U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Prepared by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

Plate 2: Radiological Assessment
Analytical Results for Uranium (pCi/g)

DATE PREPARED: June 27, 2007

FILENAME: X0090400-02

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U.S. DEPARTMENT OF ENERGY
GRAND JUNCTION, COLORADO

Prepared by
S.M. Stoller Corporation
Under DOE Contract
No. DE-AC01-02GJ79491

Plate 3: Radiological Assessment
Analytical Results for Thorium-230 (pCi/g)

DATE PREPARED: June 27, 2007

FILENAME: X0090400-01

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U.S. Department of Energy—Grand Junction, Colorado

Calculation Cover Sheet

Calc. No.: MOA-02-05-2007-4-04-00 **Discipline:** Geotechnical Properties **No. of Sheets:** 6
Doc. No.: X0215800

Location: Attachment 5, Volume II, Appendix N

Project: Moab UMTRA Project

Site: Crescent Junction Disposal Site, Disposal Cell Design

Feature: Supplemental Geotechnical Properties of Tailings Materials from the Moab Processing Site

Sources of Data:

Laboratory test results from Shaw E & I, Inc.

Boring and Test Pit Logs from the 2005 Geotechnical Investigation (Attachment 5 Vol. I, Appendix I)

Sources of Formulae and References:

Shaw E & I, Inc, November 7, 2006. *Certificate of Analysis,* Letter Report to General Engineering Laboratories.

Shaw E & I, Inc. February 15, 2007. *Certificate of Analysis,* Letter Report to General Engineering Laboratories.

Golder Associates, April 3, 2006. *Results of the Bench Scale Testing Program on Cover Soils and Uranium Mill Tailings from the Moab Tailings Impoundment, Grand County, Utah,* Draft Technical Memorandum to S.M. Stoller.

Preliminary Calc. ☐ **Final Calc.** ☒ **Supersedes Calc. No.**

Author: Roslyn Stein 5/25/07
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No text for this page

Problem Statement:

Preliminary site selection performed jointly by the U.S. Department of Energy (DOE) and the Contractor has identified a 2,300-acre withdrawal area in the Crescent Flat area just northeast of Crescent Junction, Utah, as a possible site for a final disposal cell for the Moab uranium mill tailings. The proposed disposal cell would cover approximately 250 acres.

Based on the preliminary site-selection process, the suitability of the Crescent Junction Disposal Site is being evaluated from several technical aspects, including geomorphic, geologic, hydrologic, seismic, geochemical, and geotechnical. The objective of this calculation is to present the supplemental test results of geotechnical testing performed to characterize the tailings at the Moab processing site.

These data will be incorporated into Attachment 5, Volume II of the *Remedial Action Plan and Site Design for Stabilization of Moab Title I Uranium Mill Tailings at Crescent Junction, Utah, Site* (RAP) and summarized in the Remedial Action Selection (RAS) report for the Moab Site.

Method of Solution:

Samples were collected during November and December 2005 by mixing either bulk samples obtained from the ten backhoe test pits (600-series, also referred to as the GABT series) completed in early December 2005, or selected Shelby tube and/or split spoon samples from the November/December 2005 geotechnical drilling program (700-series). Figure 1 shows the location where the tailings samples were collected. A description of the discrete samples used to obtain composite samples, along with results from settlement and compaction tests, is contained in Appendix A. Further test results, including Atterberg limits, grain size distribution, hydraulic conductivity, triaxial shear strength, consolidation, and capillary-moisture relationships are presented in Appendix B and Appendix C at the conclusion of this calculation.

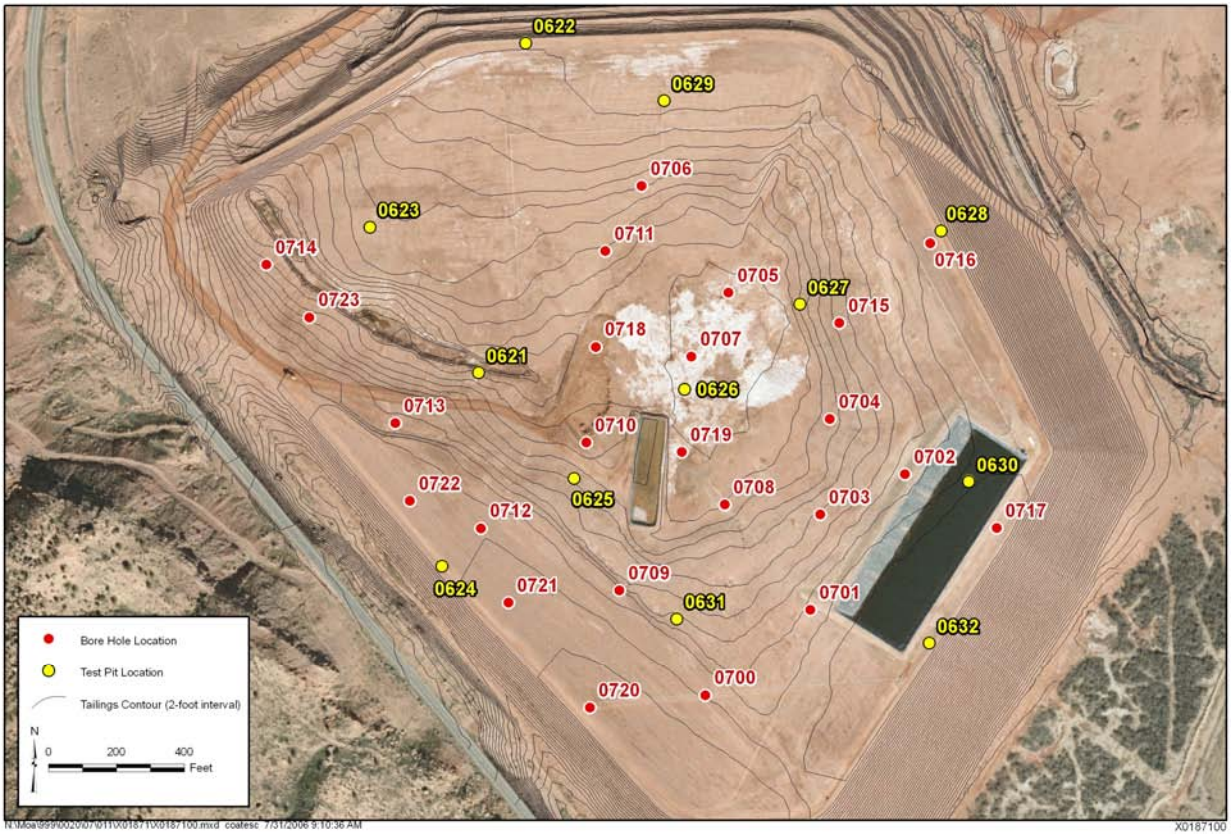

Figure 1. Location of Tailings Samples

Assumptions:

Not applicable

Calculation:

Appendixes A, B, and C contain laboratory results from the supplemental testing, and Table 1 summarizes the test results.

Discussion:

Soil and tailings samples from this sampling effort were sent to Shaw E & I, Inc. Geotechnical Laboratory (hereafter referred to as the laboratory) on May 4, 2006.

The laboratory issued to Stoller Corporation a Certificate of Analysis on November 7, 2006. Upon review of the data, three deficiencies were noted as follows:

1. Confined Undrained Triaxial Shear Strength with Pore Pressure Measurements (ASTM D 4767) tests were requested with effective confining pressures of 20, 40, and 60 pounds per square inch (psi). Test results presented in Appendix B show that tests were performed with an effective confining pressure of 2 psi. The laboratory is currently reanalyzing these tests. This calculation set will be updated when these test results are available.
2. Hydraulic Conductivity using Flexible Wall Permeameter (ASTM D 5084) tests were requested with effective confining pressures of 20, 40, and 60 psi. Test results presented in Appendix B show that tests were performed with an effective confining pressure of 2 psi. The laboratory is currently reanalyzing these tests. This calculation set will be updated when these test results are available.
3. Capillary-Moisture Relationships were analyzed using a potentiometer. These test results show very high vapor suctions, especially at high moisture contents. The laboratory is currently reanalyzing these tests using ASTM D 5298 (Measurement of Soil Potential Suction) and using filter paper. This calculation set will be updated when these test results are available.

Conclusion and Recommendations:

Not applicable

Computer Source:

Not applicable.

