



Tuesday, April 20, 2021

Karen Waters-Husted  
Central Plateau Cleanup Company, LLC  
825 Jadwin Avenue  
Richland, WA 99352

Re: ALS Workorder: 2103406  
Project Name: SURV, March 2021  
Project Number: S21-003

Dear Ms. Waters-Husted:

Three water samples were received from Central Plateau Cleanup Company, LLC, on 3/19/2021. The samples were scheduled for the following analyses:

Gross Alpha/Beta

Strontium-90

Technetium-99

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. 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:** 2103406

**Client Name:** Central Plateau Cleanup Company, LLC

**Client Project Name:** SURV, March 2021

**Client Project Number:** S21-003

**Client PO Number:** BOA 74395

---

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B404P1	2103406-1		WATER	17-Mar-21	9:07
B404P4	2103406-2		WATER	17-Mar-21	10:30
B40521	2103406-3		WATER	17-Mar-21	10:31

Collector: <b>Troy Bacon</b> CPCC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: S21-003	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 900152
Project Title: SURV, March 2021	Logbook No.: HNF-N-506 <b>119/43</b>	Ice Chest No.: <b>GLS-235</b>
Shipped To (Lab): <b>ALS Environmental Ft. Collins</b>	Method of Shipment Commercial Carrier	Bill of Lading/Air Bill No.: <b>773196888319</b>
Protocol: SURV	Priority: 30 Days	Offsite Property No.: <b>NA ASB 2/4/21</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.	Filter	*	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B404P1	(	N	W MAR 17 2021	0907	1x500-mL G/P	SMR_ALPHABETA_GPC	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
Troy Bacon CPCC	<i>Troy Bacon</i>	MAR 17 2021 0930	Curt Hoffman CPCC	<i>Curt Hoffman</i>	MAR 17 2021 0930	SE = Sediment	DL = Drum Liquids
Curt Hoffman CPCC	<i>Curt Hoffman</i>	MAR 17 2021 1105	SSU-1		MAR 17 2021 1105	SO = Solid	T = Tissue
Ivan Schaeffer CPCC	<i>Ivan Schaeffer</i>	MAR 18 2021 0615	Ivan Schaeffer CPCC	<i>Ivan Schaeffer</i>	MAR 18 2021 0615	SL = Sludge	WI = Wipe
						W = Water	L = Liquid
						O = Oil	V = Vegetation
						A = Air	X = Other

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

3 of 53

ALS2103406

April 20, 2021

Rev. 0

<b>Central Plateau Cleanup Company</b>	<b>CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST</b>	C.O.C.# <b>S21-003-018</b> 2103406
		Page 1 of 1

Collector: <b>Troy Bacon CPCC</b>	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: S21-003	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 900152
Project Title: SURV, March 2021	Logbook No.: HNF-N-506 <b>119/43</b>	Ice Chest No.: <b>GWS-044</b>
Shipped To (Lab): <b>ALS Environmental Ft. Collins</b>	Method of Shipment Commercial Carrier	Bill of Lading/Air Bill No.: <b>TB190236095</b>
Protocol: SURV	Priority: 30 Days	Offsite Property No.: <b>NA ASB 2/1/21</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.	Filter	*	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B404P4	N	W	MAR 17 2021	1630	2x1-L G/P	SMR_SR_RAD_GPC	6 Months	HNO3 to pH <2
B404P4	N	W	MAR 17 2021	1030	1x250-mL G/P	SMR_TC99_LSC	6 Months	HNO3 to pH <2

Relinquished By			Received By			<b>Matrix *</b> 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
Print First and Last Name	Signature	Date/Time	Print First and Last Name	Signature	Date/Time	
Troy Bacon CPCC	<i>Troy Bacon</i>	MAR 17 2021 1300	SSU-1		MAR 17 2021 1300	
SSU-1		MAR 18 2021	Kathy Turner CPCC	<i>Kathy Turner</i>	MAR 18 2021 0015	
Kathy Turner CPCC	<i>Kathy Turner</i>	MAR 18 2021 1400	FedEx			
			Tyler Mosso	<i>Tyler Mosso</i>	3/21/21 1000	

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

4 of 53

ALS2103406

April 20, 2021

Rev. 0

Central Plateau Cleanup Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST <i>2103406 9181105</i>				C.O.C.# S21-003-022		
Collector: <b>Kevin Patterson</b> CPCC		Contact/Requester: Karen Waters-Husted		Telephone No.: 509-376-4650				
SAF No.: S21-003		Sampling Origin: Hanford Site		Purchase Order/Charge Code: 900152				
Project Title: SURV, March 2021		Logbook No.: HNF-N-506-120-47		Ice Chest No.: <i>GLS-044</i>				
Shipped To (Lab): <b>ALS Environmental Ft. Collins</b>		Method of Shipment Commercial Carrier		Bill of Lading/Air Bill No.: <i>7731 9623 6095</i>				
Protocol: SURV		Priority: 30 Days		Offsite Property No.: <i>NA ASG 2/11/21</i>				
<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
B40521	3	N	W	3-17-21	1031	1x250-mL P SMR_TRITIUM_LSC	6 Months	None

ALS2103406

April 20, 2021

5 of 53

Relinquished By			Received By			Matrix *	
Print First and Last Name	Signature	Date/Time	Print First and Last Name	Signature	Date/Time		
Kevin Patterson CPCC	<i>[Signature]</i>	MAR 17 2021 <sup>1120</sup>	Curt Hoffman CPCC	<i>[Signature]</i>	MAR 17 2021 <sup>1120</sup>	S = Soil	DS = Drum Solids
Curt Hoffman CPCC	<i>[Signature]</i>	MAR 17 2021 <sup>1135</sup>	SSU-1		MAR 17 2021 <sup>1135</sup>	SE = Sediment	DL = Drum Liquids
Kathy Turner CPCC	<i>[Signature]</i>	MAR 18 2021 <sup>0015</sup>	Kathy Turner CPCC	<i>[Signature]</i>	MAR 18 2021 <sup>0015</sup>	SO = Solid	T = Tissue
	FedEx	MAR 18 2021 1400		FEDEX		SL = Sludge	WI = Wipe
				Tyler Mossor	<i>[Signature]</i>	W = Water	L = Liquid
					<i>[Signature]</i>	O = Oil	V = Vegetation
					<i>[Signature]</i>	A = Air	X = Other

Rev. 0



ALS Environmental - Fort Collins  
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CPCC Workorder No: 2103406  
Project Manager: KMO Initials: TEM Date: 3/19/21

