



Wednesday, May 09, 2018

Karen Waters-Husted  
CH2M HILL Plateau Remediation Company  
825 Jadwin Avenue  
Richland, WA 99352

Re: ALS Workorder: 1804199  
Project Name: AEA, APRIL 2018  
Project Number: I18-008

Dear Ms. Waters-Husted:

Two water samples were received from CH2M HILL Plateau Remediation Company, on 4/11/2018. The samples were scheduled for the following analyses:

Gamma Spectroscopy  
Strontium-90

The results for these analyses are contained in the enclosed reports.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental  
Katie M. O'Brien  
Project Manager

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

# ALS -- Fort Collins

## Sample Number(s) Cross-Reference Table

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**OrderNum:** 1804199

**Client Name:** CH2M HILL Plateau Remediation Company

**Client Project Name:** AEA, APRIL 2018

**Client Project Number:** I18-008

**Client PO Number:** BOA 54854

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Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3HWC3	1804199-1		WATER	10-Apr-18	8:14
B3HWR3	1804199-2		WATER	09-Apr-18	13:14



<b>CH2MHill Plateau Remediation Company</b>		<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>		C.O.C.# <b>I18-008-117</b> Page 1 of 1
Collector: Roy Shepard /CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650		
SAF No.: I18-008	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071		
Project Title: AEA, APRIL 2018	Logbook No.: HNF-N-506-95	Ice Chest No.: GWS-604		
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 771963319523		
Protocol: SURV	Priority: 30 Days	Offsite Property No.: 9288		
<b>POSSIBLE SAMPLE HAZARDS/REMARK</b> ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		<b>SPECIAL INSTRUCTIONS</b> N/A		
Sample No. Filter * B3HWR3 N W	Date 4-18-18	Time 1314	No/Type Container 2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON
Sample Analysis			Holding Time 6 Months	Preservative HNO3 to pH <2

Relinquished By: Roy Shepard /CHPRC Print First and Last Name	APR 09 2018 Signature	APR 09 2018 Signature	SSU-1 Print First and Last Name	APR 09 2018 Signature	APR 09 2018 Signature	Date/Time 1420	Matrix * S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air	DS = Drum Solids DL = Drum Liquid T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By: Troy Bacon /CHPRC Print First and Last Name	APR 10 2018 Signature	APR 10 2018 Signature	SSU-1 Print First and Last Name	APR 10 2018 Signature	APR 10 2018 Signature	Date/Time 1420		
Relinquished By: Troy Bacon /CHPRC Print First and Last Name	APR 10 2018 Signature	APR 10 2018 Signature	FEDEX Print First and Last Name	APR 10 2018 Signature	APR 10 2018 Signature	Date/Time 1420		
Relinquished By: Roy Shepard /CHPRC Print First and Last Name	APR 10 2018 Signature	APR 10 2018 Signature	Disposed By:	APR 10 2018 Signature	APR 10 2018 Signature	Date/Time 1420		
<b>FINAL SAMPLE DISPOSITION</b>			Disposal Method (e.g., Return to customer, per lab procedure, used in process):			Date/Time:		



ALS Environmental - Fort Collins  
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CHPRC  
Project Manager: KMO

Workorder No: 1804199  
Initials: KS Date: 4/11/18

1. Does this project require any special handling in addition to standard ALS procedures?		YES	NO
2. Are custody seals on shipping containers intact?	NONE	YES	NO
3. Are Custody seals on sample containers intact?	NONE	YES	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		YES	NO
5. Are the COC and bottle labels complete and legible?		YES	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	YES	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	YES	NO
9. Are all aqueous non-preserved samples pH 4-9?	N/A	YES	NO
10. Is there sufficient sample for the requested analyses?		YES	NO
11. Were all samples placed in the proper containers for the requested analyses?		YES	NO
12. Are all samples within holding times for the requested analyses?		YES	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		YES	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	N/A	YES	NO
15. Do any water samples contain sediment? Amount of sediment: ___ dusting ___ moderate ___ heavy	Amount N/A	YES	NO
16. Were the samples shipped on ice?		YES	NO
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 #3 #4 RAD ONLY	YES	NO
Cooler #: <u>1</u>			
Temperature (°C): <u>Amb</u>			
No. of custody seals on cooler: <u>2</u>			
External µR/hr reading: <u>9</u>			
Background µR/hr reading: <u>10</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES</u> / NO / NA (If no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

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If applicable, was the client contacted? YES / NO / NA Contact: \_\_\_\_\_ Date/Time: \_\_\_\_\_  
Project Manager Signature / Date: [Signature] 4/12/18

