

SOUTHWEST RESEARCH INSTITUTE®

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CHEMISTRY AND CHEMICAL ENGINEERING DIVISION
DEPARTMENT OF ANALYTICAL AND ENVIRONMENTAL CHEMISTRY

December 13, 2017

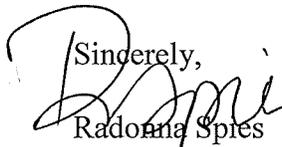
CH2M Hill Plateau Remediation Company
2420 Stevens Center Place
Mail Stop H8-41
Richland, WA 99352

Attn: Ms. Laine Sumner

Subject:	SAF No:	F17-048
	SDG Number:	623821
	SwRI Project Number:	20859.01.00X
	SwRI Task Order Number:	171116-7
	SwRI Sample Receipt Number:	60773
	Samples Received	11.16.2017
	Fraction:	EDS-SEM, XRD, and EPA 310.1 Analyses

Dear Ms. Sumner:

Please find the enclosed results for the one (01) overall sample received on the above referenced date. If you should have any questions, please do not hesitate to call me at (210) 522-3242, or at radonna.spies@swri.org.

Sincerely,

 Radonna Spies
 Principal Scientist

APPROVED:



Michael J. Dammann
Director

RPS: jz

Encl



Benefiting government, industry and the public through innovative science and technology

010001

SOUTHWEST RESEARCH INSTITUTE
CLIENT: CH2M Hill Plateau Remediation Company
SwRI PROJECT#: 20859.01.00X
SwRI TASK ORDER: 171116-7
SwRI SRR: 60773
SDG: 623821
VTSR: 11.16.2017

Chain-of-Custody
&
Sample Receipt Paperwork

Total Page Count: 010001-
Fraction Various Pages: 010032

CH2MHill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F17-048-020	PAGE 1 OF 1
COLLECTOR MIKE ESPARZA CHPRC		COMPANY CONTACT SUMNER, LC	TELEPHONE NO. 376-3922	PROJECT COORDINATOR SUMNER, LC	010002 REQUIRED TAT 30 Days	
SAMPLING LOCATION Resin Waste Box No. KX-17-011 CRUST		PROJECT DESIGNATION 100-KR-4 and 100-KX Pump & Treat - Spent Resin Waste Designation		SAF NO. F17-048	ORIGINAL	
ICE CHEST NO. GWS-657		FIELD LOGBOOK NO. HNF-N-491-16-72	ACTUAL SAMPLE DEPTH N/A	PURCHASE ORDER/CHARGE CODE 302887	METHOD OF SHIPMENT FEDERAL EXPRESS	
SHIPPED TO Southwest Research Institute		OFFSITE PROPERTY NO. 8748		BILL OF LADING/AIR BILL NO. 770757195095		

MATRIX* A=Air DL=Drum Liquids DS=Drum Solids L=Liquid O=Oil S=Soil SE=Sediment T=Tissue V=Vegetation W=Water WI=Wipe X=Other	POSSIBLE SAMPLE HAZARDS/ REMARKS *Contains Radioactive Material at concentrations that are not be regulated for transportation per 49 CFR/IATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	PRESERVATION	Cool <=6C		
		HOLDING TIME	14 Days		
		TYPE OF CONTAINER	G/P		
		NO. OF CONTAINER(S)	1		
		VOLUME	5g		
SPECIAL HANDLING AND/OR STORAGE RADIOACTIVE TIE TO: B3FLP7		SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS		
SAMPLE NO.	FILTERED	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B3FLP8	N/A	OTHER SOLID	10-31-17	0900	✓

CHPRC SRR # 60773
 SwRI Prjct # 20859.01.00X
 TO: 171116-7
 SDG # 623821

CHAIN OF POSSESSION RELINQUISHED BY/REMOVED FROM		SIGN/ PRINT NAMES RECEIVED BY/STORED IN		SPECIAL INSTRUCTIONS TRVL-18-031; **SWRI Generic Test is for Microscopy and/or SEM analyses and/or XRD (1) 310.1_ALKALINITY: COMMON {Alkalinity}; 310.1_ALKALINITY: COMMON (Add-On) {Bi-carbonate alkalinity, Carbonate alkalinity, Hydroxyllion}; Generic Testing {No CAS};	
MIKE ESPARZA CHPRC		SSU-1		DATE/TIME 10-31-2017	
NOV 15 2017 0950		Lesty Wall CHPRC		DATE/TIME 12-31-2017	
NOV 15 2017 1400		FEDEX		David Garcia David Garcia 11/14/2017 08:35	
NOV 15 2017 1400		FEDEX		David Garcia David Garcia 11/14/2017 08:35	
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY		DATE/TIME	

Southwest Research Institute

Laboratory Task Order

010003

TO #: 171116-7 Revision: 0

SDG: 623821
VTSR: 11/16/17
SAF: F17-048

SRR #s: 60773
Client(s): CH2M Hill Plateau Remediation Company

Project(s): 20859.01.00X
Manager(s): SPIES, RADONNA
To Client: 12/15/17

Instructions

CH2M Hill Plateau Remediation Company. 302887
SAF No. F17-048

SDG 623821 is CLOSED

30-day TAT.

FINAL DATA/HARDCOPY IS DUE TO THE CLIENT ON 12/16/2017.

9 overall samples (12 containers) were received on 11/16/2017.

OUT of the 9 samples, ONLY the 1 SOLID sample under SAF F17-048, is listed here.

Sample Analysis REQUIRED

EDS-SEM

XRD

310.1 _ Alkalinity, Bicarbonate, Carbonate, HYDROXYLION

DATA DELIVERABLE _ Summary (Narrative / Results only)

REQUESTER _ Laine Sumner

ATTACHMENT C - QC Requirements for Chemical and Radiochemical Analysis

Section 7.2.2 Sample Data Packages

Section 7.2.3 Hard Copy Deliverable format

Section 7.2.4 Final Data Package Requirements

Section 8.8 CHPRC Electronic Address

Electronic copies of all sample receipt information, COCs, priority data packages, final data packages, corrected/revised data packages, closure reports, status reports, invoices, etc. shall be sent to: mailto:CPP_Sample_Management@rl.gov

Documents Related to this task order: 232950[COC for SRR 60773], 232963[Paperwork for SRR 60773]

Deliverables --> Hard Copy: no EDD: -YES- PDF: -YES-

Test: ALK_310.1 Holding: 14 days from CED

Section: WETCHEM

Alkalinity by EPA 310.1

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
623821	rad	1	Other Solid	B3FLP8	31 Oct 17	14 Nov 17

Test: SEM. Holding: 180 days from CED

Section: WETCHEM

Scanning Electron Microscope Photomicroscopy

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
623821	rad	1	Other Solid	B3FLP8	31 Oct 17	29 Apr 18

Test: XRD. Holding: 180 days from CED

Section: WETCHEM

X-Ray Diffraction

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
623821	rad	1	Other Solid	B3FLP8	31 Oct 17	29 Apr 18



010004

Sample Receipt

Southwest Research Institute

VTSR: 11/16/17

Time: 08:35:00

Project: 20859.01.00X
Case #: CHPRC
Client: CH2M Hill Plateau Remediation Company

Sample Receipt Number: 60773
Revision: 1
This Receipt was Revised 11/17/2017

Manager: SPIES, RADONNA
Logged in by: DXGARCIA
Creation Date: 11/16/17

Notes

Samples were received intact- 2.0°C (wet ice)

Fed Ex Tracking #(s):
7707 5719 5095

pH Test Paper 0.0 to 3.0
Lot - 230315
Exp: 10/30/2018

pH Test Paper 0.0- 13.0
Lot - 230016
Exp: 10/30/2019

Ice Chest No:
GWS-657

Test requirements located on Task Order.

See chain-of-custody as part of the SRR system for more information.

ALL SAMPLE CONTAINERS / APPLICABLE ITEMS WERE RECEIVED OK.