		N/A	YES	NO
1.	Are airbills / shipping documents present and/or removable?		X	
	Tracking number:			
2.	Are custody seals on shipping containers intact?		X	
3.	Are custody seals on sample containers intact?		X	
4.	Is there a COC (chain-of-custody) present?		X	
5.	Is the COC in agreement with samples received? (IDs, dates, times, # of samples, # of containers, matrix, requested analyses, etc.)		X	
6.	Are short-hold samples present?			X
7.	Are all samples within holding times for the requested analyses?		X	
8.	Were all sample containers received intact? (not broken or leaking)		X	
9.	Is there sufficient sample for the requested analyses?		X	
10.	Are samples in proper containers for requested analyses? (form 250, <i>Sample Handling Guidelines</i> )		X	
11.	Are all aqueous samples preserved correctly, if required? (excluding volatiles)		X	
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)	X		
13.	Were the samples shipped on ice?		X	
14.	Were cooler temperatures measured at 0.1-6.0°C?			
	IR gun used*: #5			
		RAD ONLY	X	
	Cooler #: <u>1</u> <u>2</u> <u>3</u> <u>4</u>			
	Temperature (°C): <u>0.1</u> <u>1.3</u> <u>0.9</u> <u>0.6</u>			
	# of custody seals on cooler: <u>2</u> <u>2</u> <u>2</u> <u>2</u>			
	External µR/hr reading: <u>9</u> <u>11</u> <u>12</u> <u>11</u>			
	Background µR/hr reading: <u>11</u>			
	Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? YES			

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

---



---



---



---



---



---

Were unpreserved bottles pH checked? YES All client bottle ID's vs ALS lab ID's double-checked by TM

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

Project Manager Signature / Date: [Signature] 3/21/21

ORIGIN ID: PSCA (509) 373-7073  
KATHY TURNER  
6267 LATAH ST.

SHIP DATE: 18MAR21  
ACTWGT: 80.00 LB  
CAD: 107066051/INET4340

HANDFORD WORKS, WA 99352  
UNITED STATES US

BILL THIRD PARTY

TO **JULIE ELLINGSON**  
**ALS**  
**225 COMMERCE DRIVE**

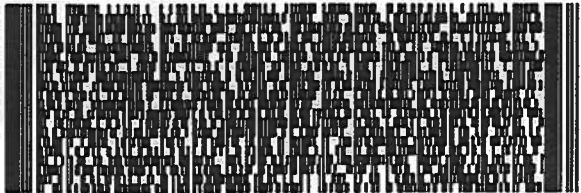
**FORT COLLINS CO 80524**

(970) 480-1511  
INV:  
PO:

REF: GWS-121.800153  
DEPT:

1-2  
0-1

56D.LJAC39FE4A



**FRI - 19 MAR 10:30A**  
**PRIORITY OVERNIGHT**

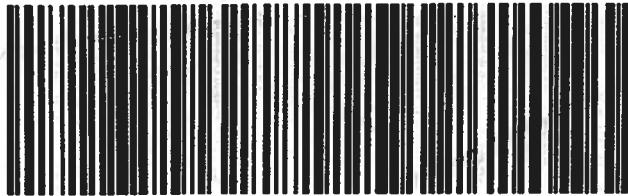
TRK# 7732 0064 2562  
0201

DSR

80524

CO-US DEN

**XH FTCA**



ORIGIN ID: PSCA (509) 373-7073  
KATHY TURNER  
6267 LATAH ST.

SHIP DATE: 18MAR21  
ACTWGT: 88.00 LB  
CAD: 107066051/INET4340

HANDFORD WORKS, WA 99352  
UNITED STATES US

BILL THIRD PARTY

TO **JULIE ELLINGSON**  
**ALS**  
**225 COMMERCE DRIVE**

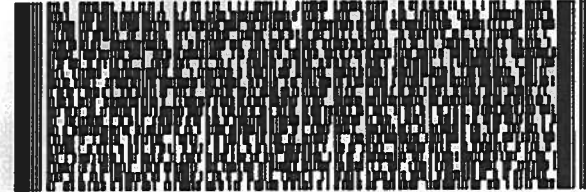
**FORT COLLINS CO 80524**

(970) 480-1511  
INV:  
PO:

REF: GWS-272.800153  
DEPT:

11-2  
1.3

56D.LJAC39FE4A



**FRI - 19 MAR 10:30A**  
**PRIORITY OVERNIGHT**

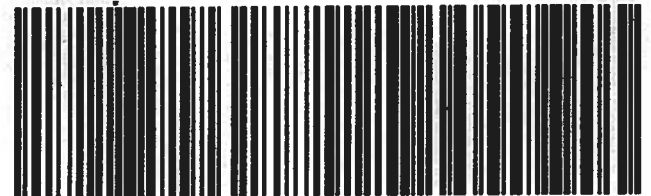
TRK# 7731 9684 8890  
0201

DSR

80524

CO-US DEN

**XH FTCA**



ORIGIN ID:PSCA (509) 373-7073  
KATHY TURNER

SHIP DATE: 18MAR21  
ACTWGT: 100.00 LB  
CAD: 107068051/NET4340

6267 LATAH ST.

HANDFORD WORKS, WA 99352  
UNITED STATES US

BILL THIRD PARTY

TO **JULIE ELLINGSON**  
**ALS**  
**225 COMMERCE DRIVE**

12-2  
0.9

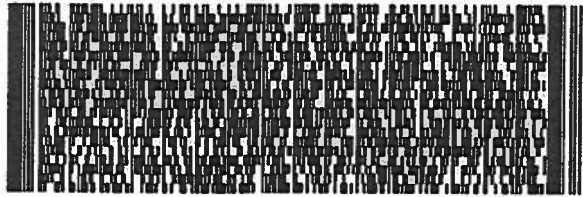
56D.GJAC39FE4A

**FORT COLLINS CO 80524**

(970) 490-1511  
INV:  
PO:

REF: GWS-235.900153

DEPT:

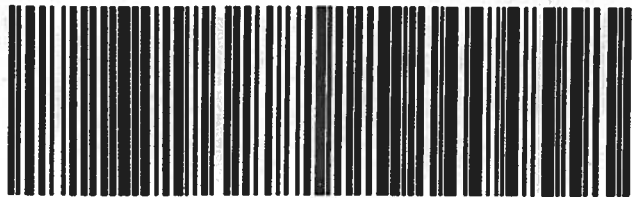


**FRI - 19 MAR 10:30A**  
**PRIORITY OVERNIGHT**

TRK#  
0201 **7731 9688 8379**

DSR  
**80524**  
CO-US **DEN**

**XH FTCA**



ORIGIN ID:PSCA (509) 373-7073  
KATHY TURNER

SHIP DATE: 18MAR21  
ACTWGT: 98.00 LB  
CAD: 107068051/NET4340

6267 LATAH ST.

HANDFORD WORKS, WA 99352  
UNITED STATES US

BILL THIRD PARTY

TO **JULIE ELLINGSON**  
**ALS GLOBAL**  
**225 COMMERCE DRIVE**

11-2  
0.6

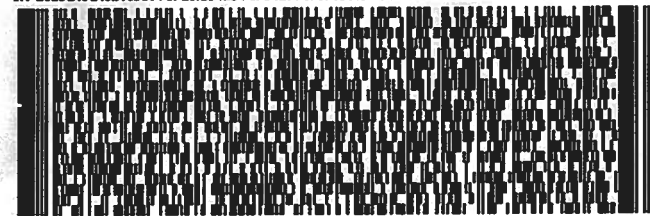
56D.GJAC39FE4A

**FORT COLLINS CO 80524**

(970) 490-1511  
INV:  
PO:

REF: GWS-044.900153

DEPT:



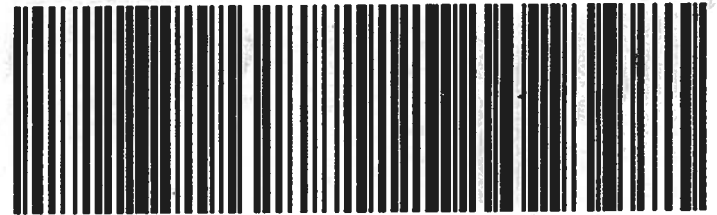
FedEx Ship Manager - Print Your Label(s)

**FRI - 19 MAR 10:30A**  
**PRIORITY OVERNIGHT**

TRK#  
0201 **7731 9623 6695**

DSR  
**80524**  
CO-US **DEN**

**XH FTCA**





# Gross Alpha/Beta Case Narrative

---

## Central Plateau Cleanup Company, LLC

SURV, March 2021 – S21-003

Work Order Number: 2103406

1. The sample was prepared according to the current revision of SOP 702.
2. The sample was analyzed for gross alpha and beta activity by gas flow proportional counting according to the current revision of SOP 724. The analysis was completed on 04/02/2021. Gross alpha results are referenced to  $^{241}\text{Am}$ . Gross beta results are referenced to  $^{90}\text{Sr/Y}$ .
3. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. The matrix spike of sample 2103359-1 is shared for this work order. The matrix spike was performed on a Central Plateau Cleanup Company, LLC sample. The results can be found in the following report.
5. The duplicate error ratio (DER) for gross alpha for samples 2103406-1 and -1DUP was elevated above the upper control limit of 3 at 3.5. DER is defined as:

$$DER = \frac{|S - D|}{\sqrt{\sigma_S^2 + \sigma_D^2}}$$

Where: S = sample result, D = duplicate result,  $\sigma_S$  = 1 sigma uncertainty of sample result, and  $\sigma_D$  = 1 sigma uncertainty of the duplicate result. The DER for gross beta is in control at 0.0135. The gross alpha results are identified with a "Y" qualifier on the final report. Results are submitted with project manager approval. The sample and the duplicate are below the MDC.

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. Due to a high level of beta activity in samples 2103406-1 and -1DUP, and subsequent beta to alpha crosstalk, the requested MDC for gross alpha was not met. This sample is identified with an "X" qualifier on the final reports. The results are submitted without further qualification.
8. The magnitude of the negative gross alpha activity for samples 2103406-1 and 2103406-1DUP is greater than the 3 sigma TPU. The analyst's review of the data does not indicate a problem with the instrument data or the subsequent reporting systems. The data quality is not believed to be affected and the results are submitted without qualification.
9. No further anomalous situations were encountered during the preparation or analysis of this sample. All remaining quality control criteria were met.

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

  
\_\_\_\_\_  
Jean Anderson  
Radiochemistry Primary Data Reviewer

4/7/21  
Date

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

4/20/21  
Date

**Gross Alpha/Beta by GFPC**

PAI 724 Rev 14

**Method Blank Results****Lab Name:** ALS -- Fort Collins**Work Order Number:** 2103406**Client Name:** Central Plateau Cleanup Company, LLC**ClientProject ID:** SURV, March 2021 S21-003**Lab ID:** AB210329-2MB**Sample Matrix:** WATER**Prep Batch:** AB210329-2**Final Aliquot:** 200 ml**Prep SOP:** PAI 702 Rev 23**QCBatchID:** AB210329-2-1**Result Units:** pCi/l**Date Collected:** 29-Mar-21**Run ID:** AB210329-2A**File Name:** ABA0401**Date Prepared:** 29-Mar-21**Count Time:** 1000 minutes**Date Analyzed:** 01-Apr-21

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	-4.14E-01 +/- 4.93E-01	8.69E-01	3.00E+00	NA	U
12587-47-2	GROSS BETA	-6.59E-01 +/- 7.08E-01	1.18E+00	4.00E+00	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:** AB2103406-1

# Gross Alpha/Beta by GFPC

PAI 724 Rev 14

## Laboratory Control Sample(s)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Lab ID:</b> AB210329-2LCS	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> AB210329-2	<b>Final Aliquot:</b> 200 ml
	<b>Prep SOP:</b> PAI 702 Rev 23	<b>QCBatchID:</b> AB210329-2-1	<b>Result Units:</b> pCi/l
	<b>Date Collected:</b> 29-Mar-21	<b>Run ID:</b> AB210329-2A	<b>File Name:</b> ABA0402
	<b>Date Prepared:</b> 29-Mar-21	<b>Count Time:</b> 30 minutes	
	<b>Date Analyzed:</b> 02-Apr-21		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	1.90E+02 +/- 3.49E+01	6.23E+00	2.210E+02	85.6	72 - 130	
12587-47-2	GROSS BETA	2.02E+02 +/- 3.49E+01	1.15E+01	2.130E+02	94.8	86 - 115	

**Comments:**

<p><b>Qualifiers/Flags:</b></p> <p>U - Result is less than the sample specific MDC.</p> <p>Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.</p> <p>Y2 - Chemical Yield outside default limits.</p> <p>L - LCS Recovery below lower control limit.</p> <p>H - LCS Recovery above upper control limit.</p> <p>P - LCS Recovery within control limits.</p> <p>M - The requested MDC was not met.</p> <p>M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.</p>	<p><b>Abbreviations:</b></p> <p>TPU - Total Propagated Uncertainty</p> <p>MDC - Minimum Detectable Concentration</p>
--	--

**Data Package ID:** AB2103406-1

# Gross Alpha/Beta by GFPC

## PAI 724 Rev 14

### Matrix Spike Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	Shared QC
<b>Lab ID:</b>	2103359-1MS

**Sample Matrix:** WATER  
**Prep SOP:** PAI 702 Rev 23  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 29-Mar-21  
**Date Analyzed:** 02-Apr-21

**Prep Batch:** AB210329-2  
**QC Batch ID:** AB210329-2-1  
**Run ID:** AB210329-2A  
**Count Time:** 420 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 200 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** NA  
**Result Units:** pCi/l  
**File Name:** ABA0402A

**Analysis ReqCode:** SMR\_ALPHABET

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
12587-46-1	GROSS ALPHA	2.25E+02	-6.10E-02	1.46E+00	2.210E+02	102	72 - 130	
12587-47-2	GROSS BETA	2.06E+02	8.08E-01	3.15E+00	2.130E+02	96.3	86 - 115	

**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:** AB2103406-1

**Gross Alpha/Beta by GFPC**

PAI 724 Rev 14

**Sample Results****Lab Name:** ALS -- Fort Collins**Work Order Number:** 2103406**Client Name:** Central Plateau Cleanup Company, LLC**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	Shared QC
<b>Lab ID:</b>	2103359-1

**Sample Matrix:** WATER**Prep Batch:** AB210329-2**Final Aliquot:** 200 ml**Prep SOP:** PAI 702 Rev 23**QCBatchID:** AB210329-2-1**Prep Basis:** Unfiltered**Date Collected:** 17-Mar-21**Run ID:** AB210329-2A**Moisture(%):** NA**Date Prepared:** 29-Mar-21**Count Time:** 420 minutes**Result Units:** pCi/l**Date Analyzed:** 02-Apr-21**Report Basis:** Unfiltered**File Name:** ABA0402A

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	-6.10E-02 +/- 5.03E-01	1.08E+00	3E+00	NA	U
12587-47-2	GROSS BETA	8.08E-01 +/- 9.43E-01	1.81E+00	4E+00	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.

