

Sandia National Laboratories, New Mexico

Environmental Restoration Operations

A U.S. Department of Energy Environmental Cleanup Program

Consolidated Quarterly Report

April – June 2016



October 2016



United States Department of Energy
Sandia Field Office

CONSOLIDATED QUARTERLY REPORT

October 2016

SANDIA NATIONAL LABORATORIES, NEW MEXICO

ENVIRONMENTAL RESTORATION OPERATIONS

U.S. DEPARTMENT OF ENERGY:
CONTRACTOR:
PROJECT MANAGER:

SANDIA FIELD OFFICE
SANDIA CORPORATION
John R. Cochran

**NUMBER OF POTENTIAL RELEASE SITES SUBJECT TO RESOURCE
CONSERVATION AND RECOVERY ACT FACILITY OPERATING PERMIT AND THE
COMPLIANCE ORDER ON CONSENT: 12**

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

REPORTING PERIOD: April – June 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,
April – June 2016

SECTION II: Perchlorate Screening Quarterly Groundwater Monitoring Report,
April – June 2016

ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
µg/L	microgram(s) per liter
µmhos/cm	micromhos per centimeter
mg/L	milligrams per liter
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
CCM	Current Conceptual Model
CFR	Code of Federal Regulations
CME	Corrective Measures Evaluation
COA	certificates of analyses
COC	constituent of concern
Consent Order	Compliance Order on Consent
CTF	Coyote Test Field
CY	Calendar Year
CYN	Canyons (Burn Site Groundwater Area of Concern)
DO	dissolved oxygen
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
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
Permit	RCRA Facility Operating Permit
PGS	Parade Ground South
PQL	practical quantitation limit
pH	potential of hydrogen (negative logarithm of the hydrogen ion concentration)
QC	quality control
RCRA	Resource Conservation and Recovery Act
SAP	sampling and analysis plan
Sandia	Sandia Corporation
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)
TAVG	Technical Area-V Groundwater
TAG	Tijeras Arroyo Groundwater
TAV	Technical Area V (acronym used for well identification numbers in tables only)
TA-V	Technical Area V
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, April – June 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 by Sandia National Laboratories, New Mexico (SNL/NM) for the April, May, and June 2016 quarterly reporting period.

The Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) identified for corrective action at SNL/NM are listed in Table I-1. 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], TA-V Groundwater [TAVG AOC], and Tijeras Area 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.

During the last reporting period on March 13, 2016, the Mixed Waste Landfill (MWL) Final Order (NMED February 2016a) became effective, granting a Class 3 Permit Modification to the Resource Conservation and Recovery Act Facility Operating Permit (Permit) to reflect that the MWL is CAC with Controls. Accordingly, the MWL (SWMU 76) will not be presented in future ER Quarterly Reports and is not further mentioned in this report beyond the fact that during this reporting period, on May 16, 2016, the MWL historical records disclosure affirmation (SNL/NM May 2016) was submitted to the NMED as required by the Final Order.

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 Technical Area (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 areas of concern (the 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.

The following activities occurred at BSG AOC during April, May, and June 2016:

- Performed semiannual groundwater sampling at ten BSG monitoring wells during April 4 through 8, 2016. The well identification and frequency that these wells were sampled are presented in Table I-2. Perchlorate data are reported in Section II. The analytical results for groundwater monitoring will be presented in the SNL/NM Calendar Year (CY) 2016 Annual Groundwater Monitoring Report, which will be delivered to NMED in the summer of 2017.
- Received a letter on April 14, 2016 from NMED (NMED April 2016) that discussed important activities for continuing investigations in the BSG AOC including the following deliverables and discussions with NMED: 1) Aquifer Pumping Test Work

Plan, 2) results of the Aquifer Pumping Test and possible need for additional monitoring wells, 3) Aquifer Pumping Test Report, 4) Monitoring Well Installation Work Plan (if necessary), 5) updated Current Conceptual Model (CCM), and 6) updated Corrective Measures Evaluation (CME) Report. The NMED's April 14, 2016 letter contains additional details on the timing and schedule constraints for these activities.

- Received a letter from NMED on May 20, 2016 (NMED May 2016a) that evaluated the necessity of two older documents following the agreements established on April 14, 2016 (NMED April 2016). The new agreements render both the *BSG Interim Measures Work Plan* (SNL/NM May 2005) and the *BSG Current Conceptual Model of Groundwater Flow and Contaminant Transport* (SNL/NM March 2008) unnecessary. Consequently, these two documents are removed from discussion in Section 2.3 of the ER Quarterly Report.
- Transmitted the Aquifer Pumping Test Work Plan for the BSG AOC to the NMED on June 3, 2016 for review and approval (SNL/NM June 2016a).
- NMED approved the Aquifer Pumping Test Work Plan for the BSG AOC on June 21, 2016 (NMED June 2016a).
- Performed depth-specific sampling at the former Burn Site production well on June 27, 2016. Collected samples from five depths within the well and sent to laboratory for the following analyses: nitrate plus nitrite, total Kjeldahl nitrogen, ammonia, cations, and anions.
- Delivered the CY 2015 Annual Groundwater Monitoring Report to NMED on June 28, 2016, and included all analytical results for BSG monitoring wells for CY 2015 (SNL/NM June 2016b).

