



Friday, January 31, 2020

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

Re: ALS Workorder: 2001206
Project Name: AEA, January 2020
Project Number: I20-009

Dear Ms. Waters-Husted:

One water sample was received from CH2M HILL Plateau Remediation Company, on 1/16/2020. The sample was scheduled for the following analyses:

Gamma Spectroscopy
Technetium-99

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. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental.

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: 2001206

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: AEA, January 2020

Client Project Number: I20-009

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3TRT5	2001206-1		WATER	13-Jan-20	13:57

2001206

23145

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

C.O.C.#
I20-009-026

Page 1 of 1

Collector: Malcom Chunn CHPRC		Contact/Requester: Karen Waters-Husted		Telephone No.: 509-376-4650	
SAF No.: I20-009		Sampling Origin: Hanford Site		Purchase Order/Charge Code: 300071	
Project Title: AEA, January 2020		Logbook No.: HNF-N-506 113/16		Ice Chest No.: GWS-646	
Shipped To (Lab): ALS Environmental Ft. Collins		Method of Shipment: Commercial Carrier		Bill of Lading/Air Bill No.: 7774 71569890	
Protocol: SURV		Priority: 30 Days		Offsite Property No.: NA	

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
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Sample No.	Filter	*	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3TRT5	N	W	JAN 13 2020	1357	1x1-L G/P	GAMMA_GS: COMMON; GAMMA_GS: GW 01	6 Months	HNO3 to pH <2
B3TRT5	N	W	JAN 13 2020	1357	1x500-mL G/P	TC99_SEP_LSC: COMMON	6 Months	HNO3 to pH <2

Relinquished By			Received By			Matrix *	
Print First and Last Name	Signature	Date/Time	Print First and Last Name	Signature	Date/Time	S = Soil	DS = Drum Solids
CHPRC M R C	<i>[Signature]</i>	JAN 13 2020 1450	SSU-1	<i>[Signature]</i>	JAN 13 2020 1450	SE = Sediment	DL = Drum Liquids
SSU-1	<i>[Signature]</i>	JAN 14 2020 0718	Ivan Schaeffer CHPRC	<i>[Signature]</i>	JAN 14 2020 0718	SO = Solid	T = Tissue
Ivan Schaeffer CHPRC	<i>[Signature]</i>	JAN 14 2020 1400	FEDEX	<i>[Signature]</i>		SL = Sludge	WI = Wipe
			Erik Evans	<i>[Signature]</i>	1/16/20 0900	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:
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3 of 30

ALS2001206

Jan. 31, 2020

Rev. 0



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CHPRC Workorder No: 2001206
Project Manager: KMO Initials: EE Date: 01-15-20

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 samples in proper containers for requested analyses? (form 250, Sample Handling Guidelines)		<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 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
13. Were the samples shipped on ice?		<input checked="" type="radio"/> YES	<input type="radio"/> NO
14. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*:	#3	#5
			RAD ONLY
		<input checked="" type="radio"/> YES	<input type="radio"/> NO
Cooler #:	<u>646</u>		
Temperature (°C):	<u>0.2</u>		
# of custody seals on cooler:	<u>2</u>		
External mR/hr reading:	<u>11</u>		
Background mR/hr reading:	<u>11</u>		
Were external mR/hr readings ≤ two times background and within DOT acceptance criteria? <input checked="" type="radio"/> YES / <input type="radio"/> NO / <input type="radio"/> 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.

Were unpreserved bottles pH checked? YES / NA All client bottle ID's vs ALS lab ID's double-checked by: EE

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

Project Manager Signature / Date: [Signature] 1/17/20

2001206

ORIGIN ID:PSCA (509) 373-3580
JANELLE ZUNKER
CH2M
6289 LATAH ST.

