



Friday, December 14, 2018

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

Re: ALS Workorder: 1812003
Project Name: CERCLA, NOVEMBER 2018
Project Number: I19-004

Dear Ms. Waters-Husted:

Ten water samples were received from CH2M HILL Plateau Remediation Company, on 12/1/2018. The samples were scheduled for the following analyses:

Metals

Strontium-90

Technetium-99

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

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

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.

Kathleen OBrien

From: Waters-husted, Karen S <karen_s_waters-husted@rl.gov>
Sent: Tuesday, November 27, 2018 3:10 PM
To: Allen, Kristine; Ashley Worthy (Ashley.Worthy@testamericainc.com); Awalt, Jayna; Bandy, Darlene; Calixto, Siobhan E; Heather Shaffer (heather.shaffer@gel.com); Jamie McKinney; Julie Ellingson; Kathleen OBrien; Medley, Heather A; Nancy Mattern; Redonna Spies (rspies@SWRI.org); Waters-husted, Karen S
Subject: I19-004 Revised
Attachments: I19-004_V1.pdf

A 15-day TAT was added to the SAF per SIR request.

Please let me know if you have any questions or concerns.
Thank you.

Karen Waters-Husted

CH2M Plateau Remediation Company
Sample Management and Reporting
Groundwater Project Coordinator
200 East / MO-277 / A-105
509-376-4650
Karen_S_Waters-husted@rl.gov

SAMPLE ISSUE RESOLUTION (SIR) REPORT	SIR Number: SIR19-0246
	Rev. Number: 0
	Date Initiated: 12/03/2018

SAMPLE EVENT INFORMATION

SAF NUM(S): I19-004
LABORATORY: ALS

SAMPLING INFORMATION

NUMBER OF SAMPLES: 1
SAMPLE NUMBERS: B3LR21
SAMPLE MATRIX: WATER
SDG NUM(S): ALS1812003

ISSUE BACKGROUND

CLASS: Field Sampling Issue
TYPE: Incorrect Sample Preservation
DESCRIPTION: The bottle for TC99 was received at a pH >2.

RESOLUTION

PROPOSED RESOLUTION: ALS proposes adding HCl to bring pH down to less than 2 and to continue with analyses.

FINAL RESOLUTION: Proposed Resolution accepted.

SUBMITTED BY:

O'BRIEN, KATIE _____ 12/03/2018 _____

ACCEPTED BY:

HEY, BE _____ 12/03/2018 _____

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1812003

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: CERCLA, NOVEMBER 2018

Client Project Number: I19-004

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3LT41	1812003-1		WATER	29-Nov-18	9:26
B3LT37	1812003-2		WATER	29-Nov-18	9:26
B3LTY0	1812003-3		WATER	29-Nov-18	8:56
B3LTY4	1812003-4		WATER	29-Nov-18	8:56
B3LV47	1812003-5		WATER	29-Nov-18	9:18
B3LV51	1812003-6		WATER	29-Nov-18	9:18
B3LRC1	1812003-7		WATER	29-Nov-18	10:25
B3LRB7	1812003-8		WATER	29-Nov-18	10:25
B3LR21	1812003-9		WATER	29-Nov-18	9:06
B3LRD5	1812003-10		WATER	29-Nov-18	10:53

1812003

23145

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# I19-004-009			
Collector: WILLIAM COLLINS CHPRC		Contact/Requester: Karen Waters-Husted		Telephone No.: 509-376-4650			
SAF No.: I19-004		Sampling Origin: Hanford Site		Purchase Order/Charge Code: 300071			
Project Title: CERCLA, NOVEMBER 2018		Logbook No.: HNF-N-506-101-57		Ice Chest No.: 6WS-428			
Shipped To (Lab): ALS Environmental Ft. Collins		Method of Shipment: Commercial Carrier		Bill of Lading/Air Bill No.: 738 5013 4070			
Protocol: CERCLA		Priority: 30 Days		Offsite Property No.: 10331			
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1							
SPECIAL INSTRUCTIONS N/A							
Sample No.	Filter	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3LT41	Y	11-29-18	0926	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2
B3LT37	N	11-29-18	0926	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2

Relinquished By: WILLIAM COLLINS CHPRC	Signature	Date/Time	Received By: Roger Friesz Jr. CHPRC	Signature	Date/Time
Relinquished By: Roger Friesz Jr. CHPRC	Signature	Date/Time	Received By: Jenelle Zurker CHPRC	Signature	Date/Time
Relinquished By: SSU-1	Signature	Date/Time	Received By: SSU-1	Signature	Date/Time
Relinquished By: Jenelle Zurker CHPRC	Signature	Date/Time	Received By: Jenelle Zurker CHPRC	Signature	Date/Time
Relinquished By: Jenelle Zurker CHPRC	Signature	Date/Time	Received By: Jenelle Zurker CHPRC	Signature	Date/Time

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

Disposed By: **FEDEX**

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

A-6004-842 (REV 3)

FSR ID = FSR69925

10/3/2018

Printed On

1812003

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# I19-004-011 Page 1 of 2			
Collector: WILLIAM COLLINS CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.:	509-376-4650				
SAF No.:	Sampling Origin: Hanford Site	Purchase Order/Charge Code:	300071				
Project Title: CERCLA, NOVEMBER 2018	Logbook No.:	HNF-N-506-101-87					
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Ice Chest No.:	6WS-428				
Protocol: CERCLA	Priority: 30 Days	Bill of Lading/Air Bill No.:	773850934070				
Offsite Property No.:	10331						
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A					
Sample No.	Filter	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3LTY0	N	11-29-18	0856	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2
B3LTY4	Y	11-29-18	0856	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2