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:** AB2103406-1

# Gross Alpha/Beta by GFPC

PAI 724 Rev 14

## Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID:	B404P1
Lab ID:	2103406-1DUP

Sample Matrix: WATER

Prep SOP: PAI 702 Rev 23

Date Collected: 17-Mar-21

Date Prepared: 29-Mar-21

Date Analyzed: 01-Apr-21

Prep Batch: AB210329-2

QCBatchID: AB210329-2-1

Run ID: AB210329-2A

Count Time: 1000 minutes

Report Basis: Unfiltered

Final Aliquot: 110 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: ABA0401

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	-2.52E+01 +/- 4.74E+00		4.89E+00	U,X	-1.47E+01 +/- 3.70E+00		5.19E+00	U,X,Y	3.5	3
12587-47-2	GROSS BETA	7.00E+03 +/- 1.12E+03		2.30E+00		7.01E+03 +/- 1.12E+03		2.27E+00		0.0135	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: AB2103406-1

## Gross Alpha/Beta by GFPC

PAI 724 Rev 14

## Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID:	B404P1
Lab ID:	2103406-1DUP

Sample Matrix: WATER  
 Prep SOP: PAI 702 Rev 23  
 Date Collected: 17-Mar-21  
 Date Prepared: 29-Mar-21  
 Date Analyzed: 01-Apr-21

Prep Batch: AB210329-2  
 QCBatchID: AB210329-2-1  
 Run ID: AB210329-2A  
 Count Time: 1000 minutes  
 Report Basis: Unfiltered

Final Aliquot: 110 ml  
 Prep Basis: Unfiltered  
 Moisture(%): NA  
 Result Units: pCi/l  
 File Name: ABA0401

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
12587-46-1	GROSS ALPHA	-2.52E+01 +/- 4.74E+00		4.89E+00	U,X	-1.47E+01 +/- 3.70E+00		5.19E+00	U,X,Y	NC	20
12587-47-2	GROSS BETA	7.00E+03 +/- 1.12E+03		2.30E+00		7.01E+03 +/- 1.12E+03		2.27E+00		0.00	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: AB2103406-1

**Gross Alpha/Beta by GFPC**

PAI 724 Rev 14

**Sample Results****Lab Name:** ALS -- Fort Collins**Work Order Number:** 2103406**Client Name:** Central Plateau Cleanup Company, LLC**ClientProject ID:** SURV, March 2021 S21-003**Field ID:** B404P1**Lab ID:** 2103406-1**Sample Matrix:** WATER**Prep SOP:** PAI 702 Rev 23**Date Collected:** 17-Mar-21**Date Prepared:** 29-Mar-21**Date Analyzed:** 01-Apr-21**Prep Batch:** AB210329-2**QC Batch ID:** AB210329-2-1**Run ID:** AB210329-2A**Count Time:** 1000 minutes**Report Basis:** Unfiltered**Final Aliquot:** 110 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** ABA0401**Analysis ReqCode:** SMR\_ALPHABET

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	-2.52E+01 +/- 4.74E+00	4.89E+00	3E+00	NA	U,X
12587-47-2	GROSS BETA	7.00E+03 +/- 1.12E+03	2.30E+00	4E+00	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:** AB2103406-1

# Gross Alpha/Beta by GFPC

PAI 724 Rev 14

## Sample Duplicate Results

**Lab Name:** ALS -- Fort Collins

**Work Order Number:** 2103406

**Client Name:** Central Plateau Cleanup Company, LLC

**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b> B404P1	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> AB210329-2	<b>Final Aliquot:</b> 110 ml
<b>Lab ID:</b> 2103406-1DUP	<b>Prep SOP:</b> PAI 702 Rev 23	<b>QCBatchID:</b> AB210329-2-1	<b>Prep Basis:</b> Unfiltered
	<b>Date Collected:</b> 17-Mar-21	<b>Run ID:</b> AB210329-2A	<b>Moisture(%):</b> NA
	<b>Date Prepared:</b> 29-Mar-21	<b>Count Time:</b> 1000 minutes	<b>Result Units:</b> pCi/l
	<b>Date Analyzed:</b> 01-Apr-21	<b>Report Basis:</b> Unfiltered	<b>File Name:</b> ABA0401

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
12587-46-1	GROSS ALPHA	-1.47E+01 +/- 3.70E+00	5.19E+00	3E+00	NA	U,X,Y
12587-47-2	GROSS BETA	7.01E+03 +/- 1.12E+03	2.27E+00	4E+00	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.

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:** AB2103406-1

**Date Printed:**

Tuesday, April 06, 2021

ALS -- Fort Collins

LIMS Version: 7.014

Page 1 of 1

**Prep Batch ID: AB210329-2**

Start Date: 03/29/21	End Date: 03/29/21	Concentration Method: NONE	Batch Created By: mig
Start Time: 13:44	End Time: 13:44	Extract Method: PAI 70223	Date Created: 03/29/21
Prep Analyst: Mikenna I. Gapinski		Initial Volume Units: ml	Time Created: 13:45
<u>Comments:</u>		Final Volume Units: ml	Validated By: mig
			Date Validated: 03/31/21
			Time Validated: 12:06

QC Batch ID: AB210329-2-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
AB210329-2	MB	XXXXXX	WATER	XXXXXX	200	200	NONE	1	2103359
AB210329-2	LCS	XXXXXX	WATER	XXXXXX	200	200	NONE	1	2103359
2103359-1	MS	XXXXXX	WATER	XXXXXX	200	200	NONE	1	2103359
2103406-1	DUP	B404P1	WATER	3/17/2021	110	110	NONE	1	2103406
2103359-1	SMP	XXXXXX	WATER	XXXXXX	200	200	NONE	1	2103359
2103406-1	SMP	B404P1	WATER	3/17/2021	110	110	NONE	1	2103406

**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



# Strontium-90

## Case Narrative

---

### Central Plateau Cleanup Company, LLC

SURV, March 2021 – S21-003

Work Order Number: 2103406

1. The sample was prepared according to the current revision of SOP 707.
2. The sample was analyzed for the presence of <sup>90</sup>Sr according to the current revision of SOP 724. The analysis was completed on 04/14/2021.
3. Total radio-strontium is reported as <sup>90</sup>Sr. The presence of other radioisotopes of strontium may cause positive bias in the measured strontium concentration.
4. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
5. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
6. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

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

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



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

Jean Anderson  
Jean Anderson  
Radiochemistry Primary Data Reviewer

4/16/21  
Date

[Signature]  
Radiochemistry Final Data Reviewer

4/20/21  
Date

**Strontium-90 by GFPC**

PAI 724 Rev 14

**Method Blank Results****Lab Name:** ALS -- Fort Collins**Work Order Number:** 2103406**Client Name:** Central Plateau Cleanup Company, LLC**ClientProject ID:** SURV, March 2021 S21-003**Lab ID:** SR210407-1MB**Sample Matrix:** WATER**Prep Batch:** SR210407-1**Final Aliquot:** 994 ml**Prep SOP:** PAI 707 Rev 16**QCBatchID:** SR210407-1-1**Result Units:** pCi/l**Date Collected:** 07-Apr-21**Run ID:** SR210407-1A**File Name:** SRC0414B**Date Prepared:** 07-Apr-21**Count Time:** 1000 minutes**Date Analyzed:** 14-Apr-21

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	-1.08E-02 +/- 8.62E-02	1.44E-01	1.00E+00	NA	U

**Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	9.970E+02	9.37E+02	ug	94.0	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.