Background CPM: <150 cpm
Container Wide CPM: <150 cpm
Total CPM: <150

System ID	Customer ID	CED	Matrix	Containers	Special Reqs.
623813	B3DJK0	11/14/17	Water	1	
623814	B3DJK1	11/14/17	Water	1	
623815	B3DJN0	11/13/17	Water	1	
623816	B3F998	11/13/17	Water	1	
623817	B3F9K8	11/14/17	Water	1	
623818	B3F9L0	11/14/17	Water	1	
623819	B3FCP8	11/13/17	Water	1	
623820	B3FCV3	11/14/17	Water	4	
623821	B3FLP8	10/31/17	Other Solid	1	

Containers: 12

Samples: 9

These documents are associated with this receipt: 232950[COC for SRR 60773], 232963[Paperwork for SRR 60773]

Thermometer: 021056
Temperature: 2.0

60773 CH2M Hill Plateau Remediation

010005

Southwest Research Institute

Traffic Report

Sample Custodian Signature:

David Garcia



- 1. Custody Seal Present
- 2. Chain of Custody Present
- 3. Sample Tags Not Present
Sample Tag Numbers Not on COC
- 4. SMO Forms Present

Client: CH2M Hill Plateau Remediation Company

Project: 20859.01.00X

Case: CHPRC / SDG: _____

Sample Receipt: 60773

Airbill: 7707 5719 5095

Custody Seal #(s): N/A

Date Received	Time Received	COC Record	SMO Sample #	Corresponding		Traffic Rpt, Tags, COC Agree	Sample Condition
				Sample Tag #	SwRI #		
11/16/17	08:35:00	W18-011-256	B3DJK0	N/A	623813	YES	Intact
11/16/17	08:35:00	W18-011-255	B3DJK1	N/A	623814	YES	Intact
11/16/17	08:35:00	W18-011-251	B3DJN0	N/A	623815	YES	Intact
11/16/17	08:35:00	S18-011-709	B3F998	N/A	623816	YES	Intact
11/16/17	08:35:00	W18-011-255	B3F9K8	N/A	623817	YES	Intact
11/16/17	08:35:00	W18-011-256	B3F9L0	N/A	623818	YES	Intact
11/16/17	08:35:00	W18-011-251	B3FCP8	N/A	623819	YES	Intact
11/16/17	08:35:00	S18-011-803	B3FCV3	N/A	623820	YES	Intact
11/16/17	08:35:00	F17-048-020	B3FLP8	N/A	623821	YES	Intact

010006

SAMPLE LOG-IN SHEET

Lab Name Southwest Research Institute			Page 1 of 1	
Received By (Print Name) DAVID GARCIA			Log-in Date 11/16/2017	
Received By (Signature) <i>David Garcia</i>				
Case Number CHPRC		Sample Delivery Group No. N/A		SAS Number N/A
Remarks: 20859.01.00X				
		EPA Sample #	Corresponding	
			Sample Tag #	Assigned Lab #
1. Custody Seal(s)	<input checked="" type="checkbox"/> Present / Absent* <input checked="" type="checkbox"/> Intact / Broken	B3DJK0	N/A	623813
2. Custody Seal Nos.	N/A	B3DJK1	N/A	623814
		B3DJN0	N/A	623815
3. Chain-of Custody Records	<input checked="" type="checkbox"/> Present / Absent*	B3F998	N/A	623816
4. Traffic Reports or Packing Lists	<input checked="" type="checkbox"/> Present / Absent*	B3F9K8	N/A	623817
5. Airbill	Airbill/Sticker <input checked="" type="checkbox"/> Present / Absent*	B3F9L0	N/A	623818
6. Airbill No.	7707 5719 5095	B3FCP8	N/A	623819
		B3FCV3	N/A	623820
7. Sample Tags	Present / Absent	B3FLP8	N/A	623821
Sample Tag Numbers	Listed / Not listed on Chain of Custody			
8. Sample Condition	<input checked="" type="checkbox"/> Intact / Broken* / Leaking			
9. Cooler Temperature	2.0C			
10. Does Information on custody records, traffic reports, and sample tags agree?	<input checked="" type="checkbox"/> Yes / No*			
11. Date Received at Lab	11/16/2017			
12. Time Received	08:35:00			
Sample Transfer				
Fraction	Inorg	Fraction		
Area #	R-13	Area #		
By	DAVID GARCIA	By		
On	11/16/2017	On		

* Contact SMO and attach record of resolution

Reviewed By <i>David Garcia</i>	Logbook No. Sample Receipt (60773)
Date 11.17.17	Logbook Page No. 10006 Sec 2 of 5

010007

SOUTHWEST RESEARCH INSTITUTE
CLIENT: CH2M Hill Plateau Remediation Company
SwRI PROJECT#: 20859.01.00X
SwRI TASK ORDER: 171116-7
SwRI SRR: 60773
SDG: 623821
VTSR: 11.16.2017

Unknown Material Analysis

010008

Unknown Material Analysis

The unknown material came from a SIR-700 resin bed. The project indicated that bentonite may be the possible source of the unknown material.

Optical Photos

Optical photomicroscopy was performed at increasing magnification and are presented in Images 1-3 below.

