Shaw™
Shaw E & I, Inc.

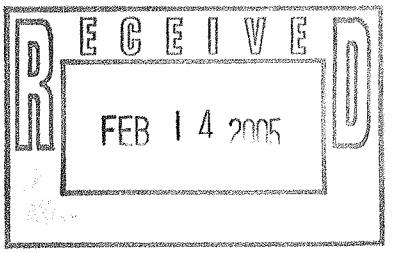
Geotechnical Laboratory
PO Box 4339
1570 Bear Creek Road
Oak Ridge TN 37830
(865) 482-6497

# *CERTIFICATE OF ANALYSIS*

Stephen Trent
Fluor Hanford, Inc.
825 Jadwin Avenue
Richland, Washington 99352

February 10, 2005

This is the Certificate of Analysis for the following samples:




| | |
|---|---|
| Shaw Project ID: | **Eberline - Hanford** |
| Shaw Project Number: | **100846.49000000** |
| Client Sample Data Group: | H2913 |
| Date Received by Lab: | December 28, 2004 |
| Number of Samples: | One (1) |
| Sample Type: | Soil |

## I. Introduction/Case Narrative

One soil sample was received by the Shaw Geotechnical Laboratory on December 28, 2004. The sample was submitted for determination of bulk density, sieve analysis, hydraulic conductivity, specific gravity, and calcium carbonate content. The sample number received was B19382.

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:

Ralph Cole
Laboratory Manager, Geotechnical Services

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## II. Analytical Results/Methodology

REFERENCES: 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)*, 2004. Shaw Environmental and infrastructure, Standard Operating Procedures.

| | |
|---|---|
| Moisture Content of Soil and Rock | **ASTM D 2216** |
| Bulk Density of Soils | **EM 1110-2-1906** |
| Particle-size Analysis of Soils | **ASTM D 422** |
| Hydraulic Conductivity of Porous Materials Using a Flexible Wall Permeameter | **ASTM D 5084** |
| Specific Gravity of Soil | **ASTM D 854** |
| Calcium Carbonate Content | **ASTM D 4373** |

## 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.

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- 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.

- Certified and trained personnel - all technicians are certified by the National Institute for Certification of Engineering Technicians (NICET) in geotechnical soil testing, and 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

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Shaw Project Name: Eberline Hanford
Shaw Project No. 100846.49000000
SDG No. H2913

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# SAMPLE NUMBER CROSS-REFERENCE LIST

| LAB SAMPLE NO. | CLIENT SAMPLE NO. | MATRIX |
|---|---|---|
| BC0517 | B19382 | Soil |

# Appendix B
# Sample Test Results

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# BULK DENSITY/DRY DENSITY
# EM-1110-2-1906, APPENDIX II

PROJECT NAME: **Eberline - Hanford**

PROJECT NUMBER: **100846.49000000**

| LAB SAMPLE NUMBER | CLIENT SAMPLE NUMBER | AVERAGE LENGTH, inches | AVERAGE DIAMETER, inches | WET WEIGHT, grams | MOISTURE CONTENT, % | BULK DENSITY, pcf | DRY DENSITY, pcf |
|---|---|---|---|---|---|---|---|
| BC0517 | B19382 | 5.6313 | 3.8642 | 2084.79 | 30.4 | 120.3 | 92.2 |
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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 Eberline Hanford

