

The order of this data package is as follows:

1. Chain-of-Custody/Lab Request
2. Copies of field COCs
3. Validation Report
4. Laboratory analysis

Comments:

[illegible]

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11366

EVENT NAME: Mortandad/Sandia (Cr Inv) MY2017 Q4

SAMPLE ID: CASA-17-142007

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	07/26/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1349		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-35a		FIELD PREP:	F	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:			SAMPLE USAGE:	INV	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / (NA)

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	WSP-All Metals	1 LITER POLY	1	HNO3 ICE	Y	NA
	WSP- GENINORG+PerChlorat e	1 LITER POLY	1	ICE		
	WSP- NH3+NO3/NO2	500 ML AMBER GLASS	1	H2SO4		

SAMPLE COMMENTS:

LOCATION COMMENTS:

FIELD PARAMETERS:

Sample Time _____ HH:MM Dissolved Oxygen _____ Flow (in gpm) _____
Oxidation-Reduction Potential _____ pH _____ Specific Conductance _____
Temperature _____ Turbidity _____

COLLECTED BY (PRINT): D. Hughes

RELINQUISHED BY (Printed Name) <i>Darren Hughes</i> (Signature) _____	Date/Time 7/26/2017 1432	RECEIVED BY (Printed Name) <i>K. Greene</i> (Signature) _____	Date/Time 7/26/17 14:32
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 07/24/2017

SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11366

EVENT NAME: Mortandad/Sandia (Cr Inv) MY2017 Q4

SAMPLE ID: CASA-17-142015

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	07/26/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1349		MEDIA:	UA	
PRS ID:	NA		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-35a		FIELD PREP:	UF	
LOCATION TYPE:	NA		FIELD QC TYPE:	REG	
TOP DEPTH:			SAMPLE USAGE:	INV	
BOTTOM DEPTH:			EXCAVATED:		YES / NO / NA

PRIORITY	ORDER	CONTAINER	#	PRESERVATIVE	COLLECTED Y/N	SPECIAL INSTRUCTIONS
NA	MSGP-Hg	1000 500-ML POLY AS 7/26/17	1	HNO3	Y	NA
	WSP-CN(T)	250 ML POLY	1	NAOH		
	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4		

SAMPLE COMMENTS: Sampled with running diesel generator ~50 ft away

LOCATION COMMENTS:

NA

FIELD PARAMETERS:

Sample Time	1349	HH:MM	Dissolved Oxygen	5.27 mg/l	Flow (in gpm)	3.80
Oxidation-Reduction Potential	186.1mV		pH	8.08	Specific Conductance	242.6 $\mu S/cm$
Temperature	24.7°C		Turbidity	0.50 NTU		

COLLECTED BY (PRINT): T. Bonham

RELINQUISHED BY <i>Tanner Bonham</i> (Printed Name) (Signature)	Date/Time 7/26/2017 1432	RECEIVED BY <i>K. Green</i> (Printed Name) (Signature)	Date/Time 7/26/17 2:32
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 07/24/2017

DATA VALIDATION REPORT

Chain Of Custody No. 2017-2116

1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
429086	EPA:120.1	1				
429086	EPA:150.1	1				
429086	EPA:160.1	1				
429086	EPA:170.0	2				
429086	EPA:245.2	2				
429086	EPA:300.0	1				
429086	EPA:310.1	1				
429086	EPA:335.4	1				
429086	EPA:350.1	1				
429086	EPA:351.2	1				
429086	EPA:353.2	1				
429086	EPA:365.4	1				
429086	SM:A2340B	1				
429086	SW-846:6010C	1				
429086	SW-846:6020	1				
429086	SW-846:6850	1				
429086	SW-846:9060	1				

SDG	Analytical Method	Analysis Lot ID	Prep Lot ID	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks	Method Blanks	Matrix Spikes	Matrix Spike Dups	Analytical Spikes	Post-Digestion Spikes	Lab Control Samples	Lab Control Sample Dups	Blank Spike	Blank Spike Dups	Lab Duplicates	Storage Blanks	Preparation Blanks	Reagent Blanks
429086	EPA:120.1	1686960	1686960	1										1			1				
429086	EPA:150.1	1687458	1687458	1										1			1				
429086	EPA:160.1	1687179	1687179	1					1					1			1				
429086	EPA:170.0	NA	NA	2																	
429086	EPA:245.2	1690070	1690066	2					1	1				1			1				
429086	EPA:300.0	1686728	1686728	1					1					1			1				
429086	EPA:310.1	1687455	1687455	1						1				1			1				

DATA VALIDATION REPORT

SDG	Analytical Method	Analysis Lot ID	Prep Lot ID	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks	Method Blanks	Matrix Spikes	Matrix Spike Dups	Analytical Spikes	Post-Digestion Spikes	Lab Control Samples	Lab Control Sample Dups	Blank Spike	Blank Spike Dups	Lab Duplicates	Storage Blanks	Preparation Blanks	Reagent Blanks
429086	EPA:335.4	1688102	1688101	1					1	1				1			1				
429086	EPA:350.1	1689399	1689398	1					1	1				1			1				
429086	EPA:351.2	1688439	1688437	1					1	1				1			1				
429086	EPA:353.2	1687584	1687584	1					1					1			2				
429086	EPA:365.4	1687583	1687582	1					1	1				1			1				
429086	SM:A2340B	1695163	1695163	1																	
429086	SW-846:6010C	1686523	1686522	1					1	1				1			1				
429086	SW-846:6020	1686539	1686538	1					1	1				1			1				
429086	SW-846:6850	1687305	1687304	1					1	1	1			1							
429086	SW-846:9060	1686981	1686981	1					1					1			1				

2. Distribution Of Analytes In EDD.

Analytical Method	Analytical Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spiked Compounds	TICS
EPA:120.1	GENERAL CHEMISTRY	CASA-17-142007	1203842288	DUP	1	0	0	0
EPA:120.1	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	1	0	0	0
EPA:120.1	GENERAL CHEMISTRY	LCS	1203842287	LCS	0	0	1	0
EPA:150.1	GENERAL CHEMISTRY	CASA-17-142007	1203843541	DUP	1	0	0	0
EPA:150.1	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	1	0	0	0
EPA:150.1	GENERAL CHEMISTRY	LCS	1203843540	LCS	0	0	1	0
EPA:160.1	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	1	0	0	0
EPA:160.1	GENERAL CHEMISTRY	CASA-17-142022	1203842818	DUP	1	0	0	0
EPA:160.1	GENERAL CHEMISTRY	LCS	1203842816	LCS	0	0	1	0
EPA:160.1	GENERAL CHEMISTRY	MB	1203842815	MB	1	0	0	0
EPA:170.0	VOC	CASA-17-142007	429086001	REG	1	0	0	0
EPA:170.0	VOC	CASA-17-142015	429086002	REG	1	0	0	0
EPA:245.2	INORGANIC	CASA-17-142007	429086001	REG	1	0	0	0
EPA:245.2	INORGANIC	CASA-17-142008	1203849963	DUP	1	0	0	0
EPA:245.2	INORGANIC	CASA-17-142008	1203849964	MS	0	0	1	0
EPA:245.2	INORGANIC	CASA-17-142015	429086002	REG	1	0	0	0
EPA:245.2	INORGANIC	LCS	1203849962	LCS	0	0	1	0
EPA:245.2	INORGANIC	MB	1203849961	MB	1	0	0	0

DATA VALIDATION REPORT

Analytical Method	Analytical Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spiked Compounds	TICS
EPA:300.0	GENERAL CHEMISTRY	CAMO-17-142234	1203841830	DUP	4	0	0	0
EPA:300.0	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	4	0	0	0
EPA:300.0	GENERAL CHEMISTRY	LCS	1203841829	LCS	0	0	4	0
EPA:300.0	GENERAL CHEMISTRY	MB	1203841828	MB	4	0	0	0
EPA:310.1	GENERAL CHEMISTRY	CASA-17-142007	1203843526	DUP	2	0	0	0
EPA:310.1	GENERAL CHEMISTRY	CASA-17-142007	1203843528	MS	0	0	1	0
EPA:310.1	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	2	0	0	0
EPA:310.1	GENERAL CHEMISTRY	LCS	1203843525	LCS	0	0	1	0
EPA:335.4	GENERAL CHEMISTRY	CASA-17-142015	1203845276	DUP	1	0	0	0
EPA:335.4	GENERAL CHEMISTRY	CASA-17-142015	1203845278	MS	0	0	1	0
EPA:335.4	GENERAL CHEMISTRY	CASA-17-142015	429086002	REG	1	0	0	0
EPA:335.4	GENERAL CHEMISTRY	LCS	1203845275	LCS	0	0	1	0
EPA:335.4	GENERAL CHEMISTRY	MB	1203845274	MB	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	LCS	1203848427	LCS	0	0	1	0
EPA:350.1	GENERAL CHEMISTRY	MB	1203848426	MB	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	WT_SEP-PO-17-141488	1203848428	DUP	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	WT_SEP-PO-17-141488	1203848429	MS	0	0	1	0
EPA:351.2	GENERAL CHEMISTRY	CASA-17-142015	1203846068	DUP	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	CASA-17-142015	1203846069	MS	0	0	1	0
EPA:351.2	GENERAL CHEMISTRY	CASA-17-142015	429086002	REG	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	LCS	1203846067	LCS	0	0	1	0
EPA:351.2	GENERAL CHEMISTRY	MB	1203846066	MB	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	CASA-17-142008	1203843872	DUP	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	LCS	1203843871	LCS	0	0	1	0
EPA:353.2	GENERAL CHEMISTRY	MB	1203843870	MB	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	WT_SEP-PO-17-141488	1203848832	DUP	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CASA-17-142007	1203843866	DUP	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CASA-17-142007	1203843868	MS	0	0	1	0
EPA:365.4	GENERAL CHEMISTRY	CASA-17-142007	429086001	REG	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	LCS	1203843863	LCS	0	0	1	0
EPA:365.4	GENERAL CHEMISTRY	MB	1203843862	MB	1	0	0	0
SM:A2340B	INORGANIC	CASA-17-142007	429086001	REG	1	0	0	0
SW-846:6010C	INORGANIC	CASA-17-142007	429086001	REG	17	0	0	0
SW-846:6010C	INORGANIC	CASA-17-142008	1203841183	DUP	17	0	0	0
SW-846:6010C	INORGANIC	CASA-17-142008	1203841184	MS	0	0	17	0
SW-846:6010C	INORGANIC	LCS	1203841182	LCS	0	0	17	0
SW-846:6010C	INORGANIC	MB	1203841181	MB	17	0	0	0
SW-846:6020	INORGANIC	CASA-17-142007	429086001	REG	11	0	0	0

DATA VALIDATION REPORT

Analytical Method	Analytical Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spiked Compounds	TICS
SW-846:6020	INORGANIC	CASA-17-142008	1203841221	DUP	11	0	0	0
SW-846:6020	INORGANIC	CASA-17-142008	1203841222	MS	0	0	11	0
SW-846:6020	INORGANIC	LCS	1203841220	LCS	0	0	11	0
SW-846:6020	INORGANIC	MB	1203841219	MB	11	0	0	0
SW-846:6850	LCMS/MS PERCHLORATE	CASA-17-142007	1203843143	MS	0	0	1	0
SW-846:6850	LCMS/MS PERCHLORATE	CASA-17-142007	1203843144	MSD	0	0	1	0
SW-846:6850	LCMS/MS PERCHLORATE	CASA-17-142007	429086001	REG	1	0	0	0
SW-846:6850	LCMS/MS PERCHLORATE	LCS	1203843142	LCS	0	0	1	0
SW-846:6850	LCMS/MS PERCHLORATE	MB	1203843141	MB	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	CASA-17-142015	429086002	REG	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	CASA-17-142016	1203842337	DUP	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	LCS	1203842336	LCS	0	0	1	0
SW-846:9060	GENERAL CHEMISTRY	MB	1203842335	MB	1	0	0	0

3. Are any analytes missing?

No.

4. Were any holding times exceeded?

No.