Relinquished By: WILLIAM COLLINS CHPRC	Signature	NOV 29 2018	Date/Time	Received By: Roger Frisco Jr. CHPRC	Signature	NOV 29 2018	Date/Time	Matrix *
Relinquished By: Roger Frisco Jr. CHPRC	Signature	NOV 29 2018	Date/Time	Received By: SSU-1	Signature	NOV 29 2018	Date/Time	S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air
Relinquished By: Roger Frisco Jr. CHPRC	Signature	NOV 29 2018	Date/Time	Received By: Janelle Zunker CHPRC	Signature	NOV 30 2018	Date/Time	DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By: Janelle Zunker CHPRC	Signature	NOV 30 2018	Date/Time	Received By: FEDEX	Signature	NOV 30 2018	Date/Time	
Relinquished By: Janelle Zunker CHPRC	Signature	NOV 30 2018	Date/Time	Received By:	Signature		Date/Time	
FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):			Disposed By:		Date/Time:		

1812003

CH2MHill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# I19-004-005 Page 1 of 2
Collector: WILLIAM COLLINS CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.:	509-376-4650	7211-30-8
SAF No.:	Sampling Origin: Hanford Site	Purchase Order/Charge Code:	300071	
Project Title: CERCLA, NOVEMBER 2018	Logbook No.:	Ice Chest No.:	6WS-428	
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.:	7385093 4070	
Protocol: CERCLA	Priority: 30 Days	Offsite Property No.:	10331	

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

SPECIAL INSTRUCTIONS
 N/A

Sample No.	Filter	*	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3LV47	N	W	11-29-18	0918	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2
B3LV51	Y	W	11-29-18	0918	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2

Relinquished By: WILLIAM COLLINS CHPRC	Signature	NOV 29 2018	Date/Time	Received By: Roger Friesz Jr. CHPRC	Signature	NOV 29 2018	Date/Time
Relinquished By: Roger Friesz Jr. CHPRC	Signature	NOV 29 2018	Date/Time	Received By: SSU-1	Signature	NOV 29 2018	Date/Time
Relinquished By: SSU-1	Signature	NOV 30 2018	Date/Time	Received By: Jenelle Zunker CHPRC	Signature	NOV 30 2018	Date/Time
Relinquished By: Jenelle Zunker CHPRC	Signature	NOV 30 2018	Date/Time	Received By: FEDEX	Signature	NOV 30 2018	Date/Time

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

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

1812003

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# I19-004-012 Page 1 of 1			
Collector: WILLIAM COLLINS CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650					
SAF No.: I19-004	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071					
Project Title: CERCLA, NOVEMBER 2018	Logbook No.: HNF-N-506-701-87	Ice Chest No.: 605-420					
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 7385034070					
Protocol: CERCLA	Priority: 30 Days	Offsite Property No.: 10331					
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A					
Sample No.	Filter	Date	Time	No/Type Container	Sample Analysis	Holding Time	Preservative
B3LRC1	Y	11-29-18	1025	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2
B3LRB7	N	11-29-18	1025	1x500-mL G/P	6020_METALS_ICPMS: Chromium (1)	6 Months	HNO3 to pH <2

Relinquished By: <i>[Signature]</i> WILLIAM COLLINS CHPRC	Signature	Date/Time NOV 29 2018	Received By: <i>[Signature]</i> SSU-1	Signature	Date/Time NOV 29 2018	Matrix * S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By: <i>[Signature]</i> SSU-1	Signature	Date/Time NOV 30 2018	Received By: <i>[Signature]</i> Jenelle Zunker CHPRC	Signature	Date/Time NOV 30 2018	
Relinquished By: <i>[Signature]</i> Jenelle Zunker CHPRC	Signature	Date/Time NOV 30 2018	Received By: <i>[Signature]</i> FEDEX	Signature	Date/Time 12.11.18	
Relinquished By: <i>[Signature]</i> Fedex	Signature	Date/Time NOV 30 2018	Received By: <i>[Signature]</i> Nick Joster	Signature	Date/Time 12.11.18	
Relinquished By: <i>[Signature]</i> Nick Joster	Signature	Date/Time 12.11.18	Disposed By:	Signature	Date/Time	

1812003

CH2MHill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# I19-004-036	Page 1 of 2
Collector: Juan Aguilar ICHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650	Telephone No.: 721-3018		
SAF No.: I19-004	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071			
Project Title: CERCLA, NOVEMBER 2018	Logbook No.: HNF-N-506 ~104/41	Ice Chest No.: 625-428			
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 7738503 4070			
Protocol: CERCLA	Priority: 30 Days	Offsite Property No.: 10331			
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS Low Volume Wells. Do not use for QC.			
Sample No. B3LR21	Filter * N	Date 11-29-18	Time 0906	No/Type Container 1x125-mL G/P	TC99_SEP_LSC: COMMON
Sample Analysis			Holding Time 6 Months	Preservative HCl to pH <2	

Relinquished By: Juan Aguilar ICHPRC	Signature	Date/Time NOV 29 2018 1010	Received By: Roger Friesz Jr. ICHPRC	Signature	Date/Time NOV 29 2018 1010
Relinquished By: Roger Friesz Jr. ICHPRC	Signature	Date/Time NOV 29 2018 1125	Received By: SSU-1	Signature	Date/Time NOV 29 2018 1125
Relinquished By: SSU-1	Signature	Date/Time NOV 30 2018 0600	Received By: Jenelle Zunker CHPRC	Signature	Date/Time NOV 30 2018 0600
Relinquished By: Jenelle Zunker CHPRC	Signature	Date/Time NOV 30 2018 1100	Received By: FEDEX	Signature	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

