

6/21/2016



June 21, 2016

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

Re: CHPRC SAF F16-043  
Work Order: 398860  
SDG: GEL398860

Dear Mr. Fitzgerald:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on June 08, 2016. 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,

*B Luthman*  
Brielle Luthman for  
Heather Shaffer  
Project Manager

Purchase Order: 304070 - 8C  
Chain of Custody: F16-043-026 and F16-043-029  
Enclosures



## Table of Contents

Case Narrative.....	1
Chain of Custody and Supporting Documentation.....	7
Data Review Qualifier Definitions.....	11
Laboratory Certifications.....	13
Metals Analysis.....	15
Case Narrative.....	16
Sample Data Summary.....	21
Quality Control Summary.....	24
General Chem Analysis.....	32
Case Narrative.....	33
Sample Data Summary.....	36
Quality Control Summary.....	39
Radiological Analysis.....	41
Case Narrative.....	42
Sample Data Summary.....	45
Quality Control Summary.....	48

# Case Narrative

**General Narrative  
for  
CH2MHill Plateau Remediation Company  
CHPRC SAF F16-043  
SDG: GEL398860**

**June 21, 2016**

**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 June 08, 2016, 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. There are no additional comments concerning sample receipt.

**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 and DER.

**Sample Identification**

The laboratory received the following samples:

<b>Laboratory Identification</b>	<b>Sample Description</b>
398860001	B35VN3
398860002	B35VN6

**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, Metals and Radiochemistry.

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.

6/21/2016

*B. Luthman*  
Brielle Luthman for  
Heather Shaffer  
Project Manager

**Technical Case Narrative**  
**CH2M Hill Plateau Remediation Company (CPRC)**  
**SDG #: GEL398860**  
**Work Order #: 398860**

## 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 potassium. Client sample concentrations were less than the MDL or greater than two times the PQL; therefore the data were not adversely affected. 398860001 (B35VN3) and 398860002 (B35VN6).

### Quality Control (QC) Information

#### **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 analyte. The post spike recovery was within the required control limits. This verifies the absence of a matrix interference in the post-spike digested sample. The recovery may be attributed to possible sample matrix interference and/or non-homogeneity.

Sample	Analyte	Value
1203564008 (B35VN3MS)	Calcium	148* (75%-125%)

### Technical Information

#### **Sample Dilutions**

Samples required dilutions for antimony in order to minimize suppression due to matrix interferences. 398860001 (B35VN3) and 398860002 (B35VN6).

Analyte	398860	
	001	002
Antimony	5X	5X

### **Determination of Metals by ICP-MS**

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**

#### **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 analyte. The post spike recovery was within the required control limits for some of the analyte. This verifies the absence of a matrix interference in the post-digested sample. For other analyte the post spike failed verifying the presence of a matrix interference in the post-digested sample. The failing spike recovery may be attributed to possible matrix interference and/or sample non-homogeneity.

Sample	Analyte	Value
1203563955 (B35VN3MS)	Chromium	132* (75%-125%)
	Strontium	65.6* (75%-125%)

#### **Duplicate Relative Percent Difference (RPD) Statement**

Not all the applicable analyte RPD values were within the acceptance criteria.

Sample	Analyte	Value
1203563954 (B35VN3DUP)	Arsenic	1180* (+/-1000 ug/kg)
	Strontium	20.9* (0%-20%)

#### **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
1203570427 (B35VN3PS)	Strontium	121* (80%-120%)

### **Technical Information**

#### **Sample Dilutions**

Samples 398860001 (B35VN3) and 398860002 (B35VN6) were diluted to ensure that the analyte concentrations were within the linear calibration range of the instrument. The ICPMS solid samples in this SDG were diluted the standard two times.

Analyte	398860	
	001	002
Several	2X 10X	2X 10X

## **General Chemistry**

### **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.

<b>Sample</b>	<b>Analyte</b>	<b>Value</b>
1203565526 (B35VN3DUP)	pH	Received 08-JUN-16, out of holding 07-JUN-16
398860001 (B35VN3)	pH	Received 08-JUN-16, out of holding 07-JUN-16
398860002 (B35VN6)	pH	Received 08-JUN-16, out of holding 07-JUN-16

### **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**

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		F16-043-026	PAGE 1 OF 1
COLLECTOR J.R. Aguitar/CHPRC	COMPANY CONTACT TODAK, D	TELEPHONE NO. 376-6427	PROJECT COORDINATOR TODAK, D	PRICE CODE 8C	DATA TURNAROUND 15 Days / 15 Days
SAMPLING LOCATION C9401, I-002	PROJECT DESIGNATION 100-NR-2 Drilling - Soil		SAF NO. F16-043	AIR QUALITY <input type="checkbox"/>	
ICE CHEST NO. 605-346	FIELD LOGBOOK NO. H.N.F.-645-3/84	ACTUAL SAMPLE DEPTH 52.15' - 54.65'	COA 304070	METHOD OF SHIPMENT FEDERAL EXPRESS	ORIGINAL
SHIPPED TO GEL Laboratories, LLC	OFFSITE PROPERTY NO. 6703		BILL OF LADING/AIR BILL NO. 776465146772		

