0099810

Shaw™
Shaw Environmental & Infrastructure, Inc.

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

EBER0111057
KB 3-24-11

CERTIFICATE OF ANALYSIS

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

March 22, 2011

This is the Certificate of Analysis for the following samples:

Shaw Project ID: Eberline Analytical
Shaw Project Number: 139736
Date Received by Lab: 02/14/2011
Number of Samples: One (1)
Sample Type: Soil

I. Introduction/Case Narrative

One (1) soil sample was received by the Shaw Geotechnical Laboratory on February14, 2011. The sample was submitted for determination of bulk density, particle size, and hydraulic conductivity/permeability as listed on the Chain of Custody/Sample Analysis Request. The sample number for the received sample was B29P77.

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**
Particle Size (sieve only) ..... **ASTM D 422**
Permeability of Granular Soils ..... **ASTM D 2434**

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.: EBER0111057
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Shaw Project Name: Eberline Analytical
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SAMPLE NUMBER CROSS-REFERENCE LIST

Lab Sample ID	Client Sample ID	MATRIX
SEK 5435	**B29P77**	**SOIL**

Appendix B
Data Results

Report No.: EBER0111057
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BULK DENSITY/DRY DENSITY
ASTM D 2937

PROJECT NAME: **Eberline**

PROJECT NUMBER: **139736.12200000**

LAB SAMPLE NUMBER	CLIENT SAMPLE NUMBER	AVERAGE LENGTH, inches	AVERAGE DIAMETER, inches*	WET WEIGHT, grams	MOISTURE CONTENT, %	BULK DENSITY, pcf	DRY DENSITY, pcf
SEK 5435	B29P77	5.4317	3.8685	2094.62	40.7	125.0	88.9

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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PARTICLE-SIZE DISTRIBUTION
ASTM D 422

Project Name Eberine

Project No. 139736.12200000

Field Sample No. B29P77

Lab Sample No. SEK 5435

Moisture Content = 40.7%

SIEVE ANALYSIS

	Sieve No.	Diameter mm	Percent Finer
COARSE	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%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	100.0%
	#40	0.425	100.0%
	#60	0.250	99.7%
	#100	0.149	76.5%
	#140	0.106	28.6%
	#200	0.075	7.5%

0.0% Gravel 92.5% Sand 7.5% Silt/Clay

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HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 2434

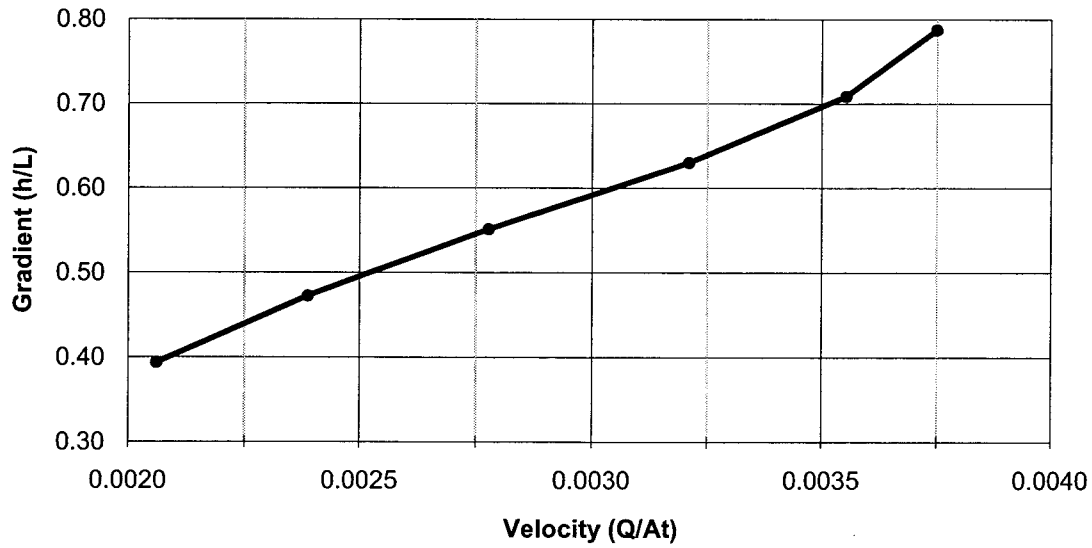
PROJECT NAME:	Eberline	CLIENT SAMPLE NO.	B29P77
PROJECT NO.	139736	LAB SAMPLE NO.	SEK 5435

