

February 20, 2018

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

Re: CHPRC SAF S18-001
Work Order: 442332
SDG: GEL442332

Dear Mr. Fitzgerald:

GEL Laboratories, LLC (GEL) appreciates the opportunity to provide the enclosed analytical results for the sample(s) we received on January 25, 2018. 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: 300071 - 7H
Chain of Custody: S18-001-098, S18-001-099, S18-001-106, S18-001-107, S18-001-118, S18-001-370 and S18-001-396
Enclosures



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Case Narrative

**General Narrative
for
CH2MHill Plateau Remediation Company
CHPRC SAF S18-001
SDG: GEL442332**

February 20, 2018

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 January 25, 2018, 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.

Sample Identification

The laboratory received the following samples:

<u>Laboratory Identification</u>	<u>Sample Description</u>
442332001	B3FX56
442332002	B3FX57
442332003	B3FVR0
442332004	B3FVR1
442332005	B3FVY1
442332006	B3FVX9
442332007	B3FYF6
442332008	B3HD22

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: 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.



Heather Shaffer
Project Manager

Technical Case Narrative
CH2MHill Plateau Remediation Company (CPRC)
SDG #: GEL442332
Work Order #: 442332

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. 442332005 (B3FVY1) and 442332006 (B3FVX9).

Continuing Calibration Blanks (CCB) Requirements

All continuing calibration blanks (CCB) bracketing the sample in this SDG did not meet the acceptance criteria for sodium. The samples bracketed by this CCB, however, contained the element with a concentration at least ten times greater than the concentration in the CCB. This indicates that any contribution to the concentration of these elements in the samples from potential laboratory contamination would be minimal. 442332005 (B3FVY1) and 442332006 (B3FVX9).

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
1203959186 (MB)	Potassium and Sodium	See applicable report

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

Method Blank (MB) Statement

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
1203959181 (MB)	Tin	1.5 between (1 - 2.5)

Radiochemistry

I129LL_SEP_LEPS_GS: COMMON (low level)

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.

GAMMA_GS:COMMON

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

Recounts

Sample 1203959128 (LCS) was recounted due to low recovery. The recount is reported.

SRISO_SEP_PRECIP_GPC: COMMON

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

Recounts

Samples 1203961246 (B3HD07DUP) and 442332007 (B3FYF6) were recounted due to results more negative than the three sigma TPU. The second counts are reported.

9310_ALPHABETA_GPC: COMMON

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**Gross Alpha/Beta Preparation Information**

High hygroscopic salt content in evaporated samples can cause the sample mass to fluctuate due to moisture absorption. To minimize this interference, the salts are converted to oxides by heating the sample under a flame until a dull red color is obtained. The conversion to oxides stabilizes the sample weight and ensures that proper alpha/beta efficiencies are assigned for each sample. Volatile radioisotopes of carbon, hydrogen, technetium, polonium and cesium may be lost during sample heating.

Recounts

Sample 1203961282 (LCS) was recounted due to high recovery. The recount is reported.

Miscellaneous Information**Additional Comments**

The matrix spike and matrix spike duplicate, 1203961280 (B3HD09MS) and 1203961281 (B3HD09MSD), aliquots were reduced to conserve sample volume.

TRITIUM_DIST_LSC: COMMON

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.

Miscellaneous Information**Additional Comments**

The matrix spike, 1203963165 (Non SDG 442329001MS), aliquot was reduced to conserve sample volume.

TC99_EIE_LSC: COMMON

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**Recounts**

Samples 1203963257 (Non SDG 442156001DUP) and 442332004 (B3FVR1) were recounted to verify sample results. Recounts are reported.

C14_LSC: COMMON

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

Sample Re-prep/Re-analysis

Samples were re-prepped due to high relative percent difference/relative error ratio and high recovery. The re-analysis is being reported.

Miscellaneous Information

Additional Comments

The matrix spike, 1203965642 (Non SDG 441930001MS), aliquot was reduced to conserve sample volume.

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		69 lbs		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# S18-001-098 Page 1 of 1	
Collector:	Lary Rosano IC/PRC	Contact/Requester:	Karen Waters-Husted				
SAF No.:	S18-001	Sampling Origin:	Hanford Site				
Project Title:	SURV, JANUARY 2018	Logbook No.:	HNF-N-506 98/30				
Shipped To (Lab):	GEL Laboratories, LLC	Method of Shipment:	Commercial Carrier				
Protocol:	SURV	Priority:	30 Days				
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A					
Sample No.	Filter	*	Date	Time	No/Type Container	Sample Analysis	
B3FX56	N	W	1-24-18	1000	1x500-mL G/P	C14_LSC: COMMON	Holding Time 6 Months
Preservative							None

Relinquished By:	Lary Rosano IC/PRC	Signature	JAN 24 2018	Date/Time	1400	Signature	JAN 24 2018	Date/Time	105
Print First and Last Name	Lary Rosano	Signature	JAN 24 2018	Date/Time	1400	Signature	JAN 24 2018	Date/Time	105
Relinquished By:	Roger Friesz Jr. IC/PRC	Signature	JAN 24 2018	Date/Time	1400	Signature	JAN 24 2018	Date/Time	105
Print First and Last Name	Roger Friesz Jr.	Signature	JAN 24 2018	Date/Time	1400	Signature	JAN 24 2018	Date/Time	105
Relinquished By:	FedEx	Signature	JAN 24 2018	Date/Time	1400	Signature	JAN 24 2018	Date/Time	105
Print First and Last Name	FedEx	Signature	JAN 24 2018	Date/Time	1400	Signature	JAN 24 2018	Date/Time	105
Received By:	Roger Friesz Jr. IC/PRC	Signature	JAN 24 2018	Date/Time	105	Signature	JAN 24 2018	Date/Time	105
Print First and Last Name	Roger Friesz Jr.	Signature	JAN 24 2018	Date/Time	105	Signature	JAN 24 2018	Date/Time	105
Received By:	FedEx	Signature	JAN 24 2018	Date/Time	105	Signature	JAN 24 2018	Date/Time	105
Print First and Last Name	FedEx	Signature	JAN 24 2018	Date/Time	105	Signature	JAN 24 2018	Date/Time	105
Received By:	E. Taylor	Signature	1/25/18	Date/Time	850	Signature	1/25/18	Date/Time	850
Print First and Last Name	E. Taylor	Signature	1/25/18	Date/Time	850	Signature	1/25/18	Date/Time	850
Received By:		Signature		Date/Time		Signature		Date/Time	
Print First and Last Name		Signature		Date/Time		Signature		Date/Time	
Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposal Method (e.g., Return to customer, per lab procedure, used in process):								
Disposed By:	Disposed By:								

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C. # S18-001-106
		Page 1 of 1
Collector: Larry Roseme CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: S18-001	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071
Project Title: SURV, JANUARY 2018	Logbook No.: HNF-N-506 98/30	Ice Chest No.: GWS-687
Shipped To (Lab): GEL Laboratories, LLC	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 7713/6893741
Protocol: SURV	Priority: 30 Days	Offsite Property No.: 8796
POSSIBLE SAMPLE HAZARDS/REMARK *** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		
SPECIAL INSTRUCTIONS N/A		
Sample No. B3FVR0	Filter * N	Time W 1-24-18 0730
No/Type Container	1x500-mL G/P	
Sample Analysis		Holding Time 6 Months
TC99_ETE_LSC: COMMON		Preservative HNO3 to pH <2

