAFB) and the southern portion of the City of Albuquerque (COA). From October 2000 to October 2003, the NMED HWB directed a series of twenty High Performing Team meetings that served as a forum for discussing groundwater issues for the study area. The facilities identified then as potentially responsible for groundwater contamination within the TAG Study Area included the DOE/National Nuclear Security Administration, SNL/NM, KAFB, the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and the COA.

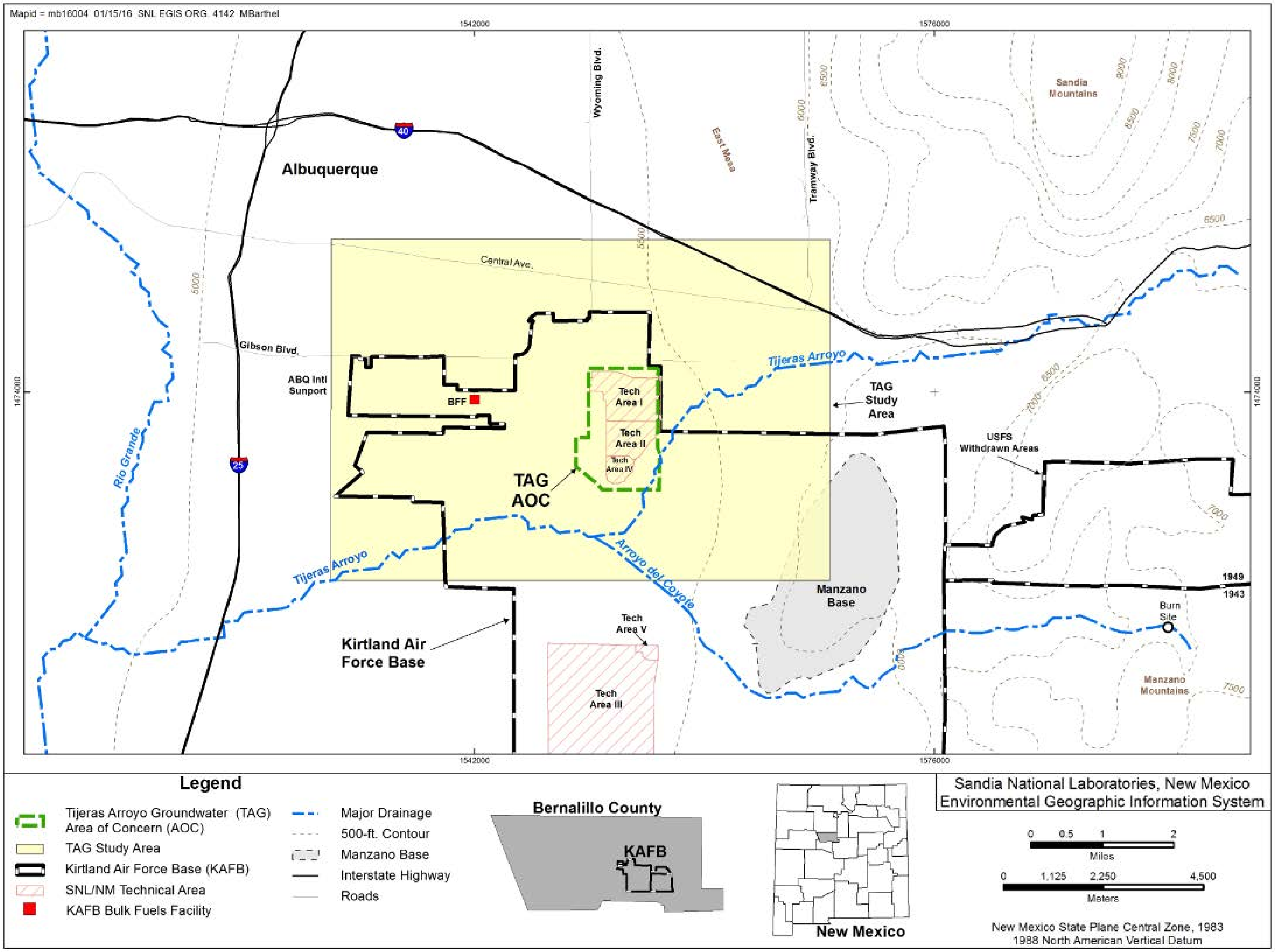


Figure 6-1. Location of the TAG AOC

KAFB operations utilize numerous facilities and properties with a variety of land uses along the north, west, south, and southeast boundaries of TA-I, TA-II, and TA-IV. The area located along the northern and western boundaries of the three TAs contains KAFB facilities consisting of base housing, office buildings, a fire station, training schools, machine workshops, storage yards, a detention facility, an electromagnetic research facility, and the former sewage lagoons. Bordering the southern and southeastern edges of the three TAs are KAFB undeveloped open spaces, an active landfill, closed landfills, emergency response training areas, and the Tijeras Arroyo Golf Course. COA residential areas are located along the northern boundary of KAFB, and a major sanitary sewer line operated by the ABCWUA trends along the floor of Tijeras Arroyo and across the southeast corner of the TAG AOC.

6.1.2 Site History

The facilities at TA-I, TA-II, and TA-IV were built on land that had been previously developed by commercial airline operators and to a much larger degree by the military. Land use development began in 1928 when the public Albuquerque Airport was built on the East Mesa. Renamed Oxnard Field in 1929, the airport was used until late 1939 when the vicinity of Oxnard Field was purchased by the federal government for use as an Army Air Depot Training Station, later to be known as Sandia Base. After World War II, the old Oxnard Field runways and an extensive grid of taxiways were used for parking aircraft. Starting in 1946, the War Assets Administration managed the sale or dismantlement of approximately 2,250 surplus military aircraft. Approximately 1,500 planes were dismantled and smelted down adjacent to the Oxnard taxiways. In addition to the smelter, numerous maintenance and machine shops were operated for several years.

In 1939, public airline service was moved approximately four miles to the west of Oxnard Field where the Albuquerque Municipal Airport was built. Using the municipal set of runways, the Albuquerque Army Air Base began operations in 1941. The air base was later dedicated as Kirtland Army Air Field and subsequently renamed as KAFB. In 1971, the operations of KAFB, Sandia Base, and Manzano Base were combined under the Air Force Materiel Command (KAFB March 2013). The municipal airfield is now identified as the Albuquerque International Sunport.

In July 1945, the “Z Division” of the Manhattan Engineers District, an extension of the original Los Alamos Laboratory, was established at Sandia Base in the area that would become known as TA-I (Furman April 1990). The primary mission of the Z Division was to provide engineering, production, stockpiling, and testing support for nuclear weapon systems. In 1949, the independent Sandia Laboratory was established at TA-I and TA-II. The primary management and administrative operations have historically been conducted at several TA-I office buildings. Construction of TA-IV began in 1977. Over the years, operations at the three TAs have evolved to include a wide variety of research and development activities including weapons design, component production, high-performance computing, and energy research programs.

6.1.3 Monitoring History

Since 1992, SNL/NM Environmental Restoration (ER) Operations has conducted numerous environmental and groundwater investigations in the TAG AOC. The historic timeline (Attachment 6A, Table 6A-1) lists the field investigations concerning groundwater quality in the TAG AOC. The majority of the ER Operations efforts have consisted of site-specific investigations that were conducted in support of Solid Waste Management Unit (SWMU) assessments involving potential soil contamination. Where required, contaminated soil and debris were excavated and removed. The NMED HWB has granted Corrective Action Complete status to all SWMUs in the TAG AOC. Only the groundwater issue remains.

Both KAFB and COA have also completed numerous groundwater investigations near the TAG AOC. Their initial findings were incorporated in the TAG Investigation Report. KAFB has issued a nitrate abatement report (KAFB December 2015) describing potential nitrate release sites and recent groundwater monitoring data. As a separate endeavor, KAFB is remediating the Bulk Fuels Facility (BFF) that is located approximately 1.6 miles west of the TAG AOC (Figure 6-1). Petroleum hydrocarbons (primarily aviation gasoline and jet fuel), associated with the BFF do not affect groundwater quality beneath the TAG AOC.

Beginning in 1992, groundwater quality has been evaluated as part of the TA-II investigation with the installation of groundwater monitoring wells in the central portion of the TAG AOC. During this initial investigation, the Perched Groundwater System was discovered at a depth of approximately 320 feet (ft) below ground surface (bgs). The Regional Aquifer was present at approximately 500 ft bgs. In October 1994, the first detection of TCE in a groundwater sample from a SNL/NM well near Tijeras Arroyo was reported at monitoring well TA2-W-01, which is screened in the Perched Groundwater System. This detection prompted further groundwater investigations.

6.1.4 Current Monitoring Network

During CY 2018, SNL/NM personnel collected groundwater samples at 21 monitoring wells (Table 6-1). Variances from the sampling frequency are discussed in Section 6.8. As shown on Figure 6-2, water levels are measured at 30 monitoring wells located within and adjacent to the TAG AOC in CY 2018. Additional monitoring wells owned by KAFB and the COA are utilized by the TAG investigation for understanding the hydrogeologic setting.

6.1.5 Summary of Calendar Year 2018 Activities

The following activities were conducted for the TAG AOC during CY 2018:

- Quarterly water level measurements were obtained from all TAG monitoring wells. Hydrographs are presented in Attachment 6B.

- In March 2018, video logging was conducted at four monitoring wells (TA1-W-03, TA2-W-24, TA2-W-25, and TJA-5). All four well casings were in good condition.

- In April 2018, slug testing was conducted at replacement monitoring well TA2-W-28 to determine the hydraulic conductivity of the screened Perched Groundwater System sediments. The average hydraulic conductivity was 2.38 ft/day (Skelly et al., August 2018).

- In July 2018, a study of KAFB water supply wells was completed for evaluating the status and survey coordinates (Copland July 2018) of the wells. More accurate coordinates were determined using field inspections and ortho-rectified aerial photography.

- Quarterly groundwater samples were collected at seven wells (TA2-W-19, TA2-W-26, TA2-W-28, TJA-2, TJA-3, TJA-4, and TJA-7) in February/March 2018, June 2018, August/September 2018, and November/December 2018. Water sample collection at well WYO-4 was not successful (Section 6.8).

- Semiannual groundwater samples were collected at four wells (TA1-W-06, TA2-W-01, TA2-W-27, and TJA-6) in February/March 2018 and August/September 2018.

- Annual groundwater samples were collected at seven wells (TA1-W-01, TA1-W-02, TA1-W-04, TA1-W-05, TA1-W-08, TA2-NW1-595, and WYO-3) in August/September 2018. Water sample collection at wells TA1-W-03 and PGS-2 was not successful (Section 6.8).

- Analytical results for groundwater samples were validated and summarized (Attachment 6C).

- Concentration trend plots for groundwater samples were prepared (Attachment 6D).

- In anticipation of NMED HWB reviewing the sampling protocol in the Revised TAG CCM/CME Report (SNL February 2018), groundwater samples were collected at three monitoring wells that had not been sampled in recent years. This voluntary sampling was conducted at wells TA2-W-24, TA2-W-25, and TJA-5.

6.1.6 Summary of Future Activities

The following activities are anticipated for the TAG AOC during the next reporting period (CY 2019) unless the NMED HWB requests otherwise after reviewing the Revised TAG CCM/CME Report that was submitted in February 2018:

- Measurement of water levels on a quarterly schedule at 30 wells in and near the TAG AOC.

- Collection of groundwater samples (typically 18 wells) using the frequency listed in Table 6-1.

6.1.7 Conceptual Site Model

The Revised TAG CCM/CME Report (SNL February 2018) presented a Conceptual Site Model (CSM) for the vicinity of the TAG AOC that describes the contaminant release sites, the geological and hydrogeological setting, and the distribution and migration of contaminants in the subsurface. The CSM incorporated previous studies conducted by Van Hart (June 2001 and June 2003). Revisions to the CCM/CME focused on the inclusion of stratigraphic cross-sections, geophysical logs, and lithologic descriptions for cores and cuttings obtained from boreholes associated with well installations. The TAG AOC is underlain by two primary water-bearing units of interest: 1) a Perched Groundwater System, and 2) the underlying Regional Aquifer. Figure 6-3 depicts a revised CSM, and Table 6-2 summarizes the hydrogeologic characteristics of the two water-bearing units. A merging zone that partially extends under the southeast corner of the TAG AOC appears to connect these two units.

The Perched Groundwater System has a limited lateral extent that encompasses approximately 4.43 sq mi across the TAG AOC and adjacent north-central KAFB. Across the TAG AOC, the saturated thickness of the Perched Groundwater System ranges from approximately 7 to 20 ft across the northern and central portions on the TAG AOC. In the far southeast corner, the saturated thickness reaches approximately 40 ft. The thickness values are based upon October 2015 water levels and the interpretation of downhole geophysical logs.

Across the TAG AOC, the estimated thickness of the Perching Horizon ranges from 4 to 11 ft based upon correlation of downhole geophysical logs and lithologic descriptions (SNL February 2018). The average thickness is approximately 7 ft. The Perching Horizon is composed of a layer of low permeability sediments (mostly clay) that dips to the southeast at approximately one degree.

Table 6-1. Groundwater Monitoring Conducted by SNL/NM and the COA near the TAG AOC during CY 2018

Well ID	Installation Year	Sampling Frequency	WQ	WL	Comments
Eubank-1	1988			✓	Regional Aquifer (COA well)
Eubank-2	1996			✓	Regional Aquifer (COA well)
Eubank-3	1996			✓	Regional Aquifer (COA well)
Eubank-5	1996			✓	Regional Aquifer (COA well)
PGS-2	1995	A	n.s.	✓	Regional Aquifer
TA1-W-01	1997	A	✓	✓	Regional Aquifer
TA1-W-02	1998	A	✓	✓	Regional Aquifer
TA1-W-03	1998	A	n.s.	✓	Perched Groundwater System
TA1-W-04	1998	A	✓	✓	Regional Aquifer
TA1-W-05	1998	A	✓	✓	Regional Aquifer
TA1-W-06	1998	SA	✓	✓	Perched Groundwater System
TA1-W-07	1998			✓	Perched Groundwater System
TA1-W-08	2001	A	✓	✓	Perched Groundwater System
TA2-NW1-325	1993			✓	Perched Groundwater System
TA2-NW1-595	1993	A	✓	✓	Regional Aquifer
TA2-W-01	1994	SA	✓	✓	Perched Groundwater System
TA2-W-19	1995	Q	✓	✓	Perched Groundwater System
TA2-W-24	1998	spec.	✓	✓	Regional Aquifer
TA2-W-25	1997	spec.	✓	✓	Regional Aquifer
TA2-W-26	1998	Q	✓	✓	Perched Groundwater System
TA2-W-27	1998	SA	✓	✓	Perched Groundwater System
TA2-W-28	2014	Q	✓	✓	Perched Groundwater System, replaced TA2-SW1-320
TJA-2	1994	Q	✓	✓	Perched Groundwater System
TJA-3	1998	Q	✓	✓	Regional Aquifer
TJA-4	1998	Q	✓	✓	Regional Aquifer – merging (intermediate) zone
TJA-5	1998	spec.	✓	✓	Perched Groundwater System
TJA-6	2001	SA	✓	✓	Regional Aquifer
TJA-7	2001	Q	✓	✓	Perched Groundwater System
WYO-3	2001	A	✓	✓	Regional Aquifer, replaced WYO-1
WYO-4	2001	Q	n.s.	✓	Perched Groundwater System, replaced WYO-2
Total	----	21	21	30	Both water-bearing units

NOTES:
(1) Check mark indicates WQ sample or WL measurement was obtained.
(2) The special (spec.) wells were sampled voluntarily for one event.
(3) Sampling frequency used by SNL/NM: Q = Quarterly, SA = Semiannual, A = annual.

AOC = Area of Concern.
COA = City of Albuquerque ownership.
CY = Calendar Year.
ID = Identifier.
n.s. = Not sampled (variance from a work plan).
PGS = Parade Ground South.
SNL/NM = Sandia National Laboratories, New Mexico.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TAG = Tijeras Arroyo Groundwater.
TJA = Tijeras Arroyo.
WL = Water level.
WQ = Water quality.
WYO = Wyoming.

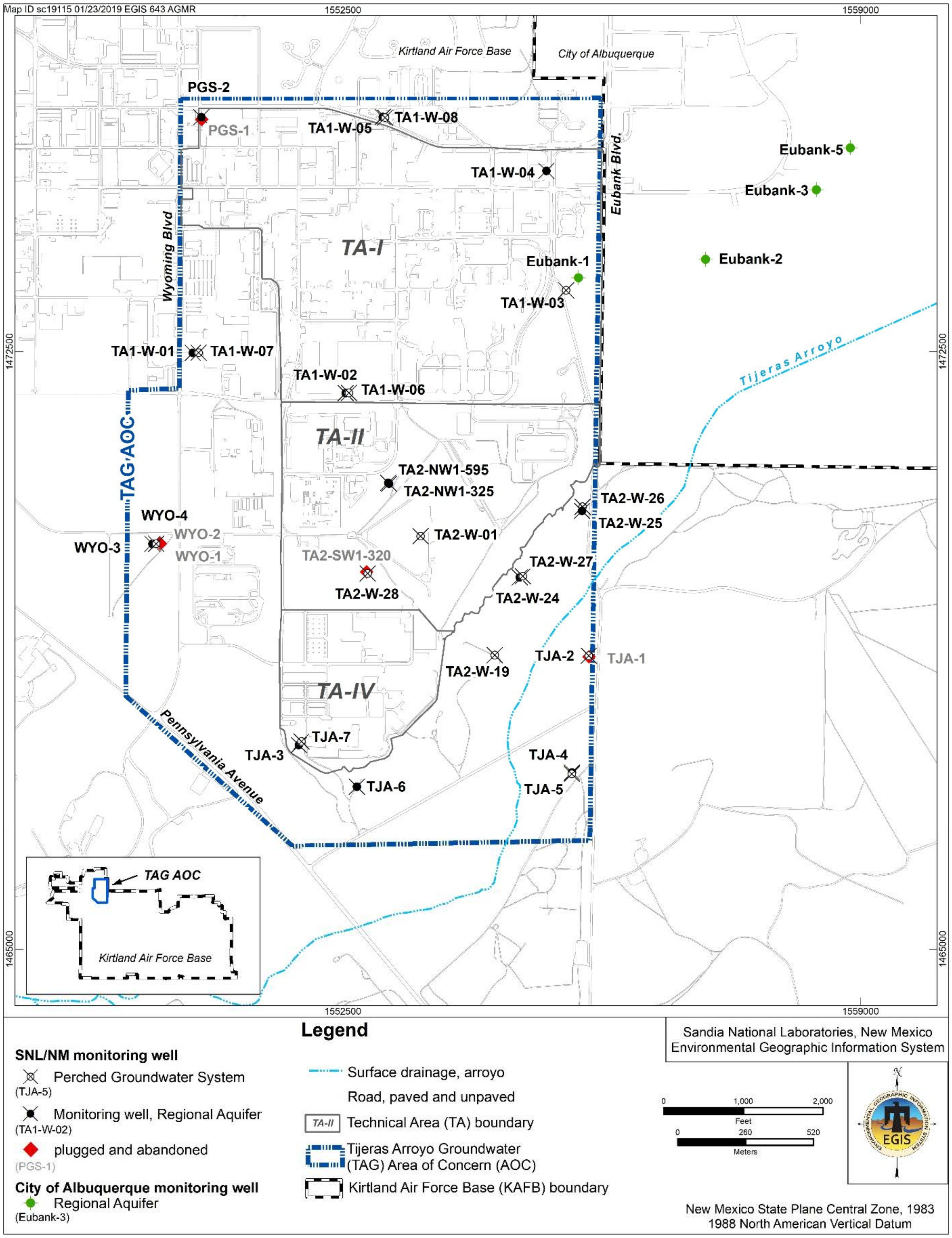


Figure 6-2. Groundwater Monitoring Wells Maintained by SNL/NM and the COA near the TAG AOC

Principal hydrogeologic controls on the direction of groundwater flow in the Perched Groundwater System consist of: (1) the stratigraphic dip of the Perching Horizon to the southeast, (2) lesser effect of the complex depositional fabric with braided paleochannels trending westward from the mountain flank, and (3) former multiple recharge locations in the northwestern and central parts of the TAG AOC.

The Perched Groundwater System is not used for any type of water supply in the TAG AOC. The Perched Groundwater System is a thin, dissipating water-bearing unit that mostly formed as a result of historical anthropogenic discharges of wastewater and septic water. Groundwater in the Perched Groundwater System migrates toward the southeast and merges with the underlying Regional Aquifer southeast of Tijeras Arroyo near Powerline Road. Based upon MODFLOW mass-balance modeling, approximately 25 percent of the total groundwater loss from the Perched Groundwater System is estimated to result from lateral flow toward the southeast where it merges with the underlying Regional Aquifer (SNL February 2018). The remaining 75 percent likely flows vertically downward through the Perching Horizon and dissipates in the upper portion of over 200 ft of unsaturated sediments present between the Perched Groundwater System and the Regional Aquifer. There is no geochemical indication that groundwater flowing downward through the Perching Horizon has reached the Regional Aquifer, except in the merging zone southeast of the TAG AOC. Declining water level trends indicate that nearly the entire extent of the Perched Groundwater System will naturally dewater in the TAG AOC by the year 2059. Some areas in the TAG AOC will dewater much sooner. Nitrate concentrations in the Perched Groundwater System are expected to decrease to background concentrations and below regulatory standards due to natural groundwater transport mechanisms such as advection, dispersion, and diffusion.

The original sources of nitrate from historical SNL/NM operations (wastewater outfall ditches and sanitary waste leach fields/seepage pits) are no longer in operation (the greatest discharge ceased in 1974 and all discharges ceased as of 1992). A driving force for downward migration of nitrate through the vadose zone to groundwater no longer exists. There is no current or anticipated use of groundwater from the Perched Groundwater System near the TAG AOC.

Figure 6-4 shows the variety of recharge sources (active and inactive) that are located near the TAG AOC. These recharge sources likely impacted the Perched Groundwater System:

- Landscape watering of grassy areas such as the Parade Ground north of TA-I (active),
- A buried ancestral Tijeras Arroyo channel with relatively older groundwater, flowing from Tijeras Canyon (active),
- Ongoing surface water and base flow along Tijeras Arroyo (active),
- Possible leaking water lines and sewer lines (active),
- Wastewater outfalls (inactive),
- Buried septic systems (inactive),
- KAFB landfills (some active and some inactive),
- The KAFB former Sewage Lagoons (inactive), and
- The Tijeras Arroyo Golf Course operated by KAFB (active).

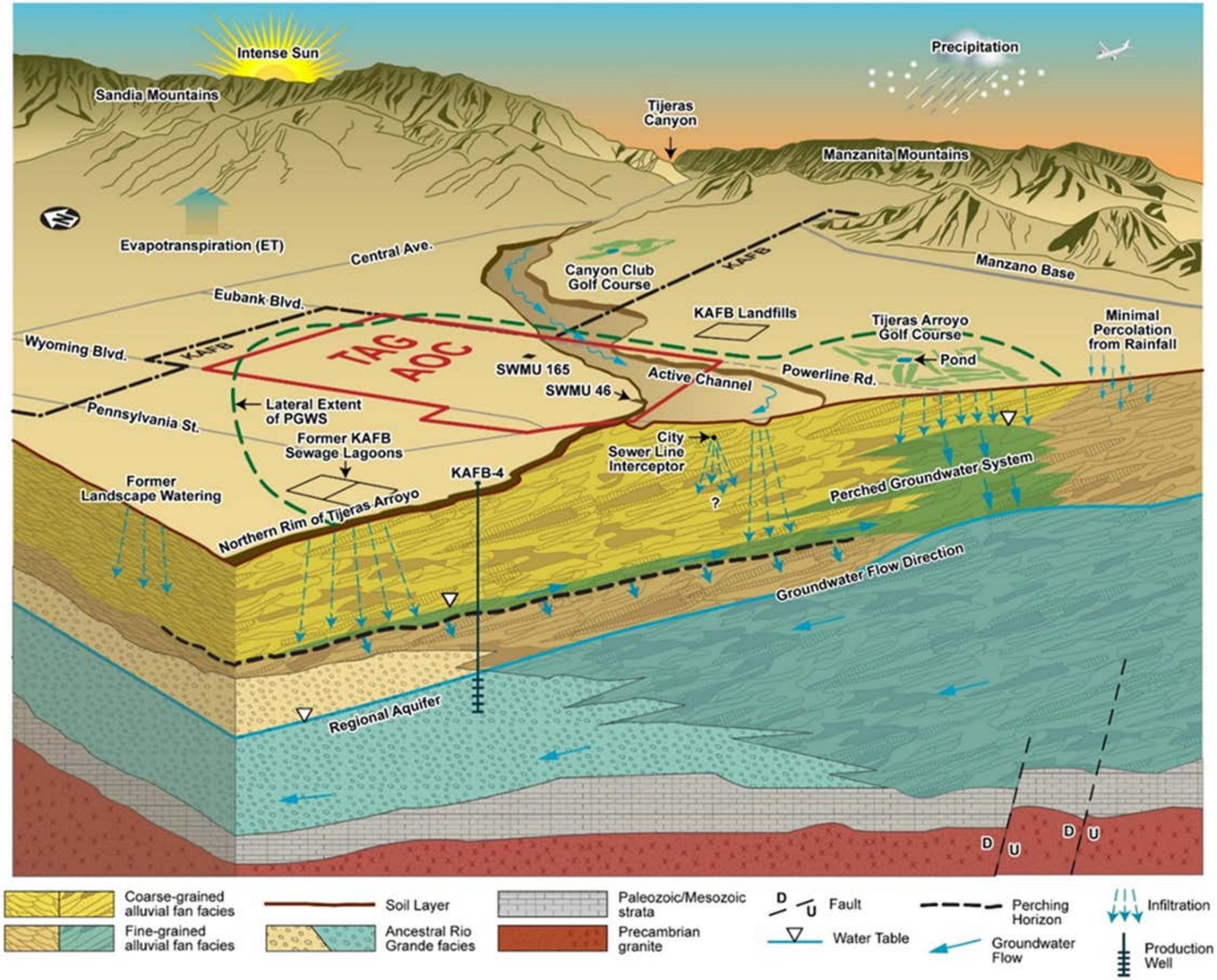


Figure 6-3. TAG Conceptual Site Model

Table 6-2. Comparison of Hydrogeologic Characteristics for the Perched Groundwater System and the Regional Aquifer in the TAG AOC

Characteristic	Perched Groundwater System	Regional Aquifer
Potentiometric Surface	Surface is inferred to slope primarily to the southeast.	Surface is inferred to slope primarily to the west and northwest.
Pressure Head	Unconfined (water table) conditions.	Unconfined to semi-confined conditions.
Lithofacies Distribution	Restricted to the alluvial fan lithofacies.	Contained within both the alluvial fan lithofacies and the ARG fluvial lithofacies.
Flow Direction	Primarily to the east and southeast.	Primarily to the west and northwest.
Horizontal Gradient	Varies from approximately 0.004 to 0.0125 ft/ft across the TAG AOC with an average of 0.01 ft/ft.	Varies from approximately 0.006 to 0.0125 ft/ft across the TAG AOC with an average of 0.01 ft/ft. Much steeper east of Powerline Road at 0.03 to 0.045 ft/ft. Nearly flat to the west of Wyoming Boulevard.
Horizontal hydraulic conductivity (Kh)	A wide range from 0.0532 ft/day to 3.06 ft/day, with an average of 1.63 ft/day.	A narrow range of 1.66 to 7.75 ft/day, with an average of 3.77 ft/day.
Vertical hydraulic conductivity (Kv)	0.0163 ft/day.	0.0377 ft/day.
Effective porosity	0.25 (25 percent), based upon studies at TA-V (SNL September 2015)	0.25 (25 percent), based upon studies at TA-V (SNL September 2015)
Groundwater velocity, horizontal	0.002 to 0.122 ft/day. Equivalent to 0.778 to 44.68 ft/yr.	0.066 to 0.310 ft/day. Equivalent to 24.24 to 113.15 ft/yr.
Groundwater velocity, horizontal average	Approximately 24 ft/yr, based on five monitoring wells screened in the Perched Groundwater System.	Approximately 55 ft/yr, based on five monitoring wells screened in the Regional Aquifer.
Usage	Not used for water supply purposes.	Utilized for water supply by KAFB, ABCWUA, and VA.
Lateral extent	Approximately 4.43 sq mi across north-central KAFB.	Laterally extensive across the Albuquerque Basin.
Saturated Thickness	Estimated from geophysical logs to range from approximately 7 to 20 ft across the northern and central portions of the TAG AOC. In the far southeast corner, the saturated thickness reaches approximately 40 ft.	In excess of 1,000 ft in thickness across much of the TAG AOC vicinity.
Geochemical Variability	Geochemical signatures variable between monitoring wells.	Geochemical signatures consistent between monitoring wells.
Geochemical Uniqueness	High chloride, nitrate, and sulfate concentrations.	Low calcium concentrations, but high bicarbonate/alkalinity concentrations.

Refer to footnotes on page 6-11.

Table 6-2. Comparison of Hydrogeologic Characteristics for the Perched Groundwater System and the Regional Aquifer in the TAG AOC *(Concluded)*

Characteristic	Perched Groundwater System	Regional Aquifer
Water Levels	Steadily declining groundwater elevations across the entire TAG AOC ranging from 0.06 to 1.17 ft/yr, except in southeast corner at well TJA-5.	Increasing groundwater elevations across the entire TAG AOC, except at the southwest corner. Variable rate ranges from a declining 0.07 to an increasing 2.65 ft/yr.
Recharge Sources	Historically recharged by anthropogenic sources (leaking water supply/sewer lines, landscape watering, the Tijeras Arroyo Golf Course, former outfalls, the former KAFB Sewage Lagoons), and ongoing natural sources such as Tijeras Arroyo.	Historically recharged by anthropogenic sources (leaking water supply/sewer lines, irrigated lawns, the Tijeras Arroyo Golf Course, the former KAFB Sewage Lagoons), and natural sources such as Tijeras Arroyo.
Principal Hydrologic Controls	Stratigraphic dip of Perching Horizon to the southeast coupled with lesser effect of the depositional fabric trending westward from mountain front.	Combined drawdown of KAFB, ABCWUA, and VA water supply wells. North to south trending paleochannels with high conductivities to the west of Wyoming Boulevard. Low conductivity east to west trending alluvial fan deposits east of Wyoming Boulevard.

NOTES:

Table was updated using the Revised TAG CCM/CME Report (SNL February 2018). All characteristics, except for effective porosity, were derirved from studies conducted in the TAG AOC.

ABCWUA = Albuquerque Bernalillo County Water Utility Authority.
AOC = Area of Concern.
ARG = Ancestral Rio Grande (lithofacies).
CCM = Current Conceptual Model.
CME = Corrective Measures Evaluation.
ft = Foot (feet).
ft/day = Feet per day.
ft/ft = Feet per foot.
ft/yr = Feet per year.
KAFB = Kirtland Air Force Base.
SNL = Sandia National Laboratories.
sq mi = Square mile(s).
TA = Technical Area.
TAG = Tijeras Arroyo Groundwater.
TJA = Tijeras Arroyo.
VA = Veterans Administration.

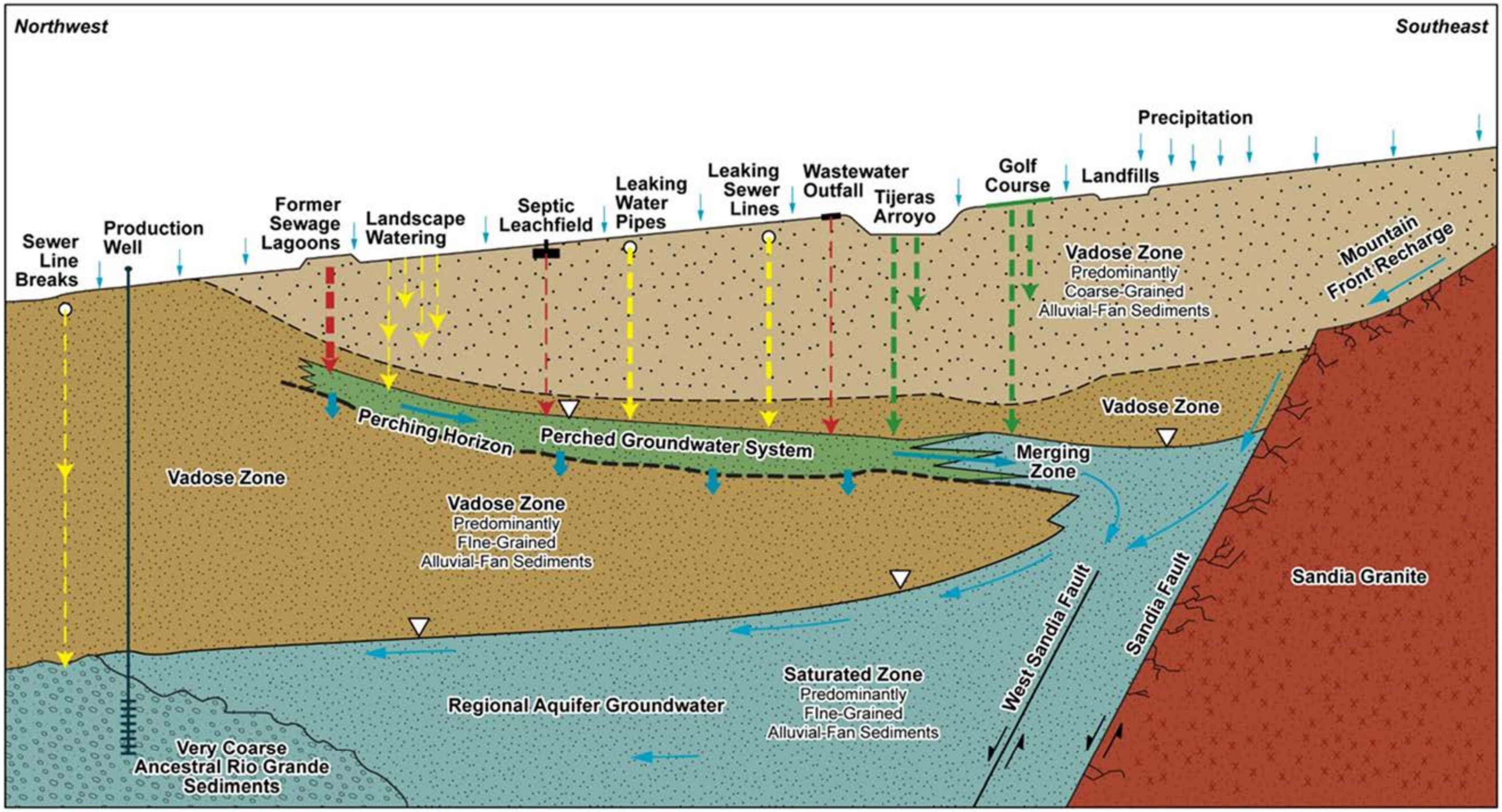
The Regional Aquifer is more laterally extensive than the Perched Groundwater System, underlying the entire TAG AOC as well as the Albuquerque Basin. The Regional Aquifer is composed of both the Ancestral Rio Grande (ARG) fluvial lithofacies and the alluvial fan lithofacies. Locally, groundwater in the Regional Aquifer flows to the northwest, in a nearly opposite direction to that of the Perched Groundwater System. The gradient in the Regional Aquifer averages approximately 0.018 feet per foot (ft/ft) across the TAG AOC, but is steeper near water supply wells operated by KAFB, the ABCWUA, and the Veterans Administration (VA). The Regional Aquifer is recharged on the eastern side of the study area by natural sources including mountain front recharge, Tijeras Arroyo, and the Perched Groundwater System. The principal hydrogeologic control upon groundwater flow direction in the Regional Aquifer is the combined drawdown effect of the KAFB, ABCWUA, and VA water supply wells.

The geochemical signatures of the Perched Groundwater System and the Regional Aquifer are distinctive. Figure 6-5 presents two Piper diagrams depicting the most comprehensive set of geochemical data for the Perched Groundwater System and the Regional Aquifer. The geochemical signature of the Perched Groundwater System exhibits a wide range of geochemistry that as a group does not correspond to a dominant type. This variability appears to indicate several sources of recharge. The Perched Groundwater System exhibits relatively higher concentrations of chloride and sulfate than the Regional Aquifer. Groundwater samples from the Regional Aquifer exhibit a more consistent chemistry that is classified as a calcium bicarbonate type. The Regional Aquifer also exhibits higher bicarbonate concentrations. The tight group of the Regional Aquifer data points indicates that the wells are screened in the same hydrostratigraphic interval (groundwater from all wells is chemically similar; therefore, in direct hydraulic communication). This water appears to have a single source such as mountain front recharge.

6.1.7.1 Regional Hydrogeologic Conditions

Tijeras Arroyo is the most significant surface water drainage feature on KAFB and trends westward across the northern portion of KAFB and eventually drains into the Rio Grande, approximately 5.6 miles west of KAFB. Water flows in the arroyo several times per year as a result of significant thunderstorms. The average annual precipitation for the area, as measured at Albuquerque International Sunport, is 9.45 inches (Chapter 2.6.2.1). During most rainfall events, rainfall quickly infiltrates into the soil. However, virtually all of the moisture subsequently undergoes evapotranspiration. Estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL February 1998).

The TAG AOC overlies the eastern margin of the Albuquerque Basin where the basin-bounding faults mostly trend parallel to the Sandia-Manzanita-Manzano mountain front. The stratigraphic unit of greatest interest is the Upper Santa Fe Group, which is primarily composed of two interfingering lithofacies: alluvial fan lithofacies and the ARG fluvial lithofacies. Both lithofacies are less than 5 Mega Annum (millions of years) and are composed of unconsolidated to poorly cemented gravel, sand, silt, and clay (Stone et al. February 2000). The alluvial fan lithofacies consists of poorly sorted piedmont-slope deposits derived from the Sandia, Manzanita, and Manzano Mountains east of the study area. Fine-grained units within the alluvial fan lithofacies produce low-permeability zones that are capable of perching groundwater. The ARG fluvial lithofacies are derived from northern sources and are typically composed of well sorted, medium- to coarse-grained sands with higher hydraulic conductivities.



Recharge Schematic for TAG Area Showing Principal Recharge and Discharge Features, View to Northeast, Not to Scale. Width of recharge arrow signifies relative volume. Color signifies the duration: green arrow denotes ongoing recharge, yellow arrow denotes a reduced rate of discharge, red arrow signifies that recharge was eliminated. (Precipitation and groundwater arrows are not scaled.)

Figure 6-4. Recharge Features near the TAG AOC

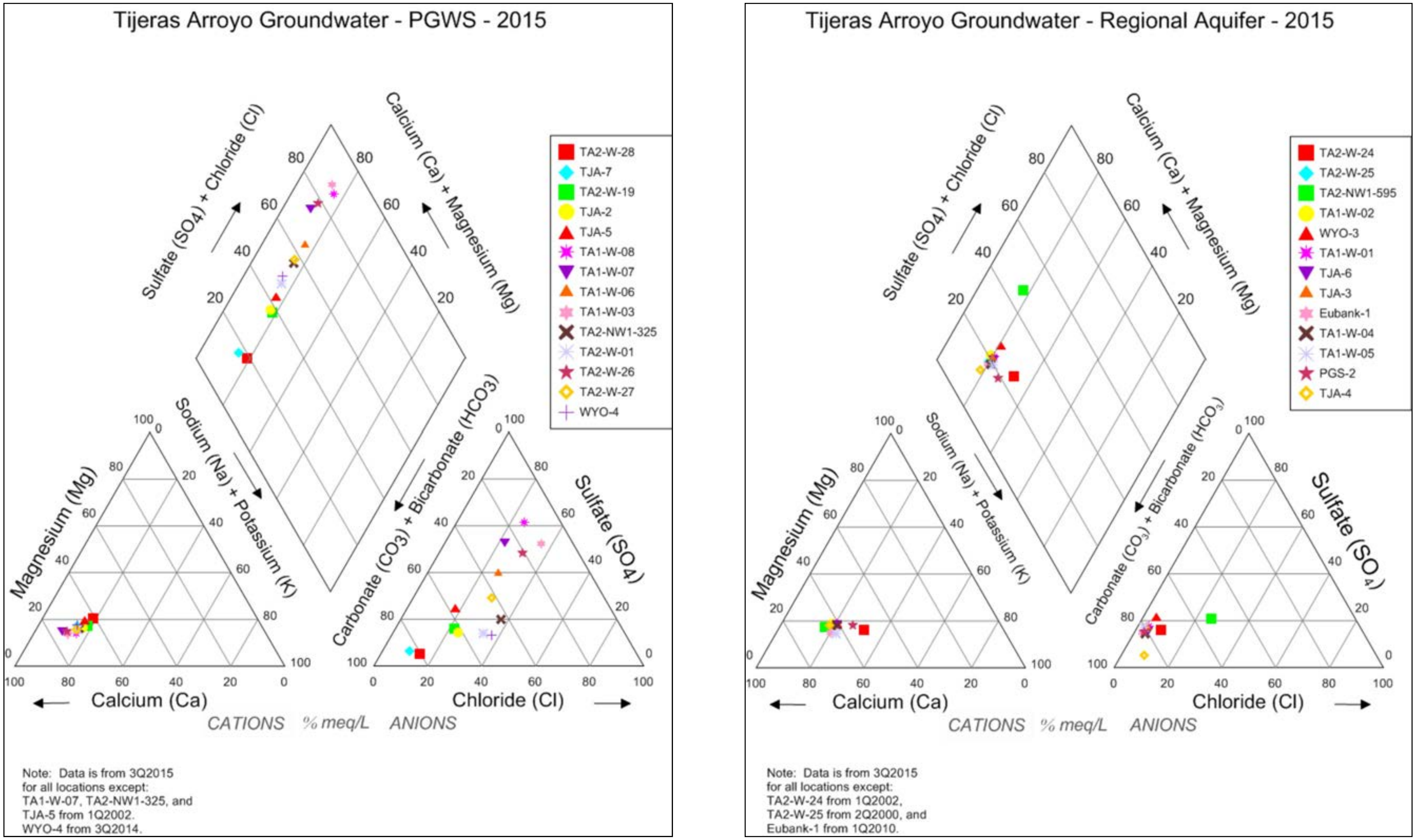


Figure 6-5. Piper Diagrams for Groundwater Samples Collected from Monitoring Wells Screened in the Perched Groundwater System and the Regional Aquifer

6.1.7.2 Hydrogeologic Conditions at the TAG AOC

Across the TAG AOC, the Perched Groundwater System is encountered at approximately 270 to 340 ft bgs, and the Regional Aquifer system is encountered at approximately 440 to 570 ft bgs. A review of lithologic borehole descriptions and geophysical logs indicates that the sediments sandwiched between the base of the Perching Horizon and the Regional Aquifer are mostly composed of moist sediments that will not yield groundwater to a well. Based on data collected in October 2015, this unsaturated thickness of sediments below the Perching Horizon averaged approximately 202 ft thick, decreasing from approximately 258 ft in the northwest corner of the TAG AOC to 177 ft in the southeast corner near the merging zone. Groundwater in the Perched Groundwater System mixes with the Regional Aquifer southeast of Tijeras Arroyo in a merging zone where the anastomosing set of alluvial fan sediments are slightly more permeable, and/or a fault is present. As noted earlier, Table 6-2 presents a comparison of the hydrogeologic characteristics for the two water-bearing units.

6.1.7.3 Local Direction of Groundwater Flow

Figure 6-6 presents the September/October 2018 potentiometric surface for the Perched Groundwater System, which has an estimated lateral extent of approximately 4.43 sq mi (SNL February 2018). Table 6-3 lists the September/October 2018 groundwater elevations. The direction of groundwater flow in the Perched Groundwater System is inferred from the potentiometric surface to be principally to the east and southeast, with an average horizontal gradient of approximately 0.01 ft/ft. The horizontal gradient of the Perched Groundwater System is variable across the TAG AOC. Beneath TA-I, TA-II, and TA-IV, the horizontal gradient varies from 0.004 to 0.0125 ft/ft. The vertical gradient is downward as indicated by the merging of the two water-bearing units near the southeast corner of the TAG AOC.

Figure 6-7 presents the September/October 2018 potentiometric surface for the Regional Aquifer. The direction of groundwater flow in the Regional Aquifer is inferred from the potentiometric surface to be principally to the west and northwest toward the KAFB, ABCWUA, and VA water supply wells. The horizontal gradient of the Regional Aquifer beneath the TAG AOC varies from approximately 0.006 to 0.0125 ft/ft, with an average of approximately 0.01 ft/ft. The horizontal gradient is steeper to the east of the TAG AOC at 0.03 to 0.045 ft/ft. Vertical flow gradients in the Regional Aquifer are inferred to be mostly downward in response to pumping of the water supply wells.

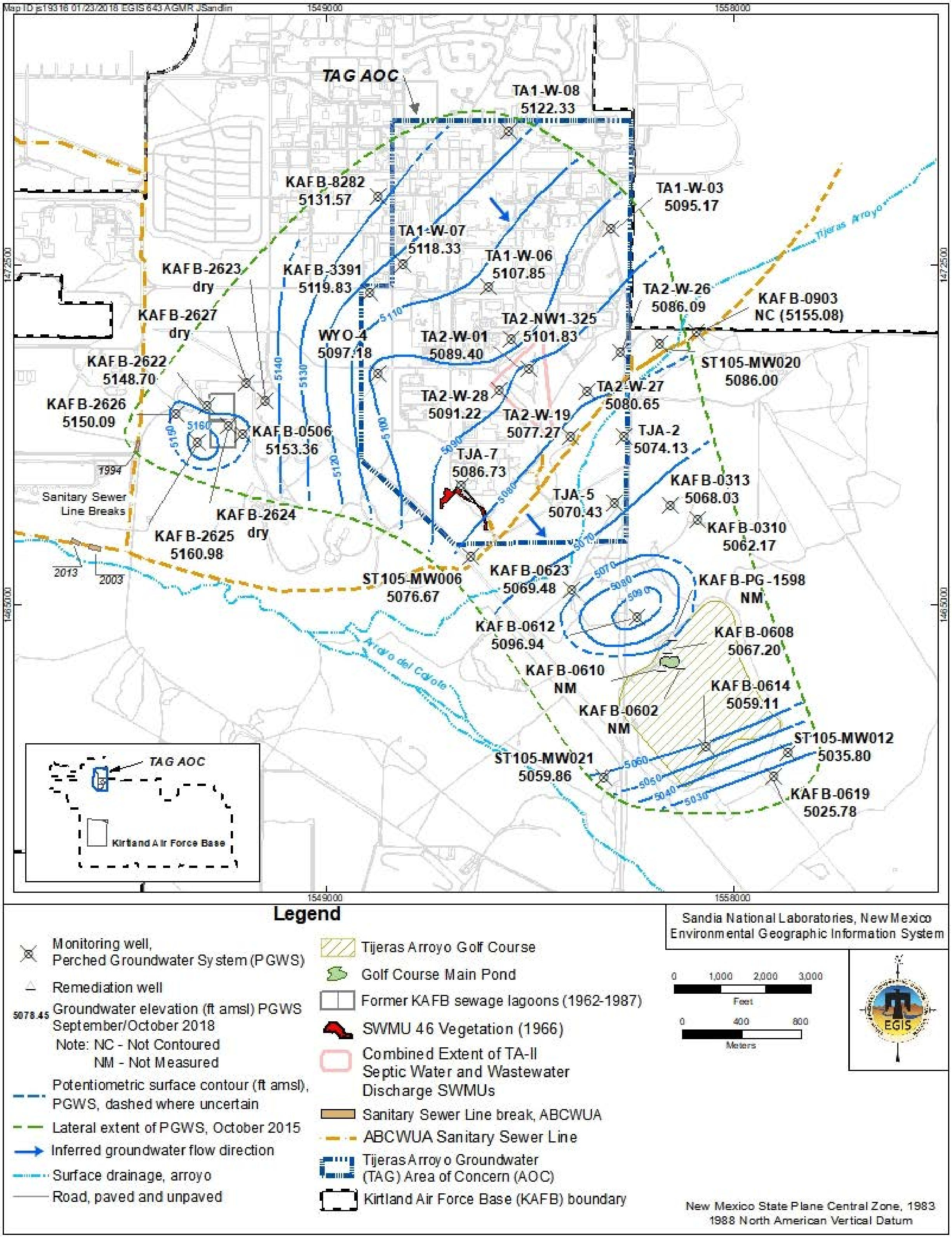


Figure 6-6. Potentiometric Surface Map for the Perched Groundwater System at the TAG AOC (September/October 2018)

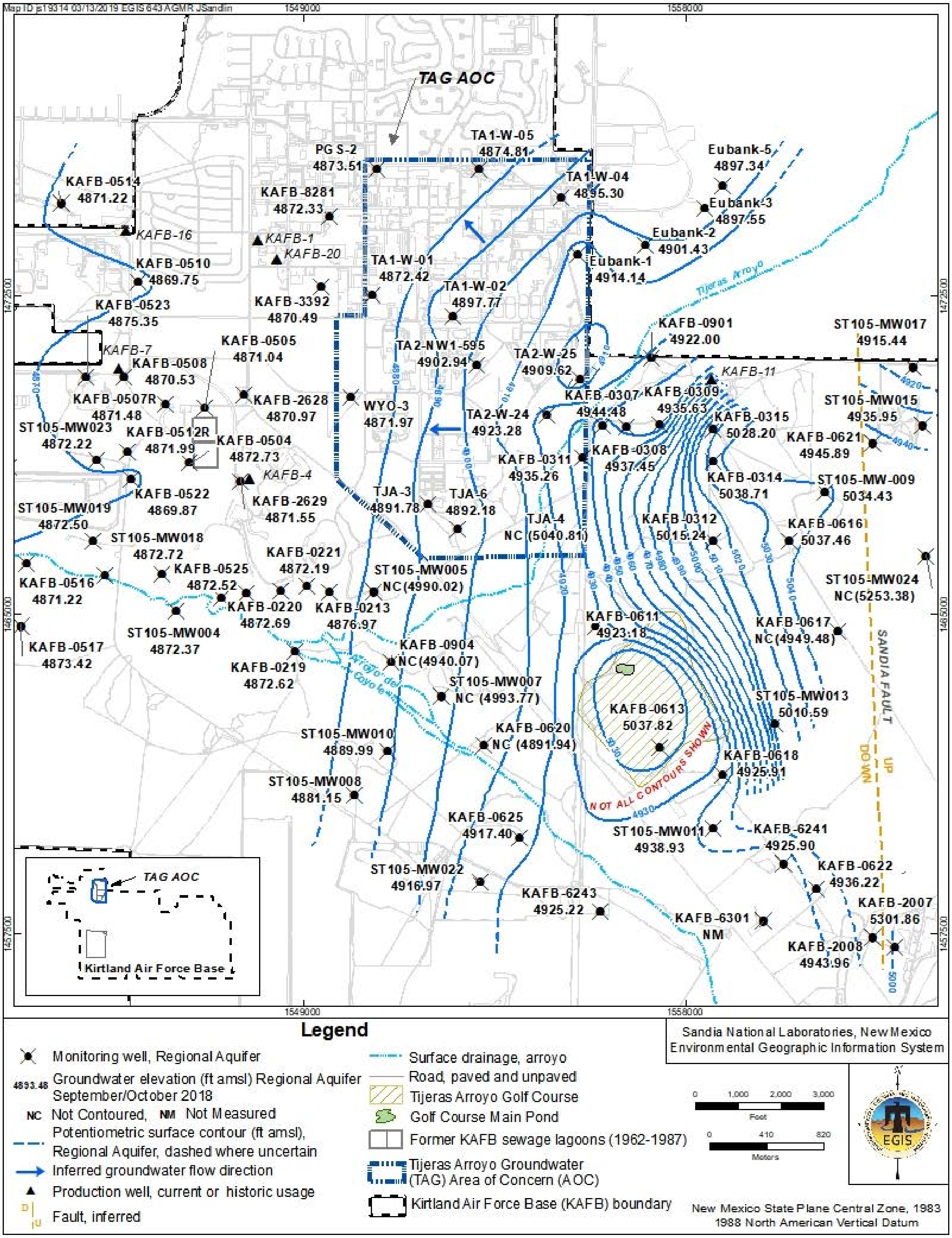


Figure 6-7. Potentiometric Surface Map of the Regional Aquifer at the TAG AOC (September/October 2018)

Table 6-3. Groundwater Elevations Measured in CY 2018 at Monitoring Wells near the TAG AOC

Well ID	Measuring Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Screened Unit in SFG sediments
Eubank-1	5460.02	5-Oct-2018	545.88	4914.14	Regional Aquifer
Eubank-2	5474.39	15-Nov-2018	572.96	4901.43	Regional Aquifer
Eubank-3	5498.73	6-Nov-2018	601.18	4897.55	Regional Aquifer
Eubank-5	5507.40	5-Nov-2018	610.06	4897.34	Regional Aquifer
PGS-2	5408.29	5-Oct-2018	534.78	4873.51	Regional Aquifer
TA1-W-01	5403.82	5-Oct-2018	531.40	4872.42	Regional Aquifer
TA1-W-02	5416.62	5-Oct-2018	518.85	4897.77	Regional Aquifer
TA1-W-03	5457.03	3-Oct-2018	361.86	5095.17	PGWS
TA1-W-04	5460.98	3-Oct-2018	565.68	4895.30	Regional Aquifer
TA1-W-05	5433.84	5-Oct-2018	559.03	4874.81	Regional Aquifer
TA1-W-06	5417.10	5-Oct-2018	309.25	5107.85	PGWS
TA1-W-07	5404.92	5-Oct-2018	286.59	5118.33	PGWS
TA1-W-08	5434.19	5-Oct-2018	311.86	5122.33	PGWS
TA2-NW1-325	5421.94	3-Oct-2018	320.11	5101.83	PGWS
TA2-NW1-595	5421.26	3-Oct-2018	518.32	4902.94	Regional Aquifer
TA2-W-01	5419.99	3-Oct-2018	330.59	5089.40	PGWS
TA2-W-19	5351.21	3-Oct-2018	273.94	5077.27	PGWS
TA2-W-24	5363.66	3-Oct-2018	440.38	4923.28	Regional Aquifer
TA2-W-25	5374.86	3-Oct-2018	465.24	4909.62	Regional Aquifer
TA2-W-26	5375.77	3-Oct-2018	289.68	5086.09	PGWS
TA2-W-27	5362.85	3-Oct-2018	282.20	5080.65	PGWS
TA2-W-28	5412.41	3-Oct-2018	321.19	5091.22	PGWS
TJA-2	5353.20	3-Oct-2018	279.07	5074.13	PGWS
TJA-3	5390.56	4-Oct-2018	498.78	4891.78	Regional Aquifer
TJA-4	5341.16	3-Oct-2018	300.35	5040.81	merging zone
TJA-5	5341.33	3-Oct-2018	270.90	5070.43	PGWS
TJA-6	5343.16	3-Oct-2018	450.98	4892.18	Regional Aquifer
TJA-7	5391.27	4-Oct-2018	304.54	5086.73	PGWS
WYO-3	5392.09	4-Oct-2018	520.12	4871.97	Regional Aquifer
WYO-4	5392.57	4-Oct-2018	295.39	5097.18	PGWS
KAFB-0213	5281.50	26-Sep-2018	409.98	4876.97	Regional Aquifer
KAFB-0219	5263.69	25-Sep-2018	391.07	4872.62	Regional Aquifer
KAFB-0220	5265.10	25-Sep-2018	392.41	4872.69	Regional Aquifer
KAFB-0221	5274.36	26-Sep-2018	402.17	4872.19	Regional Aquifer
KAFB-0307	5364.53	25-Sep-2018	420.05	4944.48	Regional Aquifer
KAFB-0308	5381.65	25-Sep-2018	444.20	4937.45	Regional Aquifer
KAFB-0309	5411.80	25-Sep-2018	476.17	4935.63	Regional Aquifer
KAFB-0310	5416.48	26-Sep-2018	354.31	5062.17	PGWS
KAFB-0311	5353.29	27-Sep-2018	418.03	4935.26	Regional Aquifer
KAFB-0312	5432.17	26-Sep-2018	416.93	5015.24	Regional Aquifer
KAFB-0313	5418.98	26-Sep-2018	350.95	5068.03	PGWS
KAFB-0314	5455.75	25-Sep-2018	417.04	5038.71	Regional Aquifer
KAFB-0315	5466.11	25-Sep-2018	437.91	5028.20	Regional Aquifer
KAFB-0504	5357.87	27-Sep-2018	485.14	4872.73	Regional Aquifer

Refer to footnotes on page 6-20.

Table 6-3. Groundwater Elevations Measured in CY 2018 at Monitoring Wells near the TAG AOC *(Continued)*

Well ID	Measuring Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Screened Unit in SFG sediments
KAFB-0505	5362.81	27-Sep-2018	491.77	4871.04	Regional Aquifer
KAFB-0506	5363.47	26-Sep-2018	210.11	5153.36	PGWS
KAFB-0507R	5358.21	27-Sep-2018	486.73	4871.48	Regional Aquifer
KAFB-0508	5351.88	25-Sep-2018	481.35	4870.53	Regional Aquifer
KAFB-0510	5367.10	25-Sep-2018	497.35	4869.75	Regional Aquifer
KAFB-0512R	5302.73	26-Sep-2018	430.74	4871.99	Regional Aquifer
KAFB-0514	5206.41	26-Sep-2018	335.19	4871.22	Regional Aquifer
KAFB-0516	5205.64	25-Sep-2018	334.42	4871.22	Regional Aquifer
KAFB-0517	5197.10	25-Sep-2018	323.68	4873.42	Regional Aquifer
KAFB-0522	5267.48	26-Sep-2018	397.61	4869.87	Regional Aquifer
KAFB-0523	5352.62	25-Sep-2018	477.27	4875.35	Regional Aquifer
KAFB-0525	5229.75	25-Sep-2018	357.23	4872.52	Regional Aquifer
KAFB-0602	5365.47	17-Oct-2017	n.m.	n.m.	PGWS
KAFB-0608	5361.17	26-Sep-2018	293.97	5067.20	PGWS
KAFB-0610	5359.47	17-Oct-2017	n.m.	n.m.	PGWS
KAFB-0611	5386.09	26-Sep-2018	462.91	4923.18	Regional Aquifer
KAFB-0612	5385.45	26-Sep-2018	288.51	5096.94	PGWS
KAFB-0613	5390.78	26-Sep-2018	352.96	5037.82	Regional Aquifer
KAFB-0614	5390.89	26-Sep-2018	331.78	5059.11	PGWS
KAFB-0616	5481.07	25-Sep-2018	443.61	5037.46	Regional Aquifer
KAFB-0617	5505.78	25-Sep-2018	556.30	4949.48	Regional Aquifer
KAFB-0618	5410.05	27-Sep-2018	484.14	4925.91	Regional Aquifer
KAFB-0619	5410.78	27-Sep-2018	385.00	5025.78	PGWS
KAFB-0620	5334.64	26-Sep-2018	442.70	4891.94	Regional Aquifer
KAFB-0621	5569.89	25-Sep-2018	624.00	4945.89	Regional Aquifer
KAFB-0622	5488.64	27-Sep-2018	552.42	4936.22	Regional Aquifer
KAFB-0623	5328.94	27-Sep-2018	259.46	5069.48	PGWS
KAFB-0625	5392.90	26-Sep-2018	472.83	4917.40	Regional Aquifer
KAFB-0901	5390.07	26-Sep-2018	468.07	4922.00	Regional Aquifer
KAFB-0903	5391.63	26-Sep-2018	236.55	5155.08	merging zone
KAFB-0904	5291.75	26-Sep-2018	351.68	4940.07	Regional Aquifer
KAFB-2007	5564.48	25-Sep-2018	262.62	5301.86	Regional Aquifer
KAFB-2008	5541.74	25-Sep-2018	597.78	4943.96	Regional Aquifer
KAFB-2622	5358.14	27-Sep-2018	209.44	5148.70	PGWS
KAFB-2623	5367.48	26-Sep-2018	dry	dry	PGWS
KAFB-2624	5362.27	27-Sep-2018	dry	dry	PGWS
KAFB-2625	5359.26	27-Sep-2018	198.28	5160.98	PGWS
KAFB-2626	5357.51	27-Sep-2018	207.42	5150.09	PGWS
KAFB-2627	5367.47	26-Sep-2018	dry	dry	PGWS
KAFB-2628	5369.64	26-Sep-2018	498.67	4870.97	Regional Aquifer
KAFB-2629	5361.53	26-Sep-2018	489.98	4871.55	Regional Aquifer
KAFB-3391	5396.60	27-Sep-2018	276.77	5119.83	PGWS
KAFB-3392	5394.51	27-Sep-2018	524.02	4870.49	Regional Aquifer
KAFB-6241	5466.50	27-Sep-2018	540.60	4925.90	Regional Aquifer
KAFB-6243	5426.22	26-Sep-2018	501.00	4925.22	Regional Aquifer

Refer to footnotes on page 6-20.

Table 6-3. Groundwater Elevations Measured in CY 2018 at Monitoring Wells near the TAG AOC *(Concluded)*

Well ID	Measuring Point (feet amsl) NAVD 88	Date Measured	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)	Screened Unit in SFG sediments
KAFB-8281	5401.03	17-May-2018	528.70	4872.33	Regional Aquifer
KAFB-8282	5402.92	17-May-2018	271.35	5131.57	PGWS
ST105-MW004	5234.61	25-Sep-2018	362.24	4872.37	Regional Aquifer
ST105-MW005	5287.57	26-Sep-2018	297.55	4990.02	Regional Aquifer
ST105-MW006	5313.26	26-Sep-2018	236.59	5076.67	PGWS
ST105-MW007	5311.18	26-Sep-2018	317.41	4993.77	Regional Aquifer
ST105-MW008	5358.94	26-Sep-2018	477.79	4881.15	Regional Aquifer
ST105-MW009	5519.71	25-Sep-2018	485.28	5034.43	Regional Aquifer
ST105-MW010	5334.70	26-Sep-2018	444.71	4889.99	Regional Aquifer
ST105-MW011	5422.66	27-Sep-2018	483.73	4938.93	Regional Aquifer
ST105-MW012	5419.90	27-Sep-2018	384.10	5035.80	PGWS
ST105-MW013	5447.27	27-Sep-2018	436.68	5010.59	Regional Aquifer
ST105-MW015	5623.95	25-Sep-2018	688.00	4935.95	Regional Aquifer
ST105-MW017	5621.97	25-Sep-2018	706.53	4915.44	Regional Aquifer
ST105-MW018	5221.68	25-Sep-2018	348.96	4872.72	Regional Aquifer
ST105-MW019	5217.94	26-Sep-2018	345.44	4872.50	Regional Aquifer
ST105-MW020	5383.72	26-Sep-2018	297.72	5086.00	PGWS
ST105-MW021	5390.90	26-Sep-2018	331.04	5059.86	PGWS
ST105-MW022	5386.66	26-Sep-2018	469.69	4916.97	Regional Aquifer
ST105-MW023	5275.86	26-Sep-2018	403.64	4872.22	Regional Aquifer
ST105-MW024	5595.67	25-Sep-2018	342.29	5253.38	Regional Aquifer

NOTES:

amsl = Above mean sea level.
AOC = Area of Concern.
btoc = Below top of casing (the measuring point).
CY = Calendar Year.
ID = Identifier.
KAFB = Kirtland Air Force Base.
NAVD 88 = North American Vertical Datum of 1988.
n.m. = Not measured.
PGS = Parade Ground South.
PGWS = Perched Groundwater System.
SFG = Santa Fe Group
ST105-MW = KAFB Site ST-105 Monitoring Well.
TAG = Tijeras Arroyo Groundwater.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TJA = Tijeras Arroyo.
WYO = Wyoming.

6.1.7.4 Groundwater Elevations

The series of hydrographs (Figures 6B-1 through 6B-10 in Attachment 6B) depict the historical trends of groundwater elevations in the TAG AOC. No seasonality such as a response to the summer monsoon season is apparent for either the Perched Groundwater System or the Regional Aquifer.

Historically, water levels in the Perched Groundwater System have fluctuated across the TAG AOC. Near the KAFB former sewage lagoons, water levels have been declining since 1987, apparently in response to the lagoons being removed from service. Within the TAG AOC, recharge to the Perched Groundwater has been nearly eliminated; SNL/NM wastewater outfall ditches and sanitary waste leach fields/seepage pits are no longer in operation (the greatest discharge ceased in 1974 and all discharges ceased as of 1992). The hydrographs on Figure 6-8 illustrate the consistently declining water levels for eight wells in the central and southeast portion of the TAG AOC. Declining water level trends indicate that nearly the entire extent of the Perched Groundwater System will naturally dewater in the TAG AOC in approximately 2059 (SNL February 2018). Some areas in the TAG AOC will dewater much sooner. Since 2010, the greatest decline in groundwater elevations occurred in the northern and central parts of the TAG AOC at approximately 0.4 to 1.2 ft per year (ft/yr). Figure 6-9 shows that monitoring wells located near the center of the TAG AOC have the shortest expected remaining lifespans (SNL February 2018).

Some Regional Aquifer monitoring wells such as TA1-W-05 and PGS-2 show a cycle related to the pumping of water supply wells operated by KAFB and ABCWUA because of increased demand in the summer months. Since late 2008, hydrographs for the Regional Aquifer wells in the TAG AOC show an increasing trend in groundwater elevations (Attachment 6B). Presumably, this is in response to the ABCWUA transitioning to surface water withdrawals for potable water supplies and a decreasing dependence on water supply wells immediately north of KAFB. Since 2010, the overall trend in groundwater elevations in the northern and central parts of the TAG AOC increased at approximately 0.5 to 2.7 ft/yr. Water levels at the southwest corner of the TAG AOC at monitoring wells TJA-3 and TJA-6 have been stable since 2000. Increases southeast of Tijeras Arroyo in some Regional Aquifer monitoring wells owned by KAFB may result from golf course watering (Balleau Groundwater, Inc. [BGW] February 2001).

6.1.7.5 Contaminant Sources

Environmental investigations for potential release sites were summarized in the TAG Continuing Investigation Report (SNL November 2002). The potential release sites were again evaluated in the Revised TAG CCM/CME Report (SNL February 2018). Historical discharges of wastewater and septic waters from SWMU 46 (Old Acid Waste Line Outfall) and nine SWMUs at TA-II with lesser discharges are the most likely sites to have impacted groundwater in the TAG AOC. As shown in Table 6-4, discharges at SWMU 46 were curtailed in 1974. Discharges at the TA-II SWMUs were curtailed in 1992 (SNL February 2018).

Stable (nonradioactive) isotopes for nitrogen (N) and oxygen (O) were used to evaluate the genesis of nitrate in groundwater for the TAG AOC. In 2004, $\delta^{15}N$ analyses were conducted for five Perched Groundwater System monitoring wells. The $\delta^{15}N$ values in water ranged from 3.6 to 7.0 (SNL November 2004), which is indicative of natural soil and septic waste. In 2012, groundwater samples for dual isotopes analyses ($\delta^{15}N$ versus $\delta^{18}O$) were collected from five Regional Aquifer monitoring wells. The isotopic results predominantly indicated that the nitrate in the Regional Aquifer was likely derived from natural (unfertilized) soil and/or manure/septic waste; denitrification was not evident (Madrid et al. June 2013).

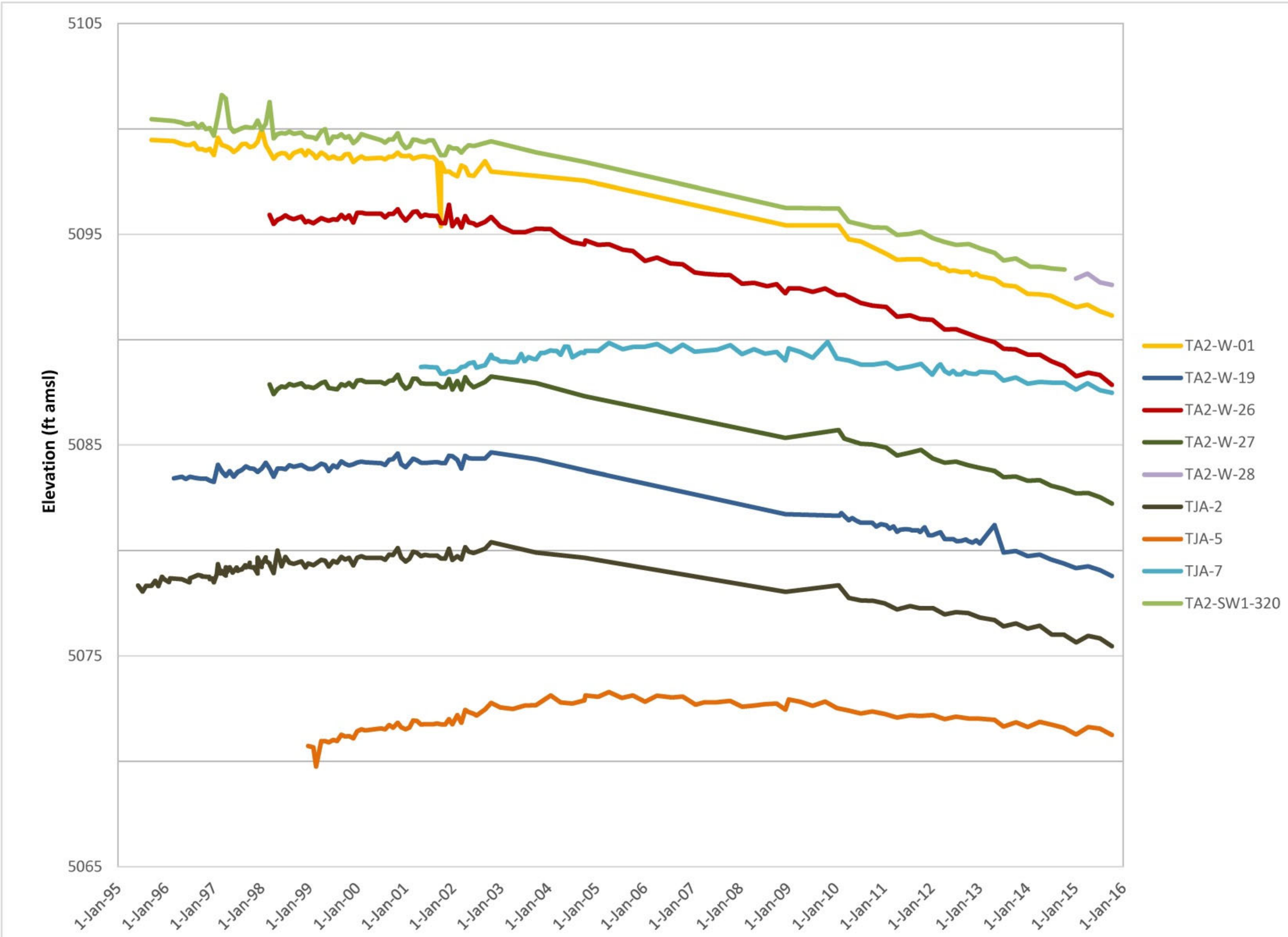


Figure 6-8. Hydrographs for Monitoring Wells Located in the Central and Southern Portion of the TAG AOC

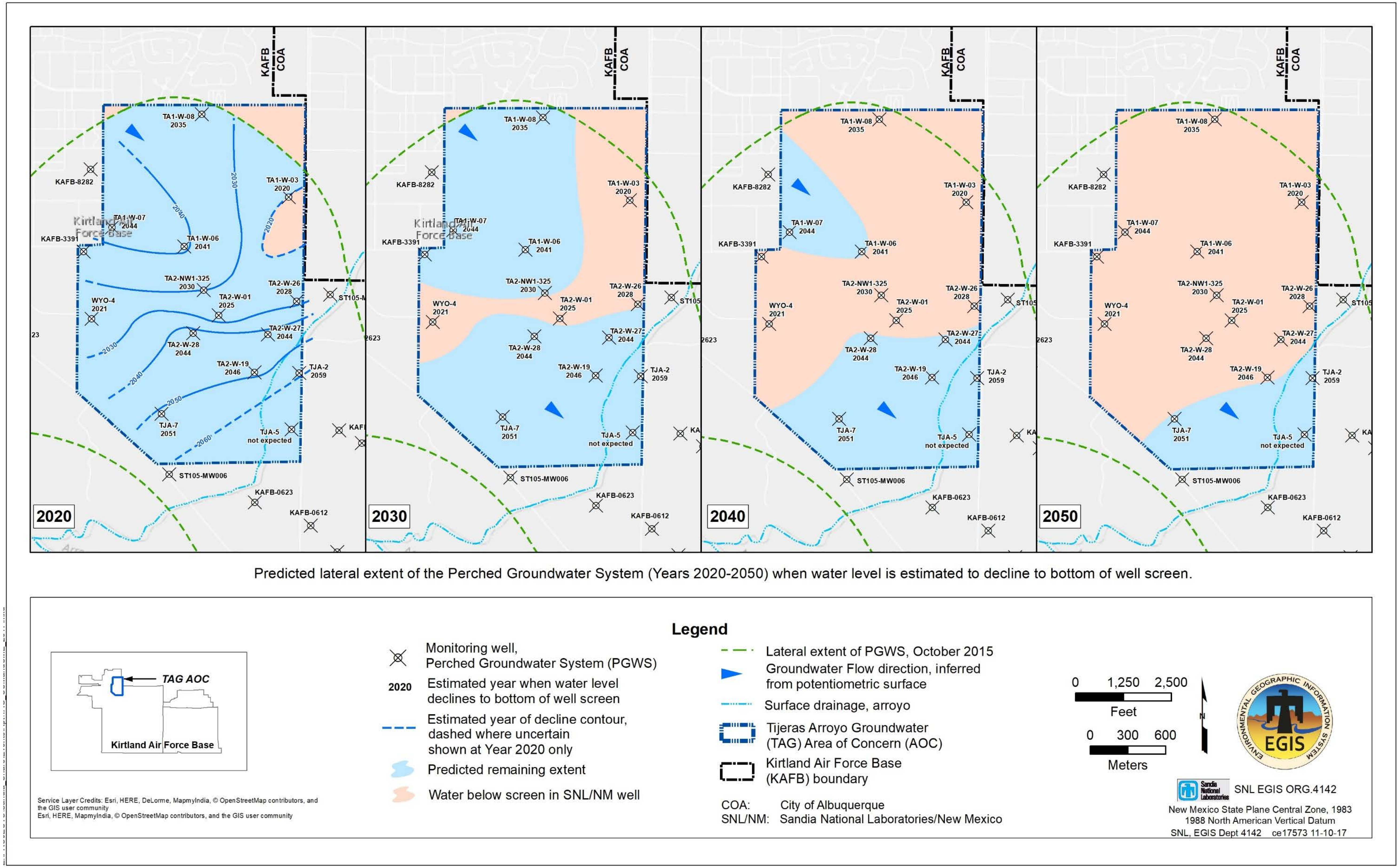


Figure 6-9. Estimated Years When Groundwater Elevations Will Decline to the Lowest Slots at Monitoring Wells Screened in the Perched Groundwater System in the TAG AOC

Table 6-4. SNL/NM SWMUs in the TAG AOC with the Greatest Potential for Having Impacted Groundwater

SWMU	SWMU Name	Years of Discharge	Wastewater Source	Septic Water Source
46	SWMU 46, Old Acid Waste Line Outfall	1948–1974	TA-I	TA-I, possibly
48	SWMU 48, Building 904 Septic System	1947–1992	TA-II	TA-II
135	SWMU 135, Building 906 Septic System	1950–1992	TA-II	TA-II
136	SWMU 136, Building 907 Septic System	1948–1992	TA-II	TA-II
159	SWMU 159, Building 935 Septic System	1963–1991	TA-II	TA-II
165	SWMU 165, Building 901 Septic System	1948–1992	TA-II	TA-II
166	SWMU 166, Building 919 Septic System	1969–1990	TA-II	TA-II
167	SWMU 167, Building 940 Septic System	1965–1990	TA-II	TA-II
227	SWMU 227, Building 904 Outfall	1947–1992	TA-II	None
229	SWMU 229, Storm Drain System Outfall (Building 904)	1947–1992	TA-II	None

NOTES:
AOC = Area of Concern.
SNL/NM = Sandia National Laboratories, New Mexico.
SWMU = Solid waste management unit.
TA = Technical Area.
TAG = Tijeras Arroyo Groundwater.

