



Ft. Collins, Colorado

LIMS Version: 6.912

Page 1 of 1

Wednesday, October 09, 2019

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

Re: ALS Workorder: 1909216
Project Name: AEA, September 2019
Project Number: I19-028

Dear Ms. Waters-Husted:

Six water samples were received from CH2M HILL Plateau Remediation Company, on 9/11/2019. The samples were scheduled for the following analyses:

Strontium-90
Tritium

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, any and all deviations, from either the analyses requested or the case narrative requested. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager (or designee) and the laboratory's client services representative as verified by their signatures on this report.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1909216

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: AEA, September 2019

Client Project Number: I19-028

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3R4H9	1909216-1		WATER	06-Sep-19	11:00
B3R4K6	1909216-2		WATER	09-Sep-19	13:21
B3R4K9	1909216-3		WATER	09-Sep-19	12:28
B3R4L5	1909216-4		WATER	09-Sep-19	12:01
B3R4W7	1909216-5		WATER	09-Sep-19	10:22
B3R4W9	1909216-6		WATER	09-Sep-19	9:52

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

C.O.C. #
I19-028-013
Page 1 of 1

1909216

Contact/Requester: Karen Waters-Husted
Telephone No.: 509-376-4650

Sampling Origin: Hanford Site
Purchase Order/Charge Code: 300071

Logbook No.: HNF-N-506 710-52
Ice Chest No.: GWS-009

Method of Shipment: Commercial Carrier
Bill of Lading/Air Bill No.: 7701881734

Priority: 30 Days
Offsite Property No.: 11557

SPECIAL INSTRUCTIONS
N/A

POSSIBLE SAMPLE HAZARDS/REMARK
** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

Sample No.	Filter	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3R4H9	N	9-6-19	1100	2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2
B3R4H9	N	9-6-19	1100	1x250-mL P	TRITIUM_DIST_LSC: COMMON	6 Months	None

Print First and Last Name	Relinquished By		Received By		Matrix *
	Signature	Date/Time	Signature	Date/Time	
CHPRC	<i>D.K. [Signature]</i>	SEP 06 2019 1440	SSU-1	SEP 06 2019 0700	DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
SSU-1	<i>[Signature]</i>	SEP 10 2019 0700	Janelle Zunker CHPRC	SEP 10 2019 0700	S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air
Janelle Zunker CHPRC	<i>[Signature]</i>	SEP 10 2019 1400	FEDEX	SEP 11 2019 0850	
			Nick Jostes	9-11-19 09:50	

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

Disposed By:

Date/Time:

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909216		C.O.C.# I19-028-019 Page 1 of 1
Collector: Dan Klug CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650		
SAF No.: I19-028	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071		
Project Title: AEA, September 2019	Logbook No.: HNF-N-506-11121	Ice Chest No.: CWS-009		
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 7769871724		
Protocol: SURV	Priority: 30 Days	Offsite Property No.: 11557		
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A		
Sample No. B3R4K6	Filter N	* W	Date 9/9/19	Time 1321
No/Type Container 2x1-L G/P	Sample Analysis SRISO_SEP_PRECIP_GPC: COMMON		Holding Time 6 Months	Preservative HNO3 to pH <2

Relinquished By		Received By	
Print First and Last Name	Signature	Print First and Last Name	Signature
Dan Klug CHPRC	<i>D. Klug</i>	SSU-1	<i>SSU-1</i>
SSU-1	<i>J. Zunker</i>	Janelle Zunker CHPRC	<i>J. Zunker</i>
Janelle Zunker CHPRC	<i>J. Zunker</i>	FEDEX	<i>FEDEX</i>
	<i>Nick Jostes</i>	Nick Jostes	<i>Nick Jostes</i>

Date/Time SEP 10 2019 1321	Date/Time SEP 10 2019 0700
Matrix * DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other	Matrix * S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air

Disposed By:	Date/Time:
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CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

1909216

C.O.C.#

I19-028-020

Page 1 of 1

Collector: Dan King CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: I19-028	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071
Project Title: AEA, September 2019	Logbook No.: HNF-N-506-11-21	Ice Chest No.: 6WS-009
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 77098871734
Protocol: SURV	Priority: 30 Days	Offsite Property No.: 11557

POSSIBLE SAMPLE HAZARDS/REMARK
 ** * Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

