4-1-2017

Environment Restoration Operations Consolidated Quarterly Report - April 2017

Sandia National Laboratories/NM

Department of Energy
National Nuclear Security Administration
Sandia Field Office
P.O. Box 5400
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APR 26 2017

Mr. John E. Kieling
Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Bldg. 1
Santa Fe, New Mexico 87505

Subject: Department of Energy/National Nuclear Security Administration, Sandia National Laboratories/New Mexico Environmental Restoration Operations Consolidated Quarterly Report, April 2017

Dear Mr. Kieling:

Enclosed is Subject report for the Department of Energy/National Nuclear Security Administration (DOE/NNSA), Sandia National Laboratories/New Mexico (SNL/NM), Environmental Protection Agency (EPA) ID NM5890110518. This report addresses all quarterly reporting (October through December 2016) required under the *Resource Conservation and Recovery Act Facility Operating Permit and the Compliance Order on Consent* for SNL/NM, EPA No. 5890110518.

If you have questions, please contact me at (505) 284-6668 or Karen Oden of our staff at (505) 845-5162.

Sincerely,

James A. Todd
Assistant Manager for Engineering

Enclosure

cc: See Page 2

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CERTIFICATION STATEMENT FOR APPROVAL AND FINAL RELEASE OF DOCUMENTS

Document Title: **Environmental Restoration Operations Consolidated Quarterly Report, April, 2017**

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.

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Sandia National Laboratories

Sandia National Laboratories, New Mexico

Environmental Restoration Operations

A U.S. Department of Energy Environmental Cleanup Program

Consolidated Quarterly Report

October – December 2016

April 2017

U.S. DEPARTMENT OF ENERGY

United States Department of Energy
Sandia Field Office

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CONSOLIDATED QUARTERLY REPORT

April 2017

SANDIA NATIONAL LABORATORIES, NEW MEXICO

ENVIRONMENTAL RESTORATION OPERATIONS

U.S. DEPARTMENT OF ENERGY:	SANDIA FIELD OFFICE
CONTRACTOR:	SANDIA CORPORATION
PROJECT MANAGER:	John R. Cochran

NUMBER OF POTENTIAL RELEASE SITES SUBJECT TO CORRECTIVE ACTION: 12

SUSPECT WASTE: Radionuclides, metals, organic compounds, and explosives

REPORTING PERIOD: October – December 2016

OVERVIEW

This Sandia National Laboratories, New Mexico Environmental Restoration Operations (ER) Consolidated Quarterly Report (ER Quarterly Report) fulfills all quarterly reporting requirements set forth in the Resource Conservation and Recovery Act Facility Operating Permit and the Compliance Order on Consent. The 12 sites in the corrective action process are listed in Table I-1. This ER Quarterly Report presents activities and data in sections as follows:

SECTION I: Environmental Restoration Operations Consolidated Quarterly Report, October – December 2016

SECTION II: Perchlorate Screening Quarterly Groundwater Monitoring Report, October – December 2016

ABBREVIATIONS AND ACRONYMS

µg/L	microgram(s) per liter
µmhos/cm	micromhos per centimeter
°C	degrees Celsius
% Sat	percent saturation
AGMR	Annual Groundwater Monitoring Report
AOC	Area of Concern
AR/COC	Analysis Request/Chain-of-Custody
AVN	Area V (North)
BSG	Burn Site Groundwater
BW	background well
CAC	corrective action complete
CCBA	Coyote Canyon Blast Area
CME	Corrective Measures Evaluation
COA	certificates of analyses
COC	constituent of concern
CTF	Coyote Test Field
CY	Calendar Year
CYN	Canyons (Burn Site Groundwater Area of Concern)
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration Operations
ER Quarterly Report	Environmental Restoration Operations (ER) Consolidated Quarterly Report
FOP	Field Operating Procedure
GEL	GEL Laboratories LLC
GWQB	Ground Water Quality Bureau
HQ	hazard quotient
HWB	Hazardous Waste Bureau
ISB	in situ bioremediation
LWDS	liquid waste disposal system
MCL	maximum contaminant level
MDL	method detection limit
mg/L	milligrams per liter
MRN	Magazine Road North
MW	monitoring well
MWL	Mixed Waste Landfill
mV	millivolts
NA	not applicable
ND	nondetect

NE	not established
NMED	New Mexico Environment Department
NNSA	National Nuclear Security Administration
NTU	nephelometric turbidity unit
NWTA	Northwest Technical Area (III)
OBS	Old Burn Site
ORP	oxidation reduction potential
PGS	Parade Ground South
pH	potential of hydrogen (negative logarithm of the hydrogen ion concentration)
PQL	practical quantitation limit
QC	quality control
Sandia	Sandia Corporation
SAP	sampling and analysis plan
SC	specific conductivity
SNL/NM	Sandia National Laboratories, New Mexico
SWMU	Solid Waste Management Unit
SWTA	Southwest Technical Area (III)
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
TAV	Technical Area V (acronym used for well identification numbers in tables only)
TA-V	Technical Area V
TAVG	Technical Area-V Groundwater
TBD	to be determined
TCE	trichloroethene
TJA	Tijeras Arroyo (acronym used for well identification numbers in tables only)
TS/IM	Treatability Study/Interim Measure
TSWP	Treatability Study Work Plan
WYO	Wyoming

SECTION I
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SECTION I
ENVIRONMENTAL RESTORATION OPERATIONS CONSOLIDATED QUARTERLY REPORT, October – December 2016

1.0 Introduction

This Environmental Restoration Operations (ER) Consolidated Quarterly Report (ER Quarterly Report) provides the status of ongoing corrective action activities being implemented at Sandia National Laboratories, New Mexico (SNL/NM) during the October, November, and December 2016 quarterly reporting period.

Table I-1 lists the Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) identified for corrective action at SNL/NM. Sections I.2.1 and I.2.2 summarize the work completed during this quarter. Section I.2.1 summarizes the quarterly activities at sites undergoing corrective action *field* activities. Field activities are conducted at the three groundwater AOCs (Burn Site Groundwater [BSG AOC], Technical Area [TA]-V Groundwater [TAVG AOC], and Tijeras Arroyo Groundwater [TAG AOC]). Section I.2.2 summarizes quarterly activities at sites where the New Mexico Environment Department (NMED) issued a certificate of completion and the sites are in the corrective action complete (CAC) *regulatory* process. Currently, SWMUs 8 and 58, 68, 149, 154, and 502 are in the CAC regulatory process.

Corrective action activities are deferred at the Long Sled Track (SWMU 83), the Gun Facilities (SWMU 84), and the Short Sled Track (SWMU 240) because these three sites are active mission facilities. These three active sites are located in TA-III.

2.0 Environmental Restoration Operations Work Completed

2.1 Sites Undergoing Corrective Action

In a letter dated April 14, 2016, the NMED defined the scope and milestones for corrective action at the three groundwater AOCs (BSG AOC, TAVG AOC, and TAG AOC) (NMED April 2016). Sections 2.1.1 through 2.1.3 discuss the specific milestones from this letter.

2.1.1 Burn Site Groundwater Area of Concern

Nitrate has been identified as a constituent of concern (COC) in groundwater at the BSG AOC based on detections above the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL) in samples collected from monitoring wells. The EPA MCL and State of New Mexico drinking water standard for nitrate is 10 milligrams per liter (mg/L) (as nitrogen).

The U.S. Department of Energy/National Nuclear Security Administration (DOE/NNSA) and Sandia Corporation (Sandia) met with the NMED Hazardous Waste Bureau (HWB) on July 20, 2015 to discuss the status of sites currently undergoing corrective action. For the BSG AOC, all parties agreed to a weight-of-evidence characterization program: (1) to conduct additional isotopic analyses/nitrate fingerprinting and age-dating of the groundwater; (2) to conduct a transducer study using existing wells to determine whether the groundwater is unconfined, semi-confined, or confined; and (3) to conduct a detailed aquifer pumping test to help determine the origin of the elevated nitrates in the groundwater.

Semiannual sampling at the BSG AOC currently includes perchlorate analyses at one groundwater monitoring well.

The following activities occurred at BSG AOC during October, November, and December 2016:

- Groundwater sampling was conducted in October 2016. Table I-2 presents the identification and the sampling frequency for these monitoring wells. The analytical results for Calendar Year (CY) 2016 groundwater monitoring will be presented in the SNL/NM CY 2016 Annual Groundwater Monitoring Report, which is anticipated to be submitted to the NMED in the summer of 2017.