6.1.7.6 Contaminant Behavior

Soil and soil-vapor samples collected from the vadose zone (land surface to the Perched Groundwater System) during drilling operations and from the soil vapor monitoring network have indicated evidence of vapor phase volatile organic compounds (VOCs). Fourteen soil vapor monitoring wells were installed in the TAG AOC. However, no free-phase TCE and no water-saturated core samples were encountered in any of the soil samples collected from the boreholes. The original source of the TCE was the aqueous phase (former wastewater outfalls). All anthropogenic sources of SNL/NM recharge (wastewater and septic water) have been removed from service and no longer contribute water to the vadose zone.

Based on soil-vapor data, the residual mass of TCE that may reside in the overlying unsaturated sediments is minimal and is not a continuing source of groundwater contamination. Therefore, the only significant potential mechanism for transporting TCE to groundwater would be through partitioning back into the aqueous phase if additional recharge occurred. Given that both current anthropogenic and natural recharge to the Perched Groundwater System is minimal, it is unlikely that significant transport of TCE in the vadose zone to groundwater could occur. Therefore, the vapor phase TCE in the vadose zone is not considered a continuing source of potential contamination to groundwater.

Nitrate was present in septic waters discharged at SNL/NM, KAFB, and ABCWUA septic systems and sanitary sewer lines in the area. The nitrate was transported to the Perched Groundwater System by the high volumes of septic water and wastewater disposed of at various locations. Nitrate is extremely soluble in water. Absence of water saturation in core samples collected in the vadose zone above the Perched Groundwater System coupled with cessation of significant recharge activities indicates there are no residual sources of anthropogenic nitrate contamination in the vadose zone.

6.1.7.7 Contaminant Distribution and Transport in Groundwater

The distribution of low nitrate concentrations is discontinuous in the Perched Groundwater System and does not indicate a single contaminant release site. Based on the historic disposal of septic waters at SNL/NM, the occurrence of nitrate is most likely associated with multiple release sites. The maximum historical concentration of nitrate plus nitrite (NPN) in the Perched Groundwater System within the TAG

AOC is 27.8 mg/L and corresponds to monitoring well TA2-SW1-320, which is located in the central part of TA-II. Due to declining groundwater levels and a damaged well casing, this well was replaced by well TA2-W-28 in December 2014. The replacement well is screened approximately 10 ft deeper (Table 1) and coincidentally had a maximum NPN concentration of 27.8 mg/L occurring in November 2015.

In 2015, KAFB issued an updated nitrate abatement report that described their potential nitrate release sites and the distribution of nitrate in groundwater. In a cooperative effort, KAFB and SNL/NM personnel are studying the distribution of nitrate in the Perched Groundwater System. Higher NPN concentrations (up to 70 mg/L) have been detected in KAFB wells located immediately to the south of the TAG AOC. These elevated nitrate concentrations may be related to the Tijeras Arroyo Golf Course or to the ABCWUA sanitary sewer line. Off base and farther upgradient sources of nitrate are being investigated.

Historically, only three Perched Groundwater System monitoring wells (TA2-W-19, TA2-W-26, and WYO-4) have yielded groundwater samples that exceeded the TCE MCL. The maximum historical concentration of TCE in the Perched Groundwater System was 10.5 µg/L, which corresponds to a sample collected from monitoring well WYO-4 in November 2014. However, NMED HWB management stated in the August 2017 meeting that well WYO-4 and the surrounding area no longer need to be considered as the responsibility of DOE and SNL/NM personnel. Responsibility for well WYO-4 is anticipated to be transferred to the KAFB ER Program. Well WYO-4 is located west of Wyoming Boulevard on land managed by the KAFB (not leased or owned by DOE). The well was not installed for investigating SNL SWMUs. The latest sample (October 2015) from well WYO-4 had a TCE concentration of 3.82 µg/L, which is below the MCL. The steadily declining water level in the well indicates that the thin zone of saturation in the Perched Groundwater System is decreasing near well WYO-4. As a result, the collection of a representative groundwater sample at WYO-4 has not been possible since October 2015 (see Section 6.3). Video logging conducted in June 2016 showed that the well was in good condition with no significant biofouling or silting.

Monitoring wells TA2-W-19 and TA2-W-26 are located on the Tijeras Arroyo floodplain in the south-central portion of the TAG AOC. The historical maximum TCE concentration for well TA2-W-19 was 6.23 µg/L, occurring in October 2007. This is the last exceedance of the TCE MCL at well TA2-W-19. At well TA2-W-26, the historical maximum TCE concentration was 9.6 µg/L, occurring in March 1998. The last exceedance of the TCE MCL at well TA2-W-26 was 9.2 (J-qualified) µg/L in May 2000.

For the Regional Aquifer in the TAG AOC, the historical maximum NPN concentration of 38.4 mg/L is associated with monitoring well TJA-4. This well is located in the extreme southeast corner of the TAG AOC and is screened in the merging zone. Because groundwater migrates to the northwest in the Regional Aquifer, the occurrence of nitrate at this well is likely associated with the ABCWUA sanitary sewer line or KAFB operations such as the Tijeras Arroyo Golf Course.

Potential downgradient receptors in the Regional Aquifer are water supply wells operated by KAFB, ABCWUA, and the VA. These wells are located to the north and northwest of the TAG AOC. Three numerical modeling efforts have been conducted for the vicinity of the TAG AOC:

- Capture zone analysis for water supply wells (SNL February 2001),
- Contaminant transport modeling (SNL August 2005), and
- Conceptual groundwater modeling incorporating recharge features and stratigraphic controls (BGW September 2002).

The nearest receptor for the potential contaminants in the Regional Aquifer is the ABCWUA Ridgecrest Well Field. The computer modeling predicts that elevated nitrate in the TAG AOC could potentially reach the well field after a travel time of 130 years and would be attenuated to 0.24 µg/L, which is well below the MCL of 10 mg/L. Thus, there is no foreseeable risk to human health or a threat to beneficial use of groundwater from historic SNL/NM operations.

6.2 Regulatory Criteria

The NMED HWB provides regulatory oversight of SNL/NM ER Operations, as well as implements and enforces regulations mandated by the Resource Conservation and Recovery Act (RCRA). All SWMUs and AOCs are listed in the *RCRA Facility Operating Permit, NM5890110518* (NMED HWB January 2015).

All corrective action requirements pertaining to the TAG AOC are contained in the Consent Order. The groundwater monitoring activities for the TAG AOC are not associated with a single SWMU, but have a broader scope. Groundwater characterization activities for TAG were originally conducted voluntarily as proposed in the Groundwater Investigation Plan (SNL March 1996a). During the TAG High Performing Team meetings, participants (staff from SNL/NM, KAFB, COA, the NMED HWB, and the EPA) debated the validity of using groundwater analytical results previously collected using low-flow sampling devices. Based on the perceived inadequacy of the sampling method, TAG quarterly groundwater sampling was temporarily suspended until an alternative sampling method could be implemented. In June 2003, DOE/ National Nuclear Security Administration and SNL/NM personnel submitted the TAG Investigation Work Plan (SNL June 2003) to the NMED HWB. The work plan presented a comprehensive scope of work for groundwater investigations that would be jointly conducted by SNL/NM, KAFB, and the COA. Based on the requirements of the work plan, groundwater sampling at SNL/NM resumed in July 2003 using conventional low-flow groundwater purging/sampling techniques.

As mentioned above, the Consent Order became effective in April 2004. The six quarterly sampling events required by the TAG CME Work Plan were completed in Fiscal Year 2005. Since then, groundwater sampling has continued using a variety of frequencies (quarterly, semiannually, and annually) according to the NMED HWB approved work plans. The TAG Investigation Report specifies that data would continue to be presented in annual reports, such as this Annual Groundwater Monitoring Report. The outline of this chapter for the TAG AOC is based on the required elements of a "Periodic Monitoring Report" as described in Section X.D of the Consent Order.

As mentioned above in Section 6.1, the Revised TAG CCM/CME Report (SNL February 2018) was submitted in response to a NMED HWB disapproval letter (NMED May 2017). The revised report utilized the understanding reached in an August 2017 meeting with NMED HWB, DOE, and SNL/NM personnel. The revised report contains a series of new attachments for borehole lithologic logs, geophysical logs, well diagrams, and stratigraphic cross-sections. These materials were used for updating the body of the revised report concerning the interpretation and mapping of the structural dip and thickness of the Perching Horizon that underlies the Perched Groundwater System. Accordingly, the discussion of the hydrogeologic setting and CSM were updated. Also, a more rigorous identification and screening of potential remedial technologies was conducted for addressing the elevated nitrate concentrations in the Perched Groundwater System. Three remedial alternatives (monitored natural attenuation, in-situ bioremediation, and groundwater extraction and treatment) were evaluated in detail for issues such as modeling optimal well locations, sampling frequency, reporting, and cost estimates for installing additional wells and associated infrastructure. The revised report also discusses guidance from NMED HWB concerning the historical TCE occurrences in groundwater at monitoring well WYO 4. This well and the surrounding area are now considered to be the responsibility of KAFB ERP and not the responsibility of DOE and SNL/NM personnel. The DOE submittal letter (DOE February 2018) for the revised report also included a response to the NMED HWB request for sampling several monitoring wells for 1,4 Dioxane. DOE proposed that six monitoring wells screened in the Perched Groundwater System be sampled for at least two sampling events each. Sampling for 1,4-Dioxane would be discontinued at a well after a non-detect was reported for at least two consecutive sampling events.

In this Annual Groundwater Monitoring Report, the TAG analytical data include both hazardous and radioactive constituents; however, the analytical data for radionuclides (gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE and SNL/NM personnel. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Consent Order. Additional information on radionuclides, and the scope of the Consent Order, is available in Section III.A of the Consent Order.

6.3 Scope of Activities

Section 6.1.5 lists the CY 2018 activities for the TAG AOC including the measurement of groundwater levels and the collection of groundwater samples. Table 6-5 summarizes the four groundwater sampling events with the corresponding analytical parameters for each well, which are listed in Table 6-6. During CY 2018, a total of 21 monitoring wells were sampled. These wells consisted of 10 Perched Groundwater System wells and 11 Regional Aquifer wells. The list of wells sampled in CY 2018 was previously summarized in Table 6-1. Monitoring wells PGS-2, TA1-W-03, and WYO-4 were not sampled; Section 6.8 discusses these variances.

Table 6-5. Groundwater Monitoring Well Network and Sampling Dates for the TAG AOC in CY 2018

Date of Sampling Event	Wells Sampled		SAP
February/ March 2018	TA1-W-06 TA2-W-01 TA2-W-19 TA2-W-26 TA2-W-27 TA2-W-28	TJA-2 TJA-3 TJA-4 TJA-6 TJA-7	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY18, 2nd Quarter Sampling* (SNL January 2018)
June 2018	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2 TJA-3	TJA-4 TJA-5 TJA-6 TJA-7	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY18, 3rd Quarter Sampling* (SNL May 2018)
August/September 2018	TA1-W-01 TA1-W-02 TA1-W-04 TA1-W-05 TA1-W-06 TA1-W-08 TA2-NW1-595 TA2-W-01 TA2-W-19 TA2-W-24	TA2-W-25 TA2-W-26 TA2-W-27 TA2-W-28 TJA-2 TJA-3 TJA-4 TJA-6 TJA-7 WYO-3	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY18, 4th Quarter Sampling* (SNL July 2018)
November/December 2018	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2	TJA-3 TJA-4 TJA-7	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY19, 1st Quarter Sampling* (SNL October 2018)

NOTES:

Wells screened in the Perched Groundwater System are highlighted with green shading.

AOC = Area of Concern.
CY = Calendar Year.
FY = Fiscal Year.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
TAG = Tijeras Arroyo Groundwater.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TJA = Tijeras Arroyo.
WYO = Wyoming.

Table 6-6. Analytes and Parameters for TAG AOC Monitoring Wells per Sampling Events in CY 2018

Parameter	February/March 2018	
NPN VOCs	TA1-W-06 TA1-W-06 (duplicate) TA2-W-01 TA2-W-19 TA2-W-26 TA2-W-27 TA2-W-28	TJA-2 TJA-3 TJA-4 TJA-6 TJA-6 (duplicate) TJA-7
Parameter	**June 2018**	
NPN VOCs	TA2-W-19 TA2-W-19 (duplicate) TA2-W-26 TA2-W-28 TJA-2 TJA-3	TJA-4 TJA-5 TJA-6 TJA-6 (duplicate) TJA-7 TJA-7 (duplicate)
Parameter	**August/September 2018**	
Alkalinity Anions Gamma Spectroscopy (short list[a]) Gross Alpha/Beta activity NPN TAL Metals, plus Total Uranium Tritium VOCs	TA1-W-01 TA1-W-01 (duplicate) TA1-W-02 TA1-W-04 TA1-W-05 TA1-W-05 (duplicate) TA1-W-06 TA1-W-08 TA2-NW1-595 TA2-NW1-595 (duplicate) TA2-W-01 TA2-W-01 (duplicate)	TA2-W-19 TA2-W-26 TA2-W-27 TA2-W-28 TJA-2 TJA-3 TJA-4 TJA-6 TJA-7 WYO-3 TA2-W-24 TA2-W-25
Parameter	**November/December 2018**	
NPN VOCs	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2 TJA-2 (duplicate)	TJA-3 TJA-3 (duplicate) TJA-4 TJA-7

NOTES:
Wells screened in the Perched Groundwater System are highlighted with green shading.
[a] Gamma spectroscopy shortlist (americium-241, cesium-137, cobalt-60, and potassium-40).
AOC = Area of Concern.
CY = Calendar Year.
NPN = Nitrate plus nitrite (reported as nitrogen).
TAG = Tijeras Arroyo Groundwater.
TAL = Target Analyte List.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TJA = Tijeras Arroyo.
VOC = Volatile organic compound.
WYO = Wyoming.

Quality control (QC) samples were collected in the field at the time of environmental sample collection. Field QC samples include duplicate environmental, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Section 1.3 discusses the utility of QC samples.

6.4 Field Methods and Measurements

Section 1.3 describes in detail the procedures used for groundwater monitoring. Specific information is discussed below.

6.5 Analytical Methods

Section 1.3.2 describes EPA-specified protocols utilized for groundwater samples analyzed by the offsite laboratories (Tables 1-5 and 1-6).

6.6 Summary of Analytical Results for CY2018

This section discusses the CY 2018 analytical results and pertinent trends in COC concentrations in the TAG AOC. Attachment 6C (Tables 6C-1 through 6C-7) presents the analytical results and field measurements for all TAG sampling events; Attachment 6D (Figures 6D-1 through 6D-6) presents the NPN concentration trend plots.

Table 6C-1 presents a summary of detected VOC results and Table 6C-2 lists the method detection limits (MDLs). Ten VOCs were detected during CY 2018 in the TAG AOC with all being reported at low concentrations near the respective detection limits and below the respective MCLs. The VOCs detected in the CY 2018 groundwater samples were:

- 1,1-Dichloroethane,1,1-Dichloroethene
- Acetone
- Chloroform
- cis-1,2-Dichloroethene
- Methylene chloride
- Tetrachloroethene
- 1,2,3-Trichlorobenzene
- 1,2,4-Trichlorobenzene
- TCE

Figure 6-10 shows the monitoring well locations with the corresponding maximum TCE concentrations in CY 2018 environmental samples for the Perched Groundwater System and the Regional Aquifer. Figure 6-11 shows the monitoring well locations with the corresponding maximum NPN concentrations in CY 2018 environmental samples for the Perched Groundwater System and the Regional Aquifer.

Table 6-7 lists the monitoring wells where MCLs were exceeded in CY 2018. For the Perched Groundwater System, five monitoring wells exceeded the MCL for nitrate (measured as NPN) while none of the monitoring wells exceeded the TCE MCL. For the merging zone in the Regional Aquifer, one monitoring well exceeded the MCL for nitrate, but no wells exceeded the TCE MCL. Additional details for contaminant values and trends are discussed below.

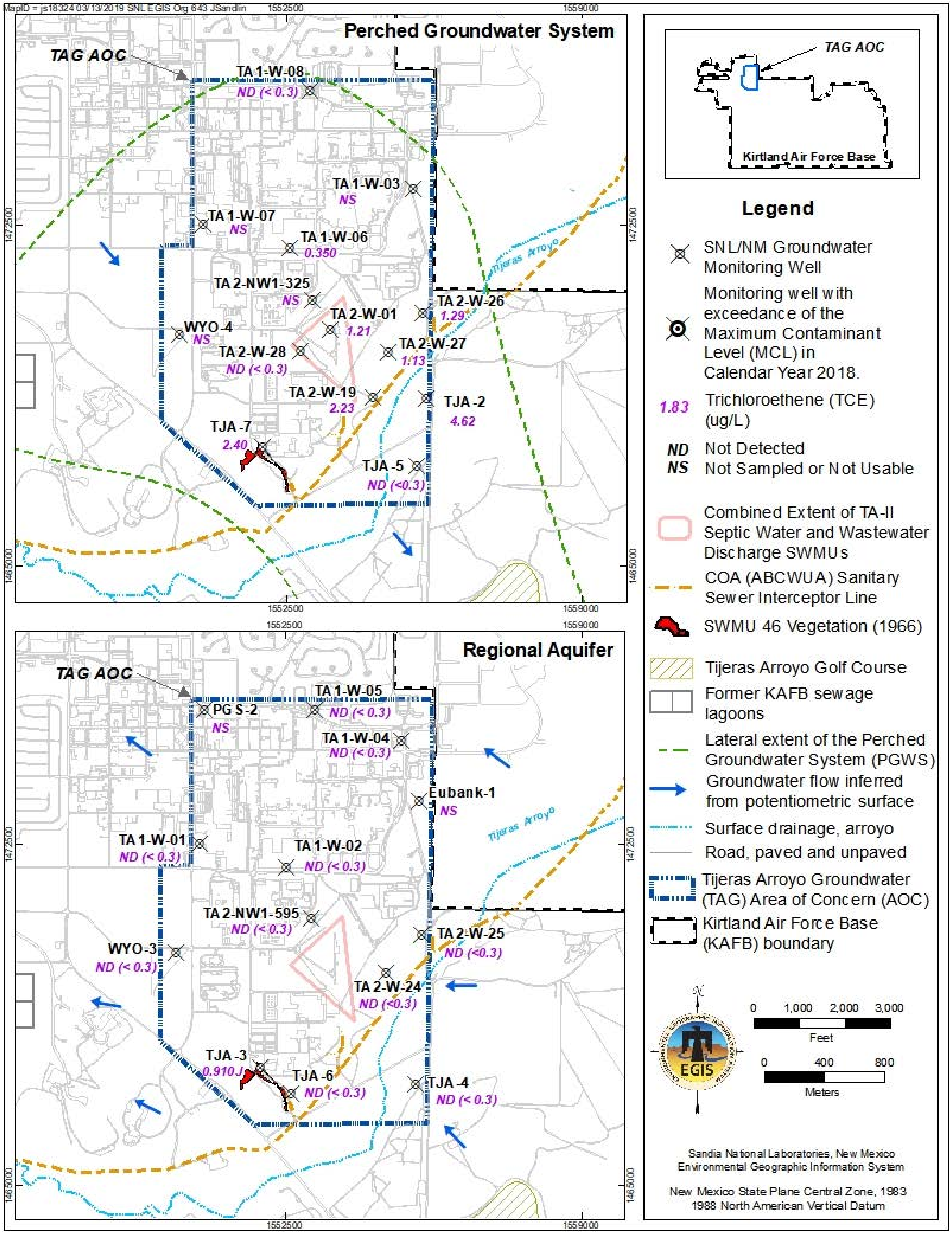


Figure 6-10. Maximum Concentrations of TCE in the Perched Groundwater System and the Regional Aquifer at the TAG AOC for CY 2018

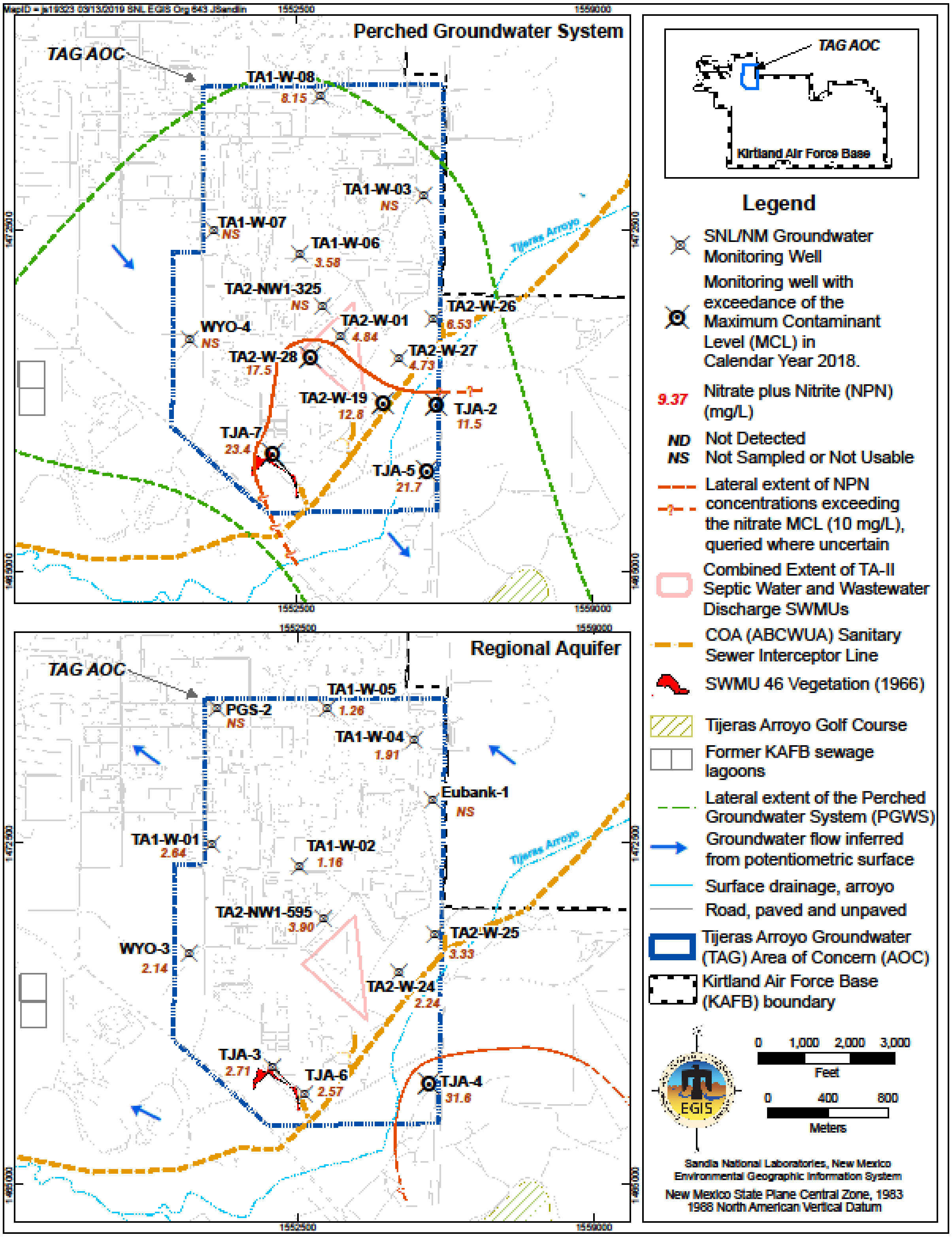


Figure 6-11. Maximum Concentrations of NPN in the Perched Groundwater System and the Regional Aquifer at the TAG AOC for CY 2018

Table 6-7. Matrix Summarizing the Monitoring Wells where Contaminant Concentrations in Groundwater Samples Exceeded the Respective MCLs for CY 2018

Aquifer	Number of Monitoring Wells Exceeding the TCE MCL of 5 µg/L	Maximum TCE Concentration in CY 2018 (µg/L)	Number of Monitoring Wells Exceeding the Nitrate MCL of 10 mg/L	Maximum NPN Concentration in CY 2018 (mg/L)
Perched Groundwater System	None	4.62 (TJA-2)	5 wells (TA2-W-19, TA2-W-28, TJA-2, TJA-5, and TJA-7)	23.4
Regional Aquifer	None	0.910 J (TJA-3)	1 well (TJA-4, merging zone)	31.6

NOTES:
µg/L = Microgram(s) per liter.
CY = Calendar Year.
J = The associated value is an estimated quantity.
MCL = Maximum Contaminant Level.
mg/L = Milligram(s) per liter.
NPN = Nitrate plus nitrite (reported as nitrogen).
TA2-W = Technical Area-II (Well).
TCE = Trichloroethene.
TJA = Tijeras Arroyo.

Groundwater monitoring has been conducted in the TAG AOC since 1992. NMED HWB identified the TAG AOC in the Consent Order because nitrate and TCE had concentrations in groundwater that exceeded the respective MCLs. When the Consent Order was issued, nitrate and TCE were specified as COCs because 1) the Perched Groundwater System contained concentrations of nitrate and TCE that exceeded the corresponding MCLs, and 2) the Regional Aquifer contained nitrate concentrations that exceeded the MCL. TCE did not exceed the MCL in the Regional Aquifer when the Consent Order was issued and has not exceeded the MCL since then. TCE has not exceeded the MCL in the Perched Groundwater System since March 2002, except at upgradient background monitoring well WYO-4. The Perched Groundwater System has been gradually dewatering and the water level in well WYO-4 has declined to the point where collecting a representative sample is no longer feasible. DOE and SNL/NM personnel and NMED HWB discussed the status of monitoring well WYO-4 in the August 2017 meeting. NMED HWB management stated the well no longer needs to be considered the responsibility of DOE and SNL/NM personnel for groundwater sampling or remedial purposes. Responsibility for well WYO-4 will transfer to the KAFB ER Program.

In CY 2018, no TCE or other VOC concentrations in groundwater samples from the Perched Groundwater System exceeded respective MCLs. The maximum TCE concentration was 4.62 µg/L and corresponded to Perched Groundwater System monitoring well TJA-2 (Table 6C-1). Only one of the Regional Aquifer monitoring wells had a TCE concentration that was above the detection limit of 0.3 µg/L (Table 6C-2). Monitoring well TJA-3 had a TCE concentration of 0.910 (J-qualified) µg/L. This well has had sporadic detections of TCE since 2001 but never above the MCL.

Five Perched Groundwater System monitoring wells (TA2-W-19, TA2-W-28, TJA-2, TJA-5, and TJA-7) had NPN results exceeding the nitrate MCL of 10 mg/L in CY 2018 (Table 6C-3). The NPN concentrations ranged from 10.5 (environmental duplicate sample) to 23.4 mg/L. For the last five years (since January 2014), the NPN trends for the environmental samples are as follows:

- TA2-W-19 (Figure 6D-1). NPN concentrations have ranged from 10.1 mg/L (May 2014) to 12.8 mg/L (May 2015 and November 2018). In CY 2018, the maximum NPN concentration was 12.8 mg/L. The overall NPN trend for the last five years is stable while the water level consistently declined at approximately 0.54 ft/yr.

- TA2-W-28 (Figure 6D-2). NPN concentrations have ranged from 15.6 mg/L (September 2018) to 27.8 mg/L (September 2015). In CY 2018, the maximum NPN concentration was 17.5 mg/L. The overall NPN trend for the last five years shows decreasing concentrations while the water level consistently declined at approximately 0.53 ft/yr. Monitoring well TA2-W-28 (first sampled in December 2014) is the replacement well for TA2-SW1-320 (last sampled in August 2014). Well TA2-W-28 is the most upgradient well in the TAG AOC with NPN concentrations exceeding the MCL.

- TJA-2 (Figure 6D-3). NPN concentrations have ranged from 10.9 mg/L (March 2014, September 2014, and June 2018) to 13.4 mg/L (September 2015). In CY 2018, the maximum NPN concentration was 11.5 mg/L. The overall NPN trend for the last five years is stable while the water level consistently declined at approximately 0.48 ft/yr.

- TJA-4 (Figure 6D-4). NPN concentrations have ranged from 26.5 mg/L (September 2015) to 33.1 mg/L (December 2017). In CY 2018, the maximum NPN concentration was 31.6 mg/L. The overall NPN trend for the last five years is stable while the water level increased at 0.16 ft/yr.

- TJA-7 (Figure 6D-5). NPN concentrations have ranged from 20.3 mg/L (September 2015) to 26.0 mg/L (December 2017). In CY 2018, the maximum NPN concentration was 23.4 mg/L. The overall NPN trend for the last five years is stable while the water level consistently declined at approximately 0.29 ft/yr.

- TJA-5 (Figure 6D-6). The collection of groundwater samples has not been required at well TJA-5. However, in anticipation of a new sampling protocol for the TAG AOC, the well was sampled in June 2018. The NPN concentration was 21.7 mg/L. A trend line is not depicted on Figure 6D-6 because of the approximately 11-year data gap. The September 2001 NPN concentration was 9.7 mg/L. Water levels have been measured quarterly since the well was installed. For the last five years, the water level consistently declined at approximately 0.28 ft/yr.

Monitoring well (TJA-4) had the greatest NPN concentration (31.6 mg/L) of all the TAG AOC wells in CY 2018. This well is located at the southeast corner of the TAG AOC and is screened in the merging zone above the Regional Aquifer. Figure 6D-4 shows that the general trend of NPN concentrations is relatively stable or slightly increasing since 2013. Monitoring well TJA-4 has historically been categorized as a Regional Aquifer well because its water level continues to increase in a manner similar to other monitoring wells that are clearly screened in the Regional Aquifer. Monitoring well TJA-4 is screened in a merging (intermediate) zone between the two water-bearing units and its potentiometric surface cannot be reasonably contoured with the potentiometric surfaces for either the Perched Groundwater System or the Regional Aquifer. Saturation of this merging zone is most likely related to groundwater recharge from the nearby Tijeras Arroyo Golf Course that is located approximately 0.6 miles to the southeast. It is likely that elevated nitrate in this well reflects contribution from sources outside the TAG AOC.

Table 6C-4 presents the analytical results for anions and alkalinity; no anion concentrations exceeded the established MCLs.

Table 6C-5 presents the analytical results for the 23 Target Analyte List metals and uranium. No analytes exceeded the established MCLs.

Table 6C-6 presents the analytical results for tritium, gross alpha, gross beta, and gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40). The gross alpha activity was measured as a radiological screening tool in accordance with 40 Code of Federal Regulations Part 141. Naturally occurring uranium was measured independently. The total uranium concentration was measured in conjunction with the metals analysis described above. The gross alpha activity measurements were corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. Radiological results were reviewed by an SNL Health Physicist to verify that the samples were nonradioactive prior to shipment to the analytical laboratories. All reported radionuclide activities were below MCLs, where established.

Table 6C-7 presents the field parameter measurements obtained during purging and immediately before collecting a groundwater sample at each well. The parameters were temperature, specific conductivity, oxidation-reduction potential, pH, turbidity, and dissolved oxygen. The parameters are measured for determining that stabilization has occurred, and representative water samples are collected.

6.7 Quality Control Results

Section 1.3 (Chapter 1) describes the field and laboratory QC sampling and analyses protocols. Tables 6C-1 through 6C-6 (Attachment 6C) provide analytical data and corresponding validation qualifiers. The results of QC samples and the influence on data quality for the TAG sampling events are discussed below. Four types of QC samples were evaluated: environmental duplicates, EB samples, FB samples, and TB samples.

For CY 2018, the results for the environmental duplicate samples for each sampling event (Table 6-6) showed good correlation as based on the Relative Percent Difference (RPD) values. RPDs are unit-less values calculated for those constituents with detections exceeding the MDL in both environmental and environmental duplicate samples per well.

The calculated RPD values for the NPN sample pairs (environmental versus environmental duplicate samples) ranged from <1 to 10; thus, are much less than the RPD goal of 35. The calculated RPD values for the TCE sample pairs ranged from 2 to 12; thus, are less than the RPD goal of 20. RPD was calculated for constituents that were detected above the lab MDL in both samples.

The calculated RPD values for the environmental duplicate analyses per quarter are as follows:

- **February/March 2018 Sampling Event**—Environmental duplicate samples were collected from monitoring wells TA1-W-06 and TJA-6. The NPN RPD values were 3 and 8, respectively. The TCE RPD value for well TA1-W-06 was 12. TCE was not detected at well TJA-6.

- **June 2018 Sampling Event**—Environmental duplicate samples were collected from three monitoring wells (TA2-W-19, TJA-6, and TJA-7). The NPN RPD values were 1, 1, and 2, respectively. The TCE RPD values for wells TA2-W-19 and TJA-7 were 2 and 3, respectively. TCE was not detected at well TJA-6.

- **August/September 2018 Sampling Event**—Environmental duplicate samples were collected from four monitoring wells (TA1-W-01, TA1-W-05, TA2-NW1-595, and TA2-W-01). The NPN RPD values ranged from <1 to 3. VOCs were only detected at well TA2-W-01; the RPD values for tetrachloroethene and TCE were both 6.

- **November/December 2018 Sampling Event**—Environmental duplicate samples were collected from monitoring wells TJA-2 and TJA-3. The NPN RPD values were <1 and 10, respectively. VOCs were only detected at well TJA-2; the RPD values for 1,1-dichloroethane and TCE were 17 and 9, respectively.

The results for the EB analyses per quarter are as follows:

- **February/March 2018 Sampling Event**—EB samples were collected prior to sampling wells TA1-W-06 and TJA-6. Acetone was detected in the two EB samples; 2-butanone was detected in one of EB sample. No corrective action was necessary, since these compounds were not detected in associated environmental samples.

- **June 2018 Sampling Event**—EB samples were collected prior to sampling three monitoring wells (TA2-W-19, TJA-6, and TJA-7). Acetone and 2-butanone were detected in every sample. However, no corrective action was necessary because these compounds were not detected in the associated environmental samples.

- **August/September 2018 Sampling Event**—EB samples were collected prior to sampling four monitoring wells (TA1-W-01, TA1-W-05, TA2-NW1-595, and TA2-W-01). Chloroform, chloride, copper, and sulfate were detected above laboratory MDLs in several EB samples. No corrective action was required because these analytes were not detected in the environmental samples or the reported values in environmental samples are greater than five times the EB concentrations.

- **November/December 2018 Sampling Event**—EB samples were collected prior to the sampling of monitoring wells TJA-2 and TJA-3. Acetone was detected in the EB sample associated with well TJA-3. Acetone was qualified as not detected for the environmental sample during data validation because the VOC was reported at a concentration less than the EB result.

The results for the FB analyses per quarter are as follows:

- **February/March 2018 Sampling Event**—FB samples for VOC analysis were collected at monitoring wells TA2-W-01 and TJA-3 by pouring deionized (DI) water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. An additional FB sample was collected from the source-DI water used during the equipment decontamination process prior to sampling well TA1-W-06. Acetone was detected in two samples, but no corrective action was required because acetone was not detected in the associated environmental or EB samples.

- **June 2018 Sampling Event**—FB samples were collected at monitoring wells TJA-2 and TJA-4 by pouring DI water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. Acetone was detected in both FB samples, but no corrective action was required since acetone was not detected in the associated environmental samples.

- **August/September 2018 Sampling Event**—FB samples were collected at three monitoring wells (TA1-W-04, TA2-NW1-595, and TJA-7) by pouring DI water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. The compounds detected in FB samples included bromoform, bromodichloromethane, chloroform, and dibromochloromethane. No corrective action was necessary because these compounds were not detected in the associated environmental samples.

- **November/December 2018 Sampling Event**—FB samples were collected at monitoring wells TA2-W-26 and TJA-4 by pouring DI water into sample containers at the sampling point to simulate the transfer of environmental samples from the sampling system to the sample container. Acetone was detected in one FB sample. Acetone for well TA2-W-26 was qualified as not detected during data validation because the VOC was reported in the environmental sample at a concentration less than 10 times greater than the FB result.

The results for the TB analyses per quarter are as follows:

- **February/March 2018 Sampling Event**—A total of 14 TB samples were submitted. No VOCs were detected above laboratory MDLs in any of the TB samples, except for acetone being detected in three TB samples. Acetone in the well TA2-W-19 environmental sample was qualified as not detected during data validation since acetone was reported in the corresponding TB sample at a higher concentration.

- **June 2018 Sampling Event**—No VOCs were detected above laboratory MDLs in any of the 12 TB samples, except for methylene chloride in two TB samples. No corrective action was required because methylene chloride was not detected in the associated environmental samples.

- **August/September 2018 Sampling Event**—No VOCs were detected above laboratory MDLs in any of the 25 TB samples, except for carbon disulfide and methylene chloride. Carbon disulfide was reported in one TB sample and methylene chloride was reported in three TB samples. No corrective action was necessary for carbon disulfide because this compound was not detected in the associated environmental sample. Methylene chloride was reported in the three TB samples at similar concentrations to associated environmental samples. The associated environmental sample results were qualified as not detected during data validation because methylene chloride was reported at less than 10 times the TB sample concentrations.

- **November/December 2018 Sampling Event**—No VOCs were detected above laboratory MDLs in any of the nine TB samples.

6.8 Variances and Nonconformances

Variances (nonconformances) from field or sampling requirements as specified in the four TAG Investigation Mini-Sampling and Analysis Plans (SAP; SNL January 2018, May 2018, July 2018, and October 2018) are noted as follows:

- **All Quarterly Events in 2018**—Monitoring well WYO-4 was not sampled because the water column in the well was not sufficient. Previous sampling events had shown that a water column of less than 5 ft did not produce enough water for filling any sample containers. This criterion was established in late 2015 using the lowest possible flow rate for the portable Bennett pump system with the pump intake set at 0.5 ft above the lowest screen slot. However, it should be noted that the dry out (purged dry) issue at well WYO-4 was anticipated for CY 2018 and is therefore not considered a variance. The two previous Annual Groundwater Monitoring Reports (SNL June 2017, SNL June 2018) noted that the well was not sampled in 2016 and 2017 because of the dry-out issue.

- **February/March 2018 Sampling Event**— VOC results in monitoring well TJA-6 were qualified as unusable during data validation; therefore, TJA-6 was re-sampled in the third quarter.

- **June 2018 Sampling Event**—No variances with the TAG Mini-SAP were identified. Monitoring well TJA-5 was voluntarily sampled by SNL/NM.

- **August/September 2018 Sampling Event**—No variances from the TAG Mini-SAPs were identified. However, wells TA1-W-03 and PGS-2 were not sampled. Both issues were previously documented. Well TA1-W-03 is screened in the Perched Groundwater System and has not contained a sufficient volume of water since August 2017 (SNL June 2018). The second issue involved Regional Aquifer monitoring well PGS-2. Grout intrusion precludes the collection of representative groundwater samples (SNL June 2018). However, the well continues to be useful for measuring water levels. Monitoring wells TA2-W-24 and TA2-W-25 were voluntarily sampled by SNL/NM.

- **November/December 2018 Sampling Event**—No variances or nonconformances with the TAG Mini-SAP were identified.

6.9 Summary and Conclusions

This section provides a brief summary of activities, contaminants, the CSM, and CY 2018 plans for the TAG AOC.

The TAG AOC encompasses an area of approximately 1.82 sq mi in the north-central portion of KAFB. Groundwater investigations were initiated in 1992 and the current groundwater network consists of 21 monitoring wells for water quality analysis and 30 monitoring wells for groundwater level measurements. For this reporting period, monitoring wells were sampled in February/March 2018, June 2018, August/September 2018, and November/December 2018. The groundwater samples for each event were analyzed for VOCs and NPN. Additional analytes (anions, alkalinity, Target Analyte List metals [plus total uranium,] gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy) were analyzed for the August/September event. Analytical results were compared with EPA MCLs for drinking water (EPA May 2009).

In CY 2018, NPN was the only analyte that exceeded a MCL in TAG AOC groundwater samples. NPN concentrations exceeded the nitrate MCL of 10 mg/L in samples from five monitoring wells (TA2-W-19, TA2-W-28, TJA-2, TJA-5, and TJA-7) that are screened in the Perched Groundwater System and from one monitoring well (TJA-4) screened in the merging zone above the Regional Aquifer. The maximum NPN concentration in groundwater samples collected from the Perched Groundwater System was 23.4 mg/L. The maximum NPN concentration in the Regional Aquifer exclusive of the merging zone was 3.90 mg/L. In the merging zone above the Regional Aquifer, the maximum NPN concentration was 31.6 mg/L.

In CY 2018, no exceedances of the TCE MCL (5 µg/L) were detected in groundwater samples collected from the TAG AOC monitoring wells. The maximum TCE concentration for the Perched Groundwater System was 4.62 µg/L and corresponds to monitoring well TJA-2. The only detected TCE concentration for the Regional Aquifer was 0.910 (J-qualified) µg/L and corresponded to the sample from well TJA-3.

The following conclusions are based on a comprehensive review of available information for current and historical groundwater analyses for the TAG AOC:

- In the Perched Groundwater System, the distribution of NPN concentrations exceeding the nitrate MCL is restricted to the southeast corner of the TAG AOC and likely reflects multiple release sites from several organizations.

- In the Regional Aquifer, the distribution of NPN concentrations exceeding the nitrate MCL is restricted to the merging zone in the extreme southeast corner of the TAG AOC and is probably attributable to release sites that are located outside of the TAG AOC.

- In the Perched Groundwater System, TCE concentrations do not exceed the MCL in the TAG AOC.

- In the Regional Aquifer, TCE has historically not been detected above the MCL in the TAG AOC.

- The potential sources of nitrate and TCE are located both within and outside the TAG AOC. The potential sources include the former sewage lagoons, wastewater outfalls, buried septic systems, landfills, sewer lines, and the golf course. SNL/NM operations involving the release of septic and wastewater that could affect groundwater were eliminated in 1992.

- The CSM was updated using the Revised TAG CCM/CME Report (SNL February 2018).

- Nitrate concentrations in the Perched Groundwater System are expected to decrease to background concentrations and far below regulatory standards because of natural groundwater transport mechanisms such as advection, dispersion, and diffusion.

- The Perched Groundwater System is a thin, artificially created water-bearing unit that was mostly created by historic anthropogenic sources (septic and wastewater discharges). These types of recharge at SNL/NM were curtailed prior to 1993. The Perching Horizon dips to the southeast.

- Water levels continue to decline in the Perched Groundwater System as the system naturally dewaters. For evaluating the remedial alternatives in the Revised TAG CCM/CME Report (SNL February 2018), the decline rate was studied for a five-year period (October 2010 to October 2015). The average decline was 0.48 ft/yr across the TAG AOC. Some areas will dewater faster than others.

- Groundwater from the Perched Groundwater System is not pumped for any type of beneficial use within or near the TAG AOC.

- There is no foreseeable risk to human health involving water supply wells completed in the Regional Aquifer.

Ongoing environmental studies in the TAG AOC include the following:

- Groundwater sampling at up to 21 monitoring wells on a quarterly, semiannual, or annual basis. At a minimum, the analytes for groundwater sampling per well will consist of NPN and VOCs.

- Quarterly measurements of groundwater elevations in 30 monitoring wells.

- Maintaining contact with the KAFB ER Program personnel with respect to the results of their nitrate abatement studies.

- Obtaining groundwater results relevant to the TAG AOC from KAFB, U.S. Geological Survey, and the COA, as available.

- Reporting future results in the CY 2019 SNL/NM Annual Groundwater Monitoring Report.

- If required, prepare a Corrective Measures Implementation Plan upon receiving NMED HWB comments for the Revised TAG CCM/CME Report that was submitted in February 2018. Three remedial alternatives (monitored natural attenuation, in-situ bioremediation, and groundwater extraction and treatment) were proposed for addressing the elevated nitrate concentrations in the Perched Groundwater System (SNL February 2018).

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Attachment 6A
Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern

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Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern

Year	Event	Reference
1928	Land-use development on the East Mesa began in 1928 when the public Albuquerque Airport was built. Renamed Oxnard Field in 1929, the airport was used until late 1939 when the vicinity of Oxnard Field was purchased by the federal government for use as an Army Air Depot Training Station, later to be known as Sandia Base.	www.airfields-freeman.com 2016; CE2 Corporation September 2016
1939	In 1939, public airline service was moved approximately four miles to the west of Oxnard Field where the Albuquerque Municipal Airport was built. Using the municipal set of runways, the Albuquerque Army Air Base began operations in 1941.	www.econtent.unm.edu 2016, en.wikipedia.org 2016
1945	"Z Division" of the Manhattan Engineers District, an extension of the original Los Alamos Laboratory, was established at Sandia Base in the area that would become known as TA-I.	Furman April 1990
1946	After World War II, the old Oxnard Field runways and a new extensive grid of taxiways were used for parking military aircraft. Starting in 1946, the War Assets Administration managed the sale or the dismantlement and smelting of approximately 2,250 surplus military aircraft.	www.militarymediainc.com 2016
1947	Wastewater and septic-water discharges begin at TA-II. (All discharges to the ground surface or buried leach fields ended in 1992).	SNL November 2005
1948	Wastewater and possibly septic-water discharges associated with TA-I begin at SWMU 46. (All discharges to ground surface at the outfall ditches ceased in 1974).	SNL November 2005
1949	The independent Sandia Laboratory was established. Existing buildings in TA-I were remodeled. New buildings in TA-I and TA-II were constructed.	Furman 1990
1977	Construction of TA-IV accelerator facilities began in 1977. All buildings use modern wastewater and septic disposal systems. No discharges to the ground are allowed.	SNL November 2005
1984	DOE created CEARP to evaluate potential release sites at SNL/NM.	DOE September 1987
1988	The SNL/NM ER Project was created and begins conducting investigations using the CEARP list of sites.	SNL March 1995a
1992	ER Project starts to investigate groundwater at TA-II. The Perched Groundwater System was discovered with the installation of monitoring wells TA2-SW1-320, TA2-NW1-325, and TA2-NW1-595. The presence of the Regional Aquifer was previously known from base-wide studies.	SNL March 1995a
1993	Installed groundwater monitoring wells TA2-NW1-325 and TA2-NW1-595.	SNL March 1995a
1994	Installed groundwater monitoring wells TA2-W-01 and TJA-2.	SNL March 1995a
1994	First detection of TCE in a groundwater sample from a SNL/NM well near Tijeras Arroyo. The October 1994 sample from monitoring well TA2-W-01 contained TCE at 1 µg/L.	SNL March 1995b, GWPP annual
1995	Installed nested groundwater monitoring wells WYO-1 and WYO-2 in a single borehole. Installed groundwater monitoring wells PGS-2 and TA2-W-19.	SNL March 1996a
1995	First TCE exceedance of the U.S. Environmental Protection Agency MCL of 5 µg/L. The November 1995 groundwater sample from monitoring well TA2-W-19 contained TCE at 8.1 µg/L.	SNL March 1996b, GWPP annual
1995	Comprehensive study of the geologic and hydrogeologic setting for SNL/NM and KAFB area completed.	GRAM and Lettis December 1995
1996	Sandia North Groundwater Investigation Plan submitted to the NMED HWB.	SNL March 1996b

Refer to footnotes on page 6A-6.

Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern *(Continued)*

Year	Event	Reference
1996	Shallow (Perched Groundwater System) Water-Bearing Zone Hydrologic Evaluation report prepared for aquifer parameters.	Wolford September 1996
1996	Pressure transducer program conducted at four Perched Groundwater System monitoring wells (TA2-NW1-325, TA2-SW1-320, and TA2-W-01, and TA2-W-19), three Regional Aquifer monitoring wells (PGS-2, TA2-NW1-595), and one water supply well (KAFB-5).	SNL March 1998
1996	Installed soil vapor monitoring wells TA2-VW-20 and TA2-VW-21.	IT January 1997
1997	Sandia North Geological Investigation Project Report was submitted to NMED HWB.	Fritts and Van Hart March 1997
1997	Installed groundwater monitoring wells TA1-W-01 and TA2-W-25.	SNL March 1998
1997	Downhole geophysical surveying (electromagnetic induction, neutron, and natural gamma) was conducted on 21 SNL/NM and KAFB/USAF monitoring wells near Tijeras Arroyo.	SNL March 1998
1998	Installed groundwater monitoring wells TA1-W-02, TA1-W-03, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-07, TA2-W-24, TA2-W-26, TA2-W-27, TJA-3, TJA-4, and TJA-5.	SNL June 2000
1998	Revision of the 1995 comprehensive study of the geologic and hydrogeologic setting for SNL/NM and KAFB area was completed.	SNL February 1998
1999	Colloidal borescope investigation was performed on 18 Perched Groundwater System monitoring wells.	AquaVISION July 1999
1999	Structural interpretation was conducted using USGS aeromagnetic survey.	Van Hart et al. October 1999
2000	Project name at SNL/NM was changed from the “Sandia North Groundwater Investigation” to the “Tijeras Arroyo Groundwater” or TAG Investigation.	Collins December 2000
2000	At NMED direction, the TAG HPT held its first meeting in Albuquerque, New Mexico.	SNL June 2003
2001	Installed groundwater monitoring wells TA1-W-08, TJA-6, and TJA-7.	SNL November 2002
2001	Installed soil vapor monitoring wells 46-VW-01, 46-VW-02, and 227-VW-01.	SNL November 2002
2001	Geologic model of the Perched Groundwater System was updated.	Van Hart June 2001
2001	Geochemical modeling of the Perched Groundwater System was conducted.	Brady and Domski 2001
2001	Capture zone analysis conducted for water supply wells located outside the TAG investigation area.	SNL February 2001
2001	Pressure transducer study was conducted using 19 monitoring wells (11 wells are screened in Perched Groundwater System and 8 wells are screened in Regional Aquifer).	SNL August 2001
2001	Installed replacement groundwater monitoring wells WYO-3 and WYO-4. Plugged and abandoned wells WYO-1 and WYO-2.	SNL June 2003
2002	Completed the calibration of the three-dimensional groundwater flow modeling of the TAG vicinity using the numerical code FEMWATER.	BGW September 2002
2002	TAG Continuing Investigation Report was submitted to the NMED HWB.	SNL November 2002
2003	Updated the interpretation of the subsurface geology at KAFB, including the TAG area.	Van Hart June 2003
2003	TAG Investigation Work Plan submitted to the NMED HWB. The plan discussed the tasks that SNL/NM proposed to conduct.	SNL June 2003
2003	TAG Investigation Work Plan was approved by the NMED HWB.	NMED HWB September 2003
2003	Installed soil vapor wells 159-VW-01, 165-VW-01, 1004-VW-01, and 1052-VW-01.	SNL October 2003
2003	Final meeting of TAG HPT was held in October 2003. Twenty meetings were held during the three-year period (2000 to 2003).	Copland and Skelly October 2003

Refer to footnotes on page 6A-6.

Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern *(Continued)*

Year	Event	Reference
2004	Slug testing was conducted at five Perched Groundwater System monitoring wells and five Regional Aquifer monitoring wells.	Skelly et al. May 2004
2004	The Compliance Order on Consent identified the TAG investigation as an AOC and required the preparation of a CME report for the TAG AOC.	NMED HWB April 2004
2004	TAG CME Work Plan was submitted to the NMED HWB.	SNL July 2004
2004	Installed soil vapor monitoring wells TAG-SV-01, TAG-SV-02, TAG-SV-03, TAG-SV-04, and TAG-SV-05.	SNL November 2005
2004	Stable isotope ($\delta^{15}N$) analyses conducted for five Perched Groundwater System monitoring wells.	SNL November 2004
2004	TAG CME Work Plan was approved by the NMED HWB.	NMED HWB October 2004
2005	TAG CME Report was submitted to NMED HWB. Report includes contaminant transport modeling for groundwater.	SNL August 2005
2005	TAG Investigation Report (analogous to a CCM) was submitted to the NMED HWB.	SNL November 2005
2006	Plugged and abandoned soil vapor monitoring well TAG-SV-03.	Skelly November 2006
2008	NMED HWB issued a NOD on the TAG Investigation Report.	NMED HWB August 2008
2009	Response for the August 2008 NOD for the TAG Investigation Report submitted to NMED HWB.	SNL February 2009
2009	NMED HWB issued a second NOD concerning the TAG Investigation Report.	NMED HWB August 2009
2010	Response to the second NOD concerning the TAG Investigation Report submitted to NMED HWB.	SNL January 2010
2010	NMED HWB issued a Notice of Approval for the TAG Investigation Report.	NMED HWB February 2010
2012	Decommissioned soil vapor monitoring wells 159-VW-01, 165-VW-01, 1004-VW-01, and 1052-VW-01.	SNL March 2013
2012	Groundwater samples for dual isotopes analyses ($\delta^{15}N$ versus $\delta^{18}O$) were collected from five Regional Aquifer monitoring wells.	Madrid et al. June 2013
2014	Installed replacement groundwater monitoring well TA2-W-28. Plugged and abandoned nearby groundwater monitoring well TA2-SW1-320.	SNL April 2015
2015	Meeting was held between personnel from SNL/NM, DOE/NNSA, and NMED HWB for discussing the schedule (milestones) for report submittals concerning the TAG AOC, the TA-V Groundwater AOC, and the Burn Site Groundwater AOC.	DOE March 2016
2016	NMED HWB milestones letter requires that an "Updated CCM and CME Report" for the TAG AOC be submitted in December 2016.	NMED HWB April 2016
2016	A combined and updated TAG CCM/CME Report (dated December 2016) was submitted to NMED HWB. The transmittal letter was dated November 23, 2016.	DOE December 2016, DOE November 2016
2017	NMED issued a disapproval letter for the TAG CCM/CME Report. NMED requested submittal of a revised report before November 30, 2017.	NMED HWB May 2017
2017	Meeting held between SNL/NM, DOE/NNSA, and NMED HWB personnel to discuss the disapproval letter issues.	none

Refer to footnotes on page 6A-6.

Table 6A-1. Historical Timeline of the Tijeras Arroyo Groundwater Area of Concern *(Concluded)*

Year	Event	Reference
2017	Requested a time extension for submittal of the Revised TAG CCM/CME Report.	DOE September 2017
2017	NMED approved the time extension request. Submittal date for the Revised TAG CCM/CME Report was set for February 15, 2018.	NMED October 2017
2018	The Revised TAG CCM/CME Report was submitted to NMED HWB.	SNL February 2018
2018	Slug testing was conducted at replacement monitoring well TA2-W-28 to determine the hydraulic conductivity of the screened sediments.	Skelly, et al. August 2018
2018	Status and locations of KAFB water supply wells were evaluated. More accurate coordinates were determined using field inspections and ortho-rectified aerial photography.	Copland July 2018
2018	Continues to conduct groundwater monitoring across the TAG AOC.	This report

NOTES:

$\delta^{15}N$ = Delta 15 nitrogen.
$\delta^{18}O$ = Delta 18 oxygen.
µg/L = Microgram(s) per liter.
AOC = Area of Concern.
BGW = Balleau Groundwater Inc.
CCM = Current Conceptual Model.
CEARP = Comprehensive Environmental Assessment and Response Program.
CME = Corrective Measures Evaluation.
DOE = U.S. Department of Energy.
ER = Environmental Restoration.
FEMWATER = Finite Element Model of Water.
GRAM = GRAM, Inc.
GWPP = Groundwater Protection Program.
HPT = High Performing Team.
HWB = Hazardous Waste Bureau.
IT = IT Corporation.
KAFB = Kirtland Air Force Base.
Lettis = William Lettis & Associates, Inc.
MCL = Maximum Contaminant Level.
NMED = New Mexico Environment Department.
NNSA = National Nuclear Security Administration.
NOD = Notice of Disapproval.
PGS = Parade Ground South.
SNL = Sandia National Laboratories.
SNL/NM = Sandia National Laboratories, New Mexico.
SV = Soil vapor.
SWMU = Solid Waste Management Unit.
TA = Technical Area.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-SW = Technical Area-II (Southwest).
TA2-W = Technical Area-II (Well).
TAG = Tijeras Arroyo Groundwater.
TCE = Trichloroethene.
TJA = Tijeras Arroyo.
USGS = U.S. Geological Survey.
VW = Vapor Well.
WYO = Wyoming.

Attachment 6B
Tijeras Arroyo Groundwater Hydrographs

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Attachment 6B Hydrographs

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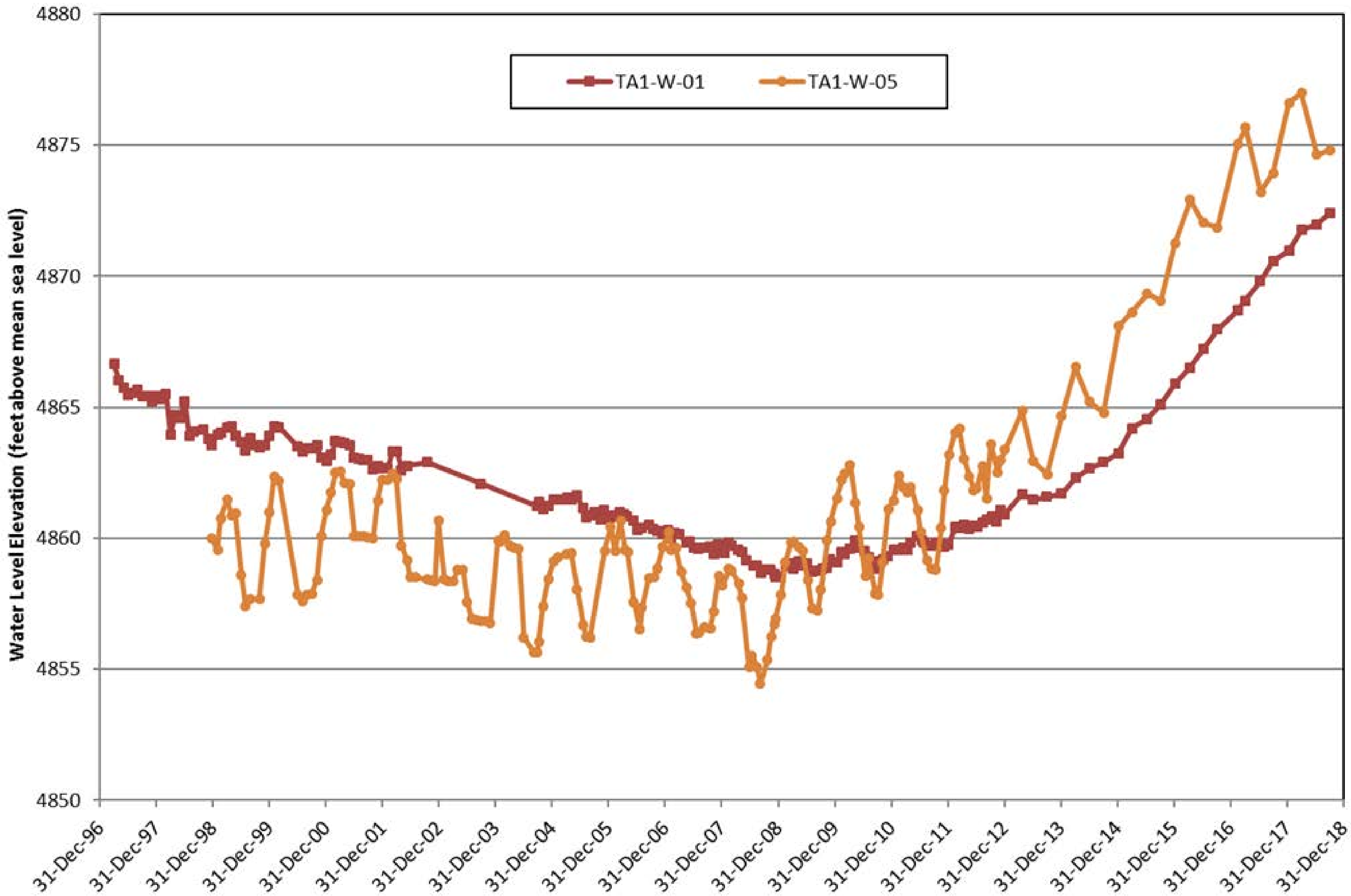

Figure 6B-1. TAG AOC Monitoring Wells (1 of 10)

Figure 6B-2. TAG AOC Monitoring Wells (2 of 10)

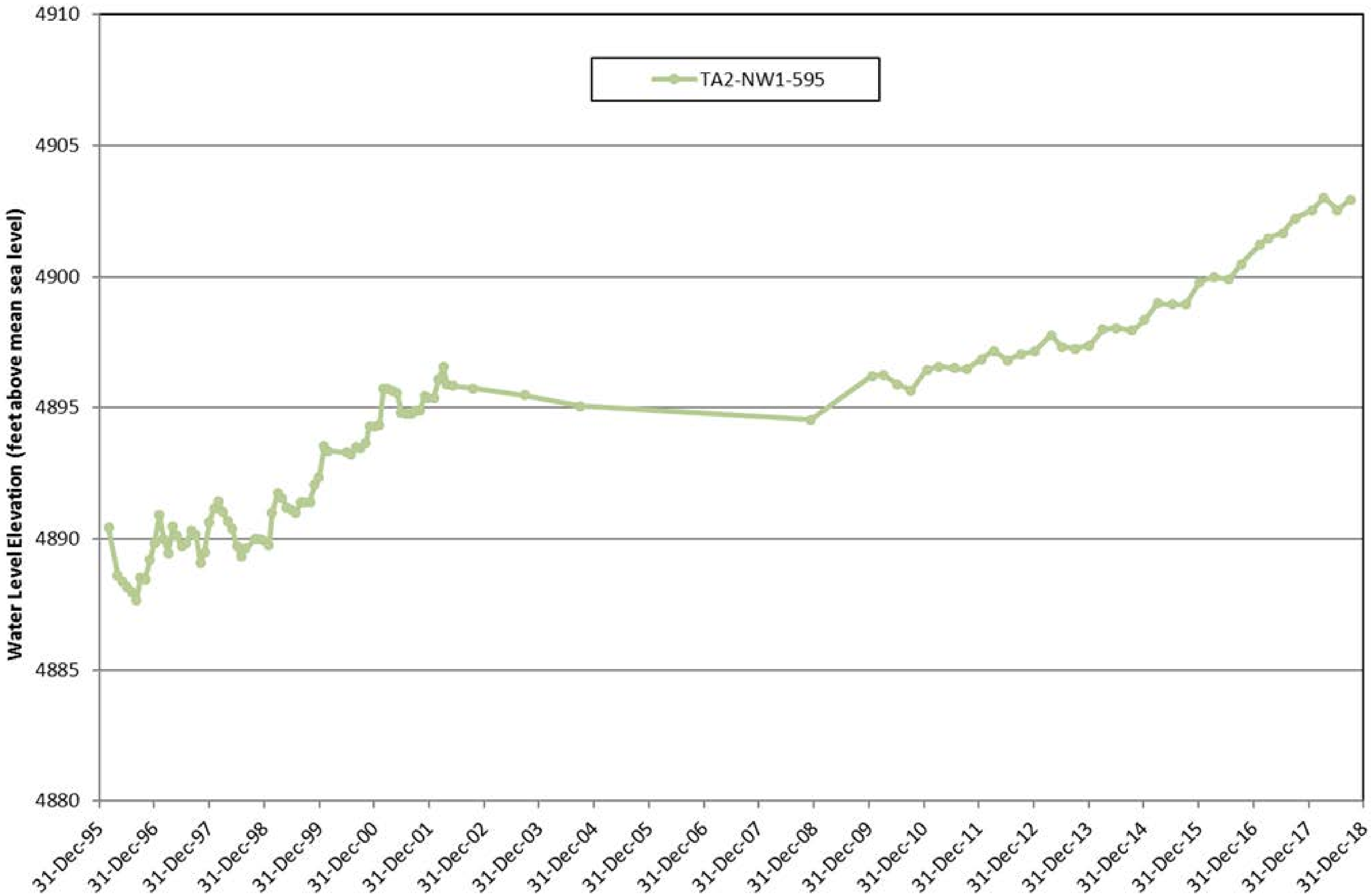

Figure 6B-3. TAG AOC Monitoring Wells (3 of 10)

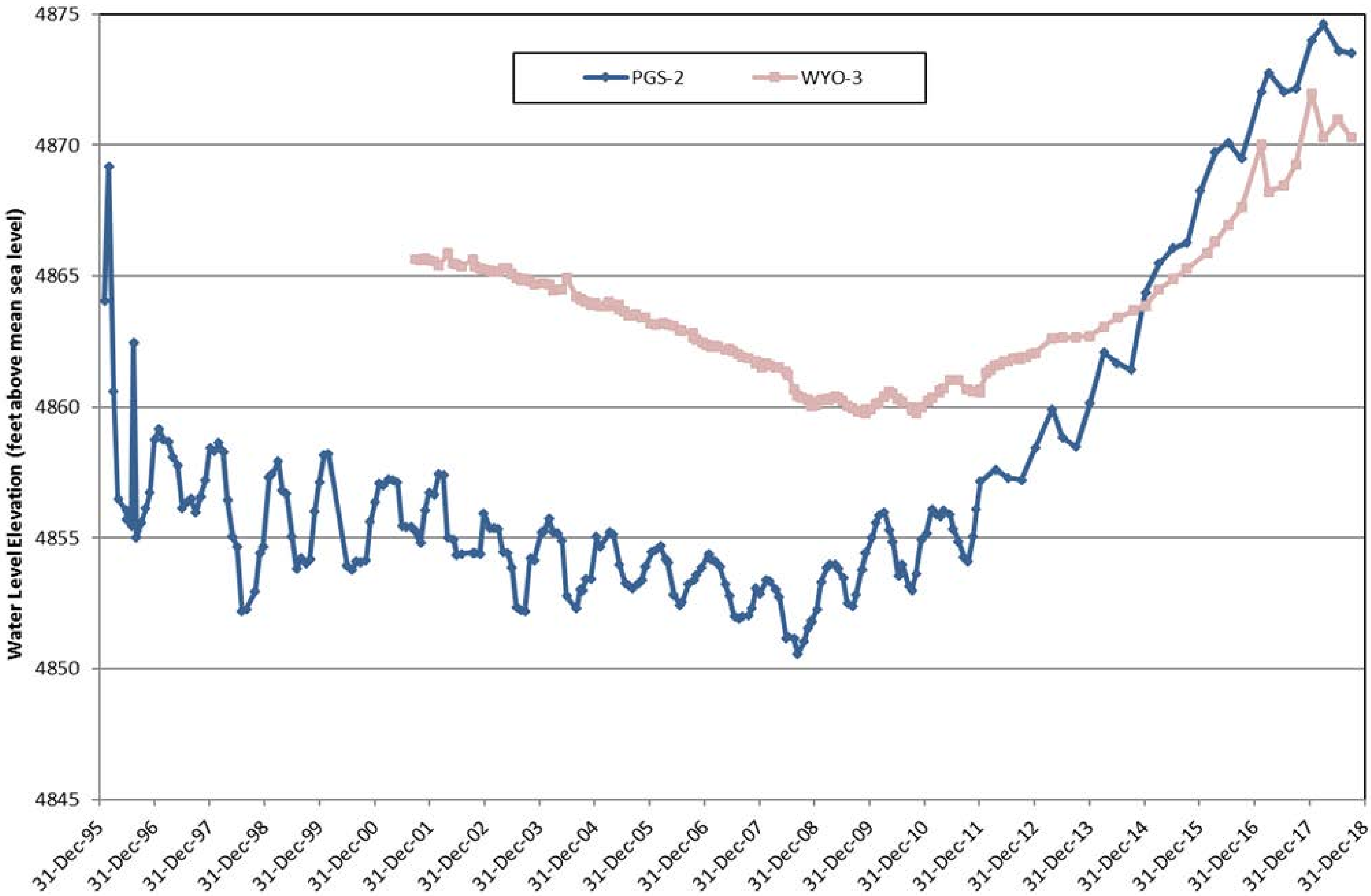

Figure 6B-4. TAG AOC Monitoring Wells (4 of 10)

