



Monday, July 30, 2018

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

Re: ALS Workorder: 1806608
Project Name: 100-N Apatite Barrier, June 20
Project Number: I18-012

Dear Ms. Waters-Husted:

Five water samples were received from CH2M HILL Plateau Remediation Company, on 6/26/2018. The samples were scheduled for the following analyses:

Metals
Strontium-90

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

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

Thank you for your confidence in ALS Environmental. Should you have any questions, please call.

Sincerely,

ALS Environmental
Katie M. O'Brien
Project Manager

We certify that this data package is in compliance with the SOW, both technically and for completeness, including a full description of, explanation of, and corrective actions for, any and all deviations, from either the analyses requested or the case narrative requested. Release of the data contained in this hard copy data package has been authorized by the Laboratory Analytical Manager (or designee) and the laboratory's client services representative as verified by their signatures on this report.

ALS -- Fort Collins

Sample Number(s) Cross-Reference Table

OrderNum: 1806608

Client Name: CH2M HILL Plateau Remediation Company

Client Project Name: 100-N Apatite Barrier, June 20

Client Project Number: I18-012

Client PO Number: BOA 54854

Client Sample Number	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
B3JFC0	1806608-1		WATER	25-Jun-18	10:15
B3J8J2	1806608-2		WATER	25-Jun-18	10:00
B3J8J6	1806608-3		WATER	25-Jun-18	10:00
B3J8J7	1806608-4		WATER	25-Jun-18	11:44
B3J8J3	1806608-5		WATER	25-Jun-18	11:44

1806608

Collector: Juan Aguilar ICHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: I18-012	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071
Project Title: 100-N Apatite Barrier, June 20	Logbook No.: HNF-N-506-9962	Ice Chest No.: 2105-653
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment Commercial Carrier	Bill of Lading/Air Bill No.: 7725 6115 7186
Protocol CERCLA	Priority: 30 Days	Offsite Property No.: 9014

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
B3JFC0 ①	N	W	6-25-18	1015	2x1-L G/P	SRISO_SEP_PRECIP_GPC: COMMON	6 Months	HNO3 to pH <2

ALS1806608
7/30/2018

Relinquished By: Juan Aguilar ICHPRC Signature: [Signature] Date/Time: JUN 25 2018 1050	Received By: Leahy Wall ICHPRC Signature: [Signature] Date/Time: JUN 25 2018 1050	Matrix * S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquid SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other	
Relinquished By: Leahy Wall ICHPRC Signature: [Signature] Date/Time: JUN 25 2018 1400	Received By: FEDEX Signature: [Signature] Date/Time: [Signature]		
Relinquished By: FED Ex Signature: [Signature] Date/Time: [Signature]	Received By: [Signature] Signature: [Signature] Date/Time: 6-26-18 0925		
Relinquished By: [Signature] Signature: [Signature] Date/Time: [Signature]	Received By: [Signature] Signature: [Signature] Date/Time: [Signature]		
FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

30136

REV.0

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST	C.O.C.# I18-012-004 Page 1 of 1
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1806608

Collector: Larry Rosane CHPRC	Contact/Requester: Karen Waters-Husted	Telephone No.: 509-376-4650
SAF No.: I18-012	Sampling Origin: Hanford Site	Purchase Order/Charge Code: 300071
Project Title: 100-N Apatite Barrier, June 20	Logbook No.: HNF-N-506 98-96	Ice Chest No.: 6125-1053
Shipped To (Lab): ALS Environmental Ft. Collins	Method of Shipment: Commercial Carrier	Bill of Lading/Air Bill No.: 772510157186
Protocol: CERCLA	Priority: 30 Days	Offsite Property No.: 91614

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
B3J8J2 ②	N	W	6-25-18	1000	1x500-mL G/P	6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: GW 01	6 Months	HNO3 to pH <2
B3J8J6 ③	Y	W	6-25-18	1000	1x500-mL G/P	6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: GW 01	6 Months	HNO3 to pH <2

ALS1806608
 7/30/2018

Relinquished By: Larry Rosane CHPRC JUN 25 2018 1245 <small>Print First and Last Name Signature Date/Time</small>	Received By: Janelle Zunker CHPRC JUN 25 2018 1245 <small>Print First and Last Name Signature Date/Time</small>	Matrix * S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquid SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other	
Relinquished By: Janelle Zunker CHPRC JUN 25 2018 140 <small>Print First and Last Name Signature Date/Time</small>	Received By: FEDEX <small>Print First and Last Name Signature Date/Time</small>		
Relinquished By: FEDEX <small>Print First and Last Name Signature Date/Time</small>	Received By: CRIMBLE C Zunker <small>Print First and Last Name Signature Date/Time</small>		
Relinquished By: <small>Print First and Last Name Signature Date/Time</small>	Received By: <small>Print First and Last Name Signature Date/Time</small>		
FINAL SAMPLE DISPOSITION	Disposal Method (e.g., Return to customer, per lab procedure, used in process):	Disposed By:	Date/Time:

40105

REV.0

Collector: Larry Rosane /CHPRC
Contact/Requester: Karen Waters-Husted
Telephone No.: 509-376-4650
SAF No.: I18-012
Sampling Origin: Hanford Site
Purchase Order/Charge Code: 300071
Project Title: 100-N Apatite Barrier, June 20
Logbook No.: HNF-N-506 98/96
Ice Chest No.: 625-653
Shipped To (Lab): ALS Environmental Ft. Collins
Method of Shipment: Commercial Carrier
Bill of Lading/Air Bill No.: 7725 6115 9186
Protocol: CERCLA
Priority: 30 Days
Offsite Property No.: 91014

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
B3J8J7 (4)	Y	W	6-25-18	1144	1x500-mL G/P	6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: GW 01	6 Months	HNO3 to pH <2
B3J8J3 (5)	N	W	6-25-18	1144	1x500-mL G/P	6010_METALS_ICP: GW 04; 6020_METALS_ICPMS: GW 01	6 Months	HNO3 to pH <2