- Perchlorate analysis of groundwater samples from the BSG AOC is discussed in Section II of this ER Quarterly Report.

- Continued working on the logistics for the Aquifer Pumping Test scheduled for March 2017.

2.1.2 Technical Area-V Groundwater Area of Concern

Trichloroethene (TCE) and nitrate have been identified as COCs in groundwater at the TAVG AOC based on detections above the EPA MCLs in samples collected from

monitoring wells. The EPA MCLs and the State of New Mexico drinking water standards for TCE and nitrate are 5 micrograms per liter (µg/L) and 10 mg/L (as nitrogen), respectively.

Personnel from the DOE/NNSA, DOE Headquarters Office of Environmental Management, Sandia, and NMED worked together to address the groundwater contamination at TAVG AOC. A meeting was held with the NMED HWB on July 20, 2015 and all parties agreed on a phased Treatability Study/Interim Measure (TS/IM) for in situ bioremediation (ISB) to evaluate the effectiveness of ISB as a potential technology to treat the groundwater contamination at TAVG AOC.

For the TS/IM, up to three injection wells (TAV-INJ1, TAV-INJ2, and TAV-INJ3) will be installed at TA-V in the vicinity of the highest contaminant concentrations in groundwater detected in monitoring wells LWDS-MW1, TAV-MW6, and TAV-MW10. The proposed injection wells will be used to deliver substrate solution and biodegradation bacteria to groundwater. The substrate solution containing essential food and nutrients for biostimulation will be prepared in aboveground tanks. The substrate solution along with the biodegradation bacteria will be gravity-injected to groundwater via injection wells.

The Revised Treatability Study Work Plan (TSWP) (SNL/NM March 2016) was approved by NMED on May 10, 2016 (NMED May 2016). The Revised TSWP covers implementing the TS/IM of ISB at TAVG AOC and installation of two more groundwater monitoring wells (TAV-MW15 and TAV-MW16) south of the TA-V boundary (SNL/NM March 2016). These new wells will help define the extent of the TCE plume and the potentiometric surface along the southern boundary of TA-V.

As described in Chapter 6 of the Revised TSWP, DOE/NNSA and Sandia will implement a revised groundwater monitoring plan for TAVG AOC (SNL/NM March 2016). The revised groundwater monitoring plan will be implemented in the first quarter of CY 2017 to obtain a complete CY of quarterly data.

The following activities occurred at TAVG AOC during October, November, and December 2016:

- DOE/NNSA and Sandia submitted the Discharge Permit Application for TA-V Treatability Study injection wells to NMED Ground Water Quality Bureau (GWQB) in July 2016 (DOE July 2016). NMED GWQB subsequently determined the Application was

administratively complete and indicated that DOE/NNSA and Sandia should proceed with the public notice requirements (NMED September 2016). DOE/NNSA and Sandia completed the public notice requirements for the Discharge Permit Application in November 2016 and submitted the affidavit of public notice completion to NMED GWQB on November 16 (DOE November 2016a). Injection well TAV-INJ1 is planned for installation after the Discharge Permit is issued.

- NMED HWB staff visited TA-V on October 5, 2016 and ER personnel provided a status update on the TAVG AOC.

- Groundwater sampling was conducted in October and November 2016. Table I-2 presents the identification and the sampling frequency for these monitoring wells. The analytical results for CY 2016 groundwater monitoring will be presented in the SNL/NM CY 2016 Annual Groundwater Monitoring Report, which is anticipated to be submitted to the NMED in the summer of 2017.

- Field Activities associated with installing two new groundwater monitoring wells TAV-MW15 and TAV-MW16 began. NMED HWB staff visited the site and confirmed the proposed drilling locations on November 2, and visited again on December 20 to observe the drilling activities. Well installation will be complete in the first quarter of CY 2017.

2.1.3 Tijeras Arroyo Groundwater Area of Concern

Nitrate has been identified as the COC in groundwater for the TAG AOC based on detections above the EPA MCL in samples collected from monitoring wells completed in the Perched Groundwater System and in the Regional Aquifer. TCE was previously identified as a COC for the Perched Groundwater System. However, TCE is no longer considered to be a COC for two reasons: (1) the area where TCE exceedances occurred has naturally dewatered, and (2) the last reported TCE concentration of 3.82 µg/L (October 2015) was less than the EPA MCL of 5 µg/L. No TCE concentrations in Regional Aquifer samples have exceeded the MCL. The EPA MCLs and State of New Mexico drinking water standards for TCE and nitrate are 5 µg/L and 10 mg/L (as nitrogen), respectively.

The following activities occurred at TAG AOC during October, November, and December 2016:

- Groundwater sampling at the TAG AOC was conducted in December 2016. Table I-2 presents the identification and the sampling frequency for these monitoring wells. The analytical results for CY 2016 groundwater monitoring will be presented in the SNL/NM CY 2016 Annual Groundwater Monitoring Report, which is anticipated to be submitted to the NMED in the summer of 2017.

- An updated Current Conceptual Model and Corrective Measures Evaluation Report for the TAG AOC (SNL/NM December 2016) was submitted to NMED's HWB on November 23, 2016 (DOE November 2016b) in accordance with NMED's "Agreements and Proposed Milestones" letter of April 14, 2016 (NMED April 2016). It should be noted that the report title mentions December 2016 while the transmittal letter was dated November 23, 2016.

2.2 Sites in Corrective Action Complete Regulatory Process

After NMED certifies completion of corrective action activities at a SWMU or an AOC, a Class 3 Modification to the Permit is requested by DOE/NNSA to formally change the status of the SWMU or AOC from Corrective Action Required to either CAC without Controls or CAC with Controls. The Class 3 Permit Modification is a regulatory process.

2.2.1 Solid Waste Management Units 8 and 58, 68, 149, and 154

In February 2015, NMED agreed that corrective action activities at SWMUs 8 and 58, 68, 149, and 154 had been completed, and that certificates of completion could be requested (NMED February 2015). A letter requesting certificates of completion for these SWMUs was submitted to NMED on September 4, 2015 (DOE September 2015). In January 2016, NMED granted the certificates of completion for these SWMUs (NMED January 2016). Section I.2.2.3 describes the Class 3 Permit Modification request for CAC status, which was prepared and submitted to the NMED on May 16, 2016 (DOE May 2016).

2.2.2 Solid Waste Management Unit 502

On February 29, 2016, the NMED approved the November 2013 SWMU 502 Voluntary Corrective Action Report and noted that the DOE and Sandia may request a permit modification for CAC status for SWMU 502 (NMED February 2016). Section I.2.2.3

describes the Class 3 Permit Modification request for CAC status, which was prepared and submitted to the NMED on May 16, 2016 (DOE May 2016).

2.2.3 Class 3 Permit Modification Request

In a letter dated May 16, 2016, the DOE/NNSA and Sandia requested a Class 3 Permit Modification to designate six SWMUs as approved for CAC status (DOE May 2016). The following SWMUs were included in the request:

- SWMU 8 Open Dump (Coyote Canyon Blast Area)
- SWMU 58 Coyote Canyon Blast Area
- SWMU 68 Old Burn Site
- SWMU 149 Building 9930 Septic System (Coyote Test Field)
- SWMU 154 Building 9960 Septic System and Seepage Pits (Coyote Test Field)
- SWMU 502 Building 9938 Surface Discharge Site

The DOE/NNSA and Sandia held a 60-day public comment period from May 25 through July 24, 2016 and hosted a public meeting with information about the SWMUs on June 21, 2016. Information about the public notices, public meeting, meeting attendance list, and summary information about the six SWMUs was provided to the NMED in a letter transmitted on September 8, 2016 (DOE September 2016).

3.0 References

New Mexico Environment Department (NMED), February 2015. Letter to G. Beausoleil (U.S. Department of Energy NNSA/Sandia Field Office) and P. Davies (Sandia National Laboratories, New Mexico), *Approval Annual Groundwater Monitoring Report, Calendar Year 2013, June 2014, Sandia National Laboratories, EPA ID# NM5890110518, HWB SNL 14 013, NMED, Hazardous Waste Bureau, Santa Fe, New Mexico*, February 4, 2015.

New Mexico Environment Department (NMED), January 2016. Letter to J. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P. Davies (Sandia National Laboratories, New Mexico), "Certificates of Completion for the Solid Waste Management Units 68, 149, 154, 8 and 58, September 2015, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-15-018," NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, January 19, 2016.