Relinquished By: Larry Roseme CHPRC	Signature	Date/Time JAN 24 2018 1105
Received By: Roger Friesz Jr. CHPRC	Signature	Date/Time JAN 24 2018 1105
Relinquished By: Larry Roseme	Signature	Date/Time JAN 24 2018 1400
Received By: Roger Friesz Jr. CHPRC	Signature	Date/Time JAN 24 2018 1400
Relinquished By: FedEx	Signature	Date/Time
Received By: Roger Friesz Jr. CHPRC	Signature	Date/Time 1/25/18 0850
Relinquished By: FedEx	Signature	Date/Time
Received By: Roger Friesz Jr. CHPRC	Signature	Date/Time
Matrix * S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquid SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other		
FINAL SAMPLE DISPOSITION		Date/Time:
Disposal Method (e.g., Return to customer, per lab procedure, used in process):		Disposed By:
Printed On 1/21/2017	FSR ID = FSR53839	

CH2MHill Plateau Remediation Company Larry Rossana /CHPRC S18-001 SURV, JANUARY 2018 GEL Laboratories, LLC SURV		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 442332 Telephone No.: 509-376-4650 Purchase Order/Charge Code: 300071 Ice Chest No.: GWS-687 Bill of Lading/Air Bill No.: 771316893741 Offsite Property No.: 8996		C.O.C.# S18-001-107 Page 1 of 1
Collector: Karen Waters-Husted Sampling Origin: Hanford Site Logbook No.: HNF-N-506 98/30 Method of Shipment: Commercial Carrier Priority: 30 Days		Sample Analysis TC99_EIE_LSC: COMMON Holding Time: 6 Months Preservative: HNO3 to pH <2		
POSSIBLE SAMPLE HAZARDS/REMARK *** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A		

Relinquished By: Larry Rossana /CHPRC Signature: <i>[Signature]</i> Date/Time: JAN 24 2018 1105	Received By: Roger Friesz Jr. Signature: <i>[Signature]</i> Date/Time: JAN 24 2018 1105	Matrix * S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquid T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By: Larry Rossana /CHPRC Signature: <i>[Signature]</i> Date/Time: JAN 24 2018 1406	Received By: FEDEX Signature: <i>[Signature]</i> Date/Time: 1/25/18 850	
Relinquished By: Larry Rossana /CHPRC Signature: <i>[Signature]</i> Date/Time:	Received By: E. Tapplin Signature: <i>[Signature]</i> Date/Time:	
Relinquished By: Larry Rossana /CHPRC Signature: <i>[Signature]</i> Date/Time:	Received By: Signature: <i>[Signature]</i> Date/Time:	
FINAL SAMPLE DISPOSITION Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By: Signature: <i>[Signature]</i> Date/Time:	Date/Time:

CH2M Hill Plateau Remediation Company Larry Rosane /CHPRC S18-001 SURV, JANUARY 2018 GEL Laboratories, LLC SURV		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST Telephone No.: 509-376-4650 Purchase Order/Charge Code: 300071 Ice Chest No.: GWS-552 Bill of Lading/Air Bill No.: 771316894222 Offsite Property No.: 8996		C.O.C.# S18-001-118 Page 1 of 1		
Collector: Larry Rosane /CHPRC SAF No.: S18-001 Project Title: SURV, JANUARY 2018 Shipped To (Lab): GEL Laboratories, LLC Protocol: SURV		Contact/Requester: Karen Waters-Husted Sampling Origin: Hanford Site Logbook No.: HNF-N-506 98/30 Method of Shipment: Commercial Carrier Priority: 30 Days		Matrix * S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquid T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other		
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A		Holding Time 6 Months HNO3 to pH <2 6 Months HNO3 to pH <2		
Sample No. B3FVY1 B3FVX9	Filter Y N	Date 1-24-18 1-24-18	Time 0839 0839	No/Type Container 1x500-mL G/P 1x500-mL G/P	Sample Analysis 6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: GW 01 6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: GW 01	Preservative HNO3 to pH <2 HNO3 to pH <2

Relinquished By: Larry Rosane /CHPRC Signature: [Signature] Date/Time: JAN 24 2018 1105	Received By: Roger Friesz Jr. /CHPRC Signature: [Signature] Date/Time: JAN 24 2018 1105
Relinquished By: Roger Friesz Jr. /CHPRC Signature: [Signature] Date/Time: JAN 24 2018 1400	Received By: FEDEX Signature: [Signature] Date/Time: 1/25/18 0858
Relinquished By: FedEx Signature: [Signature] Date/Time:	Received By: [Signature] Signature: [Signature] Date/Time:
Relinquished By: [Signature] Signature: [Signature] Date/Time:	Received By: [Signature] Signature: [Signature] Date/Time:
FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process): Disposed By:

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C. # S18-001-370 Page 1 of 1
Collector: Juan Aguilar CHPRC S18-001	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650	Purchase Order/Charge Code: 300071	
SAF No.: SURV, JANUARY 2018	Sampling Origin: Hanford Site	Logbook No.: HNF-N-506-9748	Ice Chest No.: GWS-552	Bill of Lading/Air Bill No.: 7713/6894222
Shipped To (Lab): GEL Laboratories, LLC	Method of Shipment: Commercial Carrier	Priority: 30 Days	Offsite Property No.: 8996	
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A		
Sample No. Filter * Date Time No/Type Container	Sample Analysis			
B3FYF6 N W 1-24-18 1006	SRISO_SEP_PRECIP_GPC: COMMON			
Holding Time 6 Months		Preservative HNO3 to pH <2		

Relinquished By: Juan Aguilar CHPRC	Signature [Signature]	Date/Time JAN 24 2018	Received By: Troy Bacon CHPRC	Signature [Signature]	Date/Time JAN 24 2018	Matrix * S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air
Relinquished By: Troy Bacon CHPRC	Signature [Signature]	Date/Time JAN 24 2018 1400	Received By: FEDEX	Signature [Signature]	Date/Time 1/25/18	DS = Drum Solids DL = Drum Liquid T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By: FedEx	Signature [Signature]	Date/Time [Blank]	Received By: [Signature]	Signature [Signature]	Date/Time [Blank]	
Relinquished By: [Blank]	Signature [Blank]	Date/Time [Blank]	Received By: [Blank]	Signature [Blank]	Date/Time [Blank]	
FINAL SAMPLE DISPOSITION			Disposal Method (e.g., Return to customer, per lab procedure, used in process):			Date/Time:

SAMPLE RECEIPT & REVIEW FORM

115

Client: CPRC SDG/AR/COC/Work Order: 442332

Received By: C. TARPLIN Date Received: 01/25/18

Carrier and Tracking Number
 FedEx Express (circled) FedEx Ground UPS Field Services Courier Other
7713 1689 4689 (16c)
7713 1689 3741 (2c)
7713 1689 4222 (16c)

Suspected Hazard Information Yes No
 *If Net Counts > 100cpm on samples not marked "radioactive", contact the Radiation Safety Group for further investigation.