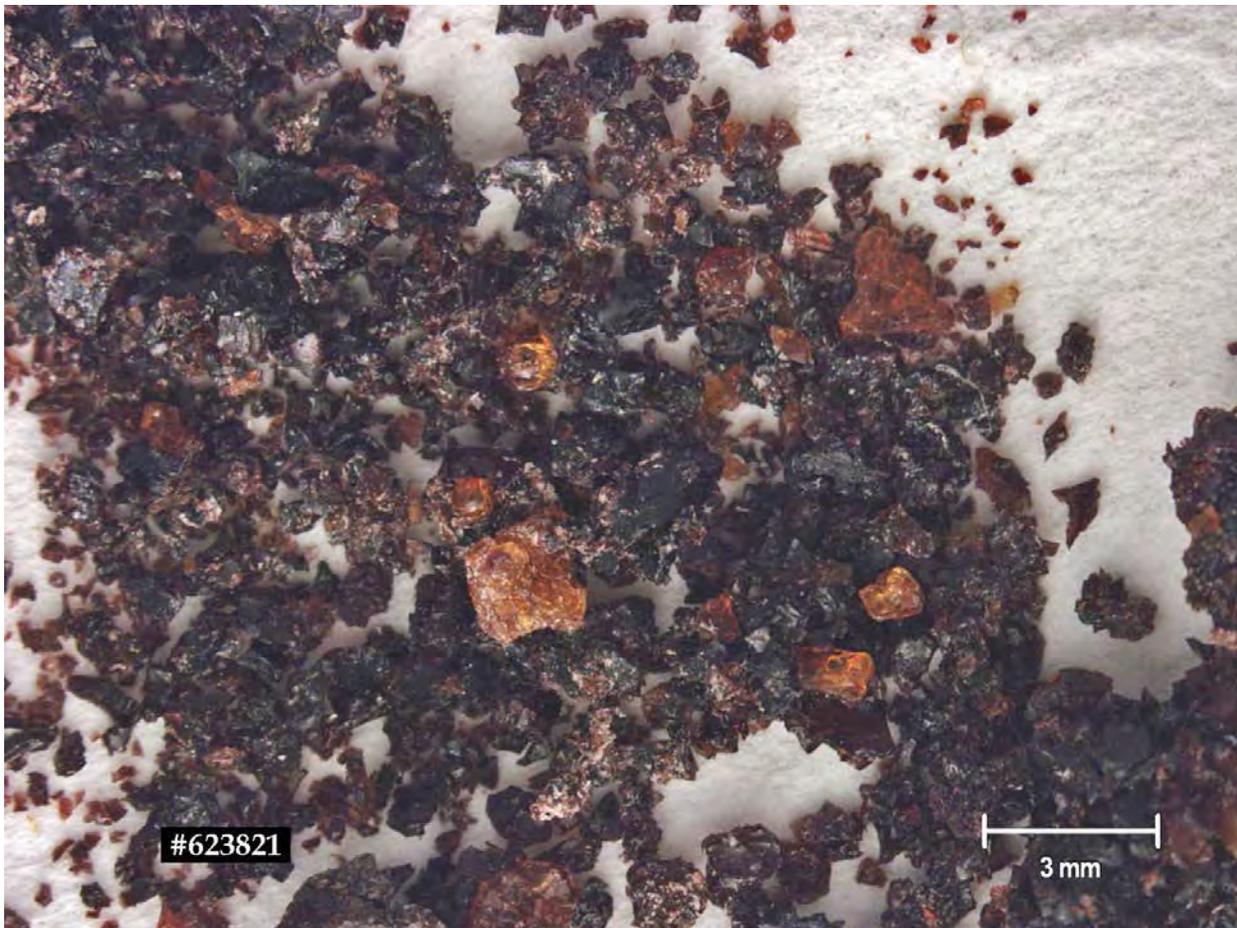


Image 1

010009

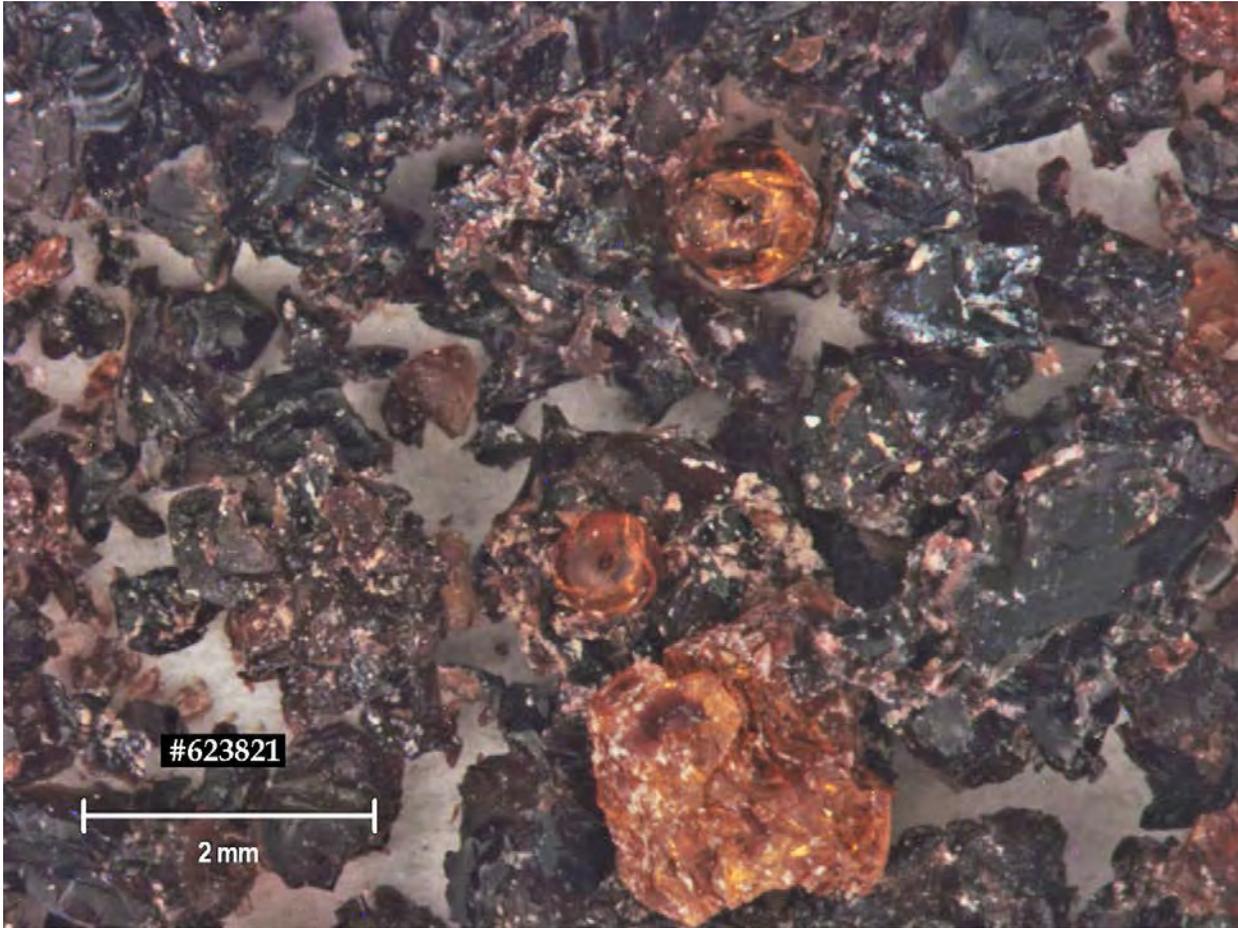


Image 2

010010

**Image 3****EDS-SEM**

The elemental composition of the solid sample was analyzed using energy dispersive spectrometry x-ray fluorescence by scanning electron microscope (EDS/SEM). This technique identifies elemental composition of the samples limited to the first 10 to 100 micron depth. Initially, an X-ray spectrum from the entire scan area of the SEM was performed and is located in Figure 1 (attached). By focusing the electron beam on particular spots of the sample area, more localized elemental information was obtained on the different particles observed. The localized spectra are provided in Figures 2-4. The EDS-XRF quantitation report is presented immediately following the respective spectrogram. Please note that the quantitation only includes elements of atomic numbers greater than 11 (sodium and higher) and is normalized to 100%. Although carbon, nitrogen and oxygen were also detected, their atomic numbers are less than 11; therefore, are not quantified. Due to the size of the carbon and oxygen peaks, it appears there is a substantial amount organic material in the samples; therefore, the metals concentrations provided in the quantitation reports are significantly biased high.

XRD

010011

To determine the chemical form of the major species in the sample, a random orientated mount X-ray Diffraction (XRD) pattern was obtained. Each crystalline component phase in an unknown specimen produces its own powder diffraction pattern. By comparing the diffraction peak positions and intensities of the unknown material against a library of known crystalline materials, it is possible to identify the crystalline components in the unknown. As can be seen from the XRD diffratogram presented in Figure 5, the sample contains no significant peaks above the baseline noise, which indicates the sample is non-crystalline (amorphous).

SUMMARY

Bentonite is an aluminium phyllosilicate clay mineral consisting mostly of montmorillonite. The EDS spectra graphically indicates the sample is primarily composed of carbon and oxygen although the quantitation tables do not identify since they cannot be quantitated using this technique. The EDS analysis focused on the white areas on the solid (Figure 4), did detect higher levels of aluminum and silicon, which may indicate small areas of bentonite in the material.

XRD is a bulk analysis and cannot discriminate trace amounts of crystalline material. Although the top library search results are presented in the in Figure 5 as well, they are not suitable matches. In Figure 6, the sample diffratogram was compared to different montmorillonites diffraction patterns contained in the XRD library for comparison. The sample does not contain any of the predominant montmorillonites peaks.

SwRI has able to obtain SIR-700 resin. Image 4 below is an optical photomicrograph for comparison to the unknown material. The unknown material and the SIR-700 resin have similar morphology. It appears the unknown material is primarily spent SIR-700 resin.

