



December 20, 2017

Mr. Scot Fitzgerald  
CH2MHill Plateau Remediation Company  
MSIN R3-50 CHPRC  
PO Box 1600  
Richland, Washington 99352

Re: CHPRC SAF F18-003  
Work Order: 439446  
SDG: GEL439446

Dear Mr. Fitzgerald:

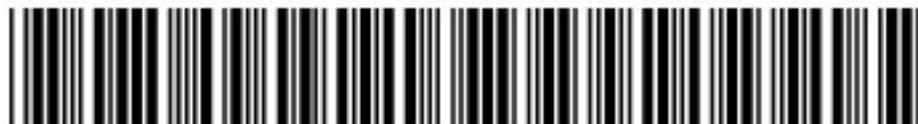
GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on December 07, 2017. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

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. 4505.

Sincerely,

Heather Shaffer  
Project Manager

Purchase Order: 300250 - 9C  
Chain of Custody: F18-003-003, F18-003-006 and F18-003-009  
Enclosures



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# Sample Issue Resolution

<b>SAMPLE ISSUE RESOLUTION (SIR) REPORT</b>		<b>SIR Number:</b> SIR18-0258
		<b>Rev. Number:</b> 0
		<b>Date Initiated:</b> 12/11/2017
<b><u>SAMPLE EVENT INFORMATION</u></b>		
<b>SAF NUM(S):</b>	F18-003	
<b>LABORATORY:</b>	GEL	
<b><u>SAMPLING INFORMATION</u></b>		
<b>NUMBER OF SAMPLES:</b>	2	
<b>SAMPLE NUMBERS:</b>	B3FXN2, B3FXN5	
<b>SAMPLE MATRIX:</b>	OTHER SOLID	
<b>SDG NUM(S):</b>	GEL439446	
<b><u>ISSUE BACKGROUND</u></b>		
<b>CLASS:</b>	General Laboratory Direction	
<b>TYPE:</b>	Other General Laboratory Direction (Specify)	
<b>DESCRIPTION:</b>	<p>The matrix of the above listed samples was described as "thin wire and tape". The lab requested to report these two samples "as received" based on the matrix. In addition, limited volume was received. After Metals took their aliquot, there was 0.07g and 0.02 left of B3FXN2 and B3FXN5 respectively. The remaining requested analysis is pH and Anions. Anions requires a minimum of 4g and will not be able to run. However, pH analyst can run the strip method with this amount of volume. Our SOP states: If limited sample is received, use smaller 1:1 ratio of grams sample to mL of DI water for the pH determination. The analyst believes she has sufficient volume remaining to use this method.</p>	
<b><u>RESOLUTION</u></b>		
<b>PROPOSED RESOLUTION:</b>	Please advise if the lab can proceed with the strip method as defined for limited volume.	
<b>FINAL RESOLUTION:</b>	Please proceed with the pH strip method per GEL's SOP. Please cancel the anion analysis for these 2 samples.	
<b>SUBMITTED BY:</b>		
SHAFFER, H	12/11/2017	
<b>ACCEPTED BY:</b>		
MEDLEY, HA	12/12/2017	

# Case Narrative

**General Narrative  
for  
CH2MHill Plateau Remediation Company  
CHPRC SAF F18-003  
SDG: GEL439446**

**December 20, 2017**

**Laboratory Identification:**

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

**Summary**

**Sample receipt**

The sample(s) arrived at GEL Laboratories, LLC, Charleston, South Carolina on December 07, 2017, for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. Based on the matrix received, the following samples will be reported as received *439446001(B3FXN2)* and *439446002(B3FXN5)*. Please refer to the enclosed SIR for details on all issues..

**Items of Note** All efforts were made by the lab to meet any short hold times. Samples that were analyzed outside of the initial hold time but still within 2X hold time will be noted in the lab case narrative.

**Sample Identification**

The laboratory received the following samples:

<b><u>Laboratory Identification</u></b>	<b><u>Sample Description</u></b>
439446001	B3FXN2
439446002	B3FXN5
439446003	B3FXN8

**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: General Narrative, Chain of Custody and Supporting Documentation, and data from the following fractions: General Chemistry and Metals.

We certify that this package is in compliance with the SOW, both technically and for completeness, including a full description of, explanation of, and corrective actions for, any and all deviations, from either the analyses requested or the case narrative requested. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager (or designee) and the laboratory's client services representative as verified by their signatures on this report.



Heather Shaffer  
Project Manager

**Technical Case Narrative**  
**CH2MHill Plateau Remediation Company (CPRC)**  
**SDG #: GEL439446**  
**Work Order #: 439446**

## Metals

### **Determination of Metals by ICP**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

### Calibration Information

#### **CRDL/PQL Requirements**

The PQL standard recoveries for SW846 6010C or 6010D met the control limits with the exception of antimony, lead, zinc, calcium, and sodium. Client sample concentrations were less than the MDL or greater than two times the PQL; therefore the data were not adversely affected. 439446001 (B3FXN2), 439446002 (B3FXN5) and 439446003 (B3FXN8).

### Quality Control (QC) Information

#### **Method Blank (MB) Statement**

The samples in this SDG contained analytes at concentrations more than ten times the amount present in the method blank, therefore the data was not adversely affected.

Sample	Analyte	Value
1203934245 (MB)	Sodium	See applicable report

The method blanks (MB) analyzed with this SDG met the acceptance criteria. However, where there were positive hits in the method blank, the results were evaluated and appropriately flagged on the data.

Sample	Analyte	Value
1203934245 (MB)	Chromium	220 between (147 - 245)

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

The MS/MSD (See Below) did not meet the recommended quality control acceptance criteria for percent recoveries for the following applicable analytes. The post spike recoveries were within the required control limits for some of the analytes. This verifies the absence of a matrix interference in the post-digested sample. For other analytes the post spike failed verifying the presence of a matrix interference in the post-digested sample. The failing spike recoveries may be attributed to possible matrix interference and/or sample non-homogeneity.

Sample	Analyte	Value
1203934297 (B3FXN8MS)	Arsenic	13.1* (75%-125%)
	Barium	143* (75%-125%)
	Cadmium	37.2* (75%-125%)

	Nickel	59* (75%-125%)
1203934298 (B3FXN8MSD)	Barium	71.5* (75%-125%)
	Nickel	229* (75%-125%)

### Post Spike (PS) Recovery Statement

The PS did not meet the recommended quality control acceptance criteria for percent recoveries for all applicable analytes and verifies the presence of matrix interferences.

Sample	Analyte	Value
1203939024 (B3FXN8PS)	Barium	7.48* (75%-125%)

### MS/MSD Relative Percent Difference (RPD) Statement

The RPD did not meet the recommended quality control acceptance criteria for the following applicable analytes. The post spike was not applicable due to high background concentrations. The serial dilution passed, confirming the absence of matrix interferences and/or sample non-homogeneity.