SPECIAL INSTRUCTIONS
 N/A

Sample No. B3R4K9	Filter N	Date 9-9-19	Time 1229	No/Type Container 2x1-L G/P	Sample Analysis SRISO_SEP_PRECIP_GPC: COMMON	Holding Time 6 Months	Preservative HNO3 to pH <2
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Relinquished By		Received By	
Print First and Last Name	Signature	Print First and Last Name	Signature
Dan King CHPRC	<i>D. King</i>	Troy Bacon CHPRC	<i>Troy Bacon</i>
Troy Bacon CHPRC	<i>Troy Bacon</i>	SSU-1	<i>SSU-1</i>
Janelle Zunker CHPRC	<i>Janelle Zunker</i>	Janelle Zunker CHPRC	<i>Janelle Zunker</i>
SSU-1	<i>SSU-1</i>	FEDEX	<i>FEDEX</i>
FEDEX	<i>FEDEX</i>	Nick Jostes	<i>Nick Jostes</i>

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

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):
Printed On: 7/20/2019	Disposed By: <i>Nick Jostes</i>
FRS ID = FSR82669	Date/Time: 9-11-19 0950

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909216		C.O.C.# I19-028-021	Page 1 of 1
Collector: Roger Friesz Jr. CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650	Purchase Order/Charge Code: 300071		
SAF No.: I19-028	Sampling Origin: Hanford Site	Ice Chest No.: GWS-009			
Project Title: AEA, September 2019	Logbook No.: HNF-N-506 - 109-35	Bill of Lading/Air Bill No.: 7269871724			
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment Commercial Carrier	Offsite Property No.: 11557			
Protocol: SURV	Priority: 30 Days				
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A			
Sample No. B3R4L5	Filter * W	Date SEP 09 2019 1201	Time 1201	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		Received By		Matrix *	
Print First and Last Name	Signature	Print First and Last Name	Signature	S = Soil	DS = Drum Solids
Roger Friesz Jr. CHPRC		SSU-1	SSU-1	SE = Sediment	DL = Drum Liquids
SSU-1		Janelle Zunker CHPRC		SO = Solid	T = Tissue
Janelle Zunker CHPRC		FEDEX	FEDEX	SL = Sludge	WI = Wipe
		Nick Jostes		W = Water	L = Liquid
				O = Oil	V = Vegetation
				A = Air	X = Other

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

Printed On 7/20/2019 FSR ID = FSR82670 A-6004-842 (REV 3)

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST 1909216		C.O.C.# I19-028-022 Page 1 of 1
Collector: Roger Fikes Jr. /CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650		
SAF No.: I19-028	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071		
Project Title: AEA, September 2019	Logbook No.: HNF-N-506 ~ 109-35	Ice Chest No.: GWS 720		
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment Commercial Carrier	Bill of Lading/Air Bill No.: 776198712887		
Protocol: SURV	Priority: 30 Days	Offsite Property No.: 11557		
POSSIBLE SAMPLE HAZARDS/REMARK ** * Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A		
Sample No. B3R4W7	Filter N	Date SEP 09 2019 10:27	Time 2x1-L G/P	No/Type Container 1027
Sample Analysis SRISO_SEP_PRECIP_GPC: COMMON		Holding Time 6 Months	Preservative HNO3 to pH <2	

Relinquished By		Received By	
Print First and Last Name	Signature	Date/Time	Signature
Roger Fikes Jr. CHPRC		SEP 09 2019 10:27	
Tim Callaway CHPRC		SEP 09 2019 14:00	SSU-1
SSU-1		SEP 10 2019 09:00	Janelle Zunker CHPRC
Janelle Zunker CHPRC		SEP 10 2019 14:00	FEDEX
		SEP 10 2019 09:50	Nick Jostes

Matrix *

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

FINAL SAMPLE DISPOSITION Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

1909216

C.O.C.#
I19-028-023
Page 1 of 1

Collector: Roger Frisze Jr. /CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: I19-028	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071
Project Title: AEA, September 2019	Logbook No.: HNF-N-506 - 109-35	Ice Chest No.: 005-009
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 77019871784
Protocol: SURV	Priority: 30 Days	Offsite Property No.: 11557

POSSIBLE SAMPLE HAZARDS/REMARK
 ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1

Sample No.	Filter	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3R4W9	N	SEP 09 2019	05:27	2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2
B3R4W9	N	SEP 09 2019	05:27	1x250-mL P	TRITIUM_DIST_LSC: COMMON	6 Months	None