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

Date/Time:

1812003

ALS1812003
12/14/2018

REV.0

CH2M Hill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		C.O.C.# I19-004-013 Page 1 of 1
Collector: WILLIAM COLLINS CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650		
SAF No.: I19-004	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071		
Project Title: CERCLA, NOVEMBER 2018	Logbook No.: HNF-N-506-101-87	Ice Chest No.: 605-428		
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 773850934070		
Protocol: CERCLA	Priority: 30 Days	Offsite Property No.: 10331		
POSSIBLE SAMPLE HAZARDS/REMARK ** ** Contains Radioactive Material at concentrations that are not regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1		SPECIAL INSTRUCTIONS N/A		
Sample No. B3LRD5	Filter N	Date 11-29-18	Time 10:53	No/Type Container 2x1-L G/P
Sample Analysis SRISO_SEP_PRECIP_GPC: COMMON		Holding Time 6 Months	Preservative HNO3 to pH <2	

Relinquished By: WILLIAM COLLINS CHPRC	Signature 	Date/Time NOV 29 2018 12:05	Received By: SSU-1	Signature 	Date/Time NOV 29 2018 12:05	Matrix * S = Soil SE = Sediment SO = Solid SL = Sludge W = Water O = Oil A = Air DS = Drum Solids DL = Drum Liquids T = Tissue WI = Wipe L = Liquid V = Vegetation X = Other
Relinquished By: SSU-1	Signature 	Date/Time NOV 30 2018 08:00	Received By: Jenella Zunker CHPRC	Signature 	Date/Time NOV 30 2018 08:00	
Relinquished By: Jenella Zunker CHPRC	Signature 	Date/Time NOV 30 2018 11:05	Received By: FEDEX	Signature 	Date/Time 12/11/18 11:05	
Relinquished By: FEDEX	Signature 	Date/Time 12/11/18 11:05	Received By: NICK JOSTES	Signature 	Date/Time 12/11/18 11:05	
Relinquished By: NICK JOSTES	Signature 	Date/Time 12/11/18 11:05	Received By: Disposed By:	Signature 	Date/Time Disposed By:	
Relinquished By: Disposed By:	Signature 	Date/Time Disposed By:	Received By: Disposed By:	Signature 	Date/Time Disposed By:	

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

Disposed By:

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

Disposed By:

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

Disposed By:

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

Disposed By:

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

Disposed By:

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

Printed On 10/3/2018

FSR ID = FSR69929

Final Sample Disposition

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

Disposed By:

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

Disposed By:

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

Disposed By:

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

Page 1 of 1

1812003

ORIGIN ID: PSCA (509) 373-3580
JANELLE ZUNKER
CH2M
6289 LATAH ST.
RICHLAND, WA 99354
UNITED STATES US

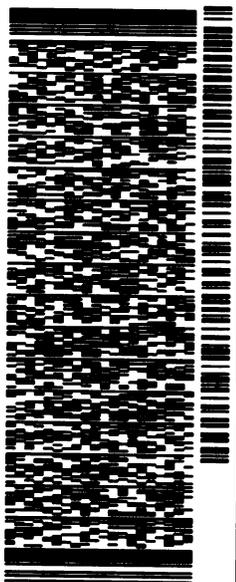
SHIP DATE: 30NOV18
ACTWGT: 23.00 LB
CWD: 107068051MET4040
BILL THIRD PARTY

TO JULIE ELLINGSON
ALS GLOBAL
225 COMMERCE DRIVE

9-2
Amb

FORT COLLINS CO 80524
(970) 490-1511 REF: 10331
NV
PO DEPT.

552J2/E4AF/DCA5

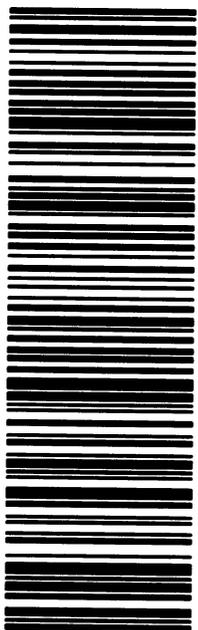


TRK# 7738 5093 4070
0201

SATURDAY 12:00P
PRIORITY OVERNIGHT
DSR

X0 FTCA

CO-US DEN
80524



After printing this label:

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Metals

Case Narrative

CH2M HILL Plateau Remediation Company

CERCLA, NOVEMBER 2018 -- I19-004

Work Order Number: 1812003

1. The samples were prepared and analyzed based on SW-846, 3rd Edition procedures.

For analysis by ICP-MS, the samples were digested following method 3005A and the current revision of SOP 806.

2. Analysis by ICP-MS followed method 6020A and the current revision of SOP 827.
3. All standards and solutions are NIST traceable and were used within their recommended shelf life.
4. The samples were prepared and analyzed within the established hold time.

All in house quality control procedures were followed, as described below.

5. General quality control procedures.
 - A preparation (method) blank and laboratory control sample were digested and analyzed with the samples in this digestion batch.
 - The preparation (method) blank associated with this digestion batch was below the reporting limit for the requested analyte. Sample results have been compared to the blank results and are flagged as appropriate.
 - All laboratory control sample criteria were met.
 - All initial and continuing calibration blanks were below the reporting limit for the requested analyte.
 - All initial and continuing calibration verifications were within the acceptance criteria for the requested analyte.



