



June 20, 2017

CH2M HILL Plateau Remediation Company  
 2420 Stevens Center Place  
 P.O. Box 1600  
 Richland, WA 99354  
 Attn.: Tracey A. Burch

**Subject: Geotechnical Laboratory Testing Services, Data Deliverable for SDG # W705089, Rev. 0**

Enclosed is the final report on geotechnical analyses performed by RJ Lee Group in conjunction with PBS Engineering and Environmental, Inc. (PBS) for Sample Delivery Group number (SDG #) W705089.

**General Set Comments**

RJ Lee Group received from CH2M-Hill Plateau Remediation Company (CHPRC) 1 sample to be tested for geotechnical analysis at the Columbia Basin Analytical Laboratories. There are no SIRs associated with this SDG.

The CHPRC sample, in SDG # W705089, has been assigned a PBS Geotechnical Lab Sample number per the below table.

CHPRC Sample #	SDG #	Geotechnical Lab Sample #	Date Processed
B39LJ2	W705089	H-0157	06/19/2017

This project deliverable, provided in Attachment 1, contains the reports of the requested analytical results and a copy of the associated chain of custody for the sample listed above.

The analytical results provided in this deliverable relate only to the items tested. The sample was received in acceptable condition unless otherwise noted in the attached report(s).

I certify that this analytical report is in compliance with the Hanford SOW, both technically and for completeness. Release of the data contained in this hard copy report has been authorized by the Laboratory Director or a designee as verified by the following signature.

06/20/2017

Donald Smith  
 Laboratory Director, Columbia Basin Analytical Laboratories

Date

If you have any questions, please feel free to contact us at 509-545-4989 or email at [don.smith@rjleegroup.com](mailto:don.smith@rjleegroup.com).

**Attachment 1**

PBS Geotechnical Laboratory Testing Results, SDG # W705089,  
Dated June 20, 2017



June 19, 2017

Mr. Larry Lockrem  
RJ Lee Group, Inc.  
2710 North 20th Avenue  
Pasco, Washington 99301

Via email: llockrem@rjleegroup.com

Regarding: Geotechnical Laboratory Testing Results  
CH2M HILL Plateau Remediation  
Sample Delivery Group No. W705089  
PBS Project No. 63797.000

Dear Mr. Lockrem:

PBS Engineering and Environmental Inc. (PBS) is pleased to present the results of our recent geotechnical laboratory testing in accordance with the request provided with Sample Delivery Group (SDG) number W705089.

PBS performed the following tests in general accordance with the relevant ASTM Standards:

- Grain Size Analysis (ASTM D422)
- Carbonate Content (ASTM D4373)
- Permeability of Granular Soils–Constant Head (ASTM D2434)

We trust this letter meets your current needs. If you have any questions, or wish to further discuss our observations, conclusions, and recommendations, please contact us at 509.942.1600.

Sincerely,



06/19/2017

Adam M. Swenson, PE  
Project Geotechnical Engineer

Attachment(s): Report of Laboratory Testing – Grain-size Analysis  
Report of Laboratory Testing – Carbonate Content  
Report of Laboratory Testing – Permeability of Granular Soils–Constant Head  
Chain of Custody



**REPORT OF LABORATORY TESTING**

<b>Report to:</b> CH2M-Hill - Plateau Remediation 2420 Stevens Center Place PO Box 1600 Richland, WA 99354	<b>Date:</b> 6/19/2017
	<b>Sample Delivery Group No.:</b> W705089
	<b>Sample Authorization No.:</b> F16-037

<b>Project:</b> CHPRC Laboratory	<b>Project No.:</b> 63797.000
<b>Report of:</b> Grain Size Analysis - Hydrometer (ASTM D422)	<b>Lab Technician:</b> P. Brice

**Items Received:**

One sample was provided to us containing soil material obtained by you, the client. PBS performed the following test:

Particle/Grain Size Analysis - Hydrometer (ASTM D422):

Mechanical Grain Size Analyses (wet sieve) were conducted on each of the soil samples to determine their grain size distribution. In addition, hydrometer tests were conducted on portions of the soil samples passing the No. 10 sieve. The results of the mechanical grain size analyses and hydrometer testing are plotted on the attached Figure (Particle Size Analysis Test Results - Hydrometer, pages 1 through 3).

