



Shaw Environmental & Infrastructure, Inc.

Geotechnical Laboratory  
304 Directors Drive  
Knoxville, TN 37923  
(865) 690-3211

**CERTIFICATE OF ANALYSIS**

Mr. Michael Neely  
CH2M Hill Plateau Remediation Company  
P.O. Box 1600  
Mail Stop – B6-06  
Richland, WA 99352

September 23, 2010

This is the Certificate of Analysis for the following samples:

Shaw Project ID: Eberline Analytical  
Shaw Project Number: 139736  
Date Received by Lab: 08/18/2010  
Number of Samples: Four  
Sample Type: Soil

**I. Introduction/Case Narrative**

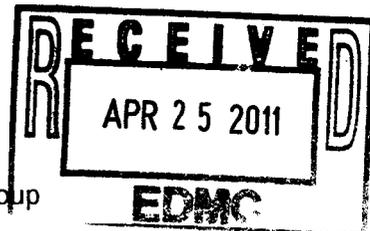
Four soil samples were received by the Shaw Geotechnical Laboratory on August 18, 2010. The samples were submitted for determination of bulk density, particle size, saturated hydraulic conductivity/ permeability, and moisture content as listed on the Chain of Custody/Sample Analysis Request. The sample numbers received were B261D7, B261D8, B26TB7, and B26TB8.

Please see Appendix A, Sample Number Cross Reference List; Appendix B, Analysis Results; Appendix C, Chain-of-Custody/Sample Receipt Records.

"I certify that this data package is in compliance the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the laboratory manager or a designee, as verified by the following signature."

Reviewed and Approved:

R. Gregory Bennett  
Geotechnical Laboratory Manager, Technology Applications Group



**II. Analytical Results/Methodology**

REFERENCES: United Nations, *Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria*, third ed. New York, 1999. United States Army Corps of Engineers (USACE), Engineer Manual 1110-2-1906, *Laboratory Soils Testing*, appendix II, 1970; United States Environmental Protection Agency, SW846, *Test Methods for Examining Solid Waste, Physical/Chemical Methods*, 3rd ed., Nov 1986 (EPA SW-846). Annual Book of ASTM Standards, Section 4, Construction, Volume 04.08, *Soil and Rock (I)*, and Volume 04.09, *Soil and Rock (II)*, 2008. Shaw Environmental and infrastructure, Standard Operating Procedures.

|   |             |
|---|-------------|
| Bulk Density .....                      | ASTM D 2937 |
| Particle Size (sieve only).....         | ASTM D 422  |
| Moisture Content of Soil and Rock ..... | ASTM D 2216 |
| Permeability.....                       | ASTM D 5084 |

**III. Quality Control**

Quality control checks such as duplicates and spikes (QC samples), are not normally applicable to geotechnical testing. This is due largely to the inability of obtaining samples with known characteristics, the heterogenous nature of the samples, and quality control procedures built-in to the analytical method.

QC measures to ensure accuracy and precision of test results include the following:

- 100% verification of all numerical results - raw data entries, transcriptions and calculations entered by lab technicians are checked, recalculated and verified. Most data calculations are performed by computer programs.
- Data validation through test reasonableness - summaries of all test results for individual reports are reviewed to determine the overall reasonableness of data and to determine the presence of any data that may be considered outliers.
- Quality control procedures are built into most standardized geotechnical procedures. For example, liquid limit and plastic limit analyses call for re-analyses and specify acceptance criteria.
- Routine instrument calibration - instruments, gauges and equipment used in testing are calibrated on a routine basis. All instrument calibration follows ASTM or manufacturer guidelines.
- Maintenance of all past calibration records - calibration records and certification documents of all instruments, gauges and equipment are updated routinely and maintained in the Quality Control Coordinators Quality/Operations files.