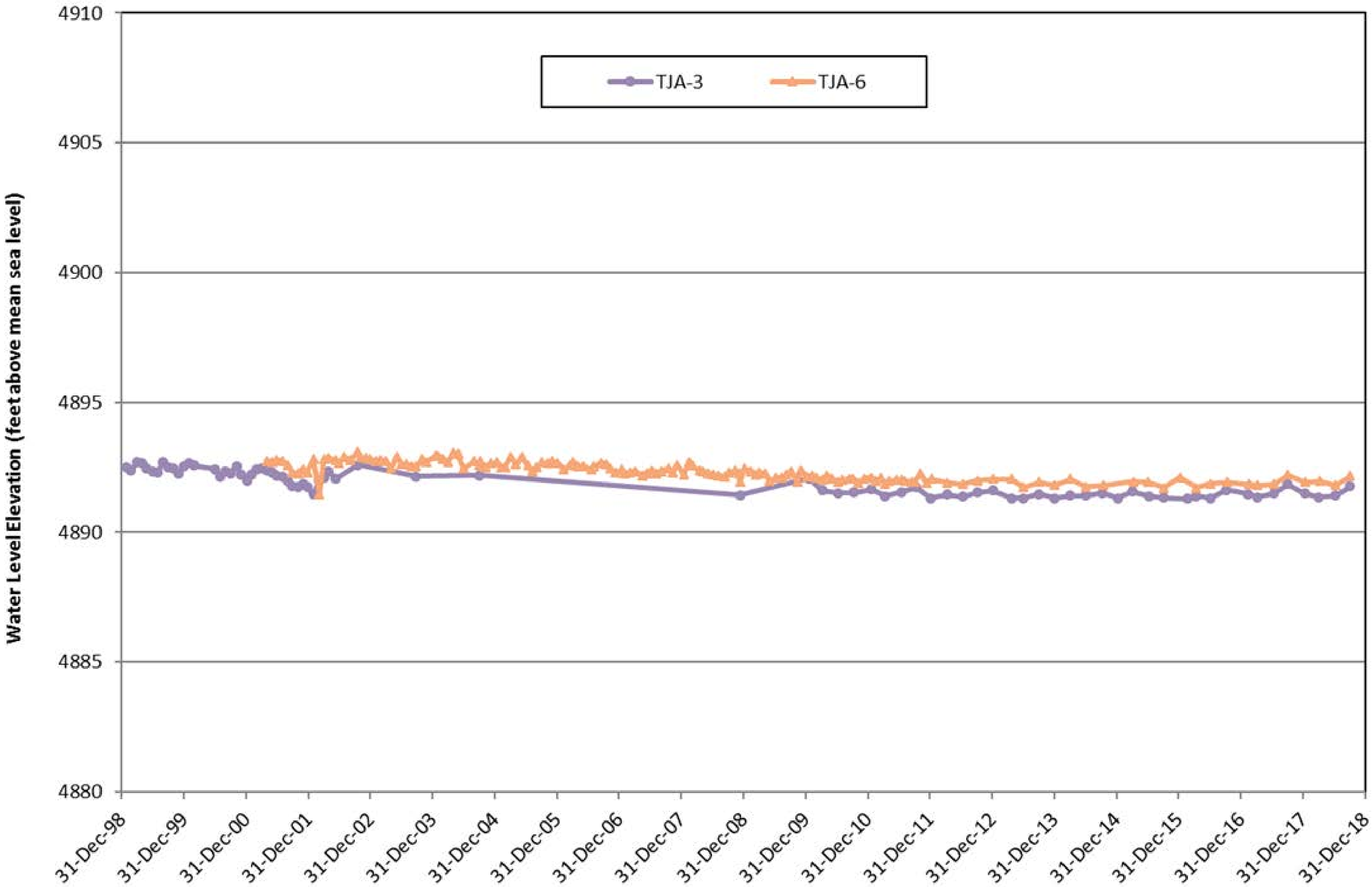

Figure 6B-5. TAG AOC Monitoring Wells (5 of 10)

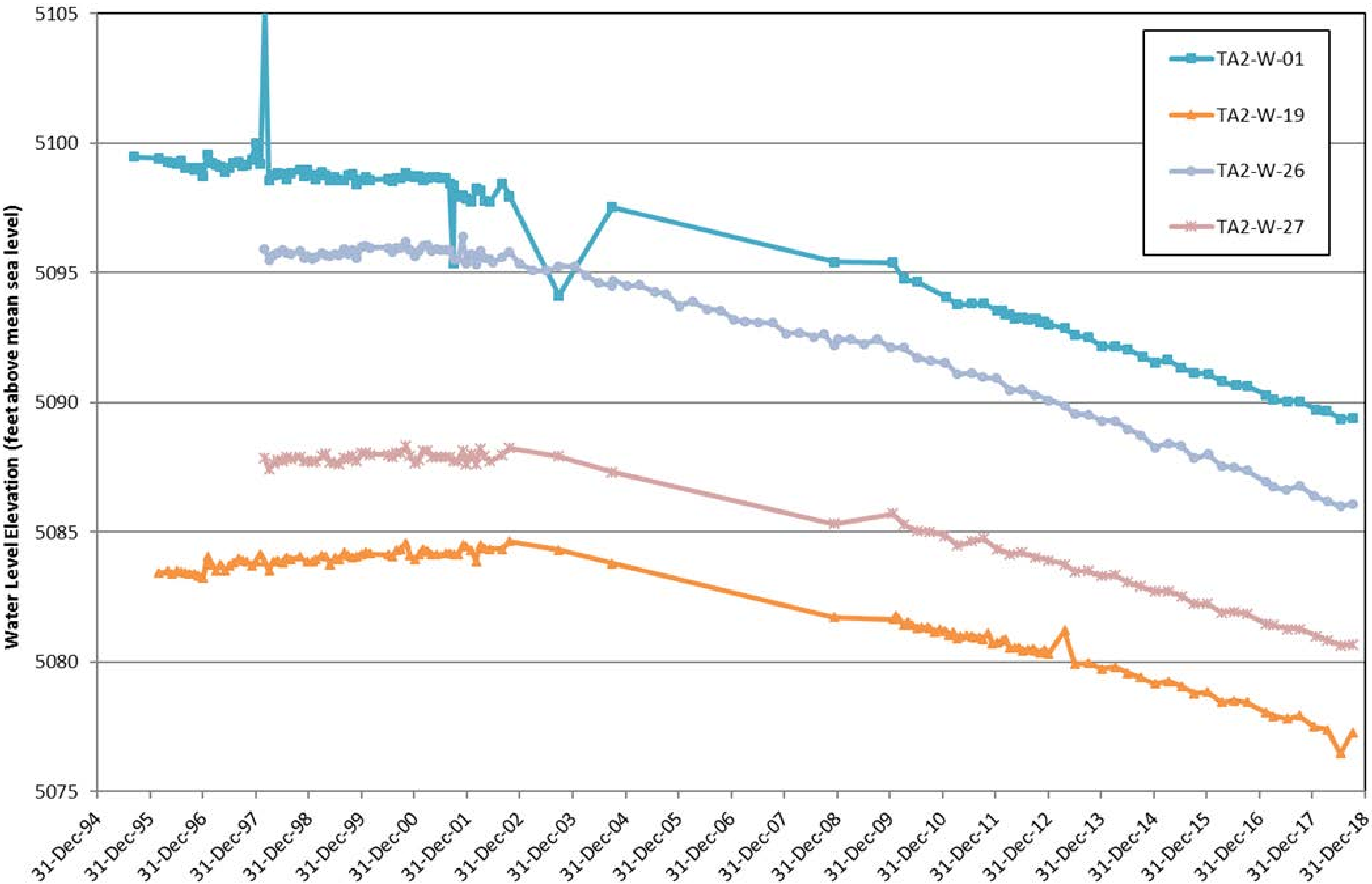

Figure 6B-6. TAG AOC Monitoring Wells (6 of 10)

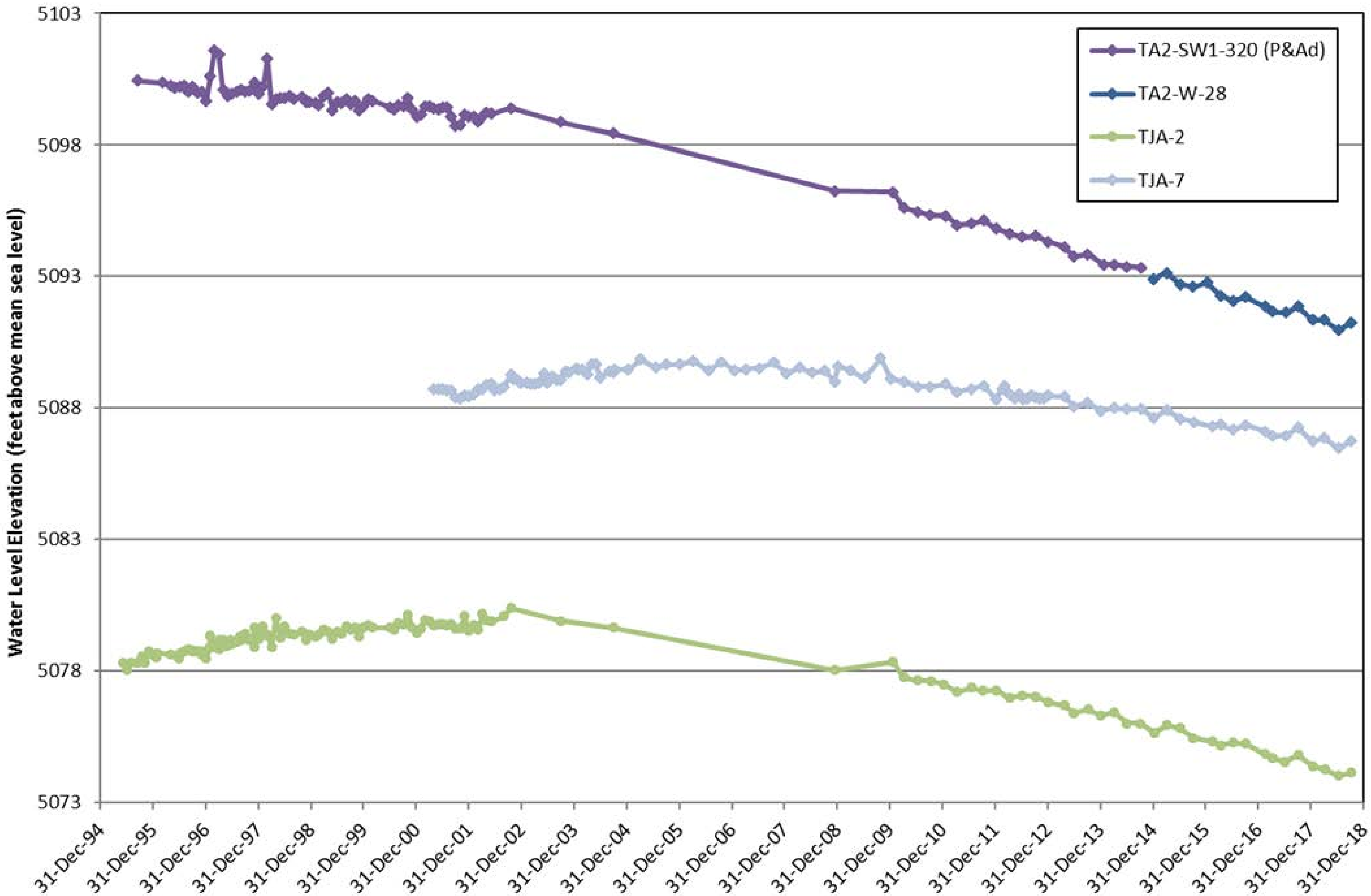

Figure 6B-7. TAG AOC Monitoring Wells (7 of 10)

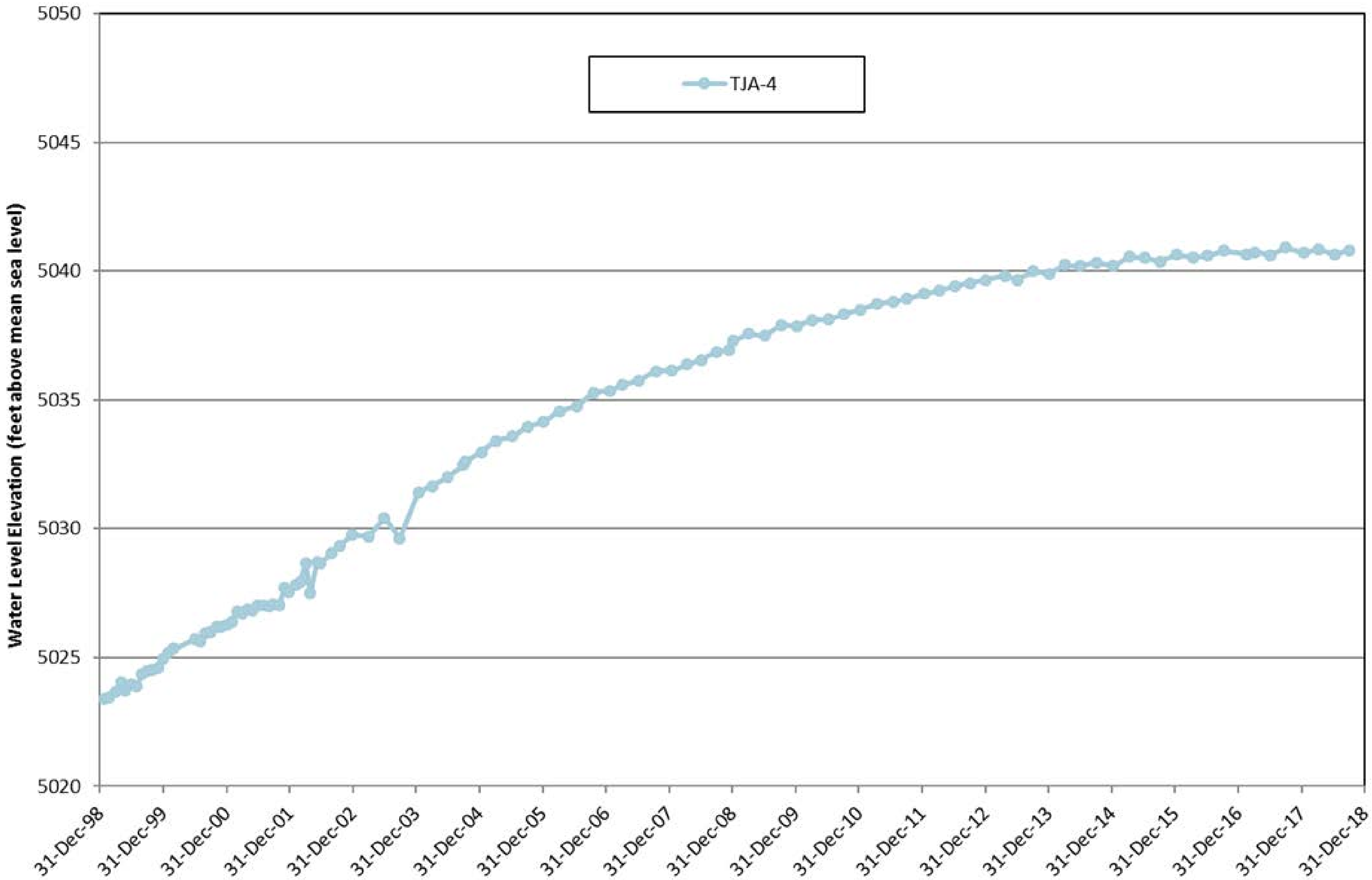

Figure 6B-8. TAG AOC Monitoring Wells (8 of 10)

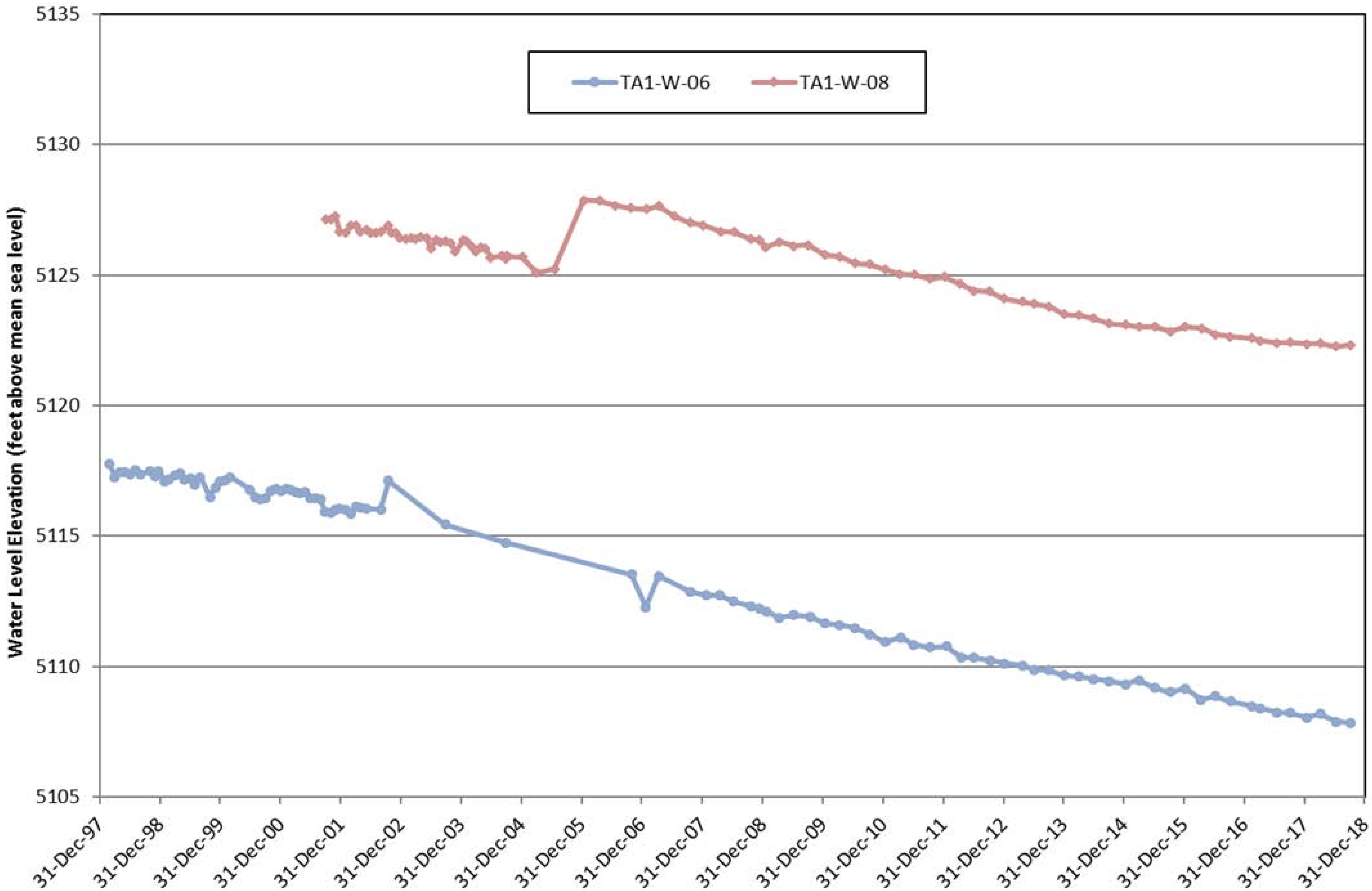

Figure 6B-9. TAG AOC Monitoring Wells (9 of 10)

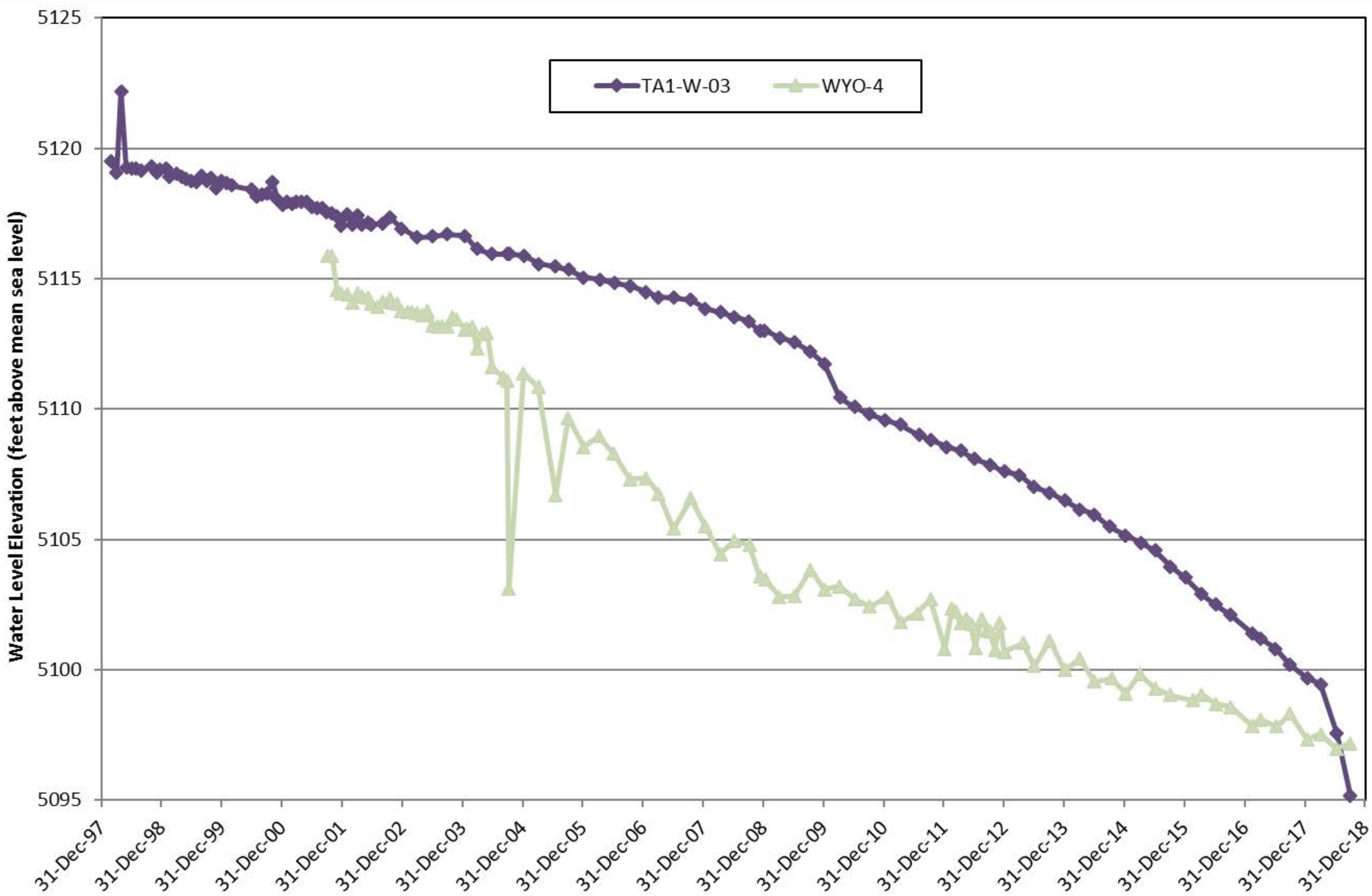

Figure 6B-10. TAG AOC Monitoring Wells (10 of 10)

Attachment 6C
Tijeras Arroyo Groundwater
Analytical Results Tables

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Attachment 6C Tables

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Table 6C-1
Summary of Detected Volatile Organic Compounds,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-06	Chloroform	0.320	0.300	1.00	NE	J		104625-001	SW846-8260
22-Feb-18	Trichloroethene	0.350	0.300	1.00	5.00	J		104625-001	SW846-8260
TA1-W-06 (Duplicate)	1,1-Dichloroethene	0.820	0.300	1.00	7.00	J		104626-001	SW846-8260
22-Feb-18	Trichloroethene	0.310	0.300	1.00	5.00	J		104626-001	SW846-8260
TA2-W-01	Tetrachloroethene	0.340	0.300	1.00	5.00	J		104629-001	SW846-8260
23-Feb-18	Trichloroethene	1.21	0.300	1.00	5.00			104629-001	SW846-8260
TA2-W-19	Acetone	ND	1.50	10.0	NE	J	10U	104638-001	SW846-8260
01-Mar-18	Tetrachloroethene	0.320	0.300	1.00	5.00	J		104638-001	SW846-8260
	Trichloroethene	2.23	0.300	1.00	5.00			104638-001	SW846-8260
TA2-W-26	Acetone	3.48	1.50	10.0	NE	J	J-	104636-001	SW846-8260
28-Feb-18	Tetrachloroethene	0.630	0.300	1.00	5.00	J		104636-001	SW846-8260
	Trichloroethene	0.830	0.300	1.00	5.00	J		104636-001	SW846-8260
	cis-1,2-Dichloroethene	0.320	0.300	1.00	70.0	J		104636-001	SW846-8260
TA2-W-27	Tetrachloroethene	1.36	0.300	1.00	5.00			104631-001	SW846-8260
26-Feb-18	Trichloroethene	1.13	0.300	1.00	5.00			104631-001	SW846-8260
TJA-2	Acetone	2.53	1.50	10.0	NE	J		104640-001	SW846-8260
02-Mar-18	Trichloroethene	4.62	0.300	1.00	5.00			104640-001	SW846-8260
	cis-1,2-Dichloroethene	0.560	0.300	1.00	70.0	J		104640-001	SW846-8260
TJA-7 06-Mar-18	Trichloroethene	2.30	0.300	1.00	5.00	H		104644-R01	SW846-8260
TA2-W-19 21-Jun-18	Trichloroethene	2.06	0.300	1.00	5.00			105542-001	SW846-8260
TA2-W-19 (Duplicate) 21-Jun-18	Trichloroethene	2.11	0.300	1.00	5.00			105543-001	SW846-8260
TA2-W-26	1,2,3-Trichlorobenzene	ND	0.300	1.00	NE	B, J	1.0U	105538-001	SW846-8260
20-Jun-18	1,2,4-Trichlorobenzene	0.300	0.300	1.00	70.0	J		105538-001	SW846-8260
	Tetrachloroethene	0.990	0.300	1.00	5.00	J		105538-001	SW846-8260
	Trichloroethene	1.13	0.300	1.00	5.00			105538-001	SW846-8260
	cis-1,2-Dichloroethene	0.420	0.300	1.00	70.0	J		105538-001	SW846-8260
TJA-2	1,1-Dichloroethane	0.380	0.300	1.00	NE	J		105546-001	SW846-8260
22-Jun-18	Trichloroethene	3.56	0.300	1.00	5.00			105546-001	SW846-8260
	cis-1,2-Dichloroethene	0.350	0.300	1.00	70.0	J		105546-001	SW846-8260
TJA-7 26-Jun-18	Trichloroethene	2.25	0.300	1.00	5.00			105552-001	SW846-8260
TJA-7 (Duplicate) 26-Jun-18	Trichloroethene	2.19	0.300	1.00	5.00			105553-001	SW846-8260

Refer to footnotes on page 6C-44.

Table 6C-1 *(Continued)*
Summary of Detected Volatile Organic Compounds, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-06	1,1-Dichloroethene	0.830	0.300	1.00	7.00	J		105951-001	SW846-8260
21-Aug-18	Methylene chloride	ND	1.00	10.0	5.00	J	10U	105951-001	SW846-8260
	Trichloroethene	0.320	0.300	1.00	5.00	J		105951-001	SW846-8260
TA2-W-01	Tetrachloroethene	0.300	0.300	1.00	5.00	J		105955-001	SW846-8260
22-Aug-18	Trichloroethene	1.12	0.300	1.00	5.00			105955-001	SW846-8260
TA2-W-01 (Duplicate)	Tetrachloroethene	0.320	0.300	1.00	5.00	J		105956-001	SW846-8260
22-Aug-18	Trichloroethene	1.06	0.300	1.00	5.00			105956-001	SW846-8260
TA2-W-19	Methylene chloride	ND	1.00	10.0	5.00	B, J	10U	105958-001	SW846-8260
04-Sep-18	Trichloroethene	1.43	0.300	1.00	5.00			105958-001	SW846-8260
TA2-W-24 27-Aug-18	Methylene chloride	ND	1.00	10.0	5.00	B, J	10U	105960-001	SW846-8260
TA2-W-25 28-Aug-18	Methylene chloride	ND	1.00	10.0	5.00	B, J	10U	105962-001	SW846-8260
TA2-W-26	Chloroform	0.300	0.300	1.00	NE	J		105964-001	SW846-8260
29-Aug-18	Methylene chloride	2.10	1.00	10.0	5.00	J		105964-001	SW846-8260
	Tetrachloroethene	0.960	0.300	1.00	5.00	J		105964-001	SW846-8260
	Trichloroethene	1.29	0.300	1.00	5.00			105964-001	SW846-8260
	cis 1,2-Dichloroethene	0.500	0.300	1.00	70.0	J		105964-001	SW846-8260
TA2-W-27	Tetrachloroethene	1.26	0.300	1.00	5.00			105966-001	SW846-8260
23-Aug-18	Trichloroethene	1.05	0.300	1.00	5.00			105966-001	SW846-8260
TA2-W-28 04-Sep-18	Methylene chloride	ND	1.00	10.0	5.00	B, J	10U	105968-001	SW846-8260
TJA-2	1,1-Dichloroethane	0.400	0.300	1.00	NE	J		105970-001	SW846-8260
05-Sep-18	Methylene chloride	ND	1.00	10.0	5.00	B, J	10U	105970-001	SW846-8260
	Trichloroethene	3.43	0.300	1.00	5.00			105970-001	SW846-8260
	cis 1,2-Dichloroethene	0.400	0.300	1.00	70.0	J		105970-001	SW846-8260
TJA-3	Methylene chloride	ND	1.00	10.0	5.00	B, J	10U	105972-001	SW846-8260
24-Aug-18	Trichloroethene	0.910	0.300	1.00	5.00	J		105972-001	SW846-8260
TJA-6	1,2,3-Trichlorobenzene	ND	0.300	1.00	NE	B, J	1.0U	105949-001	SW846-8260
27-Sep-18	1,2,4-Trichlorobenzene	ND	0.300	1.00	70.0	B, J	1.0U	105949-001	SW846-8260
TJA-7	Methylene chloride	ND	1.00	10.0	5.00	B, J	10U	105976-001	SW846-8260
05-Sep-18	Trichloroethene	2.21	0.300	1.00	5.00			105976-001	SW846-8260

Refer to footnotes on page 6C-44.

Table 6C-1 *(Concluded)*
Summary of Detected Volatile Organic Compounds,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-19 30-Nov-18	Acetone	2.58	1.50	10.0	NE	J		106760-001	SW846-8260
	Trichloroethene	1.32	0.300	1.00	5.00			106760-001	SW846-8260
TA2-W-26 26-Nov-18	Acetone	ND	1.50	10.0	NE	J	10UJ	106758-001	SW846-8260
	Tetrachloroethene	0.700	0.300	1.00	5.00	J		106758-001	SW846-8260
	Trichloroethene	1.05	0.300	1.00	5.00			106758-001	SW846-8260
	cis-1,2-Dichloroethene	0.390	0.300	1.00	70.0	J		106758-001	SW846-8260
TJA-2 10-Dec-18	1,1-Dichloroethane	0.380	0.300	1.00	NE	J		106764-001	SW846-8260
	Trichloroethene	4.10	0.300	1.00	5.00			106764-001	SW846-8260
TJA-2 (Duplicate) 10-Dec-18	1,1-Dichloroethane	0.320	0.300	1.00	NE	J		106765-001	SW846-8260
	Trichloroethene	3.73	0.300	1.00	5.00			106765-001	SW846-8260
	cis-1,2-Dichloroethene	0.310	0.300	1.00	70.0	J		106765-001	SW846-8260
TJA-3 (Duplicate) 28-Nov-18	Acetone	ND	1.50	10.0	NE	J	10U	106755-001	SW846-8260
TJA-7 12-Dec-18	Trichloroethene	2.40	0.300	1.00	5.00			106769-001	SW846-8260

Refer to footnotes on page 6C-44.

Table 6C-2
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] 8260)
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Analyte	MDL[b] (µg/L)	Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300	Chlorobenzene	0.300
1,1,2,2-Tetrachloroethane	0.300	Chloroethane	0.300
1,1,2-Trichloroethane	0.300	Chloroform	0.300
1,1-Dichloroethane	0.300	Chloromethane	0.300
1,1-Dichloroethene	0.300	Cyclohexane	0.300
1,2,3-Trichlorobenzene	0.300	Dibromochloromethane	0.300
1,2,4-Trichlorobenzene	0.300	Dichlorodifluoromethane	0.300
1,2-Dibromo-3-chloropropane	0.500	Ethylbenzene	0.300
1,2-Dibromoethane	0.300	Isopropylbenzene	0.300
1,2-Dichlorobenzene	0.300	Methyl acetate	1.50
1,2-Dichloroethane	0.300	Methylcyclohexane	0.300
1,2-Dichloropropane	0.300	Methylene chloride	1.00
1,3-Dichlorobenzene	0.300	Styrene	0.300
1,4-Dichlorobenzene	0.300	Tert-butyl methyl ether	0.300
2,2-trifluoroethane, 1,1,2-Trichloro-1	2.00	Tetrachloroethene	0.300
2-Butanone	1.50	Toluene	0.300
2-Hexanone	1.50	Trichloroethene	0.300
4-methyl-, 2-Pentanone	1.50	Trichlorofluoromethane	0.300
Acetone	1.50	Vinyl chloride	0.300
Benzene	0.300	Xylene	0.300
Bromochloromethane	0.300	cis-1,2-Dichloroethene	0.300
Bromodichloromethane	0.300	cis-1,3-Dichloropropene	0.300
Bromoform	0.300	m-, p-Xylene	0.300
Bromomethane	0.300	o-Xylene	0.300
Carbon disulfide	1.50	trans-1,2-Dichloroethene	0.300
Carbon tetrachloride	0.300	trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 6C-44.

Table 6C-3
Summary of Nitrate plus Nitrite Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-06 22-Feb-18	Nitrate plus nitrite	3.43	0.170	0.500	10.0			104625-002	EPA 353.2
TA1-W-06 (Duplicate) 22-Feb-18	Nitrate plus nitrite	3.52	0.170	0.500	10.0			104626-002	EPA 353.2
TA2-W-01 23-Feb-18	Nitrate plus nitrite	4.29	0.170	0.500	10.0			104629-002	EPA 353.2
TA2-W-19 01-Mar-18	Nitrate plus nitrite	**11.0**	0.170	0.500	10.0			104638-002	EPA 353.2
TA2-W-26 28-Feb-18	Nitrate plus nitrite	5.99	0.170	0.500	10.0			104636-002	EPA 353.2
TA2-W-27 26-Feb-18	Nitrate plus nitrite	4.01	0.085	0.250	10.0			104631-002	EPA 353.2
TA2-W-28 05-Mar-18	Nitrate plus nitrite	**17.5**	0.425	1.25	10.0			104642-002	EPA 353.2
TJA-2 02-Mar-18	Nitrate plus nitrite	**11.5**	0.425	1.25	10.0			104640-002	EPA 353.2
TJA-3 27-Feb-18	Nitrate plus nitrite	2.71	0.085	0.250	10.0			104634-002	EPA 353.2
TJA-4 07-Mar-18	Nitrate plus nitrite	**31.6**	0.850	2.50	10.0			104646-002	EPA 353.2
TJA-6 21-Feb-18	Nitrate plus nitrite	2.37	0.085	0.250	10.0			104618-002	EPA 353.2
TJA-6 (Duplicate) 21-Feb-18	Nitrate plus nitrite	2.56	0.085	0.250	10.0			104619-002	EPA 353.2
TJA-7 06-Mar-18	Nitrate plus nitrite	**22.8**	0.425	1.25	10.0			104644-002	EPA 353.2

Refer to footnotes on page 6C-44.

Table 6C-3 *(Continued)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-19 21-Jun-18	Nitrate plus nitrite	**10.6**	0.170	0.500	10.0			105542-002	EPA 353.2
TA2-W-19 (Duplicate) 21-Jun-18	Nitrate plus nitrite	**10.5**	0.170	0.500	10.0			105543-002	EPA 353.2
TA2-W-26 20-Jun-18	Nitrate plus nitrite	5.76	0.170	0.500	10.0			105538-002	EPA 353.2
TA2-W-28 25-Jun-18	Nitrate plus nitrite	**16.4**	0.850	2.50	10.0			105548-002	EPA 353.2
TJA-2 22-Jun-18	Nitrate plus nitrite	**10.9**	0.425	1.25	10.0			105546-002	EPA 353.2
TJA-3 19-Jun-18	Nitrate plus nitrite	2.59	0.085	0.250	10.0			105536-002	EPA 353.2
TJA-4 28-Jun-18	Nitrate plus nitrite	**29.1**	0.850	2.50	10.0			105558-002	EPA 353.2
TJA-5 27-Jun-18	Nitrate plus nitrite	**21.7**	0.850	2.50	10.0			105555-002	EPA 353.2
TJA-6 18-Jun-18	Nitrate plus nitrite	2.41	0.085	0.250	10.0			105527-002	EPA 353.2
TJA-6 (Duplicate) 18-Jun-18	Nitrate plus nitrite	2.38	0.085	0.250	10.0			105528-002	EPA 353.2
TJA-7 26-Jun-18	Nitrate plus nitrite	**21.1**	0.850	2.50	10.0			105552-002	EPA 353.2
TJA-7 (Duplicate) 26-Jun-18	Nitrate plus nitrite	**21.6**	0.850	2.50	10.0			105553-002	EPA 353.2

Refer to footnotes on page 6C-44.

Table 6C-3 *(Continued)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-01 09-Aug-18	Nitrate plus nitrite	2.64	0.085	0.250	10.0			105927-002	EPA 353.2
TA1-W-01 (Duplicate) 09-Aug-18	Nitrate plus nitrite	2.63	0.085	0.250	10.0			105928-002	EPA 353.2
TA1-W-02 08-Aug-18	Nitrate plus nitrite	1.16	0.085	0.250	10.0			105923-002	EPA 353.2
TA1-W-04 10-Aug-18	Nitrate plus nitrite	1.91	0.085	0.250	10.0			105931-002	EPA 353.2
TA1-W-05 16-Aug-18	Nitrate plus nitrite	1.26	0.017	0.050	10.0			105935-002	EPA 353.2
TA1-W-05 (Duplicate) 16-Aug-18	Nitrate plus nitrite	1.26	0.017	0.050	10.0			105936-002	EPA 353.2
TA1-W-06 21-Aug-18	Nitrate plus nitrite	3.58	0.170	0.500	10.0			105951-002	EPA 353.2
TA1-W-08 15-Aug-18	Nitrate plus nitrite	8.15	0.425	1.25	10.0			105938-002	EPA 353.2
TA2-NW1-595 14-Aug-18	Nitrate plus nitrite	3.90	0.170	0.500	10.0			105943-002	EPA 353.2
TA2-NW1-595 (Duplicate) 14-Aug-18	Nitrate plus nitrite	3.92	0.170	0.500	10.0			105944-002	EPA 353.2
TA2-W-01 22-Aug-18	Nitrate plus nitrite	4.84	0.170	0.500	10.0			105955-002	EPA 353.2
TA2-W-01 (Duplicate) 22-Aug-18	Nitrate plus nitrite	4.71	0.170	0.500	10.0			105956-002	EPA 353.2
TA2-W-19 04-Sep-18	Nitrate plus nitrite	**11.2**	0.170	0.500	10.0			105958-002	EPA 353.2
TA2-W-24 27-Aug-18	Nitrate plus nitrite	2.24	0.085	0.250	10.0			105960-002	EPA 353.2
TA2-W-25 28-Sep-18	Nitrate plus nitrite	3.33	0.170	0.500	10.0			105962-002	EPA 353.2
TA2-W-26 29-Aug-18	Nitrate plus nitrite	5.85	0.170	0.500	10.0			105964-002	EPA 353.2

Refer to footnotes on page 6C-44.

Table 6C-3 *(Concluded)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-27 23-Aug-18	Nitrate plus nitrite	4.73	0.170	0.500	10.0			105966-002	EPA 353.2
TA2-W-28 04-Sep-18	Nitrate plus nitrite	**15.6**	0.850	2.50	10.0			105968-002	EPA 353.2
TJA-2 05-Sep-18	Nitrate plus nitrite	**11.0**	0.170	0.500	10.0			105970-002	EPA 353.2
TJA-3 24-Aug-18	Nitrate plus nitrite	2.68	0.085	0.250	10.0			105972-002	EPA 353.2
TJA-4 10-Sep-18	Nitrate plus nitrite	**30.7**	0.850	2.50	10.0			105974-002	EPA 353.2
TJA-6 27-Sep-18	Nitrate plus nitrite	2.57	0.085	0.250	10.0			105949-002	EPA 353.2
TJA-7 05-Sep-18	Nitrate plus nitrite	**23.4**	0.850	2.50	10.0			105976-002	EPA 353.2
WYO-3 17-Aug-18	Nitrate plus nitrite	2.14	0.085	0.250	10.0			105946-002	EPA 353.2
TA2-W-19 30-Nov-18	Nitrate plus nitrite	**12.8**	0.170	0.500	10.0			106760-002	EPA 353.2
TA2-W-26 26-Nov-18	Nitrate plus nitrite	6.53	0.170	0.500	10.0			106758-002	EPA 353.2
TA2-W-28 11-Dec-18	Nitrate plus nitrite	**17.1**	0.425	1.25	10.0			106767-002	EPA 353.2
TJA-2 10-Dec-18	Nitrate plus nitrite	**11.5**	0.425	1.25	10.0			106764-002	EPA 353.2
TJA-2 (Duplicate) 10-Dec-18	Nitrate plus nitrite	**11.5**	0.425	1.25	10.0			106765-002	EPA 353.2
TJA-3 28-Nov-18	Nitrate plus nitrite	2.50	0.085	0.250	10.0			106754-002	EPA 353.2
TJA-3 (Duplicate) 28-Nov-18	Nitrate plus nitrite	2.76	0.085	0.250	10.0			106755-002	EPA 353.2
TJA-4 13-Dec-18	Nitrate plus nitrite	**30.2**	0.850	2.50	10.0			106772-002	EPA 353.2
TJA-7 12-Dec-18	Nitrate plus nitrite	**22.9**	0.425	1.25	10.0			106769-002	EPA 353.2

Refer to footnotes on page 6C-44.

Table 6C-4
Summary of Anions and Alkalinity Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-5	Bromide	0.347	0.067	0.200	NE			105555-003	SW846 9056
27-Jun-18	Chloride	21.5	0.670	2.00	NE			105555-003	SW846 9056
	Fluoride	0.353	0.033	0.100	4.0			105555-003	SW846 9056
	Sulfate	91.9	1.33	4.00	NE			105555-003	SW846 9056
	Bicarbonate Alkalinity	121	1.45	4.00	NE			105555-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105555-004	SM 2320B
TA1-W-01	Bromide	0.194	0.067	0.200	NE	J		105927-003	SW846 9056
09-Aug-18	Chloride	13.3	0.335	1.00	NE			105927-003	SW846 9056
	Fluoride	0.422	0.033	0.100	4.0			105927-003	SW846 9056
	Sulfate	72.5	0.665	2.00	NE			105927-003	SW846 9056
	Bicarbonate Alkalinity	176	1.45	4.00	NE			105927-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105927-004	SM 2320B
TA1-W-02	Bromide	0.172	0.067	0.200	NE	J		105923-003	SW846 9056
08-Aug-18	Chloride	13.5	0.335	1.00	NE			105923-003	SW846 9056
	Fluoride	0.374	0.033	0.100	4.0			105923-003	SW846 9056
	Sulfate	71.4	0.665	2.00	NE			105923-003	SW846 9056
	Bicarbonate Alkalinity	166	1.45	4.00	NE			105923-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105923-004	SM 2320B
TA1-W-04	Bromide	0.171	0.067	0.200	NE	J		105931-003	SW846 9056
10-Aug-18	Chloride	13.3	0.335	1.00	NE	H		105931-003	SW846 9056
	Fluoride	0.507	0.033	0.100	4.0			105931-003	SW846 9056
	Sulfate	71.2	0.665	2.00	NE	H		105931-003	SW846 9056
	Bicarbonate Alkalinity	178	1.45	4.00	NE			105931-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105931-004	SM 2320B
TA1-W-05	Bromide	0.144	0.067	0.200	NE	J		105935-003	SW846 9056
16-Aug-18	Chloride	10.5	0.670	2.00	NE			105935-003	SW846 9056
	Fluoride	0.254	0.033	0.100	4.0			105935-003	SW846 9056
	Sulfate	95.8	1.33	4.00	NE			105935-003	SW846 9056
	Bicarbonate Alkalinity	214	1.45	4.00	NE			105935-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105935-004	SM 2320B
TA1-W-06	Bromide	1.28	0.067	0.200	NE			105951-003	SW846 9056
21-Aug-18	Chloride	105	1.34	4.00	NE			105951-003	SW846 9056
	Fluoride	0.285	0.033	0.100	4.0			105951-003	SW846 9056
	Sulfate	211	2.66	8.00	NE			105951-003	SW846 9056
	Bicarbonate Alkalinity	91.6	1.45	4.00	NE			105951-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105951-004	SM 2320B

Refer to footnotes on page 6C-44.

Table 6C-4 *(Continued)*
Summary of Anions and Alkalinity Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-08	Bromide	2.64	0.067	0.200	NE			105938-003	SW846 9056
15-Aug-18	Chloride	205	6.70	20.0	NE		J	105938-003	SW846 9056
	Fluoride	0.225	0.033	0.100	4.0			105938-003	SW846 9056
	Sulfate	686	13.3	40.0	NE		J	105938-003	SW846 9056
	Bicarbonate Alkalinity	84.2	1.45	4.00	NE			105938-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105938-004	SM 2320B
TA2-NW1-595	Bromide	1.14	0.067	0.200	NE			105943-003	SW846 9056
14-Aug-18	Chloride	81.2	1.34	4.00	NE			105943-003	SW846 9056
	Fluoride	0.332	0.033	0.100	4.0			105943-003	SW846 9056
	Sulfate	92.9	2.66	8.00	NE			105943-003	SW846 9056
	Bicarbonate Alkalinity	137	1.45	4.00	NE			105943-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105943-004	SM 2320B
TA2-W-01	Bromide	1.48	0.067	0.200	NE			105955-003	SW846 9056
22-Aug-18	Chloride	101	1.34	4.00	NE			105955-003	SW846 9056
	Fluoride	0.309	0.033	0.100	4.0			105955-003	SW846 9056
	Sulfate	62.6	2.66	8.00	NE			105955-003	SW846 9056
	Bicarbonate Alkalinity	102	1.45	4.00	NE			105955-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105955-004	SM 2320B
TA2-W-19	Bromide	0.705	0.067	0.200	NE			105958-003	SW846 9056
04-Sep-18	Chloride	51.7	0.670	2.00	NE			105958-003	SW846 9056
	Fluoride	0.364	0.033	0.100	4.0			105958-003	SW846 9056
	Sulfate	57.6	1.33	4.00	NE			105958-003	SW846 9056
	Bicarbonate Alkalinity	116	1.45	4.00	NE			105958-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105958-004	SM 2320B
TA2-W-24	Bromide	0.178	0.067	0.200	NE	J		105960-003	SW846 9056
27-Aug-18	Chloride	14.1	0.335	1.00	NE		J	105960-003	SW846 9056
	Fluoride	0.410	0.033	0.100	4.0			105960-003	SW846 9056
	Sulfate	46.5	0.665	2.00	NE		J	105960-003	SW846 9056
	Bicarbonate Alkalinity	168	1.45	4.00	NE			105960-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105960-004	SM 2320B
TA2-W-25	Bromide	2.61	0.067	0.200	NE			105962-003	SW846 9056
28-Sep-18	Chloride	15.2	2.68	8.00	NE			105962-003	SW846 9056
	Fluoride	0.143	0.033	0.100	4.0			105962-003	SW846 9056
	Sulfate	74.4	5.32	16.0	NE			105962-003	SW846 9056
	Bicarbonate Alkalinity	173	1.45	4.00	NE			105962-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105962-004	SM 2320B

Refer to footnotes on page 6C-44.

Table 6C-4 *(Continued)*
Summary of Anions and Alkalinity Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-26	Bromide	2.82	0.067	0.200	NE			105964-003	SW846 9056
29-Aug-18	Chloride	193	3.35	10.0	NE			105964-003	SW846 9056
	Fluoride	0.182	0.033	0.100	4.0			105964-003	SW846 9056
	Sulfate	401	6.65	20.0	NE			105964-003	SW846 9056
	Bicarbonate Alkalinity	86.0	1.45	4.00	NE			105964-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105964-004	SM 2320B
TA2-W-27	Bromide	1.51	0.067	0.200	NE			105966-003	SW846 9056
23-Aug-18	Chloride	111	1.34	4.00	NE			105966-003	SW846 9056
	Fluoride	0.308	0.033	0.100	4.0			105966-003	SW846 9056
	Sulfate	151	2.66	8.00	NE			105966-003	SW846 9056
	Bicarbonate Alkalinity	97.8	1.45	4.00	NE			105966-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105966-004	SM 2320B
TA2-W-28	Bromide	0.501	0.067	0.200	NE			105968-003	SW846 9056
04-Sep-18	Chloride	34.5	0.335	1.00	NE			105968-003	SW846 9056
	Fluoride	0.440	0.033	0.100	4.0			105968-003	SW846 9056
	Sulfate	16.6	0.133	0.400	NE		J	105968-003	SW846 9056
	Bicarbonate Alkalinity	125	1.45	4.00	NE			105968-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105968-004	SM 2320B
TJA-2	Bromide	0.869	0.067	0.200	NE			105970-003	SW846 9056
05-Sep-18	Chloride	65.3	0.670	2.00	NE			105970-003	SW846 9056
	Fluoride	0.377	0.033	0.100	4.0			105970-003	SW846 9056
	Sulfate	51.4	1.33	4.00	NE			105970-003	SW846 9056
	Bicarbonate Alkalinity	114	1.45	4.00	NE			105970-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105970-004	SM 2320B
TJA-3	Bromide	0.183	0.067	0.200	NE	J		105972-003	SW846 9056
24-Aug-18	Chloride	12.5	0.335	1.00	NE		J	105972-003	SW846 9056
	Fluoride	0.323	0.033	0.100	4.0			105972-003	SW846 9056
	Sulfate	77.5	0.665	2.00	NE		J	105972-003	SW846 9056
	Bicarbonate Alkalinity	172	1.45	4.00	NE			105972-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105972-004	SM 2320B

Refer to footnotes on page 6C-44.

Table 6C-4 *(Concluded)*
Summary of Anions and Alkalinity Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-4	Bromide	0.350	0.067	0.200	NE			105974-003	SW846 9056
10-Sep-18	Chloride	21.5	0.335	1.00	NE			105974-003	SW846 9056
	Fluoride	0.413	0.033	0.100	4.0			105974-003	SW846 9056
	Sulfate	17.6	0.133	0.400	NE			105974-003	SW846 9056
	Bicarbonate Alkalinity	142	1.45	4.00	NE			105974-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105974-004	SM 2320B
TJA-6	Bromide	0.190	0.067	0.200	NE	J		105949-003	SW846 9056
27-Sep-18	Chloride	13.9	0.335	1.00	NE			105949-003	SW846 9056
	Fluoride	0.370	0.033	0.100	4.0		J+	105949-003	SW846 9056
	Sulfate	60.6	0.665	2.00	NE			105949-003	SW846 9056
	Bicarbonate Alkalinity	163	1.45	4.00	NE			105949-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105949-004	SM 2320B
TJA-7	Bromide	0.421	0.067	0.200	NE			105976-003	SW846 9056
05-Sep-18	Chloride	24.0	0.335	1.00	NE			105976-003	SW846 9056
	Fluoride	0.382	0.033	0.100	4.0			105976-003	SW846 9056
	Sulfate	22.8	0.665	2.00	NE			105976-003	SW846 9056
	Bicarbonate Alkalinity	132	1.45	4.00	NE			105976-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105976-004	SM 2320B
WYO-3	Bromide	0.214	0.067	0.200	NE			105946-003	SW846 9056
17-Aug-18	Chloride	16.2	0.670	2.00	NE			105946-003	SW846 9056
	Fluoride	0.477	0.033	0.100	4.0			105946-003	SW846 9056
	Sulfate	89.3	1.33	4.00	NE			105946-003	SW846 9056
	Bicarbonate Alkalinity	161	1.45	4.00	NE			105946-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105946-004	SM 2320B

Refer to footnotes on page 6C-44.

Table 6C-5
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-5	Aluminum	ND	0.0193	0.050	NE	U		105555-005	SW846 6020
27-Jun-18	Antimony	ND	0.001	0.003	0.006	U		103285-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		103285-005	SW846 6020
	Barium	0.0531	0.00067	0.002	2.00			103285-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		103285-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		103285-005	SW846 6020
	Calcium	83.1	1.60	4.00	NE			103285-005	SW846 6020
	Chromium	0.00364	0.003	0.010	0.100	J		103285-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		103285-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		103285-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		103285-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		103285-005	SW846 6020
	Magnesium	14.2	0.010	0.030	NE			103285-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		103285-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		103285-005	SW846 7470
	Molybdenum	0.0016	0.0002	0.0005	NE		J+	103285-005	SW846 6020
	Nickel	ND	0.0006	0.002	NE	U		103285-005	SW846 6020
	Potassium	1.98	0.080	0.300	NE			103285-005	SW846 6020
	Selenium	0.00446	0.002	0.005	0.050	J		103285-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		103285-005	SW846 6020
	Sodium	22.6	0.080	0.250	NE			103285-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		103285-005	SW846 6020
	Uranium	0.00187	0.000067	0.0002	0.030			103285-005	SW846 6020
	Vanadium	0.00562	0.0033	0.010	NE	J		103285-005	SW846 6020
	Zinc	0.0046	0.0033	0.010	NE	J		103285-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-01	Aluminum	ND	0.0193	0.050	NE	U		105927-005	SW846 6020
09-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105927-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105927-005	SW846 6020
	Barium	0.0594	0.00067	0.002	2.00			105927-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105927-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105927-005	SW846 6020
	Calcium	62.5	0.400	1.00	NE			105927-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105927-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105927-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105927-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105927-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105927-005	SW846 6020
	Magnesium	13.2	0.010	0.030	NE			105927-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105927-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105927-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105927-005	SW846 6020
	Potassium	2.21	0.080	0.300	NE			105927-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105927-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105927-005	SW846 6020
	Sodium	26.3	0.080	0.250	NE			105927-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105927-005	SW846 6020
	Uranium	0.00316	0.000067	0.0002	0.030			105927-005	SW846 6020
	Vanadium	0.00647	0.0033	0.010	NE	J		105927-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105927-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-04	Aluminum	ND	0.0193	0.050	NE	U		105931-005	SW846 6020
10-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105931-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105931-005	SW846 6020
	Barium	0.0604	0.00067	0.002	2.00			105931-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105931-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105931-005	SW846 6020
	Calcium	64.2	0.800	2.00	NE			105931-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105931-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105931-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105931-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105931-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105931-005	SW846 6020
	Magnesium	11.5	0.010	0.030	NE			105931-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105931-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105931-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105931-005	SW846 6020
	Potassium	2.12	0.080	0.300	NE			105931-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105931-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105931-005	SW846 6020
	Sodium	23.9	0.080	0.250	NE			105931-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105931-005	SW846 6020
	Uranium	0.00311	0.000067	0.0002	0.030			105931-005	SW846 6020
	Vanadium	0.0054	0.0033	0.010	NE	J		105931-005	SW846 6020
	Zinc	0.00351	0.0033	0.010	NE	J		105931-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-05	Aluminum	ND	0.0193	0.050	NE	U		105935-005	SW846 6020
16-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105935-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105935-005	SW846 6020
	Barium	0.0356	0.00067	0.002	2.00			105935-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105935-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105935-005	SW846 6020
	Calcium	81.7	0.800	2.00	NE			105935-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105935-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105935-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105935-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105935-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105935-005	SW846 6020
	Magnesium	12.0	0.010	0.030	NE			105935-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105935-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105935-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105935-005	SW846 6020
	Potassium	2.18	0.080	0.300	NE			105935-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105935-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105935-005	SW846 6020
	Sodium	30.8	0.080	0.250	NE			105935-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105935-005	SW846 6020
	Uranium	0.00325	0.000067	0.0002	0.030			105935-005	SW846 6020
	Vanadium	0.00452	0.0033	0.010	NE	J		105935-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105935-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-06	Aluminum	0.0469	0.0193	0.050	NE	J		105951-005	SW846 6020
21-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105951-005	SW846 6020
	Arsenic	0.00306	0.002	0.005	0.010	J		105951-005	SW846 6020
	Barium	0.0265	0.00067	0.002	2.00			105951-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105951-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105951-005	SW846 6020
	Calcium	130	0.800	2.00	NE			105951-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105951-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105951-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105951-005	SW846 6020
	Iron	0.0501	0.033	0.100	NE	J		105951-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105951-005	SW846 6020
	Magnesium	16.9	0.010	0.030	NE		J	105951-005	SW846 6020
	Manganese	0.00135	0.001	0.005	NE	J		105951-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105951-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105951-005	SW846 6020
	Potassium	2.12	0.080	0.300	NE			105951-005	SW846 6020
	Selenium	0.00774	0.002	0.005	0.050			105951-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105951-005	SW846 6020
	Sodium	33.0	0.080	0.250	NE			105951-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105951-005	SW846 6020
	Uranium	0.00115	0.000067	0.0002	0.030			105951-005	SW846 6020
	Vanadium	0.00622	0.0033	0.010	NE	J		105951-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105951-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-08	Aluminum	ND	0.0193	0.050	NE	U		105938-005	SW846 6020
15-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105938-005	SW846 6020
	Arsenic	0.00354	0.002	0.005	0.010	J		105938-005	SW846 6020
	Barium	0.0189	0.00067	0.002	2.00			105938-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105938-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105938-005	SW846 6020
	Calcium	315	0.800	2.00	NE			105938-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105938-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105938-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105938-005	SW846 6020
	Iron	0.0385	0.033	0.100	NE	J		105938-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105938-005	SW846 6020
	Magnesium	41.6	0.010	0.030	NE			105938-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U	R	105938-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105938-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105938-005	SW846 6020
	Potassium	3.18	0.080	0.300	NE			105938-005	SW846 6020
	Selenium	0.0288	0.002	0.005	0.050			105938-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105938-005	SW846 6020
	Sodium	77.9	0.800	2.50	NE			105938-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105938-005	SW846 6020
	Uranium	0.00169	0.000067	0.0002	0.030			105938-005	SW846 6020
	Vanadium	0.00451	0.0033	0.010	NE	J		105938-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105938-005	SW846 6020

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Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-NW1-595	Aluminum	ND	0.0193	0.050	NE	U		105943-005	SW846 6020
14-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105943-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105943-005	SW846 6020
	Barium	0.0402	0.00067	0.002	2.00			105943-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105943-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105943-005	SW846 6020
	Calcium	93.2	0.800	2.00	NE			105943-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105943-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105943-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105943-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105943-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105943-005	SW846 6020
	Magnesium	15.7	0.010	0.030	NE			105943-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105943-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105943-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105943-005	SW846 6020
	Potassium	2.26	0.080	0.300	NE			105943-005	SW846 6020
	Selenium	0.00642	0.002	0.005	0.050			105943-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105943-005	SW846 6020
	Sodium	28.2	0.080	0.250	NE			105943-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105943-005	SW846 6020
	Uranium	0.00203	0.000067	0.0002	0.030			105943-005	SW846 6020
	Vanadium	0.00426	0.0033	0.010	NE	J		105943-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105943-005	SW846 6020

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Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-01	Aluminum	ND	0.0193	0.050	NE	U		105955-005	SW846 6020
22-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105955-005	SW846 6020
	Arsenic	0.00269	0.002	0.005	0.010	J		105955-005	SW846 6020
	Barium	0.0652	0.00067	0.002	2.00			105955-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105955-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105955-005	SW846 6020
	Calcium	87.5	0.800	2.00	NE			105955-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105955-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105955-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105955-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105955-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105955-005	SW846 6020
	Magnesium	13.1	0.010	0.030	NE		J	105955-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105955-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105955-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105955-005	SW846 6020
	Potassium	1.83	0.080	0.300	NE			105955-005	SW846 6020
	Selenium	0.00661	0.002	0.005	0.050			105955-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105955-005	SW846 6020
	Sodium	24.2	0.080	0.250	NE			105955-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105955-005	SW846 6020
	Uranium	0.00104	0.000067	0.0002	0.030			105955-005	SW846 6020
	Vanadium	0.00628	0.0033	0.010	NE	J		105955-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105955-005	SW846 6020

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Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-19	Aluminum	ND	0.0193	0.050	NE	U		105958-005	SW846 6020
04-Sep-18	Antimony	ND	0.001	0.003	0.006	U		105958-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105958-005	SW846 6020
	Barium	0.0498	0.00067	0.002	2.00			105958-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105958-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105958-005	SW846 6020
	Calcium	73.4	0.800	2.00	NE			105958-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105958-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105958-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105958-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105958-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105958-005	SW846 6020
	Magnesium	11.5	0.010	0.030	NE			105958-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105958-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105958-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105958-005	SW846 6020
	Potassium	1.86	0.080	0.300	NE			105958-005	SW846 6020
	Selenium	0.00418	0.002	0.005	0.050	J		105958-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105958-005	SW846 6020
	Sodium	21.6	0.080	0.250	NE			105958-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105958-005	SW846 6020
	Uranium	0.00121	0.000067	0.0002	0.030	B		105958-005	SW846 6020
	Vanadium	0.00373	0.0033	0.010	NE	J		105958-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105958-005	SW846 6020

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Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-24	Aluminum	ND	0.0193	0.050	NE	U		105960-005	SW846 6020
27-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105960-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105960-005	SW846 6020
	Barium	0.0922	0.00067	0.002	2.00			105960-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105960-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105960-005	SW846 6020
	Calcium	53.3	0.800	2.00	NE			105960-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105960-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105960-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105960-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105960-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105960-005	SW846 6020
	Magnesium	10.4	0.010	0.030	NE			105960-005	SW846 6020
	Manganese	0.00161	0.001	0.005	NE	J		105960-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	105960-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105960-005	SW846 6020
	Potassium	3.58	0.080	0.300	NE			105960-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105960-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105960-005	SW846 6020
	Sodium	24.0	0.080	0.250	NE			105960-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105960-005	SW846 6020
	Uranium	0.0028	0.000067	0.0002	0.030	B		105960-005	SW846 6020
	Vanadium	0.00548	0.0033	0.010	NE	J		105960-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105960-005	SW846 6020

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Table 6C-5 *(Continued)*
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Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-25	Aluminum	ND	0.0193	0.050	NE	U		105962-005	SW846 6020
28-Sep-18	Antimony	ND	0.001	0.003	0.006	U		105962-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105962-005	SW846 6020
	Barium	0.0399	0.00067	0.002	2.00			105962-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105962-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105962-005	SW846 6020
	Calcium	67.8	0.800	2.00	NE			105962-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105962-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105962-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105962-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105962-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105962-005	SW846 6020
	Magnesium	10.0	0.010	0.030	NE			105962-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105962-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	105962-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105962-005	SW846 6020
	Potassium	1.73	0.080	0.300	NE			105962-005	SW846 6020
	Selenium	0.00203	0.002	0.005	0.050	J		105962-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105962-005	SW846 6020
	Sodium	25.5	0.080	0.250	NE			105962-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105962-005	SW846 6020
	Uranium	0.00251	0.000067	0.0002	0.030	B		105962-005	SW846 6020
	Vanadium	0.00412	0.0033	0.010	NE	J		105962-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105962-005	SW846 6020

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Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-26	Aluminum	ND	0.0193	0.050	NE	U		105964-005	SW846 6020
29-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105964-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105964-005	SW846 6020
	Barium	0.0564	0.00067	0.002	2.00			105964-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105964-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105964-005	SW846 6020
	Calcium	224	0.800	2.00	NE			105964-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105964-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105964-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105964-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105964-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105964-005	SW846 6020
	Magnesium	28.8	0.010	0.030	NE			105964-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105964-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	105964-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105964-005	SW846 6020
	Potassium	2.65	0.080	0.300	NE			105964-005	SW846 6020
	Selenium	0.0212	0.002	0.005	0.050			105964-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105964-005	SW846 6020
	Sodium	42.7	0.080	0.250	NE			105964-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105964-005	SW846 6020
	Uranium	0.00124	0.000067	0.0002	0.030	B		105964-005	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		105964-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105964-005	SW846 6020

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Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-27	Aluminum	ND	0.0193	0.050	NE	U		105966-005	SW846 6020
23-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105966-005	SW846 6020
	Arsenic	0.00297	0.002	0.005	0.010	J		105966-005	SW846 6020
	Barium	0.0554	0.00067	0.002	2.00			105966-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105966-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105966-005	SW846 6020
	Calcium	114	0.800	2.00	NE			105966-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105966-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105966-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105966-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105966-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105966-005	SW846 6020
	Magnesium	15.4	0.010	0.030	NE		J	105966-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105966-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105966-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105966-005	SW846 6020
	Potassium	1.96	0.080	0.300	NE			105966-005	SW846 6020
	Selenium	0.00741	0.002	0.005	0.050			105966-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105966-005	SW846 6020
	Sodium	28.9	0.080	0.250	NE			105966-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105966-005	SW846 6020
	Uranium	0.00135	0.000067	0.0002	0.030			105966-005	SW846 6020
	Vanadium	0.00574	0.0033	0.010	NE	J		105966-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105966-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-28	Aluminum	0.0202	0.0193	0.050	NE	J		105968-005	SW846 6020
04-Sep-18	Antimony	ND	0.001	0.003	0.006	U		105968-005	SW846 6020
	Arsenic	0.00204	0.002	0.005	0.010	J		105968-005	SW846 6020
	Barium	0.195	0.00067	0.002	2.00			105968-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105968-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105968-005	SW846 6020
	Calcium	61.7	0.800	2.00	NE			105968-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105968-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105968-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105968-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105968-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105968-005	SW846 6020
	Magnesium	9.95	0.010	0.030	NE			105968-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105968-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105968-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105968-005	SW846 6020
	Potassium	1.87	0.080	0.300	NE			105968-005	SW846 6020
	Selenium	0.00316	0.002	0.005	0.050	J		105968-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105968-005	SW846 6020
	Sodium	17.4	0.080	0.250	NE			105968-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105968-005	SW846 6020
	Uranium	0.00137	0.000067	0.0002	0.030	B		105968-005	SW846 6020
	Vanadium	0.00419	0.0033	0.010	NE	J		105968-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	B, J	0.010U	105968-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-2	Aluminum	ND	0.0193	0.050	NE	U		105970-005	SW846 6020
05-Sep-18	Antimony	ND	0.001	0.003	0.006	U		105970-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105970-005	SW846 6020
	Barium	0.0474	0.00067	0.002	2.00			105970-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105970-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105970-005	SW846 6020
	Calcium	80.5	0.800	2.00	NE			105970-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105970-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105970-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105970-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105970-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105970-005	SW846 6020
	Magnesium	11.1	0.010	0.030	NE			105970-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105970-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105970-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105970-005	SW846 6020
	Potassium	1.82	0.080	0.300	NE			105970-005	SW846 6020
	Selenium	0.00453	0.002	0.005	0.050	J		105970-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105970-005	SW846 6020
	Sodium	21.7	0.080	0.250	NE			105970-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105970-005	SW846 6020
	Uranium	0.00122	0.000067	0.0002	0.030	B		105970-005	SW846 6020
	Vanadium	0.00427	0.0033	0.010	NE	J		105970-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	B, J	0.010U	105970-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-3	Aluminum	ND	0.0193	0.050	NE	U		105972-005	SW846 6020
24-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105972-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105972-005	SW846 6020
	Barium	0.043	0.00067	0.002	2.00			105972-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105972-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105972-005	SW846 6020
	Calcium	62.6	0.800	2.00	NE			105972-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105972-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105972-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105972-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105972-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105972-005	SW846 6020
	Magnesium	11.0	0.010	0.030	NE			105972-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105972-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	105972-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105972-005	SW846 6020
	Potassium	1.81	0.080	0.300	NE			105972-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105972-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105972-005	SW846 6020
	Sodium	23.7	0.080	0.250	NE			105972-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105972-005	SW846 6020
	Uranium	0.00245	0.000067	0.0002	0.030	B		105972-005	SW846 6020
	Vanadium	0.0043	0.0033	0.010	NE	J		105972-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105972-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-4	Aluminum	ND	0.0193	0.050	NE	U		105974-005	SW846 6020
10-Sep-18	Antimony	ND	0.001	0.003	0.006	U		105974-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105974-005	SW846 6020
	Barium	0.175	0.00067	0.002	2.00			105974-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105974-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105974-005	SW846 6020
	Calcium	68.1	0.800	2.00	NE			105974-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105974-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105974-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105974-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105974-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105974-005	SW846 6020
	Magnesium	12.0	0.010	0.030	NE			105974-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105974-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105974-005	SW846 7470
	Nickel	0.000702	0.0006	0.002	NE	J		105974-005	SW846 6020
	Potassium	3.00	0.080	0.300	NE			105974-005	SW846 6020
	Selenium	0.00259	0.002	0.005	0.050	J		105974-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105974-005	SW846 6020
	Sodium	23.3	0.080	0.250	NE			105974-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105974-005	SW846 6020
	Uranium	0.00261	0.000067	0.0002	0.030			105974-005	SW846 6020
	Vanadium	0.00436	0.0033	0.010	NE	J		105974-005	SW846 6020
	Zinc	0.00341	0.0033	0.010	NE	J		105974-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-6	Aluminum	0.0723	0.0193	0.050	NE			105949-005	SW846 6020
27-Sep-18	Antimony	ND	0.001	0.003	0.006	U		105949-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105949-005	SW846 6020
	Barium	0.0631	0.00067	0.002	2.00			105949-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105949-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105949-005	SW846 6020
	Calcium	60.9	0.800	2.00	NE			105949-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105949-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105949-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105949-005	SW846 6020
	Iron	0.0591	0.033	0.100	NE	J		105949-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105949-005	SW846 6020
	Magnesium	11.6	0.010	0.030	NE			105949-005	SW846 6020
	Manganese	0.00137	0.001	0.005	NE	J		105949-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105949-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105949-005	SW846 6020
	Potassium	2.09	0.080	0.300	NE			105949-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105949-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105949-005	SW846 6020
	Sodium	22.9	0.080	0.250	NE			105949-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105949-005	SW846 6020
	Uranium	0.00302	0.000067	0.0002	0.030			105949-005	SW846 6020
	Vanadium	0.00659	0.0033	0.010	NE	J		105949-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	B, J	0.01U	105949-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Continued)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-7	Aluminum	ND	0.0193	0.050	NE	U		105976-005	SW846 6020
05-Sep-18	Antimony	ND	0.001	0.003	0.006	U		105976-005	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	U		105976-005	SW846 6020
	Barium	0.222	0.00067	0.002	2.00			105976-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105976-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105976-005	SW846 6020
	Calcium	66.3	0.800	2.00	NE			105976-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105976-005	SW846 6020
	Cobalt	0.000967	0.0003	0.001	NE	J		105976-005	SW846 6020
	Copper	0.00132	0.0003	0.001	NE			105976-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105976-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105976-005	SW846 6020
	Magnesium	12.0	0.010	0.030	NE			105976-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105976-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105976-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105976-005	SW846 6020
	Potassium	2.01	0.080	0.300	NE			105976-005	SW846 6020
	Selenium	0.00416	0.002	0.005	0.050	J		105976-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105976-005	SW846 6020
	Sodium	18.6	0.080	0.250	NE			105976-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105976-005	SW846 6020
	Uranium	0.00165	0.000067	0.0002	0.030	B		105976-005	SW846 6020
	Vanadium	0.00444	0.0033	0.010	NE	J		105976-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	B, J	0.010U	105976-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-5 *(Concluded)*
Summary of TAL Metals plus Uranium Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
WYO-3	Aluminum	ND	0.0193	0.050	NE	U		105946-005	SW846 6020
17-Aug-18	Antimony	ND	0.001	0.003	0.006	U		105946-005	SW846 6020
	Arsenic	0.00284	0.002	0.005	0.010	J		105946-005	SW846 6020
	Barium	0.0559	0.00067	0.002	2.00			105946-005	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105946-005	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105946-005	SW846 6020
	Calcium	66.2	0.800	2.00	NE			105946-005	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105946-005	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105946-005	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105946-005	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105946-005	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105946-005	SW846 6020
	Magnesium	13.5	0.010	0.030	NE		J	105946-005	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105946-005	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105946-005	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105946-005	SW846 6020
	Potassium	2.25	0.080	0.300	NE			105946-005	SW846 6020
	Selenium	ND	0.002	0.005	0.050	U		105946-005	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105946-005	SW846 6020
	Sodium	29.5	0.080	0.250	NE			105946-005	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105946-005	SW846 6020
	Uranium	0.00353	0.000067	0.0002	0.030			105946-005	SW846 6020
	Vanadium	0.00803	0.0033	0.010	NE	J		105946-005	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105946-005	SW846 6020

Refer to footnotes on page 6C-44.