Sample	Analyte	Value
1203934297MS and 1203934298MSD (B3FXN8)	Chromium	RPD 79.5* (0%-35%)
	Copper	RPD 40.8* (0%-35%)
	Lead	RPD 61.5* (0%-35%)
	Nickel	RPD 56.9* (0%-35%)

### Technical Information

#### Sample Dilutions

Samples were diluted for antimony to ensure that the analyte concentrations were within the linear calibration range of the instrument. Samples were diluted for calcium and aluminum in order to bring raw values within the linear range of the instrument, and for the analytes interfered with, in order to ensure that the inter-element correction factors were valid. 439446001 (B3FXN2), 439446002 (B3FXN5) and 439446003 (B3FXN8).

Analyte	439446		
	001	002	003
Several	20X 1X	20X 1X	20X 1X

## General Chemistry

### Ion Chromatography

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information****Laboratory Control Sample Duplicate (LCSD)**

An LCSD was used in place of matrix QC due to limited sample volume. 439446003 (B3FXN8).

**Technical Information****Sample Dilutions**

The following sample 439446003 (B3FXN8) was diluted because target analyte concentrations exceeded the calibration range. The following sample 439446003 (B3FXN8) in this sample group was diluted due to matrix interference.

Analyte	<b>439446</b>
	<b>003</b>
Bromide	5X
Chloride	50X
Fluoride	50X
Nitrate	50X
Nitrite	5X
Ortho-phosphate	5X
Sulfate	500X

**pH**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information****Holding Times**

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

Sample	Analyte	Value
1203934131 (B3FXN8DUP)	pH	Received 07-DEC-17, out of holding 05-DEC-17
439446003 (B3FXN8)	pH	Received 07-DEC-17, out of holding 05-DEC-17

**Miscellaneous Information****Additional Comments**

1g used due to limited sample volume. 439446003 (B3FXN8).

**pH\_by\_strip**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

### **Technical Information**

#### **Holding Times**

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

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1203937677 (Non SDG 440008013DUP)	pH	Received 13-DEC-17, out of holding 11-DEC-17
439446001 (B3FXN2)	pH	Received 07-DEC-17, out of holding 05-DEC-17
439446002 (B3FXN5)	pH	Received 07-DEC-17, out of holding 29-NOV-17

### **Radiochemistry**

#### **Dry Weight**

There are no exceptions, anomalies or deviations from the specified methods. All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable.

#### **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.

# **Chain of Custody and Supporting Documentation**



**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** **F18-003-001** **PAGE 1 OF 1**

**CH2M Hill Plateau Remediation Company**  
**COLLECTOR** Chris Fulton  
**COMPANY CONTACT** SUMNER, LC  
**TELEPHONE NO.** 376-3922  
**PROJECT COORDINATOR** SUMNER, LC  
**REQUIRED TAT** 24 Hours

**SAMPLING LOCATION** REDOX GREEN PAPER  
**PROJECT DESIGNATION** REDOX Gallery Sampling - Other Solid  
**SAF NO.** F18-003  
**ORIGINAL**

**ICE CHEST NO.** N/A  
**FIELD LOGBOOK NO.** HNF-N-507-27  
**ACTUAL SAMPLE DEPTH** N/A  
**PURCHASE ORDER/CHARGE CODE** 300250  
**METHOD OF SHIPMENT** GOVERNMENT VEHICLE

**SHIPPED TO** CHPRC Radiological Counting Facility  
**OFFSITE PROPERTY NO.** N/A  
**BILL OF LADING/AIR BILL NO.** N/A

MATRIX*	POSSIBLE SAMPLE HAZARDS/ REMARKS	PRESERVATION
A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WF=Wipe X=Other	*Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	None
		6 Months
		ag
		1
		60ml
		Rad Screen;

COPIED

SAMPLE NO.	FILTERED	MATRIX*	SAMPLE DATE	SAMPLE TIME
B3FXNO	N/A	OTHER SOLID	DEC 0 5 2017	1303

**CHAIN OF POSSESSION**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	SIGN/ PRINT NAMES	RECEIVED BY/STORED IN	DATE/TIME
Chris Fulton CHPRC	12/15/17 1425	<i>[Signature]</i>	PAUL DUKE CHPRC	DEC 0 5 2017 1425
PAUL DUKE CHPRC	DEC 0 5 2017 1615	<i>[Signature]</i>	RAO Sample Lorry	DEC 0 5 2017 1615
RAO James Stark	DEC 0 6 2017 0750	<i>[Signature]</i>	PAUL DUKE CHPRC	DEC 0 6 2017 0750
PAUL DUKE CHPRC	DEC 0 6 2017 0750	<i>[Signature]</i>	Malcom Churn CHPRC	DEC 0 6 2017 0750
Malcom Churn CHPRC	DEC 0 6 2017 0150	<i>[Signature]</i>	RELINQUISHED TO GEL # F18-003-003	DEC 0 6 2017 0750
		<i>[Signature]</i>	STACY BOONE	12/17/17 9:20

**SPECIAL INSTRUCTIONS**  
TRVL-18-044

**DISPOSAL METHOD** CHPRC  
**DATE/TIME** DEC 0 6 2017 0750  
**TRVL NUM = TRVL-18-044**  
**FSR ID = FSR53716**  
**PRINTED ON** 11/14/2017

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** **439446** **F18-003-006** **PAGE 1 OF 1**

**CH2MHill Plateau Remediation Company** **REQUIRED TAT 15 Days**

**COLLECTOR** Chris Fulton CHPRC **TELEPHONE NO.** 376-3922 **PROJECT COORDINATOR** SUMNER, LC

**SAMPLING LOCATION** REDOX CLEAN PAPER **PROJECT DESIGNATION** REDOX Gallery Sampling - Other Solid

**ICE CHEST NO.** GWS-693 **FIELD LOGBOOK NO.** HNF-N-507-27 **PURCHASE ORDER/CHARGE CODE** 300250 **METHOD OF SHIPMENT** ORIGINAL

**SHIPPED TO** GEL Laboratories, LLC **OFFSITE PROPERTY NO.** 8821 **BILL OF LADING/AIR BILL NO.** 7709 18 we 7097

<b>MATRIX*</b> A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WF=Wipe X=Other	<b>POSSIBLE SAMPLE HAZARDS/ REMARKS</b> *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	<b>PRESERVATION</b> None
<b>SPECIAL HANDLING AND/OR STORAGE</b> -RADIOACTIVE-TIE TO-BBFAA2 JUL 11/20/17	<b>HOLDING TIME</b> 6 Months	<b>TYPE OF CONTAINER</b> G/P
<b>SAMPLE NO.</b> B3FXN5	<b>NO. OF CONTAINER(S)</b> 1	<b>VOLUME</b> 60mL
<b>DATE/TIME</b> NOV 29 2017	<b>SAMPLE DATE</b> NOV 29 2017	<b>SAMPLE TIME</b> 0925 ✓
<b>FILTERED</b> N/A	<b>MATRIX*</b> OTHER SOLID	<b>SEE ITEM (1) IN SPECIAL INSTRUCTIONS</b>

