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## Data Validation Report for CH2M Hill Plateau Remediation Company

**VSR17-007**  
**Project 300 AREA RA&WD**

### Chemical and Radiochemical Validation - Level C

Validation Performed By: *Eyda Hergenreder* Date: 06-22-2017  
Eyda Hergenreder

Technical Review By: *Ellen McEntee* Date: 06-22-2017  
Ellen McEntee

Quality Review By: *Mary A. Donovan* Date: 06-30-2017  
Mary Donovan  
Quality Assurance Manager

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Date: 22 June 2017  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 300 AREA RA&WD  
 Subject: Semivolatile Organics - Sample Data Groups (SDGs) GEL424169 and SL2533

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL424169 prepared by GEL Laboratories LLC and SDG SL2533 prepared by TestAmerica Laboratories. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3B8P8	5/25/17	Soil	C	8270D, WTPH-D
B3B8R0	5/25/17	Soil	C	8270D, WTPH-D
B3B8R2	5/25/17	Soil	C	8270D, WTPH-D
B3B8R4	5/25/17	Soil	C	8270D, WTPH-D
B3B8R6	5/25/17	Soil	C	8270D, WTPH-D
B3B8R8	5/25/17	Soil	C	8270D, WTPH-D
B3B8T0	5/25/17	Soil	C	8270D, WTPH-D
B3B8T2	5/25/17	Soil	C	8270D, WTPH-D
B3B8T4	5/25/17	Soil	C	8270D, WTPH-D
B3B8T6	5/25/17	Soil	C	8270D, WTPH-D
B3B8T8	5/25/17	Soil	C	8270D, WTPH-D
B3B8V0	5/25/17	Soil	C	8270D, WTPH-D
B3B8V2	5/25/17	Soil	C	8270D, WTPH-D
B3B8V4	5/25/17	Soil	C	8270D, WTPH-D
B3B8V6	5/25/17	Soil	C	8270D, WTPH-D
B3B8V8	5/25/17	Soil	C	8270D, WTPH-D
B3B8V9	5/25/17	Soil	C	8270D, WTPH-D
B3B8W0	5/25/17	Soil	C	8270D, WTPH-D

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4, (SAP). Appendices 1 through 4 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Data Validation Supporting Documentation
- Appendix 4. Additional Documentation Requested by Client

## **DATA QUALITY OBJECTIVES**

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirements for methods 8270D and WTPH-D are extraction within 14 days of sample collection and analysis within 40 days of sample extraction. Sample preservation requires chilling to  $\leq 6$  degrees Celsius.

The samples were extracted and analyzed within the prescribed holding times and properly preserved.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

**Laboratory Blanks**

All laboratory blank results were acceptable.

**Trip Blanks**

No trip blanks were submitted for validation.

**Field Blanks**

No field blanks were submitted for validation.

**Equipment Blanks**

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing surrogate results, matrix spike sample results, and laboratory control sample results. According to the SAP, the matrix spike and laboratory control sample accuracy limits are 50% to 150%.

**Surrogates**

All surrogate recoveries were acceptable with the following exceptions.

**Method 8270D**

For SDG SL2533, surrogate recoveries were not reported with the sample. According to the case narrative all associated sample QC were acceptable, therefore based on professional judgment, data should not be qualified.

### **Method WTPH-D**

For SDG GEL424169, the o-terphenyl surrogate recovery for samples B3B8R2, B3B8R4, B3B8R6, B3B8T0, B3B8T2, B3B8T4, B3B8T6, B3B8T8, B3B8V2, B3B8V4, B3B8V6, and B3B8V8 were < the upper acceptance limit but  $\geq 20\%$ . The WTPH-D result for sample B3B8T2 and B3B8V8 were non-detects and should be qualified as estimates and flagged “UJ.” All other WTPH-D sample results were detects and should be qualified as estimates and flagged “J-.”

### **Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples**

All MS/MSD recoveries were acceptable with the following exception.

### **Method 8270D**

For SDG SL2533, the MS spiking solution did not include tributyl phosphate; therefore MS and MSD recoveries were not available. The associated sample result was a non-detect and should be qualified as an estimate and flagged “UJ” due to lack of accuracy data.

### **Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable with the following exception.

### **Method 8270D**

For SDG SL2533, the LCS spiking solution did not include tributyl phosphate; therefore LCS recovery was not available. The associated sample result was a non-detect and should be qualified as an estimate and flagged “UJ.”

- **Precision**

Precision is evaluated by reviewing MS/MSD results, field duplicate sample results, field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are  $\pm 30\%$ .

### **MS/MSD Samples**

All MS/MSD relative percent difference values were acceptable with the following exception.

### **Method 8270D**

For SDG SL2533, a laboratory duplicate was not analyzed with the sample. The tributyl phosphate sample result was a non-detect and should be qualified as an estimate and flagged “UJ” due to lack of precision data.

### **Field Duplicate Samples**

No field duplicates were submitted for validation.

### **Field Split Samples**

No field splits were submitted for validation.

- **Internal Standards**

Internal standard performance criteria ensure that GC/MS sensitivity and response are stable during each analysis. Internal standards are added to all samples, including QC samples, prior to analysis.

Internal standards data was not included in the data package. Sample results should not be qualified based on this.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were below the CRDLs.

- **Completeness**

SDGs GEL424169 and SL2533 were submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

### **MAJOR DEFICIENCIES**

None found.

### **MINOR DEFICIENCIES**

Minor deficiencies leading to qualification of sample results as estimates were due to low surrogate recovery infractions and lack of QC data. See the table in Appendix 2 for a listing of all affected sample results.

### **REFERENCES**

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **Appendix 1**

### **Glossary of Data Reporting Qualifiers**

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

**Appendix 2**  
**Summary of Data Qualification**

<b>Semivolatile Organics Data Qualification Summary</b>			
SDG: GEL424169, SL2533	Reviewer: AQA	Project: 300 AREA RA&WD	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
Tributyl phosphate	UJ	B3B8W0	Lack of MS/MSD, LCS and precision data.
WTPH-D	UJ	B3B8T2, B3B8V8	Low surrogate recoveries.
WTPH-D	J-	B3B8R2, B2B8R4, B3B8R6, B3B8T0, B3B8T4, B3B8T6, B3B8T8, B3B8V2, B3B8V4, B2B8V6	Low surrogate recoveries.

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

**Data Validation for Chemical Analyses**

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

**Appendix A - Chemical Data Validation Checklist**

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 300 AREA RA&WD			DATA PACKAGE: VSR17-007		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 06/22/17	
			SDG: GEL424169, SL2533		
<b>ANALYSES PERFORMED</b>					
SW-846 8260		SW-846 8260 (TCLP)	SW-846 8270 X		SW-846 8270 (TCLP)
SAMPLES/MATRIX Soil					
GEL424169: B3B8P8, B3B8R0, B3B8R2, B3B8R4, B3B8R6, B3B8R8, B3B8T0, B3B8T2, B3B8T4, B3B8T6, B3B8T8, B3B8V0, B3B8V2, B3B8V4, B3B8V6, B3B8V8, B3B8V9					
SL2533: B3B8W0					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A
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Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

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Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)

GC/MS tuning/performance check acceptable?	Yes No <input type="radio"/> N/A
Initial calibrations acceptable?	Yes No <input type="radio"/> N/A
Continuing calibrations acceptable?	Yes No <input type="radio"/> N/A
Standards traceable?	Yes No <input type="radio"/> N/A
Standards expired?	Yes No <input type="radio"/> N/A
Calculation check acceptable?	Yes No <input type="radio"/> N/A

Comments:

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#### 3. BLANKS (Levels B, C, D, and E)

Calibration blanks analyzed? (Levels D, E)	Yes No <input type="radio"/> N/A
Calibration blank results acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Laboratory blanks analyzed?	<input checked="" type="radio"/> Yes No N/A
Laboratory blank results acceptable?	<input checked="" type="radio"/> Yes No N/A
Field/trip blanks analyzed? (Levels C, D, E)	Yes <input type="radio"/> No N/A
Field/trip blank results acceptable? (Levels C, D, E)	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

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Effective Date: 10/03/16

## Appendix A - (Cont.) Chemical Data Validation Checklist

## 4. ACCURACY (Levels C, D, and E)

Surrogates/system monitoring compounds analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Surrogate/system monitoring compound recoveries acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Surrogates traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
Surrogates expired? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD standards? (Levels D, E)	Yes No <input type="radio"/> N/A
LCS/BSS samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
LCS/BSS results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Standards traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
Standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A
Performance audit sample(s) analyzed?	Yes No <input type="radio"/> N/A
Performance audit sample results acceptable?	Yes No <input type="radio"/> N/A

Comments:

SDG SL2533: No surrogate results were reported; however case narrative states all instrument QC were acceptable.

SDG SL2533: MS/MSD and LCS were not reported due to compound reported not included in spiking solution.

## Data Validation for Chemical Analyses

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## Appendix A - (Cont.) Chemical Data Validation Checklist

## 5. PRECISION (Levels C, D, and E)

MS/MSD samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD RPD values acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input type="radio"/> N/A
LCS/LCSD duplicates run due to insufficient sample material?	Yes <input type="radio"/> No <input type="radio"/> N/A
Field duplicate RPD values acceptable?	Yes No <input type="radio"/> N/A
Field split RPD values acceptable?	Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

SDG SL2533; no precision data included with sample

## 6. SYSTEM PERFORMANCE (Levels D and E)

Internal standards analyzed?	Yes No <input type="radio"/> N/A
Internal standard areas acceptable?	Yes No <input type="radio"/> N/A
Internal standard retention times acceptable?	Yes No <input type="radio"/> N/A
Standards traceable?	Yes No <input type="radio"/> N/A
Standards expired?	Yes No <input type="radio"/> N/A
Transcription/calculation errors?	Yes No <input type="radio"/> N/A

Comments:

## Data Validation for Chemical Analyses

Published Date: 10/03/16

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Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 7. HOLDING TIMES (all levels )

Samples properly preserved?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Sample holding times acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A

Comments:

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#### 8. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)

Compound identification acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Compound quantitation acceptable? (Levels D, E)	Yes No <input type="radio"/> N/A
Results reported for all requested analyses?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Results supported in the raw data? (Levels D, E)	Yes No <input type="radio"/> N/A
Samples properly prepared? (Levels D, E)	Yes No <input type="radio"/> N/A
Laboratory properly identified and coded all TIC? (Levels D, E)	Yes No <input type="radio"/> N/A
Detection limits meet RDL?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input type="radio"/> N/A

Comments:

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**Data Validation for Chemical Analyses**

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**Appendix A - (Cont.) Chemical Data Validation Checklist**

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 300 AREA RA&WD			DATA PACKAGE: VSR17-007		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE: 06/22/17	
			SDG: GEL424169, SL2533		
ANALYSES PERFORMED					
8015	8021	8141	8151	8315	
		WTPH-HCID	WTPH-G	WTPH-D X	
SAMPLES/MATRIX: Soil					
GEL424169: B3B8P8, B3B8R0, B3B8R2, B3B8R4, B3B8R6, B3B8R8, B3B8T0, B3B8T2, B3B8T4, B3B8T6, B3B8T8, B3B8V0, B3B8V2, B3B8V4, B3B8V6, B3B8V8, B3B8V9					
SL2533: B3B8W0					

**1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE**

Technical verification documentation present?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
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Comments:

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## Data Validation for Chemical Analyses

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### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 2. INSTRUMENT TUNING AND CALIBRATION (Levels D and E)