010012

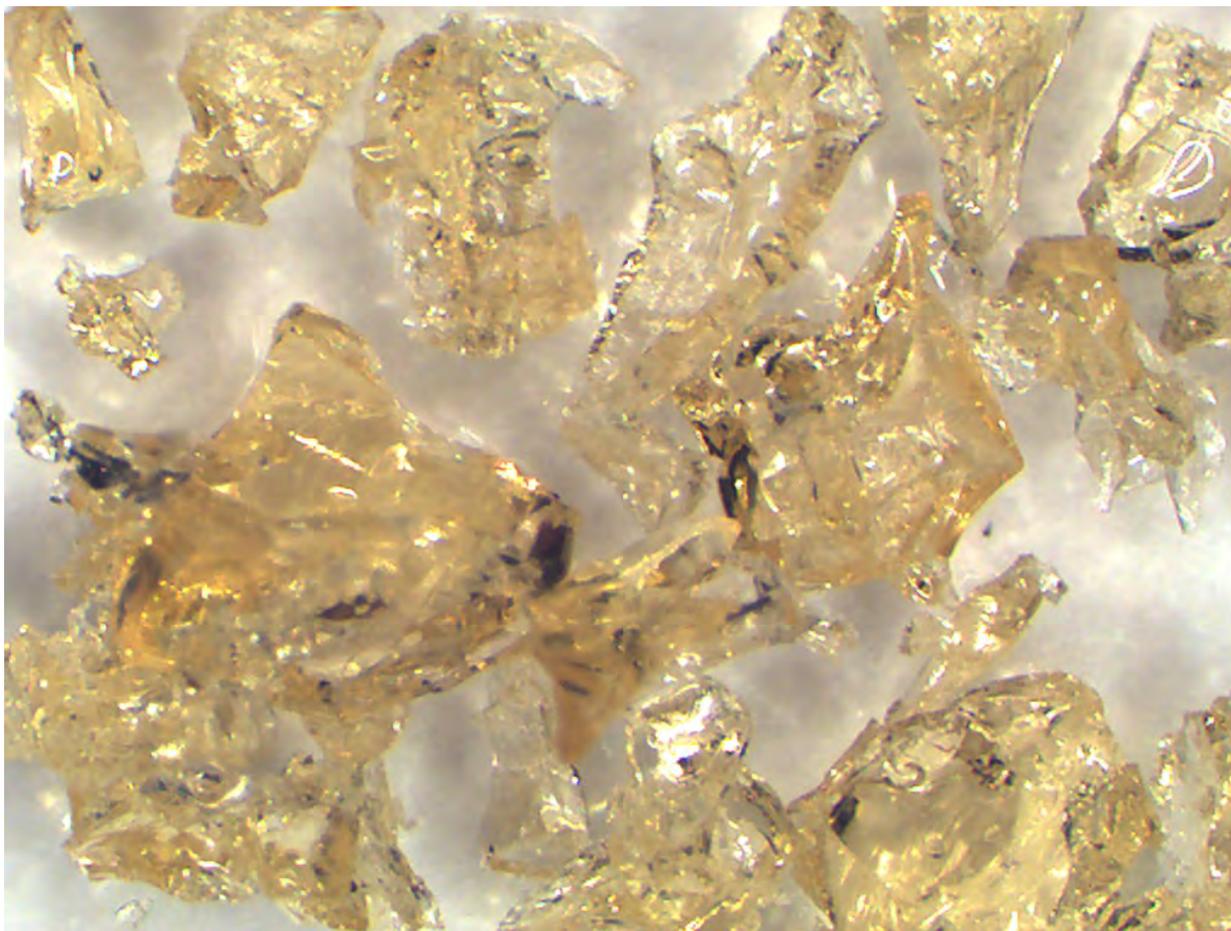


Image 4. New SIR-700 resin

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the laboratory manager or his/her designee, as verified by the following signature. This report shall not be reproduced except in full without the written approval of SwRI."

