

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]

**WORK ORDER:**

	<u>AS PLANNED</u>	<u>AS COLLECTED</u>		<u>AS PLANNED</u>	<u>AS COLLECTED</u>
Date Collected (MM/DD/YYYY):	10/30/17	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1326		MEDIA:	OK	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-44 S1		FIELD PREP:	F	
LOCATION TYPE:	OK		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+PerChlorate	1 LITER POLY	1	ICE	↓	↓
↓	WSP- NH3+NO3/NO2+PO4	500 ML AMBER GLASS	1	H2SO4	↓	↓

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

COLLECTED BY (PRINT): T. Bonham

RELINQUISHED BY (Printed Name) <i>Allison Stanfield</i> (Signature) <i>[Signature]</i>	Date/Time <i>10/30/17</i> <i>1605</i>	RECEIVED BY (Printed Name) <i>M. Mafu</i> (Signature) <i>[Signature]</i>	Date/Time <i>10/30/17</i> <i>1605</i>
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time



## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11508

EVENT NAME: Pajarito (TA-54) & Chromium October  
Monthly MY2018 Q1

SAMPLE ID: CAMO-18-147639

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	10/30/17	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1511		MEDIA:	OK	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-44 S2		FIELD PREP:	F	
LOCATION TYPE:	OK		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+PO4	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	10/30/17
Temperature	_____		Turbidity	_____		

COLLECTED BY (PRINT): T. Bonham

RELINQUISHED BY (Printed Name) Allison Stanfield (Signature)	Date/Time 10/30/17 1605	RECEIVED BY (Printed Name) M. M. M. M. (Signature)	Date/Time 10/30/17 1605
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 10/05/2017

**SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY**

EVENT ID: 11508

EVENT NAME: Pajarito (TA-54) & Chromium October  
Monthly MY2018 Q1

SAMPLE ID: CAMO-18-147648

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	10/30/17	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	10 50	OK	MEDIA:		
PRS ID:	NA		SAMPLE TECH CODE:	C-SP	
LOCATION ID:	SIMR-2		FIELD PREP:	F	
LOCATION TYPE:	N		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+PO4	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): T. Bonham D. Scrub

RELINQUISHED BY (Printed Name) Daniel Scrub (Signature) <i>D. Scrub</i>	Date/Time 10/30/17 1245	RECEIVED BY (Printed Name) Ranae Onstott (Signature) <i>Ranae Onstott</i>	Date/Time 10/30/17 1245
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 10/05/2017



## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11508

EVENT NAME: Pajarito (TA-54) & Chromium October  
Monthly MY2018 Q1

SAMPLE ID: CAMO-18-147653

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	10/30/17	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1326		MEDIA:	OK	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-44 S1		FIELD PREP:	UF	
LOCATION TYPE:	OK		FIELD QC TYPE:	REG	
TOP DEPTH:	↓		SAMPLE USAGE:	INV	↓
BOTTOM DEPTH:	↓	↓	EXCAVATED:		YES / NO / <u>NA</u>

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

SAMPLE COMMENTS: Sampled about 40 ft. from running diesel generator

LOCATION COMMENTS:

FIELD PARAMETERS:

Sample Time	1326	HH:MM	Dissolved Oxygen	6.86	Flow (in gpm)	3.33
Oxidation-Reduction Potential	213.2		pH	7.84	Specific Conductance	133.7
Temperature	19.6		Turbidity	0.51		

COLLECTED BY (PRINT): T. Bonham

RELINQUISHED BY (Printed Name) Allizyn Stanfield (Signature) <i>[Signature]</i>	Date/Time 10/30/17 1605	RECEIVED BY <i>[Signature]</i> (Printed Name) <i>[Signature]</i> (Signature)	Date/Time 10/30/17 1605
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 10/05/2017

## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11508

EVENT NAME: Pajarito (TA-54) & Chromium October  
Monthly MY2018 Q1

SAMPLE ID: CAMO-18-147654

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	10/30/17	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1511		MEDIA:	OK	
PRS ID:	OK		SAMPLE TECH CODE:	GSP	
LOCATION ID:	R-44 S2		FIELD PREP:	UF	
LOCATION TYPE:	OK		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	500 ML POLY	1	HNO3	Y	NA
↓	WSP-CN(T)	250 ML POLY	1	NAOH	↓	↓
↓	WSP-TKN+TOC	500 ML AMBER GLASS	1	H2SO4	↓	↓

SAMPLE COMMENTS: sampled 40ft. from running diesel generator

LOCATION COMMENTS: Windy while sampling

## FIELD PARAMETERS:

Sample Time	1511	HH:MM	Dissolved Oxygen	6.98	Flow (in gpm)	3.33
Oxidation-Reduction Potential	254.1		pH	7.90	Specific Conductance	140.1
Temperature	19.8		Turbidity	0.59		

COLLECTED BY (PRINT): T. Bonham

RELINQUISHED BY (Printed Name) Allison Stanfield (Signature)	Date/Time 10/30/17 1605	RECEIVED BY (Printed Name) (Signature)	Date/Time 10/30/17 1605
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 10/05/2017



## SAMPLE COLLECTION LOG/FIELD CHAIN OF CUSTODY

EVENT ID: 11508

EVENT NAME: Pajarito (TA-54) & Chromium October  
Monthly MY2018 Q1

SAMPLE ID: CAMO-18-147663

WORK ORDER:

	AS PLANNED	AS COLLECTED		AS PLANNED	AS COLLECTED
Date Collected (MM/DD/YYYY):	10/30/2017	OK	FIELD MATRIX:	WG	OK
TIME COLLECTED (HH:MM):	1050	OK	MEDIA:		
PRS ID:	NA		SAMPLE TECH CODE:	GSP	
LOCATION ID:	SIMR-2		FIELD PREP:	UF	
LOCATION TYPE:	N <sup>1</sup>		FIELD QC TYPE:	REG	
TOP DEPTH:			SAMPLE USAGE:	INV	OK
BOTTOM DEPTH:			EXCAVATED:		YES / NO / NA

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

SAMPLE COMMENTS:

LOCATION COMMENTS: Sampled 50 ft from running diesel generator

FIELD PARAMETERS:

Sample Time	NA	HH:MM	Dissolved Oxygen	7.15	Flow (in gpm)	3.79
Oxidation-Reduction Potential	32.9		pH	7.83	Specific Conductance	179.7
Temperature	20.0		Turbidity	0.14		

COLLECTED BY (PRINT): T. Bonham A. SanFelic

RELINQUISHED BY (Printed Name) Daniel Sandoz (Signature) <i>[Signature]</i>	Date/Time 10/30/17 1245	RECEIVED BY (Printed Name) Renee Christoff (Signature) <i>[Signature]</i>	Date/Time 10/30/17 1245
RELINQUISHED BY (Printed Name) (Signature)	Date/Time	RECEIVED BY (Printed Name) (Signature)	Date/Time

Report Date: 10/05/2017



COC: 2018-634		TEST - Explosives		YES	NO
Samples collected from a WFO area?					
Field Test for Explosives Results				YES	NO
Spot test shows presence of explosives residues. If YES - Do not ship.					

TEST - Chemical Preservation		YES	NO
Samples are chemically preserved?		X	
Field Team Member Statement		YES	NO
Chemical preservation exceeds limits given 40 CFR 136, Table II - Required Containers, Preservation Techniques and Holding Times (footnote 3). If YES - Do not ship.			X

TEST - Field Screen			YES	NO
The sample has field screening measurements of alpha activity and beta activity?				
Sample Activity (dpm/100cm <sup>2</sup> )	Shipment Activity (dpm*g/100cm <sup>2</sup> )	Sampled Location	YES	NO
Alpha detectable	Alpha >160,000	TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49		
Alpha > 125	Alpha >1,250,000	other locations		
Beta > 1,500	Beta >15,000,000	any location		
The sample Alpha >16,000,000 dpm*g/100cm <sup>2</sup> or Beta > 160,000,000 dpm*g/100cm <sup>2</sup> . If YES - Do not ship.				
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm <sup>2</sup> , beta activity ≥ 240 dpm/cm <sup>2</sup> , or surface activity ≥ 0.5 mR/hr. If YES - Do not ship.				
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910, based on field screening measurements of alpha and beta activity.				

TEST - Location		YES	NO
Prior analytical measurements of radioactive isotopes are available?		X	
Sample Activity (pCi/g)	Shipment Activity (pCi)	YES	NO
<ul style="list-style-type: none"> <li>Am-241 &gt; 27</li> <li>Cs-137 &gt; 270</li> <li>Pu-238 &gt; 27</li> <li>Pu-239/240 &gt; 27</li> <li>Th-228 &gt; 27</li> <li>U-234 &gt; 270</li> <li>U-238 &gt; 270</li> <li>H-3 &gt; 27,000,000</li> </ul>	<ul style="list-style-type: none"> <li>Am-241 &gt; 270,000</li> <li>Cs-137 &gt; 270,000</li> <li>Pu-238 &gt; 270,000</li> <li>Pu-239/240 &gt; 270,000</li> <li>Th-228 &gt; 270,000</li> <li>U-234 &gt; 1,600,000,000</li> <li>U-238 &gt; unlimited</li> <li>H-3 &gt; 27,000,000,000</li> </ul>		
Am-241, Pu-238, Pu-239/240, or Th 228 > 27,000,000 pCi; or Cs-137 > 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. If YES - Do not ship.			X
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910, based on prior analytical measurements of radioactive isotopes.			(X)

TEST - AK		YES	NO	NA
The shippers documented knowledge of the sample positively identifies appropriate labeling.				
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910, and the sample is submitted to ARS or RP for hazard classification analysis.				

HOLD SAMPLES FOR ANALYSIS	
The samples are held per ER-SOP-10094, Rev. 1, 5.2.2 [7]	

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed By:	Date/Time
(Printed Name) MATT ENGLERT	10-31-17
(Signature) M-Engler	1500

Hazard Assessment Reviewed By:	Date/Time
(Printed Name) Melissa Montoya	10/31/17
(Signature)	1500

## DATA VALIDATION REPORT

Chain Of Custody No. 2018-634

### 1. Distribution Of Samples In EDD.

SDG	Analytical Method	Regular Samples	Field Duplicates	Trip Blanks	Field Blanks	Equipment Blanks
436689	EPA:120.1	3				
436689	EPA:150.1	3				
436689	EPA:160.1	3				
436689	EPA:170.0	6				
436689	EPA:245.2	6				
436689	EPA:300.0	3				
436689	EPA:310.1	3				
436689	EPA:335.4	3				
436689	EPA:350.1	3				
436689	EPA:351.2	3				
436689	EPA:353.2	3				
436689	EPA:365.4	3				
436689	SM:A2340B	3				
436689	SW-846:6010C	3				
436689	SW-846:6020	3				
436689	SW-846:6850	3				
436689	SW-846:9060	3				

