Department of Energy
National Nuclear Security Administration
Sandia Field Office
P.O. Box 5400
Albuquerque, NM 87185

JUN 1 9 2020

Mr. Kevin Pierard
Chief, Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Dr. East, Bldg. 1
Santa Fe, New Mexico 87505

Subject: Calendar Year 2019 Annual Groundwater Monitoring Report for Sandia National Laboratories, New Mexico

Dear Mr. Pierard:

The Department of Energy, National Nuclear Security Administration and National Technology and Engineering Solutions of Sandia, LLC submit the Subject report.

This report is submitted in compliance with periodic reporting requirements for groundwater monitoring discussed in Section X.D of the Compliance Order on Consent. Specifically, the report meets the annual reporting requirement for the Tijeras Arroyo Groundwater, the Technical Area (TA) V Groundwater, and the Burn Site Groundwater investigations.

If you have questions, please contact David Rast of our staff at (505) 845-5349 or David.Rast@nnsa.doe.gov.

Sincerely,

Jeffrey P. Harrell
Manager

Enclosure

cc: See Page 2

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NNSA-2020-002967

Calendar Year 2019 Annual Groundwater Monitoring Report

Sandia National Laboratories
Albuquerque, New Mexico
EPA ID No. NM5890110518

CERTIFICATION STATEMENT

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

Paul E. Shoemaker

Paul E. Shoemaker, Senior Manager
National Technology & Engineering Solutions of Sandia, LLC
Albuquerque, New Mexico
Operator

6/10/2020
Date signed

Jeffrey P. Harrell, Manager
U.S. Department of Energy
National Nuclear Security Administration
Sandia Field Office
Owner

6/19/2020
Date signed

Unlimited Release
Printed June 2020

Calendar Year 2019

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.

Unlimited Release
Printed June 2020

Annual Groundwater Monitoring Report

Calendar Year 2019

Groundwater Monitoring Program

Sandia National Laboratories, New Mexico

June 2020

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

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Acknowledgments

The production of this document is a joint effort between the Sandia National Laboratories, New Mexico Long-Term Stewardship Program and Environmental Restoration Operations.

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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, 2019 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 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
amsl	Above mean sea level
AOC	Area of Concern
AOP	Administrative Operating Procedure
ARG	Ancestral Rio Grande
bgs	Below ground surface
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
Consent Order	Compliance Order on Consent
CSM	Conceptual Site Model
CWL	Chemical Waste Landfill
CY	Calendar Year
DI	Deionized water
DO	Dissolved oxygen
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
ERP	Environmental Restoration Program (KAFB)
ET	Evapotranspirative
FB	Field blank
FOP	Filed Operating Procedure
FY	Fiscal Year
GEL	GEL Laboratories LLC
GMP	Groundwater Monitoring Program
GRO	Gasoline range organics
GWQB	Ground Water Quality Bureau
HE	High explosive
HWB	Hazardous Waste Bureau
ID	Identifier
IMWP	Interim Measures Work Plan
ISB	In-situ bioremediation
JP-4	Jet propellant, fuel grade 4
KAFB	Kirtland Air Force Base
LTMM	Long-Term Monitoring and Maintenance
LTMMP	Long-Term Monitoring and Maintenance Plan

Abbreviations and Acronyms (concluded)

LWDS	Liquid Waste Disposal System
MAC	Maximum allowable concentrations
MCL	Maximum contaminant level
MDL	Method detection limit
MWL	Mixed Waste Landfill
N	Nitrogen
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
NPN	Nitrate plus nitrite
O	Oxygen
OB	Oversight Bureau
ORP	Oxidation-reduction potential
PCCP	Post-Closure Care Permit
PCE	Tetrachloroethene
PGWS	Perched Groundwater System
QC	Quality control
PQL	Practical quantitation limit
RCRA	Resource Conservation and Recovery Act
RCRA Permit	*RCRA Facility Operating Permit, NM5890110518*
RFI	RCRA Facility Investigation
RPD	Relative percent difference
SAP	Sampling and analysis plans
SC	Specific conductivity
SFG	Santa Fe Group
SNL/NM	Sandia National Laboratories, New Mexico
SMO	Sample Management Office
SWMU	Solid Waste Management Units
TA	Technical Area
TAG	Tijeras Arroyo Groundwater
TAL	Target Analyte List
TAVG	Technical Area-V Groundwater
TB	Trip blank
TCE	Trichloroethene
TOX	Total Organic Halogens
TSWP	Treatability Study Work Plan
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
VA	Veterans Affairs
VCM	Voluntary corrective measures
VCP	Vitrified clay pipe
VOC	Volatile organic compounds

Units

%	percent
% Sat	percent saturation
°C	degrees Celsius.
µg/L	micrograms per liter (equivalent to ppb)
µmho/cm	micromhos per centimeter
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
Ma	Mega Annum (million years)
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)
rem	roentgen equivalent man
sq mi	square miles
SU	standard units

Well Location Descriptions

12AUP-#	ER Site 12A Underflow Piezometer
ASL-PD	Albuquerque Seismological Laboratory Production (well)
AVN-#	Area-V (North)
BW	background well
CCBA-#	Coyote Canyon Blast Area
CTF-#	Coyote Test Field
CWL-#	Chemical Waste Landfill
CYN-#	Canyons (Lurance Canyon area)
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.
HERTF	High Energy Research Test Facility
INJ	Injection well
IP-#	Isleta Pueblo
ITRI-MW	Inhalation Toxicology Research Institute
KAFB	Kirtland Air Force Base
LMF-#	Large Melt Facility
LWDS-#	Liquid Waste Disposal System
MRN-#	Magazine Road North
MVMW#	Mountain View Monitoring Well
MW	Monitoring well
MWL-#	Mixed Waste Landfill
NMED-#	New Mexico Environment Department
NWTA3-#	Northwest Technical Area-III
OBS-#	Old Burn Site
P&A	Plugged and abandoned (decommissioned)
PGS-#	Parade Ground South
PL-#	Power Line Road
RG-#	Rio Grande
SFR-#	South Fence Road
ST105-MW	KAFB Project ST-105
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
TJA-#	Tijeras Arroyo
TRE-#	Thunder Road East
TRN-#	Target Road North
TRS-#	Target Road South
TSA-#	Transportation Safeguards Academy
VA-#	Veterans Affairs
WYO-#	Wyoming
YALE-MW	Yale Boulevard area

Meteorological Towers

A21	TA-II
A36	TA-III and TA-V
KABQ	National Weather Service Meteorological Station at the Albuquerque International Sunport
SC1	School House

Annual Groundwater Monitoring Report

Executive Summary

This Annual Groundwater Monitoring Report (AGMR) presents the results of the 2019 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 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 U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

This AGMR documents the results of the groundwater characterization and monitoring activities at SNL/NM for Calendar Year (CY) 2019. This report has been prepared to meet the environmental reporting requirements for the CY 2019 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 Affairs, and KAFB production 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 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 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 2019, 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, radon-222, radium-226, and radium-228, 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 2019 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 2019, groundwater elevations were measured in 220 wells; groundwater samples were collected from 16 monitoring wells (CCBA-MW2, CTF-MW1, CYN-MW5, Greystone-MW2, MRN-2, MRN-3D, NWTA3-MW3D, OBS-MW1, PL-2, PL-4, SFR-2S, SFR-4T, SWTA3-MW2, SWTA3-MW3, SWTA3-MW4, and TRE-1), and one surface water sample was collected 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), total alkalinity, general chemistry, Target Analyte List (TAL) metals plus total uranium, mercury, total cyanide, radionuclides by gamma spectroscopy, gross alpha/beta activity, 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 and environmental duplicate surface water samples from Coyote Springs at concentrations of 0.00702 mg/L and 0.00703 mg/L, which are similar to historical concentrations and are considered to be of natural origin. Fluoride was detected above the MAC of 1.6 mg/L in five monitoring wells (CCBA-MW2, OBS-MW1, SFR-2S, SFR-4T, and TRE-1) at concentrations of 1.61 mg/L (environmental duplicate), 2.04 mg/L, 1.62 mg/L (1.66 mg/L, for the environmental duplicate sample), 2.79 mg/L, and 1.73 mg/L, respectively. The results are similar to historical concentrations and are also considered to be of natural origin.

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 of the Regional Aquifer. The contours display a pattern that reflects the impact of the groundwater withdrawal by production 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 2019 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 from 1996 through 2002 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 2019, groundwater elevations were measured and groundwater samples were collected from four monitoring wells (CWL-BW5, CWL-MW9, CWL-MW10, and CWL-MW11). Groundwater samples collected 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 collected during the July sampling event were analyzed for TCE, nickel, and chromium. No analytes were detected at concentrations exceeding the associated MCLs or CWL PCCP-defined hazardous concentration limits, and the analytical results are comparable to historical values. Other activities conducted at the CWL during CY 2019 include 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 2019 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 2019, 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, radon-222, and tritium. No analytes were detected at concentrations exceeding the associated MCLs or MWL LTMMP-defined trigger levels, and the analytical results are comparable to historical values. Other activities conducted at the MWL during CY 2019 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 January/February, May/June, July/August, and October/November 2019 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 2019, 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), dissolved metals (arsenic, iron, and manganese), TAL metals plus total uranium, radionuclides by gamma spectroscopy, gross alpha/beta activity, 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 four monitoring wells (AVN-1, LWDS-MW1, LWDS-MW2, and TAV-MW10) with a maximum concentration of 15.3 mg/L in the sample from monitoring well LWDS-MW1 collected in June. TCE concentrations exceeded the MCL of 5 micrograms per liter (μg/L) in samples from five monitoring wells (LWDS-MW1, TAV-MW4, TAV-MW8, TAV-MW10, and TAV-MW14) with a maximum concentration of 20.2 μg/L in the sample from monitoring well LWDS-MW1 collected in November. 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 2019 include completing the discharges of treatment solution to injection well TAV-INJ1 for the Full-Scale Operation of the in-situ bioremediation Treatability Study and beginning the two-year performance monitoring for the Treatability Study.

Tijeras Arroyo Groundwater Area of Concern

Chapter 6.0 discusses the quarterly, semiannual, and annual groundwater monitoring activities conducted during February/March, June, August/September, and November/December 2019. 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 may have 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 2019, 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, alkalinity, general chemistry, TAL metals plus total uranium, radionuclides by gamma spectroscopy, gross alpha/beta activity, 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 five monitoring wells screened in the Perched Groundwater System (TA2-W-19, TA2-W-28, TJA-2, TJA-5, and TJA-7), with a maximum concentration of 24.6 mg/L. The maximum nitrate concentration for merging-zone well TJA-4 was 37.1 mg/L. None of the samples from the Regional Aquifer wells exceeded the nitrate MCL; the maximum nitrate concentration was 4.24 mg/L. 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, TJA-5, and TA2-W-19. Recent nitrate concentrations across the monitoring well network were consistent with historical trends. TCE concentrations exceeded the MCL of 5 μg/L in one sample from monitoring well TJA-2 at a concentration of 5.71 μg/L. Other field activities conducted at the TAG AOC during CY 2019 include video logging of monitoring wells TA1-W-03 and TJA-2, and installation of a BaroBall™ (i.e., passive venting device) at well TJA-2. A comprehensive study of the potential nitrate release sites relative to groundwater contamination was conducted for the north-central portion of KAFB including the TAG AOC and documented in a technical memorandum.

Burn Site Groundwater Area of Concern

Chapter 7.0 discusses the semiannual groundwater monitoring activities conducted in April and October/November 2019 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 Well (production well inactive since 2003). Activities at this AOC are regulated under the requirements of the Consent Order. During CY 2019, groundwater elevations were measured in 17 wells and groundwater samples were collected from

14 wells (CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, CYN-MW15, CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19). Samples were analyzed for VOCs, high explosive compounds, total petroleum hydrocarbons - diesel range organics, total petroleum hydrocarbons -gasoline range organics, NPN, alkalinity, general chemistry, TAL metals, perchlorate (at five wells: CYN-MW15, CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19), radionuclides by gamma spectroscopy, gross alpha/beta activity, 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-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, CYN-MW15, and CYN-MW16) with a maximum concentration of 40.3 mg/L in the April environmental sample from monitoring well CYN-MW9. The nitrate concentration trends in these wells are variable within a narrow range over the past year. Other activities conducted at the BSG AOC include submitting a Monitoring Well Installation Work Plan to NMED Hazardous Waste Bureau in January, NMED approval of the work plan in February, and the installation of monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 in September through November.

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 2020, in accordance with regulatory requirements. Based on a recent request from NMED, sampling for 1,4-dioxane at the CWL, the MWL, the TAVG AOC, and the TAG AOC will begin in the first quarter of CY 2020. The results for these monitoring events will be presented in the AGMR for CY 2020.

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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) 2019.

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 6 miles (Lozinsky 1994).

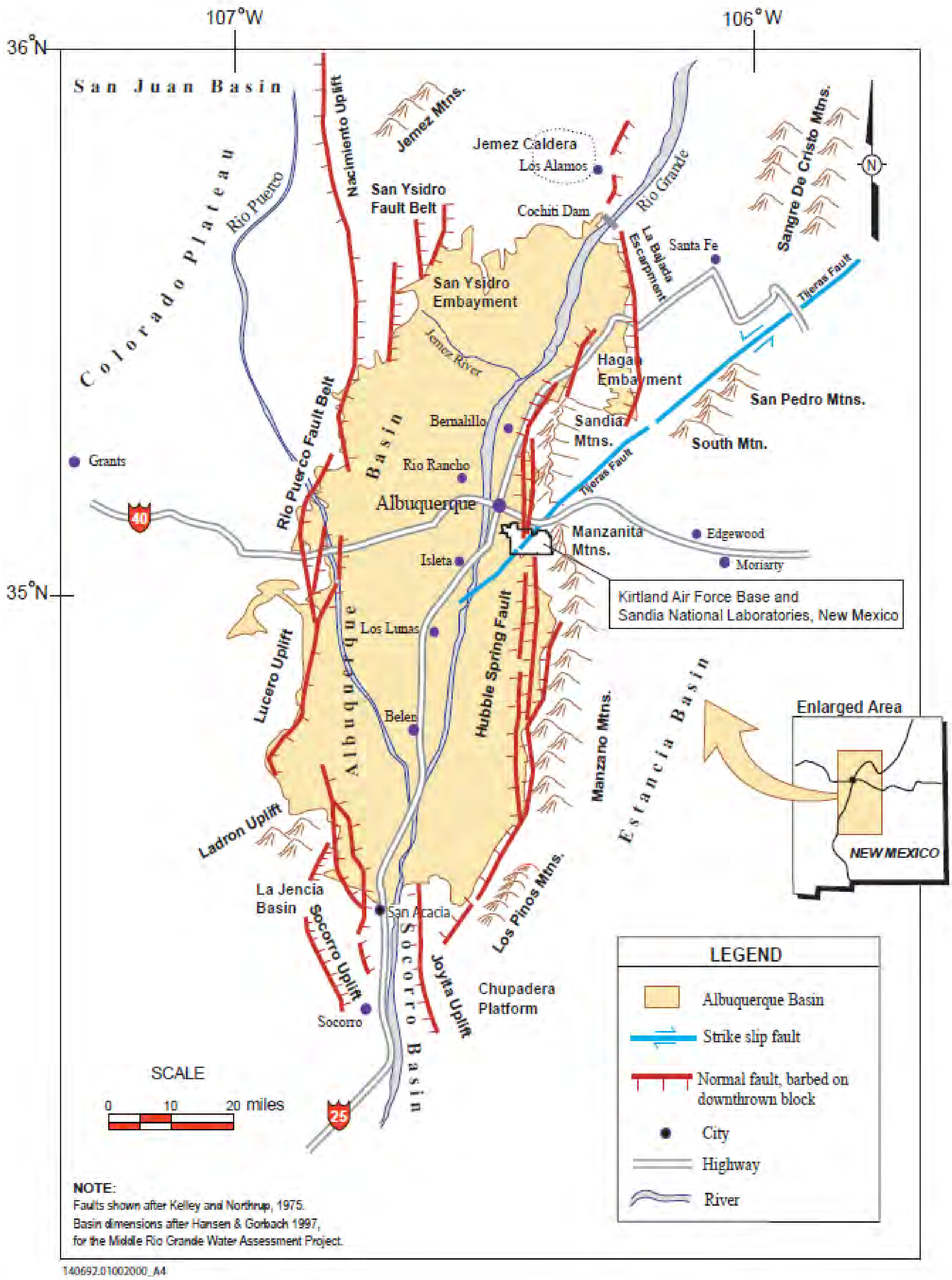

Figure 1-1. Albuquerque Basin, North-Central New Mexico

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.

Koning, et al. (August 2019) evaluated the suitability for using managed aquifer recharge in the eastern Albuquerque metropolitan area. Weighted overlay analyses were used to evaluate shallow-based recharge and deep-injection recharge. The best locales for shallow-base recharge and deep-injection recharge were most favorable in the central portion of the study area to the northwest of KAFB. Conversely, several

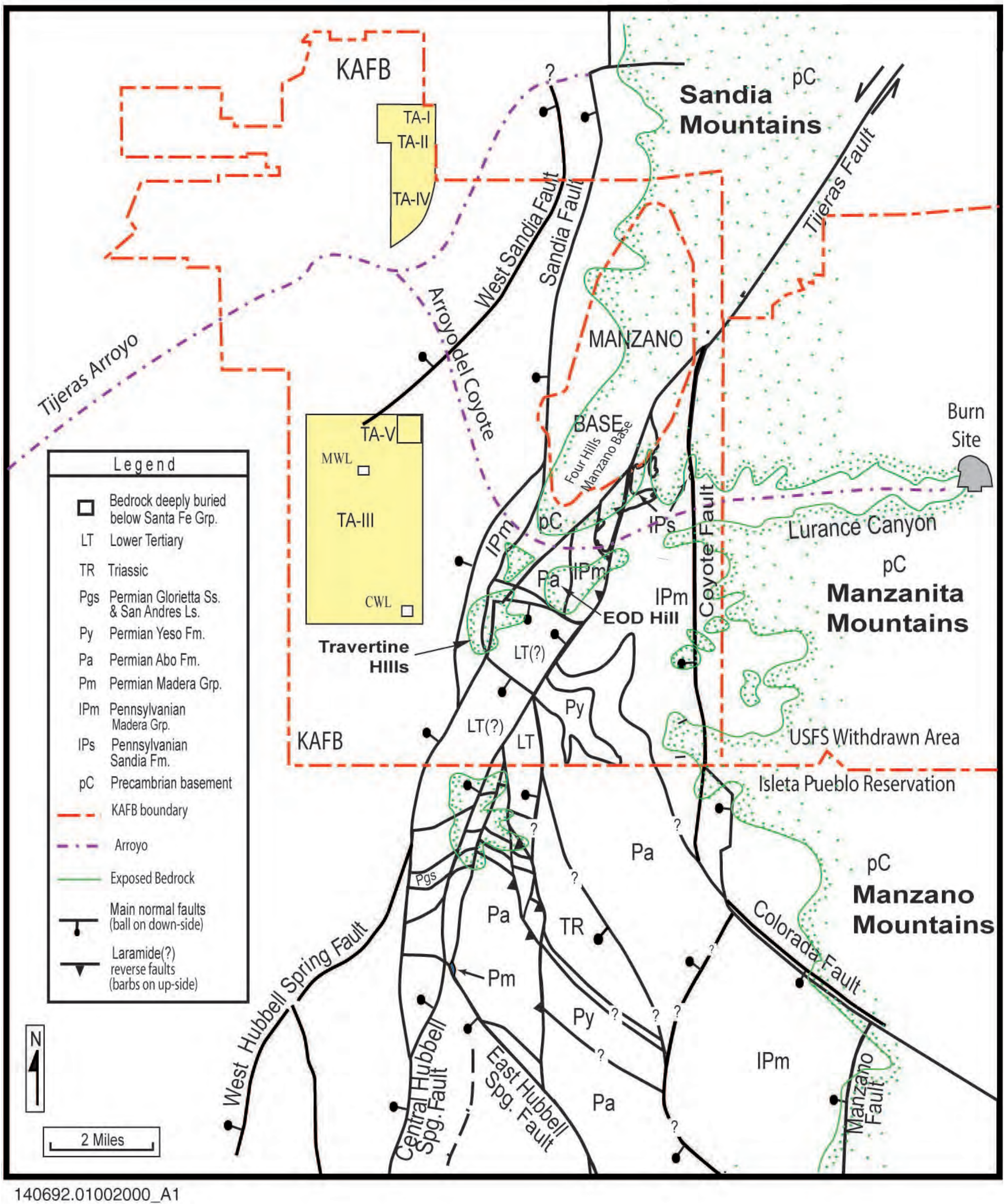

Figure 1-2. Generalized Geology in the Vicinity of Sandia National Laboratories, New Mexico and Kirtland Air Force Base (Van Hart June 2003)

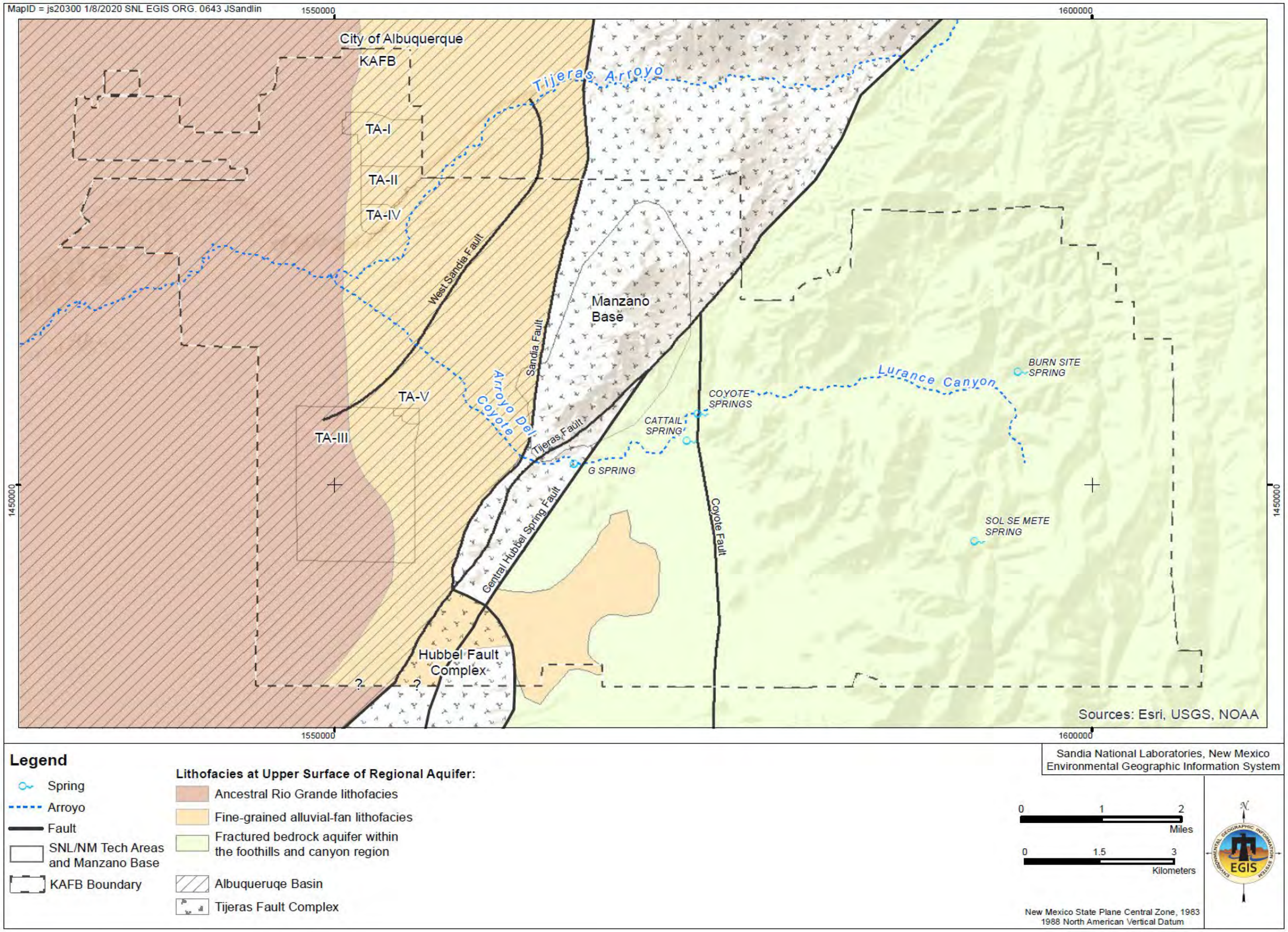

Figure 1-3. Hydrogeologically Distinct Areas Primarily Controlled by Faults (Modified from SNL March 1996)

areas in the north-central portion of KAFB, including the southeastern corner of the TAG AOC, were deemed as unsuitable for shallow-based recharge due to the known extent of groundwater contamination. Deep-injection recharge was also deemed as unsuitable due to groundwater contamination and the presence of fault zones that may act as groundwater barriers in the deeper saturated zone.

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 ft per ft (ft/ft), ft of vertical change per foot of horizontal distance) in the sediments. Possible recharge sources for the Perched Groundwater System include the former KAFB sewage lagoons, landscape watering, arroyo surface water, wastewater outfalls, buried septic systems, the Tijeras Arroyo 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 production 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 of the Regional Aquifer, 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 of the Regional Aquifer.

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 Affairs, and Albuquerque Bernalillo County Water Utility Authority (ABCWUA) production 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 Tijeras Arroyo 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 ft per year (50 acre-ft per year) (SNL February 1998). The best estimate for the groundwater recharge associated with Arroyo del Coyote is 0.4 million cubic ft per year (9.2 acre-ft 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 Environmental Restoration Program personnel and DOE through SNL/NM personnel). The Environmental Restoration Program has a large monitoring well network associated with several closed landfills and a former KAFB 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 Tables 1 and 2, which provide construction details and groundwater elevations for the groundwater monitoring, production, and remediation wells. Table 1-1 lists the CY 2019 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 March 2018) for samples collected by SNL/NM personnel during CY 2019.

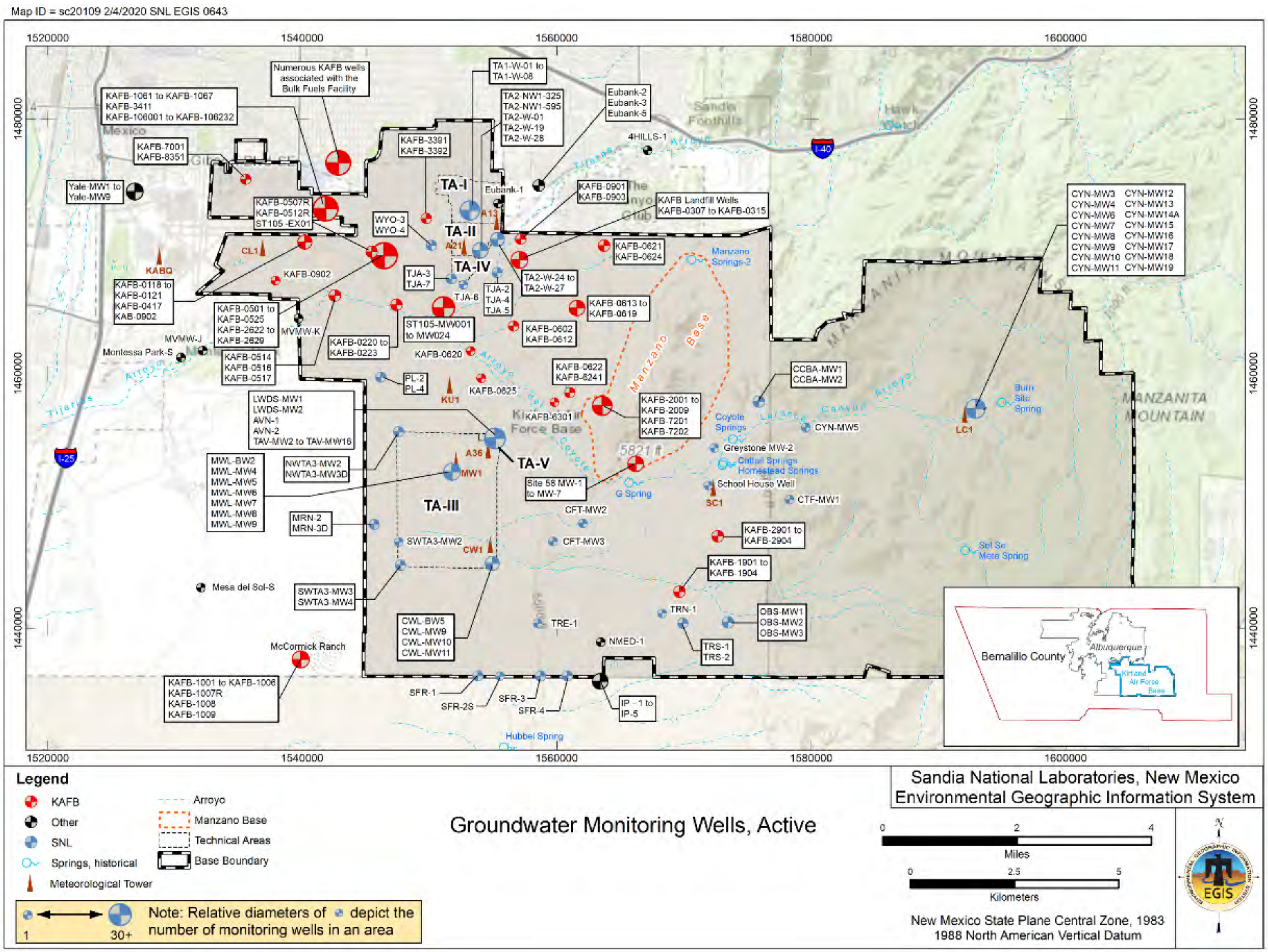

Figure 1-4. Wells and Springs within Sandia National Laboratories, New Mexico and Kirtland Air Force Base

Table 1-1. Sample Collection Dates for Groundwater Quality Monitoring at Sandia National Laboratories, New Mexico for Calendar Year 2019

2019 Sampling Event	GMP	CWL	MWL	TAVG	TAG	BSG[a]
January		√		√		
February				√	√	
March	√				√	
April			√			√
May			√	√		
June				√	√	√
July		√		√		
August				√	√	
September					√	
October			√	√		√
November				√	√	√
December					√	

NOTES:
[a] The June sampling event for the BSG AOC was a resampling at one monitoring well, see Chapter 7 for details.
BSG = Burn Site Groundwater (Area of Concern).
CWL = Chemical Waste Landfill.
GMP = Groundwater Monitoring Program.
MWL = Mixed Waste Landfill.
TAG = Tijeras Arroyo Groundwater (Area of Concern).
TAVG = Technical Area-V Groundwater (Area of Concern).

Table 1-2. Summary of Sandia National Laboratories, New Mexico Groundwater Monitoring Analytical Results for Calendar Year 2019

SNL/NM Groundwater Monitoring	
Number of Active Wells/Springs Monitored	77
Number of Analyses Performed	12,430
Percent of Non-detected Results	86 %

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	155	0	6.05	7.93	7.39	NE
Specific Conductivity in µmho/cm	155	0	322.6	3832.7	735.7	NE
Temperature in °C	155	0	12.78	26.99	19.20	NE
Turbidity in NTU	155	0	0.12	134	2.19	NE
Detected Organic Compounds in µg/L						
Acetone	6	141	1.66	3.93	2.53	NE
Chloroform	6	166	0.590	1.07	0.878	80
Dichloroethane, 1,1-	6	161	0.360	0.620	0.442	NE
Dichloroethene, 1,1-	3	169	0.890	1.02	0.973	7.0
Dichloroethene, cis-1,2-	37	130	0.310	4.18	1.145	70
Methylene Chloride	1	166	1.12	1.12	1.12	5.0
Tetrachloroethene	9	163	0.340	1.61	1.089	5.0
Toluene	2	165	0.370	0.470	0.420	1,000
Trichloroethene	75	102	0.350	20.2	4.516	5.0
Detected Metals in mg/L						
Aluminum	11	65	0.0212	0.343	0.0976	NE
Arsenic	103	38	0.0020	0.00879	0.00299	0.010
Barium	76	0	0.00925	0.221	0.06842	2.0
Beryllium	4	72	0.00183	0.00703	0.00446	0.004
Calcium	76	0	37.5	297	92.7	NE
Chromium	5	91	0.00310	0.0479	0.01685	0.100
Cobalt	9	67	0.00035	0.0102	0.00303	NE
Copper	43	33	0.00030	0.00523	0.00153	1.3
Iron	19	122	0.0352	0.524	0.1302	NE
Lead	1	75	0.00254	0.00254	0.00254	0.015
Magnesium	76	0	3.25	67.0	20.92	NE

Refer to footnotes on page 1-12.

Table 1-2. Summary of Sandia National Laboratories, New Mexico Groundwater Monitoring Analytical Results for Calendar Year 2019 *(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	31	107	0.0011	1.59	0.1443	NE
Molybdenum	8	0	0.00333	0.00567	0.00458	NE
Nickel	16	80	0.00063	0.0239	0.00464	NE
Potassium	76	0	1.29	31.8	3.80	NE
Selenium	54	22	0.00202	0.0287	0.00531	0.050
Silver	1	75	0.0016	0.0016	0.0016	NE
Sodium	76	0	15.8	1020	64.4	NE
Thallium	3	73	0.000742	0.00115	0.001007	0.002
Uranium	68	0	0.000215	0.0172	0.004664	0.030
Vanadium	42	34	0.00355	0.0119	0.00661	NE
Zinc	24	52	0.0033	0.0649	0.0141	NE
Detected Inorganic Parameters in mg/L						
Nitrate plus nitrite, as N	174	0	0.122	40.3	8.839	10
Bromide	70	2	0.141	2.97	0.579	NE
Chloride	72	0	10.0	500	64.3	NE
Fluoride	72	0	0.260	2.79	0.964	4.0
Sulfate	72	0	16.9	1980	124.5	NE
Total Organic Halogens	12	8	0.0039	0.228	0.0319	NE
Alkalinity as $CaCO_3$	68	0	83.9	1070	224.6	NE

Refer to footnotes on page 1-12.

Table 1-2. Summary of Sandia National Laboratories, New Mexico Groundwater Monitoring Analytical Results for Calendar Year 2019 *(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)	82	0	-6.13	12.77	2.16	15.0[a]
Beta, gross	75	6	1.15	35.1	5.62	4 mrem/yr
Cesium-137	1	80	3.97	3.97	3.97	NE
Potassium-40	5	62	46.2	84.9	71.0	NE
Radium-226	7	13	0.336	3.00	1.588	5.0[b]
Radium-228	6	14	0.526	1.34	0.789	5.0[b]
Radon-222	10	0	140	469	298	NE
Uranium-233/234	26	0	0.52	34.6	12.23	NE
Uranium-235/236	21	5	0.0859	0.502	0.2622	NE
Uranium-238	25	1	0.248	5.88	2.649	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.
µmho/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 (EPA) Primary Drinking Water Regulations (Title 40 Code of Federal Regulations § 141.11[b]), National Primary Drinking Water Standards (EPA March 2018).
mg/L	=	Milligrams per liter.
mrem/yr	=	Millirem per year.
N	=	Nitrogen.
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 Sandia National Laboratories, New Mexico Groundwater Monitoring Wells and Springs Sampled During Calendar Year 2019

Analyte	Well (Relevant Chapter)	Exceedance	Date
Beryllium MCL = 0.004 mg/L	Coyote Springs (Ch. 2)	0.00702 mg/L[a]	March 2019
	Coyote Springs (Duplicate) (Ch. 2)	0.00703 mg/L[a]	March 2019
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	AVN-1 (Ch. 5)	12.6 mg/L	May 2019
	CYN-MW9 (Ch. 7)	40.3 mg/L	April 2019
		34.2 mg/L	October 2019
	CYN-MW9 (Duplicate) (Ch. 7)	38.4 mg/L	October 2019
	CYN-MW11 (Ch. 7)	11.6 mg/L	April 2019
		12.5 mg/L	October 2019
	CYN-MW11 (Duplicate) (Ch. 7)	12.6 mg/L	October 2019
	CYN-MW12 (Ch. 7)	14.9 mg/L	April 2019
		15.5 mg/L	October 2019
	CYN-MW12 (Duplicate) (Ch. 7)	15.2 mg/L	October 2019
	CYN-MW13 (Ch. 7)	34.3 mg/L	April 2019
		33.4 mg/L	October 2019
	CYN-MW14A (Ch. 7)	13.6 mg/L	April 2019
		13.0 mg/L	October 2019
	CYN-MW15 (Ch. 7)	20.0 mg/L	April 2019
		19.9 mg/L	October 2019
	CYN-MW16 (Ch. 7)	10.8 mg/L	November 2019
	CYN-MW16 (Duplicate) (Ch. 7)	11.1 mg/L	November 2019
	LWDS-MW1 (Ch. 5)	12.1 mg/L	February 2019
		13.8 mg/L	June 2019
		12.2 mg/L	August 2019
		12.2 mg/L	November 2019
	LWDS-MW1 (Duplicate) (Ch. 5)	11.8 mg/L	August 2019
	LWDS-MW2 (Ch. 5)	12.3 mg/L	May 2019
	LWDS-MW2 (Duplicate) (Ch. 5)	10.1 mg/L	May 2019
	TA2-W-19 (Ch. 6)	11.5 mg/L	February 2019
		13.8 mg/L	June 2019
		11.5 mg/L	August 2019
		12.0 mg/L	November 2019
	TA2-W-19 (Duplicate) (Ch. 6)	12.0 mg/L	November 2019
	TA2-W-28 (Ch. 6)	19.6 mg/L	February 2019
		19.7 mg/L	June 2019
		16.2 mg/L	August 2019
		16.2 mg/L	December 2019
	TA2-W-28 (Duplicate) (Ch. 6)	20.5 mg/L	February 2019
	TAV-MW10 (Ch. 5)	11.3 mg/L	February 2019
		15.3 mg/L	June 2019
		11.6 mg/L	August 2019
		11.2 mg/L	November 2019
	TAV-MW10 (Duplicate) (Ch. 5)	11.3 mg/L	November 2019
	TJA-2 (Ch. 6)	12.2 mg/L	February 2019
		13.5 mg/L	June 2019
		10.8 mg/L	August 2019
		11.4 mg/L	December 2019
	TJA-2 (Duplicate) (Ch. 6)	13.9 mg/L	June 2019
	TJA-4 (Ch. 6)	30.0 mg/L	March 2019
		37.1 mg/L	June 2019
		29.5 mg/L	September 2019
		31.7 mg/L	December 2019
	TJA-4 (Duplicate) (Ch. 6)	39.7 mg/L	June 2019

Refer to footnotes on page 1-14.

Table 1-3. Summary of Exceedances for Sandia National Laboratories, New Mexico Groundwater Monitoring Wells and Springs Sampled During Calendar Year 2019 *(Concluded)*

Analyte	Well (Relevant Chapter)	Exceedance	Date
Nitrate plus Nitrite (as Nitrogen) MCL = 10.0 mg/L	TJA-5 (Ch. 6)	19.6 mg/L	August 2019
	TJA-7 (Ch. 6)	22.1 mg/L	March 2019
		24.6 mg/L	June 2019
		22.0 mg/L	September 2019
		22.8 mg/L	December 2019
	TJA-7 (Duplicate) (Ch. 6)	22.8 mg/L	December 2019
Trichloroethene MCL = 5.0 µg/L	LWDS-MW1 (Ch. 5)	15.2 µg/L	February 2019
		17.5 µg/L	June 2019
		11.4 µg/L	August 2019
		20.2 µg/L	November 2019
	LWDS-MW1 (Duplicate) (Ch. 5)	13.6 µg/L	August 2019
	TAV-MW4 (Ch. 5)	5.44 µg/L	May 2019
		5.09 µg/L	August 2019
		5.40 µg/L	November 2019
	TAV-MW4 (Duplicate) (Ch. 5)	5.05 µg/L	August 2019
	TAV-MW8 (Ch. 5)	6.30 µg/L	February 2019
		5.66 µg/L	November 2019
	TAV-MW8 (Duplicate) (Ch. 5)	6.06 µg/L	February 2019
	TAV-MW10 (Ch. 5)	14.6 µg/L	February 2019
		13.0 µg/L	June 2019
		10.6 µg/L	August 2019
		14.9 µg/L	November 2019
	TAV-MW10 (Duplicate) (Ch. 5)	14.7 µg/L	November 2019
	TAV-MW14 (Ch. 5)	6.60 µg/L	February 2019
	TAV-MW14 (Duplicate) (Ch. 5)	5.34 µg/L	November 2019
	TJA-2 (Ch. 6)	5.71 µg/L	February 2019

NOTES:

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

µg/L = Micrograms per liter.
AVN = Area-V (North).
Ch. = Chapter.
CYN = Canyons.
LWDS = Liquid Waste Disposal System.
MCL = Maximum contaminant level.
mg/L = Milligrams per liter.
MW = Monitoring well.
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).

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).

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; NMED January 2015), 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 (NMED January 2015), 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. 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 (NMED May 2007). 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 of 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 two document approval letters received in September 2019, the NMED Hazardous Waste Bureau (HWB) requested that DOE/NNSA and SNL/NM personnel add 1,4-dioxane to the groundwater monitoring analytical list at the CWL, the MWL, the TAVG AOC, and the TAG AOC (NMED September 2019a and 2019b). Specifically, the NMED HWB requested:

> *The Permittees must add 1,4-dioxane analysis for groundwater monitoring wells included in the periodic monitoring conducted at TA-V, CWL, MWL, and TAG using EPA Method 8270 SIM or equivalent, for a minimum of two quarters, in order to determine the concentration of 1,4-dioxane in groundwater at these sites. (NMED September 2019a).*
>
> and,
>
> *The Permittees must add 1,4-dioxane analysis for groundwater monitoring wells in the MWL monitoring network using EPA Method 8270 SIM or equivalent, for a minimum of two quarters, in order to evaluate for the presence of 1,4-dioxane in groundwater at these sites (NMED September 2019b).*

The NMED letters stipulate an action level of 4.59 micrograms per liter (µg/L) for 1,4-dioxane based on the carcinogenic risk-based tap water screening level in the 2018 Risk Assessment Guidance for Site Investigations and Remediation (New Mexico Water Quality Control Commission [NMWQCC] December 2018). In order to implement this new requirement, SNL/NM personnel have been evaluating appropriate analytical methods for 1,4-dioxane and modifying laboratory contracts. Sampling for 1,4-dioxane at the CWL, MWL, TAVG AOC, and TAG AOC will begin in the first quarter of CY 2020 and the results will be reported in the CY 2020 Annual Groundwater Monitoring Report.

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 2019 include presentations at semiannual DOE/NNSA public meetings held in April and October.

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 2019, 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 2016). 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 Stewardship Program 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 (µmho/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.
µmho/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. Due to severely low hydraulic conductivities, several monitoring wells purge dry prior to removal of the minimum required volume. During the monitoring events, these wells are purged to dryness, allowed to recover, and then sampled to collect the most representative groundwater sample possible given the low yield of the wells. 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 insertion into each monitoring well according to procedures described in SNL/NM FOP 05-03, *Long-Term Stewardship Program Groundwater Monitoring 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, *Long-Term Stewardship Program Groundwater Monitoring Well Sampling and Field Analytical Measurements* (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 07* (SNL April 2019) 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 Stewardship Program 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 and a discharge approval was issued.

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)	SM 2320B
Anions	SW846-9056A
Filtered Metals (including Cations)	SW846-6020B/7470A
HE compounds	SW846-8330B
NPN	EPA 353.2
Perchlorate	EPA 314.0
TAL Metals	SW846-6020B/7470A
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.

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EPA = U.S. Environmental Protection Agency.
HE = High explosives.
NPN = Nitrate plus nitrite (reported as nitrogen).
SM = Standard Method.
SW = Solid Waste.
TAL = Target Analyte List.
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-Rn B
Radium-226	EPA 903.1
Radium-228	EPA 904.0
Tritium	EPA 906.0 M

NOTES:

[a]**Analytical Method References**

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

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[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, *Data Validation Procedure for Chemical and Radiochemical Data* (SNL June 2017). Although some 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, storage, or analysis 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 environmental duplicate, 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 Environmental Duplicate Samples

Environmental duplicate samples were analyzed to estimate the overall reproducibility of the sampling and analytical process. An environmental duplicate sample is collected immediately after the original environmental sample to reduce variability caused by time and/or sampling mechanics. The results for environmental duplicate sample analyses (for concentrations above detection limits only) are used to calculate relative percent difference values. The environmental 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 insertion into each monitoring well according to procedures described in SNL/NM FOP 05-03, *Long-Term Stewardship Program Groundwater Monitoring Equipment Decontamination* (SNL January 2018b). An EB is collected periodically 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 volatile organic compounds (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 containing VOC and gasoline range organics samples. 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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References

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2.0 Groundwater Monitoring Program

2.1 Introduction

This chapter documents the results for the Calendar Year (CY) 2019 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 16 monitoring wells and 1 surface water sample from a perennial spring. As part of the activities, SNL/NM personnel used groundwater elevation data from 220 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 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 units 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/laboratory 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 2019 include sampling at designated wells (Figure 2-1), sample analysis, groundwater level measurements, and construction of hydrographs and a potentiometric surface map (Plate 1). Historically, the GMP consisted of sampling 12 monitoring wells and in CY 2019 it was expanded to 16 monitoring wells (Figure 2-1). Existing monitoring wells CCBA-MW2, CTF-MW1, CYN-MW5, and OBS-MW1 were added to the GMP annual groundwater monitoring sampling event. These four wells had been installed for investigations associated with specific Solid Waste Management Units (SWMU) as part of Environmental Restoration Operations. These SWMUs have been granted

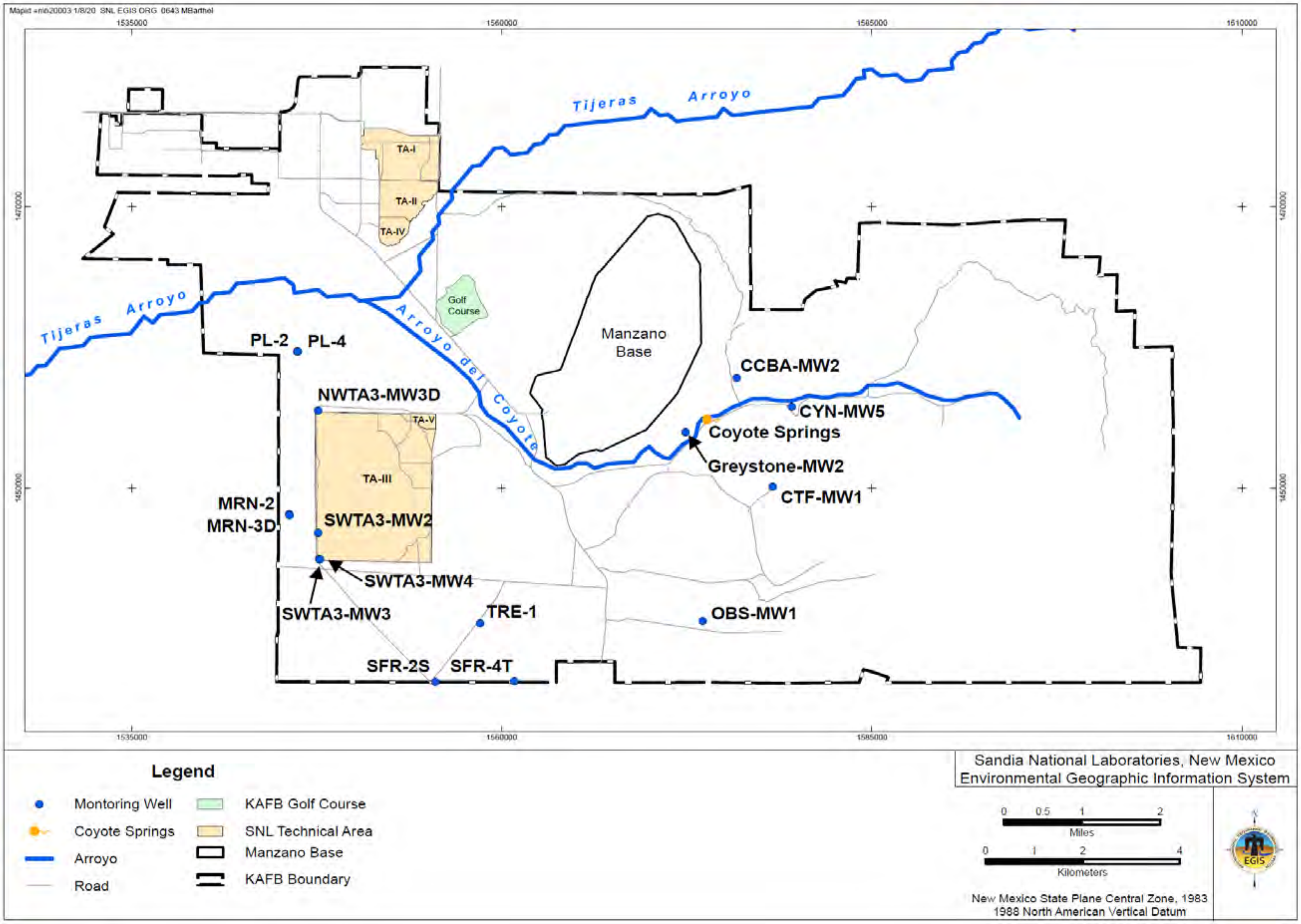

Figure 2-1. Groundwater Monitoring Program Water Quality Monitoring Network

Corrective Action Complete status. The four monitoring wells were transferred to the GMP because the location of these wells filled data gaps in the geographic distribution of the GMP well network by adding more locations in the fractured bedrock system in the eastern part of Kirtland Air Force Base (KAFB).

2.3.1 Groundwater Quality Surveillance Monitoring

Annual sampling of groundwater was conducted during the period from March 6 to March 25, 2019. Samples were collected from 16 wells and 1 perennial spring. GMP well locations are scattered throughout and along the perimeter of KAFB in areas that are not necessarily affiliated with SWMUs or Areas of Concern. Groundwater surveillance samples were collected from the following monitoring wells: CCBA-MW2, CTF-MW1, CYN-MW5, Greystone-MW2, MRN-2, MRN-3D, NWTA3-MW3D, OBS-MW1, 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 17 locations were analyzed for the following analytes:

- Safe Drinking Water Act list of volatile organic compounds (VOCs)
- Total organic halogens (TOX)
- Total phenol
- 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, CCBA-MW2, CTF-MW1, CYN-MW5, Greystone-MW2, OBS-MW1, SFR-2S, SFR-4T, and TRE-1 (see discussion in Section 2.6.1). Environmental duplicate samples from Coyote Springs and monitoring wells CCBA-MW2 and SFR-2S 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 2019, 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 Affairs production 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 2019.

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 2019 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-9, present the hydrographs that utilize the water level measurements, and Figures 2B-10 through 2B-14 present precipitation and production well data. Attachment 2C, Figures 2C-1 through 2C-6, present the time trend plots for specific parameters exceeding regulatory standards at monitoring wells CCBA-MW2, OBS-MW1, SFR-2S, SFR-4T, and TRE-1, as well as for Coyote Springs.

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 December 2018). 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 SNL/NM 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 2019. No HE compounds were detected above MDLs or above established MCLs or MACs. No VOCs were detected at concentrations above established MCLs or MACs from any groundwater sample.

Chloroform was detected below the MAC of 100 μg/L in the TRE-1 environmental sample at a concentration of 0.590 μg/L. Table 2A-2 lists the MDLs for VOC and HE compounds.

Table 2A-3 summarizes NPN results. NPN was detected in groundwater samples above associated MDLs, and ranged from 0.244 milligrams per liter (mg/L) to 7.00 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 phenol, 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 monitoring wells CCBA-MW2, OBS-MW1, SFR-2S, SFR-4T, and TRE-1 at concentrations ranging from 1.61 mg/L to 2.79 mg/L. Fluoride in groundwater is suspected to be naturally occurring (geogenic). Figures 2C-1 through 2C-5 present the time trend plots for fluoride for monitoring wells CCBA-MW2, OBS-MW1, SFR-2S, SFR-4T, and TRE-1.

Detected concentrations for alkalinity, major anions, TOX, and total phenol are consistent with historical GMP groundwater monitoring data. Only one parameter, total phenol, was qualified as not detected during data validation due to associated blank contamination because it was detected in the initial calibration blank sample outside QC acceptance criteria for well SWTA3-MW3; total phenol was qualified as not detected at the laboratory practical quantitation limit (PQL).

TOX was detected at 11 of the 17 sample locations (10 monitoring wells and Coyote Springs).

Table 2A-5 summarizes mercury results. Mercury was analyzed using unfiltered samples and is reported as total mercury. Mercury was not detected in any groundwater sample. Mercury in Coyote Springs samples was qualified as not detected during data validation because mercury was detected in in the initial calibration blank sample outside QC acceptance criteria.

Table 2A-6 summarizes 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 environmental sample and environmental duplicate sample from Coyote Springs at concentrations of 0.00702 mg/L and 0.00703 mg/L, respectively. 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 CY 2019 beryllium result is consistent with prior years. Manganese in monitoring well TRE-1 was qualified as not detected during data validation (given an R qualifier) because manganese was detected in the interference check sample at a negative value with an absolute value greater than twice the MDL.

Table 2A-7 summarizes the radiological analyses results. This includes gamma spectroscopy results for short list gamma radiation-emitting radioisotopes (americium-241, cesium-137, cobalt-60, and potassium-40), and analyses for alpha- and beta-emitting radioisotopes (gross alpha/beta activity), isotopic uranium, radium-226, and radium-228. Reported activities were below established MCLs or MACs. The analytical laboratory rejected the potassium-40 results for the samples reported for five monitoring wells (CCBA-MW2 [environmental duplicate sample], CYN-MW5, MRN-2, OBS-MW1, and SWTA3-MW3); and rejected the cesium-137 results for the Greystone-MW2 sample because the peaks 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 analyzed for Coyote Springs and monitoring wells CCBA-MW2, CTF-MW1, CYN-MW5, Greystone-MW2, OBS-MW1, 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, potential of hydrogen, temperature, specific conductivity, oxidation-reduction potential, and dissolved oxygen.

2.6.2 Groundwater Elevation Measurements

Table 1 at the back of this report lists construction details for monitoring wells located on or near KAFB. During CY 2019, SNL/NM personnel measured groundwater elevations in 106 SNL/NM monitoring wells (Table 2). The groundwater elevations were measured with an electric well sounder (water level meter). Data were also available for 114 additional monitoring wells owned by KAFB, COA EHD, USGS, and NMOSE. The groundwater elevation data are maintained in the corporate EDMS. Table 2-2 provides the total number of wells listed by the respective organization. Table 2 at the back of this report provides the groundwater elevation data for CY 2019 that were used to construct Plate 1.

Table 2-2. Groundwater Elevations Measured in Monitoring Wells by Sandia National Laboratories, New Mexico and Other Organizations during 2019

Total Wells	Measuring Agency	Well Owner	Location
106	SNL/NM GMP	DOE/NNSA	Site-wide surveillance network wells, BSG, CWL, MWL, TAG, and TAVG
107	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.

2.6.2.1 Groundwater Recharge and Withdrawal

Factors influencing fluctuations in groundwater elevation primarily include potential recharge from precipitation and groundwater withdrawals by production 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 located approximately 15 miles to the northeast. Most precipitation falls between July and October, mainly in the form of brief, heavy rain. For CY 2019, the wettest months were July and November.

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 (Figure 1-4).

Table 2-3 shows annual precipitation during CY 2019 at the four locations. CY 2018 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 8.78 inches of precipitation measured at KABQ during CY 2019 is 0.06 inches more than the corresponding period for the previous year; and it is 0.67 inches below the 30-year (1981-2010) norm of 9.45 inches. Figure 2B-10 shows monthly distribution of precipitation during CY 2019 at the four locations along with the 30 year averages. Figure 2B-11 shows the annual distribution of precipitation at these four locations for the period from January 2009 to December 2019.

Table 2-3. Precipitation Data for Kirtland Air Force Base, Calendar Years 2018 and 2019

Year	Meteorological Station			
	A21	A36	SC1	KABQ
CY 2018	13.90	11.34	14.20	8.72
CY 2019	9.27	9.08	12.40	8.78

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 production 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 (SFG). During CY 2019, KAFB pumped groundwater primarily from five production wells (KAFB-3, KAFB-4, KAFB-14, KAFB-15, and KAFB-20) for consumptive use.

KAFB supplies the water for SNL/NM and other DOE/NNSA facilities located on KAFB. Figure 2B-12 shows the CY 2019 monthly totals for KAFB production wells. The highest level of production was in July at 109 million gallons (gal); the lowest occurred in February at 36 million gal. 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-13 shows the CY 2019 monthly production for each KAFB production well. Figure 2B-14 shows the trend of total annual groundwater production at KAFB since 2009. Table 2-4 provides a comparison of water pumped during CY 2019 to the previous year.

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

Units	CY 2018	CY 2019
Million gal	788	783
Acre-feet	2,417	2,403

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

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 Environmental Restoration Program, COA EHD, USGS, and NMOSE were used to construct the base-wide CY 2019 potentiometric surface map of the Regional Aquifer as shown on Plate 1. Water level measurements for October and November 2019 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 the fractured bedrock system east of the fault zone (Figure 1-3). West of the Tijeras Fault Zone, the Regional Aquifer is under unconfined (water table) to semiconfined conditions and is present within the SFG, 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 SFG) 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 cumulative drawdown created by KAFB and ABCWUA production 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 production 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.

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 16 GMP monitoring wells (Figures 2B-1 through 2B-9). Historical data from quarterly and annual groundwater elevation measurements through CY 2019 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 production 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)**—Slight declining trend of approximately 0.15 to 0.25 ft/year since 2004.

- **SFR-4T (Figure 2B-5)**—Cyclical pattern with artificial yearly fluctuations of 20 to 30 ft since 2001; yearly minimum associated with SNL/NM sampling event and then 3 to 9 months of groundwater 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.

- **OBS-MW1 (Figure 2B-7)**—Stable groundwater elevations since 2011.

- **CCBA-MW2 (Figure 2B-8)**—Slight declining trend since 2011 of approximately 0.14 ft/year since 2014.

- **CTF-MW1 and CYN-MW5 (Figure 2B-9)**—Slight declining trend over the life of the wells of approximately 0.31 ft/year for CTF-MW1 and 0.14 ft/year for CYN-MW5.

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, equipment blank (EB), field blank (FB), and trip blank (TB) samples.

Environmental duplicate samples were collected to estimate the overall reproducibility of the sampling and analytical process. Environmental duplicate samples from Coyote Springs and monitoring wells CCBA-MW2 and SFR-2S were analyzed for all parameters. Relative percent difference (RPD) calculations of environmental samples and environmental duplicate samples were performed for detected chemical analytes only. The environmental duplicate sample results show good agreement (RPD values less than 35 for inorganic analyses) for calculated parameters, except TOX for Coyote Springs. The RPD value for TOX was calculated at 125 and is considered an estimated value because the environmental sample result is reported below the PQL. Also, the environmental duplicate sample was qualified as an estimated value during data validation due to column breakthrough during analysis.

EB samples were collected prior to well purging and sampling at monitoring wells CCBA-MW2 and SFR-2S and submitted for all analyses. EB samples contained detectable copper and TOX. Copper results were qualified as estimated values in CCBA-MW2 and SFR-2S environmental samples because copper was reported greater than the PQL and less than 5 times the EB result. TOX was qualified as not detected in the CCBA-MW2 environmental samples during data validation because TOX was reported less than the PQL and less than five times the associated EB result.

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 CYN-MW5, OBS-MW1, and PL-4 sampling points to simulate the transfer of environmental samples from the sampling system to the sample container. No VOCs were detected above 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 20 TBs were submitted with the CY 2019 samples. No VOCs were detected above associated MDLs in any TB sample, except for methylene chloride. Methylene chloride was detected in one TB sample, but no corrective action was necessary because this compound was not reported in the associated environmental samples. Methylene chloride is a common laboratory contaminant.

QC samples are prepared at the laboratory to determine whether contaminant chemicals are inadvertently introduced into laboratory processes and procedures. These include method blanks, laboratory control samples, matrix spike, matrix spike duplicate, and surrogate spike samples. Although some analytical results were qualified during the data validation process, the data were deemed acceptable except for manganese, potassium-40, and cesium-137. Manganese in monitoring well TRE-1 was qualified as not detected during data validation because manganese was detected in the interference check sample at a negative value with an absolute value greater than twice the MDL. The potassium-40 activity reported in monitoring wells CCBA-MW2, CYN-MW5, MRN-2, OBS-MW1, and SWTA3-MW3; and cesium-137 in the Greystone-MW2 sample were rejected by GEL due to the peak not meeting identification criteria.

2.8 Variances and Non-Conformances

No modifications or issues of field activities deviating from requirements in the GMP Mini-Sampling and Analysis Plan (SNL February 2019) were identified during CY 2019 sampling activities.

2.9 Summary and Conclusions

The annual groundwater surveillance monitoring sampling event was conducted between March 6 and March 25, 2019. Groundwater samples were collected from 16 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 0.244 mg/L to 7.00 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 monitoring wells CCBA-MW2, OBS-MW1, SFR-2S, SFR-4T, and TRE-1 samples at concentrations ranging from 1.61 mg/L to 2.79 mg/L. However, results did not exceed the MCL of 4.0 mg/L. Fluoride in groundwater is suspected to be naturally occurring (geogenic).
- No metals were detected above established MCLs or MACs in any of the groundwater samples. Beryllium was detected above the MCL of 0.004 mg/L in the environmental sample and environmental duplicate sample from Coyote Springs at concentrations of 0.00702 mg/L and 0.00703 mg/L, respectively. Beryllium is suspected to be naturally occurring (geogenic) and this analytical result is consistent with prior years.

Groundwater elevations were obtained during CY 2019 at 106 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 (1) impact of the groundwater withdrawal by production wells located in the northwestern portion of KAFB and adjacent parts of Albuquerque, and (2) basin margin topography.

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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 2019

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]
TRE-1 11-Mar-19	Chloroform	0.590	0.300	1.00	NE	100	J		107840-001	SW846-8260B

Refer to footnotes on page 2A-44.

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 2019

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	0.0842 – 0.172	SW846 8330B
4-Isopropyltoluene	0.300	SW846 8260	1,3-Dinitrobenzene	0.0842 – 0.172	SW846 8330B
Benzene	0.300	SW846 8260	2,4,6-Trinitrotoluene	0.0842 – 0.172	SW846 8330B
Bromobenzene	0.300	SW846 8260	2,4-Dinitrotoluene	0.0842 – 0.172	SW846 8330B
Bromochloromethane	0.300	SW846 8260	2,6-Dinitrotoluene	0.0842 – 0.172	SW846 8330B
Bromodichloromethane	0.300	SW846 8260	2-Amino-4,6-dinitrotoluene	0.0842 – 0.172	SW846 8330B
Bromoform	0.300	SW846 8260	2-Nitrotoluene	0.0863 – 0.176	SW846 8330B
Carbon tetrachloride	0.300	SW846 8260	3-Nitrotoluene	0.0842 – 0.172	SW846 8330B
Chlorobenzene	0.300	SW846 8260	4-Amino-2,6-dinitrotoluene	0.0842 – 0.172	SW846 8330B
Chloroethane	0.300	SW846 8260	4-Nitrotoluene	0.158 – 0.323	SW846 8330B
Chloroform	0.300	SW846 8260	HMX	0.0842 – 0.172	SW846 8330B
Chloromethane	0.300	SW846 8260	Nitro-benzene	0.0842 – 0.172	SW846 8330B
Dibromochloromethane	0.300	SW846 8260	Pentaerythritol tetranitrate	0.105 – 0.215	SW846 8330B
Dibromomethane	0.300	SW846 8260	RDX	0.0842 – 0.172	SW846 8330B
Dichlorodifluoromethane	0.300	SW846 8260	Tetryl	0.0842 – 0.172	SW846 8330B

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

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 25-Mar-19	Nitrate plus nitrite	0.443	0.017	0.050	10.0		J	107899-005	EPA 353.2
Coyote Springs (Duplicate) 25-Mar-19	Nitrate plus nitrite	0.452	0.017	0.050	10.0		J	107900-005	EPA 353.2
CCBA-MW2 07-Mar-19	Nitrate plus nitrite	3.36	0.085	0.250	10.0			107830-005	EPA 353.2
CCBA-MW2 (Duplicate) 07-Mar-19	Nitrate plus nitrite	3.40	0.085	0.250	10.0			107831-005	EPA 353.2
CTF-MW1 14-Mar-19	Nitrate plus nitrite	7.00	0.170	0.500	10.0		J	107859-005	EPA 353.2
CYN-MW5 06-Mar-19	Nitrate plus nitrite	2.25	0.085	0.250	10.0			107825-005	EPA 353.2
Greystone-MW2 15-Mar-19	Nitrate plus nitrite	5.15	0.085	0.250	10.0			107863-005	EPA 353.2
MRN-2 20-Mar-19	Nitrate plus nitrite	4.42	0.170	0.500	10.0			107885-005	EPA 353.2
MRN-3D 21-Mar-19	Nitrate plus nitrite	2.79	0.085	0.250	10.0			107891-005	EPA 353.2
NWTA3-MW3D 08-Mar-19	Nitrate plus nitrite	0.954	0.017	0.050	10.0			107837-005	EPA 353.2
OBS-MW1 18-Mar-19	Nitrate plus nitrite	2.00	0.085	0.250	10.0			107869-005	EPA 353.2
PL-2 19-Mar-19	Nitrate plus nitrite	3.11	0.085	0.250	10.0			107879-005	EPA 353.2
PL-4 22-Mar-19	Nitrate plus nitrite	5.27	0.170	0.500	10.0			107895-006	EPA 353.2
SFR-2S 12-Mar-19	Nitrate plus nitrite	0.902	0.017	0.050	10.0			107851-006	EPA 353.2
SFR-2S (Duplicate) 12-Mar-19	Nitrate plus nitrite	0.901	0.017	0.050	10.0			107852-006	EPA 353.2
SFR-4T 13-Mar-19	Nitrate plus nitrite	0.244	0.017	0.050	10.0			107856-006	EPA 353.2
SWTA3-MW2 19-Mar-19	Nitrate plus nitrite	0.905	0.017	0.050	10.0			107876-006	EPA 353.2
SWTA3-MW3 20-Mar-19	Nitrate plus nitrite	0.624	0.017	0.050	10.0			107882-006	EPA 353.2

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

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 21-Mar-19	Nitrate plus nitrite	1.15	0.017	0.050	10.0			107888-006	EPA 353.2
TRE-1 11-Mar-19	Nitrate plus nitrite	2.68	0.085	0.250	10.0			107840-006	EPA 353.2

Refer to footnotes on page 2A-44.

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 2019

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	0.0526	0.00333	0.010	NE	NE		J	107899-002	SW846 9020
25-Mar-19	Bromide	ND	0.067	0.200	NE	NE	U		107899-007	SW846 9056
	Chloride	496	6.70	20.0	NE	NE		J	107899-007	SW846 9056
	Fluoride	1.49	0.033	0.100	4.0	1.60			107899-007	SW846 9056
	Sulfate	131	13.3	40.0	NE	NE		J	107899-007	SW846 9056
	Alkalinity as $CaCO_3$	1,060	1.45	4.00	NE	NE			107899-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107899-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	107899-006	SW846 9012
Coyote Springs	Total Organic Halogens	0.228	0.00333	0.010	NE	NE		J	107900-002	SW846 9020
25-Mar-19	Bromide	ND	0.067	0.200	NE	NE	U		107900-007	SW846 9056
	Chloride	500	6.70	20.0	NE	NE		J	107900-007	SW846 9056
	Fluoride	1.49	0.033	0.100	4.0	1.60			107900-007	SW846 9056
	Sulfate	133	13.3	40.0	NE	NE		J	107900-007	SW846 9056
	Alkalinity as $CaCO_3$	1,070	1.45	4.00	NE	NE			107900-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107900-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	107900-006	SW846 9012
CCBA-MW2	Total Organic Halogens	0.0089	0.00333	0.010	NE	NE	J	0.01U	107830-002	SW846 9020
07-Mar-19	Bromide	0.525	0.067	0.200	NE	NE			107830-007	SW846 9056
	Chloride	34.7	0.670	2.00	NE	NE			107830-007	SW846 9056
	Fluoride	1.60	0.033	0.100	4.0	1.60			107830-007	SW846 9056
	Sulfate	87.8	1.33	4.00	NE	NE			107830-007	SW846 9056
	Alkalinity as $CaCO_3$	186	1.45	4.00	NE	NE			107830-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107830-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107830-006	SW846 9012
CCBA-MW2 (Duplicate)	Total Organic Halogens	0.0058	0.00333	0.010	NE	NE	J	0.01U	107831-002	SW846 9020
07-Mar-19	Bromide	0.535	0.067	0.200	NE	NE			107831-007	SW846 9056
	Chloride	34.8	0.670	2.00	NE	NE			107831-007	SW846 9056
	Fluoride	**1.61**	0.033	0.100	4.0	1.60			107831-007	SW846 9056
	Sulfate	88.1	1.33	4.00	NE	NE			107831-007	SW846 9056
	Alkalinity as $CaCO_3$	190	1.45	4.00	NE	NE			107831-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107831-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107831-006	SW846 9012

Refer to footnotes on page 2A-44.

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 2019

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]
CTF-MW1	Total Organic Halogens	0.00938	0.00333	0.010	NE	NE	J		107859-002	SW846 9020
14-Mar-19	Bromide	0.570	0.067	0.200	NE	NE			107859-007	SW846 9056
	Chloride	41.0	0.670	2.00	NE	NE			107859-007	SW846 9056
	Fluoride	1.60	0.033	0.100	4.0	1.60			107859-007	SW846 9056
	Sulfate	84.9	1.33	4.00	NE	NE			107859-007	SW846 9056
	Alkalinity as $CaCO_3$	204	1.45	4.00	NE	NE			107859-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107859-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107859-006	SW846 9012
CYN-MW5	Total Organic Halogens	0.00938	0.00333	0.010	NE	NE	J		107825-002	SW846 9020
06-Mar-19	Bromide	0.149	0.067	0.200	NE	NE	J		107825-007	SW846 9056
	Chloride	13.5	0.134	0.400	NE	NE			107825-007	SW846 9056
	Fluoride	0.311	0.033	0.100	4.0	1.60			107825-007	SW846 9056
	Sulfate	25.6	0.266	0.800	NE	NE			107825-007	SW846 9056
	Alkalinity as $CaCO_3$	144	1.45	4.00	NE	NE			107825-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107825-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107825-006	SW846 9012
Greystone-MW2	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		107863-002	SW846 9020
15-Mar-19	Bromide	0.606	0.067	0.200	NE	NE			107863-007	SW846 9056
	Chloride	113	1.34	4.00	NE	NE	H		107863-007	SW846 9056
	Fluoride	0.780	0.033	0.100	4.0	1.60			107863-007	SW846 9056
	Sulfate	50.0	2.66	8.00	NE	NE	H		107863-007	SW846 9056
	Alkalinity as $CaCO_3$	456	1.45	4.00	NE	NE			107863-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107863-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107863-006	SW846 9012
MRN-2	Total Organic Halogens	0.00462	0.00333	0.010	NE	NE	J		107885-002	SW846 9020
20-Mar-19	Bromide	0.166	0.067	0.200	NE	NE	J		107885-007	SW846 9056
	Chloride	12.7	0.335	1.00	NE	NE			107885-007	SW846 9056
	Fluoride	0.611	0.033	0.100	4.0	1.60			107885-007	SW846 9056
	Sulfate	50.9	0.665	2.00	NE	NE			107885-007	SW846 9056
	Alkalinity as $CaCO_3$	159	1.45	4.00	NE	NE			107885-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107885-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	107885-006	SW846 9012

Refer to footnotes on page 2A-44.

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 2019

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	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		107891-002	SW846 9020
21-Mar-19	Bromide	0.177	0.067	0.200	NE	NE	J		107891-007	SW846 9056
	Chloride	14.4	0.335	1.00	NE	NE			107891-007	SW846 9056
	Fluoride	0.464	0.033	0.100	4.0	1.60			107891-007	SW846 9056
	Sulfate	74.1	0.665	2.00	NE	NE			107891-007	SW846 9056
	Alkalinity as $CaCO_3$	172	1.45	4.00	NE	NE			107891-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107891-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	107891-006	SW846 9012
NWTA3-MW3D	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		107837-002	SW846 9020
08-Mar-19	Bromide	0.161	0.067	0.200	NE	NE	J		107837-007	SW846 9056
	Chloride	10.6	0.335	1.00	NE	NE			107837-007	SW846 9056
	Fluoride	0.768	0.033	0.100	4.0	1.60			107837-007	SW846 9056
	Sulfate	52.2	0.665	2.00	NE	NE			107837-007	SW846 9056
	Alkalinity as $CaCO_3$	140	1.45	4.00	NE	NE			107837-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107837-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107837-006	SW846 9012
OBS-MW1	Total Organic Halogens	0.00894	0.00333	0.010	NE	NE	J		107869-002	SW846 9020
18-Mar-19	Bromide	0.380	0.067	0.200	NE	NE			107869-007	SW846 9056
	Chloride	24.1	0.670	2.00	NE	NE			107869-007	SW846 9056
	Fluoride	**2.04**	0.033	0.100	4.0	1.60			107869-007	SW846 9056
	Sulfate	82.0	1.33	4.00	NE	NE			107869-007	SW846 9056
	Alkalinity as $CaCO_3$	190	1.45	4.00	NE	NE			107869-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107869-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107869-006	SW846 9012
PL-2	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		107879-002	SW846 9020
19-Mar-19	Bromide	0.194	0.067	0.200	NE	NE	J		107879-007	SW846 9056
	Chloride	14.0	0.335	1.00	NE	NE			107879-007	SW846 9056
	Fluoride	0.478	0.033	0.100	4.0	1.60			107879-007	SW846 9056
	Sulfate	71.2	0.665	2.00	NE	NE			107879-007	SW846 9056
	Alkalinity as $CaCO_3$	154	1.45	4.00	NE	NE			107879-004	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107879-003	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107879-006	SW846 9012

Refer to footnotes on page 2A-44.

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 2019

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	Total Organic Halogens	0.00928	0.00333	0.010	NE	NE	J		107895-003	SW846 9020
22-Mar-19	Bromide	0.201	0.067	0.200	NE	NE			107895-008	SW846 9056
	Chloride	15.8	0.335	1.00	NE	NE			107895-008	SW846 9056
	Fluoride	0.367	0.033	0.100	4.0	1.60			107895-008	SW846 9056
	Sulfate	72.5	0.665	2.00	NE	NE			107895-008	SW846 9056
	Alkalinity as $CaCO_3$	170	1.45	4.00	NE	NE			107895-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107895-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	107895-007	SW846 9012
SFR-2S	Total Organic Halogens	0.0108	0.00333	0.010	NE	NE		J	107851-003	SW846 9020
12-Mar-19	Bromide	0.671	0.067	0.200	NE	NE			107851-008	SW846 9056
	Chloride	133	1.34	4.00	NE	NE			107851-008	SW846 9056
	Fluoride	**1.62**	0.033	0.100	4.0	1.60			107851-008	SW846 9056
	Sulfate	74.2	2.66	8.00	NE	NE			107851-008	SW846 9056
	Alkalinity as $CaCO_3$	415	1.45	4.00	NE	NE			107851-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107851-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107851-007	SW846 9012
SFR-2S (Duplicate)	Total Organic Halogens	0.0135	0.00333	0.010	NE	NE		J	107852-003	SW846 9020
12-Mar-19	Bromide	0.761	0.067	0.200	NE	NE			107852-008	SW846 9056
	Chloride	136	1.34	4.00	NE	NE			107852-008	SW846 9056
	Fluoride	**1.66**	0.033	0.100	4.0	1.60			107852-008	SW846 9056
	Sulfate	74.7	2.66	8.00	NE	NE			107852-008	SW846 9056
	Alkalinity as $CaCO_3$	403	1.45	4.00	NE	NE			107852-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107852-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107852-007	SW846 9012
SFR-4T	Total Organic Halogens	0.0259	0.00333	0.010	NE	NE		J	107856-003	SW846 9020
13-Mar-19	Bromide	1.96	0.067	0.200	NE	NE			107856-008	SW846 9056
	Chloride	204	13.4	40.0	NE	NE		J	107856-008	SW846 9056
	Fluoride	**2.79**	0.033	0.100	4.0	1.60			107856-008	SW846 9056
	Sulfate	1980	26.6	80.0	NE	NE		J	107856-008	SW846 9056
	Alkalinity as $CaCO_3$	112	1.45	4.00	NE	NE			107856-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107856-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107856-007	SW846 9012

Refer to footnotes on page 2A-44.

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 2019

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	Total Organic Halogens	0.00392	0.00333	0.010	NE	NE	J		107876-003	SW846 9020
19-Mar-19	Bromide	0.172	0.067	0.200	NE	NE	J		107876-008	SW846 9056
	Chloride	16.5	0.335	1.00	NE	NE			107876-008	SW846 9056
	Fluoride	0.965	0.033	0.100	4.0	1.60			107876-008	SW846 9056
	Sulfate	55.9	0.665	2.00	NE	NE			107876-008	SW846 9056
	Alkalinity as $CaCO_3$	170	1.45	4.00	NE	NE			107876-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107876-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107876-007	SW846 9012
SWTA3-MW3	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		107882-003	SW846 9020
20-Mar-19	Bromide	0.150	0.067	0.200	NE	NE	J		107882-008	SW846 9056
	Chloride	14.1	0.335	1.00	NE	NE			107882-008	SW846 9056
	Fluoride	1.28	0.033	0.100	4.0	1.60			107882-008	SW846 9056
	Sulfate	65.2	0.665	2.00	NE	NE			107882-008	SW846 9056
	Alkalinity as $CaCO_3$	170	1.45	4.00	NE	NE			107882-005	SM2320B
	Total Phenol	0.00246	0.00167	0.005	NE	NE	J	0.005UJ	107882-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	107882-007	SW846 9012
SWTA3-MW4	Total Organic Halogens	0.0064	0.00333	0.010	NE	NE	J		107888-003	SW846 9020
21-Mar-19	Bromide	0.175	0.067	0.200	NE	NE	J		107888-008	SW846 9056
	Chloride	22.2	0.335	1.00	NE	NE			107888-008	SW846 9056
	Fluoride	1.57	0.033	0.100	4.0	1.60			107888-008	SW846 9056
	Sulfate	50.8	0.665	2.00	NE	NE			107888-008	SW846 9056
	Alkalinity as $CaCO_3$	186	1.45	4.00	NE	NE			107888-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107888-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U	0.005UJ	107888-007	SW846 9012
TRE-1	Total Organic Halogens	ND	0.00333	0.010	NE	NE	U		107840-003	SW846 9020
11-Mar-19	Bromide	0.679	0.067	0.200	NE	NE			107840-008	SW846 9056
	Chloride	133	1.68	5.00	NE	NE			107840-008	SW846 9056
	Fluoride	**1.73**	0.033	0.100	4.0	1.60			107840-008	SW846 9056
	Sulfate	106	3.33	10.0	NE	NE			107840-008	SW846 9056
	Alkalinity as $CaCO_3$	494	1.45	4.00	NE	NE			107840-005	SM2320B
	Total Phenol	ND	0.00167	0.005	NE	NE	U	0.005UJ	107840-004	SW846 9066
	Total Cyanide	ND	0.00167	0.005	0.200	0.200	U		107840-007	SW846 9012

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

Well ID	Mercury 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 25-Mar-19	0.000067	0.000067	0.0002	0.002	J	0.0002UJ	107899-009	SW846 7470A
Coyote Springs (Duplicate) 25-Mar-19	0.000068	0.000067	0.0002	0.002	J	0.0002UJ	107900-009	SW846 7470A
CCBA-MW2 07-Mar-19	ND	0.000067	0.0002	0.002	U		107830-009	SW846 7470A
CCBA-MW2 (Duplicate) 07-Mar-19	ND	0.000067	0.0002	0.002	U		107831-009	SW846 7470A
CTF-MW1 14-Mar-19	ND	0.000067	0.0002	0.002	U		107859-009	SW846 7470A
CYN-MW5 06-Mar-19	ND	0.000067	0.0002	0.002	U		107825-009	SW846 7470A
Greystone-MW2 15-Mar-19	ND	0.000067	0.0002	0.002	U		107863-009	SW846 7470A
MRN-2 20-Mar-19	ND	0.000067	0.0002	0.002	U		107885-009	SW846 7470A
MRN-3D 21-Mar-19	ND	0.000067	0.0002	0.002	U		107891-009	SW846 7470A
NWTA3-MW3D 08-Mar-19	ND	0.000067	0.0002	0.002	U		107837-009	SW846 7470A
OBS-MW1 18-Mar-19	ND	0.000067	0.0002	0.002	U		107869-009	SW846 7470A
PL-2 19-Mar-19	ND	0.000067	0.0002	0.002	U		107879-009	SW846 7470A
PL-4 22-Mar-19	ND	0.000067	0.0002	0.002	U	0.0002UJ	107895-010	SW846 7470A
SFR-2S 12-Mar-19	ND	0.000067	0.0002	0.002	U		107851-010	SW846 7470A
SFR-2S (Duplicate) 12-Mar-19	ND	0.000067	0.0002	0.002	U		107852-010	SW846 7470A
SFR-4T 13-Mar-19	ND	0.000067	0.0002	0.002	U		107856-010	SW846 7470A
SWTA3-MW2 19-Mar-19	ND	0.000067	0.0002	0.002	U		107876-010	SW846 7470A

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

Well ID	Mercury 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 20-Mar-19	ND	0.000067	0.0002	0.002	U		107882-010	SW846 7470A
SWTA3-MW4 21-Mar-19	ND	0.000067	0.0002	0.002	U		107888-010	SW846 7470A
TRE-1 11-Mar-19	ND	0.000067	0.0002	0.002	U		107840-010	SW846 7470A

Refer to footnotes on page 2A-44.

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 2019

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	0.196	0.0193	0.050	NE	5.00			107899-008	SW846 6020
25-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107899-008	SW846 6020
	Arsenic	0.00841	0.002	0.005	0.010	0.010			107899-008	SW846 6020
	Barium	0.0416	0.00067	0.002	2.00	2.00			107899-008	SW846 6020
	Beryllium	**0.00702**	0.0002	0.0005	0.004	0.004			107899-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107899-008	SW846 6020
	Calcium	297	0.800	2.00	NE	NE			107899-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107899-008	SW846 6020
	Cobalt	0.00977	0.0003	0.001	NE	0.50			107899-008	SW846 6020
	Copper	0.00196	0.0003	0.001	1.3	1.00			107899-008	SW846 6020
	Iron	0.0951	0.033	0.100	NE	1.00	J		107899-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107899-008	SW846 6020
	Magnesium	67.0	0.100	0.300	NE	NE		J	107899-008	SW846 6020
	Manganese	1.59	0.010	0.050	NE	0.20		J	107899-008	SW846 6020
	Mercury	0.000079	0.000067	0.0002	0.002	0.002	J	0.0002UJ	107899-008	SW846 7470
	Nickel	0.0233	0.0006	0.002	NE	0.20			107899-008	SW846 6020
	Potassium	30.5	0.080	0.300	NE	NE			107899-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107899-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107899-008	SW846 6020
	Sodium	461	0.800	2.50	NE	NE		J	107899-008	SW846 6020
	Thallium	0.00113	0.0006	0.002	0.002	0.002	J		107899-008	SW846 6020
	Uranium	0.00708	0.000067	0.0002	0.03	0.030			107899-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		107899-008	SW846 6020
	Zinc	0.0398	0.0033	0.010	NE	10.0			107899-008	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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	0.202	0.0193	0.050	NE	5.00			107900-008	SW846 6020
(Duplicate)	Antimony	ND	0.001	0.003	0.006	0.006	U		107900-008	SW846 6020
25-Mar-19	Arsenic	0.00879	0.002	0.005	0.010	0.010			107900-008	SW846 6020
	Barium	0.0425	0.00067	0.002	2.00	2.00			107900-008	SW846 6020
	Beryllium	**0.00703**	0.0002	0.0005	0.004	0.004			107900-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107900-008	SW846 6020
	Calcium	292	0.800	2.00	NE	NE			107900-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107900-008	SW846 6020
	Cobalt	0.0102	0.0003	0.001	NE	0.50			107900-008	SW846 6020
	Copper	0.00218	0.0003	0.001	1.3	1.00			107900-008	SW846 6020
	Iron	0.0947	0.033	0.100	NE	1.00	J		107900-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107900-008	SW846 6020
	Magnesium	66.0	0.100	0.300	NE	NE		J	107900-008	SW846 6020
	Manganese	1.56	0.010	0.050	NE	0.20		J	107900-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U	0.0002UJ	107900-008	SW846 7470
	Nickel	0.0239	0.0006	0.002	NE	0.20			107900-008	SW846 6020
	Potassium	31.8	0.080	0.300	NE	NE			107900-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107900-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107900-008	SW846 6020
	Sodium	468	0.800	2.50	NE	NE		J	107900-008	SW846 6020
	Thallium	0.00115	0.0006	0.002	0.002	0.002	J		107900-008	SW846 6020
	Uranium	0.00728	0.000067	0.0002	0.030	0.030			107900-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		107900-008	SW846 6020
	Zinc	0.0409	0.0033	0.010	NE	10.0			107900-008	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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]
CCBA-MW2	Aluminum	ND	0.0193	0.050	NE	5.00	U		107830-008	SW846 6020
07-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107830-008	SW846 6020
	Arsenic	0.00342	0.002	0.005	0.010	0.010	J		107830-008	SW846 6020
	Barium	0.049	0.00067	0.002	2.00	2.00			107830-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107830-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107830-008	SW846 6020
	Calcium	72.5	0.800	2.00	NE	NE			107830-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107830-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107830-008	SW846 6020
	Copper	0.0017	0.0003	0.001	1.3	1.00		J+	107830-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107830-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107830-008	SW846 6020
	Magnesium	15.6	0.010	0.030	NE	NE			107830-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107830-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107830-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107830-008	SW846 6020
	Potassium	1.38	0.080	0.300	NE	NE			107830-008	SW846 6020
	Selenium	0.00409	0.002	0.005	0.050	0.050	J		107830-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107830-008	SW846 6020
	Sodium	45.5	0.800	2.50	NE	NE			107830-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107830-008	SW846 6020
	Uranium	0.00464	0.000067	0.0002	0.030	0.030			107830-008	SW846 6020
	Vanadium	0.0113	0.0033	0.010	NE	NE			107830-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107830-008	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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]
CCBA-MW2 (Duplicate) 07-Mar-19	Aluminum	ND	0.0193	0.050	NE	5.00	U		107831-008	SW846 6020
	Antimony	ND	0.001	0.003	0.006	0.006	U		107831-008	SW846 6020
	Arsenic	0.00327	0.002	0.005	0.010	0.010	J		107831-008	SW846 6020
	Barium	0.0502	0.00067	0.002	2.00	2.00			107831-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107831-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107831-008	SW846 6020
	Calcium	71.6	0.800	2.00	NE	NE			107831-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107831-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107831-008	SW846 6020
	Copper	0.0017	0.0003	0.001	1.3	1.00		J+	107831-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107831-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107831-008	SW846 6020
	Magnesium	15.4	0.010	0.030	NE	NE			107831-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107831-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107831-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107831-008	SW846 6020
	Potassium	1.29	0.080	0.300	NE	NE			107831-008	SW846 6020
	Selenium	0.004	0.002	0.005	0.050	0.050	J		107831-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107831-008	SW846 6020
	Sodium	48.8	0.080	0.250	NE	NE			107831-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107831-008	SW846 6020
	Uranium	0.00464	0.000067	0.0002	0.030	0.030			107831-008	SW846 6020
	Vanadium	0.0118	0.0033	0.010	NE	NE			107831-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107831-008	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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]
CTF-MW1	Aluminum	ND	0.0193	0.050	NE	5.00	U		107859-008	SW846 6020
14-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107859-008	SW846 6020
	Arsenic	0.00368	0.002	0.005	0.010	0.010	J		107859-008	SW846 6020
	Barium	0.0528	0.00067	0.002	2.00	2.00			107859-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107859-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107859-008	SW846 6020
	Calcium	84.3	0.800	2.00	NE	NE			107859-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107859-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107859-008	SW846 6020
	Copper	0.00182	0.0003	0.001	1.3	1.00			107859-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107859-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107859-008	SW846 6020
	Magnesium	20.6	0.010	0.030	NE	NE			107859-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107859-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107859-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107859-008	SW846 6020
	Potassium	1.78	0.080	0.300	NE	NE			107859-008	SW846 6020
	Selenium	0.00512	0.002	0.005	0.050	0.050			107859-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107859-008	SW846 6020
	Sodium	34.4	0.080	0.250	NE	NE			107859-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107859-008	SW846 6020
	Uranium	0.0102	0.000067	0.0002	0.030	0.030			107859-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		107859-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107859-008	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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]
CYN-MW5	Aluminum	ND	0.0193	0.050	NE	5.00	U		107825-008	SW846 6020
06-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107825-008	SW846 6020
	Arsenic	0.00666	0.002	0.005	0.010	0.010			107825-008	SW846 6020
	Barium	0.166	0.00067	0.002	2.00	2.00			107825-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107825-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107825-008	SW846 6020
	Calcium	48.6	0.800	2.00	NE	NE			107825-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107825-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107825-008	SW846 6020
	Copper	0.00167	0.0003	0.001	1.3	1.00			107825-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107825-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107825-008	SW846 6020
	Magnesium	10.0	0.010	0.030	NE	NE			107825-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107825-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107825-008	SW846 7470
	Nickel	0.000993	0.0006	0.002	NE	0.20	J		107825-008	SW846 6020
	Potassium	2.23	0.080	0.300	NE	NE			107825-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107825-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107825-008	SW846 6020
	Sodium	15.8	0.080	0.250	NE	NE			107825-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107825-008	SW846 6020
	Uranium	0.000619	0.000067	0.0002	0.030	0.030			107825-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		107825-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107825-008	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

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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	5.00	U		107863-008	SW846 6020
15-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107863-008	SW846 6020
	Arsenic	0.00463	0.002	0.005	0.010	0.010	J		107863-008	SW846 6020
	Barium	0.132	0.00067	0.002	2.00	2.00			107863-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107863-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107863-008	SW846 6020
	Calcium	143	0.800	2.00	NE	NE			107863-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107863-008	SW846 6020
	Cobalt	0.000371	0.0003	0.001	NE	0.50	J		107863-008	SW846 6020
	Copper	0.00156	0.0003	0.001	1.3	1.00			107863-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107863-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107863-008	SW846 6020
	Magnesium	25.9	0.010	0.030	NE	NE			107863-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107863-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107863-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107863-008	SW846 6020
	Potassium	5.05	0.080	0.300	NE	NE			107863-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107863-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107863-008	SW846 6020
	Sodium	90.9	0.800	2.50	NE	NE			107863-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	N, U	0.002UJ	107863-008	SW846 6020
	Uranium	0.00683	0.000067	0.0002	0.030	0.030			107863-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		107863-008	SW846 6020
	Zinc	0.0033	0.0033	0.010	NE	10.0	J	J+	107863-008	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

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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	5.00	U		107885-008	SW846 6020
20-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107885-008	SW846 6020
	Arsenic	0.00267	0.002	0.005	0.010	0.010	J		107885-008	SW846 6020
	Barium	0.0553	0.00067	0.002	2.00	2.00			107885-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107885-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107885-008	SW846 6020
	Calcium	47.2	0.080	0.200	NE	NE			107885-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107885-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107885-008	SW846 6020
	Copper	0.00164	0.0003	0.001	1.3	1.00			107885-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107885-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107885-008	SW846 6020
	Magnesium	14.6	0.010	0.030	NE	NE			107885-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107885-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107885-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107885-008	SW846 6020
	Potassium	3.10	0.080	0.300	NE	NE			107885-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107885-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107885-008	SW846 6020
	Sodium	23.9	0.080	0.250	NE	NE			107885-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107885-008	SW846 6020
	Uranium	0.003	0.000067	0.0002	0.030	0.030			107885-008	SW846 6020
	Vanadium	0.00923	0.0033	0.010	NE	NE	B, J	0.01U	107885-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107885-008	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

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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	5.00	U		107891-008	SW846 6020
21-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107891-008	SW846 6020
	Arsenic	0.00245	0.002	0.005	0.010	0.010	J		107891-008	SW846 6020
	Barium	0.137	0.00067	0.002	2.00	2.00			107891-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107891-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107891-008	SW846 6020
	Calcium	57.6	0.800	2.00	NE	NE		J	107891-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107891-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107891-008	SW846 6020
	Copper	0.00188	0.0003	0.001	1.3	1.00			107891-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107891-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107891-008	SW846 6020
	Magnesium	13.7	0.010	0.030	NE	NE			107891-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107891-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107891-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107891-008	SW846 6020
	Potassium	4.46	0.080	0.300	NE	NE			107891-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107891-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107891-008	SW846 6020
	Sodium	28.8	0.080	0.250	NE	NE			107891-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107891-008	SW846 6020
	Uranium	0.00442	0.000067	0.0002	0.030	0.030			107891-008	SW846 6020
	Vanadium	0.00717	0.0033	0.010	NE	NE	B, J	0.01U	107891-008	SW846 6020
	Zinc	0.0412	0.0033	0.010	NE	10.0			107891-008	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

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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	5.00	U		107837-008	SW846 6020
08-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107837-008	SW846 6020
	Arsenic	0.003	0.002	0.005	0.010	0.010	J		107837-008	SW846 6020
	Barium	0.0933	0.00067	0.002	2.00	2.00			107837-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107837-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107837-008	SW846 6020
	Calcium	39.9	0.080	0.200	NE	NE			107837-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107837-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107837-008	SW846 6020
	Copper	0.00186	0.0003	0.001	1.3	1.00			107837-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107837-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107837-008	SW846 6020
	Magnesium	8.31	0.010	0.030	NE	NE			107837-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107837-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107837-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107837-008	SW846 6020
	Potassium	3.64	0.080	0.300	NE	NE			107837-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107837-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107837-008	SW846 6020
	Sodium	38.0	0.080	0.250	NE	NE			107837-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107837-008	SW846 6020
	Uranium	0.00341	0.000067	0.0002	0.030	0.030			107837-008	SW846 6020
	Vanadium	0.00942	0.0033	0.010	NE	NE	J		107837-008	SW846 6020
	Zinc	0.0325	0.0033	0.010	NE	10.0			107837-008	SW846 6020

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Table 2A-6 *(Continued)*
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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]
OBS-MW1	Aluminum	ND	0.0193	0.050	NE	5.00	U		107869-008	SW846 6020
18-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107869-008	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		107869-008	SW846 6020
	Barium	0.0173	0.00067	0.002	2.00	2.00			107869-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107869-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107869-008	SW846 6020
	Calcium	81.9	0.800	2.00	NE	NE			107869-008	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107869-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107869-008	SW846 6020
	Copper	0.00166	0.0003	0.001	1.3	1.00			107869-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107869-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107869-008	SW846 6020
	Magnesium	16.4	0.010	0.030	NE	NE			107869-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107869-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107869-008	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107869-008	SW846 6020
	Potassium	1.75	0.080	0.300	NE	NE			107869-008	SW846 6020
	Selenium	0.00273	0.002	0.005	0.050	0.050	J		107869-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107869-008	SW846 6020
	Sodium	24.2	0.080	0.250	NE	NE			107869-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	N, U	0.002UJ	107869-008	SW846 6020
	Uranium	0.00912	0.000067	0.0002	0.030	0.030			107869-008	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		107869-008	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107869-008	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

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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	5.00	U		107879-008	SW846 6020
19-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107879-008	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		107879-008	SW846 6020
	Barium	0.0722	0.00067	0.002	2.00	2.00			107879-008	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107879-008	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107879-008	SW846 6020
	Calcium	51.7	0.800	2.00	NE	NE			107879-008	SW846 6020
	Chromium	0.0031	0.003	0.010	0.100	0.050	J		107879-008	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107879-008	SW846 6020
	Copper	0.00255	0.0003	0.001	1.3	1.00			107879-008	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107879-008	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107879-008	SW846 6020
	Magnesium	9.34	0.010	0.030	NE	NE			107879-008	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107879-008	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107879-008	SW846 7470
	Nickel	0.00257	0.0006	0.002	NE	0.20			107879-008	SW846 6020
	Potassium	3.48	0.080	0.300	NE	NE			107879-008	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107879-008	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107879-008	SW846 6020
	Sodium	28.7	0.080	0.250	NE	NE			107879-008	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	N, U	0.002UJ	107879-008	SW846 6020
	Uranium	0.0033	0.000067	0.0002	0.030	0.030			107879-008	SW846 6020
	Vanadium	0.00654	0.0033	0.010	NE	NE	B, J	0.01U	107879-008	SW846 6020
	Zinc	0.0127	0.0033	0.010	NE	10.0			107879-008	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

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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	5.00	U		107895-009	SW846 6020
22-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107895-009	SW846 6020
	Arsenic	ND	0.002	0.005	0.010	0.010	U		107895-009	SW846 6020
	Barium	0.0728	0.00067	0.002	2.00	2.00			107895-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107895-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107895-009	SW846 6020
	Calcium	71.5	0.800	2.00	NE	NE			107895-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107895-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107895-009	SW846 6020
	Copper	0.00182	0.0003	0.001	1.3	1.00			107895-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107895-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107895-009	SW846 6020
	Magnesium	12.0	0.010	0.030	NE	NE			107895-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107895-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107895-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107895-009	SW846 6020
	Potassium	5.00	0.080	0.300	NE	NE			107895-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107895-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107895-009	SW846 6020
	Sodium	23.9	0.080	0.250	NE	NE			107895-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107895-009	SW846 6020
	Uranium	0.00357	0.000067	0.0002	0.030	0.030			107895-009	SW846 6020
	Vanadium	0.00423	0.0033	0.010	NE	NE	J		107895-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107895-009	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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	5.00	U		107851-009	SW846 6020
12-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107851-009	SW846 6020
	Arsenic	0.00354	0.002	0.005	0.010	0.010	J		107851-009	SW846 6020
	Barium	0.0576	0.00067	0.002	2.00	2.00			107851-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107851-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107851-009	SW846 6020
	Calcium	135	0.800	2.00	NE	NE			107851-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107851-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107851-009	SW846 6020
	Copper	0.00523	0.0003	0.001	1.3	1.00		J+	107851-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107851-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107851-009	SW846 6020
	Magnesium	35.4	0.010	0.030	NE	NE			107851-009	SW846 6020
	Manganese	0.00126	0.001	0.005	NE	0.20	J	J+	107851-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107851-009	SW846 7470
	Nickel	0.00341	0.0006	0.002	NE	0.20			107851-009	SW846 6020
	Potassium	7.38	0.080	0.300	NE	NE			107851-009	SW846 6020
	Selenium	0.00203	0.002	0.005	0.050	0.050	J		107851-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107851-009	SW846 6020
	Sodium	86.9	0.800	2.50	NE	NE			107851-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107851-009	SW846 6020
	Uranium	0.0146	0.000067	0.0002	0.030	0.030			107851-009	SW846 6020
	Vanadium	0.00501	0.0033	0.010	NE	NE	J		107851-009	SW846 6020
	Zinc	0.00621	0.0033	0.010	NE	10.0	J		107851-009	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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 (Duplicate)	Aluminum	ND	0.0193	0.050	NE	5.00	U		107852-009	SW846 6020
12-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107852-009	SW846 6020
	Arsenic	0.00366	0.002	0.005	0.010	0.010	J		107852-009	SW846 6020
	Barium	0.0581	0.00067	0.002	2.00	2.00			107852-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107852-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107852-009	SW846 6020
	Calcium	136	0.800	2.00	NE	NE			107852-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107852-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107852-009	SW846 6020
	Copper	0.00509	0.0003	0.001	1.3	1.00		J+	107852-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107852-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107852-009	SW846 6020
	Magnesium	36.0	0.010	0.030	NE	NE			107852-009	SW846 6020
	Manganese	0.00124	0.001	0.005	NE	0.20	J	J+	107852-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107852-009	SW846 7470
	Nickel	0.00331	0.0006	0.002	NE	0.20			107852-009	SW846 6020
	Potassium	7.78	0.080	0.300	NE	NE			107852-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107852-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107852-009	SW846 6020
	Sodium	86.9	0.800	2.50	NE	NE			107852-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107852-009	SW846 6020
	Uranium	0.0146	0.000067	0.0002	0.030	0.030			107852-009	SW846 6020
	Vanadium	0.0055	0.0033	0.010	NE	NE	J		107852-009	SW846 6020
	Zinc	0.00525	0.0033	0.010	NE	10.0	J		107852-009	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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	5.00	U		107856-009	SW846 6020
13-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107856-009	SW846 6020
	Arsenic	0.00329	0.002	0.005	0.010	0.010	J		107856-009	SW846 6020
	Barium	0.00925	0.00067	0.002	2.00	2.00			107856-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107856-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107856-009	SW846 6020
	Calcium	61.1	2.00	5.00	NE	NE			107856-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107856-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107856-009	SW846 6020
	Copper	0.0048	0.0003	0.001	1.3	1.00			107856-009	SW846 6020
	Iron	0.0456	0.033	0.100	NE	1.00	J		107856-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107856-009	SW846 6020
	Magnesium	3.25	0.010	0.030	NE	NE			107856-009	SW846 6020
	Manganese	0.00263	0.001	0.005	NE	0.20	J		107856-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107856-009	SW846 7470
	Nickel	0.00129	0.0006	0.002	NE	0.20	J		107856-009	SW846 6020
	Potassium	2.26	0.080	0.300	NE	NE			107856-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107856-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107856-009	SW846 6020
	Sodium	1,020	2.00	6.25	NE	NE			107856-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107856-009	SW846 6020
	Uranium	0.000215	0.000067	0.0002	0.030	0.030			107856-009	SW846 6020
	Vanadium	ND	0.0033	0.010	NE	NE	U		107856-009	SW846 6020
	Zinc	0.0649	0.0033	0.010	NE	10.0			107856-009	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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	5.00	U		107876-009	SW846 6020
19-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107876-009	SW846 6020
	Arsenic	0.00203	0.002	0.005	0.010	0.010	J		107876-009	SW846 6020
	Barium	0.0709	0.00067	0.002	2.00	2.00			107876-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107876-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107876-009	SW846 6020
	Calcium	45.4	0.080	0.200	NE	NE			107876-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107876-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107876-009	SW846 6020
	Copper	0.00167	0.0003	0.001	1.3	1.00			107876-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107876-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107876-009	SW846 6020
	Magnesium	13.3	0.010	0.030	NE	NE			107876-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107876-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107876-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107876-009	SW846 6020
	Potassium	4.24	0.080	0.300	NE	NE			107876-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107876-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107876-009	SW846 6020
	Sodium	39.3	0.080	0.250	NE	NE			107876-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	N, U	0.002UJ	107876-009	SW846 6020
	Uranium	0.00321	0.000067	0.0002	0.030	0.030			107876-009	SW846 6020
	Vanadium	0.00699	0.0033	0.010	NE	NE	B, J	0.01U	107876-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107876-009	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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	5.00	U		107882-009	SW846 6020
20-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107882-009	SW846 6020
	Arsenic	0.00211	0.002	0.005	0.010	0.010	J		107882-009	SW846 6020
	Barium	0.0568	0.00067	0.002	2.00	2.00			107882-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107882-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107882-009	SW846 6020
	Calcium	37.5	0.080	0.200	NE	NE			107882-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107882-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107882-009	SW846 6020
	Copper	0.00161	0.0003	0.001	1.3	1.00			107882-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107882-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107882-009	SW846 6020
	Magnesium	10.7	0.010	0.030	NE	NE			107882-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107882-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107882-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107882-009	SW846 6020
	Potassium	4.51	0.080	0.300	NE	NE			107882-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107882-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107882-009	SW846 6020
	Sodium	47.3	0.800	2.50	NE	NE		J	107882-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107882-009	SW846 6020
	Uranium	0.00228	0.000067	0.0002	0.030	0.030			107882-009	SW846 6020
	Vanadium	0.00966	0.0033	0.010	NE	NE	B, J	0.01U	107882-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107882-009	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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	5.00	U		107888-009	SW846 6020
21-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107888-009	SW846 6020
	Arsenic	0.00206	0.002	0.005	0.010	0.010	J		107888-009	SW846 6020
	Barium	0.0549	0.00067	0.002	2.00	2.00			107888-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107888-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107888-009	SW846 6020
	Calcium	37.8	0.080	0.200	NE	NE			107888-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107888-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107888-009	SW846 6020
	Copper	0.00158	0.0003	0.001	1.3	1.00			107888-009	SW846 6020
	Iron	ND	0.033	0.100	NE	1.00	U		107888-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107888-009	SW846 6020
	Magnesium	10.8	0.010	0.030	NE	NE			107888-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U		107888-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107888-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107888-009	SW846 6020
	Potassium	4.38	0.080	0.300	NE	NE			107888-009	SW846 6020
	Selenium	ND	0.002	0.005	0.050	0.050	U		107888-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107888-009	SW846 6020
	Sodium	58.0	0.800	2.50	NE	NE		J	107888-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107888-009	SW846 6020
	Uranium	0.00228	0.000067	0.0002	0.030	0.030			107888-009	SW846 6020
	Vanadium	0.0106	0.0033	0.010	NE	NE	B	J+	107888-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107888-009	SW846 6020

Refer to footnotes on page 2A-44.

