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Shaw™
Shaw Environmental & Infrastructure, Inc.

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

EBERO111056

KB
3-21-11

CERTIFICATE OF ANALYSIS

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

March 14, 2011

This is the Certificate of Analysis for the following samples:

Shaw Project ID: Eberline Analytical
Shaw Project Number: 139736
Date Received by Lab: 02/08/2011
Number of Samples: One (1)
Sample Type: Soil

I. Introduction/Case Narrative

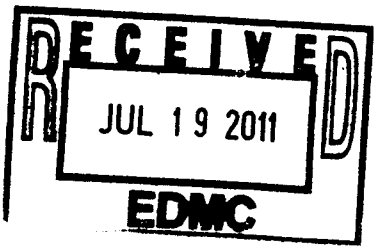
One (1) soil sample was received by the Shaw Geotechnical Laboratory on February 8, 2011. The sample was submitted for determination of bulk density, moisture content, and hydraulic conductivity/permeability as listed on the Chain of Custody/Sample Analysis Request. The sample number for the received sample was B29C46.

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

"I certify that this data package is in compliance with 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



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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**
Moisture Content ..... **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.

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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

Report No.: EBER0111056
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

Lab Sample ID	Client Sample ID	MATRIX
SEK 5429	B29C46	SOIL

Appendix B
Data Results

Report No.: EBER0111056
Mr. Michael Neely
Client: CH2M Hill Plateau Remediation Company
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BULK DENSITY/DRY DENSITY
ASTM D 2937

PROJECT NAME: **Eberline**

PROJECT NUMBER: **139736.12100000**

LAB SAMPLE NUMBER	CLIENT SAMPLE NUMBER	AVERAGE LENGTH, inches	AVERAGE DIAMETER, inches*	WET WEIGHT, grams	MOISTURE CONTENT, %	BULK DENSITY, pcf	DRY DENSITY, pcf
SEK 5429	B29C46	5.7842	3.7383	2186.99	23.3	131.3	106.5

Moisture content calculated by ASTM D 2216 based on sample dry weight.

Bulk density is the weight of wet sample divided by the volume of the wet sample (as-received).

Dry density is the weight of the dry sample solids divided by the volume of the original sample.

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MOISTURE CONTENT
ASTM D 2216

PROJECT NAME
Eberline Hanford

PROJECT NUMBER
139736.12100000

LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
SEK 5429	B29C46	23.7	19.2	80.8

ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

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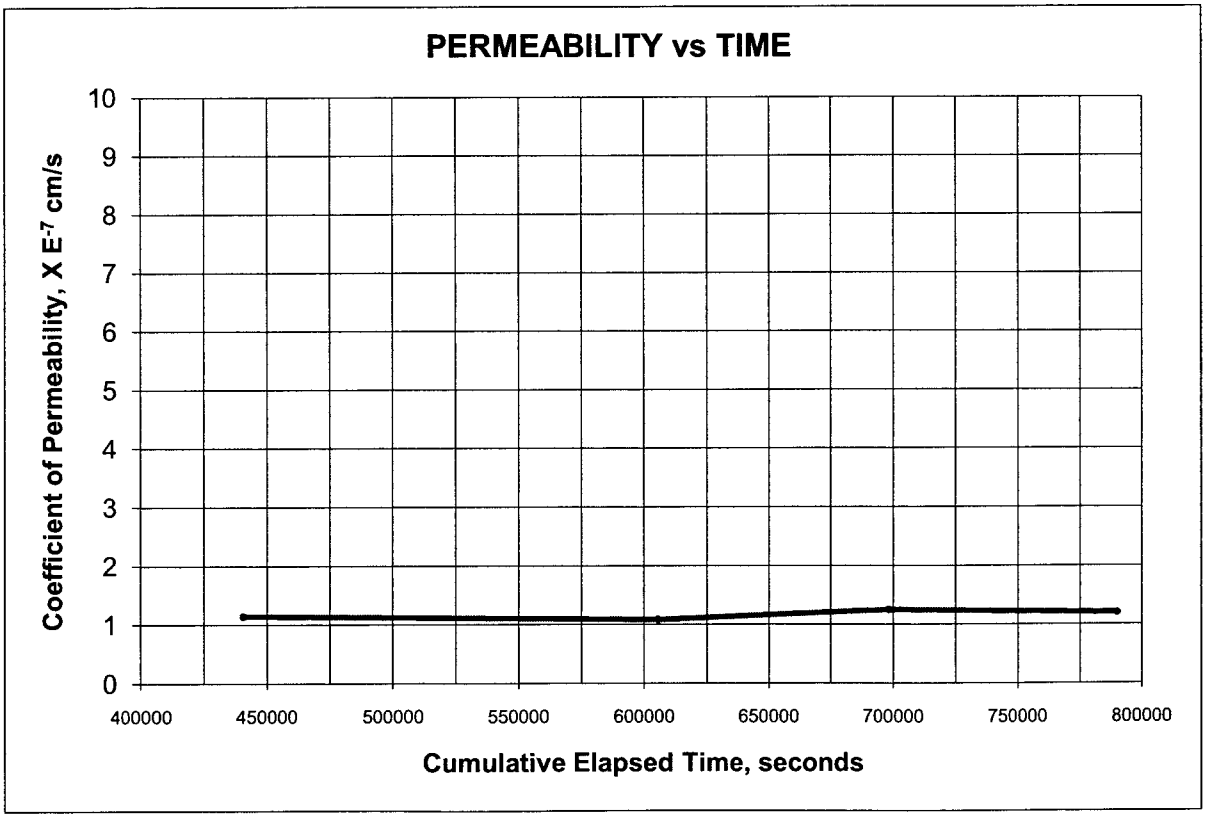
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME: Eberline
PROJECT NO. 139736.12100000
CLIENT SAMPLE NO. B29C46
LAB SAMPLE NO. SEK 5429