SHIP DATE: 14JAN20
ACTWGT: 23.00 LB
CAD: 107066051/NET4160

RICHLAND, WA 99354
UNITED STATES US

BILL THIRD PARTY

TO JULIE ELLINGSON
ALS GLOBAL
225 COMMERCE DRIVE

11-2

FORT COLLINS CO 80524

Q20C

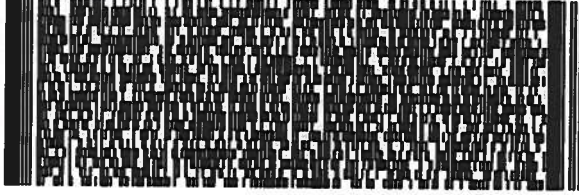
(970) 490-1511

REF: 3000721/GWS-646

INV:

PO:

DEPT:



5672JDR205A2

TRK# 7774 7156 9890
0201

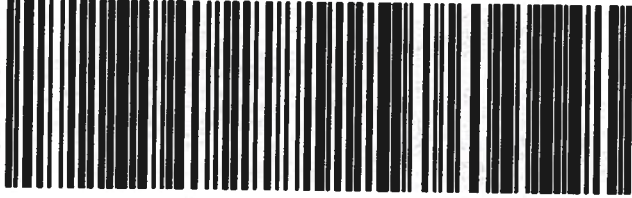
WED - 15 JAN 10:30A
PRIORITY OVERNIGHT

DSR

80524

CO-US DEN

XH FTCA



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Gamma Spectroscopy Case Narrative

CH2M HILL Plateau Remediation Company

AEA, January 2020 – I20-009

Work Order Number: 2001163

1. The 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 01/28/2020.
3. The analysis results for the sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. The duplicate of sample 2001299-1 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. Sample volume was insufficient to allow preparation of a duplicate. A duplicate analysis of sample 2001299-1 was performed in lieu of a prepared 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. 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.

7. There are cases where the magnitude of negative activity is greater than the 2σ 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 problems were encountered with either the client sample or the associated quality control 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
Radiochemistry Primary Data Reviewer

1/31/20
Date



Radiochemistry Final Data Reviewer

1/31/20
Date

Gamma Spectroscopy Results

PAI 713 Rev 15

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Lab ID: GS200123-9BMB	Sample Matrix: WATER	Prep Batch: GS200123-9	Final Aliquot: 1000 ml
Library: FANP.LIB	Prep SOP: PAI 739 Rev 13	QCBatchID: GS200123-9-2	Result Units: pCi/l
	Date Collected: 23-Jan-20	Run ID: GS200123-9A	File Name: 200091d09B
	Date Prepared: 23-Jan-20	Count Time: 240 minutes	
	Date Analyzed: 28-Jan-20		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	0E+00 +/- 6.02E+00	1.09E+01		NA	U
13967-70-9	Cs-134	-3.70E-01 +/- 5.44E+00	9.49E+00		NA	U
10045-97-3	Cs-137	-3.22E+00 +/- 4.76E+00	8.92E+00	1.00E+01	NA	U
14683-23-9	Eu-152	9.27E+00 +/- 2.90E+01	5.07E+01		NA	U
15585-10-1	Eu-154	3.18E+00 +/- 3.08E+01	5.45E+01		NA	U
14391-16-3	Eu-155	3.44E+00 +/- 1.02E+01	1.71E+01		NA	U
13966-00-2	K-40	-2.77E+01 +/- 8.99E+01	1.61E+02		NA	U
14234-35-6	Sb-125	1.16E+00 +/- 1.15E+01	2.00E+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.
 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: GSW2001206-1

Gamma Spectroscopy Results

PAI 713 Rev 15

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Lab ID: GS200123-9LCS

Library: ANALYTICAL.LI

Sample Matrix: WATER
Prep SOP: PAI 739 Rev 13
Date Collected: 23-Jan-20
Date Prepared: 23-Jan-20
Date Analyzed: 27-Jan-20

Prep Batch: GS200123-9
QCBatchID: GS200123-9-2
Run ID: GS200123-9A
Count Time: 30 minutes