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 2019

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	5.00	U		107840-009	SW846 6020
11-Mar-19	Antimony	ND	0.001	0.003	0.006	0.006	U		107840-009	SW846 6020
	Arsenic	0.00328	0.002	0.005	0.010	0.010	J		107840-009	SW846 6020
	Barium	0.0457	0.00067	0.002	2.00	2.00			107840-009	SW846 6020
	Beryllium	ND	0.0002	0.0005	0.004	0.004	U		107840-009	SW846 6020
	Cadmium	ND	0.0003	0.001	0.005	0.005	U		107840-009	SW846 6020
	Calcium	162	0.400	1.00	NE	NE			107840-009	SW846 6020
	Chromium	ND	0.003	0.010	0.100	0.050	U		107840-009	SW846 6020
	Cobalt	ND	0.0003	0.001	NE	0.50	U		107840-009	SW846 6020
	Copper	0.0016	0.0003	0.001	1.3	1.00			107840-009	SW846 6020
	Iron	0.0386	0.033	0.100	NE	1.00	J		107840-009	SW846 6020
	Lead	ND	0.0005	0.002	0.015	0.015	U		107840-009	SW846 6020
	Magnesium	35.9	0.010	0.030	NE	NE			107840-009	SW846 6020
	Manganese	ND	0.001	0.005	NE	0.20	U	R	107840-009	SW846 6020
	Mercury	ND	0.000067	0.0002	0.002	0.002	U		107840-009	SW846 7470
	Nickel	ND	0.0006	0.002	NE	0.20	U		107840-009	SW846 6020
	Potassium	7.03	0.080	0.300	NE	NE			107840-009	SW846 6020
	Selenium	0.00238	0.002	0.005	0.050	0.050	J		107840-009	SW846 6020
	Silver	ND	0.0003	0.001	NE	0.050	U		107840-009	SW846 6020
	Sodium	106	0.400	1.25	NE	NE			107840-009	SW846 6020
	Thallium	ND	0.0006	0.002	0.002	0.002	U		107840-009	SW846 6020
	Uranium	0.0172	0.000067	0.0002	0.030	0.030			107840-009	SW846 6020
	Vanadium	0.00465	0.0033	0.010	NE	NE	J		107840-009	SW846 6020
	Zinc	ND	0.0033	0.010	NE	10.0	U		107840-009	SW846 6020

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

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	-1.46 ± 3.80	5.90	2.84	NE	NE	U	BD	107899-010	EPA 901.1
25-Mar-19	Cesium-137	0.795 ± 2.83	5.01	2.34	NE	NE	U	BD	107899-010	EPA 901.1
	Cobalt-60	-0.0505 ± 2.57	4.75	2.11	NE	NE	U	BD	107899-010	EPA 901.1
	Potassium-40	42.4 ± 68.1	46.7	20.6	NE	NE	U	BD	107899-010	EPA 901.1
	Gross Alpha	0.48	NA	NA	15 pCi/L	NE	NA	None	107899-011	EPA 900.0
	Gross Beta	35.1 ± 5.46	7.57	3.67	4 mrem/yr	NE			107899-011	EPA 900.0
	Uranium-233/234	10.7 ± 1.11	0.118	0.0541	NE	NE			107902-002	HASL-300
	Uranium-235/236	0.174 ± 0.0585	0.0857	0.0368	NE	NE		J	107902-002	HASL-300
	Uranium-238	2.25 ± 0.281	0.0864	0.0383	NE	NE			107902-002	HASL-300
	Radium-226	0.121 ± 0.179	0.310	0.0947	5 pCi/L	5 pCi/L	U	BD	107899-012	EPA 903.1
	Radium-228	0.888 ± 0.389	0.359	0.156	5 pCi/L	5 pCi/L		J	107902-001	EPA 904.0
Coyote Springs	Americium-241	1.40 ± 3.38	5.39	2.60	NE	NE	U	BD	107900-010	EPA 901.1
(Duplicate)	Cesium-137	1.74 ± 2.64	4.20	1.97	NE	NE	U	BD	107900-010	EPA 901.1
25-Mar-19	Cobalt-60	0.746 ± 2.02	3.89	1.74	NE	NE	U	BD	107900-010	EPA 901.1
	Potassium-40	-23.1 ± 44.5	58.0	26.9	NE	NE	U	BD	107900-010	EPA 901.1
	Gross Alpha	1.03	NA	NA	15 pCi/L	NE	NA	None	107900-011	EPA 900.0
	Gross Beta	28.1 ± 5.18	7.38	3.57	4 mrem/yr	NE			107900-011	EPA 900.0
	Uranium-233/234	10.6 ± 1.20	0.165	0.0756	NE	NE			107903-002	HASL-300
	Uranium-235/236	0.143 ± 0.0675	0.120	0.0514	NE	NE		J	107903-002	HASL-300
	Uranium-238	2.33 ± 0.327	0.121	0.0535	NE	NE			107903-002	HASL-300
	Radium-226	0.394 ± 0.340	0.485	0.183	5 pCi/L	5 pCi/L	U	BD	107900-012	EPA 903.1
	Radium-228	1.34 ± 0.752	0.961	0.439	5 pCi/L	5 pCi/L		J+	107903-001	EPA 904.0
CCBA-MW2	Americium-241	-2.48 ± 11.2	18.4	8.97	NE	NE	U	BD	107830-010	EPA 901.1
07-Mar-19	Cesium-137	-1.67 ± 2.34	3.56	1.69	NE	NE	U	BD	107830-010	EPA 901.1
	Cobalt-60	-0.622 ± 2.08	3.58	1.66	NE	NE	U	BD	107830-010	EPA 901.1
	Potassium-40	47.5 ± 36.8	52.5	24.9	NE	NE	U	BD	107830-010	EPA 901.1
	Gross Alpha	0.81	NA	NA	15 pCi/L	NE	NA	None	107830-011	EPA 900.0
	Gross Beta	3.64 ± 1.18	1.85	0.900	4 mrem/yr	NE		J	107830-011	EPA 900.0
	Uranium-233/234	7.49 ± 0.0807	0.122	0.0561	NE	NE			107834-002	HASL-300
	Uranium-235/236	0.171 ± 0.0591	0.0888	0.0381	NE	NE		J	107834-002	HASL-300
	Uranium-238	1.63 ± 0.223	0.0895	0.0397	NE	NE			107834-002	HASL-300
	Radium-226	0.353 ± 0.332	0.518	0.211	5 pCi/L	5 pCi/L	U	BD	107830-012	EPA 903.1
	Radium-228	-0.015 ± 0.251	0.483	0.213	5 pCi/L	5 pCi/L	U	BD	107834-001	EPA 904.0

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

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]
CCBA-MW2 (Duplicate)	Americium-241	-3.43 ± 8.35	12.3	5.98	NE	NE	U	BD	107831-010	EPA 901.1
07-Mar-19	Cesium-137	-0.196 ± 3.37	3.40	1.62	NE	NE	U	BD	107831-010	EPA 901.1
	Cobalt-60	3.09 ± 4.14	3.52	1.64	NE	NE	U	BD	107831-010	EPA 901.1
	Potassium-40	33.6 ± 52.4	32.1	14.8	NE	NE	X	R	107831-010	EPA 901.1
	Gross Alpha	1.03	NA	NA	15 pCi/L	NE	NA	None	107831-011	EPA 900.0
	Gross Beta	3.04 ± 0.800	1.20	0.579	4 mrem/yr	NE		J	107831-011	EPA 900.0
	Uranium-233/234	7.37 ± 0.769	0.108	0.0496	NE	NE			107904-002	HASL-300
	Uranium-235/236	0.168 ± 0.0573	0.0786	0.0338	NE	NE		J	107904-002	HASL-300
	Uranium-238	1.63 ± 0.214	0.0792	0.0351	NE	NE			107904-002	HASL-300
	Radium-226	0.336 ± 0.257	0.322	0.111	5 pCi/L	5 pCi/L		NJ+	107831-012	EPA 903.1
	Radium-228	0.600 ± 0.354	0.449	0.197	5 pCi/L	5 pCi/L		J	107904-001	EPA 904.0
CTF-MW1	Americium-241	-2.58 ± 14.5	24.5	11.9	NE	NE	U	BD	107859-010	EPA 901.1
14-Mar-19	Cesium-137	-0.557 ± 1.75	3.10	1.47	NE	NE	U	BD	107859-010	EPA 901.1
	Cobalt-60	0.445 ± 1.97	3.53	1.64	NE	NE	U	BD	107859-010	EPA 901.1
	Potassium-40	-43.2 ± 41.1	48.2	22.8	NE	NE	U	BD	107859-010	EPA 901.1
	Gross Alpha	0.10	NA	NA	15 pCi/L	NE	NA	None	107859-011	EPA 900.0
	Gross Beta	3.37 ± 0.980	1.50	0.725	4 mrem/yr	NE		J	107859-011	EPA 900.0
	Uranium-233/234	23.7 ± 2.37	0.119	0.0545	NE	NE			107861-002	HASL-300
	Uranium-235/236	0.288 ± 0.0779	0.0863	0.0371	NE	NE			107861-002	HASL-300
	Uranium-238	3.71 ± 0.428	0.087	0.0386	NE	NE			107861-002	HASL-300
	Radium-226	0.301 ± 0.337	0.542	0.215	5 pCi/L	5 pCi/L	U	BD	107859-012	EPA 903.1
	Radium-228	0.149 ± 0.283	0.495	0.215	5 pCi/L	5 pCi/L	U	BD	107861-001	EPA 904.0
CYN-MW5	Americium-241	2.88 ± 8.75	13.9	6.79	NE	NE	U	BD	107825-010	EPA 901.1
06-Mar-19	Cesium-137	-1.14 ± 2.99	3.76	1.79	NE	NE	U	BD	107825-010	EPA 901.1
	Cobalt-60	0.372 ± 2.31	4.21	1.97	NE	NE	U	BD	107825-010	EPA 901.1
	Potassium-40	71.4 ± 74.9	37.8	17.5	NE	NE	X	R	107825-010	EPA 901.1
	Gross Alpha	0.84	NA	NA	15 pCi/L	NE	NA	None	107825-011	EPA 900.0
	Gross Beta	4.54 ± 0.872	1.25	0.612	4 mrem/yr	NE			107825-011	EPA 900.0
	Uranium-233/234	0.945 ± 0.152	0.113	0.0517	NE	NE			107827-002	HASL-300
	Uranium-235/236	0.0426 ± 0.0357	0.0819	0.0352	NE	NE	U	BD	107827-002	HASL-300
	Uranium-238	0.248 ± 0.0691	0.0825	0.0366	NE	NE			107827-002	HASL-300
	Radium-226	0.673 ± 0.432	0.572	0.233	5 pCi/L	5 pCi/L		J	107825-012	EPA 903.1
	Radium-228	0.683 ± 0.355	0.399	0.171	5 pCi/L	5 pCi/L		J	107827-001	EPA 904.0

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

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]
Greystone-MW2	Americium-241	11.8 ± 14.7	23.1	11.3	NE	NE	U	BD	107863-010	EPA 901.1
15-Mar-19	Cesium-137	4.02 ± 3.87	3.86	1.84	NE	NE	X	R	107863-010	EPA 901.1
	Cobalt-60	-1.25 ± 2.69	4.48	2.09	NE	NE	U	BD	107863-010	EPA 901.1
	Potassium-40	17.7 ± 59.4	44.9	20.9	NE	NE	U	BD	107863-010	EPA 901.1
	Gross Alpha	-1.50	NA	NA	15 pCi/L	NE	NA	None	107863-011	EPA 900.0
	Gross Beta	3.79 ± 2.46	4.02	1.95	4 mrem/yr	NE	U	BD	107863-011	EPA 900.0
	Uranium-233/234	9.36 ± 0.957	0.108	0.0494	NE	NE			107865-002	HASL-300
	Uranium-235/236	0.196 ± 0.0616	0.0782	0.0336	NE	NE		J	107865-002	HASL-300
	Uranium-238	2.24 ± 0.273	0.0788	0.035	NE	NE			107865-002	HASL-300
	Radium-226	0.549 ± 0.385	0.467	0.170	5 pCi/L	5 pCi/L		J	107863-012	EPA 903.1
	Radium-228	0.278 ± 0.305	0.489	0.213	5 pCi/L	5 pCi/L	U	BD	107865-001	EPA 904.0
MRN-2	Americium-241	-3.08 ± 7.97	13.2	6.31	NE	NE	U	BD	107885-010	EPA 901.1
20-Mar-19	Cesium-137	-2.07 ± 3.71	4.71	2.24	NE	NE	U	BD	107885-010	EPA 901.1
	Cobalt-60	-0.252 ± 1.83	3.43	1.53	NE	NE	U	BD	107885-010	EPA 901.1
	Potassium-40	55.4 ± 48.4	39.3	17.8	NE	NE	X	R	107885-010	EPA 901.1
	Gross Alpha	1.48	NA	NA	15 pCi/L	NE	NA	None	107885-011	EPA 900.0
	Gross Beta	3.86 ± 0.711	0.937	0.448	4 mrem/yr	NE			107885-011	EPA 900.0
	Radium-226	0.147 ± 0.229	0.407	0.148	5 pCi/L	5 pCi/L	U	BD	107885-012	EPA 903.1
	Radium-228	0.526 ± 0.362	0.493	0.214	5 pCi/L	5 pCi/L		J	107887-001	EPA 904.0
MRN-3D	Americium-241	0.830 ± 10.4	18.5	8.88	NE	NE	U	BD	107891-010	EPA 901.1
21-Mar-19	Cesium-137	1.24 ± 2.04	3.65	1.71	NE	NE	U	BD	107891-010	EPA 901.1
	Cobalt-60	0.398 ± 1.84	3.53	1.59	NE	NE	U	BD	107891-010	EPA 901.1
	Potassium-40	-23.6 ± 41.1	53.7	25.1	NE	NE	U	BD	107891-010	EPA 901.1
	Gross Alpha	2.51	NA	NA	15 pCi/L	NE	NA	None	107891-011	EPA 900.0
	Gross Beta	3.71 ± 0.793	1.14	0.550	4 mrem/yr	NE			107891-011	EPA 900.0
	Radium-226	0.0502 ± 0.260	0.555	0.202	5 pCi/L	5 pCi/L	U	BD	107891-012	EPA 903.1
	Radium-228	0.130 ± 0.250	0.432	0.195	5 pCi/L	5 pCi/L	U	BD	107894-001	EPA 904.0
NWTA3-MW3D	Americium-241	-12.3 ± 15.0	16.0	7.73	NE	NE	U	BD	107837-010	EPA 901.1
08-Mar-19	Cesium-137	-0.353 ± 1.71	2.95	1.39	NE	NE	U	BD	107837-010	EPA 901.1
	Cobalt-60	-0.935 ± 1.68	2.82	1.28	NE	NE	U	BD	107837-010	EPA 901.1
	Potassium-40	1.49 ± 33.8	48.6	23.1	NE	NE	U	BD	107837-010	EPA 901.1
	Gross Alpha	0.53	NA	NA	15 pCi/L	NE	NA	None	107837-011	EPA 900.0
	Gross Beta	3.96 ± 0.480	0.574	0.276	4 mrem/yr	NE			107837-011	EPA 900.0
	Radium-226	2.54 ± 0.835	0.319	0.0969	5 pCi/L	5 pCi/L			107837-012	EPA 903.1
	Radium-228	0.133 ± 0.208	0.356	0.155	5 pCi/L	5 pCi/L	U	BD	107839-001	EPA 904.0

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL / MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
OBS-MW1	Americium-241	1.02 ± 17.8	28.8	14.1	NE	NE	U	BD	107869-010	EPA 901.1
18-Mar-19	Cesium-137	1.09 ± 2.29	3.59	1.72	NE	NE	U	BD	107869-010	EPA 901.1
	Cobalt-60	-2.25 ± 2.62	4.08	1.92	NE	NE	U	BD	107869-010	EPA 901.1
	Potassium-40	45.7 ± 63.3	41.7	19.6	NE	NE	X	R	107869-010	EPA 901.1
	Gross Alpha	6.60	NA	NA	15 pCi/L	NE	NA	None	107869-011	EPA 900.0
	Gross Beta	4.22 ± 0.924	1.35	0.652	4 mrem/yr	NE			107869-011	EPA 900.0
	Uranium-233/234	16.4 ± 1.64	0.109	0.0501	NE	NE			107871-002	HASL-300
	Uranium-235/236	0.298 ± 0.0787	0.0794	0.0341	NE	NE			107871-002	HASL-300
	Uranium-238	3.30 ± 0.378	0.080	0.0355	NE	NE			107871-002	HASL-300
	Radium-226	0.389 ± 0.316	0.430	0.157	5 pCi/L	5 pCi/L	U	BD	107869-012	EPA 903.1
	Radium-228	-0.0535 ± 0.229	0.465	0.200	5 pCi/L	5 pCi/L	U	BD	107871-001	EPA 904.0
PL-2	Americium-241	0.720 ± 3.38	5.33	2.59	NE	NE	U	BD	107879-010	EPA 901.1
19-Mar-19	Cesium-137	-0.229 ± 2.58	3.88	1.84	NE	NE	U	BD	107879-010	EPA 901.1
	Cobalt-60	-2.74 ± 7.03	3.68	1.69	NE	NE	U	BD	107879-010	EPA 901.1
	Potassium-40	-22.4 ± 37.0	51.5	24.2	NE	NE	U	BD	107879-010	EPA 901.1
	Gross Alpha	2.67	NA	NA	15 pCi/L	NE	NA	None	107879-011	EPA 900.0
	Gross Beta	3.50 ± 0.699	0.925	0.442	4 mrem/yr	NE			107879-011	EPA 900.0
	Radium-226	0.00 ± 0.292	0.610	0.245	5 pCi/L	5 pCi/L	U	BD	107879-012	EPA 903.1
	Radium-228	0.0735 ± 0.264	0.474	0.213	5 pCi/L	5 pCi/L	U	BD	107881-001	EPA 904.0
PL-4	Americium-241	4.45 ± 15.1	25.1	12.0	NE	NE	U	BD	107895-011	EPA 901.1
22-Mar-19	Cesium-137	1.33 ± 2.26	3.74	1.74	NE	NE	U	BD	107895-011	EPA 901.1
	Cobalt-60	0.269 ± 2.34	4.44	2.02	NE	NE	U	BD	107895-011	EPA 901.1
	Potassium-40	7.78 ± 57.4	37.1	16.5	NE	NE	U	BD	107895-011	EPA 901.1
	Gross Alpha	1.54	NA	NA	15 pCi/L	NE	NA	None	107895-012	EPA 900.0
	Gross Beta	3.59 ± 0.790	0.986	0.459	4 mrem/yr	NE			107895-012	EPA 900.0
	Radium-226	0.388 ± 0.374	0.578	0.224	5 pCi/L	5 pCi/L	U	BD	107895-013	EPA 903.1
	Radium-228	0.141 ± 0.216	0.368	0.161	5 pCi/L	5 pCi/L	U	BD	107898-001	EPA 904.0

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL / MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SFR-2S	Americium-241	-4.05 ± 16.7	26.3	12.8	NE	NE	U	BD	107851-011	EPA 901.1
12-Mar-19	Cesium-137	1.03 ± 2.10	3.83	1.82	NE	NE	U	BD	107851-011	EPA 901.1
	Cobalt-60	-1.62 ± 2.18	3.41	1.56	NE	NE	U	BD	107851-011	EPA 901.1
	Potassium-40	-14.8 ± 34.3	47.6	22.4	NE	NE	U	BD	107851-011	EPA 901.1
	Gross Alpha	1.67	NA	NA	15 pCi/L	NE	NA	None	107851-012	EPA 900.0
	Gross Beta	11.8 ± 1.88	2.44	1.17	4 mrem/yr	NE			107851-012	EPA 900.0
	Uranium-233/234	20.6 ± 2.25	0.158	0.0725	NE	NE			107854-002	HASL-300
	Uranium-235/236	0.269 ± 0.0929	0.115	0.0493	NE	NE		J	107854-002	HASL-300
	Uranium-238	5.46 ± 0.656	0.116	0.0513	NE	NE			107854-002	HASL-300
	Radium-226	2.17 ± 0.725	0.616	0.251	5 pCi/L	5 pCi/L			107851-013	EPA 903.1
	Radium-228	0.307 ± 0.313	0.497	0.222	5 pCi/L	5 pCi/L	U	BD	107854-001	EPA 904.0
SFR-2S (Duplicate)	Americium-241	2.00 ± 16.8	19.7	9.54	NE	NE	U	BD	107852-011	EPA 901.1
12-Mar-19	Cesium-137	-0.242 ± 1.68	2.94	1.38	NE	NE	U	BD	107852-011	EPA 901.1
	Cobalt-60	-0.417 ± 1.86	3.36	1.53	NE	NE	U	BD	107852-011	EPA 901.1
	Potassium-40	22.5 ± 55.5	34.7	15.9	NE	NE	U	BD	107852-011	EPA 901.1
	Gross Alpha	0.03	NA	NA	15 pCi/L	NE	NA	None	107852-012	EPA 900.0
	Gross Beta	9.83 ± 1.70	2.22	1.07	4 mrem/yr	NE			107855-012	EPA 900.0
	Uranium-233/234	20.5 ± 2.29	0.170	0.0781	NE	NE			107855-002	HASL-300
	Uranium-235/236	0.502 ± 0.126	0.124	0.0531	NE	NE			107855-002	HASL-300
	Uranium-238	5.77 ± 0.706	0.125	0.0552	NE	NE			107852-002	HASL-300
	Radium-226	1.85 ± 0.651	0.587	0.239	5 pCi/L	5 pCi/L			107852-013	EPA 903.1
	Radium-228	0.216 ± 0.257	0.419	0.180	5 pCi/L	5 pCi/L	U	BD	107855-001	EPA 904.0
SFR-4T	Americium-241	-1.03 ± 13.2	21.8	10.6	NE	NE	U	BD	107856-011	EPA 901.1
13-Mar-19	Cesium-137	-0.539 ± 1.84	3.14	1.48	NE	NE	U	BD	107856-011	EPA 901.1
	Cobalt-60	0.424 ± 2.00	3.77	1.74	NE	NE	U	BD	107856-011	EPA 901.1
	Potassium-40	84.9 ± 42.1	30.8	14.0	NE	NE		J	107856-011	EPA 901.1
	Gross Alpha	1.83	NA	NA	15 pCi/L	NE	NA	None	107856-012	EPA 900.0
	Gross Beta	1.68 ± 5.49	9.40	4.55	4 mrem/yr	NE	U	BD	107856-012	EPA 900.0
	Uranium-233/234	0.523 ± 0.104	0.118	0.0541	NE	NE			107858-002	HASL-300
	Uranium-235/236	0.0223 ± 0.0263	0.0856	0.0368	NE	NE	U	BD	107858-002	HASL-300
	Uranium-238	0.0722 ± 0.0442	0.0863	0.0383	NE	NE	U	BD	107858-002	HASL-300
	Radium-226	0.372 ± 0.324	0.446	0.153	5 pCi/L	5 pCi/L	U	BD	107856-013	EPA 903.1
	Radium-228	0.301 ± 0.308	0.487	0.213	5 pCi/L	5 pCi/L	U	BD	107858-001	EPA 904.0

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL / MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
SWTA3-MW2	Americium-241	0.890 ± 3.39	5.47	2.65	NE	NE	U	BD	107876-011	EPA 901.1
19-Mar-19	Cesium-137	-0.821 ± 2.65	4.39	2.07	NE	NE	U	BD	107876-011	EPA 901.1
	Cobalt-60	-0.835 ± 2.55	4.37	1.98	NE	NE	U	BD	107876-011	EPA 901.1
	Potassium-40	35.7 ± 64.1	41.2	18.5	NE	NE	U	BD	107876-011	EPA 901.1
	Gross Alpha	3.58	NA	NA	15 pCi/L	NE	NA	None	107876-012	EPA 900.0
	Gross Beta	4.58 ± 0.710	0.881	0.421	4 mrem/yr	NE			107876-012	EPA 900.0
	Radium-226	0.235 ± 0.246	0.375	0.129	5 pCi/L	5 pCi/L	U	BD	107876-013	EPA 903.1
	Radium-228	0.296 ± 0.307	0.485	0.210	5 pCi/L	5 pCi/L	U	BD	107878-001	EPA 904.0
SWTA3-MW3	Americium-241	3.83 ± 10.7	18.9	9.10	NE	NE	U	BD	107882-011	EPA 901.1
20-Mar-19	Cesium-137	0.574 ± 2.03	3.62	1.69	NE	NE	U	BD	107882-011	EPA 901.1
	Cobalt-60	1.62 ± 2.21	4.19	1.90	NE	NE	U	BD	107882-011	EPA 901.1
	Potassium-40	59.3 ± 50.4	35.3	15.7	NE	NE	X	R	107882-011	EPA 901.1
	Gross Alpha	3.10	NA	NA	15 pCi/L	NE	NA	None	107882-012	EPA 900.0
	Gross Beta	5.84 ± 0.879	1.19	0.576	4 mrem/yr	NE			107882-012	EPA 900.0
	Radium-226	0.348 ± 0.326	0.481	0.175	5 pCi/L	5 pCi/L	U	BD	107882-013	EPA 903.1
	Radium-228	0.0586 ± 0.265	0.487	0.215	5 pCi/L	5 pCi/L	U	BD	107884-001	EPA 904.0
SWTA3-MW4	Americium-241	4.22 ± 7.28	12.8	6.13	NE	NE	U	BD	107888-011	EPA 901.1
21-Mar-19	Cesium-137	0.841 ± 1.88	3.43	1.60	NE	NE	U	BD	107888-011	EPA 901.1
	Cobalt-60	-0.852 ± 3.25	3.61	1.63	NE	NE	U	BD	107888-011	EPA 901.1
	Potassium-40	-28.5 ± 40.1	51.4	23.9	NE	NE	U	BD	107888-011	EPA 901.1
	Gross Alpha	3.21	NA	NA	15 pCi/L	NE	NA	None	107888-012	EPA 900.0
	Gross Beta	4.94 ± 0.999	1.48	0.718	4 mrem/yr	NE			107888-012	EPA 900.0
	Radium-226	0.221 ± 0.341	0.596	0.243	5 pCi/L	5 pCi/L	U	BD	107888-013	EPA 903.1
	Radium-228	0.332 ± 0.304	0.472	0.213	5 pCi/L	5 pCi/L	U	BD	107890-001	EPA 904.0

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

Well ID	Analyte	Activity[a] (pCi/L)	MDA[b] (pCi/L)	Critical Level[c] (pCi/L)	MCL / MAC[d] (pCi/L)		Laboratory Qualifier[e]	Validation Qualifier[f]	Sample No.	Analytical Method[g]
TRE-1	Americium-241	3.65 ± 12.5	19.2	9.35	NE	NE	U	BD	107840-011	EPA 901.1
11-Mar-19	Cesium-137	-0.832 ± 2.53	3.65	1.74	NE	NE	U	BD	107840-011	EPA 901.1
	Cobalt-60	-1.77 ± 2.44	3.82	1.77	NE	NE	U	BD	107840-011	EPA 901.1
	Potassium-40	62.6 ± 28.6	34.6	15.9	NE	NE		J	107840-011	EPA 901.1
	Gross Alpha	-6.13	NA	NA	15 pCi/L	NE	NA	None	107840-012	EPA 900.0
	Gross Beta	9.38 ± 1.66	2.17	1.03	4 mrem/yr	NE			107840-012	EPA 900.0
	Uranium-233/234	23.6 ± 2.32	0.107	0.049	NE	NE			107842-002	HASL-300
	Uranium-235/236	0.445 ± 0.094	0.0776	0.0333	NE	NE			107842-002	HASL-300
	Uranium-238	5.88 ± 0.624	0.0783	0.0347	NE	NE			107842-002	HASL-300
	Radium-226	3.00 ± 0.947	0.435	0.149	5 pCi/L	5 pCi/L			107840-013	EPA 903.1
	Radium-228	0.697 ± 0.375	0.480	0.221	5 pCi/L	5 pCi/L		J	107842-001	EPA 904.0

Refer to footnotes on page 2A-44.

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

Calendar Year 2019

Well ID	Sample Date	Temperature (^{0}C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
Coyote Springs	25-Mar-19	12.78	2527.6	181.0	6.05	0.95	29.4	2.43
CCBA-MW2	07-Mar-19	16.23	547.9	67.0	7.63	0.49	72.5	6.31
CTF-MW1	14-Mar-19	15.40	620.6	145.0	7.31	0.48	79.1	6.87
CYN-MW5	06-Mar-19	16.45	322.6	54.4	6.19	2.02	55.9	4.78
Greystone-MW2	15-Mar-19	12.91	1022.2	152.1	7.08	0.46	72.4	6.78
MRN-2	20-Mar-19	15.86	398.6	197.6	7.49	0.32	74.3	6.67
MRN-3D	21-Mar-19	18.62	481.5	23.5	7.53	1.36	32.6	2.70
NWTA3-MW3D	08-Mar-19	19.21	383.4	110.2	7.69	0.94	52.5	4.21
OBS-MW1	18-Mar-19	15.90	524.0	135.2	7.57	0.47	38.1	3.41
PL-2	19-Mar-19	18.26	457.6	183.0	7.73	0.19	81.8	6.54
PL-4	22-Mar-19	18.18	496.1	169.1	7.40	0.89	79.0	6.71
SFR-2S	12-Mar-19	17.88	1087.6	132.4	6.85	14.7	90.8	7.41
SFR-4T	13-Mar-19	14.82	3832.7	18.0	7.93	1.36	7.9	0.72
SWTA3-MW2	19-Mar-19	18.04	450.6	97.8	7.63	1.23	55.4	4.72
SWTA3-MW3	20-Mar-19	19.19	464.9	52.1	7.68	2.31	57.3	4.34
SWTA3-MW4	21-Mar-19	15.65	456.0	164.4	7.87	0.43	58.6	4.91
TRE-1	11-Mar-19	15.81	1240.8	148.6	6.70	0.38	80.4	6.90

Refer to footnotes on page 2A-44.

Footnotes for Groundwater Monitoring Program Groundwater Surveillance Task Analytical Results Tables

%	= Percent.
$CaCO_3$	= 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 and 2A-3 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 and 2A-3 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 March 2018).

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]Laboratory 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).
H	=	Analytical holding time was exceeded.
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 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.
NJ+	=	Presumptive evidence of the presence of the material at 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.
R	=	The data are unusable, and resampling or reanalysis are necessary for verification.

[g]Analytical Method

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, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C.

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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.
μmho/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 2B
Groundwater Monitoring Program
Hydrographs and Charts

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Attachment 2B Hydrographs and Charts

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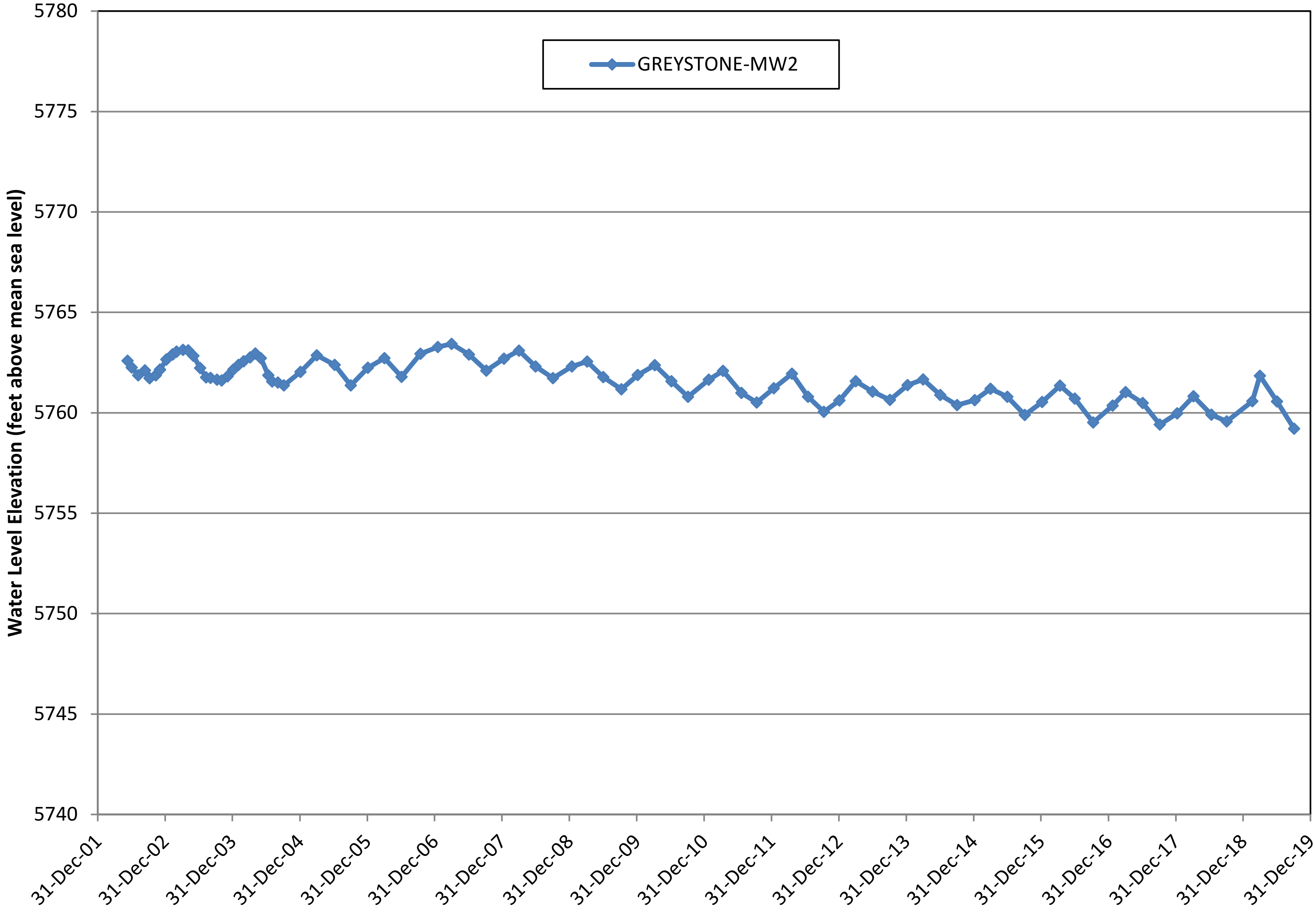

Figure 2B-1. Groundwater Monitoring Program Study Wells (1 of 9)

Figure 2B-2. Groundwater Monitoring Program Study Wells (2 of 9)

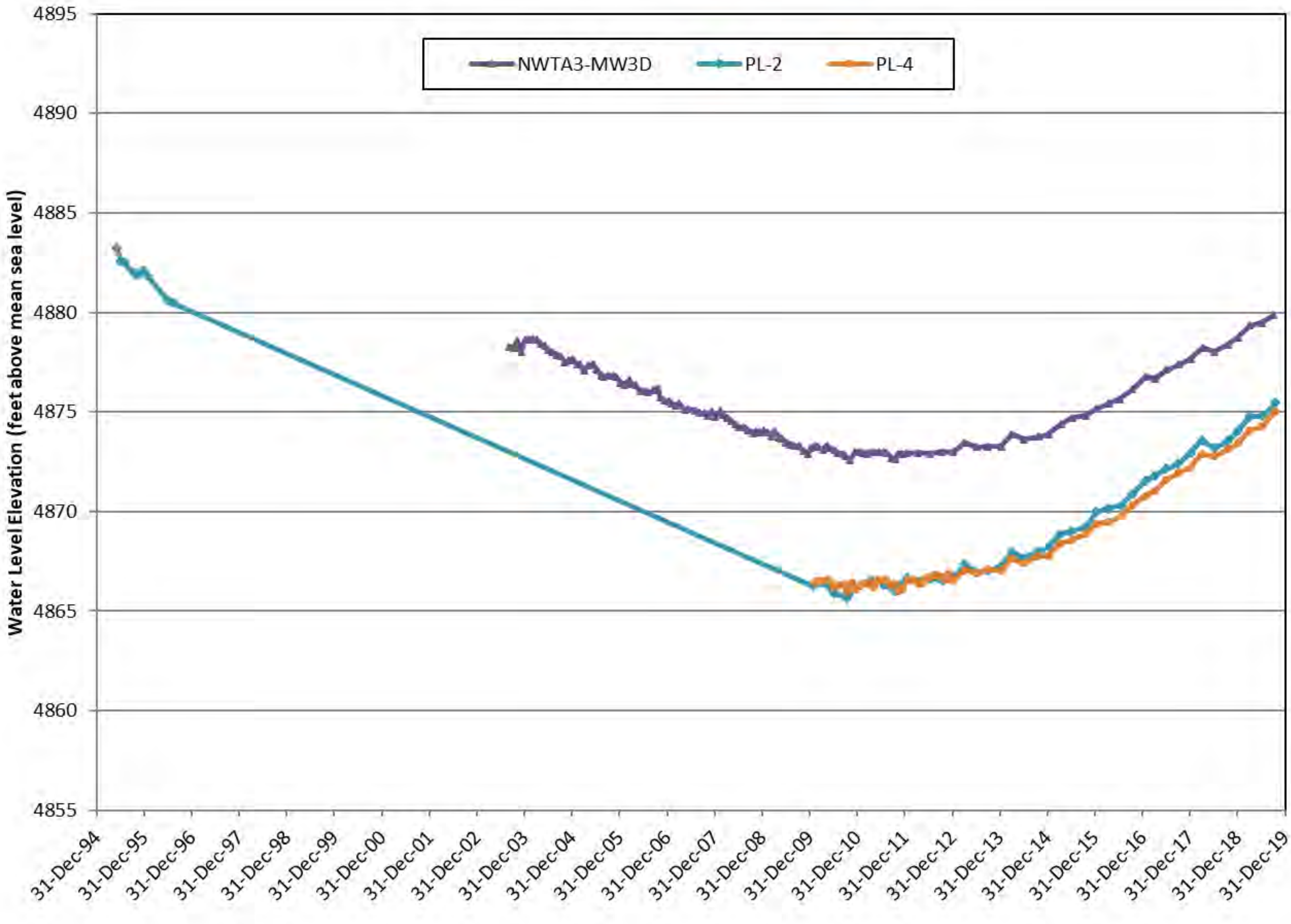

Figure 2B-3. Groundwater Monitoring Program Study Wells (3 of 9)

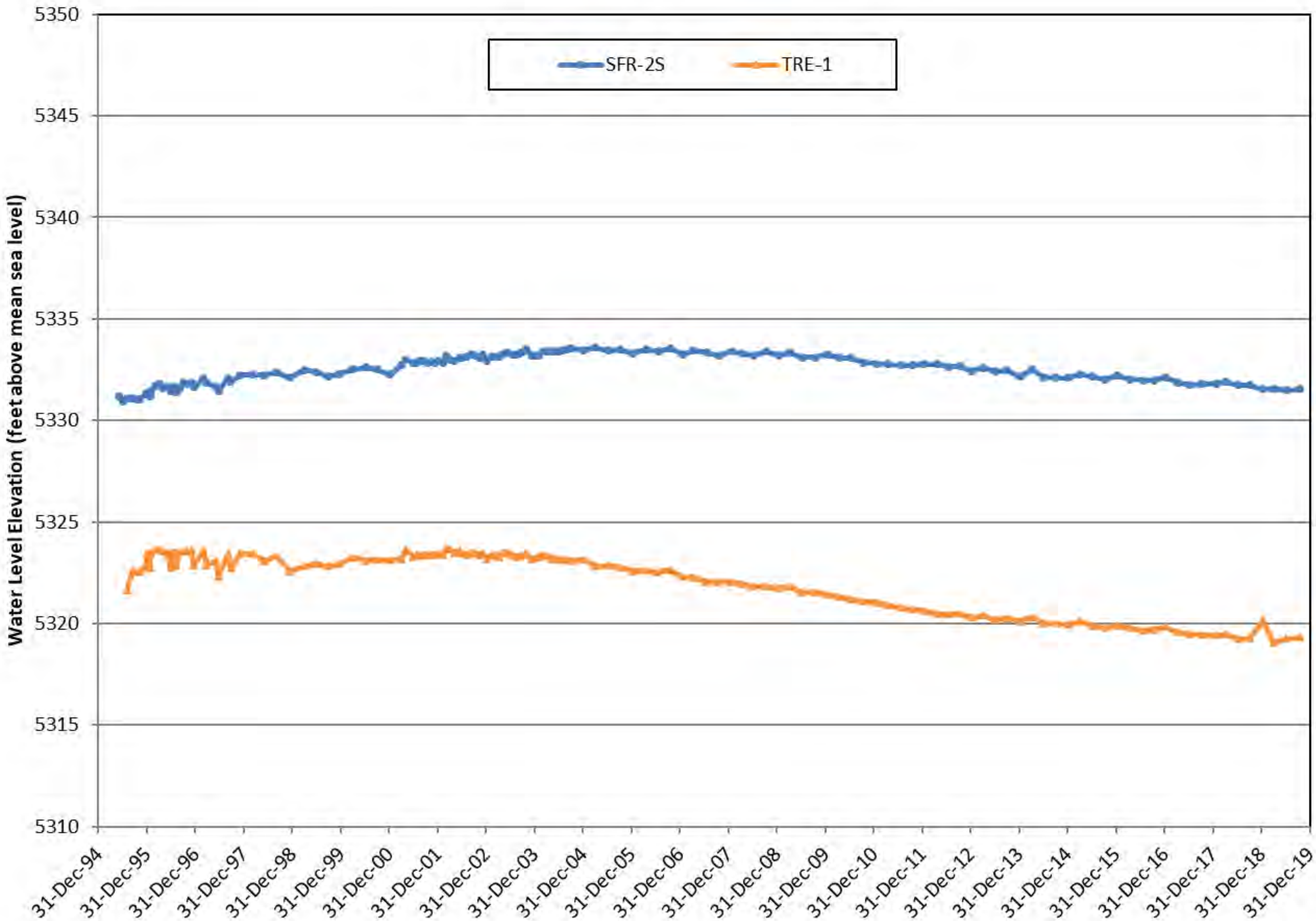

Figure 2B-4. Groundwater Monitoring Program Study Wells (4 of 9)

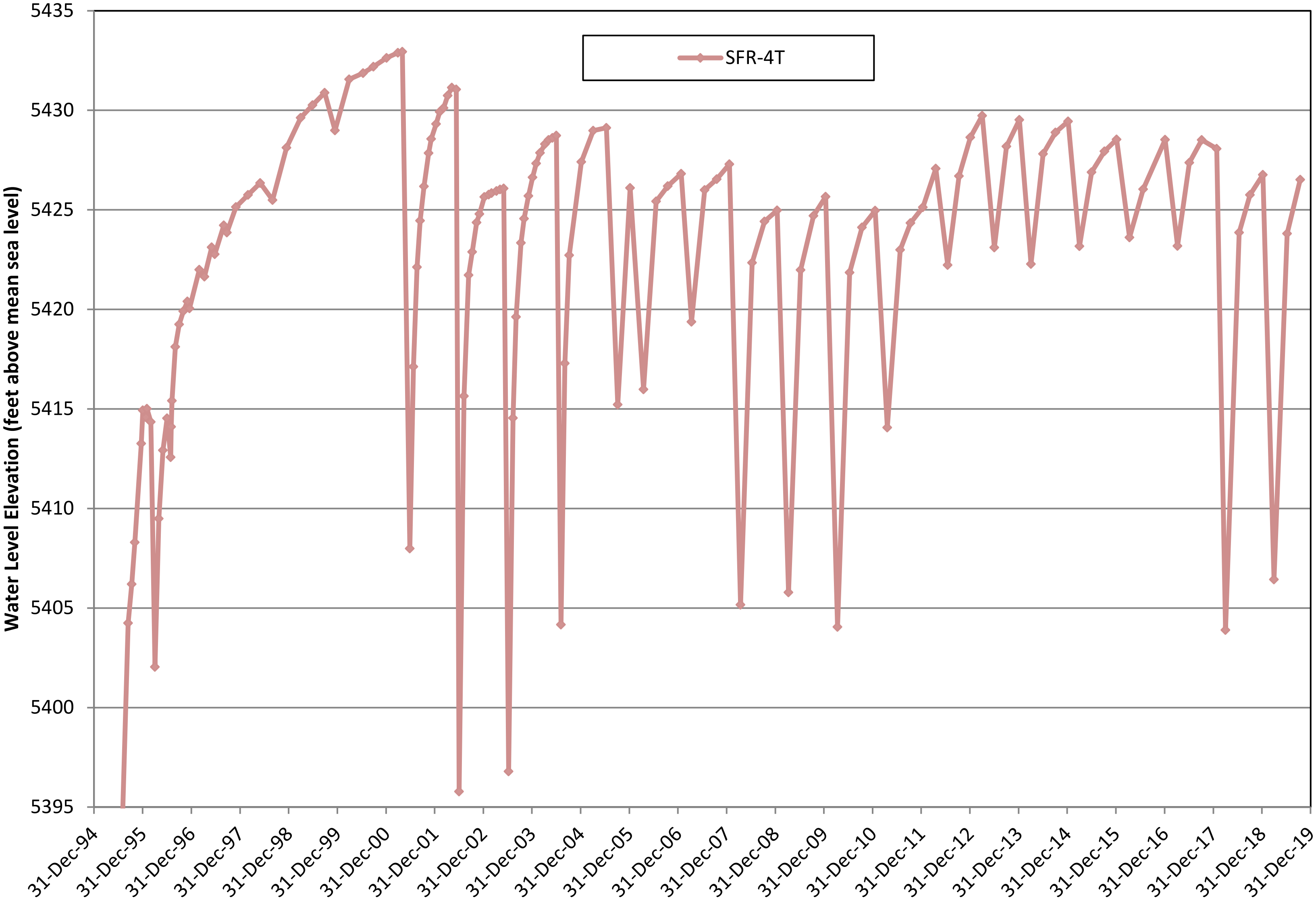

Figure 2B-5. Groundwater Monitoring Program Study Wells (5 of 9)

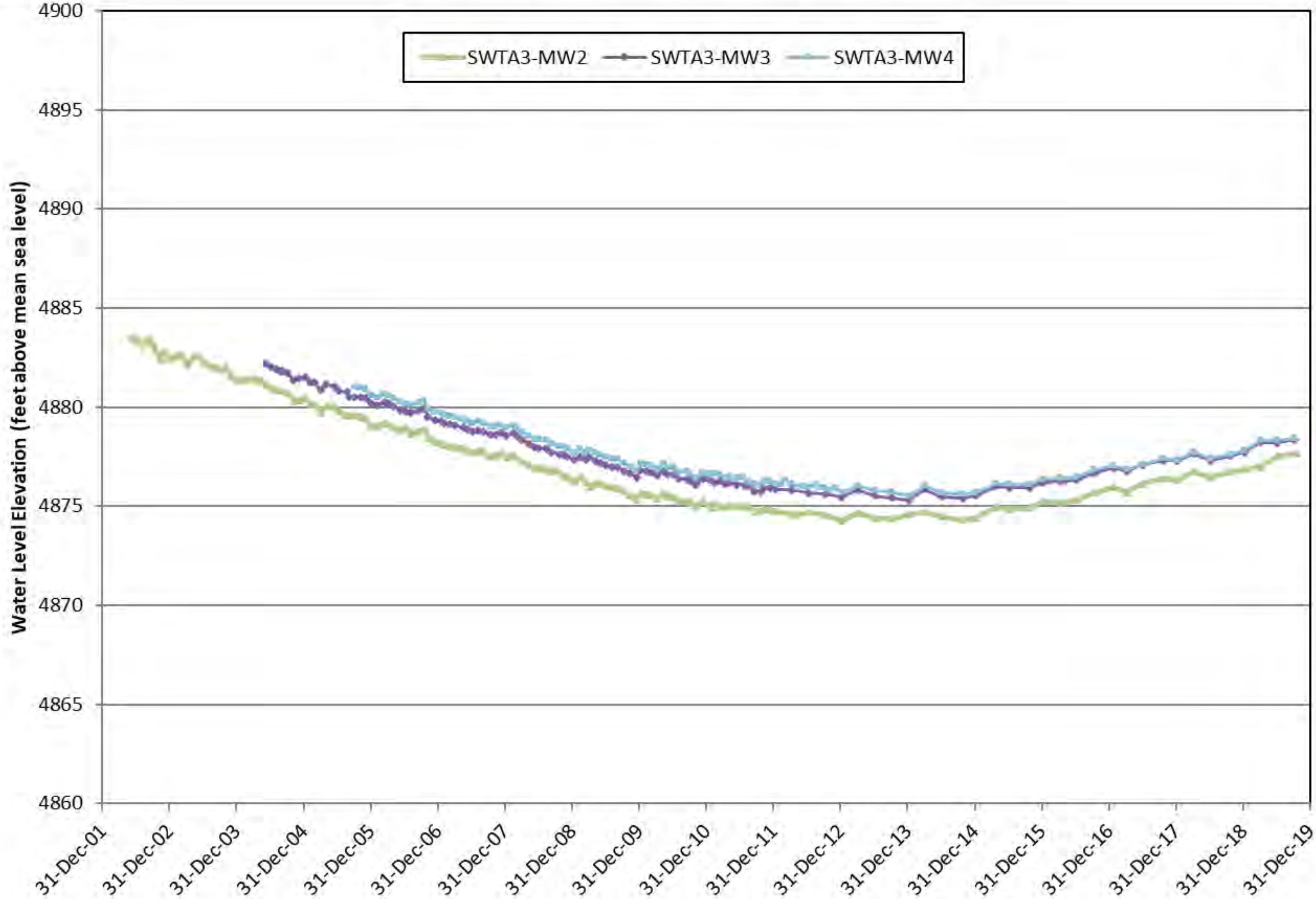

Figure 2B-6. Groundwater Monitoring Program Study Wells (6 of 9)

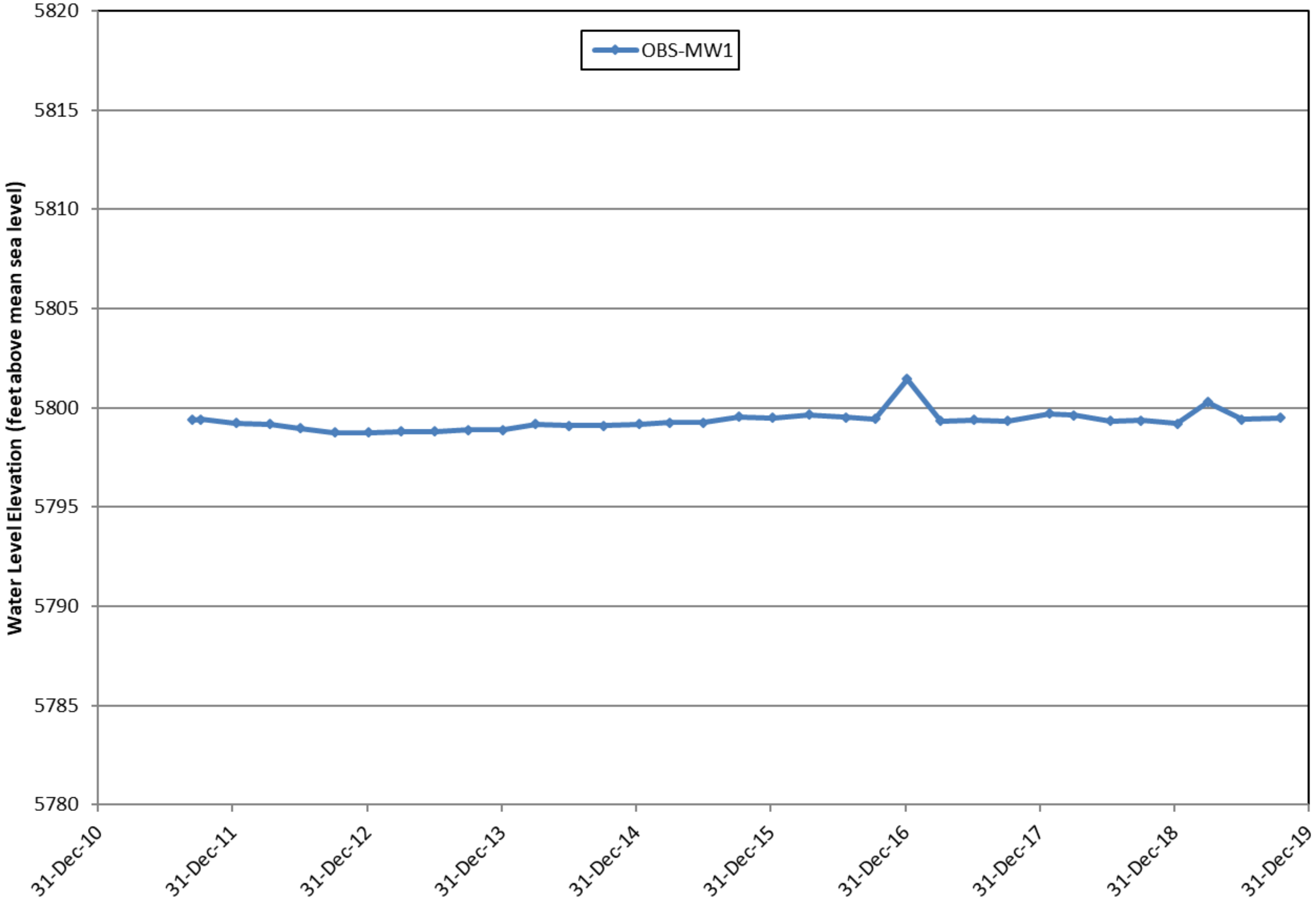

Figure 2B-7. Groundwater Monitoring Program Study Wells (7 of 9)

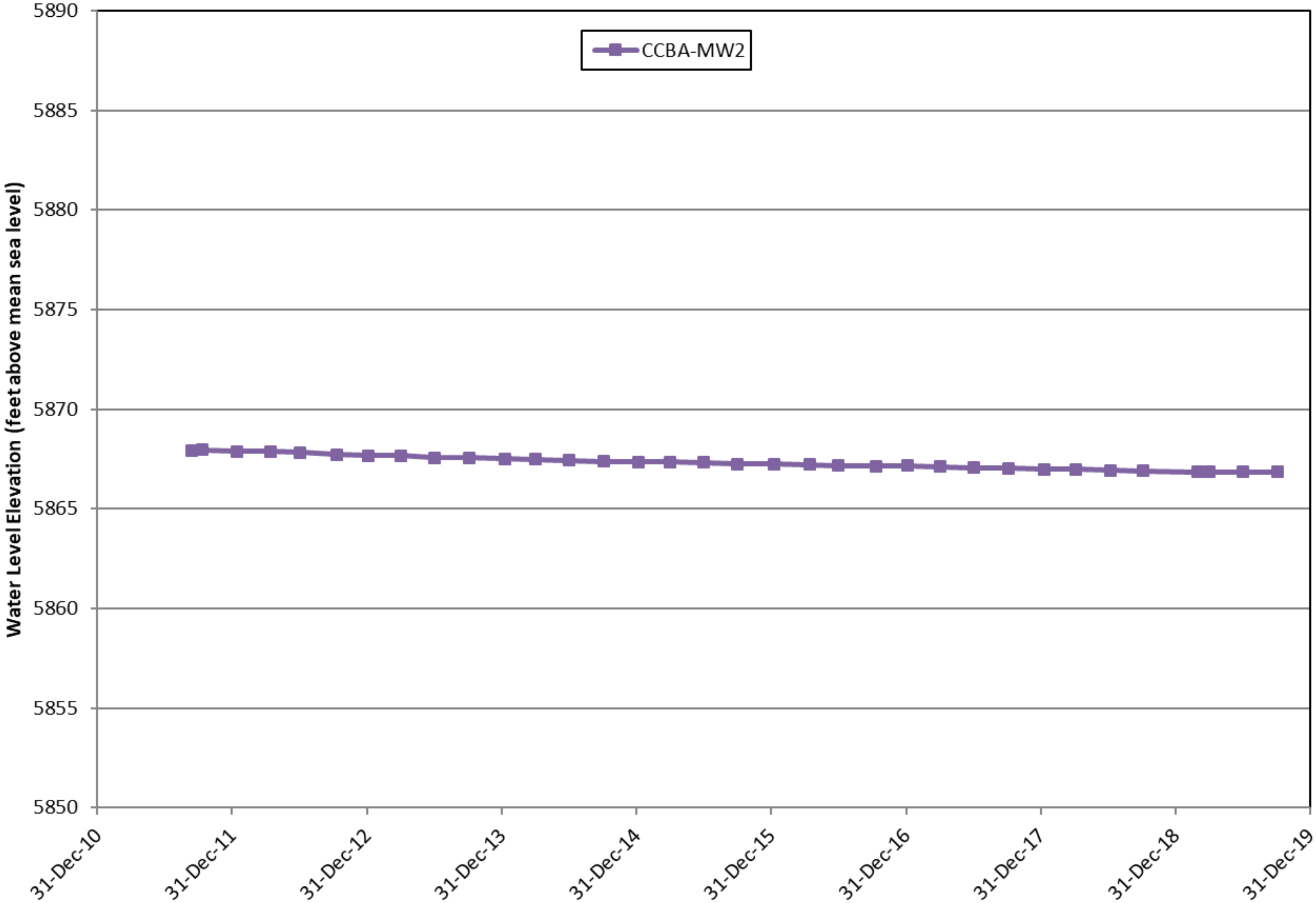

Figure 2B-8. Groundwater Monitoring Program Study Wells (8 of 9)

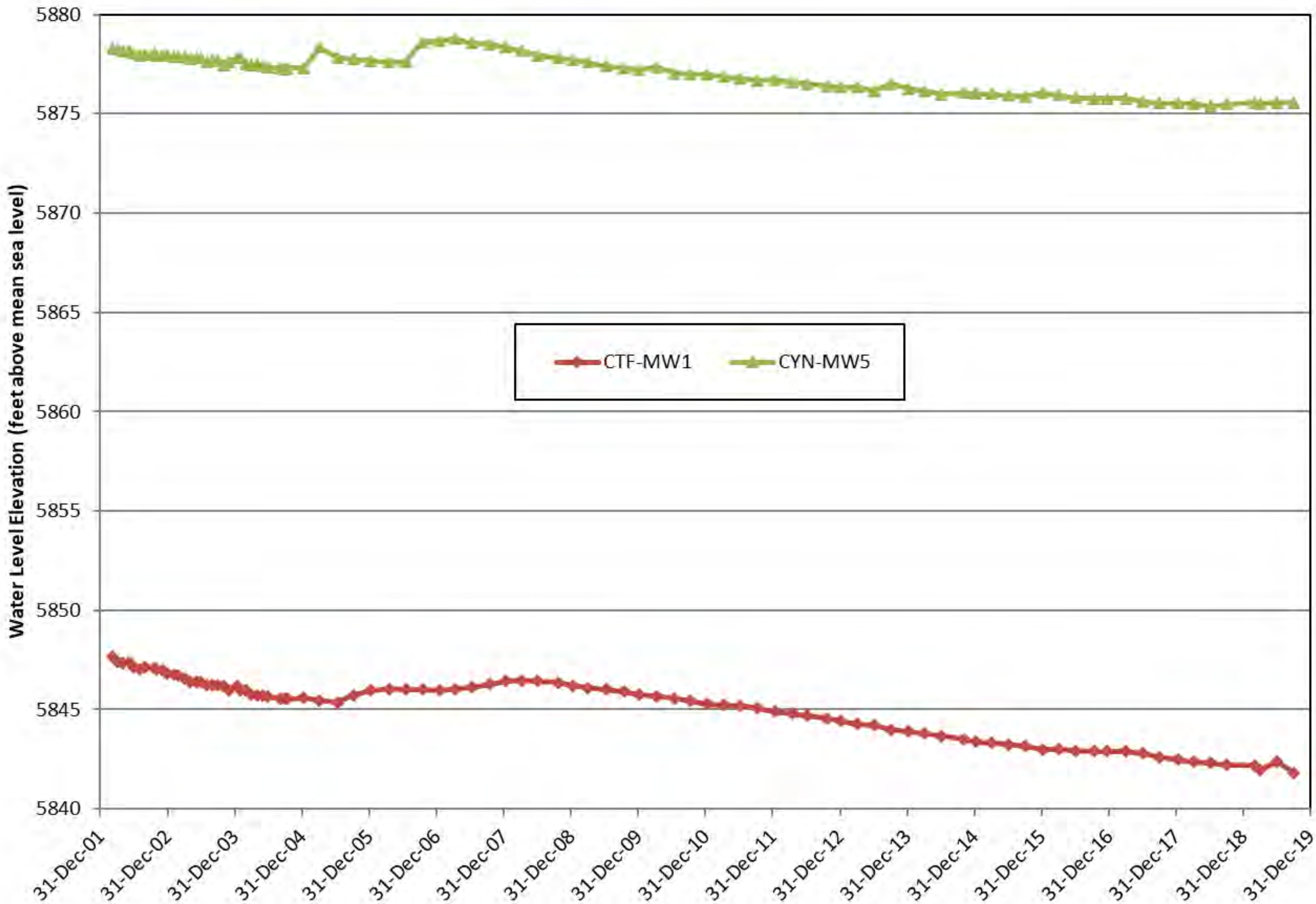

Figure 2B-9. Groundwater Monitoring Program Study Wells (9 of 9)

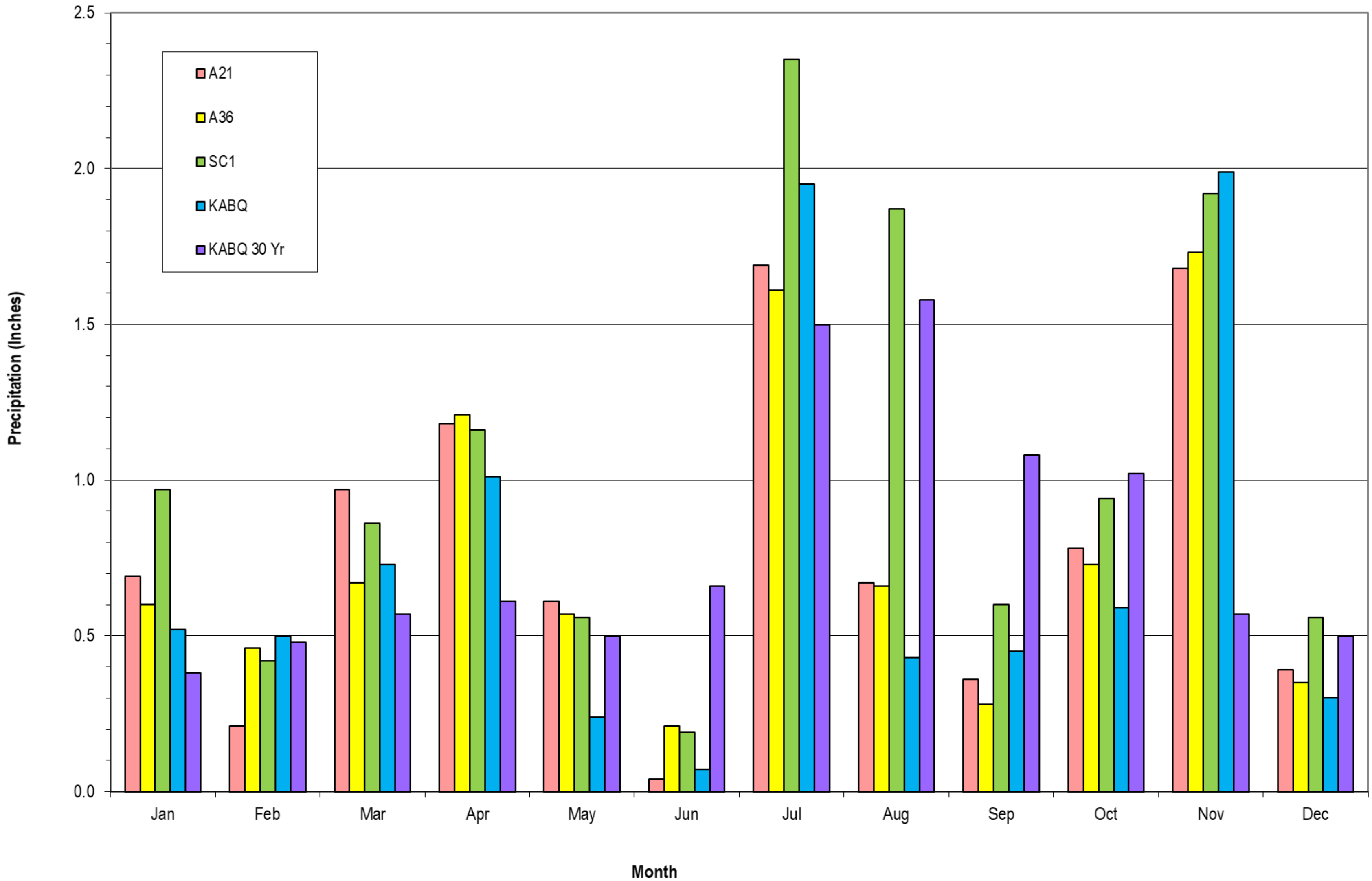

Figure 2B-10. Precipitation Data for Sandia National Laboratories, New Mexico, Calendar Year 2019

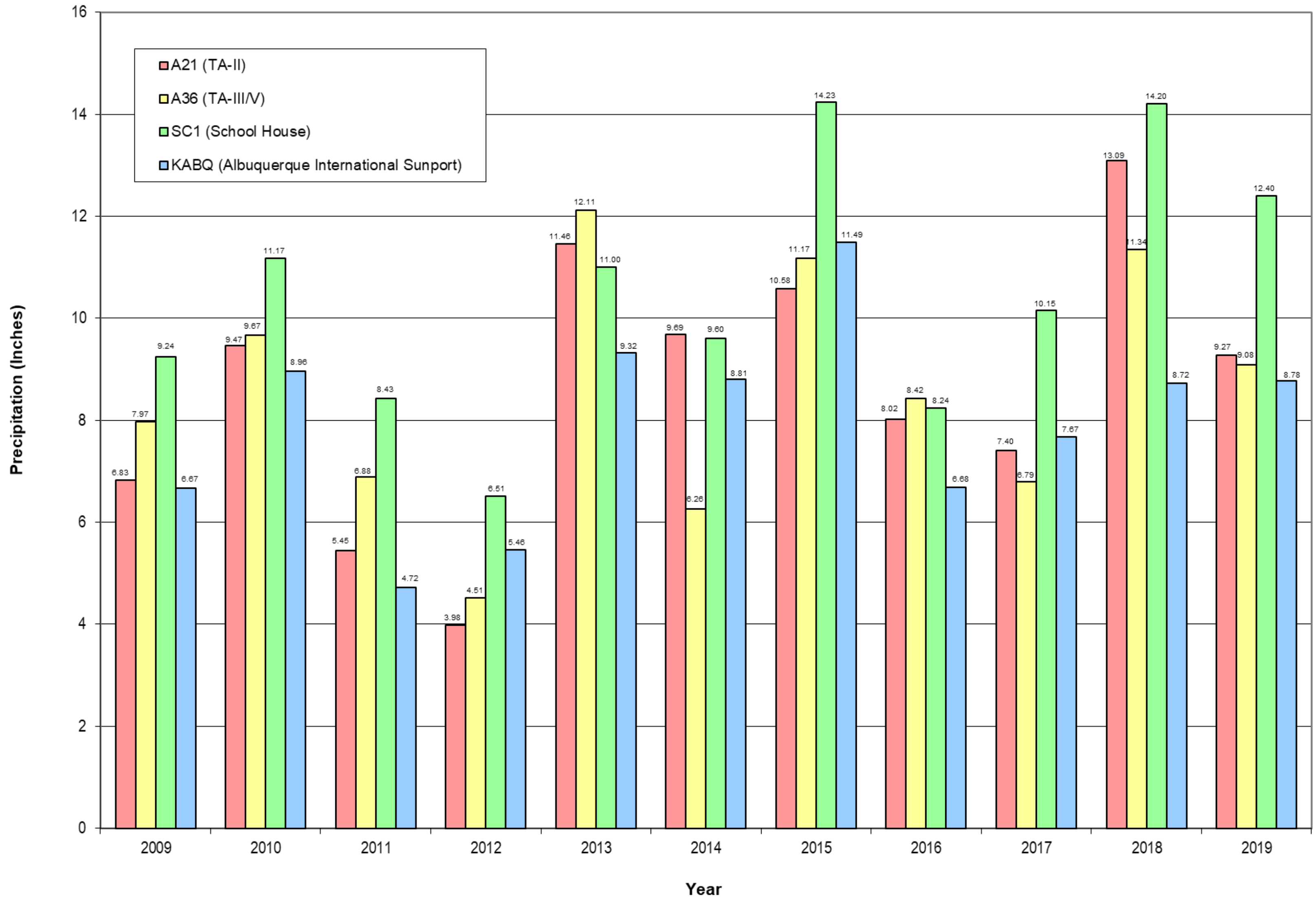

Figure 2B-11. Annual Precipitation Data for Sandia National Laboratories, New Mexico, January 2009 to December 2019

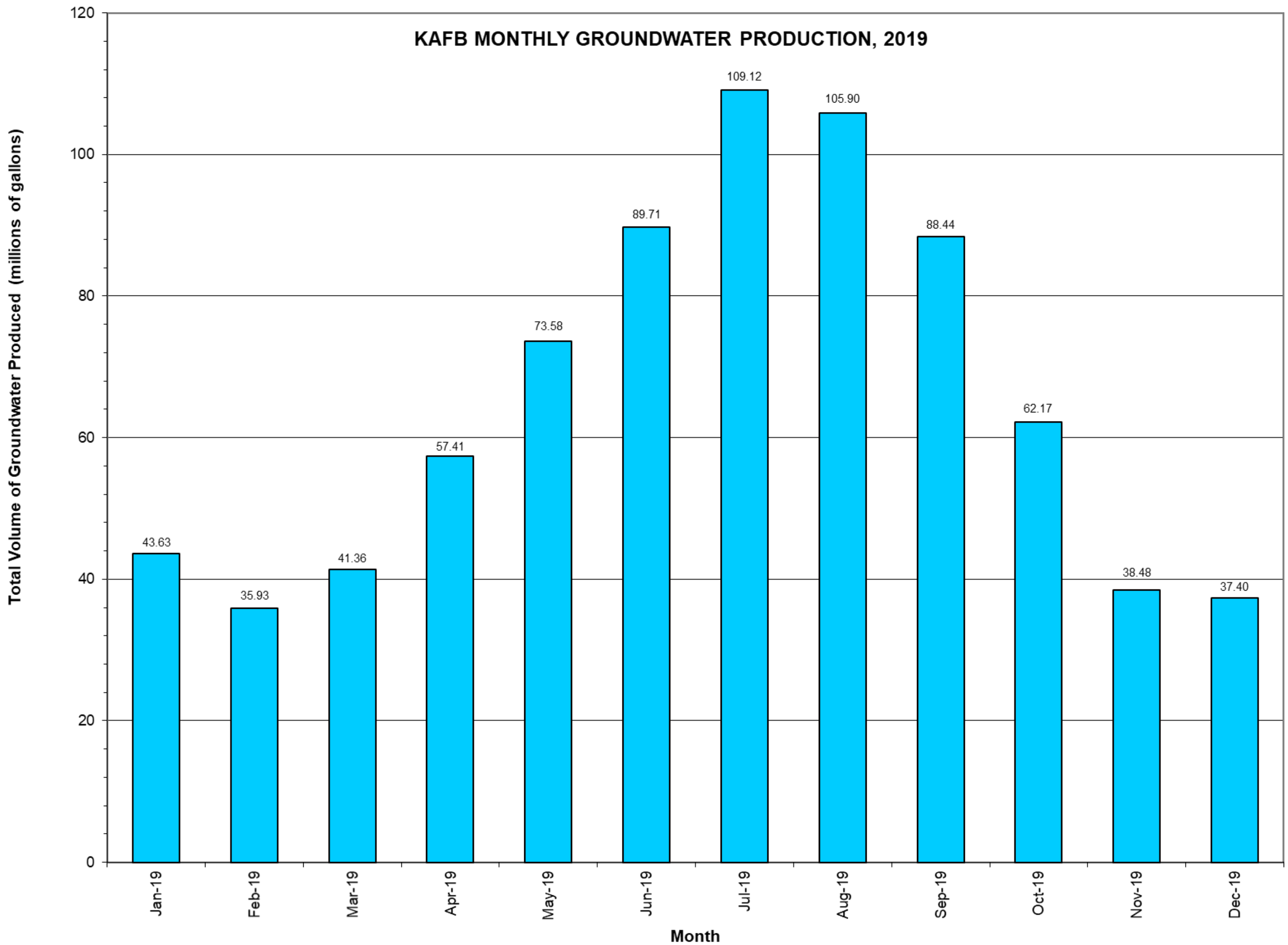

Figure 2B-12. Monthly Groundwater Pumped by Kirtland Air Force Base Production Wells, Calendar Year 2019

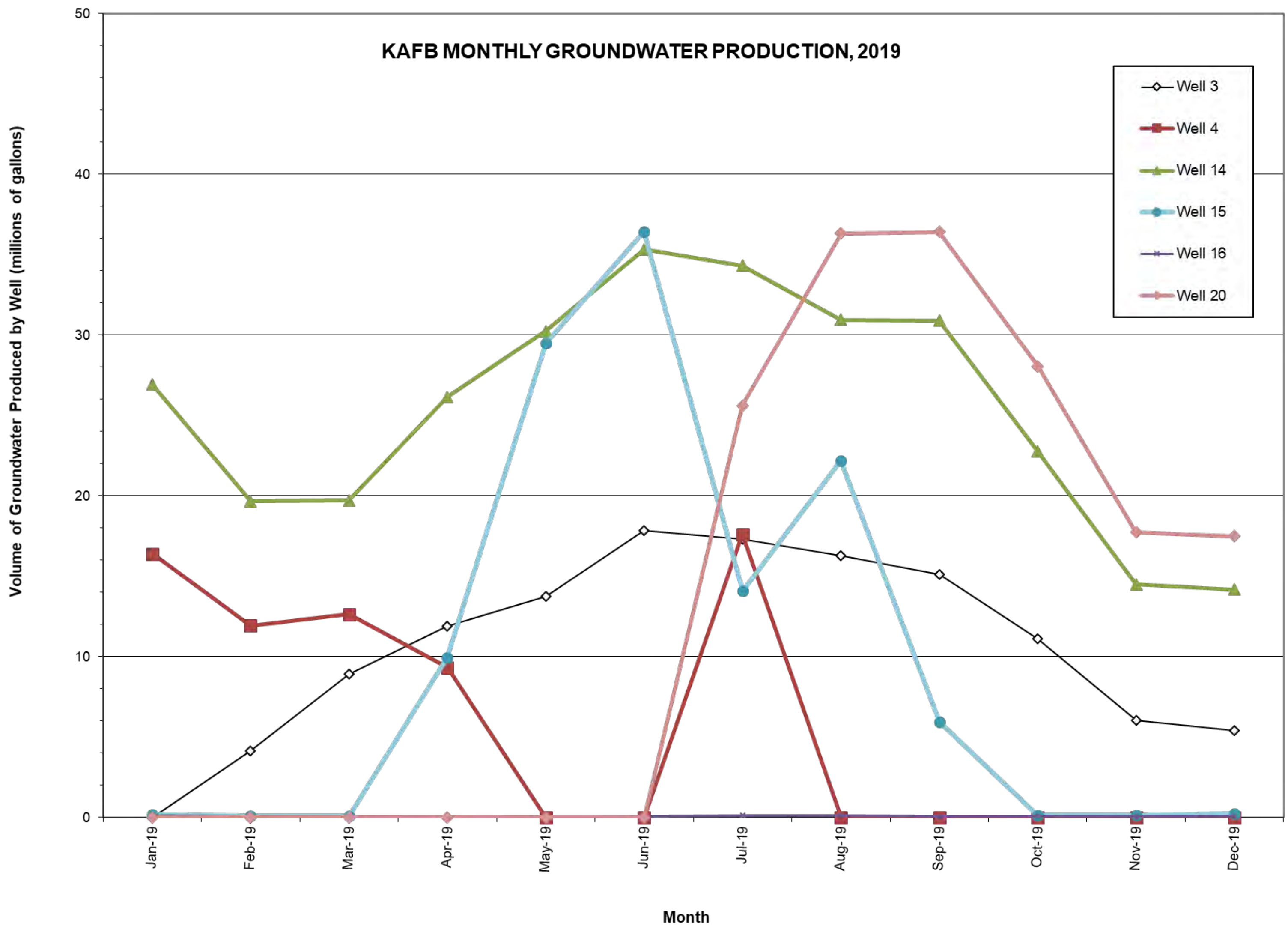

Figure 2B-13. Groundwater Pumped by Kirtland Air Force Base Production Wells, Calendar Year 2019

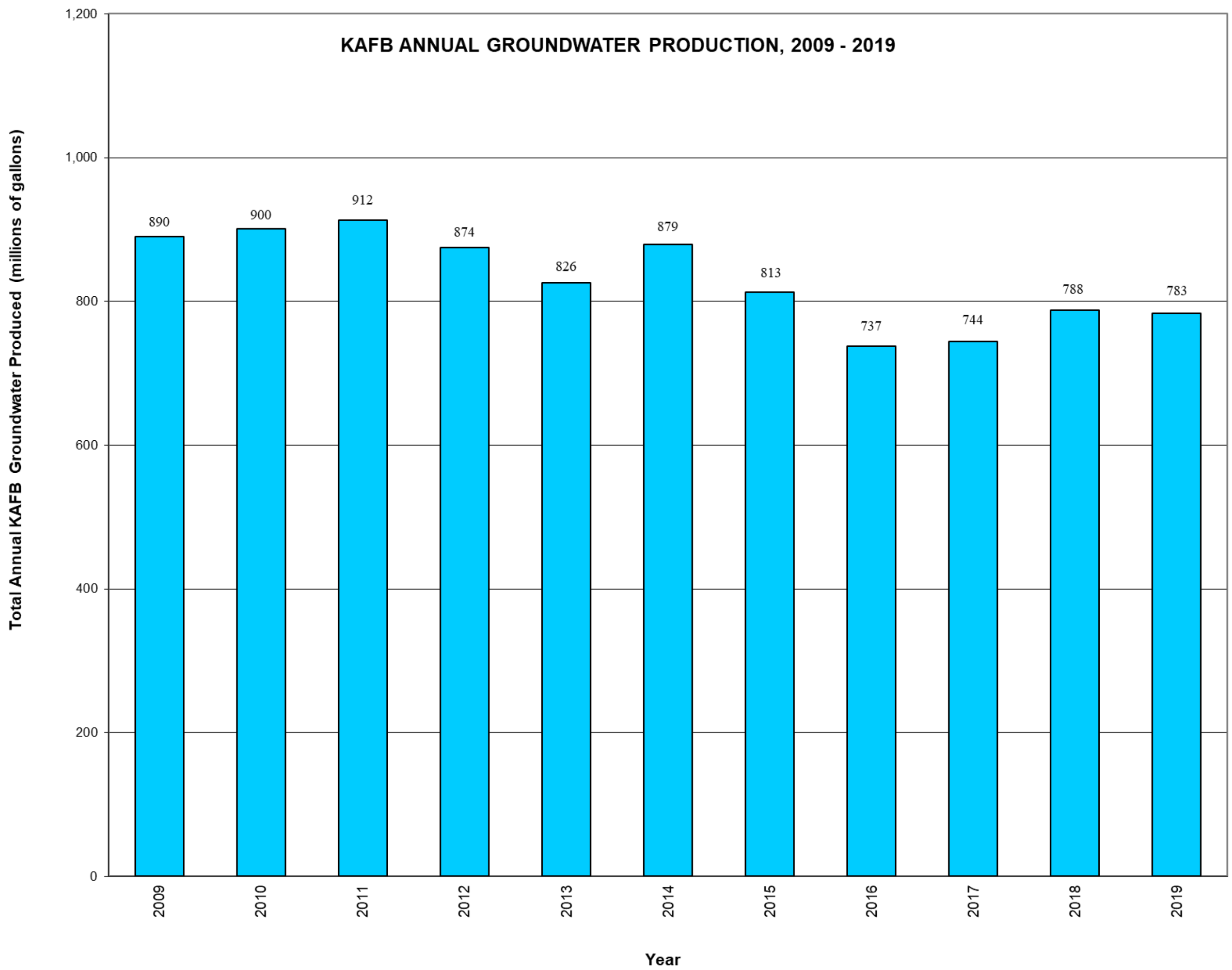

Figure 2B-14. Annual Groundwater Pumped by Kirtland Air Force Base Production Wells, 2009 to 2019

Attachment 2C
Groundwater Monitoring Program
Plots

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Attachment 2C Plots

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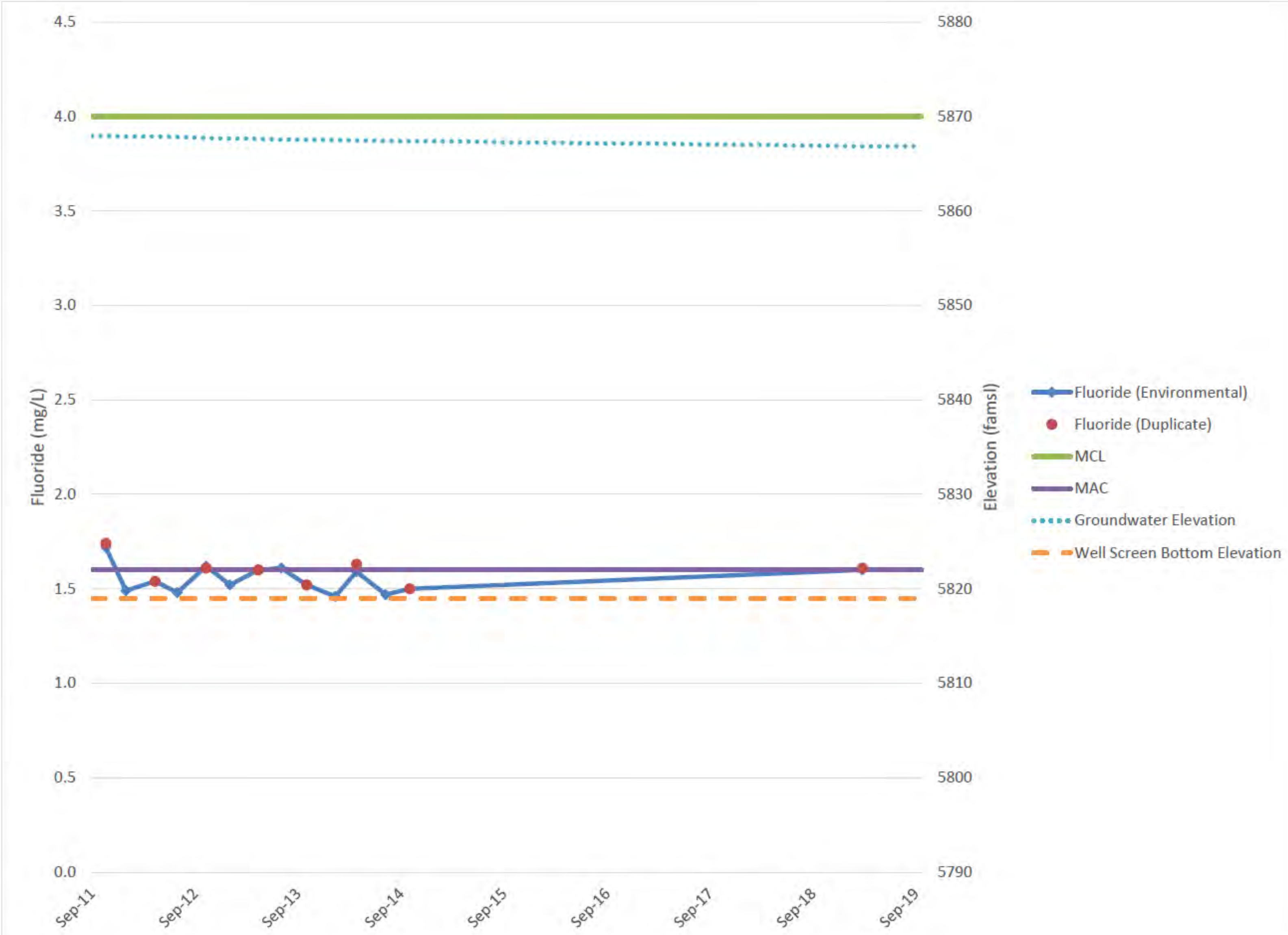

Figure 2C-1. Fluoride Concentrations, CCBA-MW2

Figure 2C-2. Fluoride Concentrations, OBS-MW1

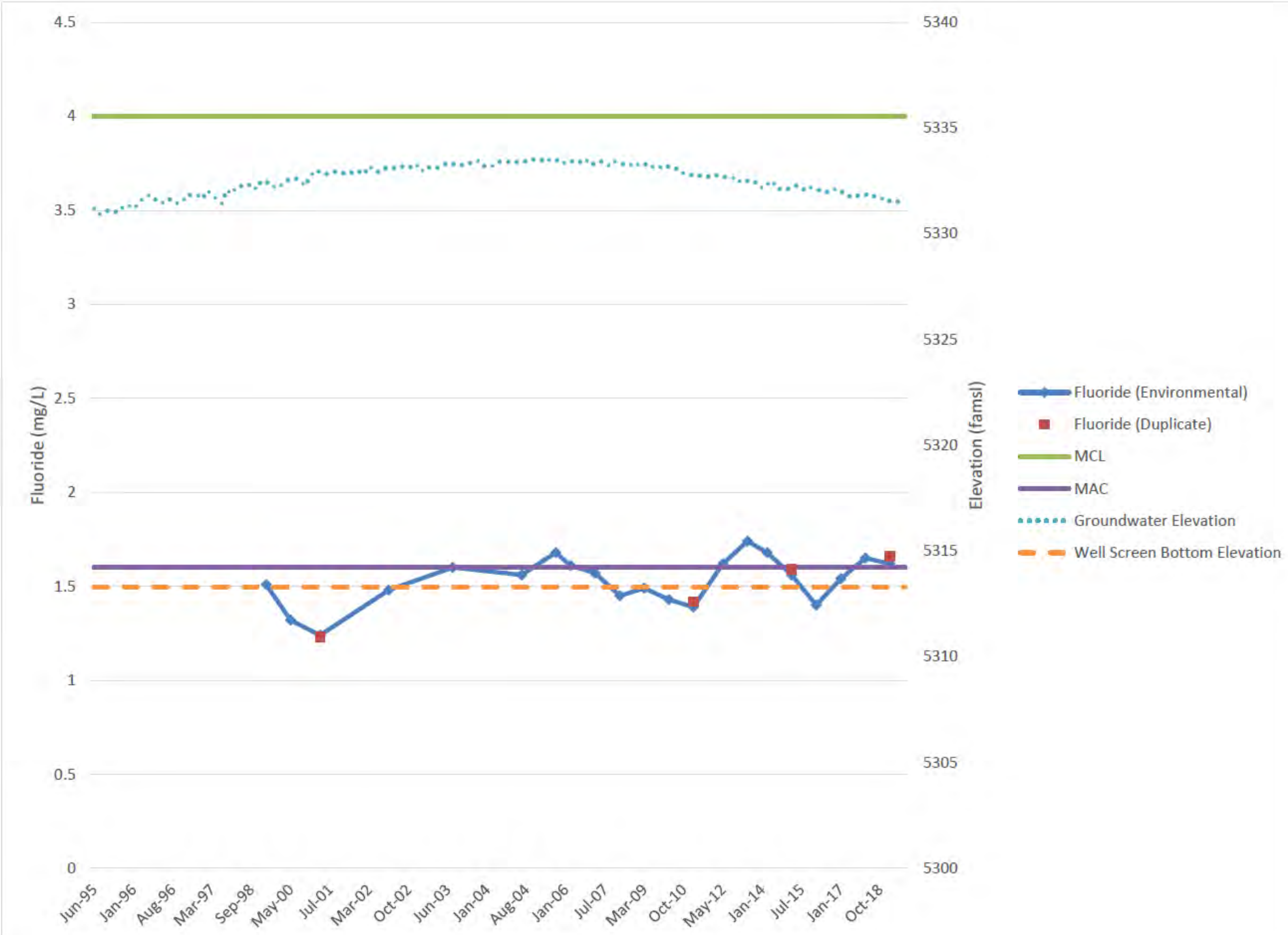

Figure 2C-3. Fluoride Concentrations, SFR-2S

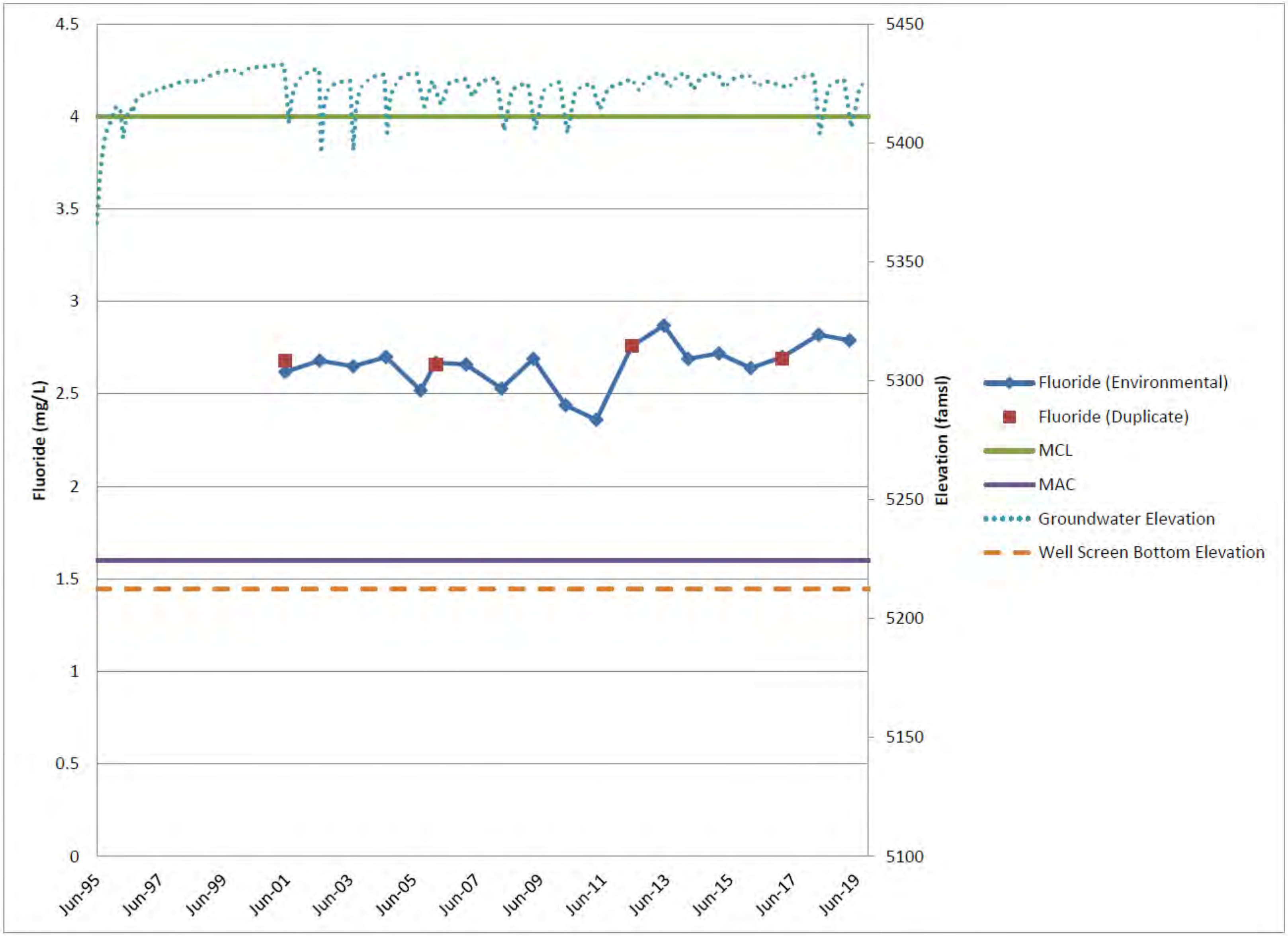

Figure 2C-4. Fluoride Concentrations, SFR-4T

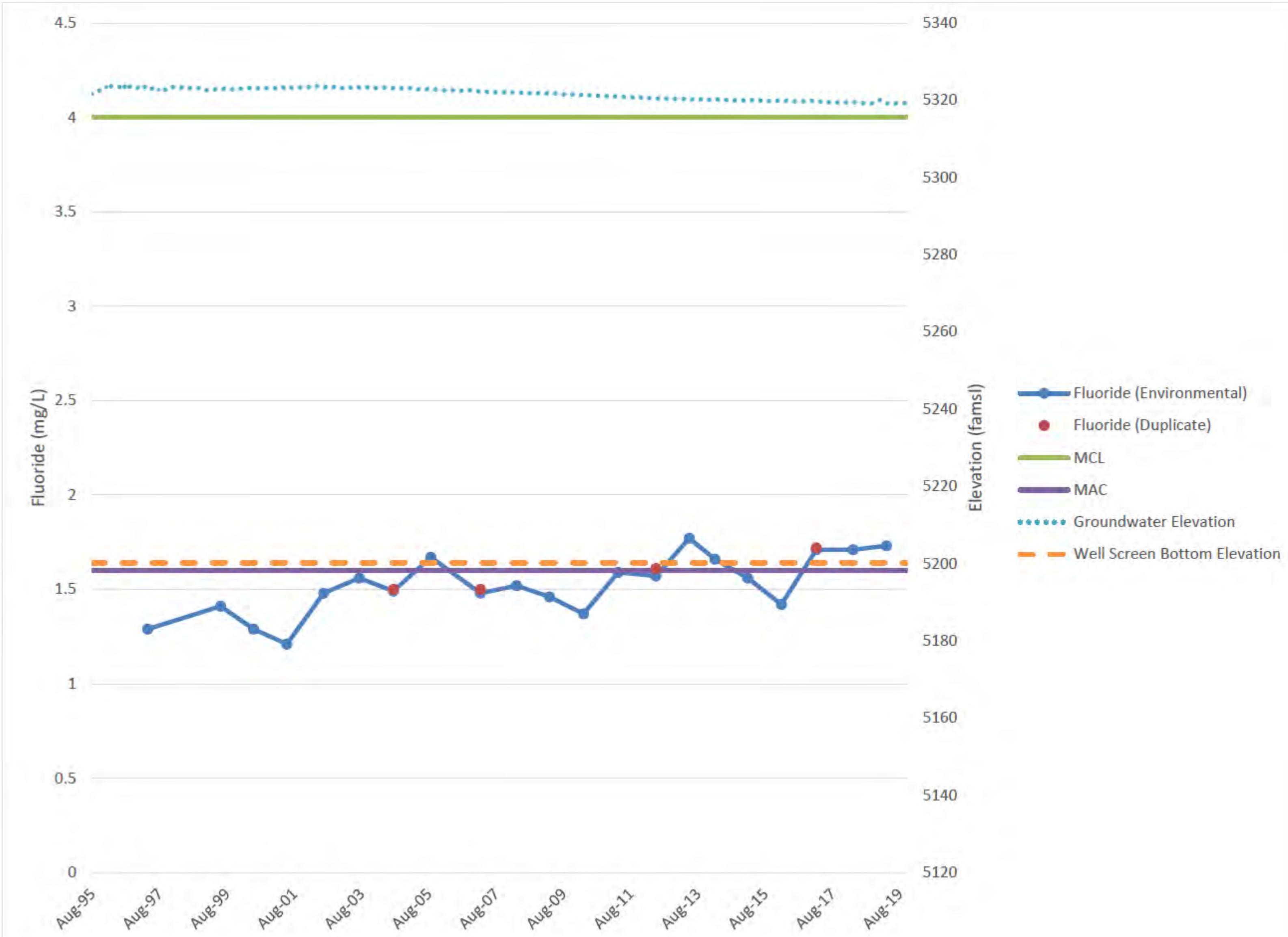

Figure 2C-5. Fluoride Concentrations, TRE-1

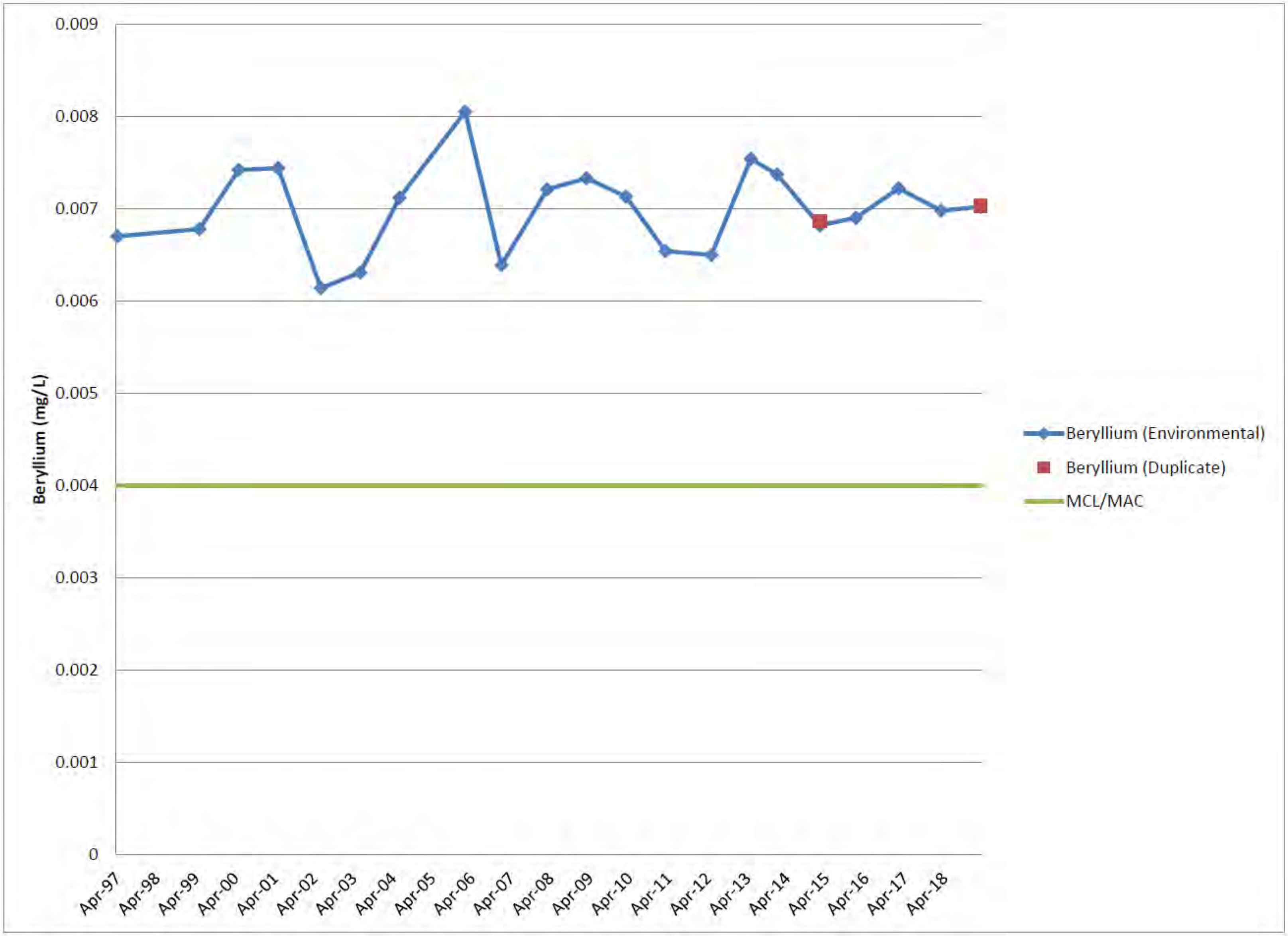

Figure 2C-6. Beryllium Concentrations, Coyote Springs

Chapter 2
Groundwater Monitoring Program
References

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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.

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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 2019 Sandia National Laboratories, New Mexico (SNL/NM), February 2019. *LTS Consolidated Groundwater Monitoring Program Mini-SAP for FY19 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 (TA)-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 (ET) 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.

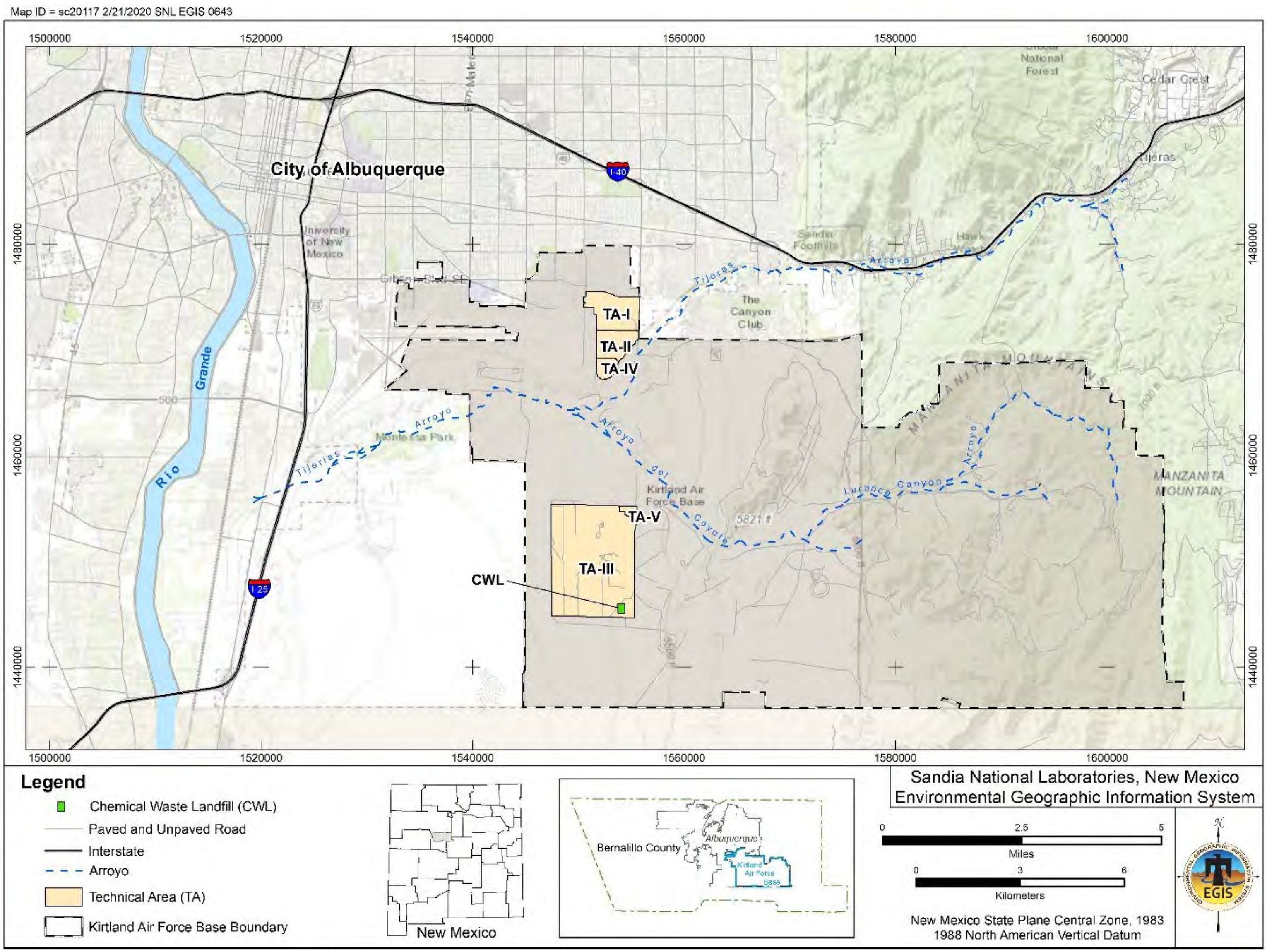

Figure 3-1. Location of the Chemical Waste Landfill with Respect to Kirtland Air Force Base and the City of Albuquerque

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) 2019, the *Chemical Waste Landfill Annual Post-Closure Care Report*, *Calendar Year 2018* (SNL March 2019) was submitted to NMED and approved (Kieling April 2019). The *Chemical Waste Landfill Annual Post-Closure Care Report, Calendar Year 2019* will be submitted to NMED in March 2020.

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 2019* will present a comprehensive statistical evaluation of CWL CY 2019 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 2019 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
Total	4	4	Total for AGMR reporting

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.