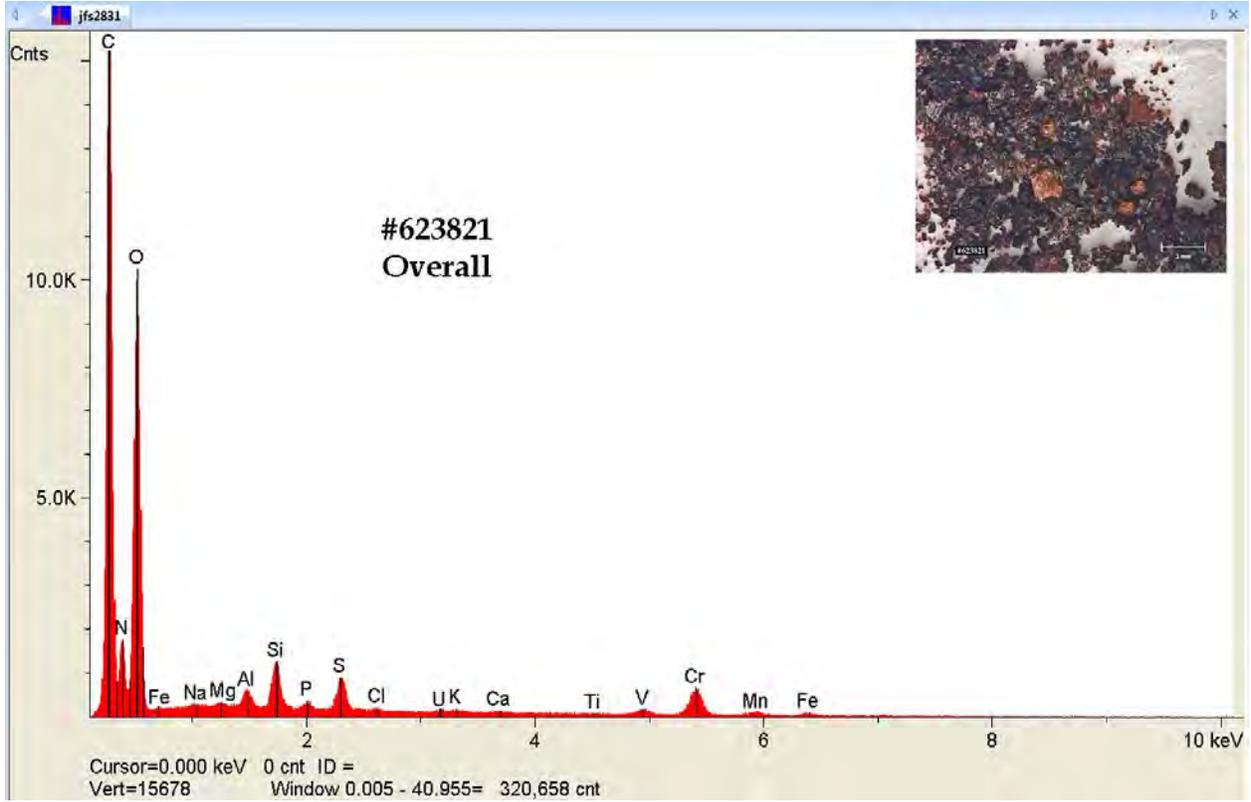
R Spies

Principal Scientist

12/13/17

Date

010013

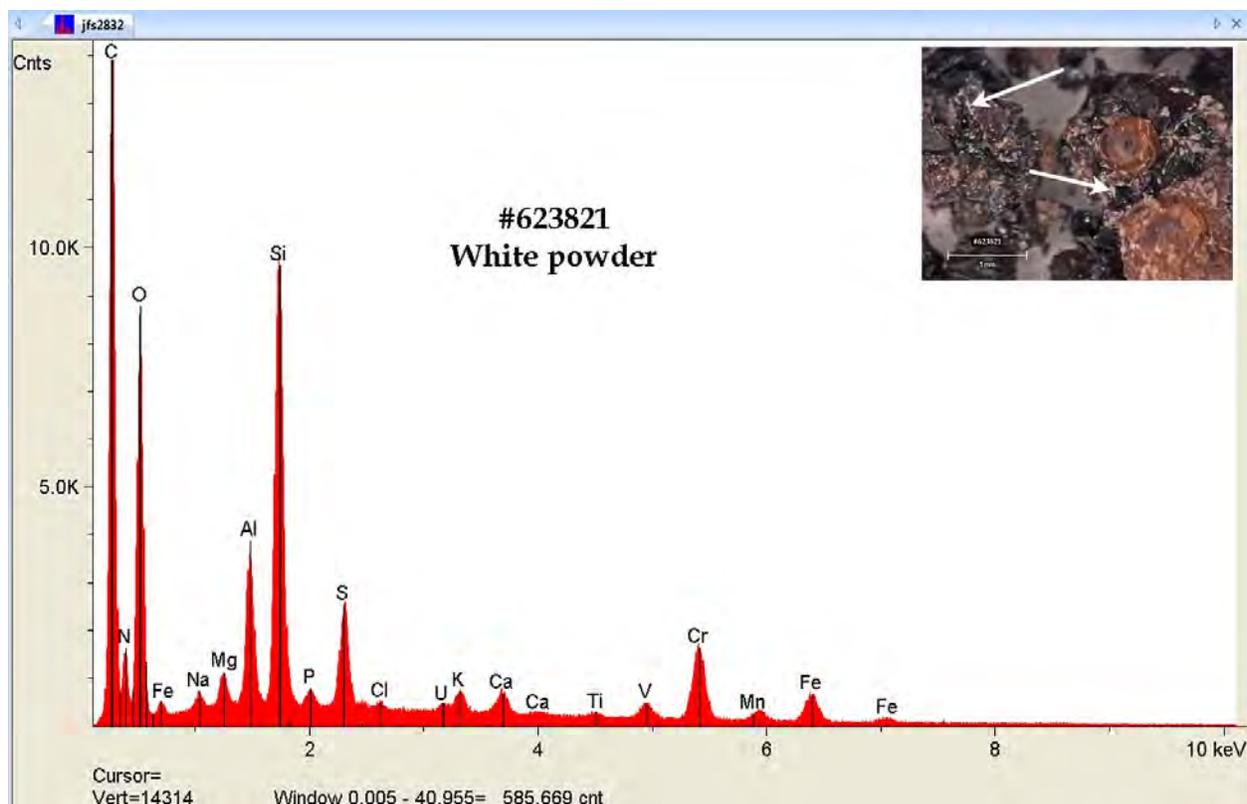


Elt.	Line	Intensity (c/s)	Atomic %	Conc	Units	
Na	Ka	1.89	4.38	2.76	wt.%	
Mg	Ka	2.40	3.48	2.31	wt.%	
Al	Ka	10.77	11.43	8.45	wt.%	
Si	Ka	29.59	27.92	21.47	wt.%	
P	Ka	4.07	4.03	3.42	wt.%	
S	Ka	23.50	19.29	16.94	wt.%	
Cl	Ka	1.63	1.33	1.29	wt.%	
K	Ka	1.07	0.71	0.76	wt.%	
Ca	Ka	1.74	1.12	1.23	wt.%	
Ti	Ka	0.71	0.46	0.60	wt.%	
V	Ka	5.22	3.58	4.99	wt.%	
Cr	Ka	25.83	18.87	26.87	wt.%	
Fe	Ka	2.78	2.65	4.04	wt.%	
U	Ma	2.22	0.75	4.87	wt.%	
			100.00	100.00	wt.%	Total

kV 20.0, Takeoff Angle 23.0°, Elapsed Livetime 300.0
 Note: Quantified results do not include elements with Z<11 (Na).

Figure 1. EDS results of the overall scan area of the SEM - Sample B3FLP8

010014



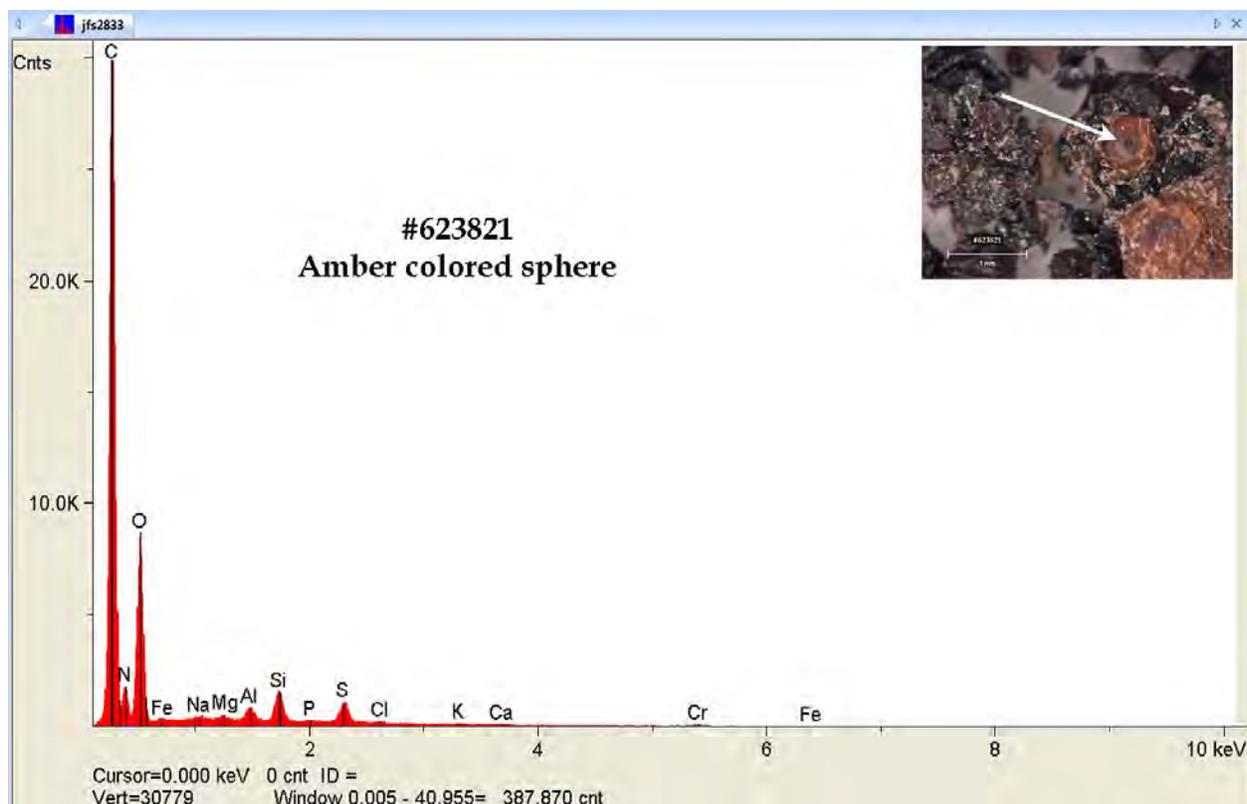
Elt.	Line	Intensity (c/s)	Atomic %	Conc	Units	
Na	Ka	8.47	2.97	2.06	wt.%	
Mg	Ka	17.95	3.97	2.91	wt.%	
Al	Ka	88.79	14.87	12.11	wt.%	
Si	Ka	273.94	44.96	38.10	wt.%	
P	Ka	9.31	1.96	1.83	wt.%	
S	Ka	68.91	11.36	10.99	wt.%	
Cl	Ka	4.11	0.62	0.67	wt.%	
K	Ka	12.24	1.48	1.75	wt.%	
Ca	Ka	17.52	2.07	2.50	wt.%	
Ti	Ka	3.84	0.46	0.66	wt.%	
V	Ka	13.42	1.66	2.55	wt.%	
Cr	Ka	66.72	8.73	13.70	wt.%	
Mn	Ka	0.39	0.06	0.09	wt.%	
Fe	Ka	27.30	4.48	7.55	wt.%	
U	Ma	5.34	0.35	2.54	wt.%	
			100.00	100.00	wt.%	Total

kV 20.0, Takeoff Angle 23.0°, Elapsed Livetime 300.0

Note: Quantified results do not include elements with Z<11 (Na).