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 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 at 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-IN2, 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 bioaugmentation 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 bioaugmentation bacteria will be gravity-injected to groundwater via injection wells.

The Revised Treatability Study Work Plan (TSWP) (SNL/NM March 2016) was reviewed and approved by NMED on May 10, 2016 (NMED May 2016b). The Revised TSWP includes 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. Well installation will occur before implementation of the TS/IM.

As described in Chapter 6 of the Revised TSWP, DOE/NNSA and Sandia will initiate a new groundwater monitoring plan for TAVG AOC (SNL/NM March 2016). The new groundwater monitoring plan will be implemented in the first quarter of CY 2017 to obtain a complete calendar year of quarterly data consistent with data from previous years.

As discussed in the July 20, 2015 meeting, the TS/IM will take six to seven years to complete. Therefore, the DOE/NNSA and Sandia requested a milestone extension from November 30, 2016 to May 20, 2022 to update the CCM and CME reports and to allow for completion of the TS/IM (DOE March 2016). The Consolidated Quarterly Reports will continue to document the progress of the TS/IM.

The following activities occurred at TAVG AOC during April, May, and June 2016:

- In a letter dated April 14, 2016 (NMED April 2016), NMED states that the results of the TS/IM will be used to refine the CCM and CME reports for TAVG, which are due by May 20, 2022 and are to replace previous CCM and CME reports submitted to NMED (SNL/NM April 2004 and SNL/NM July 2005).
- In a letter dated May 20, 2016, NMED indicated that review and approval of the TA-V Geophysical and Slug Test Results submitted to NMED on November 24, 2010 (SNL/NM November 2010) will be superseded when CCM and CME reports are updated after the TS/IM (NMED May 2016a).
- Groundwater sampling was conducted in May 2016. The well identification and the frequency that these wells were sampled are presented in Table I-2. The analytical results for groundwater monitoring will be presented in the CY 2016 Annual Groundwater Monitoring Report, which will be delivered to NMED in the summer of 2017.
- DOE/NNSA and Sandia submitted the Notice of Intent to Discharge for the Treatability Study Injection Wells to NMED Ground Water Quality Bureau (GWQB) on May 19, 2016 (DOE May 2016a). NMED GWQB responded on June 29, 2016 that a Discharge Permit would be required for the treatability study injection wells (NMED June 2016b).
- DOE/NNSA and Sandia are preparing the Permit to Drill applications for installing groundwater monitoring wells TAV-MW15 and TAV-MW16 and injection well TAV-INJ1, and plan to submit them to the New Mexico Office of the State Engineer in July 2016.

2.1.3 **Tijeras Arroyo Groundwater Area of Concern**

TCE and nitrate have been identified as COCs in groundwater at the TAG AOC based upon detections above the EPA MCLs in samples collected from monitoring wells. 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 April, May, and June 2016:

- Groundwater sampling at the TAG AOC was conducted in June 2016. The well identification and the frequency these wells were sampled are presented in Table I-2. The analytical results from groundwater monitoring will be presented in the SNL/NM

CY 2016 Annual Groundwater Monitoring Report, which will be submitted to NMED in the summer of 2017.

- Preparation of two TAG reports (the CCM and the CME Report) continued this quarter. Submittal of the two reports to NMED HWB is scheduled for December 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 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 process 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).

SWMUs 8 and 58, 68, 149, and 154 are included in the Class 3 Permit Modification request submitted to the NMED on May 16, 2016 (DOE May 2016b).

2.2.2 Solid Waste Management Unit 502

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

SWMU 502 is included in the Class 3 Permit Modification request submitted to the NMED May 16, 2016 (DOE May 2016b).

2.2.3 **Class 3 Permit Modification Request**

In a letter dated May 16, 2016, the DOE/NNSA and Sandia requested a Class 3 Modification to the Permit to designate six SWMUs as approved for CAC status (DOE May 2016b).

These include:

- 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 published a legal notice regarding the Class 3 Permit Modification request in the *Albuquerque Journal* and sent the same notice to interested parties on a list maintained by the NMED. The notice announced the start of a 60-day public comment period and provided information about a public meeting to be held June 21, 2016.

The public meeting required by the Class 3 Permit Modification request was held on June 21, 2016 at the Manzano Mesa Multicultural Center. Twenty-two posters and eight subject matter experts were available to inform the public of the proposed actions. All public comments and supporting documents for the public meeting will be submitted to NMED to complete the Sandia and DOE part of the process following the July 24 deadline for public comment submittal. Other meeting attendees included members of the NMED HWB and members of the public.

2.3 **Environmental Restoration Operations Documents Submitted to the New Mexico Environment Department Pending Regulatory Review and Approval**

Section 2.3 will be eliminated from future ER Quarterly Reports and the status of regulatory documents will be discussed in relevant Sections of 2.1 and 2.2.