Shipped as a DOT Hazardous? Hazard Class Shipped: UN#:

COC/Samples marked or classified as radioactive? Maximum Net Counts Observed* (Observed Counts - Area Background Counts): 0 (CPM) mR/Hr
 Classified as: Rad 1 Rad 2 Rad 3

Is package, COC, and/or Samples marked HAZ? If yes, select Hazards below, and contact the GEL Safety Group.
 PCB's Flammable Foreign Soil RCRA Asbestos Beryllium Other:

Sample Receipt Criteria Yes NA No Comments/Qualifiers (Required for Non-Conforming Items)

1 Shipping containers received intact and sealed? Circle Applicable: Seals broken Damaged container Leaking container Other (describe)

2 Chain of custody documents included with shipment?

3 Samples requiring cold preservation within (0 ≤ 6 deg. C)?* Preservation Method: Wet Ice Ice Packs Dry Ice None Other:
 *all temperatures are recorded in Celsius TEMP: _____

4 Daily check performed and passed on IR temperature gun? Temperature Device Serial #: IR4-17
 Secondary Temperature Device Serial # (If Applicable): _____

5 Sample containers intact and sealed? Circle Applicable: Seals broken Damaged container Leaking container Other (describe)

6 Samples requiring chemical preservation at proper pH? Sample ID's and Containers Affected:

7 Do any samples require Volatile Analysis? If Preservation added, Lot#: _____
 If Yes, Are Encores or Soil Kits present? Yes ___ No ___ (If yes, take to VOA Freezer)
 Do VOA vials contain acid preservation? Yes ___ No ___ N/A ___ (If unknown, select No)
 VOA vials free of headspace? Yes ___ No ___ N/A ___
 Sample ID's and containers affected: _____

8 Samples received within holding time? ID's and tests affected:

9 Sample ID's on COC match ID's on bottles? Sample ID's and containers affected:

10 Date & time on COC match date & time on bottles? Sample ID's affected:

11 Number of containers received match number indicated on COC? Sample ID's affected:

12 Are sample containers identifiable as GEL provided?

13 COC form is properly signed in relinquished/received sections?

Comments (Use Continuation Form if needed):

PM (or PMA) review: Initials MTA Date 1/29/18 Page 1 of 1

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 analyte was detected in the associated method blank \geq MDC or $>5\%$ sample activity.	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 February 2018

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	LA180011
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	T104704235-18-13
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 #: GEL442332

Work Order #: 442332

Product: Determination of Metals by ICP**Analytical Method:** SW846 3005A/6010D**Analytical Procedure:** GL-MA-E-013 REV# 30**Analytical Batch:** 1734358**Product: Determination of Metals by ICP-MS****Analytical Method:** SW846 3005A/6020B**Analytical Procedure:** GL-MA-E-014 REV# 32**Analytical Batch:** 1734356**Preparation Method:** SW846 3005A**Preparation Procedure:** GL-MA-E-006 REV# 14**Preparation Batches:** 1734355 and 1734357

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332005	B3FVY1
442332006	B3FVX9
1203959186	Method Blank (MB)ICP
1203959187	Laboratory Control Sample (LCS)
1203959190	442332005(B3FVY1L) Serial Dilution (SD)
1203959188	442332005(B3FVY1S) Matrix Spike (MS)
1203959189	442332005(B3FVY1SD) Matrix Spike Duplicate (MSD)
1203959181	Method Blank (MB)ICP-MS
1203959182	Laboratory Control Sample (LCS)
1203959185	442332005(B3FVY1L) Serial Dilution (SD)
1203959183	442332005(B3FVY1S) Matrix Spike (MS)
1203959184	442332005(B3FVY1SD) Matrix Spike Duplicate (MSD)

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.

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. 442332005 (B3FVY1) and 442332006 (B3FVX9)-ICP.

ICSA/ICSAB Statement

For the ICP-MS analysis, the ICSA solution contains analyte concentrations which are verified trace impurities indigenous to the purchased standard.

Continuing Calibration Blanks (CCB) Requirements

All continuing calibration blanks (CCB) bracketing the sample in this SDG did not meet the acceptance criteria for sodium. The samples bracketed by this CCB, however, contained the element with a concentration at least ten times greater than the concentration in the CCB. This indicates that any contribution to the concentration of these elements in the samples from potential laboratory contamination would be minimal. 442332005 (B3FVY1) and 442332006 (B3FVX9)-ICP.

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
1203959186 (MB)	Potassium and 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
1203959181 (MB)	Tin	1.5 between (1 - 2.5)

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: GEL442332 GEL Work Order: 442332

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 FEB 2018****Title: Data Validator**

Sample Data Summary

METALS
-1-
INORGANICS ANALYSIS DATA PACKAGE

SDG No: GEL442332

CONTRACT: CPRC0S18001

METHOD TYPE: SW846

SAMPLE ID: 442332005

BASIS: As Received

DATE COLLECTED 24-JAN-18

CLIENT ID: B3FVY1

LEVEL: Low

DATE RECEIVED 25-JAN-18

MATRIX: WATER

%SOLIDS: 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	19.3	ug/L	U	19.3	50	50	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-36-0	Antimony	1	ug/L	U	1	3	3	1	MS	BAJ	01/30/18 16:02	180130-3	1734356
7440-38-2	Arsenic	8.65	ug/L		2	5	5	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-39-3	Barium	29.4	ug/L		0.67	2	2	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-41-7	Beryllium	0.20	ug/L	U	0.2	0.5	0.5	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-42-8	Boron	64.2	ug/L		15	50	50	1	P	HSC	02/06/18 19:31	020618A-1	1734358
7440-43-9	Cadmium	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-70-2	Calcium	9660	ug/L		50	200	200	1	P	HSC	02/06/18 19:31	020618A-1	1734358
7440-47-3	Chromium	3	ug/L	U	3	10	10	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-48-4	Cobalt	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-50-8	Copper	0.485	ug/L	B	0.3	1	1	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7439-89-6	Iron	46.5	ug/L	B	30	100	100	1	P	HSC	02/06/18 19:31	020618A-1	1734358
7439-92-1	Lead	0.50	ug/L	U	0.5	2	2	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7439-95-4	Magnesium	1230	ug/L		110	300	300	1	P	HSC	02/06/18 19:31	020618A-1	1734358
7439-96-5	Manganese	11.3	ug/L		1	5	5	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7439-98-7	Molybdenum	9.53	ug/L		0.2	0.5	0.5	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-02-0	Nickel	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-09-7	Potassium	5760	ug/L		50	150	150	1	P	HSC	02/06/18 19:31	020618A-1	1734358
7782-49-2	Selenium	2	ug/L	U	2	5	5	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-22-4	Silver	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-23-5	Sodium	48900	ug/L		100	300	300	1	P	HSC	02/06/18 19:31	020618A-1	1734358
7440-24-6	Strontium	77.5	ug/L		2	10	10	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-28-0	Thallium	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-29-1	Thorium	0.70	ug/L	U	0.7	2	2	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-31-5	Tin	1	ug/L	U	1	5	5	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-61-1	Uranium	0.082	ug/L	B	0.067	0.2	0.2	1	MS	BAJ	01/29/18 20:41	180129-2	1734356
7440-62-2	Vanadium	1	ug/L	U	1	5	5	1	P	HSC	02/06/18 19:31	020618A-1	1734358
7440-66-6	Zinc	3.3	ug/L	U	3.3	10	10	1	MS	BAJ	01/30/18 16:02	180130-3	1734356

Prep Information:

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1734356	1734355	SW846 3005A	50	mL	50	mL	01/25/18	JXM8
1734358	1734357	SW846 3005A	50	mL	50	mL	01/25/18	JXM8