Figure 2. EDS report for white particles seen in sample B3FLP8

010015



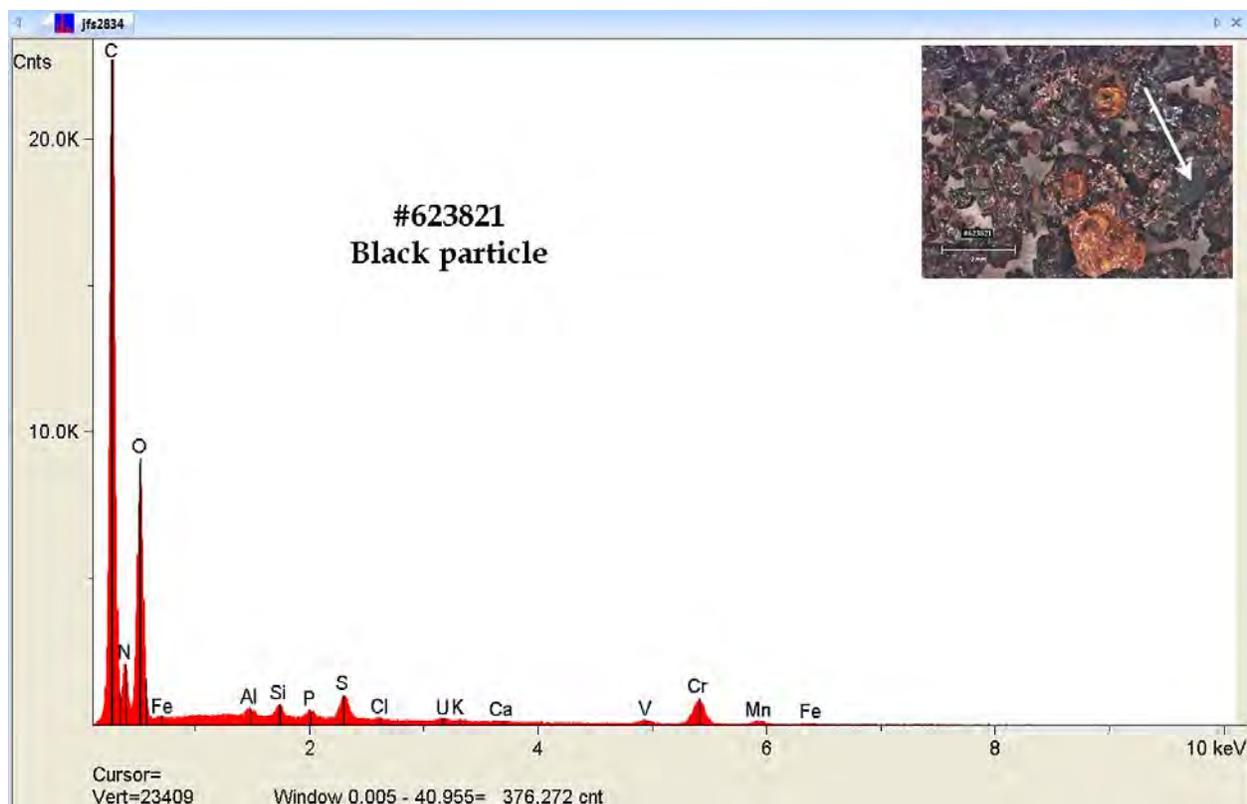
Elt.	Line	Intensity (c/s)	Atomic %	Conc	Units	
Na	Ka	5.82	8.25	6.42	wt.%	
Mg	Ka	5.88	6.17	5.08	wt.%	
Al	Ka	17.03	14.76	13.50	wt.%	
Si	Ka	38.76	34.87	33.18	wt.%	
P	Ka	2.00	2.28	2.39	wt.%	
S	Ka	28.92	26.58	28.88	wt.%	
Cl	Ka	1.56	1.57	1.88	wt.%	
K	Ka	1.78	1.39	1.84	wt.%	
Ca	Ka	1.78	1.33	1.81	wt.%	
Cr	Ka	2.88	2.28	4.01	wt.%	
Fe	Ka	0.56	0.53	1.00	wt.%	
			100.00	100.00	wt.%	Total

kV 20.0, Takeoff Angle 23.0°, Elapsed Livetime 300.0

Note: Quantified results do not include elements with $Z < 11$ (Na).

Figure 3. EDS results of amber colored particles found in sample B3FLP8

010016



Elt.	Line	Intensity (c/s)	Atomic %	Conc	Units	
Al	Ka	10.32	13.12	8.66	wt.%	
Si	Ka	12.57	13.97	9.59	wt.%	
P	Ka	8.43	8.47	6.42	wt.%	
S	Ka	26.70	23.63	18.53	wt.%	
Cl	Ka	2.14	1.94	1.68	wt.%	
K	Ka	0.12	0.09	0.09	wt.%	
Ca	Ka	1.41	1.02	1.00	wt.%	
V	Ka	5.39	4.20	5.23	wt.%	
Cr	Ka	36.00	29.97	38.11	wt.%	
Fe	Ka	2.06	2.29	3.13	wt.%	
U	Ma	3.64	1.30	7.56	wt.%	
			100.00	100.00	wt.%	Total

kV 20.0, Takeoff Angle 23.0°, Elapsed Livetime 300.0

Note: Quantified results do not include elements with Z<11 (Na).