EBER1010021

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Report No.: EBER1010021

Mr. Michael Neely

Client: CH2M Hill Plateau Remediation Company

Shaw Project Name: Eberline Analytical

Shaw Project No.: 139736

**Shaw**  
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**Knoxville, TN**  
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- Certified and trained personnel - all technicians are trained in the application of standard laboratory procedures for geotechnical analyses as well as the quality assurance measures implemented by Shaw.
- Quantitative analyses frequently used in geotechnical/physical testing programs do not use QC tools common to wet chemistry or radiochemistry laboratories. Measures not employed in the analysis of samples reported in this report include: laboratory control samples (LCS), blanks, matrix spikes (MS), duplicate analyses, dilutions, digestions, correction factors, surrogate sample analyses, detection limit determinations, control charts, and/or tentatively identified compounds (TICs).

#### IV. Data Qualification

None.

**Appendix A**  
**Sample Cross-Reference List**

**EBER1010021**

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Report No.: EBER1010021

Mr. Michael Neely

Client: CH2M Hill Plateau Remediation Company

Shaw Project Name: Eberline Analytical

Shaw Project No.: 139736

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**SAMPLE NUMBER CROSS-REFERENCE LIST**

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| Lab Sample ID | Client Sample ID | MATRIX |
|---------------|------------------|--------|
| SEK 4895      | B261D7           | SOIL   |
| SEK 4896      | B261D8           | SOIL   |
| SEK 4897      | B26TB7           | SOIL   |
| SEK 4898      | B26TB8           | SOIL   |

**Appendix B**  
**Data Results**





**PARTICLE-SIZE ANALYSIS**  
**ASTM D 422**

Project Name  
 Eberline  
 Project No.  
 139736

Client Sample No.  
 B26TB7  
 Lab Sample No.  
 SEK 4897

Specific Gravity = 2.65  
 assumed

Moisture Content = 9.3%  
 based on dry sample weight

**SIEVE ANALYSIS**

| C<br>O<br>A<br>R<br>S<br>E | Sieve No. | Diameter mm | Percent Finer |
|----------------------------|-----------|-------------|---------------|
|                            | 3"        | 75.000      | 100.0%        |
|                            | 1.5"      | 37.500      | 100.0%        |
|                            | 0.75"     | 19.000      | 90.6%         |
|                            | 0.375"    | 9.500       | 82.1%         |
|                            | #4        | 4.750       | 74.0%         |
|                            | #10       | 2.000       | 67.1%         |