ALS1806608
7/30/2018

Relinquished By: Larry Rosane /CHPRC Signature: <i>Larry Rosane</i> Date/Time: JUN 25 2018 1245	Received By: Janelle Zunker /CHPRC Signature: <i>Janelle Zunker</i> Date/Time: JUN 25 2018 1245	Matrix * S = Soil DS = Drum Solids SE = Sediment DL = Drum Liquid SO = Solid T = Tissue SL = Sludge WI = Wipe W = Water L = Liquid O = Oil V = Vegetation A = Air X = Other
Relinquished By: Janelle Zunker /CHPRC Signature: <i>Janelle Zunker</i> Date/Time: JUN 25 2018 1400	Received By: FEDEX Signature: <i>FEDEX</i> Date/Time:	
Relinquished By: FED EX Signature: <i>FED EX</i> Date/Time:	Received By: <i>Trish C...</i> Signature: <i>Trish C...</i> Date/Time: 6-26-18 0852	
Relinquished By: Signature: 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:

REV.0



ALS Environmental - Fort Collins
CONDITION OF SAMPLE UPON RECEIPT FORM

Client: CHPRC

Workorder No: 1806608

Project Manager: [Signature]

Initials: CDG Date: 6-26-18

1. Does this project require any special handling in addition to standard ALS procedures?		YES	<u>NO</u>
2. Are custody seals on shipping containers intact?	NONE	<u>YES</u>	NO
3. Are Custody seals on sample containers intact?	NONE	<u>YES</u>	NO
4. Is there a COC (Chain-of-Custody) present or other representative documents?		<u>YES</u>	NO
5. Are the COC and bottle labels complete and legible?		<u>YES</u>	NO
6. Is the COC in agreement with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		<u>YES</u>	NO
7. Were airbills / shipping documents present and/or removable?	DROP OFF	<u>YES</u>	NO
8. Are all aqueous samples requiring preservation preserved correctly? (excluding volatiles)	N/A	<u>YES</u>	NO
9. Are all aqueous non-preserved samples pH 4-9?	<u>N/A</u>	YES	NO
10. Is there sufficient sample for the requested analyses?		<u>YES</u>	NO
11. Were all samples placed in the proper containers for the requested analyses?		<u>YES</u>	NO
12. Are all samples within holding times for the requested analyses?		<u>YES</u>	NO
13. Were all sample containers received intact? (not broken or leaking, etc.)		<u>YES</u>	NO
14. Are all samples requiring no headspace (VOC, GRO, RSK/MEE, Rx CN/S, radon) headspace free? Size of bubble: ___ < green pea ___ > green pea	<u>N/A</u>	YES	NO
15. Do any water samples contain sediment? Amount of sediment: ___ dusting ___ moderate ___ heavy	Amount N/A	YES	<u>NO</u>
16. Were the samples shipped on ice?		YES	<u>NO</u>
17. Were cooler temperatures measured at 0.1-6.0°C?	IR gun used*: #1 #3 #4 RAD ONLY	YES	<u>NO</u>
Cooler #: <u>1</u>			
Temperature (°C): <u>Amb</u>			
No. of custody seals on cooler: <u>2</u>			
External µR/hr reading: <u>12</u>			
Background µR/hr reading: <u>12</u>			
Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? <u>YES</u> / NO / NA (If no, see Form 008.)			

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

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

Project Manager Signature / Date: [Signature] 6/26/18

1806608

ORIGIN ID: PSCA (509) 373-3580
JANELLE ZUNKER
CH2M
6269 LATAH ST.

RICHLAND, WA 99354
UNITED STATES US

SHIP DATE: 25 JUN 18
ACTWGT: 18.00 LB
CAD: 107066051/NET3980

BILL TO: THIRD PARTY

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

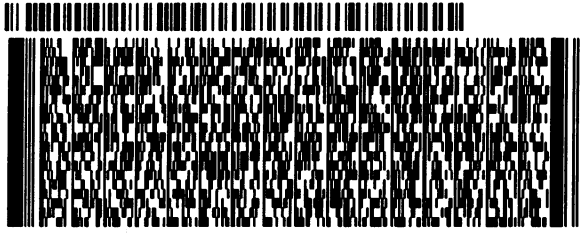
FORT COLLINS CO 80524

(970) 490-1511

REF: 9614

INV:
PO

DEPT



411118128110

552.1293DFDC45

TUE - 26 JUN 10:30A
PRIORITY OVERNIGHT

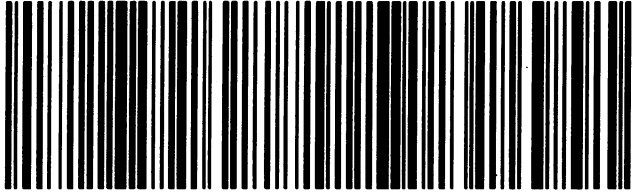
TRK# 7725 6115 7186
0201

DSR

80524

CO-US DEN

XH FTCA



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Metals

Case Narrative

CH2M HILL Plateau Remediation Company

100-N Apatite Barrier, June 20 – I18-012

Work Order Number: 1806608

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

For analysis by Trace ICP and 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.

Analysis by Trace ICP followed method 6010B and the current revision of SOP 834.

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 analytes. Sample results have been compared to the blank results and are flagged as appropriate. Chromium, nickel, tin and sodium were detected above the MDL.
 - All laboratory control sample criteria were met.
 - All initial and continuing calibration blanks were below the reporting limit for the requested analytes.



- All initial and continuing calibration verifications were within the acceptance criteria for the requested analytes.
- The interference check samples and high standard read-backs associated with Method 6010B were within acceptance criteria.
- The interference check samples associated with Method 6020A were analyzed.

6. Matrix specific quality control procedures.

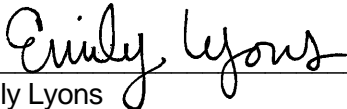
Sample 1806565-3 was designated as the quality control sample for each analysis. Results for the shared quality control samples are included at the client's request.