Project No. 100846.49000000

Field Sample No. B19382

Lab Sample No. BC0517

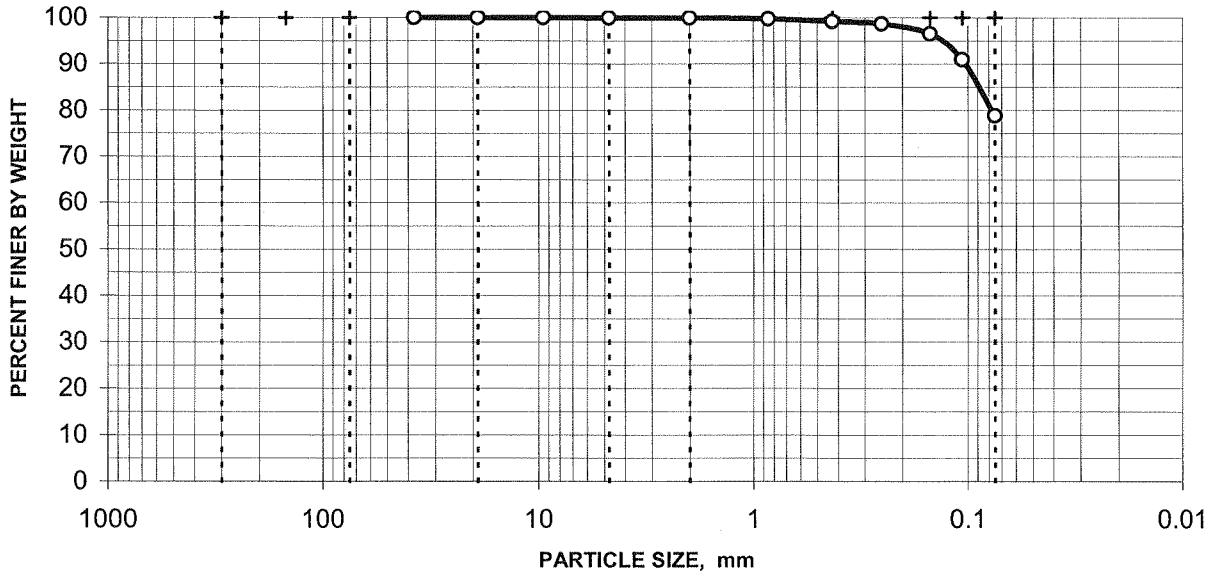
Moisture Content = 30.4%
based on dry sample weight

### *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 | 99.9% |
| | #10 | 2.000 | 99.9% |

| | Sieve No. | Diameter mm | Percent Finer |
|---|---|---|---|
| FINE | #20 | 0.850 | 99.7% |
| | #40 | 0.425 | 99.2% |
| | #60 | 0.250 | 98.6% |
| | #100 | 0.149 | 96.5% |
| | #140 | 0.106 | 90.9% |
| | #200 | 0.075 | 78.8% |