**LABORATORY TEST RESULTS**

**Particle Grain Size Analysis - Hydrometer (ASTM D422) - Sieve Portion**

Customer Sample Number	Laboratory Sample Number	Percent Passing by Sieve Size											
		3-in.	1½-in.	¾-in.	½-in.	No. 4	No. 10	No. 20	No. 40	No. 60	No. 100	No. 140	No. 200
B39LJ2	H-0157	100	100	77.8	56.2	39.3	28.9	26.4	23.7	15.8	12.4	10.8	9.5



**REPORT OF LABORATORY TESTING**

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	<b>Sample Delivery Group No.:</b> W705089
	<b>Sample Authorization No.:</b> F16-037

<b>Project:</b> CHPRC Laboratory	<b>Project No.:</b> 63797.000
<b>Report of:</b> Grain Size Analysis - Hydrometer (ASTM D422)	<b>Lab Technician:</b> P. Brice

Particle/Grain Size Analysis - Hydrometer (ASTM D422):

See page 1 of 3

**LABORATORY TEST RESULTS**

**Particle Grain Size Analysis - Hydrometer (ASTM D422) - Hydrometer Portion**

Laboratory Sample Number	Hydrometer Readings													
	2 min		5min		15 min		30 min		60 min		250 min		1440 min	
	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)	Dia. (mm)	Finer (%)
H-0157	0.033	6.3	0.021	5.4	0.013	4.3	0.009	3.7	0.006	2.8	0.003	2.3	0.001	2.3



