

May 12, 2015



Rev. 0, SDG # W150317

May 12, 2015

CH2M HILL Plateau Remediation Company  
2420 Stevens Center Place  
P.O. Box 1600  
Richland, WA 99352  
Attn.: Tracey A. Burch

**Subject: Geotechnical Laboratory Testing Services, Data Deliverable for SDG # W150317, 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 #) W150317.

**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.

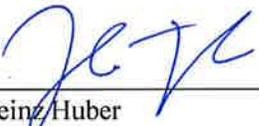
The CHPRC sample, in SDG # W150317, has been assigned a PBS Geotechnical Lab Sample number per the below table.

| CHPRC Sample # | SDG #   | Geotechnical Lab Sample # |
|----------------|---------|---------------------------|
| B30JK5         | W150317 | H-0030                    |

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.


05/12/2015  


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Heinz Huber Date  
Laboratory Manager, Columbia Basin Analytical Laboratories

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

**Attachment 1**

PBS Geotechnical laboratory Testing Results, SDG # W150317,  
dated May 11, 2015

May 12, 2015



Engineering +  
Environmental

May 11, 2015

RJ Lee Group, Inc.  
Attn: Mr. Larry Lockrem  
Columbia Basin Analytical Laboratories  
2710 North 20<sup>th</sup> Avenue  
Pasco, Washington 93301

Re: Geotechnical Laboratory Testing Results  
Sample Delivery Group No. W150317  
PBS Project No. 63737.000

Dear Mr. Lockrem:

In accordance with your request, PBS Engineering and Environmental Inc. (PBS) is providing you with the results of our recent geotechnical laboratory testing. Our services were provided in accordance with the request provided with Sample Delivery Group (SDG) number W150317.

We performed the following tests:

- Grain Size Analysis - Hydrometer (ASTM D422)
- Hydraulic Conductivity – Falling Head (ASTM D5084)

The appropriate permeability/hydraulic conductivity test (ASTM D2434 or D5084) was selected based on the texture characteristics of the sample received, per section 3.2.2 of the contract. The tests were performed in general accordance with the above-mentioned ASTM Standards.

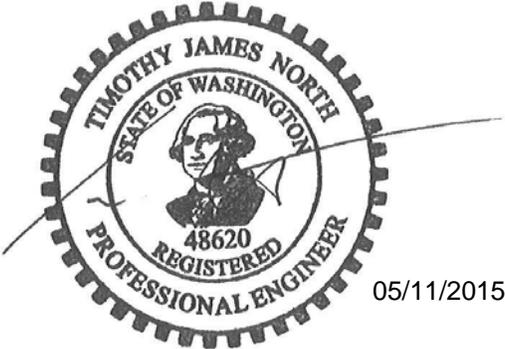
400 Bradley Boulevard, Suite 300, Richland, WA 99352  
509.942.1600 Main  
866.727.0140 Fax  
www.pbsenv.com

May 12, 2015

Mr. Larry Lockrem  
Re: Geotechnical Laboratory Testing Results – W150317  
May 11, 2015  
Page 2 of 2

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,  
PBS Engineering and Environmental, Inc.



Timothy J. North, P.E.  
Project Geotechnical Engineer

A handwritten signature in black ink, appearing to read "N.A. Bowles".

Nathan A. Bowles, P.E.  
Senior Engineer/Operations Manager

TN/NB

Attachments:      Report of Laboratory Testing – Grain-size Analysis - Hydrometer  
                         Report of Laboratory Testing – Hydraulic Conductivity – Falling Head  
                         Chain of Custody

**REPORT OF LABORATORY TESTING**
**Report to:** CH2M-Hill - Plateau Remediation  
 2420 Stevens Center Place  
 P.O. Box 1600  
 Richland, WA 99352

**Date:** 5/11/2015  
**Sample Delivery Group No.:** W150317  
**Sample Authorization No.:** F15-016

**Project:** CHPRC Laboratory

**Project No.:** 63797.000

**Report of:** Grain Size Analysis - Hydrometer (ASTM D422)

**Lab Technician:** B. Russell

**Items Received:**

One sample was provided to us containing soil material obtained by you, the client.

We 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. 200 sieve. The results of the mechanical grain size analyses and hydrometer testing are plotted on the attached Figures (Particle Size Analysis Test Results - Hydrometer - Pages 1 through 4).

