



Thursday, October 25, 2018

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

Re: ALS Workorder: 1809204  
Project Name: SURV, SEPTEMBER 2018  
Project Number: S18-009

Dear Ms. Waters-Husted:

Two water samples were received from CH2M HILL Plateau Remediation Company, on 9/12/2018. The samples were scheduled for the following analysis:

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 method 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

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**OrderNum:** 1809204

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

**Client Project Name:** SURV, SEPTEMBER 2018

**Client Project Number:** S18-009

**Client PO Number:** BOA 54854

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Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3KHM8	1809204-1		WATER	10-Sep-18	10:06
B3KHM9	1809204-2		WATER	10-Sep-18	10:06

<b>CH2M Hill Plateau Remediation Company</b> 18092046a1b5		<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b> C.O.C.# S18-009-504 Page 1 of 2	
Collector: <b>Juan Aguilar /CHPRC</b>	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650	
SAF No.: S18-009	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071	
Project Title: SURV, SEPTEMBER 2018	Logbook No.: HNF-N-506-102145	Ice Chest No.: 605-727	
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 773185651986	
Protocol: CERCLA	Priority: 30 Days	Offsite Property No.: 9932	
<b>POSSIBLE SAMPLE HAZARDS/REMARK</b> ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		<b>SPECIAL INSTRUCTIONS</b> N/A	
Sample No. Filter * Date Time No/Type Container	Sample Analysis	Holding Time	Preservative
B3XHM8 (N) W 9-10-18 1006 1x500-mL G/P	TC99_SEP_LSC: COMMON	6 Months	HCl to pH <2

Relinquished By: <b>Juan Aguilar /CHPRC</b>	Received By: <b>Jeff Lucas /CHPRC</b>	SEP 10 2018 1110	SEP 10 2018 1110
Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time
Relinquished By: <b>Jeff Lucas /CHPRC</b>	Received By: <b>SSU-1</b>	SEP 10 2018 1130	SEP 10 2018 1130
Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time
Relinquished By: <b>SSU-1</b>	Received By: <b>Leah Wall /CHPRC</b>	SEP 11 2018 0700	SEP 11 2018 0700
Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time
Relinquished By: <b>Leah Wall /CHPRC</b>	Received By: <b>FEDEX</b>	SEP 11 2018 1400	SEP 11 2018 1400
Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time	Print First and Last Name Signature Date/Time
<b>FINAL SAMPLE DISPOSITION</b>	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

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



<b>CH2M Hill Plateau Remediation Company</b>		<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>		C.O.C.# <b>S18-009-505</b> Page 1 of 2
Collector: <b>Juan Aguilar /CHPRC</b>	Contact/Requester: <b>Karen Waters-Husted</b>	Telephone No.: <b>509-376-4650</b>	11/18	
SAF No.: <b>S18-009</b>	Sampling Origin: <b>Hanford Site</b>	Purchase Order/Charge Code: <b>300071</b>		
Project Title: <b>SURV, SEPTEMBER 2018</b>	Logbook No.: <b>HNF-N-506-102145</b>	Ice Chest No.: <b>605-727</b>		
Shipped To (Lab): <b>ALS Environmental Ft. Collins</b>	Method of Shipment: <b>Commercial Carrier</b>	Bill of Lading/Air Bill No.: <b>7173185651986</b>		
Protocol: <b>CERCLA</b>	Priority: <b>30 Days</b>	Offsite Property No.: <b>9932</b>		
<b>POSSIBLE SAMPLE HAZARDS/REMARK</b> ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		<b>SPECIAL INSTRUCTIONS</b> N/A		
Sample No. <b>B3KHM9</b>	Filter <b>N</b>	* <b>W</b>	No/Type Container <b>1x500-mL G/P</b>	TC99_SEP_LSC: COMMON
	Date <b>9-10-18</b>	Time <b>10:06</b>	Sample Analysis	
			Holding Time <b>6 Months</b>	Preservative <b>HCl to pH &lt;2</b>