5. Any contaminants in blanks?

Blank FS ID	Blank Lab Sample	Blank Type	Analytical Method	Sample	Parameter Name	Blank Lab Result	Lab Qualifier	Blank Lab Units	Blank Lab Detection Limit
MB	1203841181	METHOD BLANK	SW-846:6010C	W	Calcium	69.2	J	ug/L	200
MB	1203841181	METHOD BLANK	SW-846:6010C	W	Zinc	4.65	J	ug/L	10.0
MB	1203843862	METHOD BLANK	EPA:365.4	W	Total Phosphate as Phosphorus	0.0312	J	mg/L	0.050

DATA VALIDATION REPORT

Field Sample ID	Blank Lab	Blank Type	Analytical Method	Parameter Name	Blank Lab Result	Blank Lab Units	Lab Result	Lab Qualifier	Lab Detection Limit	Detect Flag	Detect to Nondetect Factor	Detect to Estimated Factor	Use Factors
CASA-17-142007	1203843862	METHOD BLANK	EPA:365.4	Total Phosphate as Phosphorus	0.0312	mg/L	0.0264	J	0.050	Y	5	100	Y

6. Any surrogate recoveries outside the control limits?

No.

7. Any MS/MSD recoveries or RPDs outside the control limits?

Field Sample ID	MS Lab Sample ID	MSD Lab Sample ID	Analytical Method	Parameter Name	Analysis Lot ID	Analysis Date	Sample Matrix	MS Spike Recovery	MSD Spike Recovery	MS Upper Limit	MS Lower Limit	MS Reject Limit	RPD	RPD Limit
WT_SEP-PO-17-141488	1203848429		EPA:350.1	Ammonia as Nitrogen	1689398	08-08-2017	W	126		110	90	10		

8. Any LCS/LCSD or BS/BSD recoveries or RPDs outside the control limits?

No.

9. Any Field Duplicate RPDs outside the desired limits?

No.

10. Any Lab Duplicate RPDs outside the desired limits?

No.

DATA VALIDATION REPORT

11. Any required reporting limits exceeded?

No.

12. Additional Validator's Comments.

13. Display Flagged Data.

Location ID	COC Number	Field Sample ID	Sample Purpose	Analysis Type Code	Analytical Suite	Analytical Method	Parameter Name	Lab Qualifier	Validation Qualifier	Validation Reason Codes	Detect Flag	Lab Result	Lab Units	Report Result	Report Units	Report MDA	Report Uncertainty	Lab Matrix	Sample Date	Percent	Analysis Lot ID	Validation Status Code	Use Flag
R-35a	2017-2116	CASA-17-142007	REG	INIT	GENERAL CHEMISTRY	EPA:365.4	Total Phosphate as Phosphorus	J	U	I4	N	0.0264	mg/L	0.0264	mg/L			W	07/26/2017	1687583	VAL	Y	

Reason Code

Description

I4

the sample result is =<5x the concentration of related analyte in the method blank.

J_LAB

The analytical laboratory qualified the detected result as estimated (J) because the result was less the PQL but greater than the MDL

NQ

The analytical laboratory did not qualify the analyte as not detected and/or any other standard qualifire. The analyte is detected in the sample.

U_LAB

The analytical laboratory qualified the analyte as not detected.

14. Usable Result Count.

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CASA-17-142007	R-35a	REG	EPA:120.1	0	1
CASA-17-142007	R-35a	REG	EPA:150.1	0	1
CASA-17-142007	R-35a	REG	EPA:160.1	0	1
CASA-17-142007	R-35a	REG	EPA:170.0	0	1
CASA-17-142007	R-35a	REG	EPA:245.2	0	1
CASA-17-142007	R-35a	REG	EPA:300.0	0	4
CASA-17-142007	R-35a	REG	EPA:310.1	0	2
CASA-17-142007	R-35a	REG	EPA:350.1	0	1
CASA-17-142007	R-35a	REG	EPA:353.2	0	1
CASA-17-142007	R-35a	REG	EPA:365.4	0	1
CASA-17-142007	R-35a	REG	SM:A2340B	0	1
CASA-17-142007	R-35a	REG	SW-846:6010C	0	17

DATA VALIDATION REPORT

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CASA-17-142007	R-35a	REG	SW-846:6020	0	11
CASA-17-142007	R-35a	REG	SW-846:6850	0	1
CASA-17-142015	R-35a	REG	EPA:170.0	0	1
CASA-17-142015	R-35a	REG	EPA:245.2	0	1
CASA-17-142015	R-35a	REG	EPA:335.4	0	1
CASA-17-142015	R-35a	REG	EPA:351.2	0	1
CASA-17-142015	R-35a	REG	SW-846:9060	0	1

August 21, 2017

Ms. Nita Patel
Los Alamos National Laboratory
TA-00, SM1237, Rm104C
Los Alamos, New Mexico 87545

Re: LANL- WQH Water Samples
Work Order: 429086
SDG: 2017-2116

Dear Ms. Patel:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the following analytical results for the sample(s) we received on July 28, 2017, and analyzed for General Chemistry, Metals and Perchlorates by LCMSMS. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4485.

Sincerely,



Katrina Hiott for
Valerie Davis
Project Manager

Chain of Custody: 2017-2116
Enclosures



ARS International, LLC (ARS-LANS-MTOA6-25093-GEL)
LANL- WQH Water Samples
Work Order #: 429086
SDG: 2017-2116

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Case Narrative

**Case Narrative for
ARS International, LLC (ARS-LANS-MTOA6-25093-GEL)
LANL- WQH Water Samples
Workorder #: 429086
SDG # : 2017-2116**

August 21, 2017

Laboratory Identification:

GEL Laboratories LLC
2040 Savage Road
Charleston, South Carolina 29407
(843) 556-8171

Summary

Sample receipt The samples arrived at GEL Laboratories LLC, Charleston, South Carolina on July 28, 2017 for analysis. The samples were delivered with proper chain of custody documentation and signatures. The samples were screened according to GEL Standard Operating Procedure. All sample containers arrived without any visible signs of tampering or breakage. Containers were checked for pH, where appropriate, and matched the preservative as documented on the accompanying chain of custody. Shipping container temperature was within specification (0 - 6C). Shipping container temperatures were checked, documented, and within specifications. There are no additional comments concerning sample receipt.

Sample Identification The laboratory received the following samples:

<u>Laboratory ID</u>	<u>Client ID</u>
429086001	CASA-17-142007
429086002	CASA-17-142015

Case Narrative

Sample analyses were conducted using methodology as outlined in GEL Laboratories, LLC (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.

Data Package

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Data Package Qualifier Definitions and data from the following fractions: General Chemistry, Metals and Perchlorates by LCMSMS.

I certify that this data report is in compliance with the terms and conditions of the subcontract and task order, both technically and for completeness, for other than the conditions detailed in the attached case narrative.


Katrina Hiott for
Valerie Davis
Project Manager

List of current GEL Certifications as of 21 August 2017

State	Certification
Alaska	UST-0110
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA170010
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122018-1
New Hampshire NELAP	205415
New Jersey NELAP	SC002
New Mexico	SC00012
New York NELAP	11501
North Carolina	233
North Carolina SDWA	45709
North Dakota	R-158
Oklahoma	9904
Pennsylvania NELAP	68-00485
Puerto Rico	SC00012
S.Carolina Radchem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-17-12
Utah NELAP	SC000122017-23
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

Chain of Custody and Supporting Documentation

SAMPLE RECEIPT & REVIEW FORM

Client: <u>ESHL</u>		SDG/AR/COC/Work Order: <u>429086</u>	
Received By: <u>ZKW</u>		Date Received: <u>7/28/17</u>	
Carrier and Tracking Number		Circle Applicable: <input checked="" type="checkbox"/> FedEx Express <input type="checkbox"/> FedEx Ground <input type="checkbox"/> UPS <input type="checkbox"/> Field Services <input type="checkbox"/> Courier <input type="checkbox"/> Other	
		<u>5908 1782 4145</u> <u>5908 1782 4134</u>	
Suspected Hazard Information	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.	
Shipped as a DOT Hazardous?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____	
COC/Samples marked or classified as radioactive?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> <input checked="" type="checkbox"/> CPM / mR/Hr Classified as: Rad 1 Rad 2 Rad 3	
Is package, COC, and/or Samples marked HAZ?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	If yes, select Hazards below, and contact the GEL Safety Group. <input checked="" type="checkbox"/> PCB's <input type="checkbox"/> Flammable <input type="checkbox"/> Foreign Soil <input type="checkbox"/> RCRA <input type="checkbox"/> Asbestos <input type="checkbox"/> Beryllium <input type="checkbox"/> Other:	

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Wet Ice <input checked="" type="checkbox"/> Ice Packs Dry ice None Other: *all temperatures are recorded in Celsius TEMP: <u>2°C</u>
4 Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>IR3-16</u> Secondary Temperature Device Serial # (If Applicable): _____
5 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
6 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and Containers Affected: If Preservation added, Lot#:
7 Do any samples require Volatile Analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	If Yes, Are Encores or Soil Kits present? Yes ___ No ___ (If yes, take to VOA Freezer) Do VOA vials contain acid preservation? Yes ___ No ___ N/A ___ (If unknown, select No) VOA vials free of headspace? Yes ___ No ___ N/A ___ Sample ID's and containers affected:
8 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
9 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
10 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected: <u>NOPI60MW 170726 collected at 9:30 and</u> <u>NOPI60NT 170726 collected at 9:05</u>
11 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected:
12 Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
13 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials

MEL

Date

7/31/17

Page

1 of 1

ORIGIN ID: SAFA (505) 665-9966
KEITH GREENE
LOS ALAMOS NATL LAB.
TACO BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

SHIP DATE: 27
ACTWGT: 35.0
CAD: 001417

BILL SEN

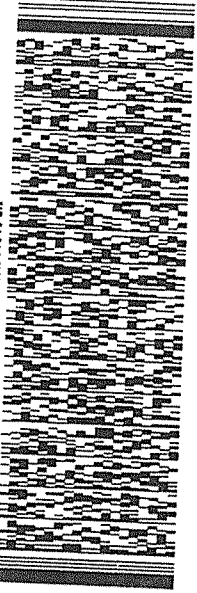
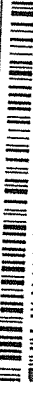
TO VALERIE DAVIS

GENERAL ENGINEERING LAB
2040 SAVAGE RD

CHARLESTON SC 29407

(843) 556-8171

REF: 21PD0ASRGW04BAGWEO



FedEx
Express

2 of 2

MPS# 5908 1782 4145

Mstr# 5908 1782 4134

FRI - 28 JUL 10:30A
PRIORITY OVERNIGHT

0201

X7 RBWA

29407
SC-US CHS



V-434 RIT2 06/15 33

ORIGIN ID: SAFA (505) 665-9966
KEITH GREENE
LOS ALAMOS NATL LAB.
TACO BLDG 1237 DPU 03

LOS ALAMOS, NM 87545
UNITED STATES US

SHIP DATE: 27 JUL 17
ACTWGT: 56.0 LB MAN
CAD: 0014176/CAFE2916

BILL SENDER

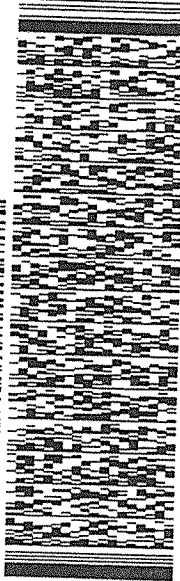
TO VALERIE DAVIS

GENERAL ENGINEERING LAB
2040 SAVAGE RD

CHARLESTON SC 29407

(843) 556-8171

REF: 21PD0ASRGW04BAGWEO



FedEx
Express

1 of 2

TRK# 5908 1782 4134

MASTER

FRI - 28 JUL 10:36A
PRIORITY OVERNIGHT

X7 RBWA

29407
SC-US CHS



V-434 RIT2 06/15 33

Data Review Qualifier Flag Definition Sheet

Data Review Qualifier Definitions

Qualifier	Explanation
-----------	-------------

*	A quality control analyte recovery is outside of specified acceptance criteria
**	Analyte is a surrogate compound
<	Result is less than value reported
>	Result is greater than value reported
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL
A	The TIC is a suspected aldol-condensation product
B	Target analyte was detected in the associated blank
B	Metals-Either presence of analyte detected in the associated blank, or MDL/IDL < sample value < PQL
BD	Results are either below the MDC or tracer recovery is low
C	Analyte has been confirmed by GC/MS analysis
D	Results are reported from a diluted aliquot of the sample
d	5-day BOD-The 2:1 depletion requirement was not met for this sample
E	Organics-Concentration of the target analyte exceeds the instrument calibration range
E	Metals-%difference of sample and SD is >10%. Sample concentration must meet flagging criteria
H	Analytical holding time was exceeded
h	Preparation or preservation holding time was exceeded
J	Value is estimated
N	Metals-The Matrix spike sample recovery is not within specified control limits
N	Organics-Presumptive evidence based on mass spectral library search to make a tentative identification of the analyte (TIC). Quantitation is based on nearest internal standard response factor
N/A	Spike recovery limits do not apply. Sample concentration exceeds spike concentration by 4X or more
ND	Analyte concentration is not detected above the reporting limit
UI	Gamma Spectroscopy-Uncertain identification
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
Y	QC Samples were not spiked with this compound
Z	Paint Filter Test-Particulates passed through the filter, however no free liquids were observed.