Table 6C-6
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-5	Americium-241	-1.17 ± 9.85	15.0	7.31	NE	U	BD	105555-006	EPA 901.1
27-Jun-18	Cesium-137	-1.88 ± 2.27	3.36	1.61	NE	U	BD	105555-006	EPA 901.1
	Cobalt-60	0.185 ± 1.88	3.38	1.58	NE	U	BD	105555-006	EPA 901.1
	Potassium-40	-9.08 ± 34.7	44.0	20.9	NE	U	BD	105555-006	EPA 901.1
	Gross Alpha	0.45	NA	NA	15 pCi/L	NA	None	105555-007	EPA 900.0
	Gross Beta	1.01 ± 0.783	1.27	0.605	4 mrem/yr	U	BD	105555-007	EPA 900.0
	Tritium	8.91 ± 75.3	138	62.4	NE	U	BD	105555-008	EPA 906.0 M
TA1-W-01	Americium-241	8.03 ± 7.31	10.3	5.00	NE	U	BD	105927-006	EPA 901.1
09-Aug-18	Cesium-137	0.471 ± 1.61	2.83	1.33	NE	U	BD	105927-006	EPA 901.1
	Cobalt-60	2.74 ± 2.20	3.34	1.55	NE	U	BD	105927-006	EPA 901.1
	Potassium-40	3.14 ± 32.9	25.9	11.7	NE	U	BD	105927-006	EPA 901.1
	Gross Alpha	-0.15	NA	NA	15 pCi/L	NA	None	105927-007	EPA 900.0
	Gross Beta	2.11 ± 0.719	0.975	0.446	4 mrem/yr	*	J	105927-007	EPA 900.0
	Tritium	-17 ± 88.6	165	75.7	NE	U	BD	105927-008	EPA 906.0 M
TA1-W-02	Americium-241	-3.47 ± 13.9	24.0	11.6	NE	U	BD	105923-006	EPA 901.1
08-Aug-18	Cesium-137	0.467 ± 1.88	3.37	1.58	NE	U	BD	105923-006	EPA 901.1
	Cobalt-60	-2.53 ± 3.35	3.63	1.65	NE	U	BD	105923-006	EPA 901.1
	Potassium-40	18.6 ± 43.1	55.5	26.1	NE	U	BD	105923-006	EPA 901.1
	Gross Alpha	0.90	NA	NA	15 pCi/L	NA	None	105923-007	EPA 900.0
	Gross Beta	3.05 ± 0.842	0.991	0.444	4 mrem/yr	*		105923-007	EPA 900.0
	Tritium	61.7 ± 94.2	160	73.6	NE	U	BD	105923-008	EPA 906.0 M
TA1-W-04	Americium-241	-3.26 ± 13.2	19.6	9.54	NE	U	BD	105931-006	EPA 901.1
10-Aug-18	Cesium-137	1.99 ± 2.09	3.19	1.52	NE	U	BD	105931-006	EPA 901.1
	Cobalt-60	0.828 ± 1.93	3.60	1.68	NE	U	BD	105931-006	EPA 901.1
	Potassium-40	-16.6 ± 42.3	49.0	23.3	NE	U	BD	105931-006	EPA 901.1
	Gross Alpha	2.94	NA	NA	15 pCi/L	NA	None	105931-007	EPA 900.0
	Gross Beta	2.75 ± 1.11	1.75	0.845	4 mrem/yr	*	J	105931-007	EPA 900.0
	Tritium	43.4 ± 106	187	85.5	NE	U	BD	105931-008	EPA 906.0 M

Refer to footnotes on page 6C-44.

Table 6C-6 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA1-W-05	Americium-241	2.90 ± 5.40	8.65	4.20	NE	U	BD	105935-006	EPA 901.1
16-Aug-18	Cesium-137	0.352 ± 1.24	2.21	1.05	NE	U	BD	105935-006	EPA 901.1
	Cobalt-60	-0.0197 ± 1.36	2.51	1.17	NE	U	BD	105935-006	EPA 901.1
	Potassium-40	6.82 ± 39.8	20.7	9.47	NE	U	BD	105935-006	EPA 901.1
	Gross Alpha	1.26	NA	NA	15 pCi/L	NA	None	105935-007	EPA 900.0
	Gross Beta	2.73 ± 1.17	1.85	0.895	4mrem/yr	*	J	105935-007	EPA 900.0
	Tritium	-29.6 ± 98.4	186	85.1	NE	U	BD	105935-008	EPA 906.0 M
TA1-W-06	Americium-241	-5.53 ± 8.97	11.3	5.45	NE	U	BD	105951-006	EPA 901.1
21-Aug-18	Cesium-137	-0.188 ± 1.64	2.92	1.36	NE	U	BD	105951-006	EPA 901.1
	Cobalt-60	-0.668 ± 1.61	2.87	1.29	NE	U	BD	105951-006	EPA 901.1
	Potassium-40	47.4 ± 44.4	32.5	14.8	NE		J	105951-006	EPA 901.1
	Gross Alpha	2.35	NA	NA	15 pCi/L	NA	None	105951-007	EPA 900.0
	Gross Beta	5.39 ± 1.21	1.78	0.859	4mrem/yr			105951-007	EPA 900.0
	Tritium	-43 ± 71.0	133	62.3	NE	U	BD	105951-008	EPA 906.0 M
TA1-W-08	Americium-241	1.34 ± 11.6	18.4	8.93	NE	U	BD	105938-006	EPA 901.1
15-Aug-18	Cesium-137	-0.214 ± 1.72	3.09	1.47	NE	U	BD	105938-006	EPA 901.1
	Cobalt-60	-0.00969 ± 1.81	3.19	1.48	NE	U	BD	105938-006	EPA 901.1
	Potassium-40	-7.89 ± 45.7	44.0	20.8	NE	U	BD	105938-006	EPA 901.1
	Gross Alpha	-3.19	NA	NA	15 pCi/L	NA	None	105938-007	EPA 900.0
	Gross Beta	2.64 ± 2.48	4.14	1.99	4mrem/yr	U*	BD	105938-007	EPA 900.0
	Tritium	-57.8 ± 92.2	180	82.4	NE	U	BD	105938-008	EPA 906.0 M
TA2-NW1-595	Americium-241	1.80 ± 8.70	14.6	7.07	NE	U	BD	105943-006	EPA 901.1
14-Aug-18	Cesium-137	-0.315 ± 1.50	2.58	1.21	NE	U	BD	105943-006	EPA 901.1
	Cobalt-60	-0.321 ± 1.67	2.96	1.36	NE	U	BD	105943-006	EPA 901.1
	Potassium-40	-31.1 ± 40.7	40.3	19.0	NE	U	BD	105943-006	EPA 901.1
	Gross Alpha	1.08	NA	NA	15 pCi/L	NA	None	105943-007	EPA 900.0
	Gross Beta	2.73 ± 1.09	1.71	0.823	4mrem/yr	*	J	105943-007	EPA 900.0
	Tritium	-35.9 ± 96.9	184	84.4	NE	U	BD	105943-008	EPA 906.0 M
TA2-W-01	Americium-241	5.48 ± 13.8	22.6	10.9	NE	U	BD	105955-006	EPA 901.1
22-Aug-18	Cesium-137	-0.292 ± 1.87	3.27	1.53	NE	U	BD	105955-006	EPA 901.1
	Cobalt-60	-0.80 ± 2.25	3.95	1.81	NE	U	BD	105955-006	EPA 901.1
	Potassium-40	15.2 ± 40.3	33.8	15.2	NE	U	BD	105955-006	EPA 901.1
	Gross Alpha	1.24	NA	NA	15 pCi/L	NA	None	105955-007	EPA 900.0
	Gross Beta	2.43 ± 1.09	1.74	0.839	4mrem/yr		NJ+	105955-007	EPA 900.0
	Tritium	-15.1 ± 67.6	123	57.6	NE	U	BD	105955-008	EPA 906.0 M

Refer to footnotes on page 6C-44.

Table 6C-6 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-19	Americium-241	-4.83 ± 25.9	39.2	19.0	NE	U	BD	105958-006	EPA 901.1
04-Sep-18	Cesium-137	0.444 ± 2.41	4.32	2.04	NE	U	BD	105958-006	EPA 901.1
	Cobalt-60	2.43 ± 2.69	4.97	2.29	NE	U	BD	105958-006	EPA 901.1
	Potassium-40	34.2 ± 58.1	44.5	20.3	NE	U	BD	105958-006	EPA 901.1
	Gross Alpha	1.79	NA	NA	15 pCi/L	NA	None	105958-007	EPA 900.0
	Gross Beta	1.73 ± 1.55	2.59	1.26	4 mrem/yr	U	BD	105958-007	EPA 900.0
	Tritium	-40.8 ± 84.4	157	73.4	NE	U	BD	105958-008	EPA 906.0 M
TA2-W-24	Americium-241	-0.605 ± 7.46	11.4	5.50	NE	U	BD	105960-006	EPA 901.1
27-Aug-18	Cesium-137	0.683 ± 2.03	3.58	1.68	NE	U	BD	105960-006	EPA 901.1
	Cobalt-60	2.04 ± 2.17	4.01	1.84	NE	U	BD	105960-006	EPA 901.1
	Potassium-40	-7.45 ± 42.1	51.6	24.4	NE	U	BD	105960-006	EPA 901.1
	Gross Alpha	-1.21	NA	NA	15 pCi/L	NA	None	105960-007	EPA 900.0
	Gross Beta	4.89 ± 1.35	2.06	0.999	4 mrem/yr		J	105960-007	EPA 900.0
	Tritium	-45.8 ± 105	202	92.1	NE	U	BD	105960-008	EPA 906.0 M
TA2-W-25	Americium-241	5.00 ± 8.13	14.3	6.87	NE	U	BD	105962-006	EPA 901.1
28-Sep-18	Cesium-137	-2.8 ± 4.29	4.98	2.38	NE	U	BD	105962-006	EPA 901.1
	Cobalt-60	0.758 ± 2.20	4.15	1.90	NE	U	BD	105962-006	EPA 901.1
	Potassium-40	-19.1 ± 46.1	55.1	25.8	NE	U	BD	105962-006	EPA 901.1
	Gross Alpha	1.50	NA	NA	15 pCi/L	NA	None	105962-007	EPA 900.0
	Gross Beta	3.09 ± 1.28	2.03	0.987	4 mrem/yr		J	105962-007	EPA 900.0
	Tritium	-13.1 ± 110	205	93.5	NE	U	BD	105962-008	EPA 906.0 M
TA2-W-26	Americium-241	6.78 ± 14.3	22.8	11.1	NE	U	BD	105964-006	EPA 901.1
29-Aug-18	Cesium-137	0.652 ± 1.65	3.01	1.44	NE	U	BD	105964-006	EPA 901.1
	Cobalt-60	-0.414 ± 1.56	2.74	1.26	NE	U	BD	105964-006	EPA 901.1
	Potassium-40	83.8 ± 42.5	32.5	15.2	NE		J	105964-006	EPA 901.1
	Gross Alpha	-1.18	NA	NA	15 pCi/L	NA	None	105964-007	EPA 900.0
	Gross Beta	3.90 ± 1.85	2.98	1.45	4 mrem/yr		J	105964-007	EPA 900.0
	Tritium	-40.9 ± 107	204	93.3	NE	U	BD	105964-008	EPA 906.0 M
TA2-W-27	Americium-241	4.20 ± 15.7	27.9	13.4	NE	U	BD	105966-006	EPA 901.1
23-Aug-18	Cesium-137	-0.602 ± 1.97	3.40	1.58	NE	U	BD	105966-006	EPA 901.1
	Cobalt-60	-0.361 ± 2.02	3.72	1.66	NE	U	BD	105966-006	EPA 901.1
	Potassium-40	-37.4 ± 40.7	52.3	24.2	NE	U	BD	105966-006	EPA 901.1
	Gross Alpha	-0.62	NA	NA	15 pCi/L	NA	None	105966-007	EPA 900.0
	Gross Beta	2.48 ± 1.27	2.07	1.01	4 mrem/yr		J	105966-007	EPA 900.0
	Tritium	36.0 ± 72.3	125	58.2	NE	U	BD	105966-008	EPA 906.0 M

Refer to footnotes on page 6C-44.

Table 6C-6 *(Continued)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TA2-W-28	Americium-241	-2.42 ± 10.6	17.6	8.43	NE	U	BD	105968-006	EPA 901.1
04-Sep-18	Cesium-137	-1.4 ± 2.95	3.39	1.58	NE	U	BD	105968-006	EPA 901.1
	Cobalt-60	-0.569 ± 2.67	4.13	1.88	NE	U	BD	105968-006	EPA 901.1
	Potassium-40	-37 ± 46.3	47.9	22.1	NE	U	BD	105968-006	EPA 901.1
	Gross Alpha	1.48	NA	NA	15 pCi/L	NA	None	105968-007	EPA 900.0
	Gross Beta	4.07 ± 1.40	2.20	1.07	4 mrem/yr		J	105968-007	EPA 900.0
	Tritium	-41.4 ± 81.1	151	70.6	NE	U	BD	105968-008	EPA 906.0 M
TJA-2	Americium-241	2.87 ± 14.6	23.3	11.3	NE	U	BD	105970-006	EPA 901.1
05-Sep-18	Cesium-137	1.41 ± 2.08	3.81	1.79	NE	U	BD	105970-006	EPA 901.1
	Cobalt-60	0.378 ± 2.35	4.27	1.95	NE	U	BD	105970-006	EPA 901.1
	Potassium-40	12.3 ± 42.0	61.0	28.7	NE	U	BD	105970-006	EPA 901.1
	Gross Alpha	0.55	NA	NA	15 pCi/L	NA	None	105970-007	EPA 900.0
	Gross Beta	2.32 ± 1.30	2.13	1.04	4 mrem/yr		J	105970-007	EPA 900.0
	Tritium	-98.6 ± 79.1	156	72.8	NE	U	BD	105970-008	EPA 906.0 M
TJA-3	Americium-241	17.2 ± 13.9	19.0	9.18	NE	U	BD	105972-006	EPA 901.1
24-Aug-18	Cesium-137	1.92 ± 2.50	4.25	2.01	NE	U	BD	105972-006	EPA 901.1
	Cobalt-60	-1.38 ± 2.16	3.48	1.56	NE	U	BD	105972-006	EPA 901.1
	Potassium-40	35.3 ± 58.0	40.7	18.5	NE	U	BD	105972-006	EPA 901.1
	Gross Alpha	1.76	NA	NA	15 pCi/L	NA	None	105972-007	EPA 900.0
	Gross Beta	4.42 ± 1.37	2.13	1.04	4 mrem/yr		J	105972-007	EPA 900.0
	Tritium	-41.7 ± 108	205	93.9	NE	U	BD	105972-008	EPA 906.0 M
TJA-4	Americium-241	0.221 ± 5.52	8.92	4.33	NE	U	BD	105974-006	EPA 901.1
10-Sep-18	Cesium-137	-0.169 ± 1.29	2.26	1.07	NE	U	BD	105974-006	EPA 901.1
	Cobalt-60	3.49 ± 2.25	3.49	1.56	NE	U	BD	105974-006	EPA 901.1
	Potassium-40	-11.8 ± 36.8	35.5	16.9	NE	U	BD	105974-006	EPA 901.1
	Gross Alpha	2.57	NA	NA	15 pCi/L	NA	None	105974-007	EPA 900.0
	Gross Beta	3.53 ± 1.38	2.20	1.07	4 mrem/yr		J	105974-007	EPA 900.0
	Tritium	-65.9 ± 76.5	146	68.3	NE	U	BD	105974-008	EPA 906.0 M
TJA-6	Americium-241	-1.92 ± 6.25	10.7	5.17	NE	U	BD	105949-006	EPA 901.1
27-Sep-18	Cesium-137	0.155 ± 2.80	3.07	1.45	NE	U	BD	105949-006	EPA 901.1
	Cobalt-60	1.39 ± 1.90	3.53	1.62	NE	U	BD	105949-006	EPA 901.1
	Potassium-40	21.4 ± 57.9	30.9	14.0	NE	U	BD	105949-006	EPA 901.1
	Gross Alpha	0.88	NA	NA	15 pCi/L	NA	None	105949-007	EPA 900.0
	Gross Beta	4.29 ± 1.29	2.00	0.969	4 mrem/yr		J	105949-007	EPA 900.0
	Tritium	-0.668 ± 65.5	118	55.0	NE	U	BD	105949-008	EPA 906.0 M

Refer to footnotes on page 6C-44.

Table 6C-6 *(Concluded)*
Summary of Tritium, Gross Alpha, Gross Beta, and Gamma Spectroscopy Results
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d] (pCi/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TJA-7	Americium-241	8.58 ± 9.78	14.2	6.92	NE	U	BD	105976-006	EPA 901.1
05-Sep-18	Cesium-137	2.85 ± 2.71	2.88	1.38	NE	U	BD	105976-006	EPA 901.1
	Cobalt-60	-1.11 ± 1.72	2.76	1.28	NE	U	BD	105976-006	EPA 901.1
	Potassium-40	-44.8 ± 46.7	39.9	19.0	NE	U	BD	105976-006	EPA 901.1
	Gross Alpha	1.89	NA	NA	15 pCi/L	NA	None	105976-007	EPA 900.0
	Gross Beta	2.29 ± 1.43	2.35	1.15	4 mrem/yr	U	BD	105976-007	EPA 900.0
	Tritium	-32.1 ± 84.8	156	73.2	NE	U	BD	105976-008	EPA 906.0 M
WYO-3	Americium-241	-2.34 ± 9.87	16.0	7.68	NE	U	BD	105946-006	EPA 901.1
17-Aug-18	Cesium-137	-0.642 ± 1.79	3.04	1.42	NE	U	BD	105946-006	EPA 901.1
	Cobalt-60	0.622 ± 1.93	3.63	1.67	NE	U	BD	105946-006	EPA 901.1
	Potassium-40	-11.7 ± 39.0	49.3	23.2	NE	U	BD	105946-006	EPA 901.1
	Gross Alpha	2.02	NA	NA	15 pCi/L	NA	None	105946-007	EPA 900.0
	Gross Beta	2.71 ± 1.19	1.88	0.906	4 mrem/yr		J	105946-007	EPA 900.0
	Tritium	-1.18 ± 70.6	127	59.4	NE	U	BD	105946-008	EPA 906.0 M

Refer to footnotes on page 6C-44.

Table 6C-7
Summary of Field Water Quality Measurements[h]
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (^{0}C)	Specific Conductivity (µmhos/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
TA1-W-06	22-Feb-18	16.71	724.3	276.0	7.64	1.00	91.0	7.35
TA2-W-01	23-Feb-18	18.01	535.1	257.9	7.70	0.92	93.6	7.34
TA2-W-19	01-Mar-18	17.70	517.2	292.1	7.71	0.33	109.4	8.64
TA2-W-26	28-Feb-18	17.07	1343.3	252.1	7.53	1.19	91.5	7.34
TA2-W-27	26-Feb-18	17.78	673.7	289.4	7.63	0.64	100.4	7.93
TA2-W-28	05-Mar-18	15.60	229.1	284.5	7.79	1.27	94.5	7.82
TJA-2	02-Mar-18	17.98	527.9	285.9	7.68	0.36	102.1	8.03
TJA-3	27-Feb-18	19.66	475.5	294.7	7.52	1.00	80.4	6.11
TJA-4	07-Mar-18	18.40	508.5	291.7	7.69	0.29	72.4	5.64
TJA-6	21-Feb-18	18.81	400.3	286.7	7.58	3.17	75.0	5.80
TJA-7	06-Mar-18	17.50	460.61	286.0	7.69	0.41	95.2	7.56
TA2-W-19	21-Jun-18	19.82	671.4	183.6	7.55	0.69	103.9	8.05
TA2-W-26	20-Jun-18	20.48	1691.1	193.6	7.37	2.10	89.0	6.79
TA2-W-28	25-Jun-18	21.55	507.1	193.4	7.79	0.80	98.1	7.36
TJA-2	22-Jun-18	19.83	569.4	203.9	7.79	0.61	94.4	7.34
TJA-3	19-Jun-18	22.26	619.1	164.2	7.40	0.46	83.8	6.19
TJA-4	28-Jun-18	21.36	586.8	174.2	7.60	0.23	72.6	5.23
TJA-5	27-Jun-18	20.10	621.1	184.0	7.64	0.43	107.9	8.05
TJA-6	18-Jun-18	21.53	565.9	156.1	7.51	2.02	73.9	5.44
TJA-7	26-Jun-18	23.24	560.8	168.7	7.69	0.69	98.3	6.91
TA1-W-01	09-Aug-18	22.40	527.0	58.9	7.50	0.75	88.6	6.25
TA1-W-02	08-Aug-18	21.58	477.8	49.6	7.46	3.66	69.0	4.97
TA1-W-04	10-Aug-18	19.78	474.6	48.3	7.53	0.57	72.2	5.37
TA1-W-05	16-Aug-18	21.36	588.6	52.1	7.35	1.22	99.4	7.15
TA1-W-06	21-Aug-18	21.20	856.0	45.4	7.66	1.75	103.7	7.49
TA1-W-08	15-Aug-18	20.32	1820.1	59.6	7.46	0.53	98.1	7.18
TA2-NW1-595	14-Aug-18	21.39	710.6	53.1	7.46	0.32	112.3	8.08
TA2-W-01	22-Aug-18	19.73	628.9	239.4	7.64	0.57	99.4	7.60
TA2-W-19	04-Sep-18	21.68	627.4	149.0	7.55	0.74	117.0	8.37
TA2-W-24	27-Aug-18	20.46	450.7	86.7	7.54	0.36	49.4	3.74
TA2-W-25	28-Sep-18	21.00	514.9	165.0	7.46	0.59	103.0	7.44
TA2-W-26	29-Aug-18	20.89	1474.3	170.8	7.41	0.99	105.8	7.64

Refer to footnotes on page 6C-44.

Table 6C-7 *(Concluded)*
Summary of Field Water Quality Measurements[h]
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (^0C)	Specific Conductivity (µmhos/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
TA2-W-27	23-Aug-18	20.84	829.2	127.1	7.68	0.63	100.0	7.53
TA2-W-28	04-Sep-18	19.44	449.3	76.7	7.70	0.93	102.5	7.68
TJA-2	05-Sep-18	20.50	619.2	158.8	7.58	0.26	112.1	8.18
TJA-3	24-Aug-18	21.79	530.2	104.9	7.43	0.28	89.9	6.65
TJA-4	10-Sep-18	19.62	553.5	155.6	7.66	0.25	74.1	5.71
TJA-6	27-Sep-18	20.32	469.3	129.6	7.56	1.51	81.0	6.21
TJA-7	05-Sep-18	19.94	510.7	110.5	7.63	0.32	104.3	7.76
WYO-3	17-Aug-18	22.10	522.1	207.9	7.66	0.91	94.9	6.67
TA2-W-19	30-Nov-18	15.86	546.4	186.9	7.66	0.63	119.5	9.19
TA2-W-26	26-Nov-18	18.39	1481.6	196.3	7.49	2.62	98.2	7.31
TA2-W-28	11-Dec-18	16.77	448.0	298.4	7.67	0.66	96.7	8.02
TJA-2	10-Dec-18	15.53	518.3	297.9	7.61	0.46	88.6	7.84
TJA-3	28-Nov-18	19.37	527.0	142.1	7.50	0.53	82.6	6.00
TJA-4	13-Dec-18	17.36	534.0	265.8	7.53	0.73	71.8	5.82
TJA-7	12-Dec-18	17.44	499.0	272.4	7.63	0.70	97.0	7.71

Refer to footnotes on page 6C-44.

Footnotes for Tijeras Arroyo Groundwater Analytical Results Tables, Sandia National Laboratories, New Mexico

Green shading indicates well is screened in the Perched Groundwater System.

% = Percent.
CFR = Code of Federal Regulations.
EPA = U.S. Environmental Protection Agency.
ID = Identifier.
µg/L = Micrograms per liter.
mg/L = Milligrams per liter.
mrem/yr = Millirem per year.
No. = Number.
pCi/L = Picocuries per liter.
RPD = Relative Percent Difference.

[a]Result
Result applies to Tables 6C-1 through 6C-5. Activity applies to Table 6C-6.
Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Parts 9, 141, and 142, Table 1-4).

Bold = Value exceed the established MCL.
ND = not detected (at method detection limit).
Activities of zero or less are considered not detected.

[b]MDL or MDA
The MDL applies to Tables 6C-1 through 6C-5. MDA applies to Table 6C-6.
MDA = The minimal detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.
MDL = Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.
NA = Not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level
The PQL applies to Tables 6C-1 through 6C-5. Critical Level applies to Table 6C-6.
Critical Level = The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero, analyte is matrix specific.
PQL = Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.
NA = Not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[d]MCL

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards, (EPA May 2009).
The following are the MCLs for gross alpha particles and beta particles in community water systems:

- 15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Parts 9, 141, and 142, Table 1-4).
- 4 mrem/yr = any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico (Continued)

[e]Lab Qualifier
If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

B	= The analyte was found in the blank above the effective MDL.
H	= Analytical holding time was exceeded.
J	= Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
NA	= Not applicable.
U	= Analyte is absent or below the method detection limit.
*	= Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where the concentration falls below the effective PQL.

[f]Validation Qualifier
If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD	= Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J	= The associated value is an estimated quantity.
J-	= The associated numerical value is an estimated quantity with a suspected negative bias.
J+	= The associated numerical value is an estimated quantity with a suspected positive bias.
None	= No data validation for corrected gross alpha activity.
NJ+	= Presumptive evidence of the presence of the material at an estimated quantity with a suspected positive bias.
U	= The analyte was analyzed for but was not detected. The associated numerical value is the sample quantitation limit.
UJ	= The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
R	= The data are unusable, and resampling or reanalysis are necessary for verification.

[g]Analytical Method
Clesceri, Rice, Baird, and Eaton, 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C..

EPA, 1986, (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed., U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1984, "Methods for Chemical Analysis of Water and Wastes." EPA 600-4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA, 1980, "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA	= U.S. Environmental Protection Agency.
SM	= Standard Method.
SW	= Solid Waste.

[h]Field Water Quality Measurements
Field measurements collected prior to sampling.

^{O}C	= degrees Celsius
% Sat	= percent saturation
µmhos/cm	= micromhos per centimeter
mg/L	= milligrams per liter
mV	= millivolts
NTU	= nephelometric turbidity units
pH	= potential of hydrogen (negative logarithm of the hydrogen ion concentration)

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Attachment 6D
Tijeras Arroyo Groundwater
Plots

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Attachment 6D Plots

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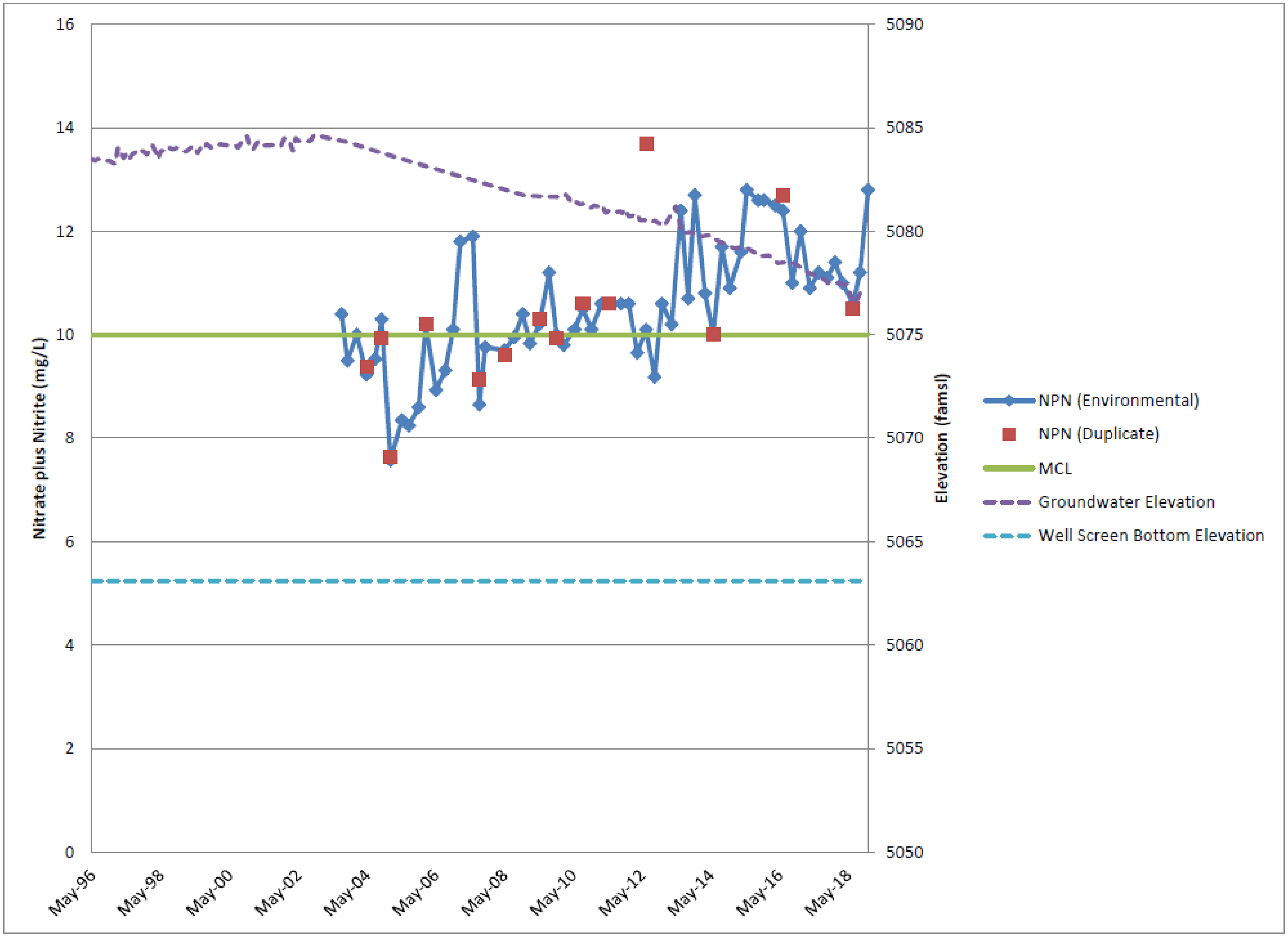

Figure 6D-1. Nitrate plus Nitrite Concentrations, TA2-W-19

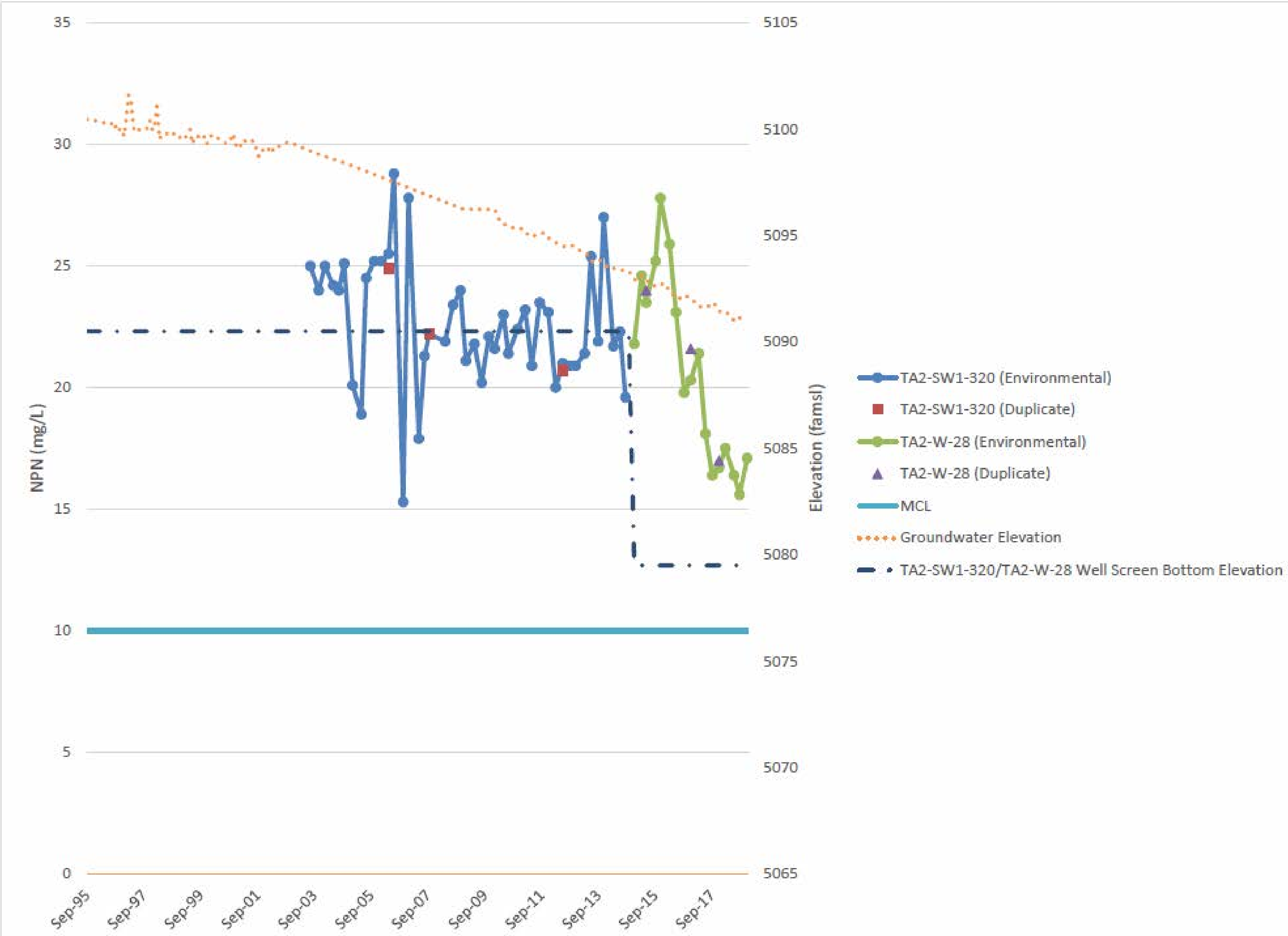

Figure 6D-2. Nitrate plus Nitrite Concentrations, TA2-W-28 and TA2-SW1-320

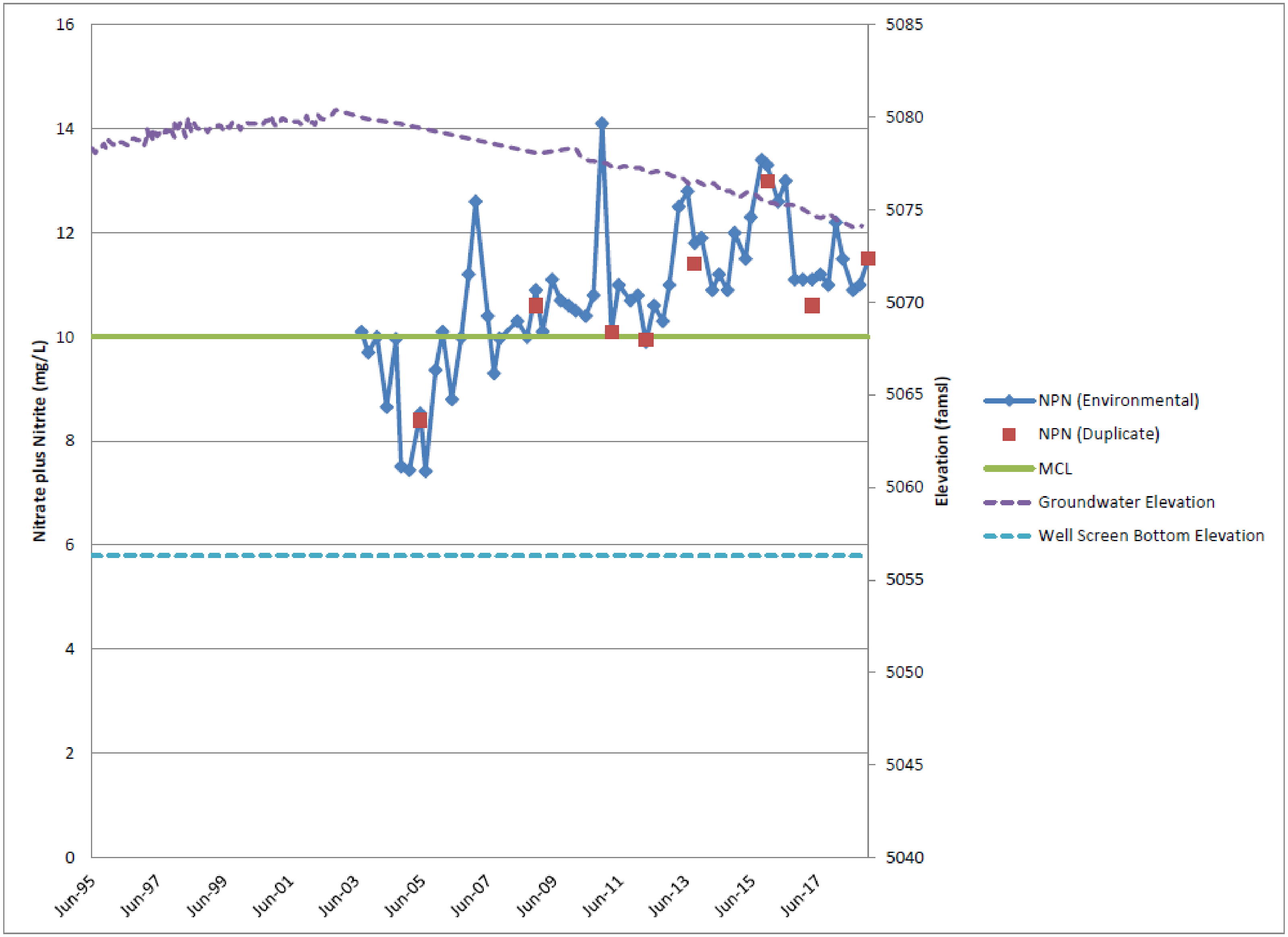

Figure 6D-3. Nitrate plus Nitrite Concentrations, TJA-2

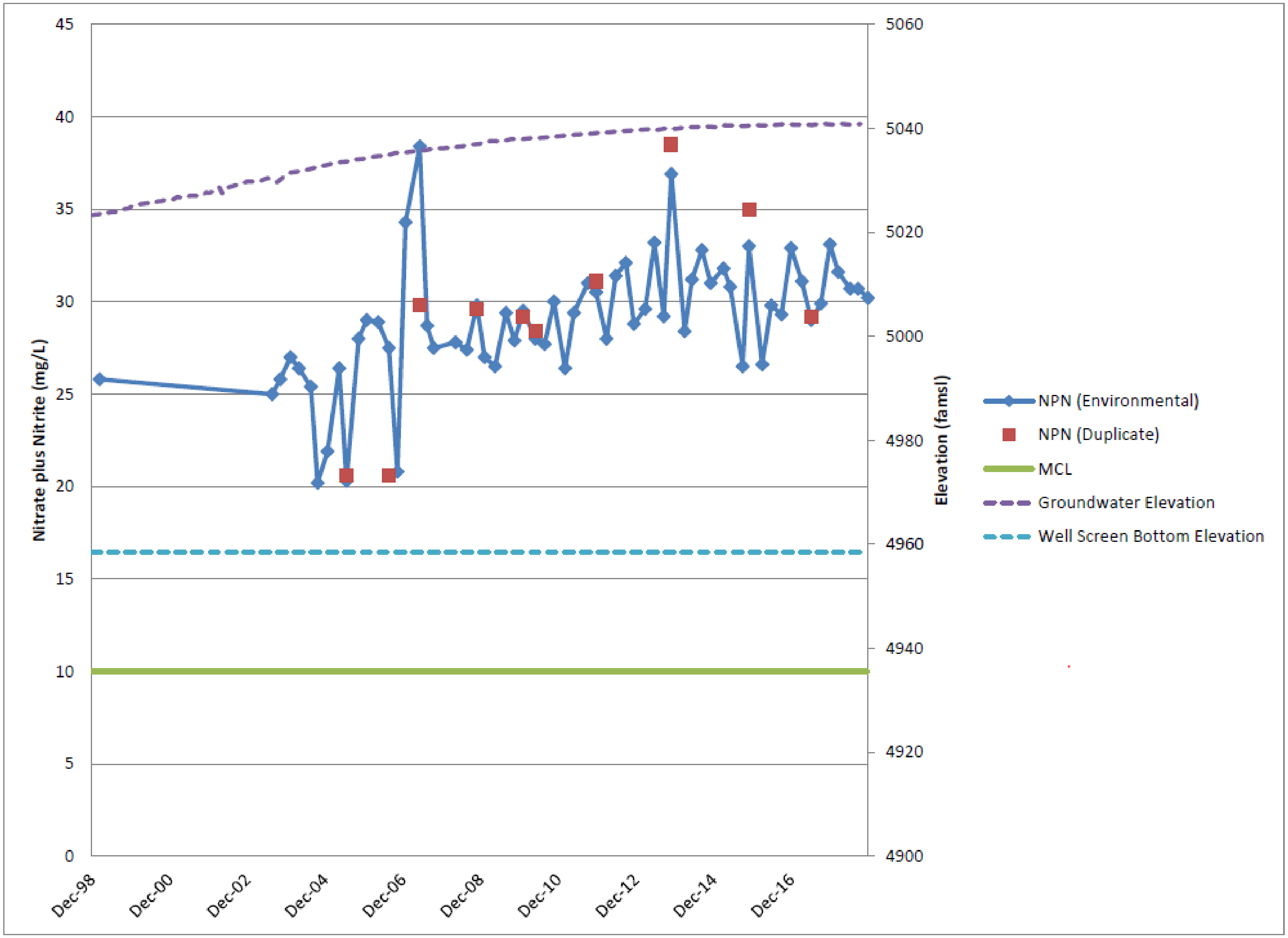

Figure 6D-4. Nitrate plus Nitrite Concentrations, TJA-4

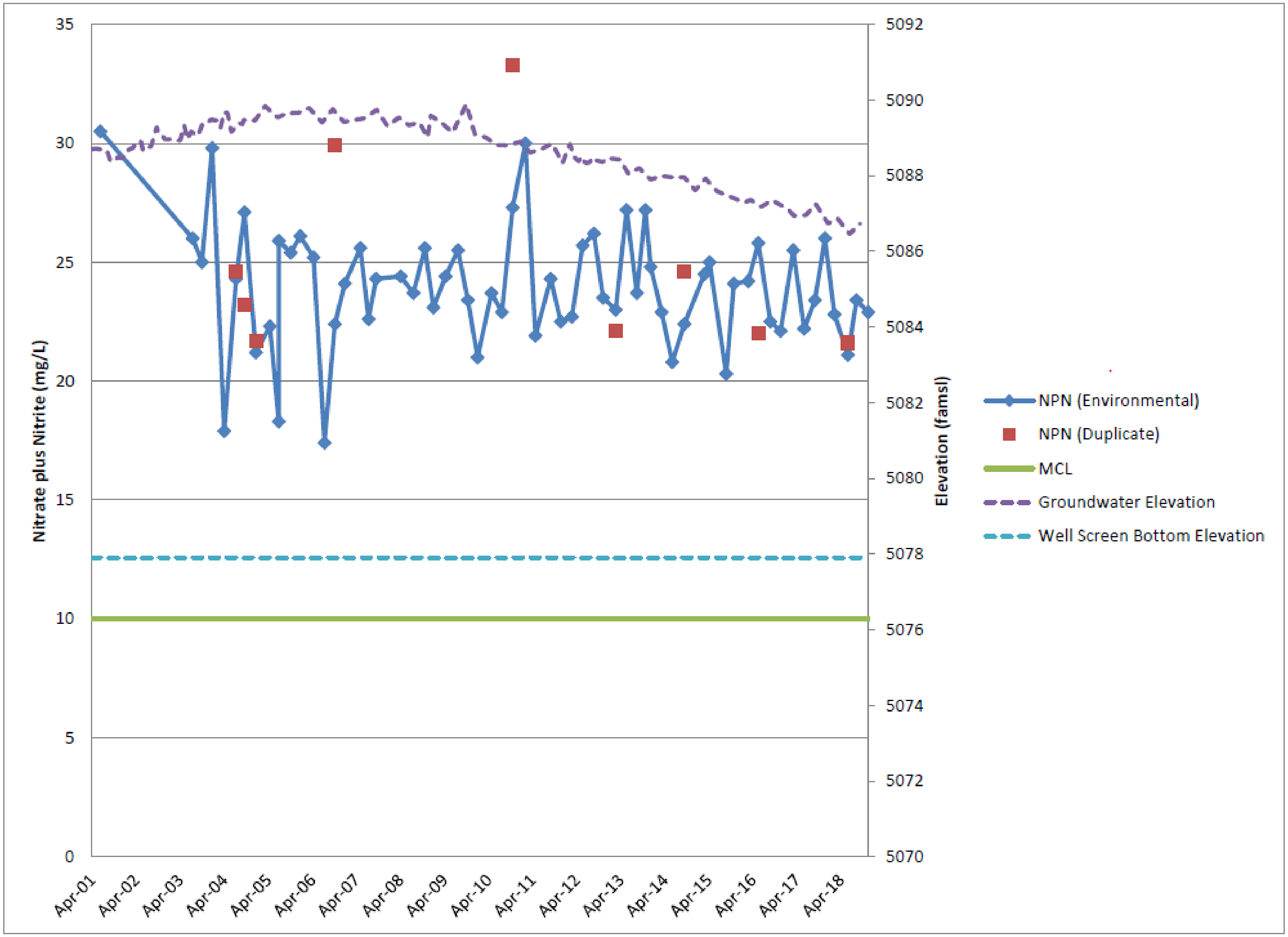

Figure 6D-5. Nitrate plus Nitrite Concentrations, TJA-7

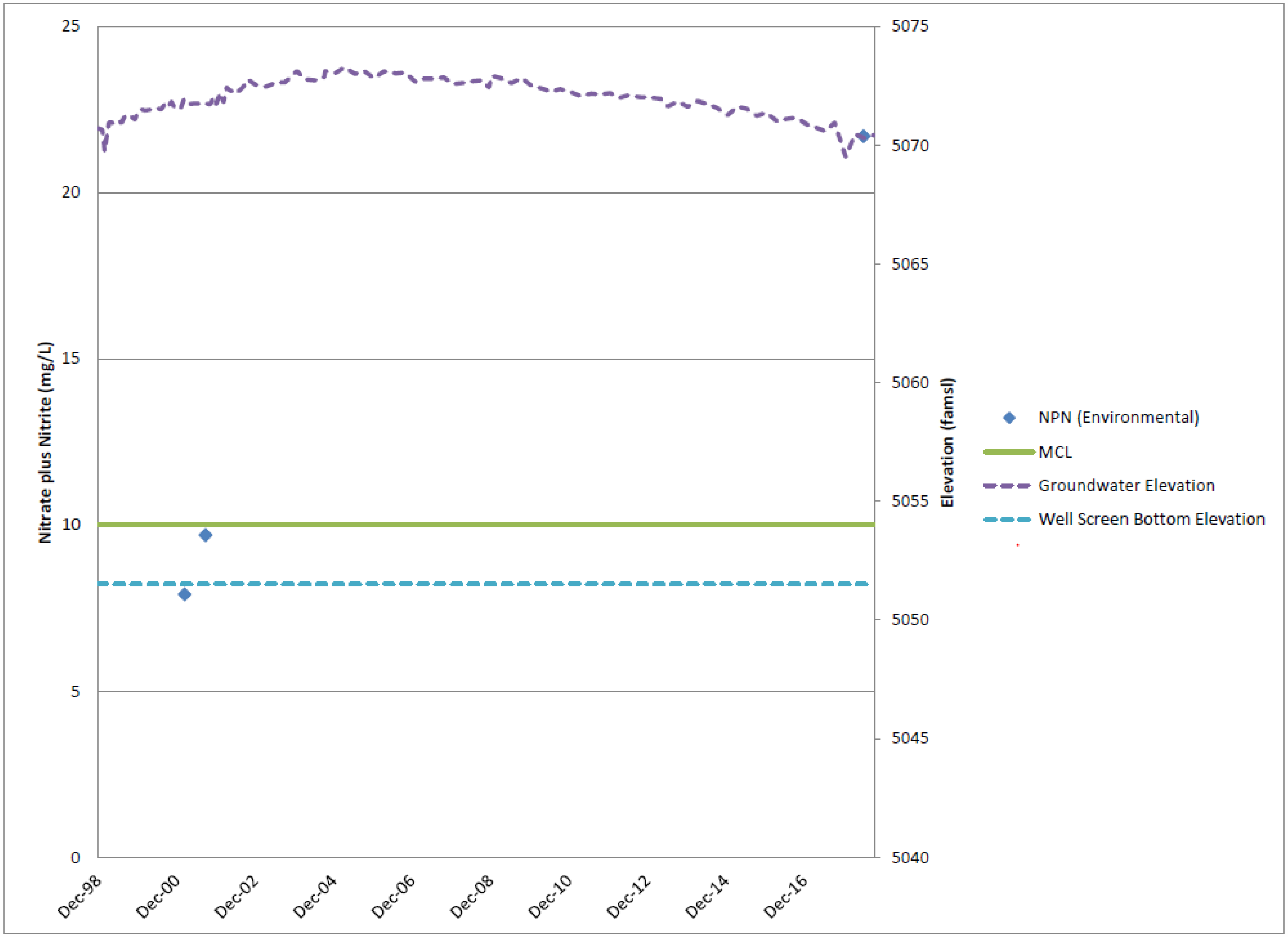

Figure 6D-6. Nitrate plus Nitrite Concentrations, TJA-5

Chapter 6
Tijeras Arroyo Groundwater
References

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AquaVISION July 1999 AquaVISION, July 1999. *Colloidal Borescope Investigation of the Sandia North Site*, Albuquerque, New Mexico, July 21, 1999, 36 pp.

BGW September 2002 Balleau Groundwater, Inc. (BGW), September 2002. *Model of a Perched Zone of Saturation at Sandia National Laboratories, New Mexico,* SAND Report SAND-2011-0005P, prepared for Sandia National Laboratories, Albuquerque, New Mexico by Balleau Groundwater, Inc., Albuquerque, New Mexico, 64 pp.

BGW February 2001 Balleau Groundwater, Inc. (BGW), February 2001. *A Preliminary Three-Dimensional Variably Saturated Model of a Perched Aquifer at Sandia National Laboratories, New Mexico*, prepared for Sandia National Laboratories, Albuquerque, New Mexico by Balleau Groundwater, Inc., Albuquerque, New Mexico.

Brady and Domski 2001 Brady, P.V. and P.S. Domski, 2001. *Geochemical Analysis of Shallow Aquifer System at Sandia North,* Internal report prepared for Sandia National Laboratories, Albuquerque, New Mexico, 24 pp.

CE2 Corporation September 2016 CE2 Corporation, September 2016, E-mail "RE: old TAG release sites," from Cook, N. at CE2 Corporation, Pleasanton, CA, to Copland, J.R. at Sandia National Laboratories, New Mexico, Environmental Operations, Albuquerque, NM, with two attachments: "Notes_HistoricalAirfieldImageryAndDocumentation_20160921.docx" and "Fx_ce16548_TAG_CCM_HistoricalFacilitySites_portrait_v03_20161017.pdf," September 13, 2016.

Collins December 2000 Collins, S., December 2000. *Memo to: All ER Personnel Re: Project Name Change from the "Sandia North Groundwater Investigation" to the "Tijeras Arroyo Groundwater Investigation*," Sandia National Laboratories, Albuquerque, New Mexico.

Copland and Skelly October 2003 Copland, J.R., and M.F. Skelly, October 2003. *Tijeras Arroyo Groundwater (TAG) High Performing Team (HPT) Meeting Notes*, Sandia National Laboratories, Albuquerque, New Mexico, October 16, 2003.

Copland July 2018 Copland, J.R., July 2018. Technical *Memorandum - Assessment and Revision of Coordinates for KAFB Production Wells,*" internal memorandum to S. Collins, Sandia National Laboratories, Albuquerque, New Mexico, July 27.

DOE February 2018 U.S. Department of Energy (DOE), February 2018. Letter to J. Kieling (New Mexico Environment Department, Hazardous Waste Bureau), "Submittal of the Revised Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, February 13.

DOE September 2017 U.S. Department of Energy (DOE), September 2017. Letter to J. Kieling (New Mexico Environment Department), "Request for Extension for Submittal of the Revised Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report in Response to the NMED Disapproval Letter dated May 18, 2017," U.S. Department of Energy, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, September 25, 2017.

DOE December 2016 U.S. Department of Energy (DOE), December 2016. *Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report – December 2016*, U.S. Department of Energy National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico.

DOE November 2016 U.S. Department of Energy (DOE), November 2016. Letter to J. Kieling (New Mexico Environment Department), "Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report – December 2016," U.S. Department of Energy National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 23, 2017.

DOE March 2016 U.S. Department of Energy (DOE), March 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015*, U.S. Department of Energy National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, March 30, 2016.

DOE September 1987 U.S. Department of Energy (DOE), September 1987. *Draft Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment, Sandia National Laboratories, Albuquerque,* U.S. Department of Energy, Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, Albuquerque, New Mexico.

en.wikipedia.org 2016 en.wikipedia.org, 2016. Website https:en.wikipedia.org/wiki/Oxnard_Field, accessed 2016.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations,* EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

Fritts and Van Hart March 1997 Fritts, J.E., and D. Van Hart, March 1997. *Sandia North Geologic Investigation Project Report*, prepared for Sandia National Laboratories Environmental Restoration Project by GRAM, Inc. under Contract AS-4959. March 31, 1997, 28 pp.

Furman 1990 Furman, N.S., 1990. *Sandia National Laboratories – The Postwar Decade*, University of New Mexico Press, Albuquerque, NM, 858 pp.

GRAM and Lettis December 1995 GRAM and Lettis, December 1995. *Conceptual Geologic Model of the Sandia National Laboratories and Kirtland Air Force Base,* prepared for Site-Wide Hydrogeologic Characterization Project, Sandia National Laboratories, Albuquerque, New Mexico by GRAM, Inc., Albuquerque NM and William Lettis & Associates, Inc. Walnut Creek, CA, 2 volumes.

IT January 1997 IT Corporation (IT), January 1997. *Soil Vapor Sampling in Technical Area 2, Boreholes 21, 23, and 20, November – December 1996*, prepared for R. Arnold, Air Force Center for Engineering and the Environment, Environmental Restoration Division by IT Corporation, Albuquerque, New Mexico.

KAFB December 2015 Kirtland Air Force Base (KAFB), December 2015. *Draft Fiscal Year 2015 Long-Term Monitoring Report, ST-105 – Nitrate Contaminated Groundwater*, prepared for Air Force Civil Engineer Center by URS Group Inc. in association with FPM Remediations, Inc.

KAFB March 2013 Kirtland Air Force Base (KAFB), March 2013. Kirtland AFB History Fact Sheet, http://www.kirtland.af.mil/library/factsheets/factsheet.asp?id=20526.

Madrid et al. June 2013 Madrid, V., M.J. Singleton., A. Visser, and B.K. Esser, June 2013. *Summary of Isotopic Data and Preliminary Interpretation of Denitrification and Age-dating for Groundwater Samples from Three Sites at Sandia National Laboratories, New Mexico*, a report to Sandia National Laboratories, New Mexico, Lawrence Livermore National Laboratory, LLNL-SR-636381.

NMED HWB October 2017 New Mexico Environment Department (NMED), October 2017. *Approval: Request for Extension for Submittal of Revised Current Conceptual Model and Corrective Measures Evaluation Report, Sandia National Laboratory [sic] EPA ID#NM5890110518, HWB-SNL-16-020,* October 13, 2017.

NMED HWB May 2017 New Mexico Environment Department (NMED), May 2017. *Disapproval: Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report December 2016, Sandia National Laboratories [sic] EPA ID#NM5890110518, HWB-SNL-16-020,* May 18, 2017.

NMED HWB April 2016 New Mexico Environment Department (NMED), April 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015, March 30, 2016, EPA ID# NM5890110518, HWB-SNL-16-MISC,* April 14, 2016.

NMED HWB January 2015 New Mexico Environment Department (NMED), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED HWB February 2010 New Mexico Environment Department (NMED), February 2010. *Notice of Approval: Tijeras Arroyo Groundwater Investigation Report, November 2005, Sandia National Laboratories EPA ID# NM5890110518, SNL-05-028,* New Mexico Environment Department, Santa Fe, New Mexico, February 22, 2010.

NMED HWB August 2009 New Mexico Environment Department (NMED), August 2009. *Notice of Disapproval: Response to the Notice of Disapproval for the Tijeras Arroyo Groundwater Investigation Report, February 2009, Sandia National Laboratories EPA ID# NM5890110518, SNL-05-028*, New Mexico Environment Department, Santa Fe, New Mexico, August 12, 2009.

NMED HWB August 2008 New Mexico Environment Department (NMED), August 2008. *Notice of Disapproval: Tijeras Arroyo Groundwater Investigation Report, November 2005, Sandia National Laboratories EPA ID# NM5890110518, SNL-05-028*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED HWB October 2004 New Mexico Environment Department (NMED), October 2004. *Approval with Modifications: Corrective Measures Evaluation Work Plan for Tijeras Arroyo Groundwater, July 2004, Sandia National Laboratories NM5890110518, HWB-SNL-04-036*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED April 2004 New Mexico Environment Department (NMED), 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

NMED HWB September 2003 New Mexico Environment Department (NMED), 2003. *Notice of Approval: Tijeras Arroyo Groundwater Investigation Work Plan, June 2003, Sandia National Laboratories, NM5890110518-1, HWB-SNL-03-006*, New Mexico Environment Department, Santa Fe, New Mexico, September 3, 2003.

Skelly et al. August 2018 Skelly, M. F., Jackson, T. O., Lynch, R. M., and Gibson, W.J., August 2018. "Technical Memorandum – Field Report on the Slug Testing Activities at Tijeras Arroyo Groundwater Area of Concern Groundwater Monitoring Well TA2-W-28," internal memorandum to John Copland, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, August 3.

Skelly November 2006 Skelly, M.F., November 2006. "Field Report – Plug and Abandonment of Vadose Monitoring Wells RB-11/RW-06 and TAG-SV03," internal memorandum to Paul Freshour, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, November 28.

Skelly et al. May 2004 Skelly, M.F., S. Griffith, R. Lynch, and G. Quintana, May 2004. "Technical Memorandum—Field Report on the Slug Tests at Tijeras Arroyo Geologic Groundwater Investigation Wells," prepared for U.S. Department of Energy, Albuquerque Operations Office by Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2018 Sandia National Laboratories, New Mexico (SNL/NM), February 2018. *Revised Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2018 Sandia National Laboratories, New Mexico (SNL/NM), October 2018. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY19, 1st Quarter Sampling*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2018 Sandia National Laboratories, New Mexico (SNL/NM), July 2018. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY18, 4th Quarter Sampling*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2018 Sandia National Laboratories, New Mexico (SNL/NM), June 2018. A*nnual Groundwater Monitoring Report, Calendar Year 2017, June 2018*, Sandia National Laboratories, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2017 Sandia National Laboratories, New Mexico (SNL/NM), June 2017. A*nnual Groundwater Monitoring Report*, *Calendar Year 2016*, *June 2017*, Sandia National Laboratories, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL May 2018 Sandia National Laboratories, New Mexico (SNL/NM), May 2018. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY18, 3rd Quarter Sampling,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2018 Sandia National Laboratories, New Mexico (SNL/NM), January 2018. *Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY18, 2nd Quarter Sampling,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL December 2016 Sandia National Laboratories, New Mexico (SNL/NM), December 2016. *Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2015 Sandia National Laboratories, New Mexico (SNL/NM), September 2015. *Current Conceptual Model for Technical Area V Groundwater Area of Concern at Sandia National Laboratories, New Mexico*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2015 Sandia National Laboratories, New Mexico (SNL/NM), April 2015. *Installation of Groundwater Monitoring Wells CYN-MW14A, CYN-MW15, and TA2-W-28, and the Decommissioning of Groundwater Monitoring Well TA2-SW1-320*, Environmental Restoration Operations and Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2013 Sandia National Laboratories, New Mexico (SNL/NM), March 2013. *Installation of Replacement Monitoring Well CYN-MW13 at the Burn Site Groundwater Study Area and the Decommissioning of Three Groundwater Monitoring Wells at the Burn Site, Eight Groundwater and Soil-Vapor Monitoring Wells at the Chemical Waste Landfill, and Eight FLUTe™ Soil-Vapor Monitoring Wells at Various SWMUs and DSS Sites*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2010 Sandia National Laboratories, New Mexico (SNL/NM), January 2010. *Response to NMED's "Notice of Disapproval: Tijeras Arroyo Groundwater Investigation Report, November 2005" Dated February 2009*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, January 19, 2010.

SNL February 2009 Sandia National Laboratories, New Mexico (SNL/NM), February 2009. *Response to NMED's "Notice of Disapproval: Tijeras Arroyo Groundwater Investigation Report, November 2005" Dated August 2008*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, February 26, 2009.

SNL November 2005 Sandia National Laboratories, New Mexico (SNL/NM), November 2005. *Tijeras Arroyo Groundwater Investigation Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL August 2005 Sandia National Laboratories, New Mexico (SNL/NM), August 2005. *Corrective Measures Evaluation Report for Tijeras Arroyo Groundwater*, SAND Report SAND2005-5297, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL November 2004 Sandia National Laboratories, New Mexico (SNL/NM), November 2004. *Corrective Measures Evaluation Work Plan, Tijeras Arroyo Groundwater*, SAND Report SAND2004-3247P, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2004 Sandia National Laboratories, New Mexico (SNL/NM), July 2004. *Corrective Measures Evaluation Work Plan, Tijeras Arroyo Groundwater*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2003 Sandia National Laboratories, New Mexico (SNL/NM), June 2003. *Tijeras Arroyo Groundwater Investigation Work Plan (Final Version)*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2003 Sandia National Laboratories, New Mexico (SNL/NM), October 2003. "Drain and Septic Systems (DSS) Soil Vapor Well Sample Results," internal memo, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, October 27, 2003.

SNL November 2002 Sandia National Laboratories, New Mexico (SNL/NM), November 2002. *Tijeras Arroyo Groundwater Continuing Investigation Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL August 2001 Sandia National Laboratories, New Mexico (SNL/NM), August 2001. *Environmental Restoration Project Operational Report: Tijeras Arroyo Groundwater Analysis of Pressure Transducer Monitoring Data Investigation*, prepared by D. Chace, August 20, 2001, 44 pp.

SNL February 2001 Sandia National Laboratories, New Mexico (SNL/NM), February 2001. *Environmental Restoration Project Long-Term Monitoring Strategy for Groundwater,* Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2000 Sandia National Laboratories, New Mexico (SNL/NM), June 2000. *Sandia North Groundwater Investigation, Annual Report, Fiscal Year 1998*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1998 Sandia National Laboratories, New Mexico (SNL/NM), March 1998. *Sandia North Groundwater Investigation, Annual Report, Fiscal Year 1997*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), February 1998. *Revised Conceptual Geologic Model of the Sandia National Laboratories and Kirtland Air Force Base, prepared for Site-Wide Hydrogeologic Characterization Project, Sandia National Laboratories, Albuquerque, New Mexico,* prepared for Sandia National Laboratories, Albuquerque, New Mexico by GRAM, Inc., Albuquerque, NM and William Lettis & Associates, Inc. Walnut Creek, CA, 2 volumes.

SNL March 1996a Sandia National Laboratories, New Mexico (SNL/NM), March 1996a. *Sandia North Groundwater Investigation Plan*, Sandia National Laboratories, Environmental Restoration Project, Albuquerque, New Mexico.

SNL March 1996b Sandia National Laboratories, New Mexico (SNL/NM), March 1996b. *Groundwater Protection Program, Calendar Year 1995 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1995a Sandia National Laboratories, New Mexico (SNL/NM), March 1995. *Site-Wide Hydrogeologic Characterization Project, Calendar Year 1994 Annual Report*, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1995b Sandia National Laboratories, New Mexico (SNL/NM), March 1995. *Groundwater Protection Program, Calendar Year 1994 Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

Stone et al. February 2000 Stone, B.D., J.C. Cole, and D.A. Sawyer, February 2000. "Regional Stratigraphic Framework for an Integrated Three-Dimensional Geologic Model of the Rio Grande Rift," in *U.S. Geological Survey, Middle Rio Grande Basin Study—Proceedings of the Fourth Annual Workshop, Albuquerque, New Mexico*, February 15-16, 2000, Open File Report 00-488. U.S. Geological Survey, Albuquerque, New Mexico.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico*, SAND Report SAND2003-1869, prepared for Sandia National Laboratories, Albuquerque, New Mexico.

Van Hart June 2001	Van Hart, D., June 2001. *Shallow Groundwater System Investigation: Tijeras Arroyo and Vicinity*, prepared for the Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.
Van Hart et al. October 1999	Van Hart, D., D.A. Hyndman, and S.S. Brandwein, October 1999. *Analysis of the USGS Isleta/Kirtland Air Force Base Aeromagnetic Survey for Application to SNL/KAFB Area Geologic Structure*, prepared for the Groundwater Protection Program/Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico, October 15, 1999.
Wolford September 1996	Wolford R., September 1996. *Hydrologic Evaluation of a Perched Aquifer near TA-II Tijeras Arroyo: Estimating Aquifer Parameters, Water Travel Times, and Possible Sources of Recharge in the Perched Zone. Site-Wide Hydrogeologic Characterization Project, Environmental Restoration Program, SNL/NM*, prepared for Sandia National Laboratories, Albuquerque, New Mexico by GRAM, Inc., Albuquerque NM, 61 pp.
www.airfields-freeman.com 2016	www.airfields-freeman.com, 2016. Website http://www.airfields-freeman.com/NM/Airfields_NM_Albuquerque.htm., Freeman, P., *Abandoned & Little-Known Airfields*, accessed 2016.
www.econtent.unm.edu 2016	www.econtent.unm.edu, 2016. Website http://www.econtent.unm.edu/cdm/search/collection, accessed 2016.
www.militarymedia inc.com 2016	www.militarymediainc.com 2016. Website http://www.militarymediainc.com/kirtland/history.html, accessed 2016.

7.0 Burn Site Groundwater Area of Concern

7.1 Introduction

The Burn Site Groundwater (BSG) Area of Concern (AOC), located in the Manzanita Mountains (Figure 7-1). Nitrate has been identified as a constituent of concern (COC) in groundwater based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) in samples collected from several monitoring wells. Since August 1998, the maximum concentration of nitrate detected has been 44.9 milligrams per liter (mg/L). The EPA MCL and State of New Mexico drinking water standard for nitrate (as nitrogen) is 10 mg/L.

Perchlorate has been detected in one groundwater monitoring well, and its replacement well, in the BSG AOC. Currently, there is no EPA MCL or State of New Mexico drinking water standard for perchlorate. However, Section IV.B of the Compliance Order on Consent (Consent Order) stipulates that a select group of groundwater monitoring wells are to be sampled for perchlorate using a screening level/method detection limit (MDL) of 4 micrograms per liter (μg/L) [New Mexico Environment Department (NMED) April 2004]. Furthermore, the Consent Order requires that for detections equal to or greater than 4 μg/L, the U.S. Department of Energy (DOE)/National Nuclear Security Administration (NNSA), and Sandia National Laboratories, New Mexico (SNL/NM) personnel will evaluate the nature and extent of perchlorate contamination in groundwater. Since perchlorate monitoring began in March 2006, the maximum concentration of perchlorate in groundwater at the BSG AOC has been 8.93 μg/L.

7.1.1 Location

The Coyote Canyon Test Area is located in the eastern portion of Kirtland Air Force Base (KAFB). The Burn Site is located in Lurance Canyon, one of three canyons that are located on the eastern edge of the Coyote Canyon Test Area and within the Manzanita Mountains. Two other canyons, Madera Canyon and Sol se Mete Canyon, intersect Lurance Canyon to the west of the Burn Site. These three canyons are the headwaters of Arroyo del Coyote, which is a tributary to Tijeras Arroyo. Testing activities at the Lurance Canyon Burn Facility, which includes the Burn Site, began in 1967.

The BSG AOC is located along the eastern margin of the Albuquerque Basin, and the terrain is characterized by large topographic relief, exceeding 500 feet (ft). Lurance Canyon, deeply incised into Paleozoic and Precambrian rocks, provides local westward drainage of ephemeral surface water flows to Arroyo del Coyote.

7.1.2 Site History

Groundwater issues at the BSG AOC are primarily associated with two Solid Waste Management Units (SWMUs). The Lurance Canyon Burn Site (SWMU 94) and the nearby Lurance Canyon Explosive Test Site (SWMU 65) have been used since 1967. The majority of the operational activities involved testing the fire survivability of transportation containers, weapon components, simulated weapons, and satellite components. Historical operations (Attachment 7A, Table 7A-1) include open detonation of high explosive (HE) compounds and ammonium-nitrate slurry along with the open burning of HE compounds, liquid propellants, and solid propellants. Most HE testing occurred between 1967 and 1975 and was completely phased out by the 1980s.

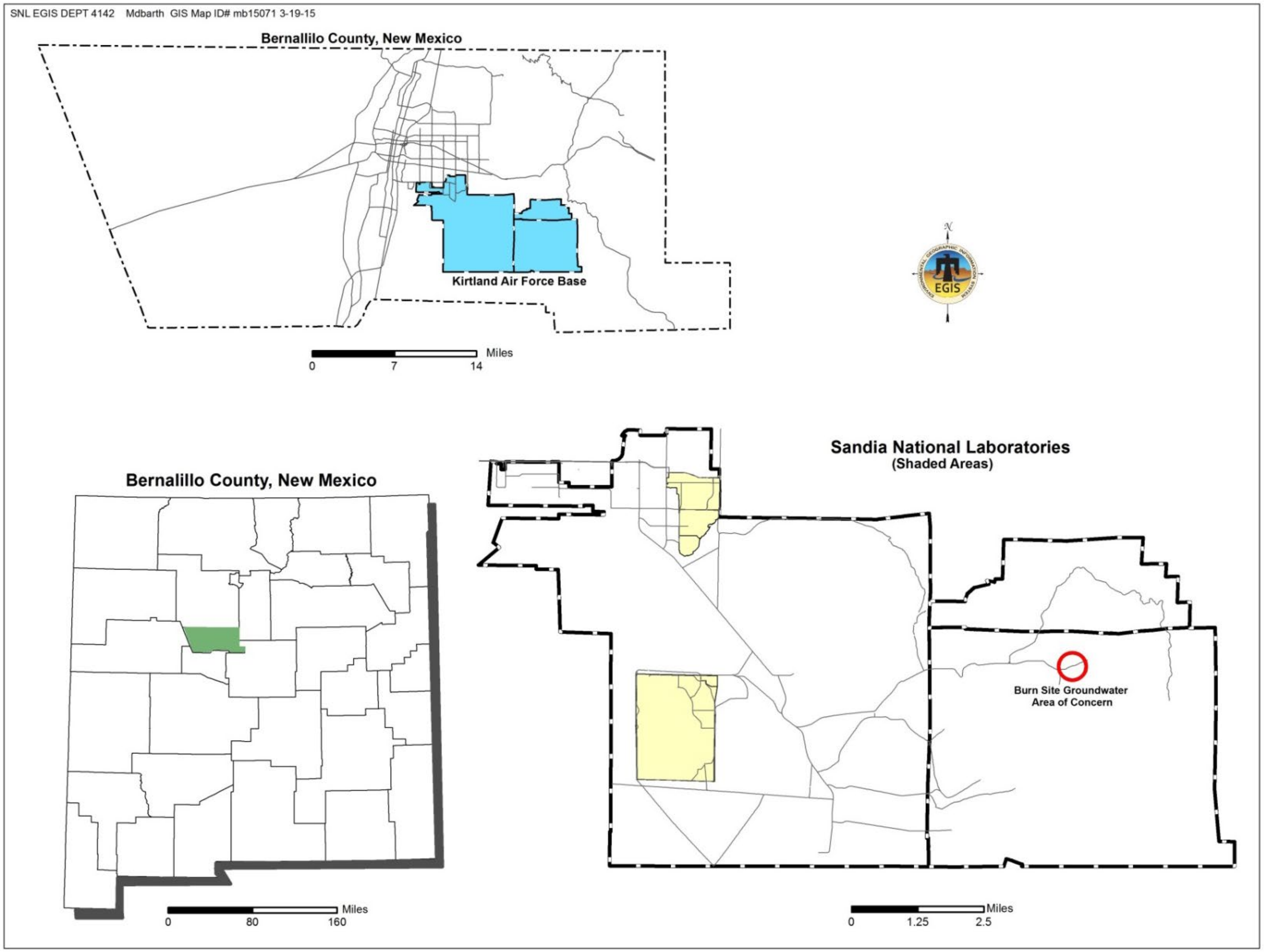

Figure 7-1. Location of the Burn Site Groundwater Area of Concern

Burn testing began in the early 1970s and has continued to the present. Early burn testing was conducted in unlined pits excavated in native soil and alluvium. By 1975, portable steel burn pans were used for open burning, mostly using jet propellant, fuel grade 4 (JP-4). Several engineered structures, such as the Light Air Transport Accident Resistant Container Unit, were used at the Burn Site. The structures mostly used JP-4 and occasionally used diesel fuel and gasoline to create the high temperatures associated with transportation accidents. In the mid-1990s, jet propellant, fuel grade 8 replaced JP-4 as the petroleum fuel used for burn tests. Most test structures have been dismantled. The only remaining test cell is the Fire Laboratory for Accreditation of Modeling by Experiment. Portable burn pans up to 25 ft in diameter are occasionally used.

7.1.3 Monitoring History

Groundwater samples collected during 1996 from the Burn Site Well (a non-potable water supply well used for fire suppression) contained elevated concentrations of nitrate (maximum of 27 mg/L in August 1996). In 1997, the NMED Hazardous Waste Bureau, DOE, and SNL/NM personnel agreed to investigate the source of this contamination. Later in 1997, monitoring wells CYN-MW1D and CYN-MW2S were installed downgradient of the Burn Site Well (Table 7-1). Samples from monitoring well CYN-MW1D contained nitrate concentrations exceeding the EPA MCL. Two more monitoring wells, CYN-MW3 and CYN-MW4, were installed between 1999 and 2001 to further characterize the study area. Based on regulatory requirements, monitoring wells CYN-MW6, CYN-MW7, and CYN-MW8 were installed from 2005 through 2006. Figure 7-2 shows the current BSG AOC groundwater monitoring network.

