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Geotechnical Laboratory  
PO Box 4339  
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Oak Ridge TN 37830  
(865) 482-6497

## CERTIFICATE OF ANALYSIS

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

December 23, 2004

This is the Certificate of Analysis for the following samples:

Shaw Project ID:	Eberline - Hanford
Shaw Project Number:	100846.32000000
Client Sample Data Group:	H2809
Date Received by Lab:	November 10, 2004
Number of Samples:	Two (2)
Sample Type:	Soil

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JUN 20 2005  
EDMC

### I. Introduction/Case Narrative

Two soil samples were received by the Shaw Geotechnical Laboratory on November 10, 2004. The samples were submitted for determination of moisture content, bulk density, sieve analysis, hydraulic conductivity, specific gravity, and calcium carbonate content. The sample numbers received were B19ND1 and B19ND2.

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
Calcium Carbonate Content.....	ASTM D 4373
Specific Gravity of Soil.....	ASTM D 854

## 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.
- 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

This pair of soil samples contained a significant amount of oversize particles. Therefore, in addition to the normal specific gravity test (ASTM D 854) the specific gravity of the coarse fraction was determined by ASTM C 127. The value representing the overall sample specific gravity is given as "average bulk specific gravity". Other values are given that relate to materials used in civil engineering fields.

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

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December 23, 2004  
Stephen Trent  
Fluor Hanford, Inc.  
Shaw Project Name: Eberline Hanford  
Shaw Project No. 100846.32000000  
SDG No. H2809

**Shaw Geotechnical  
Laboratory  
Oak Ridge TN  
(865) 482-6497**

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**SAMPLE NUMBER CROSS-REFERENCE LIST**

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<b>LAB SAMPLE NO.</b>	<b>CLIENT SAMPLE NO.</b>	<b>MATRIX</b>
BC0469 .....	B19ND1 .....	Soil
BC0470 .....	B19ND2 .....	Soil

**Appendix B**  
**Sample Test Results**





**PARTICLE-SIZE DISTRIBUTION  
 ASTM D 422**

Project Name Eberline Hanford

Field Sample No. B19ND1

Project No. 100846.32000000

Lab Sample No. BC0469

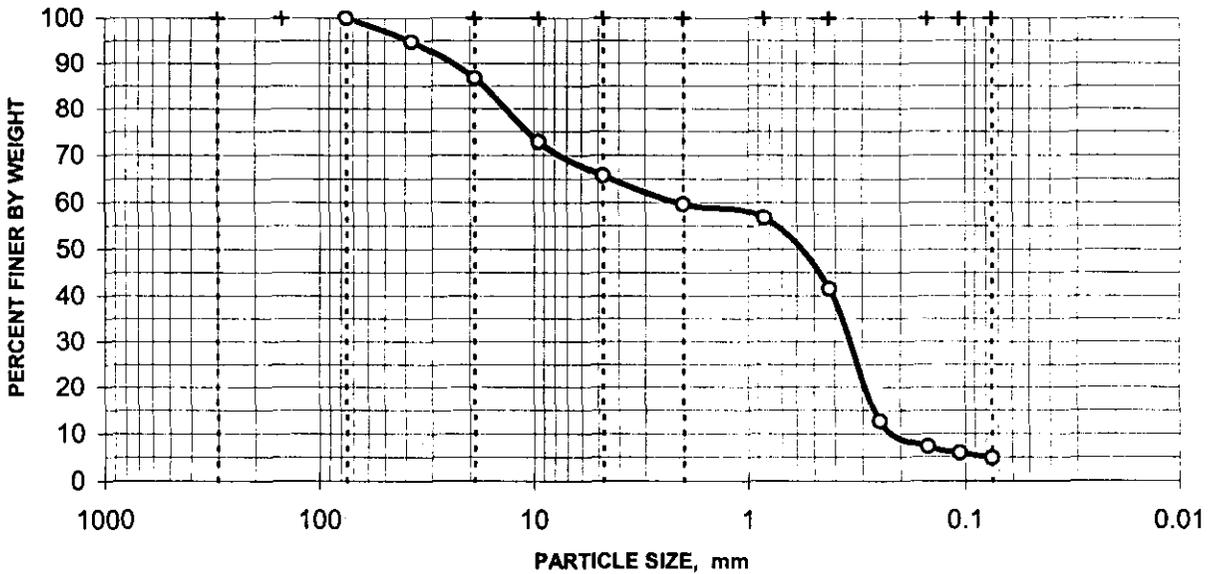
Moisture Content = 14.2%  
 based on dry sample weight