P Organics-The concentrations between the primary and confirmation columns/detectors is >40% difference.
For HPLC, the difference is >70%.

U Analyte was analyzed for, but not detected above the MDL, MDA, or LOD.

Perchlorates by LCMSMS Analysis

Case Narrative

**Perchlorates by LCMSMS
Technical Case Narrative
ARS International, LLC (ARSL)
SDG #: 2017-2116
Work Order #: 429086**

Method/Analysis Information

Procedure: **Definitive Low Level Perchlorate Analysis Utilizing Liquid Chromatography/Mass Spectrometry/Mass Spectrometry (LC/MS/MS) by EPA Method 6850 Modified (6850M)**

Analytical Method: SW-846:6850

Prep Method: SW-846:6850

Analytical Batch Number: 1687305

Prep Batch Number: 1687304

Sample Analysis

Sample ID	Client ID
429086001	429086001 (CASA-17-142007)
1203843145	Interference Check Sample (ICS)
1203843141	Method Blank (MB)
1203843142	Laboratory Control Sample (LCS)
1203843143	429086001(CASA-17-142007) Matrix Spike (MS)
1203843144	429086001(CASA-17-142007) Matrix Spike Duplicate (MSD)

The samples in this SDG were analyzed on an "as received" basis.

Preparation/Analytical Method Verification

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-OA-E-067 REV# 14.

Calibration Information

Initial Calibration

All initial calibration requirements have been met for this SDG. Due to software constraints, all Initial

Calibration Blanks must be designated as IPB001.

ICV Requirements

All associated initial calibration verification standard(s) (ICV) met the acceptance criteria.

CCB Requirements

All continuing calibration blanks (CCB) bracketing the analyses associated with this batch were within acceptance criteria.

CCV Requirements

All continuing calibration checks (CCV) requirements were met by all bracketing CCV standards.

Low Level Standard (CRI) Requirements

All low level calibration verification (CRI) requirements were met by all bracketing CRI standards.

Quality Control (QC) Information

Method Blank (MB) Statement

The MB analyzed with this SDG met the acceptance criteria.

Interference Check Sample (ICS)

The ICS spike recoveries met the acceptance criteria.

Laboratory Control Sample (LCS) Recovery

The LCS spike recoveries met the acceptance limits.

QC Sample Designation

Client sample 429086001 (CASA-17-142007) was chosen for matrix spike and matrix spike duplicate analysis.

Matrix Spike (MS) Recovery Statement

There was a low recovery of Perchlorate-101 for sample 1203843143 (MS) at 68%. The acceptance range is from 75-125%. The low recovery in the matrix spike was possibly due to the background concentration in the parent sample, 429086001 (CASA-17-142007) or anomalies of the extraction process. Recoveries were acceptable in 1203843142 (LCS) and 1203843144 (MSD). Will report data. 1203843143 (CASA-17-142007MS) and 1203843144 (CASA-17-142007MSD).

MS/MSD Relative Percent Difference (RPD) Statement

The RPDs between the MS and MSD met the acceptance limits.

Internal Standard Area Acceptance

The internal standard areas were within the required acceptance criteria for all samples and QC.

Retention Time

During the analysis of Perchlorate by LC/MS/MS, retention time shifts are commonly observed. These retention time shifts, which are caused by fouling of the column by the sample matrices, are problematic when the retention time is used as one of the criterion for confirmation. To overcome this problem, a known amount of O(18) labeled Perchlorate was added to each sample as a retention time standard. The presence of Perchlorate was confirmed by the relative retention time (RRT) of the Perchlorate peak and the O(18) standard. A RRT window of 0.98 to 1.02, as required by DOD QSM 5.0, has been used. In addition to the isotopic ratio, the presence of Perchlorate in the samples associated with this data package have been confirmed using the relative retention criteria stated above, not the absolute retention time.

Technical Information

Holding Time Specifications

All samples in this SDG in this analytical batch met the specified holding time. GEL assigns holding times based

on the associated methodology, which assigns the date and time from sample collection of sample receipt. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-extraction/Re-analysis

Re-extractions or re-analyses were not required in this SDG.

Miscellaneous Information

Manual Integrations

Manual integrations were not required for any data file associated with this SDG.

Method Comments

The samples in this SDG were not originally analyzed using EPA Method 314.0.

Additional Comments

The Perchlorate Isotope Ratio on the Form I may differ slightly from the ratio on the corresponding raw data due to rounding rules and/or significant figures or due to software limitations when there are manual integrations, dilutions or other factors. The ratio value of the Form I is the correct value. The retention time marker, Perchlorate-O (18), is added to all samples, instrument blanks, and standards prior to injection. It is used to verify the retention time of Perchlorate and Perchlorate-101 and to insure an accurate injection occurred. Due to various anions affecting the recovery of Perchlorate-O (18) and not Perchlorate and Perchlorate-101, the calibration curves of Perchlorate and Perchlorate-101 are internally corrected for using Perchlorate-O (18).

Perchlorate Isotope Ratio

The Perchlorate isotope ratio met acceptance criteria for all samples and QC samples. Please see the isotope ratio criteria in the Miscellaneous Section.

System Configuration

The laboratory utilizes a Waters LC 2795 liquid chromatography instrument for Perchlorate analysis. It is coupled with a Micromass Quattro Ultima Mass Spectrometer/Mass Spectrometer. It is designated as LCMSMS #2. It is fitted with an electrospray probe that is operated in the negative electrospray ionization mode for Perchlorate analysis. The laboratory may also utilize an Agilent 1100 liquid chromatography instrument for Perchlorate analysis. It is coupled with an Applied Biosystems 4000 Mass Spectrometer/Mass Spectrometer, designated as LCMSMS #3 or LCMSMS #4. It is also fitted with an electrospray probe that is operated in the negative electrospray ionization mode for Perchlorate analysis.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative will include the data validator's signature and title. The signature page also includes the data qualifiers used in the fractional package. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Chromatographic Columns

The LC-MS/MS Perchlorate analysis was performed on a Quatro Ultima LC/MS/MS.

Chromatographic separation of Perchlorate is accomplished through analysis on the following anion column:

Dionex: IonPac AG-16 2 x 50 mm.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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

Qualifier Definition Report for

ARSL004 ARS International, LLC (ARS-LANS-MTOA6-25093-GEL)

Client SDG: 2017-2116 GEL Work Order: 429086

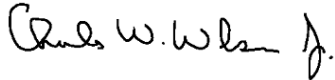
The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- ** Analyte is a surrogate compound
- J Value is estimated
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.
- DL Indicates that sample is diluted.
- RA Indicates that sample is re-analyzed without re-extraction.
- RE Indicates that sample is re-extracted.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Charles Wilson

Date: 02 AUG 2017

Title: Analyst II

Sample Data Summary

Perchlorate Analysis Data Sheet

Lab Name: GEL Laboratories LLCLab Code: GELInstrument: LCMSMSMethod: SW846 6850 ModifiedMatrix: WATERExtraction Batch ID: 1687304Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CASA-17-142007Date Received: 28-JUL-17GEL Job No (SDG): 2017-2116GEL Sample ID: 429086001Date Filtered: 01-AUG-17Injection Volume (uL): 20%Solids:

CAS No.	Analyte^	MDL	RL	Conc*	Units	Q	Dilution Factor	Date Analyzed	GEL File ID
14797-73-0	Perchlorate	.05	.2	0.427	ug/L		1	01-AUG-17 18:33	per0801020a
	Perchlorate Isotope Ratio			2.87			1	01-AUG-17 18:33	per0801020a
14797-73-0	Perchlorate-101	.05	.2	0.431	ug/L		1	01-AUG-17 18:33	per0801020a
	Perchlorate-O(18)			0.408	ug/L		1	01-AUG-17 18:33	per0801020a

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

*Concentration =

$$\text{Instrument Value} \times \frac{\text{Concentrated Extract Volume}}{\text{Aliquot}} \times \frac{1}{\% \text{Solids}}$$

Quality Control Summary

Perchlorate Laboratory Control Sample

Lab Name: General Engineering Laboratories

Lab Code: GEL

GEL Job No. (SDG): 2017-2116

Extract Batch Code: 1687304

Date Filtered: 01-AUG-17

Matrix: WATER

Sample ID: 1203843142

Analyte^	True	Found	Units	%Rec	Q	Control Limits
Perchlorate	0.200	.212	ug/L	106		85 - 115
Perchlorate Isotope Ratio		2.83				-
Perchlorate-101	0.200	.218	ug/L	109		85 - 115
Perchlorate-O(18)		.41	ug/L			-

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

Perchlorate Spike/Spike Duplicate Summary

Lab Name: General Engineering Laboratories

Lab Code: GEL

GEL Job No (SDG): 2017-2116

Extract Batch Code: 1687304

Date Extracted: 01-AUG-17

GEL MS/PS ID: 1203843143

Client ID: CASA-17-142007

GEL MSD/PSD ID: 1203843144

QC Type: MS

Compound^	Spike Added	Sample Conc	Units	MS Conc	MS Rec #	MSD Conc	MSD Rec #	RPD #	RPD Limit	Recovery Limit
Perchlorate	0.200	0.427	ug/L	0.582	78	.621	97	7	30	75 - 125
Perchlorate Isotope Ratio	0	2.87		2.98		2.94		1		-
Perchlorate-101	0.200	0.431	ug/L	0.568	68 *	.614	92	8	30	75 - 125
Perchlorate-O(18)	0	0.408	ug/L	0.424		.389		9		-

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

Quality Control Data

Perchlorate Analysis Data Sheet

Lab Name: GEL Laboratories LLCLab Code: GELInstrument: LCMSMSMethod: EPA 6850 ModifiedMatrix: WATERExtraction Batch ID: 1687304Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

MBDate Received: 01-AUG-17GEL Job No (SDG): 2017-2116GEL Sample ID: 1203843141Date Filtered: 01-AUG-17Injection Volume (uL): 20%Solids:

CAS No.	Analyte^	MDL	RL	Conc*	Units	Q	Dilution Factor	Date Analyzed	GEL File ID
14797-73-0	Perchlorate	.05	.2	0.200	ug/L	U	1	01-AUG-17 17:09	per0801013a
	Perchlorate Isotope Ratio						1	01-AUG-17 17:09	per0801013a
14797-73-0	Perchlorate-101	.05	.2	0.200	ug/L	U	1	01-AUG-17 17:09	per0801013a
	Perchlorate-O(18)			0.446	ug/L		1	01-AUG-17 17:09	per0801013a

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

*Concentration =

$$\text{Instrument Value} \times \frac{\text{Concentrated Extract Volume}}{\text{Aliquot}} \times \frac{1}{\% \text{Solids}}$$

Perchlorate Analysis Data Sheet

Lab Name: GEL Laboratories LLCLab Code: GELInstrument: LCMSMSMethod: EPA 6850 ModifiedMatrix: WATERExtraction Batch ID: 1687304Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

LCSDate Received: 01-AUG-17GEL Job No (SDG): 2017-2116GEL Sample ID: 1203843142Date Filtered: 01-AUG-17Injection Volume (uL): 20%Solids:

CAS No.	Analyte^	MDL	RL	Conc*	Units	Q	Dilution Factor	Date Analyzed	GEL File ID
14797-73-0	Perchlorate	.05	.2	0.212	ug/L		1	01-AUG-17 17:21	per0801014a
	Perchlorate Isotope Ratio			2.83			1	01-AUG-17 17:21	per0801014a
14797-73-0	Perchlorate-101	.05	.2	0.218	ug/L		1	01-AUG-17 17:21	per0801014a
	Perchlorate-O(18)			0.410	ug/L		1	01-AUG-17 17:21	per0801014a