Table 7-1. Groundwater Monitoring Wells at the Burn Site Groundwater Area of Concern

Well	Installation Year	WQ	WL	Comments
12AUP01	1996			Alluvial-underflow monitoring well, plugged and abandoned in November 2012
Burn Site Well	1986		√	Non-potable bedrock water supply well, inactive since 2003
CYN-MW1D	1997			Bedrock groundwater well, plugged and abandoned in November 2012
CYN-MW2S	1997			Alluvial-underflow monitoring well, plugged and abandoned in November 2012
CYN-MW3	1999		√	Bedrock groundwater well
CYN-MW4	1999	√	√	Bedrock groundwater well
CYN-MW6	2005		√	Bedrock groundwater well
CYN-MW7	2005	√	√	Bedrock groundwater well
CYN-MW8	2006	√	√	Bedrock groundwater well
CYN-MW9	2010	√	√	Bedrock groundwater well
CYN-MW10	2010	√	√	Bedrock groundwater well
CYN-MW11	2010	√	√	Bedrock groundwater well
CYN-MW12	2010	√	√	Bedrock groundwater well
CYN-MW13	2012	√	√	Bedrock groundwater well, replaced CYN-MW1D
CYN-MW14A	2014	√	√	Bedrock groundwater well
CYN-MW15	2014	√	√	Bedrock groundwater well, replacement for CYN-MW6

NOTES:

Check marks in the WQ and WL columns indicate WQ sampling and WL measurements were obtained during this reporting period.

CYN = Canyons.
MW = Monitoring well.
WL = Water level.
WQ = Water quality.

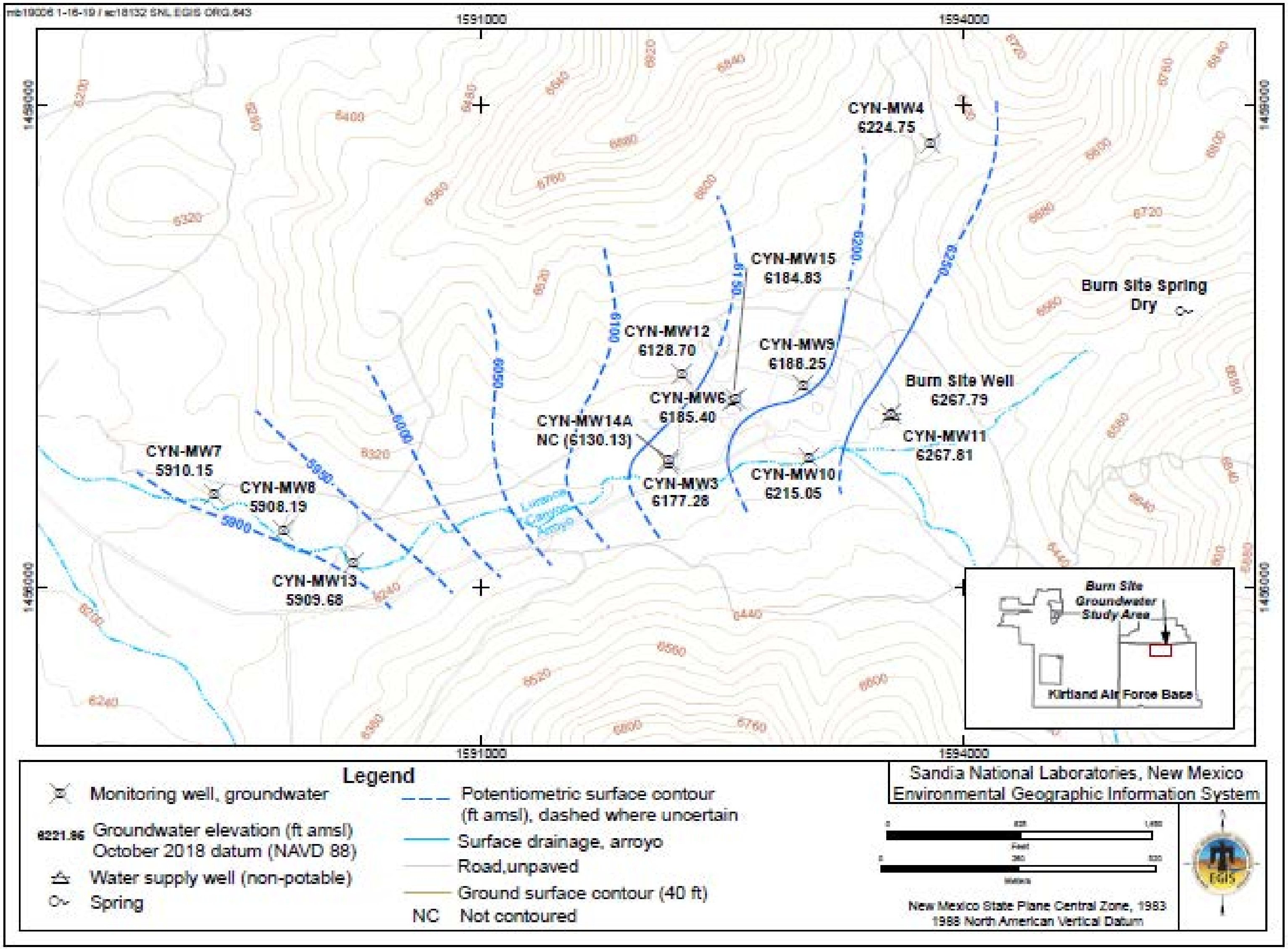

Figure 7-2. Localized Potentiometric Surface of the Burn Site Groundwater Area of Concern (October 2018)

Previous monitoring reports include analytical results for monitoring well CYN-MW5. Groundwater monitoring well CYN-MW5 was installed at SWMU 49 in 2001 as part of the investigation of Drain and Septic System sites. This monitoring well was sampled for eight quarters as part of the Drain and Septic System investigation and was incorporated into the BSG AOC investigation as a downgradient well. However, in its February 2005 letter, the NMED stated that it "will not consider monitoring well CYN-MW5 as a downgradient well because it is located over two miles away from the Burn Site" (NMED February 2005). Based on the NMED determination, monitoring well CYN-MW5 has not been sampled as part of the BSG AOC investigation since the third quarter of Fiscal Year 2005.

Since the initial discovery of nitrate at the BSG AOC, numerous characterization activities have been conducted (Attachment 7A, Table 7A-1). The results of these characterization activities are summarized in the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site* (SNL June 2004a) and subsequent update (SNL April 2008a); that report provides a comprehensive list of groundwater monitoring data sources used to support the summary of investigations.

In April 2004, the Consent Order became effective, and the Consent Order specifies the Burn Site as an area of groundwater contamination. In response to the Consent Order, the BSG AOC Corrective Measures Evaluation (CME) Work Plan was submitted to the NMED in June 2004 (SNL June 2004b). Based on requirements stipulated by the NMED (discussed in Section 7.2), the BSG Interim Measures Work Plan (IMWP) was submitted (SNL May 2005) on May 30, 2005. As detailed in the IMWP, three monitoring wells (CYN-MW6, CYN-MW7, and CYN-MW8) were installed near the Burn Site during December 2005 to January 2006. Quarterly sampling for eight quarters began for these three monitoring wells in March 2006 and was completed in December 2007. Samples from the two monitoring wells (CYN-MW7 and CYN-MW8) located downgradient of CYN-MW1D were analyzed for nitrate and other analytes. Groundwater samples from monitoring well CYN-MW6 (adjacent to SWMU 94F) were analyzed for nitrate, total petroleum hydrocarbons as gasoline range organics (GRO), diesel range organics (DRO), and other parameters. Groundwater monitoring programs have continued as outlined in the IMWP.

Based on a letter received from the NMED (NMED April 2009), DOE/NNSA and SNL/NM personnel were required to further characterize the nature and extent of the perchlorate contamination at the BSG AOC. The BSG Characterization Work Plan (SNL November 2009) was submitted and then conditionally approved by the NMED (NMED February 2010). In July 2010, the requirements of the work plan were implemented and four groundwater monitoring wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) were installed to determine the extent of groundwater contamination. These four wells were sampled for the first time in September 2010.

In February 2012, a work plan was submitted by DOE/NNSA and SNL/NM personnel to decommission three obsolete groundwater monitoring wells (12AUP01, CYN-MW1D, and CYN-MW2S); and install a replacement groundwater monitoring well, CYN-MW13 (SNL February 2012). Monitoring wells 12AUP01 and CYN-MW2S were screened at the contact of unconsolidated coarse sand and gravel (alluvium) and the underlying bedrock. Although alluvium at this contact was dry during drilling, these wells were installed in anticipation of recharge occurring after rainfall events. However, these wells were consistently dry. Monitoring well CYN-MW1D was constructed with a nonstandard completion (low carbon steel screen and riser pipe), had very turbid water, and exhibited erratic nitrate concentrations. A video log showed that the well was heavily corroded. In April 2012, the NMED approved the work plan (NMED April 2012); the three monitoring wells (12AUP01, CYN-MW1D, and CYN-MW2S) were decommissioned in November 2012; and replacement monitoring well CYN-MW13 was installed in December 2012 near well CYN-MW1D.

In August 2013, DOE/NNSA and SNL/NM personnel submitted an Extension Request to the NMED for the BSG CME Report to March 31, 2013 (DOE August 2013). DOE/NNSA and SNL/NM personnel requested the extension for consideration of recently collected groundwater sample analytical results from replacement well CYN-MW13 that could impact the CME Report.

In October 2013, DOE Office of Environmental Management submitted the BSG AOC Internal Remedy Review memorandum to the DOE/NNSA Sandia Field Office (DOE October 2013). This memorandum stated that more characterization activities should be conducted at the BSG AOC before a CME could be prepared. The Internal Remedy Review recommended a weight of evidence approach to determine the source(s) of nitrate contamination.

In September 2013, a work plan for the installation of two groundwater monitoring wells was submitted (SNL September 2013a), and in June 2014 the work plan was approved by NMED (NMED June 2014a). The work plan discussed the need for installing two replacement wells (CYN-MW14 and CYN-MW15) because of declining groundwater levels at the Burn Site. Monitoring well CYN-MW14 was planned to replace CYN-MW3, whereas well CYN-MW15 was planned to replace CYN-MW6. In December 2014, monitoring wells CYN-MW14A (note the 'A' suffix) and CYN-MW15 were installed (SNL April 2015). The installation of a direct replacement for well CYN-MW3 was not possible because the shallow water-bearing fracture zone was not encountered by either of two nearby boreholes. A deeper-than-planned well, CYN-MW14A, was installed near CYN-MW3. The replacement well CYN-MW15 was installed as planned (at a similar water-bearing fracture depth) near well CYN-MW6.

7.1.4 Current Monitoring Network

Currently 12 monitoring wells in the BSG AOC are in place to monitor for water levels and water quality, including CYN-MW3, CYN-MW4, CYN-MW6, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15 (Figure 7-2). However, monitoring well CYN-MW3 was dry, and CYN-MW6 did not produce adequate water volume during both Calendar Year (CY) 2018 sampling events.

7.1.5 Summary of Calendar Year 2018 Activities

The following activities were performed for the BSG AOC during CY 2018:

- Conducted semiannual groundwater sampling at monitoring wells CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15 in April and October/December 2018.

- Prepared tables of analytical results (Attachment 7B), concentration versus time graphs (Attachment 7C), and hydrographs (Attachment 7D) in support of this report.

- The NMED approved the Aquifer Pumping Test Report (NMED January 2018).

- Proposed recommendations for additional site characterization to the NMED (DOE June 2018).

- The NMED disapproved the proposed recommendations and required the submittal of a Well Installation Work Plan (NMED June 2018).

7.1.6 Conceptual Site Model

The BSG AOC groundwater flow is controlled by the local geologic framework and structural features described in the following sections.

7.1.6.1 Regional Hydrogeologic Conditions

The Manzanita Mountains are composed of a complex sequence of uplifted Precambrian metamorphic and granitic units that were subjected to several episodes of significant deformation. These units are capped by Paleozoic sandstones, shales, and limestones of the Sandia, Gray Mesa, and Atrasado Formations (the Gray Mesa and Atrasado Formations are part of the Madera Group; Kues 2001). The geologic history of the Manzanita Mountains is thoroughly described in the *Groundwater Investigation, Canyons Test Area, Operable Unit 1333, Burn Site, Lurance Canyon* (SNL November 2001) and utilizes the model presented by Brown et al. (1999). The local geology is also summarized in the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site* (SNL April 2008a).

Groundwater in the Manzanita Mountains predominantly occurs in fractured metamorphic and intrusive units that consist of metavolcanics, quartzite, metasediments (schists and phyllites), and the Manzanita Granite. Groundwater migrates through bedrock fractures in a generally westward direction. The only perennial spring in the immediate area, the Burn Site Spring (Figure 7-2), is located upgradient and upslope of the testing facilities at a limestone outcrop. No flow has been observed at this spring since 2007. The matrix permeability of the fractured bedrock units is low, and most groundwater is produced from discontinuous water-bearing fracture zones. Groundwater discharges to small ephemeral springs located at the base of the Manzanita Mountains approximately 3 miles west of the Burn Site. The groundwater from these springs at the base of the Manzanita Mountains is of a different geochemical character than that under the BSG AOC. Additionally, some groundwater may discharge as underflow to unconsolidated sedimentary deposits of the Albuquerque Basin after crossing the Tijeras Fault Zone.

The Precambrian metamorphic rocks (predominantly schists and phyllite) and the Precambrian intrusive rocks (predominantly granitic gneiss) are typically fractured as a result of the long and complex history of regional deformation. Drill core data and outcrop exposures indicate that some fractures in shallow bedrock are filled with chemical precipitates, such as calcium carbonate. The carbonate precipitation likely occurred when the water table was regionally elevated prior to the development of the Rio Grande. As chemical precipitates filled the fractures, permeability was effectively reduced, possibly creating a semiconfined unit above underlying bedrock with open fractures.

The Burn Site is bisected by a north-south trending system of faults, consisting locally of several high angle normal faults that are mostly downfaulted to the east. Faults (where exposed) are characterized by zones of crushing and brecciation. The Burn Site Fault trends north to south in the vicinity of the Burn Site Well and monitoring well CYN-MW4. Nearby outcrops indicate that the fault displacement is approximately 160 ft (SNL June 2004a).

The BSG AOC canyon floor consists of unconsolidated alluvium over bedrock. These deposits typically are sand and gravel derived from erosion of upslope colluvium and bedrock. These alluvial deposits range in thickness from 21 to 55 ft as evidenced in boreholes drilled at the BSG AOC. The alluvial deposits pinch-out nearby along the steep canyon slopes.

7.1.6.2 Hydrogeologic Conditions at the Burn Site Groundwater Area of Concern

When the Burn Site Well was installed in 1986, the depth to the groundwater bearing fracture zone was approximately 222 ft below ground surface. Following completion of the well in fractured bedrock, the water level rose approximately 154 ft above the groundwater bearing fracture zone due to positive head. The fractured rocks of the Manzanita Mountains are recharged by infiltration of precipitation, largely occurring from summer thundershowers and, to a lesser degree, winter snowfall on the higher elevations. Groundwater recharge is restricted by high evapotranspiration rates (losses to the atmosphere by evaporation and plant transpiration), the low-permeability of the bedrock matrix, and the discontinuous nature of the bedrock fractures.

Regionally, groundwater in the western Manzanita Mountains flows generally toward the west from a groundwater flow divide located east of the BSG AOC. Groundwater flow along Lurance Canyon discharges primarily as direct underflow to the unconsolidated basin fill deposits of the Albuquerque Basin. Based on field observations, some discharge also occurs at ephemeral and perennial springs along the mountain front. Much of the flow that discharges from these springs undergoes evapotranspiration. Some flow from the springs infiltrates nearby alluvial deposits.

Annual precipitation in the Manzanita Mountains occurs in the form of rainfall and minor snowfall. Most precipitation falls between July and October, mainly in the form of brief, heavy rain showers. The average annual precipitation in this drainage basin is estimated to range between 12 and 16 inches (SNL April 2008a). Potential evapotranspiration in the Albuquerque area greatly exceeds precipitation. Because much of the rainfall in the Lurance Canyon drainage occurs during the summer, losses to evapotranspiration are high. A small percentage of precipitation may infiltrate into the exposed bedrock, or into alluvial deposits along the canyon floor.

Ephemeral surface water flows occur in response to precipitation in the drainage basin. In 1997, two monitoring wells (CYN-MW2S and 12AUP01) were constructed in Lurance Canyon to monitor presumed water levels within the channel deposits at the contact with underlying Precambrian bedrock. No groundwater was detected in either shallow monitoring well until September 2, 2004. After a series of rain events, between 1 and 2 inches of water were measured in monitoring well 12AUP01. The water level remained constant for about one month. However, no water was measured in monitoring well 12AUP01 since 2005 and no groundwater had ever been measured in monitoring well CYN-MW2S. Both of these wells were plugged and abandoned in 2012 (SNL March 2013). It is likely that significant saturation in the alluvium occurs only after a series of significant rain events. Episodic accumulation of precipitation may provide a mechanism for recharging the brecciated fault zones and non-cemented fractures in the underlying bedrock.

7.1.6.3 Local Direction of Groundwater Flow

Figure 7-2 presents the October 2018 potentiometric surface for the BSG monitoring well network, and Table 7-2 presents the data used to construct the potentiometric surface map. The general direction of groundwater flow beneath the BSG AOC is to the west-southwest as inferred from the potentiometric surface. No water supply wells are located near the BSG AOC, except for the Burn Site Well that was used only rarely (last pumped in 2003) for non-potable applications, such as for fire suppression in testing structures and for fuel pool tests. The submersible pump was removed from the well in December 2014. Groundwater levels in the Paleozoic and Precambrian bedrock near the BSG AOC are not influenced by water supply well pumping from the basin fill deposits of the Albuquerque Basin (Regional Aquifer), which are located to the west of the Tijeras Fault Zone.

The apparent horizontal groundwater gradient based on BSG monitoring wells varies from approximately 0.08 to 0.18 feet per foot (ft/ft). Figure 7-2 shows the potentiometric surface, which infers an average horizontal gradient of approximately 0.1 ft/ft in the semiconfined to confined bedrock fracture system. The horizontal gradient west of the BSG AOC flattens substantially (Plate 1).

The variability of hydraulic gradients in Lurance Canyon indicates that localized controls are associated with brecciated fault zones in the low-permeability fractured bedrock at the BSG AOC. Limited groundwater flow velocity information is based on COC first arrival estimates. Based on petroleum fuel releases from SWMU 94F arriving at monitoring well CYN-MW1D, the minimum apparent velocity of the COCs was initially estimated to be approximately 160 feet per year (SNL April 2008a). However, recent geochemical studies indicate that inferring such a groundwater velocity may not be valid because fracture connectivity may be limited. No information is available about vertical flow velocity within the fractured rocks at the BSG AOC. However, vertical movement of groundwater within the brecciated fault zones probably occurs as rapid, partially saturated to saturated flow. Filled fractures within the upper portion of the metamorphic and intrusive rocks may act as a semiconfined unit restricting vertical flow. These concepts were corroborated by an aquifer pumping test conducted in March 2017 that showed there is significant compartmentalization of groundwater into distinct hydraulic domains, such that portions of the bedrock aquifer are unconfined and respond to precipitation infiltration, whereas other portions are semi-confined to confined. Some faults and fractures are sealed and act as barriers to groundwater flow (SNL December 2017).

Table 7-2. Groundwater Elevations Measured in October 2018 at Monitoring Wells Completed in the Fractured Bedrock System at the Burn Site Groundwater Area of Concern

Well ID	Measuring Point (ft amsl) NAVD 88	Date Measured	Depth to Water (ft btoc)	Water Elevation (ft amsl)
Burn Site Well	6374.66	01-Oct-2018	106.87	6267.79
CYN-MW3	6313.26	01-Oct-2018	135.98	6177.28
CYN-MW4	6455.48	01-Oct-2018	230.73	6224.75
CYN-MW6	6343.37	01-Oct-2018	157.97	6185.40
CYN-MW7	6216.35	01-Oct-2018	306.20	5910.15
CYN-MW8	6230.11	01-Oct-2018	321.92	5908.19
CYN-MW9	6360.67	01-Oct-2018	172.42	6188.25
CYN-MW10	6345.45	01-Oct-2018	130.40	6215.05
CYN-MW11	6374.41	01-Oct-2018	106.60	6267.81
CYN-MW12	6345.16	01-Oct-2018	216.46	6128.70
CYN-MW13	6237.79	01-Oct-2018	328.11	5909.68
CYN-MW14A	6315.85	01-Oct-2018	185.72	6130.13
CYN-MW15	6344.44	01-Oct-2018	159.61	6184.83

NOTES:

amsl = Above mean sea level.
btoc = Below top of casing.
CYN = Canyons.
ft = Feet.
ID = Identifier.
MW = Monitoring well.
NAVD 88 = North American Vertical Datum of 1988.

Water levels have been routinely monitored in BSG monitoring wells since 1999. Figures 7D-1 through 7D-9 (hydrographs, Attachment 7D) show groundwater levels in BSG wells that are completed in bedrock. There are no active water supply wells in the area and there are no substantial seasonal variations in water levels in these wells. The wide range of hydraulic gradients in Lurance Canyon and the lack of correlation between water level fluctuations in these wells support the assessment that the BSG AOC low-permeability fractured groundwater system is poorly interconnected. Water level fluctuations may be a result of local heterogeneities in hydraulic properties related to the water-bearing fracture zones. The BSG monitoring wells in the lower portion of the canyon (CYN-MW7, CYN-MW8, and CYN-MW13) exhibit little variability with a steady decline of approximately 0.75 feet per year (Figure 7D-4). The BSG monitoring wells in the upper portion of the canyon, most notably at monitoring wells CYN-MW9, CYN-MW10, and CYN-MW11, showed significant increases in groundwater levels during a two-year interval starting in early 2014, apparently in response to intense thunderstorms in the 2014 and 2015 monsoon seasons. Water levels in these three wells rebounded by 14.79 to 19.65 ft between July 2014 and October 2015 (Figures 7D-5 through 7D-7). However, these three wells and the remaining BSG wells currently show declining groundwater elevations of three or more feet per year (Figures 7D-1 through 7D-3, 7D-8, and 7D-9).

7.1.6.4 Contaminant Sources

Nitrate in the BSG AOC may be derived from both natural and anthropogenic sources. The NMED-specified background concentration for nitrate in groundwater is 4 mg/L (Dinwiddie September 1997). Potential natural sources include the weathering of rocks, atmospheric deposition, and the grading of soils and alluvium. Evaporation and transpiration of rainwater that has infiltrated canyon alluvial sediments might have increased nitrate concentrations. Potential anthropogenic nitrate sources include the use of ammonium-nitrate slurry, wastewater discharges, and the degradation of HE compounds. SNL/NM personnel have conducted several soil sampling events in the BSG AOC to identify the source of nitrate; however, no conclusive source has been identified, most likely because chemical releases ceased decades ago and precipitation has leached away the nitrate.

Some evidence indicates that evaporation and transpiration may concentrate nitrate in sediments beneath ephemeral drainages in the vicinity of the Manzanita Mountains. This evidence includes nitrate concentrations that exceed the EPA MCL in groundwater beneath these drainages and a chloride to nitrate ratio in groundwater that is similar to the chloride to nitrate ratio in rainfall (McQuillan and Space 1995).

SWMU 65 is located in the center of the BSG AOC and contains open-air detonation areas where nitrate-based explosives were used. The detonations dispersed explosive compounds across the ground surface, and subsequent degradation (weathering) of these explosive compounds most likely released some nitrate. SWMU 94 testing also involved burn tests involving large volumes of ammonium-nitrate slurry, HE compounds (both nitrate-based and plastic explosives), and rocket propellants. Nitrate is highly soluble in water, and precipitation can enhance the migration of nitrate to groundwater. In addition to nitrate, petroleum products were detected in soil samples; therefore, the potential for petroleum fuel products in groundwater was evaluated.

7.1.6.5 Contaminant Distribution and Transport in Groundwater

In October 1991, nitrate was first detected above the EPA MCL of 10 mg/L in groundwater samples from the Burn Site Well. Since the installation of the 10 monitoring wells shown in Table 7-3, nitrate concentrations that exceed the MCL have consistently been detected in groundwater samples. Nitrate concentrations in groundwater samples from monitoring wells CYN-MW4, CYN-MW7, and CYN-MW8 have not exceeded the MCL, and are not included in Table 7-3.

Potential downgradient receptors for the nitrate plume are Coyote Springs, approximately 3 miles west of the BSG AOC, and the Albuquerque Bernalillo County Water Utility Authority and KAFB well fields, located approximately 7 to 12 miles to the west-northwest of the study area. Numerical simulations suggest nitrate concentrations in groundwater would decrease to below the EPA MCL by the time the nitrate reaches Coyote Springs, and to far below MDLs in the Regional Aquifer through dispersion and dilution as the plume moves into the more hydraulically conductive alluvial-fan and Ancestral Rio Grande deposits west of Coyote Springs. Numerical simulations also predict that groundwater travel times exceed 600 years from the study area to the Albuquerque Bernalillo County Water Utility Authority and KAFB well fields (SNL May 2005).

Table 7-3. Summary of Historical Nitrate Concentrations in Groundwater Monitoring Wells that Exceed the MCL[a] at the Burn Site Groundwater Area of Concern

Well	Historical Maximum NPN Concentration (mg/L)	Approximate Distance and Direction from Burn Site Well
Burn Site Well	27.0	Not applicable
CYN-MW1D	28.0	3,400 ft south-southwest
CYN-MW3	14.7	1,400 ft west
CYN-MW6	39.9	1,000 ft west
CYN-MW9	44.9	600 ft west-northwest
CYN-MW10	21.8	600 ft west-southwest
CYN-MW11	25.4	10 ft south
CYN-MW12	20.2	1,300 ft west-northwest
CYN-MW13	39.5	3,400 ft south-southwest
CYN-MW14A	15.7	1,400 ft west
CYN-MW15	29.8	1,000 ft west

NOTES:
[a]EPA MCL for nitrate is 10 mg/L.
CYN = Canyons.
EPA = U.S. Environmental Protection Agency.
ft = Feet.
MCL = Maximum Contaminant Level.
mg/L = Milligrams per liter.
MW = Monitoring well.
NPN = Nitrate plus nitrite (as nitrogen).

7.2 Regulatory Criteria

The NMED Hazardous Waste Bureau provides regulatory oversight of SNL/NM Environmental Restoration (ER) Operations, as well as implements and enforces regulations mandated by the Resource Conservation and Recovery Act (RCRA). All SWMUs and AOCs are listed in the *RCRA Facility Operating Permit, NM5890110518* (RCRA Permit) (NMED January 2015).

All BSG AOC corrective action requirements are contained in the Consent Order. The BSG groundwater monitoring activities are not associated with a single SWMU, but are more regional in nature. Before the Consent Order became effective in April 2004, BSG AOC groundwater investigations had been conducted voluntarily by SNL/NM ER Operations.

Initially, BSG groundwater monitoring was initiated to satisfy the requirements of the RCRA Permit for characterization of SWMUs. The Consent Order transferred regulatory authority for corrective action requirements from the RCRA Permit to the Consent Order. The BSG investigation must comply with requirements set forth in the Consent Order for site characterization and the development of a CME.

In response to the Consent Order, the *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site*, and *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site* (SNL April 2008a) was submitted to the NMED. The Current Conceptual Model provides site-specific characteristics by which remedial alternatives were evaluated. The CME Work Plan provides a description and justification of the remedial alternatives considered and the methods and criteria to be used in the evaluation. The CME Work Plan was completed to comply with requirements set forth in the Consent Order and with the guidance of the *RCRA Corrective Action Plan* (EPA 1994).

On March 1, 2005, a letter was received from the NMED that disapproved the CME Work Plan and offered the following statements/requirements:

- DOE/NNSA and SNL/NM personnel must prepare and submit an IMWP within 90 days from the receipt of the letter (by May 30, 2005).

- The NMED requires additional characterization of the nitrate-contaminated groundwater near the BSG AOC. Specifically, the downgradient extent of groundwater with nitrate concentrations greater than 10 mg/L shall be determined.

- The NMED does not accept the *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site* because it is not satisfied with the existing characterization of nitrate-contaminated groundwater near the BSG AOC.

- The NMED also requires the installation of one additional monitoring well "adjacent to SWMU 94F in order to establish groundwater conditions in this petroleum-contamination source area."

In May 2005, an IMWP was submitted to the NMED that proposed the installation of additional groundwater monitoring wells to characterize the extent of nitrate contamination in the fractured bedrock system downgradient of monitoring well CYN-MW1D and fuel-related compounds downgradient of SWMU 94F (SNL May 2005). The selected interim measures described in the IMWP included additional well installation, groundwater monitoring, and institutional controls. These interim measures were proposed to serve three purposes: provide data to support the CME; monitor the migration of the nitrate plume to provide an early warning if an impact to downgradient ecological receptors (Coyote Springs) becomes apparent; and protect human health and the environment by limiting exposure to contaminated groundwater by restricting access to the monitoring wells.

In support of the selected interim measures, the IMWP included the following reports as attachments:

- Remedial Alternatives Data Gaps Review
- Nitrate Source Evaluation
- Evaluation of Contaminant Transport

The Remedial Alternatives Data Gaps Review included detailed definitions of remedial alternatives and a preliminary evaluation of data gaps (SNL May 2005). One of the data gaps included determining background nitrate concentrations in soil/rock and evaluating the potential for a residual source of nitrate in the vadose zone. The investigation initiated to fill this data gap and the analytical results were presented in the Nitrate Source Evaluation. The Evaluation of Contaminant Transport consisted of a cross-sectional modeling approach to simulate transport and dilution of nitrate between the current location of nitrate in BSG and potential human and ecological receptors.

Data collected as part of additional characterization required by the IMWP were incorporated into an updated version of the Conceptual Site Model that provides the basis for a technically defensible remediation program that was developed and documented in the CME Work Plan (SNL April 2008b), the results of which will eventually be documented in the CME Report. The April 2008 CME Work Plan was developed to address the concerns outlined in the March 1, 2005 letter from the NMED and to comply with requirements of the Consent Order. The CME Work Plan provides information and data gathered during interim measures, and performance and compliance goals and objectives for the possible remediation of BSG.

On April 30, 2009, a letter was received from the NMED entitled, *Perchlorate Contamination in Groundwater*, *Sandia National Laboratories, EPA ID #NM5890110518* (NMED April 2009). The letter discussed the occurrence of perchlorate in groundwater at concentrations at or greater than 1 µg/L at various locations at SNL/NM. The letter also stated that DOE/NNSA and SNL/NM personnel must characterize the nature and extent of the assumed perchlorate contamination at the BSG AOC and submit to the NMED a plan for such characterization. DOE/NNSA and SNL/NM personnel met with the NMED in June and July 2009 and submitted a letter requesting an extension to November 30, 2009 (DOE July 2009). The results of the discussions have been incorporated into the BSG Characterization Work Plan, which included such items as number and locations of wells and boreholes.

In February 2010, a notice of conditional approval for the November 2009 BSG Characterization Work Plan was received. In July 2010, the requirements of the work plan were implemented and subsurface soil sampling was completed at 10 deep soil borehole locations to determine contaminant sources, and installed four groundwater monitoring wells to determine the extent of groundwater contamination. Due to an outstanding schedule commitment, an extension request was submitted for the BSG CME Report in September 2010 (SNL September 2010), which was approved by the NMED (NMED October 2010) with a revised CME Report submittal date of March 31, 2014. In January 2014, the DOE/NNSA and SNL/NM personnel requested an additional extension to the delivery date of the CME Report to March 31, 2016 (DOE January 2014). In June 2015, NMED approved the DOE/NNSA's proposed extension request.

In June 2016, DOE/NNSA and SNL/NM personnel submitted the *BSG Aquifer Pumping Test Work Plan* (SNL June 2016a), and this plan was quickly approved by the NMED (NMED June 2016). Field work associated with the aquifer pumping test was performed in 2017, and in December 2017, the *BSG Aquifer Pumping Test Report* was submitted to NMED (SNL December 2017). Early in 2018 the NMED approved the *BSG Aquifer Pumping Test Report* (NMED January 2018). Based on the findings of the 2017 report, DOE/NNSA and SNL/NM personnel presented recommendations for additional site characterization to the NMED (DOE June 2018). However, the NMED disapproved the proposed recommendations and required the submittal of a Well Installation Work Plan (NMED June 2018). DOE/NNSA and SNL/NM personnel are currently preparing a Well Installation Work Plan and will submit to the NMED in early 2019.

In this report, BSG monitoring data are presented for both hazardous and radioactive constituents; however, the monitoring data for radionuclides (i.e., gamma spectroscopy, gross alpha/beta activity, and tritium) are provided voluntarily by the DOE/NNSA and SNL/NM personnel. The voluntary inclusion of such radionuclide information shall not be enforceable and shall not constitute the basis for any enforcement because such information falls wholly outside the requirements of the Consent Order. Additional information on radionuclides and the scope of the Consent Order is available in Section III.A of the Consent Order.

7.3 Scope of Activities

Section 7.1.5 lists the BSG investigation activities conducted during this reporting period, including plans and reports. The field activities completed during CY 2018 include groundwater monitoring (Table 7-4) and hydrologic tests. Table 7-5 lists the analytical parameters for each well and each sampling event.

Quality control (QC) samples are collected in the field at the time of environmental sample collection. Field QC samples include environmental duplicate samples, equipment blank (EB), field blank (FB), and trip blank (TB) samples. Section 1.3 discusses the utility of QC samples.

7.4 Field Methods and Measurements

Section 1.3 describes in detail the monitoring procedures conducted for the BSG groundwater monitoring. Figure 7-2 presents the water level information used to create the potentiometric surface map and Attachment 7D, Figures 7D-1 through 7D-9 presents the hydrographs.

Table 7-4. Groundwater Monitoring Well Network and Sampling Dates for the Burn Site Groundwater Area of Concern, Calendar Year 2018

Date of Sampling Event	Wells Sampled		SAP
April 2018	CYN-MW4 CYN-MW7 CYN-MW8 CYN-MW9 CYN-MW10	CYN-MW11 CYN-MW12 CYN-MW13 CYN-MW14A CYN-MW15	*Burn Site Groundwater Monitoring, Mini-SAP for Third Quarter Fiscal Year 2018* (SNL March 2018)
October/December 2018	CYN-MW4 CYN-MW7 CYN-MW8 CYN-MW9 CYN-MW10	CYN-MW11 CYN-MW12 CYN-MW13 CYN-MW14A CYN-MW15	*Burn Site Groundwater Monitoring, Mini-SAP for First Quarter Fiscal Year 2019* (SNL October 2018)

NOTES:
CYN = Canyons.
MW = Monitoring well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.

Table 7-5. Parameters Sampled at Burn Site Groundwater Area of Concern Wells for Each Sampling Event, Calendar Year 2018

Parameter	April 2018	
Alkalinity Anions DRO Gamma Spectroscopy (short list[a]) GRO Gross Alpha/Beta Activity HE compounds Isotopic Uranium NPN Perchlorate[b] TAL Metals Tritium VOCs	CYN-MW4 CYN-MW7 CYN-MW7 (duplicate) CYN-MW8 CYN-MW9 CYN-MW9 (duplicate) CYN-MW10 CYN-MW11	CYN-MW12 CYN-MW12 (duplicate) CYN-MW13 CYN-MW14A CYN-MW15
Parameter	**October/December 2018**	
DRO GRO NPN Perchlorate[b]	CYN-MW4 CYN-MW7 CYN-MW8 CYN-MW9 CYN-MW10 CYN-MW11 CYN-MW12	CYN-MW13 CYN-MW13 (duplicate) CYN-MW14A CYN-MW14A (duplicate) CYN-MW15 CYN-MW15 (duplicate)

NOTES:
[a]Gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40).
[b]Perchlorate analysis performed on samples from monitoring well CYN-MW15 only.
CYN = Canyons.
DRO = Diesel range organics.
GRO = Gasoline range organics.
HE = High explosive.
MW = Monitoring well.
NPN = Nitrate plus nitrate (reported as nitrogen).
TAL = Target Analyte List.
VOC = Volatile organic compound.

7.5 Analytical Methods

Section 1.3.2 describes EPA-specified protocols utilized for groundwater samples analyzed by the offsite laboratories (Tables 1-5 and 1-6).

7.6 Summary of Analytical Results

This section discusses analytical results, exceedances of regulatory standards, and pertinent trends in COC concentrations. Attachment 7B (Tables 7B-1 through 7B-11) present the analytical results and field measurements for the CY 2018 BSG sampling events. Tables 7B-1 through 7B-11 footnotes explain the data qualifiers. Attachment 7C (Figures 7C-1 through 7C-7) presents the nitrate plus nitrite (NPN) (reported as nitrogen) concentration trend plots.

During the April sampling event acetone was detected in six samples. All these acetone results were qualified as not detected during data validation due to associated TB or FB contamination (Table 7B-1). No other volatile organic compounds (VOCs) or HE compounds were detected. Table 7B-2 lists the MDLs for all analyzed VOCs and Table 7B-3 lists the MDLs for all analyzed HE compounds.

Table 7B-4 presents the analytical results for NPN and Figure 7-3 presents the BSG AOC NPN concentration contours. NPN results exceed the EPA MCL of 10 mg/L in samples from monitoring wells CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15. NPN concentrations in samples from the other BSG monitoring wells are less than the MCL (Table 7B-4). For CY 2018, the NPN concentrations for wells exceeding the MCL are summarized as follows:

- Monitoring well CYN-MW9 had reported concentrations of 29.1 mg/L (April 2018), 29.5 mg/L (April 2018, environmental duplicate sample), and 32.2 mg/L (October 2018). The historical range of NPN concentrations for monitoring well CYN-MW9 is approximately 29 to 45 mg/L with an overall consistent trend with high variability over the life of the well (Figure 7C-1).

- Monitoring well CYN-MW10 had reported concentrations of 13.1 mg/L (April 2018) and 10.2 mg/L (October 2018). The historical range of NPN concentrations for monitoring well CYN-MW10 is approximately 4 to 22 mg/L with a slightly decreasing trend until June 2014, dramatically increasing trend in 2015, and then decreasing again starting in 2016 (Figure 7C-2).

- Monitoring well CYN-MW11 had reported concentrations of 15.1 mg/L (April 2018) and 12.5 mg/L (October 2018). The historical range of NPN concentrations for monitoring well CYN-MW11 is approximately 9 to 25 mg/L with a consistent trend until June 2014, then a mostly increasing trend starting in 2015, followed by a decreasing trend for the last four sampling events (Figure 7C-3).

- Monitoring well CYN-MW12 had reported concentrations of 14.4 mg/L (April 2018), 14.5 mg/L (April 2018, environmental duplicate sample), and 15.2 mg/L (October 2018). The historical range of NPN concentrations for monitoring well CYN-MW12 is approximately 11 to 20 mg/L with increasing concentrations with high variability over the life of the well (Figure 7C-4).

- Monitoring well CYN-MW13 had reported concentrations of 32.4 mg/L (April 2018), 34.8 mg/L (October 2018), and 35.4 mg/L (October 2018, environmental duplicate sample). The historical range of NPN concentrations for monitoring well CYN-MW13 is approximately 32 to 40 mg/L with an overall consistent trend over the life of the well (Figure 7C-5).

- Monitoring well CYN-MW14A had reported concentrations of 12.2 mg/L (April 2018), 12.7 mg/L (October 2018), and 12.7 mg/L (October 2018, environmental duplicate sample). The historical range of NPN concentrations for monitoring well CYN-MW14A is approximately 10 to 16 mg/L with an overall consistent trend over the life of the well (Figure 7C-6).

- CYN-MW15 had reported concentrations of 20.3 mg/L (April 2018), 20.7 mg/L (October 2018), and 21.4 mg/L (October 2018, environmental duplicate sample). Monitoring well CYN-MW15 replaced well CYN-MW6 in December 2014; Figure 7C-7 displays all NPN concentrations for monitoring well CYN-MW6 and the replacement monitoring well CYN-MW15. The historical range of NPN concentrations for monitoring wells CYN-MW6 and CYN-MW15 is approximately 19 to 40 mg/L with a generally stable trend with high variability over the life of the wells (Figure 7C-7).

Table 7B-5 lists the results for DRO and GRO. MCLs for DRO or GRO have not been established. Monitoring wells CYN-MW9, CYN-MW13, and CYN-MW15 were resampled for GRO in December 2018 because the original samples were analyzed outside of analytical hold time requirements. No detections of DRO and GRO were reported for any of the samples collected during the CY 2018 sampling events (Table 7B-5).

Table 7B-6 lists the results for perchlorate. Perchlorate was detected at monitoring well CYN-MW15 at 0.00460 mg/L (April 2018) and 0.00404 mg/L (October 2018, environmental duplicate sample). Perchlorate was not detected in the October 2018 parent sample. Results for perchlorate are compared to the screening level of 4 μg/L.

Table 7B-7 presents the analytical results for anions. None of the analytes exceeds established MCLs.

Table 7B-8 presents the analytical results for alkalinity. No MCLs exist for alkalinity parameters.

Table 7B-9 presents total metal results. No metals exceed established MCLs.

Table 7B-10 presents the results of groundwater samples analyzed for tritium, gross alpha/beta activity, isotopic uranium, and radionuclides by gamma spectroscopy. All radionuclide activity results are below established MCLs. Gross alpha activity is measured as a radiological screening tool and in accordance with 40 Code of Federal Regulations Part 141. Naturally occurring uranium is measured independently (i.e., total uranium concentration determined by metals analysis described above) and the gross alpha activity measurements are corrected by subtracting the total uranium activity from the uncorrected gross alpha activity results. Radiological results are further reviewed by an SNL/NM Health Physicist to assure that samples are nonradioactive. Corrected gross alpha activity results are below the MCL of 15 picocuries per liter for all samples. The potassium-40 activity in CYN-MW8 was rejected by the contract laboratory (GEL Laboratories, LLC) due to the peak not meeting identification criteria.

Field water quality parameters are measured during purging of each monitoring well prior to sampling and include temperature, specific conductivity, oxidation-reduction potential, pH, turbidity, and dissolved oxygen. Table 7B-11 presents these parameter measurements obtained immediately prior to sample collection at each well.

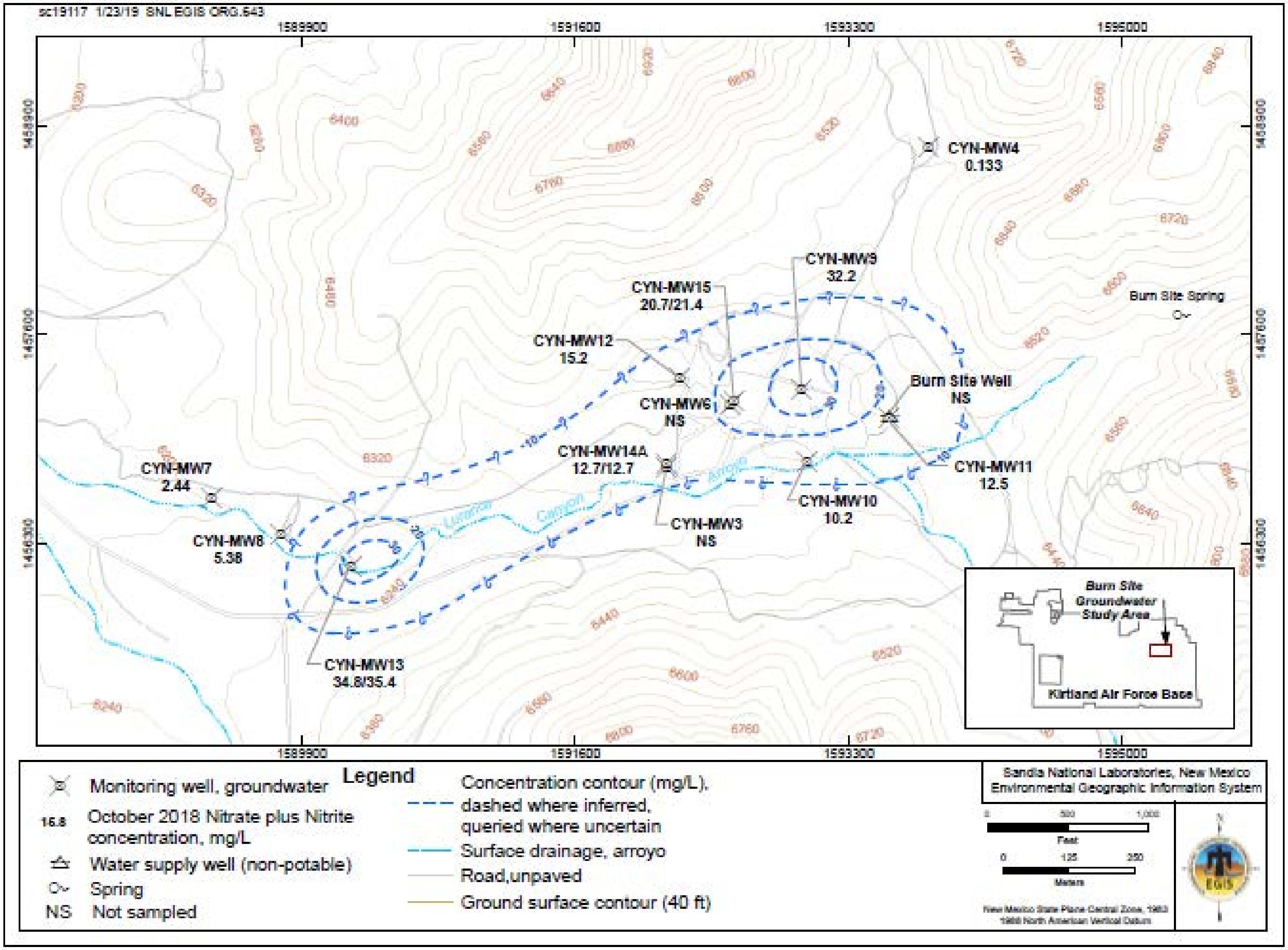

Figure 7-3. Nitrate plus Nitrite Concentration Contour Map for the Burn Site Groundwater Area of Concern, October 2018

7.7 Quality Control Results

Section 1.3 describes how the field and laboratory QC samples were collected and prepared. Attachment 7B provides data validation qualifiers with the analytical results. The results of QC samples and the impact on data quality for the BSG sampling events are discussed in the following sections.

Environmental duplicate results from all CY 2018 sampling events show good correlation (relative percent difference values less than 35 for inorganic analyses) for all calculated parameters.

The results of the EB sample analyses are as follows:

- **April 2018 Sampling Event at Monitoring Wells CYN-MW7, CYN-MW9, and CYN-MW12**—The EB samples were collected prior to sampling these wells and analyzed for all parameters. Acetone, 2-butanone, chloride, sulfate, and zinc were detected above the laboratory MDLs. No corrective action was necessary for 2-butanone, chloride, sulfate, or zinc, because these analytes were not detected in environmental samples or were detected at concentrations greater than five times the associated EB result. Acetone in samples from CYN-MW9 and CYN-MW12 were qualified as not detected, because acetone was reported at concentrations less than ten times the associated EB result.

- **October/December 2018 Sampling Event at Monitoring Wells CYN-MW13, CYN-MW14A, and CYN-MW15**—No DRO, GRO, or perchlorate were detected in EB samples. NPN was detected in the CYN-MW13 EB sample only, and no corrective action was necessary because NPN was reported in associated environmental samples at concentrations greater than five times the EB result.

The results of the FB sample analyses are as follows:

- **April 2018 Sampling Event at Monitoring Wells CYN-MW10, CYN-MW11, and CYN-MW14A**— No GRO was detected above laboratory MDLs in these FB samples. Acetone was qualified in samples from CYN-MW11 and CYN-MW14A as not detected during data validation because acetone was reported at concentrations less than ten times the associated FB result.

- **October/December 2018 Sampling Event at Monitoring Wells CYN-MW7, CYN-MW12, and CYN-MW15**—GRO was not detected in the FB samples.

The results of the TB sample analyses are as follows:

- **April 2018 Sampling Event**—A total of 15 VOC and 14 GRO TB samples were submitted during this sampling event. No VOCs or GRO were detected above laboratory MDLs, except acetone. Acetone was detected in six TB samples. Acetone was qualified in samples from CYN-MW9, CYN-MW12, CYN-MW13, and CYN-MW15 as not detected during data validation because acetone was reported at concentrations less than ten times the associated TB result.

- **October/December 2018 Sampling Event**—A total of 13 GRO TB samples were submitted during this sampling event. No GRO was detected above laboratory MDLs in any TB sample.

7.8 Project Field Notes and Comments

In December 2018 monitoring wells CYN-MW9, CYN-MW13, and CYN-MW15 were resampled for GRO analysis. The original (October) GRO samples were analyzed outside of analytical method requirements and were not usable. No other variances or issues from requirements in the BSG monitoring mini-Sampling and Analysis Plans were identified during sampling activities for the April and October/December 2018 sampling events.

7.9 Summary and Conclusions

This section provides a brief summary of the following: field activities, COC concentrations, trends of concentrations versus time, the Conceptual Site Model, and plans for studies to be completed during CY 2019 at the BSG AOC.

The BSG AOC is located in the vicinity of the active Lurance Canyon Burn Site facility. Groundwater investigations were initiated in 1997 at the request of the NMED after elevated nitrate levels were discovered in the non-potable Burn Site Well.

Monitoring wells were sampled during April and October/December 2018. The samples were analyzed for VOCs, HE compounds, DRO, GRO, NPN, Target Analyte List metals, anions, alkalinity, cations, perchlorate, gross alpha/beta activity, tritium, isotopic uranium, and radionuclides by gamma spectroscopy. Analytical results were compared with EPA MCLs for drinking water (EPA May 2009) and the screening level of 4 µg/L for perchlorate.

NPN was the only COC that exceeded a drinking water standard. NPN was detected at concentrations exceeding the EPA MCL of 10 mg/L in samples from seven BSG AOC monitoring wells: CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15. The maximum concentration reported in CY 2018 is 35.4 mg/L in the environmental duplicate sample collected from monitoring well CYN-MW13 during the October 2018 sampling event. As shown on Figure 7-3, the NPN plume exceeding 10 mg/L is over 4,000 ft long.

The analytical results for this reporting period are mostly consistent with historical concentrations.

Ongoing environmental studies of the BSG AOC include the following:

- Continue semiannual collection of groundwater samples at 10 monitoring wells (CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, and CYN-MW15) during the second and fourth quarters of CY 2019. At a minimum, the analytes for groundwater sampling per well will consist of NPN, DRO, and GRO.

- Continue periodic measurements of groundwater elevations in 12 monitoring wells and the Burn Site Well.

- Report future BSG investigation results in the CY 2019 SNL/NM Annual Groundwater Monitoring Report.

- Submit a Monitoring Well Installation Work Plan to the NMED in early CY 2019.

- Upon approval by NMED, implement the activities in the proposed Monitoring Well Installation Work Plan.

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Attachment 7A
Historical Timeline of the Burn Site Groundwater Area of Concern

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Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern

Month	Year	Event	Reference
	1967-early 1980s	HE testing conducted at the BSG AOC until early 1980s. Burn testing began in 1970s using excavation pits and portable burn pans with JP-4. Open detonations of HE materials conducted. Wastewater discharged into unlined pits.	SNL November 2001
	1987	Eighteen potential SWMUs were identified during the Comprehensive Environmental Assessment and Response Program investigation. HE compounds, nitrate, and diesel range organics identified as potential COCs.	DOE September 1987
February	1998	Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report containing description of BSG hydrogeology submitted.	SNL February 1998
November	1996	Groundwater sample from Burn Site Well yielded nitrate concentration of 25 mg/L.	SNL January 2005
July	1997	NMED/DOE/OB, DOE, and Sandia agree on installation of deep and shallow monitoring wells and one year of quarterly sampling.	SNL July 1997
November	1997	Monitoring wells CYN-MW2S and 12AUP01 are installed to serve as piezometers. (Piezometers are constructed of narrow-diameter casing and not used for collecting groundwater samples.)	SNL June 1998
December	1997	Monitoring well CYN-MW1D installed.	SNL June 1998
March	1999	GWPP Fiscal Year 1998 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 1999
June	1999	Monitoring wells CYN-MW3 and CYN-MW4 installed.	SNL November 2001
	Various (e.g., 1994)	BSG AOC SWMUs 94 and 65 proposed and approved for NFA/CAC.	Numerous references, for example: SNL February 2004
March	2000	GWPP Fiscal Year 1999 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2000
April	2001	GWPP Fiscal Year 2000 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL April 2001
August	2001	Monitoring well CYN-MW5 installed 1.7 miles west of the BSG AOC.	SNL June 2005
November	2001	Comprehensive BSG Investigation Report documenting hydrogeologic characteristics of the study area prepared.	SNL November 2001
March	2002	GWPP Fiscal Year 2001 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2002
March	2003	GWPP Fiscal Year 2002 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2003
June	2003	Further refinements of the hydrogeologic setting of the BSG AOC are presented.	Van Hart June 2003
March	2004	GWPP Fiscal Year 2003 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2004
April	2004	Compliance Order on Consent lists BSG as an AOC that requires a CME.	NMED April 2004
June	2004	A CCM of the BSG AOC prepared.	SNL June 2004a
June	2004	A CME work plan for the BSG AOC prepared.	SNL June 2004b
January	2005	Nitrate source evaluation of deep soil in the BSG AOC performed.	SNL January 2005
February	2005	NMED requires additional site characterization and the preparation of an Interim Measures Work Plan.	NMED February 2005
May	2005	BSG Interim Measures Work Plan submitted.	SNL May 2005
July	2005	NMED sends an RSI for the Interim Measures Work Plan.	NMED July 2005
August	2005	Response for RSI is submitted to NMED.	SNL August 2005

Refer to footnotes on page 7A-6.

Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern *(Continued)*

Month	Year	Event	Reference
October	2005	GWPP Fiscal Year 2004 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL October 2005
December	2005	Monitoring wells CYN-MW6 and CYN-MW7 installed.	SNL October 2006
January	2006	Monitoring well CYN-MW8 installed.	SNL October 2006
March	2007	GWPP Fiscal Year 2006 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2007
April	2008	BSG CCM resubmitted.	SNL April 2008a
April	2008	BSG CME Work Plan resubmitted.	SNL April 2008b
March	2008	GWPP Fiscal Year 2007 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL March 2008
April	2009	NMED requires supplemental characterization of soil and groundwater in the BSG AOC.	NMED April 2009
November	2009	BSG Characterization Work Plan submitted.	SNL November 2009
June	2009	GWPP Calendar Year 2008 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL June 2009
February	2010	Received notice of conditional approval for the November 2009 BSG Characterization Work Plan.	NMED February 2010
July	2010	Completed subsurface soil sampling at 10 deep soil boring locations to determine contaminant sources.	SNL November 2009
July	2010	Installed four groundwater monitoring wells (CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12) to determine extent of groundwater contamination.	SNL November 2009
September	2010	An extension request for the BSG CME Report submitted.	SNL September 2010
October	2010	Received approval of a time extension for submittal of the BSG CME Report.	NMED October 2010
October	2010	GWPP Calendar Year 2009 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL October 2010
August	2011	Received approval of the March 2008 CME Work Plan, BSG.	NMED August 2011
September	2011	GWPP Calendar Year 2010 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL September 2011
January	2012	Summary Report for BSG Characterization Field Program submitted.	SNL January 2012
February	2012	Monitoring Well Plug and Abandonment Plan and Well Construction Plan for BSG wells and status of CYN-MW3 submitted.	SNL February 2012
April	2012	Received notice of approval for the January 2012 BSG Monitoring Well Plug and Abandonment Plan and Well Construction Plan.	NMED April 2012
June	2012	Received notice of approval for the January 2012 Summary Report for BSG Characterization Field Program.	NMED June 2012
September	2012	GWPP Calendar Year 2011 Annual Groundwater Monitoring Report provided BSG analytical data.	SNL September 2012
December	2012	Completed field program to decommission BSG monitoring wells 12AUP01, CYN-MW1D, CYN-MW2S, and install monitoring well CYN-MW13.	SNL March 2013
August	2013	Submitted an Extension Request to the NMED for the Burn Site Groundwater CME Report to March 31, 2013.	DOE August 2013
September	2013	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2012 SNL/NM Annual Groundwater Monitoring Report.	SNL September 2013a
October	2013	DOE Office of Environmental Management submitted the first Internal Remedy Review of the Burn Site Groundwater AOC to DOE/NNSA Sandia Field Office.	DOE October 2013
November	2013	Monitoring Well Plug and Abandonment Plan and Well Construction Plan for Installation of Groundwater Monitoring Wells CYN-MW14 and CYN-MW15 submitted.	SNL September 2013b

Refer to footnotes on page 7A-6.

Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern *(Concluded)*

Month	Year	Event	Reference
January	2014	DOE/NNSA requested an extension to the delivery date of the Burn Site Groundwater CME Report to March 31, 2016.	DOE January 2014
June	2014	Approval for installation of groundwater monitoring wells CYN-MW14A and CYN-MW15.	NMED June 2014a
June	2014	NMED approved the proposed extension request for the Burn Site Groundwater CME Report to March 31, 2016.	NMED June 2014b
October	2014	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2013 SNL/NM Annual Groundwater Monitoring Report.	SNL October 2014
November	2014	Office of Environmental Management submitted the second Internal Remedy Review of the Burn Site Groundwater AOC to DOE/NNSA Sandia Field Office.	DOE November 2014
December	2014	Installed groundwater monitoring wells CYN-MW14A and CYN-MW15.	SNL April 2015
April	2015	Summary Report for Installation of Groundwater Monitoring Wells CYN-MW14A and CYN-MW15 submitted.	SNL April 2015
May	2015	Office of Environmental Management submitted the third Internal Remedy Review of the Burn Site Groundwater AOC to DOE/NNSA Sandia Field Office.	DOE May 2015
June	2015	Approval of the Installation Report for CYN-MW14A and CYN-MW15.	NMED June 2015
June	2015	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2014 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2015
March	2016	Proposed weight-of-evidence activities and schedule milestones for implementation of the studies.	DOE March 2016
April	2016	NMED approved the activities and milestones proposed by DOE/NNSA for the weight-of-evidence activities.	NMED April 2016
June	2016	Aquifer Pumping Test Work Plan submitted.	SNL June 2016a
June	2016	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2015 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2016b
June	2016	Aquifer Pumping Test Work Plan approved.	NMED June 2016
July	2016	Stable Isotope denitrification and groundwater age dating report summary.	Madrid et. al., July 2016
March	2017	Field requirements of the Aquifer Pumping Test were completed, including long-term transducer study, step drawdown test, constant rate test, and groundwater interval sampling for nitrate.	SNL December 2017
May	2017	Preliminary results of the pumping test were shared with NMED on May 10, 2017 at the NMED District 1 office.	SNL December 2017
June	2017	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2016 SNL/NM Annual Groundwater Monitoring Report.	SNL July 2017
November	2017	Request an extension for the submittal of recommendations for further characterization activities.	DOE November 2017
November	2017	Extension request approved.	NMED November 2017
December	2017	Aquifer Pumping Test Report submitted.	SNL December 2017
January	2018	Aquifer Pumping Test Report approved.	NMED January 2018
June	2018	Proposed recommendations for additional site characterization.	DOE June 2018
June	2018	NMED disapproved the proposed recommendations and required the submittal of a Well Installation Work Plan.	NMED June 2018
June	2018	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2017 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2018

Refer to footnotes on page 7A-6

Table 7A-1. Historical Timeline of the Burn Site Groundwater Area of Concern *(Concluded)*

NOTES:

AOC	= Area of Concern.
BSG	= Burn Site Groundwater.
CAC	= Corrective Action Complete.
CCM	= Current Conceptual Model.
CME	= Corrective Measures Evaluation.
CYN	= Canyons.
COC	= Constituent of concern.
DOE	= U.S. Department of Energy.
GWPP	= Groundwater Protection Program.
HE	= High explosive.
JP-4	= Jet propellant, fuel grade 4.
mg/L	= Milligram(s) per liter.
MW	= Monitoring well.
NFA	= No Further Action.
NMED	= New Mexico Environment Department.
NNSA	= National Nuclear Security Administration.
OB	= Oversight Bureau.
RSI	= Request for Supplemental Information.
Sandia	= Sandia Corporation.
SNL	= Sandia National Laboratories.
SNL/NM	= Sandia National Laboratories, New Mexico.
SWMU	= Solid waste management unit.

Attachment 7B
Burn Site Groundwater
Analytical Results Tables

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Attachment 7B Tables

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Table 7B-1
Summary of Detected Volatile Organic Compounds, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW9 20-Apr-18	Acetone	1.91	1.50	10.0	NE	J	10U	105071-001	SW846-8260
CYN-MW11 18-Apr-18	Acetone	1.84	1.50	10.0	NE	J	10UJ	105062-001	SW846-8260
CYN-MW12 17-Apr-18	Acetone	1.84	1.50	10.0	NE	J	10UJ	105057-001	SW846-8260
CYN-MW13 23-Apr-18	Acetone	2.53	1.50	10.0	NE	J	10U	105075-001	SW846-8260
CYN-MW14A 16-Apr-18	Acetone	1.82	1.50	10.0	NE	J	10UJ	105054-001	SW846-8260
CYN-MW15 19-Apr-18	Acetone	1.98	1.50	10.0	NE	J	10U	105068-001	SW846-8260

Refer to footnotes on page 7B-32.

Table 7B-2
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] SW846-8260B), Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Analyte	MDL[b] (µg/L)	Analyte	MDL[b] (µg/L)
1,1,1-Trichloroethane	0.300	Chlorobenzene	0.300
1,1,2,2-Tetrachloroethane	0.300	Chloroethane	0.300
1,1,2-Trichloroethane	0.300	Chloroform	0.300
1,1-Dichloroethane	0.300	Chloromethane	0.300
1,1-Dichloroethene	0.300	Cyclohexane	0.300
1,2,3-Trichlorobenzene	0.300	Dibromochloromethane	0.300
1,2,4-Trichlorobenzene	0.300	Dichlorodifluoromethane	0.300
1,2-Dibromo-3-chloropropane	0.500	Ethyl benzene	0.300
1,2-Dibromoethane	0.300	Isopropylbenzene	0.300
1,2-Dichlorobenzene	0.300	Methyl acetate	1.50
1,2-Dichloroethane	0.300	Methylcyclohexane	0.300
1,2-Dichloropropane	0.300	Methylene chloride	1.00
1,3-Dichlorobenzene	0.300	Styrene	0.300
1,4-Dichlorobenzene	0.300	Tert-butyl methyl ether	0.300
2,2-trifluoroethane, 1,1,2-Trichloro-1	2.00	Tetrachloroethene	0.300
2-Butanone	1.50	Toluene	0.300
2-Hexanone	1.50	Trichloroethene	0.300
4-methyl-, 2-Pentanone	1.50	Trichlorofluoromethane	0.300
Acetone	1.50	Vinyl chloride	0.300
Benzene	0.300	Xylene	0.300
Bromochloromethane	0.300	cis-1,2-Dichloroethene	0.300
Bromodichloromethane	0.300	cis-1,3-Dichloropropene	0.300
Bromoform	0.300	m-, p-Xylene	0.300
Bromomethane	0.300	o-Xylene	0.300
Carbon disulfide	1.50	trans-1,2-Dichloroethene	0.300
Carbon tetrachloride	0.300	trans-1,3-Dichloropropene	0.300

Refer to footnotes on page 7B-32.

Table 7B-3
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8321A), Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.0833 – 0.0889
1,3-Dinitrobenzene	0.0833 – 0.0889
2,4,6-Trinitrotoluene	0.0833 – 0.0889
2,4-Dinitrotoluene	0.0833 – 0.0889
2,6-Dinitrotoluene	0.0833 – 0.0889
2-Amino-4,6-dinitrotoluene	0.0833 – 0.0889
2-Nitrotoluene	0.0854 – 0.0911
3-Nitrotoluene	0.0833 – 0.0889
4-Amino-2,6-dinitrotoluene	0.0833 – 0.0889
4-Nitrotoluene	0.156 – 0.167
HMX	0.0833 – 0.0889
Nitro-benzene	0.0833 – 0.0889
Pentaerythritol tetranitrate	0.104 – 0.111
RDX	0.0833 – 0.0889
Tetryl	0.0833 – 0.0889

Refer to footnotes on page 7B-32.

Table 7B-4
Summary of Nitrate plus Nitrite Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4 11-Apr-18	Nitrate plus nitrite	0.131	0.017	0.050	10.0			105039-005	EPA 353.2
CYN-MW7 10-Apr-18	Nitrate plus nitrite	2.21	0.085	0.250	10.0			105035-005	EPA 353.2
CYN-MW7 (Duplicate) 10-Apr-18	Nitrate plus nitrite	2.21	0.085	0.250	10.0			105036-003	EPA 353.2
CYN-MW8 12-Apr-18	Nitrate plus nitrite	4.65	0.170	0.500	10.0			105043-005	EPA 353.2
CYN-MW9 20-Apr-18	Nitrate plus nitrite	**29.1**	0.850	2.50	10.0			105071-005	EPA 353.2
CYN-MW9 (Duplicate) 20-Apr-18	Nitrate plus nitrite	**29.5**	0.850	2.50	10.0			105072-003	EPA 353.2
CYN-MW10 13-Apr-18	Nitrate plus nitrite	**13.1**	0.425	1.25	10.0			105047-005	EPA 353.2
CYN-MW11 18-Apr-18	Nitrate plus nitrite	**15.1**	0.850	2.50	10.0			105062-005	EPA 353.2
CYN-MW12 17-Apr-18	Nitrate plus nitrite	**14.4**	0.850	2.50	10.0			105057-005	EPA 353.2
CYN-MW12 (Duplicate) 17-Apr-18	Nitrate plus nitrite	**14.5**	0.850	2.50	10.0			105058-003	EPA 353.2
CYN-MW13 23-Apr-18	Nitrate plus nitrite	**32.4**	0.850	2.50	10.0			105075-005	EPA 353.2
CYN-MW14A 16-Apr-18	Nitrate plus nitrite	**12.2**	0.425	1.25	10.0			105054-005	EPA 353.2
CYN-MW15 19-Apr-18	Nitrate plus nitrite	**20.3**	0.850	2.50	10.0			105068-005	EPA 353.2

Refer to footnotes on page 7B-32.

Table 7B-4 *(Concluded)*
Summary of Nitrate plus Nitrite Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4 08-Oct-18	Nitrate plus nitrite	0.133	0.017	0.050	10.0			106451-003	EPA 353.2
CYN-MW7 09-Oct-18	Nitrate plus nitrite	2.44	0.085	0.250	10.0			106454-003	EPA 353.2
CYN-MW8 10-Oct-18	Nitrate plus nitrite	5.38	0.170	0.500	10.0			106456-003	EPA 353.2
CYN-MW9 16-Oct-18	Nitrate plus nitrite	**32.2**	0.850	2.50	10.0			106476-003	EPA 353.2
CYN-MW10 11-Oct-18	Nitrate plus nitrite	**10.2**	0.170	0.500	10.0			106458-003	EPA 353.2
CYN-MW11 12-Oct-18	Nitrate plus nitrite	**12.5**	0.425	1.25	10.0			106468-003	EPA 353.2
CYN-MW12 15-Oct-18	Nitrate plus nitrite	**15.2**	0.425	1.25	10.0			106466-003	EPA 353.2
CYN-MW13 17-Oct-18	Nitrate plus nitrite	**34.8**	0.850	2.50	10.0			106480-003	EPA 353.2
CYN-MW13 (Duplicate) 17-Oct-18	Nitrate plus nitrite	**35.4**	0.850	2.50	10.0			106534-003	EPA 353.2
CYN-MW14A 12-Oct-18	Nitrate plus nitrite	**12.7**	0.425	1.25	10.0			106462-003	EPA 353.2
CYN-MW14A (Duplicate) 12-Oct-18	Nitrate plus nitrite	**12.7**	0.425	1.25	10.0			106463-003	EPA 353.2
CYN-MW15 16-Oct-18	Nitrate plus nitrite	**20.7**	0.850	2.50	10.0			106473-003	EPA 353.2
CYN-MW15 (Duplicate) 16-Oct-18	Nitrate plus nitrite	**21.4**	0.850	2.50	10.0			106474-003	EPA 353.2

Refer to footnotes on page 7B-32.

Table 7B-5
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Diesel Range Organics	ND	78.1	208	NE	U		105039-003	SW846 8015D
11-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105039-004	SW846 8015A/B
CYN-MW7	Diesel Range Organics	ND	81.5	217	NE	U		105035-003	SW846 8015D
10-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105035-004	SW846 8015A/B
CYN-MW7 (Duplicate)	Diesel Range Organics	ND	80.6	215	NE	U		105036-001	SW846 8015D
10-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105036-002	SW846 8015A/B
CYN-MW8	Diesel Range Organics	ND	78.9	211	NE	U		105043-003	SW846 8015D
12-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105043-004	SW846 8015A/B
CYN-MW9	Diesel Range Organics	ND	80.6	215	NE	U		105071-003	SW846 8015D
20-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105071-004	SW846 8015A/B
CYN-MW9 (Duplicate)	Diesel Range Organics	ND	78.1	208	NE	U		105072-001	SW846 8015D
20-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105072-002	SW846 8015A/B
CYN-MW10	Diesel Range Organics	ND	80.6	215	NE	U		105047-003	SW846 8015D
13-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105047-004	SW846 8015A/B
CYN-MW11	Diesel Range Organics	ND	79.8	213	NE	U		105062-003	SW846 8015D
18-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105062-004	SW846 8015A/B
CYN-MW12	Diesel Range Organics	ND	77.3	206	NE	U		105057-003	SW846 8015D
17-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105057-004	SW846 8015A/B
CYN-MW12 (Duplicate)	Diesel Range Organics	ND	76.5	204	NE	U		105058-001	SW846 8015D
17-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105058-002	SW846 8015A/B
CYN-MW13	Diesel Range Organics	ND	80.6	215	NE	U		105075-003	SW846 8015D
23-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105075-004	SW846 8015A/B
CYN-MW14A	Diesel Range Organics	ND	75.0	200	NE	U		105054-003	SW846 8015D
16-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105054-004	SW846 8015A/B
CYN-MW15	Diesel Range Organics	ND	83.3	222	NE	U		105068-003	SW846 8015D
19-Apr-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		105068-004	SW846 8015A/B

Refer to footnotes on page 7B-32.

Table 7B-5 *(Concluded)*
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (µg/L)	MDL[b] (µg/L)	PQL[c] (µg/L)	MCL[d] (µg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Diesel Range Organics	ND	75.0	200	NE	U		106451-001	SW846 8015D
08-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106451-002	SW846 8015A/B
CYN-MW7	Diesel Range Organics	ND	81.5	217	NE	U		106454-001	SW846 8015D
09-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106454-002	SW846 8015A/B
CYN-MW8	Diesel Range Organics	ND	80.6	215	NE	U		106456-002	SW846 8015D
10-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106456-001	SW846 8015A/B
CYN-MW9 16-Oct-18	Diesel Range Organics	ND	81.5	217	NE	U		106476-002	SW846 8015D
CYN-MW9 19-Dec-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106816-001	SW846 8015A/B
CYN-MW10	Diesel Range Organics	ND	78.9	211	NE	U		106458-002	SW846 8015D
11-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106458-001	SW846 8015A/B
CYN-MW11	Diesel Range Organics	ND	80.6	215	NE	U		106468-002	SW846 8015D
12-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106468-001	SW846 8015A/B
CYN-MW12	Diesel Range Organics	ND	78.1	208	NE	U		106466-002	SW846 8015D
15-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106466-001	SW846 8015A/B
CYN-MW13 17-Oct-18	Diesel Range Organics	ND	78.1	208	NE	U*	208UJ	1064-002	SW846 8015D
CYN-MW13 20-Dec-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106820-001	SW846 8015A/B
CYN-MW13 (Duplicate) 17-Oct-18	Diesel Range Organics	ND	78.1	208	NE	U*	208UJ	106534-002	SW846 8015D
CYN-MW13 (Duplicate) 20-Dec-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106821-001	SW846 8015A/B
CYN-MW14A	Diesel Range Organics	ND	75.0	200	NE	U		106462-002	SW846 8015D
12-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106462-001	SW846 8015A/B
CYN-MW14A (Duplicate)	Diesel Range Organics	ND	75.8	202	NE	U		106463-002	SW846 8015D
12-Oct-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106463-001	SW846 8015A/B
CYN-MW15 16-Oct-18	Diesel Range Organics	ND	75.8	202	NE	U		106473-002	SW846 8015D
CYN-MW15 14-Dec-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106812-001	SW846 8015A/B
CYN-MW15 (Duplicate) 16-Oct-18	Diesel Range Organics	ND	75.8	202	NE	U		106474-002	SW846 8015D
CYN-MW15 (Duplicate) 14-Dec-18	Gasoline Range Organics	ND	16.7	50.0	NE	U		106813-001	SW846 8015A/B

Refer to footnotes on page 7B-32.