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

New Mexico Environment Department (NMED), February 2016b. 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 2016a. Letter to J.P. Harrell (U.S. Department of Energy, NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), “Approval: Environmental Operations Consolidated Quarterly Report, October-December 2015, April 2016, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-16-008,” NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, May 20, 2016.

New Mexico Environment Department (NMED), May 2016b. 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), June 2016a. Letter to J.P. Harrell (U.S. Department of Energy, NNSA/Sandia Field Office) and P.B. Davies (Sandia National Laboratories, New Mexico), “Approval: Aquifer Pumping Test Work Plan for the Burn Site Groundwater Area of Concern, June 2016, Sandia National Laboratories, EPA ID# NM5890110518, HWB-SNL-16-010” NMED, Hazardous Waste Bureau, Santa Fe, New Mexico, June 21, 2016.

New Mexico Environment Department (NMED), June 2016b. Letter to J.W. Todd (U.S. Department of Energy, NNSA/Sandia Field Office), “Discharge Permit Required for Sandia National Laboratories, Technical Area-V Groundwater Remediation Treatability Study Injection Wells, DP-1845,” NMED, Ground Water Quality Bureau, Santa Fe, New Mexico, June 29, 2016.

NMED, see New Mexico Environment Department

Sandia National Laboratories, New Mexico (SNL/NM), April 2004. *Current Conceptual Model of Groundwater Flow and Contaminant Transport at Sandia National Laboratories/New Mexico Technical Area-V, Sandia National Laboratories, Albuquerque, New Mexico.*

Sandia National Laboratories, New Mexico (SNL/NM), May 2005. *Burn Site Groundwater Interim Measures Work Plan, Sandia National Laboratories, Albuquerque, New Mexico.*

Sandia National Laboratories, New Mexico (SNL/NM), July 2005. *Corrective Measures Evaluation Report for Technical Area-V Groundwater, Sandia National Laboratories, Albuquerque, New Mexico.*

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Sandia National Laboratories, New Mexico (SNL/NM), May 2016. “Historical Records Disclosure Affirmation: Contents of Solid Waste Management Unit 76, Mixed Waste Landfill,” Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories, New Mexico (SNL/NM), June 2016a, *Aquifer Pumping Test Work Plan for the Burn Site Groundwater Area of Concern, June 2016, Sandia National Laboratories, Albuquerque, New Mexico*, June 3, 2016.

Sandia National Laboratories, New Mexico (SNL/NM), June 2016b. *Annual Groundwater Monitoring Report, Calendar Year 2015, 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), March 2016. Letter to J.E. Kieling (New Mexico Environment Department), “Summary of Agreements and Proposed Milestones Pursuant to the Meeting of July 20, 2015,” DOE, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, March 30, 2016.

U.S. Department of Energy (DOE), May 2016a. Letter to S. Huddleson (New Mexico Environment Department), “Notice of Intent to Discharge for Sandia National Laboratories/New Mexico Technical Area-V Groundwater Remediation Treatability Study Injection Wells,” DOE, National Nuclear Security Administration, Sandia Field Office, Albuquerque, New Mexico, May 16, 2016.

U.S. Department of Energy (DOE), May 2016b. “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.

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.
 MWL = Mixed Waste Landfill.
 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 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

^aNot 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.
 LWDS = Liquid Waste Disposal System.
 MW = Monitoring Well.
 MWL = Mixed Waste Landfill.
 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-SW = Technical Area-II (Southwest).
 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.

SECTION II

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PERCHLORATE SCREENING QUARTERLY GROUNDWATER MONITORING

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APPENDICES

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SECTION II

PERCHLORATE SCREENING QUARTERLY GROUNDWATER MONITORING REPORT, April – June 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 second quarter of calendar year (CY) 2016 (April, May, and June 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 second quarter of CY 2016 (April, May, and June 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 ($\mu\text{g/L}$) 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. Wells discussed in previous perchlorate screening reports are included in Table II-2.

SNL/NM personnel performed groundwater sampling for perchlorate at monitoring well CYN-MW15 on April 5, 2016 (Table II-1). Groundwater sampling activities were conducted in accordance with procedures outlined in the *Burn Site Groundwater Monitoring, Mini-SAP for Third Quarter, Fiscal Year 2016* (SNL/NM March 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 BennettTM 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). The sample identification, Analysis Request/Chain-of-Custody form number, and the associated groundwater investigation are provided in Table II-3. 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 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 is 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 second quarter of CY 2016. Table II-4 summarizes current and historical perchlorate results for CYN-MW15. The analytical laboratory COA for the fourth quarter of CY 2015 perchlorate data is provided in Appendix A. Consistent with historical analytical results, no perchlorate was detected above the screening level in samples collected from monitoring well CYN-MW15.

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. The data validation sample findings summary sheets for the perchlorate data are provided in Appendix B.