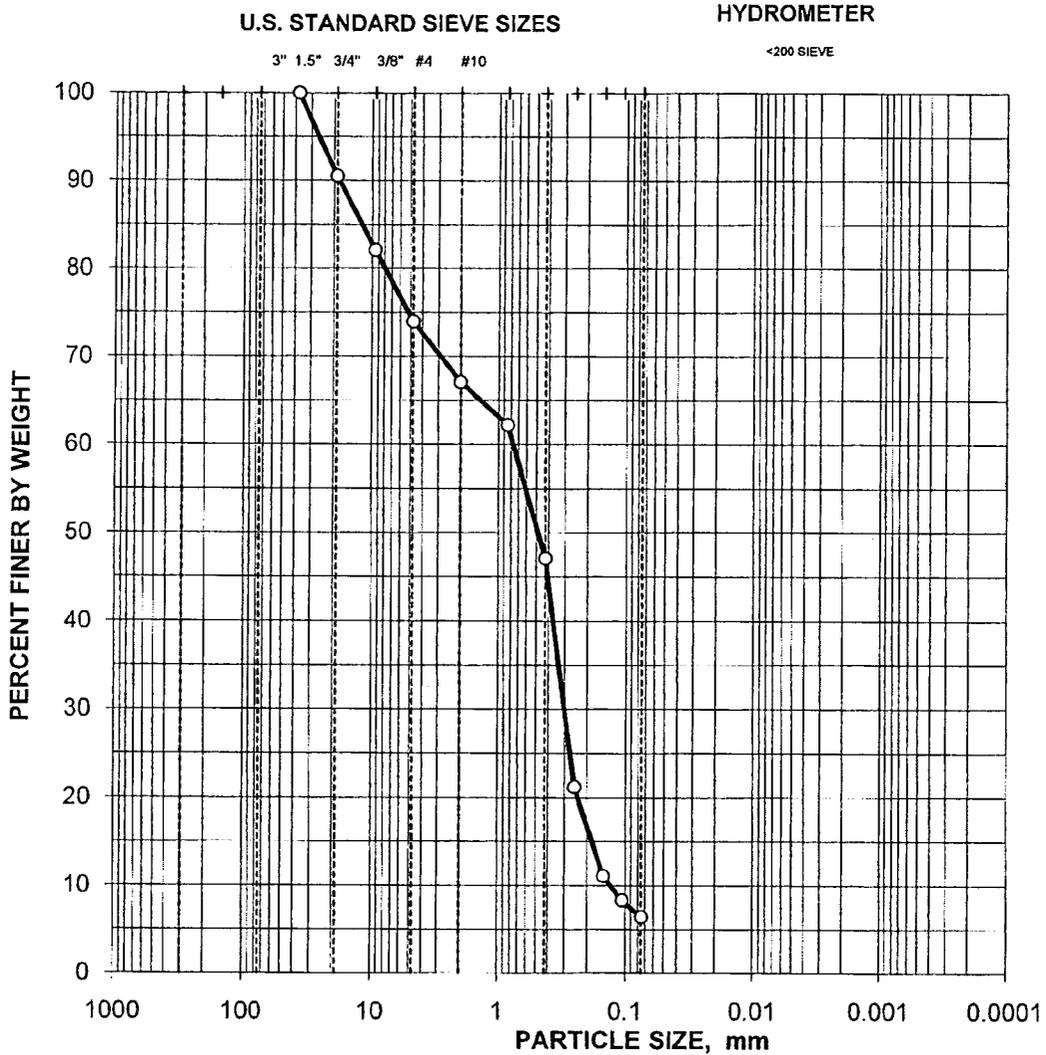
| F<br>I<br>N<br>E | Sieve No. | Diameter mm | Percent Finer |
|------------------|-----------|-------------|---------------|
|                  | #20       | 0.850       | 62.2%         |
|                  | #40       | 0.425       | 47.1%         |
|                  | #60       | 0.250       | 21.2%         |
|                  | #100      | 0.149       | 11.1%         |
|                  | #140      | 0.106       | 8.3%          |
|                  | #200      | 0.075       | 6.4%          |

26.0% Gravel

67.6% Sand

6.4% Silt/Clay

**Eberline**



CLIENT SAMPLE NO.: B26TB7

LAB SAMPLE NO.: SEK 4897

|          |         |        |      |        |        |      |           |
|----------|---------|--------|------|--------|--------|------|-----------|
| BOULDERS | COBBLES | GRAVEL |      | SAND   |        |      | Silt/Clay |
|          |         | COARSE | FINE | COARSE | MEDIUM | FINE |           |

**PARTICLE-SIZE ANALYSIS**  
**ASTM D 422**

Project Name  
 Eberline  
 Project No.  
 139736

Client Sample No.  
 B26TB8  
 Lab Sample No.  
 SEK 4898

Specific Gravity = 2.65  
 assumed

Moisture Content = 24.3%  
 based on dry sample weight

**SIEVE ANALYSIS**

| C<br>O<br>A<br>R<br>S<br>E | Sieve No. | Diameter mm | Percent Finer |
|----------------------------|-----------|-------------|---------------|
|                            | 3"        | 75.000      | 100.0%        |
|                            | 1.5"      | 37.500      | 100.0%        |
|                            | 0.75"     | 19.000      | 100.0%        |
|                            | 0.375"    | 9.500       | 100.0%        |
|                            | #4        | 4.750       | 100.0%        |
|                            | #10       | 2.000       | 100.0%        |