Table 7B-6
Summary of Perchlorate Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Perchlorate Result [a] (mg/L)	MDL [b] (mg/L)	PQL [c] (mg/L)	MCL [d] (mg/L)	Laboratory Qualifier [e]	Validation Qualifier [f]	Sample No.	Analytical Method[g]
CYN-MW15 19-Apr-18	0.0046	0.004	0.012	NE	J		105068-008	EPA 314.0
CYN-MW15 16-Oct-18	ND	0.004	0.012	NE	U		106473-004	EPA 314.0
CYN-MW15 (Duplicate) 16-Oct-18	0.00404	0.004	0.012	NE	J		106474-004	EPA 314.0

Refer to footnotes on page 7B-32.

Table 7B-7
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Bromide	0.766	0.067	0.200	NE			105039-006	SW846 9056
11-Apr-18	Chloride	25.5	0.670	2.00	NE		J	105039-006	SW846 9056
	Fluoride	1.49	0.033	0.100	4.0			105039-006	SW846 9056
	Sulfate	140	1.33	4.00	NE		J	105039-006	SW846 9056
CYN-MW7	Bromide	0.605	0.067	0.200	NE			105035-006	SW846 9056
10-Apr-18	Chloride	43.5	0.670	2.00	NE		J	105035-006	SW846 9056
	Fluoride	1.35	0.033	0.100	4.0			105035-006	SW846 9056
	Sulfate	87.1	1.33	4.00	NE		J	105035-006	SW846 9056
CYN-MW8	Bromide	0.384	0.067	0.200	NE			105043-006	SW846 9056
12-Apr-18	Chloride	59.6	0.670	2.00	NE		J	105043-006	SW846 9056
	Fluoride	0.826	0.033	0.100	4.0			105043-006	SW846 9056
	Sulfate	126	1.33	4.00	NE		J	105043-006	SW846 9056
CYN-MW9	Bromide	0.774	0.067	0.200	NE			105071-006	SW846 9056
20-Apr-18	Chloride	60.0	0.670	2.00	NE			105071-006	SW846 9056
	Fluoride	0.639	0.033	0.100	4.0			105071-006	SW846 9056
	Sulfate	145	1.33	4.00	NE			105071-006	SW846 9056
CYN-MW10	Bromide	0.665	0.067	0.200	NE			105047-006	SW846 9056
13-Apr-18	Chloride	43.7	1.34	4.00	NE			105047-006	SW846 9056
	Fluoride	0.587	0.033	0.100	4.0			105047-006	SW846 9056
	Sulfate	177	2.66	8.00	NE			105047-006	SW846 9056
CYN-MW11	Bromide	1.15	0.067	0.200	NE			105062-006	SW846 9056
18-Apr-18	Chloride	84.6	1.34	4.00	NE			105062-006	SW846 9056
	Fluoride	0.660	0.033	0.100	4.0			105062-006	SW846 9056
	Sulfate	209	2.66	8.00	NE			105062-006	SW846 9056
CYN-MW12	Bromide	0.979	0.067	0.200	NE			105057-006	SW846 9056
17-Apr-18	Chloride	85.1	1.34	4.00	NE			105057-006	SW846 9056
	Fluoride	1.14	0.033	0.100	4.0			105057-006	SW846 9056
	Sulfate	227	2.66	8.00	NE			105057-006	SW846 9056
CYN-MW13	Bromide	0.331	0.067	0.200	NE			105075-006	SW846 9056
23-Apr-18	Chloride	18.8	0.670	2.00	NE			105075-006	SW846 9056
	Fluoride	1.86	0.033	0.100	4.0			105075-006	SW846 9056
	Sulfate	78.3	1.33	4.00	NE			105075-006	SW846 9056

Refer to footnotes on page 7B-32.

Table 7B-7 *(Concluded)*
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW14A	Bromide	0.853	0.067	0.200	NE			105054-006	SW846 9056
16-Apr-18	Chloride	67.0	1.34	4.00	NE			105054-006	SW846 9056
	Fluoride	1.06	0.033	0.100	4.0			105054-006	SW846 9056
	Sulfate	193	2.66	8.00	NE			105054-006	SW846 9056
CYN-MW15	Bromide	1.29	0.067	0.200	NE			105068-006	SW846 9056
19-Apr-18	Chloride	121	1.34	4.00	NE			105068-006	SW846 9056
	Fluoride	0.687	0.033	0.100	4.0			105068-006	SW846 9056
	Sulfate	214	2.66	8.00	NE			105068-006	SW846 9056

Refer to footnotes on page 7B-32.

Table 7B-8
Summary of Alkalinity Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Bicarbonate Alkalinity	242	1.45	4.00	NE			105039-007	SM 2320B
11-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105039-007	SM 2320B
CYN-MW7	Bicarbonate Alkalinity	273	1.45	4.00	NE			105035-007	SM 2320B
10-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105035-007	SM 2320B
CYN-MW8	Bicarbonate Alkalinity	254	1.45	4.00	NE			105043-007	SM 2320B
12-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105043-007	SM 2320B
CYN-MW9	Bicarbonate Alkalinity	274	1.45	4.00	NE			105071-007	SM 2320B
20-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105071-007	SM 2320B
CYN-MW10	Bicarbonate Alkalinity	260	1.45	4.00	NE			105047-007	SM 2320B
13-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105047-007	SM 2320B
CYN-MW11	Bicarbonate Alkalinity	253	1.45	4.00	NE			105062-007	SM 2320B
18-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105062-007	SM 2320B
CYN-MW12	Bicarbonate Alkalinity	245	1.45	4.00	NE			105057-007	SM 2320B
17-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105057-007	SM 2320B
CYN-MW13	Bicarbonate Alkalinity	178	1.45	4.00	NE			105075-007	SM 2320B
23-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105075-007	SM 2320B
CYN-MW14A	Bicarbonate Alkalinity	242	1.45	4.00	NE			105054-007	SM 2320B
16-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105054-007	SM 2320B
CYN-MW15	Bicarbonate Alkalinity	289	1.45	4.00	NE			105068-007	SM 2320B
19-Apr-18	Carbonate Alkalinity	ND	1.45	4.00	NE	U		105068-007	SM 2320B

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Aluminum	ND	0.0193	0.050	NE	U		105039-008	SW846 6020
11-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105039-008	SW846 6020
	Arsenic	0.00347	0.002	0.005	0.010	J		105039-008	SW846 6020
	Barium	0.0425	0.00067	0.002	2.00			105039-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105039-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105039-008	SW846 6020
	Calcium	68.4	0.400	1.00	NE			105039-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105039-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105039-008	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105039-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U	0.10UJ	105039-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105039-008	SW846 6020
	Magnesium	35.7	0.010	0.030	NE			105039-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105039-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105039-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105039-008	SW846 6020
	Potassium	6.77	0.080	0.300	NE			105039-008	SW846 6020
	Selenium	0.0157	0.002	0.005	0.050			105039-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105039-008	SW846 6020
	Sodium	47.1	0.080	0.250	NE			105039-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105039-008	SW846 6020
	Vanadium	0.00364	0.0033	0.010	NE	J		105039-008	SW846 6020
	Zinc	0.00426	0.0033	0.010	NE	J		105039-008	SW846 6020

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Table 7B-9 *(Continued)*
Summary of Total Metal Results,
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW7	Aluminum	ND	0.0193	0.050	NE	U		105035-008	SW846 6020
10-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105035-008	SW846 6020
	Arsenic	0.00297	0.002	0.005	0.010	J		105035-008	SW846 6020
	Barium	0.113	0.00067	0.002	2.00			105035-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105035-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105035-008	SW846 6020
	Calcium	99.3	0.400	1.00	NE			105035-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105035-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105035-008	SW846 6020
	Copper	0.000484	0.0003	0.001	NE	J		105035-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U	0.10UJ	105035-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105035-008	SW846 6020
	Magnesium	21.6	0.010	0.030	NE			105035-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105035-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105035-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105035-008	SW846 6020
	Potassium	2.49	0.080	0.300	NE			105035-008	SW846 6020
	Selenium	0.00494	0.002	0.005	0.050	J		105035-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105035-008	SW846 6020
	Sodium	40.0	0.080	0.250	NE			105035-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105035-008	SW846 6020
	Vanadium	0.00515	0.0033	0.010	NE	J		105035-008	SW846 6020
	Zinc	0.00839	0.0033	0.010	NE	J		105035-008	SW846 6020

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Table 7B-9 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW8	Aluminum	ND	0.0193	0.050	NE	U		105043-008	SW846 6020
12-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105043-008	SW846 6020
	Arsenic	0.00298	0.002	0.005	0.010	J		105043-008	SW846 6020
	Barium	0.0566	0.00067	0.002	2.00			105043-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105043-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105043-008	SW846 6020
	Calcium	112	0.400	1.00	NE			105043-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105043-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105043-008	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105043-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U	0.10UJ	105043-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105043-008	SW846 6020
	Magnesium	25.3	0.010	0.030	NE			105043-008	SW846 6020
	Manganese	0.00211	0.001	0.005	NE	J	J-	105043-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105043-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105043-008	SW846 6020
	Potassium	2.34	0.080	0.300	NE			105043-008	SW846 6020
	Selenium	0.0065	0.002	0.005	0.050			105043-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105043-008	SW846 6020
	Sodium	45.8	0.080	0.250	NE			105043-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105043-008	SW846 6020
	Vanadium	0.00524	0.0033	0.010	NE	J		105043-008	SW846 6020
	Zinc	0.00452	0.0033	0.010	NE	J		105043-008	SW846 6020

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Table 7B-9 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW9	Aluminum	ND	0.0193	0.050	NE	U		105071-008	SW846 6020
20-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105071-008	SW846 6020
	Arsenic	0.00319	0.002	0.005	0.010	J		105071-008	SW846 6020
	Barium	0.0522	0.00067	0.002	2.00			105071-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105071-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105071-008	SW846 6020
	Calcium	138	0.800	2.00	NE			105071-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105071-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105071-008	SW846 6020
	Copper	0.000464	0.0003	0.001	NE	J		105071-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105071-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105071-008	SW846 6020
	Magnesium	40.3	0.010	0.030	NE			105071-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U	R	105071-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105071-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105071-008	SW846 6020
	Potassium	2.39	0.080	0.300	NE			105071-008	SW846 6020
	Selenium	0.00678	0.002	0.005	0.050			105071-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105071-008	SW846 6020
	Sodium	38.7	0.080	0.250	NE			105071-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105071-008	SW846 6020
	Vanadium	0.00423	0.0033	0.010	NE	J		105071-008	SW846 6020
	Zinc	0.009	0.0033	0.010	NE	B, J	0.01U	105071-008	SW846 6020

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Table 7B-9 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW10	Aluminum	0.0686	0.0193	0.050	NE			105047-008	SW846 6020
13-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105047-008	SW846 6020
	Arsenic	0.00289	0.002	0.005	0.010	J		105047-008	SW846 6020
	Barium	0.0572	0.00067	0.002	2.00			105047-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105047-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105047-008	SW846 6020
	Calcium	126	0.800	2.00	NE			105047-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105047-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105047-008	SW846 6020
	Copper	ND	0.0003	0.001	NE	U		105047-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105047-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105047-008	SW846 6020
	Magnesium	32.4	0.010	0.030	NE			105047-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U	R	105047-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105047-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105047-008	SW846 6020
	Potassium	1.88	0.080	0.300	NE			105047-008	SW846 6020
	Selenium	0.00661	0.002	0.005	0.050			105047-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105047-008	SW846 6020
	Sodium	38.4	0.080	0.250	NE			105047-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105047-008	SW846 6020
	Vanadium	0.00453	0.0033	0.010	NE	J		105047-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105047-008	SW846 6020

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW11	Aluminum	ND	0.0193	0.050	NE	U		105062-008	SW846 6020
18-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105062-008	SW846 6020
	Arsenic	0.00391	0.002	0.005	0.010	J		105062-008	SW846 6020
	Barium	0.0736	0.00067	0.002	2.00			105062-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105062-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105062-008	SW846 6020
	Calcium	142	0.800	2.00	NE			105062-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105062-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105062-008	SW846 6020
	Copper	0.000457	0.0003	0.001	NE	J		105062-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105062-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105062-008	SW846 6020
	Magnesium	43.3	0.010	0.030	NE			105062-008	SW846 6020
	Manganese	0.0203	0.001	0.005	NE		J-	105062-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105062-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105062-008	SW846 6020
	Potassium	3.09	0.080	0.300	NE			105062-008	SW846 6020
	Selenium	0.00622	0.002	0.005	0.050			105062-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105062-008	SW846 6020
	Sodium	41.6	0.080	0.250	NE			105062-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105062-008	SW846 6020
	Vanadium	0.00403	0.0033	0.010	NE	J		105062-008	SW846 6020
	Zinc	0.0117	0.0033	0.010	NE			105062-008	SW846 6020

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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW12	Aluminum	ND	0.0193	0.050	NE	U		105057-008	SW846 6020
17-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105057-008	SW846 6020
	Arsenic	0.00355	0.002	0.005	0.010	J		105057-008	SW846 6020
	Barium	0.0306	0.00067	0.002	2.00			105057-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105057-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105057-008	SW846 6020
	Calcium	156	0.800	2.00	NE			105057-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105057-008	SW846 6020
	Cobalt	0.000305	0.0003	0.001	NE	J		105057-008	SW846 6020
	Copper	0.000709	0.0003	0.001	NE	J		105057-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105057-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105057-008	SW846 6020
	Magnesium	40.9	0.010	0.030	NE			105057-008	SW846 6020
	Manganese	0.0062	0.001	0.005	NE		J-	105057-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105057-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105057-008	SW846 6020
	Potassium	2.55	0.080	0.300	NE			105057-008	SW846 6020
	Selenium	0.00864	0.002	0.005	0.050			105057-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105057-008	SW846 6020
	Sodium	41.8	0.080	0.250	NE			105057-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105057-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		105057-008	SW846 6020
	Zinc	0.0133	0.0033	0.010	NE		J+	105057-008	SW846 6020

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CYN-MW13	Aluminum	ND	0.0193	0.050	NE	U		105075-008	SW846 6020
23-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105075-008	SW846 6020
	Arsenic	0.00247	0.002	0.005	0.010	J		105075-008	SW846 6020
	Barium	0.0874	0.00067	0.002	2.00			105075-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105075-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105075-008	SW846 6020
	Calcium	94.6	0.800	2.00	NE			105075-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105075-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105075-008	SW846 6020
	Copper	0.000365	0.0003	0.001	NE	J		105075-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105075-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105075-008	SW846 6020
	Magnesium	19.0	0.010	0.030	NE			105075-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105075-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105075-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105075-008	SW846 6020
	Potassium	1.84	0.080	0.300	NE			105075-008	SW846 6020
	Selenium	0.00306	0.002	0.005	0.050	J		105075-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105075-008	SW846 6020
	Sodium	23.0	0.080	0.250	NE			105075-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105075-008	SW846 6020
	Vanadium	0.00443	0.0033	0.010	NE	J		105075-008	SW846 6020
	Zinc	0.0101	0.0033	0.010	NE	B	J+	105075-008	SW846 6020

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Table 7B-9 *(Continued)*
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Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW14A	Aluminum	ND	0.0193	0.050	NE	U		105054-008	SW846 6020
16-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105054-008	SW846 6020
	Arsenic	0.00296	0.002	0.005	0.010	J		105054-008	SW846 6020
	Barium	0.0394	0.00067	0.002	2.00			105054-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105054-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105054-008	SW846 6020
	Calcium	138	0.800	2.00	NE			105054-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105054-008	SW846 6020
	Cobalt	0.000856	0.0003	0.001	NE	J		105054-008	SW846 6020
	Copper	0.000449	0.0003	0.001	NE	J		105054-008	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105054-008	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105054-008	SW846 6020
	Magnesium	34.9	0.010	0.030	NE			105054-008	SW846 6020
	Manganese	0.0141	0.001	0.005	NE		J-	105054-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	U		105054-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105054-008	SW846 6020
	Potassium	2.32	0.080	0.300	NE			105054-008	SW846 6020
	Selenium	0.00892	0.002	0.005	0.050			105054-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105054-008	SW846 6020
	Sodium	39.9	0.080	0.250	NE			105054-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105054-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	U		105054-008	SW846 6020
	Zinc	0.0102	0.0033	0.010	NE			105054-008	SW846 6020

Refer to footnotes on page 7B-32.

Table 7B-9 *(Concluded)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Result[a] (mg/L)	MDL[b] (mg/L)	PQL[c] (mg/L)	MCL[d] (mg/L)	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW15	Aluminum	ND	0.0193	0.050	NE	U		105068-009	SW846 6020
19-Apr-18	Antimony	ND	0.001	0.003	0.006	U		105068-009	SW846 6020
	Arsenic	0.00217	0.002	0.005	0.010	J		105068-009	SW846 6020
	Barium	0.0631	0.00067	0.002	2.00			105068-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	U		105068-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	U		105068-009	SW846 6020
	Calcium	176	0.800	2.00	NE			105068-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	U		105068-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	U		105068-009	SW846 6020
	Copper	0.00203	0.0003	0.001	NE	*, B	J+	105068-009	SW846 6020
	Iron	ND	0.033	0.100	NE	U		105068-009	SW846 6020
	Lead	ND	0.0005	0.002	NE	U		105068-009	SW846 6020
	Magnesium	52.9	0.100	0.300	NE			105068-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	U		105068-009	SW846 6020
	Mercury	0.000096	0.000067	0.0002	0.002	J		105068-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	U		105068-009	SW846 6020
	Potassium	2.72	0.080	0.300	NE			105068-009	SW846 6020
	Selenium	0.00783	0.002	0.005	0.050			105068-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	U		105068-009	SW846 6020
	Sodium	47.6	0.080	0.250	NE	N		105068-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	U		105068-009	SW846 6020
	Vanadium	0.00381	0.0033	0.010	NE	J		105068-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	U		105068-009	SW846 6020

Refer to footnotes on page 7B-32.

Table 7B-10
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW4	Americium-241	1.17 ± 9.49	15.5	7.52	NE	U	BD	105039-009	EPA 901.1
11-Apr-18	Cesium-137	0.241 ± 1.71	2.99	1.41	NE	U	BD	105039-009	EPA 901.1
	Cobalt-60	-0.176 ± 1.78	3.20	1.47	NE	U	BD	105039-009	EPA 901.1
	Potassium-40	16.2 ± 39.0	28.4	12.8	NE	U	BD	105039-009	EPA 901.1
	Gross Alpha	0.91	NA	NA	15 pCi/L	NA	None	105039-010	EPA 900.0
	Gross Beta	10.9 ± 2.21	1.44	0.695	4 mrem/yr			105039-010	EPA 900.0
	Uranium-233/234	35.9 ± 3.50	0.126	0.0581	NE			105039-011	HASL-300
	Uranium-235/236	0.773 ± 0.135	0.0595	0.024	NE			105039-011	HASL-300
	Uranium-238	5.02 ± 0.546	0.0768	0.0337	NE			105039-011	HASL-300
	Tritium	-22.6 ± 65.2	120	56.2	NE	U	BD	105039-012	EPA 906.0
CYN-MW7	Americium-241	-1.97 ± 11.5	17.4	8.44	NE	U	BD	105035-009	EPA 901.1
10-Apr-18	Cesium-137	-0.487 ± 2.29	3.60	1.71	NE	U	BD	105035-009	EPA 901.1
	Cobalt-60	-1.21 ± 3.41	3.56	1.65	NE	U	BD	105035-009	EPA 901.1
	Potassium-40	-15.4 ± 41.5	51.3	24.3	NE	U	BD	105035-009	EPA 901.1
	Gross Alpha	7.17	NA	NA	15 pCi/L	NA	None	105035-010	EPA 900.0
	Gross Beta	5.42 ± 1.42	1.55	0.750	4 mrem/yr			105035-010	EPA 900.0
	Uranium-233/234	17.2 ± 1.81	0.215	0.0996	NE			105035-011	HASL-300
	Uranium-235/236	0.480 ± 0.127	0.102	0.0411	NE			105035-011	HASL-300
	Uranium-238	2.45 ± 0.338	0.132	0.0578	NE			105035-011	HASL-300
	Tritium	26.7 ± 68.4	119	55.6	NE	U	BD	105035-012	EPA 906.0
CYN-MW8	Americium-241	-10.8 ± 17.2	25.7	12.6	NE	U	BD	105043-009	EPA 901.1
12-Apr-18	Cesium-137	-2.03 ± 3.14	4.02	1.93	NE	U	BD	105043-009	EPA 901.1
	Cobalt-60	-0.524 ± 2.48	4.36	2.06	NE	U	BD	105043-009	EPA 901.1
	Potassium-40	138 ± 64.1	43.5	20.5	NE	X	R	105043-009	EPA 901.1
	Gross Alpha	4.41	NA	NA	15 pCi/L	NA	None	105043-010	EPA 900.0
	Gross Beta	6.30 ± 1.58	1.52	0.728	4 mrem/yr			105043-010	EPA 900.0
	Uranium-233/234	23.2 ± 2.24	0.114	0.0526	NE			105043-011	HASL-300
	Uranium-235/236	0.507 ± 0.0999	0.0539	0.0217	NE			105043-011	HASL-300
	Uranium-238	2.88 ± 0.328	0.0695	0.0305	NE			105043-011	HASL-300
	Tritium	3.75 ± 69.2	124	57.8	NE	U	BD	105043-012	EPA 906.0

Refer to footnotes on page 7B-32.

Table 7B-10 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW9	Americium-241	-3.51 ± 14.8	23.4	11.4	NE	U	BD	105071-009	EPA 901.1
20-Apr-18	Cesium-137	-0.625 ± 3.12	3.32	1.57	NE	U	BD	105071-009	EPA 901.1
	Cobalt-60	-0.332 ± 1.87	3.38	1.55	NE	U	BD	105071-009	EPA 901.1
	Potassium-40	21.3 ± 48.8	35.6	16.4	NE	U	BD	105071-009	EPA 901.1
	Gross Alpha	13.76	NA	NA	15 pCi/L	NA	None	105071-010	EPA 900.0
	Gross Beta	4.95 ± 1.22	1.73	0.829	4 mrem/yr		J	105071-010	EPA 900.0
	Uranium-233/234	8.74 ± 0.936	0.167	0.0768	NE			105071-011	HASL-300
	Uranium-235/236	0.234 ± 0.0825	0.121	0.052	NE		J	105071-011	HASL-300
	Uranium-238	2.47 ± 0.325	0.111	0.0484	NE			105071-011	HASL-300
	Tritium	59.3 ± 65.2	108	50.0	NE	U	BD	105071-012	EPA 906.0
CYN-MW10	Americium-241	-0.0727 ± 7.11	11.6	5.58	NE	U	BD	105047-009	EPA 901.1
13-Apr-18	Cesium-137	0.967 ± 1.86	3.26	1.54	NE	U	BD	105047-009	EPA 901.1
	Cobalt-60	1.63 ± 2.12	3.86	1.79	NE	U	BD	105047-009	EPA 901.1
	Potassium-40	19.5 ± 51.6	34.0	15.6	NE	U	BD	105047-009	EPA 901.1
	Gross Alpha	0.41	NA	NA	15 pCi/L	NA	None	105047-010	EPA 900.0
	Gross Beta	4.27 ± 0.959	1.30	0.618	4 mrem/yr			105047-010	EPA 900.0
	Uranium-233/234	6.24 ± 0.835	0.497	0.230	NE			105047-011	HASL-300
	Uranium-235/236	0.627 ± 0.228	0.236	0.095	NE		J	105047-011	HASL-300
	Uranium-238	2.27 ± 0.418	0.304	0.134	NE			105047-011	HASL-300
	Tritium	38.0 ± 71.0	122	57.0	NE	U	BD	105047-012	EPA 906.0
CYN-MW11	Americium-241	-8.66 ± 14.1	15.3	7.39	NE	U	BD	105062-009	EPA 901.1
18-Apr-18	Cesium-137	-0.0874 ± 1.92	3.36	1.59	NE	U	BD	105062-009	EPA 901.1
	Cobalt-60	-0.231 ± 2.06	3.72	1.72	NE	U	BD	105062-009	EPA 901.1
	Potassium-40	45.4 ± 32.1	32.0	14.6	NE		J	105062-009	EPA 901.1
	Gross Alpha	-0.08	NA	NA	15 pCi/L	NA	None	105062-010	EPA 900.0
	Gross Beta	6.58 ± 1.37	1.90	0.916	4 mrem/yr			105062-010	EPA 900.0
	Uranium-233/234	6.61 ± 0.723	0.191	0.0883	NE			105062-011	HASL-300
	Uranium-235/236	0.316 ± 0.0967	0.0904	0.0365	NE			105062-011	HASL-300
	Uranium-238	2.40 ± 0.316	0.117	0.0512	NE			105062-011	HASL-300
	Tritium	27.1 ± 72.3	126	58.9	NE	U	BD	105062-012	EPA 906.0

Refer to footnotes on page 7B-32.

Table 7B-10 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW12	Americium-241	26.7 ± 20.7	28.7	14.0	NE	U	BD	105057-009	EPA 901.1
17-Apr-18	Cesium-137	-1.37 ± 2.14	3.58	1.70	NE	U	BD	105057-009	EPA 901.1
	Cobalt-60	1.20 ± 2.18	4.01	1.86	NE	U	BD	105057-009	EPA 901.1
	Potassium-40	-32.6 ± 43.2	51.9	24.5	NE	U	BD	105057-009	EPA 901.1
	Gross Alpha	1.43	NA	NA	15 pCi/L	NA	None	105057-010	EPA 900.0
	Gross Beta	6.70 ± 1.75	2.66	1.29	4 mrem/yr		J	105057-010	EPA 900.0
	Uranium-233/234	13.8 ± 1.55	0.458	0.212	NE			105057-011	HASL-300
	Uranium-235/236	1.05 ± 0.276	0.217	0.0876	NE			105057-011	HASL-300
	Uranium-238	3.02 ± 0.487	0.280	0.123	NE			105057-011	HASL-300
	Tritium	-44.6 ± 65.3	123	57.6	NE	U	BD	105057-012	EPA 906.0
CYN-MW13	Americium-241	0.840 ± 11.7	19.1	9.29	NE	U	BD	105075-009	EPA 901.1
23-Apr-18	Cesium-137	0.487 ± 1.93	3.06	1.45	NE	U	BD	105075-009	EPA 901.1
	Cobalt-60	0.265 ± 2.00	3.66	1.71	NE	U	BD	105075-009	EPA 901.1
	Potassium-40	-32.5 ± 36.9	46.0	21.8	NE	U	BD	105075-009	EPA 901.1
	Gross Alpha	2.41	NA	NA	15 pCi/L	NA	None	105075-010	EPA 900.0
	Gross Beta	4.66 ± 0.778	0.994	0.474	4 mrem/yr			105075-010	EPA 900.0
	Uranium-233/234	9.16 ± 0.907	0.125	0.0571	NE			105075-011	HASL-300
	Uranium-235/236	0.259 ± 0.0758	0.0901	0.0387	NE		J	105075-011	HASL-300
	Uranium-238	1.67 ± 0.219	0.0824	0.036	NE			105075-011	HASL-300
	Tritium	47.6 ± 65.7	111	51.3	NE	U	BD	105075-012	EPA 906.0
CYN-MW14A	Americium-241	9.32 ± 18.5	28.9	14.1	NE	U	BD	105054-009	EPA 901.1
16-Apr-18	Cesium-137	-0.778 ± 3.36	4.06	1.93	NE	U	BD	105054-009	EPA 901.1
	Cobalt-60	-2.07 ± 2.78	4.25	1.96	NE	U	BD	105054-009	EPA 901.1
	Potassium-40	-27.7 ± 48.2	55.1	25.9	NE	U	BD	105054-009	EPA 901.1
	Gross Alpha	0.18	NA	NA	15 pCi/L	NA	None	105054-010	EPA 900.0
	Gross Beta	8.50 ± 1.32	1.76	0.850	4 mrem/yr			105054-010	EPA 900.0
	Uranium-233/234	12.8 ± 1.30	0.206	0.0952	NE			105054-011	HASL-300
	Uranium-235/236	0.890 ± 0.177	0.0975	0.0393	NE			105054-011	HASL-300
	Uranium-238	3.73 ± 0.447	0.126	0.0553	NE			105054-011	HASL-300
	Tritium	0.358 ± 69.6	125	58.4	NE	U	BD	105054-012	EPA 906.0

Refer to footnotes on page 7B-32.

Table 7B-10 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL[d]	Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
CYN-MW15	Americium-241	-6.8 ± 6.84	10.1	4.95	NE	U	BD	105068-010	EPA 901.1
19-Apr-18	Cesium-137	0.380 ± 2.09	3.19	1.53	NE	U	BD	105068-010	EPA 901.1
	Cobalt-60	0.952 ± 2.16	3.84	1.81	NE	U	BD	105068-010	EPA 901.1
	Potassium-40	-19 ± 40.1	50.9	24.3	NE	U	BD	105068-010	EPA 901.1
	Gross Alpha	-6.47	NA	NA	15 pCi/L	NA	None	105068-011	EPA 900.0
	Gross Beta	5.69 ± 1.22	1.74	0.841	4 mrem/yr			105068-011	EPA 900.0
	Uranium-233/234	14.4 ± 1.42	0.158	0.0729	NE			105068-012	HASL-300
	Uranium-235/236	0.453 ± 0.106	0.0747	0.0301	NE			105068-012	HASL-300
	Uranium-238	3.42 ± 0.397	0.0964	0.0423	NE			105068-012	HASL-300
	Tritium	-5.0 ± 58.2	106	49.1	NE	U	BD	105068-013	EPA 906.0

Refer to footnotes on page 7B-32.

Table 7B-11
Summary of Field Water Quality Measurements[h], Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2018

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmhos/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CYN-MW4	11-Apr-18	18.49	685.1	262.1	7.42	0.21	53.0	3.98
CYN-MW7	10-Apr-18	18.31	716.4	287.7	7.15	0.15	63.3	4.77
CYN-MW8	12-Apr-18	19.80	839.1	289.7	7.20	0.35	70.7	5.08
CYN-MW9	20-Apr-18	16.18	973.7	278.6	7.08	0.12	66.9	5.21
CYN-MW10	13-Apr-18	13.42	800.3	285.6	7.52	0.21	84.6	6.92
CYN-MW11	18-Apr-18	16.47	1018.6	156.1	7.42	0.12	10.77	0.83
CYN-MW12	17-Apr-18	18.43	1056.1	188.1	7.13	0.25	19.1	1.42
CYN-MW13	23-Apr-18	19.44	730.8	248.5	7.32	0.11	48.4	3.57
CYN-MW14A	16-Apr-18	17.73	939.1	170.2	7.29	0.10	20.6	1.55
CYN-MW15	19-Apr-18	15.93	1167.7	177.8	7.16	0.11	14.7	1.15
CYN-MW4	08-Oct-18	17.43	680.4	147.8	7.44	0.50	59.8	4.85
CYN-MW7	09-Oct-18	17.08	764.5	197.5	7.24	0.41	64.3	5.25
CYN-MW8	10-Oct-18	17.31	866.8	183.0	7.31	0.58	69.9	5.67
CYN-MW9	16-Oct-18	14.21	1035.9	148.3	6.99	0.45	55.8	5.04
CYN-MW9	19-Dec-18	15.47	942.2	104.0	7.06	0.33	59.8	4.98
CYN-MW10	11-Oct-18	16.40	846.4	162.0	7.45	0.29	83.3	6.90
CYN-MW11	12-Oct-18	16.86	1030.1	57.4	7.30	1.92	7.96	0.65
CYN-MW12	15-Oct-18	13.99	999.3	162.7	6.92	0.26	66.7	6.34
CYN-MW13	17-Oct-18	15.83	705.3	150.6	7.30	0.38	48.4	3.90
CYN-MW13	20-Dec-18	17.56	681.8	64.4	7.24	0.68	49.8	3.96
CYN-MW14A	12-Oct-18	16.94	952.3	64.5	7.30	0.37	19.3	1.54
CYN-MW15	16-Oct-18	13.76	1238.1	184.8	7.07	0.46	14.53	1.23
CYN-MW15	14-Dec-18	15.59	1111.4	117.3	7.05	0.46	14.8	1.25

Refer to footnotes on page 7B-32.

Footnotes for Burn Site Groundwater Analytical Results Tables

%	= Percent.
CFR	= Code of Federal Regulations.
CYN	= Canyons.
EPA	= U.S. Environmental Protection Agency.
HMX	= Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
ID	= Identifier.
µg/L	= Micrograms per liter.
mg/L	= Milligrams per liter.
mrem/yr	= Millirem per year.
MW	= Monitoring well.
No.	= Number.
pCi/L	= Picocuries per liter.
RDX	= Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Tetryl	= Methyl-2,4,6-trinitrophenylnitramine.

[a]Result or Activity

The Result applies to Tables 7B-1 through 7B-9. Activity applies to Table 7B-10.

Activity	= Gross alpha activity measurements were corrected by subtracting out the total uranium activity (40 CFR Part 141). Activities of zero or less are considered to be not detected.
Bold	= Value exceed the established MCL.
ND	= Not detected (at method detection limit).

[b]MDL or MDA

The MDL applies to Tables 7B-1 through 7B-9. MDA applies to Table 7B-10.

MDA	= The minimal detectable activity or minimum measured activity in a sample required to ensure a 95% probability that the measured activity is accurately quantified above the critical level.
MDL	= Method detection limit. The minimum concentration or activity that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix specific.
NA	= Not applicable for gross alpha activities. The MDA could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.

[c]PQL or Critical Level

The PQL applies to Tables 7B-1 through 7B-9. Critical level applies to Table 7B-10.

Critical Level	= The minimum activity that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix specific.
NA	= Not applicable for gross alpha activities. The critical level could not be calculated as the gross alpha activity was corrected by subtracting out the total uranium activity.
PQL	= Practical quantitation limit. The lowest concentration of analytes in a sample that can be reliably determined within specified limits of precision and accuracy by that indicated method under routine laboratory operating conditions.

[d]MCL

MCL = Maximum contaminant level. Established by the EPA Office of Water, National Primary Drinking Water Standards (EPA May 2009).

The following are the MCLs for gross alpha particles and beta particles in community water systems:

- 15 pCi/L = Gross alpha particle activity, excluding total uranium (40 CFR Part 141).
- 4 mrem/yr = Any combination of beta and/or gamma emitting radionuclides (as dose rate).

NE = Not established.

Footnotes for Burn Site Groundwater Analytical Results Tables (Concluded)

[e]Lab Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

B = The analyte was detected in the blank above the effective method detection limit (MDL).
J = Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
N = Results associated with the spike analysis that was outside control limits.
NA = Not applicable.
U = Analyte is absent or below the method detection limit.
X = Uncertain identification for gamma spectroscopy.
* = Recovery or relative percent difference (RPD) not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where the concentration falls below the effective PQL.

[f]Validation Qualifier

If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

BD = Below detection limit as used in radiochemistry to identify results that are not statistically different from zero.
J = The associated value is an estimated quantity.
J+ = The associated numerical value is an estimated quantity with a suspected positive bias.
J- = The associated numerical value is an estimated quantity with a suspected negative bias.
None = No data validation for corrected gross alpha activity.
R = The data are unusable, and resampling or reanalysis are necessary for verification.
U = The analyte was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
UJ = The analyte was analyzed for but was not detected. The associated numerical value is an estimate and may be inaccurate or imprecise.

[g]Analytical Method

Clesceri, Rice, Baird, and Eaton, 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd ed., Method 2320B, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C.

DOE, Environmental Measurements Laboratory, 1997, "EML Procedures Manual," 28th ed., Vol. 1, Rev. 0, HASL-300.

EPA, 1986 (and updates), "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd ed, U.S. Environmental Protection Agency, Washington, D.C.

EPA, 1984, "Methods for Chemical Analysis of Water and Wastes." EPA 600-4-79-020, U.S. Environmental Protection Agency, Cincinnati, Ohio.

EPA, 1980, "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA-600/4-80-032, U.S. Environmental Protection Agency, Cincinnati, Ohio.

DOE = U.S. Department of Energy.
HASL = Health and Safety Laboratory.
SM = Standard Method.
SW = Solid Waste.

[h]Field Water Quality Measurements

Field measurements collected prior to sampling.

°C = Degrees Celsius.
% Sat = Percent saturation.
µmhos/cm = Micromhos per centimeter.
mg/L = Milligrams per liter.
mV = Millivolts.
NTU = Nephelometric turbidity units.
pH = Potential of hydrogen (negative logarithm of the hydrogen ion concentration).

Attachment 7C
Burn Site Groundwater
Plots

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Attachment 7C Plots

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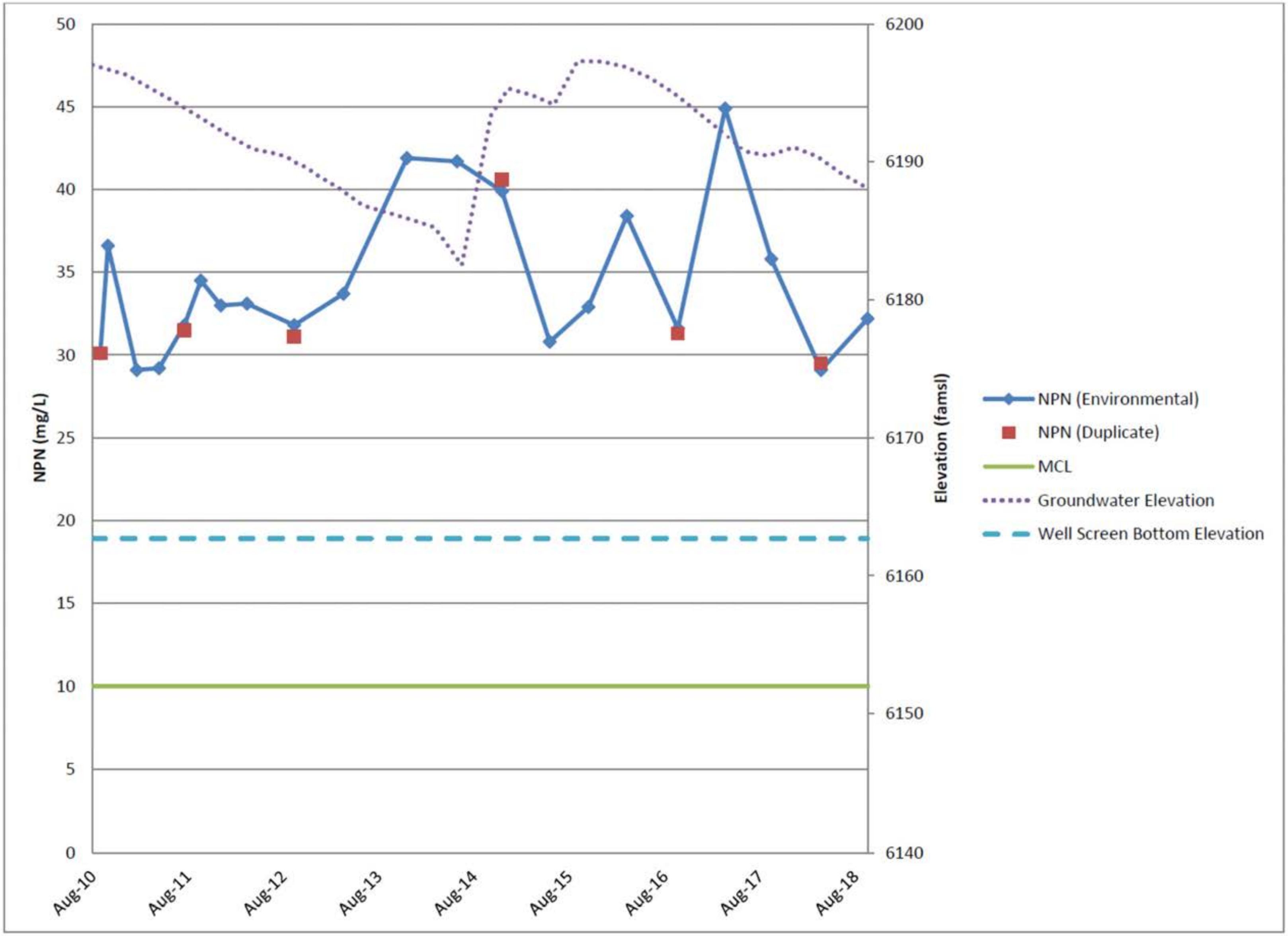

Figure 7C-1. Nitrate plus Nitrite Concentrations, CYN-MW9

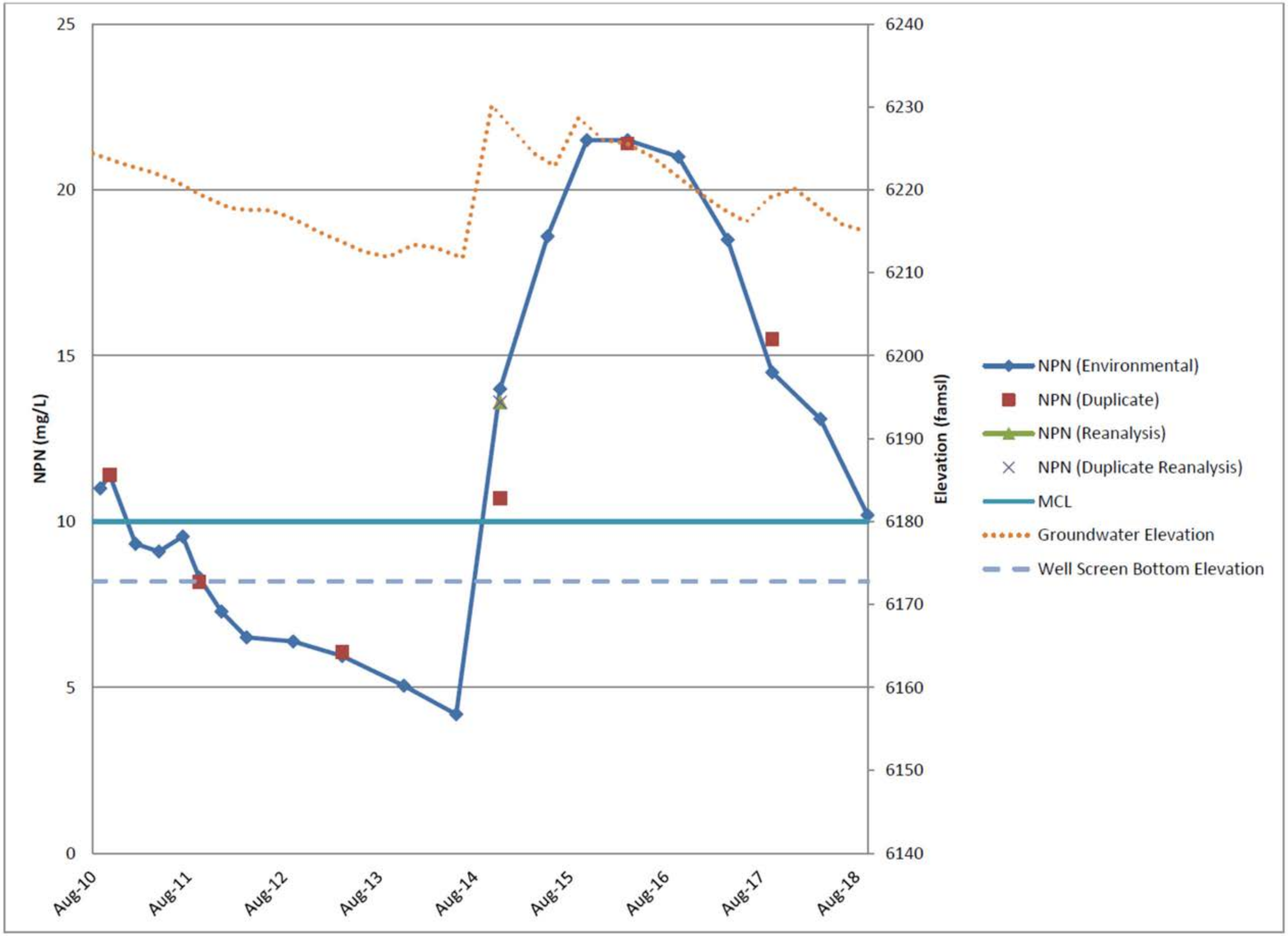

Figure 7C-2. Nitrate plus Nitrite Concentrations, CYN-MW10

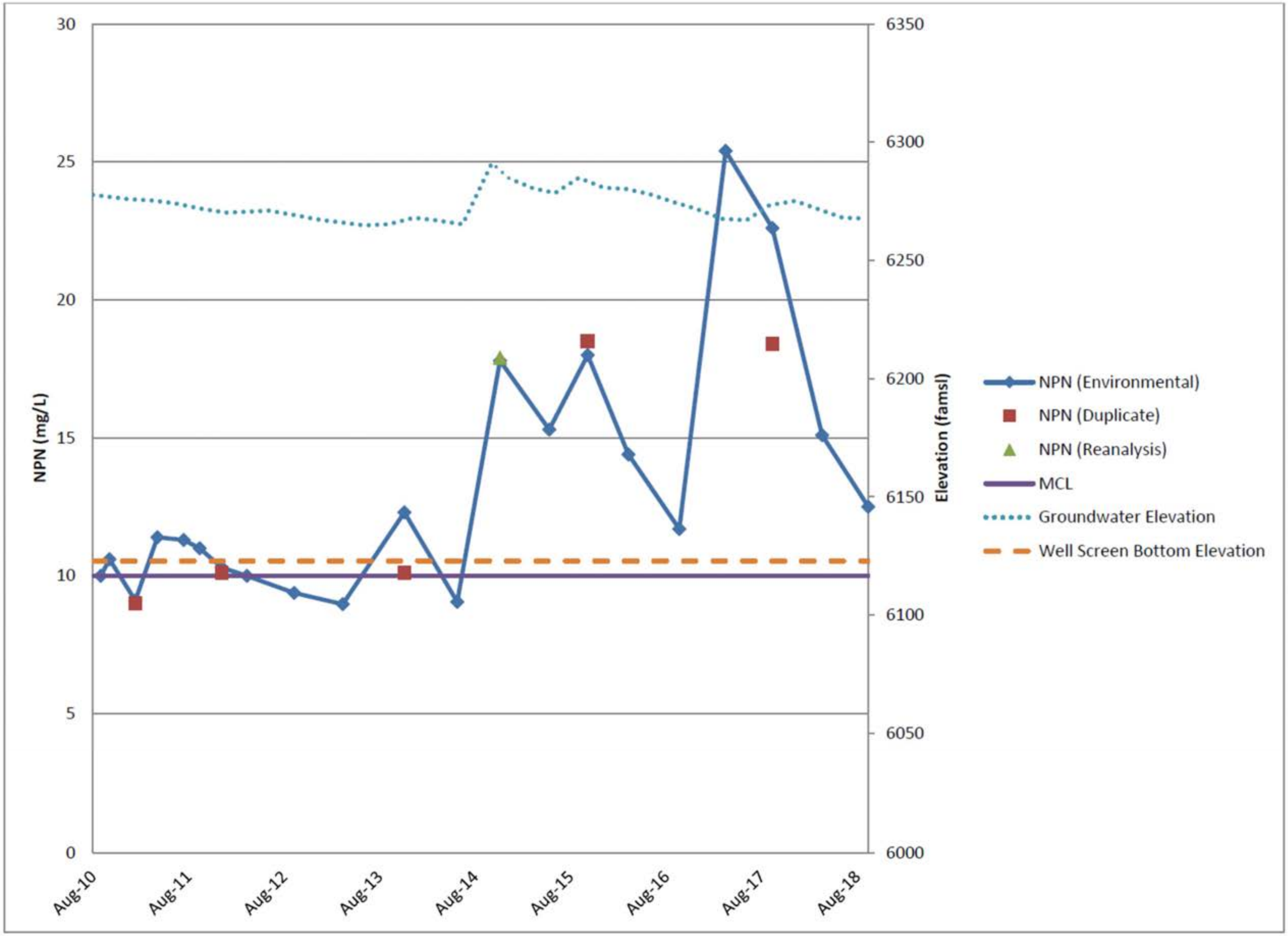

Figure 7C-3. Nitrate plus Nitrite Concentrations, CYN-MW11

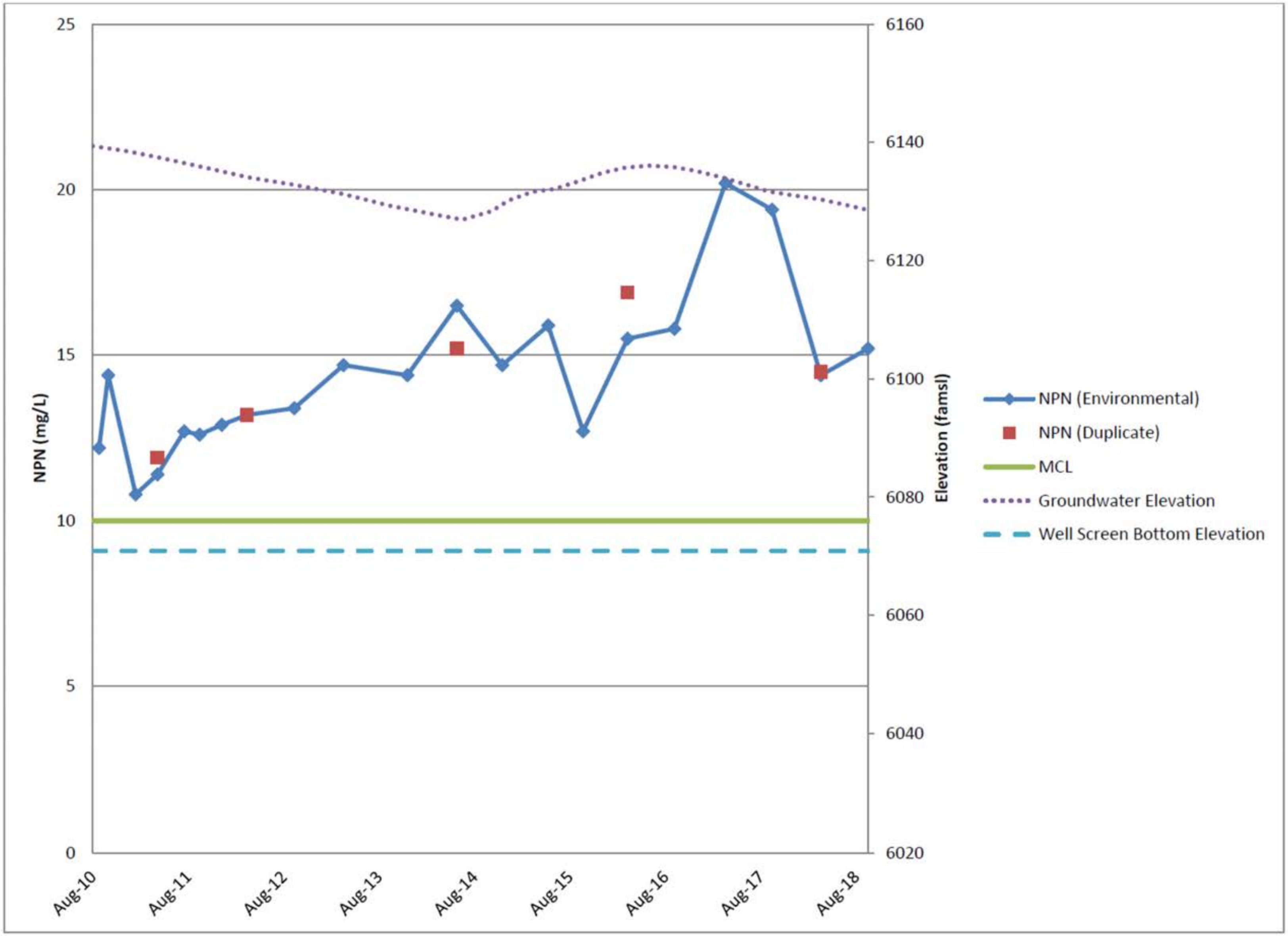

Figure 7C-4. Nitrate plus Nitrite Concentrations, CYN-MW12

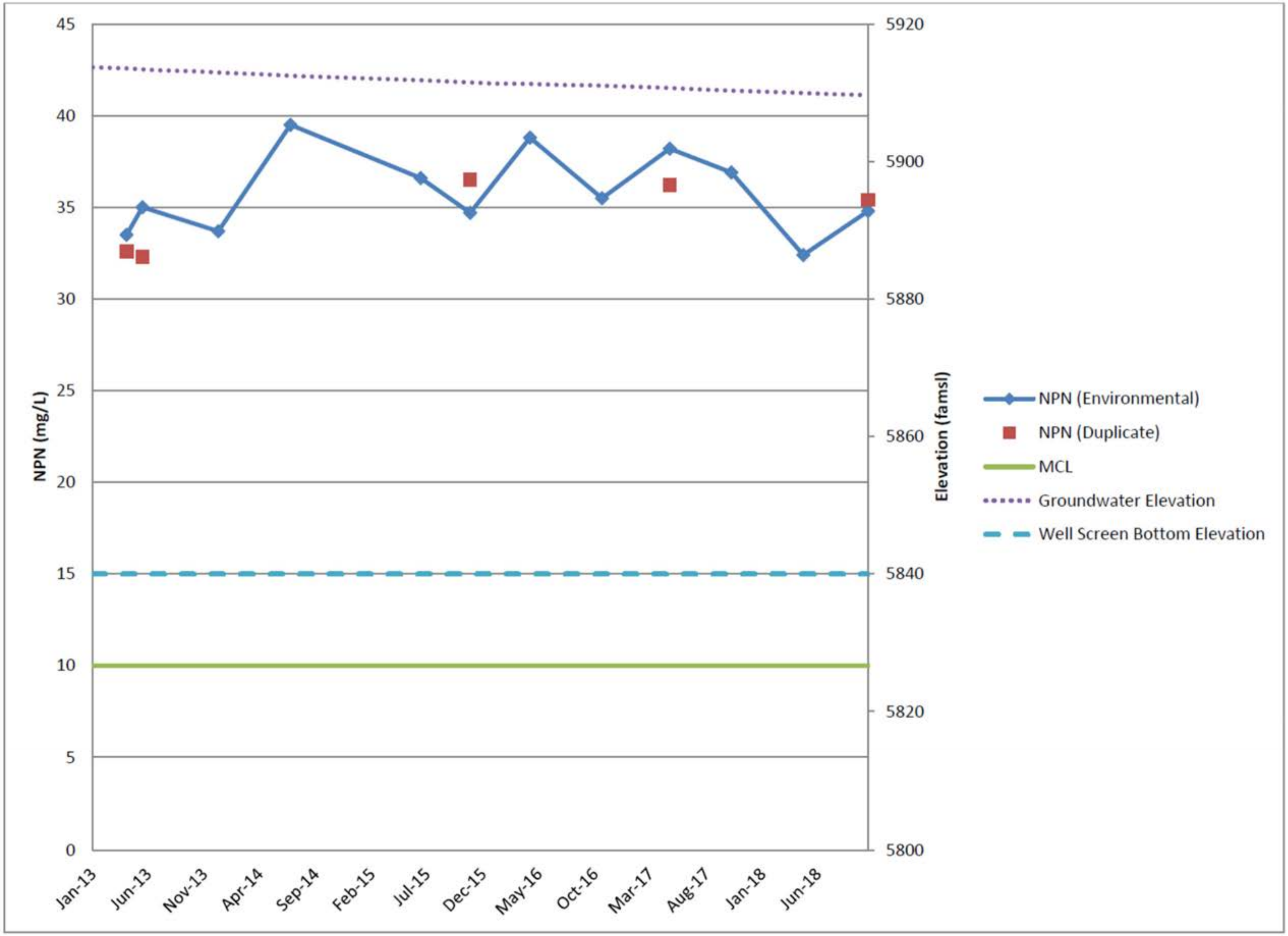

Figure 7C-5. Nitrate plus Nitrite Concentrations, CYN-MW13

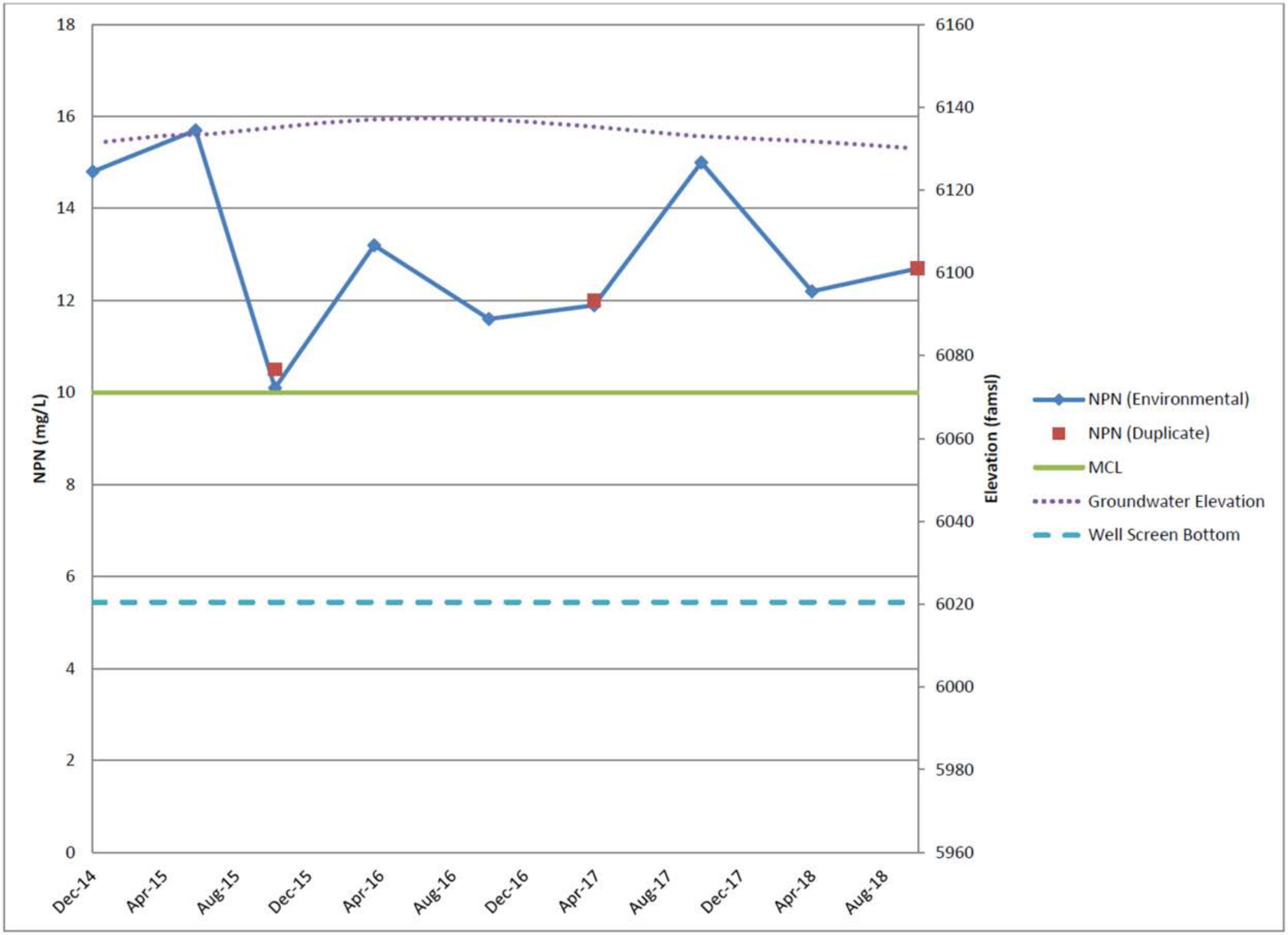

Figure 7C-6. Nitrate plus Nitrite Concentrations, CYN-MW14A

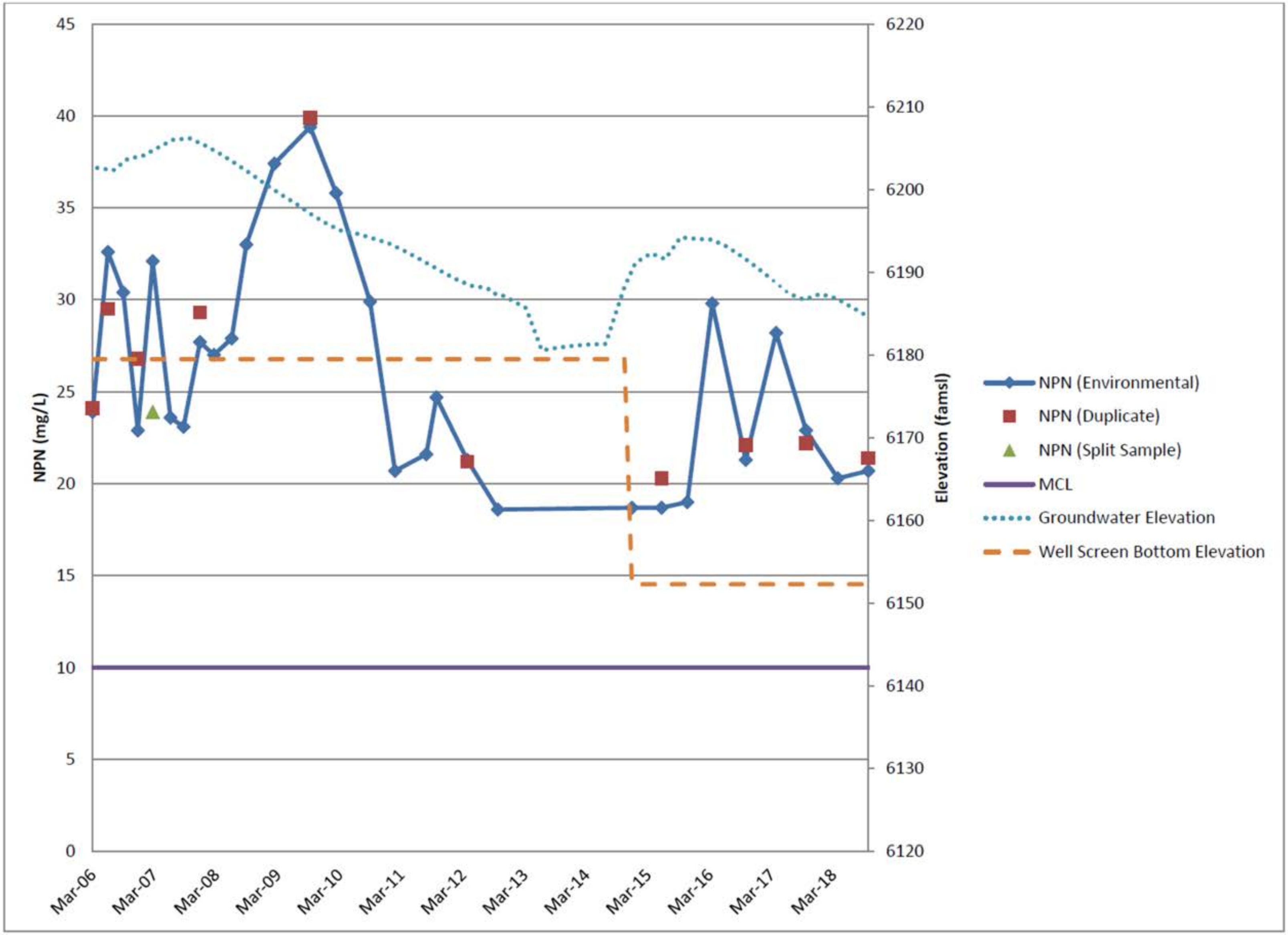

Figure 7C-7. Nitrate plus Nitrite Concentrations, CYN-MW15 (Includes Historical CYN-MW6 Data)

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Attachment 7D
Burn Site Groundwater Hydrographs

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Attachment 7D Hydrographs

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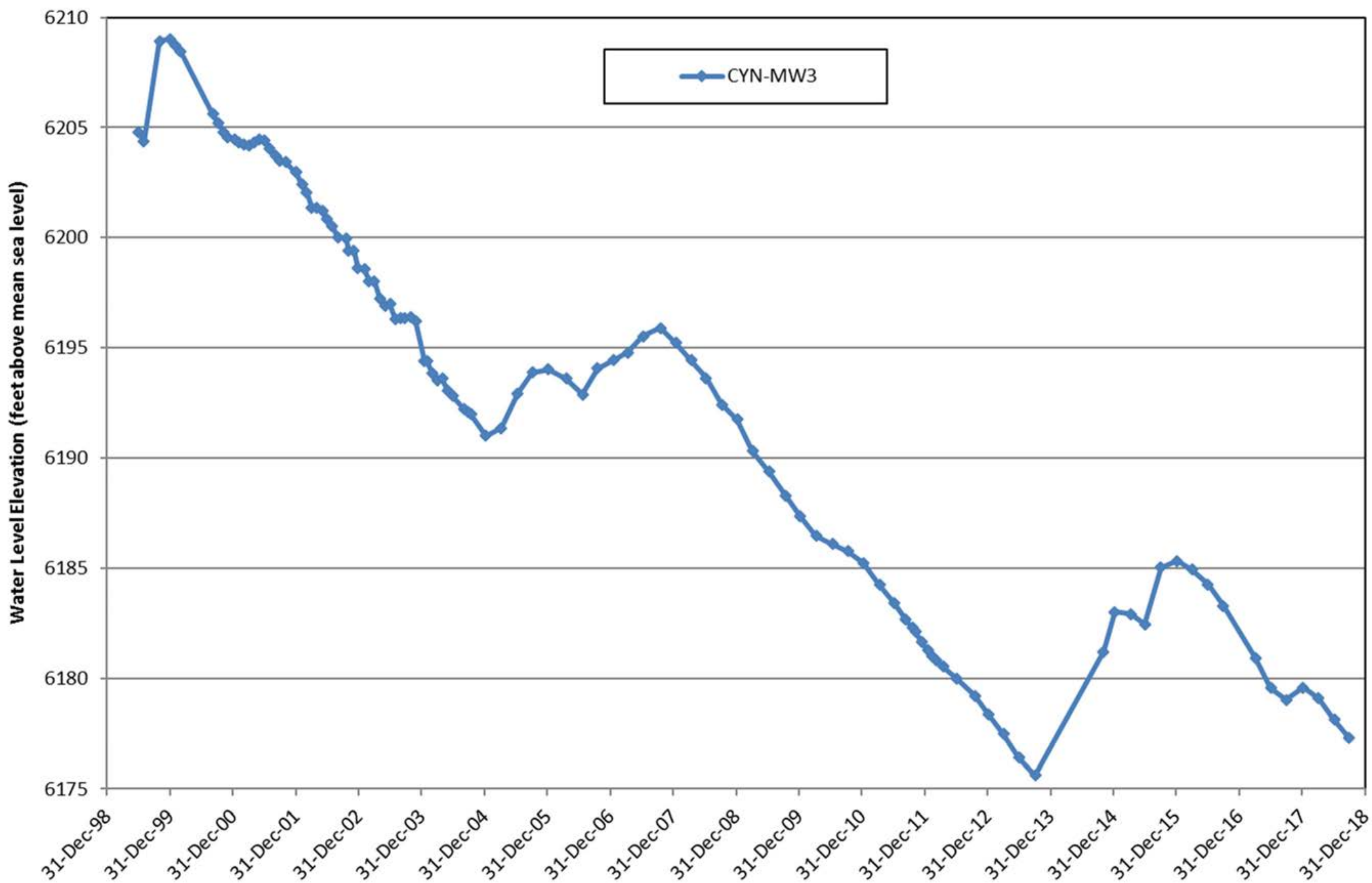

Figure 7D-1. BSG Area of Concern Wells (1 of 9)

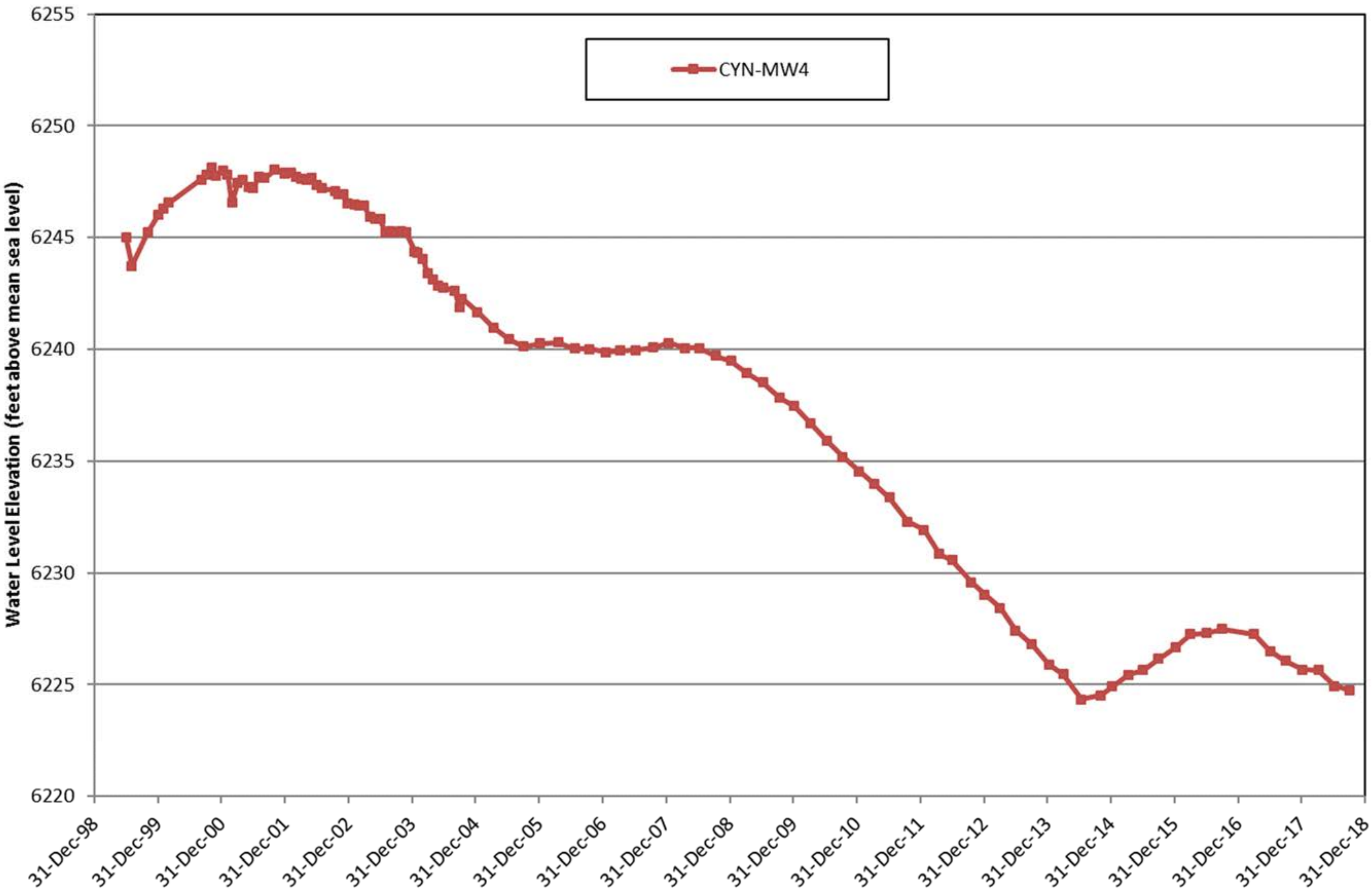

Figure 7D-2. BSG Area of Concern Wells (2 of 9)