Relinquished By: <b>Juan Aguilar /CHPRC</b>	Signature	SEP 10 2018	1110	Received By: <b>Jeff Lucas /CHPRC</b>	Signature	SEP 10 2018	1110	Matrix *
Print First and Last Name		Date/Time	Date/Time	Print First and Last Name		Date/Time	Date/Time	S = Soil
Relinquished By: <b>SSU-1</b>	Signature	SEP 10 2018	1130	Received By: <b>SSU-1</b>	Signature	SEP 10 2018	1130	SE = Sediment
Print First and Last Name		Date/Time	Date/Time	Print First and Last Name		Date/Time	Date/Time	SO = Solid
Relinquished By: <b>SSU-1</b>	Signature	SEP 11 2018	0700	Received By: <b>Loebly Walsh /CHPRC</b>	Signature	SEP 11 2018	0700	SL = Sludge
Print First and Last Name		Date/Time	Date/Time	Print First and Last Name		Date/Time	Date/Time	W = Water
Relinquished By: <b>Loebly Walsh /CHPRC</b>	Signature	SEP 11 2018	1400	Received By: <b>FEDEX</b>	Signature	SEP 11 2018	1400	O = Oil
Print First and Last Name		Date/Time	Date/Time	Print First and Last Name		Date/Time	Date/Time	A = Air
FINAL SAMPLE DISPOSITION				Disposal Method (e.g., Return to customer, per lab procedure, used in process):				Date/Time:





ORIGIN ID: PSCA (509) 528-9426  
LESLY WALL  
CH2M  
6287 LATAH ST  
6289 LATAH ST  
RICHLAND WA 99354  
UNITED STATES US

SHIP DATE: 11SEP18  
ACTWGT: 29.00 LB  
CAD: 107066057/MET4040  
BILL THIRD PARTY

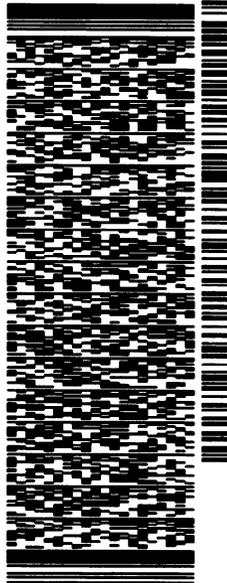
1809204

TO JULIE ELLINGSON  
ALS GLOBAL  
225 COMMERCE DRIVE

10-2  
Amb

FORT COLLINS CO 80524  
(970) 490-1511  
NV  
REF: PTR#9321COOLERM#WS-727

DEPT



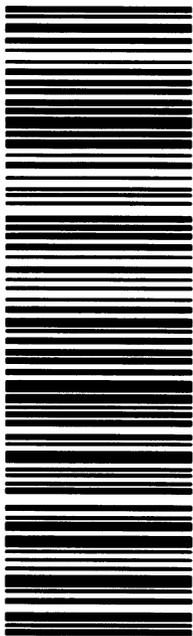
552J1F78C:DCA5

TRK# 7731 8565 1986  
0201

WED - 12 SEP 10:30A  
PRIORITY OVERNIGHT  
DSR

XH FTCA

CO-US DEN  
80524



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# Technetium-99

## Case Narrative

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### CH2M HILL Plateau Remediation Company

SURV, SEPTEMBER 2018 – S18-009

Work Order Number: 1809204

1. These samples were prepared according to the current revision of SOP 755, with procedure modifications outlined in QASS 378635 and 378636.
2. These samples were analyzed for the presence of <sup>99</sup>Tc according to the current revision of SOP 704. The analyses were completed on 10/25/2018.
3. The analysis results for these samples are reported in units of pCi/L. The samples were not filtered prior to analysis.
4. The duplicate of sample 1809370-2 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 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:

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

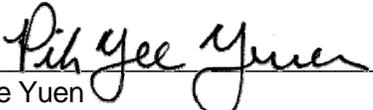
Where: S = sample activity result and D = duplicate activity result. RPD is not evaluated for sample/duplicate pairs where the reported activity for either is less than 5 times the sample specific MDC, as indicated with an "NC" on the Duplicate Sample Results (RPD) page.