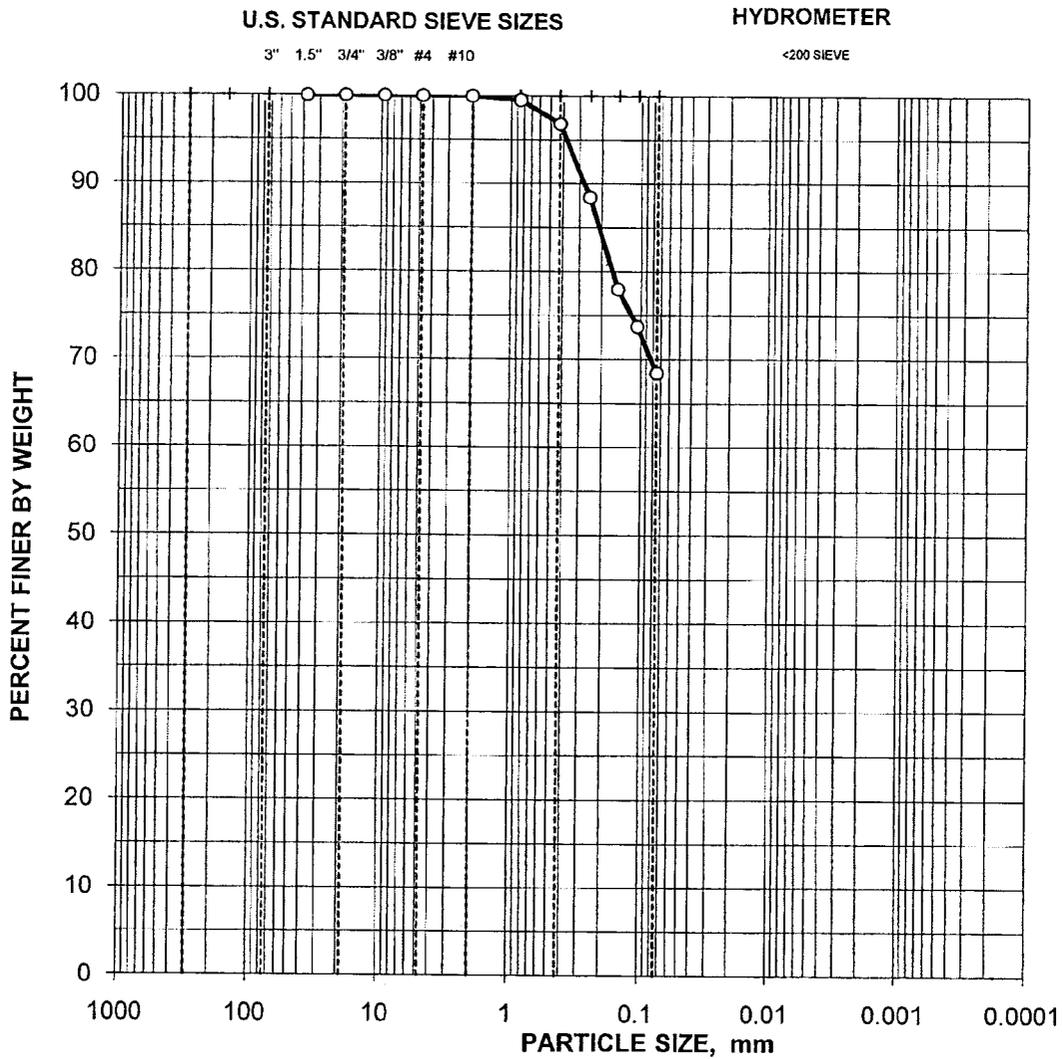
| F<br>I<br>N<br>E | Sieve No. | Diameter mm | Percent Finer |
|------------------|-----------|-------------|---------------|
|                  | #20       | 0.850       | 99.5%         |
|                  | #40       | 0.425       | 96.8%         |
|                  | #60       | 0.250       | 88.5%         |
|                  | #100      | 0.149       | 78.0%         |
|                  | #140      | 0.106       | 73.8%         |
|                  | #200      | 0.075       | 68.5%         |

0.0% Gravel

31.5% Sand

68.5% Silt/Clay

**Eberline**



CLIENT SAMPLE NO.:

B26TB8

LAB SAMPLE NO.:

SEK 4898

|          |         |        |      |        |        |      |           |
|----------|---------|--------|------|--------|--------|------|-----------|
| BOULDERS | COBBLES | GRAVEL |      | SAND   |        |      | Silt/Clay |
|          |         | COARSE | FINE | COARSE | MEDIUM | FINE |           |