Final Aliquot: 1000 ml
Result Units: pCi/l
File Name: 200092d08

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14596-10-2	Am-241	9.22E+04 +/- 1.08E+04	3.72E+02	1.010E+05	91.1	85 - 115	
10198-40-0	Co-60	3.87E+04 +/- 4.54E+03	1.16E+02	3.880E+04	99.8	85 - 115	
10045-97-3	Cs-137	3.71E+04 +/- 4.36E+03	1.79E+02	3.770E+04	98.4	85 - 115	

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.
 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: GSW2001206-1

Gamma Spectroscopy Results

PAI 713 Rev 15

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Field ID:	Shared QC
Lab ID:	2001299-1DUP

Library: FANP.LIB

Sample Matrix: WATER
Prep SOP: PAI 739 Rev 13
Date Collected: 20-Jan-20
Date Prepared: 23-Jan-20
Date Analyzed: 27-Jan-20

Prep Batch: GS200123-9
QCBatchID: GS200123-9-2
Run ID: GS200123-9A
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 1000 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: 200098d10

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10198-40-0	Co-60	-1.86E+00 +/- 5.99E+00		1.12E+01	U	-2.60E+00 +/- 4.55E+00		8.45E+00	U	0.199	3
13967-70-9	Cs-134	-2.42E+00 +/- 4.97E+00		8.95E+00	U	-1.36E+00 +/- 4.75E+00		8.30E+00	U	0.31	3
10045-97-3	Cs-137	-5.07E+00 +/- 4.91E+00		9.40E+00	U	-1.65E-01 +/- 4.40E+00		7.71E+00	U	1.49	3
14683-23-9	Eu-152	1.30E+01 +/- 2.90E+01		4.99E+01	U	-1.95E+01 +/- 2.52E+01		4.68E+01	U	1.69	3
15585-10-1	Eu-154	-7.96E+00 +/- 3.42E+01		6.17E+01	U	2.54E+01 +/- 2.33E+01		3.68E+01	U	1.61	3
14391-16-3	Eu-155	-4.93E-01 +/- 1.02E+01		1.74E+01	U	-8.27E-01 +/- 1.88E+01		3.23E+01	U	0.0312	3
13966-00-2	K-40	-1.59E+00 +/- 1.01E+02		1.77E+02	U	-4.21E+01 +/- 6.36E+01		1.14E+02	U	0.677	3
14234-35-6	Sb-125	-3.89E+00 +/- 1.14E+01		2.05E+01	U	-7.30E+00 +/- 1.10E+01		1.98E+01	U	0.429	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

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.

Data Package ID: GSW2001206-1

Gamma Spectroscopy Results

PAI 713 Rev 15

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Field ID:	Shared QC
Lab ID:	2001299-1DUP

Library: FANP.LIB

Sample Matrix: WATER

Prep SOP: PAI 739 Rev 13

Date Collected: 20-Jan-20

Date Prepared: 23-Jan-20

Date Analyzed: 27-Jan-20

Prep Batch: GS200123-9

QCBatchID: GS200123-9-2

Run ID: GS200123-9A

Count Time: 90 minutes

Report Basis: Unfiltered

Final Aliquot: 1000 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: 200098d10

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10198-40-0	Co-60	-1.86E+00 +/- 5.99E+00		1.12E+01	U	-2.60E+00 +/- 4.55E+00		8.45E+00	U	NC	20
13967-70-9	Cs-134	-2.42E+00 +/- 4.97E+00		8.95E+00	U	-1.36E+00 +/- 4.75E+00		8.30E+00	U	NC	20
10045-97-3	Cs-137	-5.07E+00 +/- 4.91E+00		9.40E+00	U	-1.65E-01 +/- 4.40E+00		7.71E+00	U	NC	20
14683-23-9	Eu-152	1.30E+01 +/- 2.90E+01		4.99E+01	U	-1.95E+01 +/- 2.52E+01		4.68E+01	U	NC	20
15585-10-1	Eu-154	-7.96E+00 +/- 3.42E+01		6.17E+01	U	2.54E+01 +/- 2.33E+01		3.68E+01	U	NC	20
14391-16-3	Eu-155	-4.93E-01 +/- 1.02E+01		1.74E+01	U	-8.27E-01 +/- 1.88E+01		3.23E+01	U	NC	20
13966-00-2	K-40	-1.59E+00 +/- 1.01E+02		1.77E+02	U	-4.21E+01 +/- 6.36E+01		1.14E+02	U	NC	20
14234-35-6	Sb-125	-3.89E+00 +/- 1.14E+01		2.05E+01	U	-7.30E+00 +/- 1.10E+01		1.98E+01	U	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