Bench Test Sample No.	Soil Type	Atterberg Limits (LL/PL/PI) ASTM D 4318	Sieve/Hydrometer Analyses				Sample Prep Dry Unit Weight (pcf)/ Water Content (%)/Confining Pressure (psi)	Hydraulic Conductivity (1)	Triaxial Shear Strength (2)		Coefficient of Consol., Cc	Volume Moisture Content at 15-bar (3)	Maximum Dry Density (pcf) (Standard Proctor) (4)	Optimum Moisture Content (Standard Proctor) (4)	Settled Percent Compaction (4)
			% Gravel	% Sand	% Silt	% Clay			c, psf	Eff. Friction Angle, degrees					
GABT-01	Cover Soil	NP	4	73	18	5	106.3 / 7.0% / 2.5	4.7E-06					117.7	11.9%	82.0%
							106.3 / 7.0 / 2.5	7.6E-06							
							106.3 / 7.0 / 2.5	1.1E-05							
GABT-02	Cover Soil	NP	3	80	14	3							109.2	13.8%	85.8%
GABT-03	Sand Tailings	NP	1	83	15	2	90.5 / 14.4 / 2.25	2.7E-04	0	34.5			106.3	12.7%	79.3%
							90.5 / 14.4 / 2.26	3.8E-04							
							90.5 / 14.4 / 2.27	7.9E-05							
GABT-04	Sand Tailings	NP	0	76	21	3	88.2 / 17.5 / 2.25	1.7E-04	0	36.5	0.15	6.1	103.9	15.6%	82.2%
							88.2 / 17.5 / 2.26	1.3E-05							
							88.2 / 17.5 / 2.27	1.8E-05							
GABT-05	Sand Tailings	NP	3	76	17	5	101.7 / 15.3 / 2.25	3.1E-04	0	38.3			113.3	13.1%	90.9%
							101.7 / 15.3 / 2.26	2.2E-04							
							101.7 / 15.3 / 2.27	2.1E-04							
GABT-06	Sand Tailings	NP	1	83	13	4					0.07	24.4	107.3	14.6%	82.6%
GABT-07	Transition Tailings	31/22/9	1	49	42	8	96.3 / 20.5 / 2.5	1.2E-05	0	47.2			107.3	18.4%	78.8%
							96.3 / 20.5 / 2.6	1.4E-05							
							96.3 / 20.5 / 2.7	1.3E-05							
GABT-08	Sand Tailings	NP	7	72	19	9	101.4 / 17.9 / 2.25	3.2E-05	0	37.1			112.8	16.0%	83.3%
							101.4 / 17.9 / 2.26	2.1E-05							
							101.4 / 17.9 / 2.27	7.4E-05							
GABT-09	Transition Tailings	23/20/3	0	42	50	8	91.8 / 23.0 / 2.5	6.4E-05	0	36.3	0.20	24.4	102.0	21.1%	87.9%
							91.8 / 23.0 / 2.6	6.9E-05							
							91.8 / 23.0 / 2.7	7.1E-05							
GABT-10	Transition Tailings	19/17/2	0	70	24	6					0.17	>50.5	107.8	18.7%	94.6%
GABT-11	Slimes Tailings	56/27/29	0	22	53	25					0.38	27.6	96.0	27.8%	68.5%
GABT-12	Slimes Tailings	35/19/16	0	41	47	12	83.6 / 20.9 / 2.5	8.4E-05	0	50.8			101.6	22.5%	39.3%
							83.6 / 20.9 / 2.6	2.1E-05							
							83.6 / 20.9 / 2.7	1.9E-05							
GABT-13	Slimes Tailings	49/23/23	0	12	63	25					0.34	25.1	95.0	28.7%	84.9%
GABT-14	Slimes Tailings	43/22/21	0	16	62	22	81.2 / 22.8 / 3.0	2.7E-06	0	37.6			101.5	20.9%	76.6%
							81.2 / 22.8 / 3.1	1.8E-06							
							81.2 / 22.8 / 3.2	1.8E-06							

(1) Hydraulic Conductivity tests performed at low confining pressures. Tests are currently being reanalyzed at estimated post-construction confining pressures. Data will be presented when available.
(2) Triaxial shear strength tests performed at low confining pressures. Tests are currently being reanalyzed at estimated post-construction confining pressures. Data will be presented when available.
(3) Capillary-Moisture Relationships analyzed with WP4 Potentiometer. Tests are currently being reanalyzed using ASTM D 5298 (filter paper method) Data will be presented when available.
(4) Test results from Golder Associates, Inc. (GAI), 2006. *Results to Bench Scale Testing Program on Cover Soils and Uranium Mill Tailings from the Moab Tailings Impoundment, Grand County, Utah*, Draft technical memorandum, Lakewood, Colorado, April 3.

End of current text

Appendix A

Results of the Bench Scale Testing Program on Cover Soils and Uranium Mill Tailings from the Moab Tailings Impoundment, Grand County, Utah

April 3, 2006

Note: The attached Technical Memorandum was issued in draft form on April 3, 2006. The memorandum was reviewed with no comments and is considered a final version.

Golder Associates Inc.

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DRAFT TECHNICAL MEMORANDUM

TO: Greg Lord, S.M. Stoller **DATE:** April 3, 2006

FR: James M. Johnson, Golder Associates Inc. **OUR REF:** 053-2269.2050
Luis A. Quirindongo, Golder Associates Inc.
Ron DiDonato, Golder Associates Inc.

RE: RESULTS OF THE BENCH SCALE TESTING PROGRAM ON COVER SOILS AND URANIUM MILL TAILINGS FROM THE MOAB TAILINGS IMPOUNDMENT, GRAND COUNTY, UTAH

INTRODUCTION

As part of our approved work program on the Moab Project, personnel from Golder Associates Inc. (Golder) completed an onsite bench scale testing program during the period of March 15 through March 23, 2006.

The objective of the bench scale testing program was to advance the tailings characterization efforts started during the August 2005 preliminary tailings test program, adjusted to meet the evolving needs and goals of the tailings relocation materials handling evaluation and design.

During this period Golder completed the following tests:

- As sampled moisture content testing of the cover soils and tailings materials after compositing (ASTM D2216) – 14 tests;
- Standard Proctor compaction testing (ASTM D698) – 14 tests;
- Loose density testing (no ASTM standard) – 14 tests; and
- Settled density tests (no ASTM standard) – 14 tests.

Each of the 14 samples was created by mixing either bulk samples obtained from the ten backhoe test pits completed in early December 2005, or selected Shelby tube and/or split spoon samples from the November/December 2005 geotechnical drilling and sampling program.

TESTING PROGRAM DESCRIPTION

Sample Preparation

The bench scale testing program was designed to make use of cover soils and tailings samples remaining onsite, exclusive of the samples already selected and shipped for offsite geotechnical laboratory testing. The samples pre-selected for use in this program are listed in the March 14, 2006 Golder letter describing the proposed bench scale testing program. At the start of the sample preparation phase of the work, Golder personnel noted that some of the pre-selected samples were no

longer available onsite or were different material types than originally classified. Therefore, the list of samples to be used in this testing program was modified based on review of the available samples and material types. The final sample list is presented in Table 1.

From March 15 through March 17, Messrs. Luis Quirindongo and Jeff Robison of Golder visited the site to begin the preparation of the samples for the testing program. Each group of samples was mixed to create a composite sample, with splits set aside for Proctor compaction and loose/settled density testing. The sample for Proctor compaction testing was set out to air dry (over the weekend of March 18-19, 2006). The samples for loose and settled density testing were placed either in buckets or bags to preserve the as-sampled moisture content.

Sample Testing

During the sample preparation period, moisture content samples were obtained and tested to determine the initial, or as-sampled moisture content. During the period of March 20 through 23, Messrs. Luis Quirindongo and Ron DiDonato were present on site to perform the standard Proctor compaction and loose/settled density testing. During the course of the week, sample processing, moisture conditioning, and testing were performed. All testing was completed by March 23.

Natural Moisture Content Testing

- Fourteen moisture content tests were performed following ASTM D2216 procedures.

Standard Proctor Compaction Testing

- Fourteen compaction tests were performed following ASTM D698, Method A procedures.

Loose Settled Density Testing

- Fourteen loose settled density tests were performed. These are non-standard tests designed to collect data which we expect to be useful indicators of material characteristics following excavation and during and after transport. ASTM D4253 - Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table and ASTM D4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density were used as guidelines. The procedures developed by Golder for these tests are as follows:

    - For loose density testing, a standard Proctor mold with a known volume was used. Material at its natural moisture content was placed in the mold as loosely as possible, struck off at the top of the mold, and the weight of the mold plus wet soil was recorded.

    - For the settled density test, the same mold and material was used. To prevent any loss of mass and obtain a smoother recording surface, a cap weighing 1.34 pounds was placed on top of the sample before proceeding with testing. To settle the sample, the mold with the sample was dropped on a concrete floor from a height of 1 to 3 inches, 100 times. After every 25 drops, the side of the mold was tapped with a

hammer approximately 16 to 20 times. After shaking the sample, height changes and moisture content were measured and recorded.

TEST RESULTS

During sample preparation and testing, materials were mixed to represent four typical types found at the site: cover soils, sand tailings, transition tailings, and slimes tailings. Golder recommends that leftover sample materials be tested for classification properties in an offsite laboratory to either confirm the visual classification presented in this technical memorandum or provide a basis for modifying the classification. The range of measurements obtained for the four primary material types are presented below.