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

*Concentration =

$$\text{Instrument Value} \times \frac{\text{Concentrated Extract Volume}}{\text{Aliquot}} \times \frac{1}{\% \text{Solids}}$$

Perchlorate Analysis Data Sheet

Lab Name: GEL Laboratories LLCLab Code: GELInstrument: LCMSMSMethod: SW846 6850 ModifiedMatrix: WATERExtraction Batch ID: 1687304Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

ICS

Date Received:

GEL Job No (SDG): 2017-2116GEL Sample ID: 1203843145Date Filtered: 01-AUG-17Injection Volume (uL): 20

%Solids:

CAS No.	Analyte^	MDL	RL	Conc*	Units	Q	Dilution Factor	Date Analyzed	GEL File ID
14797-73-0	Perchlorate	.05	.2	0.198	ug/L	J	1	01-AUG-17 17:33	per0801015a
	Perchlorate Isotope Ratio			2.91			1	01-AUG-17 17:33	per0801015a
14797-73-0	Perchlorate-101	.05	.2	0.197	ug/L	J	1	01-AUG-17 17:33	per0801015a
	Perchlorate-O(18)			0.479	ug/L		1	01-AUG-17 17:33	per0801015a

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

*Concentration =

$$\text{Instrument Value} \times \frac{\text{Concentrated Extract Volume}}{\text{Aliquot}} \times \frac{1}{\% \text{Solids}}$$

Perchlorate Analysis Data Sheet

Lab Name: GEL Laboratories LLCLab Code: GELInstrument: LCMSMSMethod: SW846 6850 ModifiedMatrix: WATERExtraction Batch ID: 1687304Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CASA-17-142007MSDate Received: 28-JUL-17GEL Job No (SDG): 2017-2116GEL Sample ID: 1203843143Date Filtered: 01-AUG-17Injection Volume (uL): 20%Solids:

CAS No.	Analyte^	MDL	RL	Conc*	Units	Q	Dilution Factor	Date Analyzed	GEL File ID
14797-73-0	Perchlorate	.05	.2	0.582	ug/L		1	01-AUG-17 18:45	per0801021a
	Perchlorate Isotope Ratio			2.98			1	01-AUG-17 18:45	per0801021a
14797-73-0	Perchlorate-101	.05	.2	0.568	ug/L		1	01-AUG-17 18:45	per0801021a
	Perchlorate-O(18)			0.424	ug/L		1	01-AUG-17 18:45	per0801021a

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

*Concentration =

$$\text{Instrument Value} \times \frac{\text{Concentrated Extract Volume}}{\text{Aliquot}} \times \frac{1}{\% \text{Solids}}$$

Perchlorate Analysis Data Sheet

Lab Name: GEL Laboratories LLCLab Code: GELInstrument: LCMSMSMethod: SW846 6850 ModifiedMatrix: WATERExtraction Batch ID: 1687304Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CASA-17-142007MSDDate Received: 28-JUL-17GEL Job No (SDG): 2017-2116GEL Sample ID: 1203843144Date Filtered: 01-AUG-17Injection Volume (uL): 20%Solids:

CAS No.	Analyte^	MDL	RL	Conc*	Units	Q	Dilution Factor	Date Analyzed	GEL File ID
14797-73-0	Perchlorate	.05	.2	0.621	ug/L		1	01-AUG-17 18:57	per0801022a
	Perchlorate Isotope Ratio			2.94			1	01-AUG-17 18:57	per0801022a
14797-73-0	Perchlorate-101	.05	.2	0.614	ug/L		1	01-AUG-17 18:57	per0801022a
	Perchlorate-O(18)			0.389	ug/L		1	01-AUG-17 18:57	per0801022a

^ When the analyte name is Perchlorate Isotope Ratio the concentration is a unitless value calculated from the ratio of Perchlorate peak area to Perchlorate-101 peak area. The Perchlorate-101 and isotopic ratio results are provided for qualitative purposes only. The results are used to verify the presence and quantitation of Perchlorate.

*Concentration =

$$\text{Instrument Value} \times \frac{\text{Concentrated Extract Volume}}{\text{Aliquot}} \times \frac{1}{\% \text{Solids}}$$

Metals Analysis

Case Narrative

Metals
Technical Case Narrative
ARS International, LLC (ARSL)
SDG #: 2017-2116
Work Order #: 429086

Sample ID	Client ID
429086001	CASA-17-142007
429086002	CASA-17-142015
1203841181	Method Blank (MB) ICP
1203841182	Laboratory Control Sample (LCS)
1203841185	429092001(CASA-17-142008L) Serial Dilution (SD)
1203841183	429092001(CASA-17-142008D) Sample Duplicate (DUP)
1203841184	429092001(CASA-17-142008S) Matrix Spike (MS)
1203841219	Method Blank (MB) ICP-MS
1203841220	Laboratory Control Sample (LCS)
1203841223	429092001(CASA-17-142008L) Serial Dilution (SD)
1203841221	429092001(CASA-17-142008D) Sample Duplicate (DUP)
1203841222	429092001(CASA-17-142008S) Matrix Spike (MS)
1203849961	Method Blank (MB) CVAA
1203849962	Laboratory Control Sample (LCS)
1203849965	429092001(CASA-17-142008L) Serial Dilution (SD)
1203849963	429092001(CASA-17-142008D) Sample Duplicate (DUP)
1203849964	429092001(CASA-17-142008S) Matrix Spike (MS)

Sample Analysis

Samples 429086001 and 002 in this SDG were analyzed for metals and mercury on an "as received" basis.

Method/Analysis Information

Analytical Batch:	1686523, 1686539, 1690070 and 1695163
Prep Batch :	1686522, 1686538 and 1690066
Standard Operating Procedures:	GL-MA-E-013 REV# 29, GL-MA-E-006 REV# 13, GL-MA-E-014 REV# 31, GL-MA-E-010 REV# 35 and GL-GC-E-107 REV# 10
Analytical Method:	SW846 3005A/6010C, SW846 3005A/6020A, EPA 245.2 1974 and SM:A2340B
Prep Method :	SW846 3005A and EPA 245.1/245.2 Prep

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

System Configuration

The Hardness as CaCO₃ is calculated from Calcium and Magnesium results.

The Metals analysis-ICP was performed on a P E 5300 Optima radial/axial-viewing inductively coupled plasma atomic emission spectrometer. The instrument is equipped with an ESI SC-FAST introduction, cyclonic spray chamber, and yttrium or scandium internal standard.

The Metals analysis - ICPMS was performed on a Perkin Elmer ELAN 9000 inductively coupled plasma mass spectrometer (ICP-MS). The instrument is equipped with a cross-flow nebulizer, quadrupole mass spectrometer, and dual mode electron multiplier detector. Internal standards of scandium, germanium, indium, tantalum, and/or lutetium were utilized to cover the mass spectrum.

The Metals analysis-Mercury was performed on a Perkin-Elmer Flow Injection Mercury System (FIMS-100) automated mercury analyzer. The instrument consists of a cold vapor atomic absorption spectrometer set to detect mercury at a wavelength of 253.7 nm.

The Metals analysis - ICPMS was performed on a PerkinElmer NexION 350X ICPMS. The instrument is equipped with a ESI PFA-ST nebulizer, quadrupole mass spectrometer, dual mode electron multiplier detector, and Kinetic Energy Discrimination (KED) technology. Internal standards of scandium, germanium, indium, tantalum, and/or lutetium were utilized to cover the mass spectrum.

Calibration Information

Instrument Calibration

All initial calibration requirements have been met for this sample delivery group (SDG).

CRDL/PQL Requirements

The CRDL/PQL standard recoveries met the referenced advisory control limits.

ICSA/ICSAB Statement

All interference check samples (ICSA and ICSAB) associated with this SDG met the established acceptance criteria. For the ICP-MS analysis, the ICSA solution contains analyte concentrations which are verified trace impurities indigenous to the purchased standard.

Continuing Calibration Blanks (CCB) Requirements

All continuing calibration blanks (CCB) bracketing this batch met the established acceptance criteria.

Continuing Calibration Verification (CCV) Requirements

All continuing calibration verifications (CCV) bracketing this SDG met the acceptance criteria.

Quality Control (QC) Information

Method Blank (MB) Statement

The MBs analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recoveries met the acceptance limits.

Quality Control (QC) Sample Statement

The following samples were selected as the quality control (QC) samples for this SDG: 429092001 (CASA-17-142008)-ICP, ICP-MS and CVAA.

Matrix Spike (MS/MSD) Recovery Statement

The percent recoveries (%R) obtained from the MS/MSD analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. The matrix spike met the recommended quality control acceptance criteria for percent recoveries for all applicable analytes.

Duplicate Relative Percent Difference (RPD) Statement

The RPD obtained from the designated sample duplicate (DUP) is evaluated based on acceptance criteria of 20% when the sample is >5X the contract required reporting limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control of +/-RL is used to evaluate the DUP results. The relative percent differences (RPD) between the sample and its duplicate (DUP) were within acceptable limits for all applicable analytes.

Serial Dilution % Difference Statement

The serial dilution is used to assess matrix suppression or enhancement. Raw element concentrations 25x the IDL/MDL for CVAA, 50X the IDL/MDL for ICP and 100X the IDL/MDL for ICP-MS analyses are applicable for serial dilution assessment. Not all the applicable analytes were within the established acceptance criteria. Matrix suppression may be suspected. The data has been qualified.

Sample	Analyte	Value
1203841185 (CASA-17-142008SDILT)	Calcium	11.9 *(0%-10%)

Technical Information**Holding Time Specifications**

GEL assigns holding times based on the associated methodology. Holding time is measured by comparison of the date and time of sample collection to the date and time of sample preparation and analysis. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration. All samples in this SDG met the specified holding time.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

The samples in this SDG did not require dilutions.

Preparation Information

The samples in this SDG were not diluted and were prepared according to the cited SOP.

Miscellaneous Information**Electronic Packaging Comment**

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative will include the data validator's signature and title. The signature page also includes the data qualifiers used in the fractional package. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Additional Comments

Total Hardness by Calculation is determined using the results of Total Calcium (Ca) and Total Magnesium (Mg) determined by ICP or ICP-MS.

$$\text{Hardness} = 2.497 (\text{Ca}) + 4.118 (\text{Mg})$$

Please refer to the Total Ca and Total Mg data to validate results appearing on the Hardness Summary sheet. Both results are in the Inorganic/metals section of the package. There is no Batch QC for calculated results, and thus no QC Summary for the Hardness by Calculation Batch. The MDLs and PQLs are calculated using the higher of the two calculated values of Ca or Mg.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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

Qualifier Definition Report for

ARSL004 ARS International, LLC (ARS-LANS-MTOA6-25093-GEL)

Client SDG: 2017-2116 GEL Work Order: 429086

The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- E %difference of sample and SD is >10%. Sample concentration must meet flagging criteria
- J Value is estimated
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature:



Name: Jamie Johnson

Date: 24 AUG 2017

Title: Group Leader

Sample Data Summary

METALS
-1-
INORGANICS ANALYSIS DATA PACKAGE

SDG No: 2017-2116**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 429086001**BASIS:** As Received**DATE COLLECTED** 26-JUL-17**CLIENT ID:** CASA-17-142007**LEVEL:** Low**DATE RECEIVED** 28-JUL-17**MATRIX:** W**%SOLIDS:** 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7439-97-6	Mercury	0.067	ug/L	U	0.067	0.2	0.2	1	AV	MTM1	08/10/17 12:19	081017W7-5	1690070