CHAIN OF POSSESSION RELINQUISHED BY/REMOVED FROM	SIGN/ PRINT NAMES RECEIVED BY/STORED IN	DATE/TIME	SPECIAL INSTRUCTIONS
Chris Fulton CHPRC	SSU-1 Malcom Chunn CHPRC	NOV 29 2017 1302	TRVL-18-044 (1) 6010_METALS_ICP: COMMON {Antimony, Arsenic, Barium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Magnesium, Manganese, Nickel, Potassium, Silver, Sodium, Vanadium, Zinc}; 6010_METALS_ICP: COMMON (Add-on) {Aluminum, Beryllium, Lead, Selenium}; 300.0_ANIONS_IC: COMMON {Chloride, Fluoride, Nitrogen in Nitrate, Nitrogen in Nitrite, Sulfate}; 300.0_ANIONS_IC: COMMON (Add-on) {Bromide, Phosphorus in phosphate}; 9045_pH (Non-Aqueous): COMMON {pH Measurement};
Malcom Chunn CHPRC	FEDEX	DEC 06 2017 0823	
Malcom Chunn CHPRC	STACY BOONTE Hys -	DEC 06 2017 1400	
		12/6/17 9:20	
<b>FINAL SAMPLE DISPOSITION</b>	<b>DISPOSAL METHOD</b>	<b>DATE/TIME</b>	
PRINTED ON 11/14/2017	FSR ID = FSR53714	TRVL NUM = TRVL-18-044	A-6003-618 (REV 3)



COPY

**CH2M Hill Plateau Remediation Company**

**COLLECTOR** Kevin Patterson  
CHPRC

**SAMPLING LOCATION** REDOX CRYSTALS

**ICE CHEST NO.** N/A

**SHIPPED TO** CHPRC Radiological Counting Facility

**COMPANY CONTACT** SUMNER, LC

**TELEPHONE NO.** 376-3922

**PROJECT DESIGNATION** REDOX Gallery Sampling - Other Solid

**FIELD LOGBOOK NO.** HNF-N-587.27

**OFFSITE PROPERTY NO.** N/A

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST** F18-003-007

**PROJECT COORDINATOR** SUMNER, LC

**SAF NO.** F18-003

**PURCHASE ORDER/CHARGE CODE** 300250

**BILL OF LADING/AIR BILL NO.** N/A

**METHOD OF SHIPMENT** ORIGINAL

**GOVERNMENT VEHICLE**

**REQUIRED TAT** 24 Hours

**PAGE 1 OF 1**

<b>PRESERVATION</b>	None
<b>HOLDING TIME</b>	6 Months
<b>TYPE OF CONTAINER</b>	ag
<b>NO. OF CONTAINER(S)</b>	1
<b>VOLUME</b>	60mL
<b>SAMPLE ANALYSIS</b>	Rad Screen
<b>SAMPLE DATE</b>	12/5/17
<b>SAMPLE TIME</b>	1303

**POSSIBLE SAMPLE HAZARDS/ REMARKS**  
\*Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.

**SPECIAL HANDLING AND/OR STORAGE**  
N/A

**CHAIN OF POSSESSION**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	SIGN/ PRINT NAMES	RECEIVED BY/STORED IN	DATE/TIME
Kevin Patterson CHPRC	DEC 05 2017 1425	PAUL DUKE CHPRC	PAUL DUKE CHPRC	DEC 05 2017 1425
PAUL DUKE CHPRC	DEC 05 2017 1615	PAUL DUKE CHPRC	PAUL DUKE CHPRC	DEC 05 2017 1615
PAUL DUKE CHPRC	DEC 06 2017 0750	PAUL DUKE CHPRC	PAUL DUKE CHPRC	DEC 06 2017 0750
PAUL DUKE CHPRC	DEC 06 2017 0750	PAUL DUKE CHPRC	PAUL DUKE CHPRC	DEC 06 2017 0750
Malcom Chunn CHPRC	DEC 06 2017 0750	Malcom Chunn CHPRC	Malcom Chunn CHPRC	DEC 06 2017 0750
		RELINQUISHED TO CEL # F18-003-009		
		STACY BOONE FedEx		

**SPECIAL INSTRUCTIONS**  
ON THE CRYSTALS THE CRFC BOTTLE WILL GO TO GEL

**DISPOSED BY** Malcom Chunn  
CHPRC

**DATE/TIME** DEC 06 2017 0750

**TRVL NUM = TRVL-18-044**

**FSR ID = FSR53715**

**PRINTED ON** 11/14/2017

**Sample became B3FXNB**



# **Data Review Qualifier Definitions**

## Project Specific Qualifier Definitions for GEL Client Code: CPRC

Qualifier	Qualifier Definition	Department	Fraction
U	Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.		
J	The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate). Value is estimated	Organics	
P	Aroclor target analyte with greater than 25% difference between column analyses.	Organics	
C	Analyte has been confirmed by GC/MS analysis	Organics	Pesticide
B	The analyte was detected in both the associated QC blank and in the sample.	Organics	
E	Concentration exceeds the calibration range of the instrument	Organics	
A	The TIC is a suspected aldol-condensation product	Organics	Semi-Volatile
X	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier		
N	Spike Sample recovery is outside control limits.		
*	Duplicate analysis not within control limits	Inorganics	
>	Result greater than quantifiable range or greater than upper limit of the analysis range	General Chemistry	
Z	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier		
B	The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).	Inorganics	Metals
D	Results are reported from a diluted aliquot of sample.		
E	Reported value is estimated due to interferences. See comment in narrative.	Inorganics	Metals
M	Duplicate precision not met.	Inorganics	Metals
o	Analyte failed to recover within LCS limits (Organics only)	Organics	
S	Reported value determined by the Method of Standard Additions (MSA)	Inorganics	
T	Spike and/or spike duplicate sample recovery is outside control limits.	Organics	
W	Post-digestion spike recovery for GFAA out of control limit. Sample absorbency < 50% of spike absorbency.	Inorganics	
B	The associated QC sample blank has a result $\geq 2X$ the MDA and, after corrections, result is $\geq$ MDA for this sample	Radiological	
Y	Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier		
+	Correlation coefficient for Method of Standard Additions (MSA) is < 0.995	Inorganics	
B	The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).	General Chemistry	
C	Target analyte was detected in the sample and the associated blank. The associated blank concentration is $\geq$ EQL or is > 5% of the measured concentration and/or decision level for associated samples.	Inorganics	Metals
C	Target analyte was detected in the sample and the associated blank. The associated blank concentration is $\geq$ EQL or is > 5% of the measured concentration and/or decision level for associated samples.	General Chemistry	
<	Sample is below the EPA guidance level for Reactive Releasable Cyanide and/or Reactive Releasable Sulfide	General Chemistry	
UX	Gamma Spectroscopy--Uncertain identification	Radiological	