***Analytical Methods:**

METALS

-1-

INORGANICS ANALYSIS DATA PACKAGE

P SW846 3005A/6010D
MS SW846 3005A/6020B

METALS
-1-
INORGANICS ANALYSIS DATA PACKAGE

SDG No: GEL442332

CONTRACT: CPRC0S18001

METHOD TYPE: SW846

SAMPLE ID: 442332006

BASIS: As Received

DATE COLLECTED 24-JAN-18

CLIENT ID: B3FVX9

LEVEL: Low

DATE RECEIVED 25-JAN-18

MATRIX: WATER

%SOLIDS: 0

CAS	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7429-90-5	Aluminum	19.3	ug/L	U	19.3	50	50	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-36-0	Antimony	1	ug/L	U	1	3	3	1	MS	BAJ	01/30/18 16:10	180130-3	1734356
7440-38-2	Arsenic	8.69	ug/L		2	5	5	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-39-3	Barium	34.1	ug/L		0.67	2	2	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-41-7	Beryllium	0.20	ug/L	U	0.2	0.5	0.5	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-42-8	Boron	68.8	ug/L		15	50	50	1	P	HSC	02/06/18 19:44	020618A-1	1734358
7440-43-9	Cadmium	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-70-2	Calcium	10300	ug/L		50	200	200	1	P	HSC	02/06/18 19:44	020618A-1	1734358
7440-47-3	Chromium	3	ug/L	U	3	10	10	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-48-4	Cobalt	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-50-8	Copper	10	ug/L		0.3	1	1	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7439-89-6	Iron	524	ug/L		30	100	100	1	P	HSC	02/06/18 19:44	020618A-1	1734358
7439-92-1	Lead	0.50	ug/L	U	0.5	2	2	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7439-95-4	Magnesium	1280	ug/L		110	300	300	1	P	HSC	02/06/18 19:44	020618A-1	1734358
7439-96-5	Manganese	16.1	ug/L		1	5	5	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7439-98-7	Molybdenum	10	ug/L		0.2	0.5	0.5	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-02-0	Nickel	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-09-7	Potassium	6150	ug/L		50	150	150	1	P	HSC	02/06/18 19:44	020618A-1	1734358
7782-49-2	Selenium	2	ug/L	U	2	5	5	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-22-4	Silver	0.30	ug/L	U	0.3	1	1	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-23-5	Sodium	49700	ug/L		100	300	300	1	P	HSC	02/06/18 19:44	020618A-1	1734358
7440-24-6	Strontium	83.4	ug/L		2	10	10	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-28-0	Thallium	0.60	ug/L	U	0.6	2	2	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-29-1	Thorium	0.70	ug/L	U	0.7	2	2	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-31-5	Tin	1	ug/L	U	1	5	5	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-61-1	Uranium	0.073	ug/L	B	0.067	0.2	0.2	1	MS	BAJ	01/29/18 20:57	180129-2	1734356
7440-62-2	Vanadium	1	ug/L	U	1	5	5	1	P	HSC	02/06/18 19:44	020618A-1	1734358
7440-66-6	Zinc	3.54	ug/L	B	3.3	10	10	1	MS	BAJ	01/30/18 16:10	180130-3	1734356

Prep Information:

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1734356	1734355	SW846 3005A	50	mL	50	mL	01/25/18	JXM8
1734358	1734357	SW846 3005A	50	mL	50	mL	01/25/18	JXM8

*Analytical Methods:

METALS

-1-

INORGANICS ANALYSIS DATA PACKAGE

P SW846 3005A/6010D
MS SW846 3005A/6020B

Quality Control Summary

QC Summary

Report Date: February 20, 2018

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CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 442332

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS											
Batch	1734356										
QC1203959182	LCS										
Aluminum	2000			1910	ug/L		95.5	(80%-120%)	BAJ	01/29/18	20:37
Antimony	50.0			44.5	ug/L		88.9	(80%-120%)		01/30/18	16:01
Arsenic	50.0			50.1	ug/L		100	(80%-120%)		01/29/18	20:37
Barium	50.0			46.9	ug/L		93.8	(80%-120%)			
Beryllium	50.0			55.8	ug/L		112	(80%-120%)			
Cadmium	50.0			49.0	ug/L		97.9	(80%-120%)			
Chromium	50.0			50.1	ug/L		100	(80%-120%)			
Cobalt	50.0			48.2	ug/L		96.4	(80%-120%)			
Copper	50.0			50.2	ug/L		100	(80%-120%)			
Lead	50.0			48.1	ug/L		96.1	(80%-120%)			
Manganese	50.0			48.6	ug/L		97.3	(80%-120%)			
Molybdenum	50.0			50.1	ug/L		100	(80%-120%)			
Nickel	50.0			49.7	ug/L		99.4	(80%-120%)			

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS											
Batch	1734356										
Selenium	50.0			52.7	ug/L		105	(80%-120%)	BAJ	01/29/18	20:37
Silver	50.0			52.2	ug/L		104	(80%-120%)			
Strontium	50.0			50.2	ug/L		100	(80%-120%)			
Thallium	50.0			44.7	ug/L		89.4	(80%-120%)			
Thorium	50.0			47.0	ug/L		94	(80%-120%)			
Tin	50.0			50.1	ug/L		100	(80%-120%)			
Uranium	50.0			47.2	ug/L		94.4	(80%-120%)			
Zinc	50.0			49.2	ug/L		98.4	(80%-120%)		01/30/18	16:01
QC1203959181	MB										
Aluminum			U	19.3	ug/L					01/29/18	20:34
Antimony			U	1.00	ug/L					01/30/18	15:59
Arsenic			U	2.00	ug/L					01/29/18	20:34
Barium			U	0.670	ug/L						
Beryllium			U	0.200	ug/L						
Cadmium			U	0.300	ug/L						
Chromium			U	3.00	ug/L						

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS											
Batch	1734356										
Cobalt			U	0.300	ug/L				BAJ	01/29/18	20:34
Copper			U	0.300	ug/L						
Lead			U	0.500	ug/L						
Manganese			U	1.00	ug/L						
Molybdenum			U	0.200	ug/L						
Nickel			U	0.600	ug/L						
Selenium			U	2.00	ug/L						
Silver			U	0.300	ug/L						
Strontium			U	2.00	ug/L						
Thallium			U	0.600	ug/L						
Thorium			U	0.700	ug/L						
Tin			B	1.50	ug/L						
Uranium			U	0.067	ug/L						
Zinc			U	3.30	ug/L					01/30/18	15:59
QC1203959183 442332005 MS											
Aluminum	2000	U	19.3	2120	ug/L		106	(75%-125%)		01/29/18	20:44

QC Summary

Workorder: 442332

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Parmname	NOM		Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS												
Batch	1734356											
Antimony	50.0	U	1.00		46.8	ug/L		92.9	(75%-125%)	BAJ	01/30/18	16:04
Arsenic	50.0		8.65		59.2	ug/L		101	(75%-125%)		01/29/18	20:44
Barium	50.0		29.4		79.0	ug/L		99.1	(75%-125%)			
Beryllium	50.0	U	0.200		62.6	ug/L		125	(75%-125%)			
Cadmium	50.0	U	0.300		50.4	ug/L		101	(75%-125%)			
Chromium	50.0	U	3.00		51.6	ug/L		102	(75%-125%)			
Cobalt	50.0	U	0.300		48.2	ug/L		96.4	(75%-125%)			
Copper	50.0	B	0.485		48.3	ug/L		95.6	(75%-125%)			
Lead	50.0	U	0.500		47.8	ug/L		95.5	(75%-125%)			
Manganese	50.0		11.3		61.5	ug/L		101	(75%-125%)			
Molybdenum	50.0		9.53		63.5	ug/L		108	(75%-125%)			
Nickel	50.0	U	0.600		49.9	ug/L		99.2	(75%-125%)			
Selenium	50.0	U	2.00		52.1	ug/L		104	(75%-125%)			
Silver	50.0	U	0.300		52.2	ug/L		104	(75%-125%)			
Strontium	50.0		77.5		135	ug/L		115	(75%-125%)			

