



July 05, 2017

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

Re: CHPRC SAF S17-006  
Work Order: 424957  
SDG: GEL424957

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, 2017. This original data report has been prepared and reviewed in accordance with GEL's standard operating procedures.

Our policy is to provide high quality, personalized analytical services to enable you to meet your analytical needs on time every time. We trust that you will find everything in order and to your satisfaction. If you have any questions, please do not hesitate to call me at (843) 556-8171, ext. 4505.

Sincerely,

*B Luthman*  
Brielle Luthman for  
Heather Shaffer  
Project Manager

Purchase Order: 300071-7H  
Chain of Custody: S17-006-197, S17-006-198 and S17-006-240  
Enclosures



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# Case Narrative

**General Narrative  
for  
CH2MHill Plateau Remediation Company  
CHPRC SAF S17-006  
SDG: GEL424957**

**July 05, 2017**

**Laboratory Identification:**

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

**Summary**

**Sample receipt**

The sample(s) arrived at GEL Laboratories, LLC, Charleston, South Carolina on June 08, 2017, for analysis. The samples were delivered with proper chain of custody documentation and signatures. All sample containers arrived without any visible signs of tampering or breakage. 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:

<b><u>Laboratory Identification</u></b>	<b><u>Sample Description</u></b>
424957001	B39P97
424957002	B39PB5
424957003	B39RX9
424957004	B39RY1

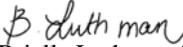
**Case Narrative**

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.

  
Brielle Luthman for  
Heather Shaffer  
Project Manager

**Technical Case Narrative**  
**CH2MHill Plateau Remediation Company (CPRC)**  
**SDG #: GEL424957**  
**Work Order #: 424957**

## **Metals**

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

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.

## **Radiochemistry**

### **PUISO\_PRECIP\_AEA: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.

### **Quality Control (QC) Information**

#### **QC Information**

Refer to Miscellaneous Information section.

### **Miscellaneous Information**

### **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**

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.

### **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.

### **Miscellaneous Information**

#### **Additional Comments**

The matrix spike and matrix spike duplicate, 1203806626 (B39TH9MS) and 1203806627 (B39TH9MSD), aliquots were reduced to conserve sample volume.

### **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.

### **Quality Control (QC) Information**

#### **QC Information**

The sample and the duplicate, 1203815774 (B39R31DUP) , did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with a value of 1.1880.

### **Technical Information**

#### **Recounts**

Samples 1203815774 (B39R31DUP), 424957001 (B39P97) and 424957002 (B39PB5) were verified by recounting at least five days from the separation date. The recounts are reported.

### **TC99\_EIE\_LSC: COMMON**

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.

### **TRITIUM\_DIST\_LSC: COMMON**

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**

424957

CH2M Hill Plateau Remediation Company		C.O.C. # S17-006-197	
Collector: Larry Rosans /CHPRC		Page 1 of 1	
SAF No. S17-006	Contact/Requester: Karen Waters-Husted	Telephone No. 509-376-4650	
Project Title: SURV, JUNE 2017	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071	
Shipped To (Lab): GEL Laboratories, LLC	Logbook No. HNF-N-506 9348	Ice Chest No. 6205-308	
Protocol: SURV	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No. 779327007088	
Priority: 30 Days	Priority: <b>PRIORITY</b>	Offsite Property No. 8012	
SPECIAL INSTRUCTIONS: N/A		Total Activity Exemption: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	
Sample No. B39P97	No/Type Container: 1x1-L G/P	Sample Analysis: SRISO_SEP_PRECIP_GPC: COMMON	Preservative: HNO3 to pH <2

**POSSIBLE SAMPLE HAZARDS/REMARKS**  
 \*\*\* 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

Relinquished By: Larry Rosans /CHPRC	Print: Larry Rosans	Sign: [Signature]	Date: JUN 07 2017	Time: 13:28	Received By: Janelle Zunker /CHPRC	Print: Janelle Zunker	Sign: [Signature]	Date: JUN 07 2017	Time: 13:22
Relinquished By: Janelle Zunker /CHPRC	Print: Janelle Zunker	Sign: [Signature]	Date: JUN 07 2017	Time: 14:00	Received By: [Signature]	Print: [Signature]	Sign: [Signature]	Date: JUN 07 2017	Time: 13:22
Relinquished By: [Signature]	Print: [Signature]	Sign: [Signature]	Date: JUN 07 2017	Time: 14:00	Received By: [Signature]	Print: [Signature]	Sign: [Signature]	Date: JUN 07 2017	Time: 13:22
Relinquished By: [Signature]	Print: [Signature]	Sign: [Signature]	Date: JUN 07 2017	Time: 14:00	Received By: [Signature]	Print: [Signature]	Sign: [Signature]	Date: JUN 07 2017	Time: 13:22