MATRIX* A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	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. NA	PRESERVATION None	None	None
	HOLDING TIME	6 Months	ASAP	None
	TYPE OF CONTAINER	G/P	G/P	Moisture Resistant Cont
	NO. OF CONTAINER(S)	1	1	1
	VOLUME	250mL	60mL	200g
	SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS	90-15_pH (Non-Aqueous) COMMON;	SEE ITEM (2) IN SPECIAL INSTRUCTIONS

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME
B35VN3	SOIL	JUN 07 2016	0910

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	SPLIT SPOON PARTS B & A WILL BE COMBINED TO ENSURE ADEQUATE SAMPLE MATERIAL FOR ANALYSIS; SAMPLE A AND B PORTION SAMPLES	
J.R. Aguitar/CHPRC	JUN 07 2016 1035	Lesly Wall / CHPRC	JUN 07 2016 1035	B35VN3, B35VN4, B35VN5	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	(1) 6020_METALS_ICPMS: COMMON {Aluminum, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Molybdenum, Selenium};	
J.R. Aguitar/CHPRC	JUN 07 2016 1400	FEDEX	DATE/TIME	6020_METALS_ICPMS: COMMON (Add-on) {Antimony, Arsenic, Manganese, Nickel, Silver, Strontium, Vanadium, Zinc};	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	6010_METALS_ICP: COMMON {Calcium, Iron, Magnesium, Potassium, Sodium}; 6010_METALS_ICP: COMMON (Add-on) {Phosphorus};	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME	(2) Moisture Content - D2216 {Percent moisture (wet sample)};	
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		FL16-043-029	PAGE 1 OF 1
COLLECTOR J.R. Aguilar/CHPRC	COMPANY CONTACT TODAK, D	TELEPHONE NO. 376-6427	PROJECT COORDINATOR TODAK, D	PRICE CODE 8C	DATA TURNAROUND 15 Days / 15 Days
SAMPLING LOCATION C9401, I-002 DUP	PROJECT DESIGNATION 100-NR-2 Drilling - Soil		SAF NO. F16-043	AIR QUALITY	
ICE CHEST NO. GWS-346	FIELD LOGBOOK NO. HNF-N-645-3184	ACTUAL SAMPLE DEPTH 52.15' - 53.15'	COA 304070	METHOD OF SHIPMENT FEDERAL EXPRESS	ORIGINAL
SHIPPED TO GEL Laboratories, LLC	OFFSITE PROPERTY NO. 6703	54.65'	BILL OF LADING/AIR BILL NO. 776465146772		

MATRIX* A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	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. NA	None	None	None	None
	PRESERVATION	None	None	None	None
	HOLDING TIME	6 Months	ASAP	None	None
	TYPE OF CONTAINER	G/P	G/P	Moisture Resistant Cont.	1
	NO. OF CONTAINER(S)	1	1	1	1
	VOLUME	250mL	60mL	200g	
	SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS	9045_pH (Non-Aqueous): COMMON;	SEE ITEM (2) IN SPECIAL INSTRUCTIONS	
SAMPLE NO. B35VN6	MATRIX* SOIL	SAMPLE DATE JUN 07 2016	SAMPLE TIME 0910		

298860

CHAIN OF POSSESSION		SIGN/ PRINT NAMES		SPECIAL INSTRUCTIONS	
RELINQUISHED BY/REMOVED FROM J.R. Aguilar/CHPRC	DATE/TIME JUN 07 2016 1035	RECEIVED BY/STORED IN J.R. Aguilar/CHPRC	DATE/TIME JUN 07 2016 1035	SPLIT SPOON PARTS B & A WILL BE COMBINED TO ENSURE ADEQUATE SAMPLE MATERIAL FOR ANALYSIS; SAMPLE A AND B PORTION SAMPLES B35VN6, B35VN7, B35VN8	
RELINQUISHED BY/REMOVED FROM Leah Wall	DATE/TIME JUN 07 2016 1400	RECEIVED BY/STORED IN Leah Wall	DATE/TIME JUN 07 2016 1400	(1) 6020_METALS_ICPMS: COMMON {Aluminum, Barium, Cadmium, Chromium, Cobalt, Copper, Lead, Molybdenum, Selenium}; 6020_METALS_ICPMS: COMMON (Add-on) {Antimony, Arsenic, Manganese, Nickel, Silver, Strontium, Vanadium, Zinc}; 6010_METALS_ICP: COMMON {Calcium, Iron, Magnesium, Potassium, Sodium}; 6010_METALS_ICP: COMMON (Add-on) {Phosphorus}; (2) Moisture Content - D2216 {Percent moisture (wet sample)};	
RELINQUISHED BY/REMOVED FROM Renee	DATE/TIME	RECEIVED BY/STORED IN M. Gasnow	DATE/TIME 6-8-16 0900		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME		
LABORATORY SECTION	RECEIVED BY	TITLE		DATE/TIME	
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY		DATE/TIME	

**SAMPLE RECEIPT & REVIEW FORM**

Client: <u>CPRC</u>		SDG/AR/COC/Work Order:	
Received By: <u>MR</u>		Date Received: <u>6-8-16</u>	
Suspected Hazard Information		Yes	No
COC/Samples marked as radioactive?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Classified Radioactive II or III by RSO?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
COC/Samples marked containing PCBs?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Package, COC, and/or Samples marked as beryllium or asbestos containing?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Shipped as a DOT Hazardous?		<input checked="" type="checkbox"/>	<input type="checkbox"/>
Samples identified as Foreign Soil?		<input checked="" type="checkbox"/>	<input type="checkbox"/>