SPECIAL INSTRUCTIONS
N/A

Relinquished By		Received By	
Print First and Last Name	Signature	Print First and Last Name	Signature
Tim Callaway /CHPRC		Tim Callaway /CHPRC	
SSU-1		SSU-1	
Janelle Zunker /CHPRC		Janelle Zunker /CHPRC	
FEDEX		FEDEX	
		Nick Jostes	

FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:
8 OCT 4			



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CHPRC

Workorder No: 1909216

Project Manager: KO

Initials: ng

Date: 9.12.19

1. Are airbills / shipping documents present and/or removable?		DROP OFF	<input checked="" type="radio"/> YES	<input type="radio"/> NO			
2. Are custody seals on shipping containers intact?		NONE	<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
3. Are custody seals on sample containers intact?		NONE	<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
4. Is there a COC (chain-of-custody) present?			<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
5. Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)			<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
6. Are short-hold samples present?			<input type="radio"/> YES	<input checked="" type="radio"/> NO			
7. Are all samples within holding times for the requested analyses?			<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
8. Were all sample containers received intact? (not broken or leaking)			<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
9. Is there sufficient sample for the requested analyses?			<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
10. Are all samples in the proper containers for the requested analyses?			<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
11. Are all aqueous samples preserved correctly, if required? (excluding volatiles)		N/A	<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
12. Are all aqueous non-preserved samples pH 4-9?		N/A	<input checked="" type="radio"/> YES	<input type="radio"/> NO *			
13. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, radon) free of bubbles > 6 mm (1/4 inch) diameter? (i.e. size of green pea)		<input checked="" type="radio"/> N/A	<input type="radio"/> YES	<input type="radio"/> NO			
14. Were the samples shipped on ice?			<input checked="" type="radio"/> YES	<input type="radio"/> NO			
15. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*:	#1	<input checked="" type="radio"/> #3	#4	RAD ONLY	<input checked="" type="radio"/> YES	<input type="radio"/> NO
Cooler #: <u>1</u> <u>2</u>							
Temperature (°C): <u>2.9</u> <u>3.3</u>							
No. of custody seals on cooler: <u>2</u> <u>2</u>							
External µR/hr reading: <u>11</u> <u>12</u>							
Background µR/hr reading: <u>13</u>							
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES / NO / NA (If no, see Form 008.)							

* Please provide details here for NO responses to gray boxes above - for 2 thru 5 & 7 thru 12, notify PM & continue w/ login.

All client bottle ID's vs ALS lab ID's double-checked by: ng

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: [Signature] 9/14/19

1909216

ORIGIN: D:PSCA (509) 531-0450
TROY BRACON
CH2M
6267 LATAH ST.
RICHLAND, WA 99352
UNITED STATES US

SHIP DATE: 10SEP19
ACTWTG: 80.00 LB
CAD: 107066051/NET/4160
BILL THIRD PARTY

TO JULIE ELLINGSON

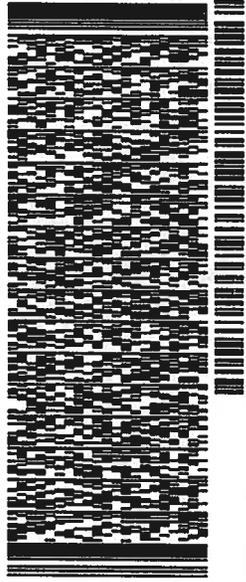
ALS GLOBAL-FORT COLLINS
225 COMMERCE DR

11-2

FORT COLLINS CO 80524

(970) 490-1511 REF: PTR#11557
INV. DEPT:

2.90



567J19D0405A2

1 of 2

TRK# 7761 9871 1734
0201
MASTER

WED - 11 SEP 10:30A
PRIORITY OVERNIGHT
DSR

XH FTCA

80524
DEN
COUS



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1909216

ORIGIN ID: PSCA (509) 531-0450
TROY BACON
CH2M
6287 LATAH ST.
RICHLAND, WA 99352
UNITED STATES US

SHIP DATE: 10SEP19
ACTWGT: 61.00 LB
CAD: 10706605/INNET4160

BILL THIRD PARTY

TO JULIE ELLINGSON
ALS GLOBAL-FORT COLLINS
225 COMMERCE DR

FORT COLLINS CO 80524

(970) 490-1511
REF: PTR#11557
DEPT:

12-2
3.30

567.119004.05A2



2 of 2

MPS# 7761 9871 2557
Mst# 7761 9871 1734

0201

WED - 11 SEP 10:30A
PRIORITY OVERNIGHT

XH FTCA

DSR 80524
CO-US DEN



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Strontium-90

Case Narrative

CH2M HILL Plateau Remediation Company

AEA, September 2019 – I19-028

Work Order Number: 1909216

1. The samples were prepared according to the current revision of SOP 707.
2. The samples were analyzed for the presence of ⁹⁰Sr according to the current revision of SOP 724. The analyses were completed on 10/05/2019.
3. Total radio-strontium is reported as ⁹⁰Sr. The presence of other radioisotopes of strontium may cause positive bias in the measured strontium concentration.
4. The analysis results for these samples are reported in units of pCi/L. The samples were 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 these samples. 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

10/7/19
Date

Kath A. W.
Radiochemistry Final Data Reviewer

10/09/19
Date

Strontium-90 by GFPC

PAI 724 Rev 13

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1909216

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Lab ID: SR191002-1MB

Sample Matrix: WATER

Prep Batch: SR191002-1

Final Aliquot: 994 ml

Prep SOP: PAI 707 Rev 15

QCBatchID: SR191002-1-1

Result Units: pCi/l

Date Collected: 02-Oct-19

Run ID: SR191002-1A

File Name: SRC1005C

Date Prepared: 02-Oct-19

Count Time: 90 minutes

Date Analyzed: 05-Oct-19

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	-8.28E-02 +/- 2.82E-01	6.73E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.22E+02	ug	90.2	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.

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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909216**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028**Lab ID:** SR191002-1LCS**Sample Matrix:** WATER**Prep Batch:** SR191002-1**Final Aliquot:** 994 ml**Prep SOP:** PAI 707 Rev 15**QCBatchID:** SR191002-1-1**Result Units:** pCi/l**Date Collected:** 02-Oct-19**Run ID:** SR191002-1A**File Name:** SRC1005B**Date Prepared:** 02-Oct-19**Count Time:** 30 minutes**Date Analyzed:** 05-Oct-19

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.19E+01 +/- 3.10E+00	1.15E+00	1.160E+01	103	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.51E+02	ug	93.0	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.
 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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: SR191002-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 02-Oct-19
Date Prepared: 02-Oct-19
Date Analyzed: 05-Oct-19

Prep Batch: SR191002-1
QCBatchID: SR191002-1-1
Run ID: SR191002-1A
Count Time: 30 minutes

Final Aliquot: 994 ml
Result Units: pCi/l
File Name: SRC1005B

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.08E+01 +/- 2.85E+00	1.13E+00	1.160E+01	93.8	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.020E+03	9.24E+02	ug	90.4	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.
- 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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	
Lab ID:	SR191002-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 02-Oct-19
Date Prepared: 02-Oct-19
Date Analyzed: 05-Oct-19

Prep Batch: SR191002-1
QCBatchID: SR191002-1-1
Run ID: SR191002-1A
Count Time: 30 minutes

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC1005B

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.19E+01 +/-	3.10E+00	1.15E+00		1.08E+01 +/-	2.85E+00	1.13E+00		0.515	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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (RPD)**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909216**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	
Lab ID:	SR191002-1LCSD

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 02-Oct-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 30 minutes**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005B

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.19E+01 +/-	3.10E+00	1.15E+00		1.08E+01 +/-	2.85E+00	1.13E+00		10.00	20

Comments:**Qualifiers/Flags:**

+ - Duplicate RPD not within limits.
 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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909216**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	B3R4H9
Lab ID:	1909216-1

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 06-Sep-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005A**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	1.14E+02 +/- 2.68E+01	6.83E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.320E+03	1.17E+03	ug	89.1	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.

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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909216**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	B3R4K6
Lab ID:	1909216-2

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 09-Sep-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005A**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	5.46E+02 +/- 1.28E+02	6.80E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.220E+03	1.10E+03	ug	90.3	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.