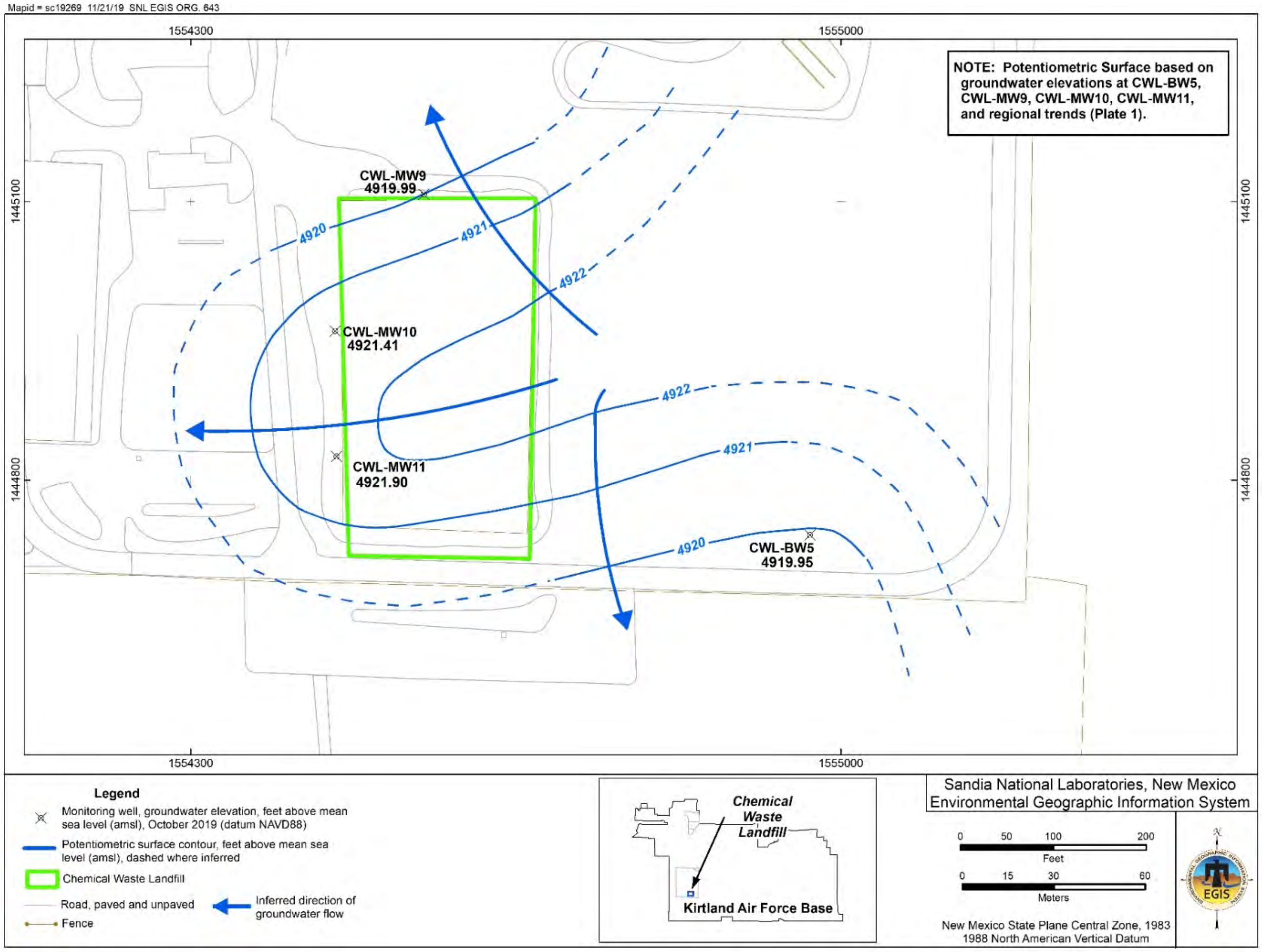

Figure 3-2. Localized Potentiometric Surface of the Regional Aquifer at the Chemical Waste Landfill, October/November 2019

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.

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 (ft) below ground surface. Groundwater flows generally westward, away from the Manzanita Mountains and toward the Rio Grande. Several production wells operated by Kirtland Air Force Base (KAFB)/U.S. Air Force and the Albuquerque Bernalillo County Water Utility Authority (ABCWUA) 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 2019 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 ft per year. The groundwater elevation decline between October 2018 and October 2019 ranged from 0.59 (CWL-MW11) to 0.69 (CWL-BW5) ft. This annual decline was slightly lower than the average change from 2017 to 2018, which was 0.81 ft. 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 ET 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 2019 potentiometric surface map shown in Figure 3-2 for the CWL groundwater monitoring network.

Table 3-2. Groundwater Elevations Measured in October/November 2019 at Monitoring Wells Completed in the Regional Aquifer at the Chemical Waste Landfill

Well ID	Measurement Point (ft amsl) NAVD 88	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
CWL-BW5	5,434.79	21-Oct-2019	514.84	4,919.95
CWL-MW9	5,426.12	1-Nov-2019	506.13	4,919.99
CWL-MW10	5,424.58	1-Nov-2019	503.17	4,921.41
CWL-MW11	5,423.24	1-Nov-2019	501.34	4,921.90

NOTES:

amsl = Above mean sea level.
btoc = Below top of casing.
BW = Background Well.
CWL = Chemical Waste Landfill.
ft = Feet.
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 TA-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 production well, KAFB-4, is located approximately 4.3 miles north-northwest of the CWL.

Measured orthogonally from the potentiometric surface contours on Figure 3-2 across the site, the horizontal gradient at the CWL did not change significantly from previous years and was approximately 0.013 ft per ft. 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 2019 calculated velocities ranged from approximately 1.8×10^{-4} to 2.8×10^{-3} ft per day. This is equivalent to approximately 0.07 to 1.02 ft 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 ABCWUA Authority production 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 2019 at the CWL in accordance with Attachment 2 of the CWL PCCP. In January, groundwater samples were analyzed for TCE, chromium, nickel, and the enhanced list of VOCs. The enhanced list of VOCs includes 1,1-dichloroethene; 1,1,2-trichloro-1,2,2-trifluoroethane; chloroform; tetrachloroethene; 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 2019, 2nd Quarter Sampling* (SNL December 2018) and the *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2019, 4th Quarter Sampling* (SNL June 2019).

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 March 2018).

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 2019

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-MW10 CWL-MW10 (Duplicate) CWL-MW11
Metals: Chromium Nickel		
VOCs: TCE	July	CWL-BW5 CWL-MW9 CWL-MW10 CWL-MW11 CWL-MW11 (Duplicate)
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 purging process included temperature, specific conductivity (SC), oxidation-reduction potential (ORP), potential of hydrogen (pH), and dissolved oxygen (DO) using an In-Situ Incorporated Aqua TROLL® 600 Multiparameter Water Quality Sonde. Turbidity measurements 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 14.0 gallons (gal) were purged from CWL-MW10 prior to the well going dry (purge volume requirement was approximately 23 gal). The average flow rate for the entire purging event was 0.112 gal per minute (gpm), and the estimated flow rate during the final three gal was 0.086 gpm (equivalent to 0.424 and 0.326 liters per minute, respectively). During July, approximately 14.0 gal were purged from CWL-MW10 prior to the well going dry (purge volume requirement was approximately 23 gal). The average flow rate for the entire purging event was 0.099 gpm, and the estimated flow rate during the final three gal was 0.079 gpm (equivalent to 0.375 and 0.299 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 Attachment 3B, 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 2019 analytical results were compared with established EPA MCLs where applicable. No detected constituents exceeded the respective EPA 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 2019 analytical results for TCE and the enhanced list of VOCs (January) and TCE (July). TCE was detected above the laboratory method detection limit (MDL) in the January environmental and duplicate samples from monitoring well CWL-MW10, both at a concentration of 0.630 µg/L. The January results are below the practical quantitation limit of 1.0 µg/L (i.e., J-qualified estimated values) and the EPA MCL of 5.0 µg/L. No other VOCs were detected above the MDL in the January samples. TCE was not detected above the MDL in any of the July environmental samples; this is the first time TCE was not detected in a groundwater sample since implementation of the PCCP in June 2011. TCE has only been detected in samples from CWL-MW10 and concentrations have shown a declining trend since January 2013, indicating the two CWL VCMs completed from 1996 through 2002 were effective.

3.6.2 Metals

Table 3B-2 summarizes the CY 2019 analytical results for chromium and nickel. Chromium and nickel were not detected above the MDL in any of the CY 2019 samples.

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, SC, ORP, pH, turbidity, and DO.

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-MW10 in January and one environmental duplicate sample was collected from monitoring well CWL-MW11 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-MW10 in January, the RPD value for TCE showed good correlation, with an RPD value of less than 1. This value is within the acceptable range of less than or equal to 20 for VOCs, as defined in Attachment 2 of the CWL PCCP. No constituents were detected in the sample pair collected at CWL-MW11 in July, so an RPD could not be calculated.

3.7.1.2 Equipment Blank Samples

One EB sample was collected in January and analyzed for TCE, chromium, nickel, and the enhanced list of VOCs. One EB sample was collected in July and analyzed for TCE, chromium, and nickel. No constituents were detected in the CY 2019 EB samples.

3.7.1.3 Field Blank Samples

Three FB samples were collected in January and analyzed for TCE and the enhanced list of VOCs. Three FB samples were collected in July and analyzed for TCE only. There were no detections above the MDL in the CY 2019 FB samples.

3.7.1.4 Trip Blank Samples

Six TB samples were submitted with the January samples and analyzed for TCE and the enhanced list of VOCs, and six TB samples were submitted with the July samples and analyzed for TCE. No VOCs were detected above the MDL 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 Non-Conformances

All analytical and field methods were performed according to the requirements specified in the CWL PCCP and associated *Chemical Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plans*. Variances and non-conformances are defined in the CWL PCCP Attachment 2, Section 2.22 for groundwater monitoring. There were no variances or non-conformances during the CY 2019 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 2019, 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, chromium, nickel, and the enhanced list of VOCs (January); and TCE, nickel, and chromium (July). Based on field and laboratory QC sample and data validation results, the CY 2019 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 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. As discussed in Section 1.2.1, NMED required the addition of 1,4-dioxane to the CWL groundwater monitoring analytical list, which will be implemented in CY 2020. 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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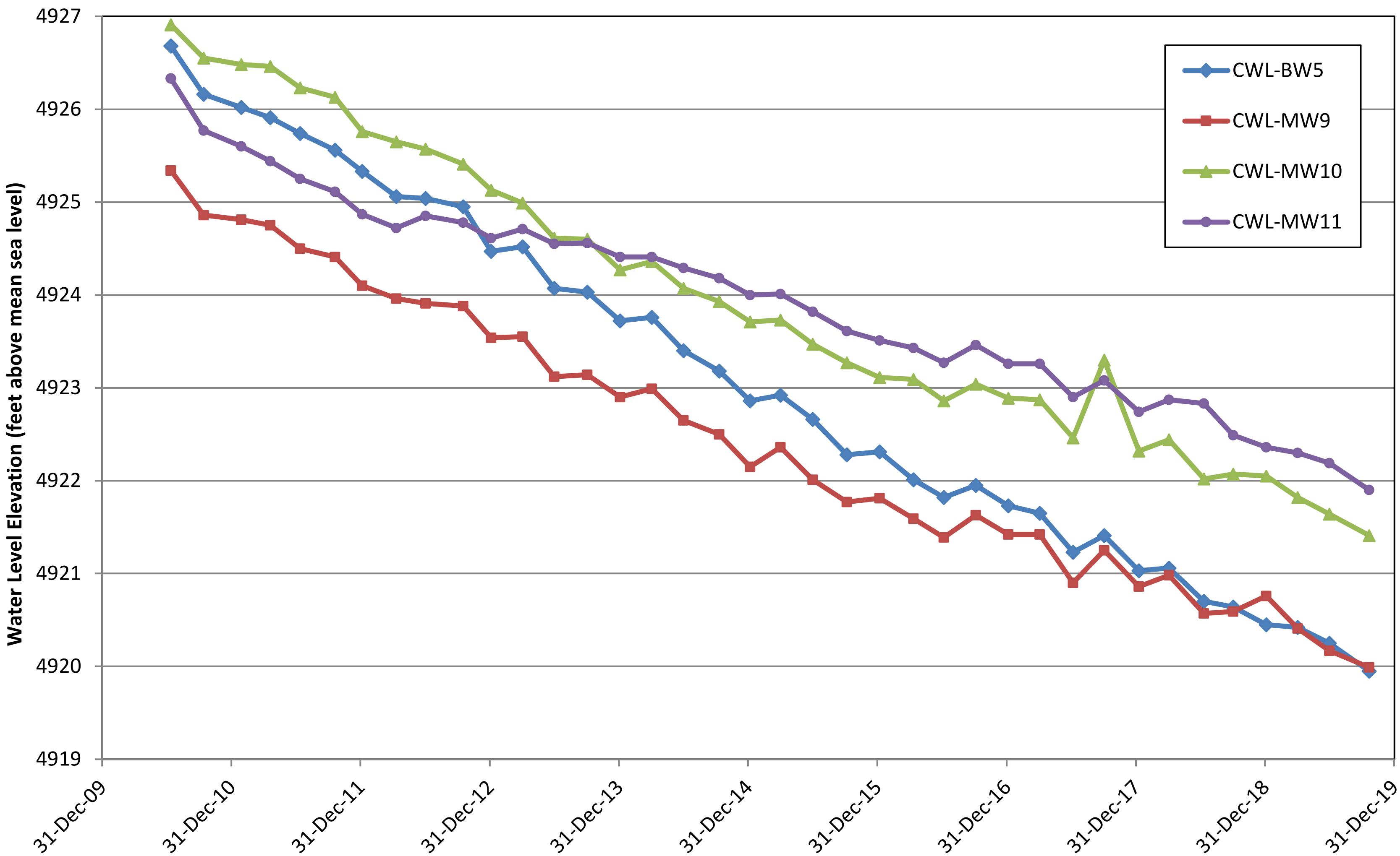

Figure 3A-1. Chemical Waste Landfill Groundwater Monitoring Wells

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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 2019

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		106910-001	SW846-8260B
14-Jan-19	Chloroform	ND	0.300	1.00	NE	U		106910-001	SW846-8260B
	Tetrachloroethene	ND	0.300	1.00	5.00	U		106910-001	SW846-8260B
	Trichloroethene	ND	0.300	1.00	5.00	U		106910-001	SW846-8260B
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		106910-001	SW846-8260B
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		106910-001	SW846-8260B
CWL-MW9	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		106915-001	SW846-8260B
15-Jan-19	Chloroform	ND	0.300	1.00	NE	U		106915-001	SW846-8260B
	Tetrachloroethene	ND	0.300	1.00	5.00	U		106915-001	SW846-8260B
	Trichloroethene	ND	0.300	1.00	5.00	U		106915-001	SW846-8260B
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		106915-001	SW846-8260B
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		106915-001	SW846-8260B
CWL-MW10	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		106926-001	SW846-8260B
21-Jan-19	Chloroform	ND	0.300	1.00	NE	U		106926-001	SW846-8260B
	Tetrachloroethene	ND	0.300	1.00	5.00	U		106926-001	SW846-8260B
	Trichloroethene	0.630	0.300	1.00	5.00	J		106926-001	SW846-8260B
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		106926-001	SW846-8260B
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		106926-001	SW846-8260B
CWL-MW10 (Duplicate)	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		106927-001	SW846-8260B
21-Jan-19	Chloroform	ND	0.300	1.00	NE	U		106927-001	SW846-8260B
	Tetrachloroethene	ND	0.300	1.00	5.00	U		106927-001	SW846-8260B
	Trichloroethene	0.630	0.300	1.00	5.00	J		106927-001	SW846-8260B
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		106927-001	SW846-8260B
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		106927-001	SW846-8260B
CWL-MW11	1,1-Dichloroethene	ND	0.300	1.00	7.00	U		106919-001	SW846-8260B
16-Jan-19	Chloroform	ND	0.300	1.00	NE	U		106919-001	SW846-8260B
	Tetrachloroethene	ND	0.300	1.00	5.00	U		106919-001	SW846-8260B
	Trichloroethene	ND	0.300	1.00	5.00	U		106919-001	SW846-8260B
	Trichlorofluoromethane	ND	0.300	1.00	NE	U		106919-001	SW846-8260B
	1,1,2-Trichloro-1,2,2-trifluoroethane	ND	2.00	5.00	NE	U		106919-001	SW846-8260B

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 2019

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 11-Jul-19	Trichloroethene	ND	0.300	1.00	5.00	U		108729-001	SW846-8260B
CWL-MW9 15-Jul-19	Trichloroethene	ND	0.300	1.00	5.00	U		108699-001	SW846-8260B
CWL-MW10 19-Jul-19	Trichloroethene	ND	0.300	1.00	5.00	U		108724-001	SW846-8260B
CWL-MW11 16-Jul-19	Trichloroethene	ND	0.300	1.00	5.00	U		108718-001	SW846-8260B
CWL-MW11 (Duplicate) 16-Jul-19	Trichloroethene	ND	0.300	1.00	5.00	U		108719-001	SW846-8260B

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 2019

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		106910-002	SW846-6020
14-Jan-19	Nickel	ND	0.0006	0.002	NE	U		106910-002	SW846-6020
CWL-MW9	Chromium	ND	0.003	0.010	0.100	U		106915-002	SW846-6020
15-Jan-19	Nickel	ND	0.0006	0.002	NE	U		106915-002	SW846-6020
CWL-MW10	Chromium	ND	0.003	0.010	0.100	U		106926-002	SW846-6020
21-Jan-19	Nickel	ND	0.0006	0.002	NE	U		106926-002	SW846-6020
CWL-MW10 (Duplicate)	Chromium	ND	0.003	0.010	0.100	U		106927-002	SW846-6020
21-Jan-19	Nickel	ND	0.0006	0.002	NE	U		106927-002	SW846-6020
CWL-MW11	Chromium	ND	0.003	0.010	0.100	U		106919-002	SW846-6020
16-Jan-19	Nickel	ND	0.0006	0.002	NE	U		106919-002	SW846-6020
CWL-BW5	Chromium	ND	0.003	0.010	0.100	U		108729-002	SW846-6020
11-Jul-19	Nickel	ND	0.0006	0.002	NE	U		108729-002	SW846-6020
CWL-MW9	Chromium	ND	0.003	0.010	0.100	U		108699-002	SW846-6020
15-Jul-19	Nickel	ND	0.0006	0.002	NE	U	UJ	108699-002	SW846-6020
CWL-MW10	Chromium	ND	0.003	0.010	0.100	U		108724-002	SW846-6020
19-Jul-19	Nickel	ND	0.0006	0.002	NE	U		108724-002	SW846-6020
CWL-MW11	Chromium	ND	0.003	0.010	0.100	U		108718-002	SW846-6020
16-Jul-19	Nickel	ND	0.0006	0.002	NE	U	UJ	108718-002	SW846-6020
CWL-MW11 (Duplicate)	Chromium	ND	0.003	0.010	0.100	U		108719-002	SW846-6020
16-Jul-19	Nickel	ND	0.0006	0.002	NE	U	UJ	108719-002	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 2019

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	14-Jan-19	15.27	1073.0	135.4	6.92	0.61	84.4	7.02
CWL-MW9	15-Jan-19	16.06	926.3	53.9	7.02	0.28	52.4	4.20
CWL-MW10	21-Jan-19	14.02	896.30	15.0	7.12	2.25	26.78	2.33
CWL-MW11	16-Jan-19	16.74	994.9	23.9	7.01	0.60	66.1	5.54
CWL-BW5	11-Jul-19	22.87	1141.1	103.6	6.89	0.43	96.59	7.38
CWL-MW9	15-Jul-19	22.87	982.8	122.9	7.03	0.21	55.93	4.57
CWL-MW10	19-Jul-19	25.20	1174.6	-11.1	6.96	2.65	27.69	1.97
CWL-MW11	16-Jul-19	26.99	1134.0	29.6	7.00	1.65	86.20	6.00

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 March 2018).

NE = Not established.

[e]Laboratory 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.

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

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
µmho/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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4.0 Mixed Waste Landfill

4.1 Introduction

The Mixed Waste Landfill (MWL) is a 2.6-acre Solid Waste Management Unit (SWMU) in the north-central portion of Technical Area (TA)-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); construction of the MWL ET cover was completed in 2009 in accordance with the NMED-approved Corrective Measures Implementation (CMI) Plan (SNL November 2005; Bearzi December 2008). The MWL CMI Report documenting cover construction 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) 2019, the sixth MWL Annual LTMM Report (SNL June 2019) was submitted to the NMED and approved (Kieling September 2019). As part of the approval, NMED required the addition of 1,4-dioxane to the MWL groundwater monitoring analytical list as discussed in Section 1.2.1.

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 2019 groundwater monitoring results will be presented in the *Mixed Waste Landfill Annual LTMM Report, April 2019 – March 2020*, which will be submitted to the NMED in June 2020.

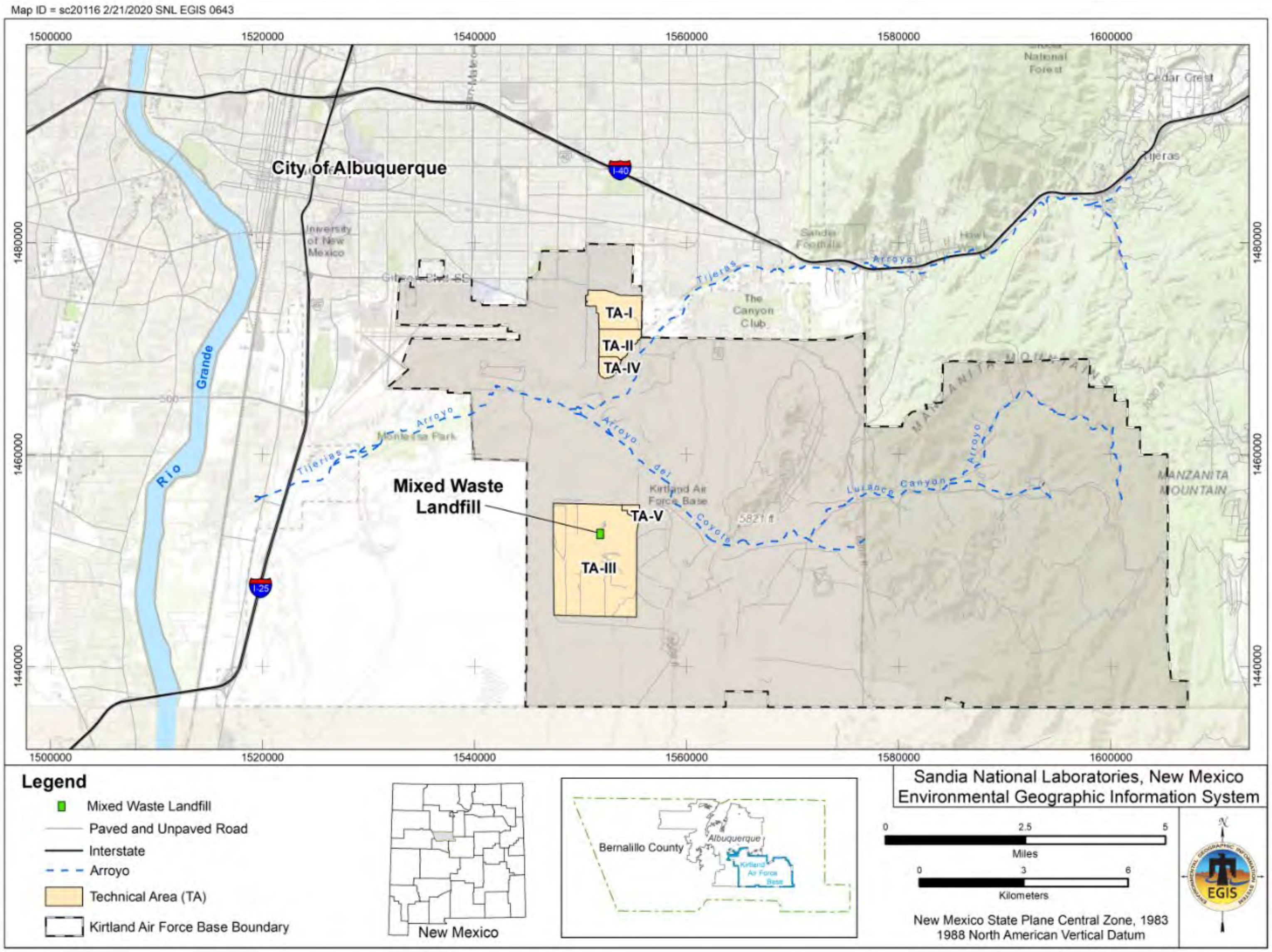

Figure 4-1. Location of the Mixed Waste Landfill with Respect to Kirtland Air Force Base and the City of Albuquerque

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 impacted 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 2019 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
Total	--	4	7	Total for AGMR reporting

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/May 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.

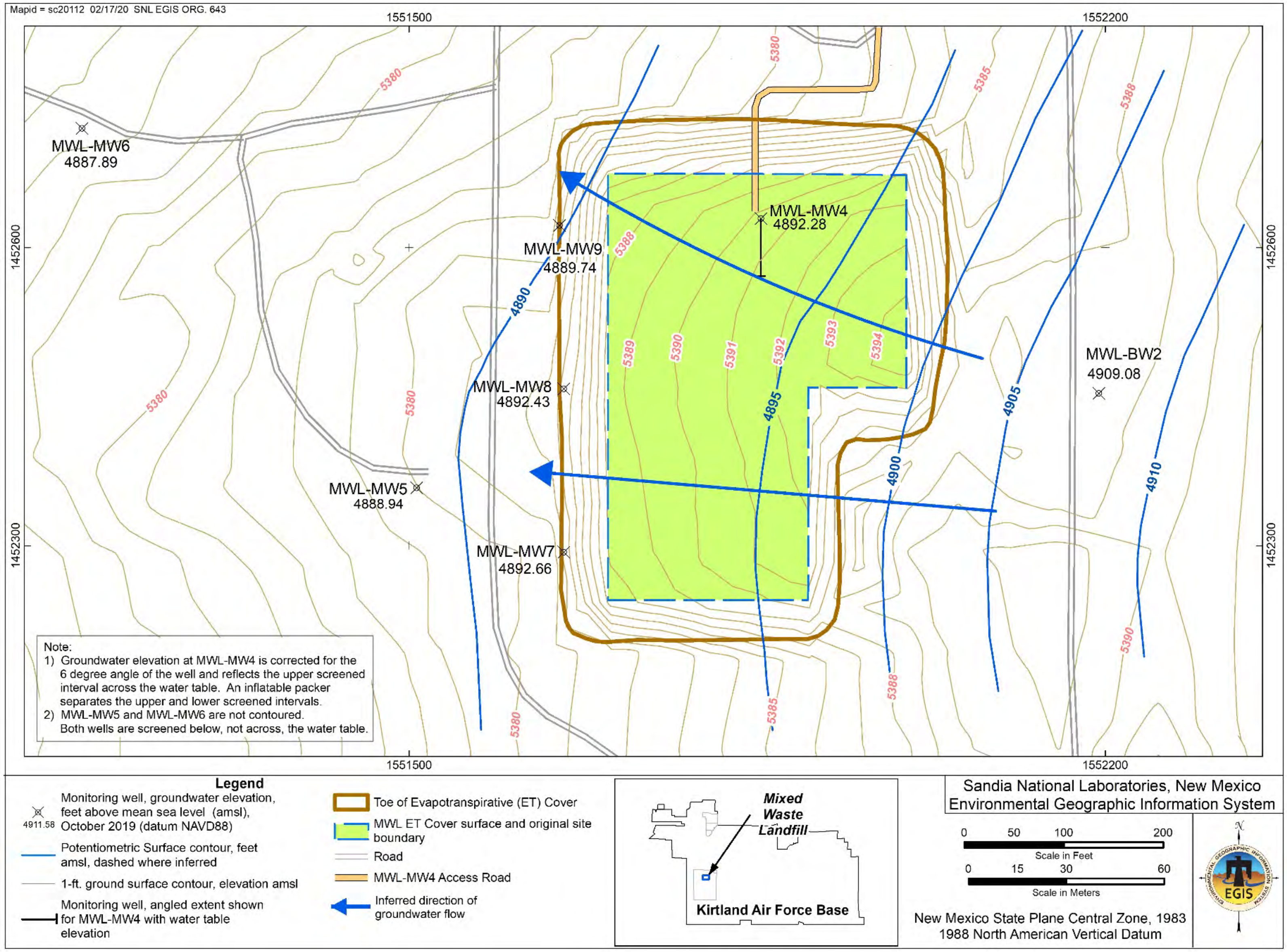

Figure 4-2. Localized Potentiometric Surface of the Regional Aquifer at the Mixed Waste Landfill, October 2019

4.1.3 Conceptual Site Model

A detailed Conceptual Site Model (CSM) 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 CSM 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 (ft) 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 ft for the two-year period. From October 2018 to October 2019, the groundwater elevation declined in the four compliance monitoring wells. The range was 0.06 (MWL-MW9) to 0.43 ft (MWL-BW2) and the average annual decline at the four compliance monitoring wells was 0.23 ft. 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 2019 potentiometric surface map shown in Figure 4-2 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 2019 at Monitoring Wells Completed in the Regional Aquifer at the Mixed Waste Landfill

Well ID	Measurement Point (ft amsl) NAVD 88	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
MWL-BW2	5,391.02	4-Oct-2019	481.94	4,909.08
MWL-MW4[a]	5,391.70	4-Oct-2019	502.17	4,892.28[b]
MWL-MW5[c]	5,382.56	4-Oct-2019	493.62	4,888.94
MWL-MW6[c]	5,375.31	4-Oct-2019	487.42	4,887.89
MWL-MW7	5,383.30	4-Oct-2019	490.64	4,892.66
MWL-MW8	5,384.67	4-Oct-2019	492.24	4,892.43
MWL-MW9	5,381.91	4-Oct-2019	492.17	4,889.74

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.
ft = Feet.
ID = Identifier.
MW = Monitoring Well.
MWL = Mixed Waste Landfill.
NAVD 88 = North American Vertical Datum of 1988.

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 4-2 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 production 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 production 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 2019 ranges from approximately 0.03 to 0.08 ft per ft. 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 2019 groundwater velocity ranges from 0.02 to 0.06 ft per day; the average is 0.04 ft per day. These very low values and the general position of the groundwater elevation contours are consistent with past years and previous estimates for horizontal groundwater flow at the water table in the MWL vicinity.

4.2 Regulatory Criteria

The MWL is regulated as SWMU 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 2019 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/beta activity; radon-222; and tritium.

Table 4-3 lists the analytical parameters and the MWL monitoring wells sampled. The CY 2019 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 2019, 3rd Quarter Sampling* (SNL March 2019) and the *Mixed Waste Landfill Groundwater Monitoring, Mini-Sampling and Analysis Plan for Fiscal Year 2020, 1st Quarter Sampling* (SNL September 2019).

Table 4-3. Analytical Parameters for the Mixed Waste Landfill Monitoring Wells, Calendar Year 2019

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

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 2019 and SNL September 2019), 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 (SC), oxidation-reduction potential (ORP), potential for hydrogen (pH), and dissolved oxygen (DO) 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 2019 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

Attachment 4B, 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 2019 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 2019 analytical results for VOCs. Acetone (April/May) and acetone and methylene chloride (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 because these common laboratory contaminants were also detected in the associated field QC samples. Table 4B-2 presents the MDLs for VOCs.

4.6.2 Metals

Table 4B-3 summarizes the CY 2019 analytical results for cadmium, chromium, nickel, and total uranium. Uranium was the only metal analyte detected above the MDL. 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 2019 analytical results for gamma-emitting radionuclides, gross alpha/beta activity, radon-222, and tritium. 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 CY 2019 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, SC, ORP, pH, turbidity, and DO.

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-MW9 (April/May) and MWL-MW8 (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 MDL in both samples.

CY 2019 sample pair (environmental sample and environmental duplicate sample) results show good correlation, with calculated RPD values ranging from 1 to 3. Total uranium was the only constituent detected above the 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-MW9 (April/May) and one EB sample associated with monitoring well MWL-MW8 (October) were collected during the CY 2019 sampling events and submitted for all analyses.

Acetone was detected above the MDL in the April/May EB sample at a concentration comparable to the associated results for the MWL-MW9 environmental and environmental duplicate samples. As a result, acetone was qualified as not detected during data validation in the samples from MWL-MW9. Bromodichloromethane, chloroform, and methylene chloride were detected above MDLs in the October EB sample. No corrective action was required for bromodichloromethane and chloroform because these compounds were not detected in the associated environmental samples. Methylene chloride was detected above the MDL at a concentration greater than the associated environmental and environmental duplicate sample concentrations. As a result, methylene chloride was qualified as not detected during data validation in the equipment blank sample due to the associated trip blank results.

4.7.1.3 Field Blank Samples

Eight FB samples (four in April/May, four in October) were collected during the CY 2019 sampling events and submitted for VOC analysis. No VOCs were detected in the April/May FB samples. Compounds detected in the October FB samples included acetone, bromodichloromethane, chloroform, dibromochloromethane, and methylene chloride. No corrective action was necessary for bromodichloromethane, chloroform, dibromochloromethane, and methylene chloride because these compounds were not detected in the associated environmental samples. Acetone was reported in both the

MWL-BW2 environmental sample and associated FB at low concentrations; therefore, acetone in the environmental sample was qualified as not detected during data validation. The methylene chloride field blank result associated with the MWL-MW8 environmental samples was qualified as not detected during validation due to the associated trip blank results.

4.7.1.4 Trip Blank Samples

Ten TB samples (five in April/May, five in October) were submitted with the CY 2019 environmental samples for analysis of VOCs. No VOCs were detected in the April/May TB samples. In the October TB samples methylene chloride was the only VOC detected above the MDL, and was reported in three TB samples at a maximum concentration of 2.10 micrograms per liter. Methylene chloride results for the MWL-MW7 and MWL-MW8 environmental samples and associated field blank and equipment blank QC samples were qualified as not detected during data validation because methylene chloride was detected in the associated trip blank samples at similar concentrations.

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 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 Non-Conformances

All analytical and field methods were performed according to the requirements specified in the MWL LTMMP and associated *Mixed Waste Landfill, Mini-Sampling and Analysis Plans*. There were no variances and/or nonconformances from requirements during CY 2019 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 SNL Administrative Operating Procedure (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 2019, 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/beta activity; radon-222; and tritium. Based on the field and laboratory QC sample and data validation results, the CY 2019 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. As discussed in Section 1.2.1, the compound 1,4-dioxane will be added to the MWL groundwater monitoring analytical list starting in CY 2020. 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 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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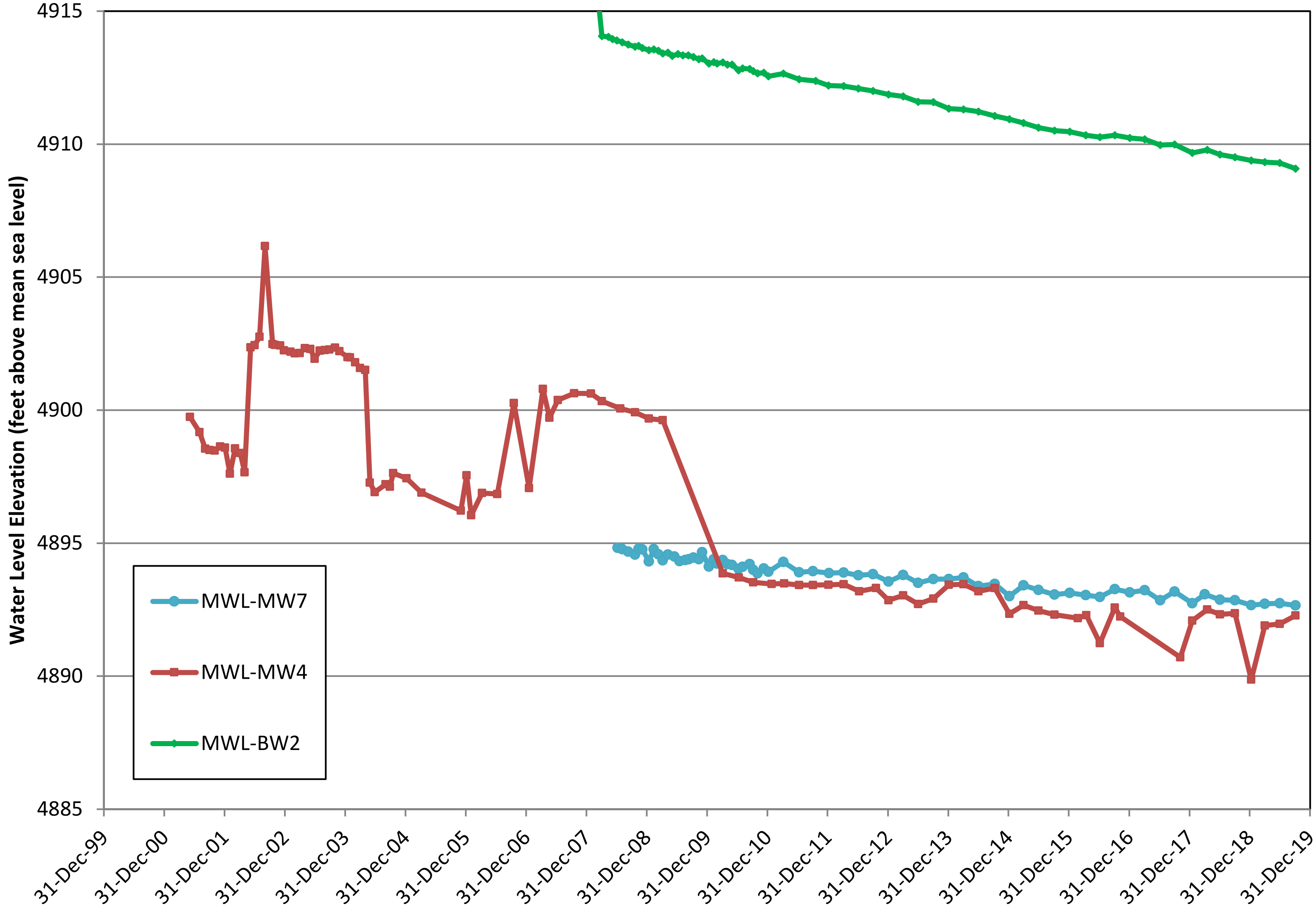

Note: GW Elevation corrected for 6°angle for MWL-MW4

Figure 4A-1. Mixed Waste Landfill Groundwater Monitoring Wells (1 of 2)

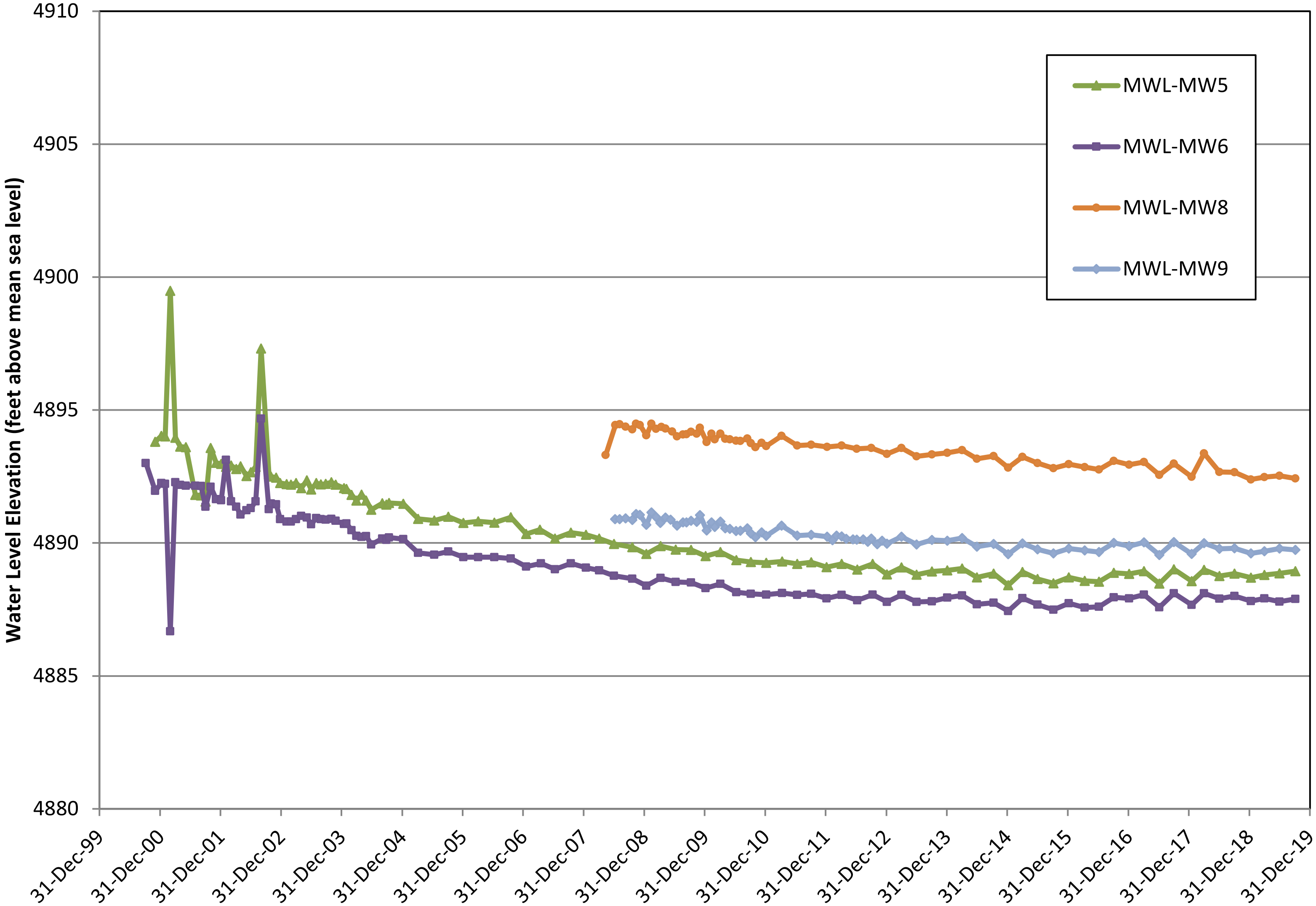

Figure 4A-2. Mixed Waste Landfill Groundwater Monitoring Wells (2 of 2)

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 2019

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-MW9 30-Apr-19	Acetone	1.51	1.50	10.0	NE	J	10U	108146-001	SW846-8260B
MWL-MW9 (Duplicate) 30-Apr-19	Acetone	1.78	1.50	10.0	NE	J	10U	108147-001	SW846-8260B
MWL-BW2 14-Oct-19	Acetone	2.89	1.50	10.0	NE	J	10.0U	110505-001	SW846-8260B
MWL-MW7 15-Oct-19	Methylene chloride	1.97	1.00	10.0	5.00	J	10.0U	110508-001	SW846-8260B
MWL-MW8 17-Oct-19	Methylene chloride	1.95	1.00	10.0	5.00	J	10.0U	110521-001	SW846-8260B
MWL-MW8 (Duplicate) 17-Oct-19	Methylene chloride	1.92	1.00	10.0	5.00	J	10.0U	110522-001	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 2019

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 2019

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		108125-002	SW846-6020
25-Apr-19	Chromium	ND	0.003	0.010	0.10	U		108125-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		108125-002	SW846-6020
	Uranium	0.00729	0.000067	0.0002	0.030			108125-002	SW846-6020
MWL-MW7	Cadmium	ND	0.0003	0.001	0.005	U		108132-002	SW846-6020
29-Apr-19	Chromium	ND	0.003	0.010	0.10	U		108132-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		108132-002	SW846-6020
	Uranium	0.00775	0.000067	0.0002	0.030			108132-002	SW846-6020
MWL-MW8	Cadmium	ND	0.0003	0.001	0.005	U		108150-002	SW846-6020
01-May-19	Chromium	ND	0.003	0.010	0.10	U		108150-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		108150-002	SW846-6020
	Uranium	0.00782	0.000067	0.0002	0.030			108150-002	SW846-6020
MWL-MW9	Cadmium	ND	0.0003	0.001	0.005	U		108146-002	SW846-6020
30-Apr-19	Chromium	ND	0.003	0.010	0.10	U		108146-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		108146-002	SW846-6020
	Uranium	0.0096	0.000067	0.0002	0.030			108146-002	SW846-6020
MWL-MW9 (Duplicate)	Cadmium	ND	0.0003	0.001	0.005	U		108147-002	SW846-6020
30-Apr-19	Chromium	ND	0.003	0.010	0.10	U		108147-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		108147-002	SW846-6020
	Uranium	0.00955	0.000067	0.0002	0.030			108147-002	SW846-6020
MWL-BW2	Cadmium	ND	0.0003	0.001	0.005	U		110505-002	SW846-6020
14-Oct-19	Chromium	ND	0.003	0.010	0.10	U		110505-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		110505-002	SW846-6020
	Uranium	0.00708	0.000067	0.0002	0.030			110505-002	SW846-6020
MWL-MW7	Cadmium	ND	0.0003	0.001	0.005	U		110508-002	SW846-6020
15-Oct-19	Chromium	ND	0.003	0.010	0.10	U		110508-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		110508-002	SW846-6020
	Uranium	0.00766	0.000067	0.0002	0.030			110508-002	SW846-6020
MWL-MW8	Cadmium	ND	0.0003	0.001	0.005	U		110521-002	SW846-6020
17-Oct-19	Chromium	ND	0.003	0.010	0.10	U		110521-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		110521-002	SW846-6020
	Uranium	0.00769	0.000067	0.0002	0.030			110521-002	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 2019

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 (Duplicate) 17-Oct-19	Cadmium	ND	0.0003	0.001	0.005	U		110522-002	SW846-6020
	Chromium	ND	0.003	0.010	0.10	U		110522-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		110522-002	SW846-6020
	Uranium	0.00748	0.000067	0.0002	0.030			110522-002	SW846-6020
MWL-MW9 16-Oct-19	Cadmium	ND	0.0003	0.001	0.005	U		110514-002	SW846-6020
	Chromium	ND	0.003	0.010	0.10	U		110514-002	SW846-6020
	Nickel	ND	0.0006	0.002	NE	U		110514-002	SW846-6020
	Uranium	0.00923	0.000067	0.0002	0.030			110514-002	SW846-6020

Refer to footnotes on page 4B-13.

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

Calendar Year 2019

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	-2.36 ± 11.7	17.8	8.65	NE	U	BD	108125-003	EPA 901.1
25-Apr-19	Cesium-137	-0.317 ± 2.33	3.89	1.86	NE	U	BD	108125-003	EPA 901.1
	Cobalt-60	1.49 ± 2.22	4.01	1.87	NE	U	BD	108125-003	EPA 901.1
	Potassium-40	79.2 ± 53.5	33.2	15.2	NE		J	108125-003	EPA 901.1
	Gross Alpha	1.38	NA	NA	15 pCi/L	NA	None	108125-004	EPA 900.0
	Gross Beta	0.618 ± 0.751	1.26	0.612	4 mrem/yr	U	BD	108125-004	EPA 900.0
	Tritium	-25.8 ± 90.9	167	78.0	4 mrem/yr	U	BD	108125-005	EPA 906.0
	Radon-222	425 ± 105	51.7	24.4	1000 pCi/L			108125-006	SM7500 Rn B
MWL-MW7	Americium-241	1.85 ± 9.11	14.6	7.11	NE	U	BD	108132-003	EPA 901.1
29-Apr-19	Cesium-137	-0.778 ± 2.43	2.89	1.37	NE	U	BD	108132-003	EPA 901.1
	Cobalt-60	0.774 ± 1.69	3.20	1.48	NE	U	BD	108132-003	EPA 901.1
	Potassium-40	19.9 ± 44.4	30.0	13.8	NE	U	BD	108132-003	EPA 901.1
	Gross Alpha	5.61	NA	NA	15 pCi/L	NA	None	108132-004	EPA 900.0
	Gross Beta	5.61 ± 1.54	2.36	1.15	4 mrem/yr		J	108132-004	EPA 900.0
	Tritium	-20.1 ± 90.3	165	77.1	4 mrem/yr	U	BD	108132-005	EPA 906.0
	Radon-222	167 ± 65.4	79.5	37.5	1000 pCi/L		J	108132-006	SM7500 Rn B
MWL-MW8	Americium-241	20.9 ± 19.4	24.1	11.6	NE	U	BD	108150-003	EPA 901.1
01-May-19	Cesium-137	-0.849 ± 2.07	3.44	1.61	NE	U	BD	108150-003	EPA 901.1
	Cobalt-60	-4.86 ± 6.43	4.42	2.04	NE	U	BD	108150-003	EPA 901.1
	Potassium-40	-31.1 ± 43.5	56.0	26.3	NE	U	BD	108150-003	EPA 901.1
	Gross Alpha	9.06	NA	NA	15 pCi/L	NA	None	108150-004	EPA 900.0
	Gross Beta	5.92 ± 1.11	1.61	0.780	4 mrem/yr			108150-004	EPA 900.0
	Tritium	-116 ± 80.7	162	75.5	4 mrem/yr	U	BD	108150-005	EPA 906.0
	Radon-222	149 ± 51.4	55.9	26.4	1000 pCi/L		J	108150-006	SM7500 Rn B
MWL-MW9	Americium-241	-0.549 ± 3.05	4.74	2.31	NE	U	BD	108146-003	EPA 901.1
30-Apr-19	Cesium-137	-0.0556 ± 2.07	3.53	1.67	NE	U	BD	108146-003	EPA 901.1
	Cobalt-60	-0.794 ± 2.03	3.45	1.58	NE	U	BD	108146-003	EPA 901.1
	Potassium-40	-48.8 ± 45.7	32.9	15.0	NE	U	BD	108146-003	EPA 901.1
	Gross Alpha	12.77	NA	NA	15 pCi/L	NA	None	108146-004	EPA 900.0
	Gross Beta	6.09 ± 1.07	1.56	0.759	4 mrem/yr			108146-004	EPA 900.0
	Tritium	-60.8 ± 87.4	166	77.5	4 mrem/yr	U	BD	108146-005	EPA 906.0
	Radon-222	469 ± 119	66.7	31.5	1000 pCi/L			108146-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

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

Calendar Year 2019

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 (Duplicate)	Americium-241	0.969 ± 12.5	23.3	11.2	NE	U	BD	108147-003	EPA 901.1
30-Apr-19	Cesium-137	-0.13 ± 1.95	3.57	1.68	NE	U	BD	108147-003	EPA 901.1
	Cobalt-60	-0.509 ± 2.02	3.67	1.66	NE	U	BD	108147-003	EPA 901.1
	Potassium-40	-81.1 ± 66.8	54.6	25.6	NE	U	BD	108147-003	EPA 901.1
	Gross Alpha	5.90	NA	NA	15 pCi/L	NA	None	108147-004	EPA 900.0
	Gross Beta	5.28 ± 1.15	1.73	0.843	4 mrem/yr			108147-004	EPA 900.0
	Tritium	-51.2 ± 87.2	164	76.6	4 mrem/yr	U	BD	108147-005	EPA 906.0
	Radon-222	464 ± 118	66.8	31.5	1000 pCi/L			108147-006	SM7500 Rn B
MWL-BW2	Americium-241	3.83 ± 12.6	21.9	10.6	NE	U	BD	110505-003	EPA 901.1
14-Oct-19	Cesium-137	0.489 ± 2.12	3.90	1.85	NE	U	BD	110505-003	EPA 901.1
	Cobalt-60	0.295 ± 2.23	4.01	1.84	NE	U	BD	110505-003	EPA 901.1
	Potassium-40	-3.89 ± 45.5	53.6	25.1	NE	U	BD	110505-003	EPA 901.1
	Gross Alpha	2.17	NA	NA	15 pCi/L	NA	None	110505-004	EPA 900.0
	Gross Beta	5.63 ± 1.19	1.72	0.838	4 mrem/yr			110505-004	EPA 900.0
	Tritium	-49.6 ± 72.7	136	64.0	4 mrem/yr	U	BD	110505-005	EPA 906.0
	Radon-222	381 ± 106	81.5	38.5	1000 pCi/L			110505-006	SM7500 Rn B
MWL-MW7	Americium-241	-3.93 ± 8.13	13.5	6.50	NE	U	BD	110508-003	EPA 901.1
15-Oct-19	Cesium-137	0.593 ± 1.68	3.03	1.42	NE	U	BD	110508-003	EPA 901.1
	Cobalt-60	-0.0356 ± 1.99	3.67	1.69	NE	U	BD	110508-003	EPA 901.1
	Potassium-40	-30.8 ± 47.1	53.1	25.1	NE	U	BD	110508-003	EPA 901.1
	Gross Alpha	1.88	NA	NA	15 pCi/L	NA	None	110508-004	EPA 900.0
	Gross Beta	9.21 ± 1.18	1.60	0.777	4 mrem/yr			110508-004	EPA 900.0
	Tritium	-52.2 ± 70.2	132	62.1	4 mrem/yr	U	BD	110508-005	EPA 906.0
	Radon-222	140 ± 55.5	68.1	32.2	1000 pCi/L		J	110508-006	SM7500 Rn B
MWL-MW8	Americium-241	5.70 ± 14.4	23.5	11.4	NE	U	BD	110521-003	EPA 901.1
17-Oct-19	Cesium-137	-1.15 ± 3.48	3.68	1.73	NE	U	BD	110521-003	EPA 901.1
	Cobalt-60	1.12 ± 2.45	4.65	2.15	NE	U	BD	110521-003	EPA 901.1
	Potassium-40	10.0 ± 52.4	33.2	14.9	NE	U	BD	110521-003	EPA 901.1
	Gross Alpha	3.90	NA	NA	15 pCi/L	NA	None	110521-004	EPA 900.0
	Gross Beta	5.88 ± 0.717	0.799	0.380	4 mrem/yr			110521-004	EPA 900.0
	Tritium	-8.04 ± 79.7	144	67.4	4 mrem/yr	U	BD	110521-005	EPA 906.0
	Radon-222	140 ± 47.2	49.5	23.3	1000 pCi/L		J	110521-006	SM7500 Rn B

Refer to footnotes on page 4B-13.

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

Calendar Year 2019

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 (Duplicate)	Americium-241	10.0 ± 18.7	29.9	14.5	NE	U	BD	110522-003	EPA 901.1
17-Oct-19	Cesium-137	0.993 ± 2.10	3.73	1.76	NE	U	BD	110522-003	EPA 901.1
	Cobalt-60	-0.285 ± 1.81	3.32	1.50	NE	U	BD	110522-003	EPA 901.1
	Potassium-40	-54.5 ± 47.2	56.4	26.6	NE	U	BD	110522-003	EPA 901.1
	Gross Alpha	6.89	NA	NA	15 pCi/L	NA	None	110522-004	EPA 900.0
	Gross Beta	6.04 ± 0.792	0.952	0.456	4 mrem/yr			110522-004	EPA 900.0
	Tritium	-49.9 ± 75.8	142	66.7	4 mrem/yr	U	BD	110522-005	EPA 906.0
	Radon-222	196 ± 57.7	49.6	23.3	1000 pCi/L			110522-006	SM7500 Rn B
MWL-MW9	Americium-241	2.52 ± 6.35	11.6	5.58	NE	U	BD	110514-003	EPA 901.1
16-Oct-19	Cesium-137	-2.59 ± 3.34	3.91	1.87	NE	U	BD	110514-003	EPA 901.1
	Cobalt-60	0.193 ± 1.66	3.13	1.43	NE	U	BD	110514-003	EPA 901.1
	Potassium-40	17.2 ± 39.3	32.2	14.8	NE	U	BD	110514-003	EPA 901.1
	Gross Alpha	0.38	NA	NA	15 pCi/L	NA	None	110514-004	EPA 900.0
	Gross Beta	7.58 ± 0.918	1.09	0.525	4 mrem/yr			110514-004	EPA 900.0
	Tritium	-44.6 ± 71.3	133	62.5	4 mrem/yr	U	BD	110514-005	EPA 906.0
	Radon-222	447 ± 113	59.7	28.1	1000 pCi/L			110514-006	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 2019

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	25-Apr-19	21.55	741.2	57.0	7.28	2.44	25.7	1.86
MWL-MW7	29-Apr-19	22.40	685.9	174.5	7.48	0.43	83.7	6.07
MWL-MW8	01-May-19	21.01	662.9	167.5	7.42	0.56	36.6	2.70
MWL-MW9	30-Apr-19	20.57	668.8	11.8	7.34	1.33	18.3	1.33
MWL-BW2	14-Oct-19	20.91	735.8	-14.8	7.34	2.21	43.86	3.25
MWL-MW7	15-Oct-19	21.79	607.9	123.1	7.54	0.29	92.40	6.59
MWL-MW8	17-Oct-19	20.50	606.8	114.6	7.49	0.19	50.61	3.69
MWL-MW9	16-Oct-19	21.77	619.6	116.2	7.46	0.24	23.73	1.70

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.
No.	= Number.
pCi/L	= Picocuries per liter.

[a]Result or Activity

Result applies to Table 4A-1 through 4A-3. Activity applies to Table 4A-4.

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 4B-1 through 4B-3. MDA applies to Table 4B-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 4B-1 through 4B-3. Critical Level applies to Table 4B-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 March 2018).
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]Laboratory Qualifier
If cell is blank, then all quality control samples met acceptance criteria with respect to submitted samples.

J = Estimated value, the analyte concentration is below the practical quantitation limit (PQL).
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.
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.

[g]Analytical Method
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SM = Standard Method.
SW = Solid Waste.

[h]Field Water Quality Measurements
Field measurements collected prior to sampling.
˚C = Degrees Celsius.
% Sat = Percent saturation.
µmho/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
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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 the 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) production wells located north of KAFB, and from the production 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 of at the Liquid Waste Disposal System (LWDS) Drain Field, the two unlined LWDS Surface Impoundments, and the TA-V Seepage Pits.

Since 1992, SNL/NM Environmental Restoration (ER) Operations personnel have conducted numerous investigations in the TAVG AOC. Table 5A-1 in Attachment 5A provides the historic timeline for the TAVG AOC investigations. Many of these investigations (soil and soil-vapor) were site-specific and were conducted for supporting various Solid Waste Management Unit (SWMU) assessments. 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.

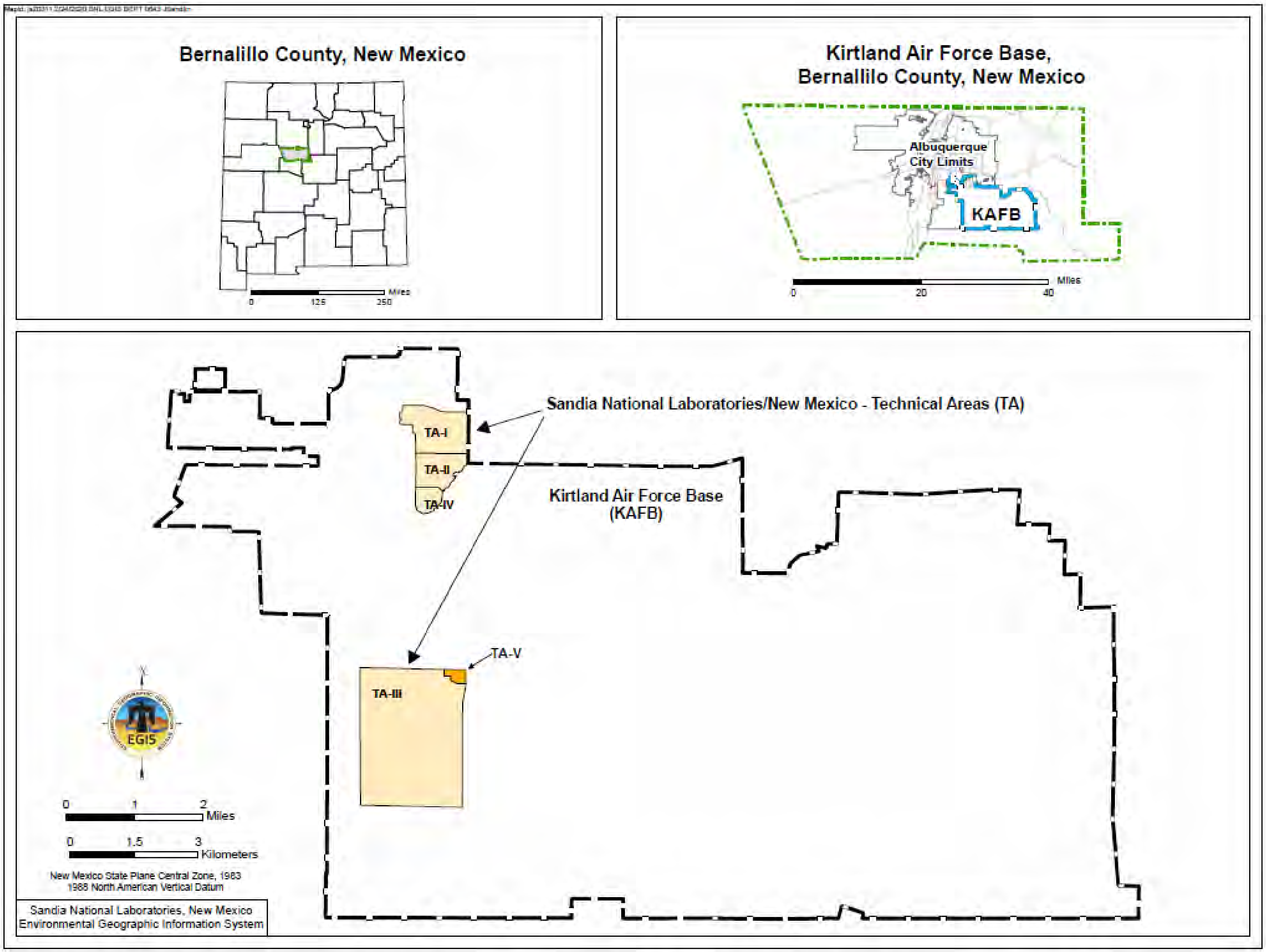

Figure 5-1. Location of Sandia National Laboratories, New Mexico and Technical Area-V

5.1.3 Monitoring History

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).

Groundwater monitoring at TA-V began in October 1992. TCE was first detected in monitoring well LWDS-MW1 in November 1993 and was 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 1992, 20 groundwater monitoring wells have been installed and two of the 20 have gone dry (Table 5-1). Groundwater monitoring results for the TAVG AOC monitoring network continue to be summarized in the Annual Groundwater Monitoring Reports (AGMRs).

Three soil-vapor monitoring wells were installed at the TAVG AOC in 2011. Soil-vapor samples were collected for eight consecutive quarters starting in April 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 AGMR (SNL June 2014), and are summarized in Section 5.1.6.5.

5.1.4 Current Monitoring Network

In CY 2019, all 18 active monitoring wells in the TAVG AOC were sampled and measured for water levels for site-characterization purposes (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 (Revised TSWP) (SNL March 2016) as approved by NMED HWB (NMED HWB May 2016a). The new sampling protocol started in CY 2017.

Monitoring well TAV-MW6 and injection well TAV-INJ1 (Table 5-1) are part of an on-going ISB Treatability Study conducted at the TAVG AOC, and follow a separate monitoring plan in accordance with the Revised TSWP (SNL March 2016). Monitoring for the ISB Treatability Study is discussed in Section 5.1.7.

5.1.5 Summary of Calendar Year 2019 Activities

The following activities were conducted for the TAVG AOC during CY 2019:

- Obtained quarterly water level measurements.
- Prepared sampling and analysis plans using a combination of quarterly and annual frequencies. The sampling events were conducted in January/February 2019, May/June 2019, July/August 2019, and October/November 2019.
- Prepared a set of summary tables for the analytical results (Attachment 5B), concentration versus time plots (Attachment 5C), and hydrographs (Attachment 5D).
- Completed the six-month injection period for the Phase I full-scale operation of the ISB Treatability Study in April 2019. A series of 110 injections totaling 531,516 gallons (gal) of treatment solution were discharged to the Regional Aquifer using injection well TAV-INJ1.

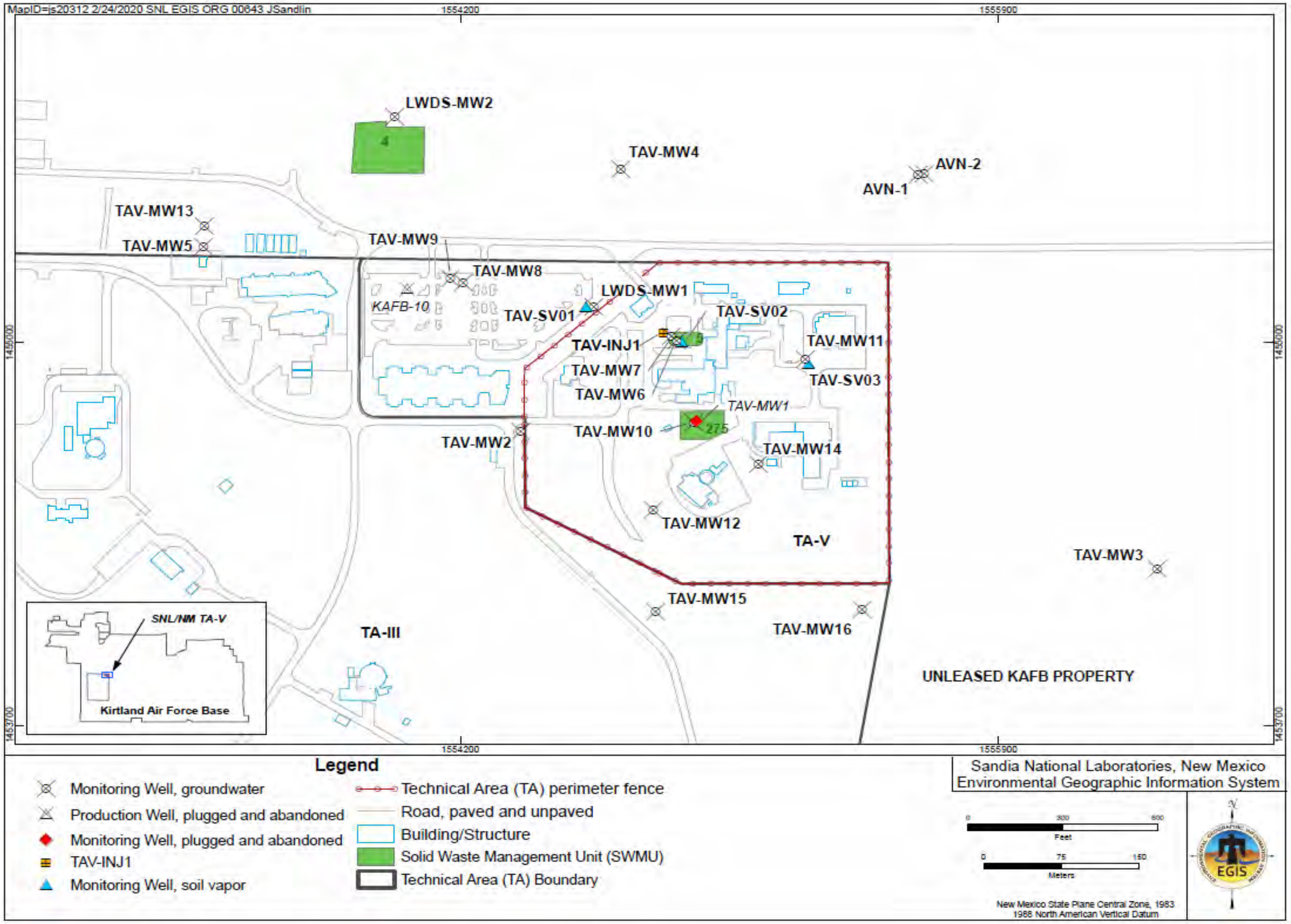

Figure 5-2. Technical Area-V Groundwater Area of Concern Monitoring Well Locations

Table 5-1. Groundwater Monitoring and Injection Wells Screened in the Regional Aquifer at the Technical Area-V Groundwater Area of Concern

Well ID	Installation Year	WQ[a]	WL[a]	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[b]	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	18	Total for AGMR reporting

NOTES:

[a] Check marks (√) indicate WQ sampling and WL measurements were obtained during this reporting period. Check marks with an asterisk (√*) indicate that results are solely presented in the ER Operations Quarterly Reports that are submitted to NMED HWB separately.

[b] 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 filter pack (2-millimeter SiLibeads®) extends from 504 to 544.5 ft bgs.

AGMR = Annual Groundwater Monitoring Report.
AVN = Area-V (North).
bgs = Below ground surface.
ER = Environmental Restoration.
ft = Foot (feet).
HWB = Hazardous Waste Bureau.
ID = Identifier.
INJ = Injection Well.
LWDS = Liquid Waste Disposal System.
MW = Monitoring well.
NA = Not applicable.
NMED = New Mexico Environment Department.
P&A = Plugged and abandoned (decommissioned).
TAV = Technical Area-V (monitoring well designation).
WL = Water level.
WQ = Water quality.

- Began the two-year performance monitoring period for the Phase I full-scale operation of the ISB Treatability Study in May 2019. Collected groundwater samples for the ISB Treatability Study parameters specified in the Revised TSWP (SNL March 2016). The monitoring results are reported in the ER Operations Quarterly Reports that are submitted to NMED HWB.

- Collected groundwater samples for Discharge Permit (DP) 1845 (DP-1845) compliance activities involving the DP-specific analytes. The corresponding analytical results are reported in the DP-1845 Quarterly Reports that are submitted to the NMED Ground Water Quality Bureau (GWQB).

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 ft thick, extend over tens of square miles, and primarily consist of unconsolidated and partially cemented deposits that interfinger in complex arrangements.

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 ft 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 ft of the vadose zone. These deposits were derived primarily from alluvial fans that developed from Coyote Canyon to the east.

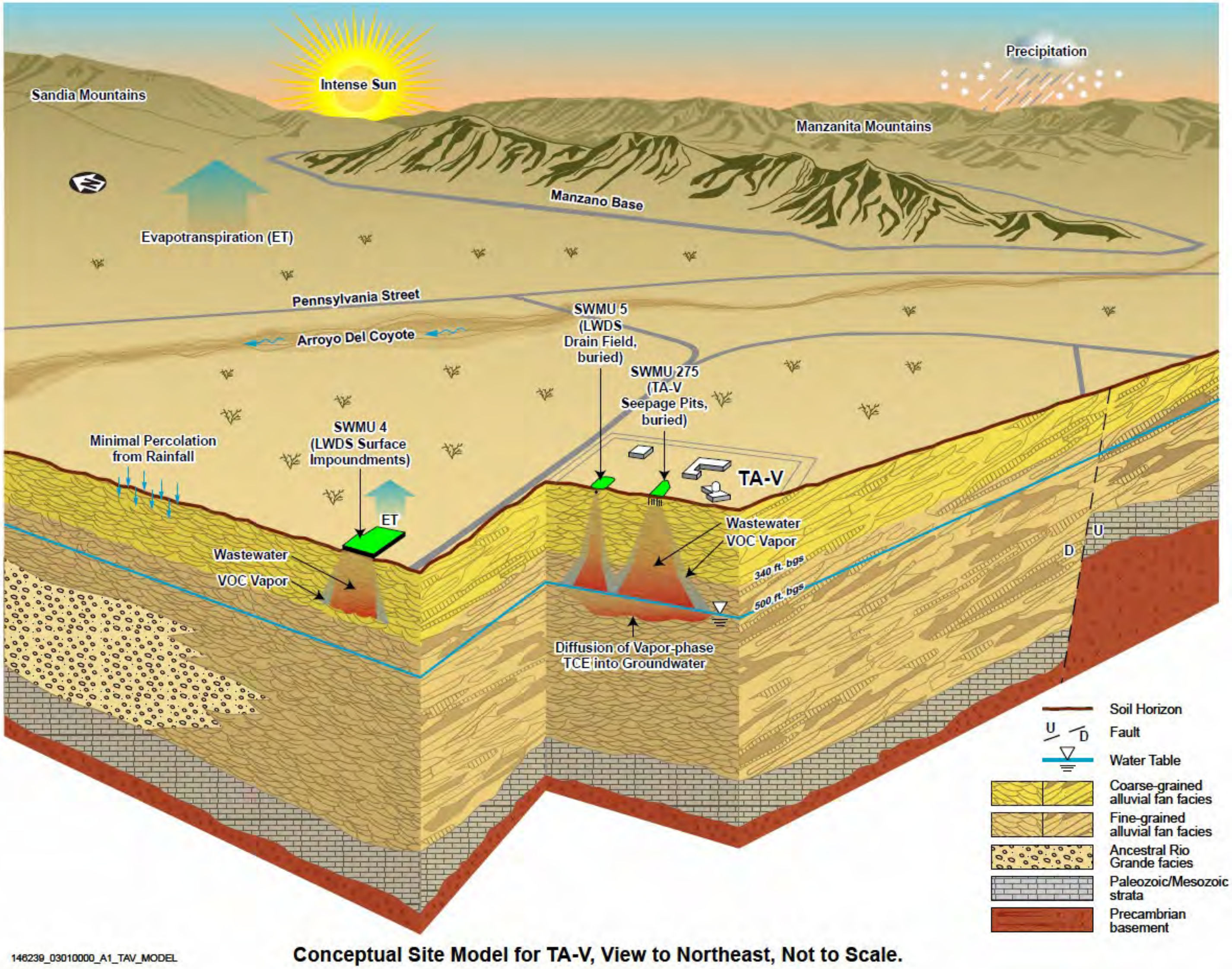

Figure 5-3. Conceptual Site Model for the Technical Area-V Groundwater Area of Concern (SNL September 2015)

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 production 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 ft 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. For the TA-V Current Conceptual Model (CCM), vertical hydraulic gradients were calculated using three well pairs (SNL September 2015). Between monitoring well pairs TAV-MW5 and TAV-MW13, the hydraulic gradient was downward at 0.12 ft per ft (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.

The geochemical signatures (cations and anions) for groundwater samples collected at all of the TA-V monitoring wells are similar and groundwater in the TAVG AOC is classified as a calcium-bicarbonate type (SNL September 2015).

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 2019 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 30.82 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 ft per year (ft/yr) (SNL September 2015).

A subtle mound in the water table near monitoring wells LWDS-MW1, TAV-MW2, and TAV-MW8 is evident on Figure 5-4. This mounding has persisted for several decades. 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 production 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 TA-V groundwater monitoring wells. The declines are due to the combined pumping of the Regional Aquifer by the KAFB and ABCWUA production wells. The rates of decline range from 0.47 to 0.84 ft/yr with an average decline rate of 0.7 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 wells TAV-MW5 and TAV-MW13. The dewatering of the aquifer is expected to continue as long as pumping of production 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 production 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 October/November 2019 at Technical Area-V Area of Concern

Well ID	Measuring Point (ft amsl) NAVD 88	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)
AVN-1	5443.00	15-Oct-2019	527.50	4915.50
LWDS-MW1	5423.83	18-Oct-2019	505.50	4918.33
LWDS-MW2	5412.41	15-Oct-2019	494.54	4917.87
TAV-INJ1	5429.70	20-Nov-2019	512.21	4917.49
TAV-MW2	5427.33	15-Oct-2019	507.52	4919.81
TAV-MW3	5464.30	15-Oct-2019	548.45	4915.85
TAV-MW4	5427.89	15-Oct-2019	510.03	4917.86
TAV-MW5	5408.71	15-Oct-2019	492.88	4915.83
TAV-MW6	5431.17	4-Nov-2019	513.65	4917.52
TAV-MW7	5430.40	21-Oct-2019	517.97	4912.43
TAV-MW8	5417.00	18-Oct-2019	498.41	4918.59
TAV-MW9	5416.27	18-Oct-2019	501.83	4914.44
TAV-MW10	5437.03	15-Oct-2019	519.70	4917.33
TAV-MW11	5440.12	15-Oct-2019	522.55	4917.57
TAV-MW12	5435.72	15-Oct-2019	519.70	4916.02
TAV-MW13	5409.02	15-Oct-2019	497.77	4911.25
TAV-MW14	5441.52	15-Oct-2019	526.28	4915.24
TAV-MW15	5437.32	15-Oct-2019	520.92	4916.40
TAV-MW16	5448.34	15-Oct-2019	536.63	4911.71

NOTES:
amsl = Above mean sea level.
AVN = Area-V (North).
btoc = Below top of casing (the measuring point).
ft = Foot or feet.
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.

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 base-wide KAFB sanitary sewer system that drains to the ABCWUA interceptor line. 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 gal. 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 gal 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 Technical Area-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[b]	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	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				

NOTES:

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

[b] 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.

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

ft = Foot or feet.
gal = Gallon.
LWDS = Liquid Waste Disposal System.
SWMU = Solid Waste Management Unit.

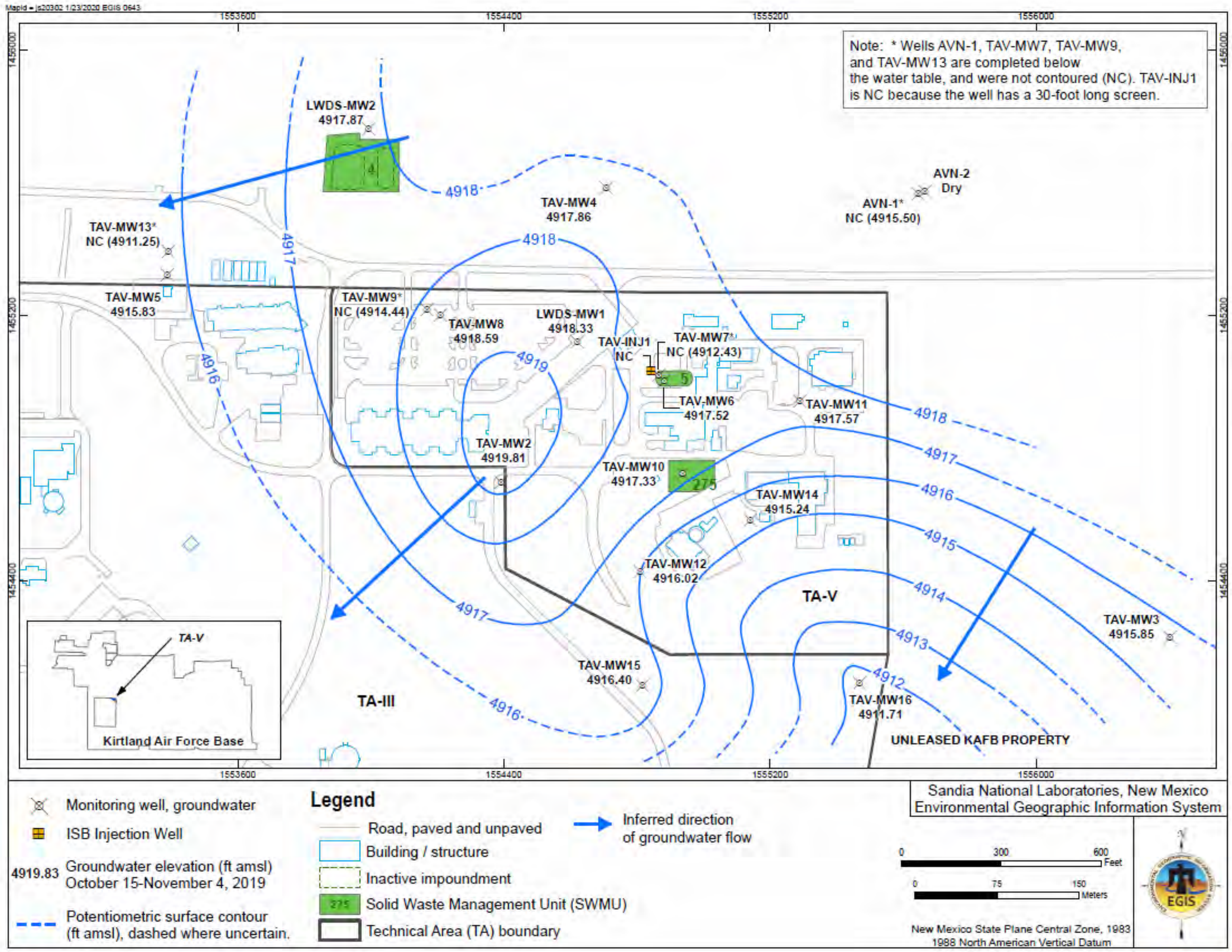

Figure 5-4. Potentiometric Surface of the Regional Aquifer at the Technical Area-V Groundwater Area of Concern (October/November 2019)

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. 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 except for one anomalous occurrence in May 2019 (discussed in Section 5.6).

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 base-wide 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 HWB-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. These two wells have historically showed similar nitrate plus nitrite (NPN; 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

Vapor migration of VOCs in the vadose zone is a possible transport mechanism contributing to the distribution and transport of COCs in groundwater. 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 1999a). 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 1999a).

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 2011 (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 (April 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.

The concentrations of TCE and nitrate in groundwater are above the MCLs at the locations where up to 86 percent of the TA-V wastewater and sanitary waste was disposed (SWMUs 5 and 275). 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 relatively stable TCE and nitrate concentrations in TA-V groundwater can be attributed to the relatively slow processes of dispersion and diffusion, and specifically for TCE the reversible sorption process.

The CY 2019 analytical results for TCE and nitrate and concentration trend analysis are discussed 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 CCM Report (SNL September 2015). Production 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. Production well KAFB-4, the nearest downgradient production well, is located approximately 2.8 miles north-northwest of TA-V. Additional production wells are located farther north near the northern boundary of KAFB and are operated by KAFB, the Veterans Affairs, and the ABCWUA. The results of MODFLOW modeling (SNL July 2005) demonstrated that contaminants in TA-V groundwater do not pose a threat to those production 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 Department of Energy (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 the 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 ISB Treatability Study is to induce biodegradation of TCE and nitrate by gravity injecting a nutrient-amended treatment solution containing dechlorinating 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 2016a).

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 TAV-MW6, TAV-MW10, and LWDS-MW1, 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. This treatment solution, along with the dechlorinating bacteria, would be gravity-injected into the Regional Aquifer via the injection wells.

The ISB 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 an approximate six-month injection period followed by two years of performance monitoring. Phase II involves the installation of two additional injection wells (TAV-INJ2 and TAV-INJ3) and conducting full-scale operations. The Phase I injection well (TAV-INJ1) was installed in November 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 gal of treatment solution would be discharged at each injection well during full-scale operation. The 530,000-gal goal was selected to treat a cylindrical portion of the aquifer that is 25-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 (potential of hydrogen [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 DOE/NNSA and SNL/NM personnel to install and operate the ISB 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 will end on May 30, 2022. As required by DP-1845, DOE/NNSA and SNL/NM personnel submit quarterly reports to the NMED GWQB responding to the terms and conditions stipulated in DP-1845.

5.1.7.4 Treatability Study Phase I Pilot Test

The pilot test for the ISB Treatability Study started in November 2017 at injection well TAV-INJ1. Two injections of approximately 4,500 gal each were discharged through injection well TAV-INJ1, with the first injection conducted over the course of two days (November 21 and 22, 2017) and the second injection conducted on November 27, 2017. 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 during the pilot test involved the measurement of in-situ water quality parameters using down-hole sondes and the collection of groundwater samples at the injection well and two nearby monitoring wells, TAV-MW6, and TAV-MW7. Performance monitoring of the three wells began on November 28, 2017 and concluded in June 2018. 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 2018).

The results of the pilot test showed that the treatment solution injected at the injection well was able to maintain the anaerobic and reduced conditions in the aquifer near the injection well for seven months after the treatment solution was injected. The aboveground injection system functioned as designed and discharges occurred without sustained mounding at the injection well. Based on these results, DOE/NNSA and SNL/NM personnel submitted the decision to proceed to full-scale operation to the NMED HWB, along with several modifications to the full-scale operation in July 2018 (DOE July 2018). The NMED HWB approved the modifications and concurred with the decision to proceed with the full-scale operation at injection well TAV-INJ1 in August 2018 (NMED HWB August 2018).

As originally planned in the Revised TSWP, wells TAV-MW6 and TAV-MW7 were categorized as performance monitoring wells for the Phase I full-scale operation of the ISB Treatability Study and were sampled for analytes and at frequencies specifically designed for the Treatability Study (SNL March 2016). The results of the pilot test showed that the injections at well TAV-INJ1 had no impact on either the water level or the groundwater quality in well TAV-MW7. This is because well TAV-MW7 is a deep well with the top of screen set at 90 ft below the water table, while the screens of wells TAV-INJ1 and TAV-MW6 are set across the water table. Therefore, DOE/NNSA and SNL/NM proposed to revert well TAV-MW7 back to the TA-V groundwater monitoring network starting in the fourth quarter of CY 2018 (DOE July 2018), which was subsequently approved (NMED HWB August 2018). Well TAV-MW6 remains as the performance monitoring well for the Phase I full-scale operation, and therefore, it is currently excluded from the TA-V groundwater monitoring network.

5.1.7.5 Treatability Study Phase I Full-Scale Operation

SNL/NM personnel started the Phase I full-scale operation in October 2018 and completed the six-month injection period in April 2019. A series of 110 injections totaling 531,516 gal of treatment solution were discharged to the Regional Aquifer using injection well TAV-INJ1. A total of 122.8 liters (32.4 gal) of dechlorinating bacteria were injected along with the treatment solution. Details on the six-month injection activities are provided in Section III of the October 2019 ER Operations Quarterly Report (SNL October 2019a). The injection period is followed by two years of performance monitoring for the ISB. The two-year performance monitoring includes three monthly sampling events followed by quarterly sampling events for the remainder of the two-year period, as planned in the Revised TSWP (SNL March 2016). The three monthly sampling events occurred in May, June, and July 2019. The Phase I full-scale operation performance monitoring is currently on a quarterly schedule until May 2021.

Full-scale operation activities and analytical results including those for injection well TAV-INJ1 and monitoring well TAV-MW6 are presented in the ER Operations Quarterly Reports that are submitted to the NMED HWB and are not repeated in the Annual Groundwater Monitoring Reports. In addition, the analytical results for DP-specific requirements are presented in DP-1845 Quarterly Reports that are submitted to the NMED GWQB and are not repeated in the AGMR.

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 HWB 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 ISB 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 AGMR. 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, TA-V groundwater monitoring data are presented for both hazardous and radioactive constituents; however, the analytical data for radionuclides (gamma spectroscopy short list, 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.

5.3 Scope of Activities

Section 5.1.5 describes the activities for the TA-V groundwater monitoring in CY 2019, including plans and reports. The field activities included groundwater level measurements and groundwater sampling. Table 5-4 summarizes the CY 2019 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 revised sampling protocol specified in the Revised TSWP (SNL March 2016).

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 environmental 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 2019 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 2019

This section discusses the CY 2019 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 5-5, the second quarter of CY 2019 was the most comprehensive sampling event for the TAVG AOC, when 17 wells (all 18 active monitoring wells minus TAV-MW6; see Section 5.1.7.4) were sampled and the annual waste characterization parameters were analyzed.

Table 5-4. Groundwater Monitoring Well Network and Sampling Dates for the Technical Area-V Groundwater Area of Concern, Calendar Year 2019

Date of Sampling Event	Wells Sampled	SAP
January/February 2019	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 Second Quarter, Fiscal Year 2019* (SNL January 2019)
May/June 2019	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	*TA-V Groundwater Monitoring Mini-SAP for Third Quarter, Fiscal Year 2019* (SNL April 2019a)
July/August 2019	LWDS-MW1, LWDS-MW2, 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 Fourth Quarter, Fiscal Year 2019* (SNL July 2019)
October/November 2019	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 2020* (SNL October 2019b)

NOTES:

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

Table 5-5. Parameters Sampled at Technical Area-V Groundwater Area of Concern Monitoring Wells for Each Sampling Event, Calendar Year 2019

January/February 2019		May/June 2019	
Parameter	**Well ID**	**Parameter**	**Well ID**
Arsenic, dissolved Iron, dissolved Manganese, dissolved NPN VOCs	LWDS-MW1 TAV-MW2 TAV-MW4 TAV-MW7 TAV-MW7 (Duplicate) TAV-MW8 TAV-MW8 (Duplicate) TAV-MW10 TAV-MW11 TAV-MW11 (Duplicate) TAV-MW12 TAV-MW14 TAV-MW15 TAV-MW16	Alkalinity[a] Anions (Bromide, Chloride, Fluoride, Sulfate)[a] Arsenic, dissolved Gamma Spectroscopy (short list[b]) Gross Alpha/Beta Activity[a] Iron, dissolved Manganese, dissolved NPN TAL Metals plus Total Uranium Tritium[a] VOCs	AVN-1 LWDS-MW1 LWDS-MW2 LWDS-MW2 (Duplicate) TAV-MW2 TAV-MW3 TAV-MW3 (Duplicate) TAV-MW4 TAV-MW5 TAV-MW7 TAV-MW8 TAV-MW9 TAV-MW9 (Duplicate) TAV-MW10 TAV-MW11 TAV-MW12 TAV-MW12 (Duplicate) TAV-MW13 TAV-MW14 TAV-MW15 TAV-MW16
July/August 2019		**October/November 2019**	
Parameter	**Well ID**	**Parameter**	**Well ID**
Arsenic, dissolved Iron, dissolved Manganese, dissolved NPN VOCs	LWDS-MW1 LWDS-MW1 (duplicate) LWDS-MW2 TAV-MW2 TAV-MW4 TAV-MW4 (Duplicate) TAV-MW7 TAV-MW8 TAV-MW10 TAV-MW11 TAV-MW12 TAV-MW14 TAV-MW15 TAV-MW15 (Duplicate) TAV-MW16	Arsenic, dissolved Iron, dissolved Manganese, dissolved NPN VOCs	LWDS-MW1 TAV-MW2 TAV-MW2 (Duplicate) TAV-MW4 TAV-MW7 TAV-MW8 TAV-MW10 TAV-MW10 (Duplicate) TAV-MW11 TAV-MW12 TAV-MW14 TAV-MW14 (Duplicate) TAV-MW15 TAV-MW16 TAV-MW16 (Duplicate)

NOTES:

[a]Analyses performed 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 (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 laboratory method detection limits (MDLs). Four VOCs were detected at concentrations above the MDLs in groundwater samples from TAVG AOC monitoring wells in CY 2019:

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

TCE was the only VOC that exceeded an MCL in CY 2019 (Table 5B-1, Attachment 5B). TCE was detected above the MCL (5 µg/L) in samples from five monitoring wells: LWDS-MW1, TAV-MW4, TAV-MW8, TAV-MW10, and TAV-MW14. The maximum TCE concentration was 20.2 µg/L in the sample collected from monitoring well LWDS-MW1 in November 2019. Historically, the highest TCE concentrations at TA-V have been consistently detected at monitoring well LWDS-MW1. Figures 5C-1 through 5C-5 (Attachment 5C) present the TCE concentration trend plots for monitoring wells LWDS-MW1, TAV-MW4, TAV-MW8, TAV-MW10, and TAV-MW14. Figures 5C-1 through 5C-5 show that:

- LWDS-MW1 (Figure 5C-1, Attachment 5C). In CY 2019, the maximum TCE concentration was 20.2 µg/L (November 2019). This well shows the widest range of fluctuations per quarter for the five wells. However, the overall TCE trend is stable.

- TAV-MW4 (Figure 5C-2, Attachment 5C). In CY 2019, the maximum TCE concentration was 5.44 µg/L (May 2019). The overall TCE trend is increasing. The TCE concentration exceeded the MCL for the first time in May 2019 and also exceeded the MCL in the subsequent two quarters in CY 2019. The first-time exceedance was reported to the NMED HWB in the October 2019 ER Operations Quarterly Report (SNL October 2019a).

- TAV-MW8 (Figure 5C-3, Attachment 5C). In CY 2019, the maximum TCE concentration was 6.30 µg/L (February 2019). The overall TCE trend is increasing.

- TAV-MW10 (Figure 5C-4, Attachment 5C). In CY 2019, the maximum TCE concentration was 14.9 µg/L (November 2019). The overall TCE trend is slightly decreasing.

- TAV-MW14 (Figure 5C-5, Attachment 5C). In CY 2019, the maximum TCE concentration was 6.60 µg/L (February 2019). The overall TCE trend is slightly decreasing.

TCE has also been consistently detected above the MCL of 5 µg/L at well TAV-MW6 since August 2006. This well is currently part of the ISB Treatability Study discussed in Section 5.1.7. TCE has been detected below the MCL at four other monitoring wells (TAV-MW2, TAV-MW11, TAV-MW12, and TAV-MW16). TCE has never been detected in the remaining eight monitoring wells (AVN-1, LWDS-MW2, TAV-MW3, TAV-MW5, TAV-MW7, TAV-MW9, TAV-MW13, and TAV-MW15), among which TAV-MW7, TAV-MW9, and TAV-MW13 are deep wells; AVN-1, TAV-MW3, TAV-MW15, TAV-MW5, and LWDS-MW2, in clockwise, are background wells surrounding TA-V. Figure 5-5 shows the TCE isoconcentration contours for second quarter of CY 2019. The general location and shape of the contours have not changed significantly over the past several years.

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-MW13 is screened approximately 40 ft deeper than well TAV-MW5. TCE has not been detected at either well.

Table 5B-3, Attachment 5B presents the analytical results for NPN (reported as nitrogen) for CY 2019. NPN concentrations exceeded the MCL (10 mg/L) in samples from four monitoring wells: AVN-1, LWDS-MW1, LWDS-MW2, and TAV-MW10. The maximum NPN concentration was 15.3 mg/L in the sample collected from monitoring well LWDS-MW1 in June 2019. The NPN concentrations in monitoring wells LWDS-MW1 and TAV-MW10 have typically exceeded the MCL. Figures 5C-6 through 5C-9 (Attachment 5C) present the NPN concentration trend plots for monitoring wells AVN-1, LWDS-MW1, LWDS-MW2, and TAV-MW10. Figures 5C-6 through 5C-9 show that:

- AVN-1 (Figure 5C-6, Attachment 5C). Well AVN-1 is sampled annually. In CY 2019, the NPN concentration was 12.6 mg/L (May 2019). The overall NPN trend is stable.

- LWDS-MW1 (Figure 5C-7, Attachment 5C). In CY 2019, the maximum NPN concentration was 13.8 mg/L (June 2019). The overall NPN trend is stable.

- LWDS-MW2 (Figure 5C-8, Attachment 5C). Well LWDS-MW2 is sampled annually. In CY 2019, the NPN concentration was 12.3 mg/L (May 2019), exceeding the MCL for the first time at this well. The first-time exceedance was reported to the NMED HWB in the October 2019 ER Operations Quarterly Report (SNL October 2019a). SNL/NM personnel voluntarily sampled this well again in August 2019 and the NPN concentration was 8.85 mg/L, which was below the MCL of 10 mg/L. The May 2019 NPN result is considered anomalous. The overall NPN trend is stable.

- TAV-MW10 (Figure 5C-9, Attachment 5C). In CY 2019, the maximum NPN concentration was 15.3 mg/L (June 2019). The overall NPN trend is stable.

Figure 5-6 shows the NPN isoconcentration contour for second quarter in CY 2019. 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 HWB-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 2019 (Figures 5-5 and 5-6, respectively) 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 of 4.0 mg/L.

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/beta activity, 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 groundwater samples could be collected.

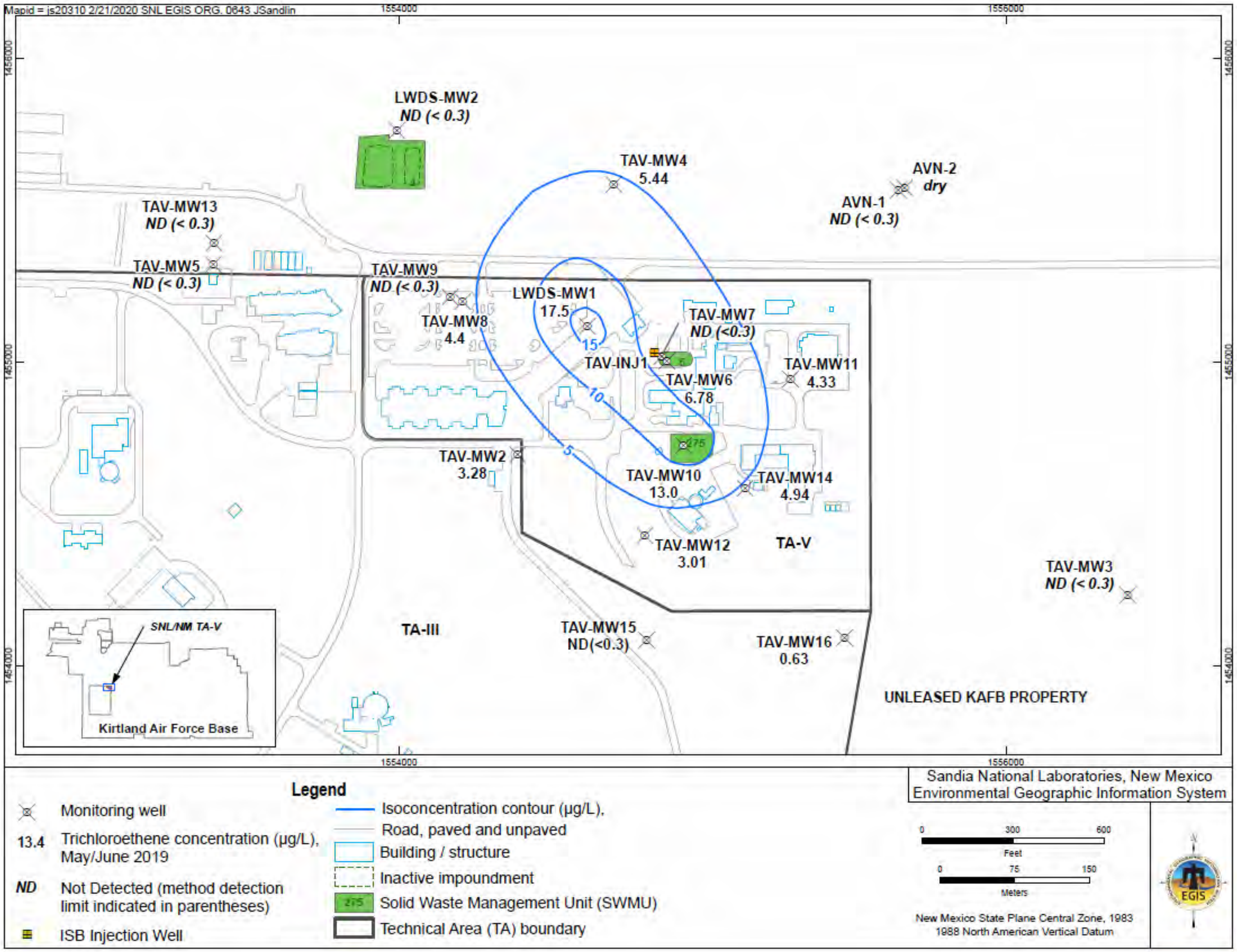

Figure 5-5. Distribution of TCE in Groundwater at Technical Area-V Groundwater Area of Concern, May/June 2019

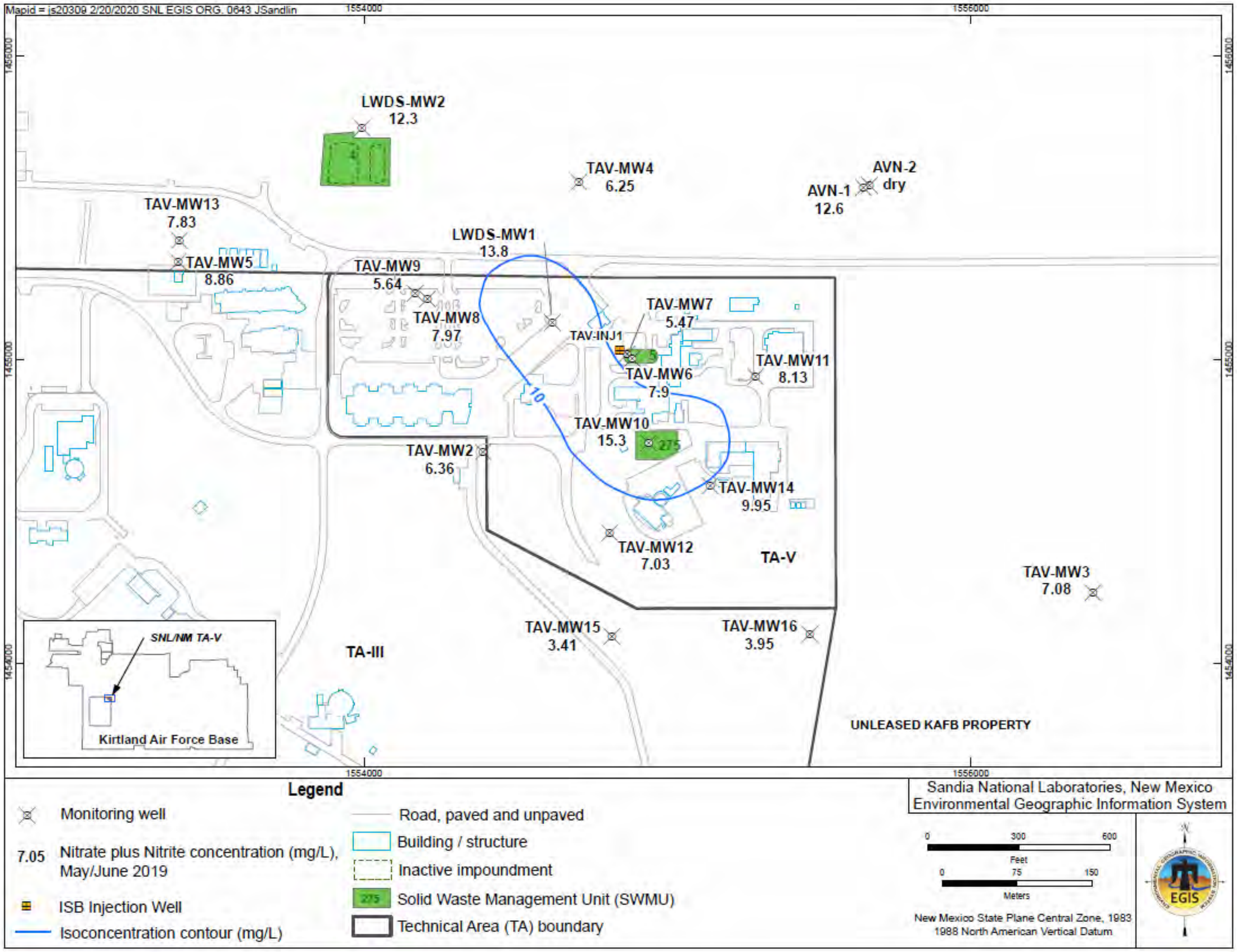

Figure 5-6. Distribution of Nitrate plus Nitrite in Groundwater at Technical Area-V Groundwater Area of Concern, May/June 2019

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-7 (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 (environmental duplicates, EB samples, FB samples, and TB samples) and their impact on data quality for the sampling events.

For the CY 2019 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 MDL in both samples (environmental versus environmental duplicate). The RPD values for NPN ranged from <1 to 20. 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 25; all are less than the RPD goal of 20 except for one RPD of 25 for the TCE sample pair collected at TAV-MW14 in November. However, the TCE concentrations are comparable to historical values at this well. Specific RPD values per quarter are as follows:

- **January/February 2019 Sampling Event—**Environmental duplicate samples were collected from three monitoring wells (TAV-MW7, TAV-MW8, and TAV-MW11). The NPN RPD values ranged from 1 to 3. The TCE RPD values were 4 and 12 at wells TAV-MW8 and TAV-MW11, respectively. TCE was not detected at well TAV-MW7.

- **May/June 2019 Sampling Event—**Environmental duplicate samples were collected from four monitoring wells (LWDS-MW2, TAV-MW3, TAV-MW9, and TAV-MW12). The NPN RPD values ranged from 1 to 20. The TCE RPD was 2 for well TAV-MW12. TCE was not detected at the other three wells.

- **July/August 2019 Sampling Event**—Environmental duplicate samples were collected from three monitoring wells (LWDS-MW1, TAV-MW4, and TAV-MW15). The NPN RPD values ranged from <1 to 3. The TCE RPD values for wells LWDS-MW1 and TAV-MW4 were 18 and 1, respectively. TCE was not detected at well TAV-MW15.

- **October/November 2019 Sampling Event—**Environmental duplicate samples were collected from four monitoring wells (TAV-MW2, TAV-MW10, TAV-MW14, and TAV-MW16). The NPN RPD values ranged from 1 to 5. The TCE RPD values ranged from 1 to 25.

The results for the EB analyses are as follows:

- **January/February 2019 Sampling Event**—EB samples were collected prior to sampling three monitoring wells (TAV-MW7, TAV-MW8, and TAV-MW11). No VOCs, NPN, or metals were detected above the MDLs in EB samples, except for 2-butanone. No corrective action was necessary because 2-butanone was not detected in the associated environmental samples.

- **May/June 2019 Sampling Event—**EB samples were collected prior to sampling four monitoring wells (LWDS-MW2, TAV-MW3, TAV-MW9, and TAV-MW12). Acetone, arsenic, 2-butanone, bromodichloromethane, bromoform, chloroform, chloride, copper, dibromochloromethane chloride, NPN, and vanadium were detected above the MDLs. No corrective action was necessary for acetone, 2-butanone, bromodichloromethane, bromoform, chloroform, chloride, copper, dibromochloromethane chloride, or NPN, because these compounds were not detected above the MDLs in the associated environmental samples or reported at concentrations greater than five times the associated EB results. Arsenic and vanadium in environmental samples collected at monitoring wells TAV-MW3 and TAV-MW9 and copper in environmental samples collected at monitoring wells LWDS-MW2, TAV-MW3, and TAV-MW9 were qualified as not detected during data validation, because these metals were reported at similar concentrations in the associated EB samples.

- **July/August 2019 Sampling Event**—EB samples were collected prior to sampling three monitoring wells (LWDS-MW1, TAV-MW4, and TAV-MW15). Acetone, bromodichloromethane, chloroform, dibromochloromethane, and NPN were detected above the MDLs. No corrective action was necessary because these compounds were not detected in the associated environmental samples or reported at concentrations less than 10 times the associated environmental sample results.

- **October/November 2019 Sampling Event**—EB samples were collected prior to sampling four monitoring wells (TAV-MW2, TAV-MW10, TAV-MW14, and TAV-MW16). Acetone, bromodichloromethane, chloroform, dibromochloromethane, and NPN were detected above the MDLs. No corrective action was necessary because these compounds were not detected in the associated environmental samples or reported at concentrations less than 10 times the associated environmental sample results.

The results for the FB analyses are as follows:

- **January/February 2019 Sampling Event**—FB samples were collected at monitoring wells TAV-MW4 and TAV-MW15 for VOCs analysis. No VOCs were detected in the FB samples.