# Laboratory Certifications

**List of current GEL Certifications as of 20 December 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	SC000122017-25
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

# Metals Analysis

# Case Narrative

**Metals**  
**Technical Case Narrative**  
**CH2MHill Plateau Remediation Company (CPRC)**  
**SDG #: GEL439446**  
**Work Order #: 439446**

**Product: Determination of Metals by ICP**

**Analytical Method:** SW846 3050B/6010D

**Analytical Procedure:** GL-MA-E-013 REV# 30

**Analytical Batch:** 1724606

**Preparation Method:** SW846 3050B

**Preparation Procedure:** GL-MA-E-009 REV# 27

**Preparation Batch:** 1724604

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
439446001	B3FXN2
439446002	B3FXN5
439446003	B3FXN8
1203934245	Method Blank (MB)ICP
1203934246	Laboratory Control Sample (LCS)
1203934249	439446003(B3FXN8L) Serial Dilution (SD)
1203934297	439446003(B3FXN8S) Matrix Spike (MS)
1203934298	439446003(B3FXN8SD) Matrix Spike Duplicate (MSD)
1203939024	439446003(B3FXN8PS) Post Spike (PS)

Sample 439446003 in this SDG was analyzed for metals on a "dry weight corrected" basis. Samples 439446001 and 002 in this SDG were analyzed for metals on an "as received" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Calibration Information**

**CRDL/PQL Requirements**

The PQL standard recoveries for SW846 6010C or 6010D met the control limits with the exception of antimony, lead, zinc, calcium, and sodium. Client sample concentrations were less than the MDL or greater than two times the PQL; therefore the data were not adversely affected. 439446001 (B3FXN2), 439446002 (B3FXN5) and 439446003 (B3FXN8).

**Quality Control (QC) Information**

**Method Blank (MB) Statement**

The samples in this SDG contained analytes at concentrations more than ten times the amount present in the method blank, therefore the data was not adversely affected.

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
---------------	----------------	--------------

1203934245 (MB)	Sodium	See applicable report
-----------------	--------	-----------------------

The method blanks (MB) analyzed with this SDG met the acceptance criteria. However, where there were positive hits in the method blank, the results were evaluated and appropriately flagged on the data.

Sample	Analyte	Value
1203934245 (MB)	Chromium	220 between (147 - 245)

#### 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 MS/MSD (See Below) did not meet the recommended quality control acceptance criteria for percent recoveries for the following applicable analytes. The post spike recoveries were within the required control limits for some of the analytes. This verifies the absence of a matrix interference in the post-digested sample. For other analytes the post spike failed verifying the presence of a matrix interference in the post-digested sample. The failing spike recoveries may be attributed to possible matrix interference and/or sample non-homogeneity.

Sample	Analyte	Value
1203934297 (B3FXN8MS)	Arsenic	13.1* (75%-125%)
	Barium	143* (75%-125%)
	Cadmium	37.2* (75%-125%)
	Nickel	59* (75%-125%)
1203934298 (B3FXN8MSD)	Barium	71.5* (75%-125%)
	Nickel	229* (75%-125%)

#### Post Spike (PS) Recovery Statement

The percent recoveries (%R) obtained from the PS analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. The PS did not meet the recommended quality control acceptance criteria for percent recoveries for all applicable analytes and verifies the presence of matrix interferences.

Sample	Analyte	Value
1203939024 (B3FXN8PS)	Barium	7.48* (75%-125%)

#### MS/MSD Relative Percent Difference (RPD) Statement

The RPD did not meet the recommended quality control acceptance criteria for the following applicable analytes. The post spike was not applicable due to high background concentrations. The serial dilution passed, confirming the absence of matrix interferences and/or sample non-homogeneity.

Sample	Analyte	Value
1203934297MS and 1203934298MSD (B3FXN8)	Chromium	RPD 79.5* (0%-35%)
	Copper	RPD 40.8* (0%-35%)
	Lead	RPD 61.5* (0%-35%)
	Nickel	RPD 56.9* (0%-35%)

**Technical Information****Preparation/Analytical Method Verification**

Method SW-846 3050B is not a total digestion technique for most samples. It is a very strong acid digestion that will dissolve almost all elements that could become environmentally available. By design, elements bound in silicate structures are not normally dissolved by this procedure as they are not usually mobile in the environment.

**Sample Dilutions**

Dilutions may be required for many reasons, including to minimize matrix interferences or to bring over range target analyte concentrations into the linear calibration range. Samples were diluted for antimony to ensure that the analyte concentrations were within the linear calibration range of the instrument. Samples were diluted for calcium and aluminum in order to bring raw values within the linear range of the instrument, and for the analytes interfered with, in order to ensure that the inter-element correction factors were valid. 439446001 (B3FXN2), 439446002 (B3FXN5) and 439446003 (B3FXN8).

Analyte	439446		
	001	002	003
Several	20X 1X	20X 1X	20X 1X

**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**

CPRC001 CH2MHill Plateau Remediation Company

Client SDG: GEL439446 GEL Work Order: 439446

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

\* Duplicate analysis not within control limits

B The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).

C Target analyte was detected in the sample and the associated blank. The associated blank concentration is  $\geq$  EQL or is  $> 5\%$  of the measured concentration and/or decision level for associated samples.

D Results are reported from a diluted aliquot of sample.

N Spike Sample recovery is outside control limits.

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.