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
436689	EPA:120.1	1717163	1717163	3										1			1				
436689	EPA:150.1	1716544	1716544	3										1			2				
436689	EPA:160.1	1714739	1714739	3					1					1			1				
436689	EPA:170.0	NA	NA	6																	
436689	EPA:245.2	1719070	1719065	6					1	1				1			1				
436689	EPA:300.0	1715632	1715632	3					1					1			1				
436689	EPA:310.1	1716537	1716537	3						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
436689	EPA:335.4	1714507	1714503	3					1	1				1				1			
436689	EPA:350.1	1715525	1715524	3					1	1				1				1			
436689	EPA:351.2	1715519	1715516	3					1	2				1				2			
436689	EPA:353.2	1715194	1715194	3					1					1				1			
436689	EPA:365.4	1715514	1715513	3					1	2				1				2			
436689	SM:A2340B	1722207	1722207	3																	
436689	SW-846:6010C	1714850	1714849	3					1	1				1				1			
436689	SW-846:6020	1714844	1714843	3					1	1				1				1			
436689	SW-846:6850	1716439	1716438	3					1	1	1			1							
436689	SW-846:9060	1714357	1714357	3					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	CAMO-18-147638	436689001	REG	1	0	0	0
EPA:120.1	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:120.1	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:120.1	GENERAL CHEMISTRY	CAPA-18-147571	1203915375	DUP	1	0	0	0
EPA:120.1	GENERAL CHEMISTRY	LCS	1203915374	LCS	0	0	1	0
EPA:150.1	GENERAL CHEMISTRY	CAMO-18-147638	1203913924	DUP	1	0	0	0
EPA:150.1	GENERAL CHEMISTRY	CAMO-18-147638	436689001	REG	1	0	0	0
EPA:150.1	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:150.1	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:150.1	GENERAL CHEMISTRY	CrIN6-18-148630	1203913925	DUP	1	0	0	0
EPA:150.1	GENERAL CHEMISTRY	LCS	1203913923	LCS	0	0	1	0
EPA:160.1	GENERAL CHEMISTRY	CAMO-18-147638	436689001	REG	1	0	0	0
EPA:160.1	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:160.1	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:160.1	GENERAL CHEMISTRY	CAPA-18-147567	1203909472	DUP	1	0	0	0
EPA:160.1	GENERAL CHEMISTRY	LCS	1203909471	LCS	0	0	1	0
EPA:160.1	GENERAL CHEMISTRY	MB	1203909470	MB	1	0	0	0
EPA:170.0	VOC	CAMO-18-147638	436689001	REG	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:170.0	VOC	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:170.0	VOC	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:170.0	VOC	CAMO-18-147653	436689002	REG	1	0	0	0
EPA:170.0	VOC	CAMO-18-147654	436689004	REG	1	0	0	0
EPA:170.0	VOC	CAMO-18-147663	436689006	REG	1	0	0	0
EPA:245.2	INORGANIC	CAMO-18-147638	436689001	REG	1	0	0	0
EPA:245.2	INORGANIC	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:245.2	INORGANIC	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:245.2	INORGANIC	CAMO-18-147653	436689002	REG	1	0	0	0
EPA:245.2	INORGANIC	CAMO-18-147654	436689004	REG	1	0	0	0
EPA:245.2	INORGANIC	CAMO-18-147663	436689006	REG	1	0	0	0
EPA:245.2	INORGANIC	CAPA-18-147566	1203920278	DUP	1	0	0	0
EPA:245.2	INORGANIC	CAPA-18-147566	1203920280	MS	0	0	1	0
EPA:245.2	INORGANIC	LCS	1203920276	LCS	0	0	1	0
EPA:245.2	INORGANIC	MB	1203920275	MB	1	0	0	0
EPA:300.0	GENERAL CHEMISTRY	CAMO-18-147638	436689001	REG	4	0	0	0
EPA:300.0	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	4	0	0	0
EPA:300.0	GENERAL CHEMISTRY	CAMO-18-147648	1203911578	DUP	4	0	0	0
EPA:300.0	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	4	0	0	0
EPA:300.0	GENERAL CHEMISTRY	LCS	1203911577	LCS	0	0	4	0
EPA:300.0	GENERAL CHEMISTRY	MB	1203911576	MB	4	0	0	0
EPA:310.1	GENERAL CHEMISTRY	CAMO-18-147638	436689001	REG	2	0	0	0
EPA:310.1	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	2	0	0	0
EPA:310.1	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	2	0	0	0
EPA:310.1	GENERAL CHEMISTRY	CrIN6-18-148630	1203913916	DUP	2	0	0	0
EPA:310.1	GENERAL CHEMISTRY	CrIN6-18-148630	1203913918	MS	0	0	1	0
EPA:310.1	GENERAL CHEMISTRY	LCS	1203913913	LCS	0	0	1	0
EPA:335.4	INORGANIC	CAMO-18-147653	436689002	REG	1	0	0	0
EPA:335.4	INORGANIC	CAMO-18-147654	436689004	REG	1	0	0	0
EPA:335.4	INORGANIC	CAMO-18-147663	436689006	REG	1	0	0	0
EPA:335.4	INORGANIC	CAPA-18-147592	1203908918	DUP	1	0	0	0
EPA:335.4	INORGANIC	CAPA-18-147592	1203908920	MS	0	0	1	0
EPA:335.4	INORGANIC	LCS	1203908917	LCS	0	0	1	0
EPA:335.4	INORGANIC	MB	1203908916	MB	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	CAMO-18-147638	436689001	REG	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	CAMO-18-147642	1203911275	DUP	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	CAMO-18-147642	1203911276	MS	0	0	1	0
EPA:350.1	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:350.1	GENERAL CHEMISTRY	LCS	1203911274	LCS	0	0	1	0



## DATA VALIDATION REPORT

Analytical Method	Analytical Method Category	Field Sample ID	Lab Sample ID	Sample Purpose	Target Analytes	Surrogates	Spiked Compounds	TICS
EPA:350.1	GENERAL CHEMISTRY	MB	1203911273	MB	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	CAMO-18-147653	436689002	REG	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	CAMO-18-147654	436689004	REG	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	CAMO-18-147657	1203911263	DUP	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	CAMO-18-147657	1203911265	MS	0	0	1	0
EPA:351.2	GENERAL CHEMISTRY	CAMO-18-147658	1203911264	DUP	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	CAMO-18-147658	1203911266	MS	0	0	1	0
EPA:351.2	GENERAL CHEMISTRY	CAMO-18-147663	436689006	REG	1	0	0	0
EPA:351.2	GENERAL CHEMISTRY	LCS	1203911262	LCS	0	0	1	0
EPA:351.2	GENERAL CHEMISTRY	MB	1203911261	MB	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	CAMO-18-147638	436689001	REG	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	CAPA-18-147566	1203910564	DUP	1	0	0	0
EPA:353.2	GENERAL CHEMISTRY	LCS	1203910562	LCS	0	0	1	0
EPA:353.2	GENERAL CHEMISTRY	MB	1203910561	MB	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CAMO-18-147638	436689001	REG	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CAMO-18-147639	436689003	REG	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CAMO-18-147642	1203911259	DUP	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CAMO-18-147642	1203911260	MS	0	0	1	0
EPA:365.4	GENERAL CHEMISTRY	CAMO-18-147648	436689005	REG	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CAPA-18-147554	1203911257	DUP	1	0	0	0
EPA:365.4	GENERAL CHEMISTRY	CAPA-18-147554	1203911258	MS	0	0	1	0
EPA:365.4	GENERAL CHEMISTRY	LCS	1203911256	LCS	0	0	1	0
EPA:365.4	GENERAL CHEMISTRY	MB	1203911255	MB	1	0	0	0
SM:A2340B	INORGANIC	CAMO-18-147638	436689001	REG	1	0	0	0
SM:A2340B	INORGANIC	CAMO-18-147639	436689003	REG	1	0	0	0
SM:A2340B	INORGANIC	CAMO-18-147648	436689005	REG	1	0	0	0
SW-846:6010C	INORGANIC	CAMO-18-147638	1203909745	DUP	17	0	0	0
SW-846:6010C	INORGANIC	CAMO-18-147638	1203909746	MS	0	0	17	0
SW-846:6010C	INORGANIC	CAMO-18-147638	436689001	REG	17	0	0	0
SW-846:6010C	INORGANIC	CAMO-18-147639	436689003	REG	17	0	0	0
SW-846:6010C	INORGANIC	CAMO-18-147648	436689005	REG	17	0	0	0
SW-846:6010C	INORGANIC	LCS	1203909744	LCS	0	0	17	0
SW-846:6010C	INORGANIC	MB	1203909743	MB	17	0	0	0
SW-846:6020	INORGANIC	CAMO-18-147638	1203909729	DUP	11	0	0	0
SW-846:6020	INORGANIC	CAMO-18-147638	1203909730	MS	0	0	11	0
SW-846:6020	INORGANIC	CAMO-18-147638	436689001	REG	11	0	0	0
SW-846:6020	INORGANIC	CAMO-18-147639	436689003	REG	11	0	0	0
SW-846:6020	INORGANIC	CAMO-18-147648	436689005	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	LCS	1203909728	LCS	0	0	11	0
SW-846:6020	INORGANIC	MB	1203909727	MB	11	0	0	0
SW-846:6850	LCMS/MS PERCHLORATE	CAMO-18-147638	1203913633	MS	0	0	1	0
SW-846:6850	LCMS/MS PERCHLORATE	CAMO-18-147638	1203913634	MSD	0	0	1	0
SW-846:6850	LCMS/MS PERCHLORATE	CAMO-18-147638	436689001	REG	1	0	0	0
SW-846:6850	LCMS/MS PERCHLORATE	CAMO-18-147639	436689003	REG	1	0	0	0
SW-846:6850	LCMS/MS PERCHLORATE	CAMO-18-147648	436689005	REG	1	0	0	0
SW-846:6850	LCMS/MS PERCHLORATE	LCS	1203913632	LCS	0	0	1	0
SW-846:6850	LCMS/MS PERCHLORATE	MB	1203913631	MB	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	CAMO-18-147653	436689002	REG	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	CAMO-18-147654	436689004	REG	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	CAMO-18-147663	436689006	REG	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	CAPA-18-147578	1203908474	DUP	1	0	0	0
SW-846:9060	GENERAL CHEMISTRY	LCS	1203908473	LCS	0	0	1	0
SW-846:9060	GENERAL CHEMISTRY	MB	1203908472	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	1203911255	METHOD BLANK	EPA:365.4	W	Total Phosphate as Phosphorus	0.0231	J	mg/L	0.050
MB	1203920275	METHOD BLANK	EPA:245.2	W	Mercury	-0.131	J	ug/L	0.200



## 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
CAMO-18-147638	1203920275	METHOD BLANK	EPA:245.2	Mercury	-0.131	ug/L	0.067	U	0.200	N	5	100	Y
CAMO-18-147653	1203920275	METHOD BLANK	EPA:245.2	Mercury	-0.131	ug/L	0.067	U	0.200	N	5	100	Y
CAMO-18-147639	1203920275	METHOD BLANK	EPA:245.2	Mercury	-0.131	ug/L	0.067	U	0.200	N	5	100	Y
CAMO-18-147654	1203920275	METHOD BLANK	EPA:245.2	Mercury	-0.131	ug/L	0.067	U	0.200	N	5	100	Y
CAMO-18-147648	1203920275	METHOD BLANK	EPA:245.2	Mercury	-0.131	ug/L	0.067	U	0.200	N	5	100	Y
CAMO-18-147663	1203920275	METHOD BLANK	EPA:245.2	Mercury	-0.131	ug/L	0.067	U	0.200	N	5	100	Y
CAMO-18-147638	1203911255	METHOD BLANK	EPA:365.4	Total Phosphate as Phosphorus	0.0231	mg/L	0.0612		0.050	Y	5	100	Y
CAMO-18-147639	1203911255	METHOD BLANK	EPA:365.4	Total Phosphate as Phosphorus	0.0231	mg/L	0.0571		0.050	Y	5	100	Y
CAMO-18-147648	1203911255	METHOD BLANK	EPA:365.4	Total Phosphate as Phosphorus	0.0231	mg/L	0.0566		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
CAMO-18-147657	1203911265		EPA:351.2	Total Kjeldahl Nitrogen	1715516	11-07-2017	W	116		110	90	10		
CAMO-18-147658	1203911266		EPA:351.2	Total Kjeldahl Nitrogen	1715516	11-07-2017	W	115		110	90	10		

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

No.

## DATA VALIDATION REPORT

9. Any Field Duplicate RPDs outside the desired limits?

No.

10. Any Lab Duplicate RPDs outside the desired limits?

No.