No variances or nonconformances in perchlorate sampling field activities, or field conditions from requirements in the groundwater monitoring Mini-SAP (SNL/NM March 2016), were identified during the second 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:

- No perchlorate was detected in the environmental samples from groundwater monitoring well CYN-MW15 at the screening level/MDL of 4 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 one of the wells (CYN-MW6) in the perchlorate screening monitoring well network. However, no perchlorate was detected in the environmental samples from groundwater monitoring well CYN-MW15, the well that was installed to replace CYN-MW6.
- DOE/Sandia will continue semiannual monitoring of perchlorate for monitoring well CYN-MW15.

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Figures

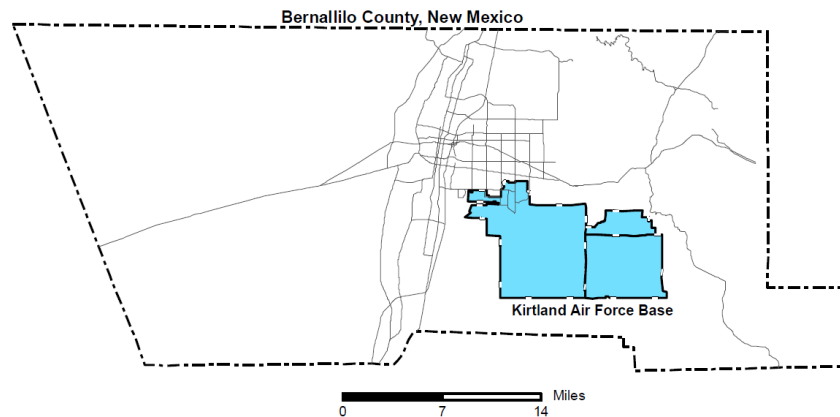


Figure II-1
Sandia National Laboratories
New Mexico
Current Perchlorate-Screening
Monitoring-Well Network

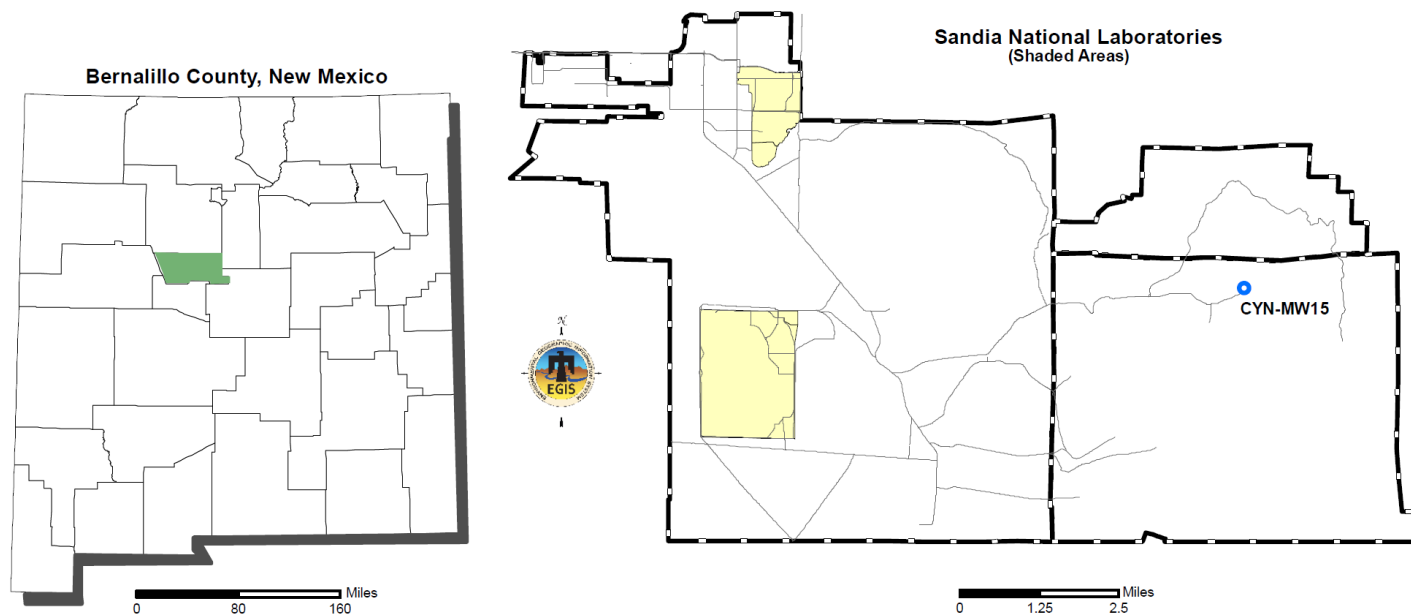


Figure II-1
Sandia National Laboratories, New Mexico
Current Perchlorate Screening Monitoring Well Network, April – June 2016

Tables

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

Well	Date Sampled	Number of Consecutive Sampling Events ^a	Remaining Number of Sampling Events	Sampling Equipment
CYN-MW15	05-Apr-16	4	TBD ^b	Bennett™ Pump

Notes

^aIncludes this sampling event.