1804199

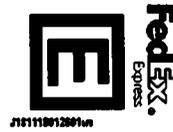
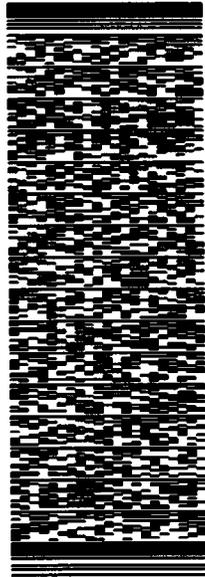
ORIGIN: DPSCA (509) 376-0951  
DANIEL KLUG  
8287 LATAH STREET  
BLDG. 6287 A00  
RICHLAND, WA 99354  
UNITED STATES US

SHIP DATE: 10APR18  
ACTWGHT: 37.00 LB  
CAD: 107086057/NET3990  
BILL THIRD PARTY

TO JULIE ELLINGSON  
ALS-GLOBAL-FT. COLLINS  
225 COMMERCE DRIVE

FORT COLLINS CO 80524  
(970) 480-1511  
REF: PTR#Z88 COOLER# GWS-604  
PO. NV. DEPT.

92  
AMBS  
55211/9132DCA5



TRK# 0201 7719 6331 9523  
WED - 11 APR 10:30A  
PRIORITY OVERNIGHT  
DSR

XH FTCA  
CO-US 80524 DEN



**After printing this label:**

1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
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3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

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# Gamma Spectroscopy Case Narrative

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## CH2M HILL Plateau Remediation Company

AEA, APRIL 2018 – I18-008

Work Order Number: 1804199

1. This sample was prepared according to the current revision of SOP739.
2. The sample was analyzed for the presence of gamma emitting radionuclides according to the current revision of SOP713. The analysis was completed on 05/05/2018.
3. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. The duplicate of sample 1804443-1 is shared for this work order. The duplicate was performed on a CH2M HILL Plateau Remediation Company sample. The results can be found in the following report.
5. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

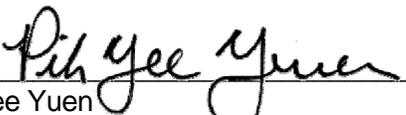
Where: S = sample activity result and D = duplicate activity result. RPD is not evaluated for sample/duplicate pairs where the reported activity is less than 5 times the sample specific MDC, as indicated with an "NC" on the Duplicate Sample Results (RPD) page.

6. There are cases where the magnitude of negative activity is greater than the  $3\sigma$  TPU. ALS is currently investigating the possible cause and frequency of this occurrence. Review of the data does not indicate a problem with the instrument or reporting systems and results are reported without further qualification.



7. There are cases where the magnitude of negative activity is greater than the  $2\sigma$  TPU. Under typical conditions, where background data is normally distributed and analyzed by paired observations, this event is likely to occur at least 2.5% of the time. Review of the data does not indicate a problem with the instrument or reporting systems and results are reported without further qualification.
8. No further problems were encountered with either the client samples or the associated quality control samples. All remaining quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

  
\_\_\_\_\_  
Pik Yee Yuen  
Radiochemistry Primary Data Reviewer

5/9/18  
Date

  
\_\_\_\_\_  
Radiochemistry Final Data Reviewer

5/9/18  
Date

# Gamma Spectroscopy Results

## PAI 713 Rev 14

### Method Blank Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

<b>Lab ID:</b> GS180504-1MB	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> GS180504-1	<b>Final Aliquot:</b> 1000 ml
<b>Library:</b> FANP.LIB	<b>Prep SOP:</b> PAI 739 Rev 12	<b>QCBatchID:</b> GS180504-1-1	<b>Result Units:</b> pCi/l
	<b>Date Collected:</b> 04-May-18	<b>Run ID:</b> GS180504-1A	<b>File Name:</b> 180625d07
	<b>Date Prepared:</b> 04-May-18	<b>Count Time:</b> 1000 minutes	
	<b>Date Analyzed:</b> 05-May-18		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	2.25E+00 +/- 3.52E+00	5.81E+00		NA	U
13967-70-9	Cs-134	-3.00E+00 +/- 2.69E+00	4.64E+00		NA	U
10045-97-3	Cs-137	-3.75E+00 +/- 2.82E+00	4.94E+00	1.00E+01	NA	U
14683-23-9	Eu-152	-1.53E+01 +/- 1.72E+01	3.03E+01		NA	U
15585-10-1	Eu-154	5.45E+00 +/- 1.59E+01	2.67E+01		NA	U
14391-16-3	Eu-155	1.47E+00 +/- 6.78E+00	1.13E+01		NA	U
13966-00-2	K-40	-1.93E+00 +/- 8.46E+01	1.41E+02		NA	U
14234-35-6	Sb-125	4.39E+00 +/- 5.52E+00	1.07E+01		NA	U