- The interference check samples associated with Method 6020A were analyzed.
6. Matrix specific quality control procedures.
- Sample 1811529-1 was designated as the quality control sample for this analysis. Results for the shared quality control samples are included at the client's request.
- Similarity of matrix and therefore relevance of the QC results should not be automatically inferred for any sample other than the native sample selected for QC.
- A matrix spike and matrix spike duplicate were digested and analyzed with this batch. All acceptance criteria for accuracy were met.
 - A serial dilution was analyzed with the ICP batch. All acceptance criteria were met.
7. It is a standard practice that samples for ICP-MS are analyzed at a dilution. The 10X factor can be considered an artifact of the prep and does not indicate a secondary dilution and is therefore not flagged as a dilution.

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.

Megan Johnstone for
Megan Johnstone
Inorganics Primary Data Reviewer

12/14/18
Date

Kath M. O.
Inorganics Final Data Reviewer

12/14/18
Date



Inorganic Data Reporting Qualifiers

The following qualifiers are used as needed by the laboratory when reporting results of inorganic analyses.

- Result qualifier -- A "B" is entered if the reported value was obtained from a reading that was less than the Reporting Limit but greater than or equal to the Method Detection Limit (MDL). If the analyte was analyzed for but not detected a "U" is entered. For samples, negative values are reported as non-detects ("U" flagged). For blanks, if the absolute value of the negative value is above the MDL and below the reporting limit, then the result is "B" flagged.
- QC qualifier -- Specified entries and their meanings are as follows:
 - E - The reported value is estimated because of the presence of interference. An explanatory note may be included in the narrative.
 - M - Duplicate injection precision was not met.
 - N - Spiked sample recovery not within control limits. A post spike is analyzed for all ICP analyses when the matrix spike and or spike duplicate fail and the native sample concentration is less than four times the spike added concentration.
 - Z - Spiked recovery not within control limits. An explanatory note may be included in the narrative.
 - * - Duplicate analysis (relative percent difference) not within control limits.
 - S - SAR value is estimated as one or more analytes used in the calculation were not detected above the detection limit.
 - C - The analyte was detected in both the sample and the associated QC blank, and the sample concentration was $\leq 20X$ the blank concentration.
 - D - Analyte was reported at a secondary dilution factor, typically $DF > 1$ (i.e., the primary preparation required dilution to either bring the analyte within the calibration range or to minimize interference). Required for organics/wetchem if the sample was diluted.

Dissolved CHROMIUM

Method SW6020A

Sample Results

Lab Name: ALS -- Fort Collins
Client Name: CH2M HILL Plateau Remediation Company
Client Project ID: CERCLA, NOVEMBER 2018 I19-004
Work Order Number: 1812003 **Final Volume:** 50 ml
Reporting Basis: As Received **Matrix:** WATER
Analyst: Brent A. Stanfield **Result Units:** UG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	MDL/DL	Flag	Sample Aliquot
B3LT41	1812003-1	11/29/2018	12/6/2018	12/08/2018	N/A	10	21	10	0.46		50 ml
B3LTY4	1812003-4	11/29/2018	12/6/2018	12/08/2018	N/A	10	19	10	0.46		50 ml
B3LV51	1812003-6	11/29/2018	12/6/2018	12/08/2018	N/A	10	12	10	0.46		50 ml
B3LRC1	1812003-7	11/29/2018	12/6/2018	12/08/2018	N/A	10	5	10	0.46	B	50 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *IM1812003-1*

Total Recoverable CHROMIUM

Method SW6020A

Sample Results

Lab Name: ALS -- Fort Collins
Client Name: CH2M HILL Plateau Remediation Company
Client Project ID: CERCLA, NOVEMBER 2018 I19-004
Work Order Number: 1812003 **Final Volume:** 50 ml
Reporting Basis: As Received **Matrix:** WATER
Analyst: Brent A. Stanfield **Result Units:** UG/L

Client Sample ID	Lab ID	Date Collected	Date Prepared	Date Analyzed	Percent Moisture	Dilution Factor	Result	RptLimit/ LOQ/LOD	MDL/DL	Flag	Sample Aliquot
B3LT37	1812003-2	11/29/2018	12/6/2018	12/08/2018	N/A	10	22	10	0.46		50 ml
B3LTY0	1812003-3	11/29/2018	12/6/2018	12/08/2018	N/A	10	19	10	0.46		50 ml
B3LV47	1812003-5	11/29/2018	12/6/2018	12/08/2018	N/A	10	12	10	0.46		50 ml
B3LRB7	1812003-8	11/29/2018	12/6/2018	12/08/2018	N/A	10	5	10	0.46	B	50 ml

Comments:

1. ND or U = Not Detected at or above the client requested detection limit.

Data Package ID: *IM1812003-1*

ICPMS Metals

Method SW6020A

Method Blank

Lab Name: ALS -- Fort Collins

Work Order Number: 1812003

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Lab ID: IP181206-1MB

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 06-Dec-18

Date Analyzed: 08-Dec-18

Prep Batch: IP181206-1

QCBatchID: IP181206-1-1

Run ID: IM181208-10A10

Cleanup: NONE

Basis: N/A

File Name: 027SMPL_

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	DF	Result	Result Qualifier	Reporting Limit	MDL
7440-47-3	CHROMIUM	10	0.46	U	10	0.46

Data Package ID: IM1812003-1

ICPMS Metals
Method SW6020A
Laboratory Control Sample

Lab Name: ALS -- Fort Collins

Work Order Number: 1812003

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Lab ID: IM181206-1LCS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 12/06/2018

Date Analyzed: 12/08/2018

Prep Method: SW3005A

Prep Batch: IP181206-1

QCBatchID: IP181206-1-1

Run ID: IM181208-10A10

Cleanup: NONE

Basis: N/A

File Name: 028SMPL_

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

CASNO	Target Analyte	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7440-47-3	CHROMIUM	500	513	10		103	80 - 120%