**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: 20 DEC 2017****Title: Data Validator**

# Sample Data Summary

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

SDG No: GEL439446

CONTRACT: CPRC0F18003

METHOD TYPE: SW846

SAMPLE ID: 439446001

BASIS: As Received

DATE COLLECTED 05-DEC-17

CLIENT ID: B3FXN2

LEVEL: Low

DATE RECEIVED 07-DEC-17

MATRIX: OTHER SOLID

%SOLIDS: 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	318000000	ug/kg	D*	134000	393000	393000	20	P	HSC	12/15/17 22:10	121517B-2	1724606
7440-36-0	Antimony	7190000	ug/kg	D	6480	19600	19600	20	P	HSC	12/15/17 22:10	121517B-2	1724606
7440-38-2	Arsenic	21900	ug/kg	*N	491	2950	2950	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-39-3	Barium	10100	ug/kg	N	98.2	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-41-7	Beryllium	207	ug/kg	B	98.2	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-43-9	Cadmium	1510	ug/kg	*N	98.2	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-70-2	Calcium	14700000	ug/kg	*	7860	24600	24600	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-47-3	Chromium	16900	ug/kg	*	147	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-48-4	Cobalt	1220	ug/kg		147	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-50-8	Copper	113000	ug/kg	*	295	982	982	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7439-89-6	Iron	1290000	ug/kg		7860	24600	24600	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7439-92-1	Lead	65400	ug/kg	D*	6480	19600	19600	20	P	HSC	12/15/17 22:10	121517B-2	1724606
7439-95-4	Magnesium	7060000	ug/kg		8350	29500	29500	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7439-96-5	Manganese	21800	ug/kg		196	982	982	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-02-0	Nickel	18300	ug/kg	*N	147	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-09-7	Potassium	2090000	ug/kg		6290	24600	24600	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7782-49-2	Selenium	9820	ug/kg	UD	9820	58900	58900	20	P	HSC	12/15/17 22:10	121517B-2	1724606
7440-22-4	Silver	143	ug/kg	B	98.2	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-23-5	Sodium	4710000	ug/kg	*	6880	24600	24600	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-62-2	Vanadium	41900	ug/kg		98.2	491	491	1	P	HSC	12/15/17 22:04	121517B-2	1724606
7440-66-6	Zinc	561000	ug/kg	*	393	982	982	1	P	HSC	12/15/17 22:04	121517B-2	1724606

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1724606	1724604	SW846 3050B	0.509	g	50	mL	12/07/17	JXM8

**\*Analytical Methods:**

P SW846 3050B/6010D

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

SDG No: GEL439446

CONTRACT: CPRC0F18003

METHOD TYPE: SW846

SAMPLE ID: 439446002

BASIS: As Received

DATE COLLECTED 29-NOV-17

CLIENT ID: B3FXN5

LEVEL: Low

DATE RECEIVED 07-DEC-17

MATRIX: OTHER SOLID

%SOLIDS: 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	154000000	ug/kg	D*	133000	392000	392000	20	P	HSC	12/15/17 22:13	121517B-2	1724606
7440-36-0	Antimony	8060000	ug/kg	D	6470	19600	19600	20	P	HSC	12/15/17 22:13	121517B-2	1724606
7440-38-2	Arsenic	3770	ug/kg	*N	490	2940	2940	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-39-3	Barium	29000	ug/kg	N	98	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-41-7	Beryllium	323	ug/kg	B	98	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-43-9	Cadmium	98	ug/kg	U*N	98	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-70-2	Calcium	174000000	ug/kg	*	7840	24500	24500	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-47-3	Chromium	7590	ug/kg	*	147	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-48-4	Cobalt	147	ug/kg	U	147	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-50-8	Copper	25400	ug/kg	*	294	980	980	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7439-89-6	Iron	740000	ug/kg		7840	24500	24500	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7439-92-1	Lead	33300	ug/kg	D*	6470	19600	19600	20	P	HSC	12/15/17 22:13	121517B-2	1724606
7439-95-4	Magnesium	2730000	ug/kg		8330	29400	29400	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7439-96-5	Manganese	12800	ug/kg		196	980	980	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-02-0	Nickel	1560	ug/kg	*N	147	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-09-7	Potassium	541000	ug/kg		6270	24500	24500	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7782-49-2	Selenium	9800	ug/kg	UD	9800	58800	58800	20	P	HSC	12/15/17 22:13	121517B-2	1724606
7440-22-4	Silver	98	ug/kg	U	98	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-23-5	Sodium	1230000	ug/kg	*	6860	24500	24500	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-62-2	Vanadium	10400	ug/kg		98	490	490	1	P	HSC	12/15/17 22:06	121517B-2	1724606
7440-66-6	Zinc	35200	ug/kg	*	392	980	980	1	P	HSC	12/15/17 22:06	121517B-2	1724606

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1724606	1724604	SW846 3050B	0.51	g	50	mL	12/07/17	JXM8

**\*Analytical Methods:**

P SW846 3050B/6010D

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

SDG No: GEL439446

CONTRACT: CPRC0F18003

METHOD TYPE: SW846

SAMPLE ID: 439446003

BASIS: Dry Weight

DATE COLLECTED 05-DEC-17

CLIENT ID: B3FXN8

LEVEL: Low

DATE RECEIVED 07-DEC-17

MATRIX: OTHER SOLID

%SOLIDS: 93.5

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	4020000	ug/kg	D*	145000	426000	426000	20	P	HSC	12/16/17 07:45	121617-1	1724606
7440-36-0	Antimony	1300000	ug/kg	D	7030	21300	21300	20	P	HSC	12/16/17 07:45	121617-1	1724606
7440-38-2	Arsenic	201000	ug/kg	*N	533	3200	3200	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-39-3	Barium	147000	ug/kg	N	107	533	533	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-41-7	Beryllium	2130	ug/kg	UD	2130	10700	10700	20	P	HSC	12/16/17 07:45	121617-1	1724606
7440-43-9	Cadmium	83500	ug/kg	*N	107	533	533	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-70-2	Calcium	125000000	ug/kg	D*	170000	533000	533000	20	P	HSC	12/16/17 07:45	121617-1	1724606
7440-47-3	Chromium	371000	ug/kg	*	160	533	533	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-48-4	Cobalt	11800	ug/kg		160	533	533	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-50-8	Copper	693000	ug/kg	*	320	1070	1070	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7439-89-6	Iron	25700000	ug/kg		8520	26600	26600	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7439-92-1	Lead	1450000	ug/kg	D*	7030	21300	21300	20	P	HSC	12/16/17 07:45	121617-1	1724606
7439-95-4	Magnesium	19600000	ug/kg		9060	32000	32000	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7439-96-5	Manganese	226000	ug/kg		213	1070	1070	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-02-0	Nickel	78400	ug/kg	*N	160	533	533	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-09-7	Potassium	5130000	ug/kg	D	136000	533000	533000	20	P	HSC	12/16/17 07:45	121617-1	1724606
7782-49-2	Selenium	11700	ug/kg	BD	10700	63900	63900	20	P	HSC	12/16/17 07:45	121617-1	1724606
7440-22-4	Silver	2940	ug/kg		107	533	533	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-23-5	Sodium	16600000	ug/kg	*	7460	26600	26600	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-62-2	Vanadium	19300	ug/kg		107	533	533	1	P	HSC	12/15/17 21:50	121517B-2	1724606
7440-66-6	Zinc	18100000	ug/kg	D*	8520	21300	21300	20	P	HSC	12/16/17 07:45	121617-1	1724606

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1724606	1724604	SW846 3050B	0.502	g	50	mL	12/07/17	JXM8

**\*Analytical Methods:**

P SW846 3050B/6010D

# Quality Control Summary

**GEL LABORATORIES LLC**

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**QC Summary**

Report Date: December 20, 2017

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CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 439446