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-44 S1	2018-634	CAMO-18-147638	REG	INIT	GENERAL CHEMISTRY	EPA:365.4	Total Phosphate as Phosphorus		U	I4	N	0.0612	mg/L	0.0612	mg/L			W	10/30/2017		1715514	VAL	Y
R-44 S2	2018-634	CAMO-18-147639	REG	INIT	GENERAL CHEMISTRY	EPA:365.4	Total Phosphate as Phosphorus		U	I4	N	0.0571	mg/L	0.0571	mg/L			W	10/30/2017		1715514	VAL	Y
SIMR-2	2018-634	CAMO-18-147648	REG	INIT	GENERAL CHEMISTRY	EPA:365.4	Total Phosphate as Phosphorus		U	I4	N	0.0566	mg/L	0.0566	mg/L			W	10/30/2017		1715514	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 qualfire. 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
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## DATA VALIDATION REPORT

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CAMO-18-147638	R-44 S1	REG	EPA:120.1	0	1
CAMO-18-147638	R-44 S1	REG	EPA:150.1	0	1
CAMO-18-147638	R-44 S1	REG	EPA:160.1	0	1
CAMO-18-147638	R-44 S1	REG	EPA:170.0	0	1
CAMO-18-147638	R-44 S1	REG	EPA:245.2	0	1
CAMO-18-147638	R-44 S1	REG	EPA:300.0	0	4
CAMO-18-147638	R-44 S1	REG	EPA:310.1	0	2
CAMO-18-147638	R-44 S1	REG	EPA:350.1	0	1
CAMO-18-147638	R-44 S1	REG	EPA:353.2	0	1
CAMO-18-147638	R-44 S1	REG	EPA:365.4	0	1
CAMO-18-147638	R-44 S1	REG	SM:A2340B	0	1
CAMO-18-147638	R-44 S1	REG	SW-846:6010C	0	17
CAMO-18-147638	R-44 S1	REG	SW-846:6020	0	11
CAMO-18-147638	R-44 S1	REG	SW-846:6850	0	1
CAMO-18-147639	R-44 S2	REG	EPA:120.1	0	1
CAMO-18-147639	R-44 S2	REG	EPA:150.1	0	1
CAMO-18-147639	R-44 S2	REG	EPA:160.1	0	1
CAMO-18-147639	R-44 S2	REG	EPA:170.0	0	1
CAMO-18-147639	R-44 S2	REG	EPA:245.2	0	1
CAMO-18-147639	R-44 S2	REG	EPA:300.0	0	4
CAMO-18-147639	R-44 S2	REG	EPA:310.1	0	2
CAMO-18-147639	R-44 S2	REG	EPA:350.1	0	1
CAMO-18-147639	R-44 S2	REG	EPA:353.2	0	1
CAMO-18-147639	R-44 S2	REG	EPA:365.4	0	1
CAMO-18-147639	R-44 S2	REG	SM:A2340B	0	1
CAMO-18-147639	R-44 S2	REG	SW-846:6010C	0	17
CAMO-18-147639	R-44 S2	REG	SW-846:6020	0	11
CAMO-18-147639	R-44 S2	REG	SW-846:6850	0	1
CAMO-18-147648	SIMR-2	REG	EPA:120.1	0	1
CAMO-18-147648	SIMR-2	REG	EPA:150.1	0	1
CAMO-18-147648	SIMR-2	REG	EPA:160.1	0	1
CAMO-18-147648	SIMR-2	REG	EPA:170.0	0	1
CAMO-18-147648	SIMR-2	REG	EPA:245.2	0	1
CAMO-18-147648	SIMR-2	REG	EPA:300.0	0	4
CAMO-18-147648	SIMR-2	REG	EPA:310.1	0	2
CAMO-18-147648	SIMR-2	REG	EPA:350.1	0	1
CAMO-18-147648	SIMR-2	REG	EPA:353.2	0	1



## DATA VALIDATION REPORT

Field Sample ID	Location ID	Sample Purpose	Analytical Method	No. Unuseable Records	Total Records
CAMO-18-147648	SIMR-2	REG	EPA:365.4	0	1
CAMO-18-147648	SIMR-2	REG	SM:A2340B	0	1
CAMO-18-147648	SIMR-2	REG	SW-846:6010C	0	17
CAMO-18-147648	SIMR-2	REG	SW-846:6020	0	11
CAMO-18-147648	SIMR-2	REG	SW-846:6850	0	1
CAMO-18-147653	R-44 S1	REG	EPA:170.0	0	1
CAMO-18-147653	R-44 S1	REG	EPA:245.2	0	1
CAMO-18-147653	R-44 S1	REG	EPA:335.4	0	1
CAMO-18-147653	R-44 S1	REG	EPA:351.2	0	1
CAMO-18-147653	R-44 S1	REG	SW-846:9060	0	1
CAMO-18-147654	R-44 S2	REG	EPA:170.0	0	1
CAMO-18-147654	R-44 S2	REG	EPA:245.2	0	1
CAMO-18-147654	R-44 S2	REG	EPA:335.4	0	1
CAMO-18-147654	R-44 S2	REG	EPA:351.2	0	1
CAMO-18-147654	R-44 S2	REG	SW-846:9060	0	1
CAMO-18-147663	SIMR-2	REG	EPA:170.0	0	1
CAMO-18-147663	SIMR-2	REG	EPA:245.2	0	1
CAMO-18-147663	SIMR-2	REG	EPA:335.4	0	1
CAMO-18-147663	SIMR-2	REG	EPA:351.2	0	1
CAMO-18-147663	SIMR-2	REG	SW-846:9060	0	1

November 27, 2017

[gel.com](http://gel.com)

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

Re: LANL- WQH Water Samples  
Work Order: 436689  
SDG: 2018-634

Dear Ms. Patel:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the following analytical results for the sample(s) we received on November 01, 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: 2018-634  
Enclosures



**ARS International, LLC (ARS-LANS-MTOA6-25093-GEL)**  
**LANL- WQH Water Samples**  
**Work Order #: 436689**  
**SDG: 2018-634**



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# Case Narrative

**Case Narrative for  
ARS International, LLC (ARS-LANS-MTOA6-25093-GEL)  
LANL- WQH Water Samples  
Workorder #: 436689  
SDG # : 2018-634**

**November 27, 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 November 01, 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 temperatures were checked, documented, and within specifications. Shipping container temperature was within specification (0 - 6C). There are no additional comments concerning sample receipt.

**Sample Identification** The laboratory received the following samples:

<b><u>Laboratory ID</u></b>	<b><u>Client ID</u></b>
436689001	CAMO-18-147638
436689002	CAMO-18-147653
436689003	CAMO-18-147639
436689004	CAMO-18-147654
436689005	CAMO-18-147648
436689006	CAMO-18-147663

**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 27 November 2017**

<b>State</b>	<b>Certification</b>
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	SC000122017-24
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

# **Chain of Custody and Supporting Documentation**

[illegible]

Special Instructions:				
Relinquished by: <i>M. Eger</i>	Print Name: MATT ENGELST	Date/Time: 10-31-17 1500	Received by: <i>[Signature]</i>	Print Name: Zac Worshearn Date/Time: 11/1/17 9:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name: Date/Time:
Relinquished by:	Print Name:	Date/Time:	Received by:	Print Name: Date/Time:

COC: 2018-634		TEST - Explosives		YES	NO
Samples collected from a WFO area?					
Field Test for Explosives Results				YES	NO
Spot test shows presence of explosives residues. If YES - Do not ship.					

TEST - Chemical Preservation		YES	NO
Samples are chemically preserved?		X	
Field Team Member Statement		YES	NO
Chemical preservation exceeds limits given 40 CFR 136, Table II - Required Containers, Preservation Techniques and Holding Times (footnote 3). If YES - Do not ship.			X

TEST - Field Screen			YES	NO
The sample has field screening measurements of alpha activity and beta activity?				
Sample Activity (dpm/100cm <sup>2</sup> )	Shipment Activity (dpm*g/100cm <sup>2</sup> )	Sampled Location	YES	NO
Alpha detectable	Alpha >160,000	TA-1 and adjacent hillsides, TA-21, Acid Canyon, MDA C at TA-50, Area G at TA-54, TA-48, or TA-49		
Alpha > 125	Alpha >1,250,000	other locations		
Beta > 1,500	Beta >15,000,000	any location		
The sample Alpha >16,000,000 dpm*g/100cm <sup>2</sup> or Beta > 160,000,000 dpm*g/100cm <sup>2</sup> . If YES - Do not ship.				
On the external surface of the sample container, alpha activity ≥ 24 dpm/cm <sup>2</sup> , beta activity ≥ 240 dpm/cm <sup>2</sup> , or surface activity ≥ 0.5 mR/hr. If YES - Do not ship.				
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910, based on field screening measurements of alpha and beta activity.				

TEST - Location		YES	NO
Prior analytical measurements of radioactive isotopes are available?		X	
Sample Activity (pCi/g)	Shipment Activity (pCi)	YES	NO
• Am-241 > 27	• Am-241 > 270,000		
• Cs-137 > 270	• Cs-137 > 270,000		
• Pu-238 > 27	• Pu-238 > 270,000		
• Pu-239/240 > 27	• Pu-239/240 > 270,000		
• Th-228 > 27	• Th-228 > 270,000		
• U-234 > 270	• U-234 > 1,600,000,000		
• U-238 > 270	• U-238 > unlimited		X
• H-3 > 27,000,000	• H-3 > 27,000,000,000		
Am-241, Pu-238, Pu-239/240, or Th 228 > 27,000,000 pCi; or Cs-137 > 270,000,000 pCi or U-234 ≥ 160,000,000 pCi; or H-3 ≥ 1 Ci. If YES - Do not ship.			X
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910, based on prior analytical measurements of radioactive isotopes.			(X)

TEST - AK		YES	NO	NA
The shippers documented knowledge of the sample positively identifies appropriate labeling.				
The sample is tentatively identified as DOT Hazard Class 7 (Radioactive). The shipment is labeled Radioactive Material, Excepted Package - Limited Quantity of Material - UN2910, and the sample is submitted to ARS or RP for hazard classification analysis.				