New Mexico Environment Department (NMED), February 2016. Letter to J. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P. Davies (Sandia National Laboratories, New Mexico), "Approval Investigation Report for Voluntary Correction Action at Solid Waste Management Unit 502 Building 9938 Surface Discharge Site for Sandia National Laboratories/New Mexico, October 2013, Sandia National Laboratories EPA ID# NM5890110518, SNL-15-013," NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, February 29, 2016.

New Mexico Environment Department (NMED), April 2016. Letter to J.P. Harrell (U.S. Department of Energy, NNSA/Sandia Field Office) and M. W. Hazen (Sandia National Laboratories, New Mexico), "Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015, March 30, 2016, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-16-MISC," NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, April 14, 2016.

New Mexico Environment Department (NMED), May 2016. Letter to J. Harrell (U.S. Department of Energy NNSA/Sandia Field Office) and P. Davies (Sandia National Laboratories, New Mexico), "Approval Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-15-020," NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, May 10, 2016.

New Mexico Environment Department (NMED), September 2016. Letter to J.W. Todd (U.S. Department of Energy, NNSA/Sandia Field Office), "Administrative Completeness Determination and Applicant's Public Notice Requirements, DP-1845, Sandia National Laboratories/New Mexico, Technical Area-V Treatability Study Injection Wells," NMED, Ground Water Quality Bureau, Santa Fe, New Mexico, September 27, 2016.

NMED, see New Mexico Environment Department

Sandia National Laboratories, New Mexico (SNL/NM), March 2016. *Revised Treatability Study Work Plan for In-Situ Bioremediation at the Technical Area-V Groundwater Area of Concern, Sandia National Laboratories, Albuquerque, New Mexico*.

Sandia National Laboratories, New Mexico (SNL/NM), December 2016. *Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report*, Environmental Restoration Operations, Sandia National Laboratories, Albuquerque, New Mexico.

SNL/NM, see Sandia National Laboratories, New Mexico.

U.S. Department of Energy (DOE), September 2015. Letter to J.E. Kieling (New Mexico Environment Department), "Request for Certificates of Completion from the New Mexico Environment Department for Solid Waste Management Units (SWMUs) 68 and 149 (without controls) and SWMUs 154, 8, and 58 (with controls)," EPA ID# NM5890110518, DOE, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, September 4, 2015.

U.S. Department of Energy (DOE), May 2016. "Request for Class 3 Modification to the Resource Conservation and Recovery Act Facility Operating Permit for Sandia National Laboratories/New Mexico, EPA ID NM5890110518, May 16, 2016.

U.S. Department of Energy (DOE), July 2016. Letter to S. Huddleson (New Mexico Environment Department), "Discharge Permit Application for Sandia National Laboratories/New Mexico Technical Area-V Treatability Study Injection Wells, DP-1845," DOE, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, July 25, 2016.

U.S. Department of Energy (DOE), September 2016. "Documentation of Public Notices, Meetings, and Comments Related to Request for Class 3 Modification to the Resource Conservation and Recovery Act Facility Operating Permit for Sandia National Laboratories/New Mexico, EPA ID NM5890110518, September 8, 2016.

U.S. Department of Energy (DOE), November 2016a. Letter to K. Jones (New Mexico Environment Department), "DP-1845, Technical Area-V Treatability Study Injection Wells Affidavit of Public Notice Completion," DOE, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, November 16, 2016.

U.S. Department of Energy (DOE), November 2016b. Letter to J.E. Kieling (New Mexico Environment Department), "Tijeras Arroyo Groundwater Current Conceptual Model and Corrective Measures Evaluation Report, December 2016", November 23, 2016.

Tables

Table I-1
Solid Waste Management Units and Areas of Concern
Where Corrective Action is Not Complete

Solid Waste Management Units and Areas of Concern	
Site Number	**Site Description**
8	Open Dump (CCBA)
58	CCBA
68	Old Burn Site
83	Long Sled Track
84	Gun Facilities
149	Building 9930 Septic System (CTF)
154	Building 9960 Septic System and Seepage Pits (CTF)
240	Short Sled Track
NA	Tijeras Arroyo Groundwater Investigation (TAG AOC)
NA	TA-V Groundwater Investigation (TAVG AOC)
NA	Burn Site Groundwater Investigation (BSG AOC)
502	Building 9938 Surface Discharge Site
Total	**12**

Notes

AOC = Area of Concern.
BSG = Burn Site Groundwater.
CCBA = Coyote Canyon Blast Area.
CTF = Coyote Test Field.
NA = Not applicable. A site number was not assigned.
TA = Technical Area.
TAG = Tijeras Arroyo Groundwater.
TA-V = Technical Area-V.
TAVG = Technical Area-V Groundwater.

Table I-2
Groundwater Sampling and Analysis

Investigation Site	Sampling Frequency in CY 2016[a]	Quarter of Sampling in CY 2016	Location of Analytical Results	Location of Perchlorate Analytical Results	Monitoring Wells in Network
TAVG AOC	Quarterly	1,2,3,4	AGMR	NA	AVN-1, LWDS-MW1, LWDS-MW2, TAV-MW2, TAV-MW3, TAV-MW4, TAV-MW5, TAV-MW6, TAV-MW7, TAV-MW8, TAV-MW9, TAV-MW10, TAV-MW11, TAV-MW12, TAV-MW13, TAV-MW14
BSG AOC	Semiannually	2,4	AGMR	Section II of ER Consolidated Quarterly Report	CYN-MW4, CYN-MW7, CYN-MW8, CYN-MW9, CYN-MW10, CYN-MW11, CYN-MW12, CYN-MW13, CYN-MW14A, CYN-MW15
TAG AOC	Quarterly	1,2,3,4	AGMR	NA	PGS-2, TA1-W-01, TA1-W-02, TA1-W-03, TA1-W-04, TA1-W-05, TA1-W-06, TA1-W-08, 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-6, TJA-7, WYO-3, WYO-4

Notes

[a]Not all wells in a particular investigation are sampled at the same frequency; this represents the maximum frequency of sampling at a site.

AGMR = Annual Groundwater Monitoring Report.
AOC = Area of Concern.
AVN = Area V (North).
BSG = Burn Site Groundwater (Area of Concern).
CY = Calendar Year.
CYN = Lurance Canyon.
ER = Environmental Restoration Operations.
LWDS = Liquid Waste Disposal System.
MW = Monitoring Well.
NA = Not applicable. No wells in the site network are currently being sampled and analyzed for perchlorate.
PGS = Parade Ground South.
TA1-W = Technical Area-I (Well).
TA2-NW = Technical Area-II (Northwest).
TA2-W = Technical Area-II (Well).
TAG = Tijeras Arroyo Groundwater (Area of Concern).
TAV = Technical Area-V.
TAVG = Technical Area-V Groundwater (Area of Concern).
TJA = Tijeras Arroyo.
WYO = Wyoming.

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SECTION II
PERCHLORATE SCREENING QUARTERLY GROUNDWATER MONITORING REPORT, October – December 2016

1.0 Introduction

Section IV.B of the Compliance Order on Consent (the Consent Order), between the New Mexico Environment Department (NMED), the U.S. Department of Energy (DOE), and Sandia Corporation (Sandia), jointly referred to as DOE/Sandia, for Sandia National Laboratories, New Mexico (SNL/NM), effective on April 29, 2004, stipulates that a select group of groundwater monitoring wells at SNL/NM be sampled for perchlorate (NMED April 2004). This section of the Environmental Restoration Operations (ER) Consolidated Quarterly Report (ER Quarterly Report) summarizes the perchlorate screening groundwater monitoring completed during the fourth quarter of calendar year (CY) 2016 (October, November, and December 2016) in response to the requirements of the Consent Order. The outline of this report is based on the required elements of a "Periodic Monitoring Report" described in Section X.D. of the Consent Order (NMED April 2004).

In November 2005, DOE/Sandia submitted a letter report on the status of perchlorate screening in groundwater at SNL/NM monitoring wells (SNL/NM November 2005). The letter report summarized previous correspondence and sampling results and outlined proposed future work to comply with NMED requirements for perchlorate screening of groundwater. As specified in the letter report, quarterly reports are submitted for wells active in the perchlorate screening monitoring well network.