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:** SR2103406-1

**Strontium-90 by GFPC**

PAI 724 Rev 14

**Laboratory Control Sample(s)****Lab Name:** ALS -- Fort Collins**Work Order Number:** 2103406**Client Name:** Central Plateau Cleanup Company, LLC**ClientProject ID:** SURV, March 2021 S21-003

<b>Lab ID:</b> SR210407-1LCS	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> SR210407-1	<b>Final Aliquot:</b> 994 ml
	<b>Prep SOP:</b> PAI 707 Rev 16	<b>QCBatchID:</b> SR210407-1-1	<b>Result Units:</b> pCi/l
	<b>Date Collected:</b> 07-Apr-21	<b>Run ID:</b> SR210407-1A	<b>File Name:</b> SRC0414A
	<b>Date Prepared:</b> 07-Apr-21	<b>Count Time:</b> 30 minutes	
	<b>Date Analyzed:</b> 14-Apr-21		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.08E+01 +/- 2.78E+00	9.44E-01	1.060E+01	102	75 - 125	

**Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	9.970E+02	9.42E+02	ug	94.5	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:** SR2103406-1

# Strontium-90 by GFPC

PAI 724 Rev 14

## Laboratory Control Sample(s)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

**Lab ID:** SR210407-1LCSD

**Sample Matrix:** WATER  
**Prep SOP:** PAI 707 Rev 16  
**Date Collected:** 07-Apr-21  
**Date Prepared:** 07-Apr-21  
**Date Analyzed:** 14-Apr-21

**Prep Batch:** SR210407-1  
**QCBatchID:** SR210407-1-1  
**Run ID:** SR210407-1A  
**Count Time:** 30 minutes

**Final Aliquot:** 994 ml  
**Result Units:** pCi/l  
**File Name:** SRC0414A

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.18E+01 +/- 3.04E+00	1.04E+00	1.060E+01	111	75 - 125	

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	9.970E+02	9.27E+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:** SR2103406-1

**Strontium-90 by GFPC**

PAI 724 Rev 14

**Duplicate Sample Results (DER)****Lab Name:** ALS -- Fort Collins**Work Order Number:** 2103406**Client Name:** Central Plateau Cleanup Company, LLC**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	
<b>Lab ID:</b>	SR210407-1LCSD

**Sample Matrix:** WATER**Prep SOP:** PAI 707 Rev 16**Date Collected:** 07-Apr-21**Date Prepared:** 07-Apr-21**Date Analyzed:** 14-Apr-21**Prep Batch:** SR210407-1**QCBatchID:** SR210407-1-1**Run ID:** SR210407-1A**Count Time:** 30 minutes**Final Aliquot:** 994 ml**Prep Basis:** Unfiltered**Moisture(%):** NA**Result Units:** pCi/l**File Name:** SRC0414A

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.08E+01 +/-	2.78E+00	9.44E-01		1.08E+01 +/-	2.78E+00	1.04E+00		0.49	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:** SR2103406-1

# Strontium-90 by GFPC

PAI 724 Rev 14

## Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID:	
Lab ID:	SR210407-1LCSD

Sample Matrix: WATER  
 Prep SOP: PAI 707 Rev 16  
 Date Collected: 07-Apr-21  
 Date Prepared: 07-Apr-21  
 Date Analyzed: 14-Apr-21

Prep Batch: SR210407-1  
 QCBatchID: SR210407-1-1  
 Run ID: SR210407-1A  
 Count Time: 30 minutes

Final Aliquot: 994 ml  
 Prep Basis: Unfiltered  
 Moisture(%): NA  
 Result Units: pCi/l  
 File Name: SRC0414A

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.08E+01 +/-	2.78E+00	9.44E-01		1.08E+01 +/-	2.78E+00	1.04E+00		9.00	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: SR2103406-1

**Strontium-90 by GFPC**

PAI 724 Rev 14

**Sample Results****Lab Name:** ALS -- Fort Collins**Work Order Number:** 2103406**Client Name:** Central Plateau Cleanup Company, LLC**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	B404P4
<b>Lab ID:</b>	2103406-2

**Sample Matrix:** WATER  
**Prep SOP:** PAI 707 Rev 16  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 07-Apr-21  
**Date Analyzed:** 14-Apr-21

**Prep Batch:** SR210407-1  
**QCBatchID:** SR210407-1-1  
**Run ID:** SR210407-1A  
**Count Time:** 120 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 994 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** NA  
**Result Units:** pCi/l  
**File Name:** SRC0414

**Analysis ReqCode:** SMR\_SR\_RAD\_

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	9.96E-02 +/- 1.98E-01	4.35E-01	1E+00	NA	U

**Chemical Yield Summary**

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.410E+03	1.32E+03	ug	93.3	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:** SR2103406-1

**Prep Batch ID: SR210407-1**

<b>Start Date:</b> 04/07/21	<b>End Date:</b> 04/07/21	<b>Concentration Method:</b> NONE	<b>Batch Created By:</b> jxh
<b>Start Time:</b> 9:48	<b>End Time:</b> 9:48	<b>Extract Method:</b> PAI 70716	<b>Date Created:</b> 04/07/21
<b>Prep Analyst:</b> Jirushaya Hantula		<b>Initial Volume Units:</b> ml	<b>Time Created:</b> 9:48
<b>Comments:</b>		<b>Final Volume Units:</b> ml	<b>Validated By:</b> jxh
n/a			<b>Date Validated:</b> 04/13/21
			<b>Time Validated:</b> 13:43

QC Batch ID: SR210407-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR210407-1	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	2103406
SR210407-1	MB	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2103406
SR210407-1	LCS	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2103406
SR210407-1	LCSD	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2104015
2103406-2	SMP	B404P4	WATER	3/17/2021	1000	994.01	NONE	1	2103406
2103436-17	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2103436
2103436-18	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2103436
2103437-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2103437
2103437-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2103437
2103439-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2103439
2104003-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2104003
2104004-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2104004
2104015-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2104015
2104015-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2104015
2104015-4	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	2104015

**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

---

### Central Plateau Cleanup Company, LLC

SURV, March 2021 – S21-003

Work Order Number: 2103406

1. The sample was prepared according to the current revision of SOP 755, with procedure modifications outlined in QASS #378635 and #387636.
2. The sample was analyzed for the presence of <sup>99</sup>Tc according to the current revision of SOP 704. The analysis was completed on 04/02/2021.
3. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. The duplicate of sample 2103409-1 is shared for this work order. The duplicate was performed on a Central Plateau Cleanup Company, LLC sample and the results are acceptable. The results can be found in the following report.
5. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

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

6. The magnitude of the negative activity for method blank TC210324-2MB is greater than the 2 sigma. The analyst's review of the data does not indicate a problem with the instrument data or the subsequent reporting systems. It is believed that the data quality is unaffected and the results are submitted without qualification. Under typical conditions, where background level sample data is normally distributed and analyzed by paired observations, this event is likely to occur at least 2.5% of the time.
7. No anomalous situations were encountered during the preparation or analysis of this sample. All quality control criteria were met.