^bThis well was installed as a replacement well for CYN-MW6. Because perchlorate concentrations in CYN-MW6 have exceeded the screening level, DOE/Sandia and the NMED have agreed to further characterization requirements in the Burn Site Groundwater Area of Concern (NMED February 2010).

µg/L = Microgram(s) per liter.
 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.
 the Consent Order = the Compliance Order on Consent.

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 Second Quarter, CY 2016 Perchlorate Sampling

Well	Sample Identification	AR/COC Number	Associated Groundwater Investigation
CYN-MW15	099139-008	616862	BSG AOC

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 Second 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	

Notes

^aLaboratory Qualifier

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

^bValidation Qualifier

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

^cAnalytical Method

EPA 314.0: EPA, November 1999, "Perchlorate in Drinking Water Using Ion Chromatography," EPA 815/R-00-014 (EPA November 1999).

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, Second 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	05-Apr-16	16.89	1161.1	280.9	7.17	0.33	13.7	1.33

Notes

^aField 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-ARCOG (4-2012)

CONTRACT LABORATORY ANALYSIS REQUEST AND CHAIN OF CUSTODY

AOP 95-16

Internal Lab

Page 1 of 2

Batch No. <i>N/A</i>		SMO Use		AR/COC 616862								
Project Name: BSG		Date Samples Shipped: <i>4/5/16</i>		SMO Authorization: <i>[Signature]</i>								
Project/Task Manager: Michael Skelly		Carrier/Waybill No: <i>246804</i>		SMO Contact Phone: <i>[Signature]</i>								
Project/Task Number: 195122.10.11.01		Lab Contact: Edie Kent/843-769-7385		Wendy Palencia/505-844-3132								
Service Order: CF058-16		Lab Destination: GEL		Send Report to SMO:								
		Contract No: 1303873		Stephanie Montaño/505.284.2553								
Tech Area:		Operational Site:		☐ Waste Characterization ☐ RMA ☐ Released by COC No. ☒ 4° Celsius								
Building:		Room:		Bill to: Sandia National Laboratories (Accounts Payable), P.O. Box 5800, MS-0154 Albuquerque, NM 87185-0154 <i>394509</i>								
Sample No.	Fraction	Sample Location Detail	Depth (ft)	Date/Time Collected	Sample Matrix	Container Type	Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
099138	001	CYN-FB3	NA	4/5/16 09:52	DIW	G	3x40 ml	HCl	G	FB	VOC, TCL (SW846-8260B)	<i>052</i>
099138	002	CYN-FB4	NA	4/5/16 09:53	DIW	AG	3x40 ml	None	G	FB	TPH-GRO (SW846-8015)	<i>053</i>
099139	001	CYN-MW15	182	4/5/16 09:52	GW	G	3x40 ml	HCl	G	SA	VOC, TCL (SW846-8260B)	<i>054</i>
099139	002	CYN-MW15	182	4/5/16 09:55	GW	AG	4x1 L	NONE	G	SA	TPH-DRO (SW846-8015)	<i>055</i>
099139	003	CYN-MW15	182	4/5/16 09:53	GW	AG	3x40 ml	NONE	G	SA	TPH-GRO (SW846-8015)	<i>056</i>
099139	004	CYN-MW15	182	4/5/16 09:56	GW	P	500 ml	HNO3	G	SA	METALS, TAL (SW846-6010/6020/7470)	<i>057</i>
099139	005	CYN-MW15	182	4/5/16 09:57	FGW	P	500 ml	HNO3	G	SA	METALS (SW846-6020): Ca, Mg, K, Na	<i>058</i>
099139	006	CYN-MW15	182	4/5/16 09:58	GW	P	125 ml	None	G	SA	ANIONS-Br, Cl, F, SO4 (SW846-9056)	<i>059</i>
099139	007	CYN-MW15	182	4/5/16 09:59	GW	P	125 ml	H2SO4	G	SA	NPN (EPA 353.2)	<i>060</i>
099139	008	CYN-MW15	182	4/5/16 10:00	GW	P	250 ml	None	G	SA	PERCHLORATE (EPA 314.0)	<i>060</i>
Last Chain: ☐ Yes			Sample Tracking			SMO Use			Special Instructions/QC Requirements:			Conditions on Receipt
Validation Req'd: ☒ Yes			Date Entered:			Entered by:			EDD ☒ Yes			
Background: ☐ Yes			QC Inits:			Turnaround Time ☐ 7-Day* ☐ 15-Day* ☒ 30-Day			Negotiated TAT ☐			
Confirmatory: ☐ Yes						Sample Disposal ☐ Return to Client ☒ Disposal by Lab			Return Samples By:			
Sample Team Members	Name	Signature	Init.	Company/Organization/Phone/Cell			Comments: If perchlorate detected, then perform verification analysis using method SW846-6850. Report short list isotopes for gamma spectroscopy analysis. Filtered samples collected in the field using in-line filter (0.45 micron).					
	William Gibson	<i>[Signature]</i>		SNL/04142/505-239-7367/505-239-7367								
	Alfred Santillanes	<i>[Signature]</i>		SNL/04142/505-284-6870/505-228-0710								
Relinquished by <i>[Signature]</i>		Org. <i>4142</i>	Date <i>4/5/16</i>	Time <i>1111</i>	Relinquished by		Org.	Date	Time			
Received by <i>[Signature]</i>		Org. <i>4143</i>	Date <i>4/5/16</i>	Time <i>1111</i>	Received by		Org.	Date	Time			
Relinquished by <i>[Signature]</i>		Org. <i>4142</i>	Date <i>4/5/16</i>	Time <i>11:35</i>	Relinquished by		Org.	Date	Time			
Received by <i>[Signature]</i>		Org. <i>GEL</i>	Date <i>4/6/16</i>	Time <i>09:00</i>	Received by		Org.	Date	Time			