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

| Customer Sample Number | Laboratory Sample Number | Date of Analysis | Percent Passing by Sieve Size |        |       |       |       |        |        |        |         |         |         |
|------------------------|--------------------------|------------------|-------------------------------|--------|-------|-------|-------|--------|--------|--------|---------|---------|---------|
|                        |                          |                  | 3-in.                         | 1½-in. | ¾-in. | ½-in. | No. 4 | No. 10 | No. 20 | No. 40 | No. 100 | No. 140 | No. 200 |
| B30JK5                 | H-0030                   | 4/13/2015        | 100                           | 89.2   | 74.2  | 69.8  | 67.9  | 63.2   | 63.2   | 60.5   | 58.9    | 57.5    | 56.3    |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |
|                        |                          |                  |                               |        |       |       |       |        |        |        |         |         |         |





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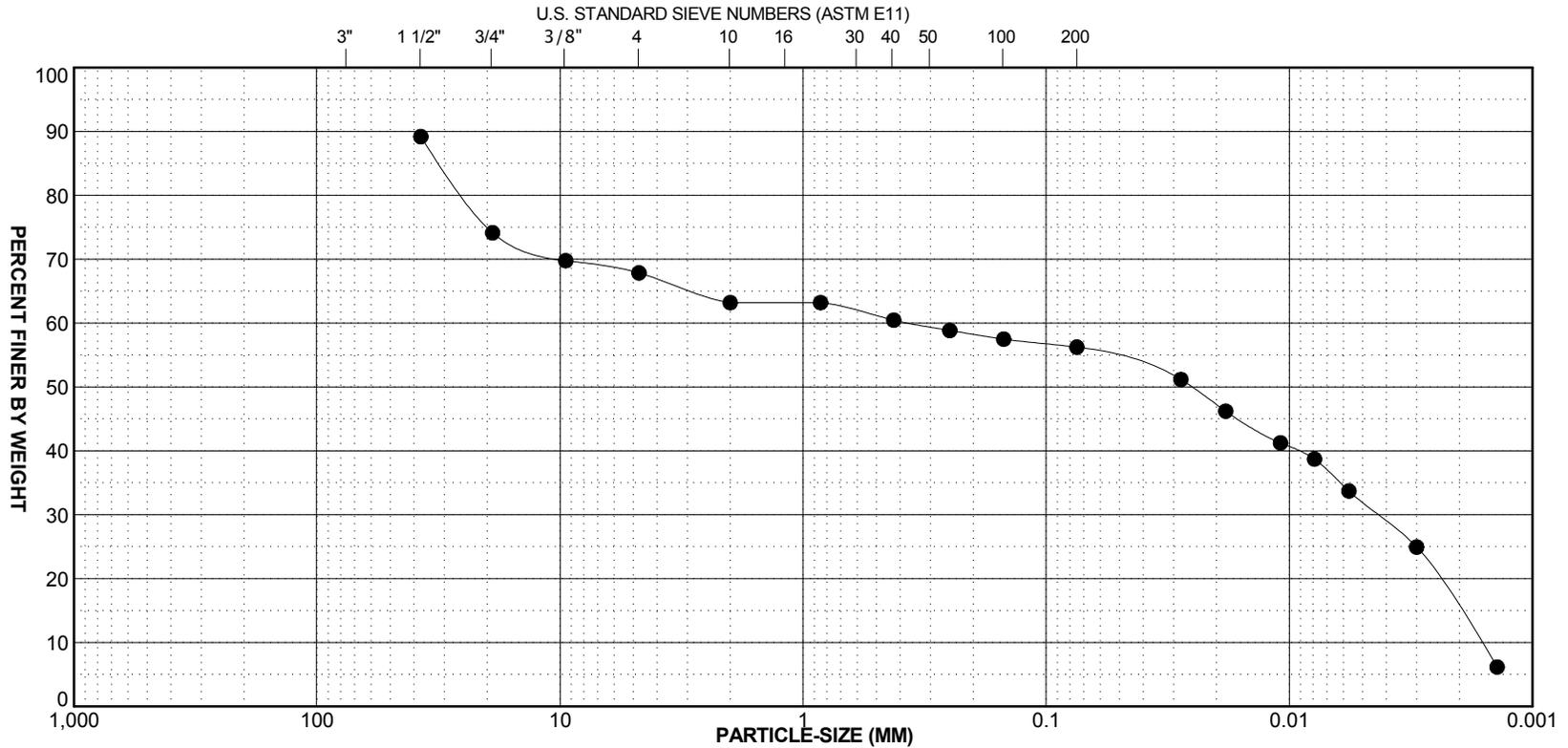
**PARTICLE-SIZE ANALYSIS TEST RESULTS**