\*If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.  
 Maximum Net Counts Observed\* (Observed Counts - Area Background Counts): CPRC  
 If yes, Were swipes taken of sample containers < action levels?  
 if yes, samples are to be segregated as Safety Controlled Samples, and opened by the GEL Safety Group.  
 Hazard Class Shipped: UN#:

Sample Receipt Criteria	Yes	NA	No	Comments/Qualifiers (Required for Non-Conforming Items)
1 Shipping containers received intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
2 Samples requiring cold preservation within (0 ≤ 6 deg. C)?*	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Preservation Method: Ice bags Blue ice Dry ice None Other (describe) *all temperatures are recorded in Celsius <u>2C</u>
2a Daily check performed and passed on IR temperature gun?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Temperature Device Serial #: <u>13046196 L</u> Secondary Temperature Device Serial # (if Applicable):
3 Chain of custody documents included with shipment?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4 Sample containers intact and sealed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: Seals broken Damaged container Leaking container Other (describe)
5 Samples requiring chemical preservation at proper pH?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's, containers affected and observed pH: If Preservation added, Lot#:
6 Do Low Level Perchlorate samples have headspace as required?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
7 VOA vials contain acid preservation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If unknown, select No)
8 VOA vials free of headspace (defined as < 6mm bubble)?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
9 Are Encore containers present?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	(If yes, immediately deliver to Volatiles laboratory)
10 Samples received within holding time?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	ID's and tests affected:
11 Sample ID's on COC match ID's on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's and containers affected:
12 Date & time on COC match date & time on bottles?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected:
13 Number of containers received match number indicated on COC?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sample ID's affected:
14 Are sample containers identifiable as GEL provided?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
15 COC form is properly signed in relinquished/received sections?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
16 Carrier and tracking number.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Circle Applicable: FedEx Air FedEx Ground UPS Field Services Courier Other <u>7764 6135 3682 21C NO ICE</u> <u>7764 6135 3384 2C</u> <u>7764 6514 6772 2C</u>

Comments (Use Continuation Form if needed):

# **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 21 June 2016

State	Certification
Alaska	UST-0110
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA160006
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122016-1
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
S.Carolina Radchem	10120002
South Carolina Chemistry	10120001
Tennessee	TN 02934
Texas NELAP	T104704235-16-11
Utah NELAP	SC000122016-20
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

# Metals Analysis

# Case Narrative

**Metals**  
**Technical Case Narrative**  
**CH2MHill Plateau Remediation Company (CPRC)**  
**SDG #: GEL398860**  
**Work Order #: 398860**

**Product:** Determination of Metals by ICP-MS  
**Analytical Method:** 6020\_METALS\_ICPMS  
**Analytical Procedure:** GL-MA-E-014 REV# 28  
**Analytical Batch:** 1573181

**Product:** Determination of Metals by ICP  
**Analytical Method:** 6010\_METALS\_ICP  
**Analytical Procedure:** GL-MA-E-013 REV# 26  
**Analytical Batch:** 1573205

**Preparation Method:** SW846 3050B  
**Preparation Procedure:** GL-MA-E-009 REV# 26  
**Preparation Batches:** 1573180 and 1573204

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>
398860001	B35VN3
398860002	B35VN6
1203564005	Method Blank (MB)ICP
1203564006	Laboratory Control Sample (LCS)
1203564009	398860001(B35VN3L) Serial Dilution (SD)
1203564007	398860001(B35VN3D) Sample Duplicate (DUP)
1203564008	398860001(B35VN3S) Matrix Spike (MS)
1203565468	398860001(B35VN3PS) Post Spike (PS)
1203563952	Method Blank (MB)ICP-MS
1203563953	Laboratory Control Sample (LCS)
1203563956	398860001(B35VN3L) Serial Dilution (SD)
1203563954	398860001(B35VN3D) Sample Duplicate (DUP)
1203563955	398860001(B35VN3S) Matrix Spike (MS)
1203570427	398860001(B35VN3PS) Post Spike (PS)

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.

**Calibration Information**

**CRDL/PQL Requirements**

The PQL standard recoveries for SW846 6010C or 6010D met the control limits with the exception of potassium. Client sample concentrations were less than the MDL or greater than two times the PQL; therefore the data were not adversely affected. 398860001 (B35VN3) and 398860002 (B35VN6)-ICP.

**Quality Control (QC) Information****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 analyte. The post spike recovery was within the required control limits. This verifies the absence of a matrix interference in the post-spike digested sample. The recovery may be attributed to possible sample matrix interference and/or non-homogeneity.

Sample	Analyte	Value
1203564008 (B35VN3MS)	Calcium	148* (75%-125%)

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

Sample	Analyte	Value
1203563955 (B35VN3MS)	Chromium	132* (75%-125%)
	Strontium	65.6* (75%-125%)

**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
1203563954 (B35VN3DUP)	Arsenic	1180* (+/-1000 ug/kg)
	Strontium	20.9* (0%-20%)

**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
1203570427 (B35VN3PS)	Strontium	121* (80%-120%)

**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 are performed to minimize matrix interferences resulting from elevated mineral element concentrations present in solid samples and/or to bring over range target analyte concentrations into the linear calibration range of the instrument. Samples required dilutions for antimony in order to minimize suppression due to matrix interferences. 398860001 (B35VN3) and 398860002 (B35VN6)-ICP. Samples 398860001 (B35VN3) and 398860002 (B35VN6)-ICP-MS were diluted to ensure that the analyte concentrations were within the linear calibration range of the instrument. The ICPMS solid samples in this SDG were diluted the standard two times. ICP-MS.