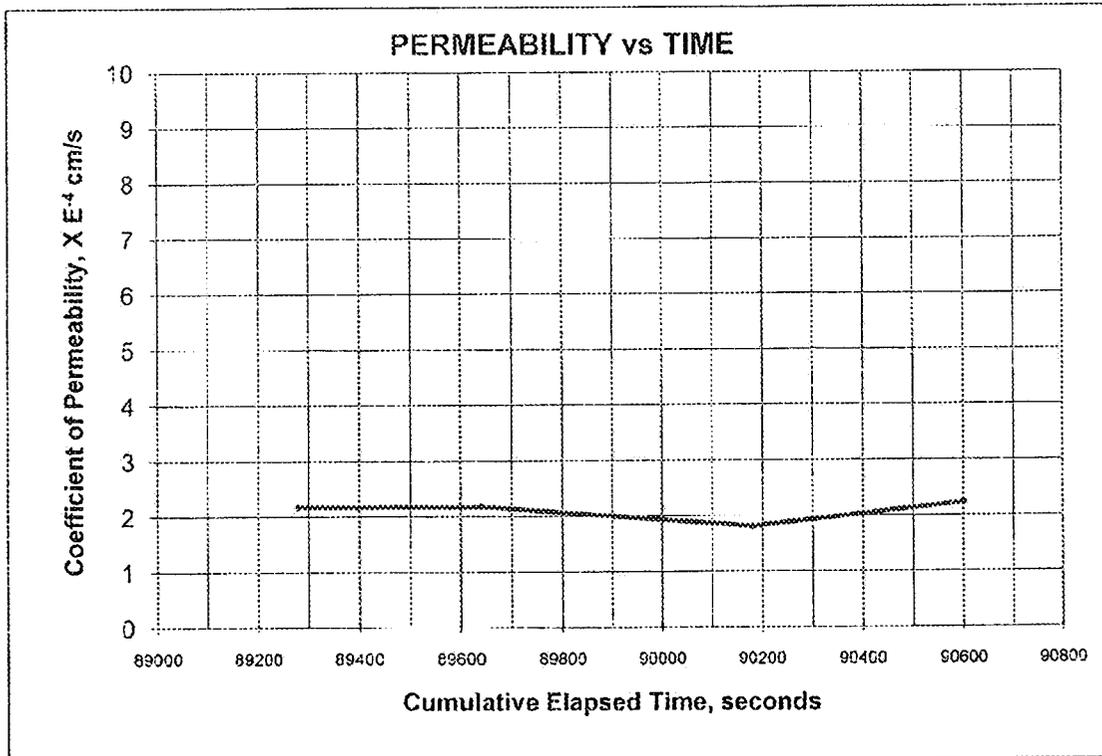
**HYDRAULIC CONDUCTIVITY / PERMEABILITY  
ASTM D 5084**

PROJECT NAME: Eberline Analytical  
PROJECT NO. 139736.04000000

CLIENT SAMPLE NO. B26TB7  
LAB SAMPLE NO. SEK 4897

|  | INITIAL | FINAL |                                |                  |
|--|---------|-------|--------------------------------|------------------|
| Specimen diameter, cm                      | 4.92    |       | Hydraulic gradient             | 9.3              |
| Specimen length, cm                        | 7.54    |       | Min. consolidation stress, psi | 2.0              |
| Wet weight of specimen, g.                 | 297.84  |       | Max. consolidation stress, psi | 3.0              |
| Specimen cross-sect. area, cm <sup>2</sup> | 19.03   |       | Total backpressure, psi        | 45.0             |
| Water content, %                           | 9.3     |       | Permeant Fluid                 | Deaired DI Water |
| Wet unit weight, pcf                       | 129.5   |       |                                |                  |
| Dry unit weight, pcf                       | 118.5   |       |                                |                  |
| Est. degree of saturation, %               | 62.4    | 62.4  |                                |                  |
| Specific gravity of solids, assume         | 2.65    |       |                                |                  |