Natural Moisture Content:

- Cover Soil – 6.5%
- Sand Tailings – 1.1 to 9.4%
- Transition Tailings – 16.5 to 37.0%
- Slimes Tailings – 37.5 to 52.3%

Proctor Maximum Dry Density:

- Cover Soil – 109.2 to 117.7 pcf
- Sand Tailings – 103.9 to 107.3 pcf
- Transition Tailings – 102.0 to 113.3 pcf
- Slimes Tailings – 95.0 to 101.6 pcf

Proctor Optimum Moisture Content:

- Cover Soil – 11.9 to 13.8%
- Sand Tailings – 12.7 to 15.6%
- Transition Tailings – 13.1 to 21.1%
- Slimes Tailings – 20.9 to 28.7%

Loose Wet Density:

- Cover Soil – 71.5 to 78.7 pcf
- Sand Tailings – 63.7 to 66.8 pcf
- Transition Tailings – 71.6 to 103.1 pcf
- Slimes Tailings – 49.0 to 93.8 pcf

Loose Dry Density:

- Cover Soil – 66.9 to 73.1 pcf
- Sand Tailings – 57.7 to 61.7 pcf
- Transition Tailings – 53.2 to 83.9 pcf
- Slimes Tailings – 33.2 to 64.3 pcf

Settled Wet Density:

- Cover Soil – 100.9 to 103.3 pcf
- Sand Tailings – 93.1 to 95.9 pcf
- Transition Tailings – 107.3 to 126.4 pcf
- Slimes Tailings – 58.9 to 114.2 pcf

Settled Dry Density:

- Cover Soil – 93.7 to 96.6 pcf
- Sand Tailings – 84.3 to 88.6 pcf
- Transition Tailings – 84.6 to 102.9 pcf
- Slimes Tailings – 39.9 to 80.7 pcf

Percent Vertical Compression (under dynamic loading):

- Cover Soil – 22.0 to 30.8%
- Sand Tailings – 30.3 to 31.5%
- Transition Tailings – 18.4 to 39%
- Slimes Tailings – 16.9 to 39.6%

Percent Compaction (Settled Dry Density as a percentage of the standard Proctor maximum dry density):

- Cover Soil – 82.0 to 85.8%
- Sand Tailings – 79.3 to 82.6%
- Transition Tailings – 78.8 to 94.6%
- Slimes Tailings – 39.3 to 84.9%

All test results are summarized on Table 2. The bench scale test data sheets are included in Attachment 1.

TABLES

TABLE 1
SAMPLE SELECTION MIX SUMMARY

Bench Test Sample No.	Borehole or Test Pit	Depth or Interval	Mixed Description
GABT-01	GATP-05	0-5'	SAND (SP), little silt, trace gravel, fine grained, reddish brown, cover soil
	GATP-11	0-5'	
GABT-02	GATP-08	0-5'	SAND (SP), some silt, poorly graded, yellowish brown, cover soil
	GATP-09	0-5'	
GABT-03	GATP-04	5-10'	SAND (SP), some silt, poorly graded, moist, yellowish brown, sand tailings
		10-15'	
		15-20'	
GABT-04	GATP-08	5-10'	SAND (SP), trace to little silt, trace clay, poorly graded, moist, light brown, sand tailings
		10-15'	
		15-20	
GABT-05	GATP-06	5-10'	Clayey SAND (SC), poorly graded, saturated, reddish brown, transition tailings
		10-15'	
		15-20'	
GABT-06	GATP-09	5-10'	SAND (SP), little to some silt, saturated, reddish brown, sand tailings
		10-15'	
		15-20'	
GABT-07	GATP-05	10-15'	Sandy SILT (ML), moist, reddish brown, transition tailings
	GATP-07	10-15'	
GABT-08	GATP-10	10-15'	Sandy SILT (ML), moist, little to some clay, reddish brown, transition tailings
	GATP-11	10-15'	
GABT-09	700	12-14'	Sandy CLAY (CL), some silt, medium plasticity, grayish brown, moist, transition tailings
		24-26'	
		40-42'	
		42-44'	
		44-46'	
GABT-10	707	6-8'	Sandy CLAY (CL), some silt, medium plasticity, dark gray, wet, transition tailings
		8-10'	
		10-12'	
		12-14'	
		18-20'	
		20-22'	
	713	13.5-15.5'	
GABT-11	703	18-20'	SILT (ML), low plasticity, moist, dark brown, slimes tailings
		33-35'	
		38-40'	
		43-45'	
		58-60'	
		63-65'	
		68-70'	
GABT-12	709	13-15'	Silty CLAY (CL), medium plasticity, moist, grayish brown, slimes tailings
		23-25'	
		28-30'	
		48-50'	
		53-55'	
		63-65'	
GABT-13	700	64-66'	CLAY (CL), low to medium plasticity, moist, grayish brown, slimes tailings
		70-72'	
		78-80'	
		80-82'	
	707	34-36'	
		50-52'	
		52-54'	
GABT-14	708	20-22'	CLAY (CH), high plasticity, moist, dark gray, slimes tailings
		30-32'	
		38-40'	
		44-46'	
		59-60'	
		60-62'	

TABLE 2
BENCH TESTING RESULTS SUMMARY

Bench Test Sample No.	Initial Moisture Content (Taken March 17, 2006)	Maximum Dry Density (pcf)	Optimum Moisture Content	Loose Wet Density (pcf)	Loose Dry Density (pcf)	Settled Wet Density (pcf)	Settled Dry Density (pcf)	Vertical Percent Settlement	Settled Percent Compaction	Comments
GABT-01	6.5%	117.7	11.9%	71.5	66.9	103.3	96.6	30.8%	82.0%	Cover Soil
GABT-02	6.5%	109.2	13.8%	78.7	73.1	100.9	93.7	22.0%	85.8%	Cover Soil
GABT-03	9.4%	106.3	12.7%	63.7	57.7	93.1	84.3	31.5%	79.3%	Sand Tailings
GABT-04	1.1%	103.9	15.6%	66.1	59.3	95.1	85.4	30.5%	82.2%	Sand Tailings
GABT-05	19.9%	113.3	13.1%	103.1	83.9	126.4	102.9	18.4%	90.9%	Transition Tailings
GABT-06	5.9%	107.3	14.6%	66.8	61.7	95.9	88.6	30.3%	82.6%	Sand Tailings
GABT-07	35.4%	107.3	18.4%	72.7	53.2	115.7	84.6	37.1%	78.8%	Transition Tailings
GABT-08	16.5%	112.8	16.0%	71.6	62.7	107.3	93.9	33.3%	83.3%	Transition Tailings
GABT-09	37.0%	102.0	21.1%	71.8	54.7	117.6	89.7	39.0%	87.9%	Transition Tailings
GABT-10	30.7%	107.8	18.7%	82.5	66.2	127.0	102.0	35.1%	94.6%	Transition Tailings
GABT-11	49.4%	96.0	27.8%	58.3	40.6	94.5	65.7	38.3%	68.5%	Slimes Tailings
GABT-12	40.8%	101.6	22.5%	49.0	33.2	58.9	39.9	16.9%	39.3%	Slimes Tailings
GABT-13	37.5%	95.0	28.7%	68.9	48.7	114.2	80.7	39.6%	84.9%	Slimes Tailings
GABT-14	52.3%	101.5	20.9%	93.8	64.3	113.4	77.7	17.3%	76.6%	Slimes Tailings

ATTACHMENT 1

DATA SHEETS

STANDARD PROCTOR COMPACTION TESTING

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings			**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-01		NA		
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		36.60
Wt Tare & Soil Dry	(W2)		34.40
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		2.20
Wt Dry Soil	(W5=W2-W3)		34.00
Water Content (dec)	(wc=W4/W5)		0.0647
Water Content (%)	(W4/W5)*100		6.47%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1867.70	1903.50	1994.80	1987.60	1961.80		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1867.70	1903.50	1994.80	1987.60	1961.80		
Wet Density, wd (pcf)	(W3/453.6*Vm)	123.76	126.13	132.18	131.70	129.99		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	310.30	355.20	302.10	391.20	435.20		
Wt. Tare & Soil Dry	(W5)	287.80	325.40	270.10	349.60	383.10		
Wt. Tare	(W6)	6.60	6.60	6.60	6.60	6.70		
Wt. Moisture	(W7=W4-W5)	22.50	29.80	32.00	41.60	52.10		
Wt. Dry Soil	(W8=W5-W6)	281.20	318.80	263.50	343.00	376.40		
Water Content (%)	(W7/W8)*100	8.00%	9.35%	12.14%	12.13%	13.84%		
Dry Density (pcf)	(wd/(1+wc))	114.6	115.3	117.9	117.5	114.2		

Maximum Dry Density (pcf)	117.7
Optimum Moisture Content (%)	11.9
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: SAND (SP), little silt, trace gravel, fine grained, reddish brown (COVER SOIL).