S	=	Soil	DS	=	Drum Solids
SE	=	Sediment	DL	=	Drum Liquids
SO	=	Solid	T	=	Tissue
SL	=	Sludge	WI	=	Wipe
W	=	Water	L	=	Liquid
O	=	Oil	V	=	Vegetation
A	=	Air	X	=	Other

Disposal Method (e.g., Return to customer, per lab procedure, used in process)

**CH2M Hill Plateau Remediation Company**

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

424957

C.O.C. # **S17-006-198**

Page 1 of 1

Collector: Larry Rosane /CHPRC

Contact/Requester: Karen Waters-Husted

Telephone No. 509-376-4650

SAF No. S17-006

Sampling Origin: Hanford Site

Purchase Order/Charge Code: 300071

Project Title: SURV, JUNE 2017

Logbook No. HNF-N-506 93,47

Ice Chest No. 625-308

Shipped To (Lab): GEL Laboratories, LLC

Method of Shipment: Commercial Carrier

Bill of Lading/Air Bill No. 7793-2730 7088

Protocol: SURV

Priority: 30 Days

Offsite Property No. 8012

Total Activity Exemption: Yes  No

**POSSIBLE SAMPLE HAZARDS/REMARKS**

\*\*\* 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

Hold Time

Sample Analysis

Holding Time

Preservative

Sample No.	Filter	* Date	Time	No./Type Container	Sample Analysis	Holding Time	Preservative
B39PB5	N	WJUN 07 2017	1016	1x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2

Relinquished By Larry Rosane /CHPRC	Print <i>Larry Rosane</i>	Sign	Date/Time JUN 07 2017 1018	Received By Janelle Zunker /CHERG	Print <i>Janelle Zunker</i>	Sign	Date/Time JUN 07 2017 1018	Matrix *
Relinquished By Janelle Zunker /CHPRC	Print <i>Janelle Zunker</i>	Sign	Date/Time JUN 07 2017 1400	Received By FED EX	Print <b>FED EX</b>	Sign	Date/Time	S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air
Relinquished By	Print	Sign	Date/Time FED EX	Received By <i>Stacy Boone</i>	Print <i>Stacy Boone</i>	Sign	Date/Time 6/8/17 9:00	DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time	
<b>FINAL SAMPLE DISPOSITION</b>	Disposal Method (e.g., Return to customer, used in process)							Date/Time

FSR ID = FSR31530

A-6004-842 (REV 2)

CH2M Hill Plateau Remediation Company  
 C.O.C. # **S17-006-240**  
 Page 1 of 1

**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**  
 424957

Collector: Juan Aguilar /CHPRC  
 Telephone No. 509-376-4650

SAF No. S17-006  
 Purchase Order/Charge Code 300071

Project Title: SURV, JUNE 2017  
 Ice Chest No. *6WS-556*

Shipped To (Lab): **GEL Laboratories, LLC**  
 Bill of Lading/Air Bill No. *7793 2730 7200*

Protocol: SURV  
 Offsite Property No. *8012*

Total Activity Exemption: Yes  No

**POSSIBLE SAMPLE HAZARDS/REMARKS**  
 \*\*\* 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	Holding Time	Preservative
B39RX9	N	W	6-7-17	1232	1x500-mL G/P	6020_METALS_ICPMS: Arsenic (1); 6020_METALS_ICPMS: Uranium (1)	6 Months	HNO3 to pH <2
B39RX9	N	W			1x1-L P	9310_ALPHABETA_GPC: COMMON	6 Months	HNO3 to pH <2
B39RX9	N	W			1x1-L P	PUISO_IE_PRECIP_AEA: COMMON	180 Days	HNO3 to pH <2
B39RX9	N	W			4x1-L G/P	GAMMA_GS: COMMON	6 Months	HNO3 to pH <2
B39RX9	N	W			4x1-L G/P	1129LL_SEP_LEPS_GS_LL: COMMON	6 Months	None
B39RX9	N	W			1x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2
B39RX9	N	W			1x500-mL G/P	TC99_EIE_LSC: COMMON	6 Months	HNO3 to pH <2
B39RX9	N	W			1x250-mL P	TRITIUM_DIST_LSC: COMMON	6 Months	None
B39RY1	Y	W	6-7-17	1232	1x500-mL G/P	6020_METALS_ICPMS: Arsenic (1)	6 Months	HNO3 to pH <2

Relinquished By	Print	Sign	Date/Time	Received By	Print	Sign	Date/Time	Matrix *
Juan Aguilar /CHPRC			JUN 07 2017 1300	Janelle Zunker /CHPRC			JUN 07 2017 1300	S = Soil, SE = Sediment, SO = Solid, SL = Sludge, W = Water, O = Oil, A = Air, DS = Drum Solids, DL = Drum Liquids, T = Tissue, WI = Wipe, L = Liquid, V = Vegetation, X = Other
Janelle Zunker /CHPRC			JUN 07 2017 1400	FEDEX			6-8-17 9:00	
				STACY BOONE			6/8/17 9:00	