**Comments:**

**Qualifiers/Flags:**

U - Result is less than the sample specific MDC or less than the associated TP  
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.  
 Y2 - Chemical Yield outside default limits.  
 LT - Result is less than Requested MDC, greater than sample specific MDC.  
 SQ - Spectral quality prevents accurate quantitation.  
 SI - Nuclide identification and/or quantitation is tentative.  
 TI - Nuclide identification is tentative.  
 R - Nuclide has exceeded 8 half-lives.  
 M - Requested MDC not met.  
 B - Analyte concentration greater than MDC.  
 B3 - Analyte concentration greater than MDC but less than Requested MDC.  
 DL - Decision Level

**Abbreviations:**

TPU - Total Propagated Uncertainty  
 MDC - Sample specific Minimum Detectable Concentration  
 BDL - Below Detection Limit

**Data Package ID:** GSW1804199-1

# Gamma Spectroscopy Results

PAI 713 Rev 14

## Laboratory Control Sample(s)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

<b>Lab ID:</b> GS180504-1LCS	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> GS180504-1	<b>Final Aliquot:</b> 1000 ml
<b>Library:</b> ANALYTICAL.LI	<b>Prep SOP:</b> PAI 739 Rev 12	<b>QCBatchID:</b> GS180504-1-1	<b>Result Units:</b> pCi/l
	<b>Date Collected:</b> 04-May-18	<b>Run ID:</b> GS180504-1A	<b>File Name:</b> 180560d08
	<b>Date Prepared:</b> 04-May-18	<b>Count Time:</b> 30 minutes	
	<b>Date Analyzed:</b> 05-May-18		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14596-10-2	Am-241	1.00E+05 +/- 1.17E+04	4.14E+02	1.010E+05	98.9	85 - 115	
10198-40-0	Co-60	4.34E+04 +/- 5.10E+03	1.24E+02	4.360E+04	99.6	85 - 115	
10045-97-3	Cs-137	3.85E+04 +/- 4.53E+03	1.87E+02	3.890E+04	99.1	85 - 115	

### Comments:

**Qualifiers/Flags:**

U - Result is less than the sample specific MDC or less than the associated TPU  
 LT - Result is less than Requested MDC, greater than sample specific MDC.  
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.  
 Y2 - Chemical Yield outside default limits.  
 L - LCS Recovery below lower control limit.  
 H - LCS Recovery above upper control limit.  
 P - LCS Recovery within control limits.  
 M - The requested MDC was not met.  
 M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

**Abbreviations:**

TPU - Total Propagated Uncertainty  
 MDC - Minimum Detectable Concentration

SQ - Spectral quality prevents accurate quantitation.  
 SI - Nuclide identification and/or quantitation is tentative.  
 TI - Nuclide identification is tentative.  
 R - Nuclide has exceeded 8 half-lives.

**Data Package ID:** GSW1804199-1

# Gamma Spectroscopy Results

PAI 713 Rev 14

## Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins  
Work Order Number: 1804199  
Client Name: CH2M HILL Plateau Remediation Company  
ClientProject ID: AEA, APRIL 2018 I18-008

Field ID:	Shared QC
Lab ID:	1804443-1DUP

Library: FANP.LIB

Sample Matrix: WATER  
Prep SOP: PAI 739 Rev 12  
Date Collected: 19-Apr-18  
Date Prepared: 04-May-18  
Date Analyzed: 05-May-18

Prep Batch: GS180504-1  
QCBatchID: GS180504-1-1  
Run ID: GS180504-1A  
Count Time: 500 minutes  
Report Basis: Unfiltered

Final Aliquot: 1000 ml  
Prep Basis: Unfiltered  
Moisture(%): NA  
Result Units: pCi/l  
File Name: 180561d08

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10198-40-0	Co-60	-3.32E+00 +/- 5.00E+00		9.08E+00	U	-2.76E-01 +/- 3.70E+00		6.50E+00	U	0.98	3
13967-70-9	Cs-134	3.69E-01 +/- 4.03E+00		6.85E+00	U	-8.63E-01 +/- 4.34E+00		7.43E+00	U	0.416	3
10045-97-3	Cs-137	-4.96E-01 +/- 4.50E+00		7.74E+00	U	-2.44E+00 +/- 3.39E+00		6.00E+00	U	0.691	3
14683-23-9	Eu-152	4.24E+00 +/- 2.65E+01		4.56E+01	U	2.74E+00 +/- 1.63E+01		2.84E+01	U	0.0961	3
15585-10-1	Eu-154	-1.32E+01 +/- 2.34E+01		4.20E+01	U	-6.01E+00 +/- 1.77E+01		3.13E+01	U	0.49	3
14391-16-3	Eu-155	1.38E+00 +/- 1.10E+01		1.85E+01	U	4.55E+00 +/- 5.78E+00		9.48E+00	U	0.511	3
13966-00-2	K-40	-4.84E+01 +/- 1.08E+02		1.85E+02	U	1.54E+01 +/- 6.95E+01		1.17E+02	U	0.992	3
14234-35-6	Sb-125	5.37E+00 +/- 8.80E+00		1.68E+01	U	3.83E+00 +/- 6.51E+00		1.14E+01	U	0.282	3