Analyte	398860	
	001	002
Several	5X 2X 10X 1X	5X 2X 10X 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: GEL398860 GEL Work Order: 398860

**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).
- 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: 21 JUN 2016**

**Title: Data Validator**

# Sample Data Summary

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

SDG No: GEL398860

CONTRACT: CPCR0F16043

METHOD TYPE: SW846

SAMPLE ID: 398860001

BASIS: Dry Weight

DATE COLLECTED 07-JUN-16

CLIENT ID: B35VN3

LEVEL: Low

DATE RECEIVED 08-JUN-16

MATRIX: SOIL

%SOLIDS: 96.5

CAS No.	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	6870000	ug/kg	D	3050	10200	50	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7440-36-0	Antimony	1650	ug/kg	UD	1650	5000	5000	5	P	HSC	06/14/16 09:40	061416-2	1573205
7440-38-2	Arsenic	2660	ug/kg	D*	204	1020	10	2	MS	BCD1	06/20/16 22:12	160620-3	1573181
7440-39-3	Barium	36900	ug/kg	D	102	407	20	2	MS	PRB	06/21/16 12:20	160621-4	1573181
7440-43-9	Cadmium	76.5	ug/kg	BD	20.4	204	5	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7440-70-2	Calcium	1790000	ug/kg	N	8000	25000	25000	1	P	HSC	06/13/16 11:27	061316-1	1573205
7440-47-3	Chromium	13600	ug/kg	DN	204	611	10	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7440-48-4	Cobalt	4370	ug/kg	D	61.1	204	20	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7440-50-8	Copper	12600	ug/kg	D	67.2	204	8	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7439-89-6	Iron	11000000	ug/kg		8000	25000	25000	1	P	HSC	06/13/16 11:27	061316-1	1573205
7439-92-1	Lead	2350	ug/kg	D	102	407	15	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7439-95-4	Magnesium	4080000	ug/kg		8500	30000	30000	1	P	HSC	06/13/16 11:27	061316-1	1573205
7439-96-5	Manganese	208000	ug/kg	D	1020	5090	5	10	MS	PRB	06/21/16 12:39	160621-4	1573181
7439-98-7	Molybdenum	195	ug/kg	BD	61.1	204	20	2	MS	BCD1	06/20/16 22:12	160620-3	1573181
7440-02-0	Nickel	14200	ug/kg	D	102	407	40	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7723-14-0	Phosphorous	353000	ug/kg		5000	15000	15000	1	P	HSC	06/13/16 11:27	061316-1	1573205
7440-09-7	Potassium	549000	ug/kg		6400	25000	25000	1	P	HSC	06/13/16 11:27	061316-1	1573205
7782-49-2	Selenium	336	ug/kg	UD	336	1020	50	2	MS	BCD1	06/20/16 22:12	160620-3	1573181
7440-22-4	Silver	100	ug/kg	U	100	500	500	1	P	HSC	06/13/16 11:27	061316-1	1573205
7440-23-5	Sodium	67000	ug/kg		7000	25000	25000	1	P	HSC	06/13/16 11:27	061316-1	1573205
7440-24-6	Strontium	19800	ug/kg	D*N	407	2040	10	2	MS	SKJ	06/20/16 15:21	160620-5	1573181
7440-62-2	Vanadium	24600	ug/kg	D	305	1020	1020	2	MS	PRB	06/21/16 12:20	160621-4	1573181
7440-66-6	Zinc	26000	ug/kg	D	407	2040	25	2	MS	SKJ	06/20/16 15:21	160620-5	1573181

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1573181	1573180	SW846 3050B	0.509	g	50	mL	06/10/16	JP1
1573205	1573204	SW846 3050B	0.518	g	50	mL	06/10/16	JP1