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1724606										
QC1203934246	LCS										
Aluminum	483000			499000	ug/kg		103	(80%-120%)	HSC	12/15/17	21:47
Antimony	48300			43900	ug/kg		91	(80%-120%)			
Arsenic	48300			49100	ug/kg		102	(80%-120%)			
Barium	48300			49300	ug/kg		102	(80%-120%)			
Beryllium	48300			49800	ug/kg		103	(80%-120%)			
Cadmium	48300			48300	ug/kg		100	(80%-120%)			
Calcium	483000			496000	ug/kg		103	(80%-120%)			
Chromium	48300			44200	ug/kg		91.6	(80%-120%)			
Cobalt	48300			49900	ug/kg		103	(80%-120%)			
Copper	48300			45600	ug/kg		94.5	(80%-120%)			
Iron	483000			496000	ug/kg		103	(80%-120%)			
Lead	48300			47900	ug/kg		99.2	(80%-120%)			
Magnesium	483000			507000	ug/kg		105	(80%-120%)			

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**QC Summary**

Workorder: 439446

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1724606										
Manganese	48300			45000	ug/kg		93.3	(80%-120%)	HSC	12/15/17	21:47
Nickel	48300			42400	ug/kg		87.8	(80%-120%)			
Potassium	483000			499000	ug/kg		103	(80%-120%)			
Selenium	48300			43700	ug/kg		90.6	(80%-120%)			
Silver	48300			50400	ug/kg		105	(80%-120%)			
Sodium	483000			509000	ug/kg		106	(80%-120%)			
Vanadium	48300			44400	ug/kg		92	(80%-120%)			
Zinc	48300			42700	ug/kg		88.5	(80%-120%)			
QC1203934245	MB										
Aluminum			U	6650	ug/kg					12/15/17	21:43
Antimony			U	323	ug/kg						
Arsenic			U	489	ug/kg						
Barium			U	97.8	ug/kg						
Beryllium			U	97.8	ug/kg						
Cadmium			U	97.8	ug/kg						
Calcium			U	7830	ug/kg						

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**QC Summary**

Workorder: 439446

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1724606										
Chromium			B	220	ug/kg				HSC	12/15/17	21:43
Cobalt			U	147	ug/kg						
Copper			U	294	ug/kg						
Iron			U	7830	ug/kg						
Lead			U	323	ug/kg						
Magnesium			U	8320	ug/kg						
Manganese			U	196	ug/kg						
Nickel			U	147	ug/kg						
Potassium			U	6260	ug/kg						
Selenium			U	489	ug/kg						
Silver			U	97.8	ug/kg						
Sodium				16300	ug/kg						
Vanadium			U	97.8	ug/kg						
Zinc			U	391	ug/kg						
QC1203934297 439446003 MS											
Aluminum	531000	D	4020000	D	7380000	ug/kg		N/A (75%-125%)		12/16/17	07:49

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**QC Summary**

Workorder: 439446

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Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>												
Batch	1724606											
Antimony	53100	D	1300000	D	1050000	ug/kg		N/A	(75%-125%)	HSC	12/16/17	07:49
Arsenic	53100	N	201000	N	208000	ug/kg		13.1 *	(75%-125%)		12/15/17	21:53
Barium	53100	N	147000	N	223000	ug/kg		143 *	(75%-125%)			
Beryllium	53100	DU	2130	D	51500	ug/kg		96.2	(75%-125%)		12/16/17	07:49
Cadmium	53100	N	83500	N	103000	ug/kg		37.2 *	(75%-125%)		12/15/17	21:53
Calcium	531000	D	125000000	D	156000000	ug/kg		N/A	(75%-125%)		12/16/17	07:49
Chromium	53100		371000		274000	ug/kg		N/A	(75%-125%)		12/15/17	21:53
Cobalt	53100		11800		56200	ug/kg		83.5	(75%-125%)			
Copper	53100		693000		199000	ug/kg		N/A	(75%-125%)			
Iron	531000		25700000		31500000	ug/kg		N/A	(75%-125%)			
Lead	53100	D	1450000	D	770000	ug/kg		N/A	(75%-125%)		12/16/17	07:49
Magnesium	531000		19600000		16700000	ug/kg		N/A	(75%-125%)		12/15/17	21:53
Manganese	53100		226000		289000	ug/kg		N/A	(75%-125%)			
Nickel	53100	N	78400	N	110000	ug/kg		59 *	(75%-125%)			
Potassium	531000	D	5130000	D	4940000	ug/kg		N/A	(75%-125%)		12/16/17	07:49

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 439446

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1724606										
Selenium	53100	BD	11700	BD	63400	ug/kg	97.4	(75%-125%)	HSC	12/16/17	07:49
Silver	53100		2940		52000	ug/kg	92.5	(75%-125%)		12/15/17	21:53
Sodium	531000	C	16600000		12900000	ug/kg	N/A	(75%-125%)			
Vanadium	53100		19300		73200	ug/kg	102	(75%-125%)			
Zinc	53100	D	18100000	D	13900000	ug/kg	N/A	(75%-125%)		12/16/17	07:49
QC1203934298 439446003 MSD											
Aluminum	518000	D	4020000	*D	5350000	ug/kg	31.9	N/A	(0%-35%)	12/16/17	07:52
Antimony	51800	D	1300000	D	1270000	ug/kg	18.9	N/A	(0%-35%)		
Arsenic	51800	N	201000	*	257000	ug/kg	21.1	108	(0%-35%)	12/15/17	21:57
Barium	51800	N	147000	N	184000	ug/kg	19	71.5*	(0%-35%)		
Beryllium	51800	DU	2130	D	51300	ug/kg	0.537	98	(0%-35%)	12/16/17	07:52
Cadmium	51800	N	83500	*	139000	ug/kg	29.4	107	(0%-35%)	12/15/17	21:57
Calcium	518000	D	125000000	*D	117000000	ug/kg	28.6	N/A	(0%-35%)	12/16/17	07:52
Chromium	51800		371000	*	635000	ug/kg	79.5*	N/A	(0%-35%)	12/15/17	21:57
Cobalt	51800		11800		61100	ug/kg	8.44	95.1	(0%-35%)		
Copper	51800		693000	*	302000	ug/kg	40.8*	N/A	(0%-35%)		