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS											
Batch	1734356										
Thallium	50.0	U	0.600	45.0	ug/L		90	(75%-125%)	BAJ	01/29/18	20:44
Thorium	50.0	U	0.700	48.5	ug/L		96.3	(75%-125%)			
Tin	50.0	U	1.00	51.2	ug/L		102	(75%-125%)			
Uranium	50.0	B	0.082	49.2	ug/L		98.2	(75%-125%)			
Zinc	50.0	U	3.30	49.7	ug/L		94	(75%-125%)		01/30/18	16:04
QC1203959184 442332005 MSD											
Aluminum	2000	U	19.3	1960	ug/L	7.92	97.7	(0%-20%)		01/29/18	20:47
Antimony	50.0	U	1.00	46.3	ug/L	1.21	91.8	(0%-20%)		01/30/18	16:06
Arsenic	50.0		8.65	56.7	ug/L	4.27	96.2	(0%-20%)		01/29/18	20:47
Barium	50.0		29.4	76.7	ug/L	2.89	94.6	(0%-20%)			
Beryllium	50.0	U	0.200	59.5	ug/L	5.12	119	(0%-20%)			
Cadmium	50.0	U	0.300	48.3	ug/L	4.24	96.5	(0%-20%)			
Chromium	50.0	U	3.00	48.8	ug/L	5.61	96	(0%-20%)			
Cobalt	50.0	U	0.300	46.3	ug/L	3.98	92.6	(0%-20%)			
Copper	50.0	B	0.485	45.8	ug/L	5.19	90.7	(0%-20%)			
Lead	50.0	U	0.500	46.2	ug/L	3.45	92.3	(0%-20%)			

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS											
Batch	1734356										
Manganese	50.0	11.3		58.0	ug/L	5.97	93.4	(0%-20%)	BAJ	01/29/18	20:47
Molybdenum	50.0	9.53		63.0	ug/L	0.832	107	(0%-20%)			
Nickel	50.0	U	0.600	47.0	ug/L	6.1	93.3	(0%-20%)			
Selenium	50.0	U	2.00	49.9	ug/L	4.23	99.6	(0%-20%)			
Silver	50.0	U	0.300	50.3	ug/L	3.62	101	(0%-20%)			
Strontium	50.0		77.5	134	ug/L	0.968	112	(0%-20%)			
Thallium	50.0	U	0.600	43.7	ug/L	3.05	87.3	(0%-20%)			
Thorium	50.0	U	0.700	46.9	ug/L	3.5	92.9	(0%-20%)			
Tin	50.0	U	1.00	50.1	ug/L	2.05	99.6	(0%-20%)			
Uranium	50.0	B	0.082	47.5	ug/L	3.47	94.8	(0%-20%)			
Zinc	50.0	U	3.30	48.1	ug/L	3.3	90.8	(0%-20%)		01/30/18	16:06
QC1203959185 442332005 SDILT											
Aluminum		U	4.11	DU	96.5	ug/L	N/A	(0%-20%)		01/29/18	20:54
Antimony		U	0.378	DU	5.00	ug/L	N/A	(0%-20%)		01/30/18	16:09
Arsenic			8.65	DU	10.0	ug/L	N/A	(0%-20%)		01/29/18	20:54
Barium			29.4	D	6.00	ug/L	2.08	(0%-20%)			

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS											
Batch	1734356										
Beryllium	U	0.010	DU	1.00	ug/L	N/A		(0%-20%)	BAJ	01/29/18	20:54
Cadmium	U	0.009	DU	1.50	ug/L	N/A		(0%-20%)			
Chromium	U	0.799	DU	15.0	ug/L	N/A		(0%-20%)			
Cobalt	U	0.040	DU	1.50	ug/L	N/A		(0%-20%)			
Copper	B	0.485	DU	1.50	ug/L	N/A		(0%-20%)			
Lead	U	0.024	DU	2.50	ug/L	N/A		(0%-20%)			
Manganese		11.3	BD	2.35	ug/L	4.44		(0%-20%)			
Molybdenum		9.53	D	2.00	ug/L	4.84		(0%-20%)			
Nickel	U	0.313	DU	3.00	ug/L	N/A		(0%-20%)			
Selenium	U	0.123	DU	10.0	ug/L	N/A		(0%-20%)			
Silver	U	0.001	DU	1.50	ug/L	N/A		(0%-20%)			
Strontium		77.5	D	15.4	ug/L	.659		(0%-20%)			
Thallium	U	0.023	DU	3.00	ug/L	N/A		(0%-20%)			
Thorium	U	0.394	DU	3.50	ug/L	N/A		(0%-20%)			
Tin	U	0.309	DU	5.00	ug/L	N/A		(0%-20%)			

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis - ICPMS											
Batch	1734356										
Uranium	B	0.082	DU	0.335	ug/L	N/A		(0%-20%)	BAJ	01/29/18	20:54
Zinc	U	2.67	BD	4.46	ug/L	N/A		(0%-20%)		01/30/18	16:09
Metals Analysis-ICP											
Batch	1734358										
QC1203959187	LCS										
Boron	500			473	ug/L		94.6	(80%-120%)	HSC	02/06/18	19:28
Calcium	5000			4900	ug/L		98.1	(80%-120%)			
Iron	5000			4570	ug/L		91.3	(80%-120%)			
Magnesium	5000			4840	ug/L		96.9	(80%-120%)			
Potassium	5000			4540	ug/L		90.7	(80%-120%)			
Sodium	5000			4480	ug/L		89.5	(80%-120%)			
Vanadium	500			466	ug/L		93.3	(80%-120%)			
QC1203959186	MB										
Boron			U	15.0	ug/L					02/06/18	19:25
Calcium			U	50.0	ug/L						
Iron			U	30.0	ug/L						
Magnesium			U	110	ug/L						
Potassium				84.1	ug/L						

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1734358										
Sodium				330	ug/L				HSC	02/06/18	19:25
Vanadium			U	1.00	ug/L						
QC1203959188 442332005 MS											
Boron	500	64.2		575	ug/L		102	(75%-125%)		02/06/18	19:34
Calcium	5000	9660		14900	ug/L		104	(75%-125%)			
Iron	5000	B	46.5	4830	ug/L		95.6	(75%-125%)			
Magnesium	5000	1230		6220	ug/L		99.8	(75%-125%)			
Potassium	5000	C	5760	11000	ug/L		104	(75%-125%)			
Sodium	5000	C	48900	55600	ug/L		N/A	(75%-125%)			
Vanadium	500	U	1.00	495	ug/L		99	(75%-125%)			
QC1203959189 442332005 MSD											
Boron	500	64.2		571	ug/L	0.763	101	(0%-20%)		02/06/18	19:37
Calcium	5000	9660		14700	ug/L	1.2	101	(0%-20%)			
Iron	5000	B	46.5	4770	ug/L	1.24	94.4	(0%-20%)			
Magnesium	5000	1230		6110	ug/L	1.67	97.7	(0%-20%)			
Potassium	5000	C	5760	10900	ug/L	0.549	103	(0%-20%)			
Sodium	5000	C	48900	53900	ug/L	3.03	N/A	(0%-20%)			

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP											
Batch	1734358										
Vanadium	500	U	1.00	489	ug/L	1.3	97.7	(0%-20%)	HSC	02/06/18	19:37
QC1203959190 442332005 SDILT											
Boron			64.2	DU	75.0	ug/L	N/A	(0%-20%)		02/06/18	19:41
Calcium			9660	D	2100	ug/L	8.79	(0%-20%)			
Iron		B	46.5	DU	150	ug/L	N/A	(0%-20%)			
Magnesium			1230	BD	235	ug/L	4.16	(0%-20%)			
Potassium		C	5760	D	1120	ug/L	2.62	(0%-20%)			
Sodium		C	48900	D	10700	ug/L	9.36	(0%-20%)			
Vanadium		U	0.296	DU	5.00	ug/L	N/A	(0%-20%)			

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

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
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 #: GEL442332
Work Order #: 442332

Product: I129LL_SEP_LEPS_GS: COMMON (low level)

Analytical Method: DOE EML HASL-300,I-01 Modified

Analytical Procedure: GL-RAD-A-006 REV# 21

Analytical Batch: 1733809

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332008	B3HD22
1203957837	Method Blank (MB)
1203957838	441685007(B3FWR5) Sample Duplicate (DUP)
1203957839	441685007(B3FWR5) Matrix Spike (MS)
1203957840	Laboratory Control Sample (LCS)

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.