### Comments:

**Duplicate Qualifiers/Flags:**

U - Result is less than the sample specific MDC.  
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.  
Y2 - Chemical Yield outside default limits.

D - DER is greater than Control Limit of 3  
LT - Result is less than Request MDC, greater than sample specific MDC

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

SQ - Spectral quality prevents accurate quantitation.

SI - Nuclide identification and/or quantitation is tentative.

TI - Nuclide identification is tentative.

R - Nuclide has exceeded 8 half-lives.

G - Sample density differs by more than 15% of LCS density.

**Abbreviations:**

TPU - Total Propagated Uncertainty

DER - Duplicate Error Ratio

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: GSW1804199-1

# Gamma Spectroscopy Results

PAI 713 Rev 14

## Duplicate Sample Results (RPD)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

<b>Field ID:</b>	Shared QC
<b>Lab ID:</b>	1804443-1DUP

**Library:** FANP.LIB

**Sample Matrix:** WATER  
**Prep SOP:** PAI 739 Rev 12  
**Date Collected:** 19-Apr-18  
**Date Prepared:** 04-May-18  
**Date Analyzed:** 05-May-18

**Prep Batch:** GS180504-1  
**QCBatchID:** GS180504-1-1  
**Run ID:** GS180504-1A  
**Count Time:** 500 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 1000 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** NA  
**Result Units:** pCi/l  
**File Name:** 180561d08

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10198-40-0	Co-60	-3.32E+00 +/- 5.00E+00		9.08E+00	U	-2.76E-01 +/- 3.70E+00		6.50E+00	U	NC	20
13967-70-9	Cs-134	3.69E-01 +/- 4.03E+00		6.85E+00	U	-8.63E-01 +/- 4.34E+00		7.43E+00	U	NC	20
10045-97-3	Cs-137	-4.96E-01 +/- 4.50E+00		7.74E+00	U	-2.44E+00 +/- 3.39E+00		6.00E+00	U	NC	20
14683-23-9	Eu-152	4.24E+00 +/- 2.65E+01		4.56E+01	U	2.74E+00 +/- 1.63E+01		2.84E+01	U	NC	20
15585-10-1	Eu-154	-1.32E+01 +/- 2.34E+01		4.20E+01	U	-6.01E+00 +/- 1.77E+01		3.13E+01	U	NC	20
14391-16-3	Eu-155	1.38E+00 +/- 1.10E+01		1.85E+01	U	4.55E+00 +/- 5.78E+00		9.48E+00	U	NC	20
13966-00-2	K-40	-4.84E+01 +/- 1.08E+02		1.85E+02	U	1.54E+01 +/- 6.95E+01		1.17E+02	U	NC	20
14234-35-6	Sb-125	5.37E+00 +/- 8.80E+00		1.68E+01	U	3.83E+00 +/- 6.51E+00		1.14E+01	U	NC	20

### Comments:

**Qualifiers/Flags:**

- + - Duplicate RPD not within limits.
- LT - Result is less than Request MDC, greater than sample specific MDC
- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC

**Abbreviations:**

- TPU - Total Propagated Uncertainty
- BDL - Below Detection Limit
- NR - Not Reported

- SQ - Spectral quality prevents accurate quantitation.
- SI - Nuclide identification and/or quantitation is tentative.
- TI - Nuclide identification is tentative.
- R - Nuclide has exceeded 8 halfives.
- G - Sample density differs by more than 15% of LCS density.

**Data Package ID:** GSW1804199-1

# Gamma Spectroscopy Results

## PAI 713 Rev 14

### Sample Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

<b>Field ID:</b>	Shared QC
<b>Lab ID:</b>	1804443-1

**Library:** FANP.LIB

<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> GS180504-1	<b>Final Aliquot:</b> 1000 ml
<b>Prep SOP:</b> PAI 739 Rev 12	<b>QCBatchID:</b> GS180504-1-1	<b>Prep Basis:</b> Unfiltered
<b>Date Collected:</b> 19-Apr-18	<b>Run ID:</b> GS180504-1A	<b>Moisture(%):</b> NA
<b>Date Prepared:</b> 04-May-18	<b>Count Time:</b> 500 minutes	<b>Result Units:</b> pCi/l
<b>Date Analyzed:</b> 05-May-18	<b>Report Basis:</b> Unfiltered	<b>File Name:</b> 180836d03