# **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 05 July 2017**

<b>State</b>	<b>Certification</b>
Alaska	UST-0110
Arkansas	88-0651
CLIA	42D0904046
California	2940
Colorado	SC00012
Connecticut	PH-0169
Delaware	SC00012
DoD ELAP/ ISO17025 A2LA	2567.01
Florida NELAP	E87156
Foreign Soils Permit	P330-15-00283, P330-15-00253
Georgia	SC00012
Georgia SDWA	967
Hawaii	SC00012
Idaho Chemistry	SC00012
Idaho Radiochemistry	SC00012
Illinois NELAP	200029
Indiana	C-SC-01
Kansas NELAP	E-10332
Kentucky SDWA	90129
Kentucky Wastewater	90129
Louisiana NELAP	03046 (AI33904)
Louisiana SDWA	LA170010
Maryland	270
Massachusetts	M-SC012
Michigan	9976
Mississippi	SC00012
Nebraska	NE-OS-26-13
Nevada	SC000122017-1
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	T104704235-17-12
Utah NELAP	SC000122017-22
Vermont	VT87156
Virginia NELAP	460202
Washington	C780
West Virginia	997404

# Metals Analysis

# Case Narrative

**Metals**  
**Technical Case Narrative**  
**CH2MHill Plateau Remediation Company (CPRC)**  
**SDG #: GEL424957**  
**Work Order #: 424957**

**Product: Determination of Metals by ICP-MS****Analytical Method:** SW846 3005A/6020B**Analytical Procedure:** GL-MA-E-014 REV# 29**Analytical Batch:** 1672232**Preparation Method:** SW846 3005A**Preparation Procedure:** GL-MA-E-006 REV# 13**Preparation Batch:** 1672231

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>
424957003	B39RX9
424957004	B39RY1
1203806865	Method Blank (MB)ICP-MS
1203806866	Laboratory Control Sample (LCS)
1203806869	424957003(B39RX9L) Serial Dilution (SD)
1203806867	424957003(B39RX9S) Matrix Spike (MS)
1203806868	424957003(B39RX9SD) 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****ICSA/ICSAB Statement**

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

**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: GEL424957 GEL Work Order: 424957

**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.
- 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: 26 JUN 2017****Title: Data Validator**

# Sample Data Summary

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

**SDG No:** GEL424957

**CONTRACT:** CPRC0S17006

**METHOD TYPE:** SW846

**SAMPLE ID:**424957003

**BASIS:** As Received

**DATE COLLECTED** 07-JUN-17

**CLIENT ID:** B39RX9

**LEVEL:** Low

**DATE RECEIVED** 08-JUN-17

**MATRIX:** WATER

**%SOLIDS:** 0

CAS No.	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7440-38-2	Arsenic	5.24	ug/L		2	5	10	1	MS	BAJ	06/16/17 17:14	170616-1	1672232
7440-61-1	Uranium	43.2	ug/L		0.067	0.2	0.2	1	MS	BAJ	06/16/17 17:14	170616-1	1672232

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1672232	1672231	SW846 3005A	50	mL	50	mL	06/08/17	CXW4

**\*Analytical Methods:**

MS SW846 3005A/6020B

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

**SDG No:** GEL424957

**CONTRACT:** CPRC0S17006

**METHOD TYPE:** SW846

**SAMPLE ID:**424957004

**BASIS:** As Received

**DATE COLLECTED** 07-JUN-17

**CLIENT ID:** B39RY1

**LEVEL:** Low

**DATE RECEIVED** 08-JUN-17

**MATRIX:** WATER

**%SOLIDS:** 0

CAS No.	Analyte	Result	Units	Qual	MDL	PQL	CRDL	DF	M*	Analyst	Run Date	Analytical Run	Analytical Batch
7440-38-2	Arsenic	4.85	ug/L	B	2	5	10	1	MS	BAJ	06/16/17 17:25	170616-1	1672232

**Prep Information:**

Analytical Batch	Prep Batch	Prep Method	Initial wt./vol.	Units	Final wt./vol.	Units	Date	Analyst
1672232	1672231	SW846 3005A	50	mL	50	mL	06/08/17	CXW4

**\*Analytical Methods:**

MS SW846 3005A/6020B

# Quality Control Summary

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: June 26, 2017

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CH2MHill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 424957

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1672232										
QC1203806866	LCS										
Arsenic	50.0			54.6	ug/L		109	(80%-120%)	BAJ	06/16/17	17:12
Uranium	50.0			51.7	ug/L		103	(80%-120%)			
QC1203806865	MB										
Arsenic			U	2.00	ug/L					06/16/17	17:10
Uranium			U	0.067	ug/L						
QC1203806867	424957003	MS									
Arsenic	50.0	5.24		59.0	ug/L		108	(75%-125%)		06/16/17	17:16
Uranium	50.0	43.2		91.7	ug/L		97	(75%-125%)			
QC1203806868	424957003	MSD									
Arsenic	50.0	5.24		59.0	ug/L	0.022	108	(0%-20%)		06/16/17	17:18
Uranium	50.0	43.2		91.6	ug/L	0.121	96.8	(0%-20%)			
QC1203806869	424957003	SDILT									
Arsenic		5.24	DU	10.0	ug/L	N/A		(0%-20%)		06/16/17	17:23
Uranium		43.2	D	8.26	ug/L	4.47		(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).