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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	B3R4K9
Lab ID:	1909216-3

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 15
Date Collected: 09-Sep-19
Date Prepared: 02-Oct-19
Date Analyzed: 05-Oct-19

Prep Batch: SR191002-1
QCBatchID: SR191002-1-1
Run ID: SR191002-1A
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC1005A

Analysis ReqCode: SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	8.82E+01 +/- 2.08E+01	7.10E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.200E+03	1.06E+03	ug	88.2	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.
- 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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909216**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	B3R4L5
Lab ID:	1909216-4

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 09-Sep-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005A**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	2.20E+03 +/- 5.17E+02	7.39E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.250E+03	1.14E+03	ug	91.5	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.

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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909216**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	B3R4W7
Lab ID:	1909216-5

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 09-Sep-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005A**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	1.20E+03 +/- 2.83E+02	7.11E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.270E+03	1.14E+03	ug	90.2	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.

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: SR1909216-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results**Lab Name:** ALS -- Fort Collins**Work Order Number:** 1909216**Client Name:** CH2M HILL Plateau Remediation Company**ClientProject ID:** AEA, September 2019 I19-028

Field ID:	B3R4W9
Lab ID:	1909216-6

Sample Matrix: WATER**Prep SOP:** PAI 707 Rev 15**Date Collected:** 09-Sep-19**Date Prepared:** 02-Oct-19**Date Analyzed:** 05-Oct-19**Prep Batch:** SR191002-1**QCBatchID:** SR191002-1-1**Run ID:** SR191002-1A**Count Time:** 90 minutes**Report Basis:** Unfiltered**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC1005A**Analysis ReqCode:** SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	2.37E+01 +/- 5.66E+00	6.80E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.290E+03	1.18E+03	ug	91.0	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.

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: SR1909216-1

Prep Batch ID: SR191002-1

Start Date: 10/02/19	End Date: 10/02/19	Concentration Method: NONE	Batch Created By: jxh
Start Time: 11:12	End Time: 11:12	Extract Method: PAI 70715	Date Created: 10/02/19
Prep Analyst: Jirushaya Hantula		Initial Volume Units: ml	Time Created: 11:13
Comments:		Final Volume Units: ml	Validated By: jxh
			Date Validated: 10/04/19
			Time Validated: 13:44

QC Batch ID: SR191002-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR191002-1	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1909172
SR191002-1	MB	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
SR191002-1	LCS	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
SR191002-1	LCSD	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909216
1909172-13	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
1909172-14	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
1909172-17	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909172
1909215-6	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909215
1909216-1	SMP	B3R4H9	WATER	9/6/2019	1000	994.01	NONE	1	1909216
1909216-2	SMP	B3R4K6	WATER	9/9/2019	1000	994.01	NONE	1	1909216
1909216-3	SMP	B3R4K9	WATER	9/9/2019	1000	994.01	NONE	1	1909216
1909216-4	SMP	B3R4L5	WATER	9/9/2019	1000	994.01	NONE	1	1909216
1909216-5	SMP	B3R4W7	WATER	9/9/2019	1000	994.01	NONE	1	1909216
1909216-6	SMP	B3R4W9	WATER	9/9/2019	1000	994.01	NONE	1	1909216
1909233-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909233
1909233-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909233
1909233-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909233
1909243-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909243
1909243-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909243
1909243-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1909243

Prep Batch ID: SR191002-1

Start Date: 10/02/19	End Date: 10/02/19	Concentration Method: NONE	Batch Created By: jxh
Start Time: 11:12	End Time: 11:12	Extract Method: PAI 70715	Date Created: 10/02/19
Prep Analyst: Jirushaya Hantula		Initial Volume Units: ml	Time Created: 11:13
Comments:		Final Volume Units: ml	Validated By: jxh
			Date Validated: 10/04/19
			Time Validated: 13:44

QC Types

CAR	Carrier reference sample		DLS	Detection Limit Standard
DUP	Laboratory Duplicate		LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicat		LODV	Limit of Detection Verification
LOQV	Limit of Quantitation Verification		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



Tritium Case Narrative

CH2M HILL Plateau Remediation Company

AEA, September 2019 – I19-028

Work Order Number: 1909216

1. The samples were prepared according to the current revision of SOP 700.
2. The samples were analyzed for the presence of tritium according to the current revision of SOP 704. The analyses were completed on 10/01/2019.
3. The duplicate of sample 1909245-9 and the matrix spikes of sample 1909213-3 are shared for this work order. The duplicate and matrix spikes were performed on CH2M HILL Plateau Remediation Company samples and the results are acceptable. The results can be found in the following report.
4. The analysis results for these samples are reported in units of pCi/L. The samples were not filtered prior to analysis.
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 for either is less than 5 times the sample specific MDC. These samples are identified with an "NC" flag on the Duplicate Sample Results (RPD) page.