**SIEVE ANALYSIS**

C O A R S E	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	94.7%
	0.75"	19.000	86.7%
	0.375"	9.500	72.8%
	#4	4.750	65.7%
	#10	2.000	59.6%

F I N E	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	56.7%
	#40	0.425	41.5%
	#60	0.250	12.7%
	#100	0.149	7.3%
	#140	0.106	5.9%
	#200	0.075	4.9%

**DISTRIBUTION CURVE**



34.3% Gravel

60.8% Sand

4.9% Silt/Clay



**PARTICLE-SIZE DISTRIBUTION  
 ASTM D 422**

Project Name Eberline Hanford

Field Sample No. B19ND2

Project No. 100846.32000000

Lab Sample No. BC0470

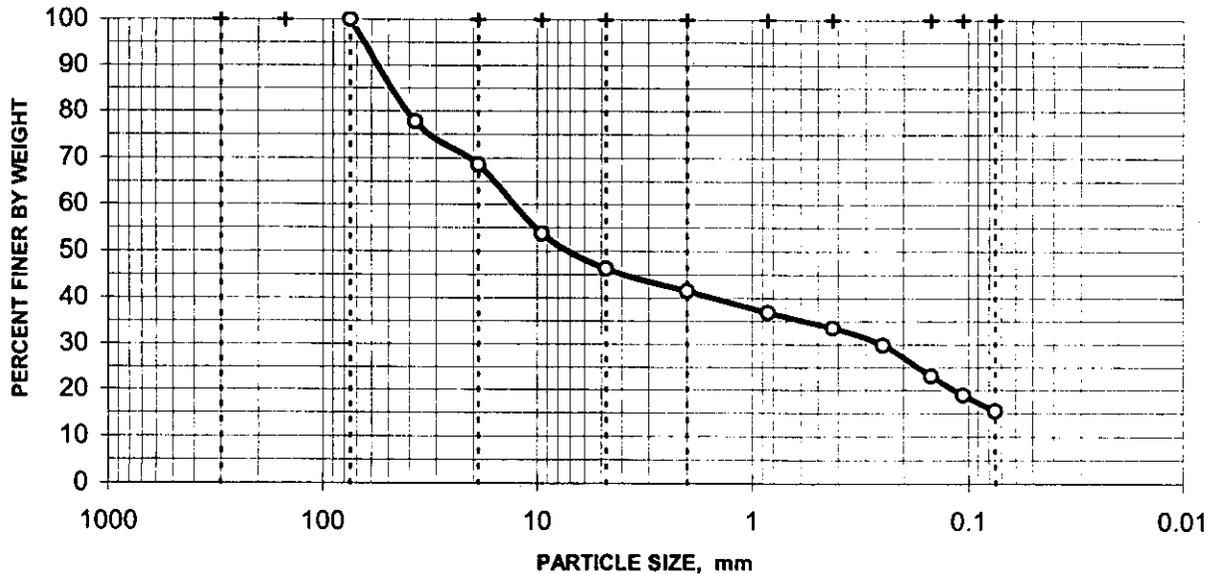
Moisture Content = 10.1%  
 based on dry sample weight

**SIEVE ANALYSIS**

C O A R S E	Sieve No.	Diameter mm	Percent Finer
	3"	75.000	100.0%
	1.5"	37.500	77.7%
	0.75"	19.000	68.6%
	0.375"	9.500	53.7%
	#4	4.750	46.2%
	#10	2.000	41.5%