Initial calibrations acceptable?	Yes No <input checked="" type="radio"/> N/A
Continuing calibrations acceptable?	Yes No <input checked="" type="radio"/> N/A
Standards traceable?	Yes No <input checked="" type="radio"/> N/A
Standards expired?	Yes No <input checked="" type="radio"/> N/A
Calculation check acceptable?	Yes No <input checked="" type="radio"/> N/A

Comments:

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#### 3. BLANKS (Levels B, C, D, and E)

Calibration blanks analyzed? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Calibration blank results acceptable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Laboratory blanks analyzed?	<input checked="" type="radio"/> Yes No N/A
Laboratory blank results acceptable?	<input checked="" type="radio"/> Yes No N/A
Field/trip blanks analyzed? (Levels C, D, E)	Yes <input checked="" type="radio"/> No N/A
Field/trip blank results acceptable? (Levels C, D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

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## Data Validation for Chemical Analyses

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Effective Date: 10/03/16

## Appendix A - (Cont.) Chemical Data Validation Checklist

## 4. ACCURACY (Levels C, D, and E)

Surrogates/system monitoring compounds analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Surrogate/system monitoring compound recoveries acceptable?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Surrogates traceable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Surrogates expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
MS/MSD samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
LCS/BSS samples analyzed?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
LCS/BSS results acceptable?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Standards traceable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Standards expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Performance audit sample(s) analyzed?	Yes No <input checked="" type="radio"/> N/A
Performance audit sample results acceptable?	Yes No <input checked="" type="radio"/> N/A

Comments:

GEL424169: surrogate %: B3B8R2 56%, B3B8R4 50%, B3B8R6 48%, B3B8T0 46%, B3B8T2 53%,  
B3B8T4 54%, B3B8T6 45%, B3B8T8 48%, B3B8V2 41%, B3B8V4 46%,  
B3B8V6 44%, B3B8V8 47%

## Data Validation for Chemical Analyses

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### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 5. PRECISION (Levels C, D, and E)

Duplicate RPD values acceptable?	<input checked="" type="radio"/> Yes No N/A
Duplicate results acceptable?	<input checked="" type="radio"/> Yes No N/A
MS/MSD standards NIST traceable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
MS/MSD standards expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
LCS/LCSD duplicates run due to insufficient sample material?	Yes <input checked="" type="radio"/> No N/A
Field duplicate RPD values acceptable?	Yes No <input checked="" type="radio"/> N/A
Field split RPD values acceptable?	Yes No <input checked="" type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

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#### 6. HOLDING TIMES (all levels)

Samples properly preserved?	<input checked="" type="radio"/> Yes No N/A
Sample holding times acceptable?	<input checked="" type="radio"/> Yes No N/A

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

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Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 7. COMPOUND IDENTIFICATION, QUANTITATION, AND DETECTION LIMITS (all levels)

Results reported for all requested analyses?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Results supported in the raw data? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Samples properly prepared? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Detection limits meet RDL?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

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#### 8. SAMPLE CLEANUP (Levels D and E)

Fluorisil ® (or other absorbent) cleanup performed?	Yes No <input checked="" type="radio"/> N/A
Lot check performed?	Yes No <input checked="" type="radio"/> N/A
Check recoveries acceptable?	Yes No <input checked="" type="radio"/> N/A
Check materials traceable?	Yes No <input checked="" type="radio"/> N/A
Check materials Expired?	Yes No <input checked="" type="radio"/> N/A
Analytical batch QC given similar cleanup?	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation Errors?	Yes No <input checked="" type="radio"/> N/A

Comments (attach additional sheets as necessary):

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## **Appendix 4**

### **Additional Documentation Requested By Client**

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: June 6, 2017

Page 1 of 3

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 424169

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatile-GC/MS</b>											
Batch	1669070										
QC1203799083	LCS										
Tributylphosphate	1670			1260	ug/kg		76	(70%-130%)	JLD1	05/31/17	22:33
**2,4,6-Tribromophenol	3330			2500	ug/kg		75	(12%-129%)			
**2-Fluorobiphenyl	1670			1210	ug/kg		73	(15%-110%)			
**2-Fluorophenol	3330			2650	ug/kg		80	(10%-115%)			
**Nitrobenzene-d5	1670			1150	ug/kg		69	(13%-112%)			
**Phenol-d5	3330			2530	ug/kg		76	(15%-117%)			
**p-Terphenyl-d14	1670			1600	ug/kg		96	(24%-141%)			
QC1203799082	MB										
Tributylphosphate			U	100	ug/kg					05/31/17	22:04
**2,4,6-Tribromophenol	3330			2110	ug/kg		63	(12%-129%)			
**2-Fluorobiphenyl	1670			1240	ug/kg		74	(15%-110%)			
**2-Fluorophenol	3330			2510	ug/kg		75	(10%-115%)			
**Nitrobenzene-d5	1670			1260	ug/kg		76	(13%-112%)			
**Phenol-d5	3330			2410	ug/kg		72	(15%-117%)			

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**QC Summary**

Workorder: 424169

Page 2 of 3

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Semi-Volatile-GC/MS</b>											
Batch	1669070										
**p-Terphenyl-d14	1670			1750	ug/kg		105	(24%-141%)	JLD1	05/31/17	22:04
QC1203799084 424169001 MS											
Tributylphosphate	1720	U	103	1270	ug/kg		74	(25%-131%)		05/31/17	23:32
**2,4,6-Tribromophenol	3430		2220	2580	ug/kg		75	(12%-129%)			
**2-Fluorobiphenyl	1720		1190	1050	ug/kg		61	(15%-110%)			
**2-Fluorophenol	3430		2400	2240	ug/kg		65	(10%-115%)			
**Nitrobenzene-d5	1720		1210	987	ug/kg		58	(13%-112%)			
**Phenol-d5	3430		2360	2200	ug/kg		64	(15%-117%)			
**p-Terphenyl-d14	1720		1700	1280	ug/kg		75	(24%-141%)			
QC1203799085 424169001 MSD											
Tributylphosphate	1720	U	103	1440	ug/kg	13	84	(0%-30%)		06/01/17	00:01
**2,4,6-Tribromophenol	3430		2220	2510	ug/kg		73	(12%-129%)			
**2-Fluorobiphenyl	1720		1190	1100	ug/kg		64	(15%-110%)			
**2-Fluorophenol	3430		2400	2570	ug/kg		75	(10%-115%)			
**Nitrobenzene-d5	1720		1210	1060	ug/kg		62	(13%-112%)			
**Phenol-d5	3430		2360	2570	ug/kg		75	(15%-117%)			

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**QC Summary**

Workorder: 424169

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatile-GC/MS											
Batch	1669070										
**p-Terphenyl-d14	1720	1700		1490	ug/kg		87	(24%-141%)	JLD1	06/01/17	00:01

**Notes:**

The Qualifiers in this report are defined as follows:

- A The TIC is a suspected aldol-condensation product
- B The analyte was detected in both the associated QC blank and in the sample.
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of sample.
- E Concentration exceeds the calibration range of the instrument
- 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
- N Spike Sample recovery is outside control limits.
- P Aroclor target analyte with greater than 25% difference between column analyses.
- T Spike and/or spike duplicate sample recovery is outside control limits.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Z Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
  - o Analyte failed to recover within LCS limits (Organics only)

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.

## Surrogate Recovery Report

SDG Number: GEL424169

Matrix Type: SOLID

Sample ID	Client ID	2FP %REC	PHL %REC	NBZ %REC	FBP %REC	TBP %REC	TPH %REC
1203799082	MB for batch 1669069	75	72	76	74	63	105
1203799083	LCS for batch 1669069	80	76	69	73	75	96
424169001	B3B8P8	70	69	70	69	65	99
1203799084	B3B8P8MS	65	64	58	61	75	75
1203799085	B3B8P8MSD	75	75	62	64	73	87
424169002	B3B8R0	80	75	78	74	58	97
424169003	B3B8R2	62	59	58	55	41	79
424169004	B3B8R4	74	72	71	67	53	86
424169005	B3B8R6	70	68	66	62	47	89
424169006	B3B8R8	63	60	59	54	42	66
424169007	B3B8T0	62	61	64	63	49	87
424169008	B3B8T2	61	60	59	57	39	80
424169009	B3B8T4	71	71	67	64	46	96
424169010	B3B8T6	70	69	67	65	64	93
424169011	B3B8T8	70	71	71	70	51	101
424169012	B3B8V0	63	63	66	66	49	95
424169013	B3B8V2	64	65	65	61	52	94
424169014	B3B8V4	84	82	82	78	70	110
424169015	B3B8V6	79	78	72	65	59	91
424169016	B3B8V8	95	94	80	72	55	91
424169017	B3B8V9	64	65	69	63	57	75

## Surrogate

## Acceptance Limits

2FP	= 2-Fluorophenol	(10%-115%)
PHL	= Phenol-d5	(15%-117%)
NBZ	= Nitrobenzene-d5	(13%-112%)
FBP	= 2-Fluorobiphenyl	(15%-110%)
TBP	= 2,4,6-Tribromophenol	(12%-129%)
TPH	= p-Terphenyl-d14	(24%-141%)

\* Recovery outside Acceptance Limits

# Column to be used to flag recovery values

D Sample Diluted

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
 SDG: SL2533

**Method: 8270D - Semivolatile Organic Compounds (GC/MS)**

Lab Sample ID: MB 160-312347/1-A  
 Matrix: Solid  
 Analysis Batch: 313034

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 312347

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyl phosphate	46	U	330	46	ug/Kg		06/07/17 14:51	06/12/17 18:05	1

**Method: 8015B - Diesel Range Organics (DRO) (GC)**

Lab Sample ID: MB 160-312349/1-A  
 Matrix: Solid  
 Analysis Batch: 313442

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 312349

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics [C10-C28]	2.4	U	25	2.4	mg/Kg		06/07/17 15:16	06/14/17 23:05	1
Kerosene (C9-C16)	2.4	U	25	2.4	mg/Kg		06/07/17 15:16	06/14/17 23:05	1
Motor Oil Range Organics [C28-C40]	2.4	U	25	2.4	mg/Kg		06/07/17 15:16	06/14/17 23:05	1

  

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
o-Terphenyl	94		49 - 133	06/07/17 15:16	06/14/17 23:05	1

Lab Sample ID: LCS 160-312349/2-A  
 Matrix: Solid  
 Analysis Batch: 313442

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 312349

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Diesel Range Organics [C10-C28]	83.3	57.7		mg/Kg		69	57 - 105

  

Surrogate	LCS %Recovery	LCS Qualifier	Limits
o-Terphenyl	79		49 - 133

Lab Sample ID: 160-22539-1 MS  
 Matrix: Soil  
 Analysis Batch: 313442

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 312349

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Diesel Range Organics [C10-C28]	2.5	U	85.6	50.4		mg/Kg	✱	59	34 - 150

  

Surrogate	MS %Recovery	MS Qualifier	Limits
o-Terphenyl	67		49 - 133

Lab Sample ID: 160-22539-1 MSD  
 Matrix: Soil  
 Analysis Batch: 313442

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 312349

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Diesel Range Organics [C10-C28]	2.5	U	85.7	68.2		mg/Kg	✱	80	34 - 150	30	30

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**QC Summary**

Report Date: June 2, 2017

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CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 424169