HOLD SAMPLES FOR ANALYSIS	
The samples are held per ER-SOP-10094, Rev. 1, 5.2.2 [7]	

These samples do not meet the criteria for classification in any hazard class according to regulation OSHA 29 CFR 1910.1200. The sample(s) contained in this shipment have been assigned a tentative proper DOT shipping name, hazard class, identification number, and packing group, based on the shipper's knowledge of the sample:

Hazard Assessment Completed By:	Date/Time
(Printed Name) MATT ENGLERT	10-31-17
(Signature) M-Engler	1500

Hazard Assessment Reviewed By:	Date/Time
(Printed Name) Melissa Marten	10/31/17
(Signature)	1500





## SAMPLE RECEIPT &amp; REVIEW FORM

Client: <u>ESHL</u>			SDG/AR/COC/Work Order: <u>436689</u>			
Received By: <u>ZKW</u>			Date Received: <u>11/1/17</u>			
Carrier and Tracking Number			Circle Applicable: <input checked="" type="radio"/> FedEx Express <input type="radio"/> FedEx Ground <input type="radio"/> UPS <input type="radio"/> Field Services <input type="radio"/> Courier <input type="radio"/> Other <u>5908 1783 0997</u> <u>5908 1783 0986</u>			
Suspected Hazard Information	Yes	No	*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.			
Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	Hazard Class Shipped: _____ UN#: _____			
COC/Samples marked or classified as radioactive?		<input checked="" type="checkbox"/>	Maximum Net Counts Observed* (Observed Counts - Area Background Counts): <u>0</u> <input checked="" type="radio"/> CPM/mR/Hr Classified as: Rad 1    Rad 2    Rad 3			
Is package, COC, and/or Samples marked HAZ?		<input checked="" type="checkbox"/>	If yes, select Hazards below, and contact the GEL Safety Group. PCB's    Flammable    Foreign Soil    RCRA    Asbestos    Beryllium    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"/>				Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
2	Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>				
3	Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>				Preservation Method: Wet Ice <input checked="" type="radio"/> 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"/>				Temperature Device Serial #: <u>IR3-16</u> Secondary Temperature Device Serial # (If Applicable): _____
5	Sample containers intact and sealed?	<input checked="" type="checkbox"/>				Circle Applicable: Seals broken    Damaged container    Leaking container    Other (describe)
6	Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>				Sample ID's and Containers Affected: _____ If Preservation added, Lot#: _____
7	Do any samples require Volatile Analysis?					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"/>				ID's and tests affected: _____
9	Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>				Sample ID's and containers affected: _____
10	Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>				Sample ID's affected: _____
11	Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>				Sample ID's affected: _____
12	Are sample containers identifiable as GEL provided?			<input checked="" type="checkbox"/>		
13	COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>				
Comments (Use Continuation Form if needed):						

PM (or PMA) review: Initials ZKWDate 11/2/17Page 1of 1

ORIGIN ID:SAFA (505) 665-9566  
SHIP DATE: 03/01/16  
ACTWT: 43.0 LB MAN  
CAD: 0014176/CAFE2916  
LOS ALAMOS NATL LAB  
TA00 BLDG 1237 DPU 03  
LOS ALAMOS, NM 87545  
UNITED STATES US  
BILL SENDER

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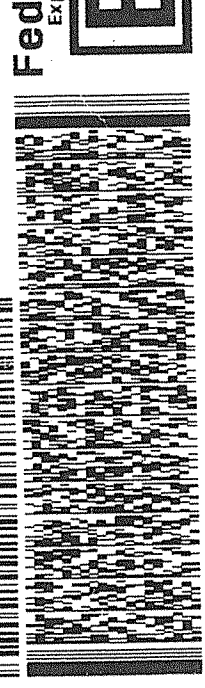
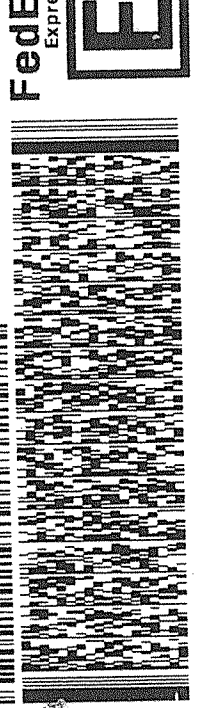
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TO **VALERIE DAVIS**  
**GENERAL ENGINEERING LAB**  
**2040 SAVAGE RD**  
**CHARLESTON SC 29407**  
(843) 566-8171  
REF: 21PD0ASRGW04RAGWS0

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1 of 2  
WED - 01 NOV 10:30  
PRIORITY OVERNIGHT  
TRK# 5908 1783 0986  
0201  
## MASTER ##  
29407  
SC-US  
CHS

2 of 2  
WED - 01 NOV 10:30  
PRIORITY OVERNIGHT  
MPS# 5908 1783 0997  
0263  
Mstr# 5908 1783 0986  
0201  
29407  
SC-US  
CHS

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WED - 01 NOV 10:30  
PRIORITY OVERNIGHT  
MPS# 5908 1783 0997  
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0201  
29407  
SC-US  
CHS



# **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 #: 2018-634  
Work Order #: 436689**

**Method/Analysis Information**

<b>Procedure:</b>	<b>Definitive Low Level Perchlorate Analysis Utilizing Liquid Chromatography/Mass Spectrometry/Mass Spectrometry (LC/MS/MS) by EPA Method 6850 Modified (6850M)</b>
Analytical Method:	SW-846:6850
Prep Method:	SW-846:6850
Analytical Batch Number:	1716439
Prep Batch Number:	1716438

**Sample Analysis**

<b>Sample ID</b>	<b>Client ID</b>
436689001	436689001 (CAMO-18-147638)
436689003	436689003 (CAMO-18-147639)
436689005	436689005 (CAMO-18-147648)
1203913635	Interference Check Sample (ICS)
1203913631	Method Blank (MB)
1203913632	Laboratory Control Sample (LCS)
1203913633	436689001(CAMO-18-147638) Matrix Spike (MS)
1203913634	436689001(CAMO-18-147638) 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.

### **Laboratory Control Sample (LCS) Recovery**

The LCS spike recoveries met the acceptance limits.

### **Interference Check Sample (ICS)**

The ICS spike recoveries met the acceptance criteria.

### **QC Sample Designation**

Client sample 436689001 (CAMO-18-147638) was chosen for matrix spike and matrix spike duplicate analysis.

### **Matrix Spike (MS) Recovery Statement**

The MS recoveries were within the established acceptance limits.

### **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: 2018-634 GEL Work Order: 436689

#### 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: Michael Penny

Date: 13 NOV 2017

Title: Group Leader

# **Sample Data Summary**

## Perchlorate Analysis Data Sheet

Lab Name: GEL Laboratories LLCLab Code: GELInstrument: LCMSMSMethod: SW846 6850 ModifiedMatrix: WATERExtraction Batch ID: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CAMO-18-147638Date Received: 01-NOV-17GEL Job No (SDG): 2018-634GEL Sample ID: 436689001Date Filtered: 07-NOV-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	0.406	ug/L		1	07-NOV-17 18:44	per1107016a
	Perchlorate Isotope Ratio			3.09			1	07-NOV-17 18:44	per1107016a
14797-73-0	Perchlorate-101	.05	.2	0.405	ug/L		1	07-NOV-17 18:44	per1107016a
	Perchlorate-O(18)			0.460	ug/L		1	07-NOV-17 18:44	per1107016a

^ 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: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CAMO-18-147639Date Received: 01-NOV-17GEL Job No (SDG): 2018-634GEL Sample ID: 436689003Date Filtered: 07-NOV-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	0.346	ug/L		1	07-NOV-17 19:12	per1107019a
	Perchlorate Isotope Ratio			3.17			1	07-NOV-17 19:12	per1107019a
14797-73-0	Perchlorate-101	.05	.2	0.337	ug/L		1	07-NOV-17 19:12	per1107019a
	Perchlorate-O(18)			0.417	ug/L		1	07-NOV-17 19:12	per1107019a

^ 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: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CAMO-18-147648Date Received: 01-NOV-17GEL Job No (SDG): 2018-634GEL Sample ID: 436689005Date Filtered: 07-NOV-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	0.399	ug/L		1	07-NOV-17 19:21	per1107020a
	Perchlorate Isotope Ratio			3.33			1	07-NOV-17 19:21	per1107020a
14797-73-0	Perchlorate-101	.05	.2	0.370	ug/L		1	07-NOV-17 19:21	per1107020a
	Perchlorate-O(18)			0.397	ug/L		1	07-NOV-17 19:21	per1107020a

^ 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):** 2018-634

**Extract Batch Code:** 1716438

**Date Filtered:** 07-NOV-17

**Matrix:** WATER

**Sample ID:** 1203913632

Analyte^	True	Found	Units	%Rec	Q	Control Limits
Perchlorate	0.200	.181	ug/L	90		85 - 115
Perchlorate Isotope Ratio		2.76				-
Perchlorate-101	0.200	.202	ug/L	101		85 - 115
Perchlorate-O(18)		.42	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):** 2018-634

**Extract Batch Code:** 1716438

**Date Extracted:** 07-NOV-17

**GEL MS/PS ID:** 1203913633

**Client ID:** CAMO-18-147638

**GEL MSD/PSD ID:** 1203913634

**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	0.406	ug/L	0.591	93	.567	81	4	30	75 - 125
Perchlorate Isotope Ratio	0	3.09		2.97		3.09		4		-
Perchlorate-101	0.200	0.405	ug/L	0.615	105	.566	80	8	30	75 - 125
Perchlorate-O(18)	0	0.460	ug/L	0.447		.464		4		-

^ 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: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

MBDate Received: 07-NOV-17GEL Job No (SDG): 2018-634GEL Sample ID: 1203913631Date Filtered: 07-NOV-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	0.050	ug/L	U	1	07-NOV-17 18:15	per1107013a
	Perchlorate Isotope Ratio						1	07-NOV-17 18:15	per1107013a
14797-73-0	Perchlorate-101	.05	.2	0.050	ug/L	U	1	07-NOV-17 18:15	per1107013a
	Perchlorate-O(18)			0.436	ug/L		1	07-NOV-17 18:15	per1107013a

^ 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: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

LCSDate Received: 07-NOV-17GEL Job No (SDG): 2018-634GEL Sample ID: 1203913632Date Filtered: 07-NOV-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	0.181	ug/L	J	1	07-NOV-17 18:25	per1107014a
	Perchlorate Isotope Ratio			2.76			1	07-NOV-17 18:25	per1107014a
14797-73-0	Perchlorate-101	.05	.2	0.202	ug/L		1	07-NOV-17 18:25	per1107014a
	Perchlorate-O(18)			0.420	ug/L		1	07-NOV-17 18:25	per1107014a

^ 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: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

ICS

Date Received:

GEL Job No (SDG): 2018-634GEL Sample ID: 1203913635Date Filtered: 07-NOV-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	0.206	ug/L		1	07-NOV-17 18:34	per1107015a
	Perchlorate Isotope Ratio			2.97			1	07-NOV-17 18:34	per1107015a
14797-73-0	Perchlorate-101	.05	.2	0.214	ug/L		1	07-NOV-17 18:34	per1107015a
	Perchlorate-O(18)			0.442	ug/L		1	07-NOV-17 18:34	per1107015a

^ 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: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CAMO-18-147638MSDate Received: 01-NOV-17GEL Job No (SDG): 2018-634GEL Sample ID: 1203913633Date Filtered: 07-NOV-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	0.591	ug/L		1	07-NOV-17 18:53	per1107017a
	Perchlorate Isotope Ratio			2.97			1	07-NOV-17 18:53	per1107017a
14797-73-0	Perchlorate-101	.05	.2	0.615	ug/L		1	07-NOV-17 18:53	per1107017a
	Perchlorate-O(18)			0.447	ug/L		1	07-NOV-17 18:53	per1107017a

^ 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: 1716438Extraction Type: Filter/DAISample Volume/Weight: 10.0 mLConcentrated Extract Volume: 10.0

Client Sample No.

CAMO-18-147638MSDDate Received: 01-NOV-17GEL Job No (SDG): 2018-634GEL Sample ID: 1203913634Date Filtered: 07-NOV-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	0.567	ug/L		1	07-NOV-17 19:03	per1107018a
	Perchlorate Isotope Ratio			3.09			1	07-NOV-17 19:03	per1107018a
14797-73-0	Perchlorate-101	.05	.2	0.566	ug/L		1	07-NOV-17 19:03	per1107018a
	Perchlorate-O(18)			0.464	ug/L		1	07-NOV-17 19:03	per1107018a

^ 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 #: 2018-634**  
**Work Order #: 436689**

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689002	CAMO-18-147653
436689003	CAMO-18-147639
436689004	CAMO-18-147654
436689005	CAMO-18-147648
436689006	CAMO-18-147663
1203909743	Method Blank (MB) <b>ICP</b>
1203909744	Laboratory Control Sample (LCS)
1203909747	436689001(CAMO-18-147638L) Serial Dilution (SD)
1203909745	436689001(CAMO-18-147638D) Sample Duplicate (DUP)
1203909746	436689001(CAMO-18-147638S) Matrix Spike (MS)
1203909727	Method Blank (MB) <b>ICP-MS</b>
1203909728	Laboratory Control Sample (LCS)
1203909731	436689001(CAMO-18-147638L) Serial Dilution (SD)
1203909729	436689001(CAMO-18-147638D) Sample Duplicate (DUP)
1203909730	436689001(CAMO-18-147638S) Matrix Spike (MS)
1203920275	Method Blank (MB) <b>CVAA</b>
1203920276	Laboratory Control Sample (LCS)
1203920282	436615001(CAPA-18-147566L) Serial Dilution (SD)
1203920278	436615001(CAPA-18-147566D) Sample Duplicate (DUP)
1203920280	436615001(CAPA-18-147566S) Matrix Spike (MS)

**Sample Analysis**

Samples 436689001,002,003,004,005 and 006 in this SDG were analyzed for metals and mercury on an "as received" basis.