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 each batch. All acceptance criteria for accuracy were met.
- A serial dilution was analyzed with each 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.



Emily Lyons
Inorganics Primary Data Reviewer

7/29/18
Date



Inorganics Final Data Reviewer

7/30/18
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.

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J2
Lab ID:	1806608-2

Sample Matrix: WATER
 % Moisture: N/A
 Date Collected: 25-Jun-18
 Date Extracted: 19-Jul-18
 Date Analyzed: 19-Jul-18
 Prep Method: SW3005 Rev A

Prep Batch: IP180719-1
 QCBatchID: IP180719-1-1
 Run ID: IT180719-1A3
 Cleanup: NONE
 Basis: As Received
 File Name: 180719A.

Analyst: Steve Workman
 Sample Aliquot: 50 ml
 Final Volume: 50 ml
 Result Units: UG/L
 Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7440-42-8	BORON	1	36	U	50	36
7440-70-2	CALCIUM	1	210	U	1000	210
7439-89-6	IRON	1	30	U	50	30
7439-95-4	MAGNESIUM	1	89	U	750	89
7440-09-7	POTASSIUM	1	130	U	1000	130
7440-23-5	SODIUM	1	74	BC	500	38
7440-62-2	VANADIUM	1	0.43	U	10	0.43

Data Package ID: IT1806608-1

Dissolved ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J6
Lab ID:	1806608-3

Sample Matrix: WATER
 % Moisture: N/A
 Date Collected: 25-Jun-18
 Date Extracted: 19-Jul-18
 Date Analyzed: 19-Jul-18
 Prep Method: SW3005 Rev A

Prep Batch: IP180719-1
 QCBatchID: IP180719-1-1
 Run ID: IT180719-1A3
 Cleanup: NONE
 Basis: As Received
 File Name: 180719A.

Analyst: Steve Workman
 Sample Aliquot: 50 ml
 Final Volume: 50 ml
 Result Units: UG/L
 Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7440-42-8	BORON	1	36	U	50	36
7440-70-2	CALCIUM	1	210	U	1000	210
7439-89-6	IRON	1	30	U	50	30
7439-95-4	MAGNESIUM	1	89	U	750	89
7440-09-7	POTASSIUM	1	130	U	1000	130
7440-23-5	SODIUM	1	72	BC	500	38
7440-62-2	VANADIUM	1	0.43	U	10	0.43

Data Package ID: IT1806608-1

Dissolved ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J7
Lab ID:	1806608-4

Sample Matrix: WATER
 % Moisture: N/A
 Date Collected: 25-Jun-18
 Date Extracted: 19-Jul-18
 Date Analyzed: 19-Jul-18
 Prep Method: SW3005 Rev A

Prep Batch: IP180719-1
 QCBatchID: IP180719-1-1
 Run ID: IT180719-1A3
 Cleanup: NONE
 Basis: As Received
 File Name: 180719A.

Analyst: Steve Workman
 Sample Aliquot: 50 ml
 Final Volume: 50 ml
 Result Units: UG/L
 Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7440-42-8	BORON	1	36	U	50	36
7440-70-2	CALCIUM	1	82000		1000	210
7439-89-6	IRON	1	30	U	50	30
7439-95-4	MAGNESIUM	1	19000		750	89
7440-09-7	POTASSIUM	1	3800		1000	130
7440-23-5	SODIUM	1	19000		500	38
7440-62-2	VANADIUM	1	0.43	U	10	0.43

Data Package ID: IT1806608-1

Total Recoverable ICP Metals

Method SW6010B

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J3
Lab ID:	1806608-5

Sample Matrix: WATER
 % Moisture: N/A
 Date Collected: 25-Jun-18
 Date Extracted: 19-Jul-18
 Date Analyzed: 19-Jul-18
 Prep Method: SW3005 Rev A

Prep Batch: IP180719-1
 QCBatchID: IP180719-1-1
 Run ID: IT180719-1A3
 Cleanup: NONE
 Basis: As Received
 File Name: 180719A.

Analyst: Steve Workman
 Sample Aliquot: 50 ml
 Final Volume: 50 ml
 Result Units: UG/L
 Clean DF: 1

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7440-42-8	BORON	1	36	U	50	36
7440-70-2	CALCIUM	1	83000		1000	210
7439-89-6	IRON	1	45	B	50	30
7439-95-4	MAGNESIUM	1	19000		750	89
7440-09-7	POTASSIUM	1	3900		1000	130
7440-23-5	SODIUM	1	20000		500	38
7440-62-2	VANADIUM	1	0.43	U	10	0.43

Data Package ID: IT1806608-1

Total Recoverable ICPMS Metals

Method SW6020A

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J2
Lab ID:	1806608-2

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 25-Jun-18

Date Extracted: 19-Jul-18

Date Analyzed: 21-Jul-18

Prep Method: SW3005 Rev A

Prep Batch: IP180719-1

QC Batch ID: IP180719-1-2

Run ID: IM180721-10A5

Cleanup: NONE

Basis: As Received

File Name: 039SMPL_

Analyst: Brent A. Stanfield

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

Analysis ReqCode: 6020_METALS_I

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7429-90-5	ALUMINUM	10	10	U	100	10
7440-36-0	ANTIMONY	10	0.12	U	1	0.12
7440-38-2	ARSENIC	10	0.39	U	2	0.39
7440-39-3	BARIUM	10	0.56	U	5	0.56
7440-41-7	BERYLLIUM	10	0.054	U	0.5	0.054
7440-43-9	CADMIUM	10	0.083	U	2	0.083
7440-47-3	CHROMIUM	10	4.3	BC	10	0.46
7440-48-4	COBALT	10	0.11	U	5	0.11
7440-50-8	COPPER	10	0.32	U	8	0.32
7439-92-1	LEAD	10	0.079	U	2	0.079
7439-96-5	MANGANESE	10	1.8	B	5	0.36
7439-98-7	MOLYBDENUM	10	0.079	U	2	0.079
7440-02-0	NICKEL	10	0.92	BC	20	0.92
7782-49-2	SELENIUM	10	0.65	U	10	0.65
7440-22-4	SILVER	10	0.029	U	0.5	0.029
7440-24-6	STRONTIUM	10	0.32	U	5	0.32
7440-28-0	THALLIUM	10	0.0041	U	0.1	0.0041
7440-29-1	THORIUM	10	0.016	U	0.2	0.016
7440-31-5	TIN	10	0.89	BC	10	0.12
7440-61-1	URANIUM	10	0.0049	U	0.1	0.0049
7440-66-6	ZINC	10	1.4	U	100	1.4