F I N E	Sieve No.	Diameter mm	Percent Finer
	#20	0.850	36.8%
	#40	0.425	33.5%
	#60	0.250	29.8%
	#100	0.149	23.1%
	#140	0.106	18.8%
	#200	0.075	15.4%

**DISTRIBUTION CURVE**



53.8% Gravel

30.8% Sand

15.4% Silt/Clay

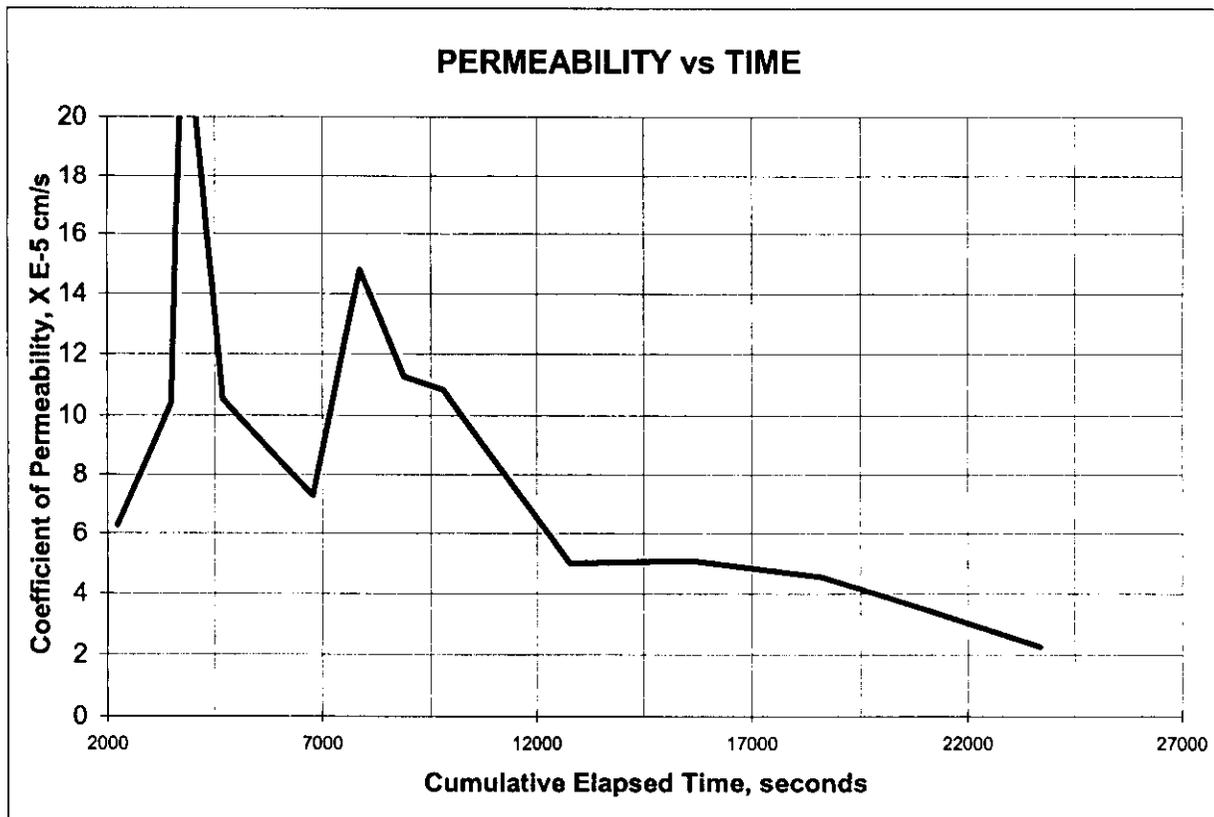
**HYDRAULIC CONDUCTIVITY / PERMEABILITY  
 ASTM D 5084**