**GEL LABORATORIES LLC**

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

**QC Summary**

Workorder: 424957

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

# Radiological Analysis

# Case Narrative

**Radiochemistry  
Technical Case Narrative  
CH2MHill Plateau Remediation Company (CPRC)  
SDG #: GEL424957  
Work Order #: 424957**

**Product:** PUISO\_PRECIP\_AEA:COMMON  
**Analytical Method:** PUISO\_PRECIP\_AEA  
**Analytical Procedure:** GL-RAD-A-011 REV# 26  
**Analytical Batch:** 1677692

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>
424957003	B39RX9
1203820112	Method Blank (MB)
1203820113	Laboratory Control Sample (LCS)
1203820114	425499002(B39T75) 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.

**Quality Control (QC) Information**

**QC Information**

All of the QC samples meet the required acceptance limits with the following exceptions: Refer to Miscellaneous Information section.

**Miscellaneous Information**

1. The Pu-242 tracer for samples 4246411003 and 1203820115 did not meet the resolution requirements of having a full width half maximum of 100 keV or less. 2. The Pu-242 tracer for sample 1203820112 is greater than 50 keV from the expected energy of 4890 keV. 1. The tracer peaks are within the Pu-242 and the client tracer yield recovery requirements were met. Reporting results. 2. The tracer peak is within the Pu-242 and the client tracer yield recovery requirements were met. Reporting results.

**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:** 1672238

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>
424957003	B39RX9

1203806881	Method Blank (MB)
1203806882	424844011(B39RM6) Sample Duplicate (DUP)
1203806883	424844011(B39RM6) Matrix Spike (MS)
1203806884	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:** 1675360

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>
424957003	B39RX9
1203814555	Method Blank (MB)
1203814556	424516023(NonSDG) Sample Duplicate (DUP)
1203814557	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:** 9310\_ALPHABETA\_GPC: COMMON

**Analytical Method:** 9310\_ALPHABETA\_GPC

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

**Analytical Batch:** 1672138

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>
424957003	B39RX9
1203806624	Method Blank (MB)
1203806625	424707004(B39TH9) Sample Duplicate (DUP)
1203806626	424707004(B39TH9) Matrix Spike (MS)

1203806627                      424707004(B39TH9) Matrix Spike Duplicate (MSD)  
 1203806628                      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.

**Miscellaneous Information**

**Additional Comments**

The matrix spike and matrix spike duplicate, 1203806626 (B39TH9MS) and 1203806627 (B39TH9MSD), aliquots were reduced to conserve sample volume.

**Product: SRISO\_SEP\_PRECIP\_GPC: COMMON**

**Analytical Method:** SRISO\_SEP\_PRECIP\_GPC

**Analytical Procedure:** GL-RAD-A-004 REV# 18

**Analytical Batch:** 1675923

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>
424957001	B39P97
424957002	B39PB5
424957003	B39RX9
1203815773	Method Blank (MB)
1203815774	425103020(B39R31) Sample Duplicate (DUP)
1203815775	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.

**Quality Control (QC) Information**

**QC Information**

All of the QC samples meet the required acceptance limits with the following exceptions: The sample and the duplicate, 1203815774 (B39R31DUP) , did not meet the relative percent difference requirement; however, they do meet the relative error ratio requirement with a value of 1.19.

**Technical Information****Recounts**

Samples 1203815774 (B39R31DUP), 424957001 (B39P97) and 424957002 (B39PB5) were verified by recounting at least five days from the separation date. The recounts are reported.

**Product:** TC99\_EIE\_LSC: COMMON

**Analytical Method:** TC99\_EIE\_LSC

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

**Analytical Batch:** 1673290

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>
424957003	B39RX9
1203809519	Method Blank (MB)
1203809520	425104001(NonSDG) Sample Duplicate (DUP)
1203809521	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:** TRITIUM\_DIST\_LSC: COMMON

**Analytical Method:** TRITIUM\_DIST\_LSC

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

**Analytical Batch:** 1673328

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>
424957003	B39RX9
1203809663	Method Blank (MB)
1203809664	424663001(NonSDG) Sample Duplicate (DUP)
1203809665	424663001(NonSDG) Matrix Spike (MS)
1203809666	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.