Data Package ID: IM1812003-1

ICPMS Metals

Method SW6020A

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS -- Fort Collins

Work Order Number: 1812003

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Field ID: SHARED QC
LabID: 1811529-1MS

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 27-Nov-18
Date Extracted: 06-Dec-18
Date Analyzed: 08-Dec-18
Prep Method: SW3005 Rev A

Prep Batch: IP181206-1
QCBatchID: IP181206-1-1
Run ID: IM181208-10A10
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: UG/L
File Name: 039SMPL_

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7440-47-3	CHROMIUM	3.3	B	503		10	500	100	75 - 125%

Field ID: SHARED QC
LabID: 1811529-1MSD

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 27-Nov-18
Date Extracted: 06-Dec-18
Date Analyzed: 08-Dec-18
Prep Method: SW3005 Rev A

Prep Batch: IP181206-1
QCBatchID: IP181206-1-1
Run ID: IM181208-10A10
Cleanup: NONE
Basis: As Received

Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: UG/L
File Name: 040SMPL_

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7440-47-3	CHROMIUM	513		500	102	10	20	2

Data Package ID: IM1812003-1

Prep Batch ID: IP181206-1

Start Date: 12/06/18	End Date: 12/06/18	Concentration Method: NONE	Batch Created By: jml
Start Time: 7:20	End Time: 18:00	Extract Method: SW3005A	Date Created: 12/06/18
Prep Analyst: Jill M. Latelle		Initial Volume Units: ml	Time Created: 7:44
Comments:		Final Volume Units: ml	Validated By: jml
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 12/06/18
			Time Validated: 9:24

QC Batch ID: IP181206-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP181206-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
IM181206-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
1811529-1	MS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
1811529-1	MSD	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
1811529-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
1811529-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
1811529-4	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
1811529-5	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811529
1811530-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811530
1811530-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811530
1811530-3	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811530
1811530-4	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1811530
1812003-1	SMP	B3LT41	WATER	11/29/2018	50	50	NONE	1	1812003
1812003-2	SMP	B3LT37	WATER	11/29/2018	50	50	NONE	1	1812003
1812003-3	SMP	B3LTY0	WATER	11/29/2018	50	50	NONE	1	1812003
1812003-4	SMP	B3LTY4	WATER	11/29/2018	50	50	NONE	1	1812003
1812003-5	SMP	B3LV47	WATER	11/29/2018	50	50	NONE	1	1812003
1812003-6	SMP	B3LV51	WATER	11/29/2018	50	50	NONE	1	1812003
1812003-7	SMP	B3LRC1	WATER	11/29/2018	50	50	NONE	1	1812003
1812003-8	SMP	B3LRB7	WATER	11/29/2018	50	50	NONE	1	1812003

QC Types

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



Strontium-90 Case Narrative

CH2M HILL Plateau Remediation Company

CERCLA, NOVEMBER 2018 – I19-004

Work Order Number: 1812003

1. The sample was prepared according to the current revision of SOP 707.
2. The sample was analyzed for the presence of ⁹⁰Sr according to the current revision of SOP 724. The analysis was completed on 12/12/2018.
3. Total radio-strontium is reported as ⁹⁰Sr. The presence of other radioisotopes of strontium may cause positive bias in the measured strontium concentration.
4. The analysis results for the sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
5. Sample volume was insufficient to allow preparation of a duplicate. A laboratory control sample duplicate (LCSD) was prepared in lieu of a client sample duplicate.
6. In accordance with project specific instructions, the evaluation threshold for Relative Percent Difference (RPD) has been set at 20%. RPD is defined as:

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

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

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



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

Pik Yee Yuen
Pik Yee Yuen
Radiochemistry Primary Data Reviewer

12/13/18
Date

Kath M. O.
Radiochemistry Final Data Reviewer

12/14/18
Date

Strontium-90 by GFPC

PAI 724 Rev 13

Method Blank Results

Lab Name: ALS -- Fort Collins
 Work Order Number: 1812003
 Client Name: CH2M HILL Plateau Remediation Company
 ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Lab ID: SR181207-1MB	Sample Matrix: WATER	Prep Batch: SR181207-1	Final Aliquot: 994 ml
	Prep SOP: PAI 707 Rev 14	QCBatchID: SR181207-1-2	Result Units: pCi/l
	Date Collected: 07-Dec-18	Run ID: SR181207-1A	File Name: SRA1211A
	Date Prepared: 07-Dec-18	Count Time: 120 minutes	
	Date Analyzed: 11-Dec-18		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	1.90E-01 +/- 2.82E-01	6.08E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	9.890E+02	8.54E+02	ug	86.4	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.

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: SR1812003-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Lab ID: SR181207-1LCS

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 14
Date Collected: 07-Dec-18
Date Prepared: 07-Dec-18
Date Analyzed: 11-Dec-18

Prep Batch: SR181207-1
QCBatchID: SR181207-1-2
Run ID: SR181207-1A
Count Time: 120 minutes

Final Aliquot: 994 ml
Result Units: pCi/l
File Name: SRA1211A

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.07E+01 +/- 2.60E+00	5.29E-01	1.060E+01	101	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	9.540E+02	8.62E+02	ug	90.3	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: SR1812003-1