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	-3.32E+00 +/- 5.00E+00	9.08E+00		NA	U
13967-70-9	Cs-134	3.69E-01 +/- 4.03E+00	6.85E+00		NA	U
10045-97-3	Cs-137	-4.96E-01 +/- 4.50E+00	7.74E+00	1E+01	NA	U
14683-23-9	Eu-152	4.24E+00 +/- 2.65E+01	4.56E+01		NA	U
15585-10-1	Eu-154	-1.32E+01 +/- 2.34E+01	4.20E+01		NA	U
14391-16-3	Eu-155	1.38E+00 +/- 1.10E+01	1.85E+01		NA	U
13966-00-2	K-40	-4.84E+01 +/- 1.08E+02	1.85E+02		NA	U
14234-35-6	Sb-125	5.37E+00 +/- 8.80E+00	1.68E+01		NA	U

#### Comments:

##### Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TP  
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.  
 Y2 - Chemical Yield outside default limits.  
 LT - Result is less than Requested MDC, greater than sample specific MDC.  
 M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.  
 M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.  
 SI - Nuclide identification and/or quantitation is tentative.  
 TI - Nuclide identification is tentative.  
 R - Nuclide has exceeded 8 halfives.  
 G - Sample density differs by more than 15% of LCS density.

##### Abbreviations:

TPU - Total Propagated Uncertainty  
 MDC - Sample specific Minimum Detectable Concentration  
 BDL - Below Detection Limit  
 DL - Decision Level

**Data Package ID:** GSW1804199-1

# Gamma Spectroscopy Results

PAI 713 Rev 14

## Sample Duplicate Results

Lab Name: ALS -- Fort Collins  
Work Order Number: 1804199  
Client Name: CH2M HILL Plateau Remediation Company  
ClientProject ID: AEA, APRIL 2018 I18-008

Field ID:	Shared QC
Lab ID:	1804443-1DUP

Library: FANP.LIB

Sample Matrix: WATER  
Prep SOP: PAI 739 Rev 12  
Date Collected: 19-Apr-18  
Date Prepared: 04-May-18  
Date Analyzed: 05-May-18

Prep Batch: GS180504-1  
QCBatchID: GS180504-1-1  
Run ID: GS180504-1A  
Count Time: 500 minutes  
Report Basis: Unfiltered

Final Aliquot: 1000 ml  
Prep Basis: Unfiltered  
Moisture(%): NA  
Result Units: pCi/l  
File Name: 180561d08

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	-2.76E-01 +/- 3.70E+00	6.50E+00		NA	U
13967-70-9	Cs-134	-8.63E-01 +/- 4.34E+00	7.43E+00		NA	U
10045-97-3	Cs-137	-2.44E+00 +/- 3.39E+00	6.00E+00	1E+01	NA	U
14683-23-9	Eu-152	2.74E+00 +/- 1.63E+01	2.84E+01		NA	U
15585-10-1	Eu-154	-6.01E+00 +/- 1.77E+01	3.13E+01		NA	U
14391-16-3	Eu-155	4.55E+00 +/- 5.78E+00	9.48E+00		NA	U
13966-00-2	K-40	1.54E+01 +/- 6.95E+01	1.17E+02		NA	U
14234-35-6	Sb-125	3.83E+00 +/- 6.51E+00	1.14E+01		NA	U

### Comments:

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TPU.  
Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.  
Y2 - Chemical Yield outside default limits.  
LT - Result is less than Requested MDC, greater than sample specific MDC.  
M - The requested MDC was not met.  
M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

SQ - Spectral quality prevents accurate quantitation.  
SI - Nuclide identification and/or quantitation is tentative.  
TI - Nuclide identification is tentative.  
R - Nuclide has exceeded 8 halfives.  
G - Sample density differs by more than 15% of LCS density.

D - DER is greater than Control Limit of 3

#### Abbreviations:

TPU - Total Propagated Uncertainty  
MDC - Sample specific Minimum Detectable Concentration  
BDL - Below Detection Limit  
DL - Decision Level