**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: GEL424957 GEL Work Order: 424957

**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: Theresa Austin****Date: 05 JUL 2017****Title: Group Leader**

# Sample Data Summary

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

SDG Number: GEL424957	Client: CPRC001	Project: CPRC0S17006
Lab Sample ID: 424957001	Date Collected: 06/07/2017 13:18	Matrix: WATER
	Date Received: 06/08/2017 09:00	
Client ID: B39P97	Method: SRISO_SEP_PRECIP_GPC	Prep Basis: "As Received"
Batch ID: 1675923	Analyst: JXB7	SOP Ref: GL-RAD-A-004
Run Date: 07/05/2017 07:59	Aliquot: 300 mL	Instrument: PIC1B
Data File: S1675923r1.xls	Prep Method: EPA 905.0 Modified/DOE RP5	Count Time: 60 min
Prep Batch: 1675923		
Prep Date: 06/28/2017 10:54		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10098-97-2	Strontium-90		15.4	pCi/L	+/-1.86	3.05	1.58	2.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Strontium Carrier	4.90	7.75	mg	63.2	(40%-110%)

**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**

SDG Number: GEL424957	Client: CPRC001	Project: CPRC0S17006
Lab Sample ID: 424957002	Date Collected: 06/07/2017 10:16	Matrix: WATER
	Date Received: 06/08/2017 09:00	
Client ID: B39PB5	Method: SRISO_SEP_PRECIP_GPC	Prep Basis: "As Received"
Batch ID: 1675923	Analyst: JXB7	SOP Ref: GL-RAD-A-004
Run Date: 07/05/2017 07:59	Aliquot: 300 mL	Instrument: PIC1D
Data File: S1675923r1.xls	Prep Method: EPA 905.0 Modified/DOE RP5	Count Time: 60 min
Prep Batch: 1675923		
Prep Date: 06/28/2017 10:54		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10098-97-2	Strontium-90		37.3	pCi/L	+/-2.46	6.33	1.13	2.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Strontium Carrier	5.70	7.75	mg	73.5	(40%-110%)

**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**

SDG Number: GEL424957	Client: CPRC001	Project: CPRC0S17006
Lab Sample ID: 424957003	Date Collected: 06/07/2017 12:32	Matrix: WATER
	Date Received: 06/08/2017 09:00	
Client ID: B39RX9	Method: PUIISO_PRECIP_AEA	Prep Basis: "As Received"
Batch ID: 1677692	Analyst: BXA4	SOP Ref: GL-RAD-A-011
Run Date: 07/01/2017 10:56	Aliquot: 0.4 L	Instrument: 1065
Data File: S0424957003_PU.1A.gcnf	Prep Method: DOE EML HASL-300, Pu-11-	Count Time: 239.9998 min
Prep Batch: 1677692		
Prep Date: 06/30/2017 00:00		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
I3981-16-3	Plutonium-238	U	0.00753	pCi/L	+/-0.143	0.143	0.288	1.00
OER-100-70	Plutonium-239/240	U	-0.0184	pCi/L	+/-0.0793	0.0794	0.193	1.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Plutonium-242 Tracer	3.79	4.92	pCi/L	77.1	(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.

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

<b>SDG Number:</b> GEL424957	<b>Client:</b> CPRC001	<b>Project:</b> CPRC0S17006
<b>Lab Sample ID:</b> 424957003	<b>Date Collected:</b> 06/07/2017 12:32	<b>Matrix:</b> WATER
	<b>Date Received:</b> 06/08/2017 09:00	
<b>Client ID:</b> B39RX9		<b>Prep Basis:</b> "As Received"
<b>Batch ID:</b> 1672138	<b>Method:</b> 9310_ALPHABETA_GPC	<b>SOP Ref:</b> GL-RAD-A-001
<b>Run Date:</b> 06/10/2017 12:05	<b>Analyst:</b> LXB3	<b>Instrument:</b> LB4100J3
<b>Data File:</b> AB1672138.xls	<b>Aliquot:</b> 150 mL	<b>Count Time:</b> 500 min
<b>Prep Batch:</b> 1672138	<b>Prep Method:</b> EPA 900.0/SW846 9310	
<b>Prep Date:</b> 06/09/2017 06:49		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
12587-46-1	Alpha ALPHA		26.3	pCi/L	+/-2.81	5.15	2.20	3.00
12587-47-2	Beta BETA		98.5	pCi/L	+/-2.35	16.3	1.29	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.

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

SDG Number: GEL424957	Client: CPRC001	Project: CPRC0S17006
Lab Sample ID: 424957003	Date Collected: 06/07/2017 12:32	Matrix: WATER
	Date Received: 06/08/2017 09:00	
Client ID: B39RX9	Method: SRISO_SEP_PRECIP_GPC	Prep Basis: "As Received"
Batch ID: 1675923	Analyst: JXB7	SOP Ref: GL-RAD-A-004
Run Date: 07/01/2017 14:19	Aliquot: 300 mL	Instrument: PIC9C
Data File: S1675923r1.xls	Prep Method: EPA 905.0 Modified/DOE RP5	Count Time: 60 min
Prep Batch: 1675923		
Prep Date: 06/28/2017 10:54		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10098-97-2	Strontium-90	U	0.385	pCi/L	+/-0.580	0.583	1.01	2.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Strontium Carrier	6.90	7.75	mg	89	(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.