	INITIAL	FINAL
Specimen diameter, cm	7.31	
Specimen length, cm	13.08	
Wet weight of specimen, g.	1131.32	
Specimen cross-sect. area, cm^2	41.97	
Water content, %	23.3	
Wet unit weight, pcf	128.6	
Dry unit weight, pcf	104.3	
Est. degree of saturation, %	105.3	105.3
Specific gravity of solids, assumed	2.65	

Hydraulic gradient	26.9
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	7.0
Total backpressure, psi	63.0
Permeant Fluid	Deaired Tap Water

Coefficient of Permeability, cm/s 1.2E-07



Appendix C
Chain of Custody Records

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F10-207-107	PAGE 1 OF 1
COLLECTOR: Emerson	COMPANY CONTACT: DYEKMAN, DL	TELEPHONE NO.: 373-2530	PROJECT COORDINATOR: RADLOFF, AW	PRICE CODE: 8N	Data Turnaround 30 Days/30 Days
SAMPLING LOCATION: C7688 (199-K-188); I-058	PROJECT DESIGNATION: 100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Soils		SAF NO.: F10-207	AIR QUALITY: ☐	
ICE CHEST NO.: GWS-194-1	FIELD LOGBOOK NO.: HNF-N-583-3/57	ACTUAL SAMPLE DEPTH: 232.5 - 235 ft	COA: 300082ES10	METHOD OF SHIPMENT: FEDERAL EXPRESS	
SHIPPED TO: Shaw Group	OFFSITE PROPERTY NO.: SEE PTR		BILL OF LADING/AIR BILL NO.: SEE PTR	7967338 25930	

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 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)

SPECIAL HANDLING AND/OR STORAGE

PRESERVATION	None	None
HOLDING TIME	None	None
TYPE OF CONTAINER	Liner	Moisture Resistant Cont.
NO. OF CONTAINER(S)	1	1
VOLUME	1000g	200g
SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS	Moisture Content - D2216;

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME		
B29C46	SOIL	2/4/11	1120	✓	✓

6.1 lbs.

SEK 5429

11 of 11

CHAIN OF POSSESSION

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
Adam Emerson	2/4/11 1230	MO-413 SSU-R1	2-4-11 1230
MO-413 SSU-R1	FEB 07 2011 0745	M. A. White	FEB 07 2011 0745
M. A. White	FEB 07 2011 1400	FEDEX	

SPECIAL INSTRUCTIONS
** Physical Properties laboratory: Conduct the hydraulic conductivity test (ASTM 5084 or 2434) as appropriate to the sample matrix.
(1) Bulk Density - D2937; Saturated Hydraulic Conductivity {Hydraulic Conductivity}; Permeability - D2434 {Hydraulic Conductivity};

ORIGINAL

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

2-8-11 @ 1400

A-6003-618 (REV 2)