USCS: SP

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)		A			
Weight of Saturated-Surface-Dry (gm)		B			
Weight of Saturated Sample in Water	(gm)	C			
Absorption of Oversize Particles (%)		[(B-A)/A]*100			
Bulk Specific Gravity		A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

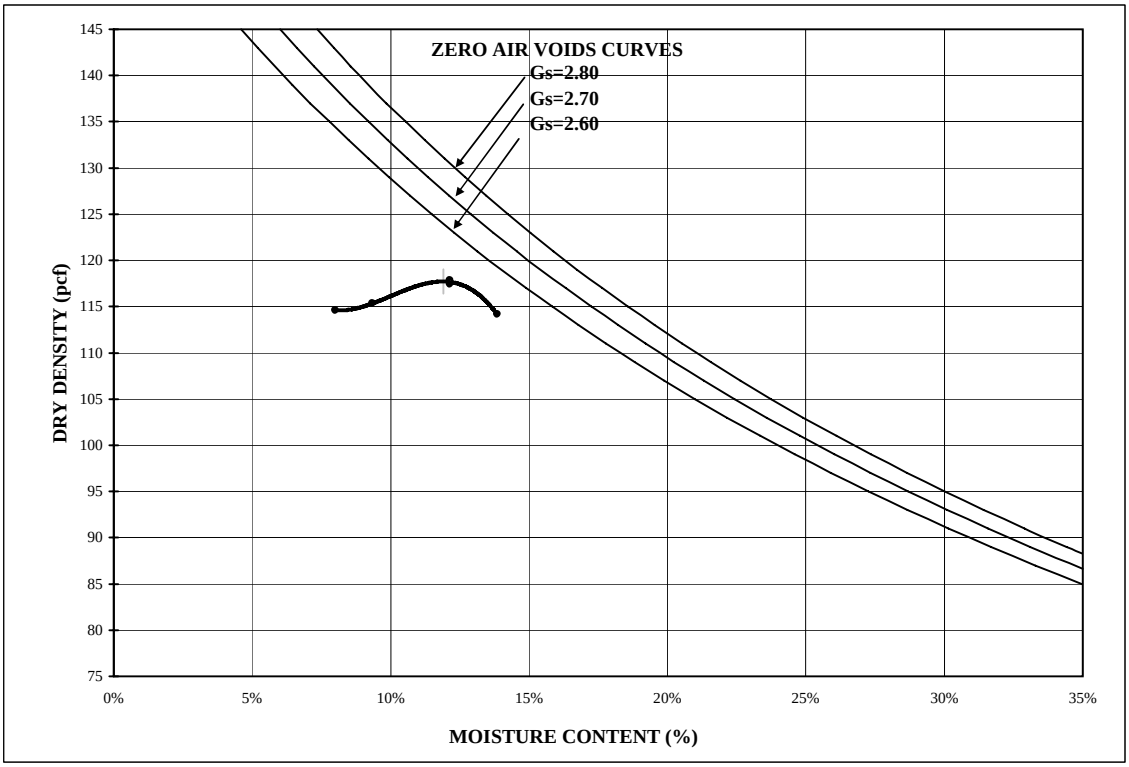
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	RPD
DATE	3/21/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-01** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	114.6	8.0%
2	115.3	9.3%
3	117.9	12.1%
4	117.5	12.1%
5	114.2	13.8%

Maximum Dry Density (pcf)	**117.7**
Optimum Moisture (%)	**11.9**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION SAND (SP), little silt, trace gravel, fine grained, reddish brown (COVER SOIL).

USCS SP

TECH	RPD
DATE	3/21/06
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings		**TEST TYPE**	ASTM D 698	Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-02	NA			
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		62.90
Wt Tare & Soil Dry	(W2)		59.10
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		3.80
Wt Dry Soil	(W5=W2-W3)		58.70
Water Content (dec)	(wc=W4/W5)		0.0647
Water Content (%)	(W4/W5)*100		6.47%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1771.80	1804.70	1868.40	1899.50	1879.00		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1771.80	1804.70	1868.40	1899.50	1879.00		
Wet Density, wd (pcf)	(W3/453.6*Vm)	117.40	119.58	123.81	125.87	124.51		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	290.50	290.80	333.30	368.10	400.00		
Wt. Tare & Soil Dry	(W5)	265.20	263.70	294.00	317.40	341.50		
Wt. Tare	(W6)	6.60	6.60	6.70	6.70	6.60		
Wt. Moisture	(W7=W4-W5)	25.30	27.10	39.30	50.70	58.50		
Wt. Dry Soil	(W8=W5-W6)	258.60	257.10	287.30	310.70	334.90		
Water Content (%)	(W7/W8)*100	9.78%	10.54%	13.68%	16.32%	17.47%		
Dry Density (pcf)	(wd/(1+wc))	106.9	108.2	108.9	108.2	106.0		

Maximum Dry Density (pcf)	109.2
Optimum Moisture Content (%)	13.8
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: SAND (SP), some silt, poorly graded, yellowish brown (COVER SOIL).

USCS: SP

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

AS-RECEIVED MOISTURE CONTENT: --

Weight of Oven Dry Sample (gm)		**A**			
Weight of Saturated-Surface-Dry (gm)		**B**			
Weight of Saturated Sample in Water	(gm)	**C**			
Absorption of Oversize Particles (%)	[(B-A)/A]*100				
Bulk Specific Gravity	A/(B-C)				

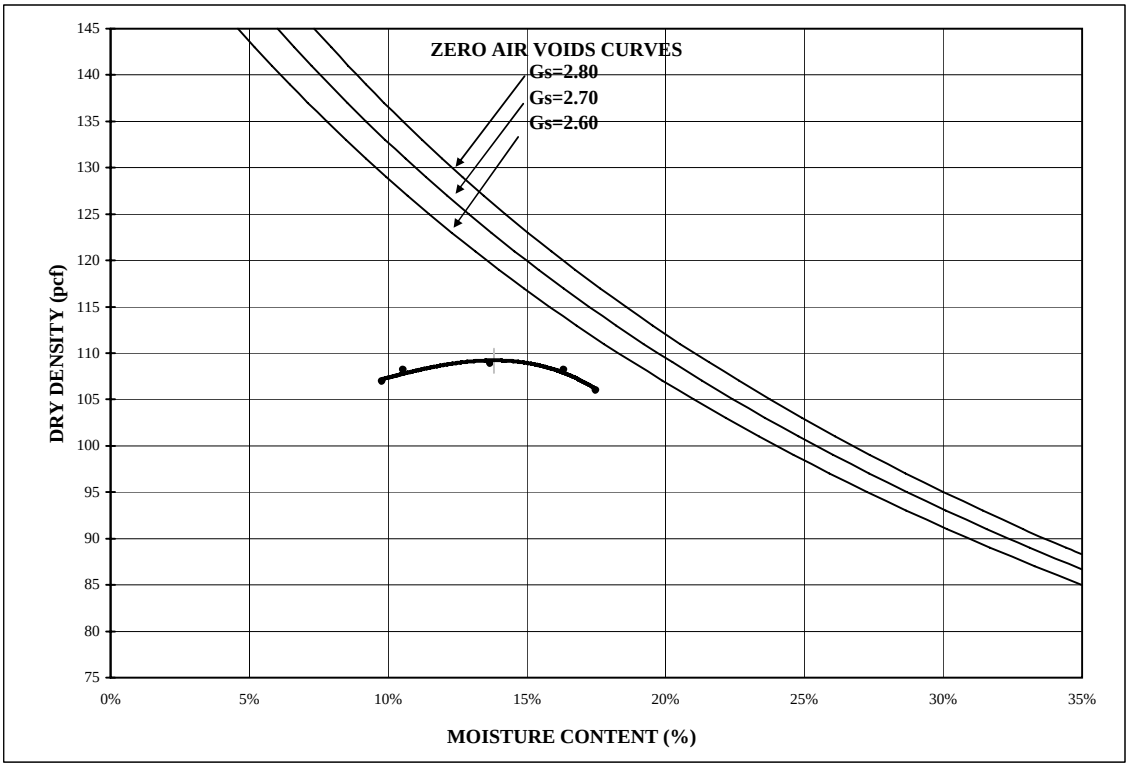
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	LAQ
DATE	3/23/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-02** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	106.9	9.8%
2	108.2	10.5%
3	108.9	13.7%
4	108.2	16.3%
5	106.0	17.5%

Maximum Dry Density (pcf)	**109.2**
Optimum Moisture (%)	**13.8**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION SAND (SP), some silt, poorly graded, yellowish brown (COVER SOIL).