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: GSW2001206-1

Gamma Spectroscopy Results

PAI 713 Rev 15

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Field ID:	Shared QC
Lab ID:	2001299-1

Library: FANP.LIB

Sample Matrix: WATER
Prep SOP: PAI 739 Rev 13
Date Collected: 20-Jan-20
Date Prepared: 23-Jan-20
Date Analyzed: 27-Jan-20

Prep Batch: GS200123-9
QCBatchID: GS200123-9-2
Run ID: GS200123-9A
Count Time: 240 minutes
Report Basis: Unfiltered

Final Aliquot: 1000 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: 200088d09

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	-1.86E+00 +/- 5.99E+00	1.12E+01		NA	U
13967-70-9	Cs-134	-2.42E+00 +/- 4.97E+00	8.95E+00		NA	U
10045-97-3	Cs-137	-5.07E+00 +/- 4.91E+00	9.40E+00	1E+01	NA	U
14683-23-9	Eu-152	1.30E+01 +/- 2.90E+01	4.99E+01		NA	U
15585-10-1	Eu-154	-7.96E+00 +/- 3.42E+01	6.17E+01		NA	U
14391-16-3	Eu-155	-4.93E-01 +/- 1.02E+01	1.74E+01		NA	U
13966-00-2	K-40	-1.59E+00 +/- 1.01E+02	1.77E+02		NA	U
14234-35-6	Sb-125	-3.89E+00 +/- 1.14E+01	2.05E+01		NA	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC or less than the associated TP
 I1
 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

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: GSW2001206-1

Gamma Spectroscopy Results

PAI 713 Rev 15

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Field ID:	Shared QC
Lab ID:	2001299-1DUP

Library: FANP.LIB

Sample Matrix: WATER
Prep SOP: PAI 739 Rev 13
Date Collected: 20-Jan-20
Date Prepared: 23-Jan-20
Date Analyzed: 27-Jan-20

Prep Batch: GS200123-9
QCBatchID: GS200123-9-2
Run ID: GS200123-9A
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 1000 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: 200098d10

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10198-40-0	Co-60	-2.60E+00 +/- 4.55E+00	8.45E+00		NA	U
13967-70-9	Cs-134	-1.36E+00 +/- 4.75E+00	8.30E+00		NA	U
10045-97-3	Cs-137	-1.65E-01 +/- 4.40E+00	7.71E+00	1E+01	NA	U
14683-23-9	Eu-152	-1.95E+01 +/- 2.52E+01	4.68E+01		NA	U
15585-10-1	Eu-154	2.54E+01 +/- 2.33E+01	3.68E+01		NA	U
14391-16-3	Eu-155	-8.27E-01 +/- 1.88E+01	3.23E+01		NA	U
13966-00-2	K-40	-4.21E+01 +/- 6.36E+01	1.14E+02		NA	U
14234-35-6	Sb-125	-7.30E+00 +/- 1.10E+01	1.98E+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.
 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: GSW2001206-1

Date Printed:

Friday, January 31, 2020

ALS -- Fort Collins

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LIMS Version: 7.004

Gamma Spectroscopy Results

PAI 713 Rev 15

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Field ID:	B3TRT5
Lab ID:	2001206-1