Data Package ID: IM1806608-1

Dissolved ICPMS Metals

Method SW6020A

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J6
Lab ID:	1806608-3

Sample Matrix: WATER
% Moisture: N/A
Date Collected: 25-Jun-18
Date Extracted: 19-Jul-18
Date Analyzed: 21-Jul-18
Prep Method: SW3005 Rev A

Prep Batch: IP180719-1
QCBatchID: IP180719-1-2
Run ID: IM180721-10A5
Cleanup: NONE
Basis: As Received
File Name: 040SMPL_

Analyst: Brent A. Stanfield
Sample Aliquot: 50 ml
Final Volume: 50 ml
Result Units: UG/L
Clean DF: 1

Analysis ReqCode: 6020_METALS_I

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7429-90-5	ALUMINUM	10	10	U	100	10
7440-36-0	ANTIMONY	10	0.12	U	1	0.12
7440-38-2	ARSENIC	10	0.39	U	2	0.39
7440-39-3	BARIUM	10	0.56	U	5	0.56
7440-41-7	BERYLLIUM	10	0.054	U	0.5	0.054
7440-43-9	CADMIUM	10	0.083	U	2	0.083
7440-47-3	CHROMIUM	10	6.3	BC	10	0.46
7440-48-4	COBALT	10	0.11	U	5	0.11
7440-50-8	COPPER	10	0.32	U	8	0.32
7439-92-1	LEAD	10	0.079	U	2	0.079
7439-96-5	MANGANESE	10	4.1	B	5	0.36
7439-98-7	MOLYBDENUM	10	0.079	U	2	0.079
7440-02-0	NICKEL	10	1.6	BC	20	0.92
7782-49-2	SELENIUM	10	0.65	U	10	0.65
7440-22-4	SILVER	10	0.029	U	0.5	0.029
7440-24-6	STRONTIUM	10	0.32	U	5	0.32
7440-28-0	THALLIUM	10	0.0041	U	0.1	0.0041
7440-29-1	THORIUM	10	0.016	U	0.2	0.016
7440-31-5	TIN	10	0.79	BC	10	0.12
7440-61-1	URANIUM	10	0.0049	U	0.1	0.0049
7440-66-6	ZINC	10	2.9	B	100	1.4

Data Package ID: IM1806608-1

Dissolved ICPMS Metals

Method SW6020A

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J7
Lab ID:	1806608-4

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 25-Jun-18

Date Extracted: 19-Jul-18

Date Analyzed: 21-Jul-18

Prep Method: SW3005 Rev A

Prep Batch: IP180719-1

QCBatchID: IP180719-1-2

Run ID: IM180721-10A5

Cleanup: NONE

Basis: As Received

File Name: 041SMPL_

Analyst: Brent A. Stanfield

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

Analysis ReqCode: 6020_METALS_I

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7429-90-5	ALUMINUM	10	10	U	100	10
7440-36-0	ANTIMONY	10	0.18	B	1	0.12
7440-38-2	ARSENIC	10	0.39	U	2	0.39
7440-39-3	BARIIUM	10	95		5	0.56
7440-41-7	BERYLLIUM	10	0.054	U	0.5	0.054
7440-43-9	CADMIUM	10	0.083	U	2	0.083
7440-47-3	CHROMIUM	10	5.8	BC	10	0.46
7440-48-4	COBALT	10	0.5	B	5	0.11
7440-50-8	COPPER	10	2.2	B	8	0.32
7439-92-1	LEAD	10	0.079	U	2	0.079
7439-96-5	MANGANESE	10	590		5	0.36
7439-98-7	MOLYBDENUM	10	0.48	B	2	0.079
7440-02-0	NICKEL	10	23	C	20	0.92
7782-49-2	SELENIUM	10	0.65	U	10	0.65
7440-22-4	SILVER	10	0.029	U	0.5	0.029
7440-24-6	STRONTIUM	10	350		5	0.32
7440-28-0	THALLIUM	10	0.0041	U	0.1	0.0041
7440-29-1	THORIUM	10	0.016	U	0.2	0.016
7440-31-5	TIN	10	0.85	BC	10	0.12
7440-61-1	URANIUM	10	1.5		0.1	0.0049
7440-66-6	ZINC	10	8.4	B	100	1.4