METALS
-1-
INORGANICS ANALYSIS DATA PACKAGE

SDG No: 2017-2116

CONTRACT: ESHL00114

METHOD TYPE: SW846

SAMPLE ID: 429086001

BASIS: As Received

DATE COLLECTED 26-JUL-17

CLIENT ID: CASA-17-142007

LEVEL: Low

DATE RECEIVED 28-JUL-17

MATRIX: W

%SOLIDS: 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	68	ug/L	U	68	200	200	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-36-0	Antimony	1	ug/L	U	1	3	3	1	MS	SKJ	08/14/17 13:29	170814-4	1686539
7440-38-2	Arsenic	2.82	ug/L	J	2	5	5	1	MS	BAJ	08/16/17 14:38	170816-2	1686539
7440-39-3	Barium	361	ug/L		1	5	5	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-41-7	Beryllium	1	ug/L	U	1	5	5	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-42-8	Boron	39.5	ug/L	J	15	50	50	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-43-9	Cadmium	0.30	ug/L	U	0.3	1	1	1	MS	SKJ	08/12/17 01:23	170811-3	1686539
7440-70-2	Calcium	22500	ug/L		50	200	200	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-47-3	Chromium	3	ug/L	U	3	10	10	1	MS	SKJ	08/12/17 01:23	170811-3	1686539
7440-48-4	Cobalt	1	ug/L	U	1	5	5	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-50-8	Copper	3	ug/L	U	3	10	10	1	P	HSC	08/02/17 12:24	080217-1	1686523
7439-89-6	Iron	30	ug/L	U	30	100	100	1	P	HSC	08/02/17 12:24	080217-1	1686523
7439-92-1	Lead	0.50	ug/L	U	0.5	2	2	1	MS	SKJ	08/12/17 01:23	170811-3	1686539
7439-95-4	Magnesium	5830	ug/L		110	300	300	1	P	HSC	08/02/17 12:24	080217-1	1686523
7439-96-5	Manganese	2	ug/L	U	2	10	10	1	P	HSC	08/02/17 12:24	080217-1	1686523
7439-98-7	Molybdenum	1.05	ug/L		0.2	0.5	0.5	1	MS	BAJ	08/16/17 14:38	170816-2	1686539
7440-02-0	Nickel	3.79	ug/L		0.6	2	2	1	MS	SKJ	08/12/17 01:23	170811-3	1686539
7440-09-7	Potassium	3850	ug/L		50	150	150	1	P	HSC	08/02/17 12:24	080217-1	1686523
7782-49-2	Selenium	2	ug/L	U	2	5	5	1	MS	BAJ	08/16/17 14:38	170816-2	1686539
7631-86-9	Silica	80300	ug/L		53	213	213	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-22-4	Silver	0.30	ug/L	U	0.3	1	1	1	MS	SKJ	08/12/17 01:23	170811-3	1686539
7440-23-5	Sodium	18500	ug/L		100	300	300	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-24-6	Strontium	178	ug/L		1	5	5	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-28-0	Thallium	0.60	ug/L	U	0.6	2	2	1	MS	SKJ	08/12/17 01:23	170811-3	1686539
7440-31-5	Tin	2.7	ug/L	J	2.5	10	10	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-61-1	Uranium	0.616	ug/L		0.067	0.2	0.2	1	MS	BAJ	08/16/17 14:38	170816-2	1686539
7440-62-2	Vanadium	16.9	ug/L		1	5	5	1	P	HSC	08/02/17 12:24	080217-1	1686523
7440-66-6	Zinc	3.53	ug/L	J	3.3	10	10	1	P	HSC	08/02/17 12:24	080217-1	1686523

METALS
-1-
INORGANICS ANALYSIS DATA PACKAGE

SDG No: 2017-2116**CONTRACT:** ESHL00114**METHOD TYPE:****SAMPLE ID:** 429086001**BASIS:** As Received**DATE COLLECTED** 26-JUL-17**CLIENT ID:** CASA-17-142007**LEVEL:** Low**DATE RECEIVED** 28-JUL-17**MATRIX:** W**%SOLIDS:** 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
	Hardness as CaCO3	80.2	mg/L		0.453	1.24	1.24	1		JJ2	08/24/17 10:44		1695163

Prep Information:

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1686523	1686522	SW846 3005A	50	mL	50	mL	07/28/17	JXM8
1686539	1686538	SW846 3005A	50	mL	50	mL	07/28/17	JXM8
1690070	1690066	EPA 245.1/245.2 Prep	20	mL	20	mL	08/09/17	AXS5

***Analytical Methods:**

P SW846 3005A/6010C
MS SW846 3005A/6020A
AV EPA 245.2 1974

METALS
-1-
INORGANICS ANALYSIS DATA PACKAGE

SDG No: 2017-2116**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 429086002**BASIS:** As Received**DATE COLLECTED** 26-JUL-17**CLIENT ID:** CASA-17-142015**LEVEL:** Low**DATE RECEIVED** 28-JUL-17**MATRIX:** W**%SOLIDS:** 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7439-97-6	Mercury	0.067	ug/L	U	0.067	0.2	0.2	1	AV	MTM1	08/10/17 12:20	081017W7-5	1690070

Prep Information:

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1690070	1690066	EPA 245.1/245.2 Prep	20	mL	20	mL	08/09/17	AXS5

***Analytical Methods:**

AV EPA 245.2 1974

Quality Control Summary

METALS
-3b-
PREPARATION BLANK SUMMARY

SDG NO. 2017-2116

Contract: ESHL00114

Matrix: W

<u>Sample ID</u>	<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Acceptance Window</u>	<u>Conc Qual</u>	<u>M*</u>	<u>MDL</u>	<u>RDL</u>
1203841181	Aluminum	68	ug/L	+/-200	U	P	68	200
	Barium	1	ug/L	+/-5	U	P	1	5
	Beryllium	1	ug/L	+/-5	U	P	1	5
	Boron	15	ug/L	+/-50	U	P	15	50
	Calcium	69.2	ug/L	+/-200	J	P	50	200
	Cobalt	1	ug/L	+/-5	U	P	1	5
	Copper	3	ug/L	+/-10	U	P	3	10
	Iron	30	ug/L	+/-100	U	P	30	100
	Magnesium	110	ug/L	+/-300	U	P	110	300
	Manganese	2	ug/L	+/-10	U	P	2	10
	Potassium	50	ug/L	+/-150	U	P	50	150
	Silica	53	ug/L	+/-213	U	P	53	213
	Sodium	100	ug/L	+/-300	U	P	100	300
	Strontium	1	ug/L	+/-5	U	P	1	5
	Tin	2.5	ug/L	+/-10	U	P	2.5	10
	Vanadium	1	ug/L	+/-5	U	P	1	5
	Zinc	4.65	ug/L	+/-10	J	P	3.3	10
1203841219	Antimony	1	ug/L	+/-3	U	MS	1	3
	Arsenic	2	ug/L	+/-5	U	MS	2	5
	Cadmium	0.3	ug/L	+/-1	U	MS	0.3	1
	Chromium	3	ug/L	+/-10	U	MS	3	10
	Lead	0.5	ug/L	+/-2	U	MS	0.5	2
	Molybdenum	0.2	ug/L	+/-0.5	U	MS	0.2	0.5
	Nickel	0.6	ug/L	+/-2	U	MS	0.6	2
	Selenium	2	ug/L	+/-5	U	MS	2	5
	Silver	0.3	ug/L	+/-1	U	MS	0.3	1
	Thallium	0.6	ug/L	+/-2	U	MS	0.6	2
	Uranium	0.067	ug/L	+/-0.2	U	MS	0.067	0.2
1203849961	Mercury	0.067	ug/L	+/-0.2	U	AV	0.067	0.2

*Analytical Methods:

P SW846 3005A/6010C
MS SW846 3005A/6020A
AV EPA 245.1/245.2

METALS

-5a-

Matrix Spike Summary

SDG NO. 2017-2116 Client ID: CASA-17-142008S

Contract: ESHL00114 Level: Low

Matrix: WATER % Solids:

Sample ID: 429092001 Spike ID: 1203841184

<u>Analyte</u>	<u>Units</u>	<u>Acceptance Limit</u>	<u>Spiked Result</u>	<u>C</u>	<u>Sample Result</u>	<u>C</u>	<u>Spike Added</u>	<u>% Recovery</u>	<u>Qual</u>	<u>M*</u>
Aluminum	ug/L	75-125	4880		68	U	5000	97.2		P
Barium	ug/L	75-125	521		38.2		500	96.6		P
Beryllium	ug/L	75-125	485		1	U	500	97		P
Boron	ug/L	75-125	525		24	J	500	100		P
Calcium	ug/L	75-125	20300		15300		5000	101		P
Cobalt	ug/L	75-125	488		1	U	500	97.7		P
Copper	ug/L	75-125	505		3	U	500	101		P
Iron	ug/L	75-125	4970		30	U	5000	99.3		P
Magnesium	ug/L	75-125	9760		4850		5000	98.2		P
Manganese	ug/L	75-125	479		2	U	500	95.5		P
Potassium	ug/L	75-125	6960		1880		5000	102		P
Silica	ug/L		83000		72100		10700	101	N/A	P
Sodium	ug/L	75-125	16500		11400		5000	103		P
Strontium	ug/L	75-125	560		66.1		500	98.8		P
Tin	ug/L	75-125	482		2.5	U	500	95.8		P
Vanadium	ug/L	75-125	501		12.9		500	97.6		P
Zinc	ug/L	75-125	477		14.7		500	92.4		P

*Analytical Methods:

P SW846 3005A/6010C

METALS

-5a-

Matrix Spike Summary

SDG NO. 2017-2116 Client ID: CASA-17-142008S

Contract: ESHL00114 Level: Low

Matrix: WATER % Solids:

Sample ID: 429092001 Spike ID: 1203841222

<u>Analyte</u>	<u>Units</u>	<u>Acceptance Limit</u>	<u>Spiked Result</u>	<u>C</u>	<u>Sample Result</u>	<u>C</u>	<u>Spike Added</u>	<u>% Recovery</u>	<u>Qual</u>	<u>M*</u>
Antimony	ug/L	75-125	47.2		1	U	50	93.2		MS
Arsenic	ug/L	75-125	52.9		2.6	J	50	101		MS
Cadmium	ug/L	75-125	50.4		0.3	U	50	101		MS
Chromium	ug/L	75-125	52.8		4.47	J	50	96.6		MS
Lead	ug/L	75-125	50.6		0.5	U	50	101		MS
Molybdenum	ug/L	75-125	56.1		1.39		50	109		MS
Nickel	ug/L	75-125	51.5		4.37		50	94.2		MS
Selenium	ug/L	75-125	50.4		2	U	50	101		MS
Silver	ug/L	75-125	49.1		0.3	U	50	98.2		MS
Thallium	ug/L	75-125	47.2		0.6	U	50	93.8		MS
Uranium	ug/L	75-125	54.2		0.302		50	108		MS

*Analytical Methods:

MS SW846 3005A/6020A

METALS

-5a-

Matrix Spike Summary

SDG NO. 2017-2116 **Client ID:** CASA-17-142008S**Contract:** ESHL00114 **Level:** Low**Matrix:** WATER **% Solids:****Sample ID:** 429092001 **Spike ID:** 1203849964

<u>Analyte</u>	<u>Units</u>	<u>Acceptance Limit</u>	<u>Spiked Result</u>	<u>C</u>	<u>Sample Result</u>	<u>C</u>	<u>Spike Added</u>	<u>% Recovery</u>	<u>Qual</u>	<u>M*</u>
Mercury	ug/L	75-125	1.9		0.067	U	2	91.6		AV

*Analytical Methods:

AV EPA 245.1/245.2

Metals
-6-
Duplicate Sample Summary

SDG No.: 2017-2116

Lab Code: GEL

Contract: ESHL00114

Client ID: CASA-17-142008D

Matrix: WATER

Level: Low

Sample ID: 429092001

Duplicate ID: 1203841183

Percent Solids for Dup: N/A

Analyte	Units	Acceptance Limit	Sample Result	C	Duplicate Result	C	RPD	Qual	M*
Aluminum	ug/L		68 U		68 U				P
Barium	ug/L	+/-20%	38.2		38		.701		P
Beryllium	ug/L		1 U		1 U				P
Boron	ug/L	+/-50	24 J		23 J		4.55		P
Calcium	ug/L	+/-20%	15300		15200		.426		P
Cobalt	ug/L		1 U		1 U				P
Copper	ug/L		3 U		3 U				P
Iron	ug/L		30 U		30 U				P
Magnesium	ug/L	+/-20%	4850		4870		.521		P
Manganese	ug/L		2 U		2 U				P
Potassium	ug/L	+/-20%	1880		1890		.859		P
Silica	ug/L	+/-20%	72100		72100		.00139		P
Sodium	ug/L	+/-20%	11400		11400		.114		P
Strontium	ug/L	+/-20%	66.1		66		.153		P
Tin	ug/L		2.5 U		2.5 U				P
Vanadium	ug/L	+/-5	12.9		13		.57		P
Zinc	ug/L	+/-10	14.7		12.7		14.5		P