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**QC Summary**

Workorder: 439446

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1724606										
Iron	518000	25700000		35200000	ug/kg	11.2	N/A	(0%-35%)	HSC	12/15/17	21:57
Lead	51800	D 1450000	*D	1450000	ug/kg	61.5*	N/A	(0%-35%)		12/16/17	07:52
Magnesium	518000	19600000		20400000	ug/kg	19.9	N/A	(0%-35%)		12/15/17	21:57
Manganese	51800	226000		353000	ug/kg	19.9	N/A	(0%-35%)			
Nickel	51800	N 78400	*N	197000	ug/kg	56.9*	229*	(0%-35%)			
Potassium	518000	D 5130000	D	5330000	ug/kg	7.74	N/A	(0%-35%)		12/16/17	07:52
Selenium	51800	BD 11700	BD	58200	ug/kg	8.6	89.6	(0%-35%)			
Silver	51800	2940		58100	ug/kg	11.1	106	(0%-35%)		12/15/17	21:57
Sodium	518000	C 16600000	*	16900000	ug/kg	26.8	N/A	(0%-35%)			
Vanadium	51800	19300		70600	ug/kg	3.64	98.9	(0%-35%)			
Zinc	51800	D 18100000	*D	17300000	ug/kg	21.9	N/A	(0%-35%)		12/16/17	07:52
QC1203939024 439446003 PS											
Arsenic	500	N 1890		2490	ug/L		119	(75%-125%)		12/16/17	07:39
Barium	500	N 1380		1420	ug/L		7.48*	(75%-125%)			
Cadmium	500	N 784		1270	ug/L		97.6	(75%-125%)			
Nickel	500	N 736		1140	ug/L		80.5	(75%-125%)			

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**QC Summary**

Workorder: 439446

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1724606										
	QC1203934249 439446003 SDILT										
Aluminum	D	1890	D	351	ug/L	7.08		(0%-10%)	HSC	12/16/17	07:55
Antimony	D	611	D	122	ug/L	.344		(0%-10%)			
Arsenic	N	1890	D	374	ug/L	.988		(0%-10%)		12/15/17	22:00
Barium	N	1380	D	286	ug/L	3.41		(0%-10%)			
Beryllium	DU	0.225	DU	10700	ug/L	N/A		(0%-10%)		12/16/17	07:55
Cadmium	N	784	D	167	ug/L	6.39		(0%-10%)		12/15/17	22:00
Calcium	D	58800	D	11600	ug/L	1.24		(0%-10%)		12/16/17	07:55
Chromium		3480	D	711	ug/L	2.21		(0%-10%)		12/15/17	22:00
Cobalt		111	D	23.7	ug/L	6.9		(0%-10%)			
Copper		6500	D	1240	ug/L	4.87		(0%-10%)			
Iron		242000	D	49000	ug/L	1.48		(0%-10%)			
Lead	D	679	D	140	ug/L	2.89		(0%-10%)		12/16/17	07:55
Magnesium		184000	D	37300	ug/L	1.37		(0%-10%)		12/15/17	22:00
Manganese		2120	D	446	ug/L	5.01		(0%-10%)			
Nickel	N	736	D	156	ug/L	6		(0%-10%)			

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**QC Summary**

Workorder: 439446

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1724606										
Potassium	D	2410	D	487	ug/L	1.16		(0%-10%)	HSC	12/16/17	07:55
Selenium	BD	5.51	BD	5.12	ug/L	364		(0%-10%)			
Silver		27.6	D	5.43	ug/L	1.73		(0%-10%)		12/15/17	22:00
Sodium	C	155000	D	30200	ug/L	2.71		(0%-10%)			
Vanadium		181	D	37.0	ug/L	2.25		(0%-10%)			
Zinc	D	8500	D	1740	ug/L	2.21		(0%-10%)		12/16/17	07:55

**Notes:**

The Qualifiers in this report are defined as follows:

- \* Duplicate analysis not within control limits
- + Correlation coefficient for Method of Standard Additions (MSA) is < 0.995
- B The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).
- C Target analyte was detected in the sample and the associated blank. The associated blank concentration is >= EQL or is > 5% of the measured concentration and/or decision level for associated samples.
- D Results are reported from a diluted aliquot of sample.
- E Reported value is estimated due to interferences. See comment in narrative.
- M Duplicate precision not met.
- N Spike Sample recovery is outside control limits.
- S Reported value determined by the Method of Standard Additions (MSA)
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- W Post-digestion spike recovery for GFAA out of control limit. Sample absorbency < 50% of spike absorbency.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Z Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

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**QC Summary**

Workorder: 439446

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<b>Parmname</b>	<b>NOM</b>	<b>Sample Qual</b>	<b>QC</b>	<b>Units</b>	<b>RPD/D%</b>	<b>REC%</b>	<b>Range</b>	<b>Anlst</b>	<b>Date</b>	<b>Time</b>
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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.

# General Chem Analysis

# Case Narrative

**General Chemistry  
Technical Case Narrative  
CH2MHill Plateau Remediation Company (CPRC)  
SDG #: GEL439446  
Work Order #: 439446**

**Product: Ion Chromatography**

**Analytical Method:** 300.0\_ANIONS\_IC

**Analytical Procedure:** GL-GC-E-086 REV# 25

**Analytical Batch:** 1724763

**Preparation Method:** EPA 300.0 PREP

**Preparation Procedure:** GL-GC-E-086 REV# 25

**Preparation Batch:** 1724762

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
439446003	B3FXN8
1203934717	Method Blank (MB)
1203934718	Laboratory Control Sample (LCS)
1203934967	Laboratory Control Sample Duplicate (LCSD)

The samples in this SDG were analyzed on a "dry weight" basis.

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Quality Control (QC) Information**

**Laboratory Control Sample Duplicate (LCSD)**

An LCSD was used in place of matrix QC due to limited sample volume. 439446003 (B3FXN8).

**Technical Information**

**Sample Dilutions**

The following sample 439446003 (B3FXN8) was diluted because target analyte concentrations exceeded the calibration range. The following sample 439446003 (B3FXN8) in this sample group was diluted due to matrix interference. Dilutions may be required for many reasons, including to minimize matrix interferences or to bring over range target analyte concentrations into the linear calibration range.

Analyte	<b>439446</b>
	<b>003</b>
Bromide	5X
Chloride	50X
Fluoride	50X
Nitrate	50X
Nitrite	5X
Ortho-phosphate	5X
Sulfate	500X

**Product:** pH\_by\_strip

**Analytical Method:** SW846 9041A

**Analytical Procedure:** GL-GC-E-008 REV# 22

**Analytical Batch:** 1725889

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
439446001	B3FXN2
439446002	B3FXN5
1203937676	Laboratory Control Sample (LCS)
1203937677	440008013(NonSDG) Sample Duplicate (DUP)

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

#### **Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

#### **Technical Information**

##### **Holding Times**

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

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1203937677 (Non SDG 440008013DUP)	pH	Received 13-DEC-17, out of holding 11-DEC-17
439446001 (B3FXN2)	pH	Received 07-DEC-17, out of holding 05-DEC-17
439446002 (B3FXN5)	pH	Received 07-DEC-17, out of holding 29-NOV-17

**Product: pH****Analytical Method:** SW846 9045D**Analytical Procedure:** GL-GC-E-008 REV# 22**Analytical Batch:** 1724554

The following samples were analyzed using the above methods and analytical procedure(s).