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

SDG Number: GEL424957	Client: CPRC001	Project: CPRC0S17006
Lab Sample ID: 424957003	Date Collected: 06/07/2017 12:32	Matrix: WATER
	Date Received: 06/08/2017 09:00	
Client ID: B39RX9		Prep Basis: "As Received"
Batch ID: 1672238	Method: DOE EML HASL-300,I-01 Mo	SOP Ref: GL-RAD-A-006
Run Date: 06/13/2017 11:49	Analyst: MJH1	Instrument: XRAY5
Data File: I424957003.CNF;1	Aliquot: 1.6 L	Count Time: 120 min
Prep Batch: 1672238	Prep Method: DOE EML HASL-300,I-01 M	
Prep Date: 06/12/2017 00:00		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
15046-84-1	Iodine-129	U	0.384	pCi/L	+/-0.579	0.580	0.662	1.00

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits

**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.

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

SDG Number: GEL424957  
 Lab Sample ID: 424957003  
  
 Client ID: B39RX9  
 Batch ID: 1675360  
 Run Date: 06/22/2017 07:30  
 Data File: G424957003.CNF;1  
 Prep Batch: 1675360  
 Prep Date: 06/21/2017 00:00

Client: CPRC001  
 Date Collected: 06/07/2017 12:32  
 Date Received: 06/08/2017 09:00  
  
 Method: 901.1\_GAMMA\_GS  
 Analyst: MXR1  
 Aliquot: 0.5 L  
 Prep Method: EPA 901.1

Project: CPRC0S17006  
 Matrix: WATER  
  
 Prep Basis: "As Received"  
 SOP Ref: GL-RAD-A-013  
 Instrument: GAM25  
 Count Time: 120 min

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10045-97-3	Cesium-137	U	-5.67	pCi/L	+/-4.89	5.53	7.21	15.0
10198-40-0	Cobalt-60	U	-2.9	pCi/L	+/-4.41	4.60	7.36	
14683-23-9	Europium-152	U	0.147	pCi/L	+/-12.5	12.5	21.7	
15585-10-1	Europium-154	U	-0.593	pCi/L	+/-14.8	14.8	29.2	
14391-16-3	Europium-155	U	-0.829	pCi/L	+/-9.71	9.71	18.0	

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.

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

SDG Number: GEL424957	Client: CPRC001	Project: CPRC0S17006
Lab Sample ID: 424957003	Date Collected: 06/07/2017 12:32	Matrix: WATER
	Date Received: 06/08/2017 09:00	
Client ID: B39RX9	Method: TC99_EIE_LSC	Prep Basis: "As Received"
Batch ID: 1673290	Analyst: CXS7	SOP Ref: GL-RAD-A-059
Run Date: 06/19/2017 06:27	Aliquot: 100 mL	Instrument: LSCGOLD
Data File: E1673290.xls	Prep Method: DOE EML HASL-300, Tc-02-	Count Time: 25 min
Prep Batch: 1673290		
Prep Date: 06/13/2017 13:27		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
14133-76-7	Technetium-99		155	pCi/L	+/-26.3	31.5	37.3	50.0

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits
Technetium-99m Tracer	30900	36900	CPM	83.8	(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.

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

SDG Number: GEL424957	Client: CPRC001	Project: CPRC0S17006
Lab Sample ID: 424957003	Date Collected: 06/07/2017 12:32	Matrix: WATER
	Date Received: 06/08/2017 09:00	
Client ID: B39RX9	Method: TRITIUM_DIST_LSC	Prep Basis: "As Received"
Batch ID: 1673328	Analyst: BXM4	SOP Ref: GL-RAD-A-002
Run Date: 06/23/2017 21:04	Aliquot: 50 mL	Instrument: LSCBROWN
Data File: T1673328.xls	Prep Method: EPA 906.0 Modified	Count Time: 45 min
Prep Batch: 1673328		
Prep Date: 06/23/2017 13:02		

CAS No.	Parmname	Qual	Result	Units	Uncert	TPU	MDC	RDL
10028-17-8	Tritium		2200	pCi/L	+/-297	518	353	400

Surrogate/Tracer recovery	Result	Nominal	Units	Recovery%	Acceptable Limits

**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

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: July 5, 2017  
Page 1 of 5

**Client :** CH2MHill Plateau Remediation Company  
MSIN R3-50 CHPRC  
PO Box 1600  
Richland, Washington 99352  
**Contact:** Mr. Scot Fitzgerald  
**Workorder:** 424957