USCS SP

TECH	LAQ
DATE	3/23/06
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings			**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-03		NA		
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		42.30
Wt Tare & Soil Dry	(W2)		38.70
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		3.60
Wt Dry Soil	(W5=W2-W3)		38.30
Water Content (dec)	(wc=W4/W5)		0.0940
Water Content (%)	(W4/W5)*100		9.40%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1639.30	1705.60	1802.10	1772.60	1770.10		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1639.30	1705.60	1802.10	1772.60	1770.10		
Wet Density, wd (pcf)	(W3/453.6*Vm)	108.62	113.02	119.41	117.46	117.29		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	245.90	274.40	236.90	252.10	260.30		
Wt. Tare & Soil Dry	(W5)	225.90	248.50	212.60	222.20	228.30		
Wt. Tare	(W6)	6.60	6.60	6.70	6.60	6.60		
Wt. Moisture	(W7=W4-W5)	20.00	25.90	24.30	29.90	32.00		
Wt. Dry Soil	(W8=W5-W6)	219.30	241.90	205.90	215.60	221.70		
Water Content (%)	(W7/W8)*100	9.12%	10.71%	11.80%	13.87%	14.43%		
Dry Density (pcf)	(wd/(1+wc))	99.5	102.1	106.8	103.2	102.5		

Maximum Dry Density (pcf)	106.3
Optimum Moisture Content (%)	12.7
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: SAND (SP), some silt, poorly graded, moist, yellowish brown (SAND TAILINGS).

USCS: SP

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	**A**			
Weight of Saturated-Surface-Dry (gm)	**B**			
Weight of Saturated Sample in Water (gm)	**C**			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

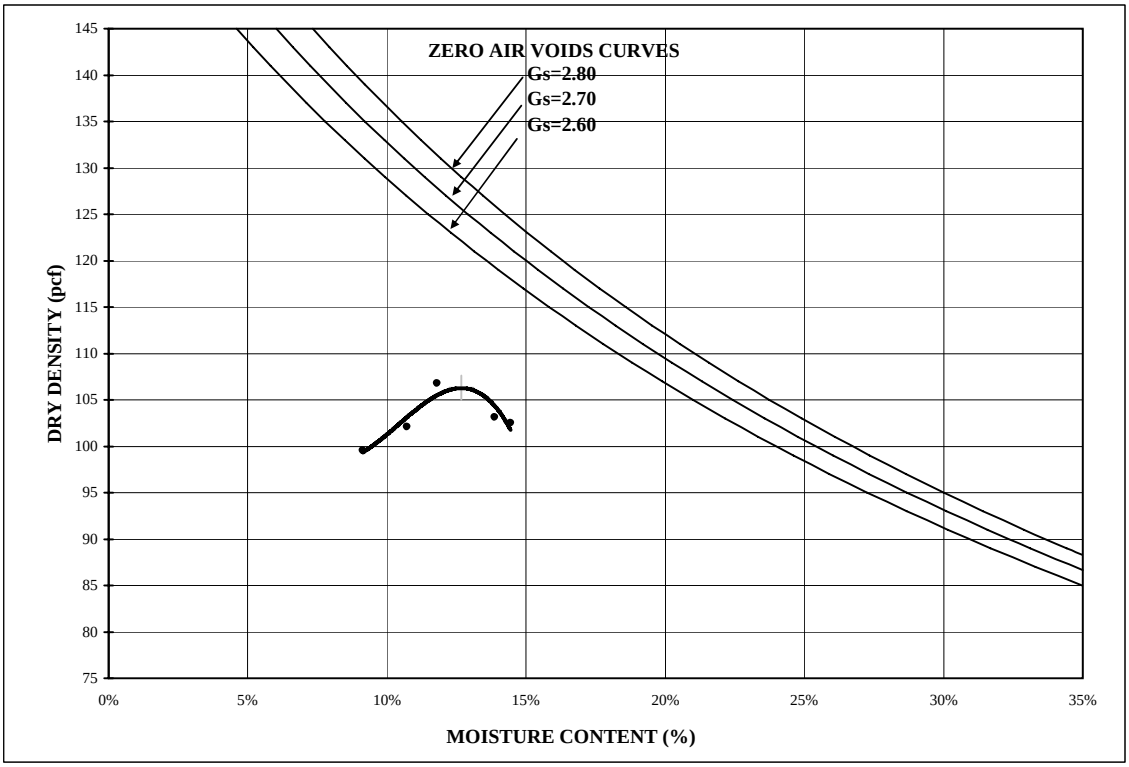
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	LAQ
DATE	3/21/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-03** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	99.5	9.1%
2	102.1	10.7%
3	106.8	11.8%
4	103.2	13.9%
5	102.5	14.4%

Maximum Dry Density (pcf)	**106.3**
Optimum Moisture (%)	**12.7**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION SAND (SP), some silt, poorly graded, moist, yellowish brown (SAND TAILINGS).

USCS SP

TECH	LAQ
DATE	3/21/06
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings	TEST TYPE	ASTM D 698 Method A
PROJECT NUMBER	0532269		
SAMPLE IDENTITY	GABT-04 NA		
SAMPLE TYPE	Composite		

	TYPE COMPACTOR	PREPARATION	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	TYPE PROCTOR	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		COARSE FRACTION	TOTAL SAMPLE
Wt Tare & Soil Wet	(W1)		45.50
Wt Tare & Soil Dry	(W2)		45.00
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		0.50
Wt Dry Soil	(W5=W2-W3)		44.60
Water Content (dec)	(wc=W4/W5)		0.0112
Water Content (%)	(W4/W5)*100		1.12%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		1	2	3	4	5	6	7
Wt. Soil & Mold	(W1)	1676.00	1749.40	1797.00	1819.60	1830.00		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1676.00	1749.40	1797.00	1819.60	1830.00		
Wet Density, wd (pcf)	(W3/453.6*Vm)	111.06	115.92	119.07	120.57	121.26		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	295.50	248.00	254.40	353.50	264.50		
Wt. Tare & Soil Dry	(W5)	268.60	220.80	222.70	305.60	222.80		
Wt. Tare	(W6)	6.60	6.80	6.70	6.70	6.80		
Wt. Moisture	(W7=W4-W5)	26.90	27.20	31.70	47.90	41.70		
Wt. Dry Soil	(W8=W5-W6)	262.00	214.00	216.00	298.90	216.00		
Water Content (%)	(W7/W8)*100	10.27%	12.71%	14.68%	16.03%	19.31%		
Dry Density (pcf)	(wd/(1+wc))	100.7	102.8	103.8	103.9	101.6		

Maximum Dry Density (pcf)	103.9
Optimum Moisture Content (%)	15.6
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: SAND (SP), trace to little silt, trace clay, poorly graded, moist, light brown (SAND TAILINGS).

USCS: SP

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

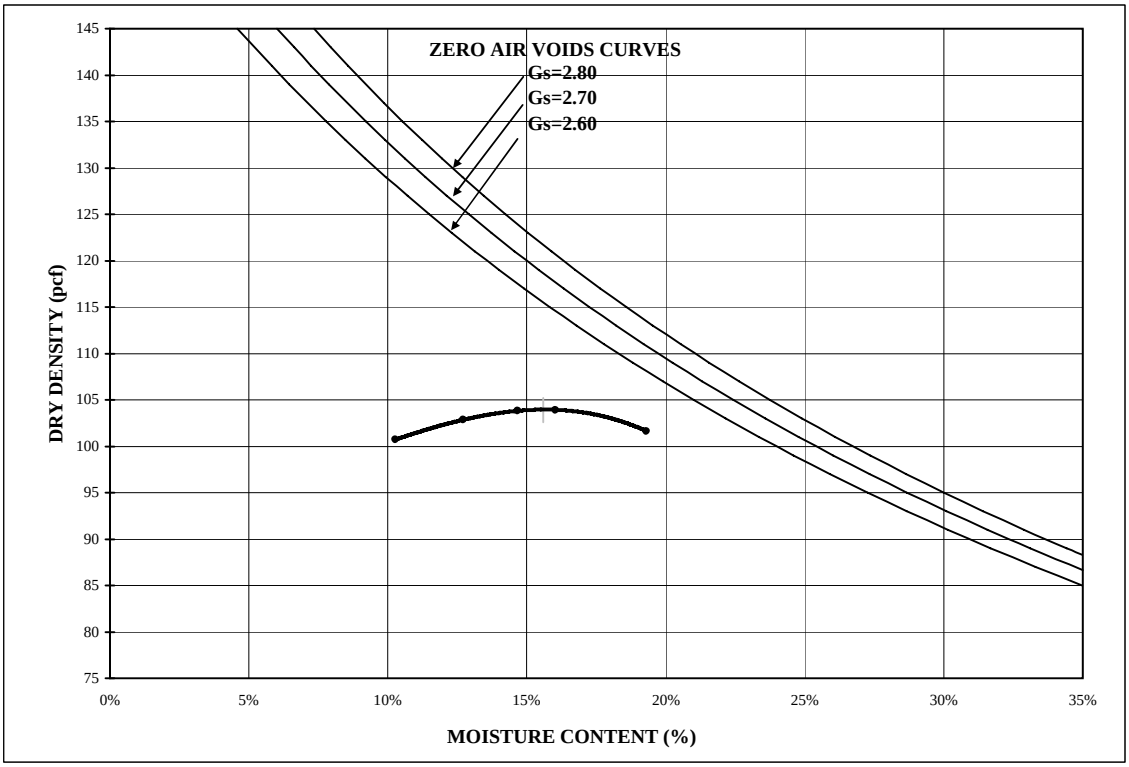
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	LAQ
DATE	3/21/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-04** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	100.7	10.3%
2	102.8	12.7%
3	103.8	14.7%
4	103.9	16.0%
5	101.6	19.3%

Maximum Dry Density (pcf)	**103.9**
Optimum Moisture (%)	**15.6**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION SAND (SP), trace to little silt, trace clay, poorly graded, moist, light brown (SAND TAILINGS).