**Method/Analysis Information**

<b>Analytical Batch:</b>	1714850, 1714844, 1719070 and 1722207
<b>Prep Batch :</b>	1714849, 1714843 and 1719065
<b>Standard Operating Procedures:</b>	GL-MA-E-013 REV# 30, GL-MA-E-006 REV# 14, GL-MA-E-014 REV# 32, GL-MA-E-010 REV# 36 and GL-GC-E-107 REV# 10
<b>Analytical Method:</b>	SW846 3005A/6010C, SW846 3005A/6020A, EPA 245.2 1974 and SM:A2340B
<b>Prep Method :</b>	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 CaCO<sub>3</sub> is calculated from Calcium and Magnesium results.

The Metals analysis-ICP was performed on a PE 7300 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-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: 436689001 (CAMO-18-147638)-ICP and ICP-MS and 436615001 (CAPA-18-147566)-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. Not all the applicable analyte RPD values were within the acceptance criteria.

Sample	Analyte	Value
1203909745 (CAMO-18-147638DUP)	Tin	abs(23.1 - .316)* (+/-10 ug/L)

#### **Serial Dilution % Difference Statement**

All applicable analytes in the serial dilution (SDILT) demonstrated acceptable correlation to its associated sample and met the established acceptance percent difference criteria.

#### **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.

Hardness = 2.497 (Ca) + 4.118 (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: 2018-634 GEL Work Order: 436689

#### **The Qualifiers in this report are defined as follows:**

- \* A quality control analyte recovery is outside of specified acceptance 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: Nik-Cole Elmore**

**Date: 28 NOV 2017**

**Title: Data Validator**

# **Sample Data Summary**

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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 436689001**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147638**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	11/16/17 12:11	111617W4-4	1719070

**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

SDG No: 2018-634

CONTRACT: ESHL00114

METHOD TYPE: SW846

SAMPLE ID: 436689001

BASIS: As Received

DATE COLLECTED 30-OCT-17

CLIENT ID: CAMO-18-147638

LEVEL: Low

DATE RECEIVED 01-NOV-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	JWJ	11/28/17 15:11	112817-1	1714850
7440-36-0	Antimony	1	ug/L	U	1	3	3	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-38-2	Arsenic	2	ug/L	U	2	5	5	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-39-3	Barium	19.2	ug/L		1	5	5	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-41-7	Beryllium	1	ug/L	U	1	5	5	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-42-8	Boron	15	ug/L	U	15	50	50	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-43-9	Cadmium	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-70-2	Calcium	12200	ug/L		50	200	200	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-47-3	Chromium	14.1	ug/L		3	10	10	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-48-4	Cobalt	1	ug/L	U	1	5	5	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-50-8	Copper	3	ug/L	U	3	10	10	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7439-89-6	Iron	30	ug/L	U	30	100	100	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7439-92-1	Lead	0.50	ug/L	U	0.5	2	2	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7439-95-4	Magnesium	3350	ug/L		110	300	300	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7439-96-5	Manganese	2	ug/L	U	2	10	10	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7439-98-7	Molybdenum	0.839	ug/L		0.2	0.5	0.5	1	MS	BAJ	11/02/17 13:22	171102-3	1714844
7440-02-0	Nickel	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-09-7	Potassium	998	ug/L		50	150	150	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7782-49-2	Selenium	2	ug/L	U	2	5	5	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7631-86-9	Silica	61700	ug/L		53	213	213	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-22-4	Silver	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-23-5	Sodium	8830	ug/L		100	300	300	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-24-6	Strontium	52	ug/L		1	5	5	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-28-0	Thallium	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-31-5	Tin	2.5	ug/L	U*	2.5	10	10	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-61-1	Uranium	0.399	ug/L		0.067	0.2	0.2	1	MS	BAJ	11/02/17 08:45	171101-2	1714844
7440-62-2	Vanadium	4.58	ug/L	J	1	5	5	1	P	JWJ	11/28/17 15:11	112817-1	1714850
7440-66-6	Zinc	3.3	ug/L	U	3.3	10	10	1	P	JWJ	11/28/17 15:11	112817-1	1714850



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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:****SAMPLE ID:** 436689001**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147638**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	44.3	mg/L		0.453	1.24	1.24	1		JJ2	11/28/17 16:03		1722207

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1714844	1714843	SW846 3005A	50	mL	50	mL	11/01/17	JXM8
1714850	1714849	SW846 3005A	50	mL	50	mL	11/01/17	JXM8
1719070	1719065	EPA 245.1/245.2 Prep	20	mL	20	mL	11/15/17	AXS5

**\*Analytical Methods:**

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

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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 436689002**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147653**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	11/16/17 12:13	111617W4-4	1719070

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1719070	1719065	EPA 245.1/245.2 Prep	20	mL	20	mL	11/15/17	AXS5

**\*Analytical Methods:**

AV      EPA 245.2 1974

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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 436689003**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147639**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	11/16/17 12:15	111617W4-4	1719070

**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

SDG No: 2018-634

CONTRACT: ESHL00114

METHOD TYPE: SW846

SAMPLE ID: 436689003

BASIS: As Received

DATE COLLECTED 30-OCT-17

CLIENT ID: CAMO-18-147639

LEVEL: Low

DATE RECEIVED 01-NOV-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	JWJ	11/28/17 15:21	112817-1	1714850
7440-36-0	Antimony	1	ug/L	U	1	3	3	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-38-2	Arsenic	2	ug/L	U	2	5	5	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-39-3	Barium	21.1	ug/L		1	5	5	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-41-7	Beryllium	1	ug/L	U	1	5	5	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-42-8	Boron	15	ug/L	U	15	50	50	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-43-9	Cadmium	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-70-2	Calcium	13200	ug/L		50	200	200	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-47-3	Chromium	7.75	ug/L	J	3	10	10	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-48-4	Cobalt	1	ug/L	U	1	5	5	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-50-8	Copper	3	ug/L	U	3	10	10	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7439-89-6	Iron	30	ug/L	U	30	100	100	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7439-92-1	Lead	0.50	ug/L	U	0.5	2	2	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7439-95-4	Magnesium	3900	ug/L		110	300	300	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7439-96-5	Manganese	2	ug/L	U	2	10	10	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7439-98-7	Molybdenum	0.707	ug/L		0.2	0.5	0.5	1	MS	BAJ	11/02/17 13:27	171102-3	1714844
7440-02-0	Nickel	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-09-7	Potassium	1140	ug/L		50	150	150	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7782-49-2	Selenium	2	ug/L	U	2	5	5	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7631-86-9	Silica	67000	ug/L		53	213	213	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-22-4	Silver	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-23-5	Sodium	9810	ug/L		100	300	300	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-24-6	Strontium	54.3	ug/L		1	5	5	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-28-0	Thallium	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-31-5	Tin	2.5	ug/L	U*	2.5	10	10	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-61-1	Uranium	0.447	ug/L		0.067	0.2	0.2	1	MS	BAJ	11/02/17 09:02	171101-2	1714844
7440-62-2	Vanadium	5.49	ug/L		1	5	5	1	P	JWJ	11/28/17 15:21	112817-1	1714850
7440-66-6	Zinc	11.5	ug/L		3.3	10	10	1	P	JWJ	11/28/17 15:21	112817-1	1714850

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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:****SAMPLE ID:** 436689003**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147639**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	49	mg/L		0.453	1.24	1.24	1		JJ2	11/28/17 16:03		1722207

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1714844	1714843	SW846 3005A	50	mL	50	mL	11/01/17	JXM8
1714850	1714849	SW846 3005A	50	mL	50	mL	11/01/17	JXM8
1719070	1719065	EPA 245.1/245.2 Prep	20	mL	20	mL	11/15/17	AXS5

**\*Analytical Methods:**

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

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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 436689004**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147654**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	11/16/17 12:16	111617W4-4	1719070

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1719070	1719065	EPA 245.1/245.2 Prep	20	mL	20	mL	11/15/17	AXS5

**\*Analytical Methods:**

AV EPA 245.2 1974

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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 436689005**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147648**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	11/16/17 12:18	111617W4-4	1719070

**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

SDG No: 2018-634

CONTRACT: ESHL00114

METHOD TYPE: SW846

SAMPLE ID: 436689005

BASIS: As Received

DATE COLLECTED 30-OCT-17

CLIENT ID: CAMO-18-147648

LEVEL: Low

DATE RECEIVED 01-NOV-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	JWJ	11/28/17 15:24	112817-1	1714850
7440-36-0	Antimony	1	ug/L	U	1	3	3	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-38-2	Arsenic	2	ug/L	U	2	5	5	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-39-3	Barium	23.4	ug/L		1	5	5	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-41-7	Beryllium	1	ug/L	U	1	5	5	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-42-8	Boron	15	ug/L	U	15	50	50	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-43-9	Cadmium	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-70-2	Calcium	12200	ug/L		50	200	200	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-47-3	Chromium	5.45	ug/L	J	3	10	10	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-48-4	Cobalt	1	ug/L	U	1	5	5	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-50-8	Copper	3	ug/L	U	3	10	10	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7439-89-6	Iron	30	ug/L	U	30	100	100	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7439-92-1	Lead	0.50	ug/L	U	0.5	2	2	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7439-95-4	Magnesium	3080	ug/L		110	300	300	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7439-96-5	Manganese	2	ug/L	U	2	10	10	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7439-98-7	Molybdenum	1.1	ug/L		0.2	0.5	0.5	1	MS	BAJ	11/02/17 13:29	171102-3	1714844
7440-02-0	Nickel	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-09-7	Potassium	1240	ug/L		50	150	150	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7782-49-2	Selenium	2	ug/L	U	2	5	5	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7631-86-9	Silica	66500	ug/L		53	213	213	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-22-4	Silver	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-23-5	Sodium	9640	ug/L		100	300	300	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-24-6	Strontium	50.7	ug/L		1	5	5	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-28-0	Thallium	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-31-5	Tin	2.5	ug/L	U*	2.5	10	10	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-61-1	Uranium	0.408	ug/L		0.067	0.2	0.2	1	MS	BAJ	11/02/17 09:05	171101-2	1714844
7440-62-2	Vanadium	5.48	ug/L		1	5	5	1	P	JWJ	11/28/17 15:24	112817-1	1714850
7440-66-6	Zinc	3.3	ug/L	U	3.3	10	10	1	P	JWJ	11/28/17 15:24	112817-1	1714850



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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:****SAMPLE ID:** 436689005**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147648**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	43.2	mg/L		0.453	1.24	1.24	1		JJ2	11/28/17 16:03		1722207

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1714844	1714843	SW846 3005A	50	mL	50	mL	11/01/17	JXM8
1714850	1714849	SW846 3005A	50	mL	50	mL	11/01/17	JXM8
1719070	1719065	EPA 245.1/245.2 Prep	20	mL	20	mL	11/15/17	AXS5

**\*Analytical Methods:**

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

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**METALS**  
**-1-**  
**INORGANICS ANALYSIS DATA PACKAGE**

**SDG No:** 2018-634**CONTRACT:** ESHL00114**METHOD TYPE:** EPA**SAMPLE ID:** 436689006**BASIS:** As Received**DATE COLLECTED** 30-OCT-17**CLIENT ID:** CAMO-18-147663**LEVEL:** Low**DATE RECEIVED** 01-NOV-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	11/16/17 12:20	111617W4-4	1719070