Data Package ID: IM1806608-1

Total Recoverable ICPMS Metals

Method SW6020A

Sample Results

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3J8J3
Lab ID:	1806608-5

Sample Matrix: WATER

% Moisture: N/A

Date Collected: 25-Jun-18

Date Extracted: 19-Jul-18

Date Analyzed: 21-Jul-18

Prep Method: SW3005 Rev A

Prep Batch: IP180719-1

QC Batch ID: IP180719-1-2

Run ID: IM180721-10A5

Cleanup: NONE

Basis: As Received

File Name: 042SMPL_

Analyst: Brent A. Stanfield

Sample Aliquot: 50 ml

Final Volume: 50 ml

Result Units: UG/L

Clean DF: 1

Analysis ReqCode: 6020_METALS_I

CASNO	Target Analyte	Dilution Factor	Result	Result Qualifier	Reporting Limit	MDL
7429-90-5	ALUMINUM	10	12	B	100	10
7440-36-0	ANTIMONY	10	0.12	U	1	0.12
7440-38-2	ARSENIC	10	0.39	U	2	0.39
7440-39-3	BARIUM	10	96		5	0.56
7440-41-7	BERYLLIUM	10	0.054	U	0.5	0.054
7440-43-9	CADMIUM	10	0.083	U	2	0.083
7440-47-3	CHROMIUM	10	9.5	BC	10	0.46
7440-48-4	COBALT	10	0.6	B	5	0.11
7440-50-8	COPPER	10	2.7	B	8	0.32
7439-92-1	LEAD	10	0.079	U	2	0.079
7439-96-5	MANGANESE	10	630		5	0.36
7439-98-7	MOLYBDENUM	10	0.62	B	2	0.079
7440-02-0	NICKEL	10	24	C	20	0.92
7782-49-2	SELENIUM	10	0.65	U	10	0.65
7440-22-4	SILVER	10	0.03	B	0.5	0.029
7440-24-6	STRONTIUM	10	350		5	0.32
7440-28-0	THALLIUM	10	0.0041	U	0.1	0.0041
7440-29-1	THORIUM	10	0.016	U	0.2	0.016
7440-31-5	TIN	10	0.85	BC	10	0.12
7440-61-1	URANIUM	10	1.5		0.1	0.0049
7440-66-6	ZINC	10	3.8	B	100	1.4

Data Package ID: IM1806608-1

ICP Metals

Method SW6010B

Method Blank

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Lab ID: IP180719-1MB

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 19-Jul-18

Date Analyzed: 19-Jul-18

Prep Batch: IP180719-1

QCBatchID: IP180719-1-1

Run ID: IT180719-1A3

Cleanup: NONE

Basis: N/A

File Name: 180719A.

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
7440-42-8	BORON	1	36	U	50	36
7440-70-2	CALCIUM	1	210	U	1000	210
7439-89-6	IRON	1	30	U	50	30
7439-95-4	MAGNESIUM	1	89	U	750	89
7440-09-7	POTASSIUM	1	130	U	1000	130
7440-23-5	SODIUM	1	67	B	500	38
7440-62-2	VANADIUM	1	0.43	U	10	0.43

Data Package ID: IT1806608-1

ICP Metals

Method SW6010B Laboratory Control Sample

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Lab ID: IP180719-1LCS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 07/19/2018

Date Analyzed: 07/19/2018

Prep Method: SW3005A

Prep Batch: IP180719-1

QCBatchID: IP180719-1-1

Run ID: IT180719-1A3

Cleanup: NONE

Basis: N/A

File Name: 180719A.

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
7440-42-8	BORON	1000	967	50		97	80 - 120%
7440-70-2	CALCIUM	40000	37400	1000		94	80 - 120%
7439-89-6	IRON	1000	1020	50		102	80 - 120%
7439-95-4	MAGNESIUM	40000	40100	750		100	80 - 120%
7440-09-7	POTASSIUM	40000	39800	1000		100	80 - 120%
7440-23-5	SODIUM	40000	37800	500		95	80 - 120%
7440-62-2	VANADIUM	500	492	10		98	80 - 120%

Data Package ID: *IT1806608-1*

ICP Metals

Method SW6010B

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I18-012

Field ID: SHARED QC LabID: 1806565-3MS	Sample Matrix: WATER % Moisture: N/A Date Collected: 22-Jun-18 Date Extracted: 19-Jul-18 Date Analyzed: 19-Jul-18 Prep Method: SW3005 Rev A	Prep Batch: IP180719-1 QCBatchID: IP180719-1-1 Run ID: IT180719-1A3 Cleanup: NONE Basis: As Received	Sample Aliquot: 50 ml Final Volume: 50 ml Result Units: UG/L File Name: 180719A.
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CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7440-42-8	BORON	36	U	970		50	1000	97	80 - 120%
7440-70-2	CALCIUM	23000		60700		1000	40000	95	80 - 120%
7439-89-6	IRON	130		1060		50	1000	93	80 - 120%
7439-95-4	MAGNESIUM	4900		45200		750	40000	101	80 - 120%
7440-09-7	POTASSIUM	1200		42600		1000	40000	103	80 - 120%
7440-23-5	SODIUM	7700		47300		500	40000	99	80 - 120%
7440-62-2	VANADIUM	4.7	B	496		10	500	98	80 - 120%

Field ID: SHARED QC LabID: 1806565-3MSD	Sample Matrix: WATER % Moisture: N/A Date Collected: 22-Jun-18 Date Extracted: 19-Jul-18 Date Analyzed: 19-Jul-18 Prep Method: SW3005 Rev A	Prep Batch: IP180719-1 QCBatchID: IP180719-1-1 Run ID: IT180719-1A3 Cleanup: NONE Basis: As Received	Sample Aliquot: 50 ml Final Volume: 50 ml Result Units: UG/L File Name: 180719A.
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CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7440-42-8	BORON	968		1000	97	50	20	0
7440-70-2	CALCIUM	60100		40000	93	1000	20	1
7439-89-6	IRON	1050		1000	91	50	20	2
7439-95-4	MAGNESIUM	44800		40000	100	750	20	1
7440-09-7	POTASSIUM	42400		40000	103	1000	20	0
7440-23-5	SODIUM	46900		40000	98	500	20	1
7440-62-2	VANADIUM	493		500	98	10	20	1

Data Package ID: IT1806608-1

Prep Batch ID: IP180719-1

Start Date: 07/19/18	End Date: 07/19/18	Concentration Method: NONE	Batch Created By: jml
Start Time: 11:08	End Time: 18:00	Extract Method: SW3005A	Date Created: 07/19/18
Prep Analyst: Jill M. Latelle		Initial Volume Units: ml	Time Created: 11:08
Comments:		Final Volume Units: ml	Validated By: jml
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 07/19/18
			Time Validated: 11:59