USCS SP

TECH	LAQ
DATE	3/21/06
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings			**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-05		NA		
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		73.80
Wt Tare & Soil Dry	(W2)		61.60
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		12.20
Wt Dry Soil	(W5=W2-W3)		61.20
Water Content (dec)	(wc=W4/W5)		0.1993
Water Content (%)	(W4/W5)*100		19.93%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1847.20	1923.60	1935.80	1898.20	1880.30		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1847.20	1923.60	1935.80	1898.20	1880.30		
Wet Density, wd (pcf)	(W3/453.6*Vm)	122.40	127.46	128.27	125.78	124.59		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	285.30	291.90	312.40	272.10	272.00		
Wt. Tare & Soil Dry	(W5)	256.80	259.70	274.20	235.70	232.70		
Wt. Tare	(W6)	6.60	6.60	8.10	8.10	6.60		
Wt. Moisture	(W7=W4-W5)	28.50	32.20	38.20	36.40	39.30		
Wt. Dry Soil	(W8=W5-W6)	250.20	253.10	266.10	227.60	226.10		
Water Content (%)	(W7/W8)*100	11.39%	12.72%	14.36%	15.99%	17.38%		
Dry Density (pcf)	(wd/(1+wc))	109.9	113.1	112.2	108.4	106.1		

Maximum Dry Density (pcf)	113.3
Optimum Moisture Content (%)	13.1
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: Clayey SAND (SC), poorly graded, saturated, reddish brown (TRANSITION TAILINGS).

USCS: SC

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

AS-RECEIVED MOISTURE CONTENT: --

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

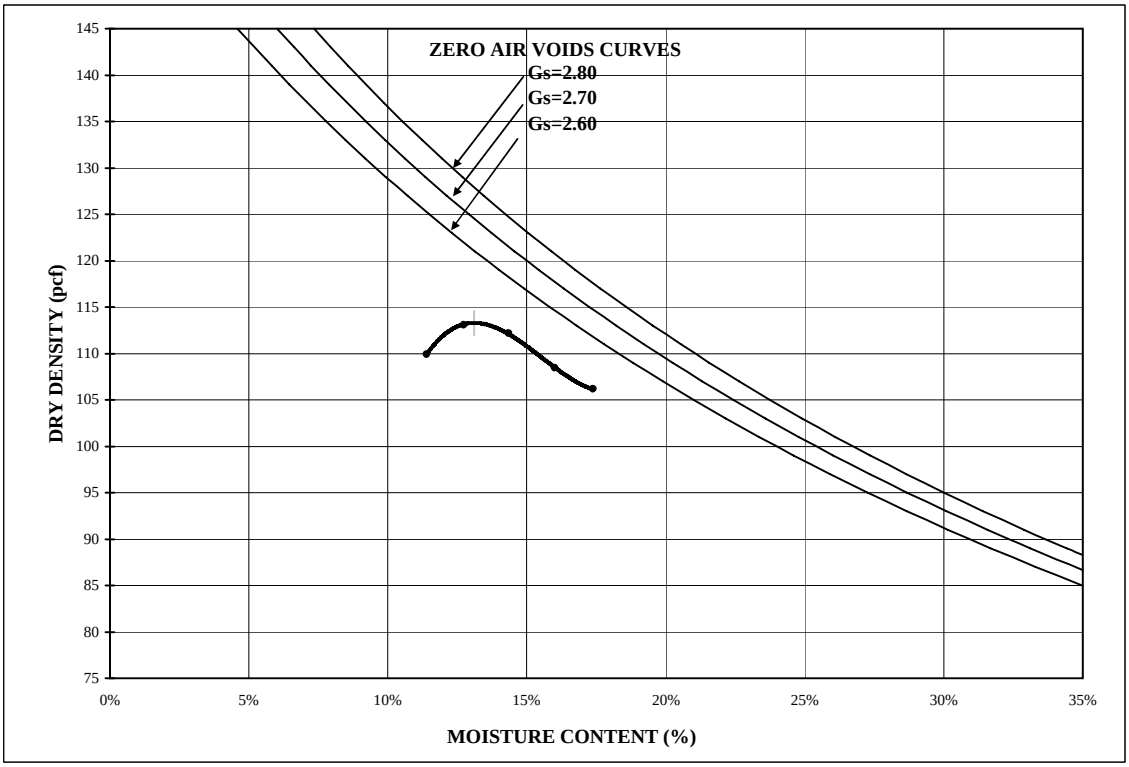
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	LAQ
DATE	3/21/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-05** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	109.9	11.4%
2	113.1	12.7%
3	112.2	14.4%
4	108.4	16.0%
5	106.1	17.4%

Maximum Dry Density (pcf)	**113.3**
Optimum Moisture (%)	**13.1**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION Clayey SAND (SC), poorly graded, saturated, reddish brown (TRANSITION TAILINGS).

USCS SC

TECH	LAQ
DATE	3/21/06
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings	**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269		
SAMPLE IDENTITY	GABT-06	NA	
SAMPLE TYPE	Composite		

TYPE COMPACTOR: Mechanical

PREPARATION: Wet Method

TYPE PROCTOR: Standard

5.5 -lbf. Rammer with 12 inch drop

Mold Number	217
Mold Weight (gm)	0.00
Mold Diameter (in.)	4.000
Mold Height (in.)	4.575
Mold Volume (cu.ft.)	0.0333

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		COARSE FRACTION	TOTAL SAMPLE
Wt Tare & Soil Wet	(W1)		56.10
Wt Tare & Soil Dry	(W2)		53.00
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		3.10
Wt Dry Soil	(W5=W2-W3)		52.60
Water Content (dec)	(wc=W4/W5)		0.0589
Water Content (%)	(W4/W5)*100		5.89%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		1	2	3	4	5	6	7
Wt. Soil & Mold	(W1)	1691.40	1811.30	1855.20	1815.50	1783.30		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1691.40	1811.30	1855.20	1815.50	1783.30		
Wet Density, wd (pcf)	(W3/453.6*Vm)	112.08	120.02	122.93	120.30	118.17		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	253.40	303.00	379.80	361.20	392.50		
Wt. Tare & Soil Dry	(W5)	227.40	268.00	332.00	309.50	334.50		
Wt. Tare	(W6)	6.70	6.60	6.50	6.70	6.60		
Wt. Moisture	(W7=W4-W5)	26.00	35.00	47.80	51.70	58.00		
Wt. Dry Soil	(W8=W5-W6)	220.70	261.40	325.50	302.80	327.90		
Water Content (%)	(W7/W8)*100	11.78%	13.39%	14.69%	17.07%	17.69%		
Dry Density (pcf)	(wd/(1+wc))	100.3	105.8	107.2	102.8	100.4		

Maximum Dry Density (pcf)	107.3
Optimum Moisture Content (%)	14.6
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: SAND (SP), little to some silt, saturated, reddish brown (SAND TAILINGS).