Data Package ID: GSW1804199-1

#### Date Printed:

Wednesday, May 09, 2018

ALS -- Fort Collins

LIMS Version: 6.862

Page 1 of 1

# Gamma Spectroscopy Results

## PAI 713 Rev 14

### Sample Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

<b>Field ID:</b>	B3HWC3
<b>Lab ID:</b>	1804199-1

<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> GS180504-1	<b>Final Aliquot:</b> 1000 ml
<b>Prep SOP:</b> PAI 739 Rev 12	<b>QCBatchID:</b> GS180504-1-1	<b>Prep Basis:</b> Unfiltered
<b>Date Collected:</b> 10-Apr-18	<b>Run ID:</b> GS180504-1A	<b>Moisture(%):</b> NA
<b>Date Prepared:</b> 04-May-18	<b>Count Time:</b> 500 minutes	<b>Result Units:</b> pCi/l
<b>Date Analyzed:</b> 04-May-18	<b>Report Basis:</b> Unfiltered	<b>File Name:</b> 180500d05

**Library:** FANP.LIB  
**Analysis ReqCode:** GAMMA\_GS: CO

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	-1.45E+00 +/- 4.19E+00	7.40E+00		NA	U
13967-70-9	Cs-134	-6.04E+00 +/- 3.92E+00	6.93E+00		NA	U
10045-97-3	Cs-137	-3.62E+00 +/- 3.79E+00	6.72E+00	1E+01	NA	U
14683-23-9	Eu-152	2.45E+00 +/- 1.92E+01	3.30E+01		NA	U
15585-10-1	Eu-154	1.17E+01 +/- 1.91E+01	3.17E+01		NA	U
14391-16-3	Eu-155	1.25E+00 +/- 1.39E+01	2.35E+01		NA	U
13966-00-2	K-40	-4.81E+01 +/- 8.79E+01	1.50E+02		NA	U
14234-35-6	Sb-125	1.33E+00 +/- 8.78E+00	1.49E+01		NA	U

#### Comments:

##### Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TP  
 Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.  
 Y2 - Chemical Yield outside default limits.  
 LT - Result is less than Requested MDC, greater than sample specific MDC.  
 M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.  
 M - The requested MDC was not met.

SQ - Spectral quality prevents accurate quantitation.  
 SI - Nuclide identification and/or quantitation is tentative.  
 TI - Nuclide identification is tentative.  
 R - Nuclide has exceeded 8 halfives.  
 G - Sample density differs by more than 15% of LCS density.

##### Abbreviations:

TPU - Total Propagated Uncertainty  
 MDC - Sample specific Minimum Detectable Concentration  
 BDL - Below Detection Limit  
 DL - Decision Level

**Data Package ID:** GSW1804199-1

**Prep Batch ID: GS180504-1**

<b>Start Date:</b> 05/04/18	<b>End Date:</b> 05/04/18	<b>Concentration Method:</b> NONE	<b>Batch Created By:</b> nmp
<b>Start Time:</b> 7:29	<b>End Time:</b> 7:29	<b>Extract Method:</b> PAI 73912	<b>Date Created:</b> 05/04/18
<b>Prep Analyst:</b> Nicholas M. Pratt		<b>Initial Volume Units:</b> ml	<b>Time Created:</b> 7:29
<b>Comments:</b>		<b>Final Volume Units:</b> ml	<b>Validated By:</b> nmp
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			<b>Date Validated:</b> 05/04/18
			<b>Time Validated:</b> 10:06

QC Batch ID: GS180504-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
GS180504-1	MB	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1804199
GS180504-1	LCS	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1804199
1804443-1	DUP	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1804443
1804199-1	SMP	B3HWC3	WATER	4/10/2018	1000	1000	NONE	1	1804199
1804443-1	SMP	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1804443
1804443-2	SMP	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1804443

**QC Types**

CAR	Carrier reference sample	DUP	Laboratory Duplicate
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat
MB	Method Blank	MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate	REP	Sample replicate
RVS	Reporting Level Verification Standar	SMP	Field Sample
SYS	Sample Yield Spike		



# Strontium-90 Case Narrative

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## CH2M HILL Plateau Remediation Company

AEA, APRIL 2018 – I18-008

Work Order Number: 1804199

1. This sample was prepared according to the current revision of SOP 707.
2. This sample was analyzed for the presence of <sup>90</sup>Sr according to the current revision of SOP 724. The analysis was completed on 04/19/2018.
3. Total radio-strontium is reported as <sup>90</sup>Sr. The presence of other radioisotopes of strontium may cause positive bias in the measured strontium concentration.
4. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
5. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
6. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

$$RPD = \frac{|S - D|}{(S + D)/2} * 100$$

Where: S = sample activity result and D = duplicate activity result.

7. No anomalous situations were encountered during the preparation and analysis of this sample. All quality control criteria were met.