- **May/June 2019 Sampling Event**—FB samples were collected at three monitoring wells (TAV-MW4, TAV-MW13, and TAV-MW14). Bromodichloromethane, bromoform, chloroform, and dibromochloromethane were detected above the MDLs. No corrective action was necessary because these compounds were not detected in the associated environmental samples or reported at concentrations greater than 5 times the associated FB samples.

- **July/August 2019 Sampling Event**—FB samples were collected at three monitoring wells (LWDS-MW1, TAV-MW8, and TAV-MW16). Acetone, bromodichloromethane, chloroform, and dibromochloromethane were detected above the MDLs. No corrective action was necessary because these compounds were not detected in the associated environment samples.

- **October/November 2019 Sampling Event—**FB samples were collected at three monitoring wells (TAV-MW4, TAV-MW7, and TAV-MW12). Acetone, bromodichloromethane, chloroform, and dibromochloromethane were detected above the MDLs. No corrective action was necessary because these compounds were not detected in the associated environment samples.

The results for the TB analyses are as follows:

- **January/February 2019 Sampling Event**—Fourteen TB samples were submitted with the environmental samples for VOCs analysis. No VOCs were detected above the MDLs, except for acetone. Acetone was reported in three TB samples. Acetone in TAV-MW7 and TAV-MW16 environmental samples and in one EB sample was qualified as not detected during data validation, because acetone was reported at similar concentrations in the associated TB samples.

- **May/June 2019 Sampling Event**—Twenty-one TB samples were submitted with the environmental samples. No VOCs were detected above the MDLs.

- **July/August 2019 Sampling Event**—Fifteen TB samples were submitted with the environmental samples. No VOCs were detected above the MDLs, except acetone. Acetone was detected in one TB sample. No corrective action was necessary because acetone was not detected in the associated environment samples.

- **October/November 2019 Sampling Event—**Fifteen TB samples were submitted with the environmental samples. No VOCs were detected above the MDLs, except for acetone. Acetone was detected in one TB sample. No corrective action was necessary because acetone was not detected in the associated environment samples.

5.8 Variances and Non-Conformances

No variances or non-conformances from requirements specified in the TAVG mini-Sampling and Analysis Plans were identified for the CY 2019 sampling activities. However, the following observations and activities associated with these sampling events were noted:

- **All Four Sampling Events in CY 2019—**Wells LWDS-MW1 and TAV-MW12 were purged to dryness prior to reaching minimum purge volume requirements. The wells were allowed to recharge and were sampled on the following day.

- **Well AVN-1 (May 2019) and Well LWDS-MW2 (May and August 2019)—**Rust colored fine-grained material was observed on the exterior of the sampling tube during purging. The casing and screen for monitoring well AVN-1 are both stainless steel. Well LWDS-MW2 has polyvinyl chloride casing and stainless steel screen.

- **May/June 2019 Sampling Event**—A passive BaroBall™ valve was installed on well TAV-MW4.

- **July/August 2019 Sampling Event—**Because the NPN concentration in well LWDS-MW2 exceeded the MCL for the first time in May 2019, this well was sampled again in August 2019 to evaluate the exceedance. Normally well LWDS-MW2 is sampled annually.

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 of 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 that occurred before 1992. Sanitary waste containing nitrate was also released at SWMU 275 from 1960s to 1992.

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 five monitoring wells (LWDS-MW1, TAV-MW4, TAV-MW8, TAV-MW10, and TAV-MW14) exceeded the MCL of 5 μg/L in CY 2019. The maximum TCE concentration was 20.2 μg/L in the sample collected from monitoring well LWDS-MW1 in November 2019.

NPN results in groundwater samples from four monitoring wells (AVN-1, LWDS-MW1, LWDS-MW2, and TAV-MW10) exceeded the MCL of 10 mg/L in CY 2019. The maximum NPN concentration was 15.3 mg/L in the sample collected from monitoring well LWDS-MW1 in June 2019.

The analytical results for CY 2019 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, which is located northeast of TA-V.

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

- Continue obtaining periodic measurements of groundwater elevations at active TA-V groundwater monitoring wells.
- Continue collecting groundwater samples at active TA-V groundwater monitoring wells.
- Continue reporting the TA-V groundwater monitoring results in future Annual Groundwater Monitoring Reports for submittal to the NMED HWB.
- Continue implementing the ISB Treatability Study for the purpose of degrading the groundwater contaminants at the TAVG AOC.
- Provide summaries of the ISB 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 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	Production well KAFB-10 was installed for fire suppression purposes. Water pumped occasionally for maintenance testing.	NMOSE May 1959
	1961	Research buildings were constructed at TA-V.	DOE September 1987
	1962	Discharge of wastewater to the vadose zone began.	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 began conducting investigations using the CEARP list of sites.	SNL March 1999a
	1992	Wastewater discharges to the vadose zone ceased after the ABCWUA sanitary sewer system was extended to TA-V.	SNL March 1999a
April	1992	The LWDS RFI Work Plan (SWMUs 4, 5, and 52) was submitted.	SNL March 1993
October	1992	Groundwater monitoring well LWDS-MW2 was installed at TA-V for the LWDS investigation.	SNL March 1993
May	1993	Groundwater monitoring well LWDS-MW1 was installed.	SNL September 1995
November	1993	LWDS-MW1 and LWDS-MW2 were sampled. The first sampling event of LWDS-MW1 revealed TCE exceeding the MCL of 5 μg/L.	SNL March 1995
June	1994	Submitted notification letter from DOE to EPA regarding TCE detection in well LWDS-MW1.	DOE June 1994
March	1995	Groundwater sample analytical results for monitoring wells LWDS-MW1 and LWDS-MW2 reported in the CY 1994 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1995
June	1995	Wells AVN-1 and AVN-2 were installed.	SNL 1995
April	1995	Wells TAV-MW1 and TAV-MW2 were installed.	SNL March 1996
	1995	The LWDS RFI report was completed.	SNL September 1995
March	1996	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 1995 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1996
March	1996	Submitted letter to the NMED HWB with notification of elevated nitrate detection for well LWDS-MW1. The result was 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 production well to act as a conduit.	SNL April 1996
March	1997	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 1996 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1997
April	1997	Wells TAV-MW3, TAV-MW4, and TAV-MW5 were installed.	SNL March 1999a
September	1997	NMED HWB issued an RSI stating that additional characterization was 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
March	1998	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 1997 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1998
October	1998	Provide cross sections to NMED HWB for the LWDS as required in the September 1997 RSI.	DOE October 1998
March	1999	Submitted a summary report detailing groundwater conditions for the TA-III/V area that included sites from OU 1306 (TA-III) and OU 1307 (LWDS).	SNL March 1999a
March	1999	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 1998 SNL/NM Annual Groundwater Monitoring Report.	SNL March 1999b

Refer to footnotes on page 5A-8.

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

Month	Year	Event	Reference
March	2000	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 1999 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2000
April	2001	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2000 SNL/NM Annual Groundwater Monitoring Report.	SNL April 2001
May	2001	Wells TAV-MW6, TAV-MW7, TAV-MW8, and TAV-MW9 were installed.	SNL October 2001
November	2001	A summary of groundwater sampling results from TAVG monitoring wells for FYs 1999 and 2000 were compiled into one report. This was an update of the March 1999 summary report.	SNL November 2001
March	2002	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2001 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2002
March	2003	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2002 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2003
June	2003	Subsurface geology at KAFB, including the TAVG monitoring area, was updated.	Van Hart June 2003
March	2004	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2003 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2004
April	2004	The NMED issued 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
December	2004	Submitted responses to the NMED HWB approval with modifications of the October 2004 TA-V CME Work Plan. 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
October	2005	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2004 SNL/NM Annual Groundwater Monitoring Report.	SNL 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

Refer to footnotes on page 5A-8.

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

Month	Year	Event	Reference
November	2006	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2005 SNL/NM Annual Groundwater Monitoring Report.	SNL November 2006
March	2007	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2006 SNL/NM Annual Groundwater Monitoring Report.	SNL March 2007
March	2008	Well TAV-MW1 plugged and abandoned. Well TAV-MW10 installed as replacement for TAV-MW1.	SNL June 2008
March	2008	Groundwater sampling analytical results for TAVG monitoring wells reported in the FY 2007 SNL/NM Annual Groundwater Monitoring Report.	SNL March 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 were 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
June	2009	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2008 SNL/NM Annual Groundwater Monitoring Report.	SNL June 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
October	2010	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2009 SNL/NM Annual Groundwater Monitoring Report.	SNL October 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 met with NMED HWB to discuss the results from the first quarter of groundwater and soil-vapor monitoring.	SNL July 2011
September	2011	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2010 SNL/NM Annual Groundwater Monitoring Report.	SNL September 2011
June	2012	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2011 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2012

Refer to footnotes on page 5A-8.

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

Month	Year	Event	Reference
June	2013	A study of denitrification parameters and isotopic signatures was conducted.	Madrid et al. June 2013
June	2013	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2012 SNL/NM Annual Groundwater Monitoring Report.	SNL 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
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
June	2014	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2013 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2014
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 corrective measures for TAVG AOC based on a multi-agency meeting including 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 issued a second 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
May	2015	DOE Office of Environmental Management issued a third IRR memorandum that had been submitted to the Deputy Assistant Secretary of the Office of Environmental Compliance as their final recommendations for TAVG AOC.	DOE May 2015
June	2015	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2014 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2015
October	2015	Submitted the CCM and a Treatability Study Work Plan (TSWP) for In Situ Bioremediation (ISB) at TAVG AOC. Two phases are proposed in the TSWP. One injection well would be installed and operated in Phase I. Dependent of the findings of Phase I, two more injection wells could 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 requested a revised TSWP and a response letter that addressed the disapproval comments by January 29, 2016.	NMED HWB December 2015
January	2016	Requested a two-month extension for the revised TSWP and the response 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	Submitted a summary of agreements and proposed milestones pursuant to a multi-agency meeting including NMED HWB on July 20, 2015. Requested an extension of schedule milestones to update the CCM and CME reports.	DOE March 2016b
April	2016	NMED HWB approved the extension of milestones and stated the new due date for the updated CCM and CME reports for TAVG AOC are May 20, 2022.	NMED HWB April 2016

Refer to footnotes on page 5A-8.

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

Month	Year	Event	Reference
May	2016	NMED HWB approved the Revised TSWP.	NMED HWB May 2016a
May	2016	Submitted the Notice of Intent to Discharge to NMED GWQB for the ISB 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 stated that a Discharge Permit would be required for the ISB Treatability Study injection wells.	NMED GWQB June 2016
June	2016	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2015 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2016
July	2016	Submitted the Discharge Permit Application for the ISB Treatability Study injection wells.	DOE July 2016a
July	2016	Submitted the Permit to Drill applications to NMOSE 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 2017
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	Started to implement the new sampling requirements per the NMED HWB-approved Revised TSWP.	DOE March 2016a NMED HWB May 2016a
May	2017	NMED GWQB issued Discharge Permit, DP-1845, for the ISB Treatability Study injection wells.	NMED GWQB May 2017
June	2017	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2016 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2017
July	2017	Well installation report for monitoring wells TAV-MW15 and TAV-MW16 was submitted to NMED HWB.	SNL July 2017
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 I of the ISB Treatability Study.	SNL June 2018a
November	2017	Notification to NMED GWQB to commence discharge under DP-1845. Pilot Test for Phase I of the ISB Treatability Study was conducted. Approximately 9,000 gallons treatment solution was discharged at well TAV-INJ1.	DOE November 2017
June	2018	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2017 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2018b
July	2018	Notification to NMED HWB to proceed to full-scale operation at well TAV-INJ1 with modifications.	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

Refer to footnotes on page 5A-8.

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 ISB Treatability Study Pilot Test operation and results.	SNL October 2018
October	2018	Full-scale operation for the Phase I ISB Treatability Study started at injection well TAV-INJ1.	SNL April 2019a
April	2019	Completed six-month injections at well TAV-INJ1. Approximately 530,000 gallons of treatment solution was discharged.	SNL October 2019a
May	2019	Started two-year performance monitoring of the Phase I ISB Treatability Study.	SNL October 2019a
June	2019	Groundwater sampling analytical results for TAVG monitoring wells reported in the CY 2018 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2019

Refer to footnotes on page 5A-8.

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.
CY	= Calendar Year.
DP	= Discharge Permit.
DOE	= U.S. Department of Energy.
EPA	= U.S. Environmental Protection Agency.
ER	= Environmental Restoration.
FY	= Fiscal Year.
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.

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 2019

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	**15.2**	0.300	1.00	5.00			107156-001	SW846-8260B
11-Feb-19	cis-1,2-Dichloroethene	3.42	0.300	1.00	70.0			107156-001	SW846-8260B
TAV-MW2 29-Jan-19	Trichloroethene	2.81	0.300	1.00	5.00			106939-001	SW846-8260B
TAV-MW4	Chloroform	0.950	0.300	1.00	80.0	J		106961-001	SW846-8260B
31-Jan-19	Trichloroethene	4.47	0.300	1.00	5.00			106961-001	SW846-8260B
	cis-1,2-Dichloroethene	0.420	0.300	1.00	70.0	J		106961-001	SW846-8260B
TAV-MW7 28-Jan-19	Acetone	2.78	1.50	10.0	NE	J, N	10UJ	106941-001	SW846-8260B
TAV-MW7 (Duplicate) 28-Jan-19	Acetone	2.84	1.50	10.0	NE	J, N	10UJ	106942-001	SW846-8260B
TAV-MW8	Acetone	2.97	1.50	10.0	NE	B, J	10UJ	106968-001	SW846-8260B
01-Feb-19	Trichloroethene	**6.30**	0.300	1.00	5.00			106968-001	SW846-8260B
	cis-1,2-Dichloroethene	0.520	0.300	1.00	70.0	J		106968-001	SW846-8260B
TAV-MW8 (Duplicate)	Acetone	3.01	1.50	10.0	NE	B, J	10UJ	106969-001	SW846-8260B
01-Feb-19	Trichloroethene	**6.06**	0.300	1.00	5.00			106969-001	SW846-8260B
	cis-1,2-Dichloroethene	0.620	0.300	1.00	70.0	J		106969-001	SW846-8260B
TAV-MW10	Acetone	1.55	1.50	10.0	NE	B, J	10UJ	107154-001	SW846-8260B
07-Feb-19	Trichloroethene	**14.6**	0.300	1.00	5.00			107154-001	SW846-8260B
	cis-1,2-Dichloroethene	2.4	0.300	1.00	70.0			107154-001	SW846-8260B
TAV-MW11	Trichloroethene	3.36	0.300	1.00	5.00			106955-001	SW846-8260B
30-Jan-19	cis-1,2-Dichloroethene	0.570	0.300	1.00	70.0	J		106955-001	SW846-8260B
TAV-MW11 (Duplicate)	Trichloroethene	3.79	0.300	1.00	5.00			106956-001	SW846-8260B
30-Jan-19	cis-1,2-Dichloroethene	0.660	0.300	1.00	70.0	J		106956-001	SW846-8260B
TAV-MW12	Acetone	1.97	1.50	10.0	NE	B, J	10UJ	107150-001	SW846-8260B
05-Feb-19	Trichloroethene	4.69	0.300	1.00	5.00			107150-001	SW846-8260B
TAV-MW14	Acetone	1.82	1.50	10.0	NE	B, J	10UJ	107152-001	SW846-8260B
06-Feb-19	Trichloroethene	**6.60**	0.300	1.00	5.00			107152-001	SW846-8260B
	cis-1,2-Dichloroethene	0.560	0.300	1.00	70.0	J		107152-001	SW846-8260B
TAV-MW16	Acetone	2.72	1.50	10.0	NE	J, N	10UJ	106936-001	SW846-8260B
25-Jan-19	Trichloroethene	0.830	0.300	1.00	5.00	J		106936-001	SW846-8260B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	**17.5**	0.300	1.00	5.00			108455-001	SW846-8260B
10-Jun-19	cis-1,2-Dichloroethene	3.59	0.300	1.00	70.0			108455-001	SW846-8260B
TAV-MW2 17-May-19	Trichloroethene	3.28	0.300	1.00	5.00			108430-001	SW846-8260B
TAV-MW4	Chloroform	0.910	0.300	1.00	80.0	J		108437-001	SW846-8260B
22-May-19	Trichloroethene	**5.44**	0.300	1.00	5.00			108437-001	SW846-8260B
	cis-1,2-Dichloroethene	0.540	0.300	1.00	70.0	J		108437-001	SW846-8260B
TAV-MW8	Trichloroethene	4.40	0.300	1.00	5.00			108441-001	SW846-8260B
23-May-19	cis-1,2-Dichloroethene	0.500	0.300	1.00	70.0	J		108441-001	SW846-8260B
TAV-MW10	Trichloroethene	**13.0**	0.300	1.00	5.00			108453-001	SW846-8260B
05-Jun-19	cis-1,2-Dichloroethene	1.92	0.300	1.00	70.0			108453-001	SW846-8260B
TAV-MW11	Trichloroethene	4.33	0.300	1.00	5.00			108432-001	SW846-8260B
20-May-19	cis-1,2-Dichloroethene	0.530	0.300	1.00	70.0	J		108432-001	SW846-8260B
TAV-MW12 30-May-19	Trichloroethene	3.01	0.300	1.00	5.00			108445-001	SW846-8260B
TAV-MW12 (Duplicate) 30-May-19	Trichloroethene	2.94	0.300	1.00	5.00			108446-001	SW846-8260B
TAV-MW14	Trichloroethene	4.94	0.300	1.00	5.00			108449-001	SW846-8260B
31-May-19	cis-1,2-Dichloroethene	0.460	0.300	1.00	70.0	J		108449-001	SW846-8260B
TAV-MW16 16-May-19	Trichloroethene	0.630	0.300	1.00	5.00	J		108428-001	SW846-8260B
LWDS-MW1	Trichloroethene	**11.4**	0.300	1.00	5.00			108811-001	SW846-8260B
19-Aug-19	cis-1,2-Dichloroethene	3.52	0.300	1.00	70.0			108811-001	SW846-8260B
LWDS-MW1 (Duplicate)	Trichloroethene	**13.6**	0.300	1.00	5.00			108812-001	SW846-8260B
19-Aug-19	cis-1,2-Dichloroethene	3.75	0.300	1.00	70.0			108812-001	SW846-8260B
TAV-MW2 02-Aug-19	Trichloroethene	3.38	0.300	1.00	5.00			108785-001	SW846-8260B
TAV-MW4	Chloroform	0.880	0.300	1.00	80.0	J	J	108793-001	SW846-8260B
06-Aug-19	Trichloroethene	**5.09**	0.300	1.00	5.00			108793-001	SW846-8260B
	cis-1,2-Dichloroethene	0.310	0.300	1.00	70.0	J		108793-001	SW846-8260B
TAV-MW4 (Duplicate)	Chloroform	0.870	0.300	1.00	80.0	J	J	108794-001	SW846-8260B
06-Aug-19	Trichloroethene	**5.05**	0.300	1.00	5.00			108794-001	SW846-8260B
TAV-MW8 07-Aug-19	Trichloroethene	4.68	0.300	1.00	5.00			108817-001	SW846-8260B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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-MW10	Trichloroethene	**10.6**	0.300	1.00	5.00			108802-001	SW846-8260B
14-Aug-19	cis-1,2-Dichloroethene	1.99	0.300	1.00	70.0			108802-001	SW846-8260B
TAV-MW11	Trichloroethene	4.43	0.300	1.00	5.00			108787-001	SW846-8260B
05-Aug-19	cis-1,2-Dichloroethene	0.390	0.300	1.00	70.0	J		108787-001	SW846-8260B
TAV-MW12 13-Aug-19	Trichloroethene	2.09	0.300	1.00	5.00			108800-001	SW846-8260B
TAV-MW14 08-Aug-19	Trichloroethene	4.53	0.300	1.00	5.00			108798-001	SW846-8260B
TAV-MW16 31-Jul-19	Trichloroethene	0.510	0.300	1.00	5.00	J		108820-001	SW846-8260B
LWDS-MW1	Acetone	3.93	1.50	10.0	NE	J	J-	110553-001	SW846-8260B
18-Nov-19	Trichloroethene	**20.2**	0.300	1.00	5.00			110553-001	SW846-8260B
	cis-1,2-Dichloroethene	4.18	0.300	1.00	70.0			110553-001	SW846-8260B
TAV-MW2 31-Oct-19	Trichloroethene	4.08	0.300	1.00	5.00			110555-001	SW846-8260B
TAV-MW2 (Duplicate) 31-Oct-19	Trichloroethene	3.99	0.300	1.00	5.00			110556-001	SW846-8260B
TAV-MW4	Chloroform	1.07	0.300	1.00	80.0		J	110561-001	SW846-8260B
05-Nov-19	Trichloroethene	**5.40**	0.300	1.00	5.00			110561-001	SW846-8260B
	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		110561-001	SW846-8260B
TAV-MW8	Trichloroethene	**5.66**	0.300	1.00	5.00			110566-001	SW846-8260B
06-Nov-19	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		110566-001	SW846-8260B
TAV-MW10	Trichloroethene	**14.9**	0.300	1.00	5.00			110568-001	SW846-8260B
13-Nov-19	cis-1,2-Dichloroethene	2.38	0.300	1.00	70.0			110568-001	SW846-8260B
TAV-MW10 (Duplicate)	Trichloroethene	**14.7**	0.300	1.00	5.00			110569-001	SW846-8260B
13-Nov-19	cis-1,2-Dichloroethene	2.51	0.300	1.00	70.0			110569-001	SW846-8260B
TAV-MW11	Trichloroethene	3.83	0.300	1.00	5.00			110573-001	SW846-8260B
04-Nov-19	cis-1,2-Dichloroethene	0.480	0.300	1.00	70.0	J		110573-001	SW846-8260B
TAV-MW12 12-Nov-19	Trichloroethene	2.81	0.300	1.00	5.00			111912-001	SW846-8260B
TAV-MW14	Trichloroethene	4.17	0.300	1.00	5.00			110575-001	SW846-8260B
07-Nov-19	cis-1,2-Dichloroethene	0.430	0.300	1.00	70.0	J		110575-001	SW846-8260B
TAV-MW14 (Duplicate)	Trichloroethene	**5.34**	0.300	1.00	5.00			110576-001	SW846-8260B
07-Nov-19	cis-1,2-Dichloroethene	0.450	0.300	1.00	70.0	J		110576-001	SW846-8260B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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-MW16 24-Oct-19	Trichloroethene	0.580	0.300	1.00	5.00	J		110580-001	SW846-8260B
TAV-MW16 (Duplicate) 24-Oct-19	Trichloroethene	0.550	0.300	1.00	5.00	J		110581-001	SW846-8260B

Refer to footnotes on page 5B-46.

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 2019

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 5B-46.

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

Calendar Year 2019

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 11-Feb-19	Nitrate plus nitrite	**12.1**	0.170	0.500	10.0			107156-002	EPA 353.2
TAV-MW2 29-Jan-19	Nitrate plus nitrite	4.63	0.170	0.500	10.0			106939-002	EPA 353.2
TAV-MW4 31-Jan-19	Nitrate plus nitrite	4.18	0.170	0.500	10.0			106961-002	EPA 353.2
TAV-MW7 28-Jan-19	Nitrate plus nitrite	3.98	0.170	0.500	10.0			106941-002	EPA 353.2
TAV-MW7 (Duplicate) 28-Jan-19	Nitrate plus nitrite	4.10	0.170	0.500	10.0			106942-002	EPA 353.2
TAV-MW8 01-Feb-19	Nitrate plus nitrite	6.06	0.170	0.500	10.0			106968-002	EPA 353.2
TAV-MW8 (Duplicate) 01-Feb-19	Nitrate plus nitrite	6.01	0.170	0.500	10.0			106969-002	EPA 353.2
TAV-MW10 07-Feb-19	Nitrate plus nitrite	**11.3**	0.170	0.500	10.0			107154-002	EPA 353.2
TAV-MW11 30-Jan-19	Nitrate plus nitrite	6.26	0.170	0.500	10.0			106955-002	EPA 353.2
TAV-MW11 (Duplicate) 30-Jan-19	Nitrate plus nitrite	6.22	0.170	0.500	10.0			106956-002	EPA 353.2
TAV-MW12 05-Feb-19	Nitrate plus nitrite	6.30	0.085	0.250	10.0			107150-002	EPA 353.2
TAV-MW14 06-Feb-19	Nitrate plus nitrite	7.81	0.170	0.500	10.0			107152-002	EPA 353.2
TAV-MW15 24-Jan-19	Nitrate plus nitrite	1.76	0.085	0.250	10.0	B		106934-002	EPA 353.2
TAV-MW16 25-Jan-19	Nitrate plus nitrite	2.31	0.170	0.500	10.0			106936-002	EPA 353.2
AVN-1 21-May-19	Nitrate plus nitrite	**12.6**	0.170	0.500	10.0			108434-002	EPA 353.2
LWDS-MW1 10-Jun-19	Nitrate plus nitrite	**13.8**	0.170	0.500	10.0			108455-002	EPA 353.2
LWDS-MW2 14-May-19	Nitrate plus nitrite	**12.3**	0.425	1.25	10.0			108420-002	EPA 353.2
LWDS-MW2 (Duplicate) 14-May-19	Nitrate plus nitrite	**10.1**	0.425	1.25	10.0			108421-002	EPA 353.2

Refer to footnotes on page 5B-46

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

Calendar Year 2019

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 17-May-19	Nitrate plus nitrite	6.36	0.170	0.500	10.0			108430-002	EPA 353.2
TAV-MW3 09-May-19	Nitrate plus nitrite	7.08	0.170	0.500	10.0		J+	108413-002	EPA 353.2
TAV-MW3 (Duplicate) 09-May-19	Nitrate plus nitrite	6.86	0.170	0.500	10.0		J+	108414-002	EPA 353.2
TAV-MW4 22-May-19	Nitrate plus nitrite	6.25	0.170	0.500	10.0			108437-002	EPA 353.2
TAV-MW5 07-May-19	Nitrate plus nitrite	8.86	0.170	0.500	10.0			108404-002	EPA 353.2
TAV-MW7 13-May-19	Nitrate plus nitrite	5.47	0.170	0.500	10.0			108416-002	EPA 353.2
TAV-MW8 23-May-19	Nitrate plus nitrite	7.97	0.170	0.500	10.0			108441-002	EPA 353.2
TAV-MW9 08-May-19	Nitrate plus nitrite	5.64	0.170	0.500	10.0		J+	108408-002	EPA 353.2
TAV-MW9 (Duplicate) 08-May-19	Nitrate plus nitrite	5.99	0.170	0.500	10.0		J+	108409-002	EPA 353.2
TAV-MW10 05-Jun-19	Nitrate plus nitrite	**15.3**	0.850	2.50	10.0			108453-002	EPA 353.2
TAV-MW11 20-May-19	Nitrate plus nitrite	8.13	0.170	0.500	10.0			108432-002	EPA 353.2
TAV-MW12 30-May-19	Nitrate plus nitrite	7.03	0.425	1.25	10.0		J+	108445-002	EPA 353.2
TAV-MW12 (Duplicate) 30-May-19	Nitrate plus nitrite	7.10	0.425	1.25	10.0		J+	108446-002	EPA 353.2
TAV-MW13 06-May-19	Nitrate plus nitrite	7.83	0.170	0.500	10.0			108402-002	EPA 353.2
TAV-MW14 31-May-19	Nitrate plus nitrite	9.95	0.850	2.50	10.0			108449-002	EPA 353.2
TAV-MW15 15-May-19	Nitrate plus nitrite	3.41	0.170	0.500	10.0			108423-002	EPA 353.2
TAV-MW16 16-May-19	Nitrate plus nitrite	3.95	0.170	0.500	10.0			108428-002	EPA 353.2

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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-Aug-19	Nitrate plus nitrite	**12.2**	0.170	0.500	10.0			108811-002	EPA 353.2
LWDS-MW1 (Duplicate) 19-Aug-19	Nitrate plus nitrite	**11.8**	0.170	0.500	10.0			108812-002	EPA 353.2
LWDS-MW2 09-Aug-19	Nitrate plus nitrite	8.85	0.425	1.25	10.0			108915-002	EPA 353.2
TAV-MW2 02-Aug-19	Nitrate plus nitrite	4.83	0.170	0.500	10.0			108785-002	EPA 353.2
TAV-MW4 06-Aug-19	Nitrate plus nitrite	4.86	0.170	0.500	10.0			108793-002	EPA 353.2
TAV-MW4 (Duplicate) 06-Aug-19	Nitrate plus nitrite	4.86	0.170	0.500	10.0			108794-002	EPA 353.2
TAV-MW7 29-Jul-19	Nitrate plus nitrite	4.32	0.085	0.250	10.0			108771-002	EPA 353.2
TAV-MW8 07-Aug-19	Nitrate plus nitrite	6.05	0.425	1.25	10.0			108817-002	EPA 353.2
TAV-MW10 14-Aug-19	Nitrate plus nitrite	**11.6**	0.425	1.25	10.0			108802-002	EPA 353.2
TAV-MW11 05-Aug-19	Nitrate plus nitrite	6.86	0.170	0.500	10.0			108787-002	EPA 353.2
TAV-MW12 13-Aug-19	Nitrate plus nitrite	4.85	0.170	0.500	10.0			108800-002	EPA 353.2
TAV-MW14 08-Aug-19	Nitrate plus nitrite	7.05	0.425	1.25	10.0			108798-002	EPA 353.2
TAV-MW15 30-Jul-19	Nitrate plus nitrite	1.83	0.085	0.250	10.0			108780-002	EPA 353.2
TAV-MW15 (Duplicate) 30-Jul-19	Nitrate plus nitrite	1.79	0.085	0.250	10.0			108781-002	EPA 353.2
TAV-MW16 31-Jul-19	Nitrate plus nitrite	2.42	0.085	0.250	10.0			108820-002	EPA 353.2

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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 18-Nov-19	Nitrate plus nitrite	**12.2**	0.425	1.25	10.0			110553-002	EPA 353.2
TAV-MW2 31-Oct-19	Nitrate plus nitrite	6.00	0.170	0.500	10.0		J	110555-002	EPA 353.2
TAV-MW2 (Duplicate) 31-Oct-19	Nitrate plus nitrite	5.69	0.170	0.500	10.0		J	110556-002	EPA 353.2
TAV-MW4 05-Nov-19	Nitrate plus nitrite	4.62	0.170	0.500	10.0			110561-002	EPA 353.2
TAV-MW7 22-Oct-19	Nitrate plus nitrite	4.34	0.170	0.500	10.0	N	J+	110564-002	EPA 353.2
TAV-MW8 06-Nov-19	Nitrate plus nitrite	6.73	0.170	0.500	10.0			110566-002	EPA 353.2
TAV-MW10 13-Nov-19	Nitrate plus nitrite	**11.2**	0.425	1.25	10.0			110568-002	EPA 353.2
TAV-MW10 (Duplicate) 13-Nov-19	Nitrate plus nitrite	**11.3**	0.425	1.25	10.0			110569-002	EPA 353.2
TAV-MW11 04-Nov-19	Nitrate plus nitrite	6.78	0.170	0.500	10.0			110573-002	EPA 353.2
TAV-MW12 12-Nov-19	Nitrate plus nitrite	4.54	0.170	0.500	10.0			111912-002	EPA 353.2
TAV-MW14 07-Nov-19	Nitrate plus nitrite	8.21	0.170	0.500	10.0			110575-002	EPA 353.2
TAV-MW14 (Duplicate) 07-Nov-19	Nitrate plus nitrite	8.09	0.170	0.500	10.0			110576-002	EPA 353.2
TAV-MW15 23-Oct-19	Nitrate plus nitrite	2.02	0.170	0.500	10.0	N	J+	110578-002	EPA 353.2
TAV-MW16 24-Oct-19	Nitrate plus nitrite	2.97	0.170	0.500	10.0	N	J+	110580-002	EPA 353.2
TAV-MW16 (Duplicate) 24-Oct-19	Nitrate plus nitrite	2.82	0.085	0.250	10.0	N	J+	110581-002	EPA 353.2

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	0.00425	0.002	0.005	0.010	J		107156-003	SW846 6020B
11-Feb-19	Iron	ND	0.033	0.100	NE	U		107156-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		107156-003	SW846 6020B
TAV-MW2	Arsenic	ND	0.002	0.005	0.010	U		106939-003	SW846 6020B
29-Jan-19	Iron	ND	0.033	0.100	NE	U		106939-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106939-003	SW846 6020B
TAV-MW4	Arsenic	0.00205	0.002	0.005	0.010	J		106961-003	SW846 6020B
31-Jan-19	Iron	ND	0.033	0.100	NE	U		106961-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106961-003	SW846 6020B
TAV-MW7	Arsenic	0.00209	0.002	0.005	0.010	J		106941-003	SW846 6020B
28-Jan-19	Iron	ND	0.033	0.100	NE	U		106941-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106941-003	SW846 6020B
TAV-MW7 (Duplicate)	Arsenic	0.00206	0.002	0.005	0.010	J		106942-003	SW846 6020B
28-Jan-19	Iron	ND	0.033	0.100	NE	U		106942-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106942-003	SW846 6020B
TAV-MW8	Arsenic	ND	0.002	0.005	0.010	U		106968-003	SW846 6020B
01-Feb-19	Iron	ND	0.033	0.100	NE	U		106968-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106968-003	SW846 6020B
TAV-MW8 (Duplicate)	Arsenic	0.00200	0.002	0.005	0.010	J		106969-003	SW846 6020B
01-Feb-19	Iron	ND	0.033	0.100	NE	U		106969-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106969-003	SW846 6020B
TAV-MW10	Arsenic	0.00304	0.002	0.005	0.010	J		107154-003	SW846 6020B
07-Feb-19	Iron	ND	0.033	0.100	NE	U		107154-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		107154-003	SW846 6020B
TAV-MW11	Arsenic	0.00201	0.002	0.005	0.010	J		106955-003	SW846 6020B
30-Jan-19	Iron	ND	0.033	0.100	NE	U		106955-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106955-003	SW846 6020B
TAV-MW11 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		106956-003	SW846 6020B
30-Jan-19	Iron	ND	0.033	0.100	NE	U		106956-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106956-003	SW846 6020B
TAV-MW12	Arsenic	0.0025	0.002	0.005	0.010	J		107150-003	SW846 6020B
05-Feb-19	Iron	ND	0.033	0.100	NE	U		107150-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		107150-003	SW846 6020B
TAV-MW14	Arsenic	0.00248	0.002	0.005	0.010	J		107152-003	SW846 6020B
06-Feb-19	Iron	ND	0.033	0.100	NE	U		107152-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		107152-003	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	Arsenic	0.00215	0.002	0.005	0.010	J		106934-003	SW846 6020B
24-Jan-19	Iron	ND	0.033	0.100	NE	U		106934-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106934-003	SW846 6020B
TAV-MW16	Arsenic	0.00209	0.002	0.005	0.010	J		106936-003	SW846 6020B
25-Jan-19	Iron	ND	0.033	0.100	NE	U		106936-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		106936-003	SW846 6020B
AVN-1	Arsenic	0.00358	0.002	0.005	0.010	J		108434-003	SW846 6020B
21-May-19	Iron	ND	0.033	0.100	NE	U		108434-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108434-003	SW846 6020B
LWDS-MW1	Arsenic	0.00458	0.002	0.005	0.010	J		108455-003	SW846 6020B
10-Jun-19	Iron	ND	0.033	0.100	NE	U		108455-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108455-003	SW846 6020B
LWDS-MW2	Arsenic	0.00284	0.002	0.005	0.010	J		108420-003	SW846 6020B
14-May-19	Iron	ND	0.033	0.100	NE	U		108420-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108420-003	SW846 6020B
LWDS-MW2 (Duplicate)	Arsenic	0.00278	0.002	0.005	0.010	J		108421-003	SW846 6020B
14-May-19	Iron	ND	0.033	0.100	NE	U		108421-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108421-003	SW846 6020B
TAV-MW2	Arsenic	0.00367	0.002	0.005	0.010	J		108430-003	SW846 6020B
17-May-19	Iron	ND	0.033	0.100	NE	U		108430-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108430-003	SW846 6020B
TAV-MW3	Arsenic	0.00292	0.002	0.005	0.010	J	0.005U	108413-003	SW846 6020B
09-May-19	Iron	ND	0.033	0.100	NE	U		108413-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108413-003	SW846 6020B
TAV-MW3 (Duplicate)	Arsenic	0.00313	0.002	0.005	0.010	J	0.005U	108414-003	SW846 6020B
09-May-19	Iron	ND	0.033	0.100	NE	U		108414-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108414-003	SW846 6020B
TAV-MW4	Arsenic	0.00369	0.002	0.005	0.010	J		108437-003	SW846 6020B
22-May-19	Iron	ND	0.033	0.100	NE	U		108437-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108437-003	SW846 6020B
TAV-MW5	Arsenic	0.00230	0.002	0.005	0.010	J		108404-003	SW846 6020B
07-May-19	Iron	ND	0.033	0.100	NE	U		108404-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108404-003	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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-MW7	Arsenic	0.00297	0.002	0.005	0.010	J		108416-003	SW846 6020B
13-May-19	Iron	ND	0.033	0.100	NE	U		108416-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108416-003	SW846 6020B
TAV-MW8	Arsenic	0.00236	0.002	0.005	0.010	J		108441-003	SW846 6020B
23-May-19	Iron	ND	0.033	0.100	NE	U		108441-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108441-003	SW846 6020B
TAV-MW9	Arsenic	0.00264	0.002	0.005	0.010	J	0.005U	108408-003	SW846 6020B
08-May-19	Iron	ND	0.033	0.100	NE	U		108408-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108408-003	SW846 6020B
TAV-MW9 (Duplicate)	Arsenic	0.00304	0.002	0.005	0.010	J	0.005U	108409-003	SW846 6020B
08-May-19	Iron	ND	0.033	0.100	NE	U		108409-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108409-003	SW846 6020B
TAV-MW10	Arsenic	0.00236	0.002	0.005	0.010	J		108453-003	SW846 6020B
05-Jun-19	Iron	ND	0.033	0.100	NE	U		108453-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108453-003	SW846 6020B
TAV-MW11	Arsenic	0.00389	0.002	0.005	0.010	J		108432-003	SW846 6020B
20-May-19	Iron	ND	0.033	0.100	NE	U		108432-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108432-003	SW846 6020B
TAV-MW12	Arsenic	ND	0.002	0.005	0.010	U		108445-003	SW846 6020B
30-May-19	Iron	ND	0.033	0.100	NE	U		108445-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108445-003	SW846 6020B
TAV-MW12 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		108446-003	SW846 6020B
30-May-19	Iron	0.0785	0.033	0.100	NE	J		108446-003	SW846 6020B
	Manganese	0.00287	0.001	0.005	NE	J		108446-003	SW846 6020B
TAV-MW13	Arsenic	0.00204	0.002	0.005	0.010	J		108402-003	SW846 6020B
06-May-19	Iron	ND	0.033	0.100	NE	U		108402-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108402-003	SW846 6020B
TAV-MW14	Arsenic	0.00210	0.002	0.005	0.010	J		108449-003	SW846 6020B
31-May-19	Iron	ND	0.033	0.100	NE	U		108449-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108449-003	SW846 6020B
TAV-MW15	Arsenic	0.00248	0.002	0.005	0.010	J		108423-003	SW846 6020B
15-May-19	Iron	ND	0.033	0.100	NE	U		108423-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108423-003	SW846 6020B
TAV-MW16	Arsenic	0.00276	0.002	0.005	0.010	J		108428-003	SW846 6020B
16-May-19	Iron	ND	0.033	0.100	NE	U		108428-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108428-003	SW846 6020B

Refer to footnotes on page 5B-46.

Table 5B-4 *(Continued)*
Summary of Filtered Metal 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]
LWDS-MW1	Arsenic	0.00393	0.002	0.005	0.010	J		108811-003	SW846 6020B
19-Aug-19	Iron	ND	0.033	0.100	NE	U		108811-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108811-003	SW846 6020B
LWDS-MW1 (Duplicate)	Arsenic	0.00423	0.002	0.005	0.010	J		108812-003	SW846 6020B
19-Aug-19	Iron	ND	0.033	0.100	NE	U		108812-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108812-003	SW846 6020B
LWDS-MW2	Arsenic	0.00293	0.002	0.005	0.010	J		108915-003	SW846 6020B
09-Aug-19	Iron	ND	0.033	0.100	NE	U		108915-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108915-003	SW846 6020B
TAV-MW2	Arsenic	0.00329	0.002	0.005	0.010	J		108785-003	SW846 6020B
02-Aug-19	Iron	ND	0.033	0.100	NE	U		108785-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108785-003	SW846 6020B
TAV-MW4	Arsenic	0.00317	0.002	0.005	0.010	J		108793-003	SW846 6020B
06-Aug-19	Iron	ND	0.033	0.100	NE	U		108793-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108793-003	SW846 6020B
TAV-MW4 (Duplicate)	Arsenic	0.00304	0.002	0.005	0.010	J		108794-003	SW846 6020B
06-Aug-19	Iron	ND	0.033	0.100	NE	U		108794-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108794-003	SW846 6020B
TAV-MW7	Arsenic	0.00284	0.002	0.005	0.010	J		108771-003	SW846 6020B
29-Jul-19	Iron	ND	0.033	0.100	NE	U		108771-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108771-003	SW846 6020B
TAV-MW8	Arsenic	0.00276	0.002	0.005	0.010	J		108817-003	SW846 6020B
07-Aug-19	Iron	ND	0.033	0.100	NE	U		108817-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108817-003	SW846 6020B
TAV-MW10	Arsenic	0.00319	0.002	0.005	0.010	J		108802-003	SW846 6020B
14-Aug-19	Iron	ND	0.033	0.100	NE	U		108802-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108802-003	SW846 6020B
TAV-MW11	Arsenic	0.00287	0.002	0.005	0.010	J		108787-003	SW846 6020B
05-Aug-19	Iron	ND	0.033	0.100	NE	U		108787-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108787-003	SW846 6020B
TAV-MW12	Arsenic	0.00335	0.002	0.005	0.010	J		108800-003	SW846 6020B
13-Aug-19	Iron	ND	0.033	0.100	NE	U		108800-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108800-003	SW846 6020B
TAV-MW14	Arsenic	0.00279	0.002	0.005	0.010	J		108798-003	SW846 6020B
08-Aug-19	Iron	ND	0.033	0.100	NE	U		108798-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108798-003	SW846 6020B

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

Calendar Year 2019

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	Arsenic	ND	0.002	0.005	0.010	U		108780-003	SW846 6020B
30-Jul-19	Iron	ND	0.033	0.100	NE	U		108780-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108780-003	SW846 6020B
TAV-MW15 (Duplicate)	Arsenic	0.00209	0.002	0.005	0.010	J		108781-003	SW846 6020B
30-Jul-19	Iron	ND	0.033	0.100	NE	U		108781-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108781-003	SW846 6020B
TAV-MW16	Arsenic	0.00252	0.002	0.005	0.010	J		108820-003	SW846 6020B
31-Jul-19	Iron	ND	0.033	0.100	NE	U		108820-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108820-003	SW846 6020B
LWDS-MW1	Arsenic	0.00368	0.002	0.005	0.010	J		110553-003	SW846 6020B
18-Nov-19	Iron	ND	0.033	0.100	NE	U		110553-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110553-003	SW846 6020B
TAV-MW2	Arsenic	0.00223	0.002	0.005	0.010	J		110555-003	SW846 6020B
31-Oct-19	Iron	ND	0.033	0.100	NE	U		110555-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110555-003	SW846 6020B
TAV-MW2 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		110556-003	SW846 6020B
31-Oct-19	Iron	ND	0.033	0.100	NE	U		110556-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110556-003	SW846 6020B
TAV-MW4	Arsenic	0.00232	0.002	0.005	0.010	J		110561-003	SW846 6020B
05-Nov-19	Iron	ND	0.033	0.100	NE	U		110561-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110561-003	SW846 6020B
TAV-MW7	Arsenic	0.00276	0.002	0.005	0.010	B, J	0.005U	110564-003	SW846 6020B
22-Oct-19	Iron	ND	0.033	0.100	NE	U		110564-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110564-003	SW846 6020B
TAV-MW8	Arsenic	0.00254	0.002	0.005	0.010	J		110566-003	SW846 6020B
06-Nov-19	Iron	ND	0.033	0.100	NE	U		110566-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110566-003	SW846 6020B
TAV-MW10	Arsenic	0.00215	0.002	0.005	0.010	J		110568-003	SW846 6020B
13-Nov-19	Iron	ND	0.033	0.100	NE	U		110568-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110568-003	SW846 6020B
TAV-MW10 (Duplicate)	Arsenic	0.00222	0.002	0.005	0.010	J		110569-003	SW846 6020B
13-Nov-19	Iron	ND	0.033	0.100	NE	U		110569-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110569-003	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	0.00251	0.002	0.005	0.010	J		110573-003	SW846 6020B
04-Nov-19	Iron	ND	0.033	0.100	NE	U		110573-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110573-003	SW846 6020B
TAV-MW12	Arsenic	ND	0.002	0.005	0.010	U		111912-003	SW846 6020B
12-Nov-19	Iron	ND	0.033	0.100	NE	U		111912-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		111912-003	SW846 6020B
TAV-MW14	Arsenic	0.00224	0.002	0.005	0.010	J		110575-003	SW846 6020B
07-Nov-19	Iron	ND	0.033	0.100	NE	U		110575-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110575-003	SW846 6020B
TAV-MW14 (Duplicate)	Arsenic	ND	0.002	0.005	0.010	U		110576-003	SW846 6020B
07-Nov-19	Iron	ND	0.033	0.100	NE	U		110576-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110576-003	SW846 6020B
TAV-MW15	Arsenic	0.00210	0.002	0.005	0.010	B, J	0.005U	110578-003	SW846 6020B
23-Oct-19	Iron	ND	0.033	0.100	NE	U		110578-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110578-003	SW846 6020B
TAV-MW16	Arsenic	0.00246	0.002	0.005	0.010	B, J	0.005U	110580-003	SW846 6020B
24-Oct-19	Iron	ND	0.033	0.100	NE	U		110580-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110580-003	SW846 6020B
TAV-MW16 (Duplicate)	Arsenic	0.00259	0.002	0.005	0.010	B, J	0.005U	110581-003	SW846 6020B
24-Oct-19	Iron	ND	0.033	0.100	NE	U		110581-003	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		110581-003	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	Bromide	0.147	0.067	0.200	NE	J		108434-005	SW846 9056A
21-May-19	Chloride	9.98	0.067	0.200	NE		J	108434-005	SW846 9056A
	Fluoride	1.17	0.033	0.100	4.0			108434-005	SW846 9056A
	Sulfate	34.0	0.665	2.00	NE			108434-005	SW846 9056A
	Bicarbonate Alkalinity	157	1.45	4.00	NE			108434-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108434-006	SM 2320B
LWDS-MW1	Bromide	0.842	0.067	0.200	NE			108455-005	SW846 9056A
10-Jun-19	Chloride	76.6	1.34	4.00	NE			108455-005	SW846 9056A
	Fluoride	0.628	0.033	0.100	4.0			108455-005	SW846 9056A
	Sulfate	37.2	2.66	8.00	NE			108455-005	SW846 9056A
	Bicarbonate Alkalinity	211	1.45	4.00	NE			108455-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108455-006	SM 2320B
LWDS-MW2	Bromide	0.202	0.067	0.200	NE		J+	108420-005	SW846 9056A
14-May-19	Chloride	12.2	0.335	1.00	NE	H	J-	108420-005	SW846 9056A
	Fluoride	1.29	0.033	0.100	4.0		J+	108420-005	SW846 9056A
	Sulfate	37.5	0.665	2.00	NE	H	J-	108420-005	SW846 9056A
	Bicarbonate Alkalinity	179	1.45	4.00	NE			108420-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108420-006	SM 2320B
TAV-MW2	Bromide	0.324	0.067	0.200	NE			108430-005	SW846 9056A
17-May-19	Chloride	48.9	0.670	2.00	NE			108430-005	SW846 9056A
	Fluoride	0.950	0.033	0.100	4.0			108430-005	SW846 9056A
	Sulfate	52.9	1.33	4.00	NE			108430-005	SW846 9056A
	Bicarbonate Alkalinity	249	1.45	4.00	NE			108430-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108430-006	SM 2320B
TAV-MW3	Bromide	0.259	0.067	0.200	NE			108413-005	SW846 9056A
09-May-19	Chloride	26.2	0.335	1.00	NE			108413-005	SW846 9056A
	Fluoride	1.66	0.033	0.100	4.0			108413-005	SW846 9056A
	Sulfate	64.8	0.665	2.00	NE			108413-005	SW846 9056A
	Bicarbonate Alkalinity	199	1.45	4.00	NE			108413-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108413-006	SM 2320B
TAV-MW4	Bromide	0.401	0.067	0.200	NE			108437-005	SW846 9056A
22-May-19	Chloride	38.2	0.670	2.00	NE			108437-005	SW846 9056A
	Fluoride	1.15	0.033	0.100	4.0			108437-005	SW846 9056A
	Sulfate	37.7	1.33	4.00	NE			108437-005	SW846 9056A
	Bicarbonate Alkalinity	175	1.45	4.00	NE			108437-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108437-006	SM 2320B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	Bromide	0.198	0.067	0.200	NE	J		108404-005	SW846 9056A
07-May-19	Chloride	17.5	0.335	1.00	NE			108404-005	SW846 9056A
	Fluoride	1.36	0.033	0.100	4.0			108404-005	SW846 9056A
	Sulfate	41.0	0.665	2.00	NE			108404-005	SW846 9056A
	Bicarbonate Alkalinity	191	1.45	4.00	NE			108404-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108404-006	SM 2320B
TAV-MW7	Bromide	0.260	0.067	0.200	NE			108416-005	SW846 9056A
13-May-19	Chloride	27.6	0.670	2.00	NE			108416-005	SW846 9056A
	Fluoride	1.12	0.033	0.100	4.0			108416-005	SW846 9056A
	Sulfate	64.0	1.33	4.00	NE			108416-005	SW846 9056A
	Bicarbonate Alkalinity	227	1.45	4.00	NE			108416-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108416-006	SM 2320B
TAV-MW8	Bromide	0.354	0.067	0.200	NE			108441-005	SW846 9056A
23-May-19	Chloride	42.1	0.670	2.00	NE			108441-005	SW846 9056A
	Fluoride	1.33	0.033	0.100	4.0			108441-005	SW846 9056A
	Sulfate	47.4	1.33	4.00	NE			108441-005	SW846 9056A
	Bicarbonate Alkalinity	205	1.45	4.00	NE			108441-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108441-006	SM 2320B
TAV-MW9	Bromide	0.280	0.067	0.200	NE			108408-005	SW846 9056A
08-May-19	Chloride	36.2	0.335	1.00	NE			108408-005	SW846 9056A
	Fluoride	1.09	0.033	0.100	4.0			108408-005	SW846 9056A
	Sulfate	64.0	0.665	2.00	NE			108408-005	SW846 9056A
	Bicarbonate Alkalinity	255	1.45	4.00	NE			108408-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108408-006	SM 2320B
TAV-MW10	Bromide	0.398	0.067	0.200	NE			108453-005	SW846 9056A
05-Jun-19	Chloride	53.2	0.670	2.00	NE			108453-005	SW846 9056A
	Fluoride	1.51	0.033	0.100	4.0			108453-005	SW846 9056A
	Sulfate	56.6	1.33	4.00	NE			108453-005	SW846 9056A
	Bicarbonate Alkalinity	189	1.45	4.00	NE			108453-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108453-006	SM 2320B
TAV-MW11	Bromide	0.480	0.067	0.200	NE			108432-005	SW846 9056A
20-May-19	Chloride	50.7	0.670	2.00	NE			108432-005	SW846 9056A
	Fluoride	1.30	0.033	0.100	4.0			108432-005	SW846 9056A
	Sulfate	39.9	1.33	4.00	NE			108432-005	SW846 9056A
	Bicarbonate Alkalinity	179	1.45	4.00	NE			108432-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108432-006	SM 2320B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	Bromide	0.297	0.067	0.200	NE			108445-005	SW846 9056A
30-May-19	Chloride	42.7	0.670	2.00	NE	H		108445-005	SW846 9056A
	Fluoride	1.42	0.033	0.100	4.0			108445-005	SW846 9056A
	Sulfate	51.3	1.33	4.00	NE	H		108445-005	SW846 9056A
	Bicarbonate Alkalinity	211	1.45	4.00	NE			108445-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108445-006	SM 2320B
TAV-MW13	Bromide	0.193	0.067	0.200	NE	J		108402-005	SW846 9056A
06-May-19	Chloride	17.3	0.335	1.00	NE			108402-005	SW846 9056A
	Fluoride	1.11	0.033	0.100	4.0			108402-005	SW846 9056A
	Sulfate	46.3	0.665	2.00	NE			108402-005	SW846 9056A
	Bicarbonate Alkalinity	200	1.45	4.00	NE			108402-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108402-006	SM 2320B
TAV-MW14	Bromide	0.360	0.067	0.200	NE			108449-005	SW846 9056A
31-May-19	Chloride	53.2	0.670	2.00	NE			108449-005	SW846 9056A
	Fluoride	1.42	0.033	0.100	4.0			108449-005	SW846 9056A
	Sulfate	56.4	1.33	4.00	NE			108449-005	SW846 9056A
	Bicarbonate Alkalinity	203	1.45	4.00	NE			108449-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108449-006	SM 2320B
TAV-MW15	Bromide	0.438	0.067	0.200	NE			108423-005	SW846 9056A
15-May-19	Chloride	75.9	1.34	4.00	NE	H		108423-005	SW846 9056A
	Fluoride	0.937	0.033	0.100	4.0			108423-005	SW846 9056A
	Sulfate	64.4	2.66	8.00	NE	H		108423-005	SW846 9056A
	Bicarbonate Alkalinity	262	1.45	4.00	NE			108423-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108423-006	SM 2320B
TAV-MW16	Bromide	0.484	0.067	0.200	NE			108428-005	SW846 9056A
16-May-19	Chloride	86.4	1.34	4.00	NE			108428-005	SW846 9056A
	Fluoride	0.945	0.033	0.100	4.0			108428-005	SW846 9056A
	Sulfate	58.9	2.66	8.00	NE			108428-005	SW846 9056A
	Bicarbonate Alkalinity	286	1.45	4.00	NE			108428-006	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108428-006	SM 2320B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	0.0319	0.0193	0.050	NE	J		108434-004	SW846 6020B
21-May-19	Antimony	ND	0.001	0.003	0.006	U		108434-004	SW846 6020B
	Arsenic	0.00404	0.002	0.005	0.010	J		108434-004	SW846 6020B
	Barium	0.0892	0.00067	0.004	2.00	B		108434-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108434-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108434-004	SW846 6020B
	Calcium	41.7	0.080	0.200	NE			108434-004	SW846 6020B
	Chromium	0.0479	0.003	0.010	0.100			108434-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108434-004	SW846 6020B
	Copper	0.00128	0.0003	0.002	1.30	J		108434-004	SW846 6020B
	Iron	0.204	0.033	0.100	NE			108434-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108434-004	SW846 6020B
	Magnesium	9.59	0.010	0.030	NE	B		108434-004	SW846 6020B
	Manganese	0.00174	0.001	0.005	NE	J		108434-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108434-004	SW846 7470A
	Nickel	0.00629	0.0006	0.002	NE			108434-004	SW846 6020B
	Potassium	3.23	0.080	0.300	NE			108434-004	SW846 6020B
	Selenium	0.00202	0.002	0.005	0.050	J		108434-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108434-004	SW846 6020B
	Sodium	37.4	0.080	0.250	NE			108434-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108434-004	SW846 6020B
	Uranium	0.00203	0.000067	0.0002	0.030			108434-004	SW846 6020B
	Vanadium	0.0119	0.0033	0.020	NE	J		108434-004	SW846 6020B
	Zinc	0.00841	0.0033	0.020	NE	B, J	0.020U	108434-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108455-004	SW846 6020B
10-Jun-19	Antimony	ND	0.001	0.003	0.006	U		108455-004	SW846 6020B
	Arsenic	0.00429	0.002	0.005	0.010	J		108455-004	SW846 6020B
	Barium	0.0806	0.00067	0.004	2.00			108455-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108455-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108455-004	SW846 6020B
	Calcium	58.7	0.800	2.00	NE			108455-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108455-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108455-004	SW846 6020B
	Copper	ND	0.0003	0.002	1.30	U		108455-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108455-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108455-004	SW846 6020B
	Magnesium	20.4	0.010	0.030	NE			108455-004	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108455-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108455-004	SW846 7470A
	Nickel	0.000644	0.0006	0.002	NE	J		108455-004	SW846 6020B
	Potassium	2.95	0.080	0.300	NE			108455-004	SW846 6020B
	Selenium	0.00692	0.002	0.005	0.050			108455-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108455-004	SW846 6020B
	Sodium	60.5	0.800	2.50	NE			108455-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108455-004	SW846 6020B
	Uranium	0.00259	0.000067	0.0002	0.030			108455-004	SW846 6020B
	Vanadium	0.00681	0.0033	0.020	NE	B, J	0.020U	108455-004	SW846 6020B
	Zinc	0.00661	0.0033	0.020	NE	J		108455-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	ND	0.0193	0.050	NE	U		108420-004	SW846 6020B
14-May-19	Antimony	ND	0.001	0.003	0.006	U		108420-004	SW846 6020B
	Arsenic	0.0027	0.002	0.005	0.010	J		108420-004	SW846 6020B
	Barium	0.0721	0.00067	0.004	2.00			108420-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108420-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108420-004	SW846 6020B
	Calcium	43.5	0.080	0.200	NE			108420-004	SW846 6020B
	Chromium	0.0035	0.003	0.010	0.100	J		108420-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108420-004	SW846 6020B
	Copper	0.000628	0.0003	0.002	1.30	J	0.002U	108420-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108420-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108420-004	SW846 6020B
	Magnesium	13.7	0.010	0.030	NE			108420-004	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108420-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108420-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108420-004	SW846 6020B
	Potassium	2.72	0.080	0.300	NE			108420-004	SW846 6020B
	Selenium	0.00262	0.002	0.005	0.050	J		108420-004	SW846 6020B
	Silver	0.0016	0.0003	0.001	NE			108420-004	SW846 6020B
	Sodium	42.8	0.080	0.250	NE			108420-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108420-004	SW846 6020B
	Uranium	0.00279	0.000067	0.0002	0.030	B		108420-004	SW846 6020B
	Vanadium	0.00925	0.0033	0.020	NE	J		108420-004	SW846 6020B
	Zinc	0.0054	0.0033	0.020	NE	B, J	0.020U	108420-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	0.0377	0.0193	0.050	NE	J		108430-004	SW846 6020B
17-May-19	Antimony	ND	0.001	0.003	0.006	U		108430-004	SW846 6020B
	Arsenic	0.00357	0.002	0.005	0.010	J		108430-004	SW846 6020B
	Barium	0.0635	0.00067	0.004	2.00	B		108430-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108430-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108430-004	SW846 6020B
	Calcium	60.3	0.800	2.00	NE			108430-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108430-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108430-004	SW846 6020B
	Copper	0.00232	0.0003	0.002	1.30			108430-004	SW846 6020B
	Iron	0.0426	0.033	0.100	NE	J		108430-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108430-004	SW846 6020B
	Magnesium	20.3	0.010	0.030	NE	B		108430-004	SW846 6020B
	Manganese	0.00151	0.001	0.005	NE	J		108430-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108430-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108430-004	SW846 6020B
	Potassium	3.42	0.080	0.300	NE			108430-004	SW846 6020B
	Selenium	0.00278	0.002	0.005	0.050	J		108430-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108430-004	SW846 6020B
	Sodium	55.0	0.800	2.50	NE			108430-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108430-004	SW846 6020B
	Uranium	0.00546	0.000067	0.0002	0.030			108430-004	SW846 6020B
	Vanadium	0.00894	0.0033	0.020	NE	J		108430-004	SW846 6020B
	Zinc	0.00618	0.0033	0.020	NE	B, J	0.020U	108430-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	0.0637	0.0193	0.050	NE			108413-004	SW846 6020B
09-May-19	Antimony	ND	0.001	0.003	0.006	U		108413-004	SW846 6020B
	Arsenic	0.00296	0.002	0.005	0.010	J	0.005U	108413-004	SW846 6020B
	Barium	0.0483	0.00067	0.004	2.00			108413-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108413-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108413-004	SW846 6020B
	Calcium	53.6	0.800	2.00	NE			108413-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108413-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108413-004	SW846 6020B
	Copper	0.00177	0.0003	0.002	1.30	J	0.002U	108413-004	SW846 6020B
	Iron	0.0449	0.033	0.100	NE	J		108413-004	SW846 6020B
	Lead	0.00254	0.0005	0.002	0.015			108413-004	SW846 6020B
	Magnesium	14.8	0.010	0.030	NE			108413-004	SW846 6020B
	Manganese	0.0201	0.001	0.005	NE			108413-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108413-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108413-004	SW846 6020B
	Potassium	4.41	0.080	0.300	NE			108413-004	SW846 6020B
	Selenium	0.00285	0.002	0.005	0.050	J		108413-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108413-004	SW846 6020B
	Sodium	51.8	0.800	2.50	NE			108413-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108413-004	SW846 6020B
	Uranium	0.00313	0.000067	0.0002	0.030			108413-004	SW846 6020B
	Vanadium	0.00789	0.0033	0.020	NE	J	0.020U	108413-004	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		108413-004	SW846 6020B

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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 2019

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	0.0296	0.0193	0.050	NE	J		108437-004	SW846 6020B
22-May-19	Antimony	ND	0.001	0.003	0.006	U		108437-004	SW846 6020B
	Arsenic	0.00376	0.002	0.005	0.010	J		108437-004	SW846 6020B
	Barium	0.0931	0.00067	0.004	2.00	B		108437-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108437-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108437-004	SW846 6020B
	Calcium	47.1	0.080	0.200	NE			108437-004	SW846 6020B
	Chromium	0.0262	0.003	0.010	0.100			108437-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108437-004	SW846 6020B
	Copper	0.000317	0.0003	0.002	1.30	J		108437-004	SW846 6020B
	Iron	0.046	0.033	0.100	NE	J		108437-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108437-004	SW846 6020B
	Magnesium	13.6	0.010	0.030	NE	B		108437-004	SW846 6020B
	Manganese	0.00248	0.001	0.005	NE	J		108437-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108437-004	SW846 7470A
	Nickel	0.000629	0.0006	0.002	NE	J		108437-004	SW846 6020B
	Potassium	2.98	0.080	0.300	NE			108437-004	SW846 6020B
	Selenium	0.00319	0.002	0.005	0.050	J		108437-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108437-004	SW846 6020B
	Sodium	42.3	0.080	0.250	NE			108437-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108437-004	SW846 6020B
	Uranium	0.00292	0.000067	0.0002	0.030			108437-004	SW846 6020B
	Vanadium	0.0103	0.0033	0.020	NE	J		108437-004	SW846 6020B
	Zinc	0.00642	0.0033	0.020	NE	B, J	0.020U	108437-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	0.0743	0.0193	0.050	NE			108404-004	SW846 6020B
07-May-19	Antimony	ND	0.001	0.003	0.006	U		108404-004	SW846 6020B
	Arsenic	0.00278	0.002	0.005	0.010	J		108404-004	SW846 6020B
	Barium	0.0647	0.00067	0.004	2.00			108404-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108404-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108404-004	SW846 6020B
	Calcium	48.2	0.080	0.200	NE			108404-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108404-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108404-004	SW846 6020B
	Copper	ND	0.0003	0.002	1.30	U		108404-004	SW846 6020B
	Iron	0.0597	0.033	0.100	NE	J		108404-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108404-004	SW846 6020B
	Magnesium	14.8	0.010	0.030	NE			108404-004	SW846 6020B
	Manganese	0.00316	0.001	0.005	NE	J		108404-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108404-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108404-004	SW846 6020B
	Potassium	2.92	0.080	0.300	NE			108404-004	SW846 6020B
	Selenium	0.00233	0.002	0.005	0.050	J		108404-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108404-004	SW846 6020B
	Sodium	47.5	0.080	0.250	NE			108404-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108404-004	SW846 6020B
	Uranium	0.00334	0.000067	0.0002	0.030			108404-004	SW846 6020B
	Vanadium	0.00965	0.0033	0.020	NE	J		108404-004	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		108404-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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-MW7	Aluminum	ND	0.0193	0.050	NE	U		108416-004	SW846 6020B
13-May-19	Antimony	ND	0.001	0.003	0.006	U		108416-004	SW846 6020B
	Arsenic	0.00291	0.002	0.005	0.010	J		108416-004	SW846 6020B
	Barium	0.0541	0.00067	0.004	2.00			108416-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108416-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108416-004	SW846 6020B
	Calcium	59.2	0.800	2.00	NE			108416-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108416-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108416-004	SW846 6020B
	Copper	0.00176	0.0003	0.002	1.30	J		108416-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108416-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108416-004	SW846 6020B
	Magnesium	19.0	0.010	0.030	NE			108416-004	SW846 6020B
	Manganese	0.00456	0.001	0.005	NE	J		108416-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108416-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108416-004	SW846 6020B
	Potassium	3.89	0.080	0.300	NE			108416-004	SW846 6020B
	Selenium	0.00217	0.002	0.005	0.050	J		108416-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108416-004	SW846 6020B
	Sodium	57.1	0.800	2.50	NE			108416-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108416-004	SW846 6020B
	Uranium	0.00462	0.000067	0.0002	0.030	B		108416-004	SW846 6020B
	Vanadium	0.00878	0.0033	0.020	NE	J		108416-004	SW846 6020B
	Zinc	0.00625	0.0033	0.020	NE	B, J	0.020U	108416-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108441-004	SW846 6020B
23-May-19	Antimony	ND	0.001	0.003	0.006	U		108441-004	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		108441-004	SW846 6020B
	Barium	0.0574	0.00067	0.004	2.00	B		108441-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108441-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108441-004	SW846 6020B
	Calcium	57.9	0.800	2.00	NE			108441-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108441-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108441-004	SW846 6020B
	Copper	ND	0.0003	0.002	1.30	U		108441-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108441-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108441-004	SW846 6020B
	Magnesium	16.9	0.010	0.030	NE			108441-004	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108441-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108441-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108441-004	SW846 6020B
	Potassium	3.77	0.080	0.300	NE			108441-004	SW846 6020B
	Selenium	0.0031	0.002	0.005	0.050	J		108441-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108441-004	SW846 6020B
	Sodium	56.0	0.800	2.50	NE			108441-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108441-004	SW846 6020B
	Uranium	0.00339	0.000067	0.0002	0.030			108441-004	SW846 6020B
	Vanadium	0.007	0.0033	0.020	NE	J		108441-004	SW846 6020B
	Zinc	0.00552	0.0033	0.020	NE	B, J	0.020U	108441-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108408-004	SW846 6020B
08-May-19	Antimony	ND	0.001	0.003	0.006	U		108408-004	SW846 6020B
	Arsenic	0.00272	0.002	0.005	0.010	J	0.005U	108408-004	SW846 6020B
	Barium	0.0655	0.00067	0.004	2.00			108408-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108408-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108408-004	SW846 6020B
	Calcium	61.9	0.800	2.00	NE			108408-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108408-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108408-004	SW846 6020B
	Copper	0.00161	0.0003	0.002	1.30	J	0.002U	108408-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108408-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108408-004	SW846 6020B
	Magnesium	21.3	0.010	0.030	NE			108408-004	SW846 6020B
	Manganese	0.00147	0.001	0.005	NE	J		108408-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108408-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108408-004	SW846 6020B
	Potassium	4.06	0.080	0.300	NE			108408-004	SW846 6020B
	Selenium	0.00231	0.002	0.005	0.050	J		108408-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108408-004	SW846 6020B
	Sodium	59.7	0.800	2.50	NE			108408-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108408-004	SW846 6020B
	Uranium	0.00555	0.000067	0.0002	0.030			108408-004	SW846 6020B
	Vanadium	0.00974	0.0033	0.020	NE	J	0.020U	108408-004	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		108408-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108453-004	SW846 6020B
05-Jun-19	Antimony	ND	0.001	0.003	0.006	U		108453-004	SW846 6020B
	Arsenic	0.00247	0.002	0.005	0.010	J		108453-004	SW846 6020B
	Barium	0.0606	0.00067	0.004	2.00	B		108453-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108453-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108453-004	SW846 6020B
	Calcium	55.2	0.800	2.00	NE			108453-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108453-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108453-004	SW846 6020B
	Copper	0.000318	0.0003	0.002	1.30	J		108453-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108453-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108453-004	SW846 6020B
	Magnesium	16.3	0.010	0.030	NE			108453-004	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108453-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108453-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108453-004	SW846 6020B
	Potassium	4.16	0.080	0.300	NE			108453-004	SW846 6020B
	Selenium	0.0028	0.002	0.005	0.050	J		108453-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108453-004	SW846 6020B
	Sodium	53.8	0.800	2.50	NE			108453-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108453-004	SW846 6020B
	Uranium	0.00303	0.000067	0.0002	0.030			108453-004	SW846 6020B
	Vanadium	0.00709	0.0033	0.020	NE	J		108453-004	SW846 6020B
	Zinc	0.00576	0.0033	0.020	NE	B, J	0.020U	108453-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108432-004	SW846 6020B
20-May-19	Antimony	ND	0.001	0.003	0.006	U		108432-004	SW846 6020B
	Arsenic	0.00373	0.002	0.005	0.010	J		108432-004	SW846 6020B
	Barium	0.0771	0.00067	0.004	2.00	B		108432-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108432-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108432-004	SW846 6020B
	Calcium	51.2	0.800	2.00	NE			108432-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108432-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108432-004	SW846 6020B
	Copper	ND	0.0003	0.002	1.30	U		108432-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108432-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108432-004	SW846 6020B
	Magnesium	15.4	0.010	0.030	NE	B		108432-004	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108432-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108432-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108432-004	SW846 6020B
	Potassium	3.63	0.080	0.300	NE			108432-004	SW846 6020B
	Selenium	0.00402	0.002	0.005	0.050	J		108432-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108432-004	SW846 6020B
	Sodium	48.3	0.800	2.50	NE			108432-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108432-004	SW846 6020B
	Uranium	0.00281	0.000067	0.0002	0.030			108432-004	SW846 6020B
	Vanadium	0.00979	0.0033	0.020	NE	J		108432-004	SW846 6020B
	Zinc	0.00617	0.0033	0.020	NE	B, J	0.020U	108432-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	ND	0.0193	0.050	NE	U		108445-004	SW846 6020B
30-May-19	Antimony	ND	0.001	0.003	0.006	U		108445-004	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		108445-004	SW846 6020B
	Barium	0.0661	0.00067	0.004	2.00			108445-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108445-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108445-004	SW846 6020B
	Calcium	55.1	0.800	2.00	NE			108445-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108445-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108445-004	SW846 6020B
	Copper	ND	0.0003	0.002	1.30	U		108445-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108445-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108445-004	SW846 6020B
	Magnesium	16.6	0.010	0.030	NE			108445-004	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108445-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108445-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108445-004	SW846 6020B
	Potassium	3.38	0.080	0.300	NE			108445-004	SW846 6020B
	Selenium	0.00205	0.002	0.005	0.050	J		108445-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108445-004	SW846 6020B
	Sodium	56.6	0.800	2.50	NE			108445-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108445-004	SW846 6020B
	Uranium	0.00443	0.000067	0.0002	0.030			108445-004	SW846 6020B
	Vanadium	0.00358	0.0033	0.020	NE	J		108445-004	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		108445-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108402-004	SW846 6020B
06-May-19	Antimony	ND	0.001	0.003	0.006	U		108402-004	SW846 6020B
	Arsenic	0.00253	0.002	0.005	0.010	J		108402-004	SW846 6020B
	Barium	0.0573	0.00067	0.004	2.00			108402-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108402-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108402-004	SW846 6020B
	Calcium	49.8	0.080	0.200	NE			108402-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108402-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108402-004	SW846 6020B
	Copper	0.00156	0.0003	0.002	1.30	J		108402-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108402-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108402-004	SW846 6020B
	Magnesium	15.6	0.010	0.030	NE			108402-004	SW846 6020B
	Manganese	0.0013	0.001	0.005	NE	J		108402-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108402-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108402-004	SW846 6020B
	Potassium	3.40	0.080	0.300	NE			108402-004	SW846 6020B
	Selenium	0.00239	0.002	0.005	0.050	J		108402-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108402-004	SW846 6020B
	Sodium	48.3	0.080	0.250	NE			108402-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108402-004	SW846 6020B
	Uranium	0.00367	0.000067	0.0002	0.030			108402-004	SW846 6020B
	Vanadium	0.00985	0.0033	0.020	NE	J		108402-004	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		108402-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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	ND	0.0193	0.050	NE	U		108449-004	SW846 6020B
31-May-19	Antimony	ND	0.001	0.003	0.006	U		108449-004	SW846 6020B
	Arsenic	0.00217	0.002	0.005	0.010	J		108449-004	SW846 6020B
	Barium	0.0562	0.00067	0.004	2.00	B		108449-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108449-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108449-004	SW846 6020B
	Calcium	54.2	0.800	2.00	NE			108449-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108449-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108449-004	SW846 6020B
	Copper	0.000491	0.0003	0.002	1.30	J		108449-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108449-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108449-004	SW846 6020B
	Magnesium	17.8	0.010	0.030	NE			108449-004	SW846 6020B
	Manganese	0.00206	0.001	0.005	NE	J		108449-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108449-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108449-004	SW846 6020B
	Potassium	3.97	0.080	0.300	NE			108449-004	SW846 6020B
	Selenium	0.00321	0.002	0.005	0.050	J		108449-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108449-004	SW846 6020B
	Sodium	55.8	0.800	2.50	NE			108449-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108449-004	SW846 6020B
	Uranium	0.00397	0.000067	0.0002	0.030			108449-004	SW846 6020B
	Vanadium	0.00613	0.0033	0.020	NE	J		108449-004	SW846 6020B
	Zinc	0.00636	0.0033	0.020	NE	B, J	0.020U	108449-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108423-004	SW846 6020B
15-May-19	Antimony	ND	0.001	0.003	0.006	U		108423-004	SW846 6020B
	Arsenic	0.00227	0.002	0.005	0.010	J		108423-004	SW846 6020B
	Barium	0.0686	0.00067	0.004	2.00			108423-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108423-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108423-004	SW846 6020B
	Calcium	72.3	0.800	2.00	NE			108423-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108423-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108423-004	SW846 6020B
	Copper	0.00185	0.0003	0.002	1.30	J		108423-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108423-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108423-004	SW846 6020B
	Magnesium	25.0	0.010	0.030	NE			108423-004	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108423-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108423-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108423-004	SW846 6020B
	Potassium	4.02	0.080	0.300	NE			108423-004	SW846 6020B
	Selenium	0.00237	0.002	0.005	0.050	J		108423-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108423-004	SW846 6020B
	Sodium	65.2	0.800	2.50	NE			108423-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108423-004	SW846 6020B
	Uranium	0.00692	0.000067	0.0002	0.030	B		108423-004	SW846 6020B
	Vanadium	0.00455	0.0033	0.020	NE	J		108423-004	SW846 6020B
	Zinc	0.00515	0.0033	0.020	NE	B, J	0.020U	108423-004	SW846 6020B

Refer to footnotes on page 5B-46.

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

Calendar Year 2019

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		108428-004	SW846 6020B
16-May-19	Antimony	ND	0.001	0.003	0.006	U		108428-004	SW846 6020B
	Arsenic	0.00276	0.002	0.005	0.010	J		108428-004	SW846 6020B
	Barium	0.0661	0.00067	0.004	2.00			108428-004	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108428-004	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108428-004	SW846 6020B
	Calcium	76.6	0.800	2.00	NE			108428-004	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108428-004	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108428-004	SW846 6020B
	Copper	0.00158	0.0003	0.002	1.30	J		108428-004	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108428-004	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108428-004	SW846 6020B
	Magnesium	27.2	0.010	0.030	NE			108428-004	SW846 6020B
	Manganese	0.00114	0.001	0.005	NE	J		108428-004	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108428-004	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108428-004	SW846 6020B
	Potassium	4.30	0.080	0.300	NE			108428-004	SW846 6020B
	Selenium	0.00219	0.002	0.005	0.050	J		108428-004	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108428-004	SW846 6020B
	Sodium	70.4	0.800	2.50	NE			108428-004	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108428-004	SW846 6020B
	Uranium	0.00632	0.000067	0.0002	0.030	B		108428-004	SW846 6020B
	Vanadium	0.00684	0.0033	0.020	NE	J		108428-004	SW846 6020B
	Zinc	0.00453	0.0033	0.020	NE	B, J	0.020U	108428-004	SW846 6020B

Refer to footnotes on page 5B-46.

Table 5B-7
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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]
AVN-1	Americium-241	0.963 ± 5.16	8.76	4.25	NE	U	BD	108434-007	EPA 901.1
21-May-19	Cesium-137	2.76 ± 2.65	2.90	1.37	NE	U	BD	108434-007	EPA 901.1
	Cobalt-60	0.342 ± 1.58	2.91	1.34	NE	U	BD	108434-007	EPA 901.1
	Potassium-40	-5.65 ± 32.1	48.8	23.2	NE	U	BD	108434-007	EPA 901.1
	Gross Alpha	2.81	NA	NA	15 pCi/L	NA	None	108434-008	EPA 900.0
	Gross Beta	4.79 ± 0.687	0.886	0.426	4 mrem/yr			108434-008	EPA 900.0
	Tritium	27.8 ± 95.6	168	78.2	NE	U	BD	108434-009	EPA 906.0
LWDS-MW1	Americium-241	1.83 ± 13.1	23.9	11.5	NE	U	BD	108455-007	EPA 901.1
10-Jun-19	Cesium-137	-0.524 ± 1.89	3.38	1.58	NE	U	BD	108455-007	EPA 901.1
	Cobalt-60	0.333 ± 2.30	4.29	1.97	NE	U	BD	108455-007	EPA 901.1
	Potassium-40	31.7 ± 50.7	42.4	19.4	NE	U	BD	108455-007	EPA 901.1
	Gross Alpha	0.67	NA	NA	15 pCi/L	NA	None	108455-008	EPA 900.0
	Gross Beta	2.97 ± 0.752	1.16	0.563	4 mrem/yr		J	108455-008	EPA 900.0
	Tritium	71.5 ± 91.1	153	68.7	NE	U	BD	108455-009	EPA 906.0
LWDS-MW2	Americium-241	5.81 ± 7.38	11.0	5.34	NE	U	BD	108420-007	EPA 901.1
14-May-19	Cesium-137	0.969 ± 1.91	2.88	1.35	NE	U	BD	108420-007	EPA 901.1
	Cobalt-60	2.08 ± 1.97	3.52	1.63	NE	U	BD	108420-007	EPA 901.1
	Potassium-40	18.6 ± 34.4	31.4	14.4	NE	U	BD	108420-007	EPA 901.1
	Gross Alpha	3.06	NA	NA	15 pCi/L	NA	None	108420-008	EPA 900.0
	Gross Beta	4.27 ± 0.653	0.875	0.422	4 mrem/yr			108420-008	EPA 900.0
	Tritium	7.36 ± 86.0	155	71.7	NE	U	BD	108420-009	EPA 906.0
TAV-MW2	Americium-241	0.567 ± 9.77	17.1	8.26	NE	U	BD	108430-007	EPA 901.1
17-May-19	Cesium-137	0.441 ± 1.68	3.01	1.42	NE	U	BD	108430-007	EPA 901.1
	Cobalt-60	1.11 ± 1.84	3.51	1.61	NE	U	BD	108430-007	EPA 901.1
	Potassium-40	82.1 ± 40.8	29.4	13.2	NE		J	108430-007	EPA 901.1
	Gross Alpha	7.14	NA	NA	15 pCi/L	NA	None	108430-008	EPA 900.0
	Gross Beta	3.44 ± 0.931	1.34	0.638	4 mrem/yr		J	108430-008	EPA 900.0
	Tritium	9.84 ± 93.0	166	77.4	NE	U	BD	108430-009	EPA 906.0
TAV-MW3	Americium-241	-5.28 ± 12.5	22.4	10.7	NE	U	BD	108413-007	EPA 901.1
09-May-19	Cesium-137	-2.18 ± 2.11	3.14	1.46	NE	U	BD	108413-007	EPA 901.1
	Cobalt-60	2.38 ± 4.56	4.70	2.17	NE	U	BD	108413-007	EPA 901.1
	Potassium-40	-25.3 ± 47.9	59.6	28.1	NE	U	BD	108413-007	EPA 901.1
	Gross Alpha	5.73	NA	NA	15 pCi/L	NA	None	108413-008	EPA 900.0
	Gross Beta	4.65 ± 1.05	1.59	0.775	4 mrem/yr	*	J	108413-008	EPA 900.0
	Tritium	-6.56 ± 83.8	153	70.8	NE	U	BD	108413-009	EPA 906.0

Refer to footnotes on page 5B-46.

Table 5B-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW4	Americium-241	-2.59 ± 13.9	23.4	11.2	NE	U	BD	108437-007	EPA 901.1
22-May-19	Cesium-137	-0.767 ± 2.24	3.46	1.62	NE	U	BD	108437-007	EPA 901.1
	Cobalt-60	-1.57 ± 2.36	3.86	1.76	NE	U	BD	108437-007	EPA 901.1
	Potassium-40	46.2 ± 44.7	38.8	17.6	NE		J	108437-007	EPA 901.1
	Gross Alpha	4.83	NA	NA	15 pCi/L	NA	None	108437-008	EPA 900.0
	Gross Beta	4.13 ± 0.735	0.923	0.442	4 mrem/yr			108437-008	EPA 900.0
	Tritium	28.3 ± 96.4	170	78.8	NE	U	BD	108437-009	EPA 906.0
TAV-MW5	Americium-241	-5.06 ± 9.41	10.2	4.93	NE	U	BD	108404-007	EPA 901.1
07-May-19	Cesium-137	0.561 ± 1.51	2.72	1.28	NE	U	BD	108404-007	EPA 901.1
	Cobalt-60	-0.505 ± 1.56	2.80	1.28	NE	U	BD	108404-007	EPA 901.1
	Potassium-40	8.65 ± 41.2	29.5	13.5	NE	U	BD	108404-007	EPA 901.1
	Gross Alpha	4.50	NA	NA	15 pCi/L	NA	None	108404-008	EPA 900.0
	Gross Beta	3.20 ± 1.05	1.65	0.805	4 mrem/yr	*	J	108404-008	EPA 900.0
	Tritium	26.8 ± 88.4	156	72.2	NE	U	BD	108404-009	EPA 906.0
TAV-MW7	Americium-241	13.1 ± 18.5	29.1	14.1	NE	U	BD	108416-007	EPA 901.1
13-May-19	Cesium-137	3.97 ± 2.67	3.15	1.48	NE		J	108416-007	EPA 901.1
	Cobalt-60	0.413 ± 1.94	3.65	1.67	NE	U	BD	108416-007	EPA 901.1
	Potassium-40	-30.0 ± 50.7	56.4	26.7	NE	U	BD	108416-007	EPA 901.1
	Gross Alpha	3.37	NA	NA	15 pCi/L	NA	None	108416-008	EPA 900.0
	Gross Beta	5.36 ± 0.868	1.18	0.570	4 mrem/yr			108416-008	EPA 900.0
	Tritium	-32.6 ± 82.6	155	71.7	NE	U	BD	108416-009	EPA 906.0
TAV-MW8	Americium-241	15.7 ± 21.1	24.5	11.9	NE	U	BD	108441-007	EPA 901.1
23-May-19	Cesium-137	2.94 ± 4.20	3.73	1.76	NE	U	BD	108441-007	EPA 901.1
	Cobalt-60	-0.00305 ± 2.25	4.19	1.93	NE	U	BD	108441-007	EPA 901.1
	Potassium-40	0.139 ± 63.8	35.9	16.3	NE	U	BD	108441-007	EPA 901.1
	Gross Alpha	2.92	NA	NA	15 pCi/L	NA	None	108441-008	EPA 900.0
	Gross Beta	3.58 ± 0.803	1.13	0.543	4 mrem/yr			108441-008	EPA 900.0
	Tritium	-9.62 ± 94.5	172	80.0	NE	U	BD	108441-009	EPA 906.0
TAV-MW9	Americium-241	1.54 ± 3.14	5.02	2.44	NE	U	BD	108408-007	EPA 901.1
08-May-19	Cesium-137	1.73 ± 2.62	4.10	1.93	NE	U	BD	108408-007	EPA 901.1
	Cobalt-60	-1.14 ± 2.33	3.86	1.74	NE	U	BD	108408-007	EPA 901.1
	Potassium-40	-49.9 ± 53.3	52.7	24.4	NE	U	BD	108408-007	EPA 901.1
	Gross Alpha	7.58	NA	NA	15 pCi/L	NA	None	108408-008	EPA 900.0
	Gross Beta	5.14 ± 0.799	1.06	0.510	4 mrem/yr	*	J	108408-008	EPA 900.0
	Tritium	-37.4 ± 82.1	155	71.7	NE	U	BD	108408-009	EPA 906.0

Refer to footnotes on page 5B-46.

Table 5B-7 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW10	Americium-241	-0.167 ± 2.75	4.67	2.27	NE	U	BD	108453-007	EPA 901.1
05-Jun-19	Cesium-137	0.987 ± 2.01	3.48	1.65	NE	U	BD	108453-007	EPA 901.1
	Cobalt-60	0.318 ± 1.78	3.29	1.50	NE	U	BD	108453-007	EPA 901.1
	Potassium-40	3.67 ± 45.7	35.8	16.4	NE	U	BD	108453-007	EPA 901.1
	Gross Alpha	2.85	NA	NA	15 pCi/L	NA	None	108453-008	EPA 900.0
	Gross Beta	4.94 ± 1.00	1.49	0.727	4 mrem/yr			108453-008	EPA 900.0
	Tritium	-2.12 ± 89.7	167	75.5	NE	U	BD	108453-009	EPA 906.0
TAV-MW11	Americium-241	-8.28 ± 10.4	15.5	7.52	NE	U	BD	108432-007	EPA 901.1
20-May-19	Cesium-137	1.42 ± 2.13	3.61	1.72	NE	U	BD	108432-007	EPA 901.1
	Cobalt-60	-0.812 ± 2.11	3.09	1.41	NE	U	BD	108432-007	EPA 901.1
	Potassium-40	30.7 ± 44.9	33.2	15.2	NE	U	BD	108432-007	EPA 901.1
	Gross Alpha	3.51	NA	NA	15 pCi/L	NA	None	108432-008	EPA 900.0
	Gross Beta	14.2 ± 1.21	1.31	0.633	4 mrem/yr			108432-008	EPA 900.0
	Tritium	39.7 ± 97.4	170	78.8	NE	U	BD	108432-009	EPA 906.0
TAV-MW12	Americium-241	-0.975 ± 3.51	5.54	2.66	NE	U	BD	108445-007	EPA 901.1
30-May-19	Cesium-137	-0.379 ± 2.85	4.89	2.27	NE	U	BD	108445-007	EPA 901.1
	Cobalt-60	-0.269 ± 288	5.21	2.33	NE	U	BD	108445-007	EPA 901.1
	Potassium-40	18.1 ± 48.8	44.2	19.4	NE	U	BD	108445-007	EPA 901.1
	Gross Alpha	4.60	NA	NA	15 pCi/L	NA	None	108445-008	EPA 900.0
	Gross Beta	5.58 ± 1.27	1.94	0.95	4 mrem/yr		J	108445-008	EPA 900.0
	Tritium	-6.22 ± 95.4	174	80.5	NE	U	BD	108445-009	EPA 906.0
TAV-MW13	Americium-241	5.36 ± 6.64	9.89	4.79	NE	U	BD	108402-007	EPA 901.1
06-May-19	Cesium-137	1.47 ± 2.67	2.67	1.26	NE	U	BD	108402-007	EPA 901.1
	Cobalt-60	2.01 ± 2.37	3.22	1.49	NE	U	BD	108402-007	EPA 901.1
	Potassium-40	-7.87 ± 40.1	41.8	19.7	NE	U	BD	108402-007	EPA 901.1
	Gross Alpha	3.28	NA	NA	15 pCi/L	NA	None	108402-008	EPA 900.0
	Gross Beta	3.87 ± 0.968	1.42	0.689	4 mrem/yr	*	J	108402-008	EPA 900.0
	Tritium	44.3 ± 87.8	151	70.2	NE	U	BD	108402-009	EPA 906.0
TAV-MW14	Americium-241	0.974 ± 4.93	8.56	4.15	NE	U	BD	108449-007	EPA 901.1
31-May-19	Cesium-137	0.483 ± 1.60	2.82	1.33	NE	U	BD	108449-007	EPA 901.1
	Cobalt-60	1.36 ± 1.82	3.33	1.55	NE	U	BD	108449-007	EPA 901.1
	Potassium-40	-10.8 ± 35.4	42.6	20.1	NE	U	BD	108449-007	EPA 901.1
	Gross Alpha	6.02	NA	NA	15 pCi/L	NA	None	108449-008	EPA 900.0
	Gross Beta	2.78 ± 1.20	1.94	0.950	4 mrem/yr		J	108449-008	EPA 900.0
	Tritium	34.0 ± 86.6	154	69.1	NE	U	BD	108449-009	EPA 906.0

Refer to footnotes on page 5B-46.

Table 5B-7 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	-1.84 ± 3.43	5.19	2.51	NE	U	BD	108423-007	EPA 901.1
15-May-19	Cesium-137	-0.497 ± 2.64	4.23	1.99	NE	U	BD	108423-007	EPA 901.1
	Cobalt-60	0.298 ± 2.64	4.28	1.93	NE	U	BD	108423-007	EPA 901.1
	Potassium-40	-33.5 ± 48.6	57.5	26.7	NE	U	BD	108423-007	EPA 901.1
	Gross Alpha	8.06	NA	NA	15 pCi/L	NA	None	108423-008	EPA 900.0
	Gross Beta	28.2 ± 1.81	1.78	0.859	4 mrem/yr			108423-008	EPA 900.0
	Tritium	-26.3 ± 84.1	157	72.6	NE	U	BD	108423-009	EPA 906.0
TAV-MW16	Americium-241	1.47 ± 3.13	4.92	2.39	NE	U	BD	108428-007	EPA 901.1
16-May-19	Cesium-137	0.853 ± 2.07	3.61	1.71	NE	U	BD	108428-007	EPA 901.1
	Cobalt-60	-0.385 ± 1.86	3.29	1.49	NE	U	BD	108428-007	EPA 901.1
	Potassium-40	-27.5 ± 40.9	51.2	24.0	NE	U	BD	108428-007	EPA 901.1
	Gross Alpha	8.67	NA	NA	15 pCi/L	NA	None	108428-008	EPA 900.0
	Gross Beta	5.33 ± 1.36	2.02	0.983	4 mrem/yr		J	108428-008	EPA 900.0
	Tritium	9.68 ± 83.8	150	69.7	NE	U	BD	108428-009	EPA 906.0

Refer to footnotes on page 5B-46.

Table 5B-8
Summary of Field Water Quality Measurements[h], Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

Well ID	Sample Date	Temperature (^{0}C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
LWDS-MW1	11-Feb-19	16.26	625.84	206.5	7.29	0.92	91.1	7.61
TAV-MW2	29-Jan-19	16.66	668.3	284.4	7.33	2.68	76.1	6.02
TAV-MW4	31-Jan-19	19.12	517.62	252.9	7.55	0.48	90.20	6.77
TAV-MW7	28-Jan-19	18.79	614.9	171.5	7.40	0.93	3.49	0.40
TAV-MW8	01-Feb-19	19.20	615.3	265.3	7.46	1.27	89.4	6.62
TAV-MW10	07-Feb-19	17.19	602.2	224.1	7.45	0.33	85.4	7.18
TAV-MW11	30-Jan-19	19.52	607.8	272.9	7.56	2.13	88.9	6.80
TAV-MW12	05-Feb-19	17.52	578.5	210.1	7.44	1.78	84.1	6.50
TAV-MW14	06-Feb-19	18.25	649.5	230.1	7.42	2.92	84.4	6.85
TAV-MW15	24-Jan-19	17.91	771.0	309.1	7.30	1.60	76.1	5.89
TAV-MW16	25-Jan-19	19.77	843.1	260.1	7.21	0.72	53.6	4.04
AVN-1	21-May-19	19.23	438.71	56.0	7.71	1.82	41.16	3.29
LWDS-MW1	10-Jun-19	18.75	742.88	162.5	7.38	1.37	95.12	7.49
LWDS-MW2	14-May-19	21.35	490.66	184.3	7.54	1.52	58.70	4.56
TAV-MW2	17-May-19	20.96	758.41	199.4	7.27	1.85	69.13	5.40
TAV-MW3	09-May-19	17.94	549.20	159.0	7.46	3.49	70.80	5.49
TAV-MW4	22-May-19	20.54	550.62	198.9	7.53	2.53	75.92	5.98
TAV-MW5	07-May-19	20.18	516.70	47.2	7.50	3.61	70.30	5.21
TAV-MW7	13-May-19	20.43	642.60	77.6	7.39	2.64	2.50	0.19
TAV-MW8	23-May-19	21.46	629.15	198.2	7.44	1.18	76.44	5.91
TAV-MW9	08-May-19	21.20	694.90	166.7	7.27	0.98	16.30	1.18
TAV-MW10	05-Jun-19	21.41	676.68	34.9	7.51	0.63	81.07	6.21
TAV-MW11	20-May-19	20.00	607.00	203.3	7.51	0.46	77.00	6.06
TAV-MW12	30-May-19	20.10	649.00	168.8	7.46	0.98	68.20	5.37
TAV-MW13	06-May-19	20.77	541.60	9.2	7.47	0.37	28.50	2.09
TAV-MW14	31-May-19	21.59	702.73	37.8	7.46	1.71	82.07	6.27
TAV-MW15	15-May-19	22.18	843.76	128.5	7.24	1.75	65.59	4.99
TAV-MW16	16-May-19	21.66	906.73	192.7	7.16	0.79	46.73	3.61

Refer to footnotes on page 5B-46.

Table 5B-8 *(Concluded)*
Summary of Field Water Quality Measurements[h], Technical Area-V Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

Well ID	Sample Date	Temperature (^{0}C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
LWDS-MW1	19-Aug-19	25.70	792.41	197.7	7.30	0.46	82.71	8.41
LWDS-MW2	09-Aug-19	21.51	485.93	251.2	7.61	3.69	72.40	5.78
TAV-MW2	02-Aug-19	22.55	711.63	26.4	7.35	2.02	92.88	7.06
TAV-MW4	06-Aug-19	21.88	514.17	245.5	7.68	0.87	90.33	7.53
TAV-MW7	29-Jul-19	21.66	606.55	-15.9	7.37	0.62	3.03	0.39
TAV-MW8	07-Aug-19	22.25	633.63	255.6	7.52	3.60	94.30	7.32
TAV-MW10	14-Aug-19	22.36	628.00	211.2	7.55	0.38	96.32	8.10
TAV-MW11	05-Aug-19	22.61	622.21	242.1	7.59	0.64	93.34	7.55
TAV-MW12	13-Aug-19	22.82	665.94	206.1	7.41	0.92	79.08	6.53
TAV-MW14	08-Aug-19	22.15	676.81	219.1	7.49	4.51	111.69	9.58
TAV-MW15	30-Jul-19	22.44	804.41	41.7	7.26	2.10	83.99	6.47
TAV-MW16	31-Jul-19	21.79	849.81	25.2	7.22	0.66	60.75	4.76
LWDS-MW1	18-Nov-19	19.14	729.3	67.8	7.36	0.31	92.00	7.12
TAV-MW2	31-Oct-19	16.43	665.6	14.5	7.40	2.66	67.70	5.48
TAV-MW4	05-Nov-19	20.17	568.5	4.8	7.61	0.56	80.19	6.04
TAV-MW7	22-Oct-19	18.43	607.1	-67.3	7.43	1.36	3.33	0.26
TAV-MW8	06-Nov-19	19.03	679.0	-2.9	7.56	3.16	75.99	5.82
TAV-MW10	13-Nov-19	19.48	625.7	35.7	7.51	0.51	81.90	6.24
TAV-MW11	04-Nov-19	21.51	626.1	15.2	7.54	0.28	79.55	5.69
TAV-MW12	12-Nov-19	17.94	726.5	73.3	7.44	2.49	71.35	5.64
TAV-MW14	07-Nov-19	16.95	712.7	25.2	7.36	1.30	74.55	5.98
TAV-MW15	23-Oct-19	19.39	782.1	3.0	7.32	1.34	62.81	4.83
TAV-MW16	24-Oct-19	19.37	854.2	-4.5	7.23	0.69	45.32	3.38

Refer to footnotes on page 5B-46.

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.
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).

Activities of zero or less are considered to be not detected.

[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 March 2018).

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 (Continued)

[e]Laboratory 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.
N	= Results associated with a spike analysis that was outside control limits.
NA	= Not applicable.
U	= Analyte is absent or below the MDL.
*	= 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.