**\*Analytical Methods:**

**P** SW846 3050B/6010C  
**MS** SW846 3050B/6020A

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

SDG No: GEL398860

CONTRACT: CPRC0F16043

METHOD TYPE: SW846

SAMPLE ID: 398860002

BASIS: Dry Weight

DATE COLLECTED 07-JUN-16

CLIENT ID: B35VN6

LEVEL: Low

DATE RECEIVED 08-JUN-16

MATRIX: SOIL

%SOLIDS: 96.5

CAS No.	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	6830000	ug/kg	D	2960	9870	50	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7440-36-0	Antimony	1690	ug/kg	UD	1690	5120	5120	5	P	HSC	06/14/16 09:38	061416-2	1573205
7440-38-2	Arsenic	1650	ug/kg	D*	197	987	10	2	MS	BCD1	06/20/16 22:45	160620-3	1573181
7440-39-3	Barium	44500	ug/kg	D	98.7	395	20	2	MS	PRB	06/21/16 12:29	160621-4	1573181
7440-43-9	Cadmium	72.1	ug/kg	BD	19.7	197	5	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7440-70-2	Calcium	2000000	ug/kg	N	8190	25600	25600	1	P	HSC	06/13/16 11:25	061316-1	1573205
7440-47-3	Chromium	14200	ug/kg	DN	197	592	10	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7440-48-4	Cobalt	4320	ug/kg	D	59.2	197	20	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7440-50-8	Copper	12100	ug/kg	D	65.1	197	8	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7439-89-6	Iron	11400000	ug/kg		8190	25600	25600	1	P	HSC	06/13/16 11:25	061316-1	1573205
7439-92-1	Lead	2540	ug/kg	D	98.7	395	15	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7439-95-4	Magnesium	4150000	ug/kg		8710	30700	30700	1	P	HSC	06/13/16 11:25	061316-1	1573205
7439-96-5	Manganese	219000	ug/kg	D	987	4940	5	10	MS	PRB	06/21/16 12:31	160621-4	1573181
7439-98-7	Molybdenum	179	ug/kg	BD	59.2	197	20	2	MS	BCD1	06/20/16 22:45	160620-3	1573181
7440-02-0	Nickel	15500	ug/kg	D	98.7	395	40	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7723-14-0	Phosphorous	401000	ug/kg		5120	15400	15400	1	P	HSC	06/13/16 11:25	061316-1	1573205
7440-09-7	Potassium	578000	ug/kg		6550	25600	25600	1	P	HSC	06/13/16 11:25	061316-1	1573205
7782-49-2	Selenium	326	ug/kg	UD	326	987	50	2	MS	BCD1	06/20/16 22:45	160620-3	1573181
7440-22-4	Silver	102	ug/kg	U	102	512	512	1	P	HSC	06/13/16 11:25	061316-1	1573205
7440-23-5	Sodium	83600	ug/kg		7170	25600	25600	1	P	HSC	06/13/16 11:25	061316-1	1573205
7440-24-6	Strontium	23700	ug/kg	D*N	395	1970	10	2	MS	SKJ	06/20/16 15:41	160620-5	1573181
7440-62-2	Vanadium	24100	ug/kg	D	296	987	987	2	MS	PRB	06/21/16 12:29	160621-4	1573181
7440-66-6	Zinc	26700	ug/kg	D	395	1970	25	2	MS	SKJ	06/20/16 15:41	160620-5	1573181

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1573181	1573180	SW846 3050B	0.525	g	50	mL	06/10/16	JP1
1573205	1573204	SW846 3050B	0.506	g	50	mL	06/10/16	JP1

**\*Analytical Methods:**

**P** SW846 3050B/6010C  
**MS** SW846 3050B/6020A

# Quality Control Summary

**GEL LABORATORIES LLC**

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**QC Summary**

Report Date: June 21, 2016

Page 1 of 7

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 398860

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1573181										
QC1203563954	398860001	DUP									
Aluminum	D	6870000	D	6830000	ug/kg	0.58		(0%-20%)	SKJ	06/20/16	15:25
Arsenic	*D	2660	*D	1480	ug/kg	57.1*^		(+/-1000)	BCD1	06/20/16	22:18
Barium	D	36900	D	35900	ug/kg	2.82		(0%-20%)	PRB	06/21/16	12:22
Cadmium	BD	76.5	BD	67.8	ug/kg	12.1 ^		(+/-200)	SKJ	06/20/16	15:25
Chromium	DN	13600	D	14700	ug/kg	7.8		(0%-20%)			
Cobalt	D	4370	D	4300	ug/kg	1.65		(0%-20%)			
Copper	D	12600	D	11000	ug/kg	12.9		(0%-20%)			
Lead	D	2350	D	2200	ug/kg	6.58		(0%-20%)			
Manganese	D	208000	D	211000	ug/kg	1.52		(0%-20%)	PRB	06/21/16	12:41
Molybdenum	BD	195	D	233	ug/kg	17.8 ^		(+/-200)	BCD1	06/20/16	22:18
Nickel	D	14200	D	14000	ug/kg	1.46		(0%-20%)	SKJ	06/20/16	15:25
Selenium	DU	336	DU	330	ug/kg	N/A			BCD1	06/20/16	22:18
Strontium	*DN	19800	*D	16100	ug/kg	20.9*		(0%-20%)	SKJ	06/20/16	15:25
Vanadium	D	24600	D	24800	ug/kg	0.804		(0%-20%)	PRB	06/21/16	12:22
Zinc	D	26000	D	25500	ug/kg	1.77		(0%-20%)	SKJ	06/20/16	15:25
QC1203563953	LCS										
Aluminum	195000		D	194000	ug/kg		99.8	(80%-120%)		06/20/16	15:09
Arsenic	4860		D	4700	ug/kg		96.6	(80%-120%)	BCD1	06/20/16	22:05
Barium	4860		D	4810	ug/kg		99	(80%-120%)	PRB	06/21/16	12:18
Cadmium	4860		D	4800	ug/kg		98.6	(80%-120%)	SKJ	06/20/16	15:09