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

**CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)**

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AR/COC 616862

[illegible]

GEL LABORATORIES LLC

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

Certificate of Analysis

Report Date: May 2, 2016

Company : Sandia National Laboratories
Address : MS-0756, Org. 06765, Bldg. 823/Rm. 4276
1515 Eubank SE
Albuquerque, New Mexico 87123
Contact: Ms. Pamela M. Puissant
Project: Groundwater, Level C Package

Client Sample ID: 099139-008
Sample ID: 394509060
Matrix: AQUEOUS
Collect Date: 05-APR-16 10:00
Receive Date: 06-APR-16
Collector: Client

Project: SNLSGWater
Client ID: SNLS004

Client Desc.: CYN-MW15
Vol. Recv.:

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography											
EPA 314.0 Perchlorate by IC "As Received"											
Perchlorate	U	ND	0.004	0.012	mg/L	1	MAR1	04/28/16	1400	1559929	1
The following Analytical Methods were performed:											
Method	Description		Analyst Comments								
1	EPA 314.0 DOE-AL										

Notes:

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: May 16, 2016
To: File
From: Linda Thal
Subject: Inorganic Data Review and Validation – SNL
Site: BSG
ARCOC: 616858, 616859, 616861, 616862 and 616872
SDG: 394509
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

Five samples were prepared and analyzed with accepted procedures using methods EPA 9056 (anions by IC), EPA 350.1 (nitrogen, ammonia), EPA 351.2 (nitrogen, total Kjeldahl [TKN]), and SM 2320B (total alkalinity). Six samples were prepared and analyzed with accepted procedures using method EPA 353.2 (nitrate/nitrite). One sample was prepared and analyzed with accepted procedures using methods EPA 314.0 (perchlorate). Data were reported for all required analytes. Problems were identified with the data package that resulted in the qualification of data.

Nitrogen, ammonia and TKN:

1. The field sample results for ammonia and TKN did not agree with historical data. The client requested re-analysis for both parameters on all samples. However, only the samples on ARCO 616858, 616859 and 616861 were re-analyzed and reported as a separate SDG. The original sample results for ammonia and TKN submitted on these ARCOs will be **qualified R,X1**. Additionally the EB submitted on ARCO 616872 was cancelled for ammonia and TKN. These results were also **qualified R,X1**.

Nitrogen, ammonia:

1. The ICAL intercept was negative with an absolute value > the MDL but ≤3X the MDL. The associated result for sample 394509061 was non-detect and will be **qualified UJ,I5**.

TKN:

1. TKN was detected at < the PQL in the MB and CCB. The associated result for sample -062 was a detect <5X the highest blank value and will be **qualified 0.40U,B,B3** at 5X the highest blank value.

Nitrate/nitrite:

1. The relative dilution factor between sample 394509059 and the matrix QC parent sample was >5. The nitrate/nitrite result for sample -059 will be **qualified J,RP1** due to lack of matrix-specific precision 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 except as noted above in the Summary section.

Blanks

No target analytes were detected in the blanks except as noted above in the Summary section and as follows. Chloride was detected at < the PQL in EB1, sample -077, associated with sample -037. The associated sample result was a detect >5X the EB value and will not be qualified.

Alkalinity blank results were reported, but were not assessed for data validation.

Laboratory Control Sample (LCS)

All LCS acceptance criteria were met.

Matrix Spike (MS)

All MS/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. The samples were not diluted except as follows.

Nitrate/nitrite:

Samples -022, -038 and -049 were diluted 5X and sample -059 25X due to over range analyte concentrations; MDLs and PQLs were adjusted accordingly

Anions:

Samples -004, -021 and -037 were diluted 10X and sample -058 20X for chloride and sulfate due to over range analyte concentrations; MDLs and PQLs were adjusted accordingly.

Other QC

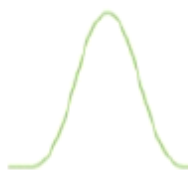
An EB was submitted with ARCO 616872 and was associated with the samples on ARCO 616861. A field duplicate pair for nitrate/nitrite was submitted with ARCO 616861. There are no "required" review criteria for field duplicate analyses comparability; no data will be qualified as a result.

No other specific issues that affect data quality were identified.