[g]Analytical Method

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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.
µmho/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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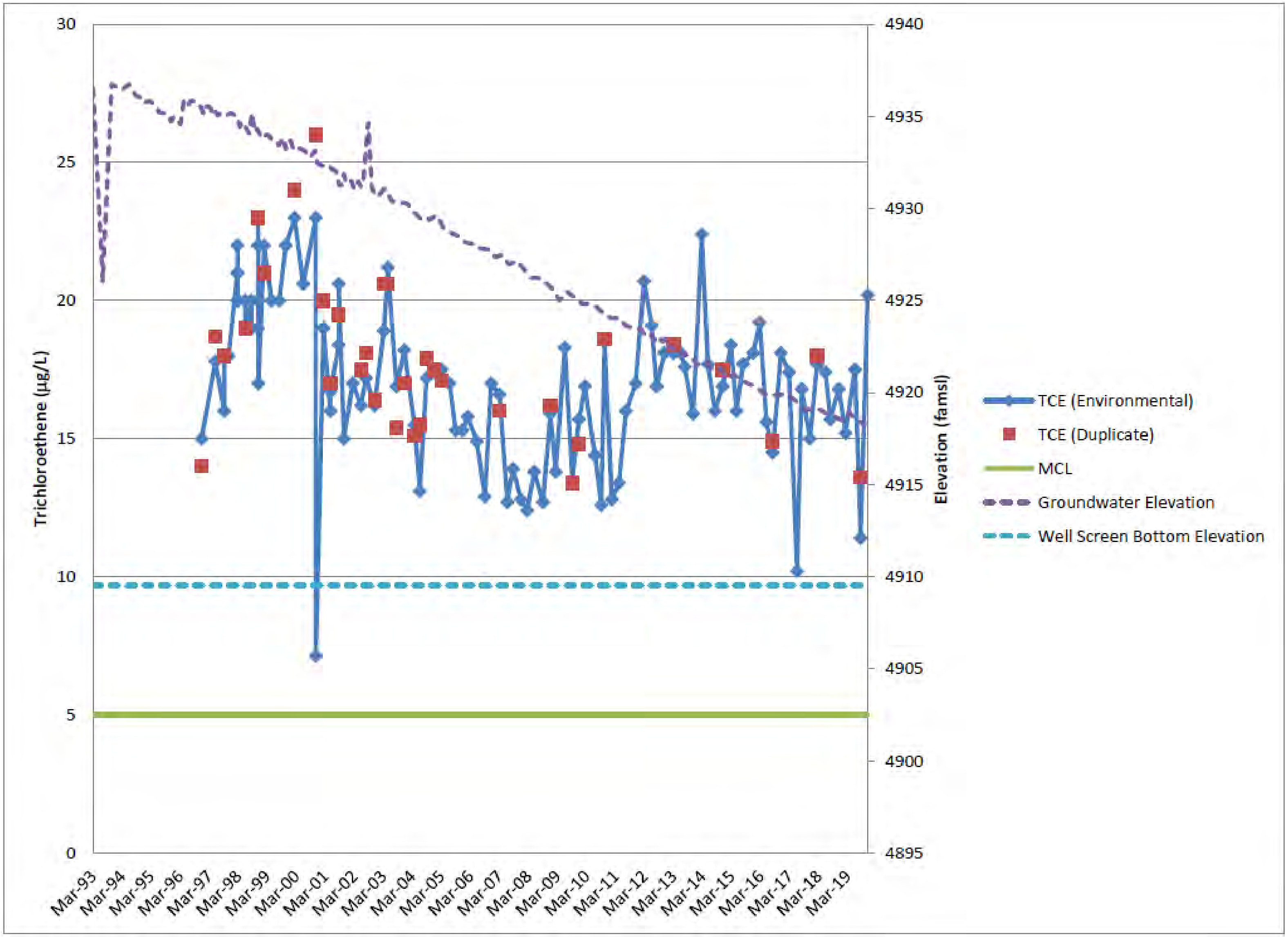

Figure 5C-1.Trichloroethene Concentrations, LWDS-MW1

Figure 5C-2. Trichloroethene Concentrations, TAV-MW4

Figure 5C-3. Trichloroethene Concentrations, TAV-MW8

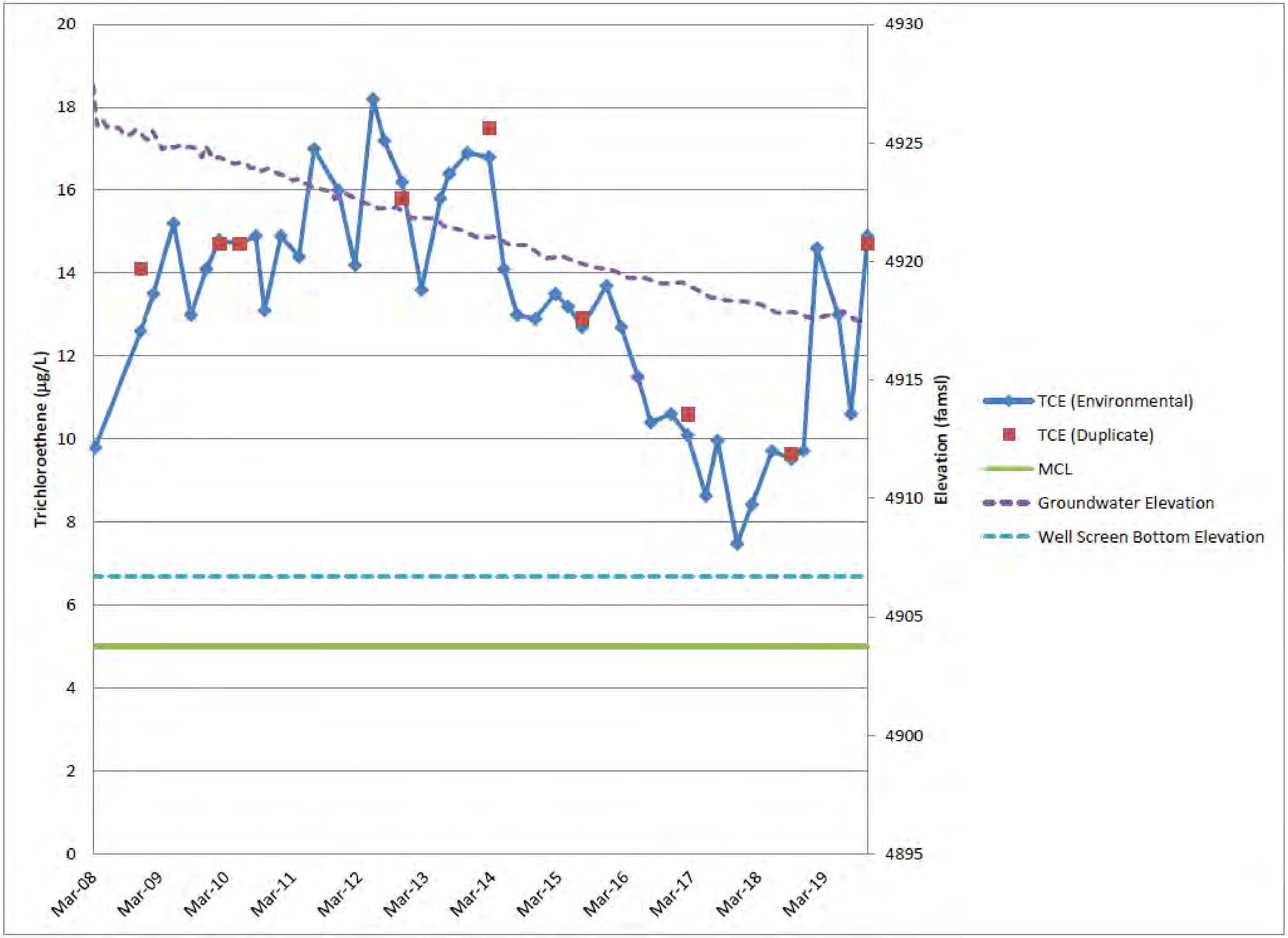

Figure 5C-4. Trichloroethene Concentrations, TAV-MW10

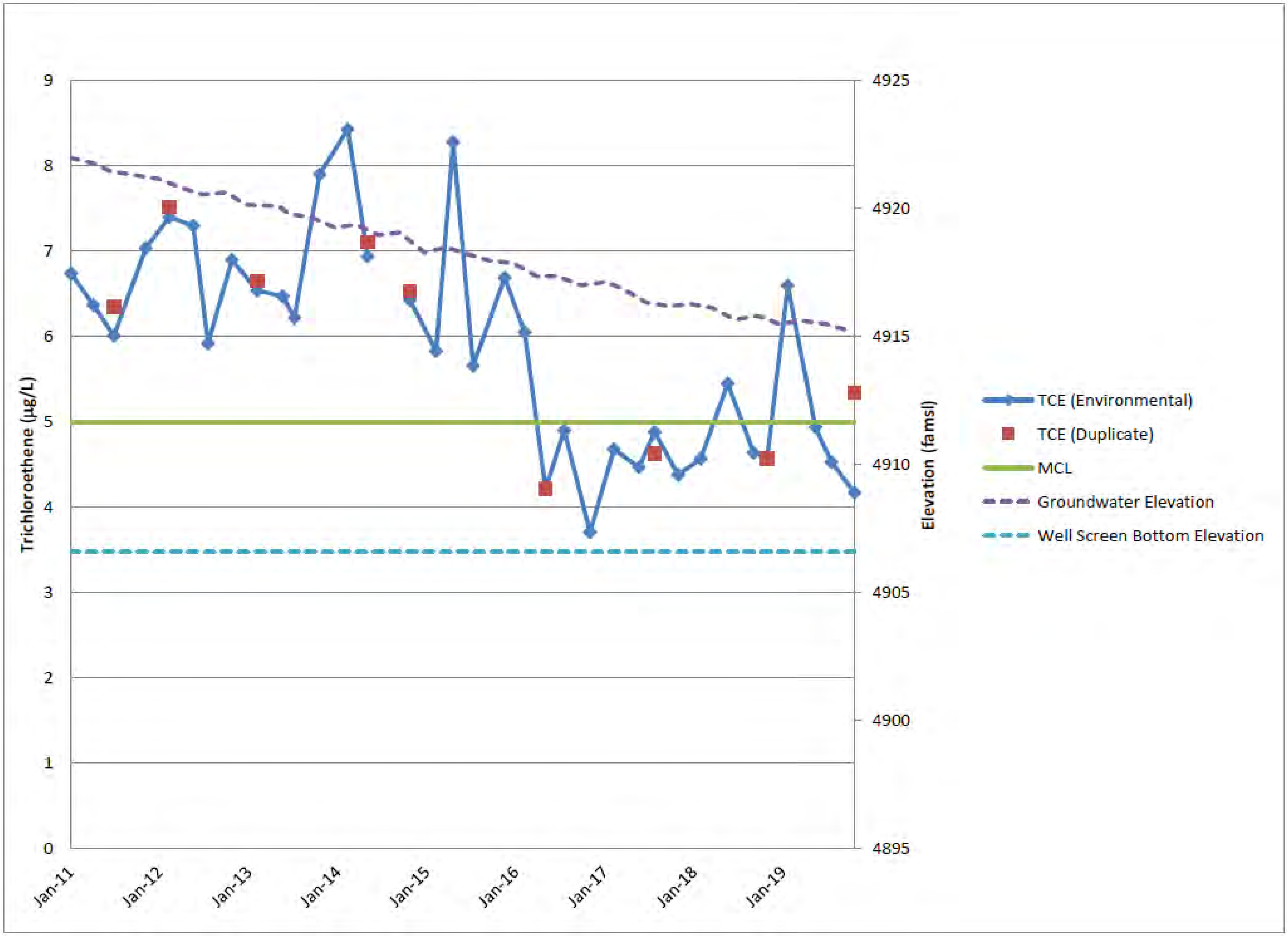

Figure 5C-5. Trichloroethene Concentrations, TAV-MW14

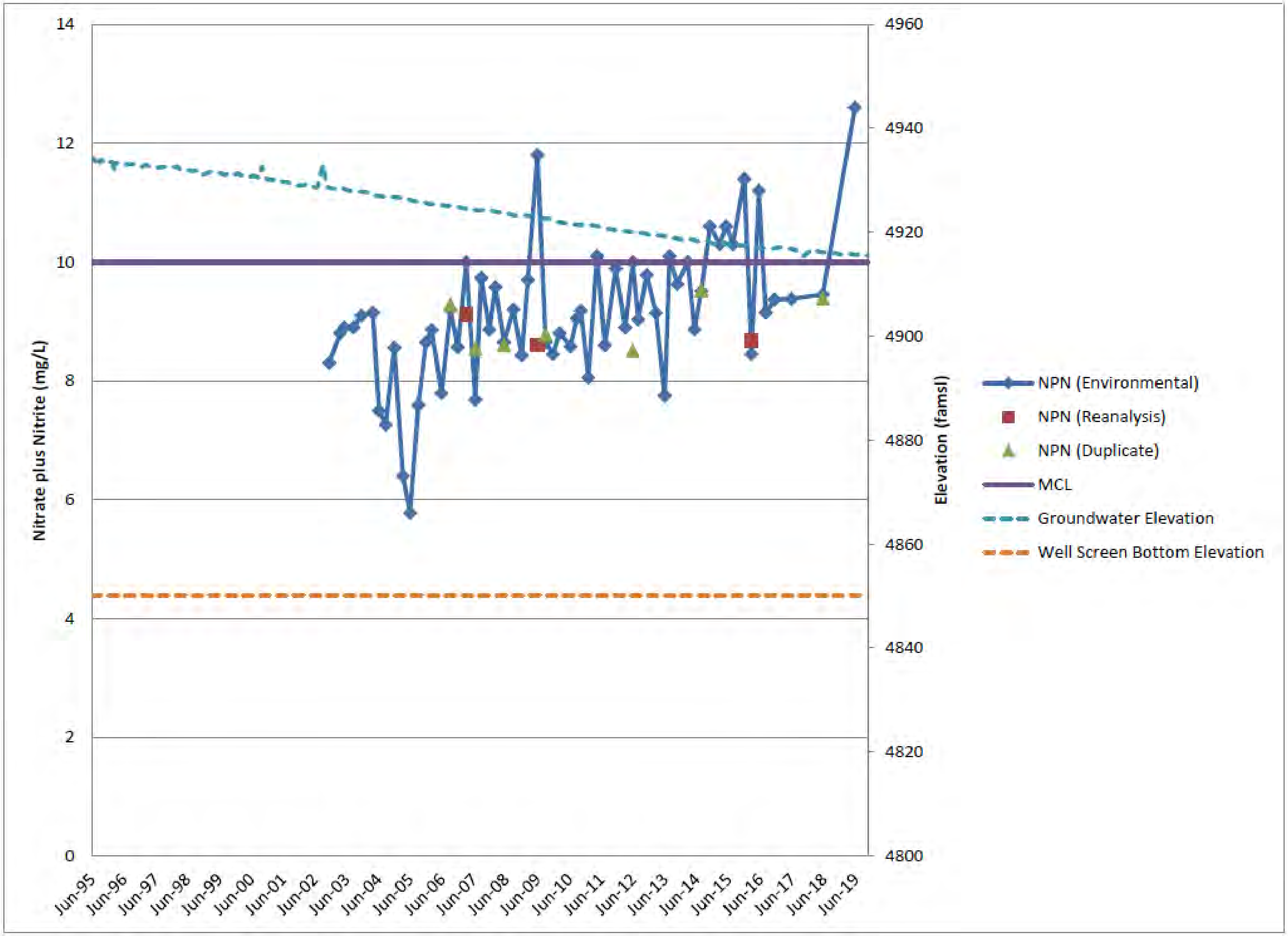

Figure 5C-6. Nitrate Plus Nitrite Concentrations, AVN-1

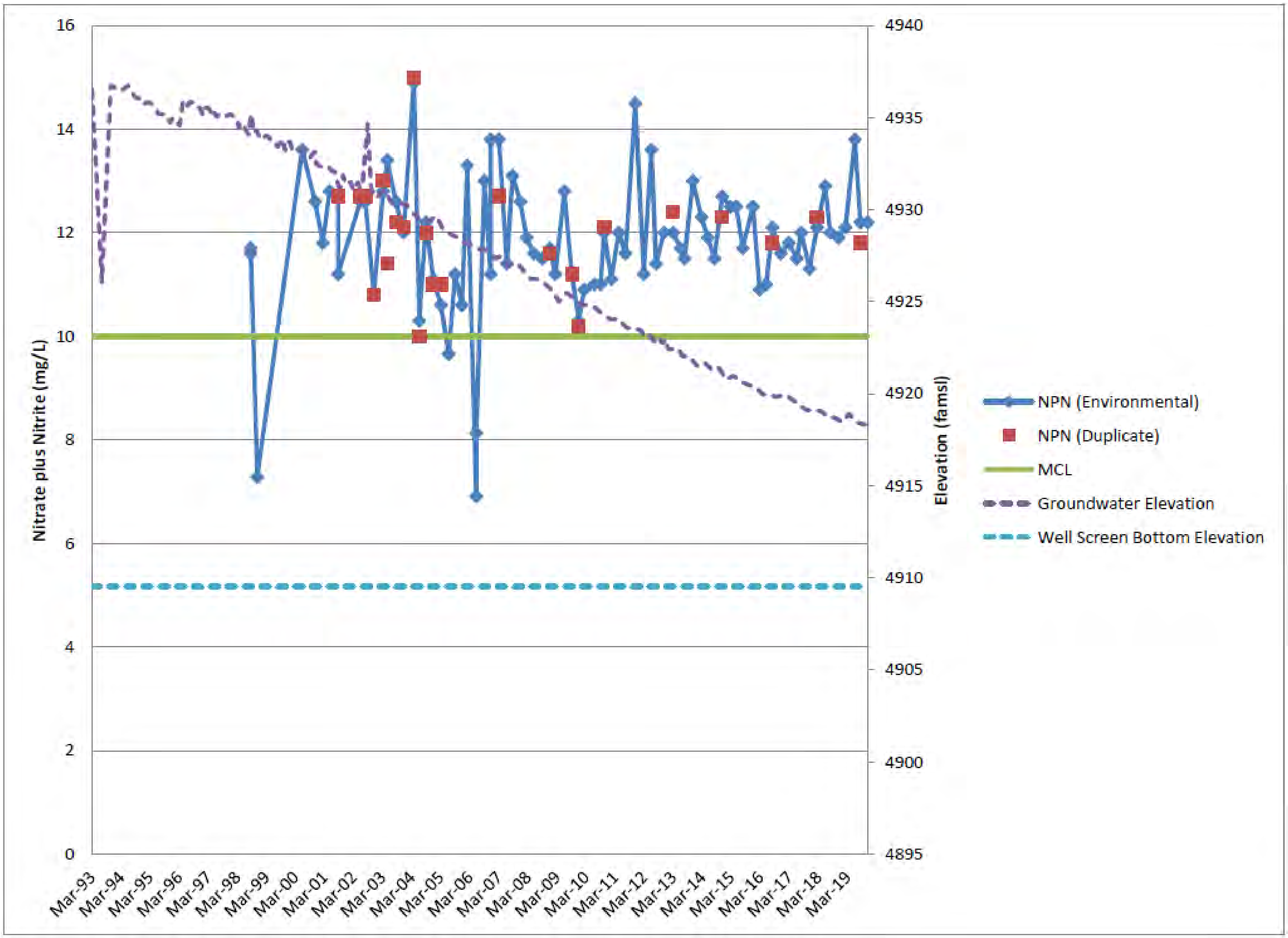

Figure 5C-7. Nitrate Plus Nitrite Concentrations, LWDS-MW1

Figure 5C-8. Nitrate Plus Nitrite Concentrations, LWDS-MW2

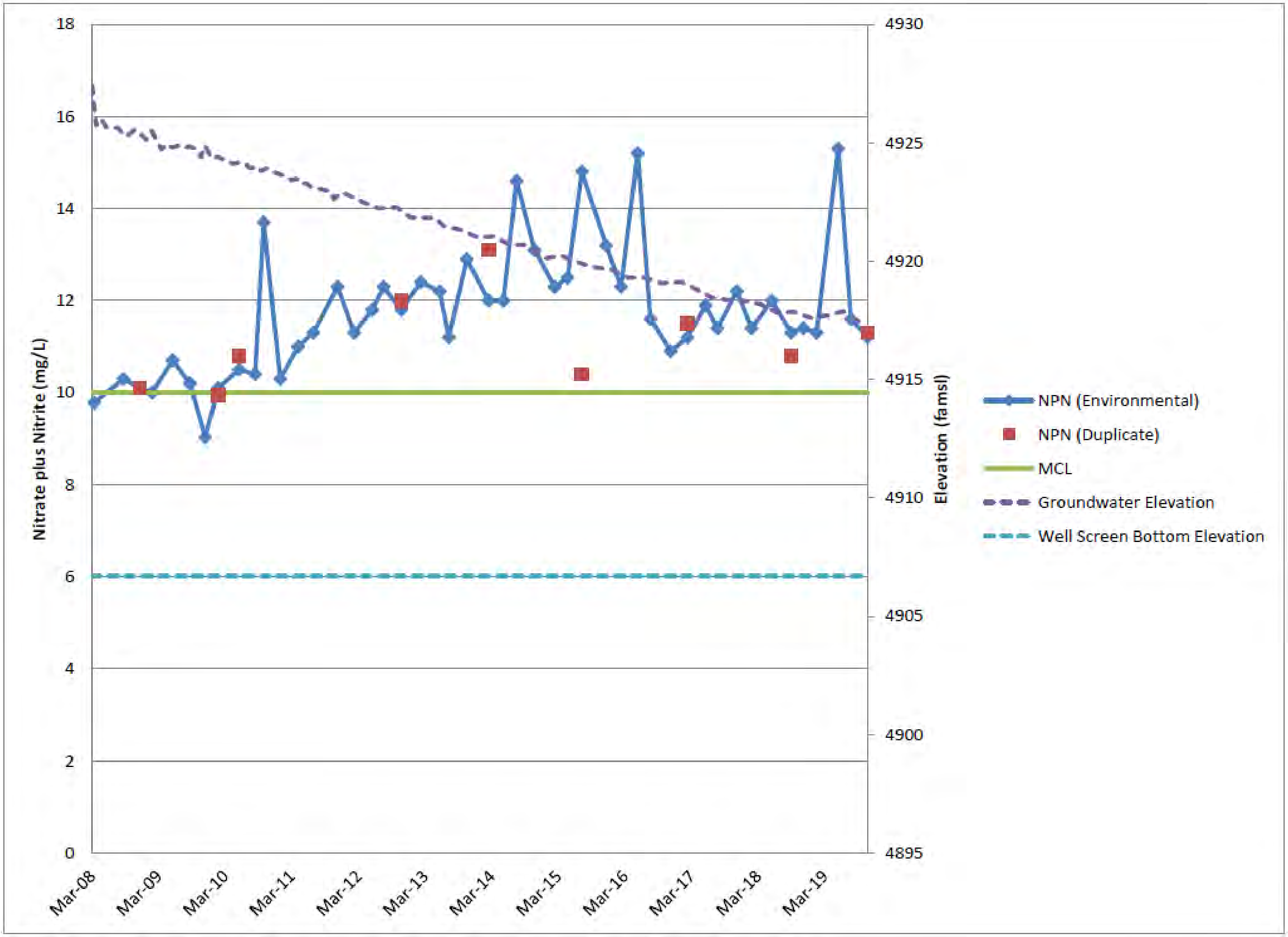

Figure 5C-9. Nitrate Plus Nitrite Concentrations, TAV-MW10

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Attachment 5D
Technical Area-V
Hydrographs

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Attachment 5D Hydrographs

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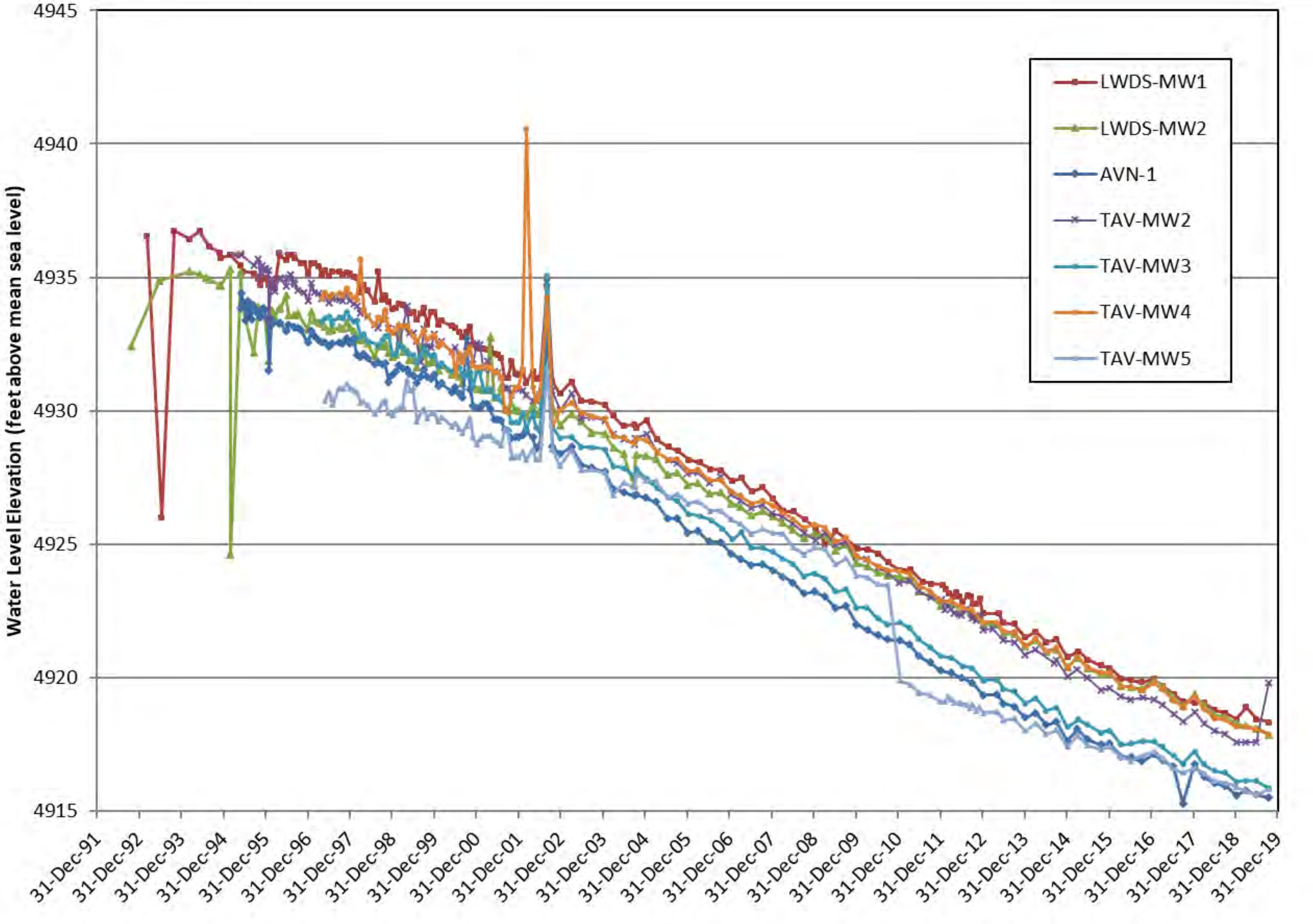

Figure 5D-1. Technical Area-V Groundwater Area of Concern Wells (1 of 3)

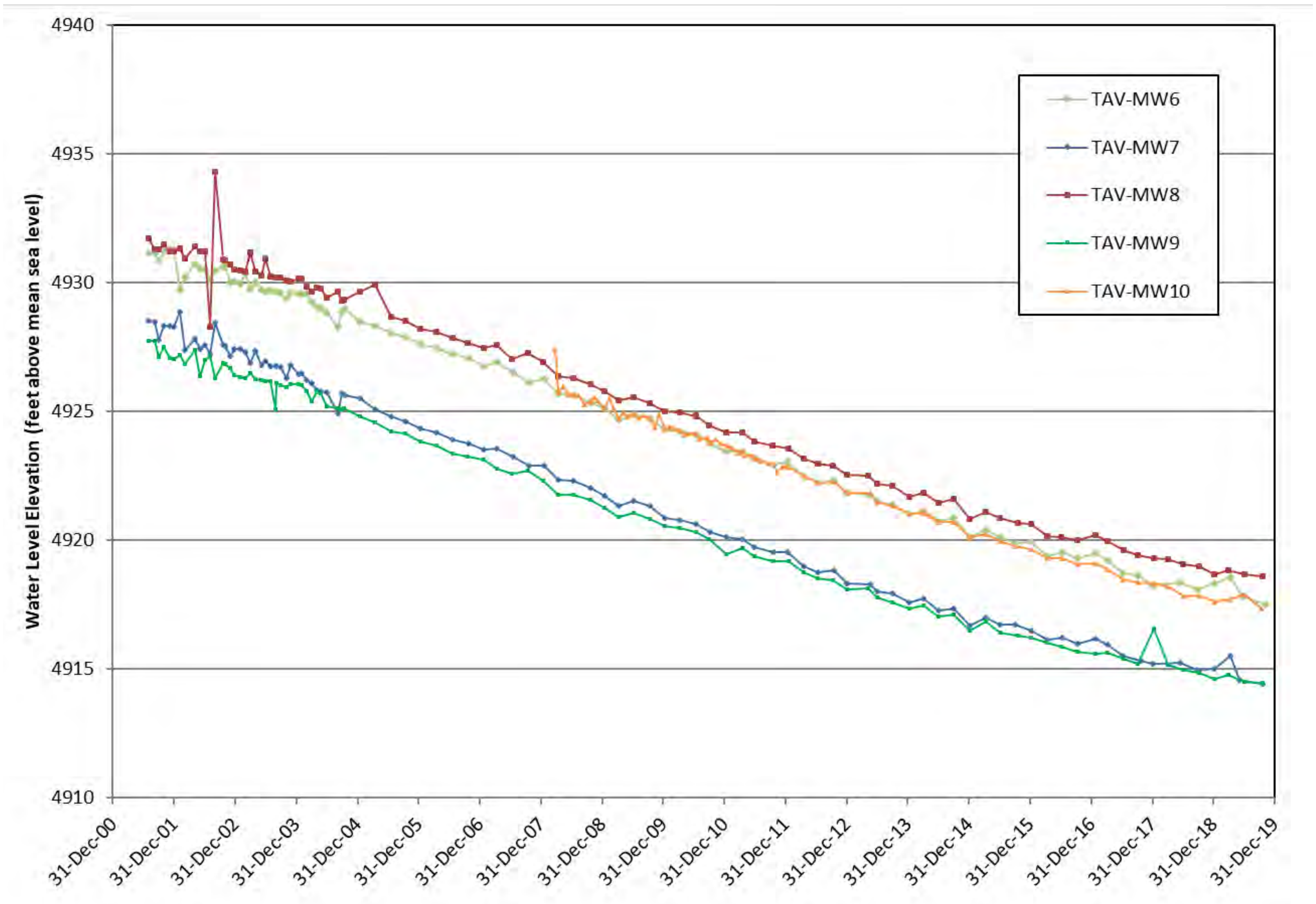

Figure 5D-2. Technical Area-V Groundwater Area of Concern Wells (2 of 3)

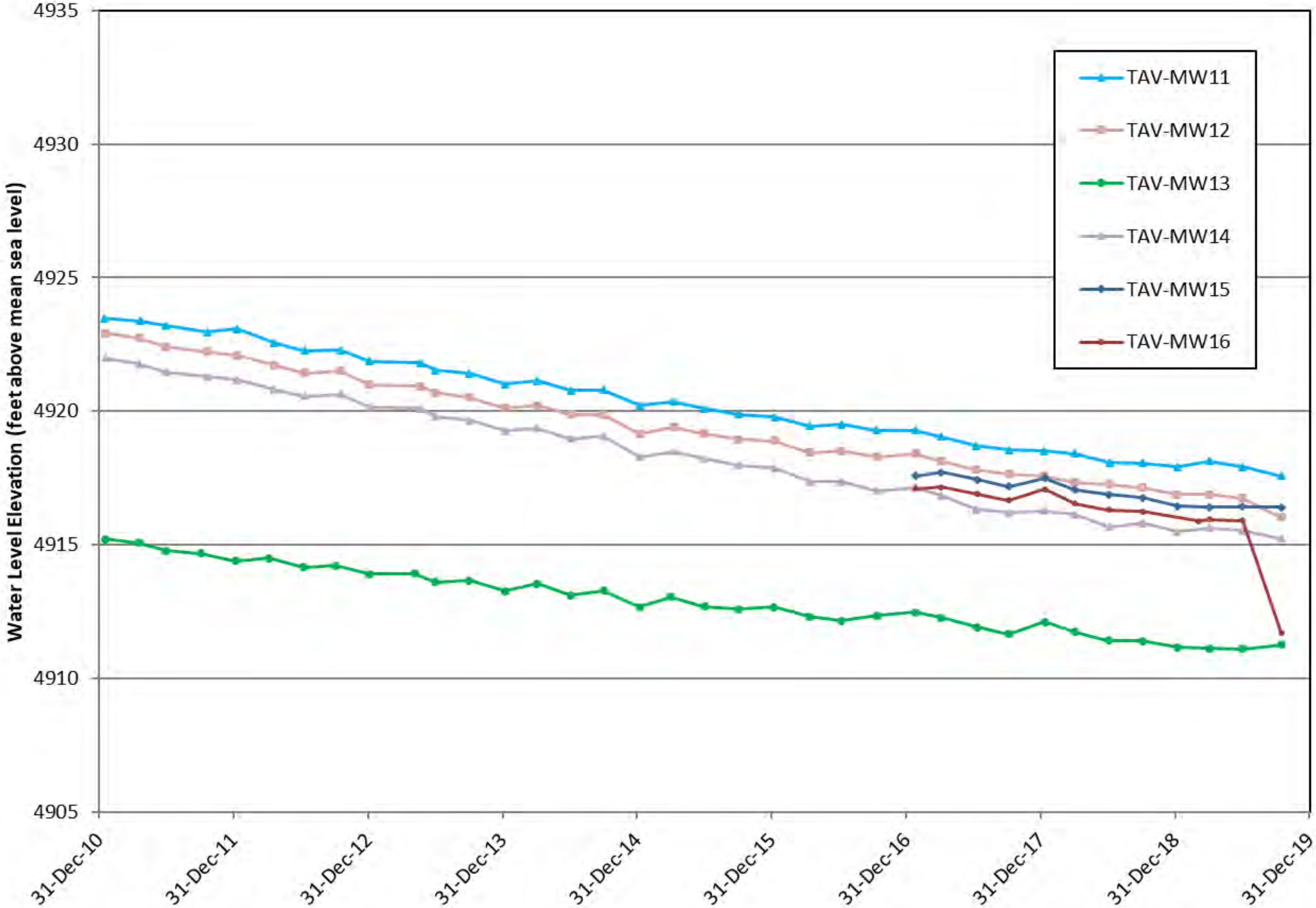

Figure 5D-3. Technical Area-V Groundwater Area of Concern Wells (3 of 3)

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Chapter 5
Technical Area-V
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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 (PGWS) 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) 2019, the maximum nitrate concentration in the PGWS was 24.6 mg/L. The maximum nitrate concentration in the Regional Aquifer exclusive of the merging zone was 4.24 mg/L. In the merging zone above the Regional Aquifer, the maximum nitrate concentration was 37.1 mg/L. Up until February 2019 TCE concentrations in the PGWS had been below the MCL since May 2009. 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 (NNSA), SNL/NM, KAFB, the Albuquerque Bernalillo County Water Utility Authority (ABCWUA), and the COA.

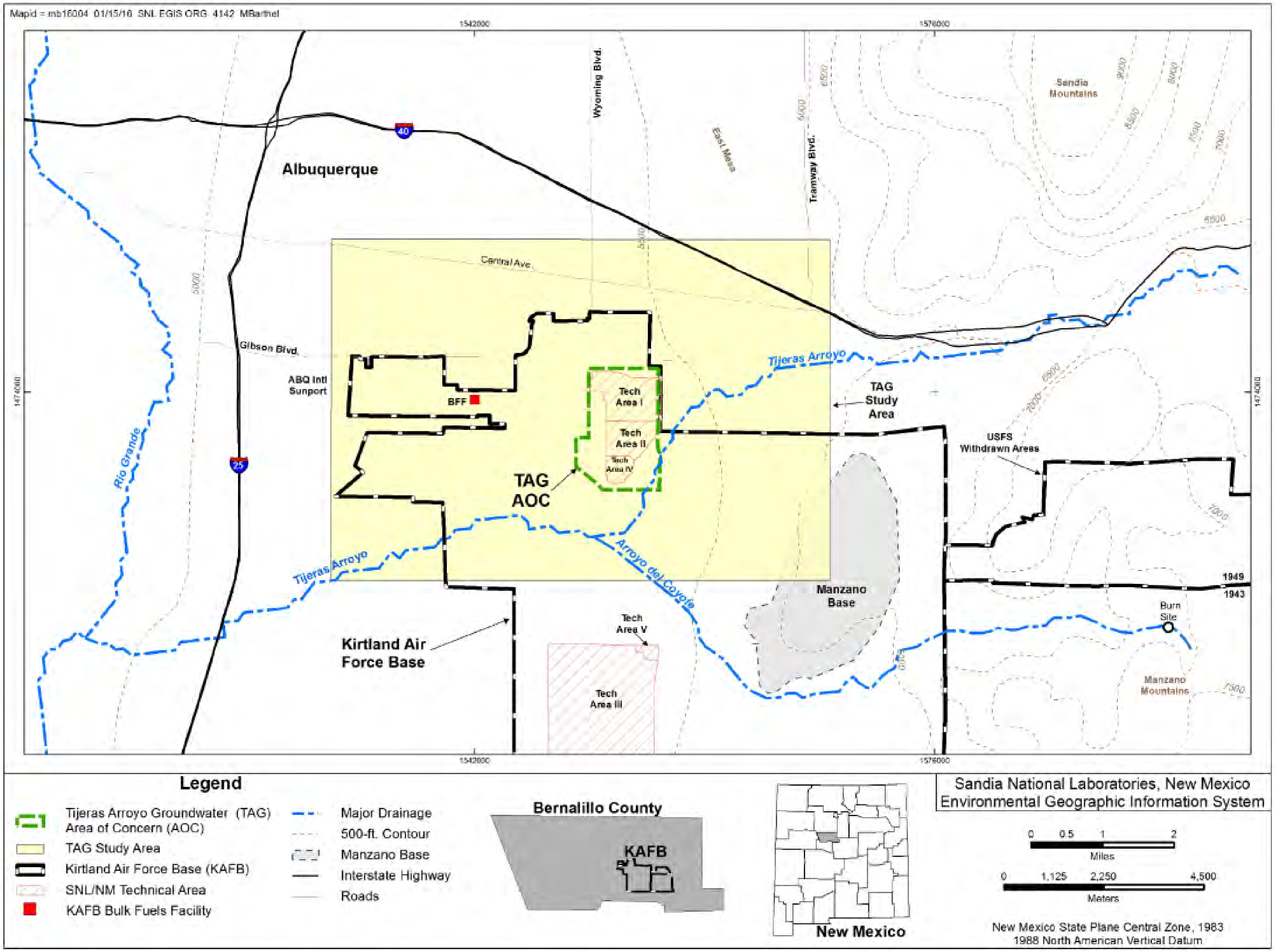


Figure 6-1. Location of the Tijeras Arroyo Groundwater Area of Concern

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 KAFB 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 (SNL November 2005). 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 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 Bulk Fuels Facility 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 PGWS 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 an SNL/NM well near Tijeras Arroyo was reported at monitoring well TA2-W-01, which is screened in the PGWS. Subsequent drilling activities identified that a merging zone of limited lateral extent was present between the PGWS and the Regional Aquifer. The Conceptual Site Model (CSM) in Section 7.1.7 describes the hydrogeologic setting in greater detail.

To date (end of CY 2019), the maximum nitrate plus nitrite (NPN) concentration for the PGWS has been 27.8 mg/L and corresponds to the sample collected on 18 November 2015 from replacement well TA2-W-28. Coincidentally, the initial well (TA2-SW1-320) contained 27.8 (J-qualified) mg/L NPN for the 8 January 2007 sample. The maximum NPN concentration for the merging zone was 38.4 mg/L at well TJA-4 when sampled on 20 November 2013; the environmental duplicate contained NPN at 38.5 mg/L. The maximum NPN concentration for the Regional Aquifer has been 3.87 mg/L at well TA2-NW1-595; the well was sampled on 26 August 2014 and the environmental duplicate contained NPN at 4.2 mg/L.

To date (end of CY 2019), the maximum TCE concentration for the PGWS has been 9.6 µg/L and corresponds to the sample collected on 17 March 1998 from monitoring well TA2-W-26. Except for the 21 February 2019 sample (5.71 µg/L) for well TJA-2, TCE has not exceeded the MCL in the PGWS since May 2009. Historically, TCE occasionally exceeded the MCL at well WYO-4 but NMED HWB transferred responsibility for this upgradient PGWS monitoring well to the KAFB Environmental Restoration Program (ERP) in 2018.

TCE has historically not exceeded detection limits (0.25 - 0.5 µg/L) at merging zone well TJA-4. Likewise, TCE has not exceeded the MCL in the Regional Aquifer. The maximum TCE concentration of 4.27 µg/L for the Regional Aquifer corresponds to the 21 August 2013 sample collected from monitoring well TJA-3.

6.1.4 Current Monitoring Network

During CY 2019, 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 2019. Additional monitoring wells owned by KAFB and the COA are utilized by the TAG investigation for understanding the hydrogeologic setting.

Table 6-1. Groundwater Monitoring Conducted by Sandia National Laboratories, New Mexico and the City of Albuquerque near the Tijeras Arroyo Groundwater Area of Concern during Calendar Year 2019

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.
(3) Sampling frequency used by SNL/NM: Q = Quarterly, SA = Semiannual, A = annual.
(4) Green shading indicates the well is completed in the PGWS.

COA = City of Albuquerque ownership.
CY = Calendar Year.
ID = Identifier.
n.s. = Not sampled (variance from a work plan).
PGS = Parade Ground South.
PGWS = Perched Groundwater System.
SNL/NM = Sandia National Laboratories, New Mexico.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-SW = Technical Area-II (Southwest).
TA2-W = Technical Area-II (Well).
TJA = Tijeras Arroyo.
WL = Water level.
WQ = Water quality.
WYO = Wyoming.

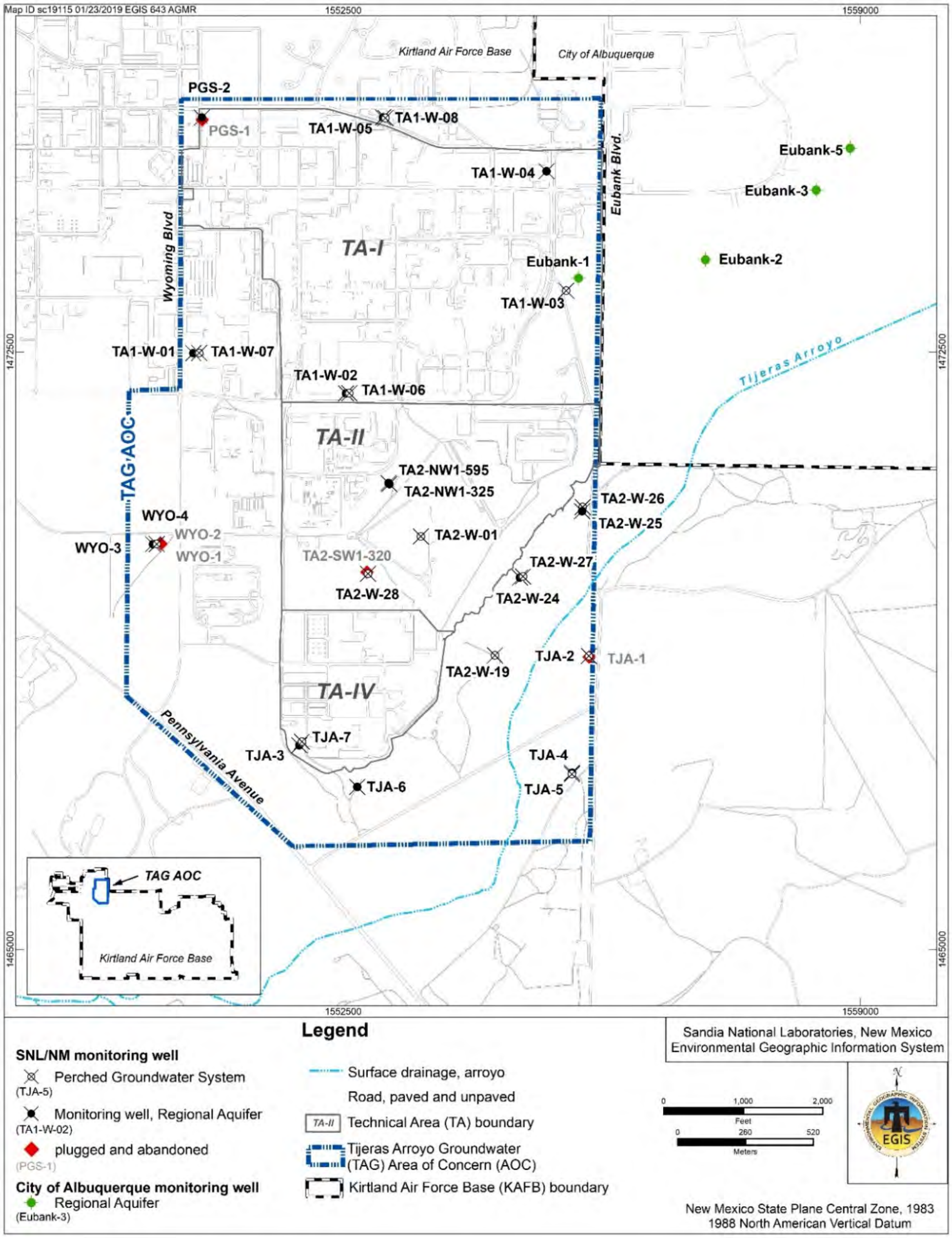


Figure 6-2. Groundwater Monitoring Wells Maintained by Sandia National Laboratories, New Mexico near the Tijeras Arroyo Groundwater Area of Concern.

6.1.5 Summary of Calendar Year 2019 Activities

The following activities were conducted for the TAG AOC during CY 2019:

- Quarterly water level measurements were obtained from all TAG monitoring wells. Hydrographs are presented in Attachment 6B.

- In April 2019, video logging was conducted at monitoring wells TA1-W-03 and TJA-2. Both well casings were in good condition. No water was present in the screen at well TA1-W-03. The water column was 17.51 ft above the bottom of the well screen in TJA-2.

- In April 2019, a BaroBall™ vented cap was installed at monitoring well TJA-2. This limits the possible accumulation of volatile organic compounds (VOCs) in vapor above the water column.

- 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 2019, June 2019, August/September 2019, and November/December 2019. 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 2019 and August/September 2019.

- 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 2019. The collection of groundwater samples 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 two monitoring wells that had been infrequently sampled in recent years. This voluntary sampling was conducted at wells TA2-W-24 and TA2-W-25 in August/September 2019.

- In December 2019, a video-inspection report (ABCWUA April 2017) for the Tijeras Interceptor became available to SNL/NM. Integrity of the interceptor was of interest because historic failure of a concrete section of the interceptor had caused an area of elevated nitrate concentrations in the Regional Aquifer approximately 1 mile west of the TAG AOC (KAFB April 2014). The video survey assessed approximately 5.9 miles of sewer lines on KAFB that ranged in diameter from 18 to 54 inches. This included the approximately 1-mile-long section that crosses the southeast corner of the TAG AOC and the approximately 0.8-mile-long section that trends northward along the eastern edge of the TAG AOC. Contrary to previously available construction details, the ABCWUA report revealed two important findings. First, the interceptor section that crosses the southeast corner of the TAG AOC is constructed of vitrified clay pipe (VCP) and not concrete. VCP is much less susceptible to hydrogen-sulfide corrosion than concrete. Second, the entire 1.8-mile-long section in the TAG AOC had "no visible defects that would cause a failure"

(ABCWUA April 2017). The north-trending section is composed of VCP and polyvinyl chloride piping. The video survey eliminates the interceptor as being a significant source of nitrate contamination in the TAG AOC.

- A comprehensive study of the potential nitrate release sites relative to groundwater contamination was conducted for the north-central portion of KAFB including the TAG AOC and documented in a Technical Memorandum (SNL December 2019). Section 6.1.7.5 discusses the findings.

6.1.6 Summary of Future Activities

The following activities are anticipated for the TAG AOC during the next reporting period (CY 2020) 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 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 PGWS, 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 PGWS 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 PGWS 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.

Balleau Groundwater Inc. (BGW) (September 2002) used a 3-dimensional, numerical, variably saturated flow model (FEMWATER) of the PGWS to study recharge in the TAG AOC vicinity. Various simulations were applied to determine the rate and volumes for several potential sources of recharge to the PGWS over the 12.5-sq mi modeling grid. The most significant recharge sources were the former KAFB Sewage Lagoons, leaking water lines, ancestral arroyos, and the Tijeras Arroyo Golf Course. The modeling also demonstrated that the PGWS has a net discharge (drains and merges) to the Regional

Aquifer. The lateral extent of the PGWS is shrinking due to the former KAFB Sewage Lagoons and other sources being taken out of service.

A useful analogy for determining recharge rates through the vadose zone was studied for the COA (Daniel B. Stephens & Associates, Inc. April 2010). At the Bear Canyon Arroyo recharge project located 5 miles north of the KAFB Wyoming Gate, surface water reached the Regional Aquifer (at approximately 500 ft bgs) in approximately 50 days (Ewing November 2019).

Considering that the sediments beneath both arroyos are typically near saturation, it can be inferred that a portion of significant surface-water flows in Tijeras Arroyo could migrate downward and impact the PGWS in about 30 days. In stretches of Tijeras Arroyo where the PGWS is not present, surface water could possibly reach the Regional Aquifer in about 40 to 50 days. Principal hydrogeologic controls on the direction of groundwater flow in the PGWS 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 PGWS is not used for any type of water production in the TAG AOC. The PGWS 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 PGWS 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 PGWS 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 PGWS 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 PGWS 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 PGWS 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 PGWS 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 PGWS:

- Landscape watering of grassy areas such as the Parade Ground north of TA-I (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 former KAFB Sewage Lagoons (inactive), and
- The Tijeras Arroyo Golf Course operated by KAFB (active).

The Regional Aquifer is more laterally extensive than the PGWS, 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 PGWS. The gradient in the Regional Aquifer averages approximately 0.018 feet per foot (ft/ft) across the TAG AOC but is steeper near production wells operated by KAFB, the ABCWUA, and the Veterans Affairs (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 PGWS. The principal hydrogeologic control upon groundwater flow direction in the Regional Aquifer is the combined drawdown effect of the KAFB, ABCWUA, and VA production wells.

The geochemical signatures of the PGWS and the Regional Aquifer are distinctive. Figure 6-5 presents two Piper diagrams depicting the most comprehensive set of geochemical data for the PGWS and the Regional Aquifer. The geochemical signature of the PGWS 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 PGWS 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.

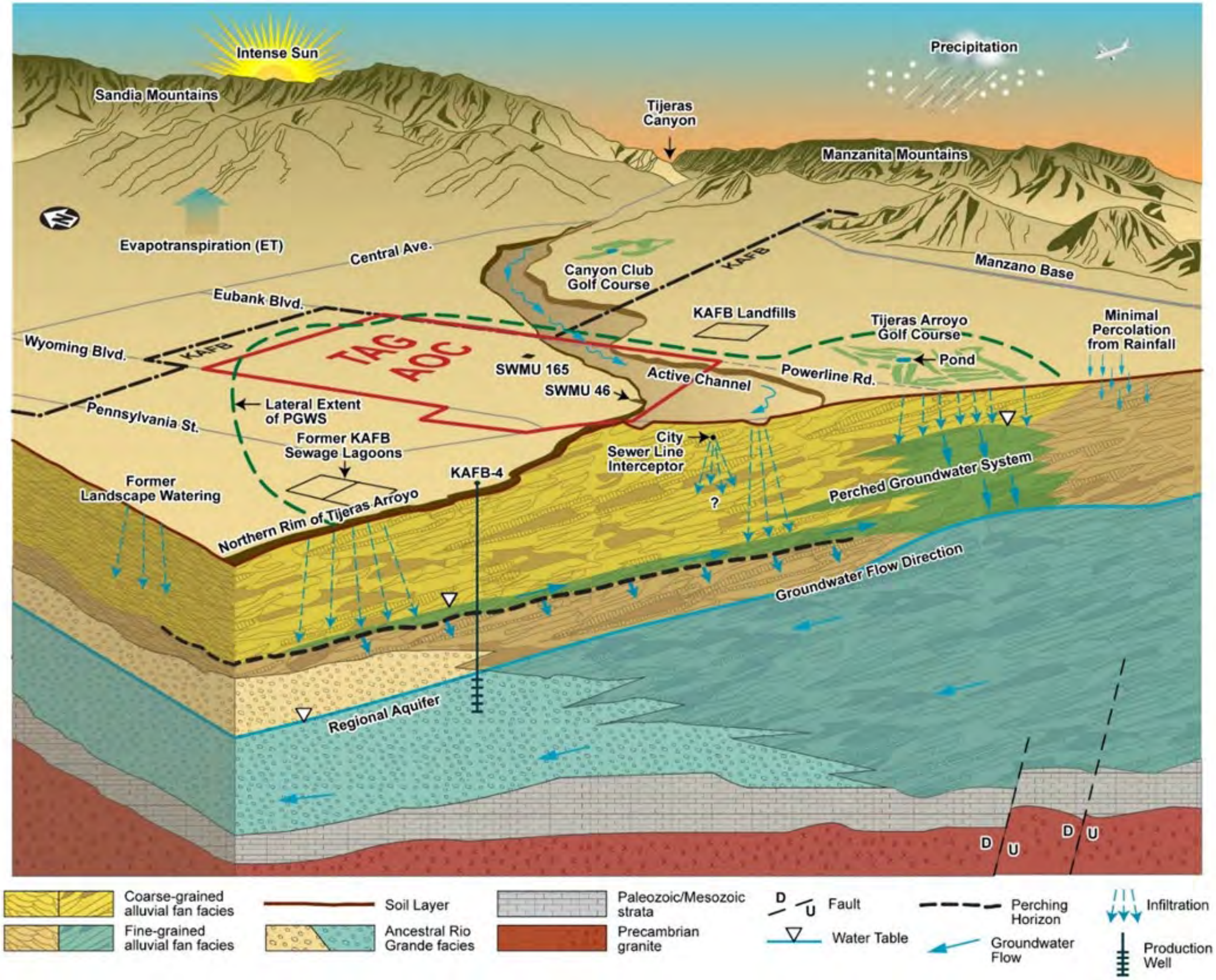


Figure 6-3. Tijeras Arroyo Groundwater Conceptual Site Model

Table 6-2. Comparison of Hydrogeologic Characteristics for the Perched Groundwater System and the Regional Aquifer in the Tijeras Arroyo Groundwater Area of Concern

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 0.018 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 production purposes.	Utilized for water production 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.

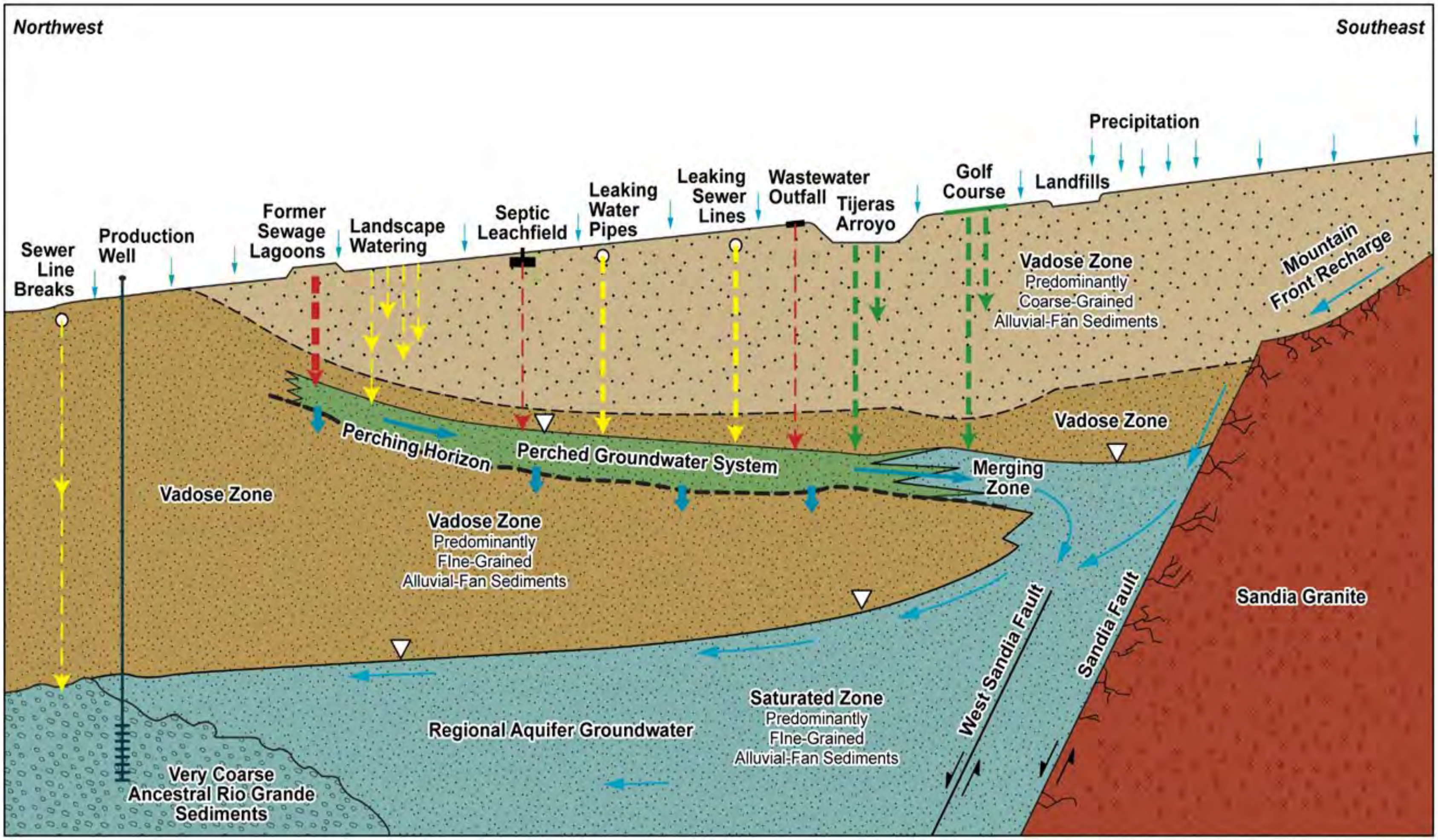
Table 6-2. Comparison of Hydrogeologic Characteristics for the Perched Groundwater System and the Regional Aquifer in the Tijeras Arroyo Groundwater Area of Concern *(Concluded)*

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 production 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:

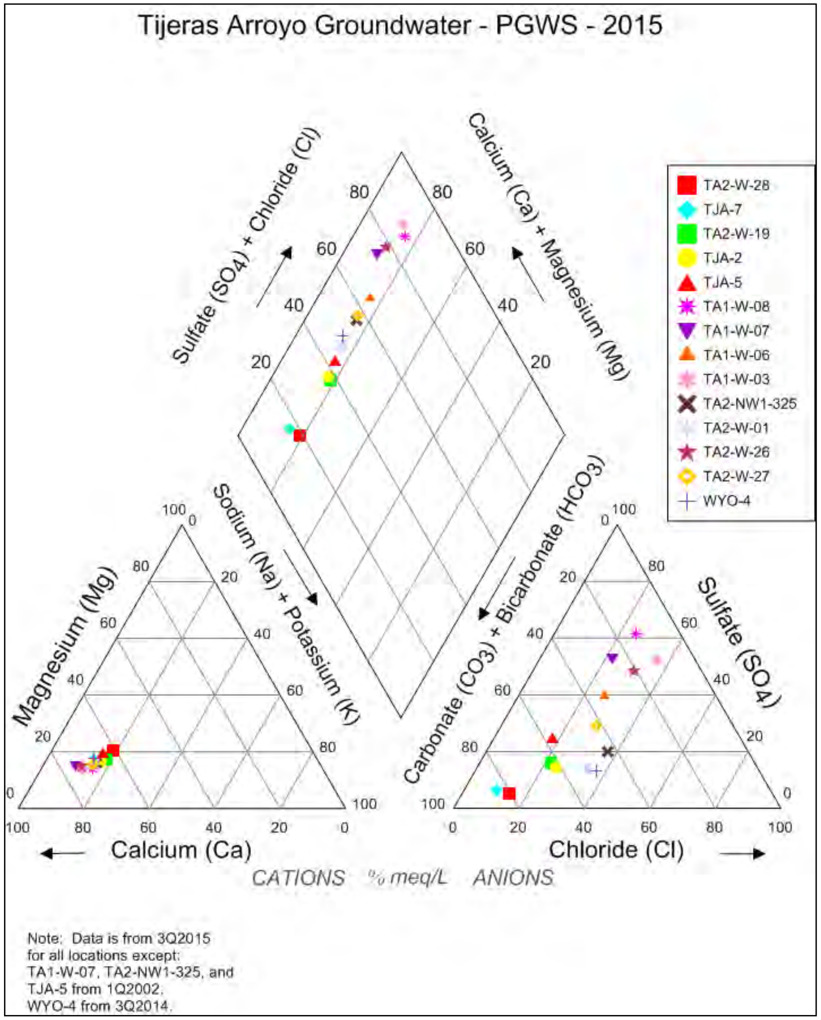
Table was updated using the Revised TAG CCM/CME Report (SNL February 2018). All characteristics, except for effective porosity, were derirved from studies conducted in the TAG AOC.

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 Affairs.



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 Tijeras Arroyo Groundwater Area of Concern



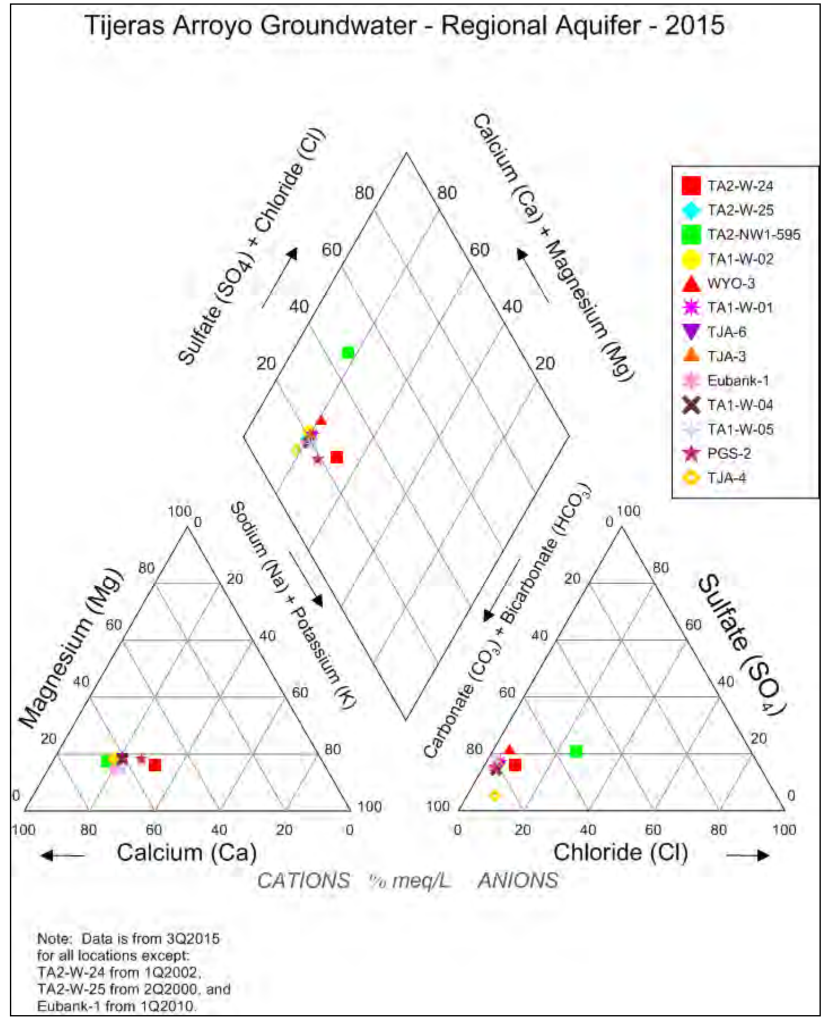


Figure 6-5. Piper Diagrams for Groundwater Samples Collected from Monitoring Wells Screened in the Perched Groundwater System and the Regional Aquifer

6.1.7.2 Hydrogeologic Conditions at the TAG AOC

Across the TAG AOC, the PGWS 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 PGWS 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 October/November 2019 potentiometric surface for the PGWS, which has an estimated lateral extent of approximately 4.43 sq mi (SNL February 2018). Table 6-3 lists the October/November 2019 groundwater elevations. The direction of groundwater flow in the PGWS 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 PGWS 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 October/November 2019 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 production 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 production wells.

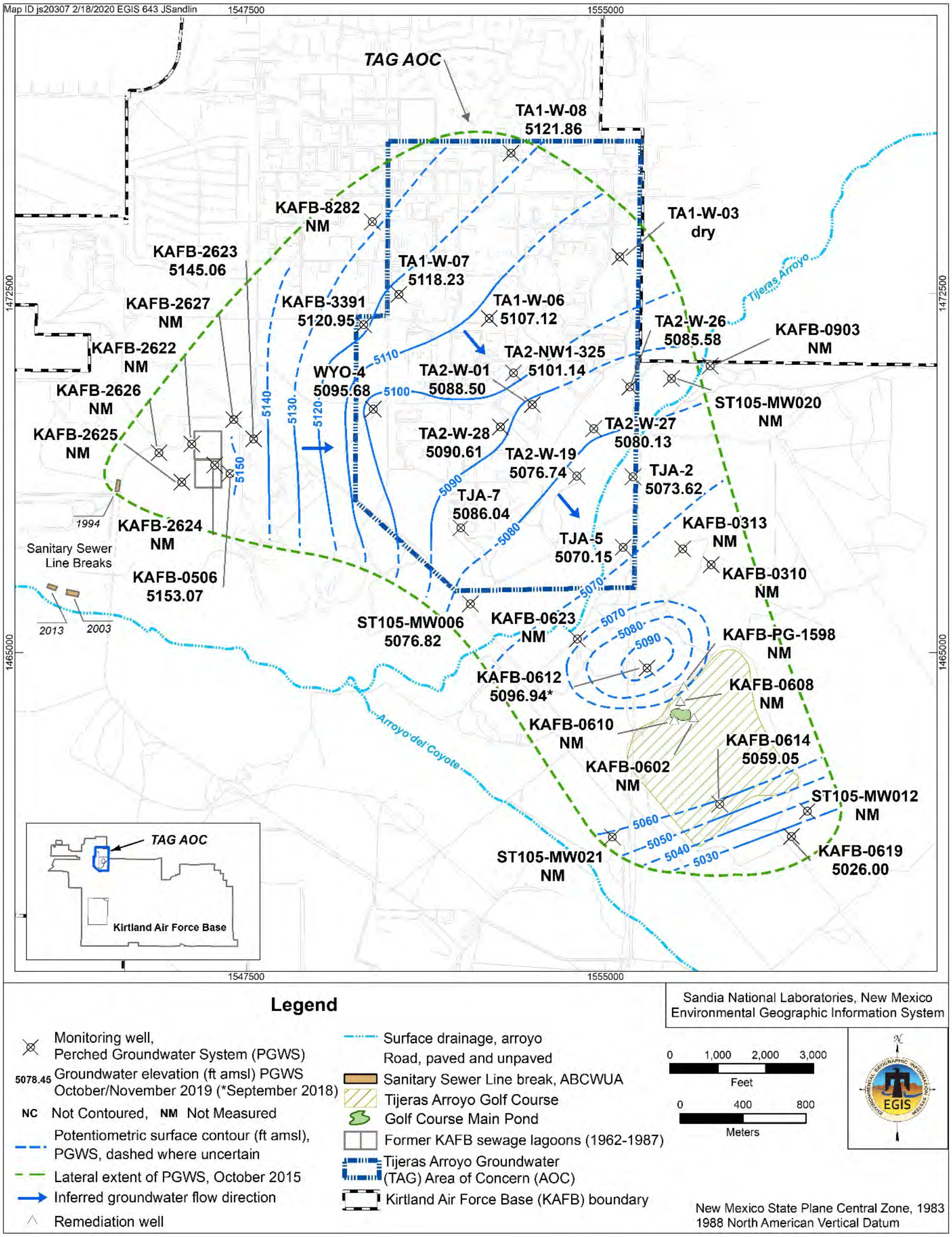


Figure 6-6. Potentiometric Surface Map for the Perched Groundwater System at the Tijeras Arroyo Groundwater Area of Concern (October/November 2019)

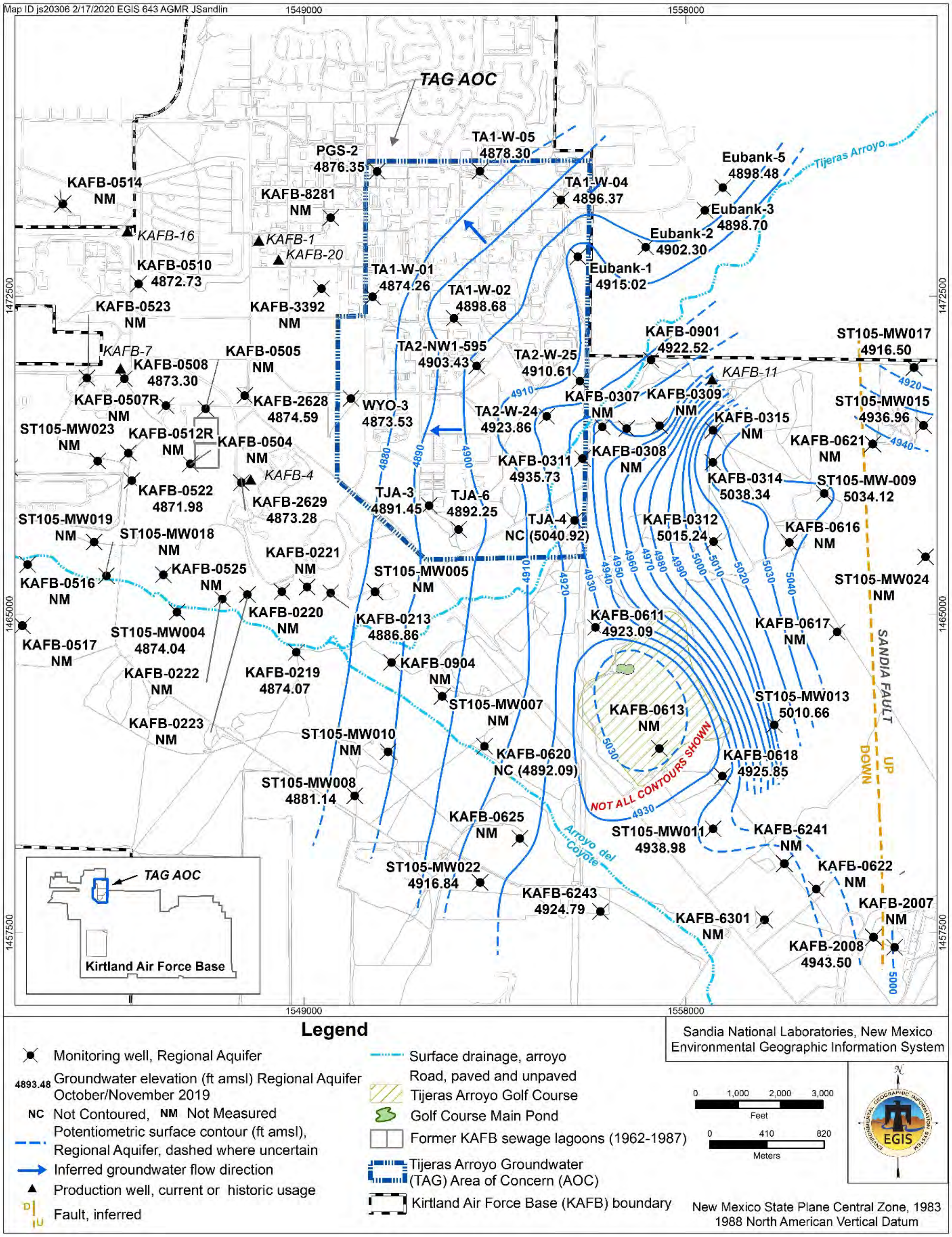


Figure 6-7. Potentiometric Surface Map of the Regional Aquifer at the Tijeras Arroyo Groundwater Area of Concern (October/November 2019)

Table 6-3. Groundwater Elevations Measured in Calendar Year 2019 at Monitoring Wells near the Tijeras Arroyo Groundwater Area of Concern

Well ID	Measuring Point (ft amsl) NAVD 88	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Screened Unit in SFG sediments
Eubank-1	5460.02	19-Oct-2019	545.00	4915.02	Regional Aquifer
Eubank-2	5474.39	7-Jun-2019	572.09	4902.30	Regional Aquifer
Eubank-3	5498.73	7-Jun-2019	600.03	4898.70	Regional Aquifer
Eubank-5	5507.40	7-Jun-2019	608.92	4898.48	Regional Aquifer
PGS-2	5408.29	3-Oct-2019	531.94	4876.35	Regional Aquifer
TA1-W-01	5403.82	3-Oct-2019	529.56	4874.26	Regional Aquifer
TA1-W-02	5416.62	1-Nov-2019	517.94	4898.68	Regional Aquifer
TA1-W-03	5457.03	1-Nov-2019	dry	dry	PGWS
TA1-W-04	5460.98	3-Oct-2019	564.61	4896.37	Regional Aquifer
TA1-W-05	5433.84	25-Oct-2019	555.54	4878.30	Regional Aquifer
TA1-W-06	5417.10	1-Nov-2019	309.98	5107.12	PGWS
TA1-W-07	5404.92	3-Oct-2019	286.69	5118.23	PGWS
TA1-W-08	5434.19	25-Oct-2019	312.33	5121.86	PGWS
TA2-NW1-325	5421.94	3-Oct-2019	320.80	5101.14	PGWS
TA2-NW1-595	5421.26	3-Oct-2019	517.83	4903.43	Regional Aquifer
TA2-W-01	5419.99	25-Oct-2019	331.49	5088.50	PGWS
TA2-W-19	5351.21	2-Oct-2019	274.47	5076.74	PGWS
TA2-W-24	5363.66	2-Oct-2019	439.80	4923.86	Regional Aquifer
TA2-W-25	5374.86	2-Oct-2019	464.25	4910.61	Regional Aquifer
TA2-W-26	5375.77	2-Oct-2019	290.19	5085.58	PGWS
TA2-W-27	5362.85	2-Oct-2019	282.72	5080.13	PGWS
TA2-W-28	5412.41	3-Oct-2019	321.80	5090.61	PGWS
TJA-2	5353.20	2-Oct-2019	279.58	5073.62	PGWS
TJA-3	5390.56	25-Oct-2019	499.11	4891.45	Regional Aquifer
TJA-4	5341.16	2-Oct-2019	300.24	5040.92	merging zone
TJA-5	5341.33	2-Oct-2019	271.18	5070.15	PGWS
TJA-6	5343.16	2-Oct-2019	450.91	4892.25	Regional Aquifer
TJA-7	5391.27	25-Oct-2019	305.23	5086.04	PGWS
WYO-3	5392.09	25-Oct-2019	518.56	4873.53	Regional Aquifer
WYO-4	5392.57	25-Oct-2019	296.89	5095.68	PGWS
KAFB-0213	5281.50	23-Jul-2019	400.09	4886.86	Regional Aquifer
KAFB-0219	5263.69	23-Jul-2019	389.62	4874.07	Regional Aquifer
KAFB-0220	5265.10		n.m.	n.m.	Regional Aquifer
KAFB-0221	5274.36		n.m.	n.m.	Regional Aquifer
KAFB-0222	5247.65		n.m.	n.m.	Regional Aquifer
KAFB-0223	5254.49		n.m.	n.m.	Regional Aquifer
KAFB-0307	5364.53		n.m.	n.m.	Regional Aquifer
KAFB-0308	5381.65		n.m.	n.m.	Regional Aquifer
KAFB-0309	5411.80		n.m.	n.m.	Regional Aquifer
KAFB-0310	5416.48		n.m.	n.m.	PGWS
KAFB-0311	5353.29	23-Jul-2019	417.56	4935.73	Regional Aquifer
KAFB-0312	5432.17	23-Jul-2019	416.93	5015.24	Regional Aquifer
KAFB-0313	5418.98		n.m.	n.m.	PGWS
KAFB-0314	5455.75	23-Jul-2019	417.41	5038.34	Regional Aquifer
KAFB-0315	5466.11		n.m.	n.m.	Regional Aquifer
KAFB-0504	5357.87		n.m.	n.m.	Regional Aquifer

Refer to footnotes on page 6-20.

Table 6-3. Groundwater Elevations Measured in Calendar Year 2019 at Monitoring Wells near the Tijeras Arroyo Groundwater Area of Concern *(Continued)*

Well ID	Measuring Point (ft amsl) NAVD 88	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Screened Unit in SFG sediments
KAFB-0505	5362.81		n.m.	n.m.	Regional Aquifer
KAFB-0506	5363.47	23-Jul-2019	210.40	5153.07	PGWS
KAFB-0507R	5358.21		n.m.	n.m.	Regional Aquifer
KAFB-0508	5351.88	23-Jul-2019	478.58	4873.30	Regional Aquifer
KAFB-0510	5367.10	23-Jul-2019	494.37	4872.73	Regional Aquifer
KAFB-0512R	5302.73		n.m.	n.m.	Regional Aquifer
KAFB-0514	5206.41		n.m.	n.m.	Regional Aquifer
KAFB-0516	5205.64		n.m.	n.m.	Regional Aquifer
KAFB-0517	5197.10		n.m.	n.m.	Regional Aquifer
KAFB-0522	5267.48	23-Jul-2019	395.50	4871.98	Regional Aquifer
KAFB-0523	5352.62		n.m.	n.m.	Regional Aquifer
KAFB-0525	5229.75		n.m.	n.m.	Regional Aquifer
KAFB-0602	5365.47		n.m.	n.m.	PGWS
KAFB-0608	5361.17		n.m.	n.m.	PGWS
KAFB-0610	5359.47		n.m.	n.m.	PGWS
KAFB-0611	5386.09	23-Jul-2019	463.00	4923.09	Regional Aquifer
KAFB-0612	5385.45	Sep-2018	288.51	5096.94	PGWS
KAFB-0613	5390.78		n.m.	n.m.	Regional Aquifer
KAFB-0614	5390.89	23-Jul-2019	331.84	5059.05	PGWS
KAFB-0616	5481.07		n.m.	n.m.	Regional Aquifer
KAFB-0617	5505.78		n.m.	n.m.	Regional Aquifer
KAFB-0618	5410.05	23-Jul-2019	484.20	4925.85	Regional Aquifer
KAFB-0619	5410.78	23-Jul-2019	384.78	5026.00	PGWS
KAFB-0620	5334.64	23-Jul-2019	442.55	4892.09	Regional Aquifer
KAFB-0621	5569.89		n.m.	n.m.	Regional Aquifer
KAFB-0622	5488.64		n.m.	n.m.	Regional Aquifer
KAFB-0623	5328.94		n.m.	n.m.	PGWS
KAFB-0625	5392.90		n.m.	n.m.	Regional Aquifer
KAFB-0901	5390.07	23-Jul-2019	467.55	4922.52	Regional Aquifer
KAFB-0903	5391.63		n.m.	n.m.	merging zone
KAFB-0904	5291.75		n.m.	n.m.	Regional Aquifer
KAFB-2007	5564.48		n.m.	n.m.	Regional Aquifer
KAFB-2008	5541.74	23-Jul-2019	598.24	4943.50	Regional Aquifer
KAFB-2622	5358.14		n.m.	n.m.	PGWS
KAFB-2623	5367.48	23-Jul-2019	222.42	5145.06	PGWS
KAFB-2624	5362.27		n.m.	n.m.	PGWS
KAFB-2625	5359.26		n.m.	n.m.	PGWS
KAFB-2626	5357.51		n.m.	n.m.	PGWS
KAFB-2627	5367.47		n.m.	n.m.	PGWS
KAFB-2628	5369.64	23-Jul-2019	495.05	4874.59	Regional Aquifer
KAFB-2629	5361.53	23-Jul-2019	488.25	4873.28	Regional Aquifer
KAFB-3391	5396.60	23-Jul-2019	275.65	5120.95	PGWS
KAFB-3392	5394.51		n.m.	n.m.	Regional Aquifer
KAFB-6241	5466.50		n.m.	n.m.	Regional Aquifer
KAFB-6243	5426.22	23-Jul-2019	501.43	4924.79	Regional Aquifer
KAFB-6301	5459.64		n.m.	n.m.	Regional Aquifer

Refer to footnotes on page 6-20.

Table 6-3. Groundwater Elevations Measured in Calendar Year 2019 at Monitoring Wells near the Tijeras Arroyo Groundwater Area of Concern *(Concluded)*

Well ID	Measuring Point (ft amsl) NAVD 88	Date Measured	Depth to Water (ft btoc)	Groundwater Elevation (ft amsl)	Screened Unit in SFG sediments
KAFB-8281	5401.03		n.m.	n.m.	Regional Aquifer
KAFB-8282	5402.92		n.m.	n.m.	PGWS
KAFB-PG-1598	5369.90		n.m.	n.m.	PGWS
ST105-MW004	5234.61	23-Jul-2019	360.57	4874.04	Regional Aquifer
ST105-MW005	5287.57		n.m.	n.m.	Regional Aquifer
ST105-MW006	5313.26	23-Jul-2019	236.44	5076.82	PGWS
ST105-MW007	5311.18		n.m.	n.m.	Regional Aquifer
ST105-MW008	5358.94	23-Jul-2019	477.80	4881.14	Regional Aquifer
ST105-MW009	5519.71	23-Jul-2019	485.59	5034.12	Regional Aquifer
ST105-MW010	5334.70		n.m.	n.m.	Regional Aquifer
ST105-MW011	5422.66	23-Jul-2019	483.68	4938.98	Regional Aquifer
ST105-MW012	5419.90		n.m.	n.m.	PGWS
ST105-MW013	5447.27	23-Jul-2019	436.61	5010.66	Regional Aquifer
ST105-MW015	5623.95	23-Jul-2019	686.99	4936.96	Regional Aquifer
ST105-MW017	5621.97	23-Jul-2019	705.47	4916.50	Regional Aquifer
ST105-MW018	5221.68		n.m.	n.m.	Regional Aquifer
ST105-MW019	5217.94		n.m.	n.m.	Regional Aquifer
ST105-MW020	5383.72		n.m.	n.m.	PGWS
ST105-MW021	5390.90		n.m.	n.m.	PGWS
ST105-MW022	5386.66	23-Jul-2019	469.82	4916.84	Regional Aquifer
ST105-MW023	5275.86		n.m.	n.m.	Regional Aquifer
ST105-MW024	5595.67		n.m.	n.m.	Regional Aquifer

NOTES:

amsl	= Above mean sea level.
AOC	= Area of Concern.
btoc	= Below top of casing (the measuring point).
CY	= Calendar Year.
ft	= Foot or feet.
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 project 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 PGWS or the Regional Aquifer.

Historically, water levels in the PGWS have fluctuated across the TAG AOC. Near the former KAFB 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 PGWS 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 production 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 production 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. The hydrographs for TA1-W-04 and TA1-W-05 have differing slopes indicating a possible impermeable barrier between the two wells. 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 (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 PGWS 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).

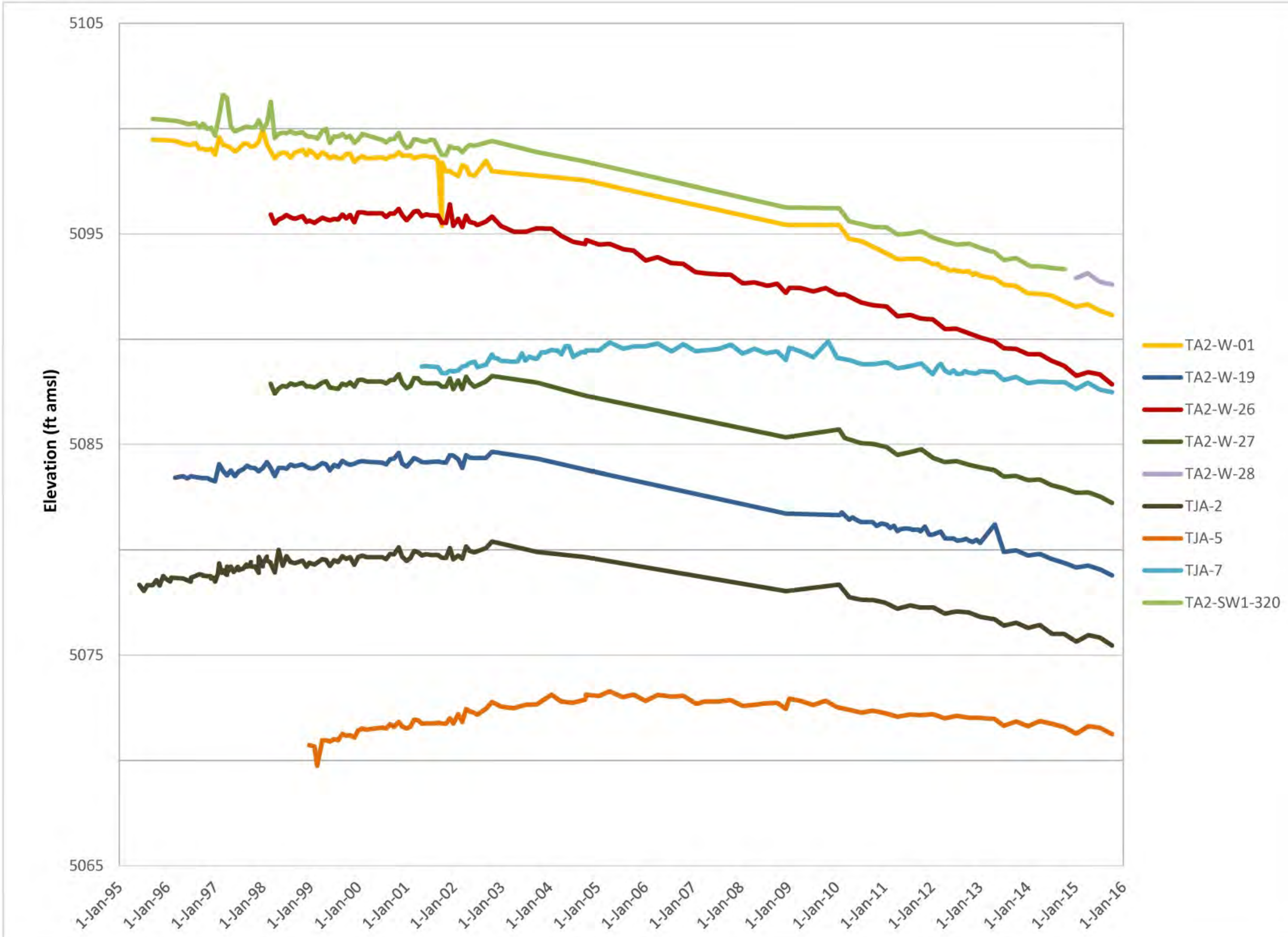


Figure 6-8. Hydrographs for Monitoring Wells Located in the Central and Southern Portion of the Tijeras Arroyo Groundwater Area of Concern through 2015

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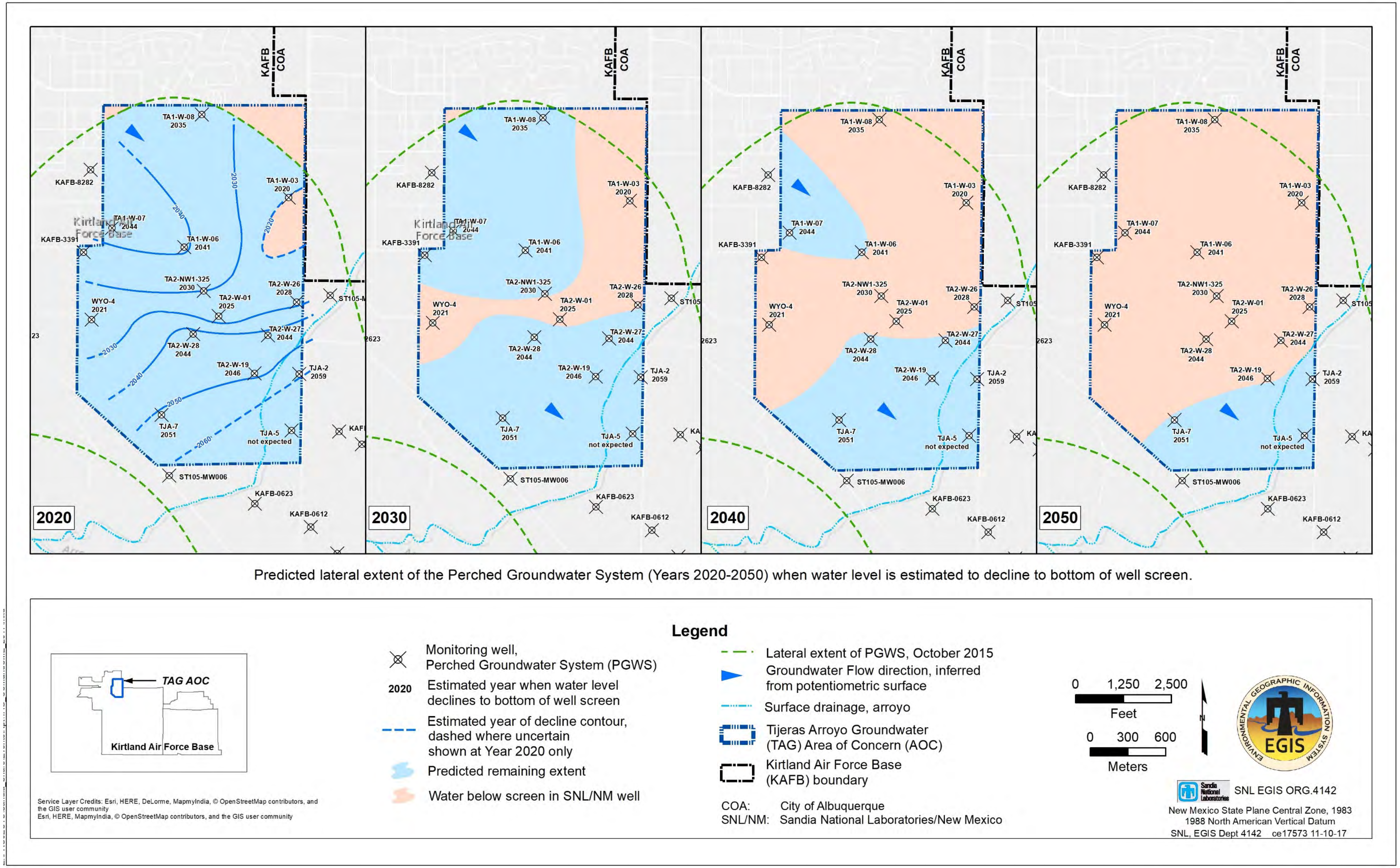

Figure 6-9. Estimated Years When Groundwater Elevations Will Decline to the Lowest Slots at Monitoring Wells Screened in the Perched Groundwater System in the Tijeras Arroyo Groundwater Area of Concern

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A comprehensive study of potential nitrate release sites was conducted for the north-central portion of KAFB including the TAG AOC (SNL December 2019). The study included the preparation of a detailed large-scale figure (Plate A) with an extent of 23 sq mi. The study summarizes the operational years and types of water associated with natural sources and anthropogenic sites owned by DOE, U.S. Air Force, ABCWUA, COA, and private entities. Historical maximum NPN concentrations for 150 wells are shown. Several septic systems located within and outside of DOE property were depicted for the first time on a SNL/NM-produced figure. Also depicted are off-base features near Tijeras Arroyo such as the Canyon Club (formerly Four Hills) Golf Course, the Shaw Mobile Home Park, and a circa 1930s cultivated area.

In 2019, SNL/NM ER Operations staff continued to participate in a multi-agency study of regional nitrate groundwater contamination with the United States Geological Survey (USGS) Water Science Center and the KAFB ERP. In 2017, the USGS had collected groundwater samples at 33 wells on KAFB including seven wells at the TAG AOC. They also sampled wells, springs, and stock tanks located outside the base boundary. The samples were analyzed for a diverse set of analytes including artificial sweeteners, stable isotopes (^{14}C, ^{15}N, and ^{18}O), tritium, dissolved noble gases, major ions, pharmaceuticals and personal care products, and various waste water indicators. Interpretation of the results by USGS geoscientists is ongoing (Linhoff July 2019).

One preliminary finding of the USGS effort is that the artificial sweetener neotame appears useful as groundwater tracer on KAFB. At wells where neotame was detected, Linhoff (December 2019) argued that neotame and associated nitrate contamination is likely from recent ABCWUA sewer-line releases rather than from the decades-old (1962-1987) discharges from the former KAFB Sewage Lagoons. However, neotame is not consistently detected at all well locations on KAFB where sewage releases are suspected.

Additional USGS interpretations for the KAFB vicinity build on the ground-breaking study by Walvoord et al. (November 2003). In the southwestern U.S., the accumulation of naturally occurring nitrate in desert-soil profiles was identified by Walvoord et al. (November 2003). Based upon chloride and nitrate analysis of soil profiles, Walvoord et al. (November 2003) proposed that ‘subsoil nitrate reservoirs’ contain significant concentrations of nitrate that can be readily mobilized to groundwater when desert lands are converted by irrigation, dam construction, or by changes in climatic precipitation patterns. Such accumulations of nitrate are below the biologically active zone (below the maximum depth of most plant roots at approximately 5 meters [16.4 ft]) in desert soils. To test this hypothesis on KAFB, the USGS collected soil cores to a depth of 50 ft at 13 Geoprobe® locations along the Tijeras Arroyo floodplain and the nearby mesa tops (Linhoff July 2019). Interpretation of chloride pulses and age dating in the vadose-zone samples indicate that a large mass of nitrate has accumulated beneath the floodplain over the last several hundred years. The elevated nitrate concentrations in groundwater samples are likely the result of where the Tijeras Arroyo channel starts to meander in response to large precipitation events; this spreads water over relatively undisturbed areas on the floodplain and flushes nitrate downward. The width of the 500-year floodplain varies from approximately 1,400 to 2,200 ft in the TAG AOC (FEMA September 2010). For purposes of discussion, Linhoff (July 2019) refers to these naturally occurring accumulations as “geologic nitrate.” The vadose-zone samples from mesa tops did not contain significant nitrate concentrations.

SNL/NM postulates that construction of a large storm-water diversion on the northern rim of Tijeras Arroyo could have similarly flushed geologic nitrate from the vadose zone to groundwater. In 1999, a concrete storm-water channel was constructed at the south end of the Ninth Street Channel storm-water dissipator. The watershed that drains to the Ninth Street Channel covers 475 acres. The new concrete channel has a length of approximately 720 ft. This new discharge point is located approximately 500 ft west of an earthen channel where the stormwater previously infiltrated.

Table 6-4. Sandia National Laboratories, New Mexico Solid Waste Management Units in the Tijeras Arroyo Groundwater Area of Concern 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.

Elevated NPN concentrations at some KAFB wells along the southern edge of the TAG AOC could be related to geologic nitrate. For example, monitoring well ST105-MW006, which is located approximately 200 ft south of the TAG AOC, has yielded a maximum NPN concentration of 77 mg/L. The well is located 500 ft southeast of the new discharge point. Also, the pair of Pennsylvania Boulevard bridge abutment berms (constructed in 2004) have occasionally allowed ponding in relatively new locations that may have driven geologic nitrate through the vadose zone.

6.1.7.6 Contaminant Behavior

Soil and soil-vapor samples collected from the vadose zone (land surface to the PGWS) during drilling operations and from the soil-vapor monitoring network have indicated evidence of vapor-phase 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 PGWS 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 PGWS 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 PGWS 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 PGWS 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 NPN in the PGWS within the TAG AOC is 27.8 (J-qualified) 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.

Historically, only three PGWS 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 PGWS 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 was transferred to the KAFB ERP in 2018. 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/NM 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 PGWS is decreasing near well WYO-4. As a result, the collection of a representative groundwater sample by SNL/NM personnel at WYO-4 had 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 production 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 production 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/NNSA 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 specified 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 HWB 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 contained 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 PGWS. 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 PGWS. 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 discussed 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 monitoring wells for 1,4-dioxane (NMED HWB September 2019). In accordance with the NMED HWB request, sampling for 1,4-dioxane at the TAG AOC will begin in CY 2020 using the current sampling schedule. The analytical results will be reported in Annual Groundwater Monitoring Reports. The monitoring wells will be sampled for at least two sampling events each.

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 2019 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 2019, a total of 21 monitoring wells were sampled. These wells consisted of 10 PGWS wells and 11 Regional Aquifer wells. The list of wells sampled in CY 2019 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.

Quality control (QC) samples were collected in the field at the time of environmental sample collection. Field QC samples include environmental duplicate, 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 CY 2019

This section discusses the CY 2019 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. Attachment 6D (Figure 6D-7) presents a TCE concentration trend plot.

Table 6-5. Groundwater Monitoring Well Network and Sampling Dates for the Tijeras Arroyo Groundwater Area of Concern in Calendar Year 2019

Date of Sampling Event	Wells Sampled		SAP
February/March 2019	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 FY19, 2nd Quarter Sampling* (SNL January 2019)
June 2019	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, 3rd Quarter Sampling* (SNL May 2019)
August/September 2019	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 WYO-3	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY19, 4th Quarter Sampling* (SNL July 2019)
November/December 2019	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2	TJA-3 TJA-4 TJA-7	*Tijeras Arroyo Groundwater Investigation, Mini-SAP for FY20, 1st Quarter Sampling* (SNL October 2019)

NOTES:

Wells screened in the Perched Groundwater System are highlighted with green shading.

FY = Fiscal Year.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.
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 Tijeras Arroyo Groundwater Area of Concern Monitoring Wells per Sampling Events in Calendar Year 2019

Parameter	February/March 2019	
NPN VOCs	TA1-W-06 TA2-W-01 TA2-W-19 TA2-W-26 TA2-W-26 (Duplicate) TA2-W-27 TA2-W-27 (Duplicate) TA2-W-28 TA2-W-28 (Duplicate)	TJA-2 TJA-3 TJA-4 TJA-6 TJA-7
Parameter	**June 2019**	
NPN VOCs	TA2-W-19 TA2-W-26 TA2-W-28 TJA-2 TJA-2 (Duplicate) TJA-3	TJA-4 TJA-4 (Duplicate) TJA-7
Parameter	**August/September 2019**	
Alkalinity Anions Gamma Spectroscopy (short list[a]) Gross Alpha/Beta Activity NPN TAL Metals, plus Total Uranium Tritium VOCs	TA1-W-01 TA1-W-02 TA1-W-02 (Duplicate) TA1-W-04 TA1-W-04 (Duplicate) TA1-W-05 TA1-W-06 TA1-W-06 (Duplicate) TA1-W-08 TA1-W-08 (Duplicate) TA2-NW1-595 TA2-W-01 TA2-W-19	TA2-W-26 TA2-W-27 TA2-W-28 TJA-2 TJA-3 TJA-4 TJA-5 TJA-6 TJA-7 WYO-3 WYO-3 (Duplicate) TA2-W-24 TA2-W-25
Parameter	**November/December 2019**	
NPN VOCs	TA2-W-19 TA2-W-19 (Duplicate) TA2-W-26 TA2-W-28 TJA-2	TJA-3 TJA-4 TJA-7 TJA-7 (Duplicate)

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).
NPN = Nitrate plus nitrite (reported as nitrogen).
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.

Table 6C-1 presents a summary of detected VOC results and Table 6C-2 lists the laboratory method detection limits (MDLs). Eight VOCs were detected during CY 2019 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 2019 groundwater samples were:

- 1,1-Dichloroethane
- 1,1-Dichloroethene
- Acetone
- cis-1,2-Dichloroethene
- Methylene chloride
- Tetrachloroethene (PCE)
- Toluene
- TCE

Figure 6-10 shows the monitoring well locations with the corresponding maximum TCE concentrations in CY 2019 environmental samples for the PGWS and the Regional Aquifer. Figure 6-11 shows the monitoring well locations with the corresponding maximum NPN concentrations in CY 2019 environmental samples for the PGWS and the Regional Aquifer.

Table 6-7 lists the monitoring wells where MCLs were exceeded in CY 2019. For the PGWS, five monitoring wells exceeded the MCL for nitrate (measured as NPN) and one 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.

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 PGWS 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 PGWS since March 2002, except at upgradient background monitoring well WYO-4. The PGWS 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 with the NMED HWB approved Bennett pump system. DOE and SNL/NM personnel and NMED HWB discussed the status of monitoring well WYO-4 in the August 2017 meeting. NMED HWB determined 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 ERP.

Except for the 21 February 2019 sample (TCE at 5.71 µg/L) collected at well TJA-2, no VOC concentrations in groundwater samples from the PGWS exceeded the respective MCLs in CY 2019. The maximum TCE concentration was 5.71 µg/L and corresponded to PGWS monitoring well TJA-2 (Table 6C-1). After installation of the BaroBall™ in April 2019, subsequent groundwater samples did not exceed the MCL. The June, August, and December 2019 samples collected from well TJA-2 contained TCE at 3.48, 4.00 (J-qualified), and 3.94 µg/L, respectively. These lower concentrations (Figure 6D-7) suggest that vapor-phase VOCs might be infiltrating the blank well casing above the well screen. Only one Regional Aquifer monitoring well 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 0.700 µg/L (J-qualified). This well has had sporadic detections of TCE since 2001 but never above the MCL.

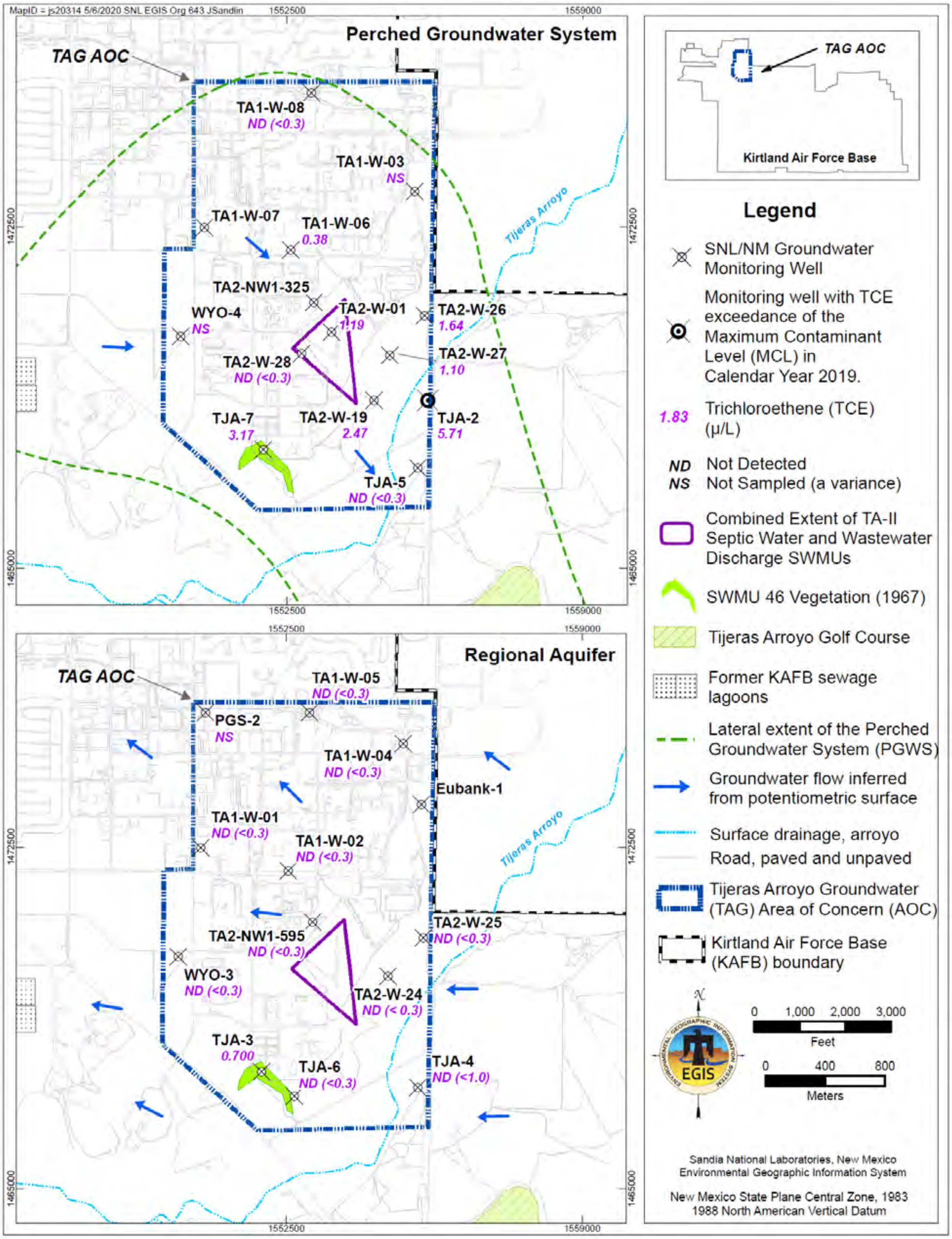

Figure 6-10. Maximum Concentrations of TCE in the Perched Groundwater System and the Regional Aquifer at the Tijeras Arroyo Groundwater Area of Concern for Calendar Year 2019

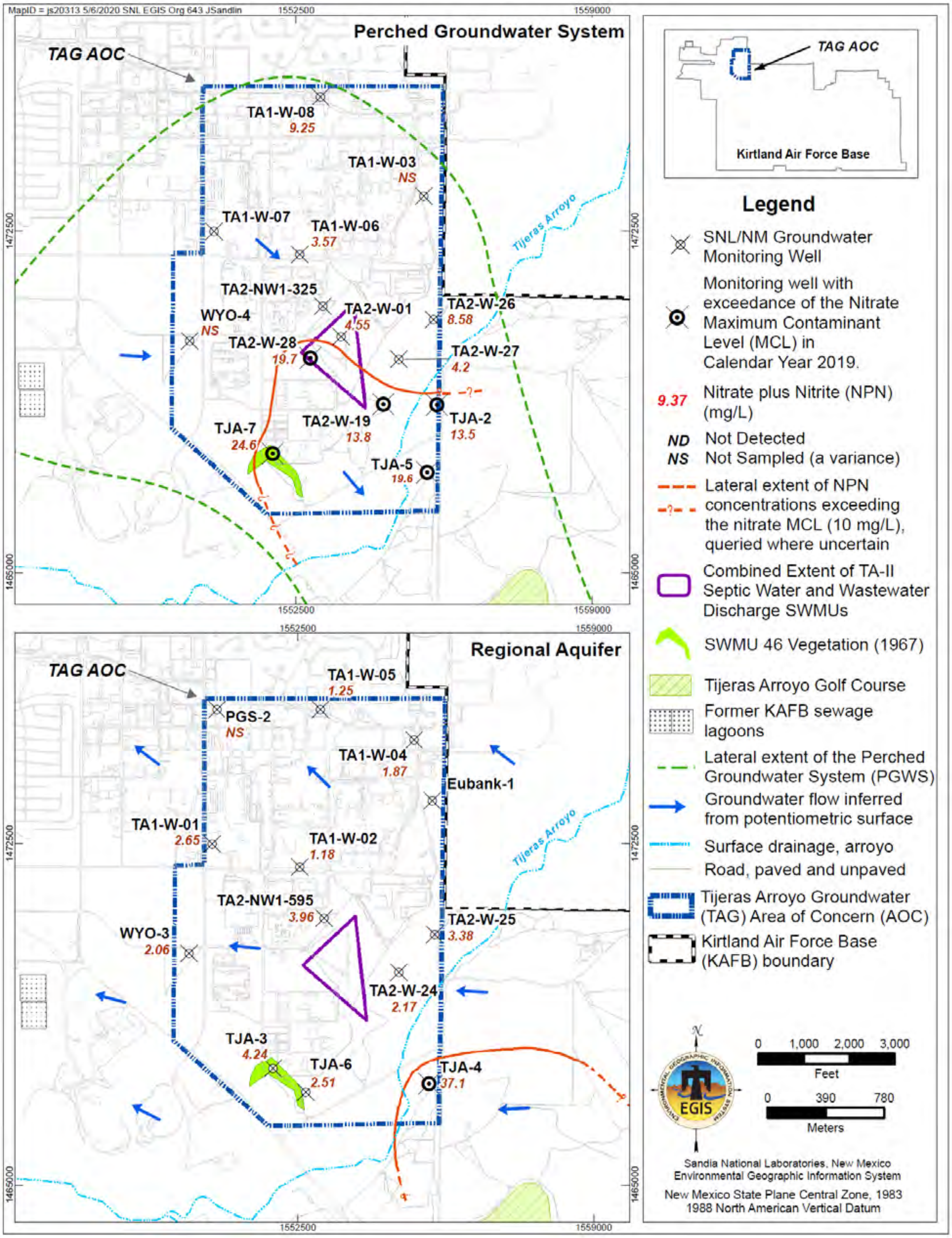

Figure 6-11. Maximum Concentrations of NPN in the Perched Groundwater System and the Regional Aquifer at the Tijeras Arroyo Groundwater Area of Concern for Calendar Year 2019

Table 6-7. Matrix Summarizing the Monitoring Wells where Contaminant Concentrations in Groundwater Samples Exceeded the Respective Maximum Contaminant Levels for Calendar Year 2019

Aquifer	Number of Monitoring Wells Exceeding the TCE MCL of 5 µg/L	Maximum TCE Concentration in CY 2019 (µg/L)	Number of Monitoring Wells Exceeding the Nitrate MCL of 10 mg/L	Maximum NPN Concentration in CY 2019 (mg/L)
Perched Groundwater System	1	5.71 (TJA-2)	5 wells (TA2-W-19, TA2-W-28, TJA-2, TJA-5, and TJA-7)	24.6
Merging Zone	None	ND (<0.300)	1 well (TJA-4)	37.1
Regional Aquifer	None	0.700J (TJA-3)	None	4.24

NOTES:
µg/L = Microgram(s) per liter.
J = The associated value is an estimated quantity (J-qualified).
mg/L = Milligram(s) per liter.
ND = Not detected
NPN = Nitrate plus nitrite (reported as nitrogen).
TA2-W = Technical Area-II (Well).
TCE = Trichloroethene.
TJA = Tijeras Arroyo.

Five PGWS 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 2019 (Table 6C-3). The NPN concentrations ranged from 10.8 to 24.6 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 a new maximum of 13.8 mg/L (June 2019). In CY 2019, the maximum NPN concentration was 13.8 mg/L. The overall NPN trend for the last five years is stable while the water level consistently declined at approximately 0.53 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 2019, the maximum NPN concentration was 19.7 mg/L. The overall NPN trend for the last five years shows overall decreasing concentrations while the water level consistently declined at approximately 0.54 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 a new maximum of 13.5 mg/L (June 2019). In CY 2019, the maximum NPN concentration in the environmental samples was 13.5 mg/L. The corresponding environmental duplicate sample contained NPN at 13.9 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 a new maximum of 37.1 mg/L (June 2019). The corresponding environmental duplicate sample contained NPN at 39.7 mg/L. The overall NPN trend for the last five years is stable while the water level increased at 0.12 ft/yr. This is the only DOE-owned monitoring well completed in the merging zone.

- 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 2019, the maximum NPN concentration was 24.6 mg/L. The overall NPN trend for the last five years is stable while the water level consistently declined at approximately 0.38 ft/yr.

- TJA-5 (Figure 6D-6). The collection of groundwater samples has not been a regulatory requirement for well TJA-5. However, in anticipation of a new sampling protocol for the TAG AOC, the well was sampled in June 2018 and August 2019. The NPN concentrations were 21.7 and 19.6 mg/L, respectively. A trend line is not depicted on Figure 6D-6 because of the approximately 17-year data gap (2001 – 2018). 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 0.29 ft/yr.

Monitoring well (TJA-4) had the greatest NPN concentration (37.1 mg/L) of all the TAG AOC wells in CY 2019. 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 PGWS 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 contributions 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 (TAL) metals and uranium. No analytes exceeded the established MCLs.

Table 6C-6 presents the analytical results for gamma spectroscopy short list (americium-241, cesium-137, cobalt-60, and potassium-40), gross alpha/beta activity, and tritium. 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 sample collection at each well. The parameters consist of 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 2019, the results for the environmental-duplicate sample pairs 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 above 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 7; thus, are much less than the RPD goal of 35. The calculated RPD values for the TCE sample pairs ranged from 1 to 13; thus, are less than the RPD goal of 20.

The calculated RPD values for the environmental duplicate analyses per quarter are as follows:

- **February/March 2019 Sampling Event**—Environmental duplicate samples were collected from monitoring wells TA2-W-26, TA2-W-27, and TA2-W-28. The NPN RPD values were 1, 2, and 4, respectively. The TCE RPD values for wells TA2-W-26 and TA2-W-27 were 5 and <1, respectively. TCE was not detected at well TA2-W-28.

- **June 2019 Sampling Event**—Environmental duplicate samples were collected from monitoring wells TJA-2 and TJA-4. The NPN RPD values were 3 and 7, respectively. VOCs were only reported for well TJA-2. The TCE RPD value was 13. The RPD values for 1,1-dichloroethane and cis-1,2-dichloroethene were 5 and 22, respectively.