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

A handwritten signature in black ink that reads "Jean Anderson".

Jean Anderson  
Radiochemistry Primary Data Reviewer

4/7/21  
Date

A handwritten signature in black ink, appearing to be "K. M. O'Brien".

Radiochemistry Final Data Reviewer

4/20/21  
Date

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 13

## Method Blank Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Lab ID: TC210324-2MB	Sample Matrix: WATER	Prep Batch: TC210324-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC210324-2-1	Result Units: pCi/l
	Date Collected: 24-Mar-21	Run ID: TC210324-2A	File Name: Z20210402_0915
	Date Prepared: 24-Mar-21	Count Time: 30 minutes	
	Date Analyzed: 02-Apr-21		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	-1.15E+00 +/- 1.10E+00	2.30E+00	2.00E+01	NA	U

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	1.190E+04	1.06E+04	Pci	88.5	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.

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: TC2103406-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 13

## Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Lab ID: TC210324-2LCS	Sample Matrix: WATER	Prep Batch: TC210324-2	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC210324-2-1	Result Units: pCi/l
	Date Collected: 24-Mar-21	Run ID: TC210324-2A	File Name: Z20210402_0915
	Date Prepared: 24-Mar-21	Count Time: 30 minutes	
	Date Analyzed: 02-Apr-21		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	8.86E+02 +/- 1.42E+02	2.55E+00	9.110E+02	97.3	75 - 125	

### Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	1.190E+04	9.62E+03	Pci	80.8	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: TC2103406-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 13

## Sample Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	Shared QC
<b>Lab ID:</b>	2103409-1

**Sample Matrix:** WATER  
**Prep SOP:** PAI 755 Rev 12  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 24-Mar-21  
**Date Analyzed:** 02-Apr-21

**Prep Batch:** TC210324-2  
**QCBatchID:** TC210324-2-1  
**Run ID:** TC210324-2A  
**Count Time:** 30 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 100 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** NA  
**Result Units:** pCi/l  
**File Name:** Z20210402\_0915

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	3.52E+03 +/- 5.63E+02	6.08E+00	2E+01	NA	

## Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	1.190E+04	1.01E+04	Pci	84.4	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.
- 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:** TC2103406-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 13

## Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

<b>Field ID:</b> Shared QC	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> TC210324-2	<b>Final Aliquot:</b> 100 ml
<b>Lab ID:</b> 2103409-1DUP	<b>Prep SOP:</b> PAI 755 Rev 12	<b>QCBatchID:</b> TC210324-2-1	<b>Prep Basis:</b> Unfiltered
	<b>Date Collected:</b> 17-Mar-21	<b>Run ID:</b> TC210324-2A	<b>Moisture(%):</b> NA
	<b>Date Prepared:</b> 24-Mar-21	<b>Count Time:</b> 30 minutes	<b>Result Units:</b> pCi/l
	<b>Date Analyzed:</b> 02-Apr-21	<b>Report Basis:</b> Unfiltered	<b>File Name:</b> Z20210402_0915

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	3.64E+03 +/- 5.83E+02	6.47E+00	2E+01	NA	

## Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	1.190E+04	9.49E+03	Pci	79.6	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.

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:** TC2103406-1

**Date Printed:**

Wednesday, April 07, 2021

ALS -- Fort Collins

LIMS Version: 7.014

Page 1 of 1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 13

## Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID:	Shared QC
Lab ID:	2103409-1DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Mar-21

Date Prepared: 24-Mar-21

Date Analyzed: 02-Apr-21

Prep Batch: TC210324-2

QCBatchID: TC210324-2-1

Run ID: TC210324-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 100 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: Z20210402\_0915

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	3.52E+03 +/-	5.63E+02	6.08E+00		3.64E+03 +/-	5.83E+02	6.47E+00		0.299	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: TC2103406-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 13

## Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID:	Shared QC
Lab ID:	2103409-1DUP

Sample Matrix: WATER

Prep SOP: PAI 755 Rev 12

Date Collected: 17-Mar-21

Date Prepared: 24-Mar-21

Date Analyzed: 02-Apr-21

Prep Batch: TC210324-2

QCBatchID: TC210324-2-1

Run ID: TC210324-2A

Count Time: 30 minutes

Report Basis: Unfiltered

Final Aliquot: 100 ml

Prep Basis: Unfiltered

Moisture(%): NA

Result Units: pCi/l

File Name: Z20210402\_0915

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	3.52E+03 +/-	5.63E+02	6.08E+00		3.64E+03 +/-	5.83E+02	6.47E+00		3.00	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: TC2103406-1

# Technetium-99 by Liquid Scintillation

PAI 704\_Tc99 Rev 13

## Sample Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	B404P4
<b>Lab ID:</b>	2103406-2

**Sample Matrix:** WATER  
**Prep SOP:** PAI 755 Rev 12  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 24-Mar-21  
**Date Analyzed:** 02-Apr-21

**Prep Batch:** TC210324-2  
**QCBatchID:** TC210324-2-1  
**Run ID:** TC210324-2A  
**Count Time:** 30 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 100 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** NA  
**Result Units:** pCi/l  
**File Name:** Z20210402\_0915

**Analysis ReqCode:** SMR\_TC99\_LSC

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	3.02E+03 +/- 4.84E+02	6.06E+00	2E+01	NA	

## Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	1.190E+04	1.00E+04	Pci	83.9	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.
- 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:** TC2103406-1

**Prep Batch ID: TC210324-2**

Start Date: 03/24/21	End Date: 03/24/21	Concentration Method: NONE	Batch Created By: jcp
Start Time: 9:11	End Time: 9:11	Extract Method: PAI 75512	Date Created: 03/24/21
Prep Analyst: John C. Petrovic		Initial Volume Units: ml	Time Created: 9:11
<b>Comments:</b>		Final Volume Units: ml	Validated By: jcp
			Date Validated: 03/25/21
			Time Validated: 9:15

QC Batch ID: TC210324-2-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
TC210324-2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2103409
TC210324-2CB1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2103409
TC210324-2CB2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2103409
TC210324-2CB3	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2103409
TC210324-2	LCS	XXXXXX	WATER	XXXXXX	250	250	NONE	1	2103409
2103409-1	DUP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	2103409
2103406-2	SMP	B404P4	WATER	3/17/2021	100	100	NONE	1	2103406
2103409-1	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	2103409