**PARTICLE-SIZE ANALYSIS TEST RESULTS**

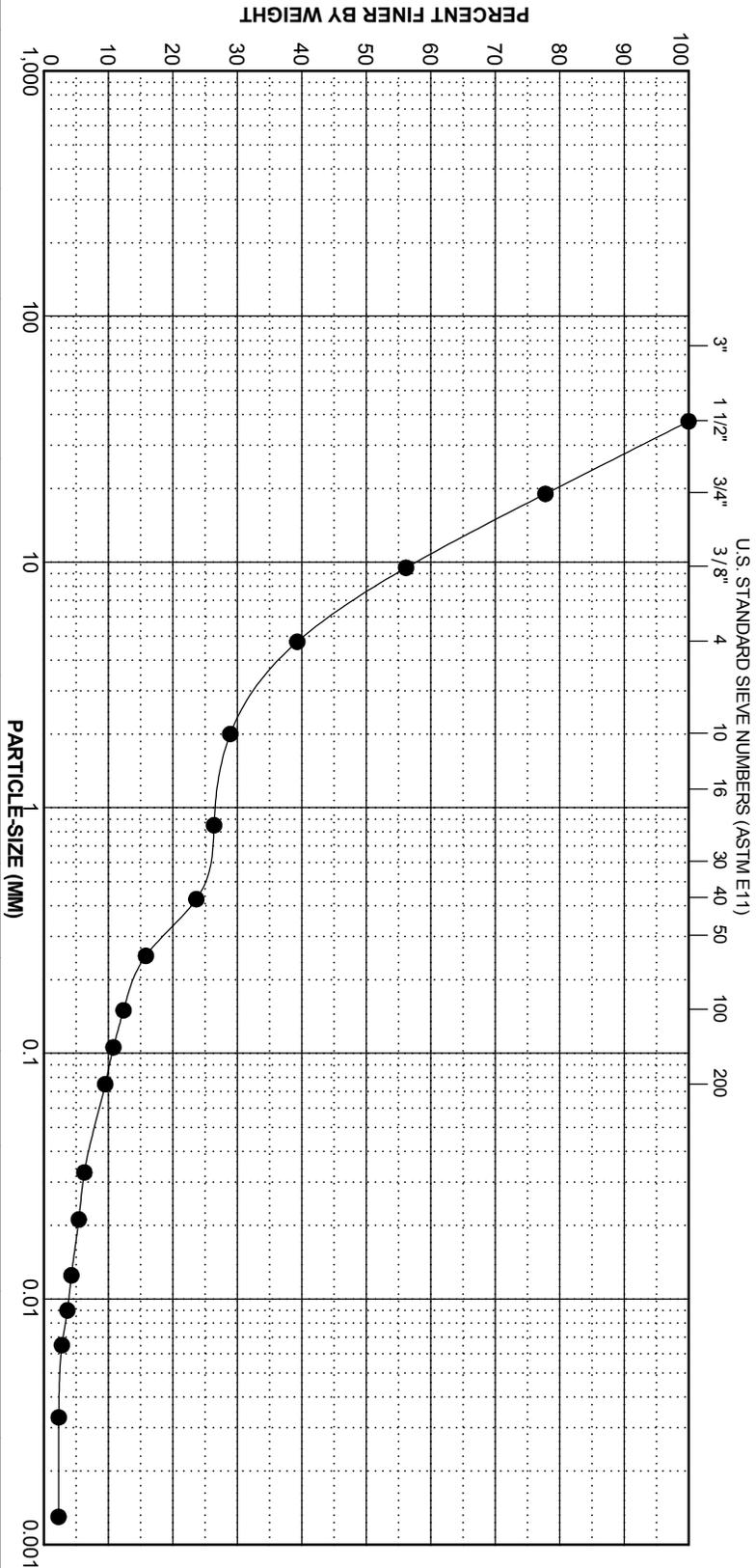
CHPRC - GEOTECHNICAL LABORATORY

PBS PROJECT NUMBER:  
63797

PARTICLE-SIZE ANALYSIS-RJ LEE GRP 63797 RESULTS.GPJ PBS DATA\TPL\_GEO.GDT PRINT DATE: 6/19/17.RPG

TEST METHOD: ASTM D422

BOULDERS	COBBLES	GRAVEL				SAND			FINES		
		COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY			



KEY	EXPLORATION NUMBER	SAMPLE NUMBER	SAMPLE DEPTH (FEET)	MOISTURE CONTENT (PERCENT)	D60 (MM)	D50 (MM)	D30 (MM)	D10 (MM)	D5 (MM)	GRAVEL (PERCENT)	SAND (PERCENT)	FINES (PERCENT)
●	H-157	B39LJ2	160.2	8	10.7	7.4	2.2	0.09	0.02	61	30	10

Columbia Basin Analytical Laboratories | 2710 North 20<sup>th</sup> Avenue, Pasco, WA 99301 | 509.545.4989

[WWW.RJLEEGROUP.COM](http://WWW.RJLEEGROUP.COM)


**REPORT OF LABORATORY TESTING**

<b>Report to:</b> CH2M-Hill - Plateau Remediation 2420 Stevens Center Place PO Box 1600 Richland, WA 99354	<b>Date :</b> 6/19/2017 <b>Sample Delivery Group No.</b> W705089 <b>Sample Authorization No.:</b> F16-037
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<b>Project:</b> CHPRC Laboratory	<b>Project No.:</b> 63797.000
<b>Report of:</b> Carbonate Content (ASTM D4373)	<b>Lab Technician:</b> P. Brice

**Items Received:**

One sample was provided to us containing soil material obtained by you, the client.  
PBS performed the following test:

Rapid Determination of Carbonate Content (ASTM D4373).

The test specimen was dried for a period of 12 to 24 hours and pulverized until all particles passed the No. 40 sieve. One gram of the pulverized sample was placed into the reactor along with 20mL of acid solution and gently mixed to initiate reaction. If there was no pressure response, but a minor reaction, the trial was repeated with 2, 5, or 10 grams of pulverized material and readings were altered accordingly. After 10 minutes of reaction time, the pressure value was read and recorded to obtain the carbonate content. If, necessary, the pressure was continually read until the change in calcite equivalent was less than 0.3% over a 10 minute time period, for a testing time of up to 120 minutes, or the change in calcite equivalent was less than 0.3% over a 30 minute time period for testing time greater than 120 minutes.

**LABORATORY TEST RESULTS**
**Rapid Determination of Carbonate Content**

Customer Sample Number	Quantity of sample used, (g)	CO <sub>2</sub> Pressure (kPa)	Calcite Equivalent (%CaCO <sub>2</sub> )
B39LJ2	10.8	2.0	5.3

SHEET 1 OF 1

REVIEWED BY: A. Swenson, P.E.


**REPORT OF LABORATORY TESTING**

**Report to:** CH2M-Hill - Plateau Remediation  
2420 Stevens Center Place  
PO Box 1600  
Richland, WA 99354

**Date:** 6/19/2017  
**Sample Delivery Group No.:** W705089  
**Sample Authorization No.:** F16-037

**Project:** CHPRC Laboratory

**Project No.:** 63797.000

**Report of:** Permeability of Granular Soils - Constant Head (ASTM D2434)

**Lab Tech:** P. Brice

**Items Received:**

One sample was provided to us containing soil material obtained by you, the client.  
PBS performed the following test:

Permeability of Granular Soils - Constant Head (ASTM D2434).