- **August/September 2019 Sampling Event**—Environmental duplicate samples were collected from five monitoring wells (TA1-W-02, TA1-W-04, TA1-W-06, TA1-W-08, and WYO-3). The NPN RPD values ranged from 1 to 5. VOCs were only detected at well TA1-W-06; the RPD values for 1,1-dichloroethene and TCE were 1 and 5, respectively.

- **November/December 2019 Sampling Event**—Environmental duplicate samples were collected from monitoring wells TA2-W-19 and TJA-7. The NPN RPD values for both wells were <1. TCE was the only VOC detected in both wells. The RPD values for TCE were 12 and 1, respectively.

The results for the EB analyses per quarter are as follows:

- **February/March 2019 Sampling Event**—EB samples were collected prior to sampling wells TA2-W-26, TA2-W-27, and TA2-W-28. Acetone, 2-butanone, and NPN were detected in the EB samples. No corrective action was required for 2-butanone or NPN because these compounds were not detected in the associated environmental samples or because the reported values in environmental samples were greater than five times the EB concentration. Acetone was qualified as not detected during data validation in the TA2-W-28 environmental and environmental duplicate samples because acetone was reported at concentrations less than the EB result.

- **June 2019 Sampling Event**—EB samples were collected prior to sampling monitoring wells TJA-2 and TJA-4. Acetone, 2-butanone, 2-hexanone, and NPN were detected in the EB samples. No corrective action was necessary because these analytes were not detected above the MDLs in the associated environmental samples or reported at concentrations greater than five times the associated EB sample.

- **August/September 2019 Sampling Event**—EB samples were collected prior to sampling five monitoring wells (TA1-W-02, TA1-W-04, TA1-W-06, TA1-W-08, and WYO-3). Acetone, alkalinity, arsenic, bromodichloromethane, chloroform, chloride, copper, dibromochloromethane, sodium, thallium, vanadium, and zinc, were detected above MDLs in various EB samples. No corrective action was required for acetone, alkalinity, bromodichloromethane, chloroform, chloride, copper, dibromochloromethane, sodium, or thallium because these parameters were not detected in the environmental samples or the reported values for environmental samples were greater than five times the EB concentration. Arsenic, vanadium, and zinc were detected in the EB sample associated with the TA-W-04 environmental sample, and qualified as not detected during data validation because these metals were detected at similar concentrations in both the EB and environmental samples.

- **November/December 2019 Sampling Event**—EB samples were collected prior to the sampling of monitoring wells TA2-W-19 and TJA-7. Acetone, bromodichloromethane, bromoform, chloroform, and dibromochloromethane were detected in the EB samples. No corrective action was necessary because these compounds were not detected above the MDLs in the associated environmental samples.

The results for the FB analyses per quarter are as follows:

- **February/March 20019 Sampling Event**—FB samples for VOC analysis were collected at monitoring wells TA1-W-06 and TJA-4. An additional FB sample was collected prior to equipment decontamination. Acetone was detected in one FB sample but no corrective action was required because acetone was not detected above MDLs in the associated environmental or EB samples.

- **June 2019 Sampling Event**—FB samples were collected at monitoring wells TA2-W-26 and **TJA**-2. Acetone was detected in one FB sample, but no corrective action was required because acetone was not detected in the associated environmental sample.

- **August/September 2019 Sampling Event**—FB samples were collected at three monitoring wells (TA1-W-05, TA2-NW1-595, and TJA-6). The compounds detected in the FB samples included acetone, bromodichloromethane, chloroform, and dibromochloromethane. No corrective action was necessary because these compounds were not detected above MDLs in the associated environmental samples.

- **November/December 2019 Sampling Event**—FB samples were collected at monitoring wells TA2-W-26 and TJA-2. Five VOCs (acetone, bromodichloromethane, bromoform, chloroform, and dibromochloromethane) were reported in the FB samples. No corrective action was necessary because these compounds were not detected above MDLs in the associated environmental samples.

The results for the TB analyses per quarter are as follows:

- **February/March 2019 Sampling Event**—A total of 15 TB samples were submitted. No VOCs were detected above MDLs in any of the TB samples, except for acetone, methylene chloride, PCE, and TCE. No corrective action was required for acetone or PCE, because these compounds were not detected in the associated environmental samples. Methylene chloride in the TJA-6 sample and TCE in the TA2-W-01 sample were qualified as not detected during data validation because these compounds were reported at similar concentrations as the associated TB samples.

- **June 2019 Sampling Event**—No VOCs were detected above MDLs in any of the nine TB samples.

- **August/September 2019 Sampling Event**—No VOCs were detected above MDLs in any of the 27 TB samples.

- **November/December 2019 Sampling Event**—No VOCs were detected above MDLs in any of the nine TB samples, except for methylene chloride. Methylene chloride was detected in the TB associated with the TJA-4 environmental sample. This compound was reported in both the TB and environmental sample at concentrations less than the Practical Quantitation Limit and was qualified as not detected in the environmental sample during data validation.

6.8 Variances and Non-Conformances

Variances (non-conformances) from field or sampling requirements as specified in the four TAG Investigation Mini-Sampling and Analysis Plans (SAP; SNL January 2019, May 2019, July 2019, and October 2019) are noted as follows:

- **All Quarterly Events in CY 2019**—Monitoring well WYO-4 was not sampled because responsibility for the well and the surrounding area has been transferred to the KAFB ERP. This well will be tracked in the mini-SAPs until NMED HWB responds to the Revised TAG CCM/CME Report (SNL February 2018).

- **February/March 2019 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 2019 Sampling Event—**No variances with the TAG Mini-SAP were identified. Monitoring well TJA-5 was voluntarily sampled by SNL/NM.

- **August/September 2019 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 (SNL June 2018). Well TA1-W-03 is screened in the PGWS and has not contained a sufficient volume of water for collecting a groundwater sample since August 2017. The second issue involved Regional Aquifer monitoring well PGS-2. Grout intrusion precludes the collection of representative groundwater samples. 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 2019 Sampling Event**—No variances or non-conformances 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 2020 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 2019, June 2019, August/September 2019, and November/December 2019. The groundwater samples for each event were analyzed for VOCs and NPN. Additional analytes (anions, alkalinity, TAL metals [plus total uranium], gamma spectroscopy [short list], gross alpha/beta activity, and tritium) were analyzed for the August/September event. Analytical results were compared with EPA MCLs for drinking water (EPA March 2018).

In CY 2019, NPN was the only analyte that exceeded the 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 PGWS 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 PGWS was 24.6 mg/L. The maximum NPN concentration in the Regional Aquifer exclusive of the merging zone was 4.24 mg/L. In the merging zone above the Regional Aquifer, the maximum NPN concentration was 37.1 mg/L.

Except for the 21 February 2019 sample (TCE at 5.71 µg/L) at well TJA-2, no VOC concentrations in groundwater samples from the PGWS exceeded the respective MCLs in CY 2019. The maximum TCE concentration was 5.71 µg/L and corresponded to PGWS monitoring well TJA-2. After installation of the BaroBall™ in April 2019, subsequent groundwater samples did not exceed the MCL. The June, August, and December 2019 samples from well TJA-2 contained TCE at concentrations of 3.48, 4.00 (J-qualified), and 3.94 µg/L, respectively. These lower concentrations suggest that vapor-phase VOCs might be infiltrating the blank well casing above the well screen.

In CY 2019, the only detected TCE concentration for the Regional Aquifer was 0.700 µg/L (J-qualified) and corresponded to the sample from well TJA-3. TCE was not detected in merging zone.

The following conclusions are based on a comprehensive review of available information for current and historical groundwater analyses for the TAG AOC:

- In the PGWS, the distribution of NPN concentrations exceeding the nitrate MCL is restricted to the southeast corner of the TAG AOC and likely reflects NPN sources from 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 PGWS, TCE concentrations do not consistently 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 KAFB Sewage Lagoons, wastewater outfalls, buried septic systems, landfills, sewer lines, the golf course, and geologic nitrate. 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 PGWS are expected to decrease to background concentrations and below regulatory standards because of natural groundwater transport mechanisms such as advection, dispersion, and diffusion unless geologic nitrate is a factor.

- The PGWS 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 PGWS 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 PGWS is not pumped for any type of beneficial use within or near the TAG AOC.

- There is no foreseeable risk to human health involving production 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 ERP personnel with respect to the results of their nitrate in groundwater abatement studies. Revision 1 of the Technical Memorandum (Section 6.1.7.5) will be prepared by SNL/NM to include newly acquired information on NPN sources and groundwater geochemical data.

- Obtaining groundwater results relevant to the TAG AOC from KAFB, USGS, and the COA, as available.

- Reporting future results in the CY 2020 SNL/NM Annual Groundwater Monitoring Report.

- If required, prepare a Corrective Measures Implementation Plan upon receiving NMED HWB comments on 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 PGWS (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
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 production 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 production 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 monitoring 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 to 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 HWB issued a disapproval letter for the TAG CCM/CME Report. NMED HWB 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 HWB approved the time extension request. Submittal date for the Revised TAG CCM/CME Report was set for February 15, 2018.	NMED HWB 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 production wells were evaluated. More accurate coordinates were determined using field inspections and ortho-rectified aerial photography.	Copland July 2018
2019	BaroBall™ vented cap installed at monitoring well TJA-2 on April 26.	This report
2019	Conducted extensive review of potential nitrate-release sites located in the north-central portion of KAFB and adjacent Albuquerque.	SNL December 2019
2019	Continue 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.
USAF = U.S. Air Force.
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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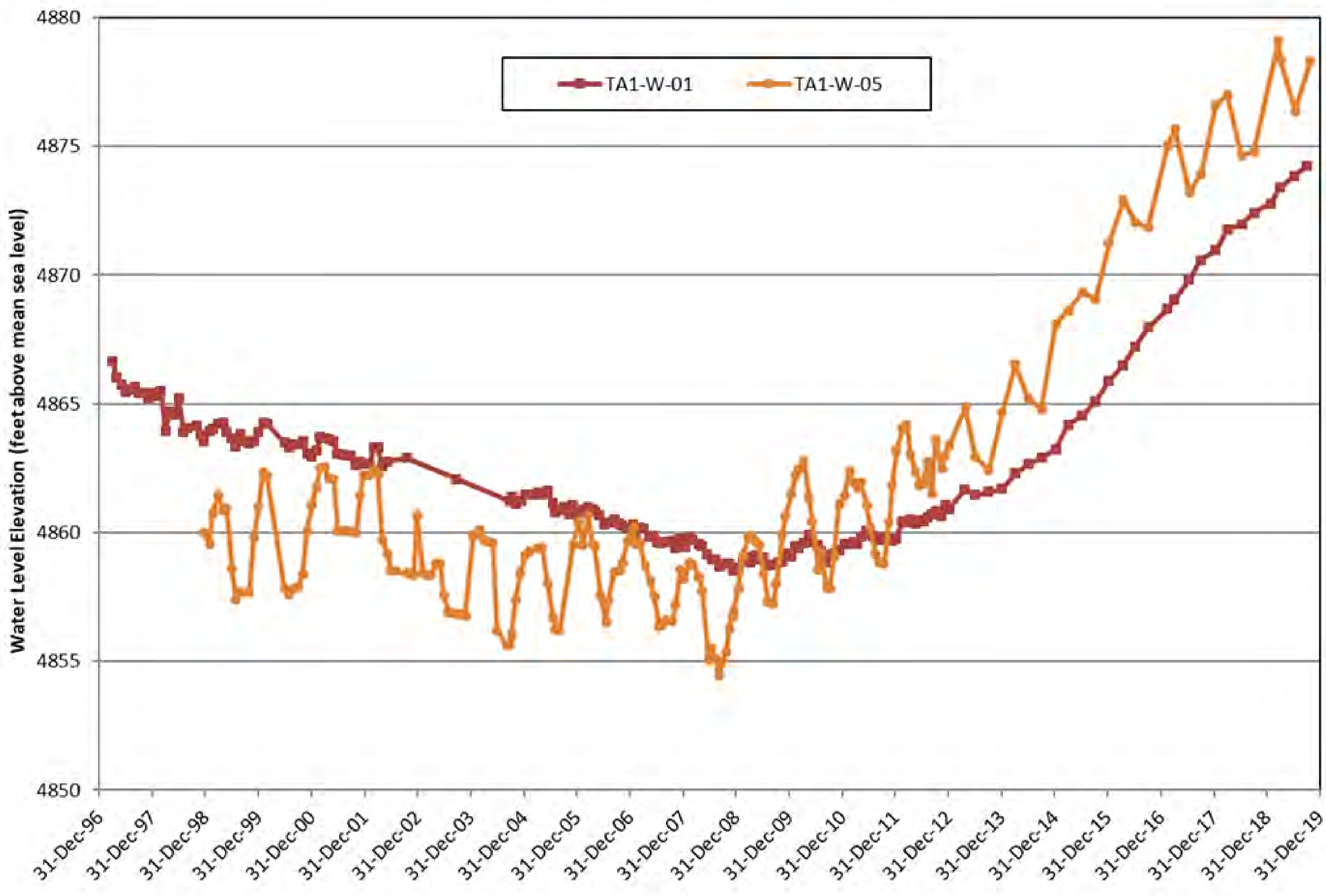

Figure 6B-1. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (1 of 10)

Figure 6B-2. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (2 of 10)

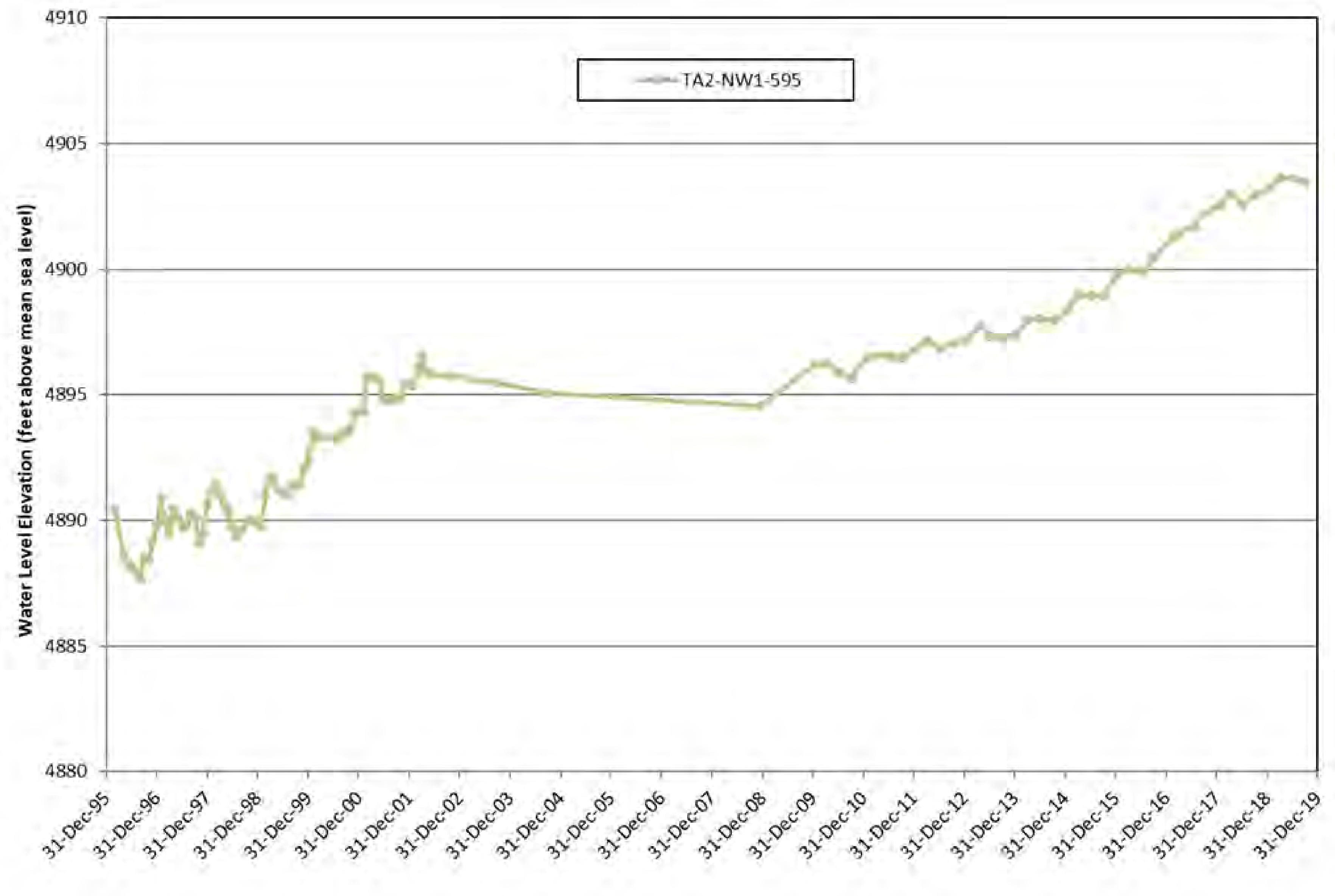

Figure 6B-3. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (3 of 10)

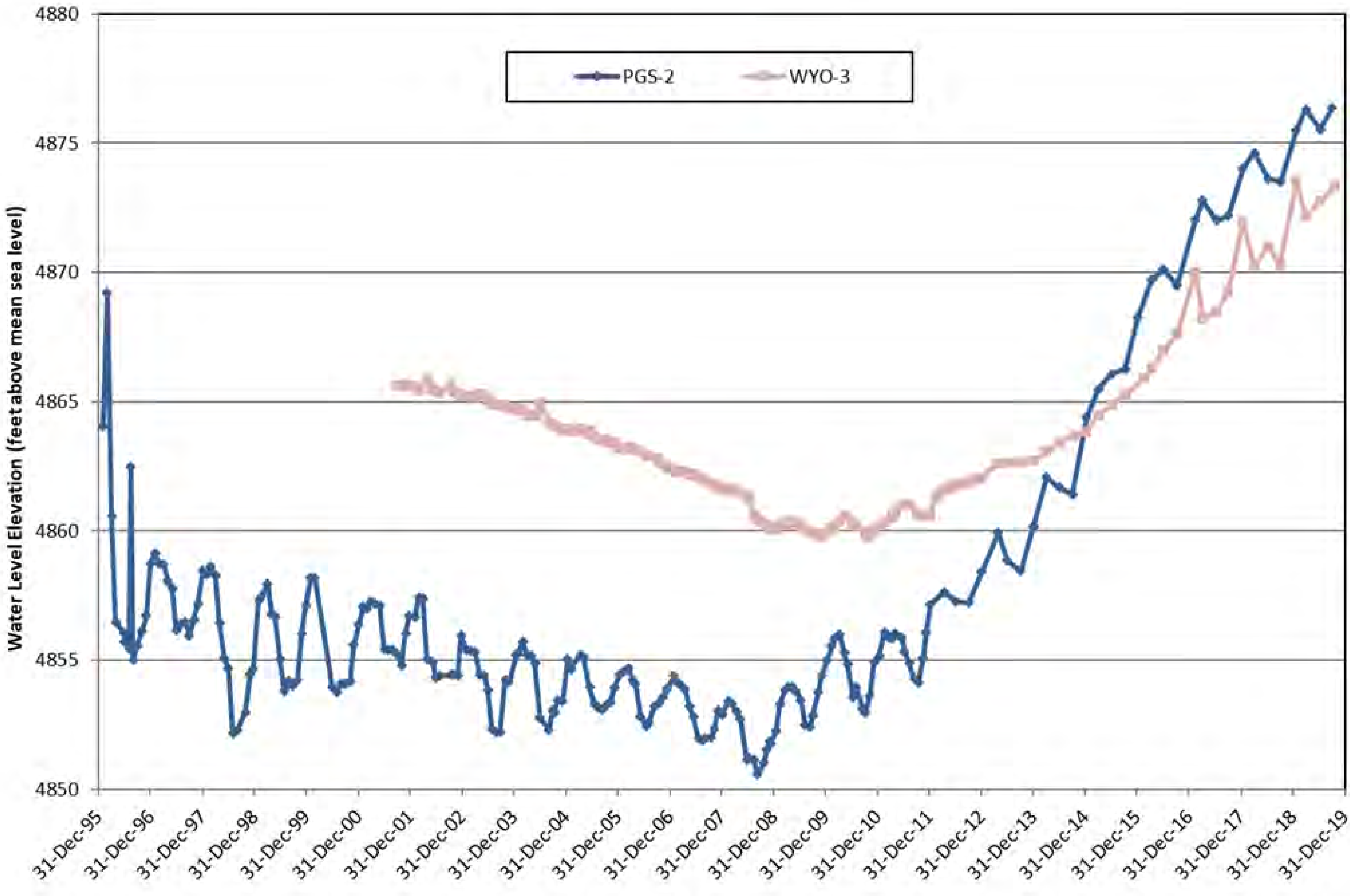

Figure 6B-4. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (4 of 10)

Figure 6B-5. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (5 of 10)

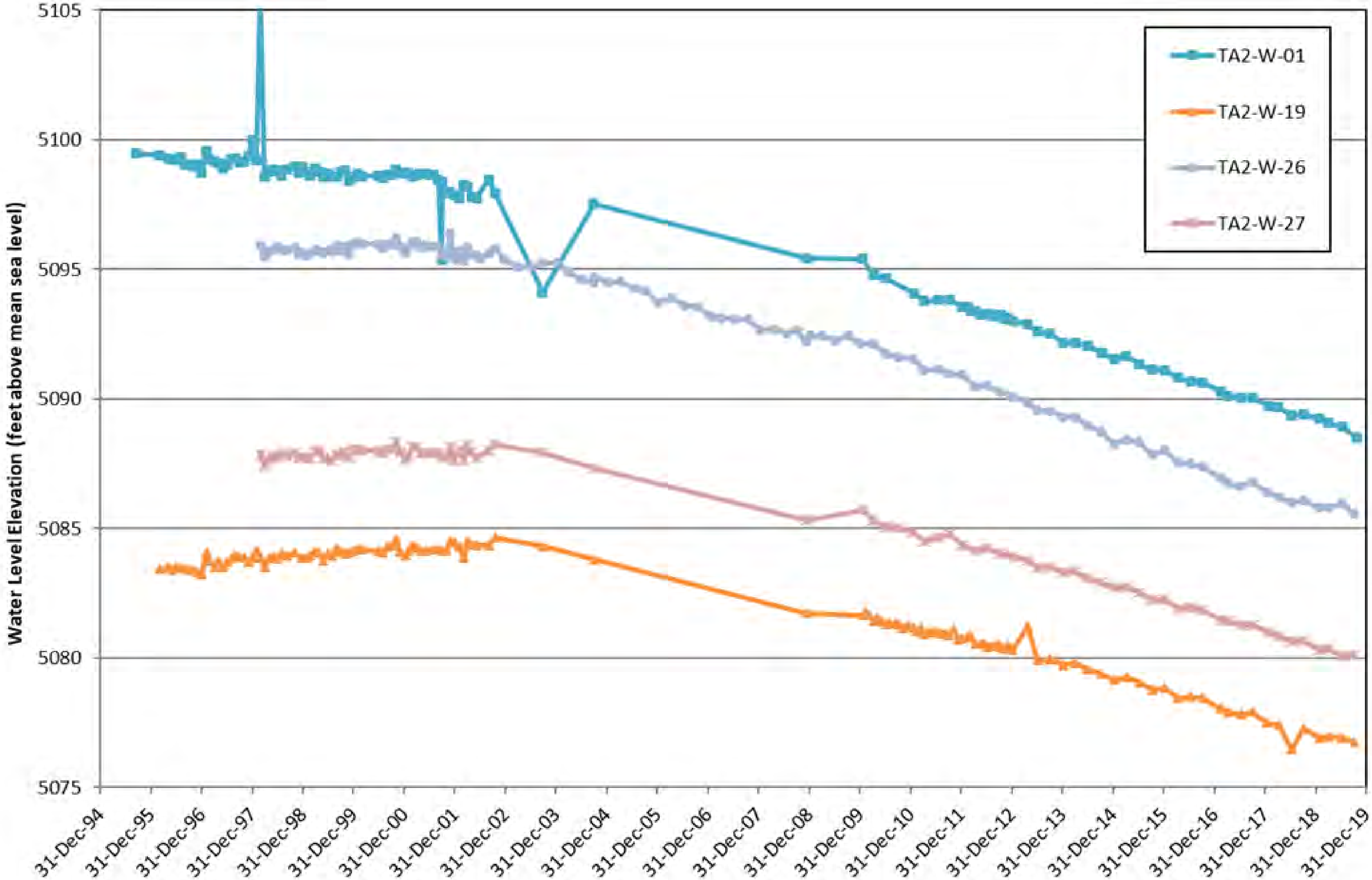

Figure 6B-6. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (6 of 10)

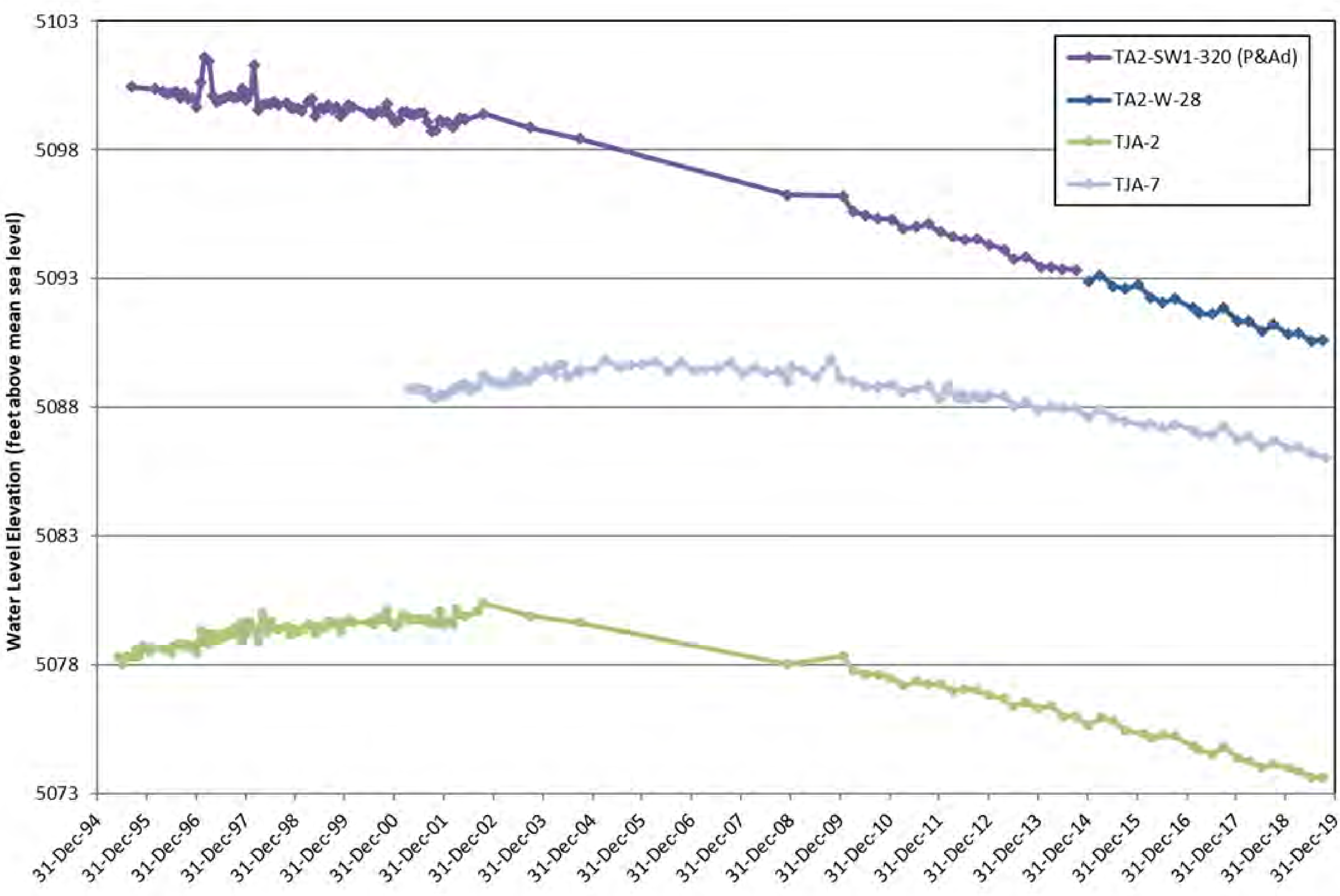

Figure 6B-7. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (7 of 10)

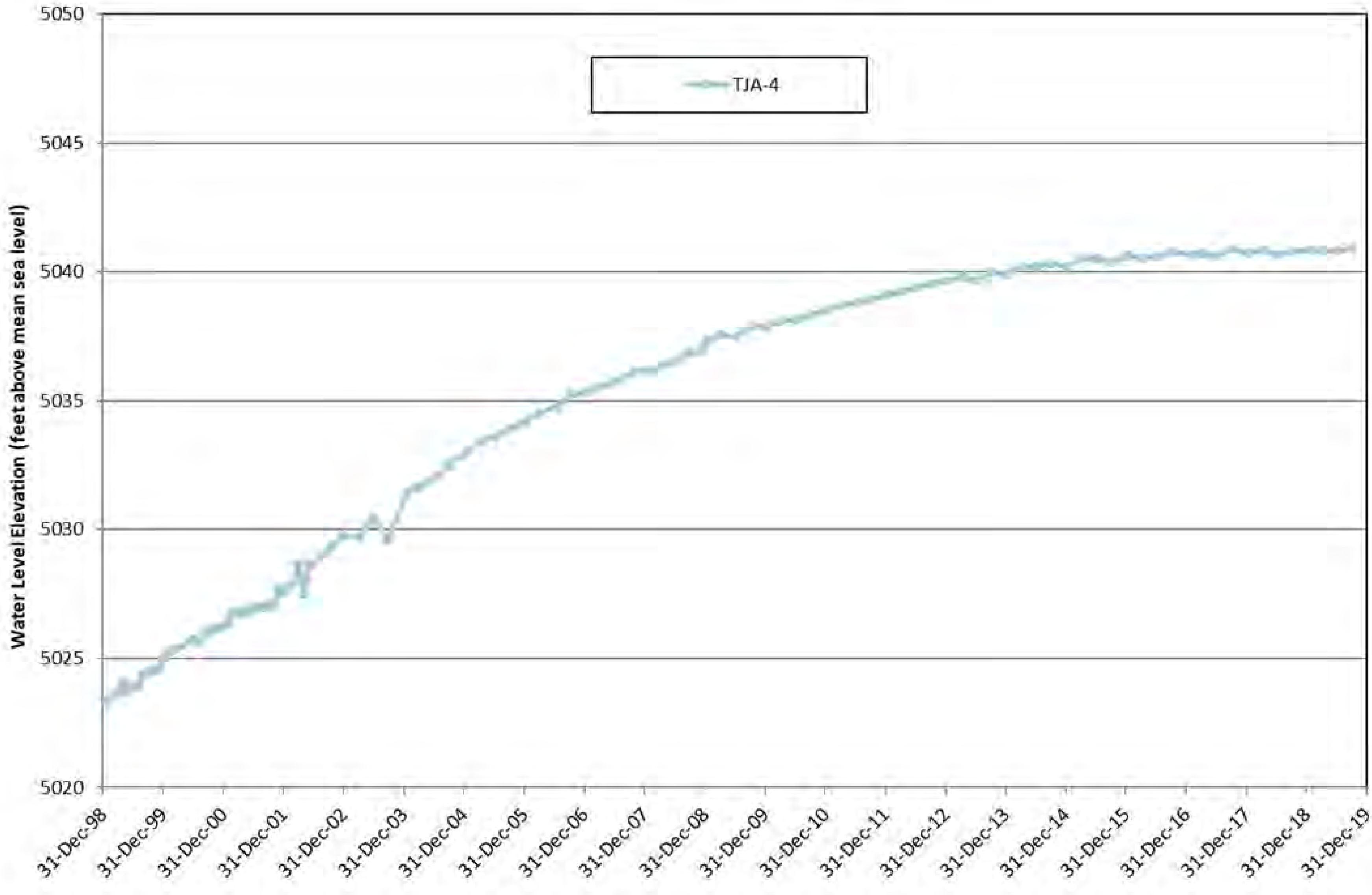

Figure 6B-8. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (8 of 10)

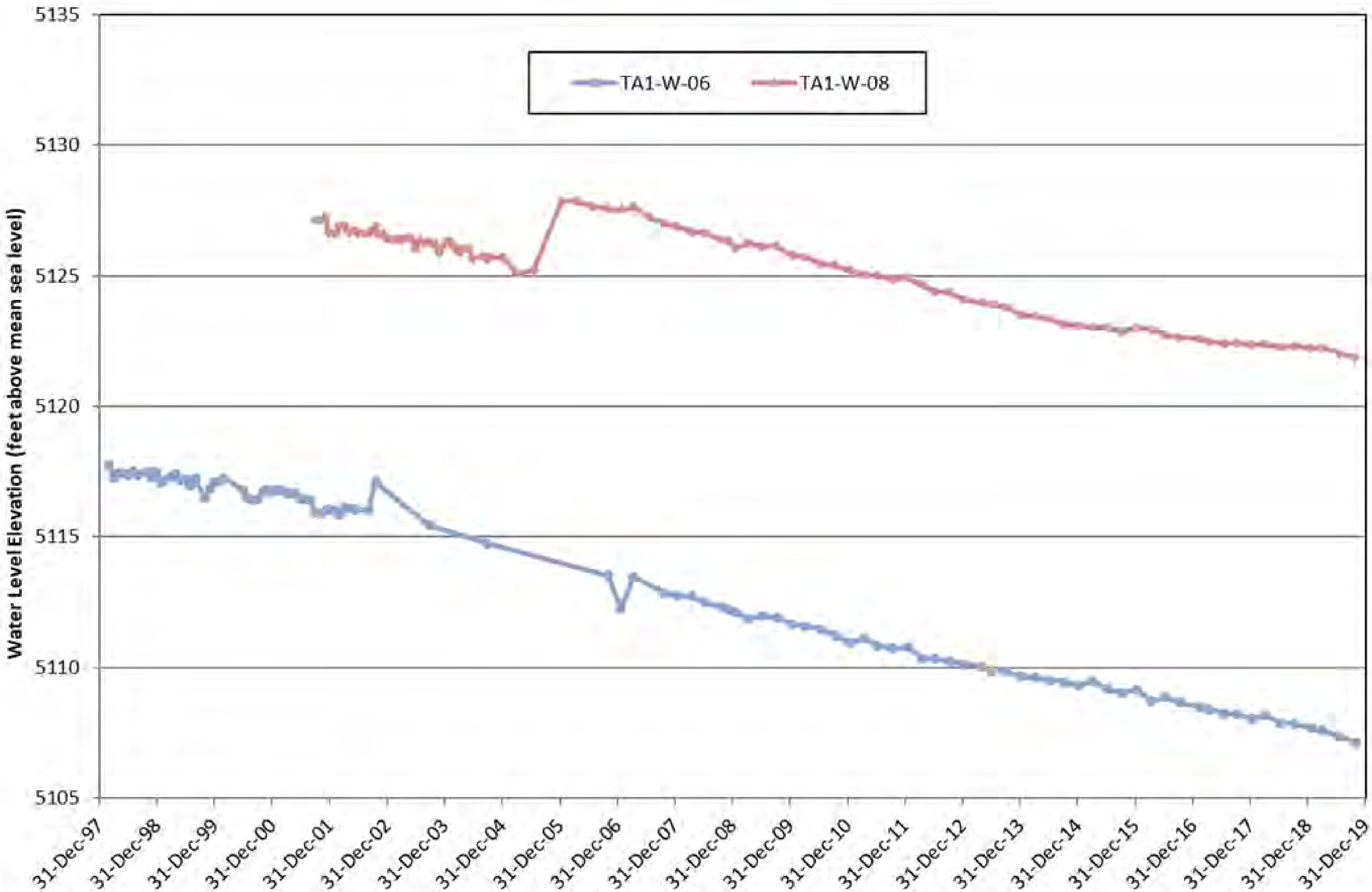

Figure 6B-9. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (9 of 10)

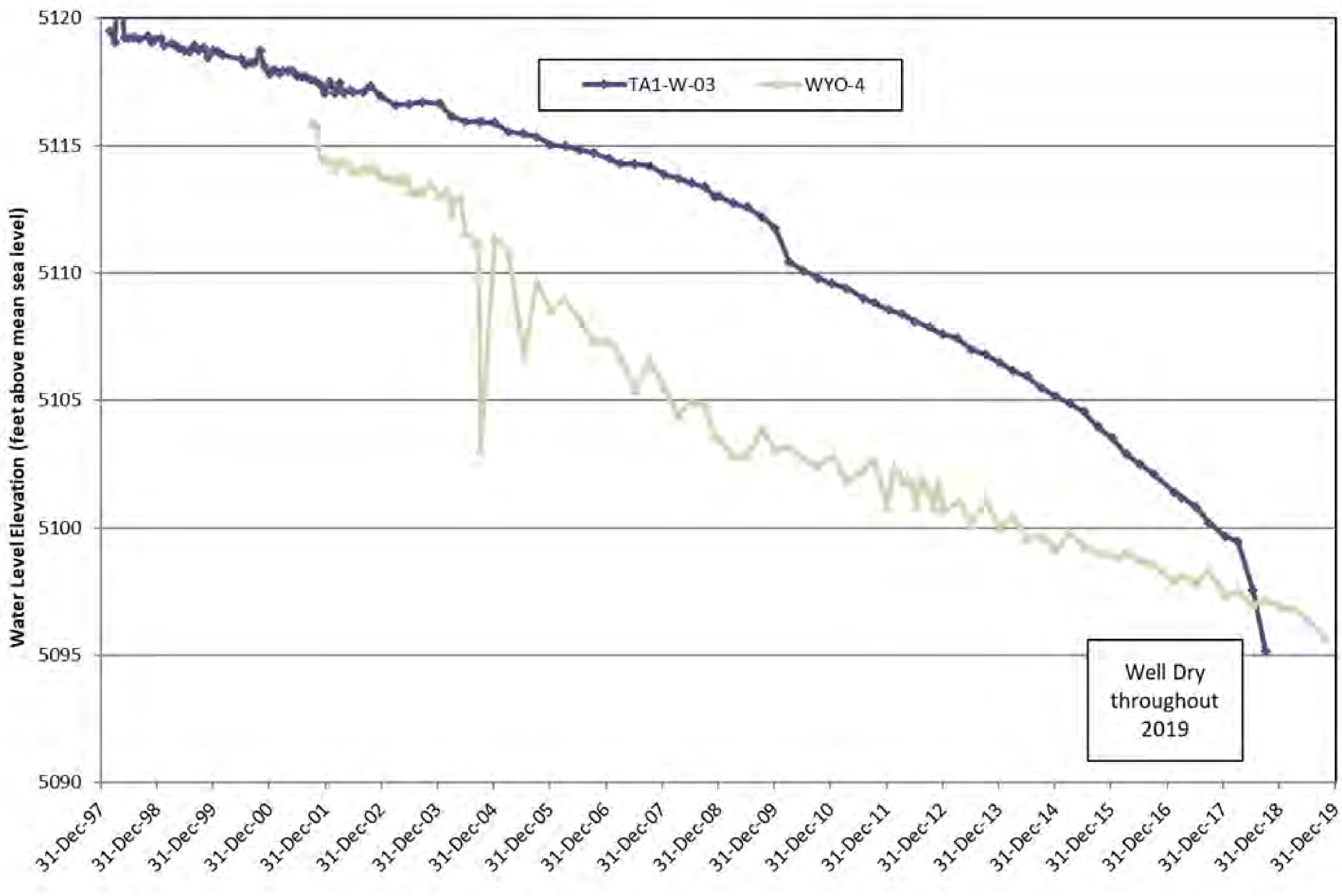

Figure 6B-10. Tijeras Arroyo Groundwater Area of Concern Monitoring Wells (10 of 10)

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 2019

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	0.890	0.300	1.00	7.00	J		107705-001	SW846-8260B
15-Feb-19	Trichloroethene	0.350	0.300	1.00	5.00	J		107705-001	SW846-8260B
TA2-W-01 19-Feb-19	Trichloroethene	1.94	0.300	1.00	5.00		1.94U	107714-001	SW846-8260B
TA2-W-19	1,1-Dichloroethane	0.360	0.300	1.00	NE	J		107727-001	SW846-8260B
27-Feb-19	Acetone	1.70	1.50	10.0	NE	J	J+	107727-001	SW846-8260B
	Toluene	0.370	0.300	1.00	1000	J		107727-001	SW846-8260B
	Trichloroethene	2.47	0.300	1.00	5.00			107727-001	SW846-8260B
TA2-W-26	Tetrachloroethene	0.940	0.300	1.00	5.00	J		107720-001	SW846-8260B
20-Feb-19	Trichloroethene	1.09	0.300	1.00	5.00			107720-001	SW846-8260B
	cis-1,2-Dichloroethene	0.350	0.300	1.00	70.0	J		107720-001	SW846-8260B
TA2-W-26 (Duplicate)	Tetrachloroethene	0.940	0.300	1.00	5.00	J		107721-001	SW846-8260B
20-Feb-19	Trichloroethene	1.15	0.300	1.00	5.00			107721-001	SW846-8260B
	cis-1,2-Dichloroethene	0.360	0.300	1.00	70.0	J		107721-001	SW846-8260B
TA2-W-27	Tetrachloroethene	1.61	0.300	1.00	5.00			107711-001	SW846-8260B
18-Feb-19	Trichloroethene	1.10	0.300	1.00	5.00			107711-001	SW846-8260B
TA2-W-27 (Duplicate)	Tetrachloroethene	1.45	0.300	1.00	5.00			107712-001	SW846-8260B
18-Feb-19	Trichloroethene	1.10	0.300	1.00	5.00			107712-001	SW846-8260B
TA2-W-28 28-Feb-19	Acetone	2.11	1.50	10.0	NE	J	10UJ	107733-001	SW846-8260B
TA2-W-28 (Duplicate) 28-Feb-19	Acetone	1.78	1.50	10.0	NE	J	10UJ	107734-001	SW846-8260B
TJA-2	1,1-Dichloroethane	0.620	0.300	1.00	NE	J		107725-001	SW846-8260B
21-Feb-19	Acetone	2.32	1.50	10.0	NE	J	J	107725-001	SW846-8260B
	Trichloroethene	**5.71**	0.300	1.00	5.00			107725-001	SW846-8260B
	cis-1,2-Dichloroethene	0.570	0.300	1.00	70.0	J		107725-001	SW846-8260B
TJA-4	Acetone	1.99	1.50	10.0	NE	B, J	10UJ	107740-001	SW846-8260B
04-Mar-19	Trichloroethene	0.630	0.300	1.00	5.00	B, J	1.0U	107740-001	SW846-8260B
TJA-6 13-Feb-19	Methylene chloride	1.11	1.00	10.0	5.00	J	10U	107537-001	SW846-8260B
TJA-7 01-Mar-19	Trichloroethene	3.05	0.300	1.00	5.00			107738-001	SW846-8260B

Refer to footnotes on page 6C-45.

Table 6C-1 *(Continued)*
Summary of Detected Volatile Organic Compounds, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 14-Jun-19	Trichloroethene	1.86	0.300	1.00	5.00			108553-001	SW846-8260B
TA2-W-26 13-Jun-19	Tetrachloroethene	1.00	0.300	1.00	5.00			108551-001	SW846-8260B
	Trichloroethene	1.41	0.300	1.00	5.00			108551-001	SW846-8260B
	cis-1,2-Dichloroethene	0.420	0.300	1.00	70.0	J		108551-001	SW846-8260B
TJA-2 18-Jun-19	1,1-Dichloroethane	0.410	0.300	1.00	NE	J		108565-001	SW846-8260B
	Trichloroethene	3.48	0.300	1.00	5.00			108565-001	SW846-8260B
	cis-1,2-Dichloroethene	0.410	0.300	1.00	70.0	J		108565-001	SW846-8260B
TJA-2 (Duplicate) 18-Jun-19	1,1-Dichloroethane	0.430	0.300	1.00	NE	J		108566-001	SW846-8260B
	Trichloroethene	3.95	0.300	1.00	5.00			108566-001	SW846-8260B
	cis-1,2-Dichloroethene	0.510	0.300	1.00	70.0	J		108566-001	SW846-8260B
TJA-7 19-Jun-19	Acetone	1.66	1.50	10.0	NE	J		108562-001	SW846-8260B
	Trichloroethene	2.76	0.300	1.00	5.00			108562-001	SW846-8260B
TA1-W-06 17-Sep-19	1,1-Dichloroethene	1.01	0.300	1.00	7.00			109021-001	SW846-8260B
	Trichloroethene	0.380	0.300	1.00	5.00	J		109021-001	SW846-8260B
TA1-W-06 (Duplicate) 17-Sep-19	1,1-Dichloroethene	1.02	0.300	1.00	7.00			109022-001	SW846-8260B
	Trichloroethene	0.360	0.300	1.00	5.00	J		109022-001	SW846-8260B
TA2-W-01 16-Sep-19	Tetrachloroethene	0.340	0.300	1.00	5.00	J		109027-001	SW846-8260B
	Trichloroethene	1.19	0.300	1.00	5.00			109027-001	SW846-8260B
TA2-W-19 22-Aug-19	Trichloroethene	1.38	0.300	1.00	5.00		J	109000-001	SW846-8260B
TA2-W-26 21-Aug-19	Tetrachloroethene	0.970	0.300	1.00	5.00	J	J	108998-001	SW846-8260B
	Trichloroethene	1.12	0.300	1.00	5.00		J	108998-001	SW846-8260B
	cis 1,2-Dichloroethene	0.360	0.300	1.00	70.0	J	J	108998-001	SW846-8260B
TA2-W-27 18-Sep-19	Tetrachloroethene	1.32	0.300	1.00	5.00			109030-001	SW846-8260B
	Trichloroethene	0.970	0.300	1.00	5.00	J		109030-001	SW846-8260B
TJA-2 26-Aug-19	1,1-Dichloroethane	0.450	0.300	1.00	NE	J	J	109004-001	SW846-8260B
	Trichloroethene	4.00	0.300	1.00	5.00		J	109004-001	SW846-8260B
	cis 1,2-Dichloroethene	0.380	0.300	1.00	70.0	J	J	109004-001	SW846-8260B
TJA-3 12-Sep-19	Acetone	1.92	1.50	10.0	NE	J	J-	109015-001	SW846-8260B
	Trichloroethene	0.700	0.300	1.00	5.00	J		109015-001	SW846-8260B
TJA-7 17-Sep-19	Acetone	3.64	1.50	10.0	NE	J		109008-001	SW846-8260B
	Methylene chloride	1.12	1.00	10.0	5.00	J	J-	109008-001	SW846-8260B
	Toluene	0.470	0.300	1.00	1000	J		109008-001	SW846-8260B
	Trichloroethene	2.65	0.300	1.00	5.00			109008-001	SW846-8260B

Refer to footnotes on page 6C-45.

Table 6C-1 *(Concluded)*
Summary of Detected Volatile Organic Compounds, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 26-Nov-19	Trichloroethene	1.67	0.300	1.00	5.00			111957-001	SW846-8260B
TA2-W-19 (Duplicate) 26-Nov-19	Trichloroethene	1.89	0.300	1.00	5.00			111958-001	SW846-8260B
TA2-W-26 25-Nov-19	Tetrachloroethene	1.23	0.300	1.00	5.00			111946-001	SW846-8260B
	Trichloroethene	1.64	0.300	1.00	5.00			111946-001	SW846-8260B
	cis-1,2-Dichloroethene	0.530	0.300	1.00	70.0	J		111946-001	SW846-8260B
TJA-2 10-Dec-19	1,1-Dichloroethane	0.380	0.300	1.00	NE	J		111955-001	SW846-8260B
	Trichloroethene	3.94	0.300	1.00	5.00			111955-001	SW846-8260B
	cis-1,2-Dichloroethene	0.420	0.300	1.00	70.0	J		111955-001	SW846-8260B
TJA-4 13-Dec-19	Methylene chloride	1.67	1.00	10	5.00	J	10.0U	111967-001	SW846-8260B
TJA-7 12-Dec-19	Trichloroethene	3.17	0.300	1.00	5.00			111964-001	SW846-8260B
TJA-7 (Duplicate) 12-Dec-19	Trichloroethene	3.14	0.300	1.00	5.00			111965-001	SW846-8260B

Refer to footnotes on page 6C-45.

Table 6C-2
Method Detection Limits for Volatile Organic Compounds (EPA Method[g] 8260), Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 6C-45.

Table 6C-3
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 15-Feb-19	Nitrate plus nitrite	3.57	0.170	0.500	10.0			107705-002	EPA 353.2
TA2-W-01 19-Feb-19	Nitrate plus nitrite	4.55	0.170	0.500	10.0			107714-002	EPA 353.2
TA2-W-19 27-Feb-19	Nitrate plus nitrite	**11.5**	0.170	0.500	10.0			107727-002	EPA 353.2
TA2-W-26 20-Feb-19	Nitrate plus nitrite	6.33	0.170	0.500	10.0			107720-002	EPA 353.2
TA2-W-26 (Duplicate) 20-Feb-19	Nitrate plus nitrite	6.41	0.170	0.500	10.0			107721-002	EPA 353.2
TA2-W-27 18-Feb-19	Nitrate plus nitrite	4.20	0.170	0.500	10.0			107711-002	EPA 353.2
TA2-W-27 (Duplicate) 18-Feb-19	Nitrate plus nitrite	4.11	0.170	0.500	10.0			107712-002	EPA 353.2
TA2-W-28 28-Feb-19	Nitrate plus nitrite	**19.6**	0.850	2.50	10.0			107733-002	EPA 353.2
TA2-W-28 (Duplicate) 28-Feb-19	Nitrate plus nitrite	**20.5**	0.850	2.50	10.0			107734-002	EPA 353.2
TJA-2 21-Feb-19	Nitrate plus nitrite	**12.2**	0.170	0.500	10.0			107725-002	EPA 353.2
TJA-3 14-Feb-19	Nitrate plus nitrite	2.70	0.085	0.250	10.0			107539-002	EPA 353.2
TJA-4 04-Mar-19	Nitrate plus nitrite	**30.0**	0.425	1.25	10.0			107740-002	EPA 353.2
TJA-6 13-Feb-19	Nitrate plus nitrite	2.45	0.085	0.250	10.0			107537-002	EPA 353.2
TJA-7 01-Mar-19	Nitrate plus nitrite	**22.1**	0.425	1.25	10.0			107738-002	EPA 353.2

Refer to footnotes on page 6C-45.

Table 6C-3 *(Continued)*
Summary of Nitrate plus Nitrite Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 14-Jun-19	Nitrate plus nitrite	**13.8**	0.170	0.500	10.0			108553-002	EPA 353.2
TA2-W-26 13-Jun-19	Nitrate plus nitrite	8.58	0.170	0.500	10.0			108551-002	EPA 353.2
TA2-W-28 17-Jun-19	Nitrate plus nitrite	**19.7**	0.825	2.50	10.0			108555-002	EPA 353.2
TJA-2 18-Jun-19	Nitrate plus nitrite	**13.5**	0.170	0.500	10.0			108565-002	EPA 353.2
TJA-2 (Duplicate) 18-Jun-19	Nitrate plus nitrite	**13.9**	0.170	0.500	10.0			108566-002	EPA 353.2
TJA-3 12-Jun-19	Nitrate plus nitrite	4.24	0.170	0.500	10.0			108548-002	EPA 353.2
TJA-4 20-Jun-19	Nitrate plus nitrite	**37.1**	0.850	2.50	10.0			108570-002	EPA 353.2
TJA-4 (Duplicate) 20-Jun-19	Nitrate plus nitrite	**39.7**	0.850	2.50	10.0			108571-002	EPA 353.2
TJA-7 19-Jun-19	Nitrate plus nitrite	**24.6**	0.850	2.50	10.0			108562-002	EPA 353.2
TA1-W-01 10-Sep-19	Nitrate plus nitrite	2.65	0.085	0.250	10.0			109013-002	EPA 353.2
TA1-W-02 21-Aug-19	Nitrate plus nitrite	1.18	0.085	0.250	10.0		J	108952-002	EPA 353.2
TA1-W-02 (Duplicate) 21-Aug-19	Nitrate plus nitrite	1.12	0.085	0.250	10.0			108953-002	EPA 353.2
TA1-W-04 26-Aug-19	Nitrate plus nitrite	1.87	0.085	0.250	10.0		J	108960-002	EPA 353.2
TA1-W-04 (Duplicate) 26-Aug-19	Nitrate plus nitrite	1.86	0.085	0.250	10.0		J	108961-002	EPA 353.2
TA1-W-05 22-Aug-19	Nitrate plus nitrite	1.25	0.085	0.250	10.0		J	108956-002	EPA 353.2
TA1-W-06 17-Sep-19	Nitrate plus nitrite	3.29	0.170	0.500	10.0			109021-002	EPA 353.2
TA1-W-06 (Duplicate) 17-Sep-19	Nitrate plus nitrite	3.26	0.170	0.500	10.0			109022-002	EPA 353.2
TA1-W-08 20-Sep-19	Nitrate plus nitrite	9.25	0.850	2.50	10.0			109034-002	EPA 353.2

Refer to footnotes on page 6C-45.

Table 6C-3 *(Continued)*
Summary of Nitrate plus Nitrite Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 (Duplicate) 20-Sep-19	Nitrate plus nitrite	9.70	0.850	2.50	10.0			109035-002	EPA 353.2
TA2-NW1-595 11-Sep-19	Nitrate plus nitrite	3.96	0.170	0.500	10.0			109025-002	EPA 353.2
TA2-W-01 16-Sep-19	Nitrate plus nitrite	3.96	0.170	0.500	10.0			109027-002	EPA 353.2
TA2-W-19 22-Aug-19	Nitrate plus nitrite	**11.5**	0.170	0.500	10.0		J	109000-002	EPA 353.2
TA2-W-24 27-Aug-19	Nitrate plus nitrite	2.17	0.085	0.250	10.0			108963-002	EPA 353.2
TA2-W-25 13-Sep-19	Nitrate plus nitrite	3.38	0.085	0.250	10.0			109017-002	EPA 353.2
TA2-W-26 21-Aug-19	Nitrate plus nitrite	6.16	0.170	0.500	10.0		J	108998-002	EPA 353.2
TA2-W-27 18-Sep-19	Nitrate plus nitrite	3.79	0.170	0.500	10.0			109030-002	EPA 353.2
TA2-W-28 23-Aug-19	Nitrate plus nitrite	**16.2**	0.850	2.50	10.0		J	109002-002	EPA 353.2
TJA-2 26-Aug-19	Nitrate plus nitrite	**10.8**	0.170	0.500	10.0		J	109004-002	EPA 353.2
TJA-3 12-Sep-19	Nitrate plus nitrite	2.64	0.170	0.500	10.0			109015-002	EPA 353.2
TJA-4 19-Sep-19	Nitrate plus nitrite	**29.5**	0.850	2.50	10.0		J	109037-002	EPA 353.2
TJA-5 27-Aug-19	Nitrate plus nitrite	**19.6**	0.850	2.50	10.0		J	109006-002	EPA 353.2
TJA-6 09-Sep-19	Nitrate plus nitrite	2.51	0.085	0.250	10.0			109011-002	EPA 353.2
TJA-7 17-Sep-19	Nitrate plus nitrite	**22.0**	0.850	2.50	10.0		J	109008-002	EPA 353.2
WYO-3 28-Aug-19	Nitrate plus nitrite	2.06	0.085	0.250	10.0			108971-002	EPA 353.2
WYO-3 (Duplicate) 28-Aug-19	Nitrate plus nitrite	2.08	0.085	0.250	10.0			108972-002	EPA 353.2

Refer to footnotes on page 6C-45.

Table 6C-3 *(Concluded)*
Summary of Nitrate plus Nitrite Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 26-Nov-19	Nitrate plus nitrite	**12.0**	0.425	1.25	10.0			111957-002	EPA 353.2
TA2-W-19 (Duplicate) 26-Nov-19	Nitrate plus nitrite	**12.0**	0.425	1.25	10.0			111958-002	EPA 353.2
TA2-W-26 25-Nov-19	Nitrate plus nitrite	6.49	0.170	0.500	10.0			111946-002	EPA 353.2
TA2-W-28 11-Dec-19	Nitrate plus nitrite	**16.2**	0.850	2.50	10.0			111960-002	EPA 353.2
TJA-2 10-Dec-19	Nitrate plus nitrite	**11.4**	0.850	2.50	10.0			111955-002	EPA 353.2
TJA-3 22-Nov-19	Nitrate plus nitrite	2.74	0.085	0.250	10.0			111941-002	EPA 353.2
TJA-4 13-Dec-19	Nitrate plus nitrite	**31.7**	0.850	2.50	10.0			111967-002	EPA 353.2
TJA-7 12-Dec-19	Nitrate plus nitrite	**22.8**	0.850	2.50	10.0			111964-002	EPA 353.2
TJA-7 (Duplicate) 12-Dec-19	Nitrate plus nitrite	**22.8**	0.850	2.50	10.0			111965-002	EPA 353.2

Refer to footnotes on page 6C-45.

Table 6C-4
Summary of Anions and Alkalinity Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	Bromide	0.199	0.067	0.200	NE	J		109013-003	SW846 9056A
10-Sep-19	Chloride	14.1	0.670	2.00	NE			109013-003	SW846 9056A
	Fluoride	0.459	0.033	0.100	4.0			109013-003	SW846 9056A
	Sulfate	72.6	1.33	4.00	NE			109013-003	SW846 9056A
	Bicarbonate Alkalinity	176	1.45	4.00	NE			109013-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109013-004	SM 2320B
TA1-W-02	Bromide	0.212	0.067	0.200	NE		J	108952-003	SW846 9056A
21-Aug-19	Chloride	15.2	0.670	2.00	NE		J	108952-003	SW846 9056A
	Fluoride	0.402	0.033	0.100	4.0		J	108952-003	SW846 9056A
	Sulfate	77.7	1.33	4.00	NE		J	108952-003	SW846 9056A
	Bicarbonate Alkalinity	173	1.45	4.00	NE			108952-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108952-004	SM 2320B
TA1-W-04	Bromide	0.173	0.067	0.200	NE	J		108960-003	SW846 9056A
26-Aug-19	Chloride	14.1	0.335	1.00	NE			108960-003	SW846 9056A
	Fluoride	0.397	0.033	0.100	4.0			108960-003	SW846 9056A
	Sulfate	69.7	0.665	2.00	NE			108960-003	SW846 9056A
	Bicarbonate Alkalinity	184	1.45	4.00	NE			108960-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108960-004	SM 2320B
TA1-W-05	Bromide	0.141	0.067	0.200	NE	J		108956-003	SW846 9056A
22-Aug-19	Chloride	11.1	0.670	2.00	NE			108956-003	SW846 9056A
	Fluoride	0.270	0.033	0.100	4.0			108956-003	SW846 9056A
	Sulfate	98.8	1.33	4.00	NE			108956-003	SW846 9056A
	Bicarbonate Alkalinity	114	1.45	4.00	NE			108956-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108956-004	SM 2320B
TA1-W-06	Bromide	1.37	0.067	0.200	NE			109021-003	SW846 9056A
17-Sep-19	Chloride	103	1.34	4.00	NE			109021-003	SW846 9056A
	Fluoride	0.293	0.033	0.100	4.0			109021-003	SW846 9056A
	Sulfate	202	2.66	8.00	NE		J-	109021-003	SW846 9056A
	Bicarbonate Alkalinity	90.9	1.45	4.00	NE			109021-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109021-004	SM 2320B
TA1-W-08	Bromide	2.97	0.067	0.200	NE			109034-003	SW846 9056A
20-Sep-19	Chloride	220	6.70	20.0	NE			109034-003	SW846 9056A
	Fluoride	0.304	0.033	0.100	4.0			109034-003	SW846 9056A
	Sulfate	705	13.3	40.0	NE			109034-003	SW846 9056A
	Bicarbonate Alkalinity	84.9	1.45	4.00	NE			109034-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109034-004	SM 2320B

Refer to footnotes on page 6C-45.

Table 6C-4 *(Continued)*
Summary of Anions and Alkalinity Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	Bromide	1.16	0.067	0.200	NE			109025-003	SW846 9056A
11-Sep-19	Chloride	93.5	1.68	5.00	NE			109025-003	SW846 9056A
	Fluoride	0.347	0.033	0.100	4.0			109025-003	SW846 9056A
	Sulfate	106	3.33	10.0	NE			109025-003	SW846 9056A
	Bicarbonate Alkalinity	140	1.45	4.00	NE			109025-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109025-004	SM 2320B
TA2-W-01	Bromide	1.44	0.067	0.200	NE			109027-003	SW846 9056A
16-Sep-19	Chloride	96.0	1.34	4.00	NE			109027-003	SW846 9056A
	Fluoride	0.321	0.033	0.100	4.0			109027-003	SW846 9056A
	Sulfate	60.6	2.66	8.00	NE		J-	109027-003	SW846 9056A
	Bicarbonate Alkalinity	101	1.45	4.00	NE			109027-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109027-004	SM 2320B
TA2-W-19	Bromide	0.732	0.067	0.200	NE			109000-003	SW846 9056A
22-Aug-19	Chloride	52.3	0.670	2.00	NE			109000-003	SW846 9056A
	Fluoride	0.361	0.033	0.100	4.0			109000-003	SW846 9056A
	Sulfate	58.8	1.33	4.00	NE			109000-003	SW846 9056A
	Bicarbonate Alkalinity	217	1.45	4.00	NE			109000-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109000-004	SM 2320B
TA2-W-24	Bromide	0.194	0.067	0.200	NE	J		108963-003	SW846 9056A
27-Aug-19	Chloride	14.4	0.670	2.00	NE			108963-003	SW846 9056A
	Fluoride	0.453	0.033	0.100	4.0			108963-003	SW846 9056A
	Sulfate	46.8	1.33	4.00	NE			108963-003	SW846 9056A
	Bicarbonate Alkalinity	168	1.45	4.00	NE			108963-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108963-004	SM 2320B
TA2-W-25	Bromide	0.212	0.067	0.200	NE			109017-003	SW846 9056A
13-Sep-19	Chloride	13.7	0.335	1.00	NE			109017-003	SW846 9056A
	Fluoride	0.326	0.033	0.100	4.0			109017-003	SW846 9056A
	Sulfate	72.2	0.665	2.00	NE			109017-003	SW846 9056A
	Bicarbonate Alkalinity	175	1.45	4.00	NE			109017-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109017-004	SM 2320B
TA2-W-26	Bromide	2.79	0.067	0.200	NE		J	108998-003	SW846 9056A
21-Aug-19	Chloride	200	3.35	10.0	NE		J	108998-003	SW846 9056A
	Fluoride	0.260	0.033	0.100	4.0		J	108998-003	SW846 9056A
	Sulfate	419	6.65	20.0	NE		J	108998-003	SW846 9056A
	Bicarbonate Alkalinity	83.9	1.45	4.00	NE			108998-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108998-004	SM 2320B

Refer to footnotes on page 6C-45.

Table 6C-4 *(Continued)*
Summary of Anions and Alkalinity Results,
Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	Bromide	1.53	0.067	0.200	NE			109030-003	SW846 9056A
18-Sep-19	Chloride	107	1.34	4.00	NE			109030-003	SW846 9056A
	Fluoride	0.279	0.033	0.100	4.0			109030-003	SW846 9056A
	Sulfate	145	2.66	8.00	NE		J-	109030-003	SW846 9056A
	Bicarbonate Alkalinity	103	1.45	4.00	NE			109030-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109030-004	SM 2320B
TA2-W-28	Bromide	0.567	0.067	0.200	NE			109002-003	SW846 9056A
23-Aug-19	Chloride	35.8	0.670	2.00	NE			109002-003	SW846 9056A
	Fluoride	0.407	0.033	0.100	4.0			109002-003	SW846 9056A
	Sulfate	16.9	1.33	4.00	NE			109002-003	SW846 9056A
	Bicarbonate Alkalinity	130	1.45	4.00	NE			109002-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109002-004	SM 2320B
TJA-2	Bromide	0.881	0.067	0.200	NE			109004-003	SW846 9056A
26-Aug-19	Chloride	65.9	1.34	4.00	NE			109004-003	SW846 9056A
	Fluoride	0.329	0.033	0.100	4.0			109004-003	SW846 9056A
	Sulfate	54.5	2.66	8.00	NE			109004-003	SW846 9056A
	Bicarbonate Alkalinity	115	1.45	4.00	NE			109004-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109004-004	SM 2320B
TJA-3	Bromide	0.176	0.067	0.200	NE	J		109015-003	SW846 9056A
12-Sep-19	Chloride	13.0	0.670	2.00	NE			109015-003	SW846 9056A
	Fluoride	0.352	0.033	0.100	4.0			109015-003	SW846 9056A
	Sulfate	78.3	1.33	4.00	NE			109015-003	SW846 9056A
	Bicarbonate Alkalinity	163	1.45	4.00	NE			109015-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109015-004	SM 2320B
TJA-4	Bromide	0.371	0.067	0.200	NE		J	109037-003	SW846 9056A
19-Sep-19	Chloride	24.5	0.335	1.00	NE		J	109037-003	SW846 9056A
	Fluoride	0.335	0.033	0.100	4.0		J	109037-003	SW846 9056A
	Sulfate	17.8	0.133	0.400	NE		J	109037-003	SW846 9056A
	Bicarbonate Alkalinity	132	1.45	4.00	NE			109037-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109037-004	SM 2320B

Refer to footnotes on page 6C-45.

Table 6C-4 *(Concluded)*
Summary of Anions and Alkalinity Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 27-Aug-19	Bromide	0.341	0.067	0.200	NE			109006-003	SW846 9056A
	Chloride	20.7	0.670	2.00	NE			109006-003	SW846 9056A
	Fluoride	0.326	0.033	0.100	4.0			109006-003	SW846 9056A
	Sulfate	101	1.33	4.00	NE			109006-003	SW846 9056A
	Bicarbonate Alkalinity	124	1.45	4.00	NE			109006-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109006-004	SM 2320B
TJA-6 09-Sep-19	Bromide	0.203	0.067	0.200	NE			109011-003	SW846 9056A
	Chloride	14.7	0.670	2.00	NE			109011-003	SW846 9056A
	Fluoride	0.429	0.033	0.100	4.0			109011-003	SW846 9056A
	Sulfate	62.5	1.33	4.00	NE			109011-003	SW846 9056A
	Bicarbonate Alkalinity	161	1.45	4.00	NE			109011-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109011-004	SM 2320B
TJA-7 17-Sep-19	Bromide	0.453	0.067	0.200	NE			109008-003	SW846 9056A
	Chloride	23.2	0.670	2.00	NE			109008-003	SW846 9056A
	Fluoride	0.373	0.033	0.100	4.0			109008-003	SW846 9056A
	Sulfate	22.3	1.33	4.00	NE		J-	109008-003	SW846 9056A
	Bicarbonate Alkalinity	142	1.45	4.00	NE			109008-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		109008-004	SM 2320B
WYO-3 28-Aug-19	Bromide	0.219	0.067	0.200	NE			108971-003	SW846 9056A
	Chloride	15.2	0.670	2.00	NE			108971-003	SW846 9056A
	Fluoride	0.537	0.033	0.100	4.0			108971-003	SW846 9056A
	Sulfate	83.7	1.33	4.00	NE			108971-003	SW846 9056A
	Bicarbonate Alkalinity	168	1.45	4.00	NE			108971-004	SM 2320B
	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108971-004	SM 2320B

Refer to footnotes on page 6C-45.

Table 6C-5
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		109013-005	SW846 6020B
10-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109013-005	SW846 6020B
	Arsenic	0.0021	0.002	0.005	0.010	J		109013-005	SW846 6020B
	Barium	0.0608	0.00067	0.004	2.00			109013-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109013-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109013-005	SW846 6020B
	Calcium	66.1	0.400	1.00	NE			109013-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109013-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109013-005	SW846 6020B
	Copper	0.000973	0.0003	0.002	1.3	B, J	0.002U	109013-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109013-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109013-005	SW846 6020B
	Magnesium	13.1	0.010	0.030	NE			109013-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109013-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	109013-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109013-005	SW846 6020B
	Potassium	2.42	0.080	0.300	NE			109013-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U		109013-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109013-005	SW846 6020B
	Sodium	25.4	0.080	0.250	NE			109013-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109013-005	SW846 6020B
	Uranium	0.0033	0.000067	0.0002	0.030			109013-005	SW846 6020B
	Vanadium	0.00604	0.0033	0.020	NE	J		109013-005	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		109013-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-02	Aluminum	0.0271	0.0193	0.050	NE	J	J	108952-005	SW846 6020B
21-Aug-19	Antimony	ND	0.001	0.003	0.006	U	UJ	108952-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U	UJ	108952-005	SW846 6020B
	Barium	0.0532	0.00067	0.004	2.00		J	108952-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	108952-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	108952-005	SW846 6020B
	Calcium	66.7	0.800	2.00	NE		J	108952-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	108952-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	108952-005	SW846 6020B
	Copper	0.000503	0.0003	0.002	1.3	J	J	108952-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	108952-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	108952-005	SW846 6020B
	Magnesium	12.8	0.010	0.030	NE		J	108952-005	SW846 6020B
	Manganese	0.00151	0.001	0.005	NE	J	J	108952-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	108952-005	SW846 7470A
	Nickel	0.000804	0.0006	0.002	NE	B, J	0.002UJ	108952-005	SW846 6020B
	Potassium	2.28	0.080	0.300	NE		J	108952-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U	UJ	108952-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	108952-005	SW846 6020B
	Sodium	23.4	0.080	0.250	NE		J	108952-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	108952-005	SW846 6020B
	Uranium	0.00328	0.000067	0.0002	0.030		J	108952-005	SW846 6020B
	Vanadium	0.00603	0.0033	0.020	NE	J	J	108952-005	SW846 6020B
	Zinc	0.00771	0.0033	0.020	NE	B, J	0.02UJ	108952-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	UJ	108960-005	SW846 6020B
26-Aug-19	Antimony	ND	0.001	0.003	0.006	U	UJ	108960-005	SW846 6020B
	Arsenic	0.0021	0.002	0.005	0.010	J	0.005UJ	108960-005	SW846 6020B
	Barium	0.0715	0.00067	0.004	2.00		J	108960-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	N, U	UJ	108960-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	108960-005	SW846 6020B
	Calcium	64.8	0.800	2.00	NE		J	108960-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	108960-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	108960-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U	UJ	108960-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	108960-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	108960-005	SW846 6020B
	Magnesium	12.0	0.010	0.030	NE		J	108960-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	UJ	108960-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	108960-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U	UJ	108960-005	SW846 6020B
	Potassium	2.34	0.080	0.300	NE		J	108960-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U	UJ	108960-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	108960-005	SW846 6020B
	Sodium	25.7	0.080	0.250	NE		J	108960-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	108960-005	SW846 6020B
	Uranium	0.00329	0.000067	0.0002	0.030		J	108960-005	SW846 6020B
	Vanadium	0.00665	0.0033	0.020	NE	J	0.020UJ	108960-005	SW846 6020B
	Zinc	0.00401	0.0033	0.020	NE	J	0.020UJ	108960-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	UJ	108956-005	SW846 6020B
22-Aug-19	Antimony	ND	0.001	0.003	0.006	U	UJ	108956-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U	UJ	108956-005	SW846 6020B
	Barium	0.0382	0.00067	0.004	2.00		J	108956-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	108956-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	108956-005	SW846 6020B
	Calcium	83.1	0.800	2.00	NE		J	108956-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	108956-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	108956-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U	UJ	108956-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	108956-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	108956-005	SW846 6020B
	Magnesium	13.0	0.010	0.030	NE		J	108956-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	UJ	108956-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	108956-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U	UJ	108956-005	SW846 6020B
	Potassium	2.56	0.080	0.300	NE		J	108956-005	SW846 6020B
	Selenium	0.00202	0.002	0.005	0.050	J	J	108956-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	108956-005	SW846 6020B
	Sodium	34.8	0.080	0.250	NE		J	108956-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	108956-005	SW846 6020B
	Uranium	0.00346	0.000067	0.0002	0.030		J	108956-005	SW846 6020B
	Vanadium	0.00458	0.0033	0.020	NE	J	J	108956-005	SW846 6020B
	Zinc	0.00381	0.0033	0.020	NE	B, J	0.02UJ	108956-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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-06	Aluminum	ND	0.0193	0.050	NE	U		109021-005	SW846 6020B
17-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109021-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		109021-005	SW846 6020B
	Barium	0.0245	0.00067	0.004	2.00			109021-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109021-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109021-005	SW846 6020B
	Calcium	126	0.800	2.00	NE			109021-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109021-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109021-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		109021-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109021-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109021-005	SW846 6020B
	Magnesium	15.0	0.010	0.030	NE			109021-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109021-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		109021-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109021-005	SW846 6020B
	Potassium	2.04	0.080	0.300	NE			109021-005	SW846 6020B
	Selenium	0.00794	0.002	0.005	0.050			109021-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109021-005	SW846 6020B
	Sodium	27.0	0.080	0.250	NE			109021-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109021-005	SW846 6020B
	Uranium	0.00107	0.000067	0.0002	0.030			109021-005	SW846 6020B
	Vanadium	0.00383	0.0033	0.020	NE	B, J	0.020U	109021-005	SW846 6020B
	Zinc	0.00627	0.0033	0.020	NE	B, J	0.020U	109021-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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		109034-005	SW846 6020B
20-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109034-005	SW846 6020B
	Arsenic	0.00239	0.002	0.005	0.010	J		109034-005	SW846 6020B
	Barium	0.0186	0.00067	0.004	2.00			109034-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109034-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109034-005	SW846 6020B
	Calcium	290	0.800	2.00	NE			109034-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109034-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109034-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		109034-005	SW846 6020B
	Iron	0.0376	0.033	0.100	NE	J		109034-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109034-005	SW846 6020B
	Magnesium	38.4	0.010	0.030	NE			109034-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109034-005	SW846 6020B
	Mercury	0.000127	0.000067	0.0002	0.002	B, J	0.0002U	109034-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109034-005	SW846 6020B
	Potassium	3.14	0.080	0.300	NE			109034-005	SW846 6020B
	Selenium	0.0287	0.002	0.005	0.050			109034-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109034-005	SW846 6020B
	Sodium	67.5	0.800	2.50	NE			109034-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109034-005	SW846 6020B
	Uranium	0.00161	0.000067	0.0002	0.030			109034-005	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U		109034-005	SW846 6020B
	Zinc	0.0049	0.0033	0.020	NE	J		109034-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		109025-005	SW846 6020B
11-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109025-005	SW846 6020B
	Arsenic	0.00217	0.002	0.005	0.010	J		109025-005	SW846 6020B
	Barium	0.0416	0.00067	0.004	2.00			109025-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109025-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109025-005	SW846 6020B
	Calcium	94.2	0.400	1.00	NE			109025-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109025-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109025-005	SW846 6020B
	Copper	0.000462	0.0003	0.002	1.3	B, J	0.002U	109025-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109025-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109025-005	SW846 6020B
	Magnesium	15.3	0.010	0.030	NE			109025-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109025-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	109025-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109025-005	SW846 6020B
	Potassium	2.34	0.080	0.300	NE			109025-005	SW846 6020B
	Selenium	0.00648	0.002	0.005	0.050			109025-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109025-005	SW846 6020B
	Sodium	28.7	0.080	0.250	NE			109025-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109025-005	SW846 6020B
	Uranium	0.00211	0.000067	0.0002	0.030			109025-005	SW846 6020B
	Vanadium	0.00496	0.0033	0.020	NE	J		109025-005	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		109025-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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		109027-005	SW846 6020B
16-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109027-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		109027-005	SW846 6020B
	Barium	0.0639	0.00067	0.004	2.00			109027-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109027-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109027-005	SW846 6020B
	Calcium	84.5	0.800	2.00	NE			109027-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109027-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109027-005	SW846 6020B
	Copper	0.000315	0.0003	0.002	1.3	J		109027-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109027-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109027-005	SW846 6020B
	Magnesium	11.8	0.010	0.030	NE			109027-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109027-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		109027-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109027-005	SW846 6020B
	Potassium	1.88	0.080	0.300	NE			109027-005	SW846 6020B
	Selenium	0.00685	0.002	0.005	0.050			109027-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109027-005	SW846 6020B
	Sodium	20.0	0.080	0.250	NE			109027-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109027-005	SW846 6020B
	Uranium	0.00105	0.000067	0.0002	0.030			109027-005	SW846 6020B
	Vanadium	0.00477	0.0033	0.020	NE	B, J	0.020U	109027-005	SW846 6020B
	Zinc	0.0106	0.0033	0.020	NE	B, J	0.020U	109027-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	UJ	109000-005	SW846 6020B
22-Aug-19	Antimony	ND	0.001	0.003	0.006	U	UJ	109000-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U	UJ	109000-005	SW846 6020B
	Barium	0.0532	0.00067	0.004	2.00		J	109000-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	109000-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	109000-005	SW846 6020B
	Calcium	72.6	0.800	2.00	NE		J	109000-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	109000-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	109000-005	SW846 6020B
	Copper	0.0003	0.0003	0.002	1.3	J	J	109000-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	109000-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	109000-005	SW846 6020B
	Magnesium	12.3	0.010	0.030	NE		J	109000-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	UJ	109000-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	109000-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U	UJ	109000-005	SW846 6020B
	Potassium	2.01	0.080	0.300	NE		J	109000-005	SW846 6020B
	Selenium	0.00482	0.002	0.005	0.050	J	J	109000-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	109000-005	SW846 6020B
	Sodium	23.6	0.080	0.250	NE		J	109000-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	109000-005	SW846 6020B
	Uranium	0.00136	0.000067	0.0002	0.030		J	109000-005	SW846 6020B
	Vanadium	0.00632	0.0033	0.020	NE	J	J	109000-005	SW846 6020B
	Zinc	0.00428	0.0033	0.020	NE	B, J	0.02UJ	109000-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	0.0198	0.0193	0.050	NE	B, J	0.050U	108963-005	SW846 6020B
27-Aug-19	Antimony	ND	0.001	0.003	0.006	U		108963-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		108963-005	SW846 6020B
	Barium	0.0937	0.00067	0.004	2.00			108963-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108963-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108963-005	SW846 6020B
	Calcium	53.3	0.400	1.00	NE			108963-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108963-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108963-005	SW846 6020B
	Copper	0.000377	0.0003	0.002	1.3	J		108963-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108963-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108963-005	SW846 6020B
	Magnesium	10.6	0.010	0.030	NE			108963-005	SW846 6020B
	Manganese	0.00227	0.001	0.005	NE	J		108963-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108963-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108963-005	SW846 6020B
	Potassium	3.28	0.080	0.300	NE			108963-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U		108963-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108963-005	SW846 6020B
	Sodium	21.3	0.080	0.250	NE			108963-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108963-005	SW846 6020B
	Uranium	0.00284	0.000067	0.0002	0.030			108963-005	SW846 6020B
	Vanadium	0.00483	0.0033	0.020	NE	J		108963-005	SW846 6020B
	Zinc	0.00519	0.0033	0.020	NE	B, J	0.020U	108963-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		109017-005	SW846 6020B
13-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109017-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		109017-005	SW846 6020B
	Barium	0.0393	0.00067	0.004	2.00			109017-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109017-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109017-005	SW846 6020B
	Calcium	73.2	0.800	2.00	NE			109017-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109017-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109017-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		109017-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109017-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109017-005	SW846 6020B
	Magnesium	9.58	0.010	0.030	NE			109017-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109017-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		109017-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109017-005	SW846 6020B
	Potassium	1.69	0.080	0.300	NE			109017-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U		109017-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109017-005	SW846 6020B
	Sodium	23.1	0.080	0.250	NE			109017-005	SW846 6020B
	Thallium	0.000742	0.0006	0.002	0.002	J		109017-005	SW846 6020B
	Uranium	0.00245	0.000067	0.0002	0.030			109017-005	SW846 6020B
	Vanadium	0.00377	0.0033	0.020	NE	B, J	0.020U	109017-005	SW846 6020B
	Zinc	0.00715	0.0033	0.020	NE	B, J	0.020U	109017-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	UJ	108998-005	SW846 6020B
21-Aug-19	Antimony	ND	0.001	0.003	0.006	U	UJ	108998-005	SW846 6020B
	Arsenic	0.00254	0.002	0.005	0.010	J	J	108998-005	SW846 6020B
	Barium	0.0614	0.00067	0.004	2.00		J	108998-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	108998-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	108998-005	SW846 6020B
	Calcium	238	0.800	2.00	NE		J	108998-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	108998-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	108998-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U	UJ	108998-005	SW846 6020B
	Iron	0.0485	0.033	0.100	NE	J	J	108998-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	108998-005	SW846 6020B
	Magnesium	33.0	0.010	0.030	NE		J	108998-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	UJ	108998-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	108998-005	SW846 7470A
	Nickel	0.000631	0.0006	0.002	NE	B, J	0.002UJ	108998-005	SW846 6020B
	Potassium	2.87	0.080	0.300	NE		J	108998-005	SW846 6020B
	Selenium	0.0229	0.002	0.005	0.050		J	108998-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	108998-005	SW846 6020B
	Sodium	44.4	0.080	0.250	NE		J	108998-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	108998-005	SW846 6020B
	Uranium	0.00141	0.000067	0.0002	0.030		J	108998-005	SW846 6020B
	Vanadium	0.00409	0.0033	0.020	NE	J	J	108998-005	SW846 6020B
	Zinc	0.0043	0.0033	0.020	NE	B, J	0.02UJ	108998-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		109030-005	SW846 6020B
18-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109030-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		109030-005	SW846 6020B
	Barium	0.0564	0.00067	0.004	2.00			109030-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109030-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109030-005	SW846 6020B
	Calcium	119	0.800	2.00	NE			109030-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109030-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109030-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		109030-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109030-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109030-005	SW846 6020B
	Magnesium	14.8	0.010	0.030	NE			109030-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109030-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		109030-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109030-005	SW846 6020B
	Potassium	2.04	0.080	0.300	NE			109030-005	SW846 6020B
	Selenium	0.00775	0.002	0.005	0.050			109030-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109030-005	SW846 6020B
	Sodium	24.8	0.080	0.250	NE			109030-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109030-005	SW846 6020B
	Uranium	0.00113	0.000067	0.0002	0.030			109030-005	SW846 6020B
	Vanadium	0.00403	0.0033	0.020	NE	B, J	0.020U	109030-005	SW846 6020B
	Zinc	0.00566	0.0033	0.020	NE	B, J	0.020U	109030-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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-28	Aluminum	0.0212	0.0193	0.050	NE	J	J	109002-005	SW846 6020B
23-Aug-19	Antimony	ND	0.001	0.003	0.006	U	UJ	109002-005	SW846 6020B
	Arsenic	0.0022	0.002	0.005	0.010	J	J	109002-005	SW846 6020B
	Barium	0.191	0.00067	0.004	2.00		J	109002-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	N, U	UJ	109002-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	109002-005	SW846 6020B
	Calcium	58.6	0.800	2.00	NE		J	109002-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	109002-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	109002-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U	UJ	109002-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	109002-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	109002-005	SW846 6020B
	Magnesium	11.1	0.010	0.030	NE		J	109002-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	UJ	109002-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	109002-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U	UJ	109002-005	SW846 6020B
	Potassium	1.90	0.080	0.300	NE		J	109002-005	SW846 6020B
	Selenium	0.00294	0.002	0.005	0.050	J	J	109002-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	109002-005	SW846 6020B
	Sodium	18.5	0.080	0.250	NE		J	109002-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	109002-005	SW846 6020B
	Uranium	0.00141	0.000067	0.0002	0.030		J	109002-005	SW846 6020B
	Vanadium	0.00616	0.0033	0.020	NE	J	J	109002-005	SW846 6020B
	Zinc	0.00526	0.0033	0.020	NE	J	J	109002-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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]
TJA-2	Aluminum	ND	0.0193	0.050	NE	U	UJ	109004-005	SW846 6020B
26-Aug-19	Antimony	ND	0.001	0.003	0.006	U	UJ	109004-005	SW846 6020B
	Arsenic	0.0024	0.002	0.005	0.010	J	J	109004-005	SW846 6020B
	Barium	0.0486	0.00067	0.004	2.00		J	109004-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	N, U	UJ	109004-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	109004-005	SW846 6020B
	Calcium	77.0	0.800	2.00	NE		J	109004-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	109004-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	109004-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U	UJ	109004-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	109004-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	109004-005	SW846 6020B
	Magnesium	12.0	0.010	0.030	NE		J	109004-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	UJ	109004-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	UJ	109004-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U	UJ	109004-005	SW846 6020B
	Potassium	1.84	0.080	0.300	NE		J	109004-005	SW846 6020B
	Selenium	0.00448	0.002	0.005	0.050	J	J	109004-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	109004-005	SW846 6020B
	Sodium	23.0	0.080	0.250	NE		J	109004-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	109004-005	SW846 6020B
	Uranium	0.00126	0.000067	0.0002	0.030		J	109004-005	SW846 6020B
	Vanadium	0.00608	0.0033	0.020	NE	J	J	109004-005	SW846 6020B
	Zinc	0.00414	0.0033	0.020	NE	J	J	109004-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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]
TJA-3	Aluminum	ND	0.0193	0.050	NE	U		109015-005	SW846 6020B
12-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109015-005	SW846 6020B
	Arsenic	0.00214	0.002	0.005	0.010	J		109015-005	SW846 6020B
	Barium	0.0441	0.00067	0.004	2.00			109015-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109015-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109015-005	SW846 6020B
	Calcium	69.9	0.400	1.00	NE			109015-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109015-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109015-005	SW846 6020B
	Copper	0.000379	0.0003	0.002	1.3	B, J	0.002U	109015-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109015-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109015-005	SW846 6020B
	Magnesium	11.5	0.010	0.030	NE			109015-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109015-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	109015-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109015-005	SW846 6020B
	Potassium	1.95	0.080	0.300	NE			109015-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U		109015-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109015-005	SW846 6020B
	Sodium	24.8	0.080	0.250	NE			109015-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109015-005	SW846 6020B
	Uranium	0.00245	0.000067	0.0002	0.030			109015-005	SW846 6020B
	Vanadium	0.0056	0.0033	0.020	NE	J		109015-005	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		109015-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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]
TJA-4	Aluminum	ND	0.0193	0.050	NE	U		109037-005	SW846 6020B
19-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109037-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		109037-005	SW846 6020B
	Barium	0.178	0.00067	0.004	2.00			109037-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109037-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109037-005	SW846 6020B
	Calcium	69.5	0.800	2.00	NE			109037-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109037-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109037-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		109037-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109037-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109037-005	SW846 6020B
	Magnesium	12.6	0.010	0.030	NE			109037-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109037-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		109037-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109037-005	SW846 6020B
	Potassium	3.02	0.080	0.300	NE			109037-005	SW846 6020B
	Selenium	0.00322	0.002	0.005	0.050	J		109037-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109037-005	SW846 6020B
	Sodium	22.0	0.080	0.250	NE			109037-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109037-005	SW846 6020B
	Uranium	0.00274	0.000067	0.0002	0.030			109037-005	SW846 6020B
	Vanadium	0.00534	0.0033	0.020	NE	B, J	0.020U	109037-005	SW846 6020B
	Zinc	0.00694	0.0033	0.020	NE	B, J	0.020U	109037-005	SW846 6020B

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Table 6C-5 *(Continued)*
Summary of Target Analyte List 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]
TJA-5	Aluminum	0.0201	0.0193	0.050	NE	B, J	0.050U	109006-005	SW846 6020B
27-Aug-19	Antimony	ND	0.001	0.003	0.006	U		109006-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		109006-005	SW846 6020B
	Barium	0.0574	0.00067	0.004	2.00			109006-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109006-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109006-005	SW846 6020B
	Calcium	79.2	0.400	1.00	NE			109006-005	SW846 6020B
	Chromium	0.00357	0.003	0.010	0.100	J		109006-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109006-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		109006-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109006-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109006-005	SW846 6020B
	Magnesium	15.3	0.010	0.030	NE			109006-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109006-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		109006-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109006-005	SW846 6020B
	Potassium	1.87	0.080	0.300	NE			109006-005	SW846 6020B
	Selenium	0.00325	0.002	0.005	0.050	J		109006-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109006-005	SW846 6020B
	Sodium	21.9	0.080	0.250	NE			109006-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109006-005	SW846 6020B
	Uranium	0.00208	0.000067	0.0002	0.030			109006-005	SW846 6020B
	Vanadium	0.00507	0.0033	0.020	NE	J		109006-005	SW846 6020B
	Zinc	0.00731	0.0033	0.020	NE	B, J	0.020U	109006-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	0.0476	0.0193	0.050	NE	J		109011-005	SW846 6020B
09-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109011-005	SW846 6020B
	Arsenic	0.00218	0.002	0.005	0.010	J		109011-005	SW846 6020B
	Barium	0.067	0.00067	0.004	2.00			109011-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109011-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109011-005	SW846 6020B
	Calcium	64.0	0.400	1.00	NE			109011-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109011-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		109011-005	SW846 6020B
	Copper	0.00107	0.0003	0.002	1.3	B, J	0.002U	109011-005	SW846 6020B
	Iron	0.0401	0.033	0.100	NE	J		109011-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109011-005	SW846 6020B
	Magnesium	11.5	0.010	0.030	NE			109011-005	SW846 6020B
	Manganese	0.00137	0.001	0.005	NE	J		109011-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002UJ	109011-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109011-005	SW846 6020B
	Potassium	2.27	0.080	0.300	NE			109011-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U		109011-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109011-005	SW846 6020B
	Sodium	22.5	0.080	0.250	NE			109011-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109011-005	SW846 6020B
	Uranium	0.00297	0.000067	0.0002	0.030			109011-005	SW846 6020B
	Vanadium	0.0069	0.0033	0.020	NE	J		109011-005	SW846 6020B
	Zinc	0.00363	0.0033	0.020	NE	J		109011-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Continued)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		109008-005	SW846 6020B
17-Sep-19	Antimony	ND	0.001	0.003	0.006	U		109008-005	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U		109008-005	SW846 6020B
	Barium	0.221	0.00067	0.004	2.00			109008-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		109008-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		109008-005	SW846 6020B
	Calcium	65.8	0.800	2.00	NE			109008-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		109008-005	SW846 6020B
	Cobalt	0.00103	0.0003	0.001	NE			109008-005	SW846 6020B
	Copper	0.000322	0.0003	0.002	1.3	J		109008-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		109008-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		109008-005	SW846 6020B
	Magnesium	11.6	0.010	0.030	NE			109008-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		109008-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		109008-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		109008-005	SW846 6020B
	Potassium	1.95	0.080	0.300	NE			109008-005	SW846 6020B
	Selenium	0.0047	0.002	0.005	0.050	J		109008-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		109008-005	SW846 6020B
	Sodium	16.9	0.080	0.250	NE			109008-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		109008-005	SW846 6020B
	Uranium	0.00172	0.000067	0.0002	0.030			109008-005	SW846 6020B
	Vanadium	0.00576	0.0033	0.020	NE	B, J	0.020U	109008-005	SW846 6020B
	Zinc	0.0149	0.0033	0.020	NE	B, J	0.020U	109008-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-5 *(Concluded)*
Summary of Target Analyte List Metals plus Uranium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	0.0194	0.0193	0.050	NE	B, J	0.050U	108971-005	SW846 6020B
28-Aug-19	Antimony	ND	0.001	0.003	0.006	U		108971-005	SW846 6020B
	Arsenic	0.00216	0.002	0.005	0.010	J		108971-005	SW846 6020B
	Barium	0.058	0.00067	0.004	2.00			108971-005	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108971-005	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108971-005	SW846 6020B
	Calcium	65.0	0.400	1.00	NE			108971-005	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108971-005	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108971-005	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		108971-005	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108971-005	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108971-005	SW846 6020B
	Magnesium	13.2	0.010	0.030	NE			108971-005	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108971-005	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108971-005	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108971-005	SW846 6020B
	Potassium	2.27	0.080	0.300	NE			108971-005	SW846 6020B
	Selenium	ND	0.002	0.005	0.050	U		108971-005	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108971-005	SW846 6020B
	Sodium	25.2	0.080	0.250	NE			108971-005	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108971-005	SW846 6020B
	Uranium	0.00357	0.000067	0.0002	0.030			108971-005	SW846 6020B
	Vanadium	0.00631	0.0033	0.020	NE	J		108971-005	SW846 6020B
	Zinc	0.00519	0.0033	0.020	NE	B, J	0.020U	108971-005	SW846 6020B

Refer to footnotes on page 6C-45.

Table 6C-6
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-01	Americium-241	6.53 ± 10.4	16.0	7.77	NE	U	BD	109013-006	EPA 901.1
10-Sep-19	Cesium-137	2.33 ± 2.56	3.54	1.68	NE	U	BD	109013-006	EPA 901.1
	Cobalt-60	-0.52 ± 2.10	3.65	1.69	NE	U	BD	109013-006	EPA 901.1
	Potassium-40	-12.4 ± 36.2	48.3	22.8	NE	U	BD	109013-006	EPA 901.1
	Gross Alpha	0.80	NA	NA	15 pCi/L	NA	None	109013-007	EPA 900.0
	Gross Beta	2.29 ± 0.783	1.20	0.582	4 mrem/yr		J	109013-007	EPA 900.0
	Tritium	-15.5 ± 82.2	155	70.3	NE	U	BD	109013-008	EPA 906.0 M
TA1-W-02	Americium-241	16.2 ± 16.6	15.3	7.43	NE	X	R	108952-006	EPA 901.1
21-Aug-19	Cesium-137	-1.66 ± 2.20	3.31	1.57	NE	U	BD	108952-006	EPA 901.1
	Cobalt-60	2.70 ± 2.41	4.10	1.92	NE	U	BD	108952-006	EPA 901.1
	Potassium-40	2.74 ± 48.2	38.2	17.7	NE	U	BD	108952-006	EPA 901.1
	Gross Alpha	-0.13	NA	NA	15 pCi/L	NA	None	108952-007	EPA 900.0
	Gross Beta	6.33 ± 0.664	0.732	0.350	4 mrem/yr		J	108952-007	EPA 900.0
	Tritium	8.48 ± 78.2	140	65.0	NE	U	BD	108952-008	EPA 906.0 M
TA1-W-04	Americium-241	2.78 ± 9.24	14.9	7.21	NE	U	BD	108960-006	EPA 901.1
26-Aug-19	Cesium-137	-1.6 ± 2.83	3.15	1.48	NE	U	BD	108960-006	EPA 901.1
	Cobalt-60	-2.58 ± 2.55	3.06	1.38	NE	U	BD	108960-006	EPA 901.1
	Potassium-40	18.5 ± 59.5	39.4	18.2	NE	U	BD	108960-006	EPA 901.1
	Gross Alpha	2.44	NA	NA	15 pCi/L	NA	None	108960-007	EPA 900.0
	Gross Beta	2.31 ± 0.659	0.968	0.462	4 mrem/yr		J	108960-007	EPA 900.0
	Tritium	-11.3 ± 70.0	128	59.5	NE	U	BD	108960-008	EPA 906.0 M
TA1-W-05	Americium-241	-1.47 ± 10.1	16.0	7.80	NE	U	BD	108956-006	EPA 901.1
22-Aug-19	Cesium-137	-0.256 ± 1.92	3.00	1.43	NE	U	BD	108956-006	EPA 901.1
	Cobalt-60	0.694 ± 1.81	3.42	1.59	NE	U	BD	108956-006	EPA 901.1
	Potassium-40	36.8 ± 49.1	29.0	13.3	NE	X	R	108956-006	EPA 901.1
	Gross Alpha	0.49	NA	NA	15 pCi/L	NA	None	108956-007	EPA 900.0
	Gross Beta	2.78 ± 0.963	1.51	0.733	4 mrem/yr		J	108956-007	EPA 900.0
	Tritium	31.2 ± 76.1	132	61.6	NE	U	BD	108956-008	EPA 906.0 M
TA1-W-06	Americium-241	11.6 ± 15.1	26.1	12.6	NE	U	BD	109021-006	EPA 901.1
17-Sep-19	Cesium-137	-1.52 ± 2.10	3.20	1.50	NE	U	BD	109021-006	EPA 901.1
	Cobalt-60	-0.739 ± 2.11	3.66	1.68	NE	U	BD	109021-006	EPA 901.1
	Potassium-40	-38.5 ± 47.4	40.3	18.7	NE	U	BD	109021-006	EPA 901.1
	Gross Alpha	-0.29	NA	NA	15 pCi/L	NA	None	109021-007	EPA 900.0
	Gross Beta	3.02 ± 1.38	2.22	1.08	4 mrem/yr		J	109021-007	EPA 900.0
	Tritium	62.9 ± 90.5	154	69.8	NE	U	BD	109021-008	EPA 906.0 M

Refer to footnotes on page 6C-45.

Table 6C-6 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-08	Americium-241	3.39 ± 9.87	15.4	7.47	NE	U	BD	109034-006	EPA 901.1
20-Sep-19	Cesium-137	1.88 ± 2.26	3.76	1.79	NE	U	BD	109034-006	EPA 901.1
	Cobalt-60	-0.438 ± 1.95	3.41	1.57	NE	U	BD	109034-006	EPA 901.1
	Potassium-40	-15.4 ± 36.7	49.7	23.5	NE	U	BD	109034-006	EPA 901.1
	Gross Alpha	3.87	NA	NA	15 pCi/L	NA	None	109034-007	EPA 900.0
	Gross Beta	5.33 ± 2.67	4.32	2.10	4 mrem/yr	*	J	109034-007	EPA 900.0
	Tritium	14.6 ± 64.2	114	52.8	NE	U	BD	109034-008	EPA 906.0 M
TA2-NW1-595	Americium-241	-1.01 ± 5.58	8.78	4.26	NE	U	BD	109025-006	EPA 901.1
11-Sep-19	Cesium-137	1.42 ± 2.13	3.28	1.56	NE	U	BD	109025-006	EPA 901.1
	Cobalt-60	0.467 ± 1.82	3.31	1.54	NE	U	BD	109025-006	EPA 901.1
	Potassium-40	-25.1 ± 37.5	46.9	22.3	NE	U	BD	109025-006	EPA 901.1
	Gross Alpha	-0.30	NA	NA	15 pCi/L	NA	None	109025-007	EPA 900.0
	Gross Beta	2.27 ± 0.976	1.56	0.756	4 mrem/yr		J	109025-007	EPA 900.0
	Tritium	-18.4 ± 79.7	151	68.6	NE	U	BD	109025-008	EPA 906.0 M
TA2-W-01	Americium-241	3.90 ± 8.12	14.0	6.77	NE	U	BD	109027-006	EPA 901.1
16-Sep-19	Cesium-137	1.23 ± 1.90	3.36	1.58	NE	U	BD	109027-006	EPA 901.1
	Cobalt-60	1.68 ± 2.13	3.95	1.83	NE	U	BD	109027-006	EPA 901.1
	Potassium-40	31.7 ± 52.5	30.2	13.6	NE	X	R	109027-006	EPA 901.1
	Gross Alpha	-0.71	NA	NA	15 pCi/L	NA	None	109027-007	EPA 900.0
	Gross Beta	2.27 ± 1.12	1.81	0.885	4 mrem/yr		J	109027-007	EPA 900.0
	Tritium	57.8 ± 95.4	164	74.6	NE	U	BD	109027-008	EPA 906.0 M
TA2-W-19	Americium-241	-1.85 ± 7.77	12.4	6.02	NE	U	BD	109000-006	EPA 901.1
22-Aug-19	Cesium-137	0.816 ± 1.81	2.93	1.39	NE	U	BD	109000-006	EPA 901.1
	Cobalt-60	-0.521 ± 1.74	3.12	1.44	NE	U	BD	109000-006	EPA 901.1
	Potassium-40	32.7 ± 41.4	31.6	14.6	NE	U	R	109000-006	EPA 901.1
	Gross Alpha	1.87	NA	NA	15 pCi/L	NA	None	109000-007	EPA 900.0
	Gross Beta	3.58 ± 1.17	1.81	0.882	4 mrem/yr		J	109000-007	EPA 900.0
	Tritium	-7.37 ± 75.1	137	63.5	NE	U	BD	109000-008	EPA 906.0 M
TA2-W-24	Americium-241	0.791 ± 9.78	16.0	7.73	NE	U	BD	108963-006	EPA 901.1
27-Aug-19	Cesium-137	1.73 ± 2.22	3.44	1.63	NE	U	BD	108963-006	EPA 901.1
	Cobalt-60	-0.738 ± 1.70	2.89	1.31	NE	U	BD	108963-006	EPA 901.1
	Potassium-40	37.1 ± 81.1	33.7	15.5	NE	X	R	108963-006	EPA 901.1
	Gross Alpha	1.86	NA	NA	15 pCi/L	NA	None	108963-007	EPA 900.0
	Gross Beta	3.28 ± 0.706	1.00	0.482	4 mrem/yr		J	108963-007	EPA 900.0
	Tritium	13.3 ± 79.1	141	65.4	NE	U	BD	108963-008	EPA 906.0 M

Refer to footnotes on page 6C-45.

Table 6C-6 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-25	Americium-241	27.9 ± 22.9	30.3	14.8	NE	U	BD	109017-006	EPA 901.1
13-Sep-19	Cesium-137	-0.272 ± 1.91	3.39	1.62	NE	U	BD	109017-006	EPA 901.1
	Cobalt-60	2.03 ± 2.42	4.17	1.96	NE	U	BD	109017-006	EPA 901.1
	Potassium-40	-33.8 ± 51.2	57.7	27.6	NE	U	BD	109017-006	EPA 901.1
	Gross Alpha	2.91	NA	NA	15 pCi/L	NA	None	109017-007	EPA 900.0
	Gross Beta	2.07 ± 0.711	1.11	0.538	4 mrem/yr		J	109017-007	EPA 900.0
	Tritium	44.5 ± 93.7	163	74.5	NE	U	BD	109017-008	EPA 906.0 M
TA2-W-26	Americium-241	5.93 ± 4.84	6.97	3.40	NE	U	BD	108998-006	EPA 901.1
21-Aug-19	Cesium-137	-0.555 ± 3.10	4.60	2.18	NE	U	BD	108998-006	EPA 901.1
	Cobalt-60	-0.342 ± 2.62	4.67	2.14	NE	U	BD	108998-006	EPA 901.1
	Potassium-40	9.25 ± 53.0	75.3	35.7	NE	U	BD	108998-006	EPA 901.1
	Gross Alpha	0.53	NA	NA	15 pCi/L	NA	None	108998-007	EPA 900.0
	Gross Beta	3.20 ± 1.43	2.25	1.08	4 mrem/yr		J	108998-007	EPA 900.0
	Tritium	10.5 ± 77.0	137	63.9	NE	U	BD	108998-008	EPA 906.0 M
TA2-W-27	Americium-241	17.8 ± 17.7	17.0	8.20	NE	X	R	109030-006	EPA 901.1
18-Sep-19	Cesium-137	1.95 ± 2.20	2.66	1.24	NE	U	BD	109030-006	EPA 901.1
	Cobalt-60	1.06 ± 1.71	3.30	1.50	NE	U	BD	109030-006	EPA 901.1
	Potassium-40	-14.9 ± 39.3	47.6	22.3	NE	U	BD	109030-006	EPA 901.1
	Gross Alpha	-0.77	NA	NA	15 pCi/L	NA	None	109030-007	EPA 900.0
	Gross Beta	2.97 ± 1.36	2.20	1.07	4 mrem/yr		J	109030-007	EPA 900.0
	Tritium	33.6 ± 89.8	159	72.3	NE	U	BD	109030-008	EPA 906.0 M
TA2-W-28	Americium-241	8.08 ± 13.0	22.0	10.7	NE	U	BD	109002-006	EPA 901.1
23-Aug-19	Cesium-137	0.171 ± 2.01	3.69	1.74	NE	U	BD	109002-006	EPA 901.1
	Cobalt-60	0.516 ± 2.37	4.27	1.97	NE	U	BD	109002-006	EPA 901.1
	Potassium-40	0.555 ± 60.1	36.0	16.4	NE	U	BD	109002-006	EPA 901.1
	Gross Alpha	0.90	NA	NA	15 pCi/L	NA	None	109002-007	EPA 900.0
	Gross Beta	2.36 ± 0.606	0.870	0.416	4 mrem/yr		J	109002-007	EPA 900.0
	Tritium	16.0 ± 69.0	122	56.8	NE	U	BD	109002-008	EPA 906.0 M
TJA-2	Americium-241	3.11 ± 6.94	11.8	5.70	NE	U	BD	109004-006	EPA 901.1
26-Aug-19	Cesium-137	-2.4 ± 3.72	4.27	2.05	NE	U	BD	109004-006	EPA 901.1
	Cobalt-60	-0.00384 ± 1.94	3.57	1.65	NE	U	BD	109004-006	EPA 901.1
	Potassium-40	41.7 ± 47.7	35.2	16.3	NE	X	R	109004-006	EPA 901.1
	Gross Alpha	0.29	NA	NA	15 pCi/L	NA	None	109004-007	EPA 900.0
	Gross Beta	2.27 ± 0.665	0.976	0.466	4 mrem/yr		J	109004-007	EPA 900.0
	Tritium	3.76 ± 74.0	133	61.8	NE	U	BD	109004-008	EPA 906.0 M

Refer to footnotes on page 6C-45.