Figure 4. EDS results of black particles found in sample B3FLP8

010017

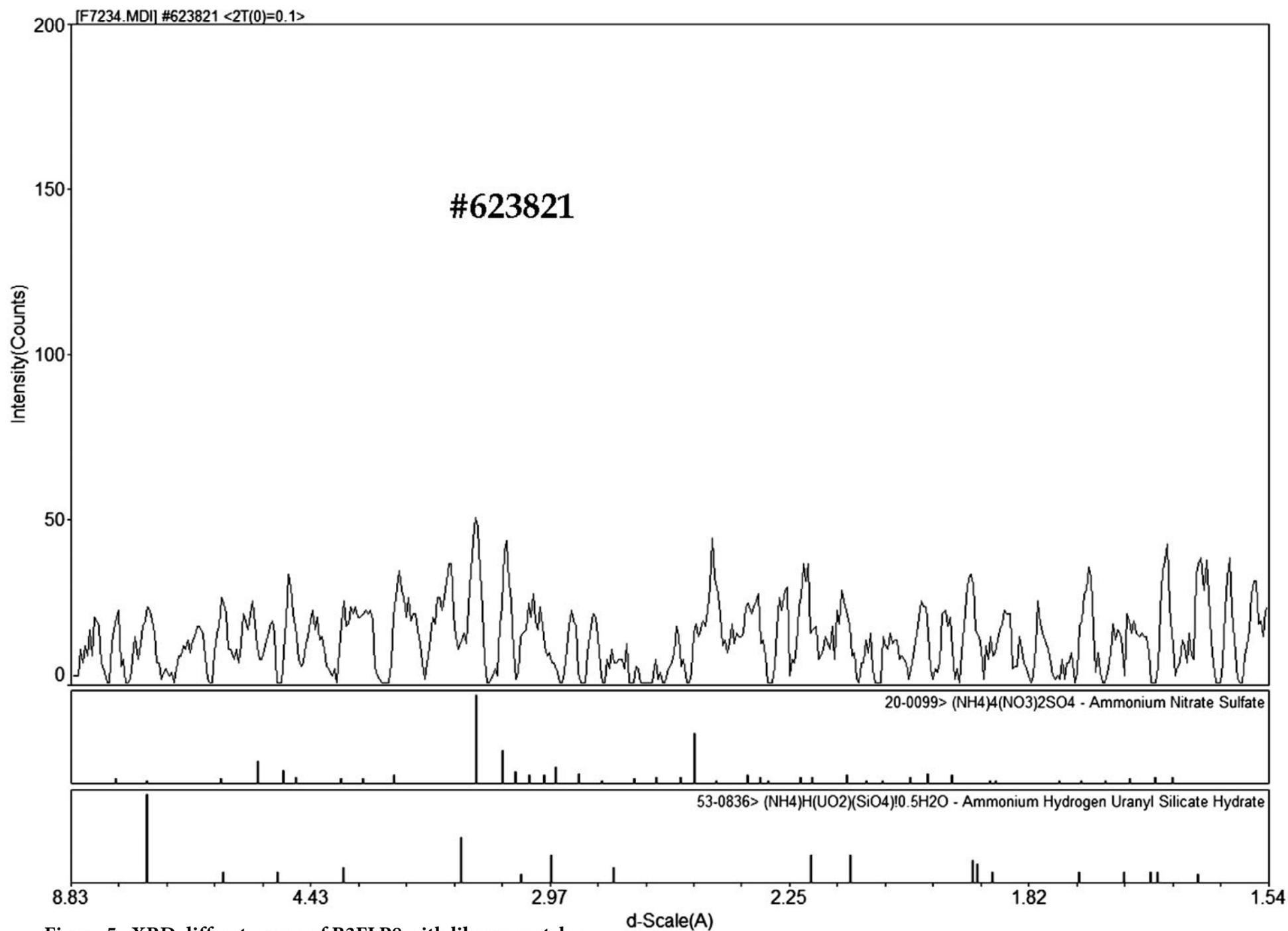


Figure 5. XRD diffractogram of B3FLP8 with library matches

010018

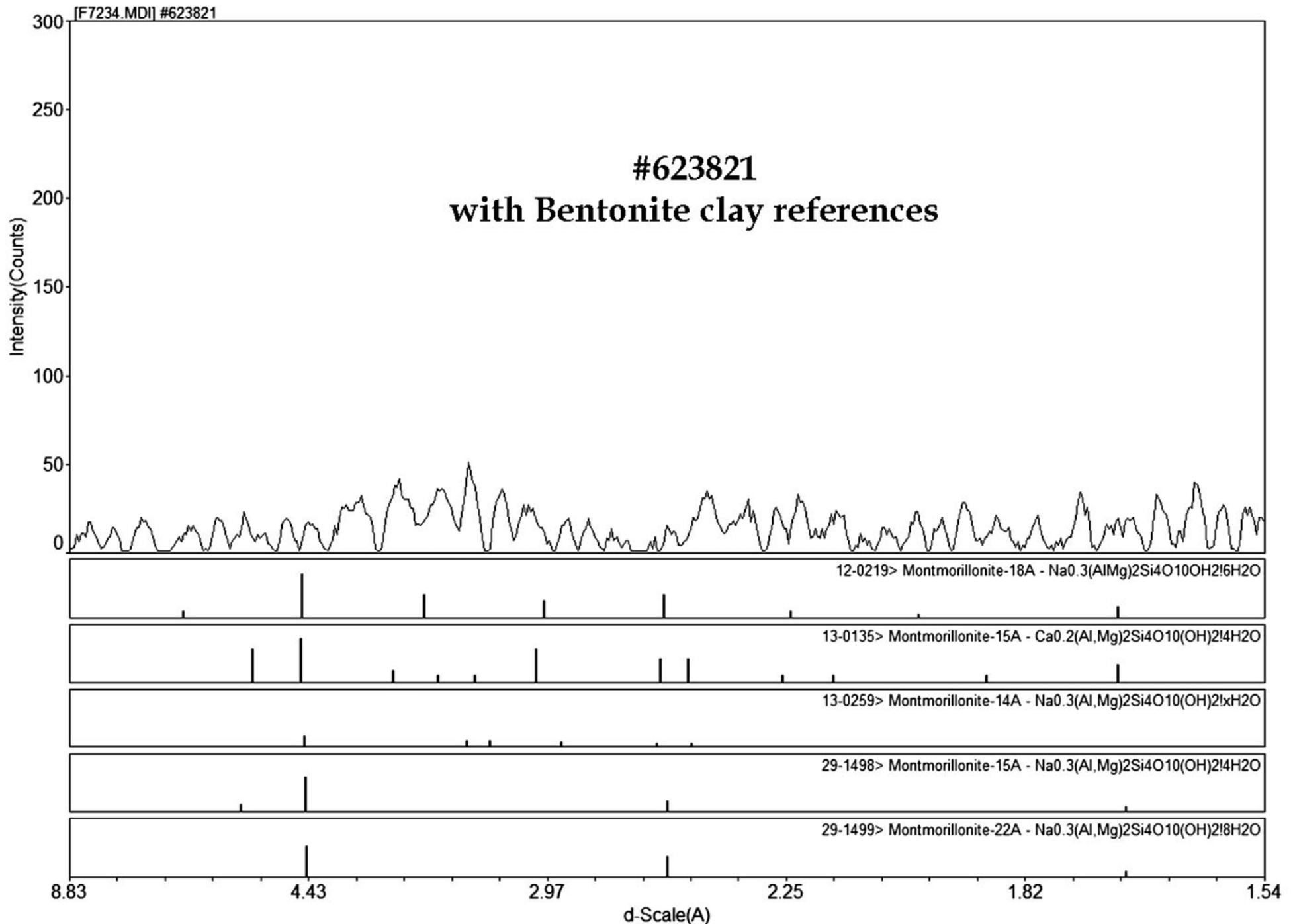


Figure 6. XRD diffractogram of B3FLP8 with bentonite clay reference peaks presented for comparison

010019

SOUTHWEST RESEARCH INSTITUTE
CLIENT: CH2M Hill Plateau Remediation Company
SwRI PROJECT#: 20859.01.00X
SwRI TASK ORDER: 171116-7
SwRI SRR: 60773
SDG: 623821
VTSR: 11.16.2017

EPA 310.1
Case Narrative

010020**CLIENT: CH2M Hill Plateau Remediation Company****SDG: 623821****SwRI Project Number: 20859.01.00X****SwRI Sample Receipt Number: 60773****Page#: 1**

SwRI CASE NARRATIVE

1. One (01) sample was received for EDS-SEM, XRD, and EPA 310.1 Analyses:

SwRI ID	Customer ID	Matrix
623821	B3FLP8	Other Solid

010021

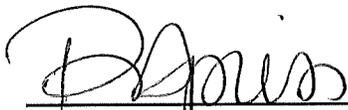
Client: CH2M Hill Plateau Remediation Company
SDG: 623821
SwRI Project Number: 20859.01.00X
SwRI Task Order Number(s): 171116-7

WETCHEMISTRY ANALYSIS

Approximately 0.100 g of sample was dissolved in 50 mL of deionized water and analyzed for total alkalinity according to EPA 310.1 and using SwRI TAP# 01-0406-089 Rev. 4. Since the total alkalinity was performed by weight, the sample results are reported on a weight basis.

All PBs, ICB's and CCB's were less than the reporting limit. All ICV's and CCV's were within 90-110% recovery. All duplicate RPD's were within 20%. An analytical spike was performed on sample SwRI #623821 with a recovery of 89.8%.

"I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on diskette has been authorized by the laboratory manager or his/her designee, as verified by the following signature. This report shall not be reproduced except in full without the written approval of SwRI."



Principal Scientist

12/7/17

Date

010022

SOUTHWEST RESEARCH INSTITUTE
CLIENT: CH2M Hill Plateau Remediation Company
SwRI PROJECT#: 20859.01.00X
SwRI TASK ORDER: 171116-7
SwRI SRR: 60773
SDG: 623821
VTSR: 11.16.2017

EPA 310.1

Results

010023

SOUTHWEST RESEARCH INSTITUTE
WetChem Report
Cover Page

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7

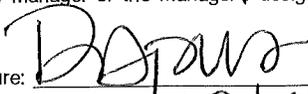
SDG: 623821
SRR: 60773

Case: CHPRC
Project: 20859.01.00X

Client Sample ID	Lab Sample ID
B3FLP8	623821
B3FLP8D	623821D
B3FLP8MS	623821S

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and the electronic data submitted has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: 
Date: 12/7/17

Name: Radonna Spies
Title: Principal Scientist

Cover Page

12/13/2017

010024 REV.0

SOUTHWEST RESEARCH INSTITUTE

WetChem Report - Form I

Certificate of Analysis

Client Sample ID

B3FLP8

Type: Unknown

Client: CH2M Hill Plateau Remediation Company
 Task Order: 171116-7
 Lab ID: 623821
 Result Units: mg/Kg

SDG: 623821
 SRR: 60773
 Matrix: Other Solid
 % Solids: NA

Case: CHPRC
 Project: 20859.01.00X
 Receipt Date: 11/16/2017
 Collection Date: 10/31/2017

CAS No.	Analyte	Result	Qual	M	RL	DF	Prep Batch	Analysis Date/Time
NA	Alkalinity As CaCO3	1,700		NA	850	1	NA	12/05/2017 15:53
NA	Bicarbonate as CaCO3	1,700		NA	850	1	NA	12/05/2017 15:53
NA	Carbonate as CaCO3	850	U	NA	850	1	NA	12/05/2017 15:53
NA	Hydroxide as CaCO3	850	U	NA	850	1	NA	12/05/2017 15:53

Data Reporting Qualifiers (Qual)	Columns	Instruments/Methods (M)
U - Result is less than the SwRI Reporting Limit (RL) N - Matrix spike and/or matrix spike duplicate criteria was not met X - Analytical spike criteria was not met E - Result is estimated due to interferences D - Result is reported from a dilution * - Duplicate criteria was not met	RL - SwRI Reporting Limit DF - Dilution Factor M - Instrument	NA - Not Applicable/Total Alkalinity SM 2320B

Form I-IN

12/13/2017

010025

REV.0

SOUTHWEST RESEARCH INSTITUTE

WetChem Report - Form I

SwRI ID

ICB

Certificate of Analysis

Type: ICB/Blank

Client: CH2M Hill Plateau Remediation Company

SDG: 623821

Case: CHPRC

Task Order: 171116-7

SRR: 60773

Project: 20859.01.00X

Lab ID: ICB

Matrix:

Receipt Date: NA

Result Units: mg/L

% Solids: NA

Collection Date: NA

CAS No.	Analyte	Result	Qual	M	RL	DF	Prep Batch	Analysis Date/Time
NA	Alkalinity As CaCO3	2.00	U	NA	2.00	1	NA	12/05/2017 15:53
NA	Bicarbonate as CaCO3	2.00	U	NA	2.00	1	NA	12/05/2017 15:53
NA	Carbonate as CaCO3	2.00	U	NA	2.00	1	NA	12/05/2017 15:53
NA	Hydroxide as CaCO3	2.00	U	NA	2.00	1	NA	12/05/2017 15:53