Sample Matrix: WATER	Prep Batch: GS200123-9	Final Aliquot: 1000 ml
Prep SOP: PAI 739 Rev 13	QCBatchID: GS200123-9-2	Prep Basis: Unfiltered
Date Collected: 13-Jan-20	Run ID: GS200123-9A	Moisture(%): NA
Date Prepared: 23-Jan-20	Count Time: 210 minutes	Result Units: pCi/l
Date Analyzed: 27-Jan-20	Report Basis: Unfiltered	File Name: 200091d08

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	-1.01E+00 +/- 5.43E+00	1.00E+01		NA	U
13967-70-9	Cs-134	5.19E-01 +/- 5.21E+00	8.98E+00		NA	U
10045-97-3	Cs-137	-3.60E+00 +/- 4.60E+00	8.64E+00	1E+01	NA	U
14683-23-9	Eu-152	3.36E+00 +/- 2.69E+01	4.80E+01		NA	U
15585-10-1	Eu-154	-1.88E+01 +/- 2.89E+01	5.44E+01		NA	U
14391-16-3	Eu-155	-5.52E-01 +/- 8.68E+00	1.50E+01		NA	U
13966-00-2	K-40	-4.30E+01 +/- 8.39E+01	1.52E+02		NA	U
14234-35-6	Sb-125	9.20E+00 +/- 1.08E+01	1.89E+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.
 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: GSW2001206-1

Prep Batch ID: GS200123-9

Start Date: 01/23/20	End Date: 01/31/20	Concentration Method: NONE	Batch Created By: sdw
Start Time: 12:00	End Time: 12:00	Extract Method: PAI 73913	Date Created: 01/23/20
Prep Analyst: Steven D. White		Initial Volume Units: ml	Time Created: 16:15
Comments:		Final Volume Units: ml	Validated By: sdw
			Date Validated: 01/23/20
			Time Validated: 16:19

QC Batch ID: GS200123-9-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
GS200123-9B	MB	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	2001206
GS200123-9	LCS	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	2001206
2001299-1	DUP	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	2001206
2001206-1	SMP	B3TRT5	WATER	1/13/2020	1000	1000	NONE	1	2001206
2001299-1	SMP	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	2001206

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	



Technetium-99

Case Narrative

CH2M HILL Plateau Remediation Company

AEA, January 2020 – I20-009

Work Order Number: 2001206

1. The sample was prepared according to the current revision of SOP 755, with procedure modifications outlined in QASS 378635 and 378636.
2. The sample was analyzed for the presence of ⁹⁹Tc according to the current revision of SOP 704. The analysis was completed on 01/30/2020.
3. The duplicate of sample 2001250-1 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.
4. Prior to analysis of the sample, an approximate volume of 15 µL of nitro-methane was added to the sample and associated QC to bring them into the usable calibration range.
5. A laboratory control sample duplicate (LCSD) was prepared in batch TC200122-1 to meet another client's duplicate requirements. The LCSD results are included in this package as an additional QC measure.
6. The analysis results for the sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
7. 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.

8. 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

1/31/20
Date

Kath M. W.
Radiochemistry Final Data Reviewer

1/31/20
Date

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Lab ID: TC200122-1MB	Sample Matrix: WATER	Prep Batch: TC200122-1	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC200122-1-3	Result Units: pCi/l
	Date Collected: 22-Jan-20	Run ID: TC200122-1A	File Name: Z20200129_1627
	Date Prepared: 22-Jan-20	Count Time: 30 minutes	
	Date Analyzed: 30-Jan-20		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	5.87E-01 +/- 1.28E+00	2.19E+00	2.00E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.750E+03	4.27E+03	Pci	89.9	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.