**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

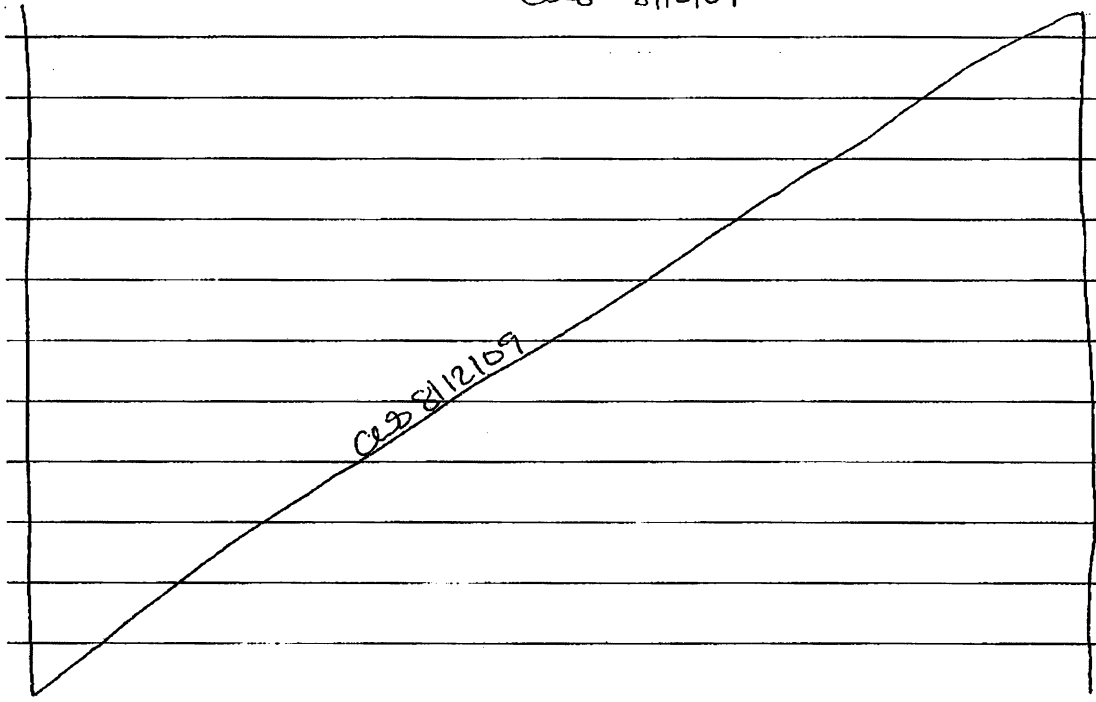
PAR W.O. # / BATCH Generic  
 TEST Tc99  
 METHOD Prep  
 SOP/REV (PREP) 705  
 SOP/REV (ANAL) \_\_\_\_\_

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.

*cas 8/12/09*

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

*cas 8/12/09*



*cas 8/12/09*

*cas 8/12/09*

TECHNICIAN/ANALYST *Crystal Sheffer* DATE 8/12/09

DEPARTMENT MANAGER *[Signature]* DATE 8/12/09

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 ver \_\_\_\_\_

**Rx# 147098**  
 Date Ordered: 20Oct2020  
 Date/Time Prepared: 21Oct2020 00:51 MT  
**CardinalHealth**  
 CARDINAL HEALTH 414, LLC  
 DENVER  
 19400 40TH AVE. STE B  
 DENVER CO 80238  
 303.373.0579

**ALS LABORATORY GROUP**  
 225 COMMERCE DR  
 FORT COLLINS CO 80524-2762  
 1 0430 Fort Collins

**Safetrac**   


Patient: **Per Physician Order**

Product: Tc-99m **Sodium Pertechnetate Unit Dose mCi (HD)**


Disp Amt: **0.54 mCi**


Calibration: **21Oct2020 08:00 MT**

Source - Not for Human Use For Calibration Use Only  
 Indication: **Point Source mCi**

Dispense Date: 21Oct2020 Lot#: E20295-0001 Price(est): N/A  
 Use By: 22Oct2020 00:51 MT Physician: Charles Orchard, RSO NPT:

Notes NDC: RPh: A. Worthem

  
 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 BUC.

TECHNICIAN/ANALYST Crystal Shreffler DATE 8/12/09  
 DEPARTMENT MANAGER [Signature] DATE 8/12/09

378636 FORM 302r6.doc (4/22/04)



# Tritium

## Case Narrative

---

### Central Plateau Cleanup Company, LLC

SURV, March 2021 – S21-003

Work Order Number: 2103406

1. The sample was prepared according to the current revision of SOP 700.
2. The sample was analyzed for the presence of tritium according to the current revision of SOP 704. The analysis was completed on 03/30/2021.
3. The analysis results for this sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. Prior to analysis of this sample, an approximate volume of 10  $\mu$ L of nitro-methane was added to the sample and all associated QC samples to bring them into the usable calibration range.
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.

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



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

Jean Anderson  
Jean Anderson  
Radiochemistry Primary Data Reviewer

4/7/21  
Date

William M. Oh  
Radiochemistry Final Data Reviewer

4/20/21  
Date

# Tritium by Liquid Scintillation

## PAI 704 Rev 13

### Method Blank Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Lab ID:</b> 3H210328-1MB	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> 3H210328-1	<b>Final Aliquot:</b> 10.0 ml
	<b>Prep SOP:</b> PAI 700 Rev 15	<b>QCBatchID:</b> 3H210328-1-1	<b>Result Units:</b> pCi/l
	<b>Date Collected:</b> 28-Mar-21	<b>Run ID:</b> 3H210328-1A	<b>File Name:</b> B60_04_032901
	<b>Date Prepared:</b> 28-Mar-21	<b>Count Time:</b> 90 minutes	
	<b>Date Analyzed:</b> 30-Mar-21		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	-3.88E+01 +/- 2.06E+02	3.48E+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:** H32103406-1

# Tritium by Liquid Scintillation

PAI 704 Rev 13

## Laboratory Control Sample(s)

**Lab Name:** ALS -- Fort Collins

**Work Order Number:** 2103406

**Client Name:** Central Plateau Cleanup Company, LLC

**ClientProject ID:** SURV, March 2021 S21-003

<b>Lab ID:</b> 3H210328-1LCS	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> 3H210328-1	<b>Final Aliquot:</b> 9.68 ml
	<b>Prep SOP:</b> PAI 700 Rev 15	<b>QCBatchID:</b> 3H210328-1-1	<b>Result Units:</b> pCi/l
	<b>Date Collected:</b> 28-Mar-21	<b>Run ID:</b> 3H210328-1A	<b>File Name:</b> B60_04_032901
	<b>Date Prepared:</b> 28-Mar-21	<b>Count Time:</b> 90 minutes	
	<b>Date Analyzed:</b> 30-Mar-21		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	3.61E+04 +/- 5.52E+03	3.58E+02	3.840E+04	94.1	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:** H32103406-1