The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, ALS certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Pik yee Yuen  
Pik Yee Yuen  
Radiochemistry Primary Data Reviewer

5/3/18  
Date

Kath M. W.  
Radiochemistry Final Data Reviewer

5/9/18  
Date

# Strontium-90 by GFPC

PAI 724 Rev 12

## Method Blank Results

Lab Name: ALS -- Fort Collins  
Work Order Number: 1804199  
Client Name: CH2M HILL Plateau Remediation Company  
ClientProject ID: AEA, APRIL 2018 I18-008

Lab ID: SR180416-1MB	Sample Matrix: WATER	Prep Batch: SR180416-1	Final Aliquot: 994 ml
	Prep SOP: PAI 707 Rev 14	QCBatchID: SR180416-1-1	Result Units: pCi/l
	Date Collected: 16-Apr-18	Run ID: SR180416-1A	File Name: SRA0419B
	Date Prepared: 16-Apr-18	Count Time: 1000 minutes	
	Date Analyzed: 19-Apr-18		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	7.70E-02 +/- 1.23E-01	2.01E-01	1.00E+00	NA	U

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.100E+03	9.87E+02	ug	89.7	40 - 110 %	

### Comments:

**Qualifiers/Flags:**

U - Result is less than the sample specific MDC.  
Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.  
Y2 - Chemical Yield outside default limits.  
LT - Result is less than Requested MDC, greater than sample specific MDC.

**Abbreviations:**

TPU - Total Propagated Uncertainty  
MDC - Sample specific Minimum Detectable Concentration  
BDL - Below Detection Limit

M - Requested MDC not met.  
B - Analyte concentration greater than MDC.  
B3 - Analyte concentration greater than MDC but less than Requested MDC.  
DL - Decision Level

Data Package ID: SR1804199-1

# Strontium-90 by GFPC

PAI 724 Rev 12

## Laboratory Control Sample(s)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

**Lab ID:** SR180416-1LCS

**Sample Matrix:** WATER  
**Prep SOP:** PAI 707 Rev 14  
**Date Collected:** 16-Apr-18  
**Date Prepared:** 16-Apr-18  
**Date Analyzed:** 19-Apr-18

**Prep Batch:** SR180416-1  
**QCBatchID:** SR180416-1-1  
**Run ID:** SR180416-1A  
**Count Time:** 30 minutes

**Final Aliquot:** 994 ml  
**Result Units:** pCi/l  
**File Name:** SRA0419

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.04E+01 +/- 2.73E+00	1.20E+00	1.070E+01	96.8	75 - 125	

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.120E+03	1.07E+03	ug	96.4	40 - 110 %	

### Comments:

**Qualifiers/Flags:**

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS Recovery within control limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

**Abbreviations:**

- TPU - Total Propagated Uncertainty
- MDC - Minimum Detectable Concentration

**Data Package ID:** SR1804199-1

# Strontium-90 by GFPC

PAI 724 Rev 12

## Laboratory Control Sample(s)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

**Lab ID:** SR180416-1LCSD

**Sample Matrix:** WATER  
**Prep SOP:** PAI 707 Rev 14  
**Date Collected:** 16-Apr-18  
**Date Prepared:** 16-Apr-18  
**Date Analyzed:** 19-Apr-18

**Prep Batch:** SR180416-1  
**QC Batch ID:** SR180416-1-1  
**Run ID:** SR180416-1A  
**Count Time:** 30 minutes

**Final Aliquot:** 994 ml  
**Result Units:** pCi/l  
**File Name:** SRA0419

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	9.68E+00 +/- 2.58E+00	1.22E+00	1.070E+01	90.2	75 - 125	

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.140E+03	1.05E+03	ug	91.9	40 - 110 %	

### Comments:

**Qualifiers/Flags:**

- U - Result is less than the sample specific MDC.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS Recovery within control limits.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

**Abbreviations:**

- TPU - Total Propagated Uncertainty
- MDC - Minimum Detectable Concentration

**Data Package ID:** SR1804199-1

**Strontium-90 by GFPC**  
 PAI 724 Rev 12  
 Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins  
 Work Order Number: 1804199  
 Client Name: CH2M HILL Plateau Remediation Company  
 ClientProject ID: AEA, APRIL 2018 I18-008

Field ID:	
Lab ID:	SR180416-1LCSD

Sample Matrix: WATER  
 Prep SOP: PAI 707 Rev 14  
 Date Collected: 16-Apr-18  
 Date Prepared: 16-Apr-18  
 Date Analyzed: 19-Apr-18

Prep Batch: SR180416-1  
 QCBatchID: SR180416-1-1  
 Run ID: SR180416-1A  
 Count Time: 30 minutes

Final Aliquot: 994 ml  
 Prep Basis: Unfiltered  
 Moisture(%): NA  
 Result Units: pCi/l  
 File Name: SRA0419

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.04E+01 +/-	2.73E+00	1.20E+00		9.68E+00 +/-	2.58E+00	1.22E+00		0.378	3