Specimen diameter, cm	6.35	Void ratio	1.13
Specimen length, cm	10.98		
Wet weight of specimen, g.	478.77	Specific gravity of solids, assumed	2.80
Specimen cross-sect. area, cm^2	31.67		
Water content, %	4.79	Permeant Fluid	Tap Water
Wet unit weight, pcf	86.0	Material Used	-3/8 inch
Dry unit weight, pcf	82.1		

Trial no.	Head, h	Q, cm3	Time, sec	Q/At	h/L	Temp, °C	k, cm/s
1	2.5	47	720	0.0021	0.3937	22.5	4.93E-03
2	3	63.5	840	0.0024	0.4724	22.5	4.76E-03
3	3.5	47.5	540	0.0028	0.5512	22.5	4.75E-03
4	4	61	600	0.0032	0.6299	22.5	4.80E-03
5	4.5	54	480	0.0036	0.7087	22.5	4.72E-03
6	5	57	480	0.0037	0.7874	22.0	4.54E-03

Coefficient of Permeability, cm/s	**4.72E-03**

Velocity vs. Hydraulic Gradient



Appendix C
Chain of Custody Records

CH2MHill Plateau Remediation Company

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F10-214-123 | PAGE 1 OF 1

COLLECTOR
Bates Anderson, Wallace

COMPANY CONTACT
RADLOFF, AW

TELEPHONE NO.
376-4554

PROJECT COORDINATOR
RADLOFF, AW

PRICE CODE 8N | **DATA TURNAROUND**

SAMPLING LOCATION
C7624 (199-D5-134); I-030

PROJECT DESIGNATION
100 Area Remedial Investigation/Feasibility Analysis - 100-HR-3 - Sediment

SAF NO.
F10-214

AIR QUALITY ☐ PRICE CODE 7 H DATA TURANAROUND 30 DAYS/30 DAYS

ICE CHEST NO.
GWS- 2011

FIELD LOGBOOK NO.
~~HNF-N~~ 491-13 page 16

ACTUAL SAMPLE DEPTH
237'-239'.5"

COA
300110ES10

METHOD OF SHIPMENT
FEDERAL EXPRESS

SHIPPED TO
Shaw Group

OFFSITE PROPERTY NO.
SEE PTR

BILL OF LADING/AIR BILL NO.
SEE PTR 7967 5441 3083

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	1000mL
SAMPLE ANALYSIS	SEE ITEM (1) IN SPECIAL INSTRUCTIONS

@ 6 lbs.

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME	
B39P77	SOIL	2-8-11	1235	—

SEK 5435

1 of 11

CHAIN OF POSSESSION

RELINQUISHED BY/REMOVED FROM	DATE/TIME	RECEIVED BY/STORED IN	DATE/TIME
Bates Anderson	2-8-11	Doug Anderson	2/8/11/1310
Doug Anderson	2-8-11/1310	MCA13 SSVR1	2-8-11/1310
SSV-R1	2-11-11 0900	Thomas Wallace	2-11-11 0900
Thomas Wallace	2-11-11 1400	FEDEX	

SIGN/ PRINT NAMES

SPECIAL INSTRUCTIONS

** The 100 Area S&GRP Characterization and Monitoring Sampling and Analysis GKI applies to this SAF.☐** The CACN for all analytical work at WSCF laboratory is 401642ES20.
(1) Bulk Density - D2937; Saturated Hydraulic Conductivity; Permeability - D2434; Particle Size (Dry Sieve) - D422;

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

R50 | 2-14-11 @1000

A-6003-618 (REV 2)