### DISTRIBUTION CURVE




0.1% Gravel 21.1% Sand 78.8% Silt/Clay

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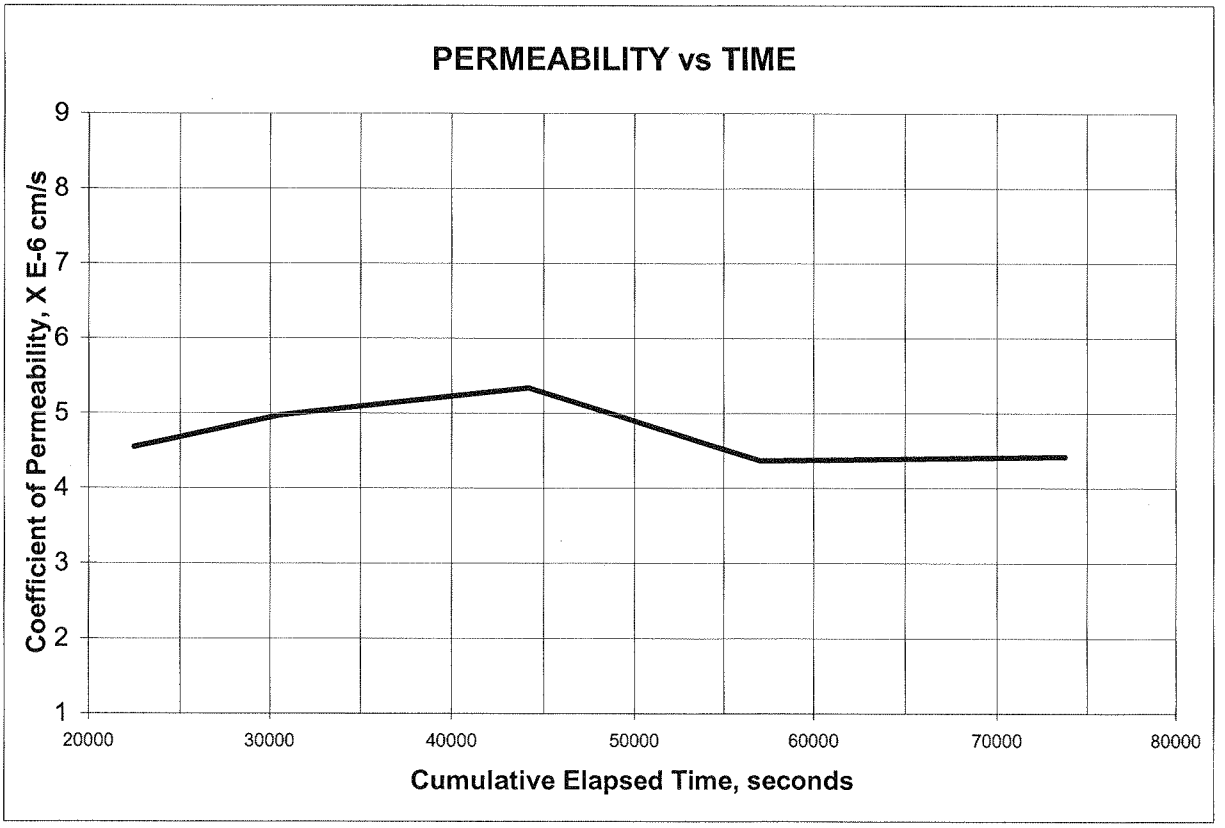
## *HYDRAULIC CONDUCTIVITY / PERMEABILITY*
## *ASTM D 5084*

| | | | |
|---|---|---|---|
| PROJECT NAME: | Eberline Hanford | CLIENT SAMPLE NO. | B19382 |
| PROJECT NO. | 100846.49000000 | LAB SAMPLE NO. | BC0517 |

| | INITIAL | FINAL |
|---|---|---|
| Specimen diameter, cm | 6.20 | |
| Specimen length, cm | 9.87 | |
| Wet weight of specimen, g. | 570.97 | |
| Specimen cross-sect. area, cm^2 | 30.16 | |
| Water content, % | 30.6 | |
| Wet unit weight, pcf | 119.7 | |
| Dry unit weight, pcf | 91.6 | |
| Degree of saturation, % | 97.5 | |
| Specific gravity of solids | 2.72 | |

| | |
|---|---|
| Hydraulic gradient | 7.1 |
| Min. consolidation stress, psi | 2.0 |
| Max. consolidation stress, psi | 3.0 |
| Total backpressure, psi | 7.0 |
| Permeant Fluid | Deaired DI Water |

**Coefficient of Permeability, cm/s 4.8E-06**



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# SPECIFIC GRAVITY
# ASTM D 854

PROJECT NAME:
**Eberline Hanford**

PROJECT NUMBER:
**100846.49000000**

| LAB SAMPLE NO. | CLIENT SAMPLE NO. | SPECIFIC GRAVITY |
|---|---|---|
| BC0517 | B19382 | 2.7218 |
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# Carbonate Content of Soils ASTM D 4373