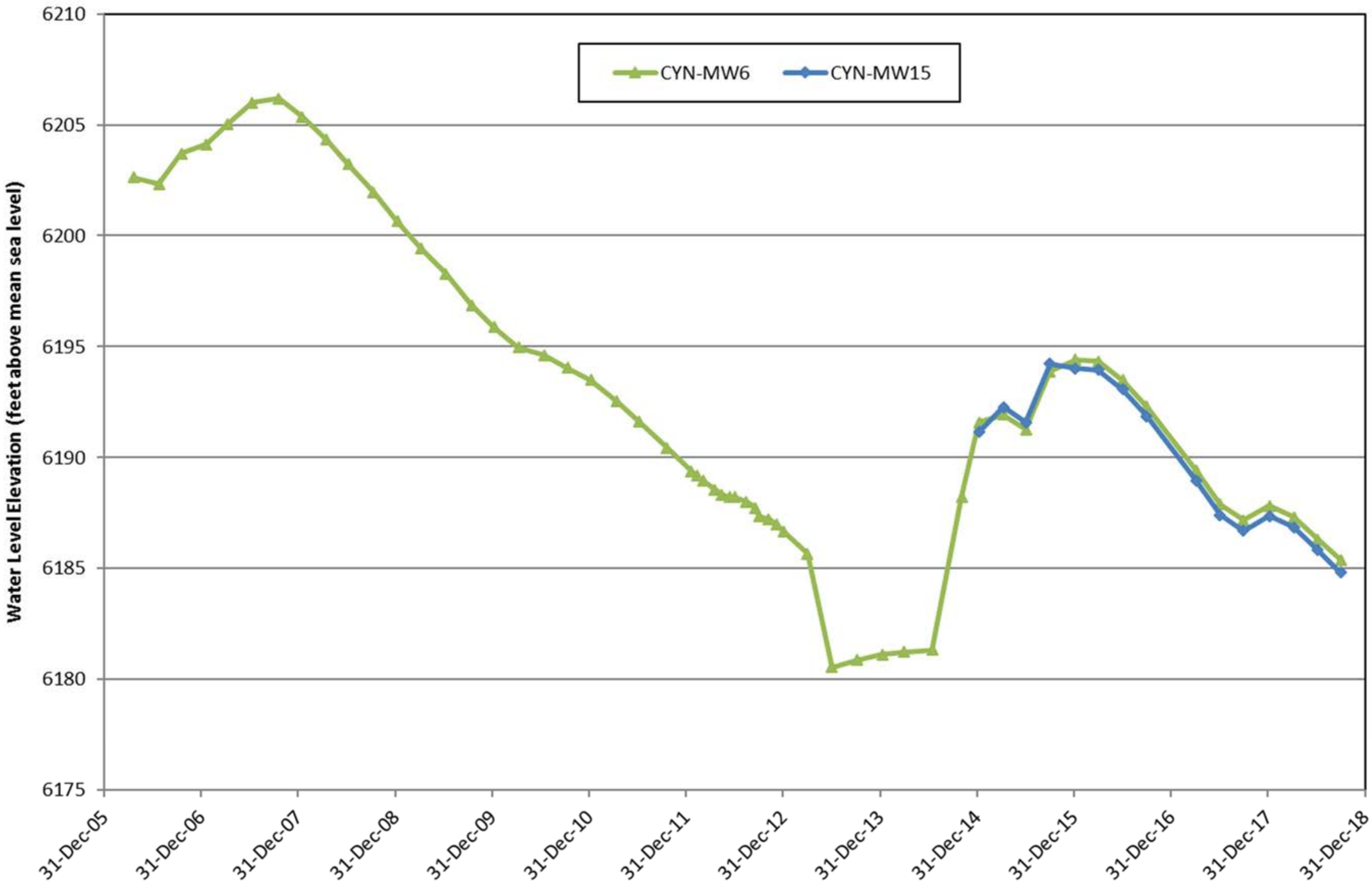

Figure 7D-3. BSG Area of Concern Wells (3 of 9)

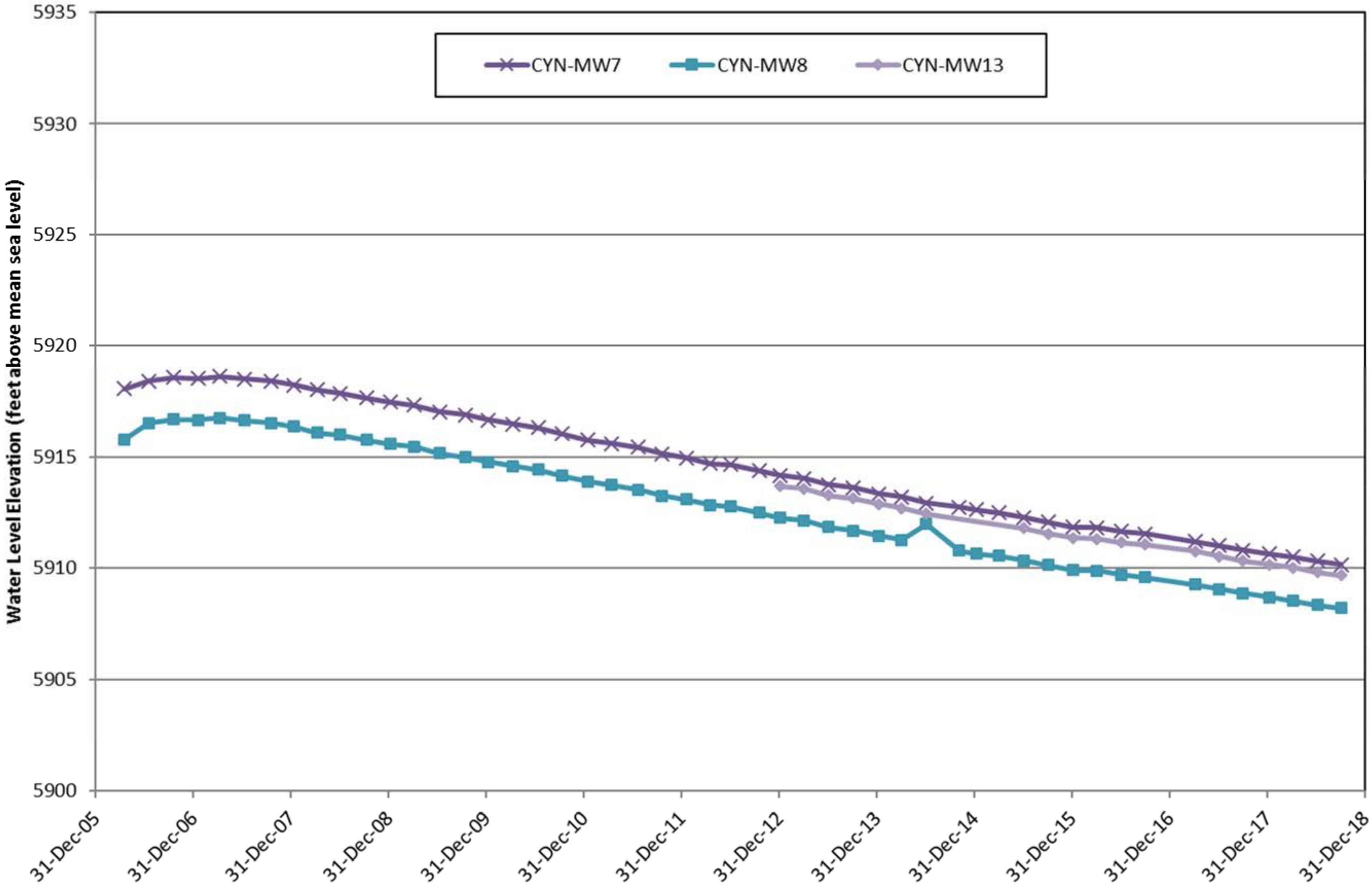

Figure 7D-4. BSG Area of Concern Wells (4 of 9)

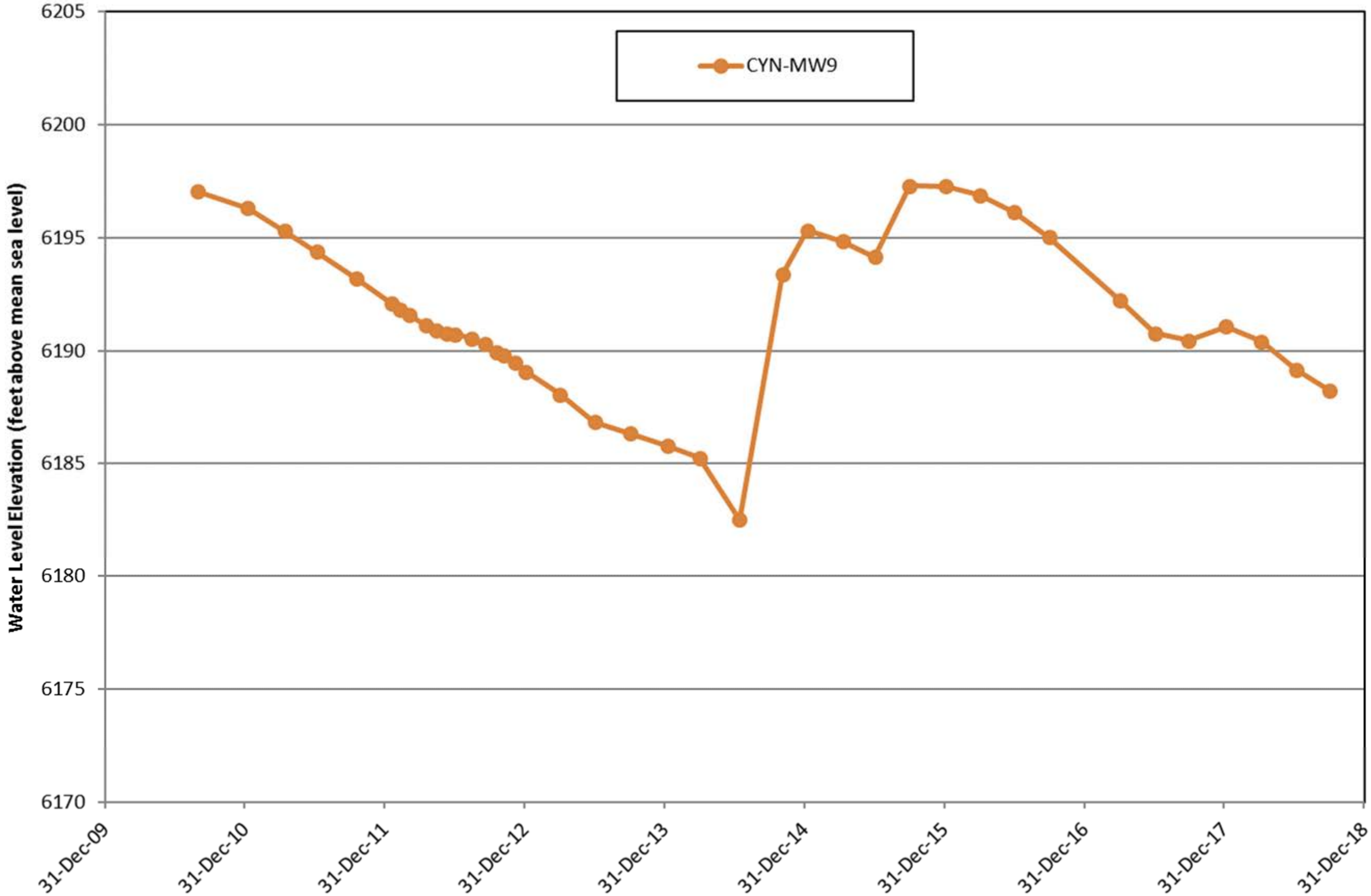

Figure 7D-5. BSG Area of Concern Wells (5 of 9)

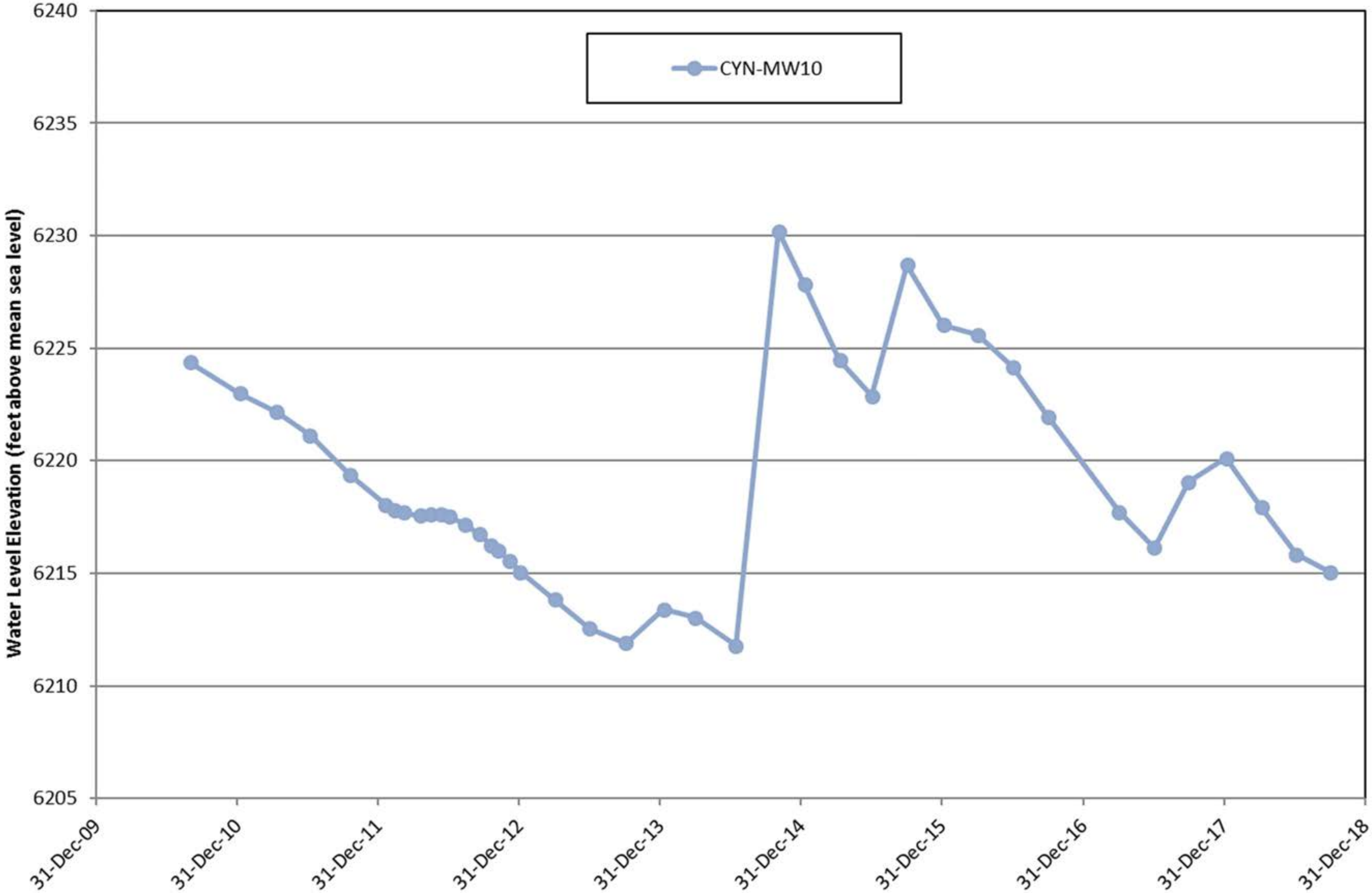

Figure 7D-6. BSG Area of Concern Wells (6 of 9)

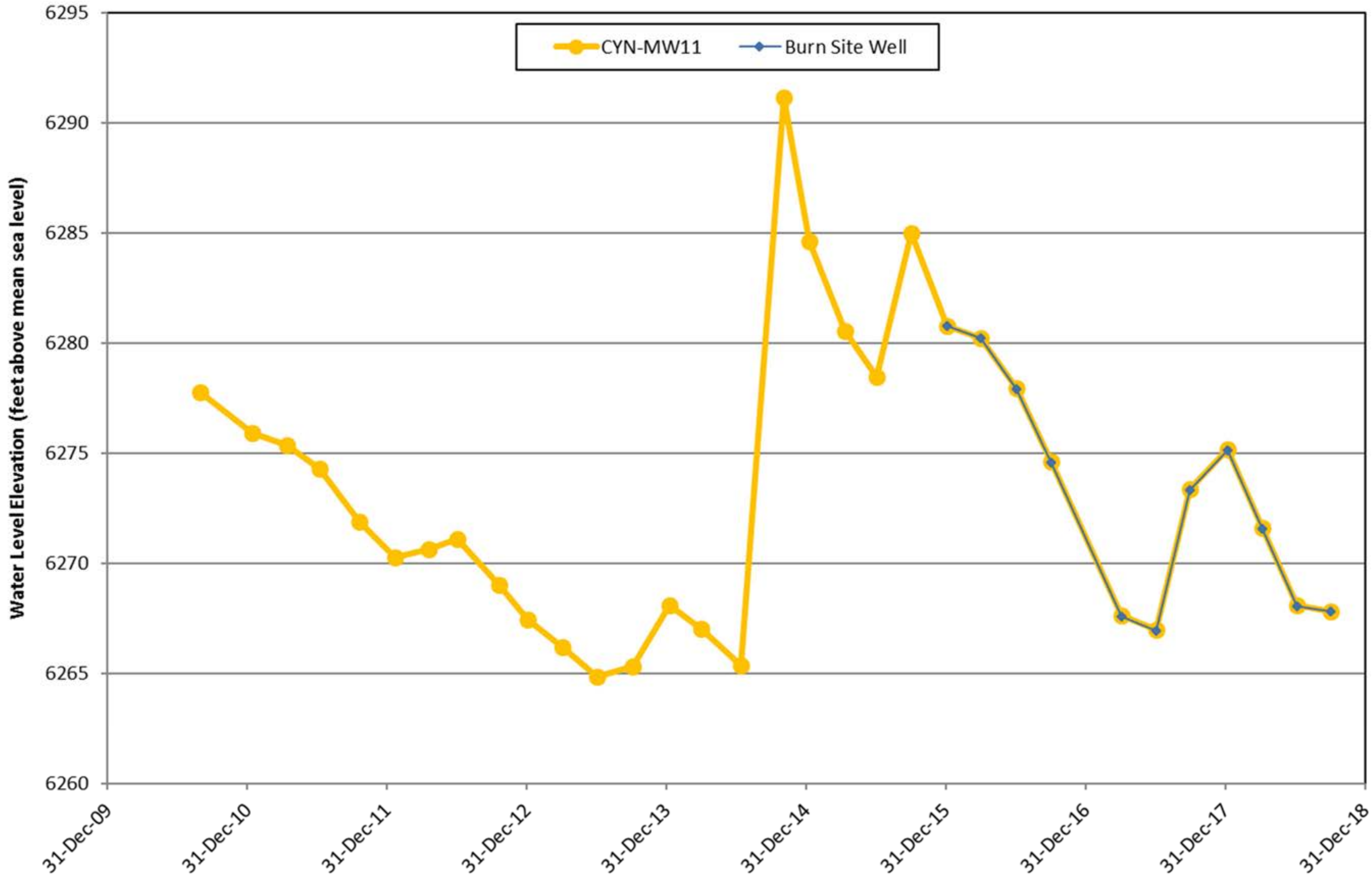

Figure 7D-7. BSG Area of Concern Wells (7 of 9)

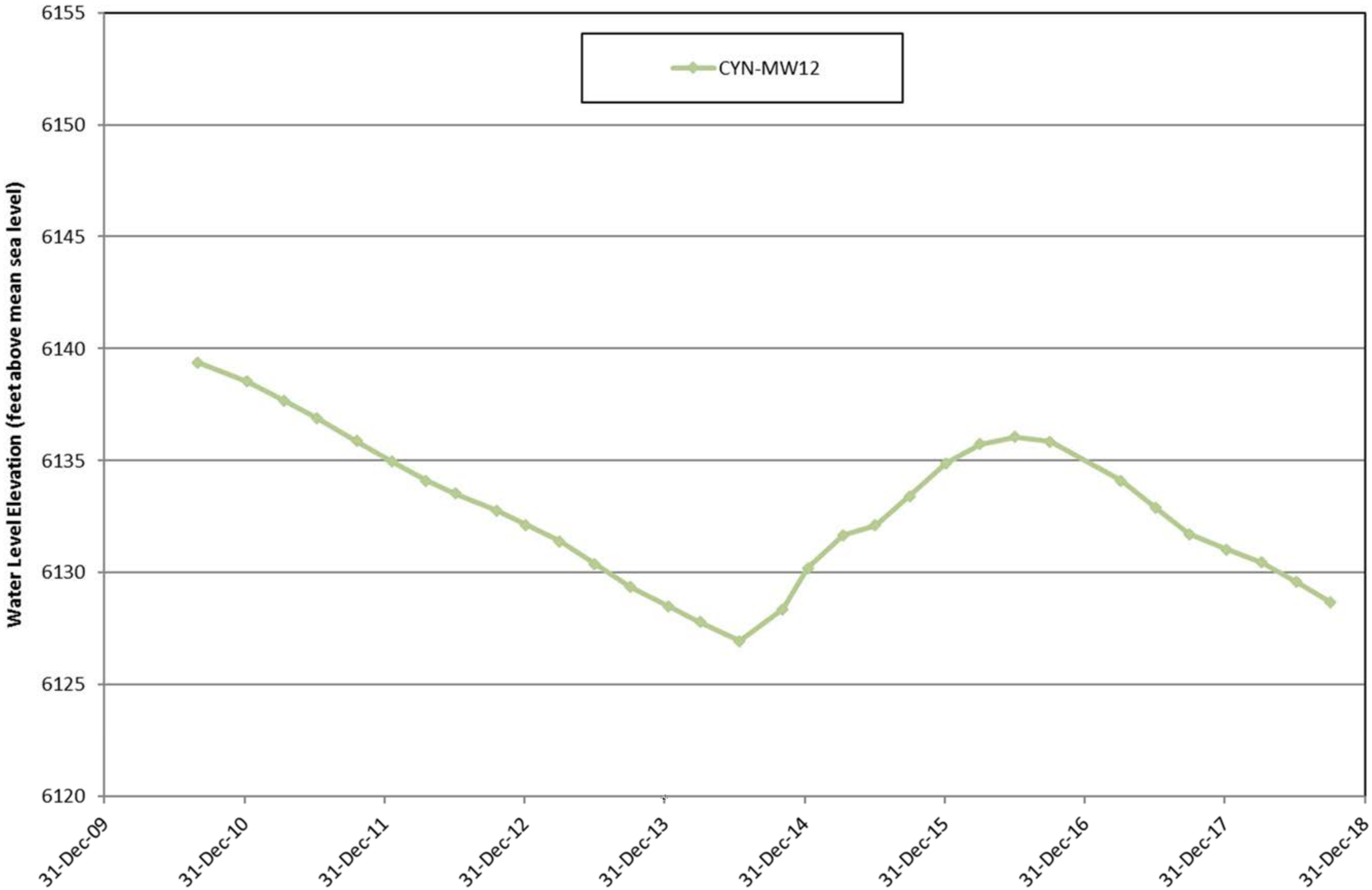

Figure 7D-8. BSG Area of Concern Wells (8 of 9)

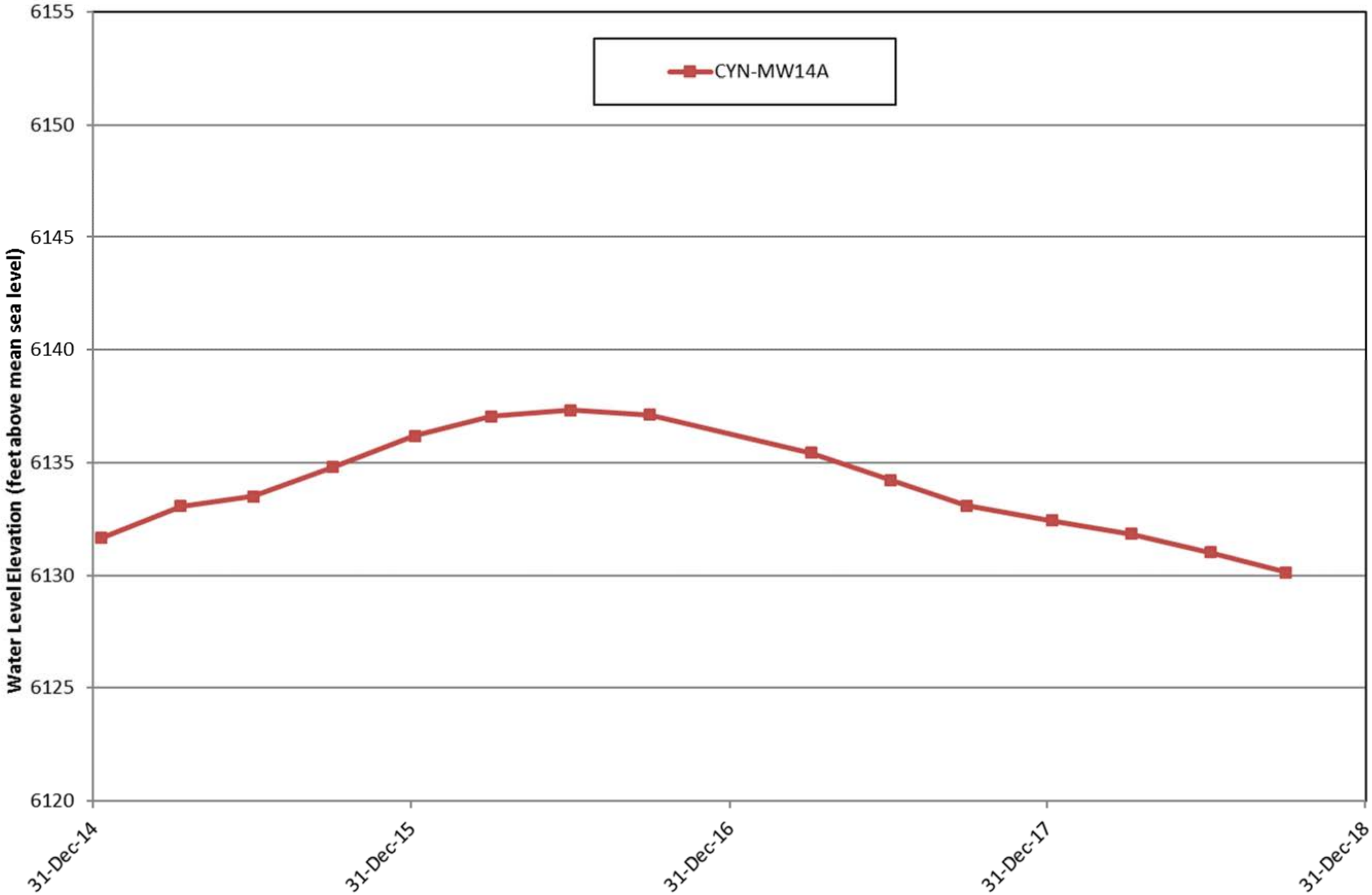

Figure 7D-9. BSG Area of Concern Wells (9 of 9)

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Chapter 7
Burn Site Groundwater
References

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Brown et al. 1999 Brown, C.L., K.E. Karlstrom, M. Heizler, and D. Unruh, 1999. *Paleoproterozoic deformation, metamorphism, and 40Ar/39Ar thermal history of the 1.65-Ga Manzanita Pluton, Manzanita Mountains, New Mexico,* in New Mexico Geological Society 50th Annual Fall Field Conference, Albuquerque Geology, pp. 255–68.

Dinwiddie September 1997 Dinwiddie, R.S., September 1997. Letter to M.J. Zamorski (U.S. Department of Energy, Kirtland Area Office), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB," New Mexico Environment Department, Hazardous & Radioactive Materials Bureau, Santa Fe, New Mexico, September 24, 1997.

DOE June 2018 U.S. Department of Energy (DOE), June 2018. Letter to J.E. Kieling (New Mexico Environment Department), "RE: Recommendations for Additional Characterization Activities at the Burn Site Groundwater Area of Concern (AOC)," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, June 5, 2018.

DOE November 2017 U.S. Department of Energy (DOE), November 2017. Letter to J.E. Kieling (New Mexico Environment Department), "RE: Burn Site Aquifer Pumping Test Report; Request for Extension for Recommendations," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, November 8, 2017.

DOE March 2016 U.S. Department of Energy (DOE), March 2016. *Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015.* Letter to John Kieling, Chief, New Mexico Environment Department Hazardous Waste Bureau, Santa Fe New Mexico, March 30, 2016.

DOE May 2015 U.S. Department of Energy (DOE), May 2015. *Final Internal Remedy Review Team Recommendations Regarding the Burn Site and Technical Area V Groundwater Areas of Concern, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Compliance, to Mark Gilbertson, Deputy Assistant Secretary for Site Restoration, U.S. Department of Energy, Washington, D.C., May 5, 2015.

DOE November 2014 U.S. Department of Energy (DOE), November 2014. *Internal Remedy Review Team Recommendations Regarding the Burn Site and Technical Area V Groundwater Areas of Concern, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Compliance, to Mark Gilbertson, Deputy Assistant Secretary, Office of Environmental Compliance, U.S. Department of Energy, Washington, D.C., November 18, 2014.

DOE January 2014 U.S. Department of Energy (DOE), January 2014. Letter to J.E. Kieling (New Mexico Environment Department), "Extension Request for the Burn Site Groundwater Corrective Measures Evaluation Report," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, January 31, 2014.

DOE October 2013 U.S. Department of Energy (DOE), October 2013. *Internal Remedy Review of the Burn Site Groundwater Area of Concern, Sandia National Laboratories, Albuquerque, New Mexico*, memorandum from Steven Golian, Chair, Office of Environmental Compliance, to Geoffrey Beausoleil, Manager, U.S. Department of Energy, Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, October 30, 2013.

DOE August 2013 U.S. Department of Energy (DOE), August 2013. Letter to J.E. Kieling (New Mexico Environment Department), "Extension Request for the Burn Site Groundwater Corrective Measures Evaluation Report," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, August 7, 2013.

DOE July 2009 U.S. Department of Energy (DOE), July 2009. Letter to J.E. Kieling (New Mexico Environment Department), :"Extension Request for Submission of Characterization Work Plan for the Burn Site Groundwater Study Area," U.S. Department of Energy, National Nuclear Security Administration, Sandia Site Office, Albuquerque, New Mexico, July 23, 2009.

DOE September 1987 U.S. Department of Energy (DOE), September 1987. *Draft Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment, Sandia National Laboratories, Albuquerque,* Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, U.S. Department of Energy, Albuquerque, New Mexico.

EPA May 2009 U.S. Environmental Protection Agency (EPA), May 2009. *National Primary Drinking Water Regulations,* EPA 816-F 09-004, U.S. Environmental Protection Agency, Washington, D.C.

EPA 1994 U.S. Environmental Protection Agency (EPA), 1994. *RCRA Corrective Action Plan,* U.S. Environmental Protection Agency, Washington, D.C.

Kues 2001 Kues, B.S., 2001. "The Pennsylvanian System in New Mexico—overview with suggestions for revision of stratigraphic nomenclature," New Mexico Geology, v. 23, p. 103–122.

Madrid et al. 2016 Madrid, V., M.J. Singleton, A. Visser, and B.K. Esser, 2016. *Interpretation of stable isotope, denitrification, and groundwater age data for samples collected from Sandia National Laboratories/New Mexico (SNL/NM) Burn Site Groundwater Area of Concern,* Lawrence Livermore National Laboratory Report LLNL-TR-694041, July 11, 2016.

McQuillan and Space 1995 McQuillan, D., and M. Space, 1995. "High ground-water nitrate in Tijeras Arroyo, Hells Canyon, and Abo Arroyo—Evidence for a natural geologic origin," Abstract in *New Mexico Geologic Society 1995 Spring Meeting* and published in *New Mexico Geology*, Vol. 17, No. 2, pp. 23.

NMED June 2018 New Mexico Environment Department (NMED), June 2018. *RE: Disapproval, Recommendations for Additional Characterization Activities at the Burn Site Groundwater Area of Concern (AOC), June 2018 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-17-015*, New Mexico Environment Department, Santa Fe, New Mexico, June 29, 2018.

NMED January 2018 New Mexico Environment Department (NMED), January 2018. *RE: Approval, Aquifer Pumping Test Report for the Burn Site Groundwater Area of Concern, December 2017 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-17-015*, New Mexico Environment Department, Santa Fe, New Mexico, January 30, 2018.

NMED November 2017 New Mexico Environment Department (NMED), November 2017. *RE: Approval, Burn Site Aquifer Pumping Test Report; Request for Extension for Recommendations, November 2017 Sandia National Laboratories, EPA ID# NM5890110518 HWB-SNL-16-010*, New Mexico Environment Department, Santa Fe, New Mexico, November 17, 2017.

NMED June 2016 New Mexico Environment Department (NMED), June 2016. *RE: Approval, Aquifer Pumping Test Work Plan for the Burn Site Groundwater Area of Concern, June 2016, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-16-010*, New Mexico Environment Department, Santa Fe, New Mexico, June 21, 2016.

NMED April 2016 New Mexico Environment Department (NMED), April 2016. *RE: Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015, March 30, 2016, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-16-MISC*, New Mexico Environment Department, Santa Fe, New Mexico, April 14, 2016.

NMED June 2015 New Mexico Environment Department (NMED), June 2014. *RE: Approval, Installation of Groundwater Monitoring Wells CYN-MW14A, CYN-MW15, and TA2-W-28, and Decommissioning of Groundwater Monitoring Well TA2-SW1-320*, New Mexico Environment Department, Santa Fe, New Mexico, June 2, 2015.

NMED January 2015 New Mexico Environment Department (NMED), January 2015. *RCRA Facility Operating Permit, NM5890110518*, New Mexico Environment Department, Santa Fe, New Mexico.

NMED June 2014a New Mexico Environment Department (NMED), June 2014. *RE: Approval, Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Well TA2-SW1-320, Installation of Groundwater Monitoring Wells TA2-W-28, CYN-MW14 and CYN-MW15, September 2013, Sandia National Laboratories, EPA ID #NM5890110518, SNL-13-010,* New Mexico Environment Department, Santa Fe, New Mexico, June 4, 2014.

NMED June 2014b New Mexico Environment Department (NMED), June 2014. *RE: Approval: Extension for Submittal of the Burn Site Corrective Measures Evaluation Report, January 31, 2014, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-12-002,* New Mexico Environment Department, Santa Fe, New Mexico, June 18, 2014.

NMED June 2012 New Mexico Environment Department (NMED), June 2012. *RE: Approval: Summary Report for Burn Site Groundwater Characterization Field Program, Installation of Groundwater Monitoring Wells CYN-MW9, CYN-MW10, CYN-MW11 and CYN-MW12, Collection of Subsurface Soil Samples at Boreholes BSG-BH001 through BSG-BH010, January 2012, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-12-002,* New Mexico Environment Department, Santa Fe, New Mexico, June 29, 2012.

NMED April 2012 New Mexico Environment Department (NMED), April 2012. *RE: Notice of Approval: Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Wells 12AUP-01, CYN-MW1D and CYN-MW2S, Installation of Groundwater Monitoring Well CYN-MW13, January 2012, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-12-003,* New Mexico Environment Department, Santa Fe, New Mexico, April 13, 2012.

NMED August 2011 New Mexico Environment Department (NMED), August 2011. *RE: Notice of Approval, Corrective Measures Evaluation Work Plan, Burn Site Groundwater, March 2008, Sandia National Laboratories, EPA ID#NM5890110518, HWB-SNL-04-035,* New Mexico Environment Department, Santa Fe, New Mexico, August 3, 2011.

NMED October 2010 New Mexico Environment Department (NMED), October 2010. *RE: Time Extension Request for Submittal of the Burn Site Groundwater Corrective Measures Evaluation Report, Sandia National Laboratories, EPA ID#NM5890110518,* New Mexico Environment Department, Santa Fe, New Mexico, October 4, 2010.

NMED February 2010 New Mexico Environment Department (NMED), February 2010. *RE: Notice of Conditional Approval, Burn Site Groundwater Characterization Work Plan, November 2009, Sandia National Laboratories, EPA ID #NM5890110518, SNL-09-017,* New Mexico Environment Department, Santa Fe, New Mexico, February 12, 2010.

NMED April 2009 New Mexico Environment Department (NMED), April 2009. *RE: Perchlorate Contamination in Groundwater, Sandia National Laboratories, EPA ID #NM5890110518,* New Mexico Environment Department, Santa Fe, New Mexico, April 30, 2009.

NMED July 2005 New Mexico Environment Department (NMED), July 2005. *Request for Supplemental Information: Burn Site Groundwater Interim Measures Work Plan, Dated May 2005, Sandia National Laboratories, EPA ID #NM5890110518, HWB-SNL-04-039*" July 18, 2005.

NMED February 2005 New Mexico Environment Department (NMED), February 2005. *RE: Current Conceptual Model for the Sandia National Laboratories Canyons Area (Burn Site), June 2004: Requirement to Conduct Additional Site Characterization and Interim Measures, Sandia National Laboratories NM5890110518, HWB-SNL-04-039,* New Mexico Environment Department, Santa Fe, New Mexico.

NMED April 2004 New Mexico Environment Department (NMED), April 2004. *Compliance Order on Consent Pursuant to the New Mexico Hazardous Waste Act 74-4-10: Sandia National Laboratories Consent Order*, New Mexico Environment Department, Santa Fe, New Mexico, April 29, 2004.

SNL June 2018 Sandia National Laboratories, New Mexico (SNL/NM), June 2018. *Annual Groundwater Monitoring Report, Calendar Year 2017, Long-Term Stewardship Consolidated Groundwater Monitoring Program,* Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, June 26, 2018.

SNL December 2017 Sandia National Laboratories, New Mexico (SNL/NM), December 2017. *Aquifer Pumping Test Report for the Burn Site Groundwater Area of Concern,* Sandia National Laboratories, New Mexico, Environmental Restoration Operations, Albuquerque, New Mexico, December 5, 2017.

SNL October 2018 Sandia National Laboratories, New Mexico (SNL/NM), September 2018. *Burn Site Groundwater Monitoring, Mini-Sampling and Analysis Plan (s) for First Quarter, Fiscal Year 2019*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 2017 Sandia National Laboratories, New Mexico (SNL/NM), July 2017. *Annual Groundwater Monitoring Report, Calendar Year 2016, Long-Term Stewardship Consolidated Groundwater Monitoring Program,* Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, July 3, 2017.

SNL March 2018 Sandia National Laboratories, New Mexico (SNL/NM), March 2018. *Burn Site Groundwater Monitoring, Mini-Sampling and Analysis Plan (SAP) for Third Quarter, Fiscal Year 2018,* Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2016a Sandia National Laboratories, New Mexico (SNL/NM), June 2016. *Aquifer Pumping Test Work Plan for the Burn Site Groundwater Area of Concern,* Sandia National Laboratories, New Mexico, Environmental Restoration Operations, Albuquerque, New Mexico, June 3, 2016.

SNL June 2016b Sandia National Laboratories, New Mexico (SNL/NM), June 2016. *Annual Groundwater Monitoring Report, Calendar Year 2015, Long-Term Stewardship Consolidated Groundwater Monitoring Program,* Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, June 28, 2016.

SNL June 2015 Sandia National Laboratories, New Mexico (SNL/NM), June 2015. *Annual Groundwater Monitoring Report, Calendar Year 2014, Long-Term Stewardship Consolidated Groundwater Monitoring Program,* Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, June 23, 2015.

SNL April 2015 Sandia National Laboratories, New Mexico (SNL/NM), April 2015. *Report: Installation of Groundwater Monitoring Wells CYN-MW14A, CYN-MW15, and TA2-W-28, and Decommissioning of Groundwater Monitoring Well TA2-SW1-320*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, April 24, 2015.

SNL October 2014 Sandia National Laboratories, New Mexico (SNL/NM), October 2014. *Annual Groundwater Monitoring Report, Calendar Year 2013, Long-Term Stewardship Consolidated Groundwater Monitoring Program,* Long-Term Stewardship, Sandia National Laboratories, Albuquerque, New Mexico, October 24, 2015.

SNL September 2013a Sandia National Laboratories, New Mexico (SNL/NM), September 2013. *Annual Groundwater Monitoring Report Calendar Year 2012, Long-Term Stewardship Consolidated Groundwater Monitoring Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2013b Sandia National Laboratories, New Mexico (SNL/NM), September 2013. *Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Wells TA2-SW1-320, Installation of Groundwater Monitoring Wells TA2-W-28, CYN-MW14, and CYN-MW15,* Environmental Restoration Operations, Sandia National Laboratories, New Mexico, Albuquerque, New Mexico.

SNL March 2013 Sandia National Laboratories, New Mexico (SNL/NM), March 2013. *Installation of Replacement Monitoring Well CYN-MW13 at the Burn Site Groundwater Study Area and the Decommissioning of Three Groundwater Monitoring Wells at the Burn Site, Eight Groundwater and Soil-Vapor Monitoring Wells at the Chemical Waste Landfill, and Eight FLUTe™ Soil-Vapor Monitoring Wells at Various SWMUs and DSS Sites,* Environmental Restoration Operations, Sandia National Laboratories, New Mexico, Albuquerque, New Mexico.

SNL September 2012 Sandia National Laboratories, New Mexico (SNL/NM), September 2012. *Annual Groundwater Monitoring Report, Calendar Year 2011, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2012 Sandia National Laboratories, New Mexico (SNL/NM), February 2012. *Monitoring Well Plug and Abandonment Plan and Well Construction Plan, Decommissioning of Groundwater Monitoring Wells 12AUP-01, CYN-MW1D, and CYN-MW2S, Installation of Groundwater Monitoring Well CYN-MW13: Status of CYN-MW3, DOE/NNSA SNL/New Mexico*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, February 3, 2012.

SNL January 2012 Sandia National Laboratories, New Mexico (SNL/NM), January 2012. *Summary Report for Burn Site Groundwater Characterization Field Program, Installation of Groundwater Monitoring Wells CYN-MW9, CYN-MW10, CYN-MW11, and CYN-MW12, Collection of Subsurface Soil Samples at Boreholes BSG-BH001 through BSG-BH010*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, January 30, 2012.

SNL September 2011 Sandia National Laboratories, New Mexico (SNL/NM), September 2011. *Annual Groundwater Monitoring Report, Calendar Year 2010, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2010 Sandia National Laboratories, New Mexico (SNL/NM), October 2010. *Annual Groundwater Monitoring Report, Calendar Year 2009, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL September 2010 Sandia National Laboratories, New Mexico (SNL/NM), September 2010. *Extension Request for the Burn Site Corrective Measures Evaluation (CME) Report*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, September 20, 2010.

SNL November 2009 Sandia National Laboratories, New Mexico (SNL/NM), November, 2009. *Burn Site Groundwater Characterization Work Plan, Installation of Groundwater Monitoring Wells CYN-MW9, CYN-MW10, and CYN-MW11, Collection of Subsurface Soil Samples*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico, November 23, 2009.

SNL June 2009 Sandia National Laboratories, New Mexico (SNL/NM), June 2009. *Annual Groundwater Monitoring Report, Calendar Year 2008, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2008a Sandia National Laboratories, New Mexico (SNL/NM), April 2008. *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2008b Sandia National Laboratories, New Mexico (SNL/NM), April 2008. *Corrective Measures Evaluation Work Plan, Burn Site Groundwater,* Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2008 Sandia National Laboratories, New Mexico (SNL/NM), March 2008. *Annual Groundwater Monitoring Report, Fiscal Year 2007, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2007 Sandia National Laboratories, New Mexico (SNL/NM), March 2007. *Annual Groundwater Monitoring Report, Fiscal Year 2006, Groundwater Protection Program,* Environmental Management Department and Environmental Programs and Assurance, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2006 Sandia National Laboratories, New Mexico (SNL/NM), October 2006. *Field Report: Installation of Burn Site Groundwater Monitoring Wells CYN-MW6, CYN-MW7, and CYN-MW8,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL October 2005 Sandia National Laboratories, New Mexico (SNL/NM), October 2005. *Annual Groundwater Monitoring Report, Fiscal Year 2004, Groundwater Protection Program,* Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL August 2005 Sandia National Laboratories, New Mexico (SNL/NM), August 2005. *Responses to NMED Request for Supplemental Information: Burn Site Groundwater Interim Measures Work Plan,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2005 Sandia National Laboratories, New Mexico (SNL/NM), June 2005. *Request for Supplemental Information Responses and Proposals for Corrective Action Complete, Drain and Septic Systems SWMUs 49, 101, 116, 138, 149, 154, and 161, Drain and Septic Systems Round 9,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL May 2005 Sandia National Laboratories, New Mexico (SNL/NM), May 2005. *Interim Measures Work Plan, Burn Site Groundwater*, SAND Report SAND2005-2952, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL January 2005 Sandia National Laboratories, New Mexico (SNL/NM), January 2005. *Field Report, Burn Site Groundwater Nitrate Source Evaluation, January 2005,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2004a Sandia National Laboratories, New Mexico (SNL/NM), June 2004. *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Burn Site,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 2004b Sandia National Laboratories, New Mexico (SNL/NM), June 2004. *Corrective Measures Evaluation Work Plan for Sandia National Laboratories/New Mexico Burn Site,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2004 Sandia National Laboratories, New Mexico (SNL/NM), March 2004. *Annual Groundwater Monitoring Report, Fiscal Year 2003, Groundwater Protection Program,* Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 2004 Sandia National Laboratories, New Mexico (SNL/NM), February 2004. *Justification for Class III Permit Modification, ER Site 94H Operable Unit 1333, JP-8 Fuel Site,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2003 Sandia National Laboratories, New Mexico (SNL/NM), March 2003. *Annual Groundwater Monitoring Report, Fiscal Year 2002, Groundwater Protection Program,* Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2002 Sandia National Laboratories, New Mexico (SNL/NM), March 2002. *Annual Groundwater Monitoring Report, Fiscal Year 2001, Groundwater Protection Program,* Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL November 2001 Sandia National Laboratories, New Mexico (SNL/NM), November 2001. *Groundwater Investigation, Canyons Test Area, Operable Unit 1333, Burn Site, Lurance Canyon,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL April 2001 Sandia National Laboratories, New Mexico (SNL/NM), April 2001. *Annual Groundwater Monitoring Report, Fiscal Year 2000, Groundwater Protection Program,* Environmental Management Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 2000 Sandia National Laboratories, New Mexico (SNL/NM), March 2000. *Annual Groundwater Monitoring Report, Fiscal Year 1999, Groundwater Protection Program,* Environmental Management and Integrated Training Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL March 1999 Sandia National Laboratories, New Mexico (SNL/NM), March 1999. *Groundwater Protection Program, Fiscal Year 1998, Annual Groundwater Monitoring Report*, Sandia National Laboratories, Albuquerque, New Mexico.

SNL June 1998 Sandia National Laboratories, New Mexico (SNL/NM), June 1998. *Letter Report–Information Summarizing Recent Well Installation and Sampling Activities Near the Burn Site,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL February 1998 Sandia National Laboratories, New Mexico (SNL/NM), February 1998. *Revised Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL July 1997 Sandia National Laboratories, New Mexico (SNL/NM), July 1997. *Bullets of Understanding Between NMED DOE OB and the SNL/NM ER Project for the Nitrate Assessment at the Lurance Canyon Explosive Test Site, ER Site 65, OU 1333, Canyons Test Area,* Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Van Hart June 2003 Van Hart, D., June 2003. *Geologic Investigation: An Update of Subsurface Geology on Kirtland Air Force Base, New Mexico,* SAND Report SAND2003-1869, prepared for Sandia National Laboratories, Albuquerque, New Mexico.

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Chemical Waste Landfill and Vicinity													
CWL-BW1	MW	5437.95	5436.0	445.0	495.0	4991.0	4941.0	495.0	2.1	SS	Regional Aquifer – SFG sediments	08-Jul-1985	Aug-2003
CWL-BW2	MW	5436.21	5434.3	490.0	980.0	4944.3	4454.3	980.0	5.6	S/SS	Regional Aquifer – SFG sediments	17-Sep-1985	2003
CWL-BW3	MW	5432.76	5431.6	485.0	505.0	4946.6	4926.6	507.5	4.8	PVC	Regional Aquifer – SFG sediments	22-Sep-1988	12-Nov-2012
CWL-BW4	MW	5427.67	5431.7	485.0	505.0	4946.7	4926.7	510.0	4.8	PVC	Regional Aquifer – SFG sediments	06-May-1994	Jan-1997
CWL-BW4A	MW	5434.03	5431.8	485.0	505.0	4946.8	4926.8	510.0	4.8	PVC	Regional Aquifer – SFG sediments	16-May-1994	14-Apr-2010
CWL-BW5	MW	5434.79	5432.2	500.0	520.0	4932.2	4912.2	525.0	4.8	PVC	Regional Aquifer – SFG sediments	11-May-2010	
CWL-MW1	MW	5425.88	5423.7	535.0	575.0	4888.7	4848.7	610.0	2.1	SS	Regional Aquifer – SFG sediments	01-Sep-1985	Sep-1997
CWL-MW1A	MW	5424.16	5423.1	474.0	494.0	4949.1	4929.1	495.0	4.8	PVC	Regional Aquifer – SFG sediments	31-Jul-1988	11-Nov-2012
CWL-MW2	MW	5421.22	5419.1	520.0	650.0	4899.1	4769.1	650.0	2.1	SS	Regional Aquifer – SFG sediments	22-Sep-1985	Sep-1997
CWL-MW2A	MW	5421.25	5419.8	473.0	493.0	4946.8	4926.8	495.0	5.0	PVC	Regional Aquifer – SFG sediments	01-Aug-1988	Jun-2004
CWL-MW2BL	MW	5421.85	5420.1	532.5	552.5	4887.6	4867.6	557.5	4.8	PVC	Regional Aquifer – SFG sediments	05-Jun-1994	10-Nov-2012
CWL-MW2BU	MW	5421.88	5420.1	476.0	496.0	4944.1	4924.1	501.0	1.9	PVC	Regional Aquifer – SFG sediments	05-Jun-1994	10-Nov-2012
CWL-MW3	MW	5421.50	5419.5	525.0	565.0	4894.5	4854.5	615.0	2.1	SS	Regional Aquifer – SFG sediments	26-Sep-1985	Sep-1997
CWL-MW3A	MW	5420.45	5419.1	470.0	490.0	4949.1	4929.1	492.0	4.8	PVC/SS	Regional Aquifer – SFG sediments	11-Aug-1988	10-Nov-2012
CWL-MW4	MW	5423.00	5421.0	478.0	498.0	4943.0	4923.0	503.0	3.8	PVC/SS	Regional Aquifer – SFG sediments	04-May-1990	14-Apr-2010
CWL-MW5L	MW	5418.47	5416.7	533.0	553.0	4883.7	4863.7	558.0	1.9	PVC	Regional Aquifer – SFG sediments	19-Apr-1994	14-Apr-2010
CWL-MW5U	MW	5418.68	5416.7	477.0	497.0	4939.7	4919.7	502.0	4.8	PVC	Regional Aquifer – SFG sediments	19-Apr-1994	14-Apr-2010
CWL-MW6L	MW	5419.80	5417.3	539.0	559.0	4878.3	4858.3	564.0	1.9	PVC	Regional Aquifer – SFG sediments	04-May-1994	14-Apr-2010
CWL-MW6U	MW	5419.45	5417.3	477.0	497.0	4940.3	4920.3	502.0	4.8	PVC	Regional Aquifer – SFG sediments	04-May-1994	14-Apr-2010
CWL-MW7	MW	5421.98	5419.9	618.0	638.0	4801.9	4781.9	643.0	4.8	PVC	Regional Aquifer – SFG sediments	20-Mar-2003	12-Nov-2012
CWL-MW8	MW	5421.71	5419.8	612.0	632.0	4807.8	4787.8	637.0	4.8	PVC	Regional Aquifer – SFG sediments	02-Apr-2003	12-Nov-2012
CWL-MW9	MW	5426.12	5423.5	495.0	515.0	4928.5	4908.5	520.0	4.8	PVC	Regional Aquifer – SFG sediments	13-May-2010	
CWL-MW10	MW	5424.58	5422.2	493.0	513.0	4929.2	4909.2	518.0	4.8	PVC	Regional Aquifer – SFG sediments	27-May-2010	
CWL-MW11	MW	5423.24	5420.8	491.0	511.0	4929.8	4909.8	516.0	4.8	PVC	Regional Aquifer – SFG sediments	27-May-2010	
MRN-1	MW	5308.54	5306.4	546.7	586.7	4759.7	4719.7	606.7	4.8	SS	Regional Aquifer – SFG sediments	22-Jan-1995	Aug-2001
MRN-2	MW	5308.18	5306.2	410.0	440.0	4896.2	4866.2	450.0	3.7	PVC	Regional Aquifer – SFG sediments	28-Jan-1995	
MRN-3D	MW	5309.34	5306.8	660.3	680.3	4646.5	4626.5	685.3	4.8	PVC	Regional Aquifer – SFG sediments	20-Jul-2003	
SWTA-3	MW	5323.24	5321.6	407.2	427.2	4914.4	4894.4	432.2	4.8	PVC/SS	Regional Aquifer – SFG sediments	06-Sep-1989	Apr-1998
SWTA3-MW2	MW	5325.60	5323.2	455.0	475.0	4868.2	4848.2	480.0	4.8	PVC	Regional Aquifer – SFG sediments	07-May-2002	
SWTA3-MW3	MW	5323.94	5321.4	619.0	639.0	4702.4	4682.4	659.4	4.8	PVC	Regional Aquifer – SFG sediments	20-Feb-2004	
SWTA3-MW4	MW	5324.81	5322.3	430.0	450.0	4892.3	4872.3	460.0	4.7	PVC	Regional Aquifer – SFG sediments	26-Aug-2005	
Lurance Canyon and Burn Site Vicinity													
CCBA-MW1	MW	5902.34	5899.9	60.0	80.0	5839.9	5819.9	85.0	4.7	PVC	Alluvium and bedrock (granite)	01-Sep-2011	
CCBA-MW2	MW	5939.28	5937.0	98.0	118.0	5839.0	5819.0	123.0	4.7	PVC	Bedrock (granite)	31-Aug-2011	
CYN-MW1D	MW	6239.59	6236.7	372.0	382.0	5864.7	5854.7	392.0	5.1	S	Bedrock (granitic gneiss)	22-Dec-1997	15-Nov-2012

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Lurance Canyon and Burn Site Vicinity (Continued)													
CYN-MW2S	MW	6239.41	6236.7	23.6	28.6	6213.1	6208.1	34.2	4.0	PVC	Alluvium and bedrock (granitic gneiss)	22-Dec-1997	15-Nov-2012
CYN-MW3	MW	6313.26	6311.9	120.0	130.0	6191.9	6181.9	135.0	5.0	PVC	Bedrock (metamorphics)	18-Jun-1999	
CYN-MW4	MW	6455.48	6454.7	260.0	280.0	6194.7	6174.7	290.0	5.0	PVC	Bedrock (quartzite)	18-Jun-1999	
CYN-MW5	MW	5984.23	5981.3	135.0	155.0	5846.3	5826.3	160.0	5.0	PVC	Bedrock (quartzite)	15-Aug-2001	
CYN-MW6	MW	6343.37	6340.5	141.5	161.3	6199.0	6179.2	161.7	5.0	PVC	Bedrock (metamorphics)	09-Dec-2005	
CYN-MW7	MW	6216.35	6213.7	315.0	334.2	5898.7	5879.5	339.9	5.0	PVC	Bedrock (granitic gneiss)	06-Dec-2005	
CYN-MW8	MW	6230.11	6227.8	338.5	358.3	5889.3	5869.5	363.4	5.0	PVC	Bedrock (granitic gneiss)	12-Jan-2006	
CYN-MW9	MW	6360.67	6358.5	175.8	195.8	6182.7	6162.7	200.8	4.8	PVC	Bedrock (metamorphics)	27-Jul-2010	
CYN-MW10	MW	6345.45	6342.8	150.4	170.4	6192.4	6172.4	175.4	4.8	PVC	Bedrock (metamorphics)	28-Jul-2010	
CYN-MW11	MW	6374.41	6371.9	229.8	249.8	6142.1	6122.1	254.8	4.8	PVC	Bedrock (metamorphics)	29-Jul-2010	
CYN-MW12	MW	6345.16	6342.9	252.5	272.5	6090.4	6070.4	277.5	4.8	PVC	Bedrock (metamorphics)	29-Jul-2010	
CYN-MW13	MW	6237.79	6236.0	376.8	396.8	5859.2	5839.2	402.2	4.8	PVC	Bedrock (granitic gneiss)	05-Dec-2012	
CYN-MW14A	MW	6315.85	6313.5	263.6	293.6	6049.9	6019.9	298.6	4.8	PVC	Bedrock (metamorphics)	09-Dec-2014	
CYN-MW15	MW	6344.44	6342.3	162.2	192.2	6180.1	6150.1	195.0	4.8	PVC	Bedrock (metamorphics)	08-Dec-2014	
12AUP01	MW	6357.00	6355.0	52.5	57.5	6302.5	6297.5	58.1	2.0	PVC	Alluvium and bedrock (granitic gneiss)	19-Nov-1996	14-Nov-2012
Greystone-MW2	MW	5814.20	5811.4	60.0	80.0	5751.4	5731.4	85.0	4.8	PVC	Alluvium, shallow	25-Apr-2002	
Mixed Waste Landfill and Vicinity													
MWL-BW1	MW	5387.18	5385.4	452.2	472.2	4933.2	4913.2	477.2	5.0	PVC	Regional Aquifer – SFG sediments	01-Jul-1989	24-Jan-2008
MWL-BW2	MW	5391.02	5388.7	467.0	497.0	4921.7	4891.7	502.0	4.8	PVC	Regional Aquifer – SFG sediments	22-Jan-2008	
MWL-MW1	MW	5384.21	5381.8	456.0	476.0	4925.8	4905.8	478.0	5.0	PVC/S	Regional Aquifer – SFG sediments	01-Oct-1988	Jul-2008
MWL-MW2	MW	5379.93	5378.4	452.0	472.0	4926.4	4906.4	477.0	5.0	PVC/SS	Regional Aquifer – SFG sediments	01-Aug-1989	Jul-2008
MWL-MW3	MW	5383.99	5381.7	451.3	471.3	4930.4	4910.4	476.3	4.8	PVC/SS	Regional Aquifer – SFG sediments	22-Aug-1989	Jul-2008
MWL-MW4 [d]	MW	5391.70	5390.2	488.4[d]	508.4[d]	4901.8[d]	4881.8[d]	553.9[d]	4.8	PVC	Regional Aquifer – SFG sediments	10-Feb-1993	
MWL-MW5	MW	5382.56	5380.4	496.5	516.5	4883.9	4863.9	521.5	4.8	PVC	Regional Aquifer – SFG sediments	19-Nov-2000	
MWL-MW6	MW	5375.31	5372.7	505.5	525.5	4867.2	4847.2	525.5	4.8	PVC	Regional Aquifer – SFG sediments	19-Oct-2000	
MWL-MW7	MW	5383.30	5380.9	464.7	494.0	4916.2	4886.9	498.8	4.8	PVC	Regional Aquifer – SFG sediments	24-Jun-2008	
MWL-MW8	MW	5384.67	5382.4	465.0	495.0	4917.4	4887.4	500.0	4.8	PVC	Regional Aquifer – SFG sediments	26-Jun-2008	
MWL-MW9	MW	5381.91	5379.3	465.0	495.0	4914.3	4884.3	500.0	4.8	PVC	Regional Aquifer – SFG sediments	30-Jun-2008	
NWTA3-MW1	MW	5336.48	5332.9	434.9	454.9	4898.0	4878.0	460.4	4.8	PVC	Regional Aquifer – SFG sediments	20-Sep-1989	12-Sep-2002
NWTA3-MW2	MW	5337.49	5335.5	455.0	475.0	4880.5	4860.5	505.0	4.8	PVC	Regional Aquifer – SFG sediments	25-Aug-2000	
NWTA3-MW3D	MW	5340.80	5335.7	654.4	674.4	4681.3	4661.3	679.4	4.8	PVC	Regional Aquifer – SFG sediments	09-Jul-2003	
PL-1	MW	5334.99	5333.4	440.0	470.0	4893.4	4863.4	480.0	2.0	PVC	Regional Aquifer – SFG sediments	28-Oct-1994	12-Sep-2009
PL-2	MW	5336.01	5333.0	577.0	597.0	4756.0	4736.0	617.0	4.8	SS	Regional Aquifer – SFG sediments	18-Nov-1994	
PL-3	MW	5334.64	5332.8	445.0	465.0	4887.8	4867.8	475.0	3.8	PVC	Regional Aquifer – SFG sediments	04-Dec-1994	12-Sep-2009
PL-4	MW	5334.98	5332.7	464.0	494.0	4868.7	4838.7	499.0	4.8	PVC	Regional Aquifer – SFG sediments	28-Sep-2009	

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Coyote Test Field and Vicinity													
OBS-MW1	MW	5871.42	5869.1	135.0	155.0	5734.1	5714.1	160.0	4.7	PVC	Bedrock (granite)	31-Aug-2011	
OBS-MW2	MW	5863.16	5860.8	234.0	254.0	5626.8	5606.8	259.0	4.7	PVC	Bedrock (granite)	30-Aug-2011	
OBS-MW3	MW	5865.50	5863.3	190.0	210.0	5673.3	5653.3	215.0	4.7	PVC	Bedrock (granite)	30-Aug-2011	
CTF-MW1	MW	6082.63	6079.7	240.0	260.0	5839.7	5819.7	265.0	5.0	PVC	Bedrock (granite)	16-Aug-2001	
CTF-MW2	MW	5578.60	5575.6	110.0	130.0	5465.6	5445.6	135.0	5.0	PVC	Bedrock (granite)	18-Aug-2001	
CTF-MW3	MW	5522.82	5519.8	340.0	360.0	5179.8	5159.8	365.0	5.0	PVC	Bedrock (granite)	21-Aug-2001	
LMF-1	MW	5628.60	5626.5	310.0	350.0	5316.5	5276.5	360.0	4.1	PVC	Bedrock (limestone)	11-Aug-1995	15-Jan-1998
SFR-1D	MW	5399.13	5396.9	348.0	368.0	5048.9	5028.9	378.0	3.8	PVC	Regional Aquifer – SFG sediments	06-Aug-1992	
SFR-1S	MW	5399.16	5396.9	152.0	172.0	5244.9	5224.9	182.0	1.9	PVC	Regional Aquifer – SFG sediments	08-Aug-1992	
SFR-2S	MW	5432.77	5430.3	97.0	117.0	5333.3	5313.3	122.0	3.8	PVC	Regional Aquifer – SFG sediments	20-Aug-1992	
SFR-3D	MW	5497.94	5496.1	311.5	351.5	5184.6	5144.6	361.5	1.9	PVC	Regional Aquifer – SFG sediments	05-Nov-1992	
SFR-3P	MW	5499.63	5497.2	175.0	195.0	5322.2	5302.2	205.0	3.8	PVC	Regional Aquifer – SFG sediments	12-Jul-1993	
SFR-3S	MW	5498.24	5496.1	182.0	212.0	5314.1	5284.1	222.0	1.9	PVC	Regional Aquifer – SFG sediments	10-Nov-1992	
SFR-3T	MW	5498.66	5496.9	713.0	733.0	4783.9	4763.9	753.0	5.4	SS	Bedrock (sandstone)	23-Sep-1993	
SFR-4P	MW	5573.33	5571.3	344.0	354.0	5227.3	5217.3	364.0	1.9	PVC	Bedrock (sandstone)	29-Jul-1993	
SFR-4T	MW	5573.95	5572.4	340.0	360.0	5232.4	5212.4	380.0	4.8	PVC/SS	Bedrock (sandstone)	30-Sep-1993	
STW-1	MW	5535.53	5533.3	149.8	169.8	5383.5	5363.5	179.8	4.3	PVC	Regional Aquifer – SFG sediments	18-Jun-1995	23-Sep-1997
TRE-1	MW	5497.25	5495.2	255.0	295.0	5240.2	5200.2	305.0	4.3	PVC	Regional Aquifer – SFG sediments	31-Jul-1995	
TRE-2	MW	5497.20	5495.2	150.0	170.0	5345.2	5325.2	190.0	2.0	PVC	Regional Aquifer – SFG sediments	31-Jul-1995	
TRN-1	MW	5735.62	5733.6	320.0	340.0	5413.6	5393.6	350.0	3.8	PVC	Bedrock (sandstone)	12-Oct-1994	
TRS-1D	MW	5779.80	5777.5	266.4	306.4	5511.1	5471.1	316.4	1.9	PVC	Bedrock (limestone)	06-Sep-1995	
TRS-1S	MW	5780.07	5777.5	164.0	204.0	5613.5	5573.5	214.8	1.9	PVC	Bedrock (limestone)	06-Sep-1995	
TRS-2	MW	5780.76	5778.3	165.0	205.0	5613.3	5573.3	210.0	4.5	S	Bedrock (limestone)	09-Sep-1995	
Tijeras Arroyo Groundwater [e]													
TA1-W-01	MW	5403.82	5401.8	575.0	595.0	4826.8	4806.8	600.0	4.8	PVC	Regional Aquifer – SFG sediments	22-Mar-1997	
TA1-W-02	MW	5416.62	5416.9	540.0	560.0	4876.9	4856.9	565.6	5.0	PVC	Regional Aquifer – SFG sediments	27-Feb-1998	
TA1-W-03	MW	5457.03	5454.9	337.0	357.0	5117.9	5097.9	362.6	5.0	PVC	PGWS – SFG sediments	27-Jan-1998	
TA1-W-04	MW	5460.98	5458.3	576.0	596.0	4882.3	4862.3	601.7	5.0	PVC	Regional Aquifer – SFG sediments	06-Oct-1998	
TA1-W-05	MW	5433.84	5434.2	597.5	617.5	4836.7	4816.7	623.2	5.0	PVC	Regional Aquifer – SFG sediments	16-Nov-1998	
TA1-W-06	MW	5417.10	5417.4	300.0	320.0	5117.4	5097.4	325.6	5.0	PVC	PGWS – SFG sediments	27-Feb-1998	
TA1-W-07	MW	5404.92	5402.8	268.6	288.6	5134.2	5114.2	289.1	5.0	PVC	PGWS – SFG sediments	03-Dec1998	
TA1-W-08	MW	5434.19	5434.7	302.0	322.0	5132.7	5112.7	327.0	4.5	PVC	PGWS – SFG sediments	10-Oct2001	
TA2-NW1-325	MW	5421.94	5420.0	295.0	325.0	5125.0	5095.0	330.3	4.8	PVC	PGWS – SFG sediments	01-Apr-1993	
TA2-NW1-595 [f]	MW	5421.26	5420.0	535.0[f]	555.0[f]	4885.0	4865.0	598.0	4.8	PVC	Regional Aquifer – SFG sediments	27-Jul-1993	
TA2-SW1-320	MW	5411.85	5410.1	299.6	319.6	5110.5	5090.5	324.6	3.8	PVC	PGWS – SFG sediments	30-Nov-1992	12-Dec-2014