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**QC Summary**

Workorder: 398860

Page 2 of 7

Parname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1573181										
Chromium	4860		D	4720	ug/kg		97	(80%-120%)			
Cobalt	4860		D	4850	ug/kg		99.8	(80%-120%)	SKJ	06/20/16	15:09
Copper	4860		D	4970	ug/kg		102	(80%-120%)			
Lead	4860		D	4700	ug/kg		96.7	(80%-120%)			
Manganese	4860		D	4810	ug/kg		98.8	(80%-120%)	PRB	06/21/16	12:18
Molybdenum	4860		D	4880	ug/kg		100	(80%-120%)	BCD1	06/20/16	22:05
Nickel	4860		D	4880	ug/kg		100	(80%-120%)	SKJ	06/20/16	15:09
Selenium	4860		D	4250	ug/kg		87.3	(80%-120%)	BCD1	06/20/16	22:05
Strontium	4860		D	5220	ug/kg		107	(80%-120%)	SKJ	06/20/16	15:09
Vanadium	4860		D	4630	ug/kg		95.2	(80%-120%)	PRB	06/21/16	12:18
Zinc	4860		D	4720	ug/kg		97.1	(80%-120%)	SKJ	06/20/16	15:09
QC1203563952	MB										
Aluminum			DU	2950	ug/kg					06/20/16	15:05
Arsenic			DU	196	ug/kg				BCD1	06/20/16	21:58
Barium			DU	98.2	ug/kg				PRB	06/21/16	12:17
Cadmium			DU	19.6	ug/kg				SKJ	06/20/16	15:05
Chromium			DU	196	ug/kg						
Cobalt			DU	58.9	ug/kg						
Copper			DU	64.8	ug/kg						
Lead			DU	98.2	ug/kg						
Manganese			DU	196	ug/kg				PRB	06/21/16	12:17
Molybdenum			DU	58.9	ug/kg				BCD1	06/20/16	21:58
Nickel			DU	98.2	ug/kg				SKJ	06/20/16	15:05

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**QC Summary**

Workorder: 398860

Page 3 of 7

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1573181										
Selenium			DU	324	ug/kg				BCD1	06/20/16	21:58
Strontium			DU	393	ug/kg				SKJ	06/20/16	15:05
Vanadium			DU	295	ug/kg				PRB	06/21/16	12:17
Zinc			DU	393	ug/kg				SKJ	06/20/16	15:05
QC1203563955 398860001 MS											
Aluminum	206000	D	6870000	D	6470000	ug/kg	N/A	(75%-125%)		06/20/16	15:29
Arsenic	5140	*D	2660	D	6910	ug/kg	82.7	(75%-125%)	BCD1	06/20/16	22:25
Barium	5140	D	36900	D	41800	ug/kg	N/A	(75%-125%)	PRB	06/21/16	12:24
Cadmium	5140	BD	76.5	D	5200	ug/kg	99.6	(75%-125%)	SKJ	06/20/16	15:29
Chromium	5140	DN	13600	DN	20400	ug/kg	132*	(75%-125%)			
Cobalt	5140	D	4370	D	9300	ug/kg	95.9	(75%-125%)			
Copper	5140	D	12600	D	17300	ug/kg	92	(75%-125%)			
Lead	5140	D	2350	D	7540	ug/kg	101	(75%-125%)			
Manganese	5140	D	208000	D	229000	ug/kg	N/A	(75%-125%)	PRB	06/21/16	12:43
Molybdenum	5140	BD	195	D	5280	ug/kg	99	(75%-125%)	BCD1	06/20/16	22:25
Nickel	5140	D	14200	D	20400	ug/kg	119	(75%-125%)	SKJ	06/20/16	15:29
Selenium	5140	DU	336	D	4230	ug/kg	82.4	(75%-125%)	BCD1	06/20/16	22:25
Strontium	5140	*DN	19800	DN	23200	ug/kg	65.6*	(75%-125%)	SKJ	06/20/16	15:29
Vanadium	5140	D	24600	D	26400	ug/kg	N/A	(75%-125%)	PRB	06/21/16	12:24
Zinc	5140	D	26000	D	29800	ug/kg	N/A	(75%-125%)	SKJ	06/20/16	15:29
QC1203570427 398860001 PS											
Chromium	25.0	DN	66.9	D	90.3	ug/L	93.4	(80%-120%)		06/20/16	15:33
Strontium	25.0	*DN	97.4	D	128	ug/L	121*	(80%-120%)			

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**QC Summary**

Workorder: 398860

Page 4 of 7

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1573181										
QC1203563956	398860001	SDILT									
Aluminum	D	33700	D	6850	ug/L	1.51		(0%-10%)	SKJ	06/20/16	15:37
Arsenic	*D	13.1	BD	2.82	ug/L	8.15		(0%-10%)	BCD1	06/20/16	22:38
Barium	D	182	D	35.1	ug/L	3.34		(0%-10%)	PRB	06/21/16	12:27
Cadmium	BD	0.376	DU	102	ug/L	N/A		(0%-10%)	SKJ	06/20/16	15:37
Chromium	DN	66.9	D	12.1	ug/L	9.38		(0%-10%)			
Cobalt	D	21.5	D	4.32	ug/L	.526		(0%-10%)			
Copper	D	61.7	D	12.7	ug/L	2.76		(0%-10%)			
Lead	D	11.5	D	2.34	ug/L	1.33		(0%-10%)			
Manganese	D	204	D	38.9	ug/L	4.89		(0%-10%)	PRB	06/21/16	12:45
Molybdenum	BD	0.957	DU	305	ug/L	N/A		(0%-10%)	BCD1	06/20/16	22:38
Nickel	D	69.9	D	14.0	ug/L	.428		(0%-10%)	SKJ	06/20/16	15:37
Selenium	DU	-1.13	DU	1680	ug/L	N/A		(0%-10%)	BCD1	06/20/16	22:38
Strontium	*DN	97.4	D	19.0	ug/L	2.34		(0%-10%)	SKJ	06/20/16	15:37
Vanadium	D	121	D	23.2	ug/L	3.96		(0%-10%)	PRB	06/21/16	12:27
Zinc	D	128	D	28.8	ug/L	12.6		(0%-10%)	SKJ	06/20/16	15:37