**Coefficient of Permeability, cm/s 2.1E-04**



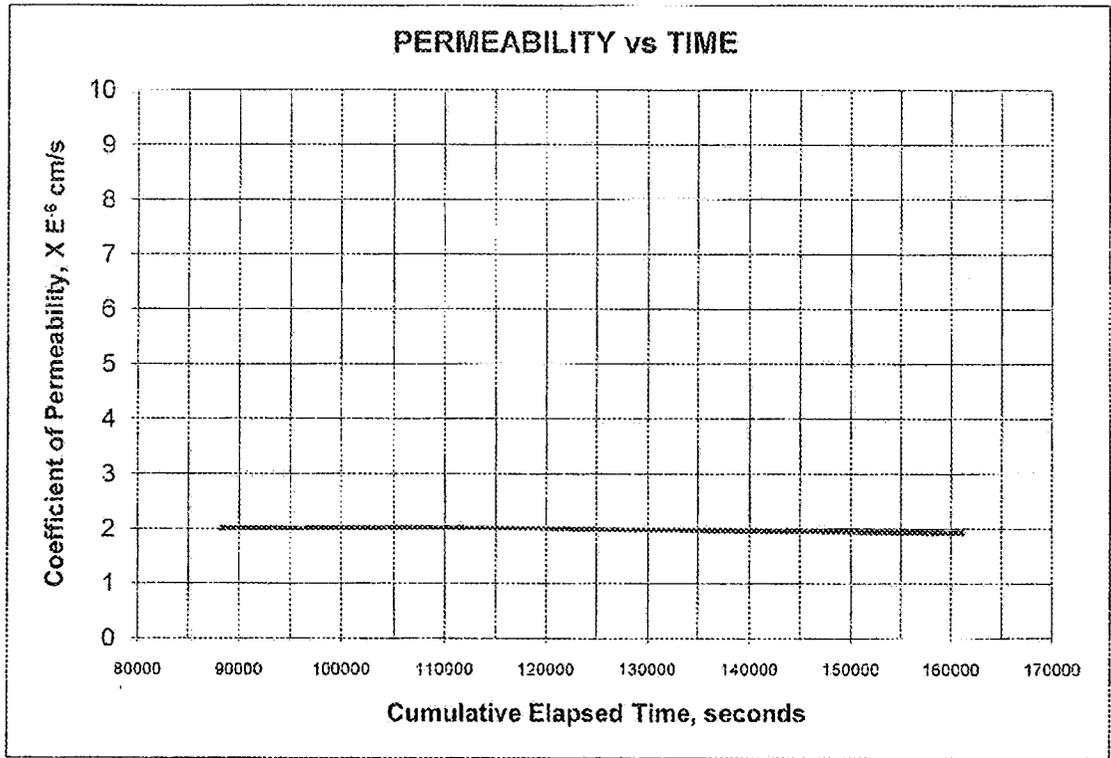
**HYDRAULIC CONDUCTIVITY / PERMEABILITY**  
**ASTM D 5084**

PROJECT NAME: Eberline Analytical  
PROJECT NO. 139736.04000000

CLIENT SAMPLE NO. B26TB8  
LAB SAMPLE NO. SEK 4898

|  | INITIAL | FINAL |                                |                  |
|--|---------|-------|--------------------------------|------------------|
| Specimen diameter, cm                      | 4.94    |       | Hydraulic gradient             | 12.0             |
| Specimen length, cm                        | 11.72   |       | Min. consolidation stress, psi | 2.0              |
| Wet weight of specimen, g.                 | 422.78  |       | Max. consolidation stress, psi | 4.0              |
| Specimen cross-sect. area, cm <sup>2</sup> | 19.14   |       | Total backpressure, psi        | 44.0             |
| Water content, %                           | 24.3    |       | Permeant Fluid                 | Deaired DI Water |
| Wet unit weight, pcf                       | 117.7   |       |                                |                  |
| Dry unit weight, pcf                       | 94.7    |       |                                |                  |
| Est. degree of saturation, %               | 86.2    | 86.2  |                                |                  |
| Specific gravity of solids, assumed        | 2.65    |       |                                |                  |