Product: GAMMA_GS:COMMON

Analytical Method: 901.1_GAMMA_GS

Analytical Procedure: GL-RAD-A-013 REV# 27

Analytical Batch: 1734330

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332008	B3HD22
1203959126	Method Blank (MB)
1203959127	442240011(B3FW03) Sample Duplicate (DUP)
1203959128	Laboratory Control Sample (LCS)

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

Recounts

Sample 1203959128 (LCS) was recounted due to low recovery. The recount is reported.

Product: SRISO_SEP_PRECIP_GPC: COMMON

Analytical Method: SRISO_SEP_PRECIP_GPC

Analytical Procedure: GL-RAD-A-004 REV# 19

Analytical Batch: 1735174

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332007	B3FYF6
1203961245	Method Blank (MB)
1203961246	442159005(B3HD07) Sample Duplicate (DUP)
1203961247	Laboratory Control Sample (LCS)

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**Recounts**

Samples 1203961246 (B3HD07DUP) and 442332007 (B3FYF6) were recounted due to results more negative than the three sigma TPU. The second counts are reported.

Product: 9310_ALPHABETA_GPC: COMMON

Analytical Method: 9310_ALPHABETA_GPC

Analytical Procedure: GL-RAD-A-001 REV# 19

Analytical Batch: 1735191

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332008	B3HD22
1203961278	Method Blank (MB)
1203961279	442240023(B3HD09) Sample Duplicate (DUP)
1203961280	442240023(B3HD09) Matrix Spike (MS)
1203961281	442240023(B3HD09) Matrix Spike Duplicate (MSD)
1203961282	Laboratory Control Sample (LCS)

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**Gross Alpha/Beta Preparation Information**

High hygroscopic salt content in evaporated samples can cause the sample mass to fluctuate due to moisture absorption. To minimize this interference, the salts are converted to oxides by heating the sample under a flame until a dull red color is obtained. The conversion to oxides stabilizes the sample weight and ensures that proper alpha/beta efficiencies are assigned for each sample. Volatile radioisotopes of carbon, hydrogen, technetium, polonium and cesium may be lost during sample heating.

Recounts

Sample 1203961282 (LCS) was recounted due to high recovery. The recount is reported.

Miscellaneous Information**Additional Comments**

The matrix spike and matrix spike duplicate, 1203961280 (B3HD09MS) and 1203961281 (B3HD09MSD), aliquots were reduced to conserve sample volume.

Product: TRITIUM_DIST_LSC: COMMON

Analytical Method: TRITIUM_DIST_LSC

Analytical Procedure: GL-RAD-A-002 REV# 22

Analytical Batch: 1735946

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332008	B3HD22
1203963163	Method Blank (MB)
1203963164	442329001(NonSDG) Sample Duplicate (DUP)
1203963165	442329001(NonSDG) Matrix Spike (MS)
1203963166	Laboratory Control Sample (LCS)

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.

Miscellaneous Information**Additional Comments**

The matrix spike, 1203963165 (Non SDG 442329001MS), aliquot was reduced to conserve sample volume.

Product: TC99_EIE_LSC: COMMON

Analytical Method: TC99_EIE_LSC

Analytical Procedure: GL-RAD-A-059 REV# 5

Analytical Batch: 1735972

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332003	B3FVR0
442332004	B3FVR1
1203963256	Method Blank (MB)
1203963257	442156001(NonSDG) Sample Duplicate (DUP)
1203963258	Laboratory Control Sample (LCS)

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

Recounts

Samples 1203963257 (Non SDG 442156001DUP) and 442332004 (B3FVR1) were recounted to verify sample results. Recounts are reported.

Product: C14_LSC: COMMON

Analytical Method: C14_LSC

Analytical Procedure: GL-RAD-A-003 REV# 15

Analytical Batch: 1736912

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

<u>GEL Sample ID#</u>	<u>Client Sample Identification</u>
442332001	B3FX56
442332002	B3FX57
1203965640	Method Blank (MB)
1203965641	441930001(NonSDG) Sample Duplicate (DUP)
1203965642	441930001(NonSDG) Matrix Spike (MS)
1203965643	Laboratory Control Sample (LCS)

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

Sample Re-prep/Re-analysis

Samples were re-prepped due to high relative percent difference/relative error ratio and high recovery. The re-analysis is being reported.

Miscellaneous Information

Additional Comments

The matrix spike, 1203965642 (Non SDG 441930001MS), aliquot was reduced to conserve sample volume.

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: GEL442332 GEL Work Order: 442332

The Qualifiers in this report are defined as follows:

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: Kate Gellatly

Date: 19 FEB 2018

Title: Analyst I

Sample Data Summary

February 21, 2018

Revision 0

**Certificate of Analysis
Sample Summary**

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332001	Date Collected: 01/24/2018 10:08	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3FX56	Method: C14_LSC	Prep Basis: "As Received"
Batch ID: 1736912	Analyst: BXM4	SOP Ref: GL-RAD-A-003
Run Date: 02/07/2018 14:20	Aliquot: 100.49 mL	Instrument: LSCRED
Data File: C1736912.xls	Prep Method: EPA EERF C-01 Modified	Count Time: 15 min
Prep Batch: 1736912		
Prep Date: 02/06/2018 14:28		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
14762-75-5	Carbon-14	U	8.63	pCi/L	+/-16.3	16.4	27.9	50.0

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
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Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
 TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).
 The MDC is a sample specific MDC.

February 21, 2018

Revision 0

Certificate of Analysis
Sample Summary

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332002	Date Collected: 01/24/2018 10:08	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3FX57	Method: C14_LSC	Prep Basis: "As Received"
Batch ID: 1736912	Analyst: BXM4	SOP Ref: GL-RAD-A-003
Run Date: 02/07/2018 14:36	Aliquot: 100.52 mL	Instrument: LSCRED
Data File: C1736912.xls	Prep Method: EPA EERF C-01 Modified	Count Time: 15 min
Prep Batch: 1736912		
Prep Date: 02/06/2018 14:28		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
14762-75-5	Carbon-14	U	8.14	pCi/L	+/-16.2	16.3	27.9	50.0

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
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Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
 TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).
 The MDC is a sample specific MDC.

February 21, 2018

Revision 0

**Certificate of Analysis
Sample Summary**

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332003	Date Collected: 01/24/2018 07:20	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3FVR0		Prep Basis: "As Received"
Batch ID: 1735972	Method: TC99_EIE_LSC	SOP Ref: GL-RAD-A-059
Run Date: 02/13/2018 06:28	Analyst: CXS7	Instrument: LSCGOLD
Data File: E1735972R.xls	Aliquot: 100 mL	Count Time: 15 min
Prep Batch: 1735972	Prep Method: DOE EML HASL-300, Tc-02-	
Prep Date: 02/08/2018 15:24		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
14133-76-7	Technetium-99	U	-32.3	pCi/L	+/-23.7	23.7	43.8	50.0

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Technetium-99m Tracer	37000	38500	CPM	96.2	(30%-105%)

Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
 TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).
 The MDC is a sample specific MDC.

February 21, 2018

Revision 0

Certificate of Analysis
Sample Summary

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332004	Date Collected: 01/24/2018 09:26	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3FVR1	Method: TC99_EIE_LSC	Prep Basis: "As Received"
Batch ID: 1735972	Analyst: CXS7	SOP Ref: GL-RAD-A-059
Run Date: 02/13/2018 14:46	Aliquot: 100 mL	Instrument: LSCGOLD
Data File: E1735972R.xls	Prep Method: DOE EML HASL-300, Tc-02-	Count Time: 15 min
Prep Batch: 1735972		
Prep Date: 02/08/2018 15:24		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
14133-76-7	Technetium-99		1820	pCi/L	+/-65.3	212	38.8	50.0

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Technetium-99m Tracer	37700	38500	CPM	98	(30%-105%)

Comments:

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

The MDC is a sample specific MDC.