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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Lab ID: TC200122-1LCS	Sample Matrix: WATER	Prep Batch: TC200122-1	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC200122-1-3	Result Units: pCi/l
	Date Collected: 22-Jan-20	Run ID: TC200122-1A	File Name: Z20200129_1627
	Date Prepared: 22-Jan-20	Count Time: 30 minutes	
	Date Analyzed: 30-Jan-20		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	8.31E+02 +/- 1.33E+02	2.03E+00	9.110E+02	91.3	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.750E+03	4.70E+03	Pci	98.8	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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Lab ID: TC200122-1LCSD	Sample Matrix: WATER	Prep Batch: TC200122-1	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC200122-1-3	Result Units: pCi/l
	Date Collected: 22-Jan-20	Run ID: TC200122-1A	File Name: Z20200129_1627
	Date Prepared: 22-Jan-20	Count Time: 30 minutes	
	Date Analyzed: 30-Jan-20		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	8.98E+02 +/- 1.44E+02	2.31E+00	9.110E+02	98.6	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.750E+03	4.35E+03	Pci	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.
 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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Field ID:	
Lab ID:	TC200122-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 22-Jan-20
Date Prepared: 22-Jan-20
Date Analyzed: 30-Jan-20

Prep Batch: TC200122-1
QCBatchID: TC200122-1-3
Run ID: TC200122-1A
Count Time: 30 minutes

Final Aliquot: 250 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20200129_1627

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	8.31E+02 +/-	1.33E+02	2.03E+00		8.98E+02 +/-	1.44E+02	2.31E+00		0.681	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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Field ID:	
Lab ID:	TC200122-1LCSD

Sample Matrix: WATER
 Prep SOP: PAI 755 Rev 12
 Date Collected: 22-Jan-20
 Date Prepared: 22-Jan-20
 Date Analyzed: 30-Jan-20

Prep Batch: TC200122-1
 QCBatchID: TC200122-1-3
 Run ID: TC200122-1A
 Count Time: 30 minutes

Final Aliquot: 250 ml
 Prep Basis: Unfiltered
 Moisture(%): NA
 Result Units: pCi/l
 File Name: Z20200129_1627

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	8.31E+02 +/-	1.33E+02	2.03E+00		8.98E+02 +/-	1.44E+02	2.31E+00		8.00	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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Field ID:	Shared QC
Lab ID:	2001250-1DUP

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 14-Jan-20
Date Prepared: 22-Jan-20
Date Analyzed: 30-Jan-20

Prep Batch: TC200122-1
QCBatchID: TC200122-1-3
Run ID: TC200122-1A
Count Time: 30 minutes

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20200129_1627

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	1.09E+02 +/-	1.97E+01	4.97E+00		1.03E+02 +/-	1.89E+01	5.34E+00		0.428	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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Field ID:	Shared QC
Lab ID:	2001250-1DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 14-Jan-20

Date Prepared: 22-Jan-20

Date Analyzed: 30-Jan-20

Prep Batch: TC200122-1

QCBatchID: TC200122-1-3

Run ID: TC200122-1A

Count Time: 30 minutes

Final Aliquot: 100 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: Z20200129_1627

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	1.09E+02 +/-	1.97E+01	4.97E+00		1.03E+02 +/-	1.89E+01	5.34E+00		6.00	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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 2001206
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: AEA, January 2020 I20-009

Field ID:	Shared QC
Lab ID:	2001250-1

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 14-Jan-20
Date Prepared: 22-Jan-20
Date Analyzed: 30-Jan-20

Prep Batch: TC200122-1
QCBatchID: TC200122-1-3
Run ID: TC200122-1A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 100 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: Z20200129_1627

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	1.09E+02 +/- 1.97E+01	4.97E+00	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.750E+03	4.69E+03	Pci	98.8	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: TC2001206-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Field ID: Shared QC	Sample Matrix: WATER	Prep Batch: TC200122-1	Final Aliquot: 100 ml
Lab ID: 2001250-1DUP	Prep SOP: PAI 755 Rev 12	QCBatchID: TC200122-1-3	Prep Basis: Unfiltered
	Date Collected: 14-Jan-20	Run ID: TC200122-1A	Moisture(%): NA
	Date Prepared: 22-Jan-20	Count Time: 30 minutes	Result Units: pCi/l
	Date Analyzed: 30-Jan-20	Report Basis: Unfiltered	File Name: Z20200129_1627

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	1.03E+02 +/- 1.89E+01	5.34E+00	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.750E+03	4.36E+03	Pci	91.7	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.