6. No anomalous situations were encountered during the preparation or analysis of these samples. 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

10/7/19
Date

Kath M. W.
Radiochemistry Final Data Reviewer

10/09/19
Date

Tritium by Liquid Scintillation

PAI 704 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1909216

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Lab ID: 3H190926-1MB	Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
	Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Result Units: pCi/l
	Date Collected: 26-Sep-19	Run ID: 3H190926-1C	File Name: B60_04_093001
	Date Prepared: 26-Sep-19	Count Time: 90 minutes	
	Date Analyzed: 01-Oct-19		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	-5.11E+01 +/- 1.82E+02	3.09E+02	4.00E+02	NA	U

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.

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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Lab ID: 3H190926-1LCS	Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 9.84 ml
	Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Result Units: pCi/l
	Date Collected: 26-Sep-19	Run ID: 3H190926-1C	File Name: B60_04_093001
	Date Prepared: 26-Sep-19	Count Time: 90 minutes	
	Date Analyzed: 01-Oct-19		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	1.60E+04 +/- 2.46E+03	3.13E+02	1.650E+04	96.6	80 - 120	

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.
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MS

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 10-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	1.58E+04	4.38E+02	3.14E+02	1.650E+04	92.7	80 - 120	

Comments:

Qualifiers/Flags:

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

MDC - Sample specific Minimum Detectable Concentration

Data Package ID: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Matrix Spike Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MSD

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 10-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 9.84 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	1.67E+04	4.38E+02	3.14E+02	1.650E+04	98.0	80 - 120	

Comments:

Qualifiers/Flags:

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

MDC - Sample specific Minimum Detectable Concentration

Data Package ID: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3

Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Prep Basis: Unfiltered
Date Collected: 10-Sep-19	Run ID: 3H190926-1C	Moisture(%): 100.000
Date Prepared: 26-Sep-19	Count Time: 90 minutes	Result Units: pCi/l
Date Analyzed: 30-Sep-19	Report Basis: Unfiltered	File Name: B60_04_093001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	4.38E+02 +/- 2.07E+02	3.09E+02	4E+02	NA	

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.
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 1909216

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MSD

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 10-Sep-19

Date Prepared: 26-Sep-19

Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1

QCBatchID: 3H190926-1-2

Run ID: 3H190926-1C

Count Time: 90 minutes

Report Basis: Unfiltered

Final Aliquot: 9.84 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	1.58E+04 +/-	2.44E+03	3.14E+02		1.67E+04 +/-	2.57E+03	3.14E+02		0.249	2.13

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.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 1909216

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909213-3MSD

Sample Matrix: WATER
 Prep SOP: PAI 700 Rev 15
 Date Collected: 10-Sep-19
 Date Prepared: 26-Sep-19
 Date Analyzed: 30-Sep-19

Prep Batch: 3H190926-1
 QCBatchID: 3H190926-1-2
 Run ID: 3H190926-1C
 Count Time: 90 minutes
 Report Basis: Unfiltered

Final Aliquot: 9.84 ml
 Prep Basis: Unfiltered
 Moisture(%): 100.000
 Result Units: pCi/l
 File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	1.58E+04 +/- 2.44E+03		3.14E+02		1.67E+04 +/- 2.57E+03		3.14E+02		5.00	20

Comments:

Qualifiers/Flags:

- + - Duplicate RPD not within limits.
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 1909216

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909245-9DUP

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 11-Sep-19

Date Prepared: 26-Sep-19

Date Analyzed: 01-Oct-19

Prep Batch: 3H190926-1

QCBatchID: 3H190926-1-2

Run ID: 3H190926-1C

Count Time: 90 minutes

Report Basis: Unfiltered

Final Aliquot: 10.0 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	5.92E+02 +/-	2.19E+02	3.09E+02		5.31E+02 +/-	2.14E+02	3.09E+02		0.198	2.13

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.
- W - DER is greater than Warning Limit of 1.42
- D - DER is greater than Control Limit of 2.13
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909245-9DUP

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 11-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	5.92E+02 +/-	2.19E+02	3.09E+02		5.31E+02 +/-	2.14E+02	3.09E+02		NC	20

Comments:

Qualifiers/Flags:

- + - Duplicate RPD not within limits.
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	Shared QC
Lab ID:	1909245-9

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 11-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	5.92E+02 +/- 2.19E+02	3.09E+02	4E+02	NA	

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.
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Field ID: Shared QC</td> </tr> <tr> <td style="padding: 2px;">Lab ID: 1909245-9DUP</td> </tr> </table>	Field ID: Shared QC	Lab ID: 1909245-9DUP	<p>Sample Matrix: WATER Prep SOP: PAI 700 Rev 15 Date Collected: 11-Sep-19 Date Prepared: 26-Sep-19 Date Analyzed: 01-Oct-19</p>	<p>Prep Batch: 3H190926-1 QCBatchID: 3H190926-1-2 Run ID: 3H190926-1C Count Time: 90 minutes Report Basis: Unfiltered</p>	<p>Final Aliquot: 10.0 ml Prep Basis: Unfiltered Moisture(%): 100.000 Result Units: pCi/l File Name: B60_04_093001</p>
Field ID: Shared QC					
Lab ID: 1909245-9DUP					

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	5.31E+02 +/- 2.14E+02	3.09E+02	4E+02	NA	

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.
- M - The requested MDC was not met.
- M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.
- W - DER is greater than Warning Limit of 1.42

- D - DER is greater than Control Limit of 2.13

Abbreviations:

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

Data Package ID: H31909216-1

Date Printed:

Monday, October 07, 2019

ALS -- Fort Collins

LIMS Version: 6.912

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Tritium by Liquid Scintillation

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Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	B3R4H9
Lab ID:	1909216-1

Sample Matrix: WATER	Prep Batch: 3H190926-1	Final Aliquot: 10.0 ml
Prep SOP: PAI 700 Rev 15	QCBatchID: 3H190926-1-2	Prep Basis: Unfiltered
Date Collected: 06-Sep-19	Run ID: 3H190926-1C	Moisture(%): 100.000
Date Prepared: 26-Sep-19	Count Time: 90 minutes	Result Units: pCi/l
Date Analyzed: 01-Oct-19	Report Basis: Unfiltered	File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	4.36E+03 +/- 7.19E+02	3.09E+02	4E+02	NA	

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.
- 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: H31909216-1

Tritium by Liquid Scintillation

PAI 704 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1909216
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, September 2019 I19-028

Field ID:	B3R4W9
Lab ID:	1909216-6

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 15
Date Collected: 09-Sep-19
Date Prepared: 26-Sep-19
Date Analyzed: 01-Oct-19

Prep Batch: 3H190926-1
QCBatchID: 3H190926-1-2
Run ID: 3H190926-1C
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: B60_04_093001

Analysis ReqCode: TRITIUM_DIST_L

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	7.16E+03 +/- 1.13E+03	3.09E+02	4E+02	NA	

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.
- 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: H31909216-1

Prep Batch ID: 3H190926-1

Start Date: 09/26/19	End Date: 09/26/19	Concentration Method: NONE	Batch Created By: rgs
Start Time: 11:25	End Time: 11:25	Extract Method: PAI 70015	Date Created: 09/26/19
Prep Analyst: Reilly G. Stockton		Initial Volume Units: ml	Time Created: 11:25
Comments:		Final Volume Units: ml	Validated By: rgs
			Date Validated: 09/29/19
			Time Validated: 7:26

QC Batch ID: 3H190926-1-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
3H190926-1	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1CB1	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1CB2	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1CB3	MB	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
3H190926-1	LCS	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909213
1909213-3	MS	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909213
1909213-3	MSD	XXXXXX	WATER	XXXXXX	30	9.8361	NONE	1	1909213
1909245-9	DUP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909245
1909213-3	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909213
1909216-1	SMP	B3R4H9	WATER	9/6/2019	30	10	NONE	1	1909216
1909216-6	SMP	B3R4W9	WATER	9/9/2019	30	10	NONE	1	1909216
1909233-2	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909233
1909233-3	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909233
1909241-1	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909241
1909243-2	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909243
1909245-9	SMP	XXXXXX	WATER	XXXXXX	30	10	NONE	1	1909245

QC Types

CAR	Carrier reference sample	DLS	Detection Limit Standard
DUP	Laboratory Duplicate	LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicat	LODV	Limit of Detection Verification
LOQV	Limit of Quantitation Verification	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