February 21, 2018

Revision 0

Certificate of Analysis
Sample Summary

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332007	Date Collected: 01/24/2018 10:06	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3FYF6	Method: SRISO_SEP_PRECIP_GPC	Prep Basis: "As Received"
Batch ID: 1735174	Analyst: KSD1	SOP Ref: GL-RAD-A-004
Run Date: 02/01/2018 10:21	Aliquot: 300 mL	Instrument: PIC10A
Data File: S1735174c1.xls	Prep Method: EPA 905.0 Modified/DOE RP5	Count Time: 60 min
Prep Batch: 1735174		
Prep Date: 01/30/2018 09:22		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10098-97-2	Strontium-90	U	-0.17	pCi/L	+/-0.543	0.543	1.13	2.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Strontium Carrier	4.00	4.30	mg	93	(40%-110%)

Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
 TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).
 The MDC is a sample specific MDC.

February 21, 2018

Revision 0

**Certificate of Analysis
Sample Summary**

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332008	Date Collected: 01/24/2018 08:39	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3HD22		Prep Basis: "As Received"
Batch ID: 1735191	Method: 9310_ALPHABETA_GPC	SOP Ref: GL-RAD-A-001
Run Date: 01/31/2018 18:04	Analyst: BXG2	Instrument: LB4100F1
Data File: AB1735191r1.xls	Aliquot: 150 mL	Count Time: 500 min
Prep Batch: 1735191	Prep Method: EPA 900.0/SW846 9310	
Prep Date: 01/31/2018 10:53		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
12587-46-1	Alpha ALPHA	U	1.03	pCi/L	+/-0.706	0.727	1.10	3.00
12587-47-2	Beta BETA		4.65	pCi/L	+/-0.939	1.20	1.41	4.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
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Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error. TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma). The MDC is a sample specific MDC.

February 21, 2018

Revision 0

**Certificate of Analysis
Sample Summary**

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332008	Date Collected: 01/24/2018 08:39	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3HD22	Method: DOE EML HASL-300,I-01 Mo	Prep Basis: "As Received"
Batch ID: 1733809	Analyst: BSW1	SOP Ref: GL-RAD-A-006
Run Date: 01/29/2018 06:11	Aliquot: 1.2 L	Instrument: XRAY4
Data File: I442332008.CNF;1	Prep Method: DOE EML HASL-300,I-01 M	Count Time: 120 min
Prep Batch: 1733809		
Prep Date: 01/25/2018 11:49		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
15046-84-1	Iodine-129	U	-0.27	pCi/L	+/-0.434	0.452	0.651	1.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
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Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
 TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).
 The MDC is a sample specific MDC.

February 21, 2018

Revision 0

**Certificate of Analysis
Sample Summary**

SDG Number: GEL442332
 Lab Sample ID: 442332008

 Client ID: B3HD22
 Batch ID: 1734330
 Run Date: 01/26/2018 07:34
 Data File: G442332008.CNF;1
 Prep Batch: 1734330
 Prep Date: 01/25/2018 11:55

Client: CPRC001
 Date Collected: 01/24/2018 08:39
 Date Received: 01/25/2018 08:50

 Method: 901.1_GAMMA_GS
 Analyst: BSW1
 Aliquot: 0.5 L
 Prep Method: EPA 901.1

Project: CPRC0S18001
 Matrix: WATER

 Prep Basis: "As Received"
 SOP Ref: GL-RAD-A-013
 Instrument: GAM11
 Count Time: 240 min

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10045-97-3	Cesium-137	U	4.02	pCi/L	+/-6.30	6.31	6.06	15.0
10198-40-0	Cobalt-60	U	-1.38	pCi/L	+/-4.74	4.78	7.43	
14683-23-9	Europium-152	U	6.64	pCi/L	+/-9.49	9.97	18.2	
15585-10-1	Europium-154	U	8.03	pCi/L	+/-11.0	11.6	22.5	
14391-16-3	Europium-155	U	-8.91	pCi/L	+/-10.5	11.3	17.5	

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
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Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
 TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).
 The MDC is a sample specific MDC.

February 21, 2018

Revision 0

Certificate of Analysis
Sample Summary

SDG Number: GEL442332	Client: CPRC001	Project: CPRC0S18001
Lab Sample ID: 442332008	Date Collected: 01/24/2018 08:39	Matrix: WATER
	Date Received: 01/25/2018 08:50	
Client ID: B3HD22	Method: TRITIUM_DIST_LSC	Prep Basis: "As Received"
Batch ID: 1735946	Analyst: BXM4	SOP Ref: GL-RAD-A-002
Run Date: 02/01/2018 19:51	Aliquot: 50 mL	Instrument: LSCYELLOW
Data File: T1735946.xls	Prep Method: EPA 906.0 Modified	Count Time: 50 min
Prep Batch: 1735946		
Prep Date: 02/01/2018 08:03		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10028-17-8	Tritium	U	186	pCi/L	+/-166	170	275	400

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
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Comments:

U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
 TPU and Counting Uncertainty are calculated at the 95% confidence level (1.96-sigma).
 The MDC is a sample specific MDC.

Quality Control Summary

QC Summary

Report Date: February 19, 2018
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Client : **CH2MHill Plateau Remediation Company**
MSIN R3-50 CHPRC
PO Box 1600
Richland, Washington 99352
 Contact: **Mr. Scot Fitzgerald**
 Workorder: **442332**

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
Rad Gamma Spec									
Batch	1733809								
QC1203957837	MB								
Iodine-129			U	0.270	pCi/L			BSW1	01/29/1806:11
				Uncert: +/-0.404					
				TPU: +/-0.423					
QC1203957838	441685007	DUP							
Iodine-129		U	-0.272	U	-0.242	pCi/L			01/29/1806:40
				Uncert: +/-0.462	+/-0.407		RPD: 0	N/A	
				TPU: +/-0.479	+/-0.422		RER: 0.0928	(0-2)	
QC1203957839	441685007	MS							
Iodine-129		34.7	U	-0.272	33.2	pCi/L	REC: 97	(75%-125%)	01/29/1807:24
				Uncert: +/-0.462	+/-3.12				
				TPU: +/-0.479	+/-4.55				
QC1203957840	LCS								
Iodine-129		34.7			36.6	pCi/L	REC: 106	(80%-120%)	01/29/1808:18
					Uncert: +/-4.18				
					TPU: +/-5.55				
Batch	1734330								
QC1203959126	MB								
Cesium-137			U	-1.88	pCi/L			BSW1	01/26/1807:35
				Uncert: +/-3.04					
				TPU: +/-3.16					
Cobalt-60			U	-0.141	pCi/L				
				Uncert: +/-2.99					
				TPU: +/-2.99					
Europium-152			U	13.5	pCi/L				
				Uncert: +/-8.54					
				TPU: +/-10.6					
Europium-154			U	-0.50	pCi/L				
				Uncert: +/-9.43					
				TPU: +/-9.43					
Europium-155			U	-5.61	pCi/L				
				Uncert: +/-9.24					
				TPU: +/-9.59					
QC1203959127	442240011	DUP							
Cesium-137		U	-1.92	U	1.66	pCi/L			01/26/1811:11
				Uncert: +/-5.07	+/-2.87		RPD: 0	N/A	
				TPU: +/-5.14	+/-2.97		RER: 1.18	(0-2)	
Cobalt-60		U	-1.64	U	2.06	pCi/L			
				Uncert: +/-3.56	+/-2.28		RPD: 0	N/A	
				TPU: +/-3.64	+/-2.47		RER: 1.65	(0-2)	
Europium-152		U	-2.42	U	-6.0	pCi/L			
				Uncert: +/-9.93	+/-7.11		RPD: 0	N/A	
				TPU: +/-10.0	+/-7.62		RER: 0.557	(0-2)	
Europium-154		U	-0.769	U	-2.41	pCi/L			
				Uncert: +/-9.92	+/-6.94		RPD: 0	N/A	