USCS: SP

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

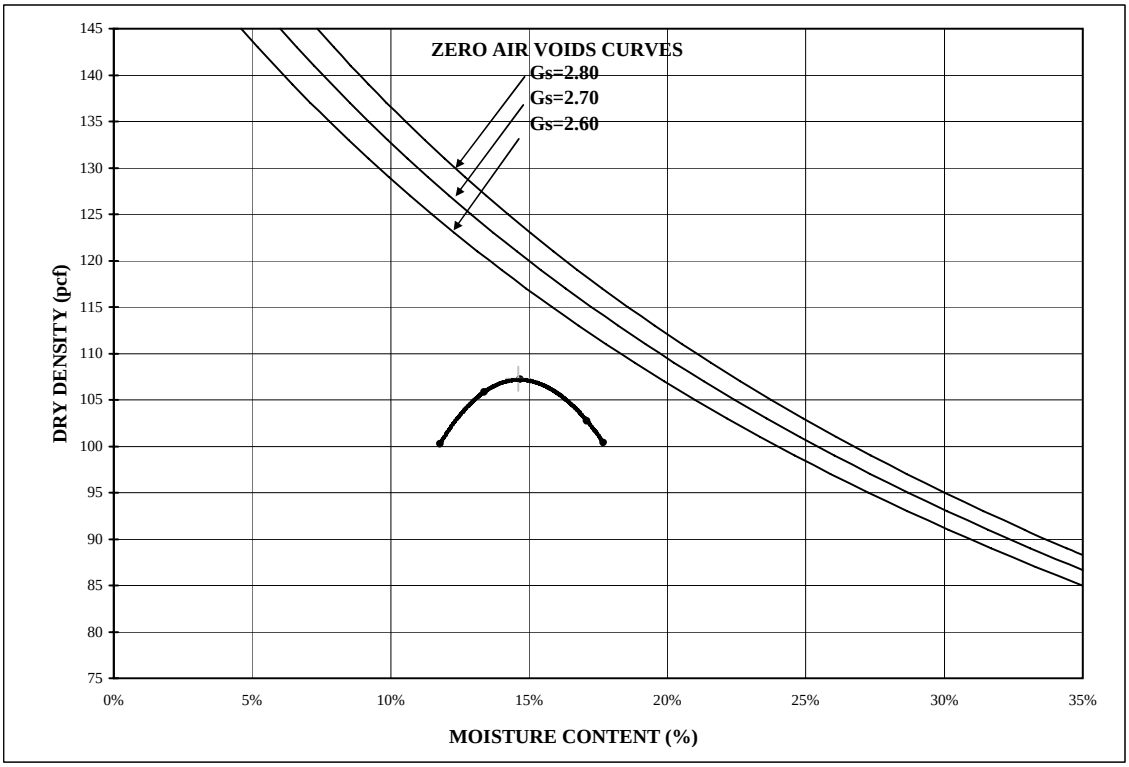
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	LAQ
DATE	3/21/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-06** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	100.3	11.8%
2	105.8	13.4%
3	107.2	14.7%
4	102.8	17.1%
5	100.4	17.7%

Maximum Dry Density (pcf)	**107.3**
Optimum Moisture (%)	**14.6**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION SAND (SP), little to some silt, saturated, reddish brown (SAND TAILINGS).

USCS SP

TECH LAQ
DATE 3/21/06
REVIEW LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings	**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269		
SAMPLE IDENTITY	GABT-07 NA		
SAMPLE TYPE	Composite		

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		56.60
Wt Tare & Soil Dry	(W2)		41.90
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		14.70
Wt Dry Soil	(W5=W2-W3)		41.50
Water Content (dec)	(wc=W4/W5)		0.3542
Water Content (%)	(W4/W5)*100		35.42%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1794.70	1864.60	1909.10	1898.50	1858.50	1836.10	
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00	0.00	
Wt. of Wet Soil	(W3=W1-W2)	1794.70	1864.60	1909.10	1898.50	1858.50	1836.10	
Wet Density, wd (pcf)	(W3/453.6*Vm)	118.92	123.55	126.50	125.80	123.15	121.67	
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	330.10	279.60	369.50	368.40	384.40	409.50	
Wt. Tare & Soil Dry	(W5)	287.10	241.30	305.10	299.70	307.60	325.10	
Wt. Tare	(W6)	6.60	6.70	6.60	6.60	6.60	6.60	
Wt. Moisture	(W7=W4-W5)	43.00	38.30	64.40	68.70	76.80	84.40	
Wt. Dry Soil	(W8=W5-W6)	280.50	234.60	298.50	293.10	301.00	318.50	
Water Content (%)	(W7/W8)*100	15.33%	16.33%	21.57%	23.44%	25.51%	26.50%	
Dry Density (pcf)	(wd/(1+wc))	103.1	106.2	104.1	101.9	98.1	96.2	

Maximum Dry Density (pcf)	107.3
Optimum Moisture Content (%)	18.4
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: Sandy SILT (ML), moist, reddish brown (TRANSITION TAILINGS).

USCS: ML

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	**A**			
Weight of Saturated-Surface-Dry (gm)	**B**			
Weight of Saturated Sample in Water (gm)	**C**			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

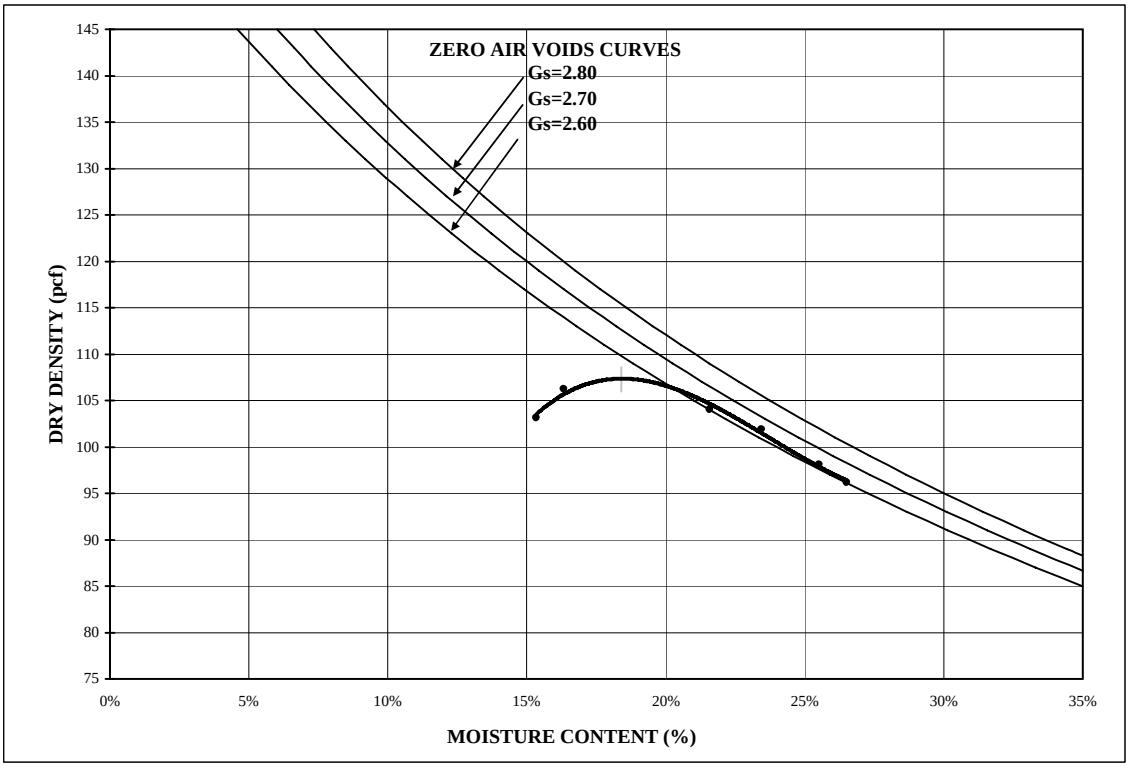
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-07** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	103.1	15.3%
2	106.2	16.3%
3	104.1	21.6%
4	101.9	23.4%
5	98.1	25.5%
6	96.2	26.5%

Maximum Dry Density (pcf)	**107.3**
Optimum Moisture (%)	**18.4**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION Sandy SILT (ML), moist, reddish brown (TRANSITION TAILINGS).

USCS ML

TECH RPD
DATE 3/23/06
REVIEW LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings	**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269		
SAMPLE IDENTITY	GABT-08 NA		
SAMPLE TYPE	Composite		

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		53.50
Wt Tare & Soil Dry	(W2)		46.00
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		7.50
Wt Dry Soil	(W5=W2-W3)		45.60
Water Content (dec)	(wc=W4/W5)		0.1645
Water Content (%)	(W4/W5)*100		16.45%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1834.70	1904.00	1955.40	1971.90	1948.90		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1834.70	1904.00	1955.40	1971.90	1948.90		
Wet Density, wd (pcf)	(W3/453.6*Vm)	121.57	126.16	129.57	130.66	129.14		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	262.40	274.80	395.00	286.10	462.60		
Wt. Tare & Soil Dry	(W5)	234.80	242.00	343.50	247.80	393.40		
Wt. Tare	(W6)	6.60	6.40	6.60	6.60	6.60		
Wt. Moisture	(W7=W4-W5)	27.60	32.80	51.50	38.30	69.20		
Wt. Dry Soil	(W8=W5-W6)	228.20	235.60	336.90	241.20	386.80		
Water Content (%)	(W7/W8)*100	12.09%	13.92%	15.29%	15.88%	17.89%		
Dry Density (pcf)	(wd/(1+wc))	108.5	110.7	112.4	112.8	109.5		

Maximum Dry Density (pcf)	112.8
Optimum Moisture Content (%)	16.0
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: Sandy SILT (ML), little to some clay, moist, reddish brown (TRANSITION TAILINGS).