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Diesel Range Organics</b>											
Batch	1670113										
QC1203801669	LCS										
Diesel Range Organics	66600			53000	UG/KG		80	(70%-130%)	LXA1	06/01/17	17:52
Motor Oil	66600			56000	UG/KG		84	(70%-130%)			
**o-Terphenyl	666			462	UG/KG		69	(60%-140%)			
QC1203801672	LCS										
Kerosene	33300			20300	UG/KG		61 *	(70%-130%)		06/01/17	18:31
**o-Terphenyl	667			434	UG/KG		65	(60%-140%)			
QC1203801673	LCSD										
Kerosene	33300			22100	UG/KG	9	66 *	(0%-30%)		06/01/17	19:10
**o-Terphenyl	666			455	UG/KG		68	(60%-140%)			
QC1203801668	MB										
Diesel Range Organics			U	2160	UG/KG					06/01/17	17:13
Kerosene			U	1110	UG/KG						
Motor Oil			U	2160	UG/KG						
**o-Terphenyl	666			493	UG/KG		74	(60%-140%)			
QC1203801670	424169004 MS										
Diesel Range Organics	67900	JT	3540	T	50100	UG/KG	69 *	(70%-130%)		06/01/17	22:24

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**QC Summary**

Workorder: 424169

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Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
<b>Diesel Range Organics</b>											
Batch	1670113										
**o-Terphenyl	679	342		455	UG/KG		67	(60%-140%)	LXA1	06/01/17	22:24
QC1203801671 424169004 MSD											
Diesel Range Organics	67900	JT	3540	T	48800	UG/KG	3	67*	(0%-30%)		06/01/17 23:03
**o-Terphenyl	679	342		428	UG/KG		63	(60%-140%)			

**Notes:**

The Qualifiers in this report are defined as follows:

- A The TIC is a suspected aldol-condensation product
- B The analyte was detected in both the associated QC blank and in the sample.
- C Analyte has been confirmed by GC/MS analysis
- D Results are reported from a diluted aliquot of sample.
- E Concentration exceeds the calibration range of the instrument
- 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
- N Spike Sample recovery is outside control limits.
- P Aroclor target analyte with greater than 25% difference between column analyses.
- T Spike and/or spike duplicate sample recovery is outside control limits.
- U Analyzed for but not detected above limiting criteria. Includes MDL, MDA, PQL, zero, counting error, and total analytical error.
- X Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Y Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- Z Consult Case Narrative, Data Summary package, or Project Manager concerning this qualifier
- o Analyte failed to recover within LCS limits (Organics only)

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.

FID Diesel Range Organics  
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Surrogate Recovery Report

SDG Number: GEL424169

Matrix Type: SOLID

Sample ID	Client ID	OTP %REC
1203801668	MB for batch 1670112	74
1203801669	LCS for batch 1670112	69
1203801672	LCS for batch 1670112	65
1203801673	LCSD for batch 1670112	68
424169001	B3B8P8	76
424169002	B3B8R0	67
424169003	B3B8R2	56 *
424169004	B3B8R4	50 *
1203801670	B3B8R4MS	67
1203801671	B3B8R4MSD	63
424169005	B3B8R6	48 *
424169006	B3B8R8	63
424169007	B3B8T0	46 *
424169008	B3B8T2	53 *
424169009	B3B8T4	54 *
424169010	B3B8T6	45 *
424169011	B3B8T8	48 *
424169012	B3B8V0	68
424169013	B3B8V2	41 *
424169014	B3B8V4	46 *
424169015	B3B8V6	44 *
424169016	B3B8V8	47 *
424169017	B3B8V9	63

**Surrogate**

OTP = o-Terphenyl

**Acceptance Limits**

(60%-140%)

\* Recovery outside Acceptance Limits

# Column to be used to flag recovery values

D Sample Diluted

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
SDG: SL2533

**Method: 8270D - Semivolatile Organic Compounds (GC/MS)**

**Lab Sample ID: MB 160-312347/1-A**  
**Matrix: Solid**  
**Analysis Batch: 313034**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 312347**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Tributyl phosphate	46	U	330	46	ug/Kg		06/07/17 14:51	06/12/17 18:05	1

**Method: 8015B - Diesel Range Organics (DRO) (GC)**

**Lab Sample ID: MB 160-312349/1-A**  
**Matrix: Solid**  
**Analysis Batch: 313442**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 312349**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Diesel Range Organics [C10-C28]	2.4	U	25	2.4	mg/Kg		06/07/17 15:16	06/14/17 23:05	1
Kerosene (C9-C16)	2.4	U	25	2.4	mg/Kg		06/07/17 15:16	06/14/17 23:05	1
Motor Oil Range Organics [C28-C40]	2.4	U	25	2.4	mg/Kg		06/07/17 15:16	06/14/17 23:05	1

  

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
<i>o</i> -Terphenyl	94		49 - 133	06/07/17 15:16	06/14/17 23:05	1

**Lab Sample ID: LCS 160-312349/2-A**  
**Matrix: Solid**  
**Analysis Batch: 313442**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 312349**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Diesel Range Organics [C10-C28]	83.3	57.7		mg/Kg		69	57 - 105

  

Surrogate	LCS %Recovery	LCS Qualifier	Limits
<i>o</i> -Terphenyl	79		49 - 133

**Lab Sample ID: 160-22539-1 MS**  
**Matrix: Soil**  
**Analysis Batch: 313442**

**Client Sample ID: B3B8W0**  
**Prep Type: Total/NA**  
**Prep Batch: 312349**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Diesel Range Organics [C10-C28]	2.5	U	85.6	50.4		mg/Kg	☼	59	34 - 150

  

Surrogate	MS %Recovery	MS Qualifier	Limits
<i>o</i> -Terphenyl	67		49 - 133

**Lab Sample ID: 160-22539-1 MSD**  
**Matrix: Soil**  
**Analysis Batch: 313442**

**Client Sample ID: B3B8W0**  
**Prep Type: Total/NA**  
**Prep Batch: 312349**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Diesel Range Organics [C10-C28]	2.5	U	85.7	68.2		mg/Kg	☼	80	34 - 150	30	30

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
 SDG: SL2533

**Method: 8015B - Diesel Range Organics (DRO) (GC) (Continued)**

Lab Sample ID: 160-22539-1 MSD  
 Matrix: Soil  
 Analysis Batch: 313442

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 312349

Surrogate	MSD %Recovery	MSD Qualifier	Limits
<i>o</i> -Terphenyl	98		49 - 133

**Method: 6020A - Metals (ICP/MS)**

Lab Sample ID: MB 160-313029/1-A  
 Matrix: Solid  
 Analysis Batch: 313370

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Uranium	0.034	U D	0.086	0.034	mg/Kg		06/12/17 11:17	06/13/17 17:04	2

Lab Sample ID: LCS 160-313029/2-A  
 Matrix: Solid  
 Analysis Batch: 313370

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Uranium	89.8	93.08	D	mg/Kg		104	80 - 120

Lab Sample ID: 160-22539-1 MS  
 Matrix: Soil  
 Analysis Batch: 313370

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Uranium	0.41	D	95.4	100.3	D	mg/Kg	☼	105	75 - 125

Lab Sample ID: 160-22539-1 MSD  
 Matrix: Soil  
 Analysis Batch: 313370

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Uranium	0.41	D	94.6	101.4	D	mg/Kg	☼	107	75 - 125	1	30

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)**

Lab Sample ID: MB 160-311120/1-A  
 Matrix: Solid  
 Analysis Batch: 312781

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 311120

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.000	U	0.0351	0.0351	1.00	0.0849	pCi/g	05/30/17 10:12	06/08/17 18:54	1
Uranium 235	-0.00564	U	0.0265	0.0265	1.00	0.0847	pCi/g	05/30/17 10:12	06/08/17 18:54	1
Uranium-238	0.00452	U	0.0344	0.0345	1.00	0.0798	pCi/g	05/30/17 10:12	06/08/17 18:54	1

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	88.8		30 - 105	05/30/17 10:12	06/08/17 18:54	1
Uranium-232	88.8		30 - 105	05/30/17 10:12	06/08/17 18:54	1

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**Surrogate Summary**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
SDG: SL2533

**Method: 8015B - Diesel Range Organics (DRO) (GC)**

**Matrix: Soil**

**Prep Type: Total/NA**

**Percent Surrogate Recovery (Acceptance Limits)**

<b>Lab Sample ID</b>	<b>Client Sample ID</b>	<b>OTPH1 (49-133)</b>
160-22539-1	B3B8W0	79
160-22539-1 MS	B3B8W0	67
160-22539-1 MSD	B3B8W0	98

**Surrogate Legend**

OTPH = o-Terphenyl

**Method: 8015B - Diesel Range Organics (DRO) (GC)**

**Matrix: Solid**

**Prep Type: Total/NA**

**Percent Surrogate Recovery (Acceptance Limits)**

<b>Lab Sample ID</b>	<b>Client Sample ID</b>	<b>OTPH1 (49-133)</b>
LCS 160-312349/2-A	Lab Control Sample	79
MB 160-312349/1-A	Method Blank	94

**Surrogate Legend**

OTPH = o-Terphenyl

Date: 22 June 2017  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 300 AREA RA&WD  
 Subject: Inorganics - Sample Data Groups (SDGs) GEL424169 and SL2533

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL424169 prepared by GEL Laboratories LLC, and SDG SL2533 prepared by TestAmerica Laboratories, Inc. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3B8P8	05/25/17	Soil	C	6020B
B3B8R0	05/25/17	Soil	C	6020B
B3B8R2	05/25/17	Soil	C	6020B
B3B8R4	05/25/17	Soil	C	6020B
B3B8R6	05/25/17	Soil	C	6020B
B3B8R8	05/25/17	Soil	C	6020B
B3B8T0	05/25/17	Soil	C	6020B
B3B8T2	05/25/17	Soil	C	6020B
B3B8T4	05/25/17	Soil	C	6020B
B3B8T6	05/25/17	Soil	C	6020B
B3B8T8	05/25/17	Soil	C	6020B
B3B8V0	05/25/17	Soil	C	6020B
B3B8V2	05/25/17	Soil	C	6020B
B3B8V4	05/25/17	Soil	C	6020B
B3B8V6	05/25/17	Soil	C	6020B
B3B8V8	05/25/17	Soil	C	6020B
B3B8V9	05/25/17	Soil	C	6020B
B3B8W0	05/25/17	Soil	C	6020B

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (SAP). Appendices 1 through 4 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Data Validation Supporting Documentation
- Appendix 4. Additional Documentation Requested by Client

## **DATA QUALITY OBJECTIVES**

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The holding time requirement for ICPMS metals are analysis within 180 days of sample collection. There are no specific preservation requirements for metals soil analysis.

The samples were analyzed within the prescribed holding times.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

**Laboratory Blanks**

All laboratory blank results were acceptable.

**Trip Blanks**

No trip blanks were submitted for validation.

**Field Blanks**

No field blanks were submitted for validation.

**Equipment Blanks**

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and ICP-AES interference check sample results. According to the SAP, the matrix spike sample and the laboratory control sample accuracy limits are 70% to 130%.

**Matrix Spike/Matrix Spike Duplicate (MS/MSD) Samples**

All MS/MSD recoveries were acceptable.

**Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable.

### **ICP-AES Interference Check Samples (ICSs)**

ICS data was not included in the data package. Sample results should not be qualified based on this.

- **Precision**

Precision is evaluated by reviewing MS/MSD results, laboratory duplicate sample results, field duplicate sample results, field split sample results, and ICP serial dilution results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are  $\pm 30\%$ .

### **MS/MSD Samples**

All MS/MSD RPD values were acceptable.

### **Laboratory Duplicate Samples**

All laboratory duplicate results were acceptable.

### **Field Duplicate Samples**

No field duplicates were submitted for validation.

### **Field Split Samples**

No field splits were submitted for validation.

### **ICP Serial Dilution Samples**

ICS serial dilution data was not included in the data package. Sample results should not be qualified based on this.