Table 6C-6 *(Continued)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-3	Americium-241	-1.67 ± 5.19	8.32	4.04	NE	U	BD	109015-006	EPA 901.1
12-Sep-19	Cesium-137	0.186 ± 1.75	2.99	1.42	NE	U	BD	109015-006	EPA 901.1
	Cobalt-60	-0.771 ± 1.90	3.14	1.46	NE	U	BD	109015-006	EPA 901.1
	Potassium-40	-35.2 ± 39.6	45.2	21.5	NE	U	BD	109015-006	EPA 901.1
	Gross Alpha	1.24	NA	NA	15 pCi/L	NA	None	109015-007	EPA 900.0
	Gross Beta	3.09 ± 0.801	1.22	0.590	4 mrem/yr		J	109015-007	EPA 900.0
	Tritium	-16.4 ± 78.8	149	67.6	NE	U	BD	109015-008	EPA 906.0 M
TJA-4	Americium-241	10.5 ± 6.33	15.5	7.51	NE	U	BD	109037-006	EPA 901.1
19-Sep-19	Cesium-137	0.533 ± 2.06	3.54	1.69	NE	U	BD	109037-006	EPA 901.1
	Cobalt-60	0.543 ± 2.03	3.32	1.52	NE	U	BD	109037-006	EPA 901.1
	Potassium-40	14.3 ± 61.8	31.7	14.5	NE	U	BD	109037-006	EPA 901.1
	Gross Alpha	3.08	NA	NA	15 pCi/L	NA	None	109037-007	EPA 900.0
	Gross Beta	3.03 ± 0.948	1.48	0.717	4 mrem/yr		J	109037-007	EPA 900.0
	Tritium	-35 ± 80.0	154	70.3	NE	U	BD	109037-008	EPA 906.0 M
TJA-5	Americium-241	3.29 ± 4.23	6.27	3.05	NE	U	BD	109006-006	EPA 901.1
27-Aug-19	Cesium-137	1.86 ± 2.92	4.97	2.36	NE	U	BD	109006-006	EPA 901.1
	Cobalt-60	-1.02 ± 2.65	4.54	2.07	NE	U	BD	109006-006	EPA 901.1
	Potassium-40	13.1 ± 55.9	48.1	22.0	NE	U	BD	109006-006	EPA 901.1
	Gross Alpha	2.13	NA	NA	15 pCi/L	NA	None	109006-007	EPA 900.0
	Gross Beta	1.95 ± 0.591	0.845	0.400	4 mrem/yr		J	109006-007	EPA 900.0
	Tritium	-26.6 ± 73.4	137	63.5	NE	U	BD	109006-008	EPA 906.0 M
TJA-6	Americium-241	5.28 ± 10.4	17.3	8.32	NE	U	BD	109011-006	EPA 901.1
09-Sep-19	Cesium-137	0.0133 ± 1.97	3.45	1.62	NE	U	BD	109011-006	EPA 901.1
	Cobalt-60	0.0766 ± 2.22	3.59	1.63	NE	U	BD	109011-006	EPA 901.1
	Potassium-40	-21.6 ± 39.6	48.4	22.5	NE	U	BD	109011-006	EPA 901.1
	Gross Alpha	0.34	NA	NA	15 pCi/L	NA	None	109011-007	EPA 900.0
	Gross Beta	1.54 ± 0.963	1.59	0.778	4 mrem/yr	U	BD	109011-007	EPA 900.0
	Tritium	22.9 ± 84.4	151	68.7	NE	U	BD	109011-008	EPA 906.0 M

Refer to footnotes on page 6C-45.

Table 6C-6 *(Concluded)*
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, and Tritium Results, Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	3.59 ± 6.38	10.8	5.21	NE	U	BD	109008-006	EPA 901.1
17-Sep-19	Cesium-137	2.80 ± 3.84	2.95	1.39	NE	U	BD	109008-006	EPA 901.1
	Cobalt-60	-0.559 ± 1.71	3.04	1.38	NE	U	BD	109008-006	EPA 901.1
	Potassium-40	34.4 ± 41.0	28.8	13.1	NE	X	R	109008-006	EPA 901.1
	Gross Alpha	-0.22	NA	NA	15 pCi/L	NA	None	109008-007	EPA 900.0
	Gross Beta	2.98 ± 0.777	1.19	0.581	4 mrem/yr		J	109008-007	EPA 900.0
	Tritium	-37.8 ± 81.3	157	71.7	NE	U	BD	109008-008	EPA 906.0 M
WYO-3	Americium-241	-1.33 ± 10.2	15.7	7.60	NE	U	BD	108971-006	EPA 901.1
28-Aug-19	Cesium-137	-0.546 ± 2.09	3.47	1.65	NE	U	BD	108971-006	EPA 901.1
	Cobalt-60	-0.012 ± 2.07	3.70	1.72	NE	U	BD	108971-006	EPA 901.1
	Potassium-40	-11 ± 38.4	51.4	24.3	NE	U	BD	108971-006	EPA 901.1
	Gross Alpha	4.13	NA	NA	15 pCi/L	NA	None	108971-007	EPA 900.0
	Gross Beta	3.24 ± 0.683	0.923	0.439	4 mrem/yr		J	108971-007	EPA 900.0
	Tritium	-24.1 ± 71.8	133	61.9	NE	U	BD	108971-008	EPA 906.0 M

Refer to footnotes on page 6C-45.

Table 6C-7
Summary of Field Water Quality Measurements[h], Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

Well ID	Sample Date	Temperature (^0C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
TA1-W-06	15-Feb-19	18.39	830.0	192.7	7.54	1.55	84.6	7.07
TA2-W-01	19-Feb-19	14.10	556.1	265.9	7.64	1.63	83.8	7.19
TA2-W-19	27-Feb-19	17.59	526.0	175.9	7.65	0.74	98.6	7.93
TA2-W-26	20-Feb-19	14.22	1246.5	220.3	7.40	1.60	84.6	7.60
TA2-W-27	18-Feb-19	16.76	738.3	226.3	7.54	0.68	87.7	7.38
TA2-W-28	28-Feb-19	19.84	477.3	192.3	7.64	1.52	102.0	8.01
TJA-2	21-Feb-19	15.84	514.8	258.7	7.56	0.43	88.3	7.67
TJA-3	14-Feb-19	18.40	497.8	173.4	7.46	0.38	73.3	6.23
TJA-4	04-Mar-19	18.21	524.9	43.5	7.53	0.58	77.2	6.24
TJA-6	13-Feb-19	18.14	447.9	143.7	7.51	1.88	71.5	5.83
TJA-7	01-Mar-19	18.48	486.3	190.0	7.63	1.64	101.1	8.09
TA2-W-19	14-Jun-19	20.92	536.67	56.1	7.56	1.08	96.07	7.55
TA2-W-26	13-Jun-19	22.55	1489.7	20.7	7.39	1.92	87.83	7.09
TA2-W-28	17-Jun-19	20.26	467.83	32.7	7.58	1.88	88.15	7.23
TJA-2	18-Jun-19	18.55	541.51	2.2	7.60	0.93	83.34	7.09
TJA-3	12-Jun-19	21.44	489.58	45.6	7.40	0.41	70.41	5.68
TJA-4	20-Jun-19	20.46	566.52	5.6	7.54	0.80	59.87	4.99
TJA-7	19-Jun-19	19.71	493.72	95.1	7.49	2.46	88.44	7.50
TA1-W-01	10-Sep-19	21.46	523.3	150.3	7.40	0.97	64.8	4.86
TA1-W-02	21-Aug-19	22.40	491.5	165.0	7.43	1.51	54.4	4.00
TA1-W-04	26-Aug-19	20.64	462.9	168.9	7.45	0.96	54.2	4.11
TA1-W-05	22-Aug-19	21.07	550.4	194.7	7.31	1.31	77.1	5.88
TA1-W-06	17-Sep-19	19.35	821.9	176.6	7.55	0.72	84.7	6.58
TA1-W-08	20-Sep-19	19.37	1848.9	148.3	7.43	0.31	84.9	6.56
TA2-NW1-595	11-Sep-19	20.70	711.1	119.4	7.37	0.67	91.9	6.91
TA2-W-01	16-Sep-19	19.11	597.8	155.9	7.62	0.30	83.9	6.46
TA2-W-19	22-Aug-19	19.54	590.4	16.5	7.61	0.23	94.5	7.35
TA2-W-24	27-Aug-19	21.61	432.1	161.1	7.51	1.15	41.9	3.12
TA2-W-25	13-Sep-19	21.11	496.8	150.1	7.45	0.51	97.5	7.40
TA2-W-26	21-Aug-19	21.32	1364.7	19.1	7.32	1.26	90.3	6.73

Refer to footnotes on page 6C-45.

Table 6C-7 *(Concluded)*
Summary of Field Water Quality Measurements[h], Tijeras Arroyo Groundwater, Sandia National Laboratories, New Mexico

Calendar Year 2019

Well ID	Sample Date	Temperature (^0C)	Specific Conductivity (μmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
TA2-W-27	18-Sep-19	21.12	796.7	166.0	7.55	0.53	89.4	6.71
TA2-W-28	23-Aug-19	20.02	457.4	31.6	7.62	1.27	91.7	7.12
TJA-2	26-Aug-19	20.59	550.1	36.0	7.60	0.23	97.4	7.47
TJA-3	12-Sep-19	21.99	539.9	166.6	7.45	0.12	74.4	5.54
TJA-4	19-Sep-19	19.80	539.4	130.1	7.56	0.97	59.2	4.61
TJA-5	27-Aug-19	20.53	514.0	17.9	7.60	0.77	87.6	6.73
TJA-6	09-Sep-19	21.89	469.2	160.5	7.54	1.85	73.8	5.46
TJA-7	17-Sep-19	19.39	500.3	123.5	7.61	0.44	93.1	7.24
WYO-3	28-Aug-19	23.13	520.0	175.6	7.59	0.49	77.1	5.59
TA2-W-19	26-Nov-19	15.61	489.7	92.4	7.67	0.27	107.3	9.25
TA2-W-26	25-Nov-19	18.46	1334.3	75.0	7.48	4.88	99.0	8.08
TA2-W-28	11-Dec-19	17.42	449.7	124.5	7.72	1.94	93.1	7.72
TJA-2	10-Dec-19	16.98	532.1	109.7	7.69	0.41	100.5	8.14
TJA-3	22-Nov-19	18.68	472.2	104.5	7.47	0.18	91.6	7.43
TJA-4	13-Dec-19	18.35	536.8	166.5	7.48	0.93	71.5	5.97
TJA-7	12-Dec-19	18.54	482.0	122.4	7.68	1.23	99.0	8.14

Refer to footnotes on page 6C-45.

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 March 2018).
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]Laboratory 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.
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
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, published jointly by American Public Health Association, American Water Works Association, and Water Environment Federation. Washington, D.C..

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EPA	= U.S. Environmental Protection Agency.
SM	= Standard Method.
SW	= Solid Waste.

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

˚C	= Degrees Celsius.
% Sat	= Percent saturation.
µmho/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 6D
Tijeras Arroyo Groundwater
Plots

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Attachment 6D Plots

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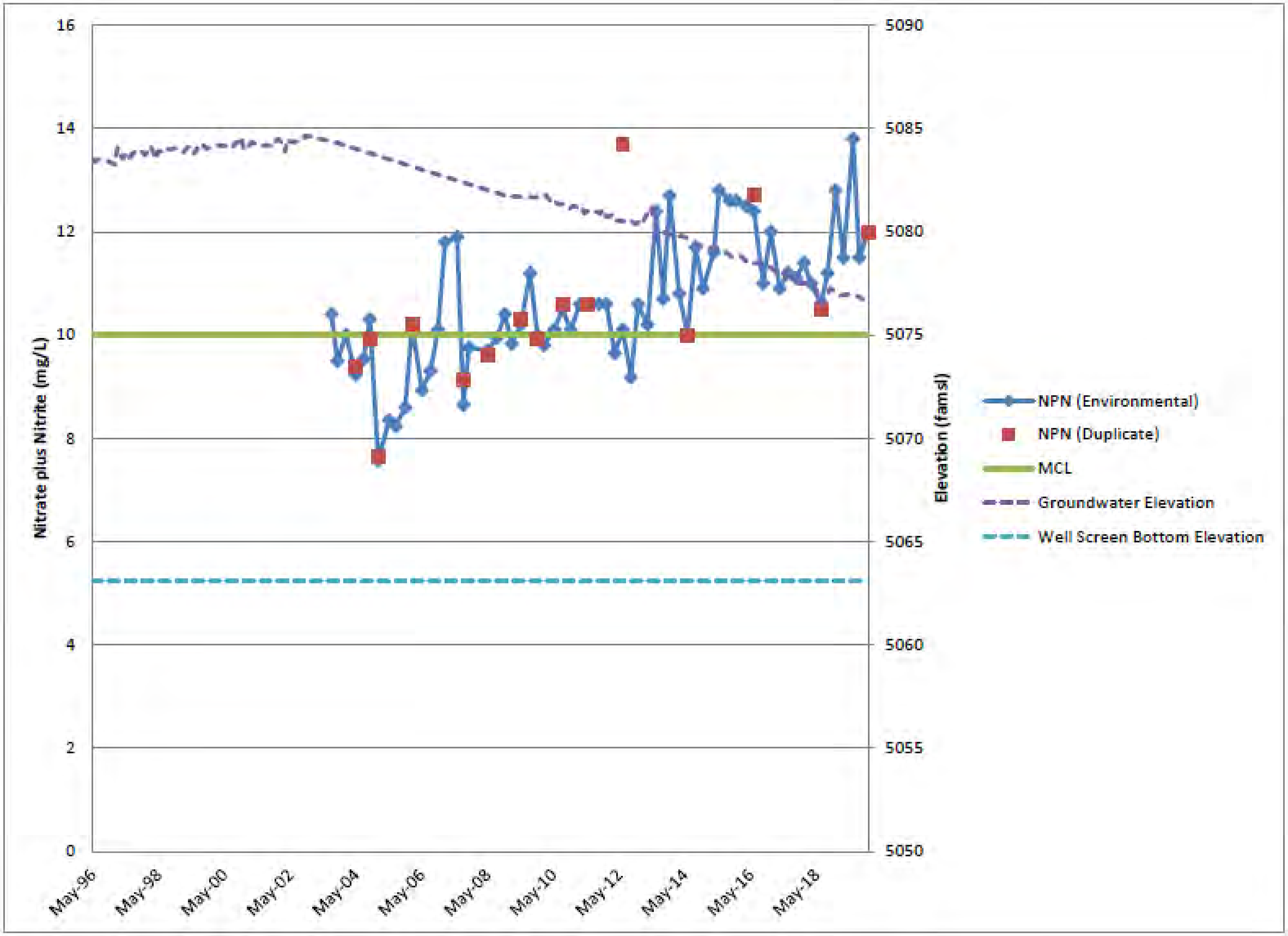

Figure 6D-1. Nitrate plus Nitrite Concentrations, TA2-W-19

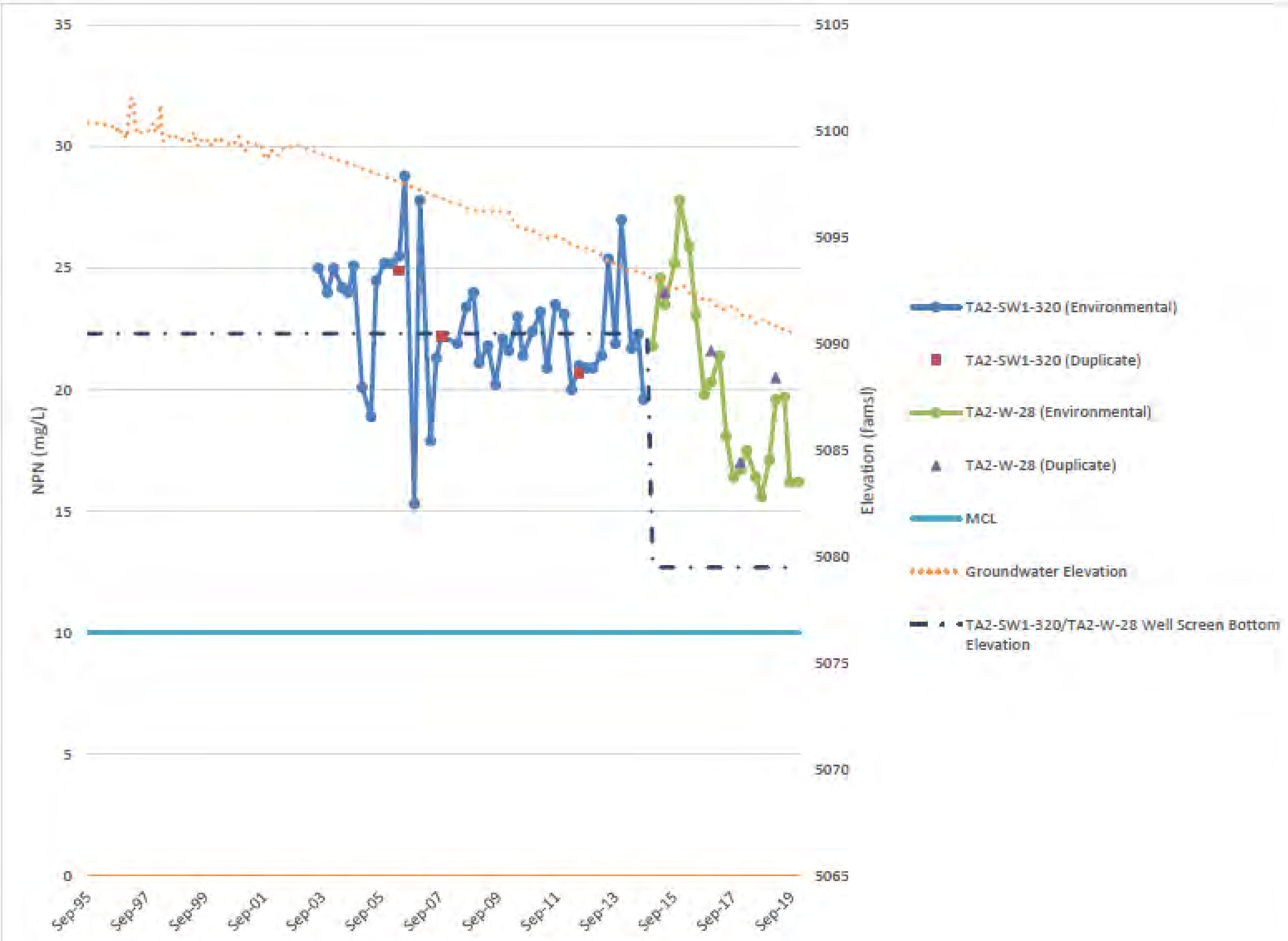

Figure 6D-2. Nitrate plus Nitrite Concentrations, TA2-W-28 and TA2-SW1-320

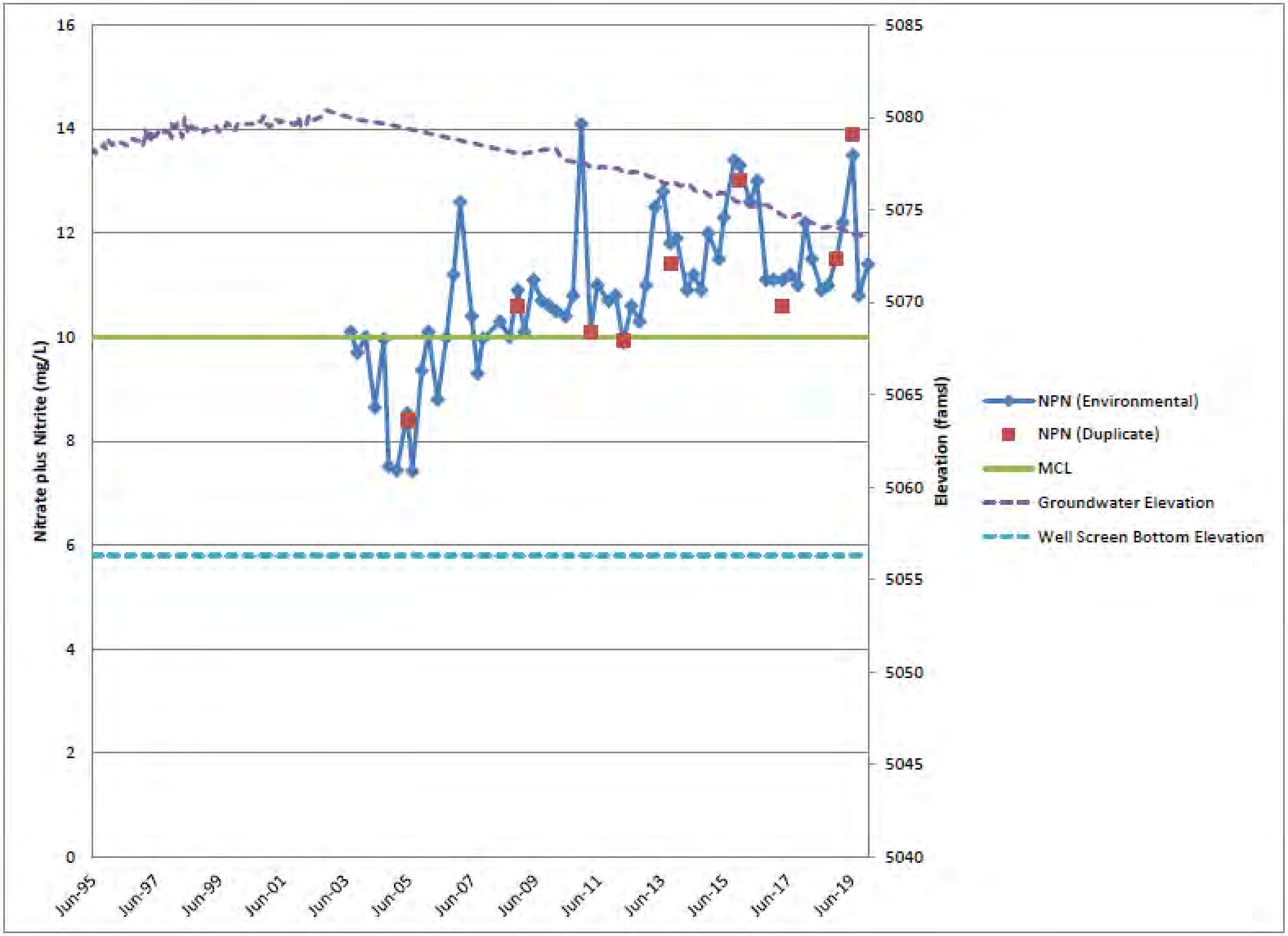

Figure 6D-3. Nitrate plus Nitrite Concentrations, TJA-2

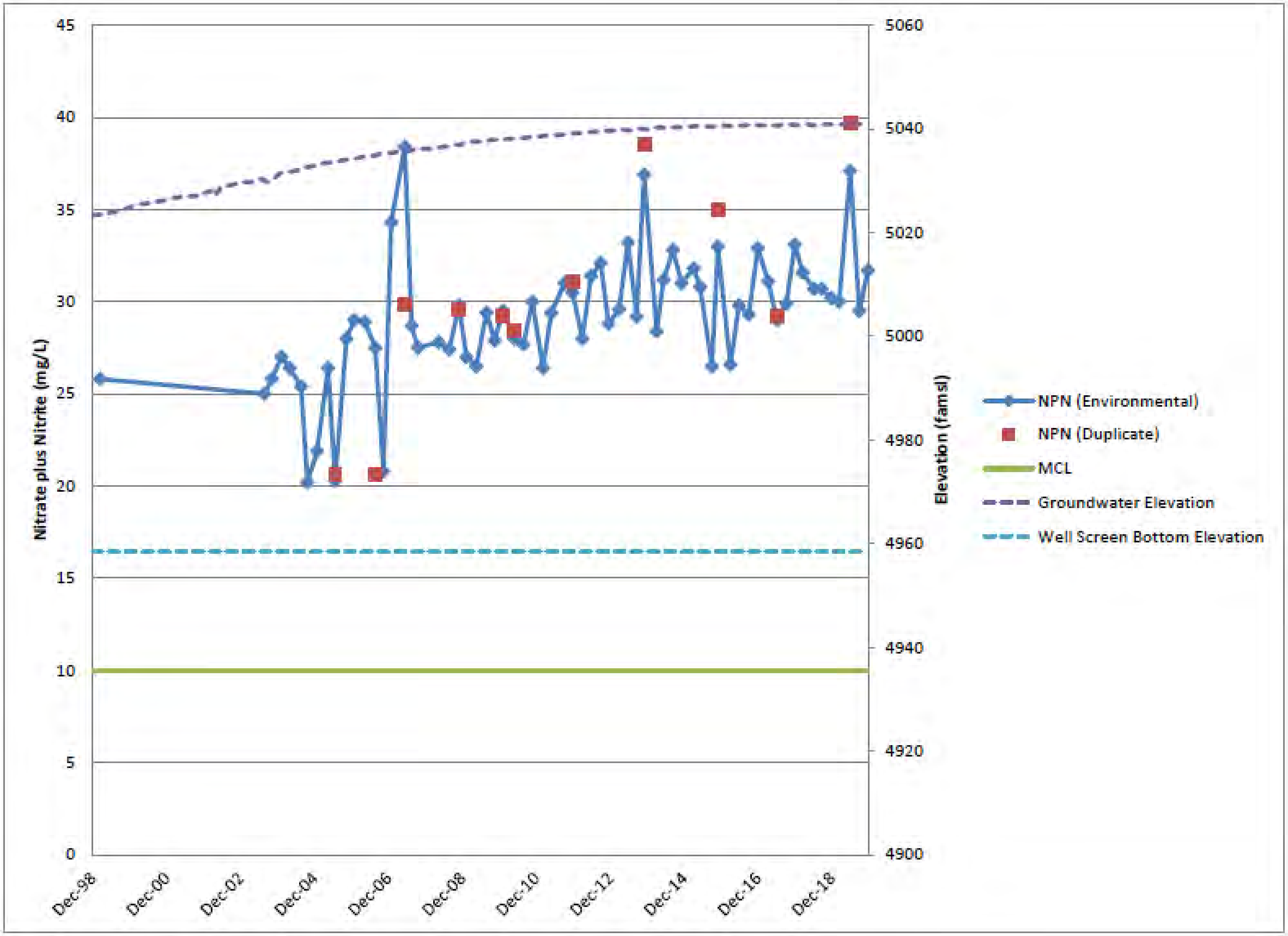

Figure 6D-4. Nitrate plus Nitrite Concentrations, TJA-4

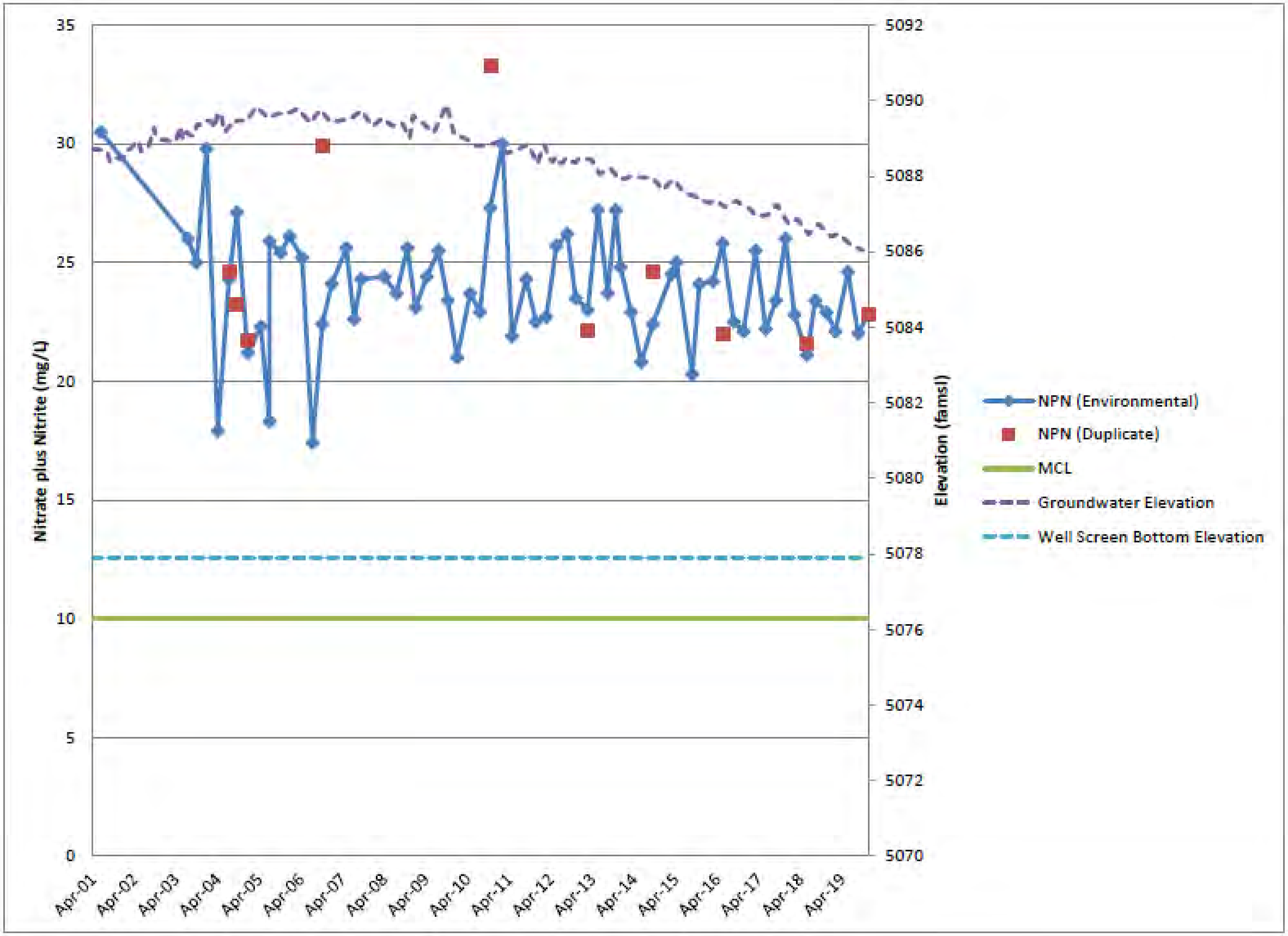

Figure 6D-5. Nitrate plus Nitrite Concentrations, TJA-7

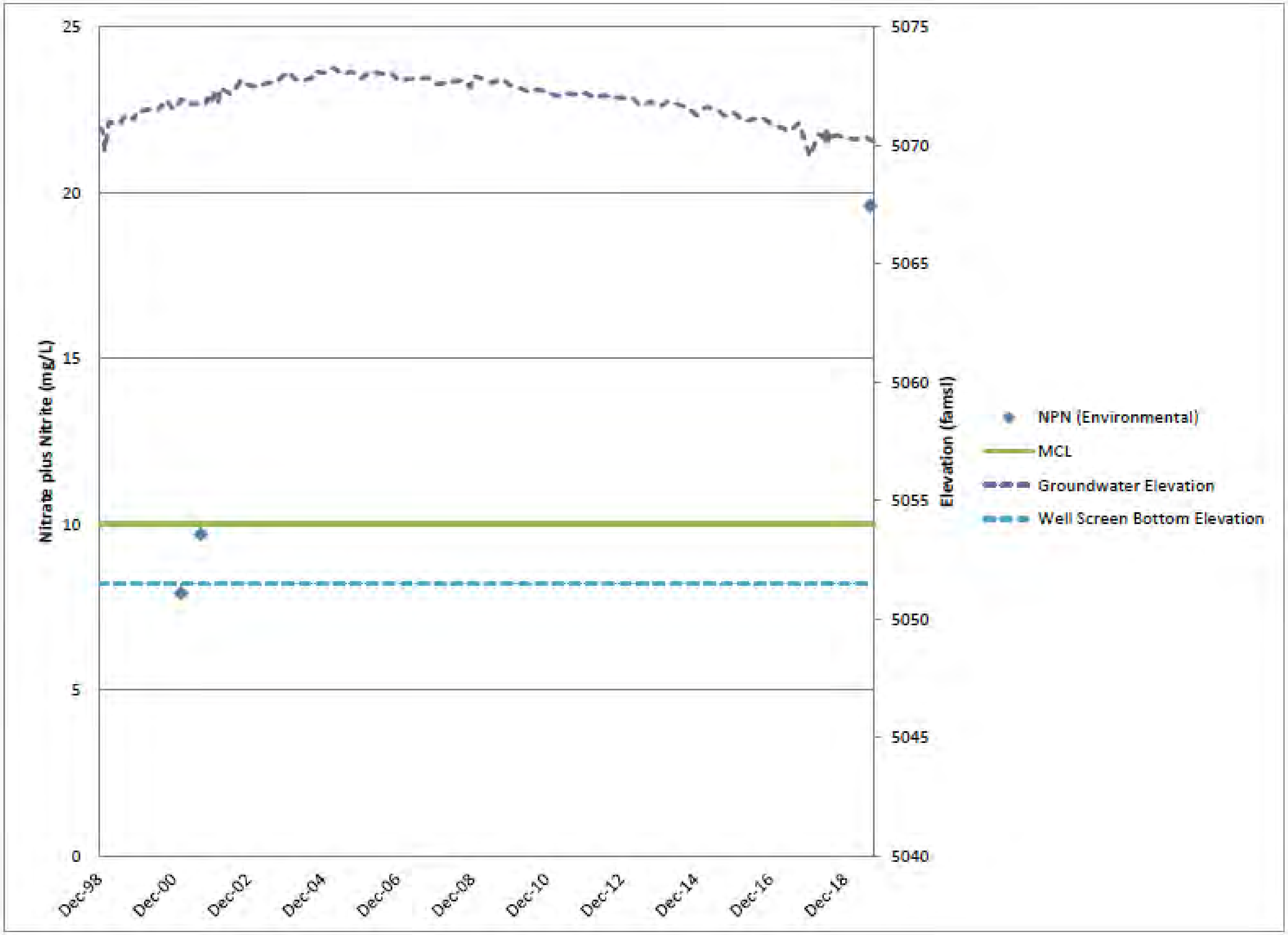

Figure 6D-6. Nitrate plus Nitrite Concentrations, TJA-5

Figure 6D-7. Trichloroethene Concentrations, TJA-2

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Chapter 6
Tijeras Arroyo Groundwater
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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), is an area with low concentrations of nitrate in a fractured bedrock aquifer. 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/laboratory 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.

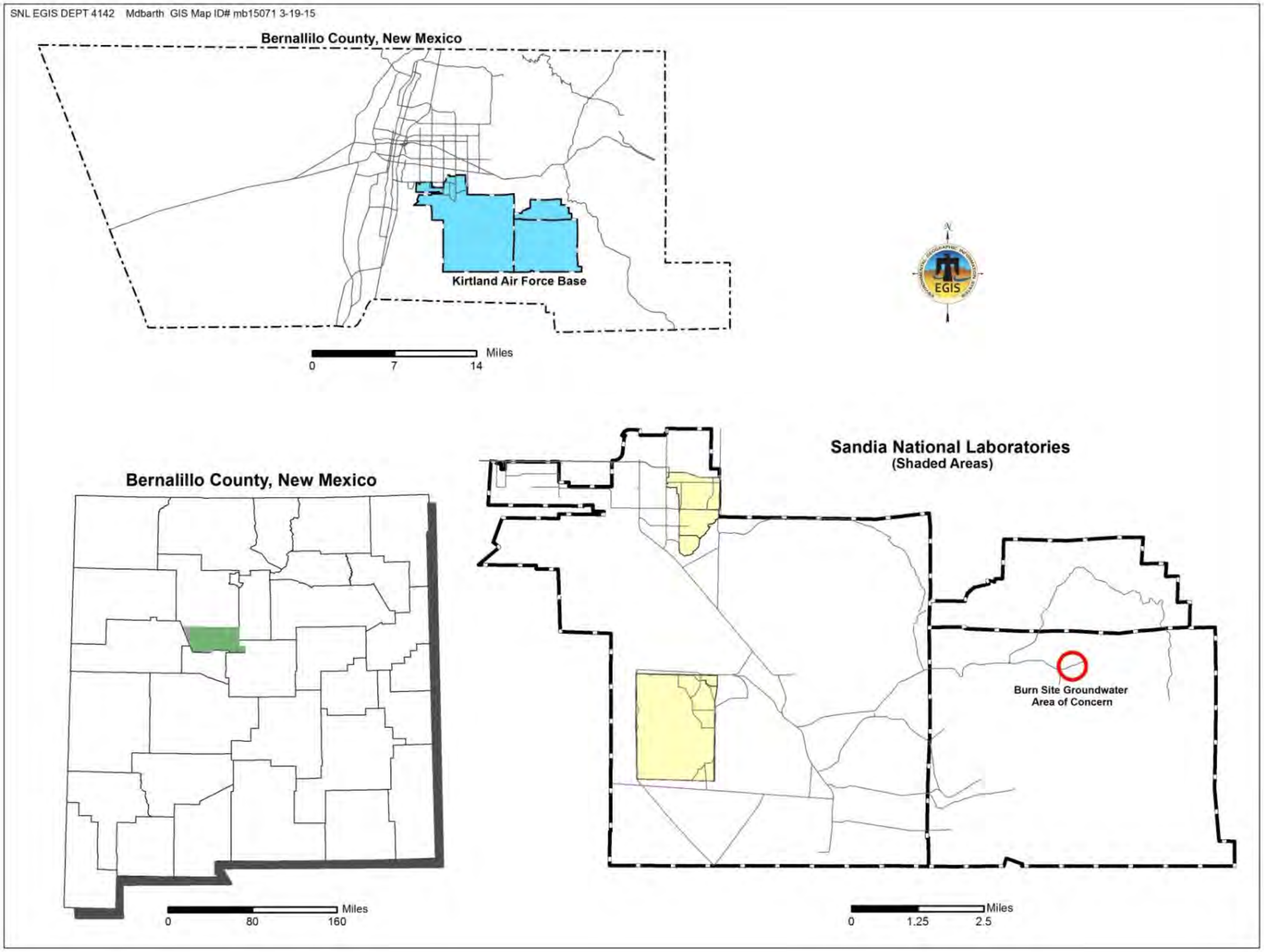

Figure 7-1. Location of the Burn Site Groundwater Area of Concern

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 production 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 (HWB), 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.

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.

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 production 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
CYN-MW16	2019	√	√	Bedrock groundwater well
CYN-MW17	2019	√	√	Bedrock groundwater well
CYN-MW18	2019	√	√	Bedrock groundwater well
CYN-MW19	2019	√	√	Bedrock groundwater well
Total		14	17	Total for AGMR reporting

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.

Based on a letter received from the 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.

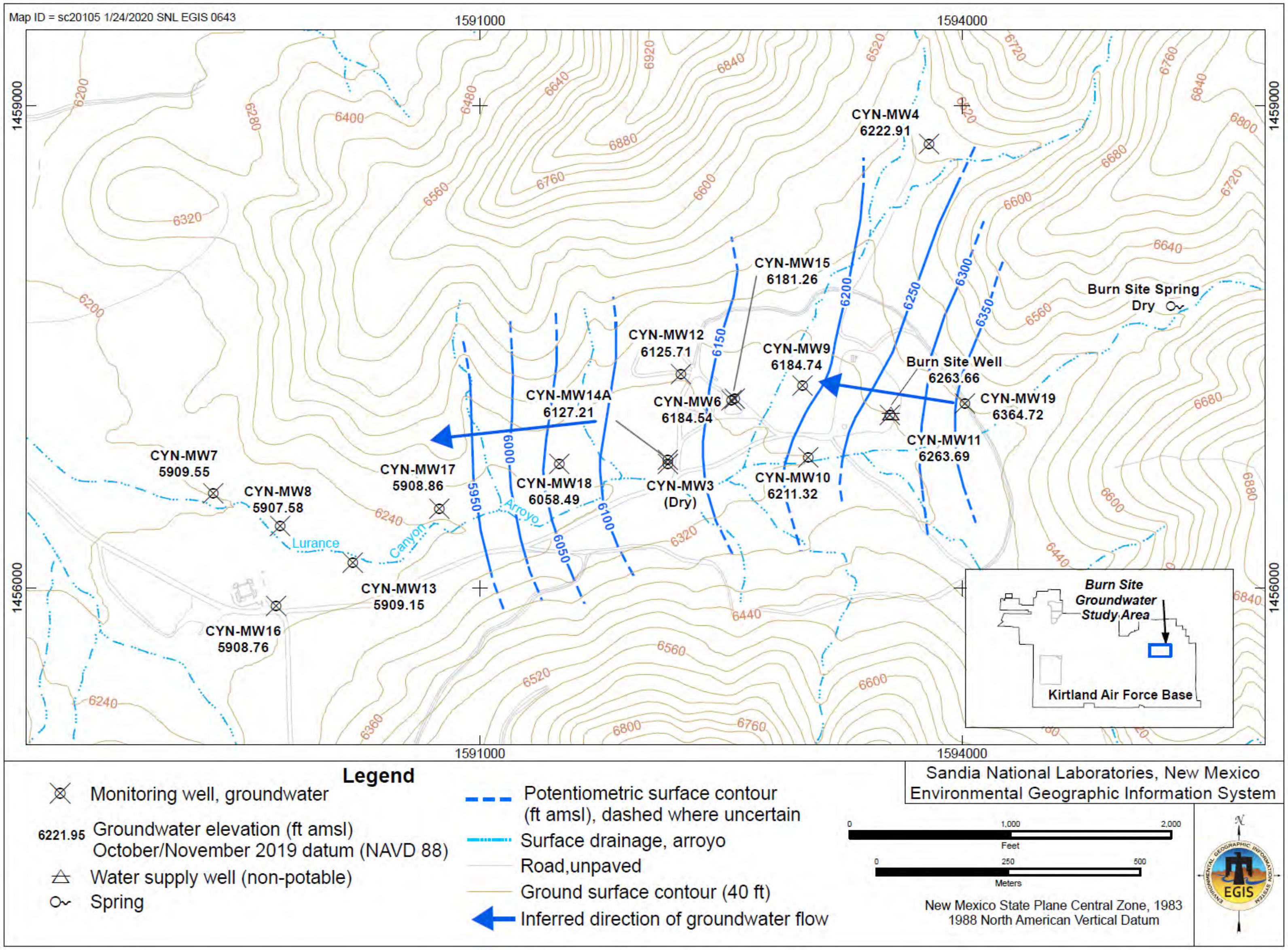

Figure 7-2. Localized Potentiometric Surface of the Burn Site Groundwater Area of Concern (October/November 2019)

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 the 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.

A work plan for the installation of at least four groundwater monitoring wells was submitted in January 2019 (SNL January 2019), and in February 2019 the work plan was approved by NMED (NMED February 2019). Based on NMED requirements (NMED June 2018) the work plan discussed the need for installing four wells (CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19) to help define the extent of nitrate concentrations in groundwater and refine the potentiometric surface. Specifically, these wells were required to define the upgradient and downgradient extent of the nitrate plume and provide information on the 2,000-ft data gap between existing wells CYN-MW3 and CYN-MW13. Groundwater monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 were installed during (CY) 2019 (see section 7.1.5); the need for any of the four contingency wells (SNL January 2019) will be evaluated when eight quarters of water level and validated analytical sample data are available. The eight-quarters strategy is a long-standing SNL/NM protocol.

7.1.4 Current Monitoring Network

Currently 16 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, CYN-MW15, CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 (Figure 7-2). However, monitoring well CYN-MW3 was dry, and CYN-MW6 did not produce adequate water volume during both CY 2019 sampling events.

7.1.5 Summary of Calendar Year 2019 Activities

The following activities were performed for the BSG AOC during CY 2019:

- Submitted a work plan for the installation of groundwater monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 to the NMED (SNL January 2019).

- The NMED approved the monitoring well installation work plan (NMED February 2019).

- 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 2019.

- Installed groundwater monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 in September through November 2019.

- 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 October 2019.

- Conducted quarterly groundwater sampling at monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 in November 2019.

- Prepared tables of analytical results (Attachment 7B), concentration versus time graphs (Attachment 7C), and hydrographs (Attachment 7D) in support of this report.

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 the Regional Aquifer in 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 and reverse faults that are mostly downfaulted to the east (Karlstrom et al. 2000). 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). Based upon recent water levels measured at the monitoring wells installed in 2019, initial interpretations suggest that faulting near CYN-MW18 has a significant control upon the potentiometric surface.

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 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/November 2019 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. With the addition of the four new monitoring wells at the Burn Site, a more defined interpretation of the potentiometric surface for the fractured bedrock system was possible. The potentiometric surface interpreted for the western part of the AOC between CY 2018 and CY 2019 is significantly different. Most notably, the 6,000-ft contour is shifted eastward by approximately 400 ft.

The 2019 potentiometric surface (Figure 7-2) depicts a steep groundwater gradient from easternmost well CYN-MW19 to well CYN-MW17 in the west with nearly 456 ft of groundwater elevation difference over approximately 3,200 ft (0.6 miles) producing a gradient of 0.14 ft per ft. In contrast, the five westernmost wells (CYN-MW7, CYN-MW8, CYN-MW13, CYN-MW16, and CYN-MW17) spread along a down-canyon distance of approximately 1,200 ft have groundwater elevations within a narrow range of approximately 2 ft producing a gradient of essentially zero. The gradient between CYN-MW17 and CYN-MW7 has less than 1 ft of groundwater elevation difference over 1,400 ft (0.27 miles), and although it is located further west (presumably the "downgradient" direction) the groundwater elevation at CYN-MW7 is slightly higher than that at CYN-MW17. Of the five western wells, CYN-MW8 has the lowest groundwater elevation and is therefore the most downgradient well at the BSG AOC.

The flat gradient in the western portion of the BSG AOC may be related to (or controlled by) several high-angle faults that offset Precambrian and Paleozoic bedrock in the area west of CYN-MW18 (Karlstrom, et. al. 2000). Another explanation for the flat groundwater gradient is that the area is possibly influenced by localized groundwater flow emanating from Sol se Mete Canyon, a large surface drainage south of the BSG AOC.

No production 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 production 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 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 ft per year (ft/yr) (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.

Table 7-2. Groundwater Elevations Measured in October/November 2019 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-2019	111.00	6263.66
CYN-MW3	6313.26	01-Oct-2019	--	--
CYN-MW4	6455.48	01-Oct-2019	232.57	6222.91
CYN-MW6	6343.37	01-Oct-2019	158.83	6184.54
CYN-MW7	6216.35	01-Oct-2019	306.80	5909.55
CYN-MW8	6230.11	01-Oct-2019	322.53	5907.58
CYN-MW9	6360.67	01-Oct-2019	175.93	6184.74
CYN-MW10	6345.45	01-Oct-2019	134.13	6211.32
CYN-MW11	6374.41	01-Oct-2019	110.72	6263.69
CYN-MW12	6345.16	01-Oct-2019	219.45	6125.71
CYN-MW13	6237.79	01-Oct-2019	328.64	5909.15
CYN-MW14A	6315.85	01-Oct-2019	188.64	6127.21
CYN-MW15	6344.44	01-Oct-2019	163.18	6181.26
CYN-MW16	6249.60	15-Nov-2019	340.84	5908.76
CYN-MW17	6268.95	15-Nov-2019	360.09	5908.86
CYN-MW18	6304.02	15-Nov-2019	245.53	6058.49
CYN-MW19	6410.43	15-Nov-2019	45.71	6364.72

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.
-- = No data, monitoring well dry during this measurement period.

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).

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 production 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 ft/yr (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 ft/yr (Figures 7D-1 through 7D-3, 7D-8, and 7D-9). Due to insufficient data, hydrographs were not constructed for newly installed monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19.

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). This value was based upon a study by the NMED (Moats and Winn January 1995). However, those authors considered the background concentration to not be “reliably established” due to the lack of suitable (convincingly uncontaminated) wells available at that time. 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 12 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, CYN-MW8, CYN-MW17, CYN-MW18, and CYN-MW19 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 nitrate-impacted groundwater 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 west-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 west-southwest
CYN-MW14A	15.7	1,400 ft west
CYN-MW15	29.8	1,000 ft west
CYN-MW16	11.1	4,000 ft west-southwest

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 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 Environmental Restoration 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 and 2008b) 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* (SNL April 2008b) 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 (SNL November 2009), 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 *Aquifer Pumping Test Work Plan for the BSG AOC* (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 *Aquifer Pumping Test Report for the BSG AOC* was submitted to NMED (SNL December 2017). Early in 2018 the NMED approved the *Aquifer Pumping Test Report for the BSG AOC* (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 submitted a Well Installation Work Plan (SNL January 2019) that was subsequently approved by the NMED (NMED February 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 2019 include groundwater monitoring well installations and groundwater monitoring (Table 7-4). 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.

Table 7-4. Groundwater Monitoring Well Network and Sampling Dates for the Burn Site Groundwater Area of Concern, Calendar Year 2019

Date of Sampling Event	Wells Sampled		SAP
April 2019	CYN-MW4 CYN-MW7[a] 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 2019* (SNL March 2019)
October 2019	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 2020* (SNL October 2019)
November 2019	CYN-MW16 CYN-MW17 CYN-MW18 CYN-MW19		*Burn Site Groundwater Monitoring, Mini-SAP for First Quarter, Fiscal Year 2020*—ER Wells (SNL November 2019)

NOTES:

[a]Monitoring well CYN-MW7 was resampled for High Explosives in June 2019 (see Section 7.8).

CYN = Canyons.
ER = Environmental Restoration (Operations).
MW = Monitoring well.
SAP = Sampling and Analysis Plan.
SNL = Sandia National Laboratories.

7.4 Field Methods and Measurements

Section 1.3 describes in detail the monitoring procedures conducted for the BSG groundwater monitoring. Figure 7-2 and Table 7-2 present the water level information used to create the potentiometric surface map, and Attachment 7D, Figures 7D-1 through 7D-9 presents the hydrographs.

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-12) present the analytical results and field measurements for the CY 2019 BSG sampling events. Tables 7B-1 through 7B-12 footnotes explain the data qualifiers. Attachment 7C (Figures 7C-1 through 7C-6) presents the nitrate plus nitrite (NPN) (reported as nitrogen) concentration trend plots.

During the April sampling event, acetone was detected in six samples, methylene chloride was detected in three samples, and toluene was detected in two samples. All these results were qualified as not detected during data validation due to associated FB, TB, or laboratory 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 7-5. Parameters Sampled at Burn Site Groundwater Area of Concern Wells for Each Sampling Event, Calendar Year 2019

Parameter	April 2019	
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-MW4 (Duplicate) CYN-MW7 CYN-MW8 CYN-MW8 (Duplicate) CYN-MW9 CYN-MW10	CYN-MW10 (Duplicate) CYN-MW11 CYN-MW12 CYN-MW13 CYN-MW14A CYN-MW15
Parameter	**October 2019**	
DRO GRO NPN Perchlorate[b]	CYN-MW4 CYN-MW7 CYN-MW8 CYN-MW9 CYN-MW9 (Duplicate) CYN-MW10 CYN-MW11 CYN-MW11 (Duplicate)	CYN-MW12 CYN-MW12 (Duplicate) CYN-MW13 CYN-MW14A CYN-MW15
Parameter	**November 2019**	
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-MW16 CYN-MW16 (Duplicate) CYN-MW17 CYN-MW18 CYN-MW19	

NOTES:

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

[b]Perchlorate analysis performed on samples from monitoring wells CYN-MW15, CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19.

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.

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-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, CYN-MW15, and CYN-MW16. NPN concentrations in samples from the other BSG monitoring wells are less than the MCL (Table 7B-4). Groundwater NPN concentrations significantly changed the interpretation of the contaminant distribution in the central and western part of the BSG AOC from CY 2018 to CY 2019. As currently depicted for CY 2019 (Figure 7-3) there are two distinct plumes with elevated NPN concentrations. NPN concentrations below the MCL in two new groundwater monitoring wells (CYN-MW17 and CYN-MW18) demonstrate that the two plumes are not contiguous, and that the areal extent of NPN exceeding the MCL is much less than previously thought. NPN concentrations below the MCL in new groundwater monitoring well CYN-MW19 defines the eastern extent of the NPN plume. In addition, NPN concentrations in CYN-MW10 were below the MCL during this reporting period so the southern boundary of the plume has been redefined.

For CY 2019, the NPN concentrations for wells exceeding the MCL are summarized as follows:

- Monitoring well CYN-MW9 had reported concentrations of 40.3 mg/L (April 2019), 34.2 mg/L (October 2019) and 38.4 (October 2019, environmental duplicate sample). 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-MW11 had reported concentrations of 11.6 mg/L (April 2019), 12.5 (October 2019), and 12.6 mg/L (October 2019, environmental duplicate sample). 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 mostly decreasing trend for the last five sampling events (Figure 7C-2).

- Monitoring well CYN-MW12 had reported concentrations of 14.9 mg/L (April 2019), 15.5 mg/L (October 2019), and 15.2 mg/L (October 2019, environmental duplicate sample). 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-3).

- Monitoring well CYN-MW13 had reported concentrations of 34.3 mg/L (April 2019) and 33.4 mg/L (October 2019). 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-4).

- Monitoring well CYN-MW14A had reported concentrations of 13.6 mg/L (April 2019) and 13.0 mg/L (October 2019). 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-5).

- Monitoring well CYN-MW15 had reported concentrations of 20.0 mg/L (April 2019) and 19.9 mg/L (October 2019). Monitoring well CYN-MW15 replaced well CYN-MW6 in December 2014; Figure 7C-6 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- 6).

- Monitoring well CYN-MW16 had reported concentrations of 10.8 mg/L (November 2019) and 11.1 mg/L (November 2019, environmental duplicate sample). This is a newly installed monitoring well and these concentrations represent the first-time exceedance of the MCL for NPN at this location. Due to insufficient data, a concentration trend plot was not constructed for monitoring well CYN-MW16.

Table 7B-5 lists the results for DRO and GRO. MCLs for DRO or GRO have not been established. No detections of DRO and GRO were reported for any of the samples collected during the CY 2019 sampling event.

Table 7B-6 lists the results for perchlorate. Results for perchlorate are compared to the screening level of 4 μg/L. No detections of perchlorate were reported for any of the samples collected during CY 2019 sampling events.

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 filtered metal results. No metals exceed established MCLs.

Table 7B-11 presents the results of groundwater samples analyzed for gamma spectroscopy (short list), gross alpha/beta activity, isotopic uranium, and tritium. 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-MW7, CYN-MW10, CYN-MW17, and CYN- MW19 were rejected by the contract laboratory (GEL Laboratories, LLC) due to the peak not meeting identification criteria. The gross beta activity in CYN-MW15 was qualified as not usable during data validation because the result was a negative value and the absolute value was greater than the minimal detectable activity.

Field water quality parameters are measured during purging of each monitoring well prior to sampling and include temperature, specific conductivity, oxidation-reduction potential, potential of hydrogen (pH), turbidity, and dissolved oxygen. Table 7B-12 presents these parameter measurements obtained immediately prior to sample collection at each well.

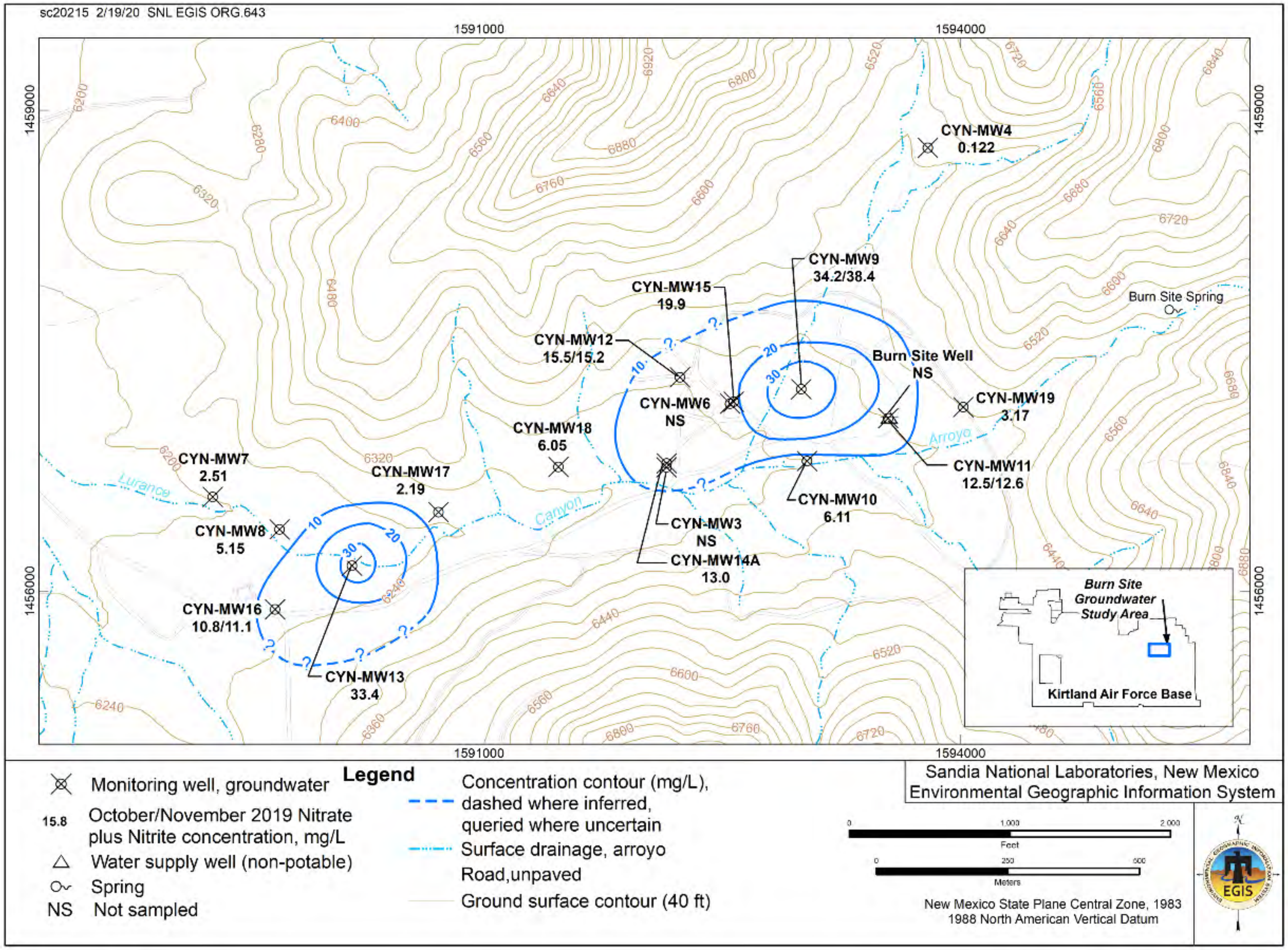

Figure 7-3. Nitrate plus Nitrite Concentration Contour Map for the Burn Site Groundwater Area of Concern, October/November 2019

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 2019 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 2019 Sampling Event at Monitoring Wells CYN-MW4, CYN-MW8, and CYN-MW10**—The EB samples were collected prior to sampling these wells and analyzed for all parameters. Acetone, 2-butanone, and GRO were detected above the MDLs in the EB samples. No corrective action was necessary for 2-butanone or GRO because these analytes were not detected in environmental samples. Acetone was detected in the CYN-MW8 environmental sample at a concentration less than ten times the associated EB result and was qualified as not detected during data validation.

- **October/November 2019 Sampling Event at Monitoring Wells CYN-MW9, CYN-MW11, CYN-MW12, and CYN-MW16**—Bromodichloromethane, chloride, chloroform, copper, dibromochloromethane, and NPN were detected above the MDLs. No corrective action was necessary for bromodichloromethane, chloride, chloroform, dibromochloromethane, or NPN because these analytes were not detected in environmental samples or were detected at concentrations less than 10 times the associated environmental sample result. Copper was detected in the CYN-MW16 environmental sample at a concentration less than five times the associated EB result and was qualified as not detected during data validation.

The results of the FB sample analyses are as follows:

- **April 2019 Sampling Event at Monitoring Wells CYN-MW7, CYN-MW11, and CYN-MW15—**No VOCs or GRO were detected above MDLs in these FB samples.

- **October/November 2019 Sampling Event at Monitoring Wells CYN-MW13, CYN-MW14A, CYN-MW15, and CYN-MW16**—GRO was not detected in the FB samples. Bromodichloromethane, chloroform, and dibromochloromethane were detected in the FB sample associated with CYN-MW16. No corrective action was necessary because these compounds were not detected in the environmental sample.

The results of the TB sample analyses are as follows:

- **April 2019 Sampling Event**—A total of 13 VOC and 13 GRO TB samples were submitted during this sampling event. No VOCs or GRO were detected above MDLs or sample quantitation limit, except acetone and methylene chloride. Each compound was reported in one TB sample. Both acetone or methylene chloride were detected in associated environmental samples at concentrations less than ten times the associated TB result and qualified as not detected during data validation.

- **October/November 2019 Sampling Event**—A total of five VOC and 18 GRO TB samples were submitted during this sampling event. No VOCs or GRO were detected above MDLs or sample quantitation limits, except acetone. No corrective action was necessary because acetone was not detected in associated environmental samples.

7.8 Project Field Notes and Comments

Monitoring well CYN-MW7 was resampled for HE in June 2019. The original sample collected in April 2019 was not usable because the laboratory QC was outside acceptance limits and the laboratory re-extracted the sample beyond the analytical method hold time requirement.

In October 2019, the field crew observed a color change and elevated turbidity measurements during purging and sampling of monitoring well CYN-MW15. The water color was reddish and maximum turbidity reading was 629 nephelometric turbidity units. An extra two gallons was purged for compliance with turbidity stability requirement prior to sample collection.

In November 2019, the field crew noted a strong sulfur-like odor from groundwater at well CYN-MW17.

No other variances or issues from requirements in the BSG mini-Sampling and Analysis Plans were identified during sampling activities for the 2019 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, and plans for studies to be completed during CY 2020 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.

Groundwater monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 were installed during CY 2019.

Monitoring wells were sampled during April and October/November 2019. The samples were analyzed for VOCs, HE compounds, DRO, GRO, NPN, Target Analyte List metals, anions, alkalinity, cations, perchlorate, gamma spectroscopy (short list), gross alpha/beta activity, isotopic uranium, and tritium. Analytical results were compared with EPA MCLs for drinking water (EPA March 2018) and the screening level of 4 µg/L for perchlorate. The November 2019 sampling event was the initial monitoring event for monitoring wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19.

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-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, CYN-MW15, and CYN-MW16. The maximum concentration reported in CY 2019 was 40.3 mg/L in the sample collected from monitoring well CYN-MW9 during the April 2019 sampling event. During the November 2019 sampling event the NPN detections above the MCL at monitoring well CYN-MW16 represent the first-time exceedance of the MCL for NPN at this new location. As shown on Figure 7-3, two distinct NPN plumes exceeding 10 mg/L are now evident.

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 2020. At a minimum, the analytes for groundwater sampling per well will consist of NPN, DRO, and GRO.

- Continue quarterly collection of groundwater samples at four monitoring wells (CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19) in all quarters of CY 2020. At a minimum, the analytes for groundwater sampling per well will consist of perchlorate, NPN, DRO, and GRO.

- Continue periodic measurements of groundwater elevations in 16 monitoring wells and the Burn Site Well.

- Report future BSG investigation results in the CY 2020 SNL/NM Annual Groundwater Monitoring Report.

- Submit a Monitoring Well Installation Report for wells CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19 to the NMED in May 2020.

- Resume discussions with NMED on future characterization activities based on the groundwater sampling analytical results from the four newly installed monitoring wells.

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 outdoor 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	1996	Burn Site Well (a non-potable production well) was installed at the eastern edge of the HE testing area.	SNL April 2008a
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
	2003	Burn Site Well (production well) removed from use.	None
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 BSG 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 2013b
October	2013	DOE Office of Environmental Management submitted the first Internal Remedy Review of the BSG 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 2013a

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
January	2014	DOE/NNSA requested an extension to the delivery date of the BSG 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 BSG 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 BSG 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 BSG 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)*

Month	Year	Event	Reference
January	2019	Monitoring Well Installation Work Plan for CYN-MW16 through CYN-MW23 submitted.	SNL January 2019
February	2019	NMED approved the Monitoring Well installation Work Plan.	NMED February 2019
June	2019	Groundwater sampling analytical results for BSG wells reported in the Calendar Year 2017 SNL/NM Annual Groundwater Monitoring Report.	SNL June 2019
September	2019	Monitoring well field program started.	This report
December	2019	Monitoring well field program completed. Four monitoring wells (CYN-MW16, CYN-MW17, CYN-MW18, and CYN-MW19) were installed and sampled.	This report

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 2019

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-MW7 09-Apr-19	Methylene chloride	1.90	1.00	10.0	5.00	J	10U	108009-001	SW846-8260B
CYN-MW8 10-Apr-19	Acetone	2.94	1.50	10.0	NE	J	10U	108011-001	SW846-8260B
	Methylene chloride	3.05	1.00	10.0	5.00	B, J	10U	108011-001	SW846-8260B
CYN-MW9 18-Apr-19	Acetone	5.46	1.50	10.0	NE	B, J	10UJ	108034-001	SW846-8260B
	Toluene	0.310	0.300	1.00	1000	B, J	1.0U	108034-001	SW846-8260B
CYN-MW10 11-Apr-19	Methylene chloride	2.20	1.00	10.0	5.00	B, J	10U	108014-001	SW846-8260B
CYN-MW11 12-Apr-19	Acetone	1.89	1.50	10.0	NE	J	10UJ	108019-001	SW846-8260B
CYN-MW13 19-Apr-19	Acetone	4.33	1.50	10.0	NE	B, J	10UJ	108036-001	SW846-8260B
	Toluene	0.500	0.300	1.00	1000	B, J	1.0U	108036-001	SW846-8260B
CYN-MW14A 15-Apr-19	Acetone	2.90	1.50	10.0	NE	B, J	10U	108021-001	SW846-8260B
CYN-MW15 17-Apr-19	Acetone	3.17	1.50	10.0	NE	B, J	10U	108030-001	SW846-8260B

Refer to footnotes on page 7B-40.

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 2019

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-40.

Table 7B-3
Method Detection Limits for High Explosive Compounds (EPA Method[g] SW846-8330B), Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

Analyte	MDL[b] (µg/L)
1,3,5-Trinitrobenzene	0.0816 – 0.0899
1,3-Dinitrobenzene	0.0816 – 0.0899
2,4,6-Trinitrotoluene	0.0816 – 0.0899
2,4-Dinitrotoluene	0.0816 – 0.0899
2,6-Dinitrotoluene	0.0816 – 0.0899
2-Amino-4,6-dinitrotoluene	0.0816 – 0.0899
2-Nitrotoluene	0.0837 – 0.0921
3-Nitrotoluene	0.0816 – 0.0899
4-Amino-2,6-dinitrotoluene	0.0816 – 0.0899
4-Nitrotoluene	0.153 – 0.169
HMX	0.0816 – 0.0899
Nitro-benzene	0.0816 – 0.0899
Pentaerythritol tetranitrate	0.102 – 0.112
RDX	0.0816 – 0.0899
Tetryl	0.0816 – 0.0899

Refer to footnotes on page 7B-40.

Table 7B-4
Summary of Nitrate plus Nitrite Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-Apr-19	Nitrate plus nitrite	0.122	0.017	0.050	10.0			108003-005	EPA 353.2
CYN-MW4 (Duplicate) 08-Apr-19	Nitrate plus nitrite	0.123	0.017	0.050	10.0			108004-003	EPA 353.2
CYN-MW7 09-Apr-19	Nitrate plus nitrite	2.28	0.085	0.250	10.0			108009-005	EPA 353.2
CYN-MW8 10-Apr-19	Nitrate plus nitrite	4.87	0.170	0.500	10.0		J	108011-005	EPA 353.2
CYN-MW8 (Duplicate) 10-Apr-19	Nitrate plus nitrite	4.95	0.170	0.500	10.0		J	108012-003	EPA 353.2
CYN-MW9 18-Apr-19	Nitrate plus nitrite	**40.3**	0.850	2.50	10.0			108034-005	EPA 353.2
CYN-MW10 11-Apr-19	Nitrate plus nitrite	6.63	0.425	1.25	10.0			108014-005	EPA 353.2
CYN-MW10 (Duplicate) 11-Apr-19	Nitrate plus nitrite	6.55	0.425	1.25	10.0		J	108015-003	EPA 353.2
CYN-MW11 12-Apr-19	Nitrate plus nitrite	**11.6**	0.425	1.25	10.0		J	108019-005	EPA 353.2
CYN-MW12 16-Apr-19	Nitrate plus nitrite	**14.9**	0.425	1.25	10.0			108027-005	EPA 353.2
CYN-MW13 19-Apr-19	Nitrate plus nitrite	**34.3**	0.850	2.50	10.0			108036-005	EPA 353.2
CYN-MW14A 15-Apr-19	Nitrate plus nitrite	**13.6**	0.425	1.25	10.0			108021-005	EPA 353.2
CYN-MW15 17-Apr-19	Nitrate plus nitrite	**20.0**	0.425	1.25	10.0			108030-005	EPA 353.2

Refer to footnotes on page 7B-40.

Table 7B-4 *(Concluded)*
Summary of Nitrate plus Nitrite Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 07-Oct-19	Nitrate plus nitrite	0.122	0.017	0.050	10.0			109207-003	EPA 353.2
CYN-MW7 07-Oct-19	Nitrate plus nitrite	2.51	0.085	0.250	10.0			109209-003	EPA 353.2
CYN-MW8 08-Oct-19	Nitrate plus nitrite	5.15	0.085	0.250	10.0			109213-003	EPA 353.2
CYN-MW9 14-Oct-19	Nitrate plus nitrite	**34.2**	0.850	2.50	10.0			110531-003	EPA 353.2
CYN-MW9 (Duplicate) 14-Oct-19	Nitrate plus nitrite	**38.4**	0.850	2.50	10.0			110532-003	EPA 353.2
CYN-MW10 09-Oct-19	Nitrate plus nitrite	6.11	0.170	0.500	10.0		J	109211-003	EPA 353.2
CYN-MW11 10-Oct-19	Nitrate plus nitrite	**12.5**	0.425	1.25	10.0		J	109220-003	EPA 353.2
CYN-MW11 (Duplicate) 10-Oct-19	Nitrate plus nitrite	**12.6**	0.425	1.25	10.0		J	109221-003	EPA 353.2
CYN-MW12 10-Oct-19	Nitrate plus nitrite	**15.5**	0.850	2.50	10.0		J	109230-003	EPA 353.2
CYN-MW12 (Duplicate) 10-Oct-19	Nitrate plus nitrite	**15.2**	0.850	2.50	10.0		J	109231-003	EPA 353.2
CYN-MW13 11-Oct-19	Nitrate plus nitrite	**33.4**	0.850	2.50	10.0		J	109234-003	EPA 353.2
CYN-MW14A 09-Oct-19	Nitrate plus nitrite	**13.0**	0.425	1.25	10.0		J	109226-003	EPA 353.2
CYN-MW15 11-Oct-19	Nitrate plus nitrite	**19.9**	0.850	2.50	10.0		J	110529-003	EPA 353.2
CYN-MW16 20-Nov-19	Nitrate plus nitrite	**10.8**	1.70	5.00	10.0		J	111922-005	EPA 353.2
CYN-MW16 (Duplicate) 20-Nov-19	Nitrate plus nitrite	**11.1**	1.70	5.00	10.0		J	111923-005	EPA 353.2
CYN-MW17 19-Nov-19	Nitrate plus nitrite	2.19	0.170	0.500	10.0			111926-005	EPA 353.2
CYN-MW18 19-Nov-19	Nitrate plus nitrite	6.05	0.850	2.50	10.0			111929-005	EPA 353.2
CYN-MW19 18-Nov-19	Nitrate plus nitrite	3.17	0.170	0.500	10.0			111932-005	EPA 353.2

Refer to footnotes on page 7B-40.

Table 7B-5
Summary of Diesel Range Organics and Gasoline Range Organics Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108003-003	SW846 8015D
08-Apr-19	Gasoline Range Organics	ND	16.7	50.0	NE	U		108003-004	SW846 8015A/B
CYN-MW4 (Duplicate)	Diesel Range Organics	ND	79.8	213	NE	U		108004-001	SW846 8015D
08-Apr-19	Gasoline Range Organics	ND	16.7	50.0	NE	U		108004-002	SW846 8015A/B
CYN-MW7	Diesel Range Organics	ND	79.8	213	NE	U		108009-003	SW846 8015D
09-Apr-19	Gasoline Range Organics	ND	16.7	50.0	NE	U		108009-004	SW846 8015A/B
CYN-MW8	Diesel Range Organics	ND	81.5	217	NE	U		108011-003	SW846 8015D
10-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	U		108011-004	SW846 8015A/B
CYN-MW8 (Duplicate)	Diesel Range Organics	ND	81.5	217	NE	U		108012-001	SW846 8015D
10-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	U		108012-002	SW846 8015A/B
CYN-MW9	Diesel Range Organics	ND	78.1	208	NE	U, *	UJ	108034-003	SW846 8015D
18-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	N, U, *	UJ	108034-004	SW846 8015A/B
CYN-MW10	Diesel Range Organics	ND	79.8	213	NE	U		108014-003	SW846 8015D
11-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	U		108014-004	SW846 8015A/B
CYN-MW10 (Duplicate)	Diesel Range Organics	ND	79.8	213	NE	U		108015-001	SW846 8015D
11-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	U		108015-002	SW846 8015A/B
CYN-MW11	Diesel Range Organics	ND	78.9	211	NE	U, *	UJ	108019-003	SW846 8015D
12-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	U		108019-004	SW846 8015A/B
CYN-MW12	Diesel Range Organics	ND	79.8	213	NE	U, *	UJ	108027-003	SW846 8015D
16-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	U		108027-004	SW846 8015A/B
CYN-MW13	Diesel Range Organics	ND	75.0	200	NE	U		108036-003	SW846 8015D
19-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	N, U, *	UJ	108036-004	SW846 8015A/B
CYN-MW14A	Diesel Range Organics	ND	75.0	200	NE	U, *	UJ	108021-003	SW846 8015D
15-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	U		108021-004	SW846 8015A/B
CYN-MW15	Diesel Range Organics	ND	78.1	208	NE	U, *	UJ	108030-003	SW846 8015D
17-Apr-19	Gasoline Range Organics	ND	16.7	100	NE	N, U, *	UJ	108030-004	SW846 8015A/B

Refer to footnotes on page 7B-40.

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 2019

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	UJ	109207-002	SW846 8015D
07-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109207-001	SW846 8015B
CYN-MW7	Diesel Range Organics	ND	80.2	214	NE	*, U	UJ	109209-002	SW846 8015D
07-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109209-001	SW846 8015B
CYN-MW8	Diesel Range Organics	ND	79.7	212	NE	*, U	UJ	109213-002	SW846 8015D
08-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109213-001	SW846 8015B
CYN-MW9	Diesel Range Organics	ND	81.4	217	NE	U		110531-002	SW846 8015D
14-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		110531-001	SW846 8015B
CYN-MW9 (Duplicate)	Diesel Range Organics	ND	76.6	204	NE	U		110532-002	SW846 8015D
14-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		110532-001	SW846 8015B
CYN-MW10	Diesel Range Organics	ND	76.8	205	NE	*, U	UJ	109211-002	SW846 8015D
09-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109211-001	SW846 8015B
CYN-MW11	Diesel Range Organics	ND	83.2	222	NE	*, U	UJ	109220-002	SW846 8015D
10-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109220-001	SW846 8015B
CYN-MW11 (Duplicate)	Diesel Range Organics	ND	79.4	212	NE	*, U	UJ	109221-002	SW846 8015D
10-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109221-001	SW846 8015B
CYN-MW12	Diesel Range Organics	ND	81.9	218	NE	*, U	UJ	109230-002	SW846 8015D
10-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109230-001	SW846 8015B
CYN-MW12 (Duplicate)	Diesel Range Organics	ND	77.8	207	NE	*, U	UJ	109231-002	SW846 8015D
10-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109231-001	SW846 8015B
CYN-MW13	Diesel Range Organics	ND	75.0	200	NE	U		109234-002	SW846 8015D
11-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109234-001	SW846 8015B
CYN-MW14A	Diesel Range Organics	ND	76.4	204	NE	*, U	UJ	109226-002	SW846 8015D
09-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		109226-001	SW846 8015B
CYN-MW15	Diesel Range Organics	ND	79.5	212	NE	U		110529-002	SW846 8015D
11-Oct-19	Gasoline Range Organics	ND	35.0	100	NE	U		110529-001	SW846 8015B
CYN-MW16	Diesel Range Organics	ND	81.2	217	NE	*, U	UJ	111922-003	SW846 8015D
20-Nov-19	Gasoline Range Organics	ND	16.7	100	NE	U		111922-004	SW846 8015A/B
CYN-MW16 (Duplicate)	Diesel Range Organics	ND	77.3	206	NE	*, U	UJ	111923-001	SW846 8015D
20-Nov-19	Gasoline Range Organics	ND	16.7	100	NE	U		111923-002	SW846 8015A/B
CYN-MW17	Diesel Range Organics	ND	80.6	215	NE	*, U	UJ	111926-003	SW846 8015D
19-Nov-19	Gasoline Range Organics	ND	16.7	100	NE	U		111926-004	SW846 8015A/B
CYN-MW18	Diesel Range Organics	ND	80.4	214	NE	*, U	UJ	111929-003	SW846 8015D
19-Nov-19	Gasoline Range Organics	ND	16.7	100	NE	U		111929-004	SW846 8015A/B
CYN-MW19	Diesel Range Organics	ND	72.0	192	NE	*, U	UJ	111932-003	SW846 8015D
18-Nov-19	Gasoline Range Organics	ND	16.7	100	NE	U		111932-004	SW846 8015A/B

Refer to footnotes on page 7B-40.

Table 7B-6
Summary of Perchlorate Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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 **17-Apr-19**	ND	0.004	0.012	NE	U		108030-008	EPA 314.0
CYN-MW15 **11-Oct-19**	ND	0.004	0.012	NE	N, U		110529-004	EPA 314.0
CYN-MW16 20-Nov-19	ND	0.004	0.012	NE	U		111922-007	EPA 314.0
CYN-MW16 (Duplicate) 20-Nov-19	ND	0.004	0.012	NE	U		111923-004	EPA 314.0
CYN-MW17 19-Nov-19	ND	0.004	0.012	NE	U		111926-007	EPA 314.0
CYN-MW18 19-Nov-19	ND	0.004	0.012	NE	U		111929-007	EPA 314.0
CYN-MW19 **18-Nov-19**	ND	0.004	0.012	NE	U		111932-007	EPA 314.0

Refer to footnotes on page 7B-40.

Table 7B-7
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	0.351	0.067	0.200	NE		J	108003-006	SW846 9056A
08-Apr-19	Chloride	23.4	0.670	2.00	NE		J	108003-006	SW846 9056A
	Fluoride	0.710	0.033	0.100	4.0		J	108003-006	SW846 9056A
	Sulfate	134	1.33	4.00	NE		J	108003-006	SW846 9056A
CYN-MW7	Bromide	0.585	0.067	0.200	NE		J	108009-006	SW846 9056A
09-Apr-19	Chloride	41.9	0.670	2.00	NE		J	108009-006	SW846 9056A
	Fluoride	1.31	0.033	0.100	4.0		J	108009-006	SW846 9056A
	Sulfate	83.9	1.33	4.00	NE		J	108009-006	SW846 9056A
CYN-MW8	Bromide	0.760	0.067	0.200	NE		J	108011-006	SW846 9056A
10-Apr-19	Chloride	57.6	0.670	2.00	NE		J	108011-006	SW846 9056A
	Fluoride	1.49	0.033	0.100	4.0		J	108011-006	SW846 9056A
	Sulfate	123	1.33	4.00	NE		J	108011-006	SW846 9056A
CYN-MW9	Bromide	0.808	0.067	0.200	NE		J	108034-006	SW846 9056A
18-Apr-19	Chloride	62.3	0.670	2.00	NE		J	108034-006	SW846 9056A
	Fluoride	0.644	0.033	0.100	4.0		J	108034-006	SW846 9056A
	Sulfate	149	1.33	4.00	NE		J	108034-006	SW846 9056A
CYN-MW10	Bromide	0.601	0.067	0.200	NE		J	108014-006	SW846 9056A
11-Apr-19	Chloride	41.7	0.670	2.00	NE		J	108014-006	SW846 9056A
	Fluoride	0.675	0.033	0.100	4.0		J	108014-006	SW846 9056A
	Sulfate	158	1.33	4.00	NE		J	108014-006	SW846 9056A
CYN-MW11	Bromide	1.15	0.067	0.200	NE		J	108019-006	SW846 9056A
12-Apr-19	Chloride	87.1	1.34	4.00	NE		J	108019-006	SW846 9056A
	Fluoride	0.797	0.033	0.100	4.0		J	108019-006	SW846 9056A
	Sulfate	194	2.66	8.00	NE		J	108019-006	SW846 9056A
CYN-MW12	Bromide	0.943	0.067	0.200	NE			108027-006	SW846 9056A
16-Apr-19	Chloride	85.8	1.68	5.00	NE	H	J-	108027-R06	SW846 9056A
	Fluoride	0.990	0.033	0.100	4.0			108027-006	SW846 9056A
	Sulfate	221	3.33	10.0	NE	H	J-	108027-R06	SW846 9056A
CYN-MW13	Bromide	0.333	0.067	0.200	NE		J	108036-006	SW846 9056A
19-Apr-19	Chloride	19.8	0.670	2.00	NE		J	108036-006	SW846 9056A
	Fluoride	1.76	0.033	0.100	4.0		J	108036-006	SW846 9056A
	Sulfate	79.9	1.33	4.00	NE		J	108036-006	SW846 9056A

Refer to footnotes on page 7B-40.

Table 7B-7 *(Concluded)*
Summary of Anion Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	0.842	0.067	0.200	NE		J	108021-006	SW846 9056A
15-Apr-19	Chloride	67.3	1.34	4.00	NE		J	108021-006	SW846 9056A
	Fluoride	1.14	0.033	0.100	4.0		J	108021-006	SW846 9056A
	Sulfate	189	2.66	8.00	NE		J	108021-006	SW846 9056A
CYN-MW15	Bromide	1.19	0.067	0.200	NE		J	108030-006	SW846 9056A
17-Apr-19	Chloride	109	1.34	4.00	NE		J	108030-006	SW846 9056A
	Fluoride	0.623	0.033	0.100	4.0		J	108030-006	SW846 9056A
	Sulfate	202	2.66	8.00	NE		J	108030-006	SW846 9056A
CYN-MW16	Bromide	0.673	0.067	0.200	NE			111922-006	SW846 9056A
20-Nov-19	Chloride	47.2	0.670	2.00	NE			111922-006	SW846 9056A
	Fluoride	1.62	0.033	0.100	4.0			111922-006	SW846 9056A
	Sulfate	130	1.33	4.00	NE			111922-006	SW846 9056A
CYN-MW17	Bromide	0.666	0.067	0.200	NE		J	111926-006	SW846 9056A
19-Nov-19	Chloride	39.9	0.670	2.00	NE		J	111926-006	SW846 9056A
	Fluoride	1.81	0.033	0.100	4.0		J	111926-006	SW846 9056A
	Sulfate	123	1.33	4.00	NE		J	111926-006	SW846 9056A
CYN-MW18	Bromide	0.635	0.067	0.200	NE		J	111929-006	SW846 9056A
19-Nov-19	Chloride	45.2	1.34	4.00	NE		J	111929-006	SW846 9056A
	Fluoride	2.03	0.033	0.100	4.0		J	111929-006	SW846 9056A
	Sulfate	213	2.66	8.00	NE		J	111929-006	SW846 9056A
CYN-MW19	Bromide	0.540	0.067	0.200	NE		J	111932-006	SW846 9056A
18-Nov-19	Chloride	33.6	0.670	2.00	NE		J	111932-006	SW846 9056A
	Fluoride	0.658	0.033	0.100	4.0		J	111932-006	SW846 9056A
	Sulfate	131	1.33	4.00	NE		J	111932-006	SW846 9056A

Refer to footnotes on page 7B-40.

Table 7B-8
Summary of Alkalinity Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	238	1.45	4.00	NE			108003-007	SM 2320B
08-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108003-007	SM 2320B
CYN-MW7	Bicarbonate Alkalinity	274	1.45	4.00	NE			108009-007	SM 2320B
09-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108009-007	SM 2320B
CYN-MW8	Bicarbonate Alkalinity	255	1.45	4.00	NE			108011-007	SM 2320B
10-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108011-007	SM 2320B
CYN-MW9	Bicarbonate Alkalinity	271	1.45	4.00	NE			108034-007	SM 2320B
18-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108034-007	SM 2320B
CYN-MW10	Bicarbonate Alkalinity	259	1.45	4.00	NE			108014-007	SM 2320B
11-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108014-007	SM 2320B
CYN-MW11	Bicarbonate Alkalinity	243	1.45	4.00	NE			108019-007	SM 2320B
12-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108019-007	SM 2320B
CYN-MW12	Bicarbonate Alkalinity	246	1.45	4.00	NE			108027-007	SM 2320B
16-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108027-007	SM 2320B
CYN-MW13	Bicarbonate Alkalinity	183	1.45	4.00	NE			108036-007	SM 2320B
19-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108036-007	SM 2320B
CYN-MW14A	Bicarbonate Alkalinity	240	1.45	4.00	NE			108021-007	SM 2320B
15-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108021-007	SM 2320B
CYN-MW15	Bicarbonate Alkalinity	292	1.45	4.00	NE			108030-007	SM 2320B
17-Apr-19	Carbonate Alkalinity	ND	1.45	4.00	NE	U		108030-007	SM 2320B

Refer to footnotes on page 7B-40.

Table 7B-9
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108003-008	SW846 6020B
08-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108003-008	SW846 6020B
	Arsenic	0.0024	0.002	0.005	0.010	J		108003-008	SW846 6020B
	Barium	0.0417	0.00067	0.004	2.00			108003-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108003-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108003-008	SW846 6020B
	Calcium	69.8	0.400	1.00	NE			108003-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108003-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108003-008	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		108003-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108003-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108003-008	SW846 6020B
	Magnesium	31.8	0.010	0.030	NE			108003-008	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108003-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U	0.0002U	108003-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108003-008	SW846 6020B
	Potassium	6.29	0.080	0.300	NE			108003-008	SW846 6020B
	Selenium	0.0133	0.002	0.005	0.050			108003-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108003-008	SW846 6020B
	Sodium	41.9	0.080	0.250	NE			108003-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108003-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U		108003-008	SW846 6020B
	Zinc	0.005	0.0033	0.020	NE	J		108003-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108009-008	SW846 6020B
09-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108009-008	SW846 6020B
	Arsenic	0.00269	0.002	0.005	0.010	J		108009-008	SW846 6020B
	Barium	0.111	0.00067	0.004	2.00			108009-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108009-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108009-008	SW846 6020B
	Calcium	101	0.400	1.00	NE			108009-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108009-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108009-008	SW846 6020B
	Copper	0.00046	0.0003	0.002	1.3	B, J	0.002U	108009-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108009-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108009-008	SW846 6020B
	Magnesium	19.3	0.010	0.030	NE			108009-008	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108009-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108009-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108009-008	SW846 6020B
	Potassium	2.43	0.080	0.300	NE			108009-008	SW846 6020B
	Selenium	0.00407	0.002	0.005	0.050	J		108009-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108009-008	SW846 6020B
	Sodium	38.0	0.080	0.250	NE			108009-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108009-008	SW846 6020B
	Vanadium	0.00402	0.0033	0.020	NE	J		108009-008	SW846 6020B
	Zinc	0.0069	0.0033	0.020	NE	J		108009-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108011-008	SW846 6020B
10-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108011-008	SW846 6020B
	Arsenic	0.00279	0.002	0.005	0.010	J		108011-008	SW846 6020B
	Barium	0.0588	0.00067	0.004	2.00			108011-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108011-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108011-008	SW846 6020B
	Calcium	110	0.400	1.00	NE			108011-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108011-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108011-008	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		108011-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108011-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108011-008	SW846 6020B
	Magnesium	22.9	0.010	0.030	NE			108011-008	SW846 6020B
	Manganese	0.00138	0.001	0.005	NE	J	J-	108011-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108011-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108011-008	SW846 6020B
	Potassium	2.30	0.080	0.300	NE			108011-008	SW846 6020B
	Selenium	0.00634	0.002	0.005	0.050			108011-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108011-008	SW846 6020B
	Sodium	44.7	0.080	0.250	NE			108011-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108011-008	SW846 6020B
	Vanadium	0.00413	0.0033	0.020	NE	J		108011-008	SW846 6020B
	Zinc	0.00602	0.0033	0.020	NE	J		108011-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108034-008	SW846 6020B
18-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108034-008	SW846 6020B
	Arsenic	0.00284	0.002	0.005	0.010	J		108034-008	SW846 6020B
	Barium	0.0563	0.00067	0.004	2.00			108034-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108034-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108034-008	SW846 6020B
	Calcium	157	0.800	2.00	NE			108034-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108034-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108034-008	SW846 6020B
	Copper	0.000491	0.0003	0.002	1.3	J	J+	108034-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108034-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108034-008	SW846 6020B
	Magnesium	42.2	0.010	0.030	NE			108034-008	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108034-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108034-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108034-008	SW846 6020B
	Potassium	2.33	0.080	0.300	NE			108034-008	SW846 6020B
	Selenium	0.00639	0.002	0.005	0.050			108034-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108034-008	SW846 6020B
	Sodium	39.3	0.080	0.250	NE			108034-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108034-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U	0.020UJ	108034-008	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		108034-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	ND	0.0193	0.050	NE	U		108014-008	SW846 6020B
11-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108014-008	SW846 6020B
	Arsenic	0.00271	0.002	0.005	0.010	J		108014-008	SW846 6020B
	Barium	0.0565	0.00067	0.004	2.00			108014-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108014-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108014-008	SW846 6020B
	Calcium	112	0.400	1.00	NE			108014-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108014-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108014-008	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		108014-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108014-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108014-008	SW846 6020B
	Magnesium	29.7	0.010	0.030	NE			108014-008	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	R	108014-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108014-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108014-008	SW846 6020B
	Potassium	1.85	0.080	0.300	NE			108014-008	SW846 6020B
	Selenium	0.00574	0.002	0.005	0.050			108014-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108014-008	SW846 6020B
	Sodium	36.3	0.080	0.250	NE			108014-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108014-008	SW846 6020B
	Vanadium	0.00363	0.0033	0.020	NE	J		108014-008	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U		108014-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108019-008	SW846 6020B
12-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108019-008	SW846 6020B
	Arsenic	0.00271	0.002	0.005	0.010	J		108019-008	SW846 6020B
	Barium	0.070	0.00067	0.004	2.00			108019-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108019-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108019-008	SW846 6020B
	Calcium	142	0.800	2.00	NE			108019-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108019-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108019-008	SW846 6020B
	Copper	0.000384	0.0003	0.002	1.3	J		108019-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108019-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108019-008	SW846 6020B
	Magnesium	45.2	0.010	0.030	NE			108019-008	SW846 6020B
	Manganese	0.014	0.001	0.005	NE			108019-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108019-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108019-008	SW846 6020B
	Potassium	3.00	0.080	0.300	NE			108019-008	SW846 6020B
	Selenium	0.00625	0.002	0.005	0.050			108019-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108019-008	SW846 6020B
	Sodium	41.1	0.080	0.250	NE			108019-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108019-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U		108019-008	SW846 6020B
	Zinc	0.00926	0.0033	0.020	NE	J		108019-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108027-008	SW846 6020B
16-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108027-008	SW846 6020B
	Arsenic	0.00234	0.002	0.005	0.010	J		108027-008	SW846 6020B
	Barium	0.030	0.00067	0.004	2.00			108027-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108027-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108027-008	SW846 6020B
	Calcium	147	0.800	2.00	NE			108027-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108027-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108027-008	SW846 6020B
	Copper	0.000404	0.0003	0.002	1.3	J		108027-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108027-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108027-008	SW846 6020B
	Magnesium	41.6	0.010	0.030	NE			108027-008	SW846 6020B
	Manganese	0.00575	0.001	0.005	NE			108027-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108027-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108027-008	SW846 6020B
	Potassium	2.42	0.080	0.300	NE			108027-008	SW846 6020B
	Selenium	0.00907	0.002	0.005	0.050			108027-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108027-008	SW846 6020B
	Sodium	40.9	0.080	0.250	NE			108027-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108027-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U		108027-008	SW846 6020B
	Zinc	0.013	0.0033	0.020	NE	J		108027-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW13	Aluminum	ND	0.0193	0.050	NE	U		108036-008	SW846 6020B
19-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108036-008	SW846 6020B
	Arsenic	0.00237	0.002	0.005	0.010	J		108036-008	SW846 6020B
	Barium	0.085	0.00067	0.004	2.00			108036-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108036-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108036-008	SW846 6020B
	Calcium	101	0.800	2.00	NE			108036-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108036-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108036-008	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U		108036-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108036-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108036-008	SW846 6020B
	Magnesium	19.1	0.010	0.030	NE			108036-008	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U		108036-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108036-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108036-008	SW846 6020B
	Potassium	1.94	0.080	0.300	NE			108036-008	SW846 6020B
	Selenium	0.00377	0.002	0.005	0.050	J		108036-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108036-008	SW846 6020B
	Sodium	23.7	0.080	0.250	NE			108036-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108036-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U		108036-008	SW846 6020B
	Zinc	0.00618	0.0033	0.020	NE	J		108036-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108021-008	SW846 6020B
15-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108021-008	SW846 6020B
	Arsenic	0.002	0.002	0.005	0.010	J		108021-008	SW846 6020B
	Barium	0.0409	0.00067	0.004	2.00			108021-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108021-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108021-008	SW846 6020B
	Calcium	138	0.800	2.00	NE			108021-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108021-008	SW846 6020B
	Cobalt	0.00174	0.0003	0.001	NE			108021-008	SW846 6020B
	Copper	0.000502	0.0003	0.002	1.3	J		108021-008	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108021-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108021-008	SW846 6020B
	Magnesium	36.7	0.010	0.030	NE			108021-008	SW846 6020B
	Manganese	0.00706	0.001	0.005	NE			108021-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108021-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108021-008	SW846 6020B
	Potassium	2.24	0.080	0.300	NE			108021-008	SW846 6020B
	Selenium	0.0104	0.002	0.005	0.050			108021-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108021-008	SW846 6020B
	Sodium	41.0	0.080	0.250	NE			108021-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108021-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U		108021-008	SW846 6020B
	Zinc	0.00821	0.0033	0.020	NE	J		108021-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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		108030-009	SW846 6020B
17-Apr-19	Antimony	ND	0.001	0.003	0.006	U		108030-009	SW846 6020B
	Arsenic	0.0024	0.002	0.005	0.010	J		108030-009	SW846 6020B
	Barium	0.0628	0.00067	0.004	2.00			108030-009	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U		108030-009	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U		108030-009	SW846 6020B
	Calcium	170	0.400	1.00	NE			108030-009	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U		108030-009	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U		108030-009	SW846 6020B
	Copper	0.00175	0.0003	0.002	1.3	J		108030-009	SW846 6020B
	Iron	ND	0.033	0.100	NE	U		108030-009	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U		108030-009	SW846 6020B
	Magnesium	49.5	0.050	0.150	NE			108030-009	SW846 6020B
	Manganese	ND	0.001	0.005	NE	U	R	108030-009	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		108030-009	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U		108030-009	SW846 6020B
	Potassium	2.92	0.080	0.300	NE			108030-009	SW846 6020B
	Selenium	0.00917	0.002	0.005	0.050			108030-009	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U		108030-009	SW846 6020B
	Sodium	46.3	0.080	0.250	NE			108030-009	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U		108030-009	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U		108030-009	SW846 6020B
	Zinc	0.00332	0.0033	0.020	NE	J		108030-009	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW16	Aluminum	ND	0.0193	0.050	NE	U	UJ	111922-008	SW846 6020B
20-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111922-008	SW846 6020B
	Arsenic	0.00256	0.002	0.005	0.010	J	J	111922-008	SW846 6020B
	Barium	0.0885	0.00067	0.004	2.00		J	111922-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	111922-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111922-008	SW846 6020B
	Calcium	116	0.400	1.00	NE		J	111922-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111922-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	111922-008	SW846 6020B
	Copper	0.000676	0.0003	0.002	1.3	J	0.002UJ	111922-008	SW846 6020B
	Iron	0.0353	0.033	0.100	NE	J	J	111922-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111922-008	SW846 6020B
	Magnesium	21.0	0.010	0.030	NE		J	111922-008	SW846 6020B
	Manganese	0.121	0.001	0.005	NE		J-	111922-008	SW846 6020B
	Molybdenum	0.00565	0.0002	0.001	NE		J	111922-008	SW846 6020B
	Nickel	0.00163	0.0006	0.002	NE	J	J	111922-008	SW846 6020B
	Potassium	2.66	0.080	0.300	NE		J	111922-008	SW846 6020B
	Selenium	0.0055	0.002	0.005	0.050		J	111922-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111922-008	SW846 6020B
	Sodium	33.7	0.080	0.250	NE		J	111922-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111922-008	SW846 6020B
	Vanadium	0.00485	0.0033	0.020	NE	J	J	111922-008	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U	UJ	111922-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW17	Aluminum	ND	0.0193	0.050	NE	U	UJ	111926-008	SW846 6020B
19-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111926-008	SW846 6020B
	Arsenic	0.00629	0.002	0.005	0.010		J	111926-008	SW846 6020B
	Barium	0.0881	0.00067	0.004	2.00		J	111926-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	111926-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111926-008	SW846 6020B
	Calcium	95.0	0.400	1.00	NE		J	111926-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111926-008	SW846 6020B
	Cobalt	0.00128	0.0003	0.001	NE		J	111926-008	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U	UJ	111926-008	SW846 6020B
	Iron	0.524	0.033	0.100	NE		J	111926-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111926-008	SW846 6020B
	Magnesium	19.6	0.010	0.030	NE		J	111926-008	SW846 6020B
	Manganese	0.407	0.001	0.005	NE		J	111926-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		111926-008	SW846 6020B
	Molybdenum	0.00545	0.0002	0.001	NE		J	111926-008	SW846 7470A
	Nickel	0.00132	0.0006	0.002	NE	J	J	111926-008	SW846 6020B
	Potassium	2.70	0.080	0.300	NE		J	111926-008	SW846 6020B
	Selenium	0.00325	0.002	0.005	0.050	J	J	111926-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111926-008	SW846 6020B
	Sodium	35.4	0.080	0.250	NE		J	111926-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111926-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U	UJ	111926-008	SW846 6020B
	Zinc	0.00461	0.0033	0.020	NE	J	J	111926-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Continued)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW18	Aluminum	0.343	0.0193	0.050	NE		J	111929-008	SW846 6020B
19-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111929-008	SW846 6020B
	Arsenic	0.00227	0.002	0.005	0.010	J	J	111929-008	SW846 6020B
	Barium	0.0475	0.00067	0.004	2.00		J	111929-008	SW846 6020B
	Beryllium	0.00197	0.0002	0.0005	0.004		J	111929-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111929-008	SW846 6020B
	Calcium	126	0.400	1.00	NE		J	111929-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111929-008	SW846 6020B
	Cobalt	0.00627	0.0003	0.001	NE	J	J	111929-008	SW846 6020B
	Copper	0.0019	0.0003	0.002	1.3	J	J	111929-008	SW846 6020B
	Iron	0.488	0.033	0.100	NE		J	111929-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111929-008	SW846 6020B
	Magnesium	28.9	0.010	0.030	NE		J	111929-008	SW846 6020B
	Manganese	0.0756	0.001	0.005	NE		J-	111929-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		111929-008	SW846 6020B
	Molybdenum	0.00338	0.0002	0.001	NE		J	111929-008	SW846 7470A
	Nickel	0.00144	0.0006	0.002	NE	J	J	111929-008	SW846 6020B
	Potassium	2.04	0.080	0.300	NE		J	111929-008	SW846 6020B
	Selenium	0.00457	0.002	0.005	0.050	J	J	111929-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111929-008	SW846 6020B
	Sodium	33.5	0.080	0.250	NE		J	111929-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111929-008	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U	UJ	111929-008	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U	UJ	111929-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-9 *(Concluded)*
Summary of Total Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW19	Aluminum	ND	0.0193	0.050	NE	U	UJ	111932-008	SW846 6020B
18-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111932-008	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U	UJ	111932-008	SW846 6020B
	Barium	0.0633	0.00067	0.004	2.00		J	111932-008	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	111932-008	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111932-008	SW846 6020B
	Calcium	112	0.400	1.00	NE		J	111932-008	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111932-008	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	111932-008	SW846 6020B
	Copper	0.000604	0.0003	0.002	1.3	J	J	111932-008	SW846 6020B
	Iron	0.0352	0.033	0.100	NE	J	J	111932-008	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111932-008	SW846 6020B
	Magnesium	32.1	0.010	0.030	NE		J	111932-008	SW846 6020B
	Manganese	0.025	0.001	0.005	NE		J-	111932-008	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		111932-008	SW846 6020B
	Molybdenum	0.00379	0.0002	0.001	NE		J	111932-008	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U	UJ	111932-008	SW846 6020B
	Potassium	1.96	0.080	0.300	NE		J	111932-008	SW846 6020B
	Selenium	0.00573	0.002	0.005	0.050		J	111932-008	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111932-008	SW846 6020B
	Sodium	24.3	0.080	0.250	NE		J	111932-008	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111932-008	SW846 6020B
	Vanadium	0.00364	0.0033	0.020	NE	J	J	111932-008	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U	UJ	111932-008	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-10
Summary of Filtered Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW16	Aluminum	ND	0.0193	0.050	NE	U	UJ	111922-009	SW846 6020B
20-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111922-009	SW846 6020B
	Arsenic	0.00251	0.002	0.005	0.010	J	J	111922-009	SW846 6020B
	Barium	0.0868	0.00067	0.004	2.00		J	111922-009	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	111922-009	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111922-009	SW846 6020B
	Calcium	113	0.400	1.00	NE		J	111922-009	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111922-009	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	111922-009	SW846 6020B
	Copper	0.000836	0.0003	0.002	1.3	J	0.002UJ	111922-009	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	111922-009	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111922-009	SW846 6020B
	Magnesium	21.3	0.010	0.030	NE		J-	111922-009	SW846 6020B
	Manganese	0.125	0.001	0.005	NE		J-	111922-009	SW846 6020B
	Molybdenum	0.00567	0.0002	0.001	NE		J	111922-009	SW846 6020B
	Nickel	0.00143	0.0006	0.002	NE	J	J-	111922-009	SW846 6020B
	Potassium	2.64	0.080	0.300	NE		J-	111922-009	SW846 6020B
	Selenium	0.00541	0.002	0.005	0.050		J	111922-009	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111922-009	SW846 6020B
	Sodium	34.6	0.080	0.250	NE		J-	111922-009	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111922-009	SW846 6020B
	Vanadium	0.00461	0.0033	0.020	NE	J	J-	111922-009	SW846 6020B
	Zinc	0.00336	0.0033	0.020	NE	J	J	111922-009	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-10 *(Continued)*
Summary of Filtered Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW17	Aluminum	ND	0.0193	0.050	NE	U	UJ	111926-009	SW846 6020B
19-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111926-009	SW846 6020B
	Arsenic	0.00603	0.002	0.005	0.010		J	111926-009	SW846 6020B
	Barium	0.087	0.00067	0.004	2.00		J	111926-009	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	111926-009	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111926-009	SW846 6020B
	Calcium	92.5	0.400	1.00	NE		J	111926-009	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111926-009	SW846 6020B
	Cobalt	0.00187	0.0003	0.001	NE		J	111926-009	SW846 6020B
	Copper	ND	0.0003	0.002	1.3	U	UJ	111926-009	SW846 6020B
	Iron	0.473	0.033	0.100	NE		J	111926-009	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111926-009	SW846 6020B
	Magnesium	18.7	0.010	0.030	NE		J	111926-009	SW846 6020B
	Manganese	0.399	0.001	0.005	NE		J	111926-009	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		111926-009	SW846 6020B
	Molybdenum	0.00552	0.0002	0.001	NE		J	111926-009	SW846 7470A
	Nickel	0.00144	0.0006	0.002	NE	J	J	111926-009	SW846 6020B
	Potassium	2.66	0.080	0.300	NE		J	111926-009	SW846 6020B
	Selenium	0.0032	0.002	0.005	0.050	J	J	111926-009	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111926-009	SW846 6020B
	Sodium	33.9	0.080	0.250	NE		J	111926-009	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111926-009	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U	UJ	111926-009	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U	UJ	111926-009	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-10 *(Continued)*
Summary of Filtered Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW18	Aluminum	ND	0.0193	0.050	NE	U	UJ	111929-009	SW846 6020B
19-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111929-009	SW846 6020B
	Arsenic	0.00201	0.002	0.005	0.010	J	J	111929-009	SW846 6020B
	Barium	0.0455	0.00067	0.004	2.00		J	111929-009	SW846 6020B
	Beryllium	0.00183	0.0002	0.0005	0.004		J-	111929-009	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111929-009	SW846 6020B
	Calcium	128	0.400	1.00	NE		J	111929-009	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111929-009	SW846 6020B
	Cobalt	0.000353	0.0003	0.001	NE	J	J	111929-009	SW846 6020B
	Copper	0.000392	0.0003	0.002	1.3	J	J	111929-009	SW846 6020B
	Iron	0.0423	0.033	0.100	NE	J	J-	111929-009	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111929-009	SW846 6020B
	Magnesium	28.4	0.010	0.030	NE		J-	111929-009	SW846 6020B
	Manganese	0.0642	0.001	0.005	NE		J-	111929-009	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		111929-009	SW846 6020B
	Molybdenum	0.00333	0.0002	0.001	NE	J	J	111929-009	SW846 7470A
	Nickel	0.000714	0.0006	0.002	NE	J	J-	111929-009	SW846 6020B
	Potassium	1.98	0.080	0.300	NE		J-	111929-009	SW846 6020B
	Selenium	0.00361	0.002	0.005	0.050	J	J	111929-009	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111929-009	SW846 6020B
	Sodium	33.3	0.080	0.250	NE		J-	111929-009	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111929-009	SW846 6020B
	Vanadium	ND	0.0033	0.020	NE	U	UJ	111929-009	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U	UJ	111929-009	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-10 *(Concluded)*
Summary of Filtered Metal Results,
Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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-MW19	Aluminum	ND	0.0193	0.050	NE	U	UJ	111932-009	SW846 6020B
18-Nov-19	Antimony	ND	0.001	0.003	0.006	U	UJ	111932-009	SW846 6020B
	Arsenic	ND	0.002	0.005	0.010	U	UJ	111932-009	SW846 6020B
	Barium	0.063	0.00067	0.004	2.00		J	111932-009	SW846 6020B
	Beryllium	ND	0.0002	0.0005	0.004	U	UJ	111932-009	SW846 6020B
	Cadmium	ND	0.0003	0.001	0.005	U	UJ	111932-009	SW846 6020B
	Calcium	113	0.400	1.00	NE		J	111932-009	SW846 6020B
	Chromium	ND	0.003	0.010	0.100	U	UJ	111932-009	SW846 6020B
	Cobalt	ND	0.0003	0.001	NE	U	UJ	111932-009	SW846 6020B
	Copper	0.000667	0.0003	0.002	1.3	J	J	111932-009	SW846 6020B
	Iron	ND	0.033	0.100	NE	U	UJ	111932-009	SW846 6020B
	Lead	ND	0.0005	0.002	0.015	U	UJ	111932-009	SW846 6020B
	Magnesium	32.7	0.010	0.030	NE		J	111932-009	SW846 6020B
	Manganese	0.0248	0.001	0.005	NE		J-	111932-009	SW846 6020B
	Mercury	ND	0.000067	0.0002	0.002	U		111932-009	SW846 6020B
	Molybdenum	0.00384	0.0002	0.001	NE		J	111932-009	SW846 7470A
	Nickel	ND	0.0006	0.002	NE	U	UJ	111932-009	SW846 6020B
	Potassium	1.98	0.080	0.300	NE		J	111932-009	SW846 6020B
	Selenium	0.00535	0.002	0.005	0.050		J	111932-009	SW846 6020B
	Silver	ND	0.0003	0.001	NE	U	UJ	111932-009	SW846 6020B
	Sodium	24.8	0.080	0.250	NE		J	111932-009	SW846 6020B
	Thallium	ND	0.0006	0.002	0.002	U	UJ	111932-009	SW846 6020B
	Vanadium	0.00355	0.0033	0.020	NE	J	J	111932-009	SW846 6020B
	Zinc	ND	0.0033	0.020	NE	U	UJ	111932-009	SW846 6020B

Refer to footnotes on page 7B-40.