Data Reporting Qualifiers (Qual)	Columns	Instruments/Methods (M)
U - Result is less than the SwRI Reporting Limit (RL) N - Matrix spike and/or matrix spike duplicate criteria was not met X - Analytical spike criteria was not met E - Result is estimated due to interferences D - Result is reported from a dilution * - Duplicate criteria was not met	RL - SwRI Reporting Limit DF - Dilution Factor M - Instrument	NA - Not Applicable/Total Alkalinity SM 2320B

Form I-IN

SOUTHWEST RESEARCH INSTITUTE
WetChem Report - Form IIA

Initial and Continuing Calibration Verification

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7
Result Units: mg/L
Associated Analytical Batches: 20171205-A002

SDG: 623821
SRR: 60773
Initial Calibration Source: ERA
Continuing Calibration Source: ERA

Case: CHPRC
Project: 20859.01.00X

Analyte	Initial Calibration Verification				Continuing Calibration Verification				
	True	Found	%Rec	Limit	True	Found1	%Rec	Limit	M
Alkalinity As CaCO3	40.1	40.0	99.8%		40.1	40.0	99.8%		
Bicarbonate as CaCO3	-	-	-		-	-	-		
Carbonate as CaCO3	-	40.0	-		-	40.0	-		
Hydroxide as CaCO3	-	-	-		-	-	-		

Instruments/Methods (M)
NA - Not Applicable/Total Alkalinity SM 2320B

Form IIA-IN

SOUTHWEST RESEARCH INSTITUTE
WetChem Report - Form III

Blanks

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7
Preparation Blank Result Units: mg/L
Initial/Continuing Blank Result Units: mg/L

SDG: 623821
SRR: 60773
Preparation Blank Matrix: Other Solid
Associated Prep Batches: NA

Case: CHPRC
Project: 20859.01.00X
Associated Analytical Batches: 20171205-A002

Analyte	Preparation Blank		Initial Calibration Blank		Continuing Calibration Blank		M
	Result	Qual	Found	Qual	Found1	Qual	
Alkalinity As CaCO3	2.00	U	2.00	U	2.00	U	
Bicarbonate as CaCO3	2.00	U	2.00	U	2.00	U	
Carbonate as CaCO3	2.00	U	2.00	U	2.00	U	
Hydroxide as CaCO3	2.00	U	2.00	U	2.00	U	

Data Reporting Qualifiers (Qual)	Instruments/Methods (M)
U - Result is less than the SwRI Reporting Limit (RL) N - Matrix spike and/or matrix spike duplicate criteria was not met X - Analytical spike criteria was not met E - Result is estimated due to interferences D - Result is reported from a dilution * - Duplicate criteria was not met	NA - Not Applicable/Total Alkalinity SM 2320B

SOUTHWEST RESEARCH INSTITUTE
WetChem Report - Form VA

Client Sample ID
B3FLP8MS/MSD

Matrix Spike/Matrix Spike Duplicate Sample Recovery

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7
Lab ID: 623821S
Result Units: mg/Kg

SDG: 623821
SRR: 60773
Matrix: Other Solid
% Solids: NA

Case: CHPRC
Project: 20859.01.00X

Analyte	Parent Sample Result	Qual	MS Result	MS Spike Added	MS %Rec	MSD Result	MSD Spike Added	MSD %Rec	%RPD	Control Limit %Rec	Control Limit %RPD	M	Note
Alkalinity As CaCO3	1700		9280	8439	89.8%	-	-	-	-	-	-	NA	
Bicarbonate as CaCO3	1700		4220	NA		-	-	-	-	-	-	NA	
Carbonate as CaCO3	850	U	5060	NA		-	-	-	-	-	-	NA	
Hydroxide as CaCO3	850	U	844	NA		-	-	-	-	-	-	NA	

Data Reporting Qualifiers (Qual)	Columns	Instruments/Methods (M)
U - Result is less than the SwRI Reporting Limit (RL) N - Matrix spike and/or matrix spike duplicate criteria was not met X - Analytical spike criteria was not met E - Result is estimated due to interferences D - Result is reported from a dilution * - Duplicate criteria was not met	M - Instrument MS - Matrix Spike MSD - Matrix Spike Duplicate Q - Qualifier RPD - Relative Percent Difference	NA - Not Applicable/Total Alkalinity SM 2320B

SOUTHWEST RESEARCH INSTITUTE
WetChem Report - Form VI

010029 Client Sample ID
B3FLP8D

Duplicates

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7
Lab ID: 623821D
Result Units: mg/Kg

SDG: 623821
SRR: 60773
Matrix: Other Solid
% Solids: NA

Case: CHPRC
Project: 20859.01.00X

Analyte	Parent Sample Result	Qual	Duplicate Result	Qual	RPD	RPD Limit	Control Limit	M	Note
Alkalinity As CaCO3	1700		1920		12.2%	-	-	NA	
Bicarbonate as CaCO3	1700		1920		12.2%	-	-	NA	
Carbonate as CaCO3	850	U	962	U	0.00%	-	-	NA	
Hydroxide as CaCO3	850	U	962	U	0.00%	-	-	NA	

Data Reporting Qualifiers (Qual)	Columns	Instruments/Method (M)
U - Result is less than the SwRI Reporting Limit (RL) N - Matrix spike and/or matrix spike duplicate criteria was not met X - Analytical spike criteria was not met E - Result is estimated due to interferences D - Result is reported from a dilution * - Duplicate criteria was not met	M - Instrument RPD - Relative Percent Difference	NA - Not Applicable/Total Alkalinity SM 2320B

Form VI-IN

12/13/2017

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SOUTHWEST RESEARCH INSTITUTE

WetChem Report - Form VII

SwRI ID

ICV

Laboratory Control Sample

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7
Lab ID: ICV
Result Units: mg/L

SDG: 623821
SRR: 60773
Matrix: Other Solid
Associated Prep Batches: NA

Case: CHPRC
Project: 20859.01.00X
LCS Source: ERA

Analyte	True	Found	Qual	%Rec.	Limit	M	Analysis Date/Time
Alkalinity As CaCO3	40.1	40.0		99.8%		NA	12/05/2017 15:53
Bicarbonate as CaCO3	0.00	2.00	U	NA		NA	12/05/2017 15:53
Carbonate as CaCO3	0.00	40.0		NA		NA	12/05/2017 15:53
Hydroxide as CaCO3	0.00	2.00	U	NA		NA	12/05/2017 15:53

Instruments/Methods (M)
NA - Not Applicable/Total Alkalinity SM 2320B

Form VII-IN

SOUTHWEST RESEARCH INSTITUTE
WetChem Report - Form IX

Detection Limits

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7
Result Units: mg/L

SDG: 623821
SRR: 60773
Instrument: Accumet 50

Case: CHPRC
Project: 20859.01.00X

Analyte	RL	Units
Alkalinity As CaCO3	2.00	mg/L
Bicarbonate as CaCO3	2.00	mg/L
Carbonate as CaCO3	2.00	mg/L
Hydroxide as CaCO3	2.00	mg/L

Columns
RL - SwRI Reporting Limit

SOUTHWEST RESEARCH INSTITUTE
WetChem Report - Form XII

Analysis Run Log

Client: CH2M Hill Plateau Remediation Company
Task Order: 171116-7
Analytical Batch: 20171205-A002
Analysis Method: Total Alkalinity SM 2320B

SDG: 623821
SRR: 60773
Instrument: Accumet 50

Case: CHPRC
Project: 20859.01.00X
Start Date: 12/05/2017
End Date: 12/05/2017

Lab Sample ID	Client Sample ID	Time	DF	A	B	C	H
				i	a	y	
				C	C	C	
ICV	NA	15:53	1	X	X	X	X
ICB	NA	15:53	1	X	X	X	X
623821	B3FLP8	15:53	1	X	X	X	X
623821D	B3FLP8D	15:53	1	X	X	X	X
623821S	B3FLP8MS	15:53	1	X	X	X	X
CCV	CCV	15:53	1	X	X	X	X
CCB	CCB	15:53	1	X	X	X	X