- **ICP-MS Internal Standards**

The analysis of ICP-MS internal standards is used to determine the existences and magnitude of instrument drift and physical interferences. The criteria for evaluation of internal standard results apply to all samples (including QC) analyzed during the analytical run, beginning with the calibration.

ICP-MS internal standards data was not included in the data package. Sample results should not be qualified based on this.

- **Detection Limits**

Reported MDLs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

All reported sample MDLs were above the CRDL.

- **Completeness**

SDGs GEL424169 and SL2533 were submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

### **MAJOR DEFICIENCIES**

None found.

### **MINOR DEFICIENCIES**

None found.

### **REFERENCES**

GRP-GD-003, Rev. 2, Change 0, *Data Validation for Chemical Analyses*, October 2016.

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **Appendix 1**

### **Glossary of Data Reporting Qualifiers**

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for, but was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the RL. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **N** — The analysis indicates the presence of an analyte that has been tentatively identified.
- **NJ** — The analysis indicates the presence of an analyte that has been tentatively identified and the associated numerical value represents its approximate concentration.
- **NJ+** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation.
- **NJ-** — The analysis indicates the presence of an analyte that has been tentatively identified. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

**Appendix 2**  
**Summary of Data Qualification**

<b>Inorganic Data Qualification Summary</b>			
SDG: GEL424169, SL2533	Reviewer: AQA	Project: 300 AREA RA&WD	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
Metals	N/A	None	None

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

## Appendix A - (Cont.) Chemical Data Validation Checklist

VALIDATION LEVEL:	A	B	<input checked="" type="radio"/> C	D	E
PROJECT: 300 AREA RA&WD			DATA PACKAGE: VSR17-007		
VALIDATOR: Eyda Hergenreder		LAB: GEL, TestAmerica		DATE:	
			SDG: GEL424169, SL2533		
ANALYSES PERFORMED					
SW-846/ICP	SW-846/GFAA	SW-846/Hg	SW-846 Cyanide	SW-846/ICPMS X	
SAMPLES/MATRIX Soil					
GEL424169: B3B8P8, B3B8R0, B3B8R2, B3B8R4, B3B8R6, B3B8R8, B3B8T0, B3B8T2, B2B8T4, B3B8T6, B3B8T8, B3B8V0, B3B8V2, B3B8V4, B3B8V6, B3B8V8, B3B8V9					
SL2533: B3B8W0					

## 1. DATA PACKAGE COMPLETENESS AND CASE NARRATIVE

Technical verification documentation present?	Yes <input checked="" type="radio"/> No N/A
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Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 2. INSTRUMENT PERFORMANCE AND CALIBRATIONS (Levels D and E)

Initial calibrations performed on all instruments?	Yes No <input checked="" type="radio"/> N/A
Initial calibrations acceptable?	Yes No <input checked="" type="radio"/> N/A
ICP interference checks acceptable?	Yes No <input checked="" type="radio"/> N/A
ICV and CCV checks performed on all instruments?	Yes No <input checked="" type="radio"/> N/A
ICV and CCV checks acceptable?	Yes No <input checked="" type="radio"/> N/A
Standards traceable?	Yes No <input checked="" type="radio"/> N/A
Standards expired?	Yes No <input checked="" type="radio"/> N/A
Calculation check acceptable?	Yes No <input checked="" type="radio"/> N/A

Comments:

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#### 3. BLANKS (Levels B, C, D, and E)

ICB and CCB checks performed for all applicable analyses? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
ICB and CCB results acceptable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Laboratory blanks analyzed?	<input checked="" type="radio"/> Yes No N/A
Laboratory blank results acceptable?	<input checked="" type="radio"/> Yes No N/A
Field blanks analyzed? (Levels C, D, E)	Yes <input checked="" type="radio"/> No N/A
Field blank results acceptable? (Levels C, D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

Comments:

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## Data Validation for Chemical Analyses

Published Date: 10/03/16

SGRP-GD-SMP-50117

Effective Date: 10/03/16

### Appendix A - (Cont.) Chemical Data Validation Checklist

#### 6. ICP QUALITY CONTROL (Levels D and E)

ICP serial dilution samples analyzed?	Yes No <input checked="" type="radio"/> N/A
ICP serial dilution %D values acceptable?	Yes No <input checked="" type="radio"/> N/A
ICP post digestion spike required?	Yes No <input checked="" type="radio"/> N/A
ICP post digestion spike values acceptable?	Yes No <input checked="" type="radio"/> N/A
Standards traceable?	Yes No <input checked="" type="radio"/> N/A
Standards expired?	Yes No <input checked="" type="radio"/> N/A
Transcription/calculation errors?	Yes No <input checked="" type="radio"/> N/A

Comments:

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#### 7. HOLDING TIMES (all levels)

Samples properly preserved?	<input checked="" type="radio"/> Yes No N/A
Sample holding times acceptable?	<input checked="" type="radio"/> Yes No N/A

Comments:

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## **Appendix 4**

### **Additional Documentation Requested By Client**

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: May 31, 2017

Page 1 of 2

CH2M Hill Plateau Remediation Company

MSIN R3-50 CHPRC

PO Box 1600

Richland, Washington

Contact: Mr. Scot Fitzgerald

Workorder: 424169

Parmname	NOM	Sample	Qual	QC	Units	RPD/D%	REC%	Range	Anlst	Date	Time
<b>Metals Analysis - ICPMS</b>											
Batch	1668957										
QC1203798778	424169001	DUP									
Uranium		D	511	D	457	ug/kg	11.1	(0%-20%)	SKJ	05/31/17	12:55
QC1203798777	LCS										
Uranium	4910			D	5410	ug/kg	110	(80%-120%)		05/31/17	12:47
QC1203798776	MB										
Uranium				DU	12.9	ug/kg				05/31/17	12:43
QC1203798779	424169001	MS									
Uranium	4980	D	511	D	5640	ug/kg	103	(75%-125%)		05/31/17	12:59
QC1203798780	424169001	SDILT									
Uranium		D	2.58	D	0.523	ug/L	1.4	(0%-20%)		05/31/17	13:07

**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  $\geq$  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

Page 52 of 83  
**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
 SDG: SL2533

**Method: 8015B - Diesel Range Organics (DRO) (GC) (Continued)**

Lab Sample ID: 160-22539-1 MSD  
 Matrix: Soil  
 Analysis Batch: 313442

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 312349

Surrogate	MSD %Recovery	MSD Qualifier	Limits
<i>o</i> -Terphenyl	98		49 - 133

**Method: 6020A - Metals (ICP/MS)**

Lab Sample ID: MB 160-313029/1-A  
 Matrix: Solid  
 Analysis Batch: 313370

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Uranium	0.034	U D	0.086	0.034	mg/Kg		06/12/17 11:17	06/13/17 17:04	2

Lab Sample ID: LCS 160-313029/2-A  
 Matrix: Solid  
 Analysis Batch: 313370

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Uranium	89.8	93.08	D	mg/Kg		104	80 - 120

Lab Sample ID: 160-22539-1 MS  
 Matrix: Soil  
 Analysis Batch: 313370

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Uranium	0.41	D	95.4	100.3	D	mg/Kg	☼	105	75 - 125

Lab Sample ID: 160-22539-1 MSD  
 Matrix: Soil  
 Analysis Batch: 313370

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
Uranium	0.41	D	94.6	101.4	D	mg/Kg	☼	107	75 - 125	1	30

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)**

Lab Sample ID: MB 160-311120/1-A  
 Matrix: Solid  
 Analysis Batch: 312781

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 311120

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.000	U	0.0351	0.0351	1.00	0.0849	pCi/g	05/30/17 10:12	06/08/17 18:54	1
Uranium 235	-0.00564	U	0.0265	0.0265	1.00	0.0847	pCi/g	05/30/17 10:12	06/08/17 18:54	1
Uranium-238	0.00452	U	0.0344	0.0345	1.00	0.0798	pCi/g	05/30/17 10:12	06/08/17 18:54	1

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	88.8		30 - 105	05/30/17 10:12	06/08/17 18:54	1
Uranium-232	88.8		30 - 105	05/30/17 10:12	06/08/17 18:54	1

TestAmerica St. Louis

Date: 22 June 2017  
 To: CH2M Hill (technical representative)  
 From: Analytical Quality Associates, Inc.  
 Project: 300 AREA RA&WD  
 Subject: Radiochemical - Sample Data Groups (SDGs) GEL424169 and SL2533

## **INTRODUCTION**

This memorandum presents the results of data validation for SDG GEL424169 prepared by GEL Laboratories LLC and SDG SL2533 prepared by TestAmerica. A list of samples validated along with the analytical methods is provided in the following table.

<b>Sample ID</b>	<b>Sample Date</b>	<b>Media</b>	<b>Validation Level</b>	<b>Analytical Methods</b>
B3B8P8	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8R0	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8R2	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8R4	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8R6	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8R8	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8T0	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8T2	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8T4	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8T6	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8T8	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8V0	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8V2	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8V4	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8V6	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8V8	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr
B3B8V9	05/25/17	Soil	C	Gamma, Am-241, Iso-U,

				Iso-Pu, Total Sr
B3B8W0	05/25/17	Soil	C	Gamma, Am-241, Iso-U, Iso-Pu, Total Sr

Data validation was conducted in accordance with the CHPRC validation statement of work and the 300 Area Remedial Action Sampling and Analysis Plan, DOE/RL-2001-48, Rev. 4 (SAP). Appendices 1 through 4 provide the following information as indicated below:

- Appendix 1. Glossary of Data Reporting Qualifiers
- Appendix 2. Summary of Data Qualification
- Appendix 3. Data Validation Supporting Documentation
- Appendix 4. Additional Documentation Requested by Client

### **DATA QUALITY OBJECTIVES**

- **Holding Times and Sample Preservation**

Holding times are calculated from Chain-of-Custody forms to determine the validity of the results. The maximum holding time for radiochemical analysis is 180 days. There are no specific preservation requirements for radiochemical soil analysis.

The samples were analyzed within the prescribed holding times.

- **Blanks**

The blank data results are reviewed to assess the extent of contamination introduced through sampling, sample preparation, and analysis.

#### **Laboratory Blanks**

All laboratory blank results were acceptable.

#### **Trip Blanks**

No trip blanks were submitted for validation.

#### **Field Blanks**

No field blanks were submitted for validation.

#### **Equipment Blanks**

No equipment blanks were submitted for validation.

- **Accuracy**

Accuracy is evaluated by reviewing matrix spike sample results, laboratory control sample results, and chemical recovery factors. Chemical recovery factors are determined through use of a carrier or tracer and provide assessment of the chemical separation process that is affected by the laboratory procedure, sample matrix, and/or interference. Chemical recovery factors are used to correct sample concentration, uncertainty, and MDC results. According to the SAP, the laboratory control sample accuracy limits are 70% to 130%.

### **Matrix Spike (MS) Samples**

MS analyses are not required for the methods performed.

### **Laboratory Control Samples (LCSs)**

All LCS recoveries were acceptable.

### **Carrier/Tracer Recovery Factors**

All carrier/tracer recovery factors were acceptable.

- **Precision**

Precision is evaluated by reviewing laboratory duplicate, field duplicate, and field split sample results. These QC results provide information on the laboratory reproducibility and whether sampling activities are adequate to acquire consistent sample results. According to the SAP, the relative percent difference (RPD) limits are  $\pm 30\%$ .

### **Laboratory Duplicate Samples**

All laboratory duplicate results were acceptable with the following exceptions.

#### **For SDG GEL424169**

The RPDs for Iso-U associated with batch 1670247 were  $>$  the acceptance limit. The U-235/236 result for sample B3B8V8 was a non-detect and should be qualified as an estimate and flagged "UJ." Results for U-233/234 and U-238 for sample B3B8V8 were detects and results for all other samples were detects and should be qualified as estimates and flagged "J." See the table in Appendix 2 for a listing of all affected sample results.