7. The calculated yield, as determined by gamma spectrometric analysis of the <sup>99m</sup>Tc tracer, for shared QC sample 1809370-2 fell between 100% and 110%. To minimize the potential for low bias, results have been calculated conservatively assuming quantitative chemical yield (100%). The magnitude of the low bias is estimated to be less than 10% of the reported value and is acceptable according the ALS LQAP.



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  
Radiochemistry Primary Data Reviewer

10/25/18

Date

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

10/25/18

Date

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809204

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, SEPTEMBER 2018 S18-009

Lab ID: tc181017-2MB	Sample Matrix: WATER	Prep Batch: tc181017-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: tc181017-2-1	Result Units: pCi/l
	Date Collected: 17-Oct-18	Run ID: TC181017-2A	File Name: B60_12_102501
	Date Prepared: 17-Oct-18	Count Time: 60 minutes	
	Date Analyzed: 25-Oct-18		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	3.00E-01 +/- 4.22E+00	7.04E+00	2.00E+01	NA	U

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.09E+03	Pci	96.1	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.

LT - Result is less than Requested MDC, greater than sample specific MDC.

#### Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

DL - Decision Level

Data Package ID: TC1809204-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 1809204

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, SEPTEMBER 2018 S18-009

Lab ID: tc181017-2LCS	Sample Matrix: WATER	Prep Batch: tc181017-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: tc181017-2-1	Result Units: pCi/l
	Date Collected: 17-Oct-18	Run ID: TC181017-2A	File Name: B60_12_102201
	Date Prepared: 17-Oct-18	Count Time: 30 minutes	
	Date Analyzed: 23-Oct-18		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	9.10E+02 +/- 1.46E+02	1.03E+01	9.110E+02	99.9	75 - 125	

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	4.94E+03	Pci	93.3	40 - 110 %	

### Comments:

#### Qualifiers/Flags:

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

#### Abbreviations:

TPU - Total Propagated Uncertainty  
 MDC - Minimum Detectable Concentration

Data Package ID: TC1809204-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 1809204

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, SEPTEMBER 2018 S18-009

Field ID:	Shared QC
Lab ID:	1809370-2DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60\_12\_102201

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	-1.73E+00 +/- 5.66E+00		9.62E+00	U	2.25E+00 +/- 5.94E+00		9.87E+00	U	0.97	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: TC1809204-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 1809204

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, SEPTEMBER 2018 S18-009

Field ID:	Shared QC
Lab ID:	1809370-2DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60\_12\_102201

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	-1.73E+00 +/- 5.66E+00		9.62E+00	U	2.25E+00 +/- 5.94E+00		9.87E+00	U	NC	20

### Comments:

#### Qualifiers/Flags:

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

M - Requested MDC not met.

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

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

#### Abbreviations:

TPU - Total Propagated Uncertainty

BDL - Below Detection Limit

NR - Not Reported

Data Package ID: TC1809204-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809204

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, SEPTEMBER 2018 S18-009

Field ID:	Shared QC
Lab ID:	1809370-2

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60\_12\_102201

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	-1.73E+00 +/- 5.66E+00	9.62E+00	2E+01	NA	U

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.36E+03	Pci	101	40 - 110 %	

### Comments:

#### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

M - The requested MDC was not met.

#### Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: TC1809204-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809204

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, SEPTEMBER 2018 S18-009

Field ID:	Shared QC
Lab ID:	1809370-2DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60\_12\_102201

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	2.25E+00 +/- 5.94E+00	9.87E+00	2E+01	NA	U

## Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.16E+03	Pci	97.6	40 - 110 %	

## Comments:

### Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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: TC1809204-1

Date Printed:

Thursday, October 25, 2018

ALS -- Fort Collins

LIMS Version: 6.882

Page 1 of 1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1809204

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: SURV, SEPTEMBER 2018 S18-009

Field ID:	B3KHM8
Lab ID:	1809204-1

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 10-Sep-18

Date Prepared: 17-Oct-18

Date Analyzed: 23-Oct-18

Prep Batch: tc181017-2

QCBatchID: tc181017-2-1

Run ID: TC181017-2A

Count Time: 11.9 minutes

Report Basis: Unfiltered

Final Aliquot: 250 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: B60\_12\_102201

Analysis ReqCode: TC99\_SEP\_LSC

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	2.84E+03 +/- 4.54E+02	1.55E+01	2E+01	NA	

## Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.28E+03	Pci	99.8	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.