PROJECT NAME:
**Eberline Hanford**

PROJECT NUMBER:
**100846.49000000**

| LAB SAMPLE NO. | CLIENT SAMPLE NO. | $CO_3$, % |
|---|---|---|
| BC0517 | B19382 | 0 |
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# Appendix C
# Chain-of-Custody and Request-for-Analysis Records

| FLUOR Hanford Inc. | CENTRAL PLATEAU CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST | F04-013-077 | Page 1 of 1 |
|---|---|---|---|
| **Collector** Johansen/Alexander/Gent/Thomas /Mahood | **Company Contact** Mark Byrnes **Telephone No.** 373-3996 | **Project Coordinator** TRENT, SJ | **Price Code** 8N **Data Turnaround** 45 Days |
| **Project Designation** 200-UP-1 Remedial Investigation Sampling and Analysis - S | **Sampling Location** 424-429 12/15/04 200-UP-1, C4300; ~~430'-435'~~ Rcm | **SAF No.** F04-013 | **Air Quality** ☐ |
| **Ice Chest No.** GRP-03-009 | **Field Logbook No.** HNF-N-3841 | **COA** 119324ES10 | **Method of Shipment** Federal Express |
| **Shipped To** Shaw Group | **Offsite Property No.** PTR 14598 | | **Bill of Lading/Air Bill No.** PTR 14598 |

**POSSIBLE SAMPLE HAZARDS/REMARKS**

*N/A*

**Special Handling and/or Storage**

*N/A*

Tie to B19364

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Preservation** | None | None | | | | | | | | | |
| **Type of Container** | Moisture Resistant | Split Spoon Liner | | | | | | | | | |
| **No. of Container(s)** | 1 | 2 | | | | | | | | | |
| **Volume** | 200g | 1000g | | | | | | | | | |
| **SAMPLE ANALYSIS** SDG# H2913 | Moisture Content - D2216 | See item (1) in Special Instructions | | | | | | | | | |
| Sample No. | Matrix * | Sample Date | Sample Time | | | | | | | | |
| B19382 | SOIL | 12 15 04 | 1700 | | 2 ✓ | | | | | | |
| BC 0517 | | | | | | | | | | | |

| CHAIN OF POSSESSION | Sign/Print Names | | |
|---|---|---|---|
| Relinquished By/Removed From | Date/Time | Received By/Stored In | Date/Time |
| PM GENT/PM Gent | 2130 12/15/04 | REFRIG #1 | 2130 12/15/04 |
| Refrig #1 | 12/16/04 1030 | Greg Thomas Greg Thomas | 12/16/04 1030 |
| Greg Thomas Greg Thomas | 12/16/04 1030 | Fed Ex | |
| FED EX | 12/20/04 10:00 | A Wilson | 12/20/04 8:00 |
| | | | |
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**SPECIAL INSTRUCTIONS**

(1) Bulk Density - D2937; Particle Size (Dry Sieve) - D422; Calcium Carbonate Content; Saturated Hydraulic Conductivity; Particle Density - D854

#1 GW = 2,799 KG

#3 GW = 2,907 KG

Matrix *
S=Soil
SE=Sediment
SO=Solid
SI=Sludge
W = Water
O=Oil
A=Air
DS=Drum Solids
DL=Drum Liquids
T=Tissue
WI=Wipe
L=Liquid
V=Vegetation
X=Other

| | | | | |
|---|---|---|---|---|
| **LABORATORY SECTION** | Received By | Title | Date/Time | |
| | SHAW | 12/20/04 @ 1030 | | |
| **FINAL SAMPLE DISPOSITION** | Disposal Method | Disposed By | Date/Time | |

A-6003-618(03/03)

SDG# H2913

PAGE 1 Eberline Srvces CHAIN OF CUSTODY ORD # R4-12-217

12/21/04 14:23:45 WORK ID: SAF# F04-013 SDG H2913

RCVD: 12/20/04 DUE: 02/03/05 KEEP: 02/03/06 DISP: S

| DASH | SAMPLE IDENTIFICATION | STORED | TESTS |
|---|---|---|---|
| 01A-S | B19382 | LION | DISPOS E329S E331S E335S E342S |

BC 0517

| RELEASED BY | DATE | TRANSFERRED TO | DATE | RECEIVED BY | DATE |
|---|---|---|---|---|---|
| [signature] | 12/22/04 | Shaw | 12/22/04 | [signature] | 12/28/04 |
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