**Metals Analysis-ICP**

Batch 1573205

QC1203564007	398860001	DUP									
Antimony	DU	1650	DU	1700	ug/kg	N/A			HSC	06/14/16	09:43
Calcium	N	1790000		1900000	ug/kg	5.45		(0%-20%)		06/13/16	11:29
Iron		11000000		11500000	ug/kg	3.66		(0%-20%)			
Magnesium		4080000		4420000	ug/kg	7.97		(0%-20%)			

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**QC Summary**

Workorder: 398860

Page 5 of 7

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1573205										
Phosphorous		353000		383000	ug/kg	8.13		(0%-20%)			
Potassium		549000		599000	ug/kg	8.84		(0%-20%)	HSC	06/13/16	11:29
Silver	U	100	U	103	ug/kg	N/A					
Sodium		67000		83200	ug/kg	21.6 ^		(+/-25700)			
QC1203564006	LCS										
Antimony	48500			48400	ug/kg		99.7	(80%-120%)		06/14/16	09:35
Calcium	485000			483000	ug/kg		99.5	(80%-120%)		06/13/16	11:22
Iron	485000			471000	ug/kg		97	(80%-120%)			
Magnesium	485000			480000	ug/kg		99	(80%-120%)			
Phosphorous	48500			45100	ug/kg		92.9	(80%-120%)			
Potassium	485000			455000	ug/kg		93.7	(80%-120%)			
Silver	48500			45700	ug/kg		94.2	(80%-120%)			
Sodium	485000			479000	ug/kg		98.7	(80%-120%)			
QC1203564005	MB										
Antimony			U	329	ug/kg					06/14/16	09:32
Calcium			U	7980	ug/kg					06/13/16	11:19
Iron			U	7980	ug/kg						
Magnesium			U	8480	ug/kg						
Phosphorous			U	4990	ug/kg						
Potassium			U	6390	ug/kg						
Silver			U	99.8	ug/kg						
Sodium			U	6990	ug/kg						
QC1203564008	398860001	MS									
Antimony	50100	DU	1650	D	47300	ug/kg	93	(75%-125%)		06/14/16	09:46

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**QC Summary**

Workorder: 398860

Page 6 of 7

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis-ICP</b>											
Batch	1573205										
Calcium	501000	N	1790000	N	2540000	ug/kg	148*	(75%-125%)		06/13/16	11:31
Iron	501000		11000000		13200000	ug/kg	N/A	(75%-125%)	HSC		
Magnesium	501000		4080000		4860000	ug/kg	N/A	(75%-125%)			
Phosphorous	50100		353000		444000	ug/kg	N/A	(75%-125%)			
Potassium	501000		549000		1010000	ug/kg	92.2	(75%-125%)			
Silver	50100	U	100		46300	ug/kg	92.4	(75%-125%)			
Sodium	501000		67000		560000	ug/kg	98.4	(75%-125%)			
QC1203565468	398860001	PS									
Calcium	5000	N	17900		22400	ug/L	88.1	(80%-120%)		06/13/16	11:33
QC1203564009	398860001	SDILT									
Antimony		DU	1.42	DU	8250	ug/L	N/A	(0%-10%)		06/14/16	09:52
Calcium		N	17900	D	3680	ug/L	2.53	(0%-10%)		06/13/16	11:35
Iron			110000	D	22800	ug/L	3.43	(0%-10%)			
Magnesium			40800	D	8330	ug/L	2.05	(0%-10%)			
Phosphorous			3530	D	720	ug/L	1.91	(0%-10%)			
Potassium			5490	D	1170	ug/L	6.45	(0%-10%)			
Silver		U	-0.912	DU	500	ug/L	N/A	(0%-10%)			
Sodium			670	D	129	ug/L	3.6	(0%-10%)			

**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.

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**QC Summary**

Workorder: 398860

Page 7 of 7

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
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										

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 #: GEL398860  
Work Order #: 398860**

**Product: pH****Analytical Method:** SW846 9045D**Analytical Procedure:** GL-GC-E-008 REV# 21**Analytical Batch:** 1573817

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>
398860001	B35VN3
398860002	B35VN6
1203565524	Laboratory Control Sample (LCS)
1203565526	398860001(B35VN3) 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>
1203565526 (B35VN3DUP)	pH	Received 08-JUN-16, out of holding 07-JUN-16
398860001 (B35VN3)	pH	Received 08-JUN-16, out of holding 07-JUN-16
398860002 (B35VN6)	pH	Received 08-JUN-16, out of holding 07-JUN-16

**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: GEL398860 GEL Work Order: 398860

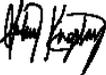
**The Qualifiers in this report are defined as follows:**

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 JUN 2016

**Title:** Analyst I

# Sample Data Summary



6/21/2016

# GEL LABORATORIES LLC

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## Certificate of Analysis

Report Date: June 20, 2016

Company : CH2MHill Plateau Remediation Company  
 Address : MSIN R3-50 CHPRC  
 PO Box 1600  
 Richland, Washington 99352  
 Contact: Mr. Scot Fitzgerald  
 Project: CHPRC SAF F16-043