**Comments:**

**Duplicate Qualifiers/Flags:**

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- D - DER is greater than Control Limit of 3
- LT - Result is less than Request MDC, greater than sample specific MDC
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits

**Abbreviations:**

- TPU - Total Propagated Uncertainty
- DER - Duplicate Error Ratio
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: SR1804199-1

# Strontium-90 by GFPC

PAI 724 Rev 12

## Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins  
Work Order Number: 1804199  
Client Name: CH2M HILL Plateau Remediation Company  
ClientProject ID: AEA, APRIL 2018 I18-008

Field ID:	
Lab ID:	SR180416-1LCSD

Sample Matrix: WATER  
Prep SOP: PAI 707 Rev 14  
Date Collected: 16-Apr-18  
Date Prepared: 16-Apr-18  
Date Analyzed: 19-Apr-18

Prep Batch: SR180416-1  
QCBatchID: SR180416-1-1  
Run ID: SR180416-1A  
Count Time: 30 minutes

Final Aliquot: 994 ml  
Prep Basis: Unfiltered  
Moisture(%): NA  
Result Units: pCi/l  
File Name: SRA0419

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.04E+01 +/- 2.73E+00		1.20E+00		9.68E+00 +/- 2.58E+00		1.22E+00		7.00	20

### Comments:

**Qualifiers/Flags:**

- + - Duplicate RPD not within limits.
- LT - Result is less than Request MDC, greater than sample specific MDC
- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.
- Y2 - Chemical Yield outside default limits.
- M - Requested MDC not met.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- L - LCS Recovery below lower control limit.
- H - LCS Recovery above upper control limit.
- P - LCS, Matrix Spike Recovery within control limits.
- N - Matrix Spike Recovery outside control limits
- NC - Not Calculated for duplicate results less than 5 times MDC

**Abbreviations:**

- TPU - Total Propagated Uncertainty
- BDL - Below Detection Limit
- NR - Not Reported

Data Package ID: SR1804199-1

# Strontium-90 by GFPC

## PAI 724 Rev 12

### Sample Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1804199  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** AEA, APRIL 2018 I18-008

<b>Field ID:</b>	B3HWR3
<b>Lab ID:</b>	1804199-2

**Sample Matrix:** WATER  
**Prep SOP:** PAI 707 Rev 14  
**Date Collected:** 09-Apr-18  
**Date Prepared:** 16-Apr-18  
**Date Analyzed:** 19-Apr-18

**Prep Batch:** SR180416-1  
**QCBatchID:** SR180416-1-1  
**Run ID:** SR180416-1A  
**Count Time:** 90 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 994 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** NA  
**Result Units:** pCi/l  
**File Name:** SRA0419A

**Analysis ReqCode:** SRISO\_SEP\_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	8.55E+01 +/- 2.02E+01	7.10E-01	1E+00	NA	

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	2.290E+03	2.09E+03	ug	91.4	40 - 110 %	

### Comments:

**Qualifiers/Flags:**

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- LT - Result is less than Requested MDC, greater than sample specific MDC.
- M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.
- M - The requested MDC was not met.

**Abbreviations:**

- TPU - Total Propagated Uncertainty
- MDC - Sample specific Minimum Detectable Concentration
- BDL - Below Detection Limit
- DL - Decision Level

**Data Package ID:** SR1804199-1

**Prep Batch ID: SR180416-1**

<b>Start Date:</b> 04/16/18	<b>End Date:</b> 04/16/18	<b>Concentration Method:</b> NONE	<b>Batch Created By:</b> rgs
<b>Start Time:</b> 12:09	<b>End Time:</b> 12:09	<b>Extract Method:</b> PAI 70714	<b>Date Created:</b> 04/16/18
<b>Prep Analyst:</b> Reilly G. Stockton		<b>Initial Volume Units:</b> ml	<b>Time Created:</b> 12:10
<b>Comments:</b>		<b>Final Volume Units:</b> ml	<b>Validated By:</b> rgs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			<b>Date Validated:</b> 04/18/18
			<b>Time Validated:</b> 9:02

QC Batch ID: SR180416-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR180416-1	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1804199
SR180416-1	MB	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1804199
SR180416-1	LCS	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1804199
SR180416-1	LCSD	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1804199
1804199-2	SMP	B3HWR3	WATER	4/9/2018	1000	994.01	NONE	1	1804199
1804226-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1804226

**QC Types**

CAR	Carrier reference sample	DUP	Laboratory Duplicate
LCS	Laboratory Control Sample	LCSD	Laboratory Control Sample Duplicat
MB	Method Blank	MS	Laboratory Matrix Spike
MSD	Laboratory Matrix Spike Duplicate	REP	Sample replicate
RVS	Reporting Level Verification Standar	SMP	Field Sample
SYS	Sample Yield Spike		