*Analytical Methods:

P SW846 3005A/6010C

Metals
-6-
Duplicate Sample Summary

SDG No.: 2017-2116

Lab Code: GEL

Contract: ESHL00114

Client ID: CASA-17-142008D

Matrix: WATER

Level: Low

Sample ID: 429092001

Duplicate ID: 1203841221

Percent Solids for Dup: N/A

Analyte	Units	Acceptance Limit	Sample Result	C	Duplicate Result	C	RPD	Qual	M*
Antimony	ug/L		1 U		1 U				MS
Arsenic	ug/L	+/-5	2.6 J		2.59 J		.655		MS
Cadmium	ug/L		0.3 U		0.3 U				MS
Chromium	ug/L	+/-10	4.47 J		4.27 J		4.76		MS
Lead	ug/L		0.5 U		0.5 U				MS
Molybdenum	ug/L	+/- .5	1.39		1.45		4.02		MS
Nickel	ug/L	+/-2	4.37		4.35		.527		MS
Selenium	ug/L		2 U		2 U				MS
Silver	ug/L		0.3 U		0.3 U				MS
Thallium	ug/L		0.6 U		0.6 U				MS
Uranium	ug/L	+/- .2	0.302		0.306		1.32		MS

*Analytical Methods:

MS SW846 3005A/6020A

Metals
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Duplicate Sample Summary

SDG No.: 2017–2116**Lab Code:** GEL**Contract:** ESHL00114**Client ID:** CASA–17–142008D**Matrix:** WATER**Level:** Low**Sample ID:** 429092001**Duplicate ID:** 1203849963**Percent Solids for Dup:** N/A

Analyte	Units	Acceptance Limit	Sample Result	C	Duplicate Result	C	RPD	Qual	M*
Mercury	ug/L		0.067	U	0.067	U			AV

*Analytical Methods:

AV EPA 245.1/245.2

METALS

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Laboratory Control Sample Summary

SDG NO. 2017-2116

Contract: ESHL00114

Aqueous LCS Source:OS2I

Solid LCS Source:

<u>Sample ID</u>	<u>Analyte</u>	<u>Units</u>	<u>True Value</u>	<u>Result</u>	<u>C</u>	<u>% Recovery</u>	<u>Acceptance Limit</u>	<u>M*</u>
1203841182								
	Aluminum	ug/L	5000	4940		98.7	80-120	P
	Barium	ug/L	500	475		95	80-120	P
	Beryllium	ug/L	500	470		93.9	80-120	P
	Boron	ug/L	500	481		96.1	80-120	P
	Calcium	ug/L	5000	4770		95.4	80-120	P
	Cobalt	ug/L	500	483		96.6	80-120	P
	Copper	ug/L	500	482		96.4	80-120	P
	Iron	ug/L	5000	4950		99	80-120	P
	Magnesium	ug/L	5000	4960		99.1	80-120	P
	Manganese	ug/L	500	473		94.6	80-120	P
	Potassium	ug/L	5000	4850		97.1	80-120	P
	Silica	ug/L	10700	9840		91.9	80-120	P
	Sodium	ug/L	5000	5230		105	80-120	P
	Strontium	ug/L	500	501		100	80-120	P
	Tin	ug/L	500	463		92.6	80-120	P
	Vanadium	ug/L	500	475		95	80-120	P
	Zinc	ug/L	500	455		91.1	80-120	P

*Analytical Methods:

P SW846 3005A/6010C

METALS

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Laboratory Control Sample Summary

SDG NO. 2017-2116

Contract: ESHL00114

Aqueous LCS Source:O2Si

Solid LCS Source:

<u>Sample ID</u>	<u>Analyte</u>	<u>Units</u>	<u>True Value</u>	<u>Result</u>	<u>C</u>	<u>% Recovery</u>	<u>Acceptance Limit</u>	<u>M*</u>
1203841220								
	Antimony	ug/L	50	46.3		92.7	80-120	MS
	Arsenic	ug/L	50	52		104	80-120	MS
	Cadmium	ug/L	50	51		102	80-120	MS
	Chromium	ug/L	50	48.6		97.1	80-120	MS
	Lead	ug/L	50	50.7		101	80-120	MS
	Molybdenum	ug/L	50	53.7		107	80-120	MS
	Nickel	ug/L	50	49.6		99.1	80-120	MS
	Selenium	ug/L	50	53.2		106	80-120	MS
	Silver	ug/L	50	50.3		101	80-120	MS
	Thallium	ug/L	50	46.7		93.5	80-120	MS
	Uranium	ug/L	50	53.7		107	80-120	MS

*Analytical Methods:

MS SW846 3005A/6020A

METALS

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Laboratory Control Sample Summary

SDG NO. 2017-2116

Contract: ESHL00114

Aqueous LCS Source: GEL

Solid LCS Source:

<u>Sample ID</u>	<u>Analyte</u>	<u>Units</u>	<u>True Value</u>	<u>Result</u>	<u>C</u>	<u>% Recovery</u>	<u>Acceptance Limit</u>	<u>M*</u>
1203849962	Mercury	ug/L	2	1.96		97.9	85-115	AV

*Analytical Methods:

AV EPA 245.1/245.2

METALS

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Serial Dilution Sample Summary

SDG NO. 2017-2116

Client ID: CASA-17-142008L

Contract: ESHL00114

Matrix: LIQUID

Level: Low

Sample ID: 429092001

Serial Dilution ID: 1203841185

<u>Analyte</u>	<u>Initial Value</u> ug/L	<u>C</u>	<u>Serial Value</u> ug/L	<u>C</u>	<u>% Difference</u>	<u>Qual</u>	<u>Acceptance Limit</u>	<u>M*</u>
Aluminum	68	U	351	J				P
Barium	38.2		38.1		.441			P
Beryllium	1	U	5	U				P
Boron	24	J	75	U	6.784			P
Calcium	15300		13500		11.865	E	10	P
Cobalt	1	U	5	U				P
Copper	3	U	15	U				P
Iron	30	U	150	U				P
Magnesium	4850		4340		10.454			P
Manganese	2	U	10	U				P
Potassium	1880		1320		29.444			P
Silica	72100		71900		.376		10	P
Sodium	11400		10500		7.498		10	P
Strontium	66.1		60.5		8.525		10	P
Tin	2.5	U	12.5	U				P
Vanadium	12.9		14.3	J	10.234			P
Zinc	14.7		46	J	213.202			P

*Analytical Methods:

P SW846 3005A/6010C

METALS

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Serial Dilution Sample Summary

SDG NO. 2017-2116

Client ID: CASA-17-142008L

Contract: ESHL00114

Matrix: LIQUID

Level: Low

Sample ID: 429092001

Serial Dilution ID: 1203841223

<u>Analyte</u>	<u>Initial Value ug/L</u>	<u>C</u>	<u>Serial Value ug/L</u>	<u>C</u>	<u>% Difference</u>	<u>Qual</u>	<u>Acceptance Limit</u>	<u>M*</u>
Antimony	1	U	5	U				MS
Arsenic	2.6	J	10	U	2.65			MS
Cadmium	.3	U	1.5	U				MS
Chromium	4.47	J	15	U	43.563			MS
Lead	.5	U	2.5	U				MS
Molybdenum	1.39		1.47	J	5.679			MS
Nickel	4.37		4.43	J	1.303			MS
Selenium	2	U	10	U				MS
Silver	.3	U	1.5	U				MS
Thallium	.6	U	3	U				MS
Uranium	.302		.335	U	5.96			MS

*Analytical Methods:

MS SW846 3005A/6020A

METALS

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Serial Dilution Sample Summary

SDG NO. 2017-2116 **Client ID:** CASA-17-142008L**Contract:** ESHL00114**Matrix:** LIQUID **Level:** Low**Sample ID:** 429092001 **Serial Dilution ID:** 1203849965

<u>Analyte</u>	<u>Initial Value ug/L</u>	<u>C</u>	<u>Serial Value ug/L</u>	<u>C</u>	<u>% Difference</u>	<u>Qual</u>	<u>Acceptance Limit</u>	<u>M*</u>
Mercury	.067	U	.335	U				AV

*Analytical Methods:

AV EPA 245.1/245.2

General Chem Analysis

Case Narrative

**General Chemistry
Technical Case Narrative
ARS International, LLC (ARSL)
SDG #: 2017-2116
Work Order #: 429086**

Method/Analysis Information

Product: Carbon and Total Organic

Analytical Batch: 1686981

Method: SW 9060 Total Organic Carbon

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW-846:9060:

Sample ID	Client ID
429086002	CASA-17-142015
1203842335	Method Blank (MB)
1203842336	Laboratory Control Sample (LCS)
1203842337	429092002(CASA-17-142016) Sample Duplicate (DUP)
1203842340	429092002(CASA-17-142016) Post Spike (PS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-093 REV# 15.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Carbon analysis was performed on a O-I Analytical 1030W Carbon Analyzer.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Continuing Calibration Blanks

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

Calibration Verification Information (CCV)

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within

acceptance limits.

Quality Control (QC) Information

Method Blank (MB) Statement

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 429092002 (CASA-17-142016) was selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The MS/PS recovery for this sample set was within the required acceptance limits where applicable.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Preservation/Integrity

All the samples from this sample group met the preservation and integrity requirements of the method.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information

Additional Comments

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will

always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product:	Cyanide and Total		
Analytical Batch:	1688102	Method:	WSP-CN(T)
Prep Batch :	1688101	Method:	EPA 335.4

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA 335.4 1993:

Sample ID	Client ID
429086002	CASA-17-142015
1203845274	Method Blank (MB)
1203845275	Laboratory Control Sample (LCS)
1203845276	429086002(CASA-17-142015) Sample Duplicate (DUP)
1203845278	429086002(CASA-17-142015) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-095 REV# 20.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Flow Injection analysis was performed on a Lachat QuickChem FIA+ 8000 Series.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Continuing Calibration Blanks

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

Y Intercept Rule

The absolute value of the intercept is less than 3 times the MDL.

Quality Control (QC) Information

Method Blank (MB) Statement

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 429086002 (CASA-17-142015) was selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The MS/PS recoveries for this sample set were within the required acceptance limits where applicable.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Preservation/Integrity

All the samples from this sample group met the preservation and integrity requirements of the method.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information**Additional Comments**

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

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Method/Analysis Information

Product: Ion Chromatography
Analytical Batch: 1686728 **Method:** WSP-ANIONS

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA:300.0:

Sample ID	Client ID
429086001	CASA-17-142007
1203841828	Method Blank (MB)
1203841829	Laboratory Control Sample (LCS)
1203841830	428612001(CAMO-17-142234) Sample Duplicate (DUP)
1203841831	428612001(CAMO-17-142234) Post Spike (PS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-086 REV# 25.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Ion Chromatography analysis was performed on a Dionex ICS-5000 Ion Chromatograph.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Continuing Calibration Blanks

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

Calibration Verification Information (CCV)

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within acceptance limits.

Y Intercept Rule

The absolute value of the intercept is less than 3 times the MDL.

Quality Control (QC) Information

Method Blank (MB) Statement

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 428612001 (CAMO-17-142234) was selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The MS/PS recovery for this sample set was within the required acceptance limits where applicable.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information

Manual Integrations

Samples 1203841830 (CAMO-17-142234DUP), 1203841831 (CAMO-17-142234PS) and 429086001 (CASA-17-142007) were manually integrated to correctly position the baseline as set in the calibration standards.

Additional Comments

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be

scanned and inserted into the electronic package.

Method/Analysis Information

Product:	Ammonia Nitrogen		
Analytical Batch:	1689399	Method:	NH3
Prep Batch :	1689398	Method:	EPA 350.1 Prep

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA:350.1:

Sample ID	Client ID
429086001	CASA-17-142007
1203848426	Method Blank (MB)
1203848427	Laboratory Control Sample (LCS)
1203848428	428615005(NonSDG) Sample Duplicate (DUP)
1203848429	428615005(NonSDG) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-106 REV# 9.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Nutrient analysis was performed on a Lachat QuickChem FIA+ 8000 Series.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Calibration Verification Information

All associated calibration verification standard(s) (ICV or CCV) met the acceptance criteria.

Continuing Calibration Blanks

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

Calibration Verification Information (CCV)

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within

acceptance limits.