<b><u>GEL Sample ID#</u></b>	<b><u>Client Sample Identification</u></b>
439446003	B3FXN8
1203934129	Laboratory Control Sample (LCS)
1203934131	439446003(B3FXN8) Sample Duplicate (DUP)

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

**Data Summary:**

All sample data provided in this report met the acceptance criteria specified in the analytical methods and procedures for initial calibration, continuing calibration, instrument controls and process controls where applicable, with the following exceptions.

**Technical Information****Holding Times**

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

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1203934131 (B3FXN8DUP)	pH	Received 07-DEC-17, out of holding 05-DEC-17
439446003 (B3FXN8)	pH	Received 07-DEC-17, out of holding 05-DEC-17

**Miscellaneous Information****Additional Comments**

1g used due to limited sample volume. 439446003 (B3FXN8).

**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.

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**Qualifier Definition Report  
for**

CPRC001 CH2MHill Plateau Remediation Company

Client SDG: GEL439446 GEL Work Order: 439446

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

**B** The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).

**D** Results are reported from a diluted aliquot of sample.

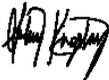
**U** Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.

**X** Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

**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: 20 DEC 2017****Title: Analyst I**

# Sample Data Summary





**GEL LABORATORIES LLC**

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**Certificate of Analysis**

Report Date: December 20, 2017

Company : CH2MHill Plateau Remediation Company  
 Address : MSIN R3-50 CHPRC  
 PO Box 1600  
 Richland, Washington 99352  
 Contact: Mr. Scot Fitzgerald  
 Project: CHPRC SAF F18-003

Client Sample ID: B3FXN8 Project: CPRC0F18003  
 Sample ID: 439446003 Client ID: CPRC001  
 Matrix: OTHER SOLID  
 Collect Date: 05-DEC-17 13:03  
 Receive Date: 07-DEC-17  
 Collector: Client  
 Moisture: 6.52%

Parameter	Qualifier	Result	DL	RL	Units	PF	DF	Analyst	Date	Time	Batch	Method
<b>Ion Chromatography</b>												
<b>EPA 300.0 Anions, Solid (Br) "Dry Weight Corrected"</b>												
Bromide	D	22800	3570	10700	ug/kg	9.98	5	MAR1	12/08/17	1217	1724763	1
Nitrite-N	BD	4000	1760	5340	ug/kg	9.98	5					
Phosphorus in phosphate	DU	3570	3570	10700	ug/kg	9.98	5					
Chloride	D	4620000	38400	107000	ug/kg	9.98	50	MAR1	12/08/17	1343	1724763	2
Fluoride	BD	29900	18100	53400	ug/kg	9.98	50					
Nitrate-N	D	729000	17600	53400	ug/kg	9.98	50					
Sulfate	D	58000000	710000	2130000	ug/kg	9.98	500	MAR1	12/08/17	1412	1724763	3

**Titration and Ion Analysis**

<b>9045_pH (Non-Aqueous):COMMON "As Received"</b>												
pH at Temp 23.0C	X	10.1	0.010	0.100	SU		1	RXB5	12/15/17	1320	1724554	4

The following Prep Methods were performed:

Method	Description	Analyst	Date	Time	Prep Batch
EPA 300.0 PREP	EPA 300.0 Total Anions in Soil	MAR1	12/08/17	0854	1724762

The following Analytical Methods were performed:

Method	Description	Analyst Comments
1	300.0_ANIONS_IC	
2	300.0_ANIONS_IC	
3	300.0_ANIONS_IC	
4	SW846 9045D	

**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: December 20, 2017

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CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 439446

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1724763										
QC1203934718	LCS										
Bromide	12500			12500	ug/kg		100	(80%-120%)	MAR1	12/08/17	11:19
Chloride	50000			46600	ug/kg		93.1	(80%-120%)			
Fluoride	25000			24900	ug/kg		99.8	(80%-120%)			
Nitrate-N	25000			23900	ug/kg		95.5	(80%-120%)			
Nitrite-N	25000			24300	ug/kg		97.3	(80%-120%)			
Phosphorus in phosphate	12500			12900	ug/kg		103	(80%-120%)			
Sulfate	100000			96600	ug/kg		96.6	(80%-120%)			
QC1203934967	LCSD										
Bromide	12500			12500	ug/kg	0.288	99.8	(0%-35%)		12/08/17	11:48
Chloride	50000			46100	ug/kg	1.03	92.2	(0%-35%)			
Fluoride	25000			24900	ug/kg	0.012	99.8	(0%-35%)			
Nitrate-N	25000			23900	ug/kg	0.113	95.6	(0%-35%)			
Nitrite-N	25000			24300	ug/kg	0.111	97.4	(0%-35%)			
Phosphorus in phosphate	12500			13000	ug/kg	0.548	104	(0%-35%)			

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**QC Summary**

Workorder: 439446

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Ion Chromatography</b>											
Batch	1724763										
Sulfate	100000			96400	ug/kg	0.229	96.4	(0%-35%)	MAR1	12/08/17	11:48
QC1203934717 MB											
Bromide			U	670	ug/kg					12/08/17	10:50
Chloride			U	720	ug/kg						
Fluoride			U	340	ug/kg						
Nitrate-N			U	330	ug/kg						
Nitrite-N			U	330	ug/kg						
Phosphorus in phosphate			U	670	ug/kg						
Sulfate			U	1330	ug/kg						
<b>Titration and Ion Analysis</b>											
Batch	1724554										
QC1203934131 439446003 DUP											
pH		X	10.1	X	10.1	SU	0.0995	(0%-30%)	RXB5	12/15/17	13:21
QC1203934129 LCS											
pH	7.00				6.99	SU		99.9	(70%-130%)		12/15/17 13:09
Batch 1725889											
QC1203937677 440008013 DUP											
pH		X	4.70	X	4.70	SU	0	(0%-5%)	RXB5	12/15/17	11:35
QC1203937676 LCS											
pH	7.00				7.00	SU		100	(80%-120%)		12/15/17 11:14

Notes:

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**QC Summary**

Workorder: 439446

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
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The Qualifiers in this report are defined as follows:

- < Sample is below the EPA guidance level for Reactive Releasable Cyanide and/or Reactive Releasable Sulfide
- > Result greater than quantifiable range or greater than upper limit of the analysis range
- B The analyte was detected at a value less than the contract required detection limit (RDL), but greater than or equal to the IDL/MDL (as appropriate).
- C Target analyte was detected in the sample and the associated blank. The associated blank concentration is  $\geq$  EQL or is  $>$  5% of the measured concentration and/or decision level for associated samples.
- D Results are reported from a diluted aliquot of sample.
- N Spike Sample recovery is outside control limits.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Z Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier

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.