Based on the NMED response (NMED January 2006), DOE/Sandia submits each quarterly report within 90 days following the quarter that the data represent. In November 2008, DOE/Sandia received approval from the NMED to proceed to semiannual reporting (NMED November 2008); however, upon further consideration, the NMED once more required quarterly reporting (NMED April 2009). This did not alter the previously negotiated frequency for monitoring well CYN-MW6, an existing Burn Site Groundwater (BSG) Area of Concern (AOC) monitoring well that has been under the sampling and reporting requirements of the Consent Order since the well was installed, which remains at a semiannual frequency for sampling and reporting. Due to declining water levels, CYN-MW6 has insufficient water to routinely sample and the replacement monitoring well (CYN-MW15) was installed in December 2014; the negotiated semiannual sampling frequency transferred to this well.

In September 2011, DOE/Sandia requested an extension of the submittal dates by one month for ER Quarterly Reports (SNL/NM September 2011). The request was approved by the NMED (September 2011), which allows DOE/Sandia to submit perchlorate quarterly reports within 120 days following the quarter that the data represent.

This report is the forty-first perchlorate screening quarterly report to be submitted since the November 2005 letter report; the previous reports were submitted for fourth quarter of CY 2005 through the fourth quarter of CY 2015 (SNL/NM February 2006 and April 2016).

Groundwater at BSG AOC monitoring well CYN-MW15 was sampled semiannually and was sampled for the fourth time during the reporting period (Table II-1). The corresponding reporting will continue for as long as a well remains active in the perchlorate screening network, or unless otherwise negotiated with the NMED.

2.0 Scope of Activities

This report provides perchlorate screening groundwater monitoring analytical results for the fourth quarter of CY 2016 (October, November, and December 2016) for the one well currently active in the perchlorate screening program (CYN-MW15) as shown on Figure II-1 and listed in Table II-1. In accordance with the requirements of Table XI-1 of the Consent Order, a well with four consecutive quarters of nondetects (NDs) for perchlorate at the screening level/method detection limit (MDL) of 4 micrograms per liter (µg/L) is removed from the requirement of continued monitoring for perchlorate.

Data for numerous wells identified in the Consent Order have satisfied this requirement; therefore, these wells have been removed from the perchlorate screening program. The perchlorate results for these wells have been provided in previous reports and are not discussed in this current report. Table II-2 includes wells discussed in previous perchlorate screening reports.

SNL/NM personnel performed groundwater sampling for perchlorate at monitoring well CYN-MW15 on October 21, 2016 (Table II-1). Groundwater sampling activities were conducted in accordance with procedures outlined in the *Burn Site Groundwater Monitoring, Mini-SAP for First Quarter, Fiscal Year 2017* (SNL/NM September 2016).

As described in the Mini-Sampling and Analysis Plan (SAP), groundwater sampling was performed in accordance with current SNL/NM Environmental Management, Long-Term Stewardship Project Field Operating Procedures (FOPs). A portable Bennett™ groundwater sampling system was used to collect the groundwater samples. The sampling pump and

tubing bundle were decontaminated prior to placement into the monitoring well in accordance with procedures described in FOP 05-03, "Groundwater Monitoring Equipment Decontamination" (SNL/NM January 2015a). The well was purged a minimum of one saturated screen volume before sampling in accordance with FOP 05-01, "Groundwater Monitoring Well Sampling and Field Analytical Measurements" (SNL/NM January 2015b). Field water quality measurements for turbidity, pH, temperature, specific conductance (SC), oxidation-reduction potential (ORP), and dissolved oxygen (DO) were obtained from the well prior to collecting the groundwater sample. Groundwater temperature, SC, ORP, DO, and pH were measured with an YSI™ Model EXO1 water quality meter. Turbidity was measured with a HACH™ Model 2100Q turbidity meter. Purging continued until four stable measurements for turbidity, pH, temperature, and SC were obtained. Groundwater stability is considered acceptable when the following parameters are achieved:

- Turbidity measurements are less than 5 nephelometric turbidity units (NTUs), or within 10 percent for turbidity values greater than 5 NTUs.
- pH is within 0.1 units.
- Temperature is within 1.0 degree Celsius.
- SC is within 5 percent.

Field measurement logs documenting details of well purging and water quality measurements have been submitted to the SNL/NM Customer Funded Record Center.

The groundwater samples were submitted to GEL Laboratories LLC (GEL) for chemical analysis of perchlorate using U.S. Environmental Protection Agency (EPA) Method 314.0 (EPA November 1999). Table II-3 provides the sample identification, Analysis Request/Chain-of-Custody form number, and the associated groundwater investigation. The analytical report from GEL, including certificates of analyses (COA) (Appendix A), analytical methods, MDLs, practical quantitation limits, dates of analyses, and results of quality control (QC) analyses and data validation findings (Appendix B), have been submitted to the SNL/NM Customer Funded Record Center.

3.0 Regulatory Criteria

For a given monitoring well, four consecutive ND results using the screening level/MDL of 4 μg/L are considered by the NMED as evidence of the absence of perchlorate, such that additional monitoring for perchlorate in that well is not required. If perchlorate is detected

using the screening level/MDL of 4 µg/L in a specific well, then monitoring will continue at that well at a frequency negotiated with the NMED. The Consent Order (NMED April 2004) also requires that for detections equal to or greater than 4 µg/L, DOE/Sandia will evaluate the nature and extent of perchlorate contamination and incorporate the results of this evaluation into a Corrective Measures Evaluation (CME), based on a screening level/MDL of 4 µg/L. Section VII.C of the Consent Order clarifies that the CME 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.

3.1 Burn Site Groundwater Area of Concern

In March 2007, DOE/Sandia received a letter of approval from the NMED, which stated the requirement that DOE/Sandia "determine the nature and extent of the contamination and complete a CME for the perchlorate-impacted groundwater in the vicinity of CYN-MW6" (NMED March 2007). As this was based solely on four quarters of monitoring results, DOE/Sandia submitted a letter to the NMED in April 2007 (SNL/NM April 2007) recommending further characterization through continued quarterly monitoring of monitoring well CYN-MW6 for four additional quarters, ending in December 2007, to ensure appropriate characterization of this well. In January 2008, DOE/Sandia requested a meeting with the NMED to discuss the need for continued monitoring or additional characterization work and, potentially, a CME.

In preparation for discussing the perchlorate-impacted groundwater in the vicinity of monitoring well CYN-MW6, and to show that the requirement "to determine the nature and extent of contamination" (NMED March 2007) has been met, DOE/Sandia provided supporting information to the NMED (SNL/NM March 2008). Perchlorate in surface soil has been characterized at several Solid Waste Management Units (SWMUs) in the study area (SNL/NM June 2006 and March 2008–Appendix C). Based on these data, DOE/Sandia considers the nature and extent of perchlorate in groundwater at the BSG AOC to be sufficiently characterized. Since 2004, groundwater samples from four other monitoring wells in the vicinity of the BSG AOC have been analyzed for perchlorate, including monitoring wells CYN-MW1D, CYN-MW5, CYN-MW7, and CYN-MW8. All wells were sampled for four quarters and all results were ND for perchlorate (SNL/NM March 2008–Appendix D).

In accordance with the requirements of Section VI.K.1.b of the Consent Order (NMED April 2004), a human health risk assessment has been performed to evaluate the potential for adverse health effects from the concentrations of perchlorate detected in monitoring well CYN-MW6 groundwater samples. The maximum perchlorate concentration to date of 8.93 µg/L was used in the risk assessment. The calculated hazard

quotient (HQ) of 0.35 is less than the NMED target level of a hazard index (the sum of all HQs) of 1.0 (NMED June 2006, SNL/NM March 2008–Appendix E). For another point of comparison, NMED risk assessment guidance has a tap water standard for perchlorate of 13.8 μg/L (NMED March 2015); therefore, the historical maximum concentration detected is 35 percent less than the NMED standard.

Because perchlorate concentrations in samples from monitoring well CYN-MW6 have exceeded the screening level, DOE/Sandia initiated a negotiation process with the NMED (SNL/NM March 2007) to determine the frequency of continued monitoring. In November 2008, DOE/Sandia received approval from the NMED to proceed with semiannual monitoring of perchlorate in monitoring well CYN-MW6 and proceed with semiannual reporting of all perchlorate results (NMED November 2008). Upon further consideration, the NMED once more required that DOE/Sandia resume quarterly reporting of perchlorate results with the exception of monitoring well CYN-MW6 (NMED April 2009). Due to declining water levels, CYN-MW6 has insufficient water to routinely sample and was replaced; the last sample collected at CYN-MW6 was on October 15, 2012. The replacement monitoring well (CYN-MW15) was installed in December 2014 and assumed the negotiated semiannual monitoring frequency. Monitoring well CYN-MW14A was also installed in December 2014; this well was considered to be a new monitoring well that requires quarterly sampling due to its deep screen interval.