Y Intercept Rule

The absolute value of the intercept is less than 3 times the MDL.

Quality Control (QC) Information**Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 428615005 (NonSDG) was selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The percent recoveries (%R) obtained from the spike analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. The matrix spike recovered outside of the established acceptance limits due to matrix interference and/or non-homogeneity.

Analyte	Sample	Value
Nitrogen, Ammonia	1203848429 (Non SDG 428615005MS)	126* (90%-110%)

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Preservation/Integrity

All the samples from this sample group met the preservation and integrity requirements of the method.

Sample Dilutions

The following samples 1203848428 (Non SDG 428615005DUP) and 1203848429 (Non SDG 428615005MS) were diluted because target analyte concentrations exceeded the calibration range. Samples 1203848428 (Non SDG 428615005DUP) and 1203848429 (Non SDG 428615005MS) were diluted at the prep step due to high concentration. Dilutions may be required for many reasons, including to minimize matrix interferences or to bring over range target analyte concentrations into the linear calibration range.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information

Additional Comments

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product:	Total Kjeldahl Nitrogen		
Analytical Batch:	1688439	Method:	TKN
Prep Batch :	1688437	Method:	EPA 351.2 Prep

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA:351.2:

Sample ID	Client ID
429086002	CASA-17-142015
1203846066	Method Blank (MB)
1203846067	Laboratory Control Sample (LCS)
1203846068	429086002(CASA-17-142015) Sample Duplicate (DUP)
1203846069	429086002(CASA-17-142015) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-104 REV# 14.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Nutrient analysis was performed on a Lachat QuickChem FIA+ 8000 Series.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Calibration Verification Information

All associated calibration verification standard(s) (ICV or CCV) met the acceptance criteria.

Continuing Calibration Blanks

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

Calibration Verification Information (CCV)

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within

acceptance limits.

Y Intercept Rule

The absolute value of the intercept is less than 3 times the MDL.

Quality Control (QC) Information**Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 429086002 (CASA-17-142015) was selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The MS/PS recoveries for this sample set were within the required acceptance limits where applicable.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Preservation/Integrity

All the samples from this sample group met the preservation and integrity requirements of the method.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

Sample 429086002 (CASA-17-142015) was re-analyzed due to instrument failure. The results from the reanalysis are reported. Samples 1203846066 (MB), 1203846067 (LCS), 1203846068 (CASA-17-142015DUP), 1203846069 (CASA-17-142015MS) and 429086002 (CASA-17-142015) were re-analyzed due to CCV failure. The reanalysis data with passing instrument QC was reported.

Miscellaneous Information**Additional Comments**

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product: Nitrate Nitrite by Cadmium Reduction

Analytical Batch: 1687584

Method: NO3NO2

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA:353.2:

Sample ID	Client ID
429086001	CASA-17-142007
1203843870	Method Blank (MB)
1203843871	Laboratory Control Sample (LCS)
1203843872	429092001(CASA-17-142008) Sample Duplicate (DUP)
1203848832	428615005(NonSDG) Sample Duplicate (DUP)
1203843874	429092001(CASA-17-142008) Post Spike (PS)
1203848833	428615005(NonSDG) Post Spike (PS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-128 REV# 9.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Nutrient analysis was performed on a Lachat QuickChem FIA+ 8500 Series.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Calibration Verification Information

All associated calibration verification standard(s) (ICV or CCV) met the acceptance criteria.

Continuing Calibration Blanks

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

Calibration Verification Information (CCV)

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within

acceptance limits.

Y Intercept Rule

The absolute value of the intercept is less than 3 times the MDL.

Quality Control (QC) Information**Method Blank (MB) Statement**

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Samples 428615005 (NonSDG) and 429092001 (CASA-17-142008) were selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The MS/PS recoveries for this sample set were within the required acceptance limits where applicable.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Preservation/Integrity

All the samples from this sample group met the preservation and integrity requirements of the method.

Sample Dilutions

The following samples 1203843872 (CASA-17-142008DUP), 1203843874 (CASA-17-142008PS), 1203848832 (Non SDG 428615005DUP) and 1203848833 (Non SDG 428615005PS) in this sample group were diluted due to matrix interference. Dilutions may be required for many reasons, including to minimize matrix interferences or to bring over range target analyte concentrations into the linear calibration range.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information**Additional Comments**

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product:	Total Phosphorus		
Analytical Batch:	1687583	Method:	PO4
Prep Batch :	1687582	Method:	EPA 365.4 Prep

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA 365.4 1974:

Sample ID	Client ID
429086001	CASA-17-142007
1203843862	Method Blank (MB)
1203843863	Laboratory Control Sample (LCS)
1203843866	429086001(CASA-17-142007) Sample Duplicate (DUP)
1203843868	429086001(CASA-17-142007) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-103 REV# 10.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Nutrient analysis was performed on a Lachat QuickChem FIA+ 8000 Series.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Continuing Calibration Blanks

All continuing calibration blanks (CCBs) associated with reported data from this batch were within acceptance limits.

Calibration Verification Information (CCV)

All continuing calibration verification standards (CCVs) associated with reported data from this batch were within acceptance limits.

Y Intercept Rule

The absolute value of the intercept is less than 3 times the MDL.

Quality Control (QC) Information

Method Blank (MB) Statement

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 429086001 (CASA-17-142007) was selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The MS/PS recovery for this sample set was within the required acceptance limits where applicable.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Preservation/Integrity

All the samples from this sample group met the preservation and integrity requirements of the method.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information

Additional Comments

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will

always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product: Solids and Total Dissolved

Analytical Batch: 1687179

Method: TDS

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA:160.1:

Sample ID	Client ID
429086001	CASA-17-142007
1203842815	Method Blank (MB)
1203842816	Laboratory Control Sample (LCS)
1203842818	429092005(CASA-17-142022) Sample Duplicate (DUP)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-001 REV# 15.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Solids analysis was performed on a Sartorius Balance BAL216. Solids lab

Initial Calibration

All initial calibration requirements have been met for this SDG.

Quality Control (QC) Information

Method Blank (MB) Statement

The MB analyzed with this SDG met the acceptance criteria.

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Consecutive Weight Checks

All consecutive weight checks were met.

Quality Control (QC) Designation

Sample 429092005 (CASA-17-142022) was selected for QC analysis.

Duplicate Relative Percent Difference (RPD) Statement

The Relative Percent Difference (RPD) between the sample and duplicate falls outside of the established acceptance limits because of the heterogeneous matrix of the sample:

Analyte	Sample	Value
Total Dissolved Solids	1203842818 (CASA-17-142022DUP)	8.7* (0%-5%)

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information

Additional Comments

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product: Specific Conductivity

Analytical Batch: 1686960

Method: EPA120.1 Specific Conductivity

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA:120.1:

Sample ID	Client ID
429086001	CASA-17-142007
1203842287	Laboratory Control Sample (LCS)
1203842288	429086001(CASA-17-142007) Sample Duplicate (DUP)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-009 REV# 14.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Titration and Ion analysis was performed on a Orion 160 Conductivity Meter.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Initial Standardization

The titrant was properly standardized

Calibration Verification Information

All associated calibration verification standard(s) (ICV or CCV) met the acceptance criteria.

Quality Control (QC) Information

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 429086001 (CASA-17-142007) was selected for QC analysis.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information**Additional Comments**

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product: pH

Analytical Batch: 1687458 **Method:** PH

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA 150.1 1982:

Sample ID	Client ID
429086001	CASA-17-142007
1203843540	Laboratory Control Sample (LCS)
1203843541	429086001(CASA-17-142007) Sample Duplicate (DUP)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-008 REV# 22.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Titration and Ion analysis was performed on a Thermo Orion Star A111. Immediates

Initial Calibration

All initial calibration requirements have been met for this SDG.

Initial Standardization

The titrant was properly standardized

Quality Control (QC) Information

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 429086001 (CASA-17-142007) was selected for QC analysis.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

Samples (See Below) were received by the laboratory outside of the method specified holding time. The data is qualified.

Sample	Analyte	Value
1203843541 (CASA-17-142007DUP)	pH	Received 28-JUL-17, out of holding 26-JUL-17
429086001 (CASA-17-142007)	pH	Received 28-JUL-17, out of holding 26-JUL-17

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information**Additional Comments**

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Method/Analysis Information

Product: Alkalinity

Analytical Batch: 1687455 **Method:** EPA 310.1 Total Alkalinity

Sample Analysis

The following samples were analyzed using the analytical protocol as established in EPA:310.1:

Sample ID	Client ID
429086001	CASA-17-142007
1203843525	Laboratory Control Sample (LCS)
1203843526	429086001(CASA-17-142007) Sample Duplicate (DUP)
1203843528	429086001(CASA-17-142007) Matrix Spike (MS)

The samples in this SDG were analyzed on an "as received" basis.

SOP Reference

Procedure for preparation, analysis and reporting of analytical data are controlled by GEL Laboratories LLC as Standard Operating Procedure (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-033 REV# 13.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by GEL Laboratories, LLC. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information

The Titration and Ion analysis was performed on a Electronic bottle-top buret.

Initial Calibration

All initial calibration requirements have been met for this SDG.

Initial Standardization

The titrant was properly standardized

Quality Control (QC) Information

Laboratory Control Sample Duplicate (LCSD)

An LCSD was not used in place of matrix QC.

Laboratory Control Sample (LCS) Recovery

The LCS spike recovery met the acceptance limits.

Quality Control (QC) Designation

Sample 429086001 (CASA-17-142007) was selected for QC analysis.

Matrix Spike (MS)/Post Spike (PS) Recovery Statement

The MS/PS recovery for this sample set was within the required acceptance limits where applicable.

Duplicate Relative Percent Difference (RPD) Statement

The RPD between the sample and its duplicate met the acceptance limits.

Technical Information

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples in this SDG met the specified holding time.

Sample Dilutions

The samples in this SDG did not require dilutions.

Sample Re-analysis

The samples in this SDG did not require re-analysis.

Miscellaneous Information

Additional Comments

Additional comments were not required for this SDG.

Electronic Packaging Comment

This data package was generated using an electronic data processing program referred to as virtual packaging. In an effort to increase quality and efficiency, the laboratory has developed systems to generate all data packages electronically. The following change from traditional packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

GEL LABORATORIES LLC

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Qualifier Definition Report for

ARSL004 ARS International, LLC (ARS-LANS-MTOA6-25093-GEL)

Client SDG: 2017-2116 GEL Work Order: 429086


The Qualifiers in this report are defined as follows:

- * A quality control analyte recovery is outside of specified acceptance criteria
- H Analytical holding time was exceeded
- J Value is estimated
- U Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.

Review/Validation

GEL requires all analytical data to be verified by a qualified data reviewer. In addition, all CLP-like deliverables receive a third level review of the fractional data package.