PROJECT NAME: Eberline Hanford  
 PROJECT NO. 100846.32000000

CLIENT SAMPLE NO. B19ND1  
 LAB SAMPLE NO. BC0469

	INITIAL	FINAL		
Specimen diameter, cm	6.17		Hydraulic gradient	5.1
Specimen length, cm	6.92		Min. consolidation stress, psi	10.0
Wet weight of specimen, g.	430.58		Max. consolidation stress, psi	10.0
Specimen cross-sect. area, cm <sup>2</sup>	29.90		Total backpressure, psi	0.0
Water content, %	17.6		Permeant Fluid	Deaired DI Water
Wet unit weight, pcf	129.9			
Dry unit weight, pcf	110.4			
Degree of saturation, %	92.9			
Specific gravity of solids	2.66			

**Coefficient of Permeability, cm/s      4.2E-05**



**HYDRAULIC CONDUCTIVITY / PERMEABILITY  
 ASTM D 5084**

PROJECT NAME: Eberline Hanford  
 PROJECT NO. 100846.32000000

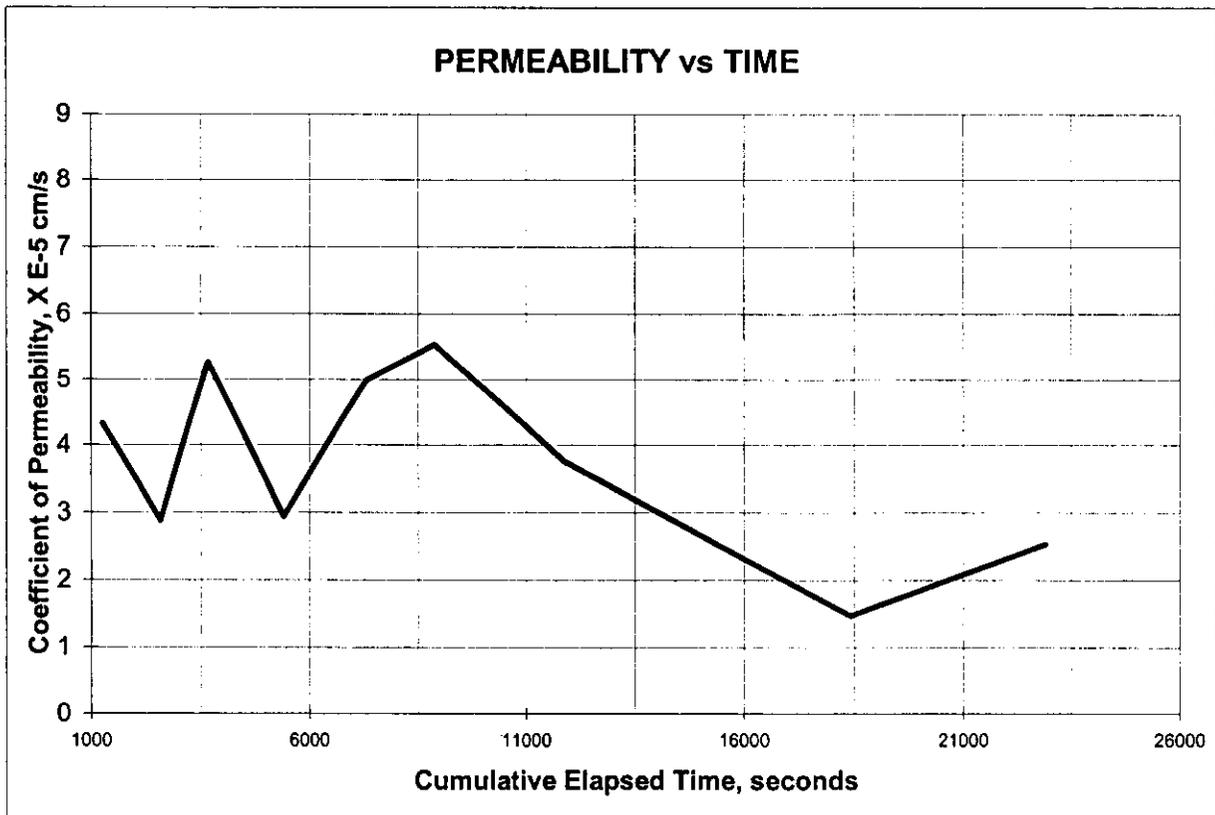
CLIENT SAMPLE NO. B19ND2  
 LAB SAMPLE NO. BC0470