In April 2009, DOE/Sandia received a letter from the NMED requiring DOE/Sandia to characterize the nature and extent of the perchlorate contamination in soil and groundwater in the BSG AOC (NMED April 2009). A characterization work plan was prepared and submitted to the NMED (SNL/NM November 2009), approved by the NMED (February 2010), and implemented in July 2010.

3.2 Tijeras Arroyo Groundwater and Technical Area-V Groundwater Areas of Concern

The April 2009 letter from the NMED to DOE/Sandia was not limited to the BSG AOC (NMED April 2009). In the April 2009 letter, the NMED had also requested that DOE/Sandia monitor perchlorate concentrations for a minimum of four quarters at five monitoring wells in the Tijeras Arroyo Groundwater (TAG) AOC and at four monitoring wells in the Technical Area-V Groundwater AOC (NMED April 2009). All nine wells from these two AOCs have been sampled for four consecutive monitoring events with no perchlorate detections being reported; therefore, these nine wells have been removed from the perchlorate sampling list. A TAG monitoring well (TA2-SW1-320) was damaged and was replaced by well, TA2-W-28 in December 2014. The replacement well was installed for the purpose of monitoring the same depth interval as damaged well TA2-SW1-320. Because

well TA2-SW1-320 was not one of the four TAG wells selected for perchlorate sampling, replacement well TA2-W-28 does not require perchlorate sampling.

3.3 March 2006 and January 2008 Permit Modification Requests

During the first quarter of CY 2011, four monitoring wells were added to the perchlorate monitoring network based on the NMED letter of April 8, 2010, entitled, "Class 3 Permit Modification Requests for Granting Corrective Action Complete Status for 26 SWMUs/AOCs (Request of March 1, 2006) and 5 Other SWMUs/AOCs (Request of January 7, 2008), Sandia National Laboratories, EPA ID #NM5890110518 HWB-SNL-06-007 and HWB-SNL-08-001" (NMED April 2010). The sites and the corresponding requests are described in Section I.2.2 of this ER Quarterly Report. The NMED letter required work plans and groundwater monitoring at the following SWMUs:

- SWMU 8/58—Installation of at least two groundwater monitoring wells west of and near Features YY and OO and submittal and approval of a work plan.

- SWMU 49—Annual sampling of existing monitoring well CYN-MW5.

- SWMU 68—Installation of monitoring wells near the burn pan and associated ditch/surface impoundments and submittal and approval of a work plan.

- SWMU 116—Annual sampling of existing monitoring well CTF-MW1.

- SWMU 149—Submittal of a SAP and quarterly sampling of existing monitoring well CTF-MW3 for a minimum of eight quarters.

- SWMU 154—Submittal of a SAP and quarterly sampling of existing monitoring well CTF-MW2 for a minimum of eight quarters.

To fulfill the requirements of the April 2010 NMED letter, DOE/Sandia submitted a SAP for monitoring wells CTF-MW2 and CTF-MW3 (SNL/NM June 2010) that was subsequently approved with modifications by the NMED (December 2010). All of these wells have been sampled for the required number of monitoring events, with no perchlorate detections, and have since been removed from the perchlorate sampling list.

The NMED letter of April 8, 2010, also required work plans, installation of groundwater monitoring wells, and groundwater monitoring at the following SWMUs:

- SWMUs 8/58—Two groundwater monitoring wells must be installed (CCBA-MW1 and CCBA-MW2) and sampled quarterly for a minimum of eight quarters.

- SWMU 68—Three groundwater monitoring wells must be installed (OBS-MW1, OBS-MW2, and OBS-MW3) and sampled quarterly for a minimum of eight quarters.

To fulfill requirements of the April 2010 NMED letter, DOE/Sandia submitted SWMU 68 and SWMUs 8/58 Groundwater Characterization Work Plans that included a Well Installation Plan/SAP for monitoring wells CCBA-MW1, CCBA-MW2, OBS-MW1, OBS-MW2, and OBS-MW3 (SNL/NM September 2010) that was subsequently approved with modification by the NMED (January 2011). All of these wells have been sampled for eight or more consecutive monitoring events with no perchlorate detections and have since been removed from the perchlorate sampling list.

4.0 Monitoring Results

Table II-3 summarizes the details of samples collected from monitoring well CYN-MW15 in the fourth quarter of CY 2016. Table II-4 summarizes current and historical perchlorate results for CYN-MW15. Appendix A provides the analytical laboratory COA for the fourth quarter of CY 2015 perchlorate data. For the first time in five sampling events (since December 2014), perchlorate was detected above the screening level/MDL of 4.0 µg/L in the CYN-MW15 environmental and duplicate environmental groundwater samples at concentrations of 4.09 µg/L and 4.18 µg/L, respectively. SNL/NM personnel requested GEL verify results using a different analytical method, specifically EPA Method 6850 (EPA 1986). Perchlorate was reported in verification samples at 3.98 µg/L in the environmental sample and 4.01 µg/L in the duplicate environmental sample.

As shown on Figure II-2, the October 2016 perchlorate concentrations reported for monitoring well CYN-MW15 is just above the perchlorate screening level/MDL of 4.0 µg/L. The hydrograph for monitoring well CYN-MW15 (Figure II-2) shows that the water table elevation has been relatively consistent for the past two years.

Table II-5 summarizes the stabilized water quality values measured immediately before the groundwater samples were collected. The field water quality measurements include turbidity, pH, temperature, SC, ORP, and DO.

The analytical data were reviewed and validated in accordance with Administrative Operating Procedure 00-03, "Data Validation Procedure for Chemical and Radiochemical Data," Revision 4 (SNL/NM June 2014). No problems were identified with the analytical data that resulted in qualification of the data as unusable. The data are acceptable, and reported QC measures are adequate. Appendix B provides the data validation sample findings summary sheets for the perchlorate data.

No variances or nonconformances in perchlorate sampling field activities, or field conditions from requirements in the groundwater monitoring Mini-SAP (SNL/NM September 2016), were identified during the fourth quarter of CY 2016 sampling activities.

5.0 Summary and Conclusions

Based on the analytical data presented in Table II-4 and in previous reports, the following statements can be made:

- The perchlorate concentration for monitoring well CYN-MW15 for the Fourth Quarter of CY 2016 sampling event ranged up to 4.18 µg/L, which is the first detection of perchlorate at this well (Figure II-2). However, this was not an unexpected result as CYN-MW15 was installed to replace CYN-MW6, a well with historical perchlorate detections that ranged up to 8.93 µg/L.

- Since June 2004 (the start of sampling as required by the Consent Order), perchlorate was detected above the screening level/MDL (4 µg/L) in groundwater samples from only two wells (CYN-MW6 and its replacement well CYN-MW15) in the perchlorate screening monitoring well network. DOE/Sandia will continue semiannual monitoring of perchlorate for monitoring well CYN-MW15.