The following data validator verified the information presented in this data report:

Signature: 

Name: Aubrey Kingsbury

Date: 23 AUG 2017

Title: Analyst I

Sample Data Summary

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: August 23, 2017

Company : Los Alamos National Laboratory
Address : TA-00, SM1237, Rm104C

Los Alamos, New Mexico 87545
Contact: Ms. Nita Patel
Project: LANL- WQH Water Samples

Client SDG: 2017-2116

Client Sample ID: CASA-17-142007
Sample ID: 429086001
Matrix: W
Collect Date: 26-JUL-17 13:49
Receive Date: 28-JUL-17
Collector: Client

Project: ESHL00114
Client ID: ARSL004

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Ion Chromatography												
WSP-ANIONS "As Received"												
Bromide	J	0.0707	0.067	0.200	mg/L		1	MXL2	07/28/17	1735	1686728	1
Chloride		6.42	0.067	0.200	mg/L		1					
Fluoride		0.239	0.033	0.100	mg/L		1					
Sulfate		5.70	0.133	0.400	mg/L		1					
Nutrient Analysis												
NH3 "As Received"												
Nitrogen, Ammonia		0.0505	0.017	0.050	mg/L	1.00	1	KLP1	08/08/17	1244	1689399	2
NO3NO2 "As Received"												
Nitrogen, Nitrate/Nitrite		0.504	0.017	0.050	mg/L		1	AXH3	08/08/17	0757	1687584	3
PO4 "As Received"												
Phosphorus, Total as P	J	0.0264	0.020	0.050	mg/L	1.00	1	KLP1	08/03/17	1232	1687583	4
Solids Analysis												
TDS "As Received"												
Total Dissolved Solids		204	3.40	14.3	mg/L			KLP1	08/02/17	1417	1687179	5
Titration and Ion Analysis												
EPA 310.1 Total Alkalinity "As Received"												
Alkalinity, Total as CaCO3		113	1.45	4.00	mg/L			RXB5	08/09/17	1538	1687455	6
Carbonate alkalinity (CaCO3)	U	ND	1.45	4.00	mg/L							
EPA120.1 Specific Conductivity "As Received"												
Conductivity		244	1.00	1.00	umhos/cm		1	VH1	07/31/17	1330	1686960	7
PH "As Received"												
pH at Temp 15.3C	H	8.11	0.010	0.100	SU		1	RXB5	08/09/17	1537	1687458	8

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
EPA 350.1 Prep	EPA 350.1 Ammonia Nitrogen Prep	AXH3	08/08/17	1107	1689398
EPA 365.4 Prep	EPA 365.4 Phosphorus, Total in liquid PR	KLP1	08/02/17	1400	1687582

GEL LABORATORIES LLC

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Certificate of Analysis

Report Date: August 23, 2017

Company : Los Alamos National Laboratory
Address : TA-00, SM1237, Rm104C

Los Alamos, New Mexico 87545
Contact: Ms. Nita Patel
Project: LANL- WQH Water Samples

Client SDG: 2017-2116

Client Sample ID: CASA-17-142007
Sample ID: 429086001

Project: ESHL00114
Client ID: ARSL004

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
The following Analytical Methods were performed:												
Method	Description					Analyst Comments						
1	EPA:300.0											
2	EPA:350.1											
3	EPA:353.2											
4	EPA 365.4 1974											
5	EPA:160.1											
6	EPA:310.1											
7	EPA:120.1											
8	EPA 150.1 1982											

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

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Certificate of Analysis

Report Date: August 23, 2017

Company : Los Alamos National Laboratory
Address : TA-00, SM1237, Rm104C

Los Alamos, New Mexico 87545
Contact: Ms. Nita Patel
Project: LANL- WQH Water Samples

Client SDG: 2017-2116

Client Sample ID: CASA-17-142015
Sample ID: 429086002
Matrix: W
Collect Date: 26-JUL-17 13:49
Receive Date: 28-JUL-17
Collector: Client

Project: ESHL00114
Client ID: ARSL004

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
Carbon Analysis												
SW 9060 Total Organic Carbon "As Received"												
Total Organic Carbon Average	J	0.369	0.330	1.00	mg/L		1	TSM	08/01/17	0411	1686981	1
Flow Injection Analysis												
WSP-CN(T) "As Received"												
Cyanide, Total	U	ND	1.67	5.00	ug/L	1.00	1	AXH3	08/04/17	1016	1688102	2
Nutrient Analysis												
TKN "As Received"												
Nitrogen, Total Kjeldahl	U	ND	0.033	0.100	mg/L	1.00	1	KLP1	08/04/17	1306	1688439	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
EPA 335.4	EPA 335.4 Total Cyanide	AXH3	08/04/17	0850	1688101
EPA 351.2 Prep	EPA 351.2 Total Kjeldahl Nitrogen Prep	KLP1	08/04/17	0940	1688437

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	SW-846:9060	
2	EPA 335.4 1993	
3	EPA:351.2	

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

Quality Control Summary

GEL LABORATORIES LLC

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QC Summary

Report Date: August 23, 2017

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Los Alamos National Laboratory
TA-00, SM1237, Rm104C
Los Alamos, New Mexico

Contact: Ms. Nita Patel

Workorder: 429086

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Carbon Analysis											
Batch	1686981										
QC1203842337	429092002	DUP									
Total Organic Carbon Average		U	ND	U	ND	mg/L	N/A		TSM	08/01/17	05:39
QC1203842336	LCS										
Total Organic Carbon Average	10.0				9.85	mg/L	98.5	(80%-120%)		07/31/17	18:18
QC1203842335	MB										
Total Organic Carbon Average			U	ND	mg/L					07/31/17	18:07
QC1203842340	429092002	PS									
Total Organic Carbon Average	10.0	U	ND		10.5	mg/L	102	(75%-125%)		08/01/17	06:23
Flow Injection Analysis											
Batch	1688102										
QC1203845276	429086002	DUP									
Cyanide, Total		U	ND	U	ND	ug/L	N/A		AXH3	08/04/17	10:18
QC1203845275	LCS										
Cyanide, Total	50.0				49.6	ug/L	99.2	(90%-110%)		08/04/17	10:15
QC1203845274	MB										
Cyanide, Total			U	ND	ug/L					08/04/17	10:14
QC1203845278	429086002	MS									
Cyanide, Total	100	U	ND		109	ug/L	109	(90%-110%)		08/04/17	10:19
Ion Chromatography											
Batch	1686728										
QC1203841830	428612001	DUP									
Bromide		J	0.0848	J	0.0835	mg/L	1.54 ^	(+/-0.200)	MXL2	07/28/17	16:08

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QC Summary

Workorder: 429086

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Ion Chromatography											
Batch	1686728										
Chloride		9.33		9.34	mg/L	0.161		(0%-20%)	MXL2	07/28/17	16:08
Fluoride		0.242		0.243	mg/L	0.206	^	(+/-0.100)			
Sulfate		13.4		13.4	mg/L	0.555		(0%-20%)			
QC1203841829	LCS										
Bromide	1.25			1.27	mg/L		102	(80%-120%)		07/28/17	15:10
Chloride	5.00			4.78	mg/L		95.6	(80%-120%)			
Fluoride	2.50			2.41	mg/L		96.5	(80%-120%)			
Sulfate	10.0			9.93	mg/L		99.3	(80%-120%)			
QC1203841828	MB										
Bromide			U	ND	mg/L					07/28/17	14:41
Chloride			U	ND	mg/L						
Fluoride			U	ND	mg/L						
Sulfate			U	ND	mg/L						
QC1203841831	428612001	PS									
Bromide	1.25	J	0.0848	1.30	mg/L		96.9	(75%-125%)		07/28/17	16:37
Chloride	5.00		9.33	15.0	mg/L		113	(75%-125%)			
Fluoride	2.50		0.242	2.59	mg/L		93.7	(75%-125%)			
Sulfate	10.0		13.4	24.1	mg/L		107	(75%-125%)			

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QC Summary

Workorder: 429086

Page 3 of 6

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Nutrient Analysis											
Batch	1687583										
QC1203843866	429086001	DUP									
Phosphorus, Total as P	J	0.0264	J	0.0213	mg/L	21.4	^	(+/-0.050)	KLP1	08/03/17	12:33
QC1203843863	LCS										
Phosphorus, Total as P	1.00			0.991	mg/L			99.1	(80%-124%)		08/03/17 12:31
QC1203843862	MB										
Phosphorus, Total as P			J	0.0312	mg/L						08/03/17 12:31
QC1203843868	429086001	MS									
Phosphorus, Total as P	1.00	J	0.0264	0.972	mg/L			94.6	(63%-139%)		08/03/17 12:34
Batch	1687584										
QC1203843872	429092001	DUP									
Nitrogen, Nitrate/Nitrite		1.17		1.17	mg/L	0.428	^	(+/-0.250)	AXH3	08/08/17	07:59
QC1203848832	428615005	DUP									
Nitrogen, Nitrate/Nitrite	U	ND	U	ND	mg/L	N/A					08/08/17 07:54
QC1203843871	LCS										
Nitrogen, Nitrate/Nitrite	1.00			1.01	mg/L			101	(90%-110%)		08/08/17 07:52
QC1203843870	MB										
Nitrogen, Nitrate/Nitrite			U	ND	mg/L						08/08/17 07:51
QC1203843874	429092001	PS									
Nitrogen, Nitrate/Nitrite	1.00	0.234		1.27	mg/L			104	(90%-110%)		08/08/17 08:00
QC1203848833	428615005	PS									
Nitrogen, Nitrate/Nitrite	1.00	U	ND	1.02	mg/L			102	(90%-110%)		08/08/17 07:55
Batch	1688439										
QC1203846068	429086002	DUP									
Nitrogen, Total Kjeldahl	U	ND	U	ND	mg/L	N/A			KLP1	08/04/17	12:40

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Nutrient Analysis											
Batch	1688439										
QC1203846067	LCS										
Nitrogen, Total Kjeldahl	1.00			0.990	mg/L		99	(90%-110%)	KLP1	08/04/17	12:35
QC1203846066	MB										
Nitrogen, Total Kjeldahl			U	ND	mg/L					08/04/17	12:34
QC1203846069	429086002	MS									
Nitrogen, Total Kjeldahl	1.00	U	ND	1.04	mg/L		104	(90%-110%)		08/04/17	12:41
Batch	1689399										
QC1203848428	428615005	DUP									
Nitrogen, Ammonia			19.0	19.9	mg/L	4.76		(0%-20%)	KLP1	08/08/17	13:19
QC1203848427	LCS										
Nitrogen, Ammonia	1.00			0.997	mg/L		99.7	(90%-110%)		08/08/17	12:41
QC1203848426	MB										
Nitrogen, Ammonia			U	ND	mg/L					08/08/17	12:40
QC1203848429	428615005	MS									
Nitrogen, Ammonia	5.00		19.0	25.3	mg/L		126*	(90%-110%)		08/08/17	13:20
Solids Analysis											
Batch	1687179										
QC1203842818	429092005	DUP									
Total Dissolved Solids			164	157	mg/L	8.7*		(0%-5%)	KLP1	08/02/17	14:17
QC1203842816	LCS										
Total Dissolved Solids	300			294	mg/L		98.1	(95%-105%)		08/02/17	14:17
QC1203842815	MB										
Total Dissolved Solids			U	ND	mg/L					08/02/17	14:17

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Titration and Ion Analysis											
Batch	1686960										
QC1203842288	429086001	DUP									
Conductivity		244		245	umhos/cm	0.409		(0%-10%)	VH1	07/31/17	13:31
QC1203842287	LCS										
Conductivity	1410			1400	umhos/cm		99.2	(95%-105%)		07/31/17	13:29
Batch	1687455										
QC1203843526	429086001	DUP									
Alkalinity, Total as CaCO3		113		112	mg/L	0.539		(0%-20%)	RXB5	08/09/17	15:39
Carbonate alkalinity (CaCO3)	U	ND	U	ND	mg/L	N/A					
QC1203843525	LCS										
Alkalinity, Total as CaCO3	100			110	mg/L		110	(90%-110%)		08/09/17	15:35
QC1203843528	429086001	MS									
Alkalinity, Total as CaCO3	100	113		216	mg/L		103	(80%-120%)		08/09/17	15:40
Batch	1687458										
QC1203843541	429086001	DUP									
pH	H	8.11	H	8.14	SU	0.369		(0%-5%)	RXB5	08/09/17	15:38
QC1203843540	LCS										
pH	7.00			6.99	SU		99.9	(99%-101%)		08/09/17	15:37

Notes:

- < Result is less than value reported
- > Result is greater than value reported
- B The target analyte was detected in the associated blank.
- E General Chemistry--Concentration of the target analyte exceeds the instrument calibration range
- H Analytical holding time was exceeded
- J Value is estimated
- N/A RPD or %Recovery limits do not apply.
- N1 See case narrative

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
ND	Analyte concentration is not detected above the detection limit										
NJ	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Q	One or more quality control criteria have not been met. Refer to the applicable narrative or DER.										
R	Per section 9.3.4.1 of Method 1664 Revision B, due to matrix spike recovery issues, this result may not be reported or used for regulatory compliance purposes.										
R	Sample results are rejected										
U	Analyte was analyzed for, but not detected above the MDL, MDA, MDC or LOD.										
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier										
Z	Paint Filter Test--Particulates passed through the filter, however no free liquids were observed.										
^	RPD of sample and duplicate evaluated using +/-RL. Concentrations are <5X the RL. Qualifier Not Applicable for Radiochemistry.										
d	5-day BOD--The 2:1 depletion requirement was not met for this sample										
e	5-day BOD--Test replicates show more than 30% difference between high and low values. The data is qualified per the method and can be used for reporting purposes										
h	Preparation or preservation holding time was exceeded										

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more or %RPD not applicable.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

* Indicates that a Quality Control parameter was not within specifications.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.