M - The requested MDC was not met.

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

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: TC2001206-1

Date Printed:

Friday, January 31, 2020

ALS -- Fort Collins

LIMS Version: 7.004

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Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2001206

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: AEA, January 2020 I20-009

Field ID:	B3TRT5
Lab ID:	2001206-1

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 13-Jan-20

Date Prepared: 22-Jan-20

Date Analyzed: 30-Jan-20

Prep Batch: TC200122-1

QCBatchID: TC200122-1-3

Run ID: TC200122-1A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 100 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: Z20200129_1627

Analysis ReqCode: TC99_SEP_LSC

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	8.39E+01 +/- 1.61E+01	5.72E+00	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.750E+03	4.28E+03	Pci	90.1	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: TC2001206-1

Prep Batch ID: TC200122-1

Start Date: 01/22/20	End Date: 01/22/20	Concentration Method: NONE	Batch Created By: jcp
Start Time: 9:49	End Time: 9:49	Extract Method: PAI 75512	Date Created: 01/22/20
Prep Analyst: John C. Petrovic		Initial Volume Units: ml	Time Created: 9:50
Comments:		Final Volume Units: ml	Validated By: jcp
			Date Validated: 01/23/20
			Time Validated: 9:37

QC Batch ID: TC200122-1-3

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
TC200122-1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2001250
TC200122-1CB1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2001250
TC200122-1CB2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2001250
TC200122-1CB3	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2001250
TC200122-1	LCS	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2001250
TC200122-1	LCSD	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2001250
2001250-1	DUP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	2001250
2001206-1	SMP	B3TRT5	WATER	1/13/2020	100	100	NONE	1	2001206
2001250-1	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	2001250

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

ALS Laboratory Group - Fort Collins

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH General
 TEST Tc99
 METHOD Prep
 SOP/REV (PREP) 755
 SOP/REV (ANAL) _____

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

CLB 8/12/09

Tc99^m 711.2613.17 was used as a tracer for this batch. It has a half-life of 6 hours and therefore must be delivered the day of prep and diluted to a working level solution. The procedure noted below is standard for all Tc99^m dilutions.

1. Open the Pb shielded container and carefully remove the vial containing the Tc99^m primary standard.
2. Withdraw a 1 mL aliquot of the Tc99^m primary standard from the vial using a 10 mL syringe fitted with a hypodermic needle. Dispense the aliquot into a disposable beaker that contains ~100 mL of DI water. Cap and mix well. This intermediate solution is a 1/100x dilution of the primary standard.
3. Using a 10 mL syringe, transfer 10 mL of the intermediate solution prepared in step 2 into a disposable beaker that contains ~70 mL of DI water. Cap and mix well. This working standard solution is a 1/800x dilution of the primary standard.



CLB 8/12/09

CLB 8/12/09

Attach vendor l



Rx# 865370
 Date Ordered : 22Jan2020
 Date/Time Prepared : 23Jan2020 00:25 MT
ALS LABORATORY GROUP
 226 COMMERCE DR
 FORT COLLINS CO 80524-2762
 1 0430 Fort Collins

CardinalHealth
 CARDINAL HEALTH 414, LLC
 DENVER
 10400 48TH AVE. STE B
 DENVER CO 80238
 303.373.0579

Safetrac 


Patient : **Per Physician Order**
 Product : Tc-99m **Sodium Pertechnetate Unit Dose mCi**
 Disp Amt : **0.52 mCi**
 Calibration: **23Jan2020 08:00 MT**

Source - Not for Human Use For Calibration Use Only
 Indication : **Point Source mCi**
 Dispense Date : **23Jan2020** Lot# : **E20023-0002** Price(est) : **N/A**
 Use By : **24Jan2020 00:25 MT** Physician : **Charles Orchard, RSO** NPT :
 Notes : NDC : RPh : **G. Hall**

CAUTION

RADIOACTIVE MATERIALS


Caution: Federal law prohibits dispensing without a prescription - Rx only All Tc-99m drugs are below 0.15 uCi of Mo-99mCi of Tc-99m at EUD.