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Figures

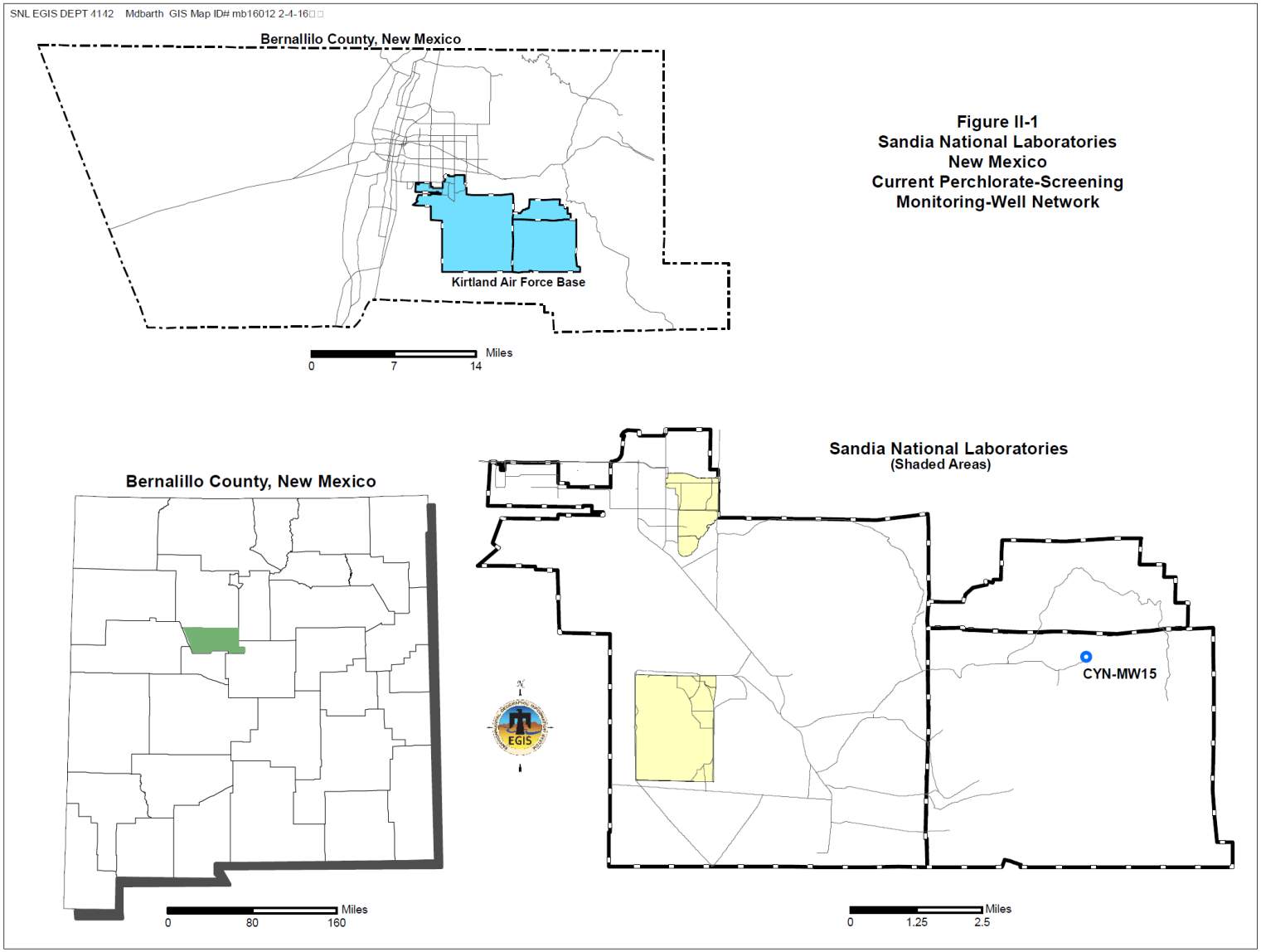

Figure II-1
Sandia National Laboratories, New Mexico
Current Perchlorate Screening Monitoring Well Network, October – December 2016

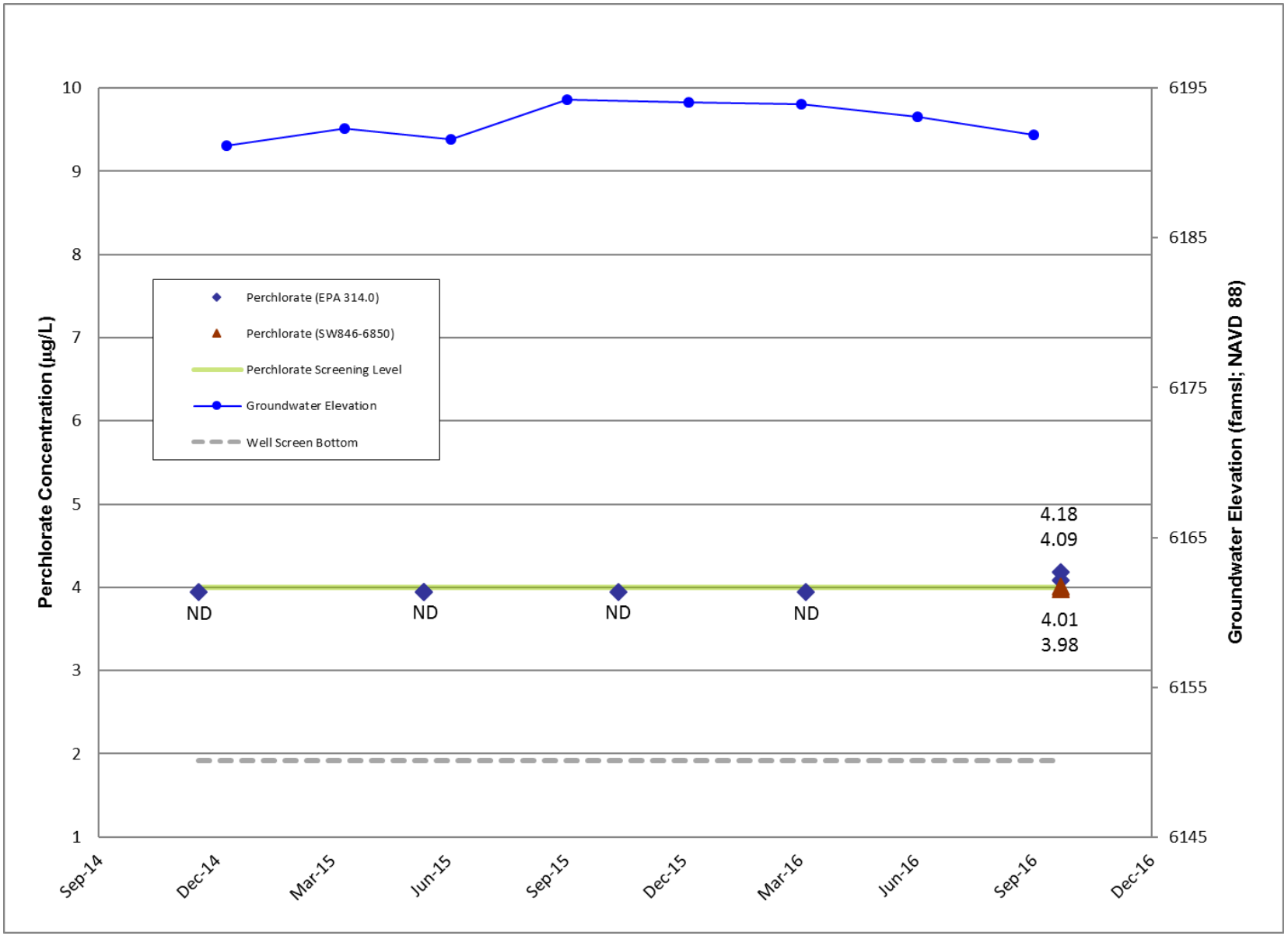

Figure II-2

Groundwater Elevations and Perchlorate Concentrations over Time in CYN MW15

Tables

Table II-1
Current Perchlorate Screening Monitoring Well Network
Fourth Quarter, CY 2016

Well	Date Sampled	Number of Consecutive Sampling Events[a]	Remaining Number of Sampling Events	Sampling Equipment
CYN-MW15	21-Oct-16	5	TBD[b]	Bennett™ Pump

Notes

[a]Includes this sampling event.
[b]This well was installed as a replacement well for CYN-MW6. Because perchlorate concentrations in CYN-MW6 have exceeded the screening level/MDL, DOE/Sandia and the NMED have agreed to further characterization requirements in the Burn Site Groundwater Area of Concern (NMED February 2010).

CY = Calendar Year.
CYN = Canyons (Burn Site Groundwater Area of Concern).
DOE = U.S. Department of Energy.
MDL = Method Detection Limit.
MW = Monitoring well.
NMED = New Mexico Environment Department.
Sandia = Sandia Corporation.
TBD = To be determined.

Table II-2
Monitoring Wells Discussed in Previous Perchlorate Screening Reports

Well
CCBA-MW1
CCBA-MW2
CTF-MW1
CTF-MW2
CTF-MW3
CYN-MW1D
CYN-MW5
CYN-MW6
CYN-MW7
CYN-MW8
CYN-MW9
CYN-MW10
CYN-MW11
CYN-MW12
CYN-MW14A
LWDS-MW1
MRN-2
MRN-3D
MWL-BW1
MWL-BW2
MWL-MW1
MWL-MW7
MWL-MW8
MWL-MW9
NWTA3-MW2
OBS-MW1
OBS-MW2
OBS-MW3
SWTA3-MW4
TA1-W-03
TA1-W-06
TA1-W-08
TA2-W-01
TA2-W-27
TAV-MW11
TAV-MW12
TAV-MW13
TAV-MW14

Notes

BW = Background well.
CCBA = Coyote Canyon Blast Area.
CTF = Coyote Test Field.
CYN = Canyons (Burn Site Groundwater Area of Concern).
LWDS = Liquid Waste Disposal System.
MRN = Magazine Road North.
MW = Monitoring well.
MWL = Mixed Waste Landfill.
NWTA = Northwest Technical Area (III).
OBS = Old Burn Site.
SWTA = Southwest Technical Area (III).
TA1-W = Technical Area I (Well).
TA2-W = Technical Area II (Well).
TAV = Technical Area-V.