The RPD for Am-241 associated with batch 1668980 was  $>$  the acceptance limit. The Am-241 result for parent sample B3B8V2 was non-detect; therefore, data were not qualified.

The RPDs for Cs-137 and Eu-152 were  $>$  the acceptance limit. The Cs-137 and Eu-152 results for parent sample B3B8V2 were non-detect; therefore, data were not qualified.

#### **For SDG SL2533**

The RPD for U-233/234 was > the upper acceptance limit; however the RER was within the acceptance limit; therefore data was not qualified.

### **Field Duplicate Samples**

No field duplicates were submitted for validation.

### **Field Split Samples**

No field splits were submitted for validation.

- **Detection Limits**

Reported MDCs are compared against the contractually required detection limits (CRDLs) to ensure that laboratory detection limits meet the required criteria.

For SDG GEL424169, numerous reported MDCs were above the CRDLs due to sample matrix.

For SDG SL2533, the MDCs for Eu-152, Eu-154 and Eu-155 were > the CRDL.

- **Completeness**

SDGs GEL424169 and SL2533 were submitted for validation and verified for completeness. Completeness is based on the percentage of data determined to be valid (i.e., not rejected). The completion percentage was 100%.

### **MAJOR DEFICIENCIES**

None found.

### **MINOR DEFICIENCIES**

Minor deficiencies leading to qualification of sample results as estimates were due to laboratory duplicate infraction. See the table in Appendix 2 for a listing of all affected sample results.

### **REFERENCES**

GRP-GD-002, Rev. 2, Change 0, *Data Validation for Radiochemical Analyses*, September 2016.

DOE/RL-2001-48, Rev. 4, *300 Area Remedial Action Sampling and Analysis Plan*, November 2014.

## **Appendix 1**

### **Glossary of Data Reporting Qualifiers**

Qualifiers that may be applied by data validators in compliance with the CHPRC statement of work are as follows:

- **U** — The constituent was analyzed for and was not detected. The data should be considered usable for decision-making purposes.
- **UJ** — The constituent was analyzed for and was not detected. Due to a quality control deficiency identified during data validation the value reported may not accurately reflect the MDC. The data should be considered usable for decision-making purposes.
- **J** — Indicates the constituent was analyzed for and detected. The associated value is estimated due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J+** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected positive bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **J-** — Indicates the constituent was analyzed for and detected. The associated value is estimated with a suspected negative bias due to a quality control deficiency identified during data validation. The data should be considered usable for decision-making purposes.
- **UR** — Indicates the constituent was analyzed for and not detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.
- **R** — Indicates the constituent was analyzed for and detected; however, due to an identified quality control deficiency the data should be considered unusable for decision-making purposes.

**Appendix 2**  
**Summary of Data Qualification**

<b>Radiochemical Data Qualification Summary</b>			
SDGs: GEL424169, SL2533	Reviewer: AQA	Project: 300 AREA RA&WD	Page 1 of 1
<b>Analyte(s)</b>	<b>Qualifier</b>	<b>Samples Affected</b>	<b>Reason</b>
U-235/236	UJ	B3B8V8	Poor laboratory duplicate precision
U-233/234 U-238	J	B3B8V8	Poor laboratory duplicate precision
U-233/234, U-235/236 U-238	J	B3B8V2, B3B8V4 B3B8V6	Poor laboratory duplicate precision

Comments: None

## **Appendix 3**

### **Data Validation Supporting Documentation**

## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - Radiochemical Data Validation Checklist

Validation Level:	A	B	<b>Ⓒ</b>	D	E
Project: 300 AREA RA&WD			Data Package: VSR17-007		
Validator: Eyda Hergenreder		Lab: GEL, TestAmerica		Date: 06/22/17	
			SDG: GEL424169, SL2533		
Analyses Performed					
<input type="checkbox"/> Gross Alpha/Beta	<input checked="" type="checkbox"/> Strontium-90-total	<input type="checkbox"/> Technetium-99	<input checked="" type="checkbox"/> Alpha Spectroscopy	<input checked="" type="checkbox"/> Gamma Spectroscopy	<input type="checkbox"/> Tritium
<input type="checkbox"/> Total Uranium	<input type="checkbox"/> Radium-22				
Samples/Matrix Soil					
GEL424169:B3B8P8, B3B8R0, B3B8R2, B3B8R4, B3B8R6, B3B8R8, B3B8T0, B3B8T2, B3B8T4, B3B8T6, B3B8T8, B3B8V0, B3B8V2, B3B8V4, B3B8V6, B3B8V8, B3B8V9					
SL2533: B3B8W0					

1. Completeness and Case Narrative	<input type="checkbox"/> N/A
Technical verification forms present?	Yes <b>Ⓒ</b> No N/A

**Comments:**


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2. Initial Calibration (Levels D, E)	<input checked="" type="checkbox"/> N/A
Instruments/detectors calibrated?	Yes No N/A
Initial calibration acceptable?	Yes No N/A
Standards NIST traceable?	Yes No N/A
Standards expired?	Yes No N/A
Calculation check acceptable?	Yes No N/A

**Comments:**


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## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - (Cont.) Radiochemical Data Validation Checklist

3. Continuing Calibration (Levels D, E)	<input checked="" type="checkbox"/> N/A
Calibration checked within required frequency?	Yes No N/A
Calibration check acceptable?	Yes No N/A
Calibration check standards traceable?	Yes No N/A
Calibration check standards expired?	Yes No N/A
Calculation check acceptable?	Yes No N/A
<b>Comments:</b>	

4. Background Counts (Levels D, E)	<input checked="" type="checkbox"/> N/A
Background counts checked within required frequency?	Yes No N/A
Background counts acceptable?	Yes No N/A
Calculation check acceptable?	Yes No N/A

**Comments:**

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## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - (Cont.) Radiochemical Data Validation Checklist

5. Blanks (Levels B, C, D, E)	<input type="checkbox"/> N/A
Method blank analyzed within required frequency?	<input checked="" type="radio"/> Yes No N/A
Method blank results acceptable?	<input checked="" type="radio"/> Yes No N/A
Analytes detected in method blank?	Yes <input checked="" type="radio"/> No N/A
Field blank(s) analyzed?	Yes <input checked="" type="radio"/> No N/A
Field blank results acceptable?	Yes No <input checked="" type="radio"/> N/A
Analytes detected in field blank(s)?	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation Errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**


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6. Laboratory Control Samples or Blank Spike Samples (Levels C, D, E)	<input type="checkbox"/> N/A
LCS /BSS analyzed within required frequency?	<input checked="" type="radio"/> Yes No N/A
LCS/BSS recoveries acceptable?	<input checked="" type="radio"/> Yes No N/A
LCS/BSS traceable? (Levels D,E)	Yes No <input checked="" type="radio"/> N/A
LCS/BSS expired? (Levels D,E)	Yes No <input checked="" type="radio"/> N/A
LCS/BSS levels correct? (Levels D,E)	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**


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## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - (Cont.) Radiochemical Data Validation Checklist

7. Chemical Carrier Recovery (Levels C, D, E)	<input type="checkbox"/> N/A
Chemical carrier added?	<input checked="" type="radio"/> Yes No N/A
Chemical recovery acceptable?	<input checked="" type="radio"/> Yes No N/A
Chemical carrier traceable? (Levels D, E )	Yes No <input checked="" type="radio"/> N/A
Chemical carrier expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**


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8. Tracer Recovery (Levels C, D, E )	<input type="checkbox"/> N/A
Tracer added?	<input checked="" type="radio"/> Yes No N/A
Tracer recovery acceptable?	Yes <input checked="" type="radio"/> No N/A
Tracer traceable? (Levels D, E )	Yes No <input checked="" type="radio"/> N/A
Tracer expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**

SDG SL2533: LCS tracer Am-243 26%

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## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - (Cont.) Radiochemical Data Validation Checklist

9. Matrix Spikes (Levels C, D, E)	<input type="checkbox"/> N/A
Matrix spike analyzed?	Yes No <input checked="" type="radio"/> N/A
Spike recoveries acceptable?	Yes No <input checked="" type="radio"/> N/A
Spike source traceable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Spike source expired? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**

Matrix spike were not required for the requested methods

10. Duplicates (Levels C, D, E)	<input type="checkbox"/> N/A
Duplicates analyzed at required frequency?	<input checked="" type="radio"/> Yes No <input type="radio"/> N/A
RPD values acceptable?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:****SDG GEL424169:**

Batch 1670247: B3B8V2 RPD: U-233/234 46%; U-235/236 53%, U-238 48%

Batch 1668980: B3B8V2: RPD Am-241; 311% (due to negative number)

Batch 1669370: B3B8V2: RPD, Cs-137 303%, Eu-152 44%

SDG SL2533: U-233/234 calculated RPD 31%, reported RER was within the acceptance limit

## Data Validation for Radiochemical Analyses

Published Date: 09/13/16

SGRP-GD-SMP-50116

Effective Date: 09/13/16

## Appendix B - (Cont.) Radiochemical Data Validation Checklist

11. Field QC Samples (Levels C, D, E)	<input type="checkbox"/> N/A
Field duplicate sample(s) analyzed?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Field duplicate RPD values acceptable?	Yes No <input checked="" type="radio"/> N/A
Field split sample(s) analyzed?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Field split RPD values acceptable?	Yes No <input checked="" type="radio"/> N/A
Performance audit sample(s) analyzed?	Yes No <input checked="" type="radio"/> N/A
Performance audit sample results acceptable?	Yes No <input checked="" type="radio"/> N/A

**Comments:**


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12. Holding Times (All levels)	<input type="checkbox"/> N/A
Are sample holding times acceptable?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A

**Comments:**


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13. Results and MDCs (All Levels )	<input type="checkbox"/> N/A
Results reported for all required sample analyses?	<input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> N/A
Results supported in raw data?(Levels D, E)	Yes No <input checked="" type="radio"/> N/A
Results acceptable? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A
MDC's meet required reporting limits?	Yes <input checked="" type="radio"/> No <input type="radio"/> N/A
Transcription/Calculation errors? (Levels D, E)	Yes No <input checked="" type="radio"/> N/A

**Comments:**

SDG GEL424169: MDCs for numerous samples were > the RDLs due to sample matrix.