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1677692								
QC1203820112	MB								
Plutonium-238			U	-0.0389	pCi/L			BXA4	07/01/1710:56
				Uncert: +/-0.0737					
				TPU: +/-0.0739					
Plutonium-239/240			U	0.0168	pCi/L				
				Uncert: +/-0.0936					
				TPU: +/-0.0938					
**Plutonium-242 Tracer	4.92			2.76	pCi/L	REC: 56	(30%-105%)		
				Uncert: +/-0.788					
				TPU: +/-1.15					
QC1203820113	LCS								
Plutonium-238			U	0.0115	pCi/L				07/01/1710:56
				Uncert: +/-0.0638					
				TPU: +/-0.0639					
Plutonium-239/240	4.94			4.63	pCi/L	REC: 94	(80%-120%)		
				Uncert: +/-0.631					
				TPU: +/-0.914					
**Plutonium-242 Tracer	4.92			3.82	pCi/L	REC: 78	(30%-105%)		
				Uncert: +/-0.649					
				TPU: +/-0.957					
QC1203820114	425499002	DUP							
Plutonium-238		U	-0.0073	U	-0.00508	pCi/L			
			Uncert: +/-0.0876		+/-0.0438		RPD: 0	N/A	
			TPU: +/-0.0877		+/-0.0439		RER: 0.0443	(0-2)	
Plutonium-239/240		U	-0.0705	U	-0.0102	pCi/L			
			Uncert: +/-0.0941		+/-0.0449		RPD: 0	N/A	
			TPU: +/-0.0942		+/-0.045		RER: 1.13	(0-2)	
**Plutonium-242 Tracer	4.92		4.06		3.93	pCi/L	REC: 80	(30%-105%)	
			Uncert: +/-0.622		+/-0.634				
			TPU: +/-0.920		+/-0.937				
<b>Rad Gamma Spec</b>									
Batch	1672238								
QC1203806881	MB								
Iodine-129			U	0.0782	pCi/L			MJH1	06/13/1713:04
				Uncert: +/-0.406					
				TPU: +/-0.408					
QC1203806882	424844011	DUP							
Iodine-129			2.94		3.32	pCi/L			06/13/1713:54
			Uncert: +/-1.24		+/-1.05		RPD: 12	(0% - 100%)	
			TPU: +/-1.28		+/-1.10		RER: 0.448	(0-2)	
QC1203806883	424844011	MS							
Iodine-129			32.0	2.94	31.5	pCi/L	REC: 89	(75%-125%)	06/13/1713:54
			Uncert: +/-1.24		+/-5.02				
			TPU: +/-1.28		+/-5.99				
QC1203806884	LCS								

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gamma Spec</b>									
Batch	1672238								
Iodine-129	26.0			24.8	pCi/L	REC: 95	(80%-120%)		
	Uncert:			+/-3.28					
	TPU:			+/-4.11					
Batch	1675360								
QC1203814555	MB								
Cesium-137			U	1.64	pCi/L			MXR1	06/22/1707:31
	Uncert:			+/-4.69					
	TPU:			+/-4.75					
Cobalt-60			U	1.89	pCi/L				
	Uncert:			+/-5.64					
	TPU:			+/-5.71					
Europium-152			U	-1.48	pCi/L				
	Uncert:			+/-11.3					
	TPU:			+/-11.4					
Europium-154			U	-0.932	pCi/L				
	Uncert:			+/-12.7					
	TPU:			+/-12.7					
Europium-155			U	-0.472	pCi/L				
	Uncert:			+/-14.7					
	TPU:			+/-14.7					
QC1203814556	424516023	DUP							
Cesium-137		107		117	pCi/L				06/22/1707:31
	Uncert:	+/-15.3		+/-18.7		RPD: 9	(0% - 20%)		
	TPU:	+/-16.1		+/-19.5		RER: 0.776	(0-2)		
Cobalt-60		110		117	pCi/L				
	Uncert:	+/-16.2		+/-19.4		RPD: 7	(0% - 20%)		
	TPU:	+/-16.8		+/-20.0		RER: 0.578	(0-2)		
Europium-152		U -5.64	U	-10.4	pCi/L				
	Uncert:	+/-11.6		+/-13.5		RPD: 0	N/A		
	TPU:	+/-11.8		+/-14.3		RER: 0.507	(0-2)		
Europium-154		U 6.37	U	-3.19	pCi/L				
	Uncert:	+/-11.2		+/-12.1		RPD: 0	N/A		
	TPU:	+/-11.5		+/-12.2		RER: 1.12	(0-2)		
Europium-155		U -5.07	U	-1.14	pCi/L				
	Uncert:	+/-13.5		+/-18.8		RPD: 0	N/A		
	TPU:	+/-13.7		+/-18.8		RER: 0.331	(0-2)		
QC1203814557	LCS								
Americium-241	1.10E+05			1.16E+05	pCi/L	REC: 105	(80%-120%)		06/22/1707:35
	Uncert:			+/-2150					
	TPU:			+/-9420					
Cesium-137	42000			43900	pCi/L	REC: 104	(80%-120%)		
	Uncert:			+/-746					
	TPU:			+/-4200					
Cobalt-60	38000			39300	pCi/L	REC: 103	(80%-120%)		
	Uncert:			+/-822					
	TPU:			+/-3450					
Europium-152			U	-339	pCi/L				
	Uncert:			+/-294					
	TPU:			+/-333					
Europium-154			U	-90.2	pCi/L				

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gamma Spec</b>									
Batch	1675360								
				Uncert:		+/-201			
				TPU:		+/-205			
Europium-155			U	405	pCi/L				
				Uncert:		+/-371			
				TPU:		+/-415			
<b>Rad Gas Flow</b>									
Batch	1672138								
QC1203806624	MB								
Alpha			U	-0.228	pCi/L			LXB3	06/10/1712:18
				Uncert:		+/-0.500			
				TPU:		+/-0.500			
Beta			U	0.222	pCi/L				
				Uncert:		+/-0.781			
				TPU:		+/-0.782			
QC1203806625	424707004	DUP							
Alpha				13.2	pCi/L				06/10/1712:18
				Uncert:		+/-1.30			
				TPU:		+/-2.53			
Beta				4.28	pCi/L				
				Uncert:		+/-0.846			
				TPU:		+/-1.11			
QC1203806626	424707004	MS							
Alpha				242	pCi/L	REC:	109 (75%-125%)		06/12/1709:09
				Uncert:		+/-1.30			
				TPU:		+/-2.53			
Beta				875	pCi/L	REC:	110 (75%-125%)		
				Uncert:		+/-0.846			
				TPU:		+/-1.11			
QC1203806627	424707004	MSD							
Alpha				242	pCi/L	REC:	102 (75%-125%)		06/12/1709:14
				Uncert:		+/-1.30			
				TPU:		+/-2.53			
Beta				875	pCi/L	REC:	111 (75%-125%)		
				Uncert:		+/-0.846			
				TPU:		+/-1.11			
QC1203806628	LCS								
Alpha				80.6	pCi/L	REC:	103 (80%-120%)		06/12/1709:14
				Uncert:		+/-7.55			
				TPU:		+/-15.7			
Beta				292	pCi/L	REC:	111 (80%-120%)		
				Uncert:		+/-11.2			
				TPU:		+/-55.4			
Batch	1675923								
QC1203815773	MB								
Strontium-90			U	-0.266	pCi/L			JXB7	07/01/1714:19
				Uncert:		+/-0.572			
				TPU:		+/-0.572			
**Strontium Carrier				7.75	mg	REC:	75 (40%-110%)		
QC1203815774	425103020	DUP							
Strontium-90				5.98	pCi/L				07/05/1708:00

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gas Flow</b>									
Batch	1675923								
		Uncert:	+/-1.06	+/-1.02					
		TPU:	+/-1.43	+/-1.27		RPD:	21* (0% - 20%)		
						RER:	1.19 (0-2)		
**Strontium Carrier	7.75	5.50		7.20	mg	REC:	93 (40%-110%)		
QC1203815775	LCS								
Strontium-90	72.8			83.3	pCi/L	REC:	114 (80%-120%)		07/01/1714:20
		Uncert:		+/-4.35					
		TPU:		+/-14.1					
**Strontium Carrier	7.75			5.20	mg	REC:	67 (40%-110%)		
<b>Rad Liquid Scintillation</b>									
Batch	1673290								
QC1203809519	MB								
Technetium-99			U	7.31	pCi/L			CXS7	06/19/1710:30
		Uncert:		+/-19.9					
		TPU:		+/-20.0					
**Technetium-99m Tracer	36900			34300	CPM	REC:	93 (30%-105%)		
QC1203809520	425104001								
Technetium-99		48.5	U	39.9	pCi/L				06/19/1710:57
		Uncert:	+/-21.8	+/-25.6		RPD:	19 (0% - 100%)		
		TPU:	+/-22.5	+/-26.0		RER:	0.488 (0-2)		
**Technetium-99m Tracer	36900	33200		27800	CPM	REC:	75 (30%-105%)		
QC1203809521	LCS								
Technetium-99	861			795	pCi/L	REC:	92 (80%-120%)		06/19/1711:24
		Uncert:		+/-42.8					
		TPU:		+/-98.1					
**Technetium-99m Tracer	36900			29300	CPM	REC:	79 (30%-105%)		
Batch	1673328								
QC1203809663	MB								
Tritium			U	-85.5	pCi/L			BXM4	06/24/1700:12
		Uncert:		+/-195					
		TPU:		+/-195					
QC1203809664	424663001								
Tritium		1600		1660	pCi/L				06/24/1700:59
		Uncert:	+/-284	+/-281		RPD:	4 (0% - 100%)		
		TPU:	+/-420	+/-426		RER:	0.199 (0-2)		
QC1203809665	424663001								
Tritium	2240	1600		3380	pCi/L	REC:	79 (75%-125%)		06/24/1701:46
		Uncert:	+/-284	+/-345					
		TPU:	+/-420	+/-738					
QC1203809666	LCS								
Tritium	2240			1900	pCi/L	REC:	85 (80%-120%)		06/24/1702:33
		Uncert:		+/-294					
		TPU:		+/-471					

**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

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date	Time
+						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 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.