Table II-3
Sample Details for Fourth Quarter, CY 2016 Perchlorate Sampling

Well	Sample Identification	AR/COC Number	Associated Groundwater Investigation
CYN-MW15	100705-004	617385	BSG AOC
CYN-MW15 (duplicate)	100706-004		

Notes

AOC = Area of Concern.
AR/COC = Analysis Request/Chain-of-Custody.
BSG = Burn Site Groundwater.
CY = Calendar Year.
CYN = Canyons (Burn Site Groundwater Area of Concern).
MW = Monitoring well.

Table II-4
Summary of Perchlorate Screening Analytical Results for the Current Monitoring Well Network as of Fourth Quarter, CY 2016

Well	Sample Date	AR/COC Number	Sample Number	Result (µg/L)	MDL (µg/L)	PQL (µg/L)	MCL (µg/L)	Laboratory Qualifier[a]	Validation Qualifier[b]	Analytical Method[c]	Comments
Burn Site Groundwater Area of Concern											
CYN-MW15	17-Dec-14	615941	096979-020	ND	4.0	12	NE	U		EPA 314.0	
	11-Jun-15	616178	097842-020	ND	4.0	12	NE	U		EPA 314.0	
			097843-020	ND	4.0	12	NE	U		EPA 314.0	Duplicate sample
	10-Nov-15	616396	098486-020	ND	4.0	12	NE	U		EPA 314.0	
	05-Apr-16	616862	099139-008	ND	4.0	12	NE	U		EPA 314.0	
	21-Oct-16	617385	100705-004	4.09	4.0	12	NE	J		EPA 314.0	
			100705-R04	3.98	0.25	1	NE			SW846 6850	
			100706-004	4.18	4.0	12	NE	J		EPA 314.0	Duplicate sample
			100706-R04	4.01	0.25	1	NE			SW846 6850	Duplicate sample

Notes

[a]Laboratory Qualifier
If cell is blank, then all quality control samples meet acceptance criteria with respect to submitted samples and no qualifier was assigned.
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.

[b]Validation Qualifier
If cell is blank, then all quality control samples meet acceptance criteria with respect to submitted samples and no qualifier was assigned.

[c]Analytical Method
EPA 314.0: EPA, November 1999, "Perchlorate in Drinking Water Using Ion Chromatography," EPA 815/R-00-014 (EPA November 1999).
SW846 6850 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.

µg/L = Micrograms per liter.
AR/COC = Analysis Request/Chain-of-Custody.
CFR = Code of Federal Regulations.
CY = Calendar Year.
CYN = Canyons (Burn Site Groundwater Area of Concern).
EPA = U.S. Environmental Protection Agency.
MCL = Maximum contaminant level. Established by the U.S. Environmental Protection Agency Primary Water Regulations (40 CFR 141.11, Subpart B) and subsequent amendments or Title 20, Chapter 7, Part 1 of the New Mexico Administrative Code, incorporating 40 CFR 141.
MDL = Method Detection Limit. The minimum concentration that can be measured and reported with 99% confidence that the analyte is greater than zero; analyte is matrix-specific.
MW = Monitoring well.
ND = Nondetect (at MDL).
NE = Not established.
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 the indicated method under routine laboratory operating conditions.

Table II-5
Perchlorate Screening Groundwater Monitoring
Field Water Quality Measurements[a], Fourth Quarter, CY 2016

Well	Sample Date	Temperature (°C)	Specific Conductivity (µmhos/cm)	Oxidation-Reduction Potential (mV)	pH	Turbidity (NTU)	Dissolved Oxygen (% Sat)	Dissolved Oxygen (mg/L)
Burn Site Groundwater Area of Concern								
CYN-MW15	21-Oct-16	16.82	1188.9	269.5	8.50	0.78	19.6	1.89

Notes

[a]Field measurements obtained immediately before the groundwater sample was collected.

°C = Degrees Celsius.
% Sat = Percent saturation.
µmhos/cm = Micromhos per centimeter.
CY = Calendar Year.
CYN = Canyons (Burn Site Groundwater Area of Concern).
mg/L = Milligrams per liter.
mV = Millivolt(s).
MW = Monitoring well.
NTU = Nephelometric turbidity unit.
pH = Potential of hydrogen (negative logarithm of the hydrogen ion concentration).

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Appendix A
Analytical Laboratory Certificates of Analysis for the Perchlorate Data

SMO 2012-ARCOC (4-2012)

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

AOP 95-16

Internal Lab

Batch No. N107

SMO Use

Page 1 of 1

AR/COC 617385

Project Name: BSG	Date Samples Shipped: 10/24/16	SMO Authorization:	☐ Waste Characterization
Project/Task Manager: Michael Skelly	Carrier/Waybill No. 256228	SMO Contact Phone: SMO	☐ RMA
Project/Task Number: 195122.10.11.01	Lab Contact: Edie Kent/843-769-7385	Wendy Palencia/505-844-3132	☐ Released by COC No.
Service Order: CF058-17	Lab Destination: GEL	Send Report to SMO:	☑ 4° Celsius
Tech Area:	Contract No.: 1303873	Stephanie Montaño/505.284.2553	Bill to: Sandia National Laboratories (Accounts Payable), P.O. Box 5800, MS-0154 Albuquerque, NM 87185-0154 4085462
Building: Room:	Operational Site:		

Sample No.	Fraction	Sample Location Detail	Depth (ft)	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
100705	001	CYN-MW15	182	10/21/16 10:03	GW	AG	3x40 ml	NONE	G	SA	TPH-GRO (SW846-8015)	009
100705	002	CYN-MW15	182	10/21/16 10:05	GW	AG	4x1 L	NONE	G	SA	TPH-DRO (SW846-8015)	010
100705	003	CYN-MW15	182	10/21/16 10:07	GW	P	125 ml	H2SO4	G	SA	NPN (EPA 353.2)	011
100705	004	CYN-MW15	182	10/21/16 10:09	GW	P	250 ml	None	G	SA	PERCHLORATE (EPA 314.0) 410542001	012
100706	001	CYN-MW15	182	10/21/16 10:04	GW	AG	3x40 ml	NONE	G	DU	TPH-GRO (SW846-8015)	013
100706	002	CYN-MW15	182	10/21/16 10:06	GW	AG	4x1 L	NONE	G	DU	TPH-DRO (SW846-8015)	014
100706	003	CYN-MW15	182	10/21/16 10:08	GW	P	125 ml	H2SO4	G	DU	NPN (EPA 353.2)	015
100706	004	CYN-MW15	182	10/21/16 10:10	GW	P	250 ml	None	G	DU	PERCHLORATE (EPA 314.0) 410542002	016
100707	001	CYN-TB9	NA	10/21/16 10:03	DIW	AG	3x40 ml	None	G	TB	TPH-GRO (SW846-8015)	017

Last Chain:	☐ Yes	Sample Tracking	SMO Use
Validation Req'd:	☑ Yes	Date Entered:	
Background:	☐ Yes	Entered by:	
Confirmatory:	☐ Yes	QC inits.:	

Sample Team Members	Name	Signature	Init.	Company/Organization/Phone/Cell
	Timmie Jackson	Timmie Jackson	TJ	SNL/04131/505-284-2547/505-263-6639
	Robert Lynch	RLynch	RL	SNL/04141/505-844-4013/505-250-7090

Special Instructions/QC Requirements:

EDD ☑ Yes

Turnaround Time ☐ 7-Day* ☐ 15-Day* ☑ 30-Day

Negotiated TAT ☐

Sample Disposal ☐ Return to Client ☑ Disposal by Lab

Return Samples By:

Comments: If perchlorate detect, then request verification analysis using method SW846-6850.