SDG SL2533: MDCs for Eu-152, Eu-154, Eu-155 >RDL

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## **Appendix 4**

### **Additional Documentation Requested By Client**

**GEL LABORATORIES LLC**

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

**QC Summary**

Report Date: June 2, 2017

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**Client :** CH2MHill Plateau Remediation Company  
**MSIN R3-50 CHPRC**  
**PO Box 1600**  
**Richland, Washington 99352**

**Contact:** Mr. Scot Fitzgerald

**Workorder:** 424169

Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1669008								
QC1203798909	MB								
Americium-241			U	0.131	pCi/g			BXA4	06/01/1710:48
				Uncert:					
				TPU:					
**Americium-243 Tracer	18.6			14.4	pCi/g	REC: 77	(30%-105%)		
				Uncert:					
				TPU:					
QC1203798910	424169001	DUP							
Americium-241		U	-0.176	U	0.143	pCi/g			
			Uncert:	+/-0.256	+/-0.273	RPD:	0	N/A	
			TPU:	+/-0.257	+/-0.274	RER:	1.67	(0-2)	
**Americium-243 Tracer	20.2		13.6		16.7	pCi/g	REC: 83	(30%-105%)	
			Uncert:	+/-2.96	+/-2.47				
			TPU:	+/-4.40	+/-3.75				
QC1203798911	LCS								
Americium-241					15.6	pCi/g	REC: 90	(80%-120%)	
					Uncert:				
					TPU:				
**Americium-243 Tracer	18.6				19.0	pCi/g	REC: 102	(30%-105%)	
					Uncert:				
					TPU:				
Batch	1669009								
QC1203798912	MB								
Plutonium-238				U	0.112	pCi/g		BXA4	06/01/1714:24
					Uncert:				
					TPU:				
Plutonium-239/240				U	0.0659	pCi/g			
					Uncert:				
					TPU:				
**Plutonium-242 Tracer	17.4				13.3	pCi/g	REC: 76	(30%-105%)	
					Uncert:				
					TPU:				
QC1203798913	424169001	DUP							
Plutonium-238		U	-0.0102	U	-0.0434	pCi/g			06/01/1710:35
			Uncert:	+/-0.275	+/-0.222	RPD:	0	N/A	
			TPU:	+/-0.275	+/-0.223	RER:	0.184	(0-2)	
Plutonium-239/240		U	0.059	U	0.234	pCi/g			
			Uncert:	+/-0.266	+/-0.429	RPD:	0	N/A	
			TPU:	+/-0.266	+/-0.431	RER:	0.676	(0-2)	
**Plutonium-242 Tracer	19.0		15.3		14.8	pCi/g	REC: 78	(30%-105%)	
			Uncert:	+/-2.63	+/-2.80				
			TPU:	+/-3.87	+/-4.11				
QC1203798914	LCS								
Plutonium-238				U	0.0355	pCi/g			06/01/1710:35
					Uncert:				
					+/-0.262				

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**QC Summary**

Workorder: 424169

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1669009								
Plutonium-239/240	17.5	TPU:		+/-0.262					
		Uncert:		16.4	pCi/g	REC: 94	(80%-120%)		
		TPU:		+/-2.40					
**Plutonium-242 Tracer	17.4	TPU:		+/-3.47					
		Uncert:		15.1	pCi/g	REC: 86	(30%-105%)		
		TPU:		+/-2.48					
		TPU:		+/-3.65					
Batch	1669010								
QC1203798915	MB								
Uranium-233/234			U	-0.0676	pCi/g			BXA4	06/01/1710:46
		Uncert:		+/-0.350					
		TPU:		+/-0.352					
Uranium-235/236			U	0.174	pCi/g				
		Uncert:		+/-0.602					
		TPU:		+/-0.604					
Uranium-238			U	0.681	pCi/g				
		Uncert:		+/-0.766					
		TPU:		+/-0.779					
**Uranium-232 Tracer	18.5			17.4	pCi/g	REC: 94	(30%-105%)		
		Uncert:		+/-3.54					
		TPU:		+/-5.19					
QC1203798916	424169001	DUP							
Uranium-233/234		U	0.510	U	0.254	pCi/g			06/01/1711:02
		Uncert:	+/-0.620		+/-0.506		RPD: 0	N/A	
		TPU:	+/-0.626		+/-0.508		RER: 0.624	(0-2)	
Uranium-235/236		U	0.158	U	0.704	pCi/g			
		Uncert:	+/-0.484		+/-0.802		RPD: 0	N/A	
		TPU:	+/-0.485		+/-0.813		RER: 1.13	(0-2)	
Uranium-238		U	0.0618	U	0.487	pCi/g			
		Uncert:	+/-0.396		+/-0.654		RPD: 0	N/A	
		TPU:	+/-0.397		+/-0.660		RER: 1.08	(0-2)	
**Uranium-232 Tracer	20.1		19.1		17.0	pCi/g	REC: 85	(30%-105%)	
		Uncert:	+/-3.34		+/-3.40				
		TPU:	+/-4.95		+/-5.04				
QC1203798917	LCS								
Uranium-233/234					28.9	pCi/g			06/01/1710:47
		Uncert:			+/-4.59				
		TPU:			+/-7.66				
Uranium-235/236					1.35	pCi/g			
		Uncert:			+/-1.20				
		TPU:			+/-1.24				
Uranium-238	23.9				26.2	pCi/g	REC: 109	(80%-120%)	
		Uncert:			+/-4.36				
		TPU:			+/-7.06				
**Uranium-232 Tracer	18.5				16.2	pCi/g	REC: 88	(30%-105%)	
		Uncert:			+/-3.67				
		TPU:			+/-5.38				
Batch	1669839								
QC1203801129	MB								

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 424169

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1669839								
Americium-241			U	-0.0092	pCi/g			BXA4	06/01/1712:29
				Uncert: +/-0.213					
				TPU: +/-0.213					
**Americium-243 Tracer	18.9			18.9	pCi/g	REC: 100	(30%-105%)		
				Uncert: +/-2.03					
				TPU: +/-3.14					
QC1203801130 424169013 DUP									
Americium-241		U -0.44	U	0.0957	pCi/g				06/01/1708:50
				Uncert: +/-0.303		RPD: 0	N/A		
				TPU: +/-0.303		RER: 2.36	(0-2)		
**Americium-243 Tracer	20.4	14.3		16.2	pCi/g	REC: 80	(30%-105%)		
				Uncert: +/-2.99					
				TPU: +/-4.43					
QC1203801131 LCS									
Americium-241		17.7		15.7	pCi/g	REC: 88	(80%-120%)		
				Uncert: +/-2.13					
				TPU: +/-3.06					
**Americium-243 Tracer	18.9			19.2	pCi/g	REC: 102	(30%-105%)		
				Uncert: +/-2.32					
				TPU: +/-3.52					
Batch	1669841								
QC1203801132 MB									
Plutonium-238			U	-0.161	pCi/g			BXA4	06/01/1708:50
				Uncert: +/-0.210					
				TPU: +/-0.210					
Plutonium-239/240			U	-0.0806	pCi/g				
				Uncert: +/-0.198					
				TPU: +/-0.198					
**Plutonium-242 Tracer	17.8			14.9	pCi/g	REC: 84	(30%-105%)		
				Uncert: +/-2.52					
				TPU: +/-3.71					
QC1203801133 424169013 DUP									
Plutonium-238		U 0.205	U	0.00	pCi/g				06/01/1708:50
				Uncert: +/-0.384		RPD: 0	N/A		
				TPU: +/-0.386		RER: 0.936	(0-2)		
Plutonium-239/240		U 0.185	U	-0.114	pCi/g				
				Uncert: +/-0.386		RPD: 0	N/A		
				TPU: +/-0.387		RER: 1.34	(0-2)		
**Plutonium-242 Tracer	19.1	14.8		14.5	pCi/g	REC: 76	(30%-105%)		
				Uncert: +/-2.83					
				TPU: +/-4.14					
QC1203801134 LCS									
Plutonium-238			U	0.186	pCi/g				
				Uncert: +/-0.323					
				TPU: +/-0.325					
Plutonium-239/240		17.8		17.3	pCi/g	REC: 97	(80%-120%)		
				Uncert: +/-2.33					
				TPU: +/-3.42					
**Plutonium-242 Tracer	17.8			14.7	pCi/g	REC: 83	(30%-105%)		
				Uncert: +/-2.36					

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**QC Summary**

Workorder: 424169

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1669841								
		TPU:		+/-3.48					
Batch	1670247								
QC1203801972	MB								
Uranium-233/234			U	0.810	pCi/g			BXA4	06/01/1723:12
		Uncert:		+/-1.86					
		TPU:		+/-1.86					
Uranium-235/236			U	1.66	pCi/g				
		Uncert:		+/-2.64					
		TPU:		+/-2.65					
Uranium-238			U	2.68	pCi/g				
		Uncert:		+/-2.82					
		TPU:		+/-2.84					
**Uranium-232 Tracer		161		139	pCi/g	REC:	87 (30%-105%)		
		Uncert:		+/-18.5					
		TPU:		+/-28.7					
QC1203801973	424169013	DUP							
Uranium-233/234		536		851	pCi/g				
		Uncert:	+/-37.9	+/-45.6		RPD:	46* (0% - 20%)		
		TPU:	+/-84.3	+/-129		RER:	4.02* (0-2)		
Uranium-235/236		36.1		62.1	pCi/g				
		Uncert:	+/-11.1	+/-13.9		RPD:	53* (0% - 20%)		
		TPU:	+/-12.2	+/-16.4		RER:	2.49* (0-2)		
Uranium-238		597		977	pCi/g				
		Uncert:	+/-40.0	+/-48.9		RPD:	48* (0% - 20%)		
		TPU:	+/-93.0	+/-147		RER:	4.3* (0-2)		
**Uranium-232 Tracer		174	170	146	pCi/g	REC:	84 (30%-105%)		
		Uncert:	+/-22.6	+/-21.0					
		TPU:	+/-35.0	+/-32.3					
QC1203801974	LCS								
Uranium-233/234				233	pCi/g				06/01/1723:12
		Uncert:		+/-21.3					
		TPU:		+/-37.8					
Uranium-235/236				20.5	pCi/g				
		Uncert:		+/-7.15					
		TPU:		+/-7.65					
Uranium-238		208		223	pCi/g	REC:	107 (80%-120%)		
		Uncert:		+/-20.8					
		TPU:		+/-36.3					
**Uranium-232 Tracer		161		132	pCi/g	REC:	83 (30%-105%)		
		Uncert:		+/-17.9					
		TPU:		+/-27.9					
Batch	1670355								
QC1203802206	MB								
Plutonium-238			U	-0.000303	pCi/g			BXA4	06/01/1723:11
		Uncert:		+/-0.0988					
		TPU:		+/-0.0989					
Plutonium-239/240			U	-0.0171	pCi/g				
		Uncert:		+/-0.193					
		TPU:		+/-0.193					
						REC:			

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**QC Summary**

Workorder: 424169

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Alpha Spec</b>									
Batch	1670355								
**Plutonium-242 Tracer	18.1			15.0	pCi/g	83	(30%-105%)		
	Uncert:			+/-1.46					
	TPU:			+/-2.31					
QC1203802207 424169006 DUP									
Plutonium-238	U	-0.0493	U	-0.0152	pCi/g				
	Uncert:	+/-0.0907		+/-0.0727		RPD: 0	N/A		
	TPU:	+/-0.0907		+/-0.0727		RER: 0.574	(0-2)		
Plutonium-239/240	U	-0.0168	U	-0.0612	pCi/g				
	Uncert:	+/-0.111		+/-0.115		RPD: 0	N/A		
	TPU:	+/-0.111		+/-0.115		RER: 0.545	(0-2)		
**Plutonium-242 Tracer	18.8	15.7		15.6	pCi/g	REC: 83	(30%-105%)		
	Uncert:	+/-1.54		+/-1.48					
	TPU:	+/-2.44		+/-2.35					
QC1203802208 LCS									
Plutonium-238			U	0.130	pCi/g				
	Uncert:			+/-0.145					
	TPU:			+/-0.146					
Plutonium-239/240	18.1			16.9	pCi/g	REC: 93	(80%-120%)		
	Uncert:			+/-1.38					
	TPU:			+/-2.14					
**Plutonium-242 Tracer	18.1			15.7	pCi/g	REC: 87	(30%-105%)		
	Uncert:			+/-1.43					
	TPU:			+/-2.27					
<b>Rad Gamma Spec</b>									
Batch	1669359								
QC1203799777 MB									
Cesium-137			U	-0.0027	pCi/g			MXR1	06/01/1706:13
	Uncert:			+/-0.0111					
	TPU:			+/-0.0112					
Cobalt-60			U	0.00494	pCi/g				
	Uncert:			+/-0.010					
	TPU:			+/-0.0103					
Europium-152			U	-0.00803	pCi/g				
	Uncert:			+/-0.0269					
	TPU:			+/-0.0271					
Europium-154			U	0.00608	pCi/g				
	Uncert:			+/-0.0376					
	TPU:			+/-0.0377					
Europium-155			U	-0.0395	pCi/g				
	Uncert:			+/-0.0301					
	TPU:			+/-0.0351					
QC1203799778 424169003 DUP									
Cesium-137	U	0.0157	U	0.011	pCi/g				06/01/1706:14
	Uncert:	+/-0.0147		+/-0.0175		RPD: 0	N/A		
	TPU:	+/-0.0163		+/-0.0182		RER: 0.381	(0-2)		
Cobalt-60	U	0.00487	U	-0.00148	pCi/g				
	Uncert:	+/-0.0157		+/-0.0199		RPD: 0	N/A		
	TPU:	+/-0.0159		+/-0.0199		RER: 0.489	(0-2)		
Europium-152	U	-0.00879	U	-0.00161	pCi/g				
	Uncert:	+/-0.0341		+/-0.0473		RPD: 0	N/A		