INITIAL      FINAL

Specimen diameter, cm      6.18  
 Specimen length, cm      5.28  
 Wet weight of specimen, g.      358.03  
 Specimen cross-sect. area, cm<sup>2</sup>      29.96  
 Water content, %      13.6  
 Wet unit weight, pcf      141.2  
 Dry unit weight, pcf      124.3  
 Degree of saturation, %      107.0  
 Specific gravity of solids      2.67

Hydraulic gradient      6.7  
 Min. consolidation stress, psi      10.0  
 Max. consolidation stress, psi      10.0  
 Total backpressure, psi      0.0  
 Permeant Fluid      Deaired DI Water

**Coefficient of Permeability, cm/s      3.3E-05**







**Appendix C**  
**Chain-of-Custody and Request-for-Analysis Records**

SDG# H2809  
Eberline Svcs

CHAIN OF CUSTODY

ORD # R4-11-058

11/04/04 12:52:45

WORK ID: SAF# F03-018 SDG H2809

RCVD: 11/04/04 DUE: 12/19/04

KEEP: 12/19/05 DISP: S

<u>DASH</u>	<u>SAMPLE IDENTIFICATION</u>	<u>STORED</u>	<u>TESTS</u>				
01A-S	B19ND1	SHAW	DISPOS	E331S	E333S	E335S	E342S
*****							
02A-S	B19ND2	SHAW	DISPOS	E331S	E333S	E335S	E342S
=====							

<u>RELEASED BY</u>	<u>DATE</u>	<u>TRANSFERRED TO</u>	<u>DATE</u>	<u>RECEIVED BY</u>	<u>DATE</u>
<i>Jed Jones</i>	<i>11/09/04</i>	<i>Shaw</i>	<i>11/09/04</i>	<i>Jed Jones</i>	<i>11.10.04</i>
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

FLUOR Hanford Inc.

CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST

F03-018-144

PAGE 1 OF 1

COLLECTOR  
Pope/Pfister/Wiberg/Tyra/M. WEIL

COMPANY CONTACT  
Steve Trent

TELEPHONE NO.  
373-5869

PROJECT COORDINATOR  
TRENT, SJ

PRICE CODE 8N

DATA TURNAROUND

SAMPLING LOCATION  
216-Z-9/C3426 - Interval 317FT - 319.5FT

PROJECT DESIGNATION  
216-Z-9 Trench Characterization Borehole - Soil

SAF NO.  
F03-018

AIR QUALITY

45 Days / 45 Days

ICE CHEST NO.  
GHP-03-008

FIELD LOGBOOK NO.  
HNF-N-360 1

COA  
119325ES10

METHOD OF SHIPMENT  
Federal Express

SHIPPED TO  
Shaw Group

OFFSITE PROPERTY NO.  
See PTR 14391

BILL OF LADING/AIR BILL NO.  
See PTR 14391

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  
RADIOACTIVE TIE TO: B19LK5

SDG# H2809

SPECIAL HANDLING AND/OR STORAGE

PRESERVATION

None None

TYPE OF CONTAINER

Moisture Resistant Cont Liner

NO. OF CONTAINER(S)

1 2

VOLUME

200g 1000g

SAMPLE ANALYSIS

Moisture Content - D2216; SEE ITEM (1) IN SPECIAL INSTRUCTIONS

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME						
B19ND1	SOIL	10/28/04	0730	X	X				BC 0469