Reviewed by: Mary Donovan

Level: I

Date: 06/15/16



Sample Findings Summary



AR/COC: 616858, 616859, 616861, 616862, 616872

Page 1 of 5

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
DOE EML HASL-300, U-02-RC			
	099128-014/CYN-MW4	Uranium-233/234 (13968-55-3/13966-29-)	R, X1
	099128-014/CYN-MW4	Uranium-235/236 (15117-96-1/13982-70-)	R, X1
	099128-014/CYN-MW4	Uranium-238 (7440-61-1)	R, X1
	099135-014/CYN-MW8	Uranium-233/234 (13968-55-3/13966-29-)	R, X1
	099135-014/CYN-MW8	Uranium-235/236 (15117-96-1/13982-70-)	R, X1
	099135-014/CYN-MW8	Uranium-238 (7440-61-1)	R, X1
	099162-014/CYN-EB1	Uranium-233/234 (13968-55-3/13966-29-)	BD, FR3
	099162-014/CYN-EB1	Uranium-235/236 (15117-96-1/13982-70-)	BD, FR3
	099162-014/CYN-EB1	Uranium-238 (7440-61-1)	BD, FR3
EPA 350.1			
	099128-010/CYN-MW4	Nitrogen, Ammonia (7664-41-7)	R, X1
	099130-009/CYN-MW7	Nitrogen, Ammonia (7664-41-7)	R, X1
	099135-009/CYN-MW8	Nitrogen, Ammonia (7664-41-7)	R, X1
	099139-009/CYN-MW15	Nitrogen, Ammonia (7664-41-7)	UJ, I5
	099162-009/CYN-EB1	Nitrogen, Ammonia (7664-41-7)	R, X1
EPA 351.2			
	099128-011/CYN-MW4	Nitrogen, Total Kjeldahl (N/A)	R, X1
	099130-010/CYN-MW7	Nitrogen, Total Kjeldahl (N/A)	R, X1
	099135-011/CYN-MW8	Nitrogen, Total Kjeldahl (N/A)	R, X1
	099139-010/CYN-MW15	Nitrogen, Total Kjeldahl (N/A)	0.40U, B,B3
	099162-011/CYN-EB1	Nitrogen, Total Kjeldahl (N/A)	R, X1

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
EPA 353.2			
	099139-007/CYN-MW15	Nitrogen, Nitrate/Nitrite (NO3ASN)	J, RP1
EPA 900.0/SW846 9310			
	099128-013/CYN-MW4	ALPHA (12587-46-1)	R, X1
	099128-013/CYN-MW4	BETA (12587-47-2)	R, X1
	099130-013/CYN-MW7	BETA (12587-47-2)	J, FR7
	099135-013/CYN-MW8	ALPHA (12587-46-1)	R, X1
	099135-013/CYN-MW8	BETA (12587-47-2)	R, X1
	099162-013/CYN-EB1	ALPHA (12587-46-1)	BD, FR3
	099162-013/CYN-EB1	BETA (12587-47-2)	BD, FR3
EPA 901.1			
	099128-012/CYN-MW4	Americium-241 (14596-10-2)	BD, FR3
	099128-012/CYN-MW4	Cesium-137 (10045-97-3)	BD, FR3
	099128-012/CYN-MW4	Cobalt-60 (10198-40-0)	BD, FR3
	099128-012/CYN-MW4	Potassium-40 (13966-00-2)	BD, FR3
	099130-012/CYN-MW7	Americium-241 (14596-10-2)	BD, FR3
	099130-012/CYN-MW7	Cesium-137 (10045-97-3)	BD, FR3
	099130-012/CYN-MW7	Cobalt-60 (10198-40-0)	BD, FR3
	099130-012/CYN-MW7	Potassium-40 (13966-00-2)	BD, FR3
	099135-012/CYN-MW8	Americium-241 (14596-10-2)	BD, FR3
	099135-012/CYN-MW8	Cesium-137 (10045-97-3)	BD, FR3
	099135-012/CYN-MW8	Cobalt-60 (10198-40-0)	BD, FR3
	099135-012/CYN-MW8	Potassium-40 (13966-00-2)	BD, FR3
	099139-011/CYN-MW15	Americium-241 (14596-10-2)	BD, FR3
	099139-011/CYN-MW15	Cesium-137 (10045-97-3)	BD, FR3
	099139-011/CYN-MW15	Cobalt-60 (10198-40-0)	BD, FR3
	099139-011/CYN-MW15	Potassium-40 (13966-00-2)	BD, FR3
	099162-012/CYN-EB1	Americium-241 (14596-10-2)	BD, FR3
	099162-012/CYN-EB1	Cesium-137 (10045-97-3)	BD, FR3