The permeability of the representative soil was determined in the laboratory using the above referenced samples. The samples were prepared for the permeameter and all the required measures were taken. Air was evacuated from the samples and were then saturated with low mineral content water. The manometer system was attached and a stable head condition was attained. The quantity of flow, water temperature, water head and time were measured. This was repeated, if necessary, to establish an accurate region of laminar flow with velocity.

**LABORATORY TEST RESULTS**
**Permeability of Granular Soils - Constant Head (ASTM D2434)**

Customer Sample Number	Laboratory Sample Number	Date of Analysis	Quantity of flow discharged (cm <sup>3</sup> )	Dist. between manometers, L (cm)	Specimen area, A (cm <sup>2</sup> )	Total discharge time, t (sec)	Head diff. betw. manometers, h (cm)	Avg. Hydraulic Conductivity, k (cm/s)
B39LJ2	H-0157	6/13/2017	64	6.35	31.48	420	34.4	9.37E-04

SHEET 1 OF 1

REVIEWED BY: A. Swenson, P.E.

CH2MHill Plateau Remediation Company		CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST		F16-037-154	PAGE 1 OF 1
COLLECTOR Daniel Klud CHPRC	COMPANY CONTACT TODAK, D	TELEPHONE NO. 376-6427	PROJECT COORDINATOR TODAK, D	PRICE CODE 8H	DATA TURNAROUND 30 Days / 30 Days
SAMPLING LOCATION C9712, I-005	PROJECT DESIGNATION 100-KR-4 Long Term & Interim Action Monitoring - Soil	FIELD LOGBOOK NO. NAF-N-645-5	ACTUAL SAMPLE DEPTH 160.2 - 160.8'	SAF NO. F16-037	<input type="checkbox"/> AIR QUALITY
ICE CHEST NO. NA	OFFSITE PROPERTY NO. NA	COA 300085	METHOD OF SHIPMENT GOVERNMENT VEHICLE	<b>ORIGINAL</b>	
SHIPPED TO RJ LEE - GEOTECHNICAL	BILL OF LADING/AIR BILL NO. NA				

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/LATA Dangerous Goods Regulations but are not releasable per DOE Order 458.1.	PRESERVATION None	HOLDING TIME None	TYPE OF CONTAINER Liner	NO. OF CONTAINER(S) 1	VOLUME 1000g	SPECIAL HANDLING AND/OR STORAGE NA	SEE ITEM (1) IN SPECIAL INSTRUCTIONS
SAMPLE NO. B39LJ2	MATRIX* SOIL	SAMPLE DATE MAY 08 2017	SAMPLE TIME 1310					

W7465089  
12.6°C

06/20/2017

CHAIN OF POSSESSION	SIGN/ PRINT NAMES	SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM Daniel Klud CHPRC	RECEIVED BY/STORED IN SSU #1	TRVL-17-102; ** All requests for Geotechnical Parameters will be given a unique HEIS sample number and be assigned to a separate COC. In addition, all split spoon sleeves will be properly stored until authorized for shipment. ** Laboratory shall perform the Particle Size (Dry Sieve) analysis to determine if they should proceed with Permeability by D2434 or Hydraulic Conductivity by D5084. (1) D422_PARTICLE SIZE (Dry Sieve): COMMON; D4373 CARBONATE CONTENT: COMMON;
RELINQUISHED BY/REMOVED FROM SSU #1	RECEIVED BY/STORED IN CHPRC	
RELINQUISHED BY/REMOVED FROM Frank Klud CHPRC	RECEIVED BY/STORED IN Daniel Klud CHPRC	
RELINQUISHED BY/REMOVED FROM	RECEIVED BY/STORED IN	
RELINQUISHED BY/REMOVED FROM	RECEIVED BY/STORED IN	

LABORATORY SECTION	RECEIVED BY	TITLE	DATE/TIME
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME

PRINTED ON 4/6/2017      FSR ID = FSR43451      TRVL NUM = TRVL-17-102      A-6003-618 (REV 2)