CHAIN OF POSSESSION	SIGN/ PRINT NAMES	DATE/TIME	DATE/TIME
RELINQUISHED BY/REMOVED FROM MR. WEIL	RECEIVED BY/STORED IN REFER #1	10/28/04 1300	10/28/04 1300
RELINQUISHED BY/REMOVED FROM MR. [Signature]	RECEIVED BY/STORED IN M. B. [Signature]	11/2/04 0800	11/2/04 0800
RELINQUISHED BY/REMOVED FROM M.H. [Signature]	RECEIVED BY/STORED IN Fed Ex	11/2/04 0800	
RELINQUISHED BY/REMOVED FROM Fed Ex	RECEIVED BY/STORED IN [Signature]	11/04/04 9:45	11/04/04 11:05
RELINQUISHED BY/REMOVED FROM [Signature]	RECEIVED BY/STORED IN Fed Ex	11/9/04	
RELINQUISHED BY/REMOVED FROM	RECEIVED BY/STORED IN	DATE/TIME	DATE/TIME

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

LABORATORY SECTION	RECEIVED BY [Signature]	TITLE R50	DATE/TIME 11/009 0730
FINAL SAMPLE DISPOSITION	DISPOSAL METHOD	DISPOSED BY	DATE/TIME

COLLECTOR: Pope/Pfister/Wiberg/Tyra / M. WEIL  
 COMPANY CONTACT: Steve Trent TELEPHONE NO.: 373-5869 PROJECT COORDINATOR: TRENT, SJ  
 PRICE CODE: 8N DATA TURNAROUND: 45 Days / 45 Days

SAMPLING LOCATION: 216-Z-9/C3426 - Interval 337FT - 339.5FT  
 PROJECT DESIGNATION: 216-Z-9 Trench Characterization Borehole - Soil SAF NO.: F03-018  
 AIR QUALITY:

ICE CHEST NO.: GRRP-03-008  
 FIELD LOGBOOK NO.: HNF-N-360 1 COA: 119325ES10 METHOD OF SHIPMENT: Federal Express

SHIPPED TO: Shaw Group OFFSITE PROPERTY NO.: SU PTR 14391 BILL OF LADING/AIRBILL NO.: SU PTR 14391

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 RADIOACTIVE TIE TO: <del>819LK6</del> <del>MAD 11/1/04</del> 819LK5  SDG# H 2809	PRESERVATION	None	None																
		TYPE OF CONTAINER	Moisture Resistant Cont	Liner																
		NO. OF CONTAINER(S)	1	2																
		VOLUME	200g	1000g																
SPECIAL HANDLING AND/OR STORAGE		SAMPLE ANALYSIS	Moisture Content - D2216;	SEE ITEM (1) IN SPECIAL INSTRUCTIONS																

SAMPLE NO.	MATRIX*	SAMPLE DATE	SAMPLE TIME																	
B19ND2	SOIL	11-02-04	0710	X	X															

CHAIN OF POSSESSION	SIGN/ PRINT NAMES	SPECIAL INSTRUCTIONS
RELINQUISHED BY/REMOVED FROM: M. WEIL	DATE/TIME: 11/2/04 1430	RECEIVED BY/STORED IN: M. WEIL
RELINQUISHED BY/REMOVED FROM: M. WEIL	DATE/TIME: 11/3/04 0805	RECEIVED BY/STORED IN: M. WEIL
RELINQUISHED BY/REMOVED FROM: M. WEIL	DATE/TIME: 11/3/04 0805	RECEIVED BY/STORED IN: M. WEIL
RELINQUISHED BY/REMOVED FROM: M. WEIL	DATE/TIME: 11/04/04	RECEIVED BY/STORED IN: M. WEIL
RELINQUISHED BY/REMOVED FROM: M. WEIL	DATE/TIME: 11/9/04	RECEIVED BY/STORED IN: M. WEIL
RELINQUISHED BY/REMOVED FROM: M. WEIL	DATE/TIME:	RECEIVED BY/STORED IN: M. WEIL
RELINQUISHED BY/REMOVED FROM: M. WEIL	DATE/TIME:	RECEIVED BY/STORED IN: M. WEIL

LABORATORY SECTION: RECEIVED BY: [Signature] TITLE: R50 DATE/TIME: 11-10-04 0930  
 FINAL SAMPLE DISPOSITION: DISPOSAL METHOD: [Signature] DISPOSED BY: DATE/TIME: