0099539

Shaw
Shaw Environmental & Infrastructure, Inc.

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

EBER 0111054
KB 4-5-11

CERTIFICATE OF ANALYSIS

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

March 8, 2011

This is the Certificate of Analysis for the following samples:

Shaw Project ID: Eberline Analytical
Shaw Project Number: 139736
Date Received by Lab: 02/02/11
Number of Samples: Two (2)
Sample Type: Soil

I. Introduction/Case Narrative

Two (2) soil samples were received by the Shaw Geotechnical Laboratory on February 2, 2011. The samples were submitted for determination of bulk density, moisture content, particle size, and hydraulic conductivity/permeability as listed on the Chain of Custody/Sample Analysis Requests. The sample numbers for the received samples were B2B923 and B29C44.

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**
Particle Size (sieve only)	**ASTM D 422**
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.: EBER0111054
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 5391	B2B923	SOIL
SEK 5392	B29C44	SOIL

Appendix B
Data Results

Report No.: EBER0111054
Mr. Michael Neely
Client: CH2M Hill Plateau Remediation Company
Shaw Project Name: Eberline Analytical
Shaw Project No.: 139736

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BULK DENSITY/DRY DENSITY
ASTM D 2937

PROJECT NAME: **Eberline**

PROJECT NUMBER: **139736.11900000**

LAB SAMPLE NUMBER	CLIENT SAMPLE NUMBER	AVERAGE LENGTH, inches	AVERAGE DIAMETER, inches*	WET WEIGHT, grams	MOISTURE CONTENT, %	BULK DENSITY, pcf	DRY DENSITY, pcf
SEK 5391	B2B923	6.0083	3.7273	2138.61	5.5	124.3	117.8
SEK 5392	B29C44	5.9915	3.8705	2412.60	17.8	130.4	110.7

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
139736.11900000

LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
SEK 5392	B29C44	17.6	14.9	85.1

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.

Report No.: EBER0111054
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Shaw Project Name: Eberline Analytical
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PARTICLE-SIZE DISTRIBUTION
ASTM D 422

Project Name Eberine
Project No. 139736.11900000
Field Sample No. B2B923
Lab Sample No. SEK 5391
Moisture Content = 5.5%

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	3"	75.000	100.0%
	1.5"	37.500	69.6%
	0.75"	19.000	50.3%
	0.375"	9.500	39.0%
	#4	4.750	31.3%
	#10	2.000	20.8%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	9.4%
	#40	0.425	3.8%
	#60	0.250	2.3%
	#100	0.149	1.6%
	#140	0.106	1.4%
	#200	0.075	1.2%

68.7% Gravel 30.1% Sand 1.2% Silt/Clay

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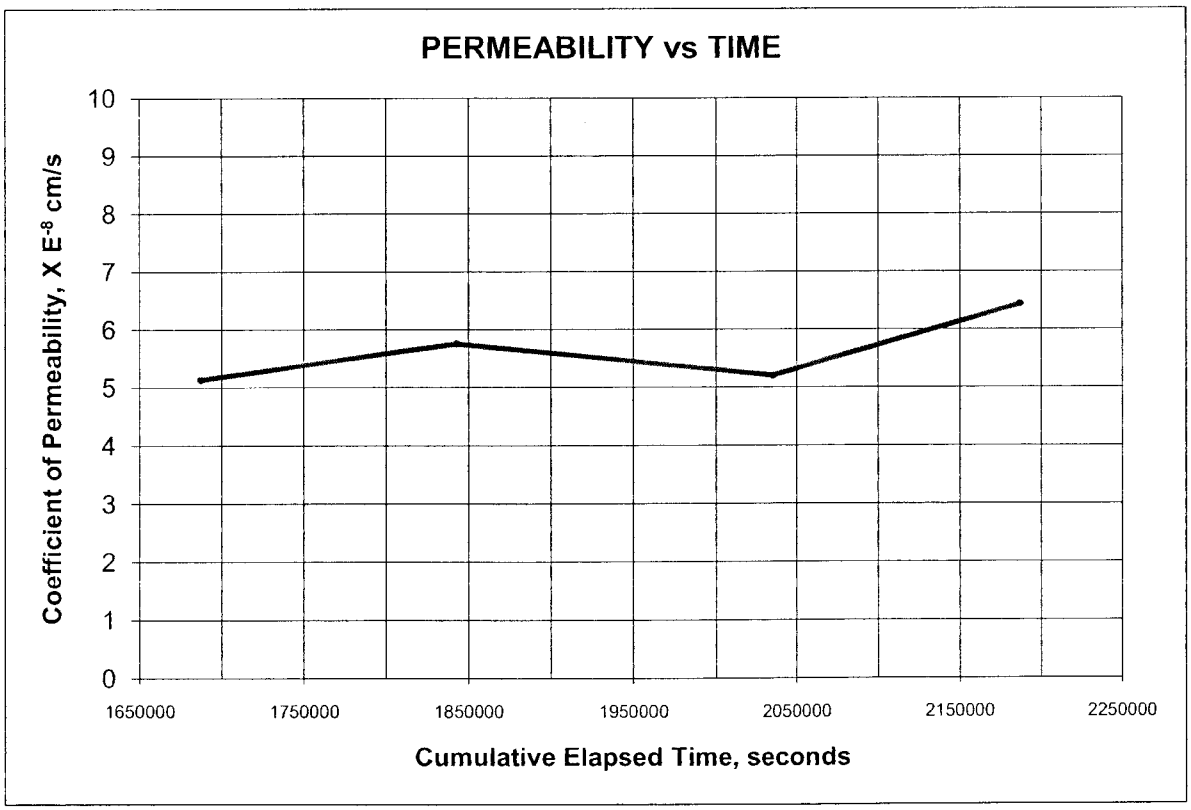
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME: Eberline
PROJECT NO. 139736.11900000
CLIENT SAMPLE NO. B29C44
LAB SAMPLE NO. SEK 5392

	INITIAL	FINAL
Specimen diameter, cm	7.33	
Specimen length, cm	12.59	
Wet weight of specimen, g.	1137.12	
Specimen cross-sect. area, cm^2	42.16	
Water content, %	17.8	
Wet unit weight, pcf	133.8	
Dry unit weight, pcf	113.5	
Est. degree of saturation, %	103.3	103.3
Specific gravity of solids, assumed	2.65	

Hydraulic gradient	11.2
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	7.0
Total backpressure, psi	68.0
Permeant Fluid	Deaired Tap Water

Coefficient of Permeability, cm/s 5.6E-08



Appendix C
Chain of Custody Records

CH2MHill Plateau Remediation Company	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST			F10-196-190	PAGE 1 OF 1
COLLECTOR: Rosanne Higuera	COMPANY CONTACT: RADLOFF, AW	TELEPHONE NO.: 376-4554	PROJECT COORDINATOR: RADLOFF, AW	PRICE CODE: 8H	DATA TURNAROUND: 30 Days / 30 Days
SAMPLING LOCATION: C7662 (399-4-15); I-013	PROJECT DESIGNATION: 300 Area Remedial Investigation/Feasibility Analysis - 300-FF-5 Soils		SAF NO.: F10-196	AIR QUALITY: ☐	
ICE CHEST NO.: GWS-001	FIELD LOGBOOK NO.: HNF-N-505-2 pg 93	ACTUAL SAMPLE DEPTH: 47.0 - 50.3	COA: 300206ES10	METHOD OF SHIPMENT: FEDERAL EXPRESS	
SHIPPED TO: Shaw Group	OFFSITE PROPERTY NO.: SEE PTR		BILL OF LADING/AIR BILL NO.: SEE PTR 796715547135		

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
HOLDING TIME	None
TYPE OF CONTAINER	Liner
NO. OF CONTAINER(S)	1
VOLUME	100g
SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B2B923	SOIL	1-28-11	1004	✓

Disposal weight 5.24 lbs.

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SEK 5391

CHAIN OF POSSESSION

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
Lenny Rouse Lenny Rouse	1-28-11 / 1410	SSU-R1	1/28/11 1410
MO-413 SSU-R1	FEB 0 1 2011 0745	M.A. White Mchite	FEB 0 1 2011 0745
M.A. White Mchite	FEB 0 1 2011 1400	FEDEX	
		M. Borgia / Shaw Grp	2-2-11 / 11:30

SIGN/ PRINT NAMES

SPECIAL INSTRUCTIONS

** The 300 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.
(1) Bulk Density - D2937; Particle Size (Dry Sieve) - D422;

☐ ORIGINAL

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

A-6003-615 (REV 2)

CH2MHill Plateau Remediation Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F10-207-105 PAGE 1 OF 1

COLLECTOR
Farris, Bates

COMPANY CONTACT
DYEKMAN, DL

TELEPHONE NO.
373-2530

PROJECT COORDINATOR
RADLOFF, AW

PRICE CODE 8N

AIR QUALITY ☐

Data Turnaround
30 Days/30 Days

SAMPLING LOCATION
C7688 (199-K-188); I-056

PROJECT DESIGNATION
100 Area Remedial Investigation/Feasibility Analysis - 100-KR-4 Soils

SAF NO.
F10-207

ICE CHEST NO.
CWS-001

FIELD LOGBOOK NO.
HNF-N-583-3 / 56

ACTUAL SAMPLE DEPTH
185.4' - 187.9'

COA
300082ES10

METHOD OF SHIPMENT
FEDERAL EXPRESS

SHIPPED TO
Shaw Group

OFFSITE PROPERTY NO.
SEE PTR

BILL OF LADING/AIR BILL NO.
SEE PTR 796715547135

Disposal weight 8.14 lbs.

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		
B29C44	SOIL	1-31-11	1125	✓	✓

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SEK 5392

CHAIN OF POSSESSION / **SIGN/ PRINT NAMES**

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
Calvin Farris / Calvin Farris	1-31-11 1250	MO-413 SSU-R1	1-31-11 1250
MO-413 SSU-R1	FEB 0 1 2011 0745	M. A. White Mallee	FEB 0 1 2011 0745
M. A. White Mallee	FEB 0 1 2011 1400	FEDEX	
		M. Borgia / Shaw Geo	2-2-11 / 1130

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

A-6003-618 (REV 2)