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1719070	1719065	EPA 245.1/245.2 Prep	20	mL	20	mL	11/15/17	AXS5

**\*Analytical Methods:**

AV      EPA 245.2 1974

# **Quality Control Summary**

**METALS**  
**-3b-**  
**PREPARATION BLANK SUMMARY**

**SDG NO.** 2018-634  
**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>
1203909727	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
	Molybdenum	0.2	ug/L	+/-0.5	U	MS	0.2	0.5
	Nickel	0.6	ug/L	+/-2	U	MS	0.6	2
	Lead	0.5	ug/L	+/-2	U	MS	0.5	2
	Chromium	3	ug/L	+/-10	U	MS	3	10
	Selenium	2	ug/L	+/-5	U	MS	2	5
	Thallium	0.6	ug/L	+/-2	U	MS	0.6	2
	Uranium	0.067	ug/L	+/-0.2	U	MS	0.067	0.2
	Silver	0.3	ug/L	+/-1	U	MS	0.3	1
1203909743	Calcium	50	ug/L	+/-200	U	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
	Boron	15	ug/L	+/-50	U	P	15	50
	Beryllium	1	ug/L	+/-5	U	P	1	5
	Barium	1	ug/L	+/-5	U	P	1	5
	Aluminum	68	ug/L	+/-200	U	P	68	200
	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	3.3	ug/L	+/-10	U	P	3.3	10
1203920275	Mercury	-0.131	ug/L	+/-0.2	J	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. 2018-634 Client ID CAMO-18-147638S

Contract: ESHL00114 Level: Low

Matrix: WATER % Solids:

Sample ID: 436689001 Spike ID: 1203909730

<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>
Arsenic	ug/L	75-125	50.1		2	U	50	98		MS
Cadmium	ug/L	75-125	49		0.3	U	50	98		MS
Chromium	ug/L	75-125	62		14.1		50	95.9		MS
Lead	ug/L	75-125	47.2		0.5	U	50	94.4		MS
Molybdenum	ug/L	75-125	48.9		0.839		50	96		MS
Nickel	ug/L	75-125	49.9		0.6	U	50	98.9		MS
Selenium	ug/L	75-125	50.1		2	U	50	98.6		MS
Silver	ug/L	75-125	49.4		0.3	U	50	98.9		MS
Thallium	ug/L	75-125	46		0.6	U	50	92		MS
Uranium	ug/L	75-125	44.9		0.399		50	89.1		MS
Antimony	ug/L	75-125	48.2		1	U	50	96		MS

## \*Analytical Methods:

MS SW846 3005A/6020A

## METALS

-5a-

## Matrix Spike Summary

SDG NO. 2018-634 Client ID: CAMO-18-147638S

Contract: ESHL00114 Level: Low

Matrix: WATER % Solids:

Sample ID: 436689001 Spike ID: 1203909746

<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	4950		68	U	5000	98.9		P
Barium	ug/L	75-125	499		19.2		500	96		P
Beryllium	ug/L	75-125	484		1	U	500	96.7		P
Boron	ug/L	75-125	486		15	U	500	95		P
Calcium	ug/L	75-125	17300		12200		5000	102		P
Cobalt	ug/L	75-125	483		1	U	500	96.4		P
Copper	ug/L	75-125	489		3	U	500	97.8		P
Iron	ug/L	75-125	4970		30	U	5000	99.3		P
Magnesium	ug/L	75-125	8440		3350		5000	102		P
Manganese	ug/L	75-125	479		2	U	500	95.8		P
Potassium	ug/L	75-125	5750		998		5000	95		P
Silica	ug/L		73000		61700		10700	106	N/A	P
Sodium	ug/L	75-125	13700		8830		5000	98.3		P
Strontium	ug/L	75-125	533		52		500	96.2		P
Tin	ug/L	75-125	473		2.5	U	500	94.5		P
Vanadium	ug/L	75-125	487		4.58	J	500	96.4		P
Zinc	ug/L	75-125	473		3.3	U	500	94.4		P

\*Analytical Methods:

P SW846 3005A/6010C

## METALS

-5a-

## Matrix Spike Summary

**SDG NO.** 2018-634 **Client ID:** CAPA-18-147566S**Contract:** ESHL00114 **Level:** Low**Matrix:** WATER **% Solids:****Sample ID:** 436615001 **Spike ID:** 1203920280

<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	2		0.067	U	2	100		AV

## \*Analytical Methods:

AV EPA 245.1/245.2

**Metals**  
**-6-**  
**Duplicate Sample Summary**

SDG No.: 2018-634

Lab Code: GEL

Contract: ESHL00114

Client ID: CAMO-18-147638D

Matrix: WATER

Level: Low

Sample ID: 436689001

Duplicate ID: 1203909729

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		2 U		2 U				MS
Cadmium	ug/L		0.3 U		0.3 U				MS
Chromium	ug/L	+/-10	14.1		14		.249		MS
Lead	ug/L		0.5 U		0.5 U				MS
Molybdenum	ug/L	+/- .5	0.839		0.897		6.68		MS
Nickel	ug/L		0.6 U		0.6 U				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	0.399		0.389		2.54		MS

\*Analytical Methods:

MS SW846 3005A/6020A



**Metals**  
**-6-**  
**Duplicate Sample Summary**

SDG No.: 2018-634

Lab Code: GEL

Contract: ESHL00114

Client ID: CAMO-18-147638D

Matrix: WATER

Level: Low

Sample ID: 436689001

Duplicate ID: 1203909745

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	+/-5	19.2		20		3.74		P
Beryllium	ug/L		1 U		1 U				P
Boron	ug/L		15 U		15 U				P
Calcium	ug/L	+/-20%	12200		12500		2.45		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%	3350		3430		2.33		P
Manganese	ug/L		2 U		2 U				P
Potassium	ug/L	+/-20%	998		1070		7.17		P
Silica	ug/L	+/-20%	61700		63500		2.97		P
Sodium	ug/L	+/-20%	8830		8980		1.7		P
Strontium	ug/L	+/-20%	52		52.9		1.77		P
Tin	ug/L	+/-10	0.316 U		23.1		195	*	P
Vanadium	ug/L	+/-5	4.58 J		4.15 J		9.73		P
Zinc	ug/L		3.3 U		3.3 U				P

\*Analytical Methods:

P SW846 3005A/6010C

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**Metals**  
**–6–**  
**Duplicate Sample Summary**

**SDG No.:** 2018–634**Lab Code:** GEL**Contract:** ESHL00114**Client ID:** CAPA–18–147566D**Matrix:** WATER**Level:** Low**Sample ID:** 436615001**Duplicate ID:** 1203920278**Percent Solids for Dup:** N/A

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

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**\*Analytical Methods:**

AV EPA 245.1/245.2

## METALS

-7-

## Laboratory Control Sample Summary

SDG NO. 2018-634

Contract: ESHL00114

Aqueous LCS Source: Inorganic Ventures

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>
1203909728								
	Antimony	ug/L	50	46		92	80-120	MS
	Arsenic	ug/L	50	49.2		98.4	80-120	MS
	Cadmium	ug/L	50	48		96.1	80-120	MS
	Chromium	ug/L	50	48.3		96.6	80-120	MS
	Lead	ug/L	50	45.7		91.5	80-120	MS
	Molybdenum	ug/L	50	45.2		90.5	80-120	MS
	Nickel	ug/L	50	48.6		97.2	80-120	MS
	Selenium	ug/L	50	50.5		101	80-120	MS
	Silver	ug/L	50	47.5		94.9	80-120	MS
	Thallium	ug/L	50	44.6		89.3	80-120	MS
	Uranium	ug/L	50	42.7		85.4	80-120	MS

## \*Analytical Methods:

MS SW846 3005A/6020A

## METALS

-7-

## Laboratory Control Sample Summary

SDG NO. 2018-634

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>
1203909744								
	Aluminum	ug/L	5000	5080		102	80-120	P
	Barium	ug/L	500	485		97	80-120	P
	Beryllium	ug/L	500	484		96.7	80-120	P
	Boron	ug/L	500	477		95.4	80-120	P
	Calcium	ug/L	5000	5100		102	80-120	P
	Cobalt	ug/L	500	489		97.8	80-120	P
	Copper	ug/L	500	491		98.1	80-120	P
	Iron	ug/L	5000	5010		100	80-120	P
	Magnesium	ug/L	5000	5170		103	80-120	P
	Manganese	ug/L	500	490		98.1	80-120	P
	Potassium	ug/L	5000	4730		94.7	80-120	P
	Silica	ug/L	10700	9820		91.7	80-120	P
	Sodium	ug/L	5000	4870		97.5	80-120	P
	Strontium	ug/L	500	488		97.6	80-120	P
	Tin	ug/L	500	474		94.8	80-120	P
	Vanadium	ug/L	500	488		97.6	80-120	P
	Zinc	ug/L	500	481		96.3	80-120	P

## \*Analytical Methods:

P SW846 3005A/6010C

## METALS

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## Laboratory Control Sample Summary

SDG NO. 2018-634

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>
1203920276	Mercury	ug/L	2	2.04		102	85-115	AV

## \*Analytical Methods:

AV EPA 245.1/245.2

## METALS

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## Serial Dilution Sample Summary

SDG NO. 2018-634

Client ID: CAMO-18-147638L

Contract: ESHL00114

Matrix: LIQUID

Level: Low

Sample ID: 436689001

Serial Dilution ID: 1203909731

<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	U	10	U				MS
Cadmium	.3	U	1.5	U				MS
Chromium	14.1		15	U	2.109			MS
Lead	.5	U	2.5	U				MS
Molybdenum	.839		1	U	29.678			MS
Nickel	.6	U	3	U				MS
Selenium	2	U	10	U				MS
Silver	.3	U	1.5	U				MS
Thallium	.6	U	3	U				MS
Uranium	.399		.46	J	15.288			MS

## \*Analytical Methods:

MS SW846 3005A/6020A

## METALS

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## Serial Dilution Sample Summary

SDG NO. 2018-634

Client ID: CAMO-18-147638L

Contract: ESHL00114

Matrix: LIQUID

Level: Low

Sample ID: 436689001

Serial Dilution ID: 1203909747

<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>
Aluminum	68	U	340	U				P
Barium	19.2		20.8	J	8.058			P
Beryllium	1	U	5	U				P
Boron	15	U	75	U				P
Calcium	12200		12600		3.389		10	P
Cobalt	1	U	5	U				P
Copper	3	U	15	U				P
Iron	30	U	150	U				P
Magnesium	3350		3400		1.537			P
Manganese	2	U	10	U				P
Potassium	998		1160		16.3			P
Silica	61700		63300		2.637		10	P
Sodium	8830		8850		.296		10	P
Strontium	52		52		.06		10	P
Tin	2.5	U	12.5	U				P
Vanadium	4.58	J	5	U	7.808			P
Zinc	3.3	U	16.5	U				P

## \*Analytical Methods:

P SW846 3005A/6010C

## METALS

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## Serial Dilution Sample Summary

**SDG NO.** 2018-634 **Client ID:** CAPA-18-147566L**Contract:** ESHL00114**Matrix:** LIQUID **Level:** Low**Sample ID:** 436615001 **Serial Dilution ID:** 1203920282

<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 #: 2018-634  
Work Order #: 436689**

**Method/Analysis Information**

**Product:** Carbon and Total Organic

**Analytical Batch:** 1714357

**Method:** SW 9060 Total Organic Carbon

**Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689002	CAMO-18-147653
436689004	CAMO-18-147654
436689006	CAMO-18-147663
1203908472	Method Blank (MB)
1203908473	Laboratory Control Sample (LCS)
1203908474	436322006(CAPA-18-147578) Sample Duplicate (DUP)
1203908476	436322006(CAPA-18-147578) 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 436322006 (CAPA-18-147578) 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:

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**

<b>Product:</b>	<b>Cyanide and Total</b>		
<b>Analytical Batch:</b>	1714507	<b>Method:</b>	WSP-CN(T)
<b>Prep Batch :</b>	1714503	<b>Method:</b>	EPA 335.4

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689002	CAMO-18-147653
436689004	CAMO-18-147654
436689006	CAMO-18-147663
1203908916	Method Blank (MB)
1203908917	Laboratory Control Sample (LCS)
1203908918	436615002(CAPA-18-147592) Sample Duplicate (DUP)
1203908920	436615002(CAPA-18-147592) 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 436615002 (CAPA-18-147592) 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:

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### **Method/Analysis Information**

**Product:** Ion Chromatography

**Analytical Batch:** 1715632

**Method:** WSP-ANIONS

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203911576	Method Blank (MB)
1203911577	Laboratory Control Sample (LCS)
1203911578	436689005(CAMO-18-147648) Sample Duplicate (DUP)
1203911579	436689005(CAMO-18-147648) 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-3000 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 436689005 (CAMO-18-147648) 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 1203911578 (CAMO-18-147648DUP), 436689001 (CAMO-18-147638), 436689003 (CAMO-18-147639) and 436689005 (CAMO-18-147648) 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:

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### **Method/Analysis Information**

**Product:** Ammonia Nitrogen  
**Analytical Batch:** 1715525      **Method:** NH3  
**Prep Batch :** 1715524      **Method:** EPA 350.1 Prep

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203911273	Method Blank (MB)
1203911274	Laboratory Control Sample (LCS)
1203911275	436504001(CAMO-18-147642) Sample Duplicate (DUP)
1203911276	436504001(CAMO-18-147642) 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 436504001 (CAMO-18-147642) 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**

<b>Product:</b>	<b>Total Kjeldahl Nitrogen</b>		
<b>Analytical Batch:</b>	1715519	<b>Method:</b>	TKN
<b>Prep Batch :</b>	1715516	<b>Method:</b>	EPA 351.2 Prep

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689002	CAMO-18-147653
436689004	CAMO-18-147654
436689006	CAMO-18-147663
1203911261	Method Blank (MB)
1203911262	Laboratory Control Sample (LCS)
1203911263	436504002(CAMO-18-147657) Sample Duplicate (DUP)
1203911264	436504004(CAMO-18-147658) Sample Duplicate (DUP)
1203911265	436504002(CAMO-18-147657) Matrix Spike (MS)
1203911266	436504004(CAMO-18-147658) 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**

Samples 436504002 (CAMO-18-147657) and 436504004 (CAMO-18-147658) were 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, Total Kjeldahl	1203911265 (CAMO-18-147657MS)	116* (90%-110%)
	1203911266 (CAMO-18-147658MS)	115* (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 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:** Nitrate Nitrite by Cadmium Reduction

**Analytical Batch:** 1715194

**Method:** NO3NO2

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203910561	Method Blank (MB)
1203910562	Laboratory Control Sample (LCS)
1203910564	436615001(CAPA-18-147566) Sample Duplicate (DUP)
1203910569	436615001(CAPA-18-147566) 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**

Sample 436615001 (CAPA-18-147566) 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:

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**

<b>Product:</b>	<b>Total Phosphorus</b>		
<b>Analytical Batch:</b>	1715514	<b>Method:</b>	PO4
<b>Prep Batch :</b>	1715513	<b>Method:</b>	EPA 365.4 Prep

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203911255	Method Blank (MB)
1203911256	Laboratory Control Sample (LCS)
1203911257	436315001(CAPA-18-147554) Sample Duplicate (DUP)
1203911259	436504001(CAMO-18-147642) Sample Duplicate (DUP)
1203911258	436315001(CAPA-18-147554) Matrix Spike (MS)
1203911260	436504001(CAMO-18-147642) 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**

Samples 436315001 (CAPA-18-147554) and 436504001 (CAMO-18-147642) 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 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:** 1714739

**Method:** TDS

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203909470	Method Blank (MB)
1203909471	Laboratory Control Sample (LCS)
1203909472	436615004(CAPA-18-147567) 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 436615004 (CAPA-18-147567) 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:** Specific Conductivity

**Analytical Batch:** 1717163

**Method:** EPA120.1 Specific Conductivity

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203915374	Laboratory Control Sample (LCS)
1203915375	436504008(CAPA-18-147571) 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# 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 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

### **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 436504008 (CAPA-18-147571) 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:** 1716544 **Method:** PH

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203913923	Laboratory Control Sample (LCS)
1203913924	436689001(CAMO-18-147638) Sample Duplicate (DUP)
1203913925	436983004(CrIN6-18-148630) 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**

Samples 436689001 (CAMO-18-147638) and 436983004 (CrIN6-18-148630) were 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
1203913924 (CAMO-18-147638DUP)	pH	Received 01-NOV-17, out of holding 30-OCT-17
1203913925 (CrIN6-18-148630DUP)	pH	Received 03-NOV-17, out of holding 01-NOV-17
436689001 (CAMO-18-147638)	pH	Received 01-NOV-17, out of holding 30-OCT-17
436689003 (CAMO-18-147639)	pH	Received 01-NOV-17, out of holding 30-OCT-17
436689005 (CAMO-18-147648)	pH	Received 01-NOV-17, out of holding 30-OCT-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:** 1716537      **Method:** EPA 310.1 Total Alkalinity

### **Sample Analysis**

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

<b>Sample ID</b>	<b>Client ID</b>
436689001	CAMO-18-147638
436689003	CAMO-18-147639
436689005	CAMO-18-147648
1203913913	Laboratory Control Sample (LCS)
1203913916	436983004(CrIN6-18-148630) Sample Duplicate (DUP)
1203913918	436983004(CrIN6-18-148630) 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 436983004 (CrIN6-18-148630) 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:

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**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: 2018-634 GEL Work Order: 436689


#### **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:** 17 NOV 2017

**Title:** Analyst I

# **Sample Data Summary**



# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147638  
Sample ID: 436689001  
Matrix: W  
Collect Date: 30-OCT-17 13:26  
Receive Date: 01-NOV-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	U	ND	0.067	0.200	mg/L		1	MAR1	11/03/17	2119	1715632	1
Chloride		2.39	0.067	0.200	mg/L		1					
Fluoride		0.246	0.033	0.100	mg/L		1					
Sulfate		3.35	0.133	0.400	mg/L		1					
Nutrient Analysis												
NH3 "As Received"												
Nitrogen, Ammonia		0.101	0.017	0.050	mg/L	1.00	1	KLP1	11/06/17	1522	1715525	2
NO3NO2 "As Received"												
Nitrogen, Nitrate/Nitrite		1.08	0.017	0.050	mg/L		1	KLP1	11/02/17	1054	1715194	3
PO4 "As Received"												
Phosphorus, Total as P		0.0612	0.020	0.050	mg/L	1.00	1	KLP1	11/07/17	1433	1715514	4
Solids Analysis												
TDS "As Received"												
Total Dissolved Solids		140	3.40	14.3	mg/L			KLP1	11/02/17	1301	1714739	5
Titration and Ion Analysis												
EPA 310.1 Total Alkalinity "As Received"												
Alkalinity, Total as CaCO3		59.3	1.45	4.00	mg/L			RXB5	11/10/17	1307	1716537	6
Carbonate alkalinity (CaCO3)	U	ND	1.45	4.00	mg/L							
EPA120.1 Specific Conductivity "As Received"												
Conductivity		162	1.00	1.00	umhos/cm		1	VH1	11/14/17	1339	1717163	7
PH "As Received"												
pH at Temp 13.5C	H	7.97	0.010	0.100	SU		1	RXB5	11/10/17	1308	1716544	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	11/06/17	0910	1715524
EPA 365.4 Prep	EPA 365.4 Phosphorus, Total in liquid PR	KLP1	11/06/17	1700	1715513

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147638  
Sample ID: 436689001

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: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147653  
Sample ID: 436689002  
Matrix: W  
Collect Date: 30-OCT-17 13:26  
Receive Date: 01-NOV-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	U	ND	0.330	1.00	mg/L		1	TSM	11/05/17	1823	1714357	1
Flow Injection Analysis												
WSP-CN(T) "As Received"												
Cyanide, Total	U	ND	1.67	5.00	ug/L	1.00	1	AXH3	11/02/17	0859	1714507	2
Nutrient Analysis												
TKN "As Received"												
Nitrogen, Total Kjeldahl	U	ND	0.033	0.100	mg/L	1.00	1	KLP1	11/07/17	1301	1715519	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
EPA 335.4	EPA 335.4 Total Cyanide	AXH3	11/02/17	0706	1714503
EPA 351.2 Prep	EPA 351.2 Total Kjeldahl Nitrogen Prep	KLP1	11/06/17	1700	1715516

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

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147639  
Sample ID: 436689003  
Matrix: W  
Collect Date: 30-OCT-17 15:11  
Receive Date: 01-NOV-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	U	ND	0.067	0.200	mg/L		1	MAR1	11/03/17	2148	1715632	1
Chloride		2.32	0.067	0.200	mg/L		1					
Fluoride		0.250	0.033	0.100	mg/L		1					
Sulfate		2.71	0.133	0.400	mg/L		1					
Nutrient Analysis												
NH3 "As Received"												
Nitrogen, Ammonia	J	0.0197	0.017	0.050	mg/L	1.00	1	KLP1	11/06/17	1523	1715525	2
NO3NO2 "As Received"												
Nitrogen, Nitrate/Nitrite		0.717	0.017	0.050	mg/L		1	KLP1	11/02/17	1100	1715194	3
PO4 "As Received"												
Phosphorus, Total as P		0.0571	0.020	0.050	mg/L	1.00	1	KLP1	11/07/17	1434	1715514	4
Solids Analysis												
TDS "As Received"												
Total Dissolved Solids		174	3.40	14.3	mg/L			KLP1	11/02/17	1301	1714739	5
Titration and Ion Analysis												
EPA 310.1 Total Alkalinity "As Received"												
Alkalinity, Total as CaCO3		65.7	1.45	4.00	mg/L			RXB5	11/10/17	1311	1716537	6
Carbonate alkalinity (CaCO3)	U	ND	1.45	4.00	mg/L							
EPA120.1 Specific Conductivity "As Received"												
Conductivity		169	1.00	1.00	umhos/cm		1	VH1	11/14/17	1340	1717163	7
PH "As Received"												
pH at Temp 13.4C	H	7.94	0.010	0.100	SU		1	RXB5	11/10/17	1309	1716544	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	11/06/17	0910	1715524
EPA 365.4 Prep	EPA 365.4 Phosphorus, Total in liquid PR	KLP1	11/06/17	1700	1715513

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147639  
Sample ID: 436689003

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

DL: Detection Limit

MDA: Minimum Detectable Activity

MDC: Minimum Detectable Concentration

Lc/LC: Critical Level

PF: Prep Factor

RL: Reporting Limit

SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 17, 2017

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

Los Alamos, New Mexico 87545

Contact: Ms. Nita Patel

Client SDG: 2018-634

Project: LANL- WQH Water Samples

Client Sample ID: CAMO-18-147654

Project: ESHL00114

Sample ID: 436689004

Client ID: ARSL004

Matrix: W

Collect Date: 30-OCT-17 15:11

Receive Date: 01-NOV-17

Collector: Client

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	U	ND	0.330	1.00	mg/L		1	TSM	11/05/17	1910	1714357	1
Flow Injection Analysis												
WSP-CN(T) "As Received"												
Cyanide, Total	U	ND	1.67	5.00	ug/L	1.00	1	AXH3	11/02/17	0900	1714507	2
Nutrient Analysis												
TKN "As Received"												
Nitrogen, Total Kjeldahl	U	ND	0.033	0.100	mg/L	1.00	1	KLP1	11/07/17	1302	1715519	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
EPA 335.4	EPA 335.4 Total Cyanide	AXH3	11/02/17	0706	1714503
EPA 351.2 Prep	EPA 351.2 Total Kjeldahl Nitrogen Prep	KLP1	11/06/17	1700	1715516