CHPRC - GEOTECHNICAL LABORATORY

PBS PROJECT NUMBER:  
63797

TEST METHOD: ASTM C136

|          |         |        |      |        |        |      |       |      |
|----------|---------|--------|------|--------|--------|------|-------|------|
| 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-030              | B30JK5        | 100.0               |                            | 0.4      | 0.03     | 0.00     | 0.00     |         | 21               | 12             | 56              |
|     |                    |               |                     |                            |          |          |          |          |         |                  |                |                 |
|     |                    |               |                     |                            |          |          |          |          |         |                  |                |                 |

**REPORT OF LABORATORY TESTING**

|                   |   |                                   |           |
|-------------------|---|-----------------------------------|-----------|
| <b>Report to:</b> | CH2M-Hill - Plateau Remediation<br>2420 Stevens Center Place<br>P.O. Box 1600<br>Richland, WA 99352 | <b>Date:</b>                      | 5/11/2015 |
|                   |   | <b>Sample Delivery Group No.:</b> | W150317   |
|                   |   | <b>Sample Authorization No.:</b>  | F15-016   |

|                   |  |                     |            |
|-------------------|--|---------------------|------------|
| <b>Project:</b>   | CHPRC Laboratory                                   | <b>Project No.:</b> | 63797.000  |
| <b>Report of:</b> | Hydraulic conductivity - Falling Head (ASTM D5084) | <b>Lab Tech:</b>    | B. Russell |

**Items Received:**

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

Hydraulic Conductivity - Falling Head (ASTM D5084).

The hydraulic conductivity of the representative soil was determined in the laboratory using the above referenced samples. The samples were trimmed to a minimum diameter and height of 1 inch and measured. Trimmings were then tested for their moisture content in accordance with ASTM D2216. A membrane was wrapped around each specimen and back pressure was applied to aid in sample water saturation. Following saturation, the specimens were consolidated, if necessary. Once air was evacuated from the sample, the water volume outflow was measured and recorded over time (t). This time was greater than 9 seconds unless measured to the nearest 0.1 second. Following test completion, the samples' height, diameter, mass, and water content were measured.

**LABORATORY TEST RESULTS**
**Hydraulic Conductivity - Falling Head (ASTM D5084)**

| Customer Sample Number | Laboratory Sample Number | Date of Analysis | Length of specimen, L (cm) | Specimen area, A (cm <sup>2</sup> ) | Total discharge time, t (sec) | Head loss across specimen, h (cm) | Hydraulic conductivity, k (cm/s) |
|------------------------|--------------------------|------------------|----------------------------|-------------------------------------|-------------------------------|-----------------------------------|----------------------------------|
| B30JK5                 | H-0030                   | 4/13/2015        | 7.25                       | 41.27                               | 3600                          | 352.1                             | 1.26E-07                         |
|                        |                          |                  |                            |                                     |                               |                                   |                                  |
|                        |                          |                  |                            |                                     |                               |                                   |                                  |
|                        |                          |                  |                            |                                     |                               |                                   |                                  |
|                        |                          |                  |                            |                                     |                               |                                   |                                  |

**COLLECTOR** M WHITE  
**COMPANY CONTACT** TODAK, D  
 376-6427  
**PROJECT COORDINATOR** TODAK, D  
**PRICE CODE** 8H  
**DATA TURNAROUND** 30 Days / 30 Days

**SAMPLING LOCATION** C9377, 1-004, 100-402.5-bgs-2k-2-25-15-  
**PROJECT DESIGNATION** FY15 100-HR-3 Drilling - Soil  
**FIELD LOGBOOK NO.** HNF-N-645-208  
**ACTUAL SAMPLE DEPTH** 100.0 - 102.5 ft  
**SAF NO.** F15-016  
**AIR QUALITY**   
**METHOD OF SHIPMENT** GOVERNMENT VEHICLE  
**ORIGINAL**

**SHIPPED TO** RIJEE - GEOTECHNICAL  
**OFFSITE PROPERTY NO.** N/A  
**BILL OF LADING/AIR BILL NO.** N/A

**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

**PRESERVATION** None  
**HOLDING TIME** 6 Months  
**TYPE OF CONTAINER** Split Spoon Liner  
**NO. OF CONTAINER(S)** 2  
**VOLUME** 1000g  
**SPECIAL HANDLING AND/OR STORAGE** SEE ITEM (1) IN SPECIAL INSTRUCTIONS