LT - Result is less than Requested MDC, greater than sample specific MDC.

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

M - The requested MDC was not met.

### Abbreviations:

TPU - Total Propagated Uncertainty

MDC - Sample specific Minimum Detectable Concentration

BDL - Below Detection Limit

DL - Decision Level

Data Package ID: TC1809204-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 11

## Sample Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 1809204  
**Client Name:** CH2M HILL Plateau Remediation Company  
**ClientProject ID:** SURV, SEPTEMBER 2018 S18-009

<b>Field ID:</b>	B3KHM9
<b>Lab ID:</b>	1809204-2

**Sample Matrix:** WATER  
**Prep SOP:** PAI 755 Rev 12  
**Date Collected:** 10-Sep-18  
**Date Prepared:** 17-Oct-18  
**Date Analyzed:** 23-Oct-18

**Prep Batch:** tc181017-2  
**QCBatchID:** tc181017-2-1  
**Run ID:** TC181017-2A  
**Count Time:** 11.8 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 250 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** NA  
**Result Units:** pCi/l  
**File Name:** B60\_12\_102201

**Analysis ReqCode:** TC99\_SEP\_LSC

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	2.94E+03 +/- 4.71E+02	1.60E+01	2E+01	NA	

## Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	5.290E+03	5.15E+03	Pci	97.4	40 - 110 %	

## Comments:

### Qualifiers/Flags:

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

### Abbreviations:

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

**Data Package ID:** TC1809204-1

**Prep Batch ID: tc181017-2**

<b>Start Date:</b> 10/17/18	<b>End Date:</b> 10/17/18	<b>Concentration Method:</b> NONE	<b>Batch Created By:</b> trs
<b>Start Time:</b> 14:56	<b>End Time:</b> 14:56	<b>Extract Method:</b> PAI 75512	<b>Date Created:</b> 10/17/18
<b>Prep Analyst:</b> Tyler R. Secor		<b>Initial Volume Units:</b> ml	<b>Time Created:</b> 14:56
<b>Comments:</b>		<b>Final Volume Units:</b> ml	<b>Validated By:</b> trs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			<b>Date Validated:</b> 10/18/18
			<b>Time Validated:</b> 13:56

**QC Batch ID:** tc181017-2-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
tc181017-2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2CB1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2CB2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2CB3	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
tc181017-2	LCS	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809204
1809370-2	DUP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809370
1809204-1	SMP	B3KHM8	WATER	9/10/2018	250	250	NONE	1	1809204
1809204-2	SMP	B3KHM9	WATER	9/10/2018	250	250	NONE	1	1809204
1809269-7	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809269
1809370-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809370
1809396-2	SMP	XXXXXX	WATER	XXXXXX	125	125	NONE	1	1809396
1809403-11	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809403
1809403-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809403
1809461-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809461
1809536-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809536
1809537-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809537
1809581-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809581
1809582-6	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1809582

**QC Types**

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

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.

CLS 8/12/09

Tc99<sup>m</sup> 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<sup>m</sup> dilutions.

1. Open the Pb shielded container and carefully remove the vial containing the Tc99<sup>m</sup> primary standard.
2. Withdraw a 1 mL aliquot of the Tc99<sup>m</sup> 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.