Table 7B-11
Summary of Gamma Spectroscopy, Gross Alpha, Gross Beta, Isotopic Uranium, and Tritium Results, Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

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	-8.04 ± 13.7	21.0	10.1	NE	U	BD	108003-009	EPA 901.1
08-Apr-19	Cesium-137	1.29 ± 1.97	3.52	1.66	NE	U	BD	108003-009	EPA 901.1
	Cobalt-60	0.0421 ± 2.04	3.82	1.74	NE	U	BD	108003-009	EPA 901.1
	Potassium-40	-15.6 ± 38.3	54.3	25.5	NE	U	BD	108003-009	EPA 901.1
	Gross Alpha	4.57	NA	NA	15 pCi/L	NA	None	108003-010	EPA 900.0
	Gross Beta	10.0 ± 1.31	1.65	0.797	4 mrem/yr	*	J	108003-010	EPA 900.0
	Uranium-233/234	34.6 ± 3.39	0.156	0.0715	NE			108003-011	HASL-300
	Uranium-235/236	0.472 ± 0.122	0.113	0.0486	NE			108003-011	HASL-300
	Uranium-238	4.46 ± 0.514	0.114	0.0506	NE			108003-011	HASL-300
	Tritium	1.26 ± 80.3	146	67.3	NE	U	BD	108003-012	EPA 906.0
CYN-MW7	Americium-241	0.354 ± 3.38	5.34	2.59	NE	U	BD	108009-009	EPA 901.1
09-Apr-19	Cesium-137	1.08 ± 2.54	3.97	1.88	NE	U	BD	108009-009	EPA 901.1
	Cobalt-60	-0.0752 ± 2.27	4.08	1.87	NE	U	BD	108009-009	EPA 901.1
	Potassium-40	47.9 ± 54.8	35.3	15.9	NE	X	R	108009-009	EPA 901.1
	Gross Alpha	5.91	NA	NA	15 pCi/L	NA	None	108009-010	EPA 900.0
	Gross Beta	4.10 ± 1.14	1.72	0.828	4 mrem/yr	*	J	108009-010	EPA 900.0
	Uranium-233/234	18.0 ± 1.74	0.132	0.0603	NE			108009-011	HASL-300
	Uranium-235/236	0.244 ± 0.0757	0.0955	0.041	NE		J	108009-011	HASL-300
	Uranium-238	2.25 ± 0.279	0.0963	0.0427	NE			108009-011	HASL-300
	Tritium	-0.297 ± 79.6	145	66.8	NE	U	BD	108009-012	EPA 906.0
CYN-MW8	Americium-241	-7.22 ± 14.6	25.7	12.5	NE	U	BD	108011-009	EPA 901.1
10-Apr-19	Cesium-137	0.658 ± 2.21	3.58	1.72	NE	U	BD	108011-009	EPA 901.1
	Cobalt-60	0.826 ± 2.39	4.37	2.06	NE	U	BD	108011-009	EPA 901.1
	Potassium-40	35.1 ± 54.4	42.7	20.1	NE	U	BD	108011-009	EPA 901.1
	Gross Alpha	-2.50	NA	NA	15 pCi/L	NA	None	108011-010	EPA 900.0
	Gross Beta	7.05 ± 1.16	1.52	0.730	4 mrem/yr	*	J	108011-010	EPA 900.0
	Uranium-233/234	23.7 ± 2.23	0.123	0.0566	NE			108011-011	HASL-300
	Uranium-235/236	0.247 ± 0.0761	0.0896	0.0385	NE		J	108011-011	HASL-300
	Uranium-238	2.65 ± 0.312	0.0904	0.0401	NE			108011-011	HASL-300
	Tritium	34.8 ± 110	189	91.4	NE	U	BD	108011-012	EPA 906.0

Refer to footnotes on page 7B-40.

Table 7B-11 *(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 2019

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	161 ± 6.59	12.0	5.83	NE	U	BD	108034-009	EPA 901.1
18-Apr-19	Cesium-137	0.650 ± 5.03	3.00	1.41	NE	U	BD	108034-009	EPA 901.1
	Cobalt-60	1.63 ± 2.22	3.70	1.72	NE	U	BD	108034-009	EPA 901.1
	Potassium-40	-19.3 ± 34.4	45.0	21.2	NE	U	BD	108034-009	EPA 901.1
	Gross Alpha	0.22	NA	NA	15 pCi/L	NA	None	108034-010	EPA 900.0
	Gross Beta	0.0716 ± 1.78	3.05	1.48	4 mrem/yr	U	BD	108034-010	EPA 900.0
	Uranium-233/234	8.05 ± 0.962	0.227	0.104	NE			108034-011	HASL-300
	Uranium-235/236	0.223 ± 0.0951	0.165	0.0708	NE		J	108034-011	HASL-300
	Uranium-238	2.31 ± 0.350	0.166	0.0737	NE			108034-011	HASL-300
	Tritium	-32.0 ± 84.6	158	73.3	NE	U	BD	108034-012	EPA 906.0
CYN-MW10	Americium-241	7.16 ± 11.3	19.2	9.31	NE	U	BD	108014-009	EPA 901.1
11-Apr-19	Cesium-137	1.04 ± 1.99	3.60	1.70	NE	U	BD	108014-009	EPA 901.1
	Cobalt-60	-2.33 ± 3.99	4.03	1.85	NE	U	BD	108014-009	EPA 901.1
	Potassium-40	35.6 ± 47.5	31.9	14.3	NE	X	R	108014-009	EPA 901.1
	Gross Alpha	-1.79	NA	NA	15 pCi/L	NA	None	108014-010	EPA 900.0
	Gross Beta	2.26 ± 0.954	1.47	0.707	4 mrem/yr	*	J	108014-010	EPA 900.0
	Uranium-233/234	5.28 ± 0.611	0.170	0.0781	NE			108014-011	HASL-300
	Uranium-235/236	0.0837 ± 0.0556	0.124	0.0531	NE	U	BD	108014-011	HASL-300
	Uranium-238	1.82 ± 0.265	0.125	0.0552	NE			108014-011	HASL-300
	Tritium	19.4 ± 79.8	142	65.5	NE	U	BD	108014-012	EPA 906.0
CYN-MW11	Americium-241	4.98 ± 10.0	17.8	8.61	NE	U	BD	108019-009	EPA 901.1
12-Apr-19	Cesium-137	0.178 ± 2.27	3.56	1.68	NE	U	BD	108019-009	EPA 901.1
	Cobalt-60	-0.697 ± 2.20	3.82	1.74	NE	U	BD	108019-009	EPA 901.1
	Potassium-40	24.3 ± 52.5	38.8	17.7	NE	U	BD	108019-009	EPA 901.1
	Gross Alpha	0.18	NA	NA	15 pCi/L	NA	None	108019-010	EPA 900.0
	Gross Beta	6.00 ± 1.16	1.52	0.723	4 mrem/yr			108019-010	EPA 900.0
	Uranium-233/234	4.99 ± 0.519	0.0929	0.0426	NE			108019-011	HASL-300
	Uranium-235/236	0.225 ± 0.0597	0.0675	0.029	NE			108019-011	HASL-300
	Uranium-238	1.81 ± 0.219	0.068	0.0302	NE			108019-011	HASL-300
	Tritium	60.6 ± 86.7	147	67.4	NE	U	BD	108019-012	EPA 906.0

Refer to footnotes on page 7B-40.

Table 7B-11 *(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 2019

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	8.24 ± 16.8	26.6	12.9	NE	U	BD	108027-009	EPA 901.1
16-Apr-19	Cesium-137	-2.48 ± 2.92	4.02	1.91	NE	U	BD	108027-009	EPA 901.1
	Cobalt-60	-0.324 ± 2.69	4.66	2.17	NE	U	BD	108027-009	EPA 901.1
	Potassium-40	8.59 ± 62.7	45.2	21.0	NE	U	BD	108027-009	EPA 901.1
	Gross Alpha	-1.20	NA	NA	15 pCi/L	NA	None	108027-010	EPA 900.0
	Gross Beta	-1.06 ± 1.30	2.32	1.12	4 mrem/yr	U	BD	108027-010	EPA 900.0
	Uranium-233/234	12.1 ± 1.24	0.114	0.0524	NE			108027-011	HASL-300
	Uranium-235/236	0.402 ± 0.0913	0.083	0.0356	NE			108027-011	HASL-300
	Uranium-238	2.90 ± 0.344	0.0836	0.0371	NE			108027-011	HASL-300
	Tritium	-41.9 ± 72.9	139	64.3	NE	U	BD	108027-012	EPA 906.0
CYN-MW13	Americium-241	0.567 ± 12.2	18.7	9.11	NE	U	BD	108036-009	EPA 901.1
19-Apr-19	Cesium-137	-0.939 ± 3.08	3.45	1.64	NE	U	BD	108036-009	EPA 901.1
	Cobalt-60	-0.472 ± 2.10	3.67	1.70	NE	U	BD	108036-009	EPA 901.1
	Potassium-40	22.7 ± 47.6	35.0	16.1	NE	U	BD	108036-009	EPA 901.1
	Gross Alpha	-3.13	NA	NA	15 pCi/L	NA	None	108036-010	EPA 900.0
	Gross Beta	1.15 ± 0.534	0.782	0.371	4 mrem/yr		J	108036-010	EPA 900.0
	Uranium-233/234	9.25 ± 0.996	0.170	0.078	NE			108036-011	HASL-300
	Uranium-235/236	0.109 ± 0.0664	0.124	0.0531	NE	U	BD	108036-011	HASL-300
	Uranium-238	1.36 ± 0.214	0.125	0.0552	NE			108036-011	HASL-300
	Tritium	-34.6 ± 82.3	154	71.6	NE	U	BD	108036-012	EPA 906.0
CYN-MW14A	Americium-241	0.273 ± 6.72	11.2	5.53	NE	U	BD	108021-009	EPA 901.1
15-Apr-19	Cesium-137	1.21 ± 2.15	3.22	1.56	NE	U	BD	108021-009	EPA 901.1
	Cobalt-60	1.55 ± 2.06	3.54	1.69	NE	U	BD	108021-009	EPA 901.1
	Potassium-40	-11.8 ± 33.6	43.9	21.1	NE	U	BD	108021-009	EPA 901.1
	Gross Alpha	-0.56	NA	NA	15 pCi/L	NA	None	108021-010	EPA 900.0
	Gross Beta	4.19 ± 1.37	2.09	1.01	4 mrem/yr		J	108021-010	EPA 900.0
	Uranium-233/234	11.6 ± 1.10	0.0826	0.0379	NE			108021-011	HASL-300
	Uranium-235/236	0.387 ± 0.0786	0.060	0.0258	NE			108021-011	HASL-300
	Uranium-238	2.87 ± 0.309	0.0605	0.0268	NE			108021-011	HASL-300
	Tritium	134 ± 98.0	151	69.0	NE	U	BD	108021-012	EPA 906.0

Refer to footnotes on page 7B-40.

Table 7B-11 *(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 2019

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	-4.69 ± 16.4	25.6	12.4	NE	U	BD	108030-010	EPA 901.1
17-Apr-19	Cesium-137	-1.06 ± 2.28	3.94	1.87	NE	U	BD	108030-010	EPA 901.1
	Cobalt-60	0.629 ± 2.56	4.58	2.13	NE	U	BD	108030-010	EPA 901.1
	Potassium-40	-11.7 ± 43.1	56.2	26.5	NE	U	BD	108030-010	EPA 901.1
	Gross Alpha	0.23	NA	NA	15 pCi/L	NA	None	108030-011	EPA 900.0
	Gross Beta	-3.39 ± 1.47	2.76	1.33	4 mrem/yr	U	R	108030-011	EPA 900.0
	Uranium-233/234	13.6 ± 1.35	0.139	0.0636	NE			108030-012	HASL-300
	Uranium-235/236	0.268 ± 0.0815	0.101	0.0432	NE		J	108030-012	HASL-300
	Uranium-238	3.20 ± 0.375	0.102	0.045	NE			108030-012	HASL-300
	Tritium	-0.973 ± 88.5	160	74.4	NE	U	BD	108030-013	EPA 906.0
CYN-MW16	Americium-241	-14.7 ± 26.4	42.9	21.1	NE	U	BD	111922-010	EPA 901.1
20-Nov-19	Cesium-137	-0.626 ± 3.17	4.66	2.24	NE	U	BD	111922-010	EPA 901.1
	Cobalt-60	2.34 ± 5.36	4.91	2.31	NE	U	BD	111922-010	EPA 901.1
	Potassium-40	-14.7 ± 46.3	62.2	29.7	NE	U	BD	111922-010	EPA 901.1
	Gross Alpha	-1.10	NA	NA	15 pCi/L	NA	None	111922-011	EPA 900.0
	Gross Beta	3.13 ± 1.19	1.90	0.929	4 mrem/yr		J	111922-011	EPA 900.0
	Uranium-233/234	8.45 ± 0.942	0.102	0.045	NE			111922-012	HASL-300
	Uranium-235/236	0.102 ± 0.0579	0.0769	0.0311	NE		J	111922-012	HASL-300
	Uranium-238	1.52 ± 0.226	0.105	0.0467	NE			111922-012	HASL-300
	Tritium	26.3 ± 93.0	166	75.7	NE	U	BD	111922-013	EPA 906.0
CYN-MW17	Americium-241	1.24 ± 14.4	23.9	11.6	NE	U	BD	111926-010	EPA 901.1
19-Nov-19	Cesium-137	-0.787 ± 2.60	3.87	1.83	NE	U	BD	111926-010	EPA 901.1
	Cobalt-60	-0.782 ± 2.66	4.58	2.13	NE	U	BD	111926-010	EPA 901.1
	Potassium-40	62.3 ± 62.5	47.0	21.8	NE	X	R	111926-010	EPA 901.1
	Gross Alpha	1.01	NA	NA	15 pCi/L	NA	None	111926-011	EPA 900.0
	Gross Beta	5.13 ± 1.02	1.51	0.735	4 mrem/yr			111926-011	EPA 900.0
	Uranium-233/234	6.09 ± 0.692	0.126	0.0556	NE			111926-012	HASL-300
	Uranium-235/236	0.0666 ± 0.0587	0.0949	0.0384	NE	U	BD	111926-012	HASL-300
	Uranium-238	1.18 ± 0.195	0.130	0.0577	NE			111926-012	HASL-300
	Tritium	-15.9 ± 87.2	163	74.5	NE	U	BD	111926-013	EPA 906.0

Refer to footnotes on page 7B-40.

Table 7B-11 *(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 2019

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-MW18	Americium-241	-19.5 ± 29.6	47.2	23.2	NE	U	BD	111929-010	EPA 901.1
19-Nov-19	Cesium-137	0.394 ± 4.00	6.33	3.06	NE	U	BD	111929-010	EPA 901.1
	Cobalt-60	-3.16 ± 4.55	7.05	3.36	NE	U	BD	111929-010	EPA 901.1
	Potassium-40	49.9 ± 131	75.0	35.9	NE	U	BD	111929-010	EPA 901.1
	Gross Alpha	-1.60	NA	NA	15 pCi/L	NA	None	111929-011	EPA 900.0
	Gross Beta	4.47 ± 0.920	1.30	0.629	4 mrem/yr			111929-011	EPA 900.0
	Uranium-233/234	5.75 ± 0.614	0.0773	0.0341	NE			111929-012	HASL-300
	Uranium-235/236	0.0859 ± 0.0425	0.0583	0.0236	NE		J	111929-012	HASL-300
	Uranium-238	1.32 ± 0.184	0.0798	0.0354	NE			111929-012	HASL-300
	Tritium	31.9 ± 88.7	157	71.5	NE	U	BD	111929-013	EPA 906.0
CYN-MW19	Americium-241	5.43 ± 6.89	10.7	5.25	NE	U	BD	111932-010	EPA 901.1
18-Nov-19	Cesium-137	0.191 ± 2.22	3.32	1.60	NE	U	BD	111932-010	EPA 901.1
	Cobalt-60	-1.16 ± 2.46	3.45	1.63	NE	U	BD	111932-010	EPA 901.1
	Potassium-40	43.7 ± 59.4	34.5	16.3	NE	X	R	111932-010	EPA 901.1
	Gross Alpha	-2.10	NA	NA	15 pCi/L	NA	None	111932-011	EPA 900.0
	Gross Beta	2.45 ± 0.957	1.52	0.740	4 mrem/yr		J	111932-011	EPA 900.0
	Uranium-233/234	4.77 ± 0.523	0.0973	0.043	NE			111932-012	HASL-300
	Uranium-235/236	0.196 ± 0.0694	0.0734	0.0297	NE		J	111932-012	HASL-300
	Uranium-238	2.12 ± 0.270	0.101	0.0446	NE			111932-012	HASL-300
	Tritium	-2.60 ± 75.1	135	63.2	NE	U	BD	111932-013	EPA 906.0

Refer to footnotes on page 7B-40.

Table 7B-12
Summary of Field Water Quality Measurements[h], Burn Site Groundwater Monitoring, Sandia National Laboratories, New Mexico

Calendar Year 2019

Well ID	Sample Date	Temperature (°C)	Specific Conductivity (µmho/cm)	Oxidation Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
CYN-MW4	08-Apr-19	18.53	742.3	303.9	7.42	0.87	52.9	4.27
CYN-MW7	09-Apr-19	19.65	819.8	323.3	7.19	0.59	55.8	4.39
	27-Jun-19	20.89	740.6	169.2	7.22	0.89	54.5	4.11
CYN-MW8	10-Apr-19	17.62	888.8	308.4	7.34	0.37	62.0	5.03
CYN-MW9	18-Apr-19	15.74	1015.1	187.2	7.01	0.28	52.2	4.45
CYN-MW10	11-Apr-19	14.07	836.8	302.6	7.49	0.21	72.8	6.47
CYN-MW11	12-Apr-19	16.75	1048.9	98.2	7.33	0.68	6.82	0.55
CYN-MW12	16-Apr-19	18.66	1118.6	216.4	7.11	0.37	14.1	1.13
CYN-MW13	19-Apr-19	19.52	764.8	188.2	7.27	0.22	50.3	3.93
CYN-MW14A	15-Apr-19	17.91	996.8	185.4	7.36	0.64	15.8	1.29
CYN-MW15	17-Apr-19	14.28	1132.1	221.1	7.10	0.37	13.1	1.15
CYN-MW4	07-Oct-19	18.57	696.3	22.8	7.51	0.28	70.0	5.38
CYN-MW7	07-Oct-19	19.13	730.1	152.0	7.19	0.45	58.2	4.44
CYN-MW8	08-Oct-19	19.50	833.1	141.0	7.25	1.02	67.9	5.09
CYN-MW9	14-Oct-19	16.46	990.6	147.3	7.06	1.07	63.3	5.00
CYN-MW10	09-Oct-19	17.72	1038.2	16.6	7.23	1.71	8.7	0.68
CYN-MW11	10-Oct-19	18.73	1088.9	138.3	7.12	0.43	13.7	1.06
CYN-MW12	10-Oct-19	18.40	710.9	-4.6	7.24	0.17	41.3	3.22
CYN-MW13	11-Oct-19	18.35	968.5	161.0	7.27	0.23	18.4	1.41
CYN-MW14A	09-Oct-19	17.55	722.9	20.6	7.29	0.82	14.5	1.22
CYN-MW15	11-Oct-19	18.01	644.2	-41.3	7.10	1.06	15.5	1.24
CYN-MW16	20-Nov-19	17.62	785.3	90.4	6.85	20.0	11.1	0.92
CYN-MW17	19-Nov-19	16.01	686.3	92.6	7.43	0.72	77.7	6.73
CYN-MW18	19-Nov-19	18.57	696.3	22.8	7.51	0.28	70.0	5.38
CYN-MW19	18-Nov-19	19.13	730.1	152.0	7.19	0.45	58.2	4.44

Refer to footnotes on page 7B-36.

Footnotes for Burn Site Groundwater Analytical Results Tables

%	= Percent.
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 7B-1 through 7B-10. Activity applies to Table 7B-11.

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-10. MDA applies to Table 7B-11.

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-10. Critical level applies to Table 7B-11.

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 March 2018).

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]Laboratory 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).
H = Analytical holding time was exceeded.
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

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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.
µmho/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 7C
Burn Site Groundwater
Plots

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Attachment 7C Plots

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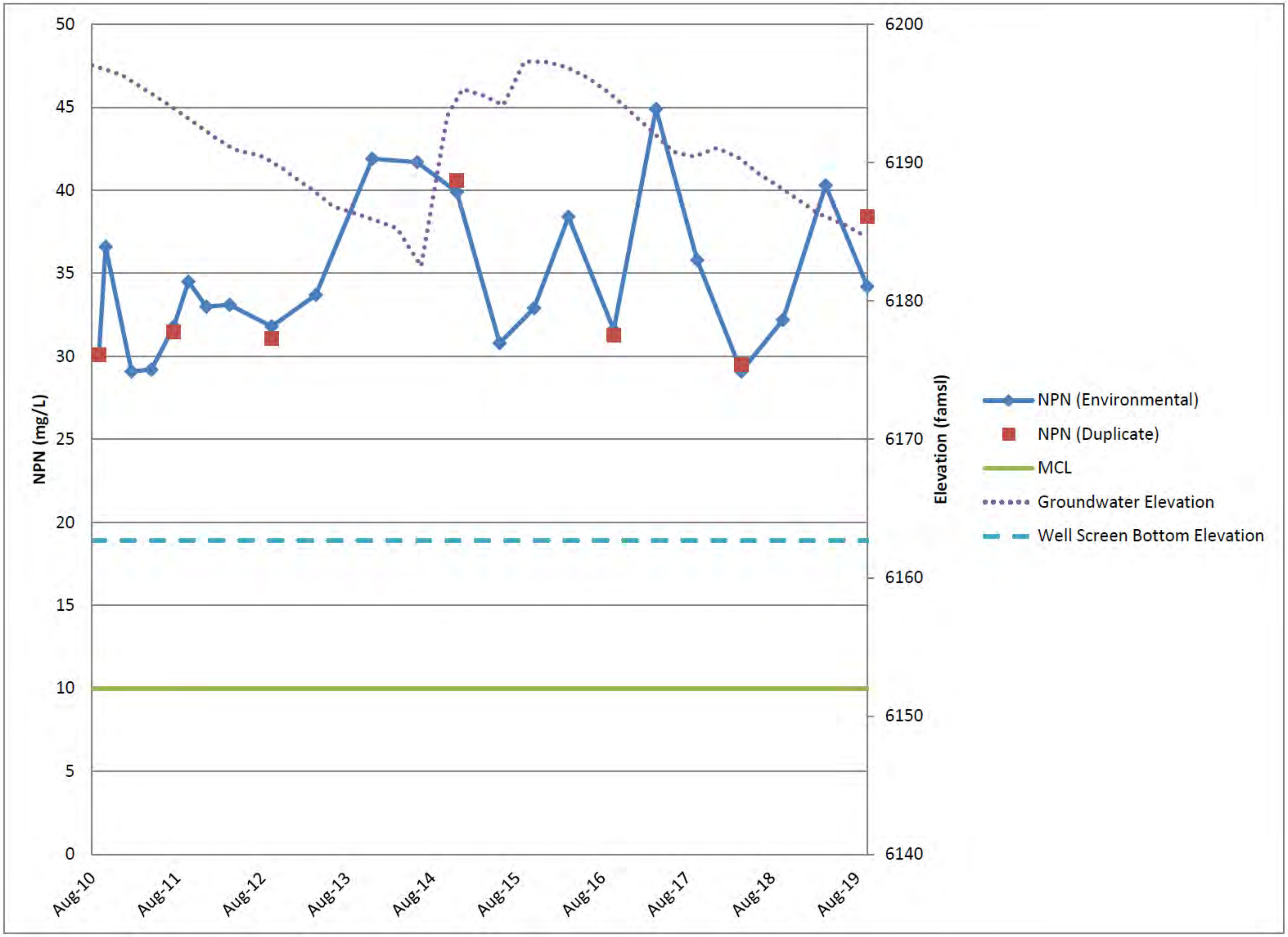

Figure 7C-1. Nitrate plus Nitrite Concentrations, CYN-MW9

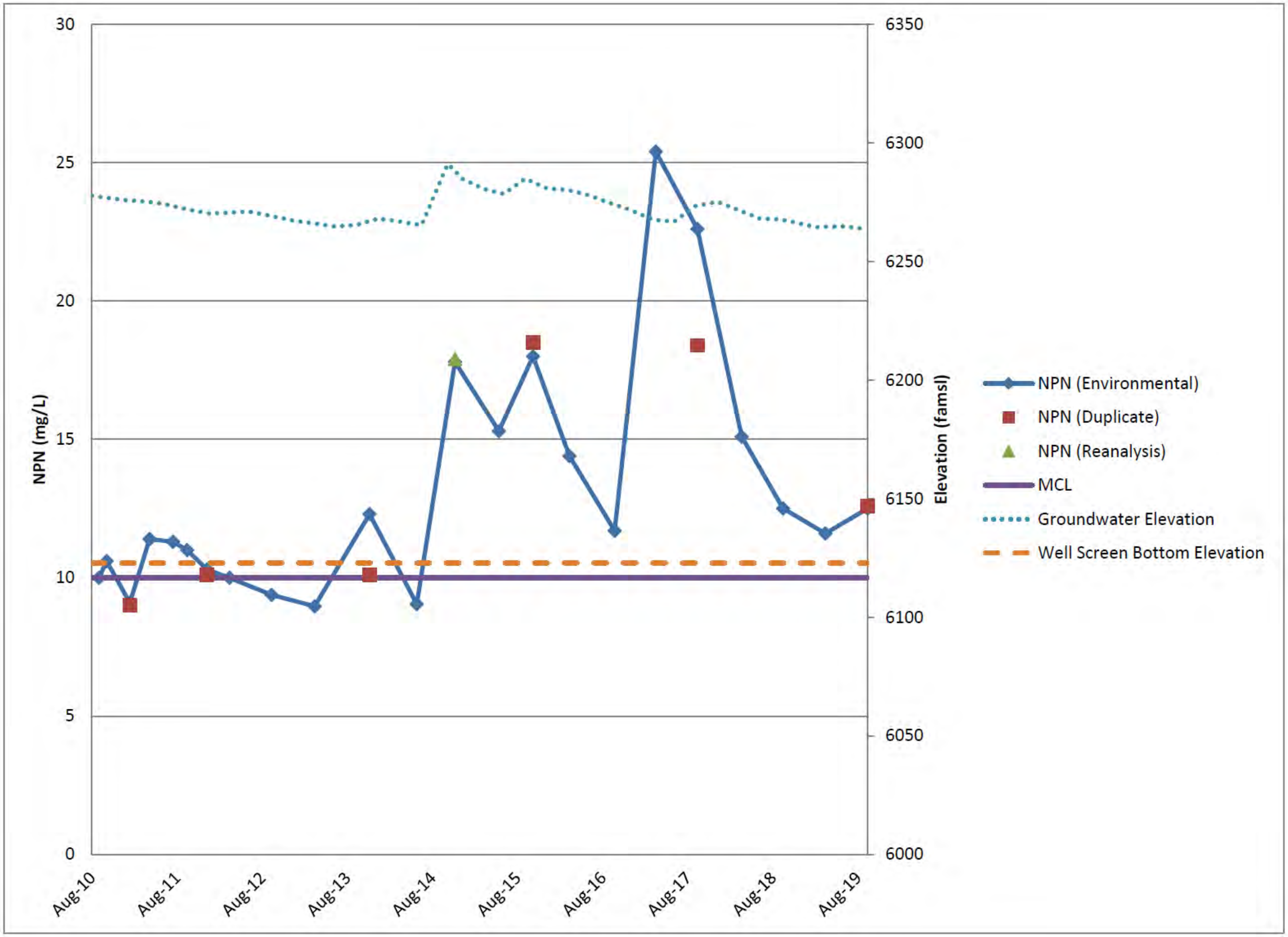

Figure 7C-2. Nitrate plus Nitrite Concentrations, CYN-MW11

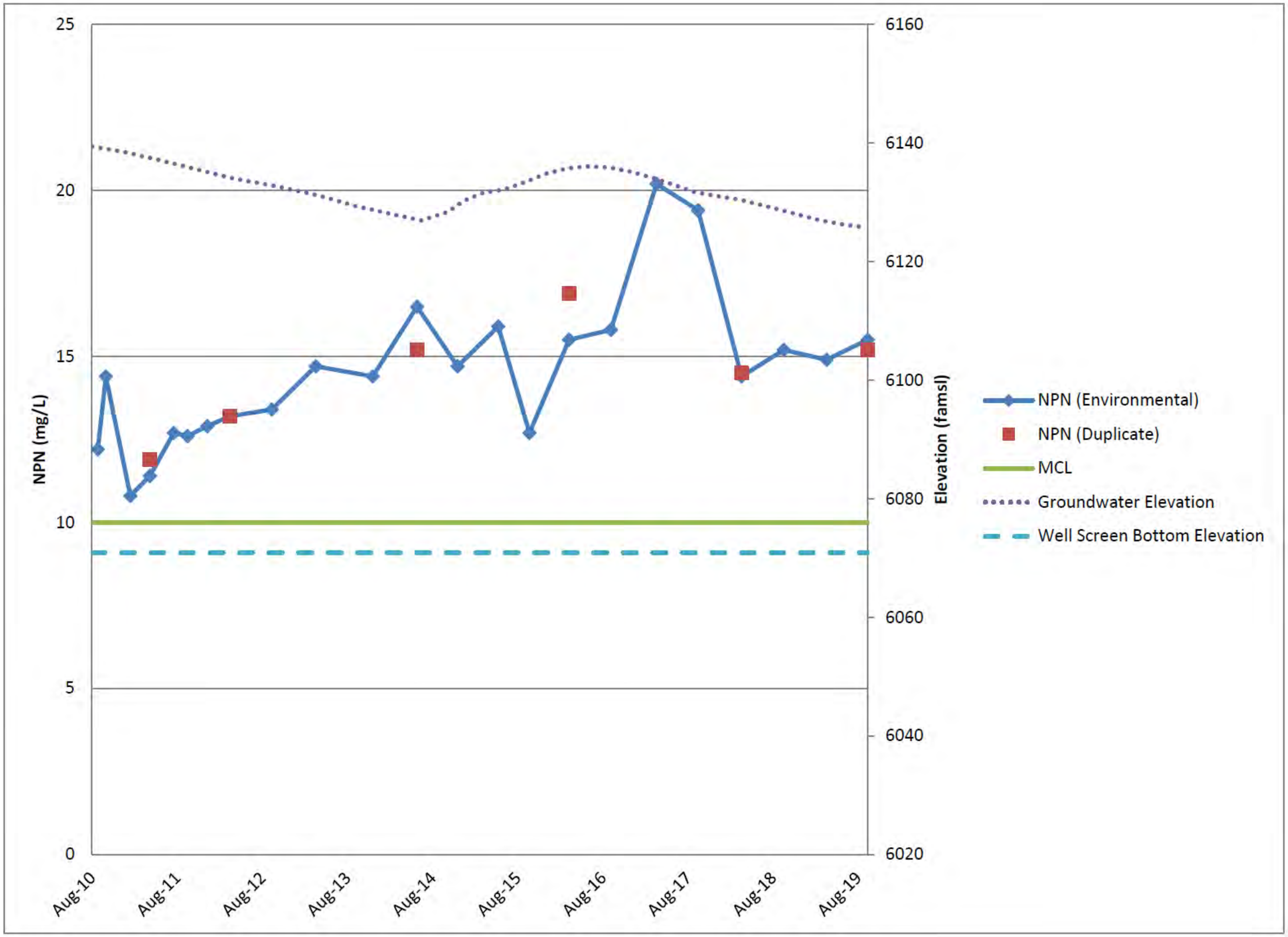

Figure 7C-3. Nitrate plus Nitrite Concentrations, CYN-MW12

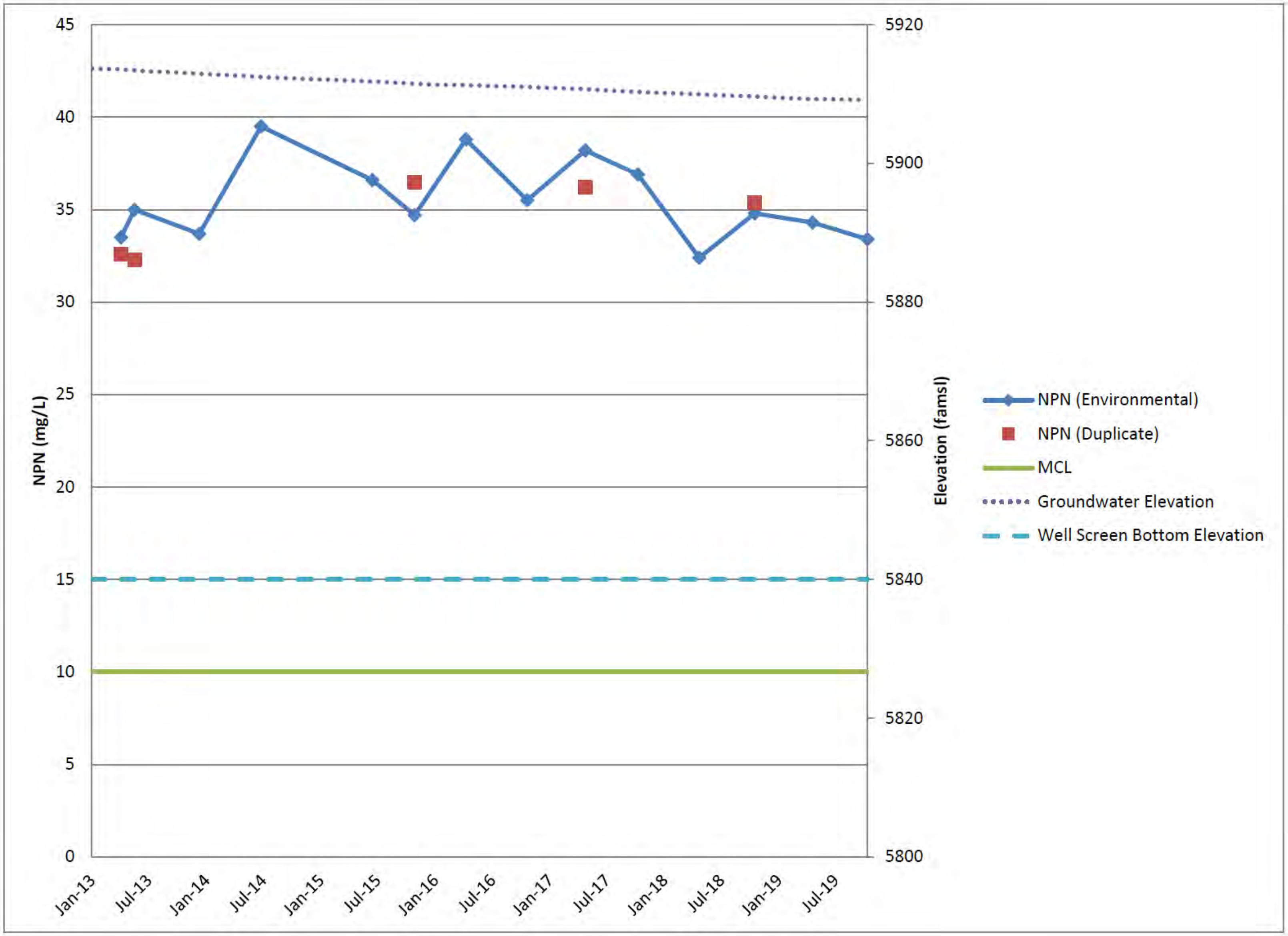

Figure 7C-4. Nitrate plus Nitrite Concentrations, CYN-MW13

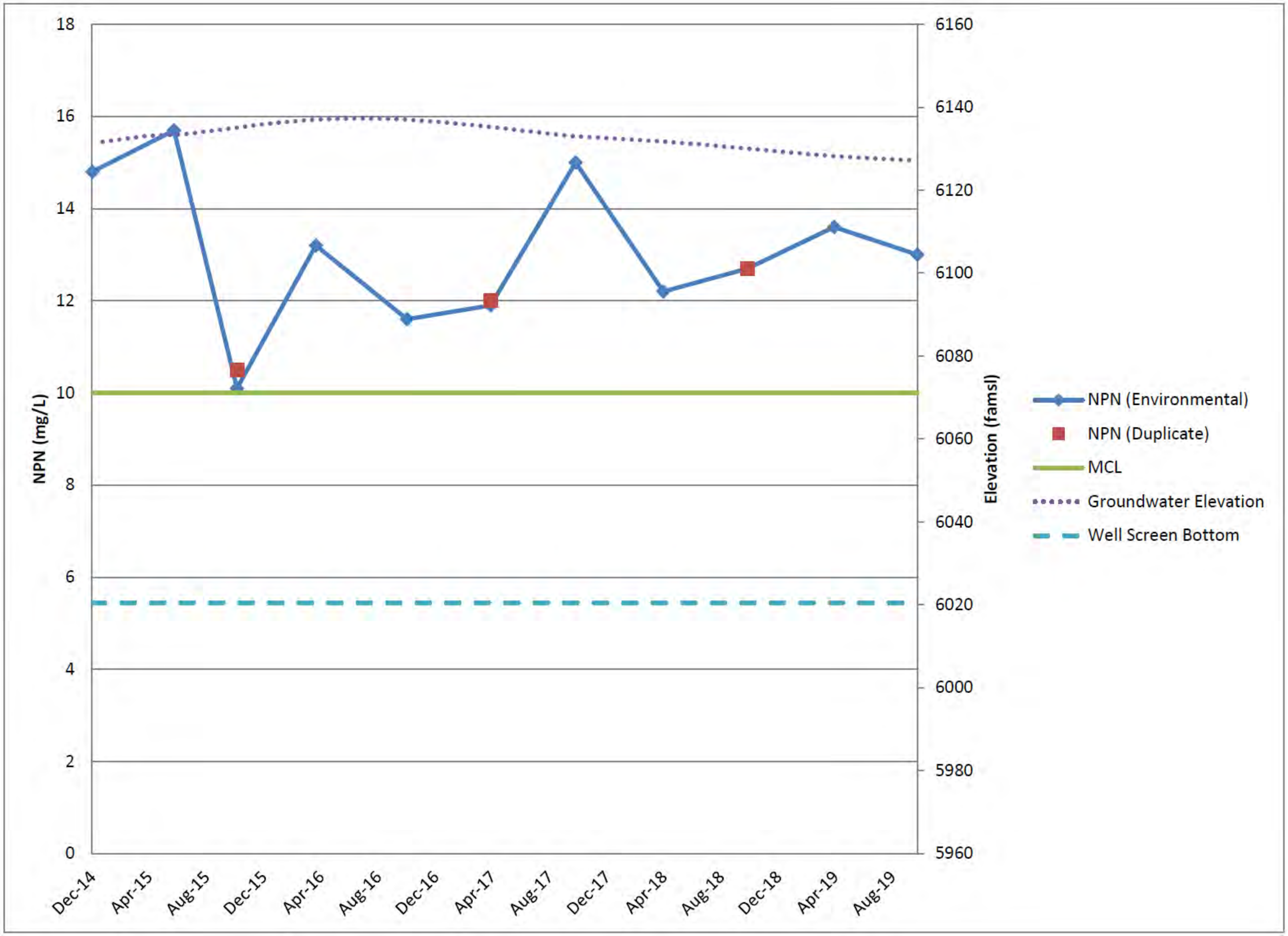

Figure 7C-5. Nitrate plus Nitrite Concentrations, CYN-MW14A

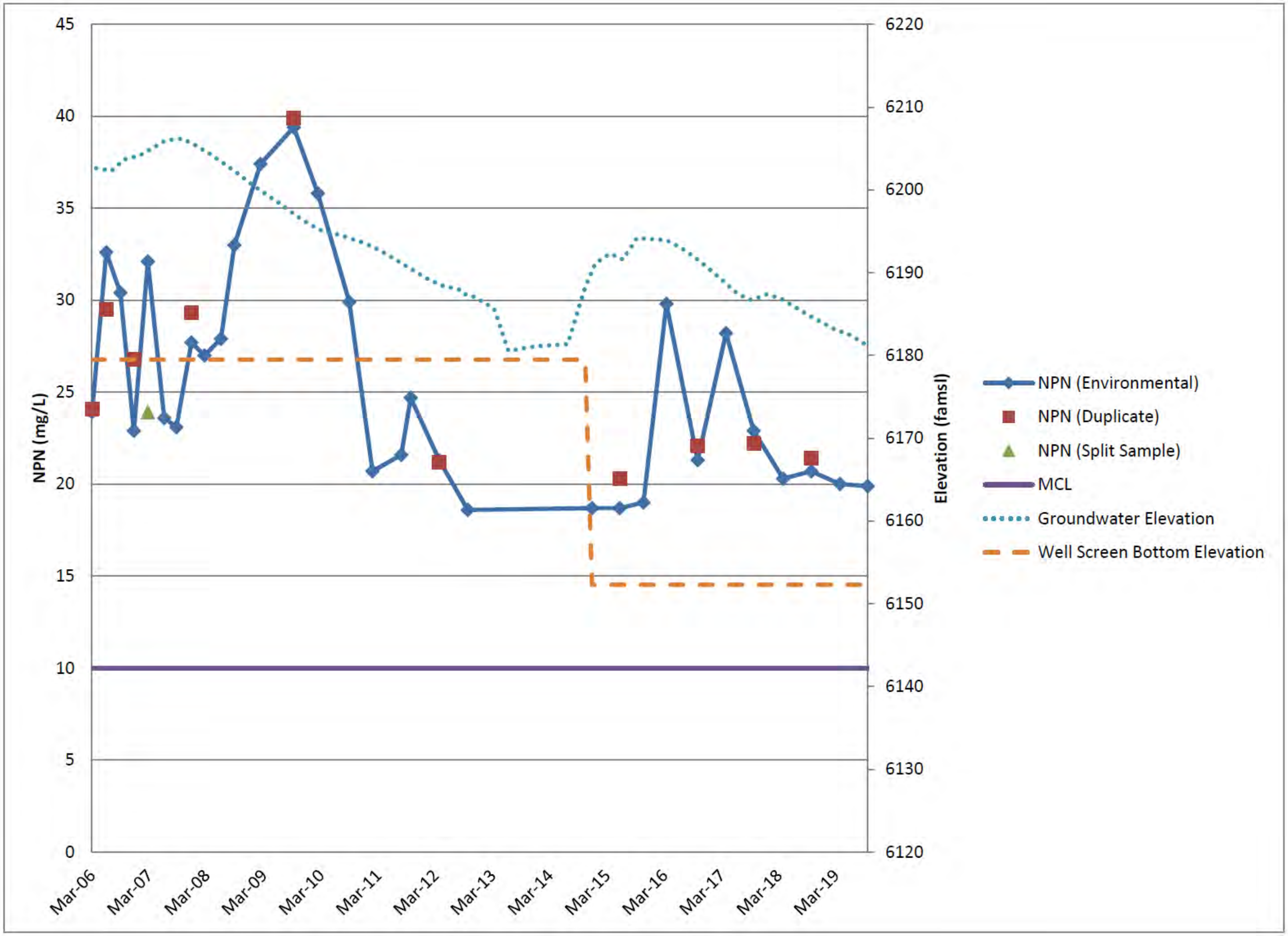

Figure 7C-6. Nitrate plus Nitrite Concentrations, CYN-MW15 (Includes Historical CYN-MW6 Data)

Attachment 7D
Burn Site Groundwater
Hydrographs

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Attachment 7D Hydrographs

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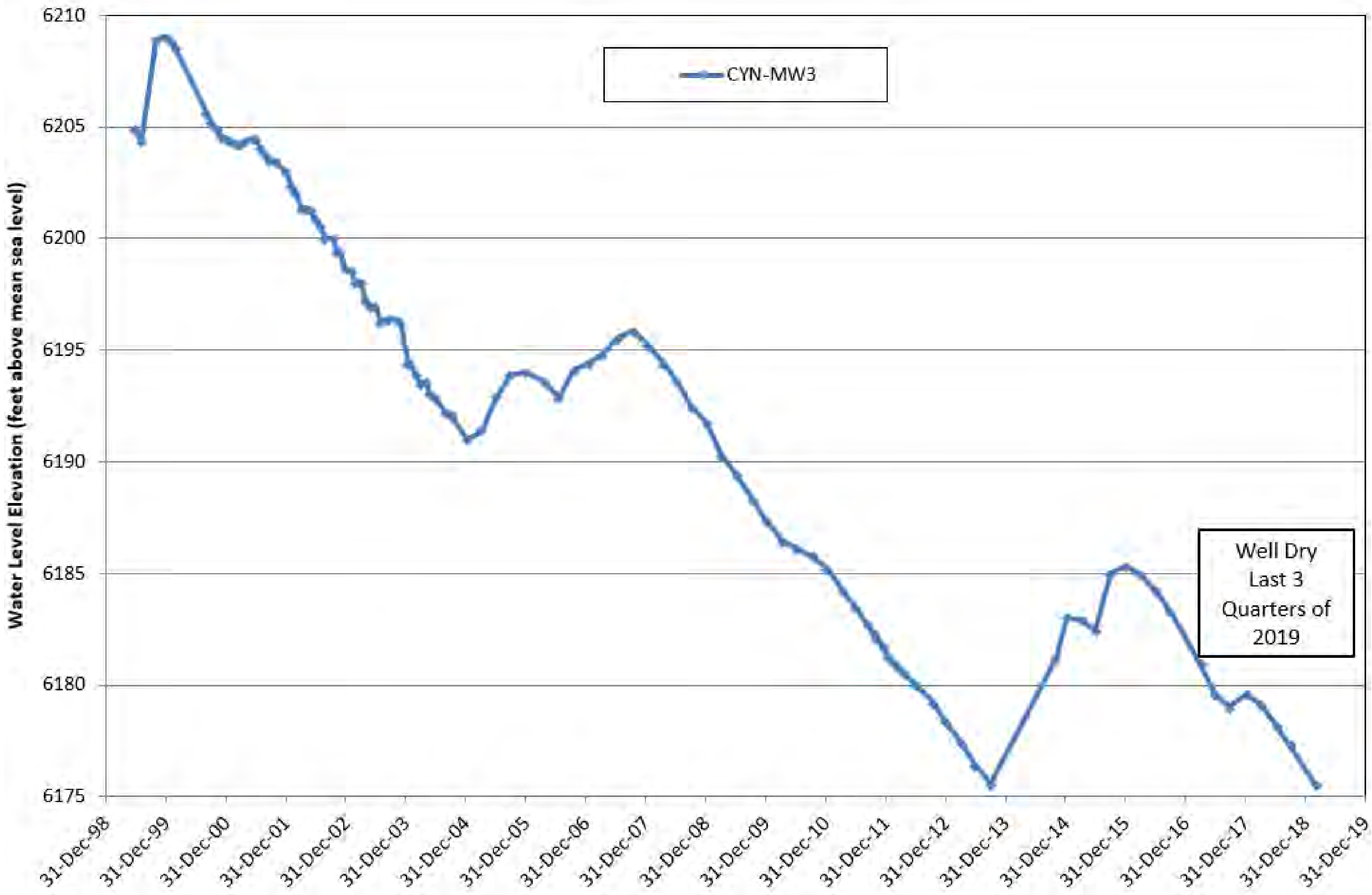

Figure 7D-1. Burn Site Groundwater Area of Concern Wells (1 of 9)

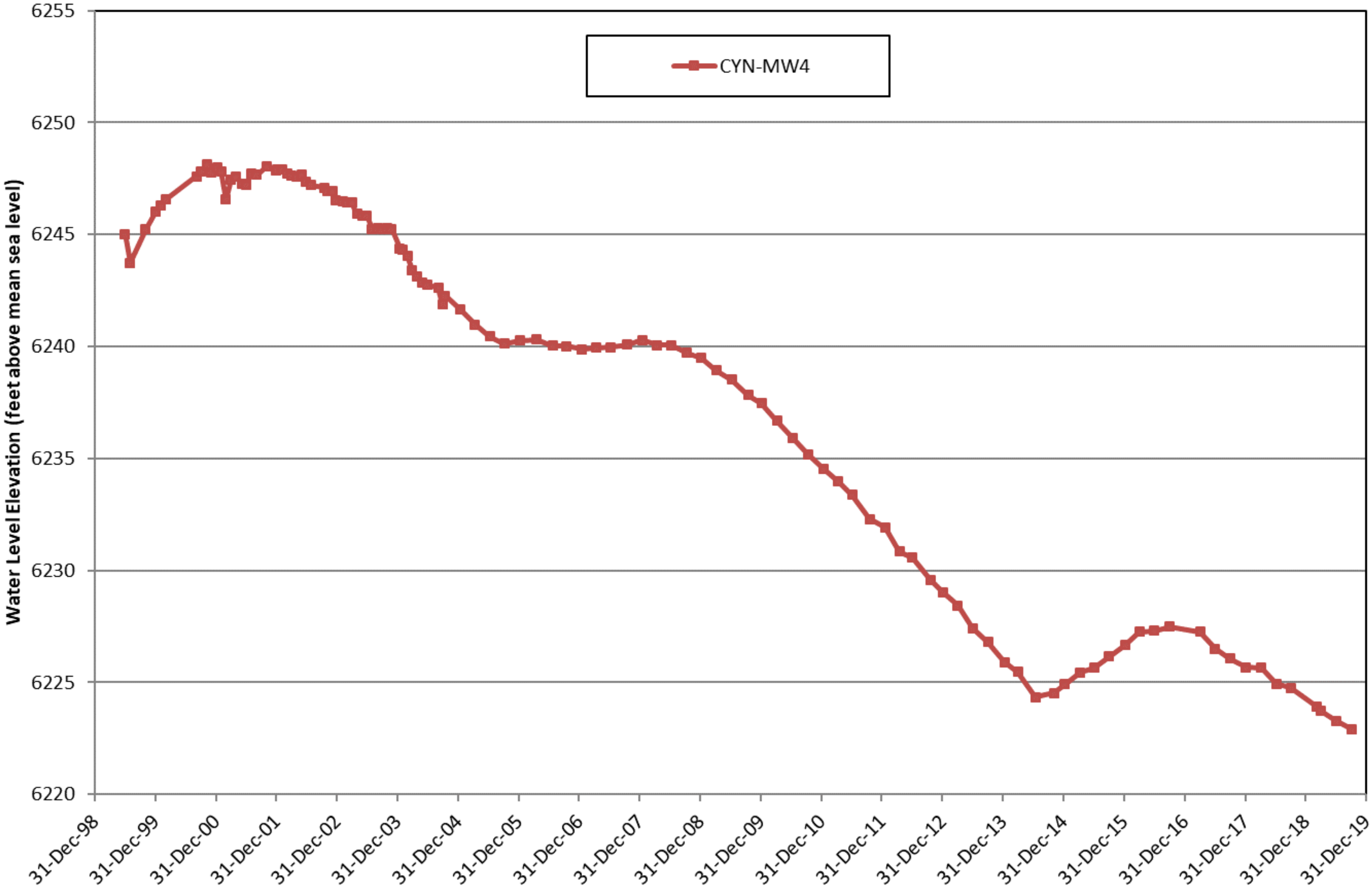

Figure 7D-2. Burn Site Groundwater Area of Concern Wells (2 of 9)

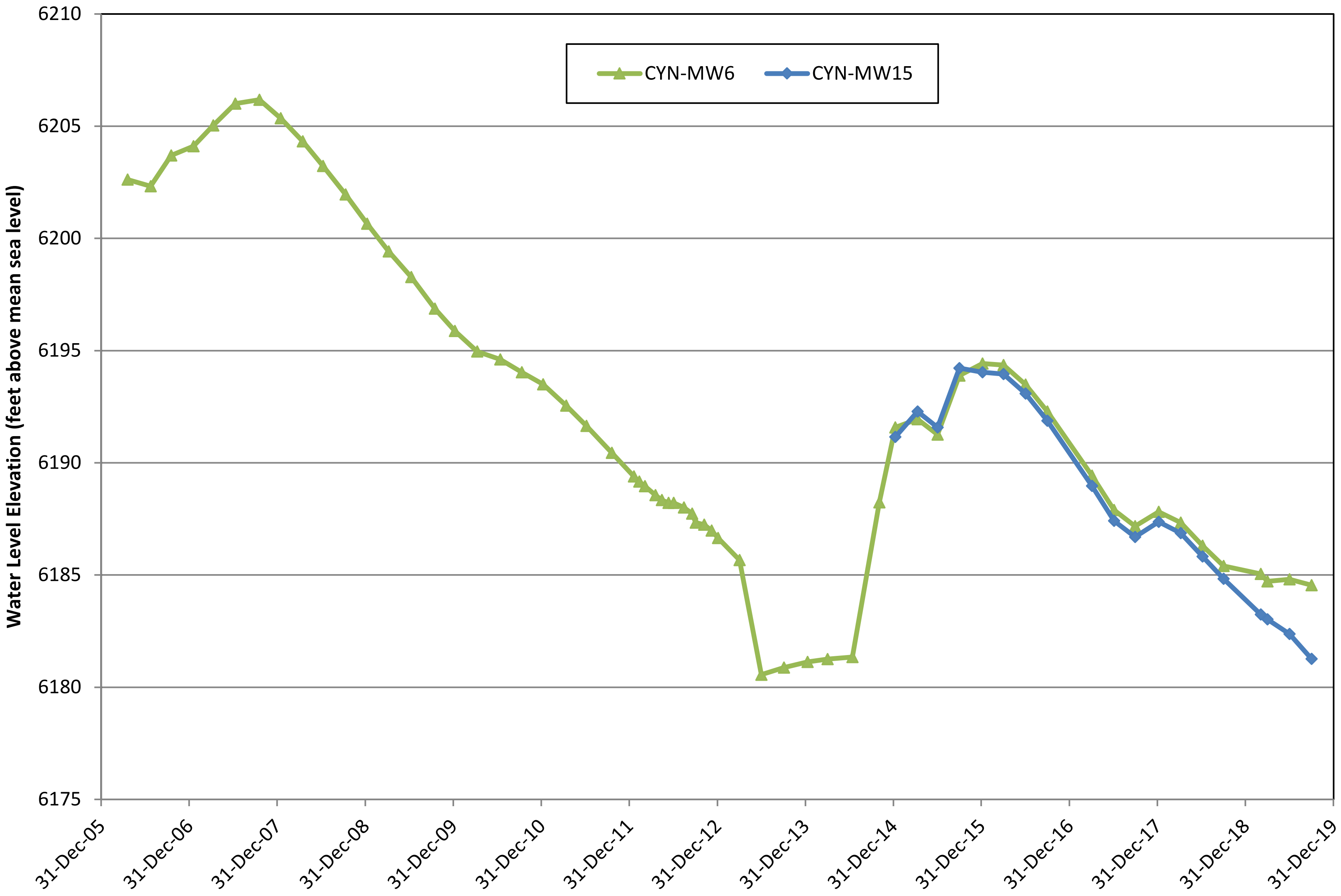

Figure 7D-3. Burn Site Groundwater Area of Concern Wells (3 of 9)

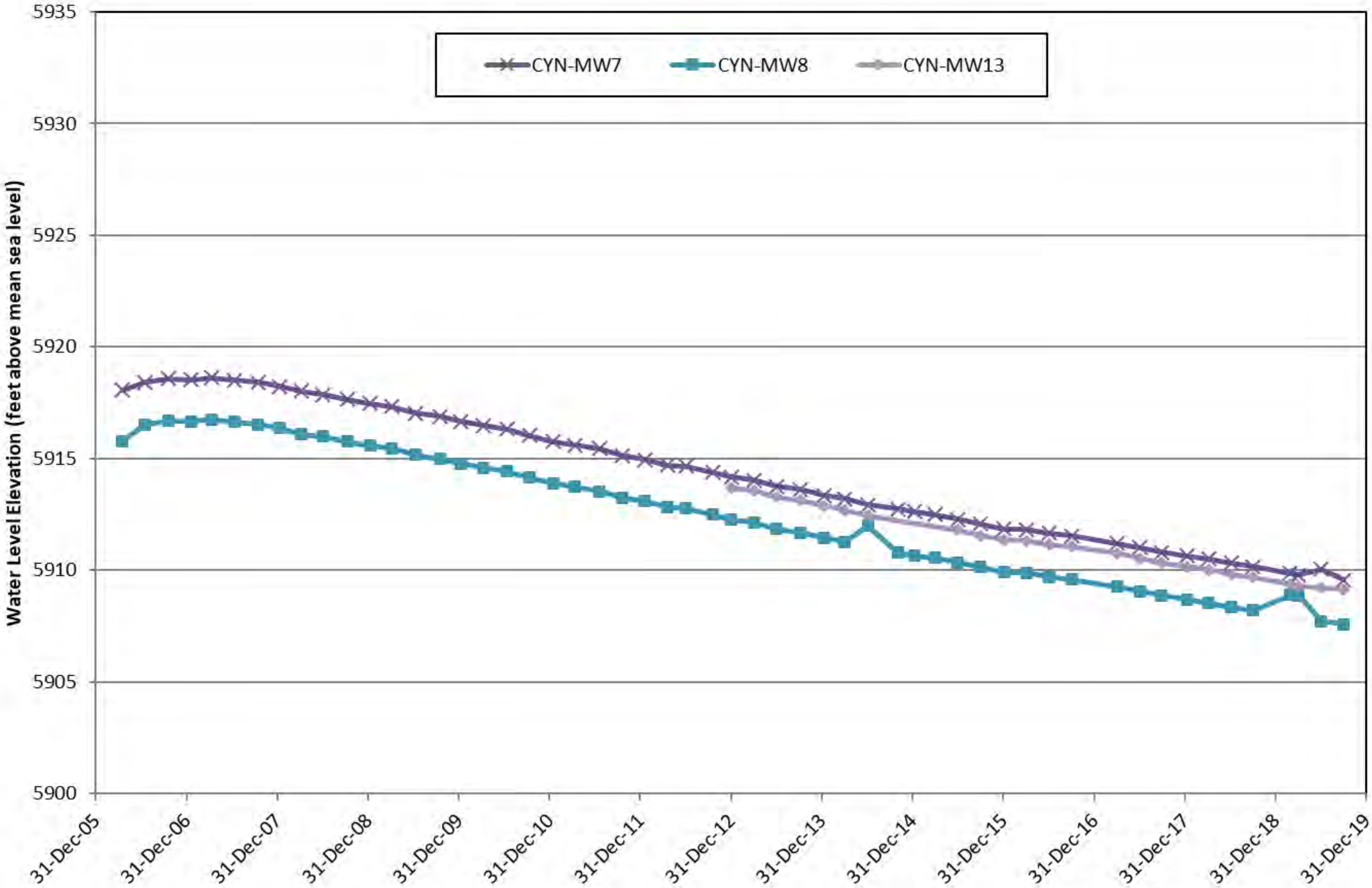

Figure 7D-4. Burn Site Groundwater Area of Concern Wells (4 of 9)

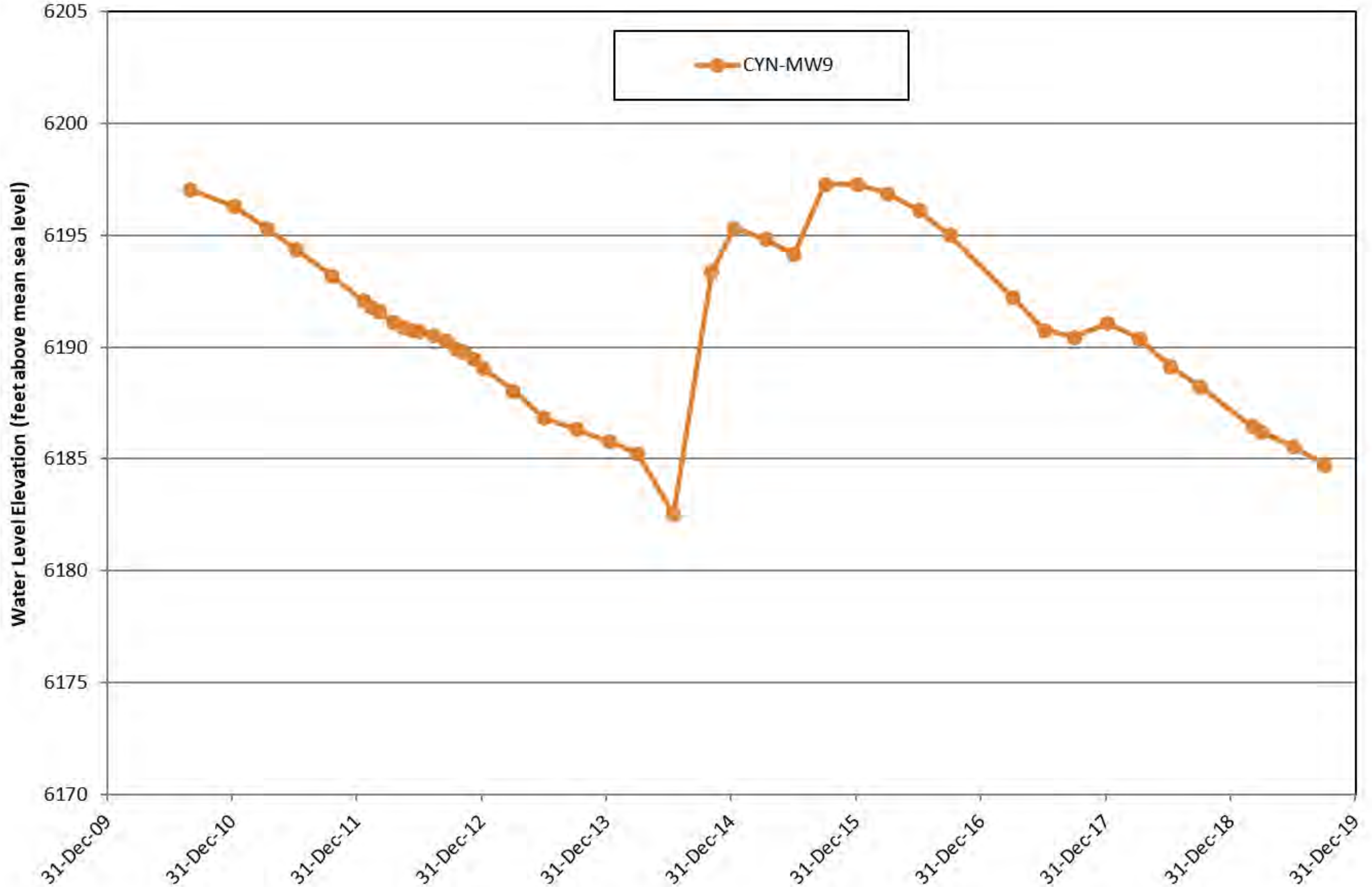

Figure 7D-5. Burn Site Groundwater Area of Concern Wells (5 of 9)

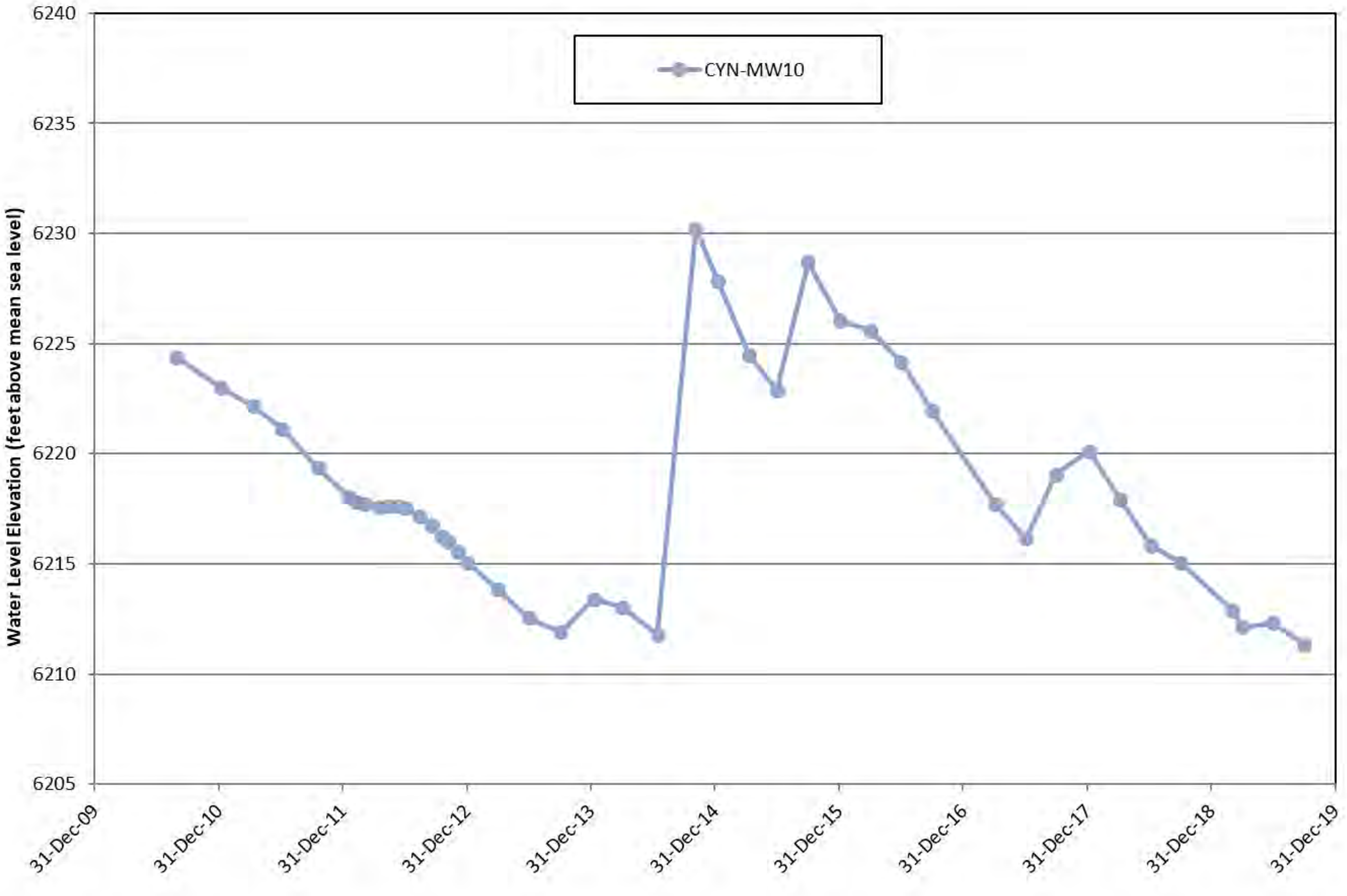

Figure 7D-6. Burn Site Groundwater Area of Concern Wells (6 of 9)

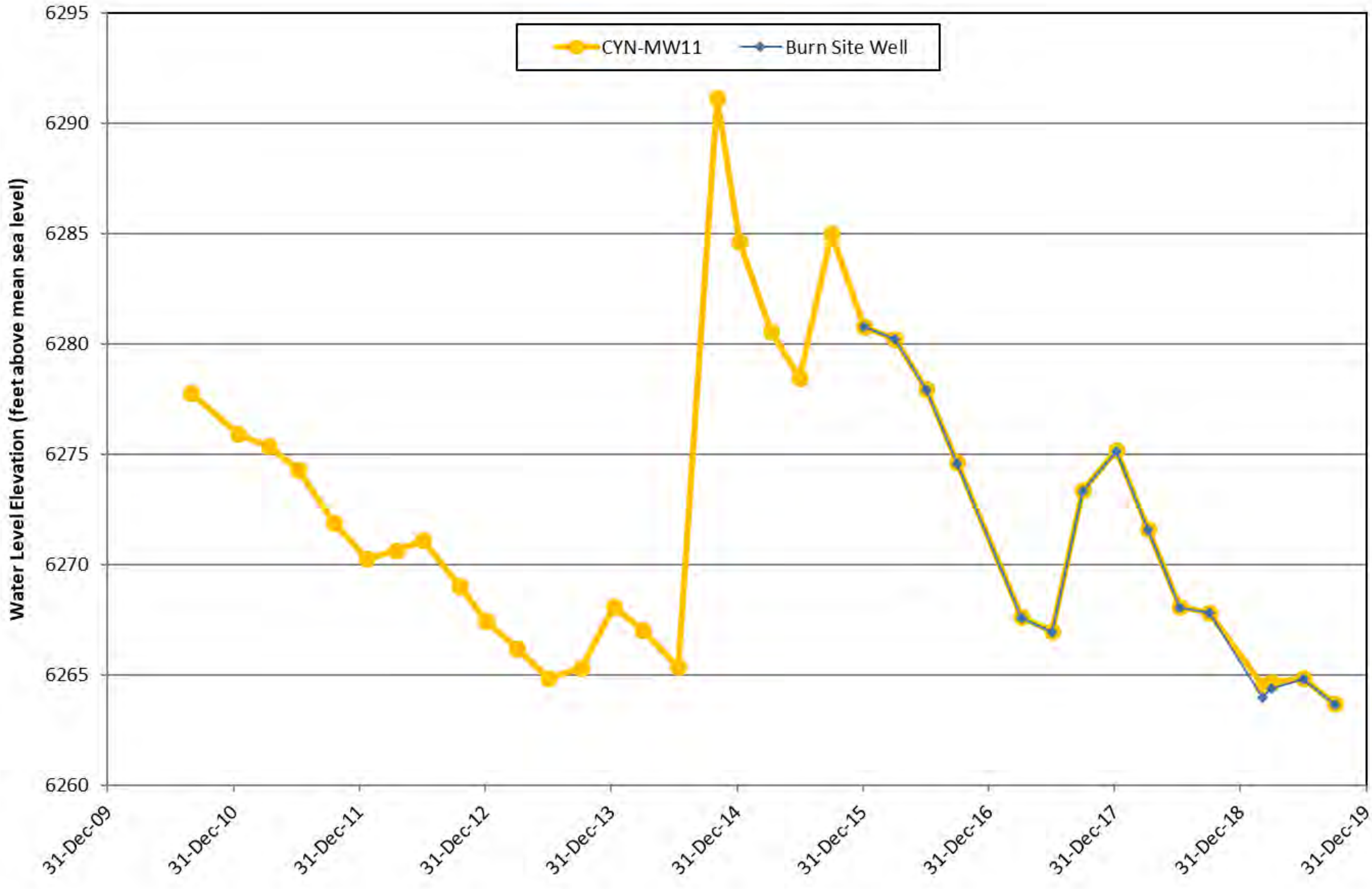

Figure 7D-7. Burn Site Groundwater Area of Concern Wells (7 of 9)

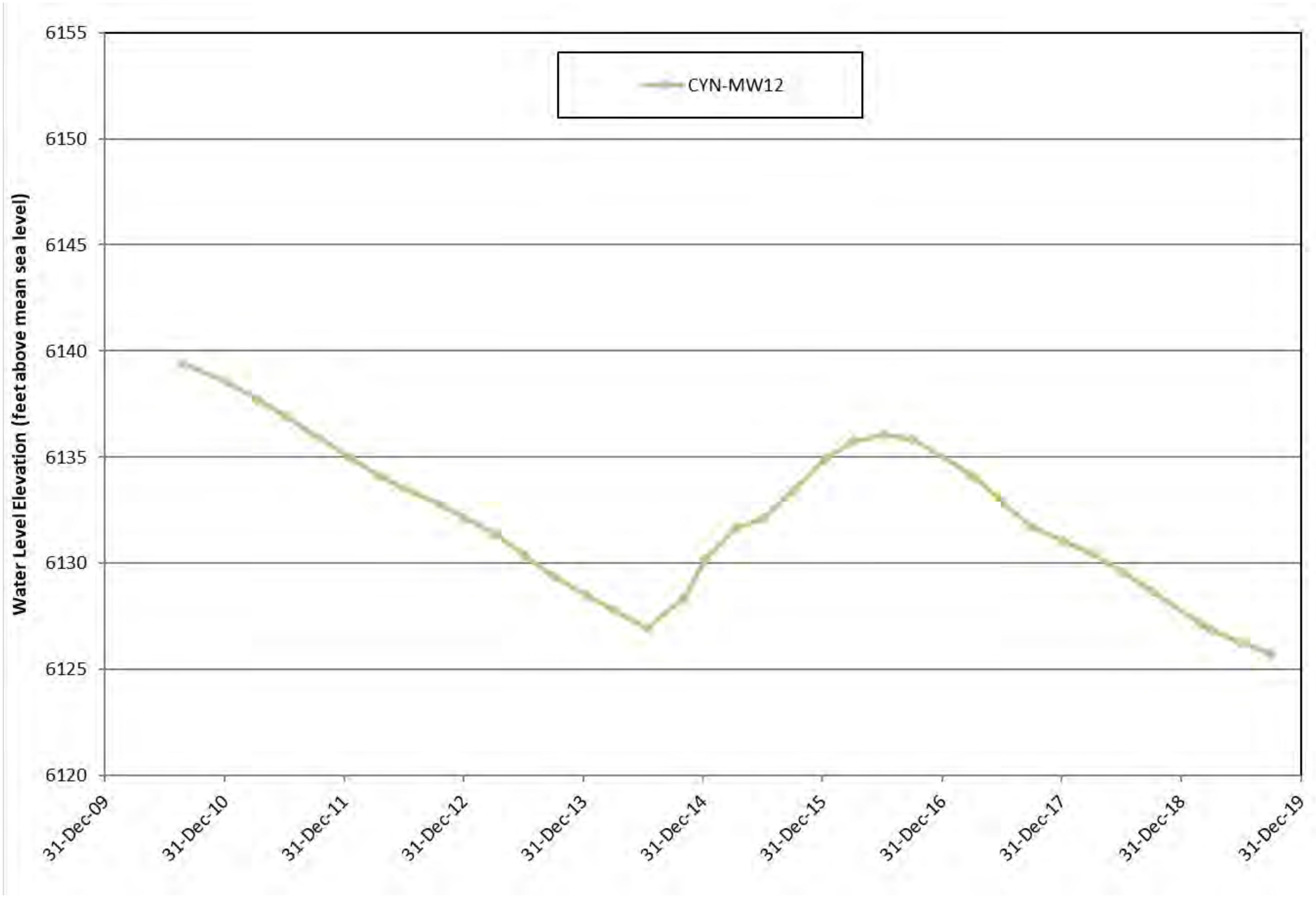

Figure 7D-8. Burn Site Groundwater Area of Concern Wells (8 of 9)

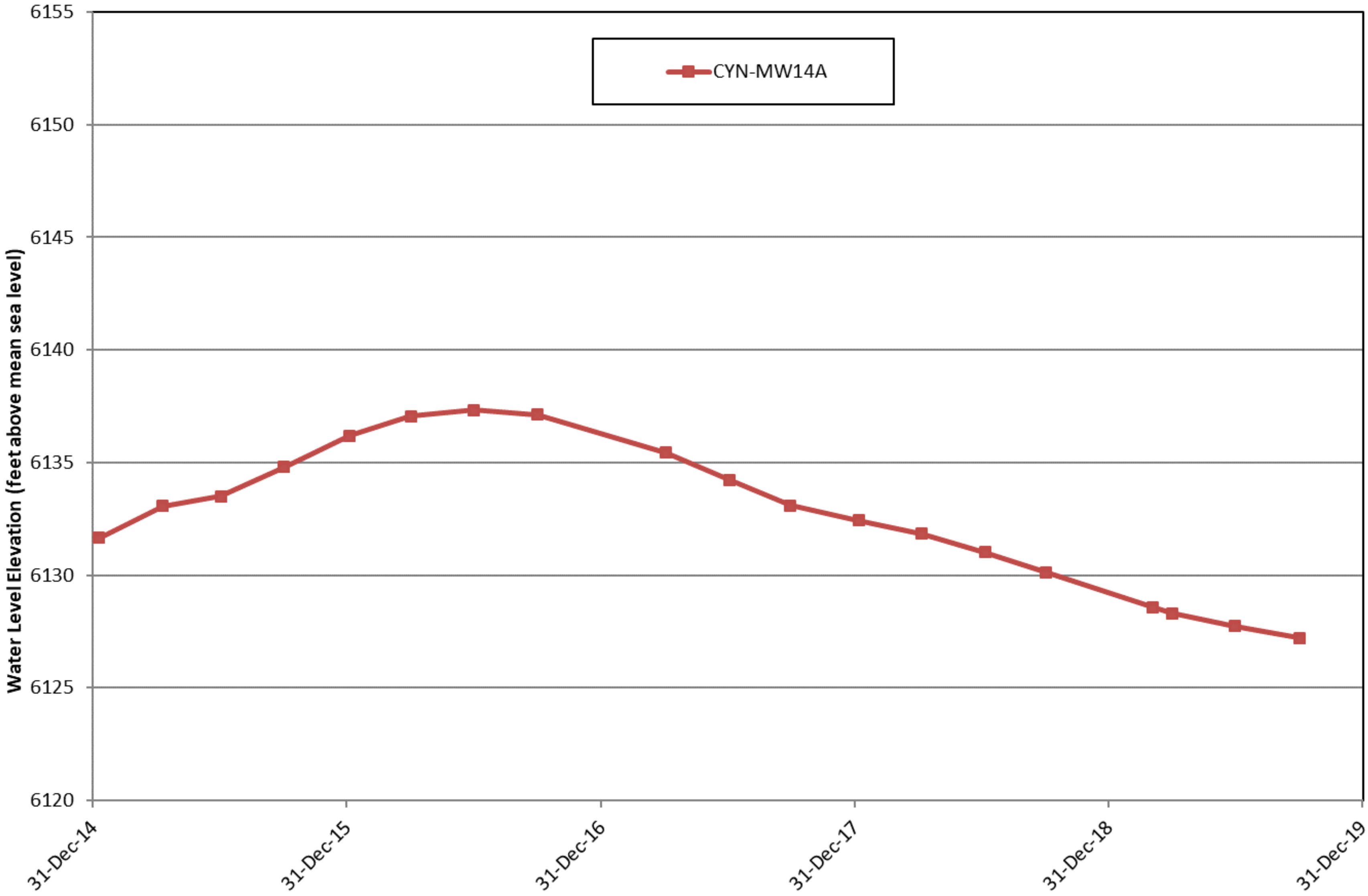

Figure 7D-9. Burn Site Groundwater Area of Concern Wells (9 of 9)

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Chapter 7
Burn Site Groundwater
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Table 1. Inventory of Active and Decommissioned 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													
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
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	

Table 1. Inventory of Active and Decommissioned 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-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
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	
CYN-MW16	MW	6249.60	6247.4	375.6	405.6	5871.8	5841.8	410.6	4.75	PVC	Bedrock (granitic gneiss)	5-Nov-2019	
CYN-MW17	MW	6268.95	6266.6	370.3	400.3	5896.3	5866.3	405.3	4.75	PVC	Bedrock (granitic gneiss)	6-Nov-2019	
CYN-MW18	MW	6304.02	6301.5	270.4	300.4	6031.1	6001.1	305.4	4.75	PVC	Bedrock (metamorphics)	7-Nov-2019	
CYN-MW19	MW	6410.43	6408.1	59.3	89.3	6348.8	6318.8	94.3	4.75	PVC	Bedrock (metamorphics)	8-Nov-2019	
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	530.5	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	

Table 1. Inventory of Active and Decommissioned 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
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	
Coyote Test Field and Vicinity													
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
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	
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]													
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	
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	

Table 1. Inventory of Active and Decommissioned Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM[a], Kirtland Air Force Base, and Surrounding Areas *(Continued)*

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Tijeras Arroyo Groundwater (Continued)													
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
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	5076.3	5056.3	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 [e]	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	
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	

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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													
4HILLS-1	MW	5554.17	5552.7	24.0	64.0	5528.7	5488.7	69.0	4.0	PVC	Alluvial sands and gravels	1-Dec-1989	
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	
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	2017
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	
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	2016
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	
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?	Apr? 2019
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	

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Kirtland Air Force Base/U.S. Air Force (Continued)													
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	
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-0521	MW	5352.45	5349.7	550	655	4799.7	4694.7	562	5	FLUTe™	Regional Aquifer – SFG sediments	7-May-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	

Table 1. Inventory of Active and Decommissioned 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-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	
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	above PGWS – 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	Bedrock (granite)	17-Feb-2002	
KAFB-2005	MW	5624.27	5624.6	126.0	156.0	5498.6	5468.6	158.5	4.0	PVC	Bedrock (granite)	10-May-2006	
KAFB-2006	MW	5590.88	5591.0?	303.0	333.0	5288.0	5258.0	335.0	4.0	PVC	Bedrock (granite)	10-May-2006	
KAFB-2007	MW	5564.48	5562.1	273.0	303.0	5289.1	5259.1	305.5	4.0	PVC	Bedrock (granite)	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	15-Oct-2010	
KAFB-2009	MW	5655.63	5653.4	74.0	104.0	5579.4	5549.4	110.0	4.0	PVC	Bedrock (granite)	15-Oct-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	

Table 1. Inventory of Active and Decommissioned 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-2632	MW	5329.08	5328.8	157.4	177.2	5171.4	5151.6	179.4	4.0	PVC	SFG sediments	11-Aug-2011	
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	
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?	
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	

Table 1. Inventory of Active and Decommissioned 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)													
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	Bedrock (granite)	12-Nov-2013	
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	1,006.0	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	

Table 1. Inventory of Active and Decommissioned 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-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	
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	
RG-01091	Px	unk	5602.0?	unk	unk	unk	unk	1,200.0	18	S	Regional Aquifer – SFG sediments	1-Sep-1957	
RG-44737	P	unk	6021.0?	unk	unk	unk	unk	100?	5?	unk	Bedrock (metamorphics?)	1986?	Aug 1991
RG-58935-3	P	unk	6260.0?	160	480	6100.0?	5780.0?	480	4	PVC	Bedrock (metamorphics)	2017?	
RG-61206	P	unk	6320.0?	100	500	6220.0?	5820.0?	500	4	PVC	Bedrock (metamorphics)	18-Dec-1994	
RG-61207	P	unk	6370.0?	100	480	6270.0?	5890	500	4	PVC	Bedrock (metamorphics)	17-Dec-1994	
RG-76274	P	unk	6280.0?	180	540	6100.0?	5740.0?	540	4	PVC	Bedrock (granite and metamorphics?)	3-Sep-2001	
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.

Table 1. Inventory of Active and Decommissioned Base-Wide Groundwater Monitoring, Production, and Extraction Wells Located at SNL/NM, Kirtland Air Force Base, and Surrounding Areas *(Concluded)*

Notes (Continued):

[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.

AGMR = Annual Groundwater Monitoring Report.
amsl = Above mean sea level.
ASL-PD = Albuquerque Seismological Laboratory Production.
AVN = Area-V (North).
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).
D = Deep.
Dual PVC = Two PVC pipes in one borehole.
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 (also known as Pole 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).
RG = Rio Grande.
S = Shallow
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.
SOR = Starfire Optical Range.
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).
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 Affairs.
WYO = Wyoming.
YALE = Yale Boulevard area.
? = Value is an estimate or has questionable accuracy.
12AUP = Environmental Restoration Site 12A underflow 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 2019

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	15-Oct-2019	527.50	4915.50	4916		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
Burn Site Well	6374.66	1-Oct-2019	111.00	6263.66	6264		SNL/NM	DOE/NNSA	Bedrock (schist and granite)
CCBA-MW1	5902.34	2-Oct-2019	48.10	5854.24	5854		SNL/NM	DOE/NNSA	Alluvium and bedrock (granite)
CCBA-MW2	5939.28	3-Oct-2019	72.42	5866.86	5867		SNL/NM	DOE/NNSA	Bedrock (granite)
CTF-MW1	6082.63	14-Oct-2019	240.42	5842.21	5842		SNL/NM	DOE/NNSA	Bedrock (granite)
CTF-MW2	5578.60	2-Oct-2019	43.67	5534.93	5535		SNL/NM	DOE/NNSA	Bedrock (granite)
CTF-MW3	5522.82	4-Oct-2019	310.54	5212.28	5212		SNL/NM	DOE/NNSA	Bedrock (granite)
CWL-BW5	5434.79	21-Oct-2019	514.84	4919.95	4920		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
CWL-MW9	5426.12	1-Nov-2019	506.13	4919.99	4920		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
CWL-MW10	5424.58	1-Nov-2019	503.17	4921.41	4921		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
CWL-MW11	5423.24	1-Nov-2019	501.34	4921.90	4922		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
CYN-MW3	6313.26	1-Nov-2019	dry	dry	dry		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW4	6455.48	1-Oct-2019	232.57	6222.91	6223		SNL/NM	DOE/NNSA	Bedrock (quartzite)
CYN-MW5	5984.23	1-Oct-2019	108.67	5875.56	5876		SNL/NM	DOE/NNSA	Bedrock (quartzite)
CYN-MW6	6343.37	1-Oct-2019	158.83	6184.54	6185		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW7	6216.35	1-Oct-2019	306.80	5909.55	5910		SNL/NM	DOE/NNSA	Bedrock (granitic gneiss)
CYN-MW8	6230.11	1-Oct-2019	322.53	5907.58	5908		SNL/NM	DOE/NNSA	Bedrock (granitic gneiss)
CYN-MW9	6360.67	1-Oct-2019	175.93	6184.74	6185		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW10	6345.45	1-Oct-2019	134.13	6211.32	6211		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW11	6374.41	1-Oct-2019	110.72	6263.69	6264		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW12	6345.16	1-Oct-2019	219.45	6125.71	6126		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW13	6237.79	1-Oct-2019	328.64	5909.15	5909		SNL/NM	DOE/NNSA	Bedrock (granitic gneiss)
CYN-MW14A	6315.85	1-Oct-2019	188.64	6127.21	6127	NC - deeper fracture	SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW15	6344.44	1-Oct-2019	163.18	6181.26	6181		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW16	6249.60	1-Oct-2019	340.84	5908.76	5909		SNL/NM	DOE/NNSA	Bedrock (granitic gneiss)
CYN-MW17	6268.95	1-Oct-2019	360.09	5908.86	5909		SNL/NM	DOE/NNSA	Bedrock (granitic gneiss)
CYN-MW18	6304.02	1-Oct-2019	245.53	6058.49	6058		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
CYN-MW19	6410.43	1-Oct-2019	45.71	6364.72	6365		SNL/NM	DOE/NNSA	Bedrock (metamorphics)
Greystone-MW2	5814.20	3-Oct-2019	54.99	5759.21	5759	NC - shallow alluvium	SNL/NM	DOE/NNSA	Alluvium in arroyo, recent
LWDS-MW1	5423.83	18-Oct-2019	505.50	4918.33	4918		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
LWDS-MW2	5412.41	15-Oct-2019	494.54	4917.87	4918		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MRN-2	5308.18	18-Oct-2019	431.62	4876.56	4877		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MRN-3D	5309.34	18-Oct-2019	431.84	4877.50	4878		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MWL-BW2	5391.02	4-Oct-2019	481.94	4909.08	4909		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MWL-MW4	5391.70	4-Oct-2019	499.74	4891.96	4892	corrected for inclined casing	SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MWL-MW5	5382.56	4-Oct-2019	493.62	4888.94	4889		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MWL-MW6	5375.31	4-Oct-2019	487.42	4887.89	4888		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MWL-MW7	5383.30	4-Oct-2019	490.64	4892.66	4893		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MWL-MW8	5384.67	4-Oct-2019	492.24	4892.43	4892		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
MWL-MW9	5381.91	4-Oct-2019	492.17	4889.74	4890		SNL/NM	DOE/NNSA	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 2019 *(Continued)*

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
NWTA3-MW2	5337.49	4-Oct-2019	462.28	4875.21	4875		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
NWTA3-MW3D	5340.80	4-Oct-2019	460.94	4879.86	4880		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
OBS-MW1	5871.42	14-Oct-2019	71.93	5799.49	5799		SNL/NM	DOE/NNSA	Bedrock (granite)
OBS-MW2	5863.16	14-Oct-2019	174.01	5689.15	5689		SNL/NM	DOE/NNSA	Bedrock (granite)
OBS-MW3	5865.50	14-Oct-2019	69.40	5796.10	5796		SNL/NM	DOE/NNSA	Bedrock (granite)
PGS-2	5408.29	3-Oct-2019	531.94	4876.35	4876		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
PL-2	5336.01	18-Oct-2019	460.55	4875.46	4875		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
PL-4	5334.98	14-Oct-2019	459.97	4875.01	4875		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SFR-1D	5399.13	14-Oct-2019	139.90	5259.23	5259	NC - deeper fracture	SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SFR-1S	5399.16	14-Oct-2019	90.19	5308.97	5309		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SFR-2S	5432.77	14-Oct-2019	101.23	5331.54	5332		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SFR-3D	5497.94	14-Oct-2019	162.38	5335.56	5336		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SFR-3P	5499.63	14-Oct-2019	162.78	5336.85	5337		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SFR-3S	5498.24	14-Oct-2019	161.46	5336.78	5337		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SFR-3T	5498.66	14-Oct-2019	68.50	5430.16	5430		SNL/NM	DOE/NNSA	Bedrock (sandstone)
SFR-4P	5573.33	14-Oct-2019	149.83	5423.50	5424		SNL/NM	DOE/NNSA	Bedrock (sandstone)
SFR-4T	5573.95	14-Oct-2019	147.43	5426.52	5427		SNL/NM	DOE/NNSA	Bedrock (sandstone)
SWTA3-MW2	5325.60	18-Oct-2019	447.95	4877.65	4878		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SWTA3-MW3	5323.94	4-Oct-2019	445.60	4878.34	4878		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
SWTA3-MW4	5324.81	4-Oct-2019	446.39	4878.42	4878		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA1-W-01	5403.82	3-Oct-2019	529.56	4874.26	4874		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA1-W-02	5416.62	1-Nov-2019	517.94	4898.68	4899		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA1-W-03	5457.03	1-Nov-2019	dry	dry	dry		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA1-W-04	5460.98	3-Oct-2019	564.61	4896.37	4896		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA1-W-05	5433.84	25-Oct-2019	555.54	4878.30	4878		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA1-W-06	5417.10	1-Nov-2019	309.98	5107.12	5107		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA1-W-07	5404.92	3-Oct-2019	286.69	5118.23	5118		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA1-W-08	5434.19	25-Oct-2019	312.33	5121.86	5122		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA2-NW1-325	5421.94	3-Oct-2019	320.80	5101.14	5101		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA2-NW1-595	5421.26	3-Oct-2019	517.83	4903.43	4903		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA2-W-01	5419.99	25-Oct-2019	331.49	5088.50	5089		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA2-W-19	5351.21	2-Oct-2019	274.47	5076.74	5077		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA2-W-24	5363.66	2-Oct-2019	439.80	4923.86	4924		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA2-W-25	5374.86	2-Oct-2019	464.25	4910.61	4911		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TA2-W-26	5375.77	2-Oct-2019	290.19	5085.58	5086		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TA2-W-27	5362.85	2-Oct-2019	282.72	5080.13	5080		SNL/NM	DOE/NNSA	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 2019 *(Continued)*

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
TA2-W-28	5412.41	3-Oct-2019	321.80	5090.61	5091		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TAV-INJ1	5429.70	20-Nov-2019	512.21	4917.49	4917		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW2	5427.33	15-Oct-2019	507.52	4919.81	4920		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW3	5464.30	15-Oct-2019	548.45	4915.85	4916		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW4	5427.89	15-Oct-2019	510.03	4917.86	4918		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW5	5408.71	15-Oct-2019	492.88	4915.83	4916		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW6	5431.17	4-Nov-2019	513.65	4917.52	4918		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW7	5430.40	21-Oct-2019	515.97	4914.43	4914		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW8	5417.00	18-Oct-2019	498.41	4918.59	4919		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW9	5416.27	18-Oct-2019	501.83	4914.44	4914		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW10	5437.03	15-Oct-2019	519.70	4917.33	4917		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW11	5440.12	15-Oct-2019	522.55	4917.57	4918		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW12	5435.72	15-Oct-2019	519.70	4916.02	4916		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW13	5409.02	15-Oct-2019	497.77	4911.25	4911		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW14	5441.52	15-Oct-2019	526.28	4915.24	4915		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW15	5437.32	15-Oct-2019	520.92	4916.40	4916		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TAV-MW16	5448.34	15-Oct-2019	536.63	4911.71	4912		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TJA-2	5353.20	2-Oct-2019	279.58	5073.62	5074		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TJA-3	5390.56	25-Oct-2019	499.11	4891.45	4891		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TJA-4	5341.16	2-Oct-2019	300.24	5040.92	5041	NC - merging zone	SNL/NM	DOE/NNSA	merging zone – SFG sediments
TJA-5	5341.33	2-Oct-2019	271.18	5070.15	5070		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TJA-6	5343.16	2-Oct-2019	450.91	4892.25	4892		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TJA-7	5391.27	25-Oct-2019	305.23	5086.04	5086		SNL/NM	DOE/NNSA	PGWS - SFG sediments
TRE-1	5497.25	14-Oct-2019	177.94	5319.31	5319		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
TRN-1	5735.62	14-Oct-2019	92.64	5642.98	5643		SNL/NM	DOE/NNSA	Bedrock (sandstone)
TRS-1D	5779.80	14-Oct-2019	135.17	5644.63	5645		SNL/NM	DOE/NNSA	Bedrock (limestone)
TRS-1S	5780.07	14-Oct-2019	135.99	5644.08	5644		SNL/NM	DOE/NNSA	Bedrock (limestone)
TRS-2	5780.76	14-Oct-2019	128.80	5651.96	5652		SNL/NM	DOE/NNSA	Bedrock (limestone)
WYO-3	5392.09	25-Oct-2019	518.56	4873.53	4874		SNL/NM	DOE/NNSA	Regional Aquifer – SFG sediments
WYO-4	5392.57	25-Oct-2019	296.89	5095.68	5096		SNL/NM	DOE/NNSA	PGWS - SFG sediments
Non Sandia Wells									
Eubank-1	5460.02	19-Oct-2019	545.00	4915.02	4915		SNL/NM	COA EHD	Regional Aquifer – SFG sediments
Eubank-2	5474.39	7-Jun-2019	572.09	4902.30	4902		COA EHD	COA EHD	Regional Aquifer – SFG sediments
Eubank-3	5498.73	7-Jun-2019	600.03	4898.70	4899		COA EHD	COA EHD	Regional Aquifer – SFG sediments
Eubank-5	5507.40	7-Jun-2019	608.92	4898.48	4898		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 2019 *(Continued)*

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
Non Sandia Wells (Continued)									
KAFB-0213	5286.95	23-Jul-2019	400.09	4886.86	4887		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0219	5263.69	23-Jul-2019	389.62	4874.07	4874		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0311	5353.29	23-Jul-2019	417.56	4935.73	4936		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0312	5432.17	23-Jul-2019	416.93	5015.24	5015		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0314	5455.75	23-Jul-2019	417.41	5038.34	5038		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0417	5313.07	23-Jul-2019	442.54	4870.53	4871		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0506	5363.47	23-Jul-2019	210.40	5153.07	5153		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0508	5351.88	23-Jul-2019	478.58	4873.30	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0510	5367.10	23-Jul-2019	494.37	4872.73	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0522	5267.48	23-Jul-2019	395.50	4871.98	4872		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0611	5386.09	23-Jul-2019	463.00	4923.09	4923		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0614	5390.89	23-Jul-2019	331.84	5059.05	5059		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0618	5410.05	23-Jul-2019	484.20	4925.85	4926		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0619	5410.78	23-Jul-2019	384.78	5026.00	5026		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-0620	5334.64	23-Jul-2019	442.55	4892.09	4892		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0624	5673.78	23-Jul-2019	768.20	4905.58	4906	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-0901	5390.07	23-Jul-2019	467.55	4922.52	4923		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2008	5541.74	23-Jul-2019	598.24	4943.50	4944		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2623	5367.48	23-Jul-2019	222.42	5145.06	5145		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2624	5362.27	23-Jul-2019	dry	dry	dry		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2627	5367.47	23-Jul-2019	dry	dry	dry		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-2628	5369.64	23-Jul-2019	495.05	4874.59	4875		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-2629	5361.53	23-Jul-2019	488.25	4873.28	4873		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-3391	5396.60	23-Jul-2019	275.65	5120.95	5121		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
KAFB-6243	5426.22	23-Jul-2019	501.43	4924.79	4925		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
KAFB-8351	5325.51	23-Jul-2019	446.77	4878.74	4879		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
Mesa del Sol-S	5302.67	23-Jul-2019	420.67	4882	4882		USGS	NMOSE	Regional Aquifer – SFG sediments
Montessa Park-S	5102.67	18-Oct-2019	213.67	4889.25	4889		USGS	ABCWUA	Regional Aquifer – SFG sediments
ST105-MW004	5234.61	23-Jul-2019	360.57	4874.04	4874		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW006	5313.26	23-Jul-2019	236.44	5076.82	5077		KAFB/USAF	KAFB/USAF	PGWS - SFG sediments
ST105-MW008	5358.94	23-Jul-2019	477.80	4881.14	4881		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW009	5519.71	23-Jul-2019	485.59	5034.12	5034		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW011	5422.66	23-Jul-2019	483.68	4938.98	4939		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW013	5447.27	23-Jul-2019	436.61	5010.66	5011		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW015	5623.95	23-Jul-2019	686.99	4936.96	4937	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW017	5621.97	23-Jul-2019	705.47	4916.50	4917	NC - nearby fault	KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
ST105-MW022	5386.66	23-Jul-2019	469.82	4916.84	4917		KAFB/USAF	KAFB/USAF	Regional Aquifer – SFG sediments
YALE-MW1	5308.45	7-Jun-2019	419.12	4889.33	4889		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 *(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.
DOE/NNSA	= Department of Energy / National Nuclear Security Administration.
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 – 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.
NC – screened above PGWS	= Well is screened in alluvium stratigraphically above the PGWS.
NC – shallow alluvium	= Well is screened in alluvium along the arroyo channel.
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 (also known as Pole Line Road) is near the golf course.
R	= Replacement well (term used by KAFB).
S	= Shallow (shallower bedrock well completion) at TRS 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).
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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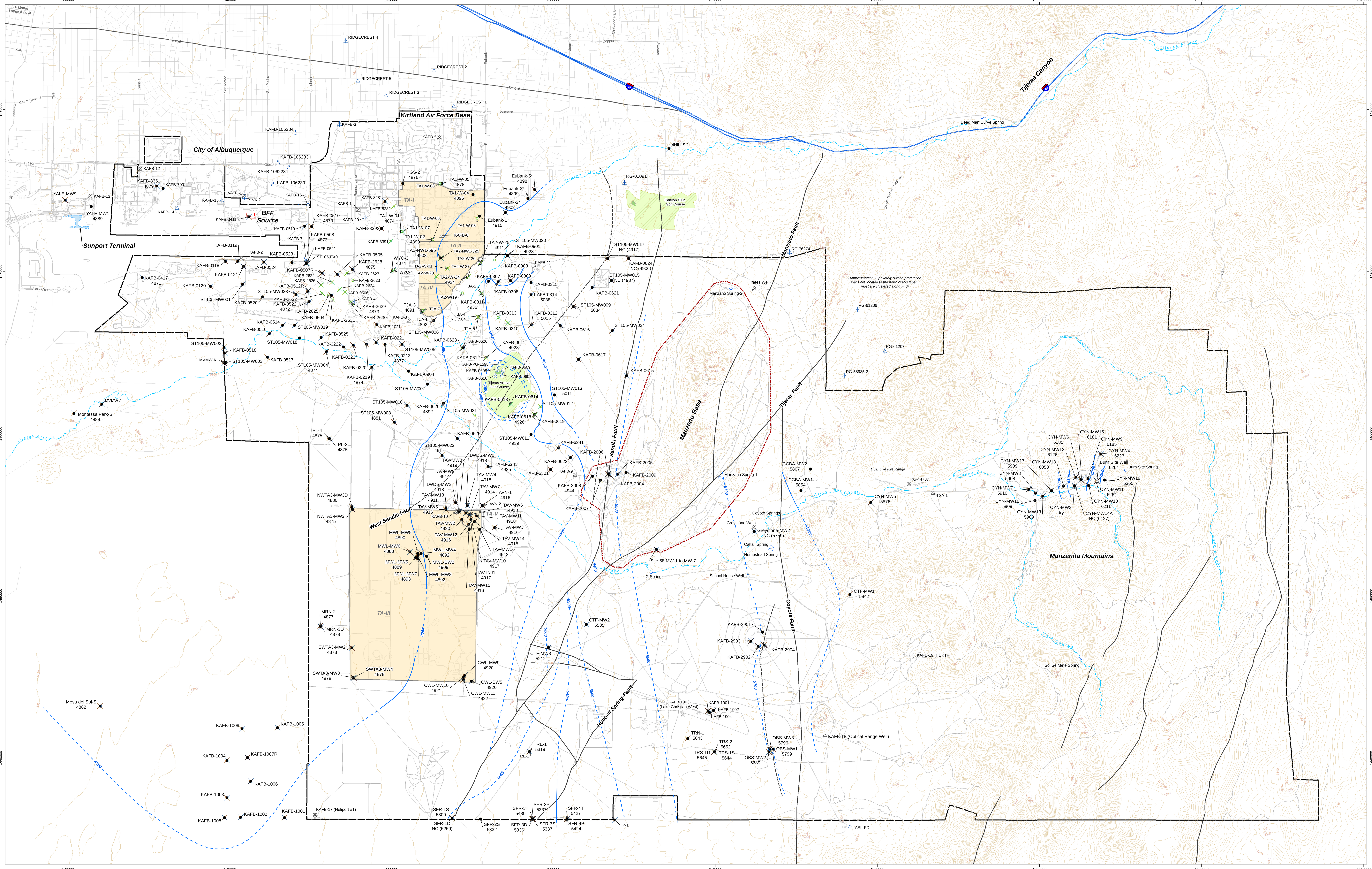

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Feet

0 750 1,500
Meters

0 0.5 1
Miles

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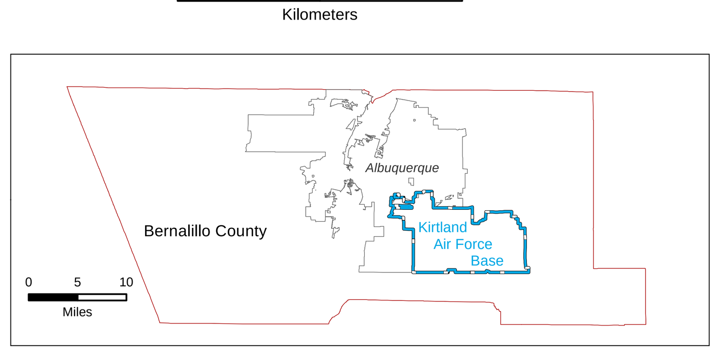
Kilometers



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
- Golf Course Main Pond
- 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 1 October and 20 November 2019. 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.
7. Most of the monitoring wells located near the KAFB Bulk Fuels Facility and at KAFB Site 58 are not plotted.
8. Decommissioned (plugged and abandoned) monitoring wells are not shown.
9. 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.
10. 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.
11. The West Sandia Fault does not affect the alluvial-fan sediments at the water table.
12. 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 2019

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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