TECHNICIAN/ANALYST Crystal Shreffler

DATE 8/12/09

DEPARTMENT MANAGER Jeffery Z

DATE 8/12/09

378636

FORM 302r6.doc (4/22/04)

ALS Laboratory Group - Fort Collins

QUALITY ASSURANCE SUMMARY SHEET

PAR W.O. # / BATCH Generic
 TEST Tc99
 METHOD Prep
 SOP/REV (PREP) 755
 SOP/REV (ANAL) _____

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

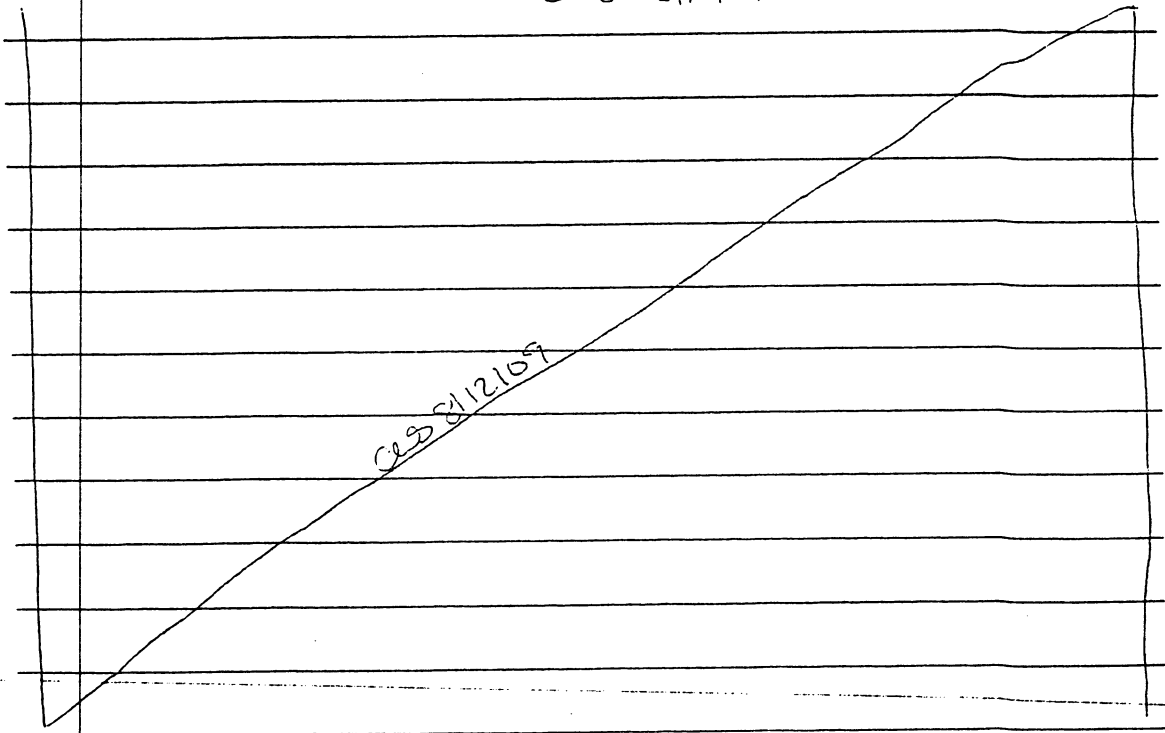
ces 8/12/09

ces 8/12/09

ces 8/12/09

Due to possible matrix interference, a ferric hydroxide precipitation was performed on all samples per SOP 755, section 8.2.10

ces 8/12/09



TECHNICIAN/ANALYST Crystal Sheaffer

DATE 8/12/09

DEPARTMENT MANAGER [Signature]

DATE 8/12/09