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

DL: Detection Limit

MDA: Minimum Detectable Activity

MDC: Minimum Detectable Concentration

Lc/LC: Critical Level

PF: Prep Factor

RL: Reporting Limit

SQL: Sample Quantitation Limit

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147648  
Sample ID: 436689005  
Matrix: W  
Collect Date: 30-OCT-17 10:50  
Receive Date: 01-NOV-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	U	ND	0.067	0.200	mg/L		1	MAR1	11/03/17	2217	1715632	1
Chloride		2.24	0.067	0.200	mg/L		1					
Fluoride		0.191	0.033	0.100	mg/L		1					
Sulfate		2.88	0.133	0.400	mg/L		1					
Nutrient Analysis												
NH3 "As Received"												
Nitrogen, Ammonia	U	ND	0.017	0.050	mg/L	1.00	1	KLP1	11/06/17	1528	1715525	2
NO3NO2 "As Received"												
Nitrogen, Nitrate/Nitrite		0.679	0.017	0.050	mg/L		1	KLP1	11/02/17	1101	1715194	3
PO4 "As Received"												
Phosphorus, Total as P		0.0566	0.020	0.050	mg/L	1.00	1	KLP1	11/07/17	1434	1715514	4
Solids Analysis												
TDS "As Received"												
Total Dissolved Solids		166	3.40	14.3	mg/L			KLP1	11/02/17	1301	1714739	5
Titration and Ion Analysis												
EPA 310.1 Total Alkalinity "As Received"												
Alkalinity, Total as CaCO3		60.9	1.45	4.00	mg/L			RXB5	11/10/17	1313	1716537	6
Carbonate alkalinity (CaCO3)	U	ND	1.45	4.00	mg/L							
EPA120.1 Specific Conductivity "As Received"												
Conductivity		158	1.00	1.00	umhos/cm		1	VH1	11/14/17	1341	1717163	7
PH "As Received"												
pH at Temp 14.2C	H	7.95	0.010	0.100	SU		1	RXB5	11/10/17	1312	1716544	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	11/06/17	0910	1715524
EPA 365.4 Prep	EPA 365.4 Phosphorus, Total in liquid PR	KLP1	11/06/17	1700	1715513

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## Certificate of Analysis

Report Date: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147648  
Sample ID: 436689005

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



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## Certificate of Analysis

Report Date: November 17, 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: 2018-634

Client Sample ID: CAMO-18-147663  
Sample ID: 436689006  
Matrix: W  
Collect Date: 30-OCT-17 10:50  
Receive Date: 01-NOV-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	U	ND	0.330	1.00	mg/L		1	TSM	11/05/17	2020	1714357	1
Flow Injection Analysis												
WSP-CN(T) "As Received"												
Cyanide, Total	U	ND	1.67	5.00	ug/L	1.00	1	AXH3	11/02/17	0901	1714507	2
Nutrient Analysis												
TKN "As Received"												
Nitrogen, Total Kjeldahl	U	ND	0.033	0.100	mg/L	1.00	1	KLP1	11/07/17	1302	1715519	3

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
EPA 335.4	EPA 335.4 Total Cyanide	AXH3	11/02/17	0706	1714503
EPA 351.2 Prep	EPA 351.2 Total Kjeldahl Nitrogen Prep	KLP1	11/06/17	1700	1715516

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: November 17, 2017

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

Contact: Ms. Nita Patel

Workorder: 436689

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Carbon Analysis</b>											
Batch	1714357										
QC1203908474	436322006	DUP									
Total Organic Carbon Average		J	0.524	J	0.395	mg/L	28.1	^	(+/-1.00)	TSM	11/05/17 04:41
QC1203908473	LCS										
Total Organic Carbon Average	10.0				10.2	mg/L			102	(80%-120%)	11/05/17 01:46
QC1203908472	MB										
Total Organic Carbon Average			U		ND	mg/L					11/05/17 01:34
QC1203908476	436322006	PS									
Total Organic Carbon Average	10.0	J	0.524		11.3	mg/L			107	(75%-125%)	11/05/17 05:28
<b>Flow Injection Analysis</b>											
Batch	1714507										
QC1203908918	436615002	DUP									
Cyanide, Total		U	ND	U	ND	ug/L	N/A			AXH3	11/02/17 08:56
QC1203908917	LCS										
Cyanide, Total	50.0				45.2	ug/L			90.4	(90%-110%)	11/02/17 08:34
QC1203908916	MB										
Cyanide, Total			U		ND	ug/L					11/02/17 08:33
QC1203908920	436615002	MS									
Cyanide, Total	100	U	ND		101	ug/L			101	(90%-110%)	11/02/17 08:57
<b>Ion Chromatography</b>											
Batch	1715632										
QC1203911578	436689005	DUP									
Bromide		U	ND	U	ND	mg/L	N/A			MAR1	11/03/17 23:44

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## QC Summary

Workorder: 436689

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1715632										
Chloride		2.24		2.23	mg/L	0.277		(0%-20%)	MAR1	11/03/17	23:44
Fluoride		0.191		0.162	mg/L	16.4	^	(+/-0.100)			
Sulfate		2.88		2.89	mg/L	0.329		(0%-20%)			
QC1203911577 LCS											
Bromide	1.25			1.22	mg/L		97.8	(80%-120%)		11/03/17	18:26
Chloride	5.00			4.86	mg/L		97.3	(80%-120%)			
Fluoride	2.50			2.58	mg/L		103	(80%-120%)			
Sulfate	10.0			9.99	mg/L		99.9	(80%-120%)			
QC1203911576 MB											
Bromide			U	ND	mg/L					11/03/17	17:57
Chloride			U	ND	mg/L						
Fluoride			U	ND	mg/L						
Sulfate			U	ND	mg/L						
QC1203911579 436689005 PS											
Bromide	1.25	U	ND	1.28	mg/L		99.4	(75%-125%)		11/04/17	00:13
Chloride	5.00		2.24	7.60	mg/L		107	(75%-125%)			
Fluoride	2.50		0.191	2.92	mg/L		109	(75%-125%)			
Sulfate	10.0		2.88	13.2	mg/L		103	(75%-125%)			

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## QC Summary

Workorder: 436689

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Nutrient Analysis</b>											
Batch	1715194										
QC1203910564	436615001	DUP									
Nitrogen, Nitrate/Nitrite		0.388		0.388	mg/L	0		(0%-20%)	KLP1	11/02/17	10:49
QC1203910562	LCS										
Nitrogen, Nitrate/Nitrite	1.00			1.08	mg/L		108	(90%-110%)		11/02/17	10:28
QC1203910561	MB										
Nitrogen, Nitrate/Nitrite			U	ND	mg/L					11/02/17	10:27
QC1203910569	436615001	PS									
Nitrogen, Nitrate/Nitrite	1.00	0.388		1.49	mg/L		110	(90%-110%)		11/02/17	10:50
Batch	1715514										
QC1203911257	436315001	DUP									
Phosphorus, Total as P		0.0726		0.0601	mg/L	18.8 ^		(+/-0.050)	KLP1	11/07/17	14:22
QC1203911259	436504001	DUP									
Phosphorus, Total as P	J	0.0278		0.0519	mg/L	60.5 ^		(+/-0.050)		11/07/17	14:24
QC1203911256	LCS										
Phosphorus, Total as P	1.00			1.04	mg/L		104	(80%-124%)		11/07/17	14:20
QC1203911255	MB										
Phosphorus, Total as P			J	0.0231	mg/L					11/07/17	14:19
QC1203911258	436315001	MS									
Phosphorus, Total as P	1.00	0.0726		0.977	mg/L		90.4	(63%-139%)		11/07/17	14:23
QC1203911260	436504001	MS									
Phosphorus, Total as P	1.00	J	0.0278	1.04	mg/L		101	(63%-139%)		11/07/17	14:25
Batch	1715519										
QC1203911263	436504002	DUP									
Nitrogen, Total Kjeldahl	U	ND	U	ND	mg/L	N/A			KLP1	11/07/17	12:49

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## QC Summary

Workorder: 436689

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Nutrient Analysis</b>											
Batch	1715519										
QC1203911264	436504004	DUP									
Nitrogen, Total Kjeldahl		U	ND	U	ND	mg/L	N/A		KLP1	11/07/17	12:52
QC1203911262	LCS										
Nitrogen, Total Kjeldahl	1.00				1.05	mg/L	105	(90%-110%)		11/07/17	12:47
QC1203911261	MB										
Nitrogen, Total Kjeldahl			U		ND	mg/L				11/07/17	12:47
QC1203911265	436504002	MS									
Nitrogen, Total Kjeldahl	1.00	U	ND		1.16	mg/L	116*	(90%-110%)		11/07/17	12:50
QC1203911266	436504004	MS									
Nitrogen, Total Kjeldahl	1.00	U	ND		1.16	mg/L	115*	(90%-110%)		11/07/17	12:52
Batch	1715525										
QC1203911275	436504001	DUP									
Nitrogen, Ammonia		J	0.018	U	ND	mg/L	200 ^		KLP1	11/06/17	15:16
QC1203911274	LCS										
Nitrogen, Ammonia	1.00				1.08	mg/L	108	(90%-110%)		11/06/17	15:11
QC1203911273	MB										
Nitrogen, Ammonia			U		ND	mg/L				11/06/17	15:10
QC1203911276	436504001	MS									
Nitrogen, Ammonia	1.00	J	0.018		1.04	mg/L	102	(90%-110%)		11/06/17	15:17
<b>Solids Analysis</b>											
Batch	1714739										
QC1203909472	436615004	DUP									
Total Dissolved Solids			136		131	mg/L	3.21	(0%-5%)	KLP1	11/02/17	13:01

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## QC Summary

Workorder: 436689

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Solids Analysis</b>											
Batch	1714739										
QC1203909471	LCS										
Total Dissolved Solids	300			299	mg/L		99.5	(95%-105%)	KLP1	11/02/17	13:01
QC1203909470	MB										
Total Dissolved Solids			U	ND	mg/L					11/02/17	13:01
<b>Titration and Ion Analysis</b>											
Batch	1716537										
QC1203913916	436983004	DUP									
Alkalinity, Total as CaCO3		68.5		67.3	mg/L	1.78		(0%-20%)	RXB5	11/10/17	16:18
Carbonate alkalinity (CaCO3)	U	ND	U	ND	mg/L	N/A					
QC1203913913	LCS										
Alkalinity, Total as CaCO3	100			108	mg/L		108	(90%-110%)		11/10/17	12:44
QC1203913918	436983004	MS									
Alkalinity, Total as CaCO3	100	68.5		173	mg/L		105	(80%-120%)		11/10/17	16:19
Batch	1716544										
QC1203913924	436689001	DUP									
pH	H	7.97	H	7.99	SU	0.251		(0%-5%)	RXB5	11/10/17	13:08
QC1203913925	436983004	DUP									
pH	H	7.97	H	7.98	SU	0.125		(0%-5%)		11/10/17	16:16
QC1203913923	LCS										
pH	7.00			7.01	SU		100	(99%-101%)		11/10/17	12:43
Batch	1717163										
QC1203915375	436504008	DUP									
Conductivity		149		145	umhos/cm	2.18		(0%-10%)	VH1	11/14/17	13:31

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## QC Summary

Workorder: 436689

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Titration and Ion Analysis											
Batch	1717163										
QC1203915374	LCS										
Conductivity	1410			1390	umhos/cm		98.5	(95%-105%)	VH1	11/14/17	13:29

### 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
- 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.