QC Batch ID: IP180719-1-1

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP180719-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
IP180719-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-3	MS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-3	MSD	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-3	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-4	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-5	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-6	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806608-2	SMP	B3J8J2	WATER	6/25/2018	50	50	NONE	1	1806608
1806608-3	SMP	B3J8J6	WATER	6/25/2018	50	50	NONE	1	1806608
1806608-4	SMP	B3J8J7	WATER	6/25/2018	50	50	NONE	1	1806608
1806608-5	SMP	B3J8J3	WATER	6/25/2018	50	50	NONE	1	1806608
1807319-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1807319
1807319-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1807319

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		

ICPMS Metals

Method SW6020A

Method Blank

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Lab ID: IP180719-1MB

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 19-Jul-18

Date Analyzed: 21-Jul-18

Prep Batch: IP180719-1

QCBatchID: IP180719-1-2

Run ID: IM180721-10A5

Cleanup: NONE

Basis: N/A

File Name: 026SMPL_

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
7429-90-5	ALUMINUM	10	10	U	100	10
7440-36-0	ANTIMONY	10	0.12	U	1	0.12
7440-38-2	ARSENIC	10	0.39	U	2	0.39
7440-39-3	BARIUM	10	0.56	U	5	0.56
7440-41-7	BERYLLIUM	10	0.054	U	0.5	0.054
7440-43-9	CADMIUM	10	0.083	U	2	0.083
7440-47-3	CHROMIUM	10	5.6	B	10	0.46
7440-48-4	COBALT	10	0.11	U	5	0.11
7440-50-8	COPPER	10	0.32	U	8	0.32
7439-92-1	LEAD	10	0.079	U	2	0.079
7439-96-5	MANGANESE	10	0.36	U	5	0.36
7439-98-7	MOLYBDENUM	10	0.079	U	2	0.079
7440-02-0	NICKEL	10	1.2	B	20	0.92
7782-49-2	SELENIUM	10	0.65	U	10	0.65
7440-22-4	SILVER	10	0.029	U	0.5	0.029
7440-24-6	STRONTIUM	10	0.32	U	5	0.32
7440-28-0	THALLIUM	10	0.0041	U	0.1	0.0041
7440-29-1	THORIUM	10	0.016	U	0.2	0.016
7440-31-5	TIN	10	0.58	B	10	0.12
7440-61-1	URANIUM	10	0.0049	U	0.1	0.0049
7440-66-6	ZINC	10	1.4	U	100	1.4

Data Package ID: IM1806608-1

ICPMS Metals
Method SW6020A
Laboratory Control Sample

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Lab ID: IM180719-1LCS

Sample Matrix: WATER

% Moisture: N/A

Date Collected: N/A

Date Extracted: 07/19/2018

Date Analyzed: 07/21/2018

Prep Method: SW3005A

Prep Batch: IP180719-1

QCBatchID: IP180719-1-2

Run ID: IM180721-10A5

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	Spike Added	LCS Result	Reporting Limit	Result Qualifier	LCS % Rec.	Control Limits
7429-90-5	ALUMINUM	5000	4560	100		91	80 - 120%
7440-36-0	ANTIMONY	30	28.4	1		95	80 - 120%
7440-38-2	ARSENIC	100	93	2		93	80 - 120%
7440-39-3	BARIUM	100	96.5	5		97	80 - 120%
7440-41-7	BERYLLIUM	50	50.5	0.5		101	80 - 120%
7440-43-9	CADMIUM	30	29.8	2		99	80 - 120%
7440-47-3	CHROMIUM	500	491	10		98	80 - 120%
7440-48-4	COBALT	100	99.6	5		100	80 - 120%
7440-50-8	COPPER	1000	974	8		97	80 - 120%
7439-92-1	LEAD	50	48.8	2		98	80 - 120%
7439-96-5	MANGANESE	100	100	5		100	80 - 120%
7439-98-7	MOLYBDENUM	100	95.8	2		96	80 - 120%
7440-02-0	NICKEL	500	491	20		98	80 - 120%
7782-49-2	SELENIUM	100	99.6	10		100	80 - 120%
7440-22-4	SILVER	10	9.94	0.5		99	80 - 120%
7440-24-6	STRONTIUM	100	91.4	5		91	80 - 120%
7440-28-0	THALLIUM	2	1.9	0.1		95	80 - 120%
7440-29-1	THORIUM	10	9.26	0.2		93	80 - 120%
7440-31-5	TIN	500	460	10		92	80 - 120%
7440-61-1	URANIUM	10	9.1	0.1		91	80 - 120%
7440-66-6	ZINC	2000	1940	100		97	80 - 120%

Data Package ID: IM1806608-1

ICPMS Metals

Method SW6020A

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I18-012

Field ID: SHARED QC	Sample Matrix: WATER	Prep Batch: IP180719-1	Sample Aliquot: 50 ml
LabID: 1806565-3MS	% Moisture: N/A	QCBatchID: IP180719-1-2	Final Volume: 50 ml
	Date Collected: 22-Jun-18	Run ID: IM180721-10A5	Result Units: UG/L
	Date Extracted: 19-Jul-18	Cleanup: NONE	File Name: 030SMPL_
	Date Analyzed: 21-Jul-18	Basis: As Received	
	Prep Method: SW3005 Rev A		