Strontium-90 by GFPC

PAI 724 Rev 13

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Lab ID: SR181207-1LCSD	Sample Matrix: WATER	Prep Batch: SR181207-1	Final Aliquot: 994 ml
	Prep SOP: PAI 707 Rev 14	QCBatchID: SR181207-1-2	Result Units: pCi/l
	Date Collected: 07-Dec-18	Run ID: SR181207-1A	File Name: SRA1211A
	Date Prepared: 07-Dec-18	Count Time: 120 minutes	
	Date Analyzed: 11-Dec-18		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.16E+01 +/- 2.81E+00	6.25E-01	1.060E+01	110	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	9.790E+02	8.53E+02	ug	87.1	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: SR1812003-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 119-004

Field ID:	
Lab ID:	SR181207-1LCSD

Sample Matrix: WATER	Prep Batch: SR181207-1	Final Aliquot: 994 ml
Prep SOP: PAI 707 Rev 14	QCBatchID: SR181207-1-2	Prep Basis: Unfiltered
Date Collected: 07-Dec-18	Run ID: SR181207-1A	Moisture(%): NA
Date Prepared: 07-Dec-18	Count Time: 120 minutes	Result Units: pCi/l
Date Analyzed: 11-Dec-18		File Name: SRA1211A

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.07E+01 +/-	2.60E+00	5.29E-01		1.16E+01 +/-	2.81E+00	6.25E-01		0.448	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: SR1812003-1

Strontium-90 by GFPC

PAI 724 Rev 13

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
 Work Order Number: 1812003
 Client Name: CH2M HILL Plateau Remediation Company
 ClientProject ID: CERCLA, NOVEMBER 2018 119-004

Field ID:	
Lab ID:	SR181207-1LCSD

Sample Matrix: WATER
 Prep SOP: PAI 707 Rev 14
 Date Collected: 07-Dec-18
 Date Prepared: 07-Dec-18
 Date Analyzed: 11-Dec-18
 Prep Batch: SR181207-1
 QCBatchID: SR181207-1-2
 Run ID: SR181207-1A
 Count Time: 120 minutes
 Final Aliquot: 994 ml
 Prep Basis: Unfiltered
 Moisture(%): NA
 Result Units: pCi/l
 File Name: SRA1211A

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.07E+01 +/-	2.60E+00	5.29E-01		1.16E+01 +/-	2.81E+00	6.25E-01		8.00	20

Comments:

Qualifiers/Flags:

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

Abbreviations:

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

Data Package ID: SR1812003-1

Strontium-90 by GFPC

PAI 724 Rev 13

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Field ID:	B3LRD5
Lab ID:	1812003-10

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 14
Date Collected: 29-Nov-18
Date Prepared: 07-Dec-18
Date Analyzed: 11-Dec-18

Prep Batch: SR181207-1
QCBatchID: SR181207-1-2
Run ID: SR181207-1A
Count Time: 120 minutes
Report Basis: Unfiltered

Final Aliquot: 994 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRA1211A

Analysis ReqCode: SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	5.86E+00 +/- 1.46E+00	5.06E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.310E+03	1.23E+03	ug	94.2	40 - 110 %	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- 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: SR1812003-1

Prep Batch ID: SR181207-1

Start Date: 12/07/18	End Date: 12/07/18	Concentration Method: NONE	Batch Created By: rgs
Start Time: 11:30	End Time: 11:30	Extract Method: PAI 70714	Date Created: 12/07/18
Prep Analyst: Reilly G. Stockton		Initial Volume Units: ml	Time Created: 11:30
Comments:		Final Volume Units: ml	Validated By: rgs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 12/11/18
			Time Validated: 9:34

QC Batch ID: SR181207-1-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR181207-1	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1811349
SR181207-1	MB	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1811349
SR181207-1	LCS	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1811349
SR181207-1	LCSD	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1811349
1811349-5	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1811349
1811349-6	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1811349
1811349-7	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1811349
1811349-8	SMP	XXXXXX	WATER	XXXXXX	1000	994.01	NONE	1	1811349
1812003-10	SMP	B3LRD5	WATER	11/29/2018	1000	994.01	NONE	1	1812003

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		



Technetium-99

Case Narrative

CH2M HILL Plateau Remediation Company

CERCLA, NOVEMBER 2018 – I19-004

Work Order Number: 1812003

1. The sample was prepared according to the current revision of SOP 755, with procedure modifications outlined in QASS 378635 and 378636.
2. The sample was analyzed for the presence of ⁹⁹Tc according to the current revision of SOP 704. The analysis was completed on 12/10/2018.
3. The analysis results for the sample are reported in units of pCi/L. The sample was not filtered prior to analysis.
4. The duplicate of sample 1811349-1 is shared for this work order. The duplicate was performed on a CH2M HILL Plateau Remediation Company 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. RPD is not evaluated for sample/duplicate pairs where the reported activity for either is less than 5 times the sample specific MDC. These samples are identified with an "NC" flag on the Duplicate Sample Results (RPD) page.

6. The requested MDC was not met for sample 1812003-9. The reported activity exceeds the achieved MDC. Results are submitted without further qualification. The results are flagged with an "X" flag on the final report.



7. The calculated yield, as determined by gamma spectrometric analysis of the ^{99m}Tc tracer, for shared QC sample 1811349-1 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 further 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.