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
	099162-012/CYN-EB1	Cobalt-60 (10198-40-0)	BD, FR3
	099162-012/CYN-EB1	Potassium-40 (13966-00-2)	BD, FR3
EPA 906.0 Modified			
	099128-015/CYN-MW4	Tritium (10028-17-8)	BD, FR3
	099130-015/CYN-MW7	Tritium (10028-17-8)	BD, FR3
	099135-015/CYN-MW8	Tritium (10028-17-8)	BD, FR3
	099139-014/CYN-MW15	Tritium (10028-17-8)	BD, FR3
	099162-015/CYN-EB1	Tritium (10028-17-8)	BD, FR3
SW846 3005/6020 DOE-AL			
	099128-008/CYN-MW4	Potassium (7440-09-7)	J, D1
	099128-008/CYN-MW4	Vanadium (7440-62-2)	0.037U, B
	099128-009/CYN-MW4	Potassium (7440-09-7)	J, D1
	099130-004/CYN-MW7	Copper (7440-50-8)	UJ, CK3
	099130-004/CYN-MW7	Potassium (7440-09-7)	J, D1
	099130-004/CYN-MW7	Thallium (7440-28-0)	0.0050UJ, B,B3,CK2
	099130-004/CYN-MW7	Vanadium (7440-62-2)	0.037U, B
	099130-005/CYN-MW7	Potassium (7440-09-7)	J, D1
	099135-004/CYN-MW8	Cadmium (7440-43-9)	J+, CK2
	099135-004/CYN-MW8	Copper (7440-50-8)	UJ, CK3
	099135-004/CYN-MW8	Manganese (7439-96-5)	J+, CK2
	099135-004/CYN-MW8	Potassium (7440-09-7)	J, D1
	099135-004/CYN-MW8	Thallium (7440-28-0)	0.0050UJ, B,B3,CK2
	099135-004/CYN-MW8	Vanadium (7440-62-2)	0.037U, B
	099135-005/CYN-MW8	Potassium (7440-09-7)	J, D1
	099139-004/CYN-MW15	Copper (7440-50-8)	J-, CK3
	099139-004/CYN-MW15	Potassium (7440-09-7)	J, D1
	099139-004/CYN-MW15	Vanadium (7440-62-2)	0.037U, B
	099139-005/CYN-MW15	Potassium (7440-09-7)	J, D1

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
	099162-004/CYN-EB1	Potassium (7440-09-7)	UJ, D1
	099162-004/CYN-EB1	Vanadium (7440-62-2)	0.037U, B
	099162-005/CYN-EB1	Potassium (7440-09-7)	UJ, D1
SW846 3535A/8015D			
	099128-002/CYN-MW4	Diesel Range Organics (68334-30-5)	UJ, H2
	099128-002/CYN-MW4	Diesel Range Organics (68334-30-5)	R, X1
	099130-002/CYN-MW7	Diesel Range Organics (68334-30-5)	R, X1
	099130-002/CYN-MW7	Diesel Range Organics (68334-30-5)	UJ, H2
	099135-002/CYN-MW8	Diesel Range Organics (68334-30-5)	R, X1
	099135-002/CYN-MW8	Diesel Range Organics (68334-30-5)	UJ, H2
	099136-002/CYN-MW8	Diesel Range Organics (68334-30-5)	UJ, H2
	099136-002/CYN-MW8	Diesel Range Organics (68334-30-5)	R, X1
	099139-002/CYN-MW15	Diesel Range Organics (68334-30-5)	R, X1
	099139-002/CYN-MW15	Diesel Range Organics (68334-30-5)	UJ, H2
	099162-002/CYN-EB1	Diesel Range Organics (68334-30-5)	UJ, H2
	099162-002/CYN-EB1	Diesel Range Organics (68334-30-5)	R, X1
SW846 3535A/8330B			
	099128-006/CYN-MW4	Nitrobenzene (98-95-3)	UJ, I4
	099130-011/CYN-MW7	Nitrobenzene (98-95-3)	UJ, I4
	099135-010/CYN-MW8	Nitrobenzene (98-95-3)	UJ, I4
	099139-015/CYN-MW15	Nitrobenzene (98-95-3)	UJ, I4
	099162-010/CYN-EB1	Nitrobenzene (98-95-3)	UJ, I4
SW846 8260B DOE-AL			
	099128-001/CYN-MW4	Acetone (67-64-1)	UJ, I5
	099129-001/CYN-TB1	Acetone (67-64-1)	UJ, I5
	099130-001/CYN-MW7	Acetone (67-64-1)	UJ, I5
	099131-001/CYN-TB3	Acetone (67-64-1)	UJ, I5
	099135-001/CYN-MW8	Acetone (67-64-1)	UJ, I5
	099137-001/CYN-TB7	Acetone (67-64-1)	UJ, I5

Analytical Method	Sample ID	Analyte Name (CAS#)	Qualifier, RC
	099138-001/CYN-FB3	Acetone (67-64-1)	UJ, I5
	099139-001/CYN-MW15	Acetone (67-64-1)	UJ, I5
	099140-001/CYN-TB9	Acetone (67-64-1)	UJ, I5
	099161-001/CYN-DIW QC 1	Acetone (67-64-1)	UJ, I5
	099162-001/CYN-EB1	Acetone (67-64-1)	UJ, I5
	099163-001/CYN-TB5	Acetone (67-64-1)	UJ, I5

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