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Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Tijeras Arroyo Groundwater (Continued)													
TA2-W-01	MW	5419.99	5417.4	312.0	332.0	5105.4	5085.4	332.0	4.8	PVC	PGWS – SFG sediments	27-Jun-1994	
TA2-W-19	MW	5351.21	5349.0	265.9	285.9	5083.1	5063.1	285.9	4.8	PVC	PGWS – SFG sediments	29-Nov-1995	
TA2-W-24	MW	5363.66	5361.8	465.0	485.0	4896.8	4876.8	490.6	5.0	PVC	Regional Aquifer – SFG sediments	09-Feb-1998	
TA2-W-25	MW	5374.86	5372.5	492.0	512.0	4880.5	4860.5	517.8	4.8	PVC	Regional Aquifer – SFG sediments	28-Apr-1997	
TA2-W-26	MW	5375.77	5373.8	276.0	296.0	5097.8	5077.8	301.6	5.0	PVC	PGWS – SFG sediments	19-Jan-1998	
TA2-W-27	MW	5362.85	5360.8	275.0	295.0	5085.8	5065.8	300.6	5.0	PVC	PGWS – SFG sediments	09-Feb-1998	
TA2-W-28	MW	5412.41	5410.0	310.5	330.5	5099.5	5079.5	335.45	4.8	PVC	PGWS – SFG sediments	10-Dec-2014	
TJA-1	MW	unk	5351.3	275.0	295.0	unk	unk	305.0	3.8	PVC	PGWS – SFG sediments	25-Jun-1994	9-Jul-1994
TJA-2	MW	5353.20	5351.3	275.0	295.0	5076.3	5056.3	305.0	3.8	PVC	PGWS – SFG sediments	12-Jul-1994	
TJA-3	MW	5390.56	5387.8	496.0	516.0	4891.8	4871.8	521.7	5.0	PVC	Regional Aquifer – SFG sediments	04-Dec-1998	
TJA-4	MW	5341.16	5338.5	360.0	380.0	4978.5	4958.5	385.7	5.0	PVC	merging zone – SFG sediments	01-Dec-1998	
TJA-5	MW	5341.33	5338.5	267.0	287.0	5071.5	5051.5	292.7	5.0	PVC	PGWS – SFG sediments	02-Dec1998	
TJA-6	MW	5343.16	5340.6	454.9	474.9	4885.7	4865.7	480.7	5.0	PVC	Regional Aquifer – SFG sediments	04-Feb-2001	
TJA-7	MW	5391.27	5388.4	290.5	310.5	5097.9	5077.9	316.3	5.0	PVC	PGWS – SFG sediments	12-Mar-2001	
WYO-1	MW	5392.50	5390.4	510.0	560.0	4880.4	4830.4	570.0	4.3	PVC	Regional Aquifer – SFG sediments	28-Aug-1995	Jul-2001
WYO-2	MW	5392.50	5390.4	265.0	285.0	5125.4	5105.4	295.0	2.0	PVC	PGWS – SFG sediments	26-Sep-1995	Jul-2001
WYO-3	MW	5392.09	5390.0	520.0	540.0	4870.0	4850.0	545.0	4.5	PVC	Regional Aquifer – SFG sediments	10-Oct-2001	
WYO-4	MW	5392.57	5390.2	275.0	295.0	5115.2	5095.2	300.0	4.5	PVC	PGWS – SFG sediments	16-Oct-2001	
PGS-1	MW	5407.41	5407.9	503.0	513.0	4904.9	4894.9	538.0	5.0	SS	Regional Aquifer – SFG sediments	12-Oct-1994	Apr-1998
PGS-2 [g]	MW	5408.29	5407.9	535.0[g]	565.0[g]	4872.9	4842.9	655.0	5.0	SS	Regional Aquifer – SFG sediments	22-Sep-1995	
Technical Area V													
AVN-1	MW	5443.00	5440.2	570.0	590.0	4870.2	4850.2	600.0	5.0	SS	Regional Aquifer – SFG sediments	23-May-1995	
AVN-2	MW	5442.39	5440.6	495.0	515.0	4945.6	4925.6	520.0	3.8	PVC	Regional Aquifer – SFG sediments	5-Jun-1995	
LWDS-MW1	MW	5423.83	5424.5	495.0	515.0	4929.5	4909.5	520.3	3.9	PVC	Regional Aquifer – SFG sediments	03-May-1993	
LWDS-MW2	MW	5412.41	5411.5	506.0	526.0	4905.5	4885.5	531.0	3.9	PVC	Regional Aquifer – SFG sediments	30-Oct-1992	
TAV-INJ1	INJ	5429.70	5430.1	509.0	539.0	4921.1	4891.1	544.0	5.0	Dual PVC	Regional Aquifer – SFG sediments	11-Oct-2017	
TAV-MW1	MW	5437.81	5435.2	489.5	509.5	4945.7	4925.7	509.5	5.0	PVC	Regional Aquifer – SFG sediments	28-Feb-1995	05-Feb-2008
TAV-MW2	MW	5427.33	5424.3	497.0	513.5	4927.3	4910.8	513.5	4.8	PVC	Regional Aquifer – SFG sediments	30-Mar-1995	
TAV-MW3	MW	5464.30	5461.6	532.0	552.0	4929.6	4909.6	557.7	4.8	PVC	Regional Aquifer – SFG sediments	11-Apr-1997	
TAV-MW4	MW	5427.89	5425.4	495.0	515.0	4930.4	4910.4	520.7	4.8	PVC	Regional Aquifer – SFG sediments	18-Apr-1997	
TAV-MW5	MW	5408.71	5406.6	487.0	507.0	4919.6	4899.6	512.7	4.8	PVC	Regional Aquifer – SFG sediments	26-Apr-1997	
TAV-MW6	MW	5431.17	5431.5	507.0	527.0	4924.5	4904.5	532.0	4.8	PVC	Regional Aquifer – SFG sediments	24-Apr-2001	
TAV-MW7	MW	5430.40	5430.9	597.0	617.0	4833.9	4813.9	622.0	4.8	PVC	Regional Aquifer – SFG sediments	06-Apr-2001	
TAV-MW8	MW	5417.00	5417.4	491.0	511.0	4926.4	4906.4	516.0	4.8	PVC	Regional Aquifer – SFG sediments	11-Apr-2001	
TAV-MW9	MW	5416.27	5416.9	582.0	602.0	4834.9	4814.9	607.0	4.8	PVC	Regional Aquifer – SFG sediments	17-Mar-2001	
TAV-MW10	MW	5437.03	5434.7	508.0	528.0	4926.7	4906.7	533.0	4.8	PVC	Regional Aquifer – SFG sediments	06-Feb-2008	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Technical Area V (Continued)													
TAV-MW11	MW	5440.12	5440.4	512.0	532.0	4928.4	4908.4	537.0	4.8	PVC	Regional Aquifer – SFG sediments	19-Nov-2010	
TAV-MW12	MW	5435.72	5432.9	507.0	527.0	4925.9	4905.9	532.0	4.8	PVC	Regional Aquifer – SFG sediments	16-Nov-2010	
TAV-MW13	MW	5409.02	5406.0	525.0	545.0	4881.0	4861.0	550.0	4.8	PVC	Regional Aquifer – SFG sediments	12-Nov-2010	
TAV-MW14	MW	5441.52	5438.6	512.0	532.0	4926.6	4906.6	538.0	4.8	PVC	Regional Aquifer – SFG sediments	09-Nov-2010	
TAV-MW15	MW	5437.32	5435.1	516.0	541.0	4919.1	4894.1	546.0	4.8	PVC	Regional Aquifer – SFG sediments	18-Jan-2017	
TAV-MW16	MW	5448.34	5446.1	527.0	552.0	4919.1	4894.1	557.0	4.8	PVC	Regional Aquifer – SFG sediments	12-Jan-2017	
Albuquerque Bernalillo County Water Utility Authority, Lovelace Respiratory Research Institute, New Mexico Environment Department, Isleta Pueblo, and Unites States Geological Survey													
Eubank-1	MW	5460.02	5458.1	550.0	610.0	4908.1	4848.1	615.0	4.0	SS	Regional Aquifer – SFG sediments	16-Jul-1998	
Eubank-2	MW	5474.39	5472.4	552.0	592.0	4920.4	4880.4	597.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Nov-1996	
Eubank-3	MW	5498.73	5496.7	590.0	650.0	4906.7	4846.7	655.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Nov-1996	
Eubank-5	MW	5507.40	5505.4	605.0	665.0	4900.4	4840.4	670.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Nov-1996	
IP-1	MW	5622.18	5620.7	78.0	98.0	5542.7	5522.7	98.0	2.0	PVC	Regional Aquifer – SFG sediments	17-Jul-1994	2016
ITRI-MW-16	MW	5644.91	5643.7	100.0	120.0	5543.7	5523.7	120.0	4.0	PVC	Regional Aquifer – SFG sediments	13-Jan-1993	2016
NMED-1	MW	5623.44	5620.7	90.0	110.0	5530.7	5510.7	115.0	4.0	PVC	Regional Aquifer – SFG sediments	12-Jun-1995	
Mesa del Sol-S	MW	5302.67	5302.7	420.0	520.0	4882.7	4782.7	525.0	2.2	PVC	Regional Aquifer – SFG sediments	14-May-1997	
Montessa Park-S	MW	5102.67	5102.7	260.0	320.0	4842.7	4782.7	330.0	2.2	PVC	Regional Aquifer – SFG sediments	10-Sep-1997	
MVMW-J	MW	5118.04	5118.6	200.0	220.0	4918.6	4898.6	225.0	2.0	PVC	Regional Aquifer – SFG sediments	30-Sep-1988	
MVMW-K	MW	5186.05	5186.5	unk	unk	unk	unk	unk	unk	unk	Regional Aquifer – SFG sediments	30-Sep-1988	
YALE-MW1	MW	5308.45	5309.0?	400.0	464.0	4909.0	4845.0	464.0	4.0	PVC	Regional Aquifer – SFG sediments	1997?	
YALE-MW9	MW	5271.06	5272.0?	382.0	422.0	4890.0	4850.0	427.0	4.0	PVC	Regional Aquifer – SFG sediments	19-May-1997	
4HILLS-1	MW	5671.34	5692.6	24.0	64.0	5668.6	5628.6	69.0	4.0	PVC	Regional Aquifer – SFG sediments	Mar-2000?	
Kirtland Air Force Base/U.S. Air Force [h]													
EOD Well	MW	5829.70	5828.7	206.0	247.0	5622.7	5581.7	206.0	6.0	S/OH	Bedrock (granite)	1970?	
KAFB-0118	MW	5320.75	5321.2	458.0	488.0	4863.2	4833.2	499.6	5.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0119	MW	5315.82	5315.6	452.3	482.3	4863.3	4833.3	482.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0120	MW	5292.29	5288.7	429.0	459.0	4859.7	4829.7	461.5	4.0	PVC	Regional Aquifer – SFG sediments	12-Jun-2006	
KAFB-0121	MW	5307.60	5305.0	445.8	475.8	4859.2	4829.2	480.8	4.0	PVC	Regional Aquifer – SFG sediments	24-Nov-2006	
KAFB-0213	MW	5286.95	5285.1	378.0	428.0	4919.3	4869.3	438.0	5.0	PVC	Regional Aquifer – SFG sediments	10-Jan-1984	
KAFB-0219	MW	5263.69	5262.7	396.0	426.0	4866.7	4836.7	428.5	4.0	PVC	Regional Aquifer – SFG sediments	08-Jun-2006	
KAFB-0220	MW	5265.10	5262.5	424.0	454.0	4838.5	4808.5	456.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	15-Jul-2006	
KAFB-0221	MW	5274.36	5271.5	410.5	440.5	4861.0	4831.0	455.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0222	MW	5247.65	5245.2	366.0	396.0	4879.2	4849.2	401.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0223	MW	5254.49	5252.1	376.0	406.0	4876.1	4846.1	411.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0307	MW	5364.53	5362.7	405.0	450.0	4957.7	4912.7	460.0	3.8	PVC	Regional Aquifer – SFG sediments	04-Aug-1991	
KAFB-0308	MW	5381.65	5380.7	463.0	488.0	4917.7	4892.7	498.0	3.8	PVC	Regional Aquifer – SFG sediments	31-Jul-1991	
KAFB-0309	MW	5411.80	5410.7	500.0	525.0	4910.7	4885.7	535.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	6-Jul-1992	
KAFB-0310	MW	5416.48	5413.2	400.0	445.0	5013.2	4968.2	455.0	3.8	PVC	PGWS – SFG sediments	27-Aug-1991	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM [a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Kirtland Air Force Base/U.S. Air Force (Continued)													
KAFB-0311	MW	5353.29	5351.7	433.0	458.0	4918.7	4893.7	468.0	3.8	PVC	Regional Aquifer – SFG sediments	24-Jul-1992	
KAFB-0312	MW	5432.17	5430.2	503.0	528.0	4927.2	4902.2	533.0	4.5	PVC	Regional Aquifer – SFG sediments	26-Aug-1998	
KAFB-0313	MW	5418.98	5416.9	348.0	368.0	5068.9	5048.9	373.0	4.5	PVC	PGWS – SFG sediments	13-Aug-1998	
KAFB-0314	MW	5455.75	5453.9	428.0	448.0	5025.9	5005.9	453.0	4.5	PVC	Regional Aquifer – SFG sediments	30-Sep-1998	
KAFB-0315	MW	5466.11	5464.1	447.0	472.0	5017.1	4992.1	477.0	4.5	PVC	Regional Aquifer – SFG sediments	08-Sep-2000	
KAFB-0417	MW	5313.07	5310.0	430.0	455.0	4880.0	4855.0	465.0	3.8	PVC	Regional Aquifer – SFG sediments	06-Jun-1992	
KAFB-0504	MW	5357.87	5356.9	470.0	490.0	4886.9	4866.9	500.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	20-Jan-1990	
KAFB-0505	MW	5362.81	5360.8	495.4	520.5	4865.4	4840.3	521.3	4.5	PVC	Regional Aquifer – SFG sediments	22-Jul-1999	
KAFB-0506	MW	5363.47	5361.0	200.0	220.0	5161.0	5141.0	220.0	4.5	PVC	PGWS – SFG sediments	31-Aug-1998	
KAFB-0507R	MW	5358.21	5355.7	492.0	512.0	4863.7	4843.7	517.0	4.0	PVC	Regional Aquifer – SFG sediments	3-Apr-2013	
KAFB-0508	MW	5351.88	5349.7	481.0	506.0	4868.7	4843.7	507.0	3.5	PVC	Regional Aquifer – SFG sediments	02-May-2001	
KAFB-0510	MW	5367.10	5364.7	511.0	536.0	4853.7	4828.7	537.0	3.5	PVC	Regional Aquifer – SFG sediments	17-May-2001	
KAFB-0512R	MW	5302.73	5300.2	430.0	450.0	4870.2	4850.2	455.0	4.0	PVC	Regional Aquifer – SFG sediments	4-Apr-2013	
KAFB-0514	MW	5206.41	5204.7	340.0	365.0	4864.7	4839.7	366.0	3.5	PVC	Regional Aquifer – SFG sediments	17-May-2001	
KAFB-0516	MW	5205.64	5203.4	322.0	357.0	4881.4	4846.4	358.0	4.0	PVC	Regional Aquifer – SFG sediments	29-Jan-2002	
KAFB-0517	MW	5197.10	5194.6	325.0	350.0	4869.6	4844.6	352.0	4.0	PVC	Regional Aquifer – SFG sediments	08-Nov-2002	
KAFB-0518	MW	5177.76	5175.5	305.0	335.0	4870.5	4840.5	337.0	4.0	PVC	Regional Aquifer – SFG sediments	22-Dec-2002	
KAFB-0519	MW	5365.37	5362.7	700.0	725.0	4662.7	4637.7	727	5	PVC	Regional Aquifer – SFG sediments	12-May-2003	
KAFB-0520	MW	5247.90	5246.2	379.5	404.5	4866.7	4841.7	410.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Jun-2004	
KAFB-0522	MW	5267.48	5265.7	405.0	430.0	4860.7	4835.7	432.5	4.0	PVC	Regional Aquifer – SFG sediments	23-Jun-2004	
KAFB-0523	MW	5352.62	5350.5	600.0	625.0	4750.5	4725.5	627.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-0524	MW	5345.61	5343.4	484.0	509.0	4859.4	4834.4	511.0	4.0	PVC	Regional Aquifer – SFG sediments	31-Oct-2006	
KAFB-0525	MW	5229.75	5227.9	371.0	396.0	4856.9	4831.9	398.0	4.0	PVC	Regional Aquifer – SFG sediments	19-Nov-2006	
KAFB-0611	MW	5386.09	5383.5	498.0	508.0	4885.5	4875.5	513.0	4.0	PVC	Regional Aquifer – SFG sediments	13-Nov-2002	
KAFB-0612	MW	5385.45	5383.5	290.0	315.0	5093.5	5068.5	317.0	4.0	PVC	PGWS – SFG sediments	21-Nov-2002	
KAFB-0613	MW	5390.78	5391.3	420.0	450.0	4971.3	4941.3	452.0	4.0	PVC	Regional Aquifer – SFG sediments	08-Dec-2002	
KAFB-0614	MW	5390.89	5391.4	360.0	370.0	5031.4	5021.4	372.0	4.0	PVC	PGWS – SFG sediments	12-Dec-2002	
KAFB-0615	MW	5638.43	5636.3	300.0	325.0	5336.3	5311.3	327.0	4.0	PVC	Bedrock (granite)	27-Nov-2002	
KAFB-0616	MW	5481.07	5478.7	472.0	497.0	5006.7	4981.7	499.0	4.0	PVC	Regional Aquifer – SFG sediments	24-Nov-2002	
KAFB-0617	MW	5505.78	5503.3	565.0	590.0	4938.3	4913.3	592.0	4.0	PVC	Regional Aquifer – SFG sediments	18-May-2004	
KAFB-0618	MW	5410.05	5408.2	535.0	560.0	4873.2	4848.2	562.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Jun-2004	
KAFB-0619	MW	5410.78	5409.0	389.0	404.0	5020.0	5005.0	406.0	4.0	PVC	PGWS – SFG sediments	04-Jun-2004	
KAFB-0620	MW	5334.64	5332.0	447.0	472.0	4885.0	4860.0	474.5	4.0	PVC	Regional Aquifer – SFG sediments	18-Jun-2004	
KAFB-0621	MW	5569.89	5568.0	624.0	649.0	4944.0	4919.0	650.0	4.0	PVC	Regional Aquifer – SFG sediments	17-Jun-2004	
KAFB-0622	MW	5488.64	5486.2	529.0	554.0	4957.2	4932.2	555.0	4.0	PVC	Regional Aquifer – SFG sediments	25-Jun-2004	
KAFB-0623	MW	5328.94	5327.0	265.0	290.0	5062.0	5037.0	292.5	4.0	PVC	PGWS – SFG sediments	29-Jun-2004	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Kirtland Air Force Base/U.S. Air Force (Continued)													
KAFB-0624	MW	5673.78	5671.1	765.0	790.0	4906.1	4881.1	792.5	3.8	PVC	Regional Aquifer – SFG sediments	31-Oct-2008	
KAFB-0625	MW	5390.23?	5387.5?	470.0	495.0	4917.5	4892.5	497.5	4.0	unk	Regional Aquifer – SFG sediments	unk	
KAFB-0626	MW	5331.21	5328.8	425.0[i]	629.0[i]	4903.8	4699.8	638.4	5.0	FLUTe	Regional Aquifer – SFG sediments	20-Aug-2010	
KAFB-0901	MW	5390.07	5389.8	465.0	527.0	4924.8	4862.8	537.0	4.0	PVC	Regional Aquifer – SFG sediments	15-Mar-1990	
KAFB-0903	MW	5391.63	5389.4	225.0	250.0	5164.4	5139.4	251.0	4.0	PVC	merging zone – SFG sediments	3-Apr-2002	
KAFB-0904	MW	5291.75	5289.3?	343.0	368.0	5034.0	5009.0	368.0	4.0	PVC	Regional Aquifer – SFG sediments	2002	
KAFB-1001	MW	5260.43	5255.7	342.0	367.0	4913.7	4888.7	377.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	19-Apr-1992	
KAFB-1002	MW	5254.75	5252.7	342.0	367.0	4910.7	4885.7	377.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	30-Mar-1992	
KAFB-1003	MW	5258.29	5257.7	345.0	370.0	4912.7	4887.7	380.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	21-May-1992	
KAFB-1004	MW	5258.81	5267.7	348.0	373.0	4919.7	4894.7	383.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	24-Aug-1992	
KAFB-1005	MW	5274.68	5287.7	363.0	388.0	4924.7	4899.7	398.0	4.0	PVC/SS	Regional Aquifer – SFG sediments	26-May-1992	
KAFB-1006	MW	5257.01	5257.0	363.0	383.0	4894.0	4874.0	383.0	4.0	SS	Regional Aquifer – SFG sediments	10-Aug-1996	
KAFB-1007R	MW	5260.62	5258.4	376.5	396.5	4881.9	4861.9	401.5	4.0	PVC	Regional Aquifer – SFG sediments	18-May-2013	
KAFB-1008	MW	5260.77	5258.8	367.6	397.6	4891.2	4861.2	400.0	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-1009	MW	5272.16	5271.8	392.7	422.7	4879.1	4849.1	427.7	4.0	PVC	Regional Aquifer – SFG sediments	unk	
KAFB-1021	MW	5348.02	5348.0	479.0	504.0	4869.0	4844.0	505	4	PVC	Regional Aquifer – SFG sediments	17-Mar-2002	
KAFB-1901	MW	5751.58	5748.7	80.5	105.5	5668.2	5643.2	115.5	4.0	PVC/SS	Regional Aquifer – SFG sediments	30-Jun-1992	
KAFB-1902	MW	5754.27	5752.7	80.7	105.7	5672.0	5647.0	115.7	4.0	PVC/SS	Regional Aquifer – SFG sediments	9-Jul-1992	
KAFB-1904	MW	5752.29	5750.0?	84.3	104.3	5665.7	5645.7	104.3	4.0	SS	Regional Aquifer – SFG sediments	1992?	
KAFB-2004	MW	5592.08	5592.5?	278.0	308.0	5314.5	5284.5	309.0	4.0	PVC	Regional Aquifer – SFG sediments	17-Feb-2002	
KAFB-2005	MW	5624.27	5624.6	126.0	156.0	5498.6	5468.6	158.5	4.0	PVC	Regional Aquifer – SFG sediments	10-May-2006	
KAFB-2006	MW	5590.88	5591.0?	303.0	333.0	5288.0	5258.0	335.0	4.0	PVC	Regional Aquifer – SFG sediments	10-May-2006	
KAFB-2007	MW	5564.48	5562.1	273.0	303.0	5289.1	5259.1	305.5	4.0	PVC	Regional Aquifer – SFG sediments	13-May-2006	
KAFB-2008	MW	5541.74	5539.5	650.0	680.0	4889.5	4859.5	688.0	5.0	PVC	Regional Aquifer – SFG sediments	2010?	
KAFB-2009	MW	5655.63	5653.4	74.0	104.0	5579.4	5549.4	110.0	4.0	PVC	Regional Aquifer – SFG sediments	2010?	
KAFB-2622	MW	5358.14	5356.5	195.0	215.0	5161.5	5141.5	217.0	4.0	PVC	PGWS – SFG sediments	02-Dec-2004	
KAFB-2623	MW	5367.48	5365.3	199.8	219.8	5165.5	5145.5	221.8	4.0	PVC	PGWS – SFG sediments	30-Dec-2004	
KAFB-2624	MW	5362.27	5359.6	195.0	215.0	5164.6	5144.6	217.0	4.0	PVC	PGWS – SFG sediments	2013?	
KAFB-2625	MW	5359.26	5357.4	185.0	205.0	5172.4	5152.4	207.0	4.0	PVC	PGWS – SFG sediments	2010?	
KAFB-2626	MW	5357.51	5355.6	185.0	205.0	5170.6	5150.6	208.0	4.0	PVC	PGWS – SFG sediments	22-Feb-2009	
KAFB-2627	MW	5367.47	5365.5	195.0	215.0	5170.5	5150.5	217.5	4.0	PVC	PGWS – SFG sediments	2-Mar-2009	
KAFB-2628	MW	5369.64	5367.4	506.0	530.0	4861.4	4837.4	535.0	5.0	PVC	Regional Aquifer – SFG sediments	2-Aug-2011	
KAFB-2629	MW	5361.53	5359.0	499.5	519.5	4859.7	4839.7	523.5	5.0	PVC	Regional Aquifer – SFG sediments	9-Aug-2011	
KAFB-2630	MW	5361.71	5359.2	205.9	225.7	5153.3	5133.5	227.9	4.0	PVC	SFG sediments	20-Aug-2011	
KAFB-2631	MW	5335.70	5335.5	154.3	174.1	5181.2	5161.4	176.3	4.0	PVC	SFG sediments	16-Aug-2011	
KAFB-2632	MW	5329.08	5328.8	157.4	177.2	5171.4	5151.6	179.4	4.0	PVC	SFG sediments	11-Aug-2011	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Kirtland Air Force Base/U.S. Air Force (Continued)													
KAFB-2901	MW	5839.08	5836.7	121.0	141.0	5715.7	5695.7	146.0	4.0	PVC	Regional Aquifer – SFG sediments	31-May-2015	
KAFB-2902	MW	5832.10	5829.7	160.0	180.0	5669.7	5649.7	185.0	4.0	PVC	Regional Aquifer – SFG sediments	9-May-2015	
KAFB-2903	MW	5819.46	5817.0	165.0	185.0	5652.0	5632.0	190.0	4.0	PVC	Bedrock (Abo Formation) siltstone and shale	11-Jun-2015	
KAFB-2904	MW	5842.72	5840.4	58.0	78.0	5782.4	5762.4	83.0	4.0	PVC	Bedrock (Madera Formation) limestone	14-Jun-2015	
KAFB-3391	MW	5396.60	5394.1	262.3	282.3	5131.8	5111.8	284.3	4.0	PVC	PGWS – SFG sediments	1-Aug-1998	
KAFB-3392	MW	5394.51	5393.4	536.0	561.0	4857.4	4832.4	562.0	4.0	PVC	Regional Aquifer – SFG sediments	08-Oct-1999	
KAFB-3411	MW	5342.81	5340.5	477.0	502.0	4863.5	4838.5	503.0	4.0	PVC	Regional Aquifer – SFG sediments	11-Nov-1999	
KAFB-6241	MW	5466.50	5463.2	528.0	553.0	4935.2	4910.2	555.0	4.0	PVC	Regional Aquifer – SFG sediments	16-Jan-2007	
KAFB-6243	MW	5426.22	5421.0	488.0	513.0	4933.0	4908.0	516.0	4.0	unk	Regional Aquifer – SFG sediments	2009?	
KAFB-6301	MW	5459.64	5457.3	535.0	560.0	4922.3	4897.3	561.0	4.0	PVC	Regional Aquifer – SFG sediments	7-Sep-1999	
KAFB-7001	MW	5322.87	5323.0?	454.0	479.0	4869.0	4844.0	480.0	4.0	PVC	Regional Aquifer – SFG sediments	before 2011	
KAFB-8281	MW	5401.03	5401.7	544.0	569.0	4857.7	4832.7	570.0	4.0	PVC	Regional Aquifer – SFG sediments	27-Oct-1999	
KAFB-8282	MW	5402.92	5403.4	262.0	287.0	5141.4	5116.4	288.0	4.0	PVC	PGWS – SFG sediments	1999?	
KAFB-8351	MW	5325.51	5323.3	474.0	499.0	4849.3	4824.3	505.0	4.0	PVC	Regional Aquifer – SFG sediments	23-Nov-1999	
ST105-EX01	MW	5353.54	5348.5	505.0	575.0	4843.5	4773.5	575.0	10.0	PVC/SS	Regional Aquifer – SFG sediments	2008?	
ST105-MW001	MW	5279.34	5276.6	408.0	428.0	4868.6	4848.6	433.0	4.0	PVC	Regional Aquifer – SFG sediments	11-Mar-2103	
ST105-MW002	MW	5180.32	5177.8	308.8	328.8	4869.0	4849.0	333.8	4.0	PVC	Regional Aquifer – SFG sediments	25-Feb-2013	
ST105-MW003	MW	5174.61	5171.9	301.0	321.0	4870.9	4850.9	326.0	4.0	PVC	Regional Aquifer – SFG sediments	28-Feb-2013	
ST105-MW004	MW	5234.61	5234.1	365.0	385.0	4869.1	4849.1	390.0	4.0	PVC	Regional Aquifer – SFG sediments	20-Feb-2013	
ST105-MW005	MW	5287.57	5284.9	273.0	293.0	5011.9	4991.9	298.0	4.0	PVC	Regional Aquifer – SFG sediments	27-May-2103	
ST105-MW006	MW	5313.26	5310.7	228.0	248.0	5082.7	5062.7	253.0	4.0	PVC	PGWS – SFG sediments	2-Feb-2013	
ST105-MW007	MW	5311.18	5308.5	290.0	310.0	5018.5	4998.5	315.0	4.0	PVC	Regional Aquifer – SFG sediments	24-Feb-2013	
ST105-MW008	MW	5358.94	5356.5	461.0	476.0	4895.5	4880.5	481.0	4.0	PVC	Regional Aquifer – SFG sediments	20-Feb-2013	
ST105-MW009	MW	5519.71	5517.5	480.0	500.0	5037.5	5017.5	505.0	4.0	PVC	Regional Aquifer – SFG sediments	7-Nov-2013	
ST105-MW010	MW	5334.70	5332.1	436.5	456.5	4895.6	4875.6	461.5	4.0	PVC	Regional Aquifer – SFG sediments	1-Jun-2013	
ST105-MW011	MW	5422.66	5420.0	456.8	476.8	4963.2	4943.2	482.3	4.0	PVC	Regional Aquifer – SFG sediments	9-Apr-2013	
ST105-MW012	MW	5419.90	5417.1	376.0	396.0	5041.1	5021.1	401.0	4.0	PVC	PGWS – SFG sediments	17-Apr-2013	
ST105-MW013	MW	5447.27	5444.5	433.6	453.6	5010.9	4990.9	453.6	4.0	PVC	Regional Aquifer – SFG sediments	16-Apr-2013	
ST105-MW015	MW	5623.95	5621.2	687.0	707.0	4934.2	4914.2	712.0	4.0	PVC	Regional Aquifer – SFG sediments	7-May-2013	
ST105-MW017	MW	5621.97	5619.6	702.0	722.0	4917.6	4897.6	727.0	4.0	PVC	Regional Aquifer – SFG sediments	14-Jun-2013	
ST105-MW018	MW	5221.68	5218.8	349.2	369.2	4869.6	4849.6	374.6	4.0	PVC	Regional Aquifer – SFG sediments	9-Mar-2013	
ST105-MW019	MW	5217.94	5215.2	345.0	365.0	4870.2	4850.2	370.0	4.0	PVC	Regional Aquifer – SFG sediments	6-Mar-2013	
ST105-MW020	MW	5383.72	5381.0	281.0	301.0	5100.0	5080.0	306.0	4.0	PVC	PGWS – SFG sediments	24-Apr-2013	
ST105-MW021	MW	5390.90	5388.4	322.0	342.0	5066.4	5046.4	347.0	4.0	PVC	PGWS – SFG sediments	5-Apr-2013	
ST105-MW022	MW	5386.66	5383.9	472.0	492.0	4911.9	4891.9	497.0	4.0	PVC	Regional Aquifer – SFG sediments	10-Apr-2013	
ST105-MW023	MW	5275.86	5273.3	406.0	426.0	4867.3	4847.3	431.0	4.0	PVC	Regional Aquifer – SFG sediments	28-Oct-2013	
ST105-MW024	MW	5595.67	5593.3	442.0	462.0	5151.3	5131.3	467.0	4.0	PVC	Regional Aquifer – SFG sediments	12-Nov-2013	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Kirtland Air Force Base/U.S. Air Force (Continued)													
Site 58 MW-1	MW	5720.88	5718.4?	46.8	71.8	5671.6	5646.6	71.8	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-2	MW	5715.94	5715.9	76.7	96.7	5639.2	5619.2	96.7	2.0	PVC	Bedrock (granite)	2001?	
Site 58 MW-3	MW	5717.88	5717.9	52.0	72.0	5665.9	5645.9	72.0	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-4	MW	5722.31	5719.8?	55.5	75.5	5664.3	5644.3	75.5	2.0	PVC	Bedrock (granite)	2001?	
Site 58 MW-5	MW	5716.83	5716.8	25.0	65.0	5691.8	5651.8	80.0	4.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-6	MW	5720.30	5717.8?	57.0	82.0	5660.8	5635.8	87.0	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Site 58 MW-7	MW	5717.76	5715.3?	50.0	75.0	5665.3	5640.3	80.0	2.0	PVC	Colluvium and Bedrock (granite)	2001?	
Production, Injection, and Extraction Wells													
ASL-PD	P	6030.00	6030.0	337.0	401.6	5693.0	5628.4	401.6	4.0	PVC	Bedrock (granite)	11-Jan-1990	
Burn Site Well	Px	6374.66	6372.9	231.0	341.0	6141.9	6031.9	341.0	4.0	PVC	Bedrock (schist and granite)	20-Feb-1986	Inactive 2003
Greystone Well	P	5822.87	5820.8	44.0	54.0	5776.8	5766.8	54.0	4.0	PVC/S	Alluvium	1902?	12-Sep-2002
KAFB-1	P	unk	5386.5	550.0	1,199.0	4836.5	4187.5	1,199.0	12.0	S	Regional Aquifer – SFG sediments	1-Aug-1949	Dec 2016
KAFB-2	P	5327.06	5327.1	494.0	1,000.0	4833.1	4327.1	1,000.0	12.0	S	Regional Aquifer – SFG sediments	Jan-1951	Dec 2016
KAFB-3	P	unk	5356.9	452.0	900.0	4904.9	4456.9	920.0	14.0	S	Regional Aquifer – SFG sediments	01-Oct-1949	
KAFB-4	P	unk	5360.2	494.0	1,000.0	4866.2	4360.2	1,000.0	14.0	S	Regional Aquifer – SFG sediments	01-Dec-1949	
KAFB-5	P	unk	5439.0	504.0	1,004.0	4935.0	4435.0	1,004.0	14.0	S	Regional Aquifer – SFG sediments	1-Jul-1952	1999
KAFB-6	P	unk	5423.5	504.0	1,002.0	4919.5	4421.5	1,006.0	14.0	S	Regional Aquifer – SFG sediments	1-Jul-1952	1999
KAFB-7	INJ	unk	5350.4	448.0	976.0	4902.4	4374.4	976.0	16.0	S	Regional Aquifer – SFG sediments	1-Feb-1955	Inj. starts 2016
KAFB-8	P	5372.00	5372.0	440.0	975.0	4932.0	4397.0	1,000.0	14.0	S	Regional Aquifer – SFG sediments	1-Feb-1955	1999
KAFB-9	P	5501.19	5501.2	unk	unk	unk	4851.2?	650.0	10.0	S	Regional Aquifer – SFG sediments	1-Oct-1949	1970
KAFB-10	P	5418.65	5418.7	495.0	970.0	4923.7	4448.7	970.0	12.75	S	Regional Aquifer – SFG sediments	27-May-1959	Apr 1996
KAFB-11	P	5470.67	5481.0	670.0	1,327.0	4811.0	4154.0	1,327.0	16.0	S	Regional Aquifer – SFG sediments	10-Apr-1972	Dec 2016
KAFB-12	P	5322.87	5324.2	446.0	1,032.0	4878.2	4292.2	1,032.0	16.0	S	Regional Aquifer – SFG sediments	1-Oct-1952	1999
KAFB-13	P	5305.67	5307.0	413.0	953.0	4894.0	4354.0	977.0	14.0	S	Regional Aquifer – SFG sediments	1-Mar-1956	1999
KAFB-14	P	5324.67	5324.2	380.0	1,000.0	4944.2	4324.2	1,000.0	16.0	S	Regional Aquifer – SFG sediments	01-Jan-1969	
KAFB-15	P	unk	5347.0	697.0	993.0	4650.0	4354.0	1,600.0	30.0	S	Regional Aquifer – SFG sediments	1996	
KAFB-16	P	unk	5370.0	697.0	993.0	4673.0	4377.0	1,600.0	30.0	S	Regional Aquifer – SFG sediments	1996	
KAFB-17 (Heliport #1)	Px	unk	5301.7	530 .0	598.0	4771.7	4703.7	598.0	6.0	SS	Regional Aquifer – SFG sediments	1992	Dec 2016
KAFB-18 (SOR) [j]	Px	5965.70	5965.7	160.0	320.0	5805.7	5645.7	320.0	5.0	PVC	Bedrock (metarhyolite)	19-Aug-1987	
KAFB-19 (HERTF)	P	unk	6229.7	449.0	500.0	5780.7	5729.7	500.0	5.0	S/OH?	Bedrock (granite)	13-Jul-1990	2008
KAFB-20	P	unk	5389.0	710.0	1,180.0	4679.0	4209.0	1,240.0	20.0	S	Regional Aquifer – SFG sediments	Jan 2008	
KAFB-PG-1598 [k]	Ext	5369.90	5368.4	290.0	440.0	5078.4	4928.4	455.0	12.0	SS	PGWS – SFG sediments	14-Oct-1998	
KAFB-0602	Ext	5365.47	5364.2	437.0	457.0	4927.2	4907.2	467.0	4.0	PVC/SS	PGWS – SFG sediments	20-Mar-1990	
KAFB-0608	Ext	5361.17	5359.9	307.0	327.0	5052.9	5032.9	338.0	4.0	PVC/SS	PGWS – SFG sediments	28-Mar-1990	
KAFB-0609	Ext	5365.87	5364.7	316.0	336.0	5048.7	5028.7	345.0	4.0	PVC/SS	PGWS – SFG sediments	31-Mar-1990	22-Jun-2014
KAFB-0610	Ext	5359.47	5357.3	333.0	353.0	5024.3	5004.3	363.0	4.0	PVC/SS	PGWS – SFG sediments	04-Apr-1990	
KAFB-106228	Ext	5319.62	5322.9	440.0	540.0	4882.9	4782.9	545.0	8.0	SS	Regional Aquifer – SFG sediments	2-June-2015	

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

Well ID	Type	Measuring Point [b, c] (ft amsl, NAVD 88)	Ground Surface [c] (ft amsl, NAVD 88)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft amsl)	Bottom of Screen (ft amsl)	Casing Total Depth (ft bgs)	Casing, Inner Diameter (inches)	Casing Material	Lithology of Screened Interval	Installation Date	P&A Date, If Applicable
Production, Injection, and Extraction Wells (Continued)													
KAFB-106233	Ext	5312.20	5315.5	430.0	532.1	4885.5	4783.4	537.1	8.0	SS	Regional Aquifer – SFG sediments	30-Sep-2015	
KAFB-106234	Ext	5323.07	5326.3	439.7	539.7	4886.6	4786.6	544.7	8.0	SS	Regional Aquifer – SFG sediments	9-Oct-2015	
KAFB-106239	Ext	5330.09	5333.4	470.0	570.0	4863.4	4763.4	575.0	8.0	SS	Regional Aquifer – SFG sediments	3-May-2017	
Lake Christian West [l]	Px	5716.61	5714.8	60.0	72.0	5654.8	5642.8	72.0	6.0	S	SFG sediments or sandstone	before 1990	after 2004
Ridgecrest-1	P	unk	5444.7	636.0	1,260.0	4808.7	4184.7	1,260.0	16.0	S	Regional Aquifer – SFG sediments	13-Jan-1964	
Ridgecrest-2	P	unk	5418.7	730.0	1,500.0	4688.7	3918.7	1,543.0	16.0	S	Regional Aquifer – SFG sediments	1-Jan-1977	
Ridgecrest-3	P	unk	5387.7	621.0	1,436.0	4766.7	3951.7	1,449.0	16.0	S	Regional Aquifer – SFG sediments	01-May-1974	
Ridgecrest-4	P	unk	5346.7	573.0	1,413.0	4773.7	3933.7	1,450.0	unk	S	Regional Aquifer – SFG sediments	01-Mar-1974	
Ridgecrest-5	P	unk	5356.7	650.0	1,450.0	4706.7	3906.7	1,450.0	20.0	S	Regional Aquifer – SFG sediments	8-Dec-1990	
School House Well	P	5796.33	5799.0	83.0	103.0	5716.0	5696.0	103.0	6.0	S/OH	Bedrock (Sandia Formation) sandstone?	1930s?	inactive
TSA-1	P	6063.68	6060.2	190.0	210.0	5870.2	5850.2	300.0	6.0	S	Bedrock (metamorphics)	10-Nov-1987	Aug 2001
VA-1	P	unk	unk	unk	unk	unk	unk	unk	unk	unk	Regional Aquifer – SFG sediments	1940?	1997?
VA-2	P	unk	5346.3?	590.0	990.0	4756.3	4356.3	1,010.0	13.4	SS	Regional Aquifer – SFG sediments	18-Apr-1997	
Yates Well	P	6104.67	6102.7	unk	unk	unk	unk	unk	unk	S	Bedrock (granite)	1929	1942?

Notes:

[a] The status of all SNL/NM-installed groundwater wells is maintained in this table. However, not all of decommissioned (P&A) groundwater wells for KAFB and LRRI are listed.

[b] Measuring Point is the elevation for the top of well casing, typically the top of PVC casing, that is used for measuring and calculating groundwater elevations.

[c] Elevations are relative to the NAVD 88, New Mexico State Plane Coordinate System, Central Zone. Elevation data from other government agencies were converted as necessary using a conversion (re-projection) of +2.671 feet.

[d] MWL-MW4 well casing was installed at 6 degrees from vertical. Casing depths were measured during well installation and are not corrected for true vertical (perpendicular to the ground surface) distance of the slant hole.

[e] Merging zone refers to isolated layers of saturation near Tijeras Arroyo, typically between the Perched Groundwater System and the Regional Aquifer. A merging zone is occasionally present above the Perched Groundwater System.

[f] Monitoring well TA2-NW1-595 has two screens: 535 to 555 ft bgs, and 585 to 595 ft bgs. Groundwater samples are collected from the upper screen.

[g] Monitoring well PGS-2 has three screens: 535 to 565 ft bgs, 585 to 595 ft bgs, and 625 to 645 ft bgs. Groundwater samples are collected from the upper screen.

[h] Many of the Bulk Fuels Facility (BFF) monitoring wells, such as KAFB-1062, are not shown in order to reduce clutter on the AGMR figures and Plate 1. The BFF plume does not impact groundwater quality in the SNL/NM groundwater areas of concern.

[i] Monitoring well KAFB-0626 was constructed with a FLUTe™ monitoring system with four sampling ports labeled as KAFB-0626A through KAFB-0626D. Sample tubing (0.25-inch diameter) for the four ports was installed in a 5-inch diameter PVC casing. Groundwater elevations cannot be measured. Port KAFB-0626A is set at 425 ft bgs. Port KAFB-06262B is set at 471 ft bgs. Port KAFB-06262C is set at 515 ft bgs. Port KAFB-06262D is set at 629 ft bgs. Each port has an interval of silica sand that is separated by bentonite chips.

[j] KAFB-18 is also known as the Optical Range Well or the Starfire Optical Range well.

[k] The production-non-potable well (water supply well) KAFB-PG-1598 is also known as the Golf Course Main Pond well. Some KAFB documents also use the identifier RG-1598-S-4 or RG-1589-S-4. Pumped water is used for irrigating the KAFB Tijeras Arroyo Golf Course.

[l] Lake Christian West is also known as well KAFB-1903. Well was used for non-potable purposes including the filling of a U.S. Air Force high-explosives testing pond located approximately 1,600 ft to the east of the well.

The casings for wells SFR-1D and SFR-1S were installed in a single borehole.

Injection well TAV-INJ1 is a nested well with two PVC casings installed in a single borehole. The 5-inch diameter monitoring screen extends from 509 to 539 ft bgs. The 1.5-inch diameter injection screen extends from 519 to 539 ft bgs). The primary sandpack (2-millimeter SilLibeads®) extends from 504 to 544.5 ft bgs.

Table 1. Inventory of Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM, Kirtland Air Force Base, and Surrounding Areas *(Concluded)*

Notes (Continued):

AGMR = Annual Groundwater Monitoring Report.
amsl = Above mean sea level.
ASL-PD = Albuquerque Seismological Laboratory Production.
AVN = Area-V (North).
BFF = Bulk Fuels Facility at KAFB.
bgs = Below ground surface.
BW = Background Well.
CCBA = Coyote Canyon Blast Area.
CTF = Coyote Test Field.
CWL = Chemical Waste Landfill.
CYN = Canyons (Lurance Canyon area).
EOD = Explosive Ordnance Disposal.
EX = Well proposed for extraction purposes, but used for monitoring purposes only. This applies to the well number for ST105-EX01.
Ext = Extraction well used for remediating groundwater at the KAFB BFF and the KAFB Tijeras Arroyo Golf Course.
ft = feet/foot.
FLUTe = Flexible Liner Underground Technologies, LLC.
HERTF = High Energy Research Test Facility.
ID = Identifier.
INJ = Injection well.
IP = Isleta Pueblo.
ITRI = Inhalation Toxicology Research Institute (renamed in 1996 as Lovelace Respiratory Research Institute).
KAFB = Kirtland Air Force Base.
L = Lower screen, a term used at CWL.
LMF = Large Melt Facility.
LRRI = Lovelace Respiratory Research Institute.
LWDS = Liquid Waste Disposal System.
MRN = Magazine Road North.
MVMW = Mountain View Monitoring Well.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
NAVD 88 = North American Vertical Datum of 1988.
NMED = New Mexico Environment Department.
NWTA3 = Northwest Technical Area-III.
OBS = Old Burn Site.
P = Production well (water supply well) used for potable purposes.
P&A = Plugged and abandoned (decommissioned).
Px = Production well (water supply well) used for non-potable purposes such as irrigating the golf course.
PGS = Parade Ground South.
PGWS = Perched Groundwater System.
PL = Power Line road (northwest of Technical Area-III). The better-known Power Line Road is near the golf course.
PVC = Polyvinyl chloride.
PVC/S = Composition of blank well casing is PVC and composition of well screen is steel (carbon steel).
PVC/SS = Composition of blank well casing is PVC and composition of well screen is stainless steel.
R = Replacement well (term used by KAFB).
S = Steel (carbon steel).
S/OH = Open hole completion (no well screen) with blank casing above.
S/SS = Composition of blank well casing is carbon steel and composition of well screen is stainless steel.
SFG = Santa Fe Group
SFR = South Fence Road.
SNL/NM = Sandia National Laboratories, New Mexico.
SS = Stainless steel.
ST105 = Series of KAFB/USAF wells for nitrate abatement study.
STW = Solar Tower (West).
SWTA3 = Southwest Technical Area-III.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-SW = Technical Area-II (Southwest).
TA2-W = Technical Area-II (Well).
TAV = Technical Area-V (monitoring well designation).
TAV-INJ = TAV injection well.
TJA = Tijeras Arroyo.
TRE = Thunder Road East.
TRN = Target Road North.
TRS = Target Road South.
TSA = Transportation Safeguards Academy.
U = Upper screen, a term used at CWL.
unk = Unknown information, not available.
USAF = U.S. Air Force.
VA = Veterans Administration.
WYO = Wyoming.
YALE = Yale Boulevard area.
? = Value is an estimate or has questionable accuracy.
12AUP = Environmental Restoration Site 12A upper piezometer.

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Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2018

Well ID	Measuring Point [a,b], (ft amsl, NAVD 88)	Date Measured [c]	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Groundwater Elevation, Rounded (ft amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, as Needed	Data Source	Well Owner	Screened Unit
AVN-1	5443.00	3-Oct-2018	527.04	4915.96	4916		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
Burn Site Well	6374.66	1-Oct-2018	106.87	6267.79	6268		SNL/NM	SNL/NM	Bedrock (schist and granite)
CCBA-MW1	5902.34	3-Oct-2018	48.14	5854.20	5854		SNL/NM	SNL/NM	Alluvium and bedrock (granite)
CCBA-MW2	5939.28	3-Oct-2018	72.38	5866.90	5867		SNL/NM	SNL/NM	Bedrock (granite)
CTF-MW1	6082.63	3-Oct-2018	240.45	5842.18	5842		SNL/NM	SNL/NM	Bedrock (granite)
CTF-MW2	5578.60	5-Oct-2018	43.95	5534.65	5535		SNL/NM	SNL/NM	Bedrock (granite)
CTF-MW3	5522.82	5-Oct-2018	309.67	5213.15	5213		SNL/NM	SNL/NM	Bedrock (granite)
CWL-BW5	5434.79	2-Oct-2018	514.15	4920.64	4921		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CWL-MW9	5426.12	2-Oct-2018	505.53	4920.59	4921		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CWL-MW10	5424.58	2-Oct-2018	502.51	4922.07	4922		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CWL-MW11	5423.24	2-Oct-2018	500.75	4922.49	4922		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
CYN-MW3	6313.26	1-Oct-2018	135.98	6177.28	6177		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW4	6455.48	1-Oct-2018	230.73	6224.75	6225		SNL/NM	SNL/NM	Bedrock (quartzite)
CYN-MW5	5984.23	1-Oct-2018	108.75	5875.48	5875		SNL/NM	SNL/NM	Bedrock (quartzite)
CYN-MW6	6343.37	1-Oct-2018	157.97	6185.40	6185		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW7	6216.35	1-Oct-2018	306.20	5910.15	5910		SNL/NM	SNL/NM	Bedrock (granitic gneiss)
CYN-MW8	6230.11	1-Oct-2018	321.92	5908.19	5908		SNL/NM	SNL/NM	Bedrock (granitic gneiss)
CYN-MW9	6360.67	1-Oct-2018	172.42	6188.25	6188		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW10	6345.45	1-Oct-2018	130.40	6215.05	6215		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW11	6374.41	1-Oct-2018	106.60	6267.81	6268		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW12	6345.16	1-Oct-2018	216.46	6128.70	6129		SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW13	6237.79	1-Oct-2018	328.11	5909.68	5910		SNL/NM	SNL/NM	Bedrock (granitic gneiss)
CYN-MW14A	6315.85	1-Oct-2018	185.72	6130.13	6130	NC - deeper fracture	SNL/NM	SNL/NM	Bedrock (metamorphics)
CYN-MW15	6344.44	1-Oct-2018	159.61	6184.83	6185		SNL/NM	SNL/NM	Bedrock (metamorphics)
Greystone-MW2	5814.20	3-Oct-2018	54.63	5759.57	5760	NC - shallow alluvium	SNL/NM	SNL/NM	Alluvium in arroyo, recent
LWDS-MW1	5423.83	3-Oct-2018	505.15	4918.68	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
LWDS-MW2	5412.41	3-Oct-2018	493.88	4918.53	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MRN-2	5308.18	19-Oct-2018	432.88	4875.30	4875		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MRN-3D	5309.34	19-Oct-2018	433.27	4876.07	4876		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-BW2	5391.02	2-Oct-2018	481.51	4909.51	4910		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW4	5391.70	2-Oct-2018	499.32	4892.38	4892	corrected for inclined casing	SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW5	5382.56	2-Oct-2018	493.71	4888.85	4889		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW6	5375.31	2-Oct-2018	487.30	4888.01	4888		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW7	5383.30	2-Oct-2018	490.45	4892.85	4893		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW8	5384.67	2-Oct-2018	492.01	4892.66	4893		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
MWL-MW9	5381.91	2-Oct-2018	492.11	4889.80	4890		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2018 *(Continued)*

Well ID	Measuring Point, (ft amsl, NAVD 88)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Groundwater Elevation, Rounded (ft amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, as Needed	Data Source	Well Owner	Screened Unit
NWTA3-MW2	5337.49	10-Oct-2018	465.59	4871.90	4872		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
NWTA3-MW3D	5340.80	19-Oct-2018	462.42	4878.38	4878		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
OBS-MW1	5871.42	2-Oct-2018	72.06	5799.36	5799		SNL/NM	SNL/NM	Bedrock (granite)
OBS-MW2	5863.16	2-Oct-2018	174.53	5688.63	5689		SNL/NM	SNL/NM	Bedrock (granite)
OBS-MW3	5865.50	2-Oct-2018	69.30	5796.20	5796		SNL/NM	SNL/NM	Bedrock (granite)
PGS-2	5408.29	5-Oct-2018	534.78	4873.51	4874		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
PL-2	5336.01	19-Oct-2018	462.47	4873.54	4874		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
PL-4	5334.98	19-Oct-2018	461.86	4873.12	4873		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-1D	5399.13	2-Oct-2018	139.89	5259.24	5259	NC - deeper fracture	SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-1S	5399.16	2-Oct-2018	90.08	5309.08	5309		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-2S	5432.77	2-Oct-2018	101.03	5331.74	5332		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3D	5497.94	2-Oct-2018	162.37	5335.57	5336		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3P	5499.63	2-Oct-2018	162.53	5337.10	5337		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3S	5498.24	2-Oct-2018	161.53	5336.71	5337		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SFR-3T	5498.66	2-Oct-2018	68.55	5430.11	5430		SNL/NM	SNL/NM	Bedrock (sandstone)
SFR-4P	5573.33	2-Oct-2018	149.71	5423.62	5424		SNL/NM	SNL/NM	Bedrock (sandstone)
SFR-4T	5573.95	2-Oct-2018	148.20	5425.75	5426		SNL/NM	SNL/NM	Bedrock (sandstone)
SWTA3-MW2	5325.60	19-Oct-2018	448.86	4876.74	4877		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SWTA3-MW3	5323.94	19-Oct-2018	446.41	4877.53	4878		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
SWTA3-MW4	5324.81	19-Oct-2018	447.17	4877.64	4878		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-01	5403.82	5-Oct-2018	531.40	4872.42	4872		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-02	5416.62	5-Oct-2018	518.85	4897.77	4898		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-03	5457.03	3-Oct-2018	361.86	5095.17	5095		SNL/NM	SNL/NM	PGWS - SFG sediments
TA1-W-04	5460.98	3-Oct-2018	565.68	4895.30	4895		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-05	5433.84	5-Oct-2018	559.03	4874.81	4875		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA1-W-06	5417.10	5-Oct-2018	309.25	5107.85	5108		SNL/NM	SNL/NM	PGWS - SFG sediments
TA1-W-07	5404.92	5-Oct-2018	286.59	5118.33	5118		SNL/NM	SNL/NM	PGWS - SFG sediments
TA1-W-08	5434.19	5-Oct-2018	311.86	5122.33	5122		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-NW1-325	5421.94	3-Oct-2018	320.11	5101.83	5102		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-NW1-595	5421.26	3-Oct-2018	518.32	4902.94	4903		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA2-W-01	5419.99	3-Oct-2018	330.59	5089.40	5089		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-W-19	5351.21	3-Oct-2018	273.94	5077.27	5077		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-W-24	5363.66	3-Oct-2018	440.38	4923.28	4923		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA2-W-25	5374.86	3-Oct-2018	465.24	4909.62	4910		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TA2-W-26	5375.77	3-Oct-2018	289.68	5086.09	5086		SNL/NM	SNL/NM	PGWS - SFG sediments
TA2-W-27	5362.85	3-Oct-2018	282.20	5080.65	5081		SNL/NM	SNL/NM	PGWS - SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2018 *(Continued)*

Well ID	Measuring Point, (ft amsl, NAVD 88)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Groundwater Elevation, Rounded (ft amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, as Needed	Data Source	Well Owner	Screened Unit
TA2-W-28	5412.41	2-Oct-2017	320.55	5091.86	5092		SNL/NM	SNL/NM	PGWS - SFG sediments
TAV-INJ1	5429.70	26-Sep-2018	511.76	4917.94	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW2	5427.33	3-Oct-2018	509.44	4917.89	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW3	5464.30	3-Oct-2018	547.86	4916.44	4916		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW4	5427.89	3-Oct-2018	509.45	4918.44	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW5	5408.71	3-Oct-2018	492.64	4916.07	4916		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW6	5431.17	25-Sep-2018	513.09	4918.08	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW7	5430.40	24-Sep-2018	515.44	4914.96	4915		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW8	5417.00	3-Oct-2018	498.00	4919.00	4919		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW9	5416.27	3-Oct-2018	501.42	4914.85	4915		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW10	5437.03	4-Oct-2018	519.17	4917.86	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW11	5440.12	4-Oct-2018	522.07	4918.05	4918		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW12	5435.72	4-Oct-2018	518.58	4917.14	4917		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW13	5409.02	3-Oct-2018	497.62	4911.40	4911		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW14	5441.52	4-Oct-2018	525.71	4915.81	4916		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW15	5437.32	3-Oct-2018	520.56	4916.76	4917		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TAV-MW16	5448.34	3-Oct-2018	532.10	4916.24	4916		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TJA-2	5353.20	3-Oct-2018	279.07	5074.13	5074		SNL/NM	SNL/NM	PGWS - SFG sediments
TJA-3	5390.56	4-Oct-2018	498.78	4891.78	4892		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TJA-4	5341.16	3-Oct-2018	300.35	5040.81	5041	NC - merging zone	SNL/NM	SNL/NM	merging zone – SFG sediments
TJA-5	5341.33	3-Oct-2018	270.90	5070.43	5070		SNL/NM	SNL/NM	PGWS - SFG sediments
TJA-6	5343.16	3-Oct-2018	450.98	4892.18	4892		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TJA-7	5391.27	4-Oct-2018	304.54	5086.73	5087		SNL/NM	SNL/NM	PGWS - SFG sediments
TRE-1	5497.25	2-Oct-2018	177.98	5319.27	5319		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
TRN-1	5735.62	2-Oct-2018	92.69	5642.93	5643		SNL/NM	SNL/NM	Bedrock (sandstone)
TRS-1D	5779.80	2-Oct-2018	127.59	5652.21	5652		SNL/NM	SNL/NM	Bedrock (limestone)
TRS-1S	5780.07	2-Oct-2018	135.31	5644.76	5645		SNL/NM	SNL/NM	Bedrock (limestone)
TRS-2	5780.76	2-Oct-2018	135.89	5644.87	5645		SNL/NM	SNL/NM	Bedrock (limestone)
WYO-3	5392.09	4-Oct-2018	520.12	4871.97	4872		SNL/NM	SNL/NM	Regional Aquifer – SFG sediments
WYO-4	5392.57	4-Oct-2018	295.39	5097.18	5097		SNL/NM	SNL/NM	PGWS - SFG sediments
Non Sandia Wells									
EOD Well	5829.70	9-Dec-2016	144.91	5684.79	5685		KAFB/USAF	KAFB/USAF	Bedrock (granite)
Eubank-1	5460.02	5-Oct-2018	545.88	4914.14	4914		SNL/NM	COA EHD	Regional Aquifer – SFG sediments
Eubank-2	5474.39	15-Nov-2018	572.96	4901.43	4901		COA EHD	COA EHD	Regional Aquifer – SFG sediments
Eubank-3	5498.73	6-Nov-2018	601.18	4897.55	4898		COA EHD	COA EHD	Regional Aquifer – SFG sediments
Eubank-5	5507.40	5-Nov-2018	610.06	4897.34	4897		COA EHD	COA EHD	Regional Aquifer – SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2018 *(Continued)*

Well ID	Measuring Point, (ft amsl, NAVD 88)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Groundwater Elevation, Rounded (ft amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, as Needed	Data Source	Well Owner	Screened Unit
Non Sandia Wells (Continued)									
KAFB-0118	5320.75	25-Sep-2018	446.81	4873.94	4874		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0119	5315.82	25-Sep-2018	442.34	4873.48	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0120	5292.29	25-Sep-2018	415.43	4876.86	4877		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0121	5307.60	25-Sep-2018	434.10	4873.50	4874		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0213	5286.95	26-Sep-2018	409.98	4876.97	4877		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0219	5263.69	25-Sep-2018	391.07	4872.62	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0220	5265.10	25-Sep-2018	392.41	4872.69	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0221	5274.36	26-Sep-2018	402.17	4872.19	4872		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0222	5247.65	25-Sep-2018	371.96	4875.69	4876		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0223	5254.49	25-Sep-2018	379.00	4875.49	4875		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0307	5364.53	25-Sep-2018	420.05	4944.48	4944		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0308	5381.65	25-Sep-2018	444.20	4937.45	4937		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0309	5411.80	25-Sep-2018	476.17	4935.63	4936		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0310	5416.48	26-Sep-2018	354.31	5062.17	5062		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0311	5353.29	27-Sep-2018	418.03	4935.26	4935		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0312	5432.17	26-Sep-2018	416.93	5015.24	5015		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0313	5418.98	26-Sep-2018	350.95	5068.03	5068		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0314	5455.75	25-Sep-2018	417.04	5038.71	5039		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0315	5466.11	25-Sep-2018	437.91	5028.20	5028		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0417	5313.07	25-Sep-2018	444.22	4868.85	4869		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0504	5357.87	27-Sep-2018	485.14	4872.73	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0505	5362.81	27-Sep-2018	491.77	4871.04	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0506	5363.47	26-Sep-2018	210.11	5153.36	5153		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0507R	5358.21	27-Sep-2018	486.73	4871.48	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0508	5351.88	25-Sep-2018	481.35	4870.53	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0510	5367.10	25-Sep-2018	497.35	4869.75	4870		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0512R	5302.73	26-Sep-2018	430.74	4871.99	4872		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0514	5206.41	26-Sep-2018	335.19	4871.22	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0516	5205.64	25-Sep-2018	334.42	4871.22	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0517	5197.10	25-Sep-2018	323.68	4873.42	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0518	5177.76	25-Sep-2018	303.89	4873.87	4874		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0520	5247.90	26-Sep-2018	376.89	4871.01	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0522	5267.48	26-Sep-2018	397.61	4869.87	4870		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0523	5352.62	25-Sep-2018	477.27	4875.35	4875		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0524	5345.61	25-Sep-2018	472.74	4872.87	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0525	5229.75	25-Sep-2018	357.23	4872.52	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0608	5361.17	26-Sep-2018	293.97	5067.20	5067		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2018 *(Continued)*

Well ID	Measuring Point, (ft amsl, NAVD 88)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Groundwater Elevation, Rounded (ft amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, as Needed	Data Source	Well Owner	Screened Unit
Non Sandia Wells (Continued)									
KAFB-0611	5386.09	26-Sep-2018	462.91	4923.18	4923		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0612	5385.45	26-Sep-2018	288.51	5096.94	5097		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0613	5390.78	26-Sep-2018	352.96	5037.82	5038		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0614	5390.89	26-Sep-2018	331.78	5059.11	5059		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0615	5638.43	25-Sep-2018	207.64	5430.79	5431		KAFB/USAF	KAFB/USAF	Bedrock (granite)
KAFB-0616	5481.07	25-Sep-2018	443.61	5037.46	5037		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0617	5505.78	25-Sep-2018	556.30	4949.48	4949	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0618	5410.05	27-Sep-2018	484.14	4925.91	4926		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0619	5410.78	27-Sep-2018	385.00	5025.78	5026		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0620	5334.64	26-Sep-2018	442.70	4891.94	4892		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0621	5569.89	25-Sep-2018	624.00	4945.89	4946	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0622	5488.64	27-Sep-2018	552.42	4936.22	4936		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0623	5328.94	27-Sep-2018	259.46	5069.48	5069		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0624	5673.78	25-Sep-2018	769.21	4904.57	4905	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0625	5390.23	26-Sep-2018	472.83	4917.40	4917		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0901	5390.07	26-Sep-2018	468.07	4922.00	4922		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0903	5391.63	26-Sep-2018	236.55	5155.08	5155	NC - semiconfined?	KAFB/USAF	KAFB/USAF	merging zone – SFG sediments
KAFB-0904	5291.75	26-Sep-2018	351.68	4940.07	4940	NC - semiconfined?	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-1006	5257.01	1-Dec-2016	380.28	4876.73	4877		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-1007R	5260.62	1-Dec-2016	383.65	4876.97	4877		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-1008	5260.77	1-Dec-2016	380.71	4880.06	4880		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-1009	5272.16	1-Dec-2016	392.89	4879.27	4879		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2005	5624.27	25-Sep-2018	113.80	5510.47	5510		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2006	5590.88	25-Sep-2018	287.16	5303.72	5304		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2007	5564.48	25-Sep-2018	262.62	5301.86	5302		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2008	5541.74	25-Sep-2018	597.78	4943.96	4944		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2009	5655.63	25-Sep-2018	75.96	5579.67	5580		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2622	5358.14	27-Sep-2018	209.44	5148.70	5149		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2623	5367.48	26-Sep-2018	dry	dry	dry		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2624	5362.27	27-Sep-2018	dry	dry	dry		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2625	5359.26	27-Sep-2018	198.28	5160.98	5161		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2626	5357.51	27-Sep-2018	207.42	5150.09	5150		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2627	5367.47	26-Sep-2018	dry	dry	dry		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2628	5369.64	26-Sep-2018	498.67	4870.97	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2629	5361.53	26-Sep-2018	489.98	4871.55	4872		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2901	5839.08	4-Jan-2017	126.35	5712.73	5713		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2018 *(Continued)*

Well ID	Measuring Point, (ft amsl, NAVD 88)	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Groundwater Elevation, Rounded (ft amsl)	Comment for Plate 1 Concerning Regional Aquifer and Bedrock Wells, as Needed	Data Source	Well Owner	Screened Unit
Non Sandia Wells (Continued)									
KAFB-2902	5832.10	3-Jan-2017	168.45	5663.65	5664		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2903	5819.46	3-Jan-2017	141.21	5678.25	5678		KAFB/USAF	KAFB/USAF	Bedrock (Abo Formation)
KAFB-2904	5842.72	4-Jan-2017	46.30	5796.42	5796		KAFB/USAF	KAFB/USAF	Bedrock (Madera Formation)
KAFB-3391	5396.60	27-Sep-2018	276.77	5119.83	5120		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-3392	5394.51	27-Sep-2018	524.02	4870.49	4870		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-3411	5342.81	25-Sep-2018	469.93	4872.88	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-6241	5466.50	27-Sep-2018	540.60	4925.90	4926		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-6243	5426.22	26-Sep-2018	501.00	4925.22	4925		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-8281	5401.03	17-May-2018	528.70	4872.33	4872		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-8282	5402.92	17-May-2018	271.35	5131.57	5132		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-8351	5325.51	25-Sep-2018	448.74	4876.77	4877		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
Mesa del Sol-S	5302.67	2-Oct-2018	421.35	4881.32	4881		USGS	NMOSE	Regional Aquifer – SFG sediments
Montessa Park-S	5102.67	8-Nov-2018	215.19	4887.48	4887		USGS	ABCWUA	Regional Aquifer – SFG sediments
Site 58 MW-5	5716.83	31-Oct-2017	61.87	5654.96	5655		KAFB/USAF	KAFB/USAF	Bedrock (granite)
ST105-MW001	5279.34	25-Sep-2018	406.21	4873.13	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW002	5180.32	25-Sep-2018	306.92	4873.40	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW003	5174.61	25-Sep-2018	301.22	4873.39	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW004	5234.61	25-Sep-2018	362.24	4872.37	4872		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW005	5287.57	26-Sep-2018	297.55	4990.02	4990	NC - semiconfined?	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW006	5313.26	26-Sep-2018	236.59	5076.67	5077		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
ST105-MW007	5311.18	26-Sep-2018	317.41	4993.77	4994	NC - semiconfined?	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW008	5358.94	26-Sep-2018	477.79	4881.15	4881		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW009	5519.71	25-Sep-2018	485.28	5034.43	5034		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW010	5334.70	26-Sep-2018	444.71	4889.99	4890		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW011	5422.66	27-Sep-2018	483.73	4938.93	4939		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW012	5419.90	27-Sep-2018	384.10	5035.80	5036		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
ST105-MW013	5447.27	27-Sep-2018	436.68	5010.59	5011		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW015	5623.95	25-Sep-2018	688.00	4935.95	4936	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW017	5621.97	25-Sep-2018	706.53	4915.44	4915	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW018	5221.68	25-Sep-2018	348.96	4872.72	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW019	5217.94	26-Sep-2018	345.44	4872.50	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW020	5383.72	26-Sep-2018	297.72	5086.00	5086		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
ST105-MW021	5390.90	26-Sep-2018	331.04	5059.86	5060		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
ST105-MW022	5386.66	26-Sep-2018	469.69	4916.97	4917		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW023	5275.86	26-Sep-2018	403.64	4872.22	4872		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW024	5595.67	25-Sep-2018	342.29	5253.38	5253		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
YALE-MW1	5308.45	20-Jul-2018	420.95	4887.50	4888		ABCWUA	ABCWUA	Regional Aquifer – SFG sediments

Table 2. Base-Wide Groundwater Elevations for Monitoring Wells Located at Sandia National Laboratories, New Mexico and the Kirtland Air Force Base Vicinity for Calendar Year 2018 *(Concluded)*

Notes:

[a] Measuring point is the top of casing elevation used for measuring and calculating groundwater elevations. The measuring point is typically the top of polyvinyl chloride (PVC) well casing at a monitoring well.

[b] Elevations are relative to the North American Vertical Datum of 1988 (NAVD 88), New Mexico State Plane Coordinate System, Central Zone. Where necessary, elevation data from other government agencies that was based on the National Geodetic Vertical Datum of 1929 (NGVD 29) were converted (re-projected) by +2.671 ft.

[c] As noted on Plate 1, groundwater elevations from previous events are used for some KAFB/USAF monitoring wells. The KAFB compliance activities for the associated sites had changed and the measurement of recent water levels was no longer required.

ABCWUA	= Albuquerque Bernalillo County Water Utility Authority.
amsl	= Above mean sea level.
AVN	= Area-V (North).
btoc	= Below top of casing.
BW	= Background Well.
CCBA	= Coyote Canyon Blast Area.
COA EHD	= City of Albuquerque Environmental Health Department.
corrected	= MWL-MW4 depth to groundwater was corrected for the inclined well casing (6 degrees).
CTF	= Coyote Test Field.
CWL	= Chemical Waste Landfill.
CYN	= Canyons (Lurance Canyon area).
D	= Deep (deeper bedrock well completion) at TRS wells.
EOD	= Explosive Ordnance Disposal.
ft	= feet//foot.
ID	= Identifier.
INJ	= Injection Well.
KAFB	= Kirtland Air Force Base.
LWDS	= Liquid Waste Disposal System.
MRN	= Magazine Road North.
MW	= Monitoring Well.
MWL	= Mixed Waste Landfill.
NC	= Not contoured (see explanations below).
NC – shallow alluvium	= Well is screened in alluvium along the arroyo channel.
NC – deeper fracture	= Well is screened in a deeper fracture zone at the Burn Site.
NC – merging zone	= Well is screened in a merging zone between the Regional Aquifer and the PGWS.
NC – nearby fault	= A buried (unmapped) fault appears to have a localized effect on groundwater.
NC – semiconfined?	= The screened unit maybe under semiconfined conditions or is hydraulically isolated.
NMOSE	= New Mexico Office of the State Engineer.
NWTA3	= Northwest Technical Area-III.
OBS	= Old Burn Site.
PGS	= Parade Ground South.
PGWS	= Perched Groundwater System.
PL	= Power Line road (northwest of Technical Area-III). The better-known Power Line Road is near the golf course.
R	= Replacement well (term used by KAFB).
S	= Shallow (shallower bedrock well completion) at TRE well.
SFG	= Santa Fe Group.
SFR	= South Fence Road.
SNL/NM	= Sandia National Laboratories, New Mexico.
ST105	= Series of KAFB/USAF wells for nitrate abatement study.
SWTA3	= Southwest Technical Area-III.
TA1-W	= Technical Area-I (Well).
TA2-NW	= Technical Area-II (Northwest).
TA2-W	= Technical Area-II (Well).
TAV	= Technical Area-V (monitoring well designation).
TAV-INJ	= TAV injection well.
TJA	= Tijeras Arroyo.
TRE	= Thunder Road East.
TRN	= Target Road North.
TRS	= Target Road South.
USAF	= U.S. Air Force.
USGS	= U.S. Geological Survey.
WYO	= Wyoming.
YALE	= Yale Boulevard area.

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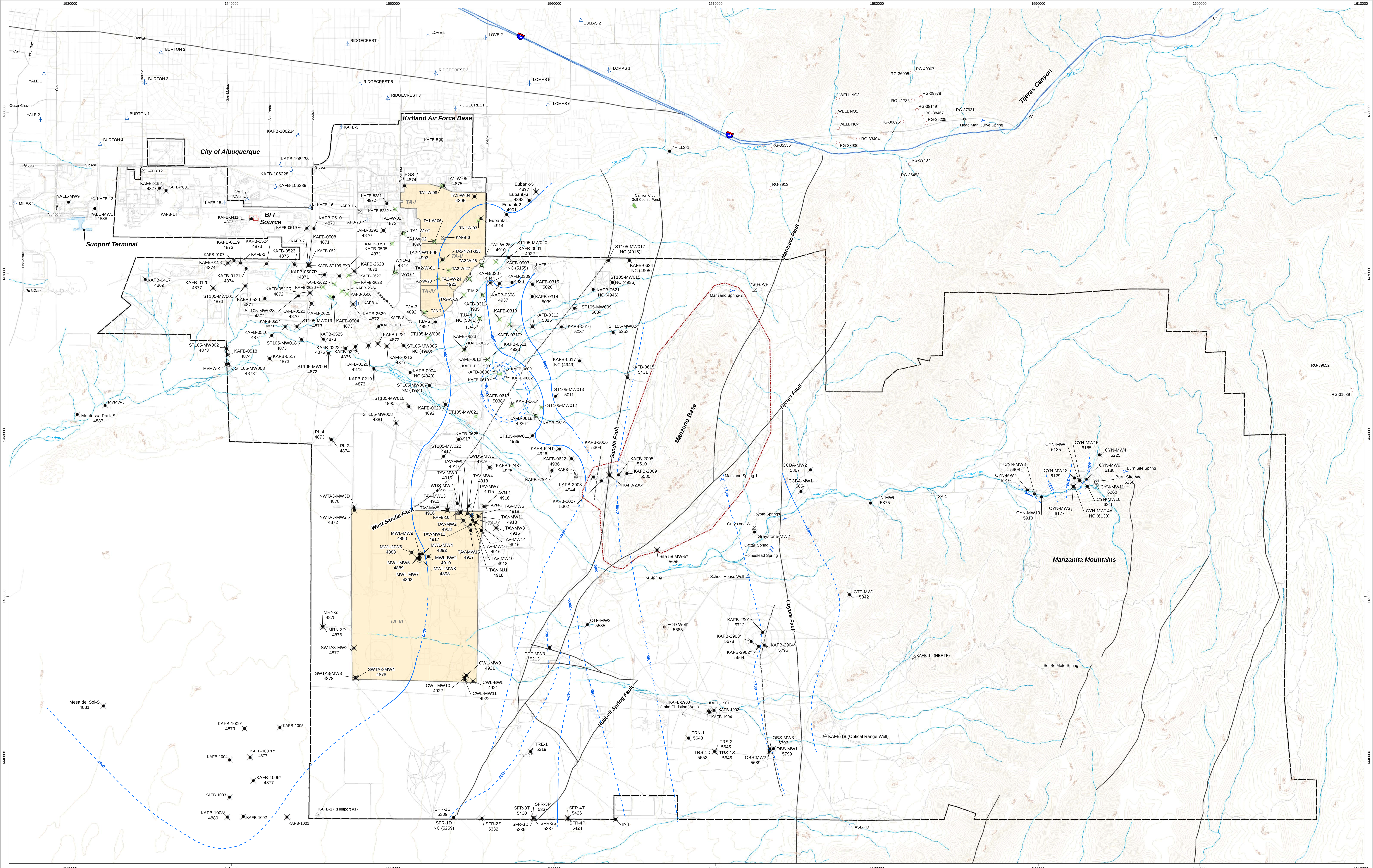

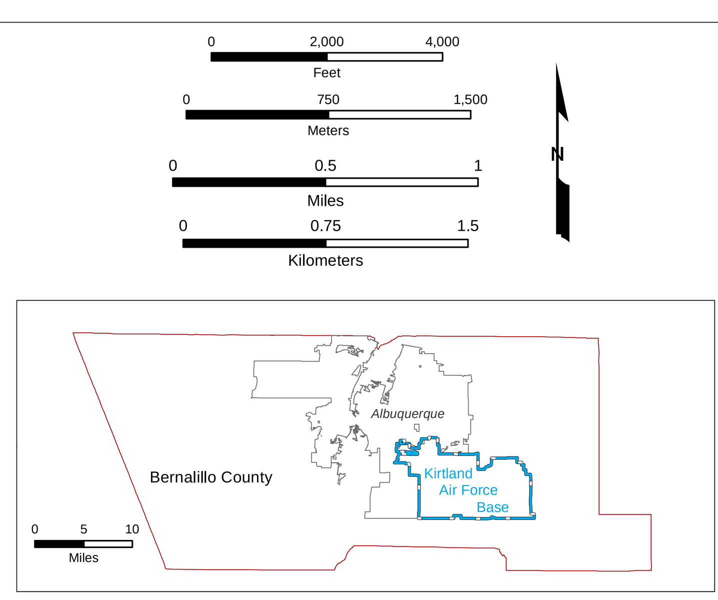

Legend

- Monitoring Well, Regional Aquifer / Fractured Bedrock System
- Monitoring Well, Perched Groundwater System
- Production Well, potable
- Production Well, non-potable
- Production Well, plugged and abandoned
- Extraction Well
- Extraction Well, plugged and abandoned
- Injection Well
- Off-base Well, private use
- Spring, current or historical flow
- NC Not Contoured
- * See Note 3
- Potentiometric surface contour (ft amsl), dashed where uncertain
- Fault, exposed and concealed
- Fault, fully concealed
- Surface drainage, arroyo
- Ground surface contour (40 ft interval)
- Bulk Fuels Facility, KAFB
- Golf Course Main Pond, KAFB
- SNL/NM Technical Area (TA) boundary
- Manzano Base boundary
- Kirtland Air Force Base (KAFB) boundary
- Road, paved and unpaved

NOTES:

1. Groundwater elevations for the Regional Aquifer and the Fractured Bedrock System are shown for monitoring wells located near SNL/NM facilities. The wells with no available groundwater elevation have no value plotted.
2. Monitoring wells with anomalous groundwater elevations in the Regional Aquifer or Fractured Bedrock System are shown with an NC (not contoured) label next to the value. Table 2 states the rationale.
3. Groundwater elevations are rounded to the nearest foot. Water levels were measured at SNL/NM wells between 24 September and 19 October 2018. Wells owned by other agencies that were measured outside this date range are noted by an asterisk next to the well number. Groundwater elevations and measurement dates are listed in Table 2.
4. Groundwater elevations were not used for production-potable wells.
5. Groundwater elevations for monitoring wells screened in the Perched Groundwater System are not plotted. A potentiometric surface figure for the Perched Groundwater System is presented in Chapter 6.
6. Potentiometric surface contours for the Regional Aquifer are primarily shown using two intervals: below 5000 ft amsl the contour intervals are 40 and 60 feet; above 5000 ft amsl the contour interval is 100 feet.
6. Most of the monitoring wells located near the KAFB Bulk Fuels Facility and at KAFB Site 58 are not plotted.
7. Decommissioned (plugged and abandoned) monitoring wells are not shown.
8. Principal faults are derived from GRAM and Lettis (1995), Karlstrom et al., (2000), and Van Hart (2003). The dashed faults located near wells KAFB-2007 and OBS-MW1 are inferred from groundwater elevations.
9. West of the Sandia Fault, the Regional Aquifer is present within the unconsolidated Santa Fe Group sediments. Groundwater within and east of the Tijeras Fault Zone (bounded by the Sandia and Tijeras Faults) is primarily present in the Paleozoic and Precambrian bedrock.
10. The West Sandia Fault does not affect the alluvial-fan sediments at the water table.
11. Coordinates for some KAFB production wells were more accurately plotted using ortho-rectified aerial photography (Copland July 2018).

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Plate 1
Potentiometric Surface for the Regional Aquifer and the Fractured Bedrock System at Sandia National Laboratories/New Mexico and Kirtland Air Force Base for Calendar Year 2018

Transverse Mercator Projection
New Mexico State Plane Coordinate System, Central Zone
1983 North American Horizontal Datum
1988 North American Vertical Datum

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