Pik Yee Yuen
Pik Yee Yuen
Radiochemistry Primary Data Reviewer

12/14/18
Date

Kathleen M. O.
Radiochemistry Final Data Reviewer

12/14/18
Date

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Method Blank Results

Lab Name: ALS -- Fort Collins
 Work Order Number: 1812003
 Client Name: CH2M HILL Plateau Remediation Company
 ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Lab ID: TC181204-1MB	Sample Matrix: WATER	Prep Batch: TC181204-1	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC181204-1-2	Result Units: pCi/l
	Date Collected: 04-Dec-18	Run ID: TC181204-1A	File Name: B60_12_121001
	Date Prepared: 04-Dec-18	Count Time: 30 minutes	
	Date Analyzed: 10-Dec-18		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	6.83E-01 +/- 5.95E+00	9.99E+00	2.00E+01	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.190E+03	4.00E+03	Pci	95.3	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.
 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: TC1812003-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Lab ID: TC181204-1LCS	Sample Matrix: WATER	Prep Batch: TC181204-1	Final Aliquot: 250 ml
	Prep SOP: PAI 755 Rev 12	QCBatchID: TC181204-1-2	Result Units: pCi/l
	Date Collected: 04-Dec-18	Run ID: TC181204-1A	File Name: B60_12_121001
	Date Prepared: 04-Dec-18	Count Time: 30 minutes	
	Date Analyzed: 10-Dec-18		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
14133-76-7	Tc-99	9.32E+02 +/- 1.50E+02	9.98E+00	9.110E+02	102	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.190E+03	4.03E+03	Pci	96.1	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: TC1812003-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 119-004

Field ID:	Shared QC
Lab ID:	1811349-1DUP

Sample Matrix: WATER	Prep Batch: TC181204-1	Final Aliquot: 250 ml
Prep SOP: PAI 755 Rev 12	QCBatchID: TC181204-1-2	Prep Basis: Unfiltered
Date Collected: 16-Nov-18	Run ID: TC181204-1A	Moisture(%): NA
Date Prepared: 04-Dec-18	Count Time: 30 minutes	Result Units: pCi/l
Date Analyzed: 10-Dec-18	Report Basis: Unfiltered	File Name: B60_12_121001

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	4.00E+01 +/-	9.30E+00	9.59E+00		5.15E+01 +/-	1.14E+01	1.10E+01		1.57	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: TC1812003-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
 Work Order Number: 1812003
 Client Name: CH2M HILL Plateau Remediation Company
 ClientProject ID: CERCLA, NOVEMBER 2018 119-004

Field ID:	Shared QC
Lab ID:	1811349-1DUP

Sample Matrix: WATER	Prep Batch: TC181204-1	Final Aliquot: 250 ml
Prep SOP: PAI 755 Rev 12	QCBatchID: TC181204-1-2	Prep Basis: Unfiltered
Date Collected: 16-Nov-18	Run ID: TC181204-1A	Moisture(%): NA
Date Prepared: 04-Dec-18	Count Time: 30 minutes	Result Units: pCi/l
Date Analyzed: 10-Dec-18	Report Basis: Unfiltered	File Name: B60_12_121001

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
14133-76-7	Tc-99	4.00E+01 +/-	9.30E+00	9.59E+00		5.15E+01 +/-	1.14E+01	1.10E+01		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: TC1812003-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Field ID:	Shared QC
Lab ID:	1811349-1

Sample Matrix: WATER	Prep Batch: TC181204-1	Final Aliquot: 250 ml
Prep SOP: PAI 755 Rev 12	QCBatchID: TC181204-1-2	Prep Basis: Unfiltered
Date Collected: 16-Nov-18	Run ID: TC181204-1A	Moisture(%): NA
Date Prepared: 04-Dec-18	Count Time: 30 minutes	Result Units: pCi/l
Date Analyzed: 10-Dec-18	Report Basis: Unfiltered	File Name: B60_12_121001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	4.00E+01 +/- 9.30E+00	9.59E+00	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.190E+03	4.23E+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: TC1812003-1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Sample Duplicate Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 119-004

Field ID:	Shared QC
Lab ID:	1811349-1DUP

Sample Matrix: WATER
Prep SOP: PAI 755 Rev 12
Date Collected: 16-Nov-18
Date Prepared: 04-Dec-18
Date Analyzed: 10-Dec-18

Prep Batch: TC181204-1
QCBatchID: TC181204-1-2
Run ID: TC181204-1A
Count Time: 30 minutes
Report Basis: Unfiltered

Final Aliquot: 250 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: B60_12_121001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	5.15E+01 +/- 1.14E+01	1.10E+01	2E+01	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.190E+03	3.72E+03	Pci	88.9	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.
- 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: TC1812003-1

Date Printed:

Friday, December 14, 2018

ALS -- Fort Collins

LIMS Version: 6.886

Page 1 of 1

Technetium-99 by Liquid Scintillation

PAI 704_Tc99 Rev 11

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1812003
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: CERCLA, NOVEMBER 2018 I19-004

Field ID:	B3LR21
Lab ID:	1812003-9

Sample Matrix: WATER	Prep Batch: TC181204-1	Final Aliquot: 110 ml
Prep SOP: PAI 755 Rev 12	QCBatchID: TC181204-1-2	Prep Basis: Unfiltered
Date Collected: 29-Nov-18	Run ID: TC181204-1A	Moisture(%): NA
Date Prepared: 04-Dec-18	Count Time: 30 minutes	Result Units: pCi/l
Date Analyzed: 10-Dec-18	Report Basis: Unfiltered	File Name: B60_12_121001

Analysis ReqCode: TC99_SEP_LSC

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
14133-76-7	Tc-99	1.78E+02 +/- 3.38E+01	2.35E+01	2E+01	NA	X

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
Tc-99m	4.190E+03	3.91E+03	Pci	93.2	40 - 110 %	

Comments:

Qualifiers/Flags:

- U - Result is less than the sample specific MDC.
- Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.
- Y2 - Chemical Yield outside default limits.
- 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: TC1812003-1