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date	Time
Rad Gamma Spec										
Batch	1734330									
		TPU:	+/-9.93		+/-7.03					
Europium-155		U	0.263	U	0.800	pCi/L				
		Uncert:	+/-9.40		+/-9.31		RER: 0.264	(0-2)		
		TPU:	+/-9.41		+/-9.32		RPD: 0	N/A		
QC1203959128	LCS						RER: 0.0795	(0-2)		
Americium-241	1.10E+05				1.22E+05	pCi/L	REC: 111	(80%-120%)		01/29/1808:37
		Uncert:			+/-3160					
		TPU:			+/-16800					
Cesium-137	41500				42000	pCi/L	REC: 101	(80%-120%)		
		Uncert:			+/-832					
		TPU:			+/-3800					
Cobalt-60	35100				38100	pCi/L	REC: 109	(80%-120%)		
		Uncert:			+/-962					
		TPU:			+/-4000					
Europium-152				U	-195	pCi/L				
		Uncert:			+/-371					
		TPU:			+/-382					
Europium-154				U	-71	pCi/L				
		Uncert:			+/-258					
		TPU:			+/-260					
Europium-155				U	-184	pCi/L				
		Uncert:			+/-326					
		TPU:			+/-336					
Rad Gas Flow										
Batch	1735174									
QC1203961245	MB									
Strontium-90				U	-0.275	pCi/L			KSD1	01/31/1813:59
		Uncert:			+/-0.649					
		TPU:			+/-0.649					
**Strontium Carrier		4.30			4.00	mg	REC: 93	(40%-110%)		
QC1203961246	442159005	DUP								
Strontium-90		U	-0.394	U	0.422	pCi/L				01/31/1817:47
		Uncert:	+/-0.516		+/-0.782		RPD: 0	N/A		
		TPU:	+/-0.516		+/-0.785		RER: 1.7	(0-2)		
**Strontium Carrier		4.30	4.00		3.80	mg	REC: 88	(40%-110%)		
QC1203961247	LCS									
Strontium-90	78.6				83.8	pCi/L	REC: 107	(80%-120%)		01/31/1813:59
		Uncert:			+/-4.51					
		TPU:			+/-13.9					
**Strontium Carrier		4.30			4.00	mg	REC: 93	(40%-110%)		
Batch	1735191									
QC1203961278	MB									
Alpha				U	0.0962	pCi/L			BXG2	01/31/1818:04
		Uncert:			+/-0.430					
		TPU:			+/-0.430					
Beta				U	0.731	pCi/L				
		Uncert:			+/-0.735					

QC Summary

Workorder: 442332

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
Rad Gas Flow									
Batch	1735191								
QC1203961279	442240023	DUP							
Alpha		TPU:		+/-0.745					
			3.75	4.25	pCi/L				
		Uncert:	+/-1.23	+/-1.44		RPD:	12	(0% - 100%)	
		TPU:	+/-1.38	+/-1.61		RER:	0.457	(0-2)	
Beta			18.4	18.3	pCi/L				
		Uncert:	+/-1.21	+/-1.19		RPD:	1	(0%-20%)	
		TPU:	+/-3.32	+/-3.21		RER:	0.0536	(0-2)	
QC1203961280	442240023	MS							
Alpha		483	3.75	531	pCi/L	REC:	109	(75%-125%)	01/31/1818:03
		Uncert:	+/-1.23	+/-50.7					
		TPU:	+/-1.38	+/-101					
Beta		1890	18.4	1980	pCi/L	REC:	104	(75%-125%)	
		Uncert:	+/-1.21	+/-68.6					
		TPU:	+/-3.32	+/-330					
QC1203961281	442240023	MSD							
Alpha		483	3.75	462	pCi/L	REC:	95	(75%-125%)	01/31/1818:03
		Uncert:	+/-1.23	+/-48.8		RPD:	14	(0%-20%)	
		TPU:	+/-1.38	+/-91.1		RER:	0.984	(0-2)	
Beta		1890	18.4	1830	pCi/L	REC:	96	(75%-125%)	
		Uncert:	+/-1.21	+/-64.9		RPD:	8	(0%-20%)	
		TPU:	+/-3.32	+/-305		RER:	0.662	(0-2)	
QC1203961282	LCS								
Alpha		80.6		77.5	pCi/L	REC:	96	(80%-120%)	02/01/1809:42
		Uncert:		+/-7.40					
		TPU:		+/-15.0					
Beta		314		330	pCi/L	REC:	105	(80%-120%)	
		Uncert:		+/-11.4					
		TPU:		+/-56.3					
Rad Liquid Scintillation									
Batch	1735946								
QC1203963163	MB								
Tritium			U	52.1	pCi/L			BXM4	02/02/1803:53
		Uncert:		+/-156					
		TPU:		+/-156					
QC1203963164	442329001	DUP							
Tritium			3350	3520	pCi/L				
		Uncert:	+/-305	+/-318		RPD:	5	(0%-20%)	
		TPU:	+/-716	+/-750		RER:	0.309	(0-2)	
QC1203963165	442329001	MS							
Tritium		4330	3350	8010	pCi/L	REC:	108	(75%-125%)	02/02/1805:35
		Uncert:	+/-305	+/-653					
		TPU:	+/-716	+/-1680					
QC1203963166	LCS								
Tritium		2160		1860	pCi/L	REC:	86	(80%-120%)	02/02/1806:26
		Uncert:		+/-244					
		TPU:		+/-434					
Batch	1735972								
QC1203963256	MB								
Technetium-99			U	-35.7	pCi/L			CXS7	02/13/1807:17

QC Summary

Workorder: 442332

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
Rad Liquid Scintillation									
Batch	1735972								
				Uncert:					
				TPU:					
**Technetium-99m Tracer	38500			36900	CPM	REC: 96	(30%-105%)		
QC1203963257	442156001	DUP							
Technetium-99		147		114	pCi/L				02/13/1815:19
				Uncert:		RPD: 25	(0% - 100%)		
				TPU:		RER: 1.45	(0-2)		
**Technetium-99m Tracer	38500	38900		36600	CPM	REC: 95	(30%-105%)		
QC1203963258	LCS								
Technetium-99	888			749	pCi/L	REC: 84	(80%-120%)		02/13/1807:51
				Uncert:					
				TPU:					
**Technetium-99m Tracer	38500			35500	CPM	REC: 92	(30%-105%)		
Batch	1736912								
QC1203965640	MB								
Carbon-14			U	-7.58	pCi/L			BXM4	02/07/1814:53
				Uncert:					
				TPU:					
QC1203965641	441930001	DUP							
Carbon-14		U	13.4	U	-3.22	pCi/L			02/07/1815:09
				Uncert:		RPD: 0	N/A		
				TPU:		RER: 1.42	(0-2)		
QC1203965642	441930001	MS							
Carbon-14	3630	U	13.4	3470	pCi/L	REC: 96	(75%-125%)		02/07/1815:25
				Uncert:					
				TPU:					
QC1203965643	LCS								
Carbon-14	744			649	pCi/L	REC: 87	(80%-120%)		02/07/1815:41
				Uncert:					
				TPU:					

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
- 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 analyte was detected in the associated method blank >= MDC or >5% sample activity.
- 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.
- UX Gamma Spectroscopy--Uncertain identification

QC Summary

Workorder: 442332

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date	Time
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.