# Tritium by Liquid Scintillation

## PAI 704 Rev 13

### Matrix Spike Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	B40521
<b>Lab ID:</b>	2103406-3MS

**Sample Matrix:** WATER  
**Prep SOP:** PAI 700 Rev 15  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 28-Mar-21  
**Date Analyzed:** 30-Mar-21

**Prep Batch:** 3H210328-1  
**QC Batch ID:** 3H210328-1-1  
**Run ID:** 3H210328-1A  
**Count Time:** 90 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 9.68 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** 100.000  
**Result Units:** pCi/l  
**File Name:** B60\_04\_032901

**Analysis ReqCode:** SMR\_TRITIUM\_L

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	3.55E+04	2.06E+03	3.55E+02	3.840E+04	86.9	75 - 125	

**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:** H32103406-1

# Tritium by Liquid Scintillation

## PAI 704 Rev 13

### Matrix Spike Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b> B40521	<b>Sample Matrix:</b> WATER	<b>Prep Batch:</b> 3H210328-1	<b>Final Aliquot:</b> 9.68 ml
<b>Lab ID:</b> 2103406-3MSD	<b>Prep SOP:</b> PAI 700 Rev 15	<b>QCBatchID:</b> 3H210328-1-1	<b>Prep Basis:</b> Unfiltered
<b>Analysis ReqCode:</b> SMR_TRITIUM_L	<b>Date Collected:</b> 17-Mar-21	<b>Run ID:</b> 3H210328-1A	<b>Moisture(%):</b> 100.000
	<b>Date Prepared:</b> 28-Mar-21	<b>Count Time:</b> 82.4 minutes	<b>Result Units:</b> pCi/l
	<b>Date Analyzed:</b> 30-Mar-21	<b>Report Basis:</b> Unfiltered	<b>File Name:</b> B60_04_032901

CASNO	Target Nuclide	Matrix Spike	Sample Results	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	4.04E+04	2.06E+03	3.81E+02	3.840E+04	99.7	75 - 125	

#### 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:** H32103406-1

# Tritium by Liquid Scintillation

PAI 704 Rev 13

## Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID:	B40521
Lab ID:	2103406-3MSD

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 17-Mar-21

Date Prepared: 28-Mar-21

Date Analyzed: 30-Mar-21

Prep Batch: 3H210328-1

QCBatchID: 3H210328-1-1

Run ID: 3H210328-1A

Count Time: 82.4 minutes

Report Basis: Unfiltered

Final Aliquot: 9.68 ml

Prep Basis: Unfiltered

Moisture(%): 100.000

Result Units: pCi/l

File Name: B60\_04\_032901

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	3.55E+04 +/-	5.43E+03	3.55E+02		4.04E+04 +/-	6.17E+03	3.81E+02		0.595	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.

W - DER is greater than Warning Limit of 1.42

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: H32103406-1

# Tritium by Liquid Scintillation

PAI 704 Rev 13

## Duplicate Sample Results (RPD)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	B40521
<b>Lab ID:</b>	2103406-3MSD

**Sample Matrix:** WATER  
**Prep SOP:** PAI 700 Rev 15  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 28-Mar-21  
**Date Analyzed:** 30-Mar-21

**Prep Batch:** 3H210328-1  
**QCBatchID:** 3H210328-1-1  
**Run ID:** 3H210328-1A  
**Count Time:** 82.4 minutes  
**Report Basis:** Unfiltered

**Final Aliquot:** 9.68 ml  
**Prep Basis:** Unfiltered  
**Moisture(%):** 100.000  
**Result Units:** pCi/l  
**File Name:** B60\_04\_032901

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	3.55E+04 +/- 5.43E+03		3.55E+02		4.04E+04 +/- 6.17E+03		3.81E+02		13.00	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:** H32103406-1

# Tritium by Liquid Scintillation

PAI 704 Rev 13

## Duplicate Sample Results (DER)

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	B40521
<b>Lab ID:</b>	2103406-3DUP

**Sample Matrix:** WATER  
**Prep SOP:** PAI 700 Rev 15  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 28-Mar-21  
**Date Analyzed:** 30-Mar-21

**Prep Batch:** 3H210328-1  
**QCBatchID:** 3H210328-1-1  
**Run ID:** 3H210328-1A  
**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\_032901

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	2.06E+03 +/-	4.06E+02	3.51E+02		2.01E+03 +/-	3.99E+02	3.50E+02		0.0821	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.
- W - DER is greater than Warning Limit of 1.42
- 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:** H32103406-1

# Tritium by Liquid Scintillation

PAI 704 Rev 13

## Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID:	B40521
Lab ID:	2103406-3DUP

Sample Matrix: WATER

Prep SOP: PAI 700 Rev 15

Date Collected: 17-Mar-21

Date Prepared: 28-Mar-21

Date Analyzed: 30-Mar-21

Prep Batch: 3H210328-1

QCBatchID: 3H210328-1-1

Run ID: 3H210328-1A

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\_032901

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10028-17-8	H-3	2.06E+03 +/-	4.06E+02	3.51E+02		2.01E+03 +/-	3.99E+02	3.50E+02		2.00	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: H32103406-1

# Tritium by Liquid Scintillation

PAI 704 Rev 13

## Sample Results

**Lab Name:** ALS -- Fort Collins  
**Work Order Number:** 2103406  
**Client Name:** Central Plateau Cleanup Company, LLC  
**ClientProject ID:** SURV, March 2021 S21-003

<b>Field ID:</b>	B40521
<b>Lab ID:</b>	2103406-3

**Sample Matrix:** WATER  
**Prep SOP:** PAI 700 Rev 15  
**Date Collected:** 17-Mar-21  
**Date Prepared:** 28-Mar-21  
**Date Analyzed:** 30-Mar-21

**Prep Batch:** 3H210328-1  
**QCBatchID:** 3H210328-1-1  
**Run ID:** 3H210328-1A  
**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\_032901

**Analysis ReqCode:** SMR\_TRITIUM\_L

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	2.06E+03 +/- 4.06E+02	3.51E+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:** H32103406-1

# Tritium by Liquid Scintillation

PAI 704 Rev 13

## Sample Duplicate Results

Lab Name: ALS -- Fort Collins

Work Order Number: 2103406

Client Name: Central Plateau Cleanup Company, LLC

ClientProject ID: SURV, March 2021 S21-003

Field ID: B40521	Sample Matrix: WATER	Prep Batch: 3H210328-1	Final Aliquot: 10.0 ml
Lab ID: 2103406-3DUP	Prep SOP: PAI 700 Rev 15	QCBatchID: 3H210328-1-1	Prep Basis: Unfiltered
	Date Collected: 17-Mar-21	Run ID: 3H210328-1A	Moisture(%): 100.000
	Date Prepared: 28-Mar-21	Count Time: 90 minutes	Result Units: pCi/l
	Date Analyzed: 30-Mar-21	Report Basis: Unfiltered	File Name: B60_04_032901

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10028-17-8	H-3	2.01E+03 +/- 3.99E+02	3.50E+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 3

#### Abbreviations:

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

Data Package ID: H32103406-1

Date Printed:

Monday, April 05, 2021

ALS -- Fort Collins

LIMS Version: 7.014

Page 1 of 1