Prep Batch ID: TC181204-1

Start Date: 12/04/18	End Date: 12/04/18	Concentration Method: NONE	Batch Created By: trs
Start Time: 10:26	End Time: 10:26	Extract Method: PAI 75512	Date Created: 12/04/18
Prep Analyst: Tyler R. Secor		Initial Volume Units: ml	Time Created: 10:29
Comments:		Final Volume Units: ml	Validated By: trs
			Date Validated: 12/06/18
			Time Validated: 11:21

QC Batch ID: TC181204-1-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
TC181204-1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
TC181204-1CB1	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
TC181204-1CB2	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
TC181204-1CB3	MB	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
TC181204-1	LCS	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
1811349-1	DUP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
1811349-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
1811349-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
1811349-3	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
1811349-4	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811349
1811350-1	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811350
1811484-1	SMP	XXXXXX	WATER	XXXXXX	100	100	NONE	1	1811484
1811532-2	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811532
1811532-5	SMP	XXXXXX	WATER	XXXXXX	250	250	NONE	1	1811532
1812003-9	SMP	B3LR21	WATER	11/29/2018	110	110	NONE	1	1812003

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		

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

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

CLS 8/12/09

CLS 8/12/09

Attach vendor label on the right side of page →

CLS 8/12/09

Cardinal Health
 CARDINAL HEALTH 414, LLC
 DENVER
 10400 48TH AVE, STE B
 DENVER CO 80238
 303.373.0579

Rx# 689920
 Date Ordered : 04Dec2018
 Date/Time Prepared : 06Dec2018 03:08 MT
ALS LABORATORY GROUP
 225 COMMERCE DR
 FORT COLLINS CO 80524 - 2762
10359 Fort Collins
 Patient : **For Physician Order**

Safetrac™

CH102864

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

Disp Amt : **0.54 mCi**

Calibration: **06Dec2018 10:00 MT**

Not for Human Use For Calibration Use Only

Indication : **Calibration**

Dispense Date : **06Dec2018** Lot# : **E18340-0048** Price(est) : **N/A**

Use By : **07Dec2018 03:08 MT** Physician : **Charles Orchard, RSO** NPT : _____

Notes : _____ NDC : _____ RPh : **S.Sulfrian**

Ordered Amount : 0.50 mCi
 Volume : 10.00 mL
 Conc : 0.05 mCi/mL

RADIOACTIVE MATERIALS

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

TECHNICIAN/ANALYST Crystal Sheaffer

DATE 8/12/09

DEPARTMENT MANAGER Jeffery Z

DATE 8/12/09

378636

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

ALS Laboratory Group - Fort Collins

QUALITY ASSURANCE SUMMARY SHEET

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

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

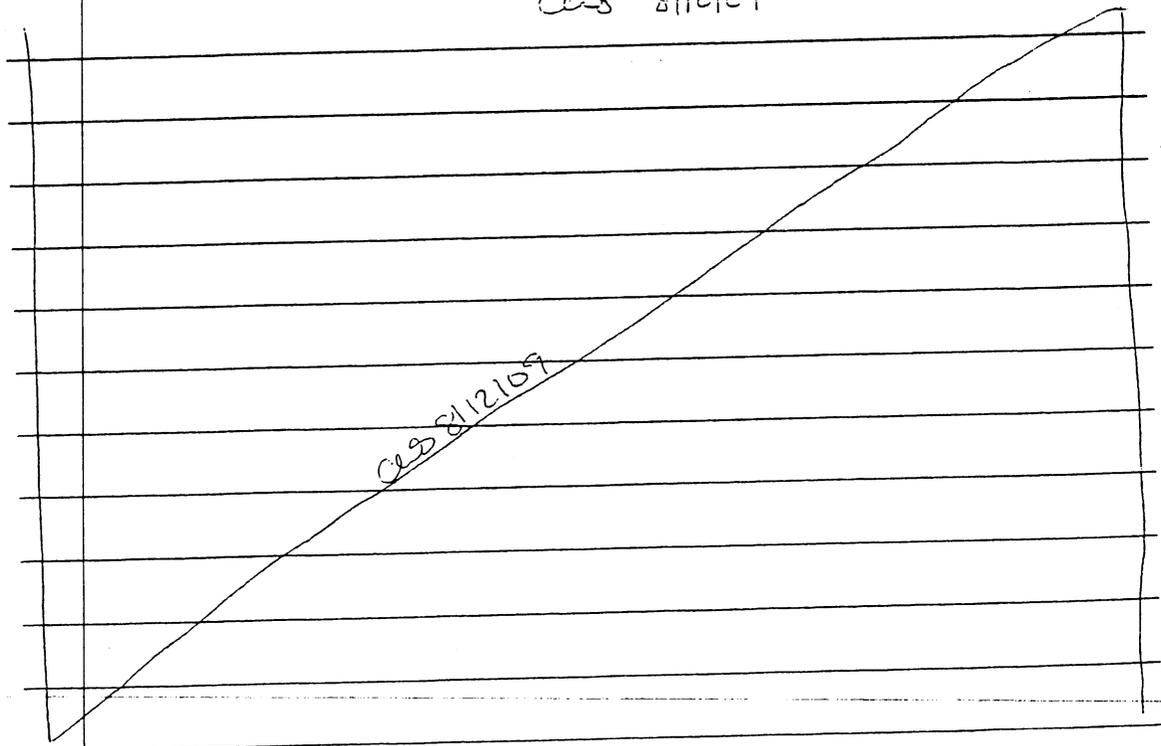
ces 8/12/09

ces 8/12/09

ces 8/12/09

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

ces 8/12/09



TECHNICIAN/ANALYST Crystal Sheefer

DATE 8/12/09

DEPARTMENT MANAGER [Signature]

DATE 8/12/09

378635