---

Client Sample ID:	B35VN6	Project:	CPRC0F16043
Sample ID:	398860002	Client ID:	CPRC001
Matrix:	SOIL		
Collect Date:	07-JUN-16 09:10		
Receive Date:	08-JUN-16		
Collector:	Client		
Moisture:	3.52%		

---

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	Method
Titration and Ion Analysis											
9045_pH (Non-Aqueous):COMMON "As Received"											
pH at Temp 23.4C	X	8.09	0.010	0.100	SU	1	RXB5	06/15/16	1820	1573817	1

The following Analytical Methods were performed:

---

Method	Description	Analyst Comments
1	SW846 9045D	

Notes:

# Quality Control Summary

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: June 20, 2016

Page 1 of 1

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 398860

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Titration and Ion Analysis</b>											
Batch	1573817										
QC1203565526	398860001	DUP									
pH	X	7.96	X	8.02	SU	0.751		(0%-30%)	RXB5	06/15/16	18:19
QC1203565524	LCS										
pH	7.00			7.00	SU		100	(70%-130%)		06/15/16	18:15

**Notes:**

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.

# Radiological Analysis

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
CH2MHill Plateau Remediation Company (CPRC)  
SDG #: GEL398860  
Work Order #: 398860**

**Product: Dry Weight**

**Analytical Method:** ASTM D 2216 (Modified)

**Analytical Procedure:** GL-OA-E-020 REV# 10

**Analytical Batch:** 1573257

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>
398860001	B35VN3
398860002	B35VN6
1203564131	398860001(B35VN3) Sample Duplicate (DUP)

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

**Data Summary:**

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.

**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: GEL398860 GEL Work Order: 398860

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

**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:** Theresa Austin

**Date:** 16 JUN 2016

**Title:** Group Leader

# Sample Data Summary

**Rad**  
**Certificate of Analysis**  
**Sample Summary**

<b>SDG Number:</b> GEL398860	<b>Client:</b> CPRC001	<b>Project:</b> CPRC0F16043
<b>Lab Sample ID:</b> 398860001	<b>Date Collected:</b> 06/07/2016 09:10	<b>Matrix:</b> SOIL
	<b>Date Received:</b> 06/08/2016 09:00	<b>%Moisture:</b> 3.5
<b>Client ID:</b> B35VN3		<b>Prep Basis:</b> "As Received"
<b>Batch ID:</b> 1573257	<b>Method:</b> ASTM D 2216 (Modified)	<b>SOP Ref:</b> GL-OA-E-020
<b>Run Date:</b> 06/08/2016 15:51	<b>Analyst:</b> KYW2	<b>Instrument:</b> SP-39020004
<b>Data File:</b>		<b>Count Time:</b>
<b>Prep Batch:</b> 1573257		
<b>Prep Date:</b> 06/08/2016 15:51		

CAS No.	Parmname	Qual	Result	Units	MDC	
	Moisture		3.47	percent	+/-	
<b>Surrogate/Tracer recovery</b>		<b>Result</b>	<b>Nominal</b>	<b>Units</b>	<b>Recovery%</b>	<b>Acceptable Limits</b>

**Comments:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).  
 The MDC is a sample specific MDC.

**Rad**  
**Certificate of Analysis**  
**Sample Summary**

<b>SDG Number:</b> GEL398860	<b>Client:</b> CPRC001	<b>Project:</b> CPRC0F16043
<b>Lab Sample ID:</b> 398860002	<b>Date Collected:</b> 06/07/2016 09:10	<b>Matrix:</b> SOIL
	<b>Date Received:</b> 06/08/2016 09:00	<b>%Moisture:</b> 3.5
<b>Client ID:</b> B35VN6		<b>Prep Basis:</b> "As Received"
<b>Batch ID:</b> 1573257	<b>Method:</b> ASTM D 2216 (Modified)	<b>SOP Ref:</b> GL-OA-E-020
<b>Run Date:</b> 06/08/2016 15:51	<b>Analyst:</b> KYW2	<b>Instrument:</b> SP-39020004
<b>Data File:</b>		<b>Count Time:</b>
<b>Prep Batch:</b> 1573257		
<b>Prep Date:</b> 06/08/2016 15:51		

CAS No.	Parmname	Qual	Result	Units	Recovery%	Acceptable Limits	MDC
	Moisture		3.52	percent	+/-		
<b>Surrogate/Tracer recovery</b>			<b>Result</b>	<b>Nominal</b>	<b>Units</b>	<b>Recovery%</b>	<b>Acceptable Limits</b>

**Comments:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).  
 The MDC is a sample specific MDC.

# Quality Control Summary

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: June 16, 2016

Page 1 of 1

Client : CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington 99352

Contact: Mr. Scot Fitzgerald

Workorder: 398860

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date	Time
<b>Gravimetric Solids</b>										
Batch	1573257									
QC1203564131	398860001	DUP								
Moisture		3.47		3.99	percent	RPD: 14	(0%-20%)	KYW2	06/08/16	15:51

**Notes:**

TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).

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
- < 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).
- B The associated QC sample blank has a result  $\geq 2X$  the MDA and, after corrections, result is  $\geq$  MDA for this sample
- 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.
- 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.
- UX Gamma Spectroscopy--Uncertain identification
- 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

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.

\*\* Indicates analyte is a surrogate compound.

^ 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.

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.