CASNO	Target Analyte	Sample Result	Samp Qual	MS Result	MS Qual	Reporting Limit	Spike Added	MS % Rec.	Control Limits
7429-90-5	ALUMINUM	72	B	4610		100	5000	91	75 - 125%
7440-36-0	ANTIMONY	0.29	B	29.1		1	30	96	75 - 125%
7440-38-2	ARSENIC	3.1		95.1		2	100	92	75 - 125%
7440-39-3	BARIUM	13		108		5	100	94	75 - 125%
7440-41-7	BERYLLIUM	0.054	U	51.4		0.5	50	103	75 - 125%
7440-43-9	CADMIUM	0.083	U	30		2	30	100	75 - 125%
7440-47-3	CHROMIUM	2.2	BC	489		10	500	97	75 - 125%
7440-48-4	COBALT	0.17	B	100		5	100	100	75 - 125%
7440-50-8	COPPER	0.86	B	982		8	1000	98	75 - 125%
7439-92-1	LEAD	0.079	U	49.5		2	50	99	75 - 125%
7439-96-5	MANGANESE	15		111		5	100	96	75 - 125%
7439-98-7	MOLYBDENUM	0.54	B	96.3		2	100	96	75 - 125%
7440-02-0	NICKEL	1.6	BC	490		20	500	98	75 - 125%
7782-49-2	SELENIUM	0.65	U	97.4		10	100	97	75 - 125%
7440-22-4	SILVER	0.029	U	9.96		0.5	10	100	75 - 125%
7440-24-6	STRONTIUM	80		168		5	100	88	75 - 125%
7440-28-0	THALLIUM	0.02	B	1.97		0.1	2	98	75 - 125%
7440-29-1	THORIUM	0.02	B	9.28		0.2	10	93	75 - 125%
7440-31-5	TIN	0.73	BC	469		10	500	94	75 - 125%
7440-61-1	URANIUM	0.04	B	9.17		0.1	10	91	75 - 125%
7440-66-6	ZINC	1.8	B	1940		100	2000	97	75 - 125%

Data Package ID: IM1806608-1

ICPMS Metals

Method SW6020A

Matrix Spike And Matrix Spike Duplicate

Lab Name: ALS -- Fort Collins

Work Order Number: 1806608

Client Name: CH2M HILL Plateau Remediation Company

ClientProject ID: 100-N Apatite Barrier, June 20 I18-012

Field ID: SHARED QC	Sample Matrix: WATER	Prep Batch: IP180719-1	Sample Aliquot: 50 ml
LabID: 1806565-3MSD	% Moisture: N/A	QCBatchID: IP180719-1-2	Final Volume: 50 ml
	Date Collected: 22-Jun-18	Run ID: IM180721-10A5	Result Units: UG/L
	Date Extracted: 19-Jul-18	Cleanup: NONE	File Name: 031SMPL_
	Date Analyzed: 21-Jul-18	Basis: As Received	
	Prep Method: SW3005 Rev A		

CASNO	Target Analyte	MSD Result	MSD Qual	Spike Added	MSD % Rec.	Reporting Limit	RPD Limit	RPD
7429-90-5	ALUMINUM	4510		5000	89	100	20	2
7440-36-0	ANTIMONY	27.7		30	91	1	20	5
7440-38-2	ARSENIC	93		100	90	2	20	2
7440-39-3	BARIUM	105		100	92	5	20	2
7440-41-7	BERYLLIUM	50.5		50	101	0.5	20	2
7440-43-9	CADMIUM	29.6		30	99	2	20	1
7440-47-3	CHROMIUM	483		500	96	10	20	1
7440-48-4	COBALT	98		100	98	5	20	2
7440-50-8	COPPER	950		1000	95	8	20	3
7439-92-1	LEAD	48.8		50	98	2	20	1
7439-96-5	MANGANESE	112		100	97	5	20	1
7439-98-7	MOLYBDENUM	92.4		100	92	2	20	4
7440-02-0	NICKEL	483		500	96	20	20	2
7782-49-2	SELENIUM	95		100	95	10	20	2
7440-22-4	SILVER	9.79		10	98	0.5	20	2
7440-24-6	STRONTIUM	168		100	89	5	20	0
7440-28-0	THALLIUM	1.95		2	97	0.1	20	1
7440-29-1	THORIUM	9.09		10	91	0.2	20	2
7440-31-5	TIN	464		500	93	10	20	1
7440-61-1	URANIUM	8.83		10	88	0.1	20	4
7440-66-6	ZINC	1940		2000	97	100	20	0

Data Package ID: IM1806608-1

Prep Batch ID: IP180719-1

Start Date: 07/19/18	End Date: 07/19/18	Concentration Method: NONE	Batch Created By: jml
Start Time: 11:08	End Time: 18:00	Extract Method: SW3005A	Date Created: 07/19/18
Prep Analyst: Jill M. Latelle		Initial Volume Units: ml	Time Created: 11:08
Comments:		Final Volume Units: ml	Validated By: jml
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 07/19/18
			Time Validated: 11:59

QC Batch ID: IP180719-1-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
IP180719-1	MB	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
IM180719-1	LCS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-3	MS	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-3	MSD	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-3	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-4	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-5	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806565-6	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806565
1806608-2	SMP	B3J8J2	WATER	6/25/2018	50	50	NONE	1	1806608
1806608-3	SMP	B3J8J6	WATER	6/25/2018	50	50	NONE	1	1806608
1806608-4	SMP	B3J8J7	WATER	6/25/2018	50	50	NONE	1	1806608
1806608-5	SMP	B3J8J3	WATER	6/25/2018	50	50	NONE	1	1806608
1806807-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806807
1806807-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1806807
1807057-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1807057
1807319-1	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1807319
1807319-2	SMP	XXXXXX	WATER	XXXXXX	50	50	NONE	1	1807319

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

100-N Apatite Barrier, June 20 – I18-012

Work Order Number: 1806608

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 07/03/2018.
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 the 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

7/23/18
Date

Kath M. W.
Radiochemistry Final Data Reviewer

7/30/18
Date

Strontium-90 by GFPC

PAI 724 Rev 12

Method Blank Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806608
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 I18-012

Lab ID: SR180627-1MB	Sample Matrix: WATER	Prep Batch: SR180627-1	Final Aliquot: 995 ml
	Prep SOP: PAI 707 Rev 14	QCBatchID: SR180627-1-2	Result Units: pCi/l
	Date Collected: 27-Jun-18	Run ID: SR180627-1A	File Name: SRC0703B
	Date Prepared: 27-Jun-18	Count Time: 300 minutes	
	Date Analyzed: 03-Jul-18		