**Coefficient of Permeability, cm/s 2.0E-06**



**Appendix C**  
**Chain of Custody Records**



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**CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST**

**COLLECTOR:** CH2M Hill Plateau Remediation Company  
*Reserve Post House to you*

**COMPANY CONTACT:** DYERMAN, DL  
 TELEPHONE NO. 373-2530

**PROJECT COORDINATOR:** DYERMAN, DL

**PRICE CODE:** SN

**SAF NO.:** F10-196

**PROJECT DESIGNATION:** 300 Area Remedial Investigation/Feasibility Analysis - 300-FF-5 Soils

**FIELD LOGBOOK NO.:** HRP-N-503-2 m 33  
 ACTUAL SAMPLE DEPTH: 68.3 - 70.8

**ICE CHEST NO.:** GWS-829-1

**SAF NO.:** F10-196

**COA:** 300204ES10

**SAF QUALITY:**

**METHOD OF SHIPMENT:** FEDERAL EXPRESS

**BILL OF LADING/AIR BILL NO.:** 7989 5325 6612

**SEE PTR:**

**PAGE 1 OF 1**

**DATA TURNAROUND:** 45 Days / 45 Days

| DATE/TIME  | SIGN/PRINT NAMES | RECEIVED BY/STORED IN | DATE/TIME        |
|--|------------------|-----------------------|------------------|
| 8-12-10 0730 <td></td> <td>100 PMS Robert Jones</td> <td>8-12-10 1330</td> |                  | 100 PMS Robert Jones  | 8-12-10 1330     |
|  |                  | MC 413 554 R 1        | 8-12-10 1430     |
|  |                  | SSURI                 | AUG 17 2010 0915 |
|  |                  | FEDEX                 | AUG 17 2010 0915 |

SEK 4896

**CHAIN OF POSSESSION**

**SPECIAL INSTRUCTIONS:**  
 \*\* The CACN for WSCF Analytical is 401980.  \*\* The 300 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.  \*\* The laboratory is to report all TICs for Method 8260.

**RELINQUISHED BY/REMOVED FROM:** [Signature] DATE/TIME: 8-12-10 1330

**RECEIVED BY/STORED IN:** [Signature] DATE/TIME: 8-12-10 1430

**RELINQUISHED BY/REMOVED FROM:** [Signature] DATE/TIME: AUG 17 2010 0915

**RECEIVED BY/STORED IN:** [Signature] DATE/TIME: AUG 17 2010 0915

**RELINQUISHED BY/REMOVED FROM:** [Signature] DATE/TIME: [ ]

**RECEIVED BY/STORED IN:** [Signature] DATE/TIME: [ ]

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**RECEIVED BY/STORED IN:** [Signature] DATE/TIME: [ ]