CLS 8/12/09

CLS 8/12/09

Attach vendor label on the right side of page →

CLS 8/12/09

**Rx# 670410**  
 Date Ordered : 17Oct2018  
 Date/Time Prepared : 18Oct2018 02:09 MT  
**ALS LABORATORY GROUP**  
 225 COMMERCE DR  
 FORT COLLINS CO 80524 - 2762  
 1 0359 Fort Collins



**Patient : Per Physician Order**  
 Product : Tc-99m **Sodium Pertechnetate Unit Dose mCi (AP)**  
 Disp Amt : 0.54 mCi  
 Calibration: 18Oct2018 10:00 MT

Not for Human Use For Calibration Use Only  
 Indication : **Calibration**  
 Dispense Date : 18Oct2018 Lot# : E18291-0036 Price(est) : N/A  
 Use By : 19Oct2018 02:09 MT Physician : Charles Orchard, RSO NPT :  
 Notes NDC : RPh : B.Stoltz

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 m BUI3

TECHNICIAN/ANALYST Crystal Sheaffer

DATE 8/12/09

DEPARTMENT MANAGER [Signature]

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 Te99  
 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.

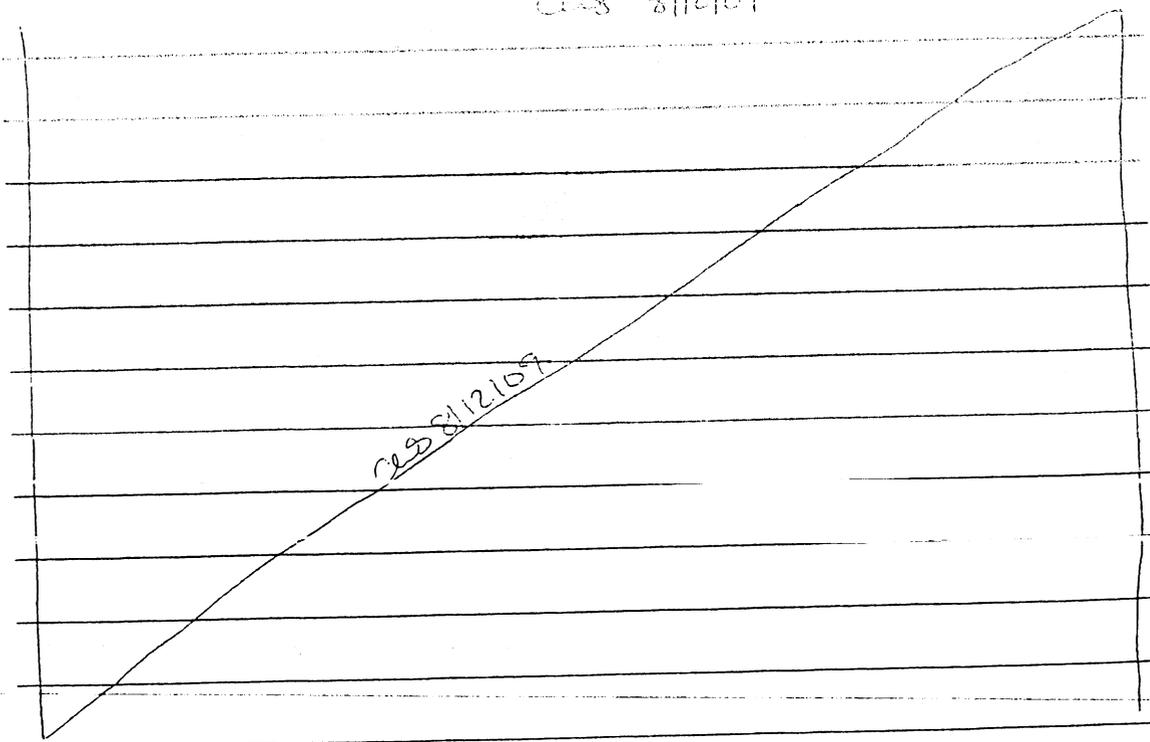
*ews 8/12/09*

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

*ews 8/12/09*

*ews 8/12/09*

*ews 8/12/09*



TECHNICIAN/ANALYST *Crystal Sheaffer*

DATE 8/12/09

DEPARTMENT MANAGER *[Signature]*

DATE 8/12/09

**378635**