Conditions on Receipt

Relinquished by		Org. 4131	Date 10/21/16	Time 1050	Relinquished by	Org.	Date / Time
Received by		Org. 4131	Date 10/21/16	Time 1050	Received by	Org.	Date / Time
Relinquished by		Org. 4131	Date 10/24/16	Time 0800	Relinquished by	Org.	Date / Time
Received by		Org. GEL	Date 10/25/16	Time 7:55	Received by	Org.	Date / Time

Lab Use

*Prior confirmation with SMO required for 7 and 15 day TAT

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: November 14, 2016

Company :	Sandia National Laboratories
Address :	1515 Eubank SE,ORG 4142 BLDG. 1090/120, MS 1103 Albuquerque, New Mexico 87123
Contact:	Ms. Wendy Palencia
Project:	Groundwater, Level C Package

Client Sample ID:	100705-004	Project:	SNLSGWater
Sample ID:	408962012	Client ID:	SNLS004
Matrix:	AQUEOUS		
Collect Date:	21-OCT-16 10:09		
Receive Date:	25-OCT-16	Client Desc.:	CYN-MW15
Collector:	Client	Vol. Recv.:	

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
EPA 314.0 Perchlorate by IC "As Received"												
Perchlorate	J	0.00409	0.004	0.012	mg/L		1	MAR1	10/29/16	1738	1611735	1

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 314.0 DOE-AL	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

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Certificate of Analysis

Report Date: November 14, 2016

Company :	Sandia National Laboratories
Address :	1515 Eubank SE,ORG 4142 BLDG. 1090/120, MS 1103 Albuquerque, New Mexico 87123
Contact:	Ms. Wendy Palencia
Project:	Groundwater, Level C Package

Client Sample ID:	100706-004	Project:	SNLSGWater
Sample ID:	408962016	Client ID:	SNLS004
Matrix:	AQUEOUS		
Collect Date:	21-OCT-16 10:10		
Receive Date:	25-OCT-16	Client Desc.:	CYN-MW15
Collector:	Client	Vol. Recv.:	

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
EPA 314.0 Perchlorate by IC "As Received"												
Perchlorate	J	0.00418	0.004	0.012	mg/L		1	MAR1	10/29/16	1841	1611735	1

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	EPA 314.0 DOE-AL	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 21, 2016

Company :	Sandia National Laboratories
Address :	1515 Eubank SE,ORG 4142 BLDG. 1090/120, MS 1103 Albuquerque, New Mexico 87123
Contact:	Ms. Wendy Palencia
Project:	Groundwater, Level C Package

Client Sample ID:	100705-R04	Project:	SNLSGWater
Sample ID:	410542001	Client ID:	SNLS004
Matrix:	AQUEOUS		
Collect Date:	21-OCT-16 10:09		
Receive Date:	25-OCT-16	Client Desc.:	CYN-MW15
Collector:	Client	Vol. Recv.:	

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
LC-MS/MS Perchlorate												
Perchlorate by LC-MS/MS "As Received"												
Perchlorate		3.98	0.250	1.00	ug/L	1.00	5	CWW	11/16/16	1742	1616523	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 6850 Modified	EPA 6850 Perchlorate Extraction in Liquid	CWW	11/15/16	1546	1616521

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 6850 Modified	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

GEL LABORATORIES LLC
2040 Savage Road Charleston SC 29407 - (843) 556-8171 - www.gel.com

Certificate of Analysis

Report Date: December 21, 2016

Company :	Sandia National Laboratories
Address :	1515 Eubank SE,ORG 4142 BLDG. 1090/120, MS 1103 Albuquerque, New Mexico 87123
Contact:	Ms. Wendy Palencia
Project:	Groundwater, Level C Package

Client Sample ID:	100706-R04	Project:	SNLSGWater
Sample ID:	410542002	Client ID:	SNLS004
Matrix:	AQUEOUS		
Collect Date:	21-OCT-16 10:10		
Receive Date:	25-OCT-16	Client Desc.:	CYN-MW15
Collector:	Client	Vol. Recv.:	

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
LC-MS/MS Perchlorate												
Perchlorate by LC-MS/MS "As Received"												
Perchlorate		4.01	0.250	1.00	ug/L	1.00	5	CWW	11/16/16	1805	1616523	1

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
SW846 6850 Modified	EPA 6850 Perchlorate Extraction in Liquid	CWW	11/15/16	1546	1616521

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW846 6850 Modified	

Notes:

Column headers are defined as follows:

DF: Dilution Factor	Lc/LC: Critical Level
DL: Detection Limit	PF: Prep Factor
MDA: Minimum Detectable Activity	RL: Reporting Limit
MDC: Minimum Detectable Concentration	SQL: Sample Quantitation Limit

Appendix B
Data Validation Sample Findings Summary Sheets for the Perchlorate Data

PO Box 21987
Albuquerque, NM 87154
1-888-678-5447
www.aqainc.net

Memorandum

Date: November 29, 2016

To: File

From: Linda Thal

Subject: Inorganic Data Review and Validation – SNL
Site: BSG
ARCOC: 617385, 617389 and 617427
SDG: 408962
Laboratory: GEL
Project/Task: 195122.10.11.01
Analysis: General Chemistry

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM ER Project AOP 00-03 Rev 4.

Summary

Three samples were prepared and analyzed with accepted procedures using method EPA 353.2 (nitrate/nitrite) and two samples were prepared and analyzed with accepted procedures using method EPA 314.0 (perchlorate). Data were reported for all required analytes. No problems were identified with the data package that resulted in the qualification of data.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times and Preservation

The samples were prepared and analyzed within the prescribed holding times and properly preserved.

Calibration

All initial and continuing calibration met QC acceptance criteria.

Blanks

No target analytes were detected in any of the blanks.

Laboratory Control Sample (LCS)

All LCS acceptance criteria were met.

Matrix Spike (MS)

The PS recoveries met QC acceptance criteria.

Laboratory Replicate

The replicate analyses met all QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported and were correctly adjusted for dilutions.

Nitrate/Nitrite:
All samples were diluted 25X due to over range analyte concentration.

Other QC

Perchlorate was detected at < the PQL in samples 408962012(100705-004) and 408962016(100706-004). The client was notified and the samples were relogged for LC/MS/MS confirmation in SDG 410542.

An EB was included on ARCOC 617384, submitted with SDG 408383, and was associated with the samples on ARCOC 617385. A field duplicate pair was included on ARCOC 617385. There are no "required" review criteria for field duplicate analyses comparability; no data will be qualified as a result.

No other specific issues that affect data quality were identified.

Reviewed by: Mary Donivan **Level:** I **Date:** 11/29/16

Sample Findings Summary

AR/COC: 617385, 617389, 617427

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC

All other analyses met QC acceptance criteria; no further data should be qualified.

ANALYTICAL QUALITY ASSOCIATES, INC.

PO Box 21987
Albuquerque, NM 87154
1-888-678-5447
www.aqainc.net

Memorandum

Date: December 15, 2016

To: File

From: Linda Thal

Subject: LC/MS/MS Organic Data Review and Validation – SNL
Site: BSG
ARCOC: 617385
SDG: 410542
Laboratory: GEL
Project/Task: 195122.10.11.01
Analysis: Perchlorate

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. Data are evaluated using SNL/NM SMO AOP 00-03 Rev 4.

Summary

Two samples were prepared and analyzed with accepted procedures using method EPA 6850 Mod. (Perchlorate by LCMSMS). All compounds were successfully analyzed. No problems were identified with the data package that resulted in the qualification of data.

Data are acceptable and reported QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times

The samples were extracted and analyzed within the prescribed holding times and properly preserved.

Instrument Tune

The instrument tune was not reported or evaluated.

Calibration

All initial and continuing calibration met QC acceptance criteria.

Reporting Limit Verification

All CRI (low level verification standard) recoveries met QC acceptance criteria.

Interference Check Standard (ICS)

The ICS recovery met QC acceptance criteria.

Blanks

No target analytes were detected in any of the blanks.

Matrix Spike/Matrix Spike Duplicate (MS/MSD)

The MS/MSD analyses met all QC acceptance criteria.

Laboratory Control Sample (LCS)

All LCS recoveries met QC acceptance criteria.

Compound Identification

Perchlorate-O(18) was added to all samples, instrument blanks and standards prior to injection. All retention time and recovery criteria were met.

Perchlorate isotope ratios were met for all field and QC samples.

Detection Limits/Dilutions

All detection limits were properly reported. The samples were diluted 5X due to high amounts of target analyte present in the sample.

Other QC

Samples 410542001 and -002 were originally analyzed by EPA method 314.0 as samples 408962012 and -016. The original results were confirmed.

No other specific issues that affect data quality were identified.

Reviewed by: Mary Donivan **Level:** I **Date:** 12/15/16

Sample Findings Summary

AR/COC: 617385

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC

All other analyses met QC acceptance criteria; no further data should be qualified.

Sandia National Laboratories