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	1.50E-02 +/- 1.37E-01	2.86E-01	1.00E+00	NA	U

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.040E+03	9.08E+02	ug	87.3	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: SR1806608-1

Strontium-90 by GFPC

PAI 724 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806608
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Lab ID: SR180627-1LCS	Sample Matrix: WATER	Prep Batch: SR180627-1	Final Aliquot: 995 ml
	Prep SOP: PAI 707 Rev 14	QCBatchID: SR180627-1-2	Result Units: pCi/l
	Date Collected: 27-Jun-18	Run ID: SR180627-1A	File Name: SRC0703C
	Date Prepared: 27-Jun-18	Count Time: 30 minutes	
	Date Analyzed: 03-Jul-18		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.11E+01 +/- 2.84E+00	8.98E-01	1.070E+01	104	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.040E+03	9.49E+02	ug	91.2	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: SR1806608-1

Strontium-90 by GFPC

PAI 724 Rev 12

Laboratory Control Sample(s)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806608
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Lab ID: SR180627-1LCSD	Sample Matrix: WATER	Prep Batch: SR180627-1	Final Aliquot: 995 ml
	Prep SOP: PAI 707 Rev 14	QCBatchID: SR180627-1-2	Result Units: pCi/l
	Date Collected: 27-Jun-18	Run ID: SR180627-1A	File Name: SRC0703C
	Date Prepared: 27-Jun-18	Count Time: 30 minutes	
	Date Analyzed: 03-Jul-18		

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10098-97-2	Sr-90	1.11E+01 +/- 2.85E+00	9.36E-01	1.070E+01	104	75 - 125	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.070E+03	9.33E+02	ug	87.0	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: SR1806608-1

Strontium-90 by GFPC
PAI 724 Rev 12
Duplicate Sample Results (DER)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806608
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	
Lab ID:	SR180627-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 14
Date Collected: 27-Jun-18
Date Prepared: 27-Jun-18
Date Analyzed: 03-Jul-18

Prep Batch: SR180627-1
QCBatchID: SR180627-1-2
Run ID: SR180627-1A
Count Time: 30 minutes

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC0703C

CASNO	Analyte	Sample				Duplicate				DER	DER Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.11E+01 +/- 2.84E+00		8.98E-01		1.11E+01 +/- 2.85E+00		9.36E-01		0.00309	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: SR1806608-1

Strontium-90 by GFPC
PAI 724 Rev 12
Duplicate Sample Results (RPD)

Lab Name: ALS -- Fort Collins
Work Order Number: 1806608
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	
Lab ID:	SR180627-1LCSD

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 14
Date Collected: 27-Jun-18
Date Prepared: 27-Jun-18
Date Analyzed: 03-Jul-18

Prep Batch: SR180627-1
QCBatchID: SR180627-1-2
Run ID: SR180627-1A
Count Time: 30 minutes

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC0703C

CASNO	Analyte	Sample				Duplicate				RPD	RPD Lim
		Result +/-	2 s TPU	MDC	Flags	Result +/-	2 s TPU	MDC	Flags		
10098-97-2	Sr-90	1.11E+01 +/- 2.84E+00		8.98E-01		1.11E+01 +/- 2.85E+00		9.36E-01		0.00	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: SR1806608-1

Strontium-90 by GFPC

PAI 724 Rev 12

Sample Results

Lab Name: ALS -- Fort Collins
Work Order Number: 1806608
Client Name: CH2M HILL Plateau Remediation Company
ClientProject ID: 100-N Apatite Barrier, June 20 118-012

Field ID:	B3JFC0
Lab ID:	1806608-1

Sample Matrix: WATER
Prep SOP: PAI 707 Rev 14
Date Collected: 25-Jun-18
Date Prepared: 27-Jun-18
Date Analyzed: 03-Jul-18

Prep Batch: SR180627-1
QCBatchID: SR180627-1-2
Run ID: SR180627-1A
Count Time: 75 minutes
Report Basis: Unfiltered

Final Aliquot: 995 ml
Prep Basis: Unfiltered
Moisture(%): NA
Result Units: pCi/l
File Name: SRC0703A

Analysis ReqCode: SRISO_SEP_PR

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Requested MDC	DL	Lab Qualifier
10098-97-2	Sr-90	1.20E+01 +/- 2.92E+00	5.96E-01	1E+00	NA	

Chemical Yield Summary

Carrier/Tracer	Amount Added	Result	Units	Yield	Control Limits	Flag
STRONTIUM	1.190E+03	1.08E+03	ug	90.0	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.
- 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: SR1806608-1

Prep Batch ID: SR180627-1

Start Date: 06/27/18	End Date: 06/27/18	Concentration Method: NONE	Batch Created By: rgs
Start Time: 7:32	End Time: 7:32	Extract Method: PAI 70714	Date Created: 06/27/18
Prep Analyst: Reilly G. Stockton		Initial Volume Units: ml	Time Created: 7:32
Comments:		Final Volume Units: ml	Validated By: rgs
<div style="border: 1px solid black; height: 30px; width: 100%;"></div>			Date Validated: 06/29/18
			Time Validated: 8:11

QC Batch ID: SR180627-1-2

Lab ID	QC Type	Field ID	Matrix	Date Collected	Initial Wt/Vol	Final Wt/Vol	Cleanup Method	Cleanup DF	Order Number
SR180627-1	CAR	XXXXXX	WATER	XXXXXX	1000	1000	NONE	1	1806446
SR180627-1	MB	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806446
SR180627-1	LCS	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806446
SR180627-1	LCSD	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806446
1806446-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806446
1806449-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806449
1806510-3	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806510
1806511-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806511
1806512-5	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806512
1806512-6	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806512
1806512-7	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806512
1806564-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806564
1806565-1	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806565
1806565-2	SMP	XXXXXX	WATER	XXXXXX	1000	994.50	NONE	1	1806565
1806608-1	SMP	B3JFC0	WATER	6/25/2018	1000	994.50	NONE	1	1806608

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		