W150317  
 H-0030

| SAMPLE NO. | MATRIX* | SAMPLE DATE | SAMPLE TIME | SAMPLE ANALYSIS |           |
|------------|---------|-------------|-------------|-----------------|-----------|
|            |         |             |             | DATE/TIME       | DATE/TIME |
| B30JK5     | SOIL    | MAR 04 2015 | 1020        |                 | ✓         |

**CHAIN OF POSSESSION**

| RELINQUISHED BY/REMOVED FROM | DATE/TIME         | RECEIVED BY/STORED IN | DATE/TIME         |
|------------------------------|-------------------|-----------------------|-------------------|
| M White                      | MAR 04 2015 1238  | J.A. Sheppard/CHPRC   | MAR 04 2015 1238  |
| J.A. Sheppard/CHPRC          | MAR 04 2015 01:44 | J.A. Sheppard         | MAR 04 2015 01:44 |
| J.A. Sheppard                | MAR 04 2015 01:44 | J.A. Sheppard         | MAR 04 2015 01:44 |
| J.A. Sheppard                | MAR 04 2015 01:44 | J.A. Sheppard         | MAR 04 2015 01:44 |
| J.A. Sheppard                | MAR 04 2015 01:44 | J.A. Sheppard         | MAR 04 2015 01:44 |
| J.A. Sheppard                | MAR 04 2015 01:44 | J.A. Sheppard         | MAR 04 2015 01:44 |

**SPECIAL INSTRUCTIONS**  
 \*\* The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF. \*\* 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. TRVL-15-029  
 (1) D2434\_PERMEABILITY: COMMON {Hydraulic Conductivity};  
 D422\_PARTICLE SIZE (Dry Sieve): COMMON; D5084\_HYDRRAULIC CONDUCTIVITY: COMMON {Hydraulic Conductivity};

**RELINQUISHED BY/REMOVED FROM** J.A. Sheppard  
**DATE/TIME** MAR 04 2015 01:44  
**RECEIVED BY/STORED IN** J.A. Sheppard  
**DATE/TIME** MAR 04 2015 01:44

**RELINQUISHED BY/REMOVED FROM** J.A. Sheppard  
**DATE/TIME** MAR 04 2015 01:44  
**RECEIVED BY/STORED IN** J.A. Sheppard  
**DATE/TIME** MAR 04 2015 01:44

**RELINQUISHED BY/REMOVED FROM** J.A. Sheppard  
**DATE/TIME** MAR 04 2015 01:44  
**RECEIVED BY/STORED IN** J.A. Sheppard  
**DATE/TIME** MAR 04 2015 01:44

**LABORATORY SECTION** RECEIVED BY  
**FINAL SAMPLE DISPOSITION** DISPOSAL METHOD  
**TITLE** TRVL-15-029  
**DATE/TIME**  
**DISPOSED BY**  
**DATE/TIME**

May 12, 2015



### Geotechnical Laboratory Sample Receipt

Date/Time Received: 3/4/15 1:44

SDG#: W150317

Work Order Number: 300115

SAF# F15-016-016

Shipping Container Identification: GWS-232

1. Custody Seals on shipping container intact? Yes  No [ ]

2. Custody Seals dated and signed? Yes  No [ ]

3. Chain-of-Custody record present? Yes  No [ ]

4. Cooler temperature NA

5. Vermiculite/packing materials is Wet [ ] Dry [ ]

6. Number of samples in shipping container: \_\_\_\_\_

7. Samples have:

tape \_\_\_\_\_ hazard labels

custody seals \_\_\_\_\_ appropriate sample labels

8. Samples are:

in good condition for the geotechnical tests required \_\_\_\_\_ leaking/desiccated

\_\_\_\_\_ broken or disaggregated

9. Were any anomalies identified in sample receipt? Yes [ ] No

10. Description of anomalies (include sample numbers):

11. Rad Screen Performed: NA

12. Chain of Custody # F15-016-016

Comments: \_\_\_\_\_

Sample Custodian/Laboratory: Christina Lopez Date: 3/4/15

Telephoned to: \_\_\_\_\_ On \_\_\_\_\_ by \_\_\_\_\_ **10 of 10**