**RELINQUISHED BY/REMOVED FROM:** [Signature] DATE/TIME: [ ]

**RECEIVED BY/STORED IN:** [Signature] DATE/TIME: [ ]

**LABORATORY SECTION:** [Signature]

**DISPOSAL METHOD:** [Signature]

**TITLE:** R50

**DATE/TIME:** 8/17/10 1330

|   |  |  |  |   |   |
|---|--|--|--|---|---|
| CH2MHill Plateau Remediation Company<br>COLLECTOR <i>Victory Betty Ramirez</i>  |  | CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST |  | F10-234-005                                 | PAGE 1 OF 1                             |
| COMPANY CONTACT<br>DYEKMAN, DL  |  | TELEPHONE NO.<br>373-2530                |  | PROJECT COORDINATOR<br>DYEKMAN, DL          | PRICE CODE<br>8N                        |
| PROJECT DESIGNATION<br>100 Area Remedial Investigation/Feasibility Analysis - 100- FR-3 Soils   |  | ACTUAL SAMPLE DEPTH<br>69.7 - 69.8       |  | SAF NO.<br>F10-234                          | AIR QUALITY<br><input type="checkbox"/> |
| FIELD LOGBOOK NO.<br><i>40F-100-14 69.7-69.8</i>  |  | OFFSITE PROPERTY NO.<br>SEE PTR          |  | COA<br>300118E510                           | METHOD OF SHIPMENT<br>FEDERAL EXPRESS   |
| SHIPPED TO<br>Shaw Group  |  | PRESERVATION<br>None                     |  | BILL OF LADING/AIR BILL NO.<br>SEE PTR      |   |
| SAMPLING LOCATION<br>C7790 (199-F5-52), Bottom of Unconfined Aquifer  |  | HOLDING TIME<br>6 Months                 |  | 7987 5325 6612                              |   |
| ICE CHEST NO.<br><i>207 WS-229-1</i>  |  | TYPE OF CONTAINER<br>Liner               |  | 33  |   |
| MATRIX*<br>A=Air<br>DL=Drum<br>L=Liquids<br>DS=Drum<br>S=Solids<br>O=Oil<br>S=Soil<br>SF=Sediment<br>T=Tissue<br>V=Vegetation<br>W=Water<br>WT=Wipe<br>X=Other  |  | NO. OF CONTAINER(S)<br>1                 |  | VOLUME<br>1000ml                            |   |
| POSSIBLE SAMPLE HAZARDS/ REMARKS<br>Contains Radioactive Material at concentrations that may or may not be regulated for transportation per 49 CFR / IATA Dangerous Goods Regulations but are not releasable per DOE Order 5400.5 (1990/1993) |  | SAMPLE ANALYSIS                          |  | SEE ITEM (1) IN SPECIAL INSTRUCTIONS D2216; |   |
| SPECIAL HANDLING AND/OR STORAGE   |  | SAMPLE DATE<br><i>8/14/00</i>            |  | SAMPLE TIME<br><i>12:25</i>                 |   |
| SAMPLE NO.<br>B261B7  |  | MATRIX*                                  |  | SOIL  |   |

SEK 4897

|  |                                   |                                       |                                      |
|--|-----------------------------------|---------------------------------------|--------------------------------------|
| CHAIN OF POSSESSION                        |                                   | SIGN/ PRINT NAMES                     |                                      |
| RELINQUISHED BY/REMOVED FROM<br><i>SSU</i> | DATE/TIME<br>1579                 | RECEIVED BY/STORED IN<br><i>LA</i>    | DATE/TIME<br><i>1880530</i>          |
| RELINQUISHED BY/REMOVED FROM<br><i>SSU</i> | DATE/TIME<br>AUG 18 2000          | RECEIVED BY/STORED IN<br><i>FEDEX</i> | DATE/TIME<br>AUG 17 2000             |
| RELINQUISHED BY/REMOVED FROM<br><i>SSU</i> | DATE/TIME<br>AUG 17 2000          | RECEIVED BY/STORED IN<br><i>FEDEX</i> | DATE/TIME<br>AUG 17 2000             |
| RELINQUISHED BY/REMOVED FROM               | DATE/TIME                         | RECEIVED BY/STORED IN                 | DATE/TIME                            |
| RELINQUISHED BY/REMOVED FROM               | DATE/TIME                         | RECEIVED BY/STORED IN                 | DATE/TIME                            |
| RELINQUISHED BY/REMOVED FROM               | DATE/TIME                         | RECEIVED BY/STORED IN                 | DATE/TIME                            |
| RELINQUISHED BY/REMOVED FROM               | DATE/TIME                         | RECEIVED BY/STORED IN                 | DATE/TIME                            |
| LABORATORY SECTION                         | RECEIVED BY<br><i>[Signature]</i> | TITLE<br><i>R50</i>                   | DATE/TIME<br><i>8/17/00 / 091330</i> |
| FINAL SAMPLE DISPOSITION                   | DISPOSAL METHOD                   | DISPOSED BY                           | DATE/TIME                            |

SPECIAL INSTRUCTIONS  
 \*\* The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF  \*\* Physical Properties laboratory: Conduct the hydraulic conductivity test (ASTM 5084 or 2434) as appropriate to the sample matrix.  
 (1) Permeability - D2434 (Hydraulic Conductivity); Particle Size (Dry Sieve) - D422; Saturated Hydraulic Conductivity (Hydraulic Conductivity); Bulk Density - D2937;

ORIGINAL