**GEL LABORATORIES LLC**

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**QC Summary**

Workorder: 424169

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gamma Spec</b>									
Batch	1669359								
		TPU:	+/-0.0344	+/-0.0473					
Europium-154		U	-0.0266	U	0.0413	pCi/g	RER: 0.241 (0-2)		
		Uncert:	+/-0.050	+/-0.0613			RPD: 0 N/A		
		TPU:	+/-0.0515	+/-0.0641			RER: 1.62 (0-2)		
Europium-155		UX	0.00	U	0.0569	pCi/g			
		Uncert:	+/-0.0538	+/-0.0559			RPD: 0 N/A		
		TPU:	+/-0.0544	+/-0.0617			RER: 1.36 (0-2)		
QC1203799779 LCS									
Americium-241	489			543	pCi/g	REC: 111 (80%-120%)			06/01/1706:14
		Uncert:		+/-5.98					
		TPU:		+/-45.8					
Cesium-137	176			179	pCi/g	REC: 102 (80%-120%)			
		Uncert:		+/-3.78					
		TPU:		+/-17.6					
Cobalt-60	147			143	pCi/g	REC: 97 (80%-120%)			
		Uncert:		+/-3.93					
		TPU:		+/-11.7					
Europium-152			U	-0.546	pCi/g				
		Uncert:		+/-1.49					
		TPU:		+/-1.51					
Europium-154			U	0.328	pCi/g				
		Uncert:		+/-1.07					
		TPU:		+/-1.08					
Europium-155			U	-0.406	pCi/g				
		Uncert:		+/-1.04					
		TPU:		+/-1.06					
Batch	1669370								
QC1203799804 MB									
Cesium-137			U	0.00467	pCi/g			MXR1	05/31/1712:46
		Uncert:		+/-0.0143					
		TPU:		+/-0.0144					
Cobalt-60			U	0.00616	pCi/g				
		Uncert:		+/-0.0113					
		TPU:		+/-0.0116					
Europium-152			U	0.00269	pCi/g				
		Uncert:		+/-0.0298					
		TPU:		+/-0.0298					
Europium-154			U	0.0273	pCi/g				
		Uncert:		+/-0.045					
		TPU:		+/-0.0467					
Europium-155			U	-0.0359	pCi/g				
		Uncert:		+/-0.0322					
		TPU:		+/-0.0362					
QC1203799805 424169013 DUP									
Cesium-137		U	0.0577	U	-0.0119	pCi/g			05/31/1716:32
		Uncert:	+/-0.0529	+/-0.0252			RPD: 0 N/A		
		TPU:	+/-0.0592	+/-0.0257			RER: 2.11 (0-2)		
Cobalt-60		U	0.021	U	0.00237	pCi/g			

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**QC Summary**

Workorder: 424169

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Parmname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date Time
<b>Rad Gamma Spec</b>									
Batch	1669370								
		Uncert:	+/-0.0397	+/-0.0163					
		TPU:	+/-0.0408	+/-0.0163		RPD: 0	N/A		
						RER: 0.832	(0-2)		
Europium-152	UX	0.00	U	-0.052	pCi/g	RPD: 44	N/A		
		Uncert:	+/-0.156	+/-0.0693		RER: 2.46	(0-2)		
		TPU:	+/-0.178	+/-0.0732					
Europium-154	U	-0.0256	U	-0.0249	pCi/g	RPD: 0	N/A		
		Uncert:	+/-0.122	+/-0.0484		RER: 0.0101	(0-2)		
		TPU:	+/-0.123	+/-0.0497					
Europium-155	UX	0.00	UX	0.00	pCi/g	RPD: 21	N/A		
		Uncert:	+/-0.339	+/-0.530		RER: 0.722	(0-2)		
		TPU:	+/-0.411	+/-1.42					
QC1203799806	LCS								
Americium-241		489		539	pCi/g	REC: 110	(80%-120%)		05/31/1715:32
		Uncert:		+/-12.9					
		TPU:		+/-42.3					
Cesium-137		176		182	pCi/g	REC: 103	(80%-120%)		
		Uncert:		+/-3.62					
		TPU:		+/-8.61					
Cobalt-60		147		140	pCi/g	REC: 95	(80%-120%)		
		Uncert:		+/-3.64					
		TPU:		+/-6.30					
Europium-152			U	0.594	pCi/g				
		Uncert:		+/-1.54					
		TPU:		+/-1.57					
Europium-154				3.14	pCi/g				
		Uncert:		+/-2.70					
		TPU:		+/-3.05					
Europium-155			U	-0.899	pCi/g				
		Uncert:		+/-1.45					
		TPU:		+/-1.51					
<b>Rad Gas Flow</b>									
Batch	1669006								
QC1203798903	MB								
Total Strontium			U	-0.506	pCi/g			MYM1	06/01/1712:39
		Uncert:		+/-0.682					
		TPU:		+/-0.682					
**Strontium Carrier		7.75		6.80	mg	REC: 88	(40%-110%)		
QC1203798905	LCS								
Total Strontium		57.2		53.6	pCi/g	REC: 94	(80%-120%)		06/01/1712:39
		Uncert:		+/-3.34					
		TPU:		+/-14.0					
**Strontium Carrier		7.75		6.70	mg	REC: 87	(40%-110%)		
QC1203801297	424169001	DUP							
Total Strontium		U	1.30	U	0.176				06/01/1712:39
		Uncert:	+/-1.00	+/-0.567		RPD: 0	N/A		
		TPU:	+/-1.06	+/-0.569		RER: 1.83	(0-2)		
**Strontium Carrier		7.75	6.90	7.20	mg	REC: 93	(40%-110%)		
Batch	1669903								

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**QC Summary**

Workorder: 424169

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Parname	NOM	Sample	Qual	QC	Units	QC Criteria	Range	Analyst	Date	Time
<b>Rad Gas Flow</b>										
Batch	1669903									
QC1203801298	MB									
Total Strontium			U	0.626	pCi/g			MYM1	06/01/1712:00	
				Uncert:						
				TPU:						
**Strontium Carrier	7.75			6.60	mg	REC: 85 (40%-110%)				
QC1203801299	424169015	DUP								
Total Strontium		U	0.664	U	0.407				06/01/1712:01	
				Uncert:	+/-0.700	+/-0.795	RPD: 0	N/A		
				TPU:	+/-0.720	+/-0.802	RER: 0.466	(0-2)		
**Strontium Carrier	7.75	7.20		6.60	mg	REC: 85 (40%-110%)				
QC1203801300	LCS									
Total Strontium	57.0			58.7	pCi/g	REC: 103 (80%-120%)			06/01/1712:01	
				Uncert:		+/-3.62				
				TPU:		+/-15.3				
**Strontium Carrier	7.75			7.10	mg	REC: 92 (40%-110%)				

**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
- A The TIC is a suspected aldol-condensation product
- 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 both the associated QC blank and in the sample.
- B The associated QC sample blank has a result  $\geq 2X$  the MDA and, after corrections, result is  $\geq$  MDA for this sample
- C Analyte has been confirmed by GC/MS analysis
- 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 Concentration exceeds the calibration range of the instrument
- E Reported value is estimated due to interferences. See comment in narrative.
- 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
- M Duplicate precision not met.
- N Spike Sample recovery is outside control limits.
- P Aroclor target analyte with greater than 25% difference between column analyses.
- S Reported value determined by the Method of Standard Additions (MSA)
- T Spike and/or spike duplicate 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.
- 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
- o Analyte failed to recover within LCS limits (Organics only)

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
 SDG: SL2533

**Method: 8015B - Diesel Range Organics (DRO) (GC) (Continued)**

Lab Sample ID: 160-22539-1 MSD  
 Matrix: Soil  
 Analysis Batch: 313442

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 312349

Surrogate	MSD %Recovery	MSD Qualifier	Limits
<i>o</i> -Terphenyl	98		49 - 133

**Method: 6020A - Metals (ICP/MS)**

Lab Sample ID: MB 160-313029/1-A  
 Matrix: Solid  
 Analysis Batch: 313370

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Uranium	0.034	U D	0.086	0.034	mg/Kg		06/12/17 11:17	06/13/17 17:04	2

Lab Sample ID: LCS 160-313029/2-A  
 Matrix: Solid  
 Analysis Batch: 313370

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Uranium	89.8	93.08	D	mg/Kg		104	80 - 120

Lab Sample ID: 160-22539-1 MS  
 Matrix: Soil  
 Analysis Batch: 313370

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	Limits
Uranium	0.41	D	95.4	100.3	D	mg/Kg	☼	105	75 - 125

Lab Sample ID: 160-22539-1 MSD  
 Matrix: Soil  
 Analysis Batch: 313370

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 313029

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
Uranium	0.41	D	94.6	101.4	D	mg/Kg	☼	107	75 - 125	1	30

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)**

Lab Sample ID: MB 160-311120/1-A  
 Matrix: Solid  
 Analysis Batch: 312781

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 311120

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Uranium-233/234	0.000	U	0.0351	0.0351	1.00	0.0849	pCi/g	05/30/17 10:12	06/08/17 18:54	1
Uranium 235	-0.00564	U	0.0265	0.0265	1.00	0.0847	pCi/g	05/30/17 10:12	06/08/17 18:54	1
Uranium-238	0.00452	U	0.0344	0.0345	1.00	0.0798	pCi/g	05/30/17 10:12	06/08/17 18:54	1

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Uranium-232	88.8		30 - 105	05/30/17 10:12	06/08/17 18:54	1
Uranium-232	88.8		30 - 105	05/30/17 10:12	06/08/17 18:54	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
 SDG: SL2533

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry) (Continued)**

Lab Sample ID: LCS 160-311120/2-A  
 Matrix: Solid  
 Analysis Batch: 311871

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 311120

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits	
Uranium-233/234	6.37	6.443		0.732	1.00	0.0628	pCi/g	101	80 - 120	
Uranium-238	6.51	6.139		0.705	1.00	0.0282	pCi/g	94	80 - 120	
<b>Tracer</b>	<b>%Yield</b>	<b>LCS Qualifier</b>	<b>LCS</b>	<b>Limits</b>						
Uranium-232	79.4			30 - 105						

Lab Sample ID: 160-22539-1 DU  
 Matrix: Soil  
 Analysis Batch: 311874

Client Sample ID: B3B8W0  
 Prep Type: Total/NA  
 Prep Batch: 311120

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Uranium-233/234	0.485		0.356		0.125	1.00	0.0708	pCi/g	0.48	1
Uranium 235	0.0332	U	0.0124	U	0.0248	1.00	0.0372	pCi/g	0.31	1
Uranium-238	0.344		0.266		0.106	1.00	0.0481	pCi/g	0.35	1
<b>Tracer</b>	<b>%Yield</b>	<b>DU Qualifier</b>	<b>DU</b>	<b>Limits</b>						
Uranium-232	78.8			30 - 105						

**Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry)**

Lab Sample ID: MB 160-311118/1-A  
 Matrix: Solid  
 Analysis Batch: 311875

Client Sample ID: Method Blank  
 Prep Type: Total/NA  
 Prep Batch: 311118

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Plutonium-238	0.0391	U	0.0391	0.0392	1.00	0.0522	pCi/g	05/30/17 10:12	06/02/17 18:42	1
Plutonium-239/240	0.0196	U	0.0327	0.0328	1.00	0.0588	pCi/g	05/30/17 10:12	06/02/17 18:42	1
<b>Tracer</b>	<b>%Yield</b>	<b>MB Qualifier</b>	<b>Limits</b>							
Pu-242 (T)	97.2		30 - 105							
								<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
								05/30/17 10:12	06/02/17 18:42	1

Lab Sample ID: LCS 160-311118/2-A  
 Matrix: Solid  
 Analysis Batch: 312503

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA  
 Prep Batch: 311118

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Plutonium-238	5.34	5.384		0.615	1.00	0.0605	pCi/g	101	80 - 120
Plutonium-239/240	6.60	7.032		0.759	1.00	0.0242	pCi/g	107	80 - 120

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
SDG: SL2533

**Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry) (Continued)**

**Lab Sample ID: LCS 160-311118/2-A**  
**Matrix: Solid**  
**Analysis Batch: 312503**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 311118**

Tracer	LCS %Yield	LCS Qualifier	Limits
Pu-242 (T)	97.1		30 - 105

**Lab Sample ID: 160-22539-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 311878**

**Client Sample ID: B3B8W0**  
**Prep Type: Total/NA**  
**Prep Batch: 311118**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Plutonium-238	0.0307	U	0.0242	U	0.0460	1.00	0.0848	pCi/g	0.07	1
Plutonium-239/240	0.0219	U	0.0485	U	0.0438	1.00	0.0494	pCi/g	0.35	1

  

Tracer	DU %Yield	DU Qualifier	Limits
Pu-242 (T)	95.0		30 - 105

**Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)**

**Lab Sample ID: MB 160-311117/1-A**  
**Matrix: Solid**  
**Analysis Batch: 312499**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 311117**

Analyte	MB Result	MB Qualifier	Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
Americium-241	0.0277	U	0.0371	0.0373	1.00	0.0619	pCi/g	05/30/17 10:12	06/07/17 12:25	1

  

Tracer	MB %Yield	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
Americium-243	35.7		30 - 105	05/30/17 10:12	06/07/17 12:25	1

**Lab Sample ID: LCS 160-311117/2-A**  
**Matrix: Solid**  
**Analysis Batch: 312500**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 311117**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Americium-241	3.73	3.757		0.541	1.00	0.109	pCi/g	101	80 - 120

  

Tracer	LCS %Yield	LCS Qualifier	Limits
Americium-241	25.8	X	30 - 105

**Lab Sample ID: 160-22539-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 312241**

**Client Sample ID: B3B8W0**  
**Prep Type: Total/NA**  
**Prep Batch: 311117**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Americium-241	-0.011	U	0.00666	U	0.0224	1.00	0.0439	pCi/g	0.34	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
SDG: SL2533

**Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry) (Continued)**

Lab Sample ID: 160-22539-1 DU  
Matrix: Soil  
Analysis Batch: 312241

Client Sample ID: B3B8W0  
Prep Type: Total/NA  
Prep Batch: 311117

Tracer	%Yield	DU Qualifier	DU Limits
Americium-241	67.8	U	30 - 105

**Method: GA-01-R - Cesium-137 & Other Gamma Emitters (GS)**

Lab Sample ID: MB 160-311565/1-A  
Matrix: Solid  
Analysis Batch: 311748

Client Sample ID: Method Blank  
Prep Type: Total/NA  
Prep Batch: 311565

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Cesium-137	-0.00734	U	0.0352	0.0352	0.100	0.0612	pCi/g	06/01/17 14:19	06/02/17 12:53	1
Cobalt-60	0.00547	U	0.0272	0.0272		0.0324	pCi/g	06/01/17 14:19	06/02/17 12:53	1
Europium-152	0.0410	U	0.0492	0.0493		0.155	pCi/g	06/01/17 14:19	06/02/17 12:53	1
Europium-154	0.0435	U	0.0706	0.0708		0.389	pCi/g	06/01/17 14:19	06/02/17 12:53	1
Europium-155	0.000	U	0.0241	0.0241		0.271	pCi/g	06/01/17 14:19	06/02/17 12:53	1

Lab Sample ID: LCS 160-311565/2-A  
Matrix: Solid  
Analysis Batch: 311518

Client Sample ID: Lab Control Sample  
Prep Type: Total/NA  
Prep Batch: 311565

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec.	
									Limits	
Americium-241	97.0	99.11		10.3		0.788	pCi/g	102	80 - 120	
Cesium-137	29.0	28.76		3.03	0.100	0.180	pCi/g	99	80 - 120	
Cobalt-60	15.1	14.59		1.49		0.0829	pCi/g	97	80 - 120	

Lab Sample ID: 160-22539-1 DU  
Matrix: Soil  
Analysis Batch: 311511

Client Sample ID: B3B8W0  
Prep Type: Total/NA  
Prep Batch: 311565

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER	
										Limit	
Cesium-137	0.00961	U	0.0130	U	0.0289	0.100	0.0493	pCi/g	0.06		1
Cobalt-60	-0.0068	U	-0.0161	U	0.0561		0.0603	pCi/g	0.09		1
Europium-152	0.0600	U	0.0754	U	0.105		0.236	pCi/g	0.07		1
Europium-154	0.115	U	-0.281	U	0.404		0.669	pCi/g	0.68		1
Europium-155	0.000	U	0.143		0.0879		0.102	pCi/g	1.02		1

**Method: SR-03-RC - Total Beta Strontium (GFPC)**

Lab Sample ID: MB 160-311551/1-A  
Matrix: Solid  
Analysis Batch: 311847

Client Sample ID: Method Blank  
Prep Type: Total/NA  
Prep Batch: 311551

Analyte	MB MB		Count Uncert. (2σ+/-)	Total Uncert. (2σ+/-)	RL	MDC	Unit	Prepared	Analyzed	Dil Fac
	Result	Qualifier								
Total Beta Strontium	0.0165	U	0.104	0.104	2.00	0.185	pCi/g	06/01/17 12:34	06/05/17 19:36	1

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**QC Sample Results**

Client: CH2M Hill Plateau Remediation Company  
Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
SDG: SL2533

**Method: SR-03-RC - Total Beta Strontium (GFPC) (Continued)**

**Lab Sample ID: MB 160-311551/1-A**  
**Matrix: Solid**  
**Analysis Batch: 311847**

**Client Sample ID: Method Blank**  
**Prep Type: Total/NA**  
**Prep Batch: 311551**

Carrier	MB %Yield	MB Qualifier	Limits
Sr Carrier	90.9		40 - 110

Prepared	Analyzed	Dil Fac
06/01/17 12:34	06/05/17 19:36	1

**Lab Sample ID: LCS 160-311551/2-A**  
**Matrix: Solid**  
**Analysis Batch: 311847**

**Client Sample ID: Lab Control Sample**  
**Prep Type: Total/NA**  
**Prep Batch: 311551**

Analyte	Spike Added	LCS Result	LCS Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	%Rec	%Rec. Limits
Total Beta Strontium	8.45	6.843		0.630	2.00	0.186	pCi/g	81	80 - 120

  

Carrier	LCS %Yield	LCS Qualifier	Limits
Sr Carrier	89.2		40 - 110

**Lab Sample ID: 160-22539-1 DU**  
**Matrix: Soil**  
**Analysis Batch: 311847**

**Client Sample ID: B3B8W0**  
**Prep Type: Total/NA**  
**Prep Batch: 311551**

Analyte	Sample Result	Sample Qual	DU Result	DU Qual	Total Uncert. (2σ+/-)	RL	MDC	Unit	RER	RER Limit
Total Beta Strontium	0.121	U	-0.0965	U	0.103	2.00	0.203	pCi/g	0.96	1

  

Carrier	DU %Yield	DU Qualifier	Limits
Sr Carrier	84.7		40 - 110

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**Tracer/Carrier Summary**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
 SDG: SL2533

**Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)**

**Matrix: Soil**

**Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Am-243 (30-105)	
160-22539-1	B3B8W0	52.7	
160-22539-1 DU	B3B8W0	67.8	
<b>Tracer/Carrier Legend</b>			
Am-243 = Americium-243			

**Method: A-01-R - Isotopic Curium and/or Americium 241 (Alpha Spectrometry)**

**Matrix: Solid**

**Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Am-243 (30-105)	
LCS 160-311117/2-A	Lab Control Sample	25.8 X	
MB 160-311117/1-A	Method Blank	35.7	
<b>Tracer/Carrier Legend</b>			
Am-243 = Americium-243			

**Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry)**

**Matrix: Soil**

**Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Pu-242 (T) (30-105)	
160-22539-1	B3B8W0	84.1	
160-22539-1 DU	B3B8W0	95.0	
<b>Tracer/Carrier Legend</b>			
Pu-242 (T) = Pu-242 (T)			

**Method: A-01-R - Isotopic Plutonium (Alpha Spectrometry)**

**Matrix: Solid**

**Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	Pu-242 (T) (30-105)	
LCS 160-311118/2-A	Lab Control Sample	97.1	
MB 160-311118/1-A	Method Blank	97.2	
<b>Tracer/Carrier Legend</b>			
Pu-242 (T) = Pu-242 (T)			

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)**

**Matrix: Soil**

**Prep Type: Total/NA**

		Percent Yield (Acceptance Limits)	
Lab Sample ID	Client Sample ID	U-232 (30-105)	
160-22539-1	B3B8W0	78.1	
160-22539-1 DU	B3B8W0	78.8	

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**Tracer/Carrier Summary**

Client: CH2M Hill Plateau Remediation Company  
 Project/Site: FRC17-04

TestAmerica Job ID: 160-22539-1  
 SDG: SL2533

**Tracer/Carrier Legend**

U-232 = Uranium-232

**Method: A-01-R - Isotopic Uranium (Alpha Spectrometry)**

**Matrix: Solid**

**Prep Type: Total/NA**

**Percent Yield (Acceptance Limits)**

Lab Sample ID	Client Sample ID	U-232 (30-105)	U-232 (30-105)
LCS 160-311120/2-A	Lab Control Sample	79.4	79.4
MB 160-311120/1-A	Method Blank	88.8	88.8

**Tracer/Carrier Legend**

U-232 = Uranium-232

**Method: SR-03-RC - Total Beta Strontium (GFPC)**

**Matrix: Soil**

**Prep Type: Total/NA**

**Percent Yield (Acceptance Limits)**

Lab Sample ID	Client Sample ID	Sr (C) (40-110)
160-22539-1	B3B8W0	86.4
160-22539-1 DU	B3B8W0	84.7

**Tracer/Carrier Legend**

Sr (C) = Sr Carrier

**Method: SR-03-RC - Total Beta Strontium (GFPC)**

**Matrix: Solid**

**Prep Type: Total/NA**

**Percent Yield (Acceptance Limits)**

Lab Sample ID	Client Sample ID	Sr (C) (40-110)
LCS 160-311551/2-A	Lab Control Sample	89.2
MB 160-311551/1-A	Method Blank	90.9

**Tracer/Carrier Legend**

Sr (C) = Sr Carrier