USCS: ML

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

AS-RECEIVED MOISTURE CONTENT: --

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

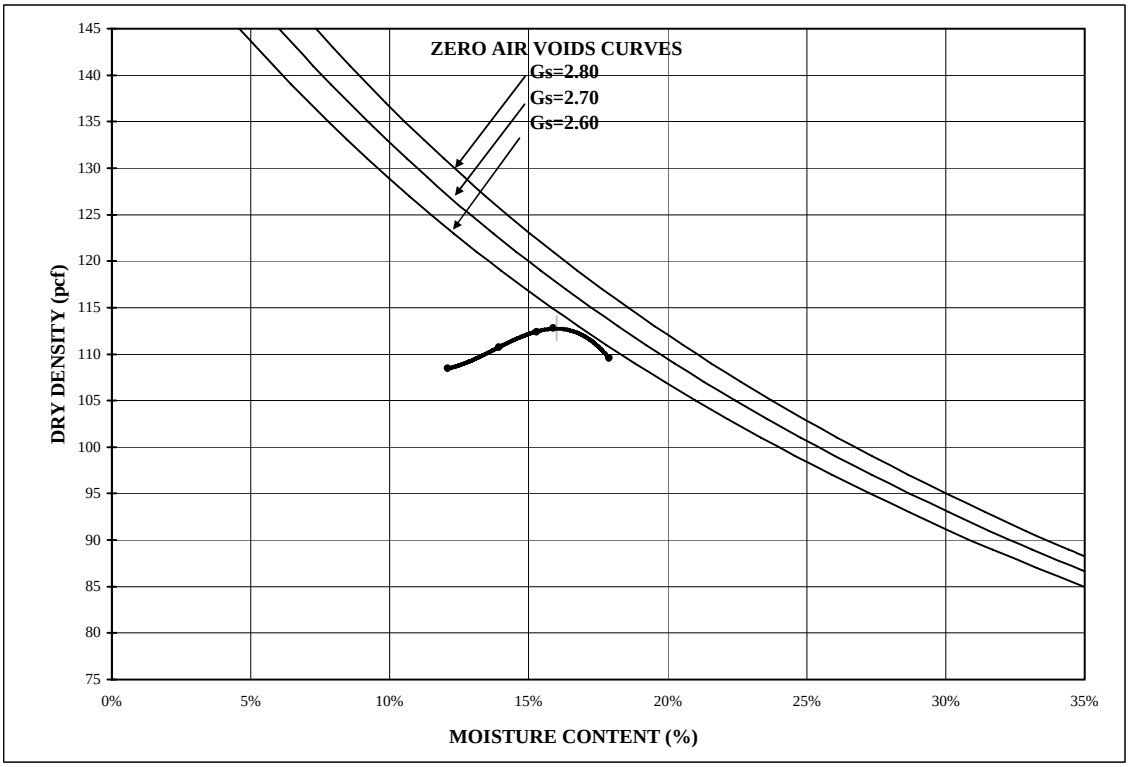
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	RPD
DATE	3/22/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-08** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	108.5	12.1%
2	110.7	13.9%
3	112.4	15.3%
4	112.8	15.9%
5	109.5	17.9%

Maximum Dry Density (pcf)	**112.8**
Optimum Moisture (%)	**16.0**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION Sandy SILT (ML), little to some clay, moist, reddish brown (TRANSITION TAILINGS).

USCS ML

TECH	RPD
DATE	38798
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings		**TEST TYPE**	ASTM D 698	Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-09	NA			
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		39.30
Wt Tare & Soil Dry	(W2)		28.80
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		10.50
Wt Dry Soil	(W5=W2-W3)		28.40
Water Content (dec)	(wc=W4/W5)		0.3697
Water Content (%)	(W4/W5)*100		36.97%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1760.40	1808.40	1836.80	1853.90	1871.10	1821.90	
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00	0.00	
Wt. of Wet Soil	(W3=W1-W2)	1760.40	1808.40	1836.80	1853.90	1871.10	1821.90	
Wet Density, wd (pcf)	(W3/453.6*Vm)	116.65	119.83	121.71	122.84	123.98	120.72	
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	328.20	287.60	451.70	399.20	357.80	409.00	
Wt. Tare & Soil Dry	(W5)	281.60	243.10	378.30	332.10	294.00	328.30	
Wt. Tare	(W6)	8.10	6.60	6.50	6.50	6.50	6.80	
Wt. Moisture	(W7=W4-W5)	46.60	44.50	73.40	67.10	63.80	80.70	
Wt. Dry Soil	(W8=W5-W6)	273.50	236.50	371.80	325.60	287.50	321.50	
Water Content (%)	(W7/W8)*100	17.04%	18.82%	19.74%	20.61%	22.19%	25.10%	
Dry Density (pcf)	(wd/(1+wc))	99.7	100.9	101.6	101.9	101.5	96.5	

Maximum Dry Density (pcf)	102.0
Optimum Moisture Content (%)	21.1
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: Sandy CLAY (CL), some silt, medium plasticity, grayish brown, moist (TRANSITION TAILINGS).

USCS: CL

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

AS-RECEIVED MOISTURE CONTENT: --

Weight of Oven Dry Sample (gm)	A				
Weight of Saturated-Surface-Dry (gm)	B				
Weight of Saturated Sample in Water (gm)	C				
Absorption of Oversize Particles (%)	[(B-A)/A]*100				
Bulk Specific Gravity	A/(B-C)				

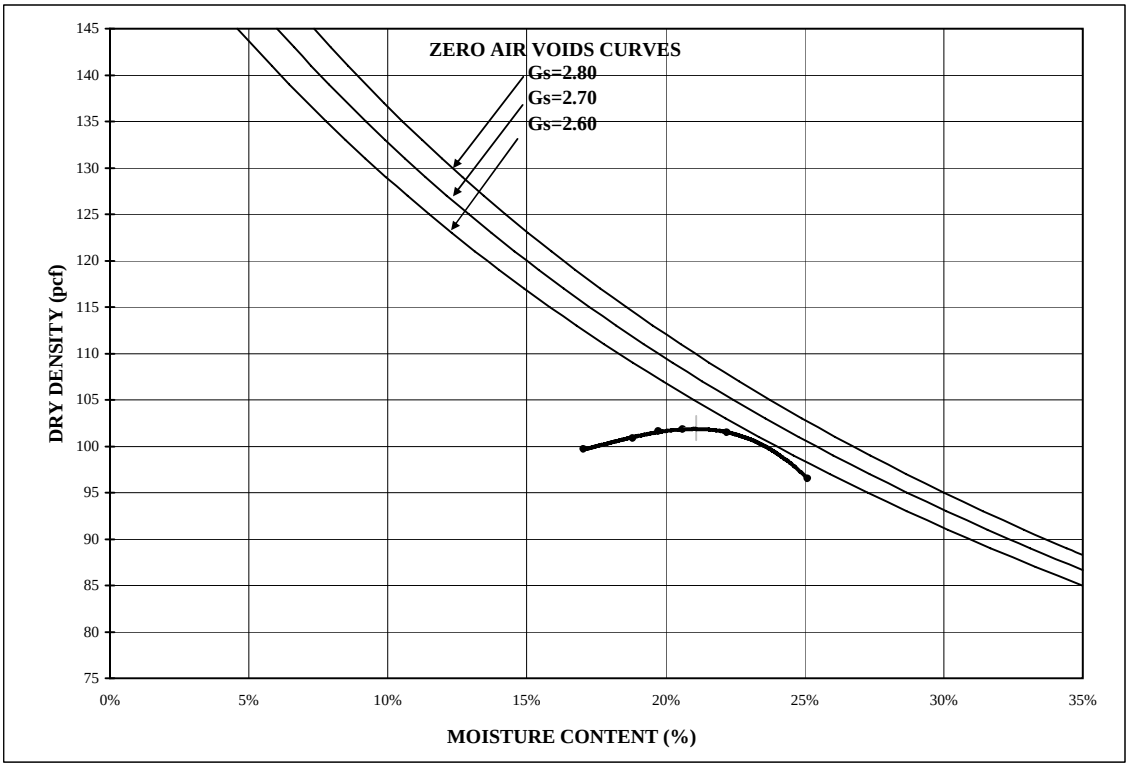
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	RPD
DATE	2/23/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-09** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	99.7	17.0%
2	100.9	18.8%
3	101.6	19.7%
4	101.9	20.6%
5	101.5	22.2%
6	96.5	25.1%

Maximum Dry Density (pcf)	**102.0**
Optimum Moisture (%)	**21.1**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION Sandy CLAY (CL), some silt, medium plasticity, grayish brown, moist (TRANSITION TAILINGS).

USCS CL

TECH RPD
DATE 2/23/06
REVIEW LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings		**TEST TYPE**	ASTM D 698	Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-10	NA			
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		48.50
Wt Tare & Soil Dry	(W2)		37.20
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		11.30
Wt Dry Soil	(W5=W2-W3)		36.80
Water Content (dec)	(wc=W4/W5)		0.3071
Water Content (%)	(W4/W5)*100		30.71%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1841.40	1897.30	1945.90	1923.40	1872.10		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1841.40	1897.30	1945.90	1923.40	1872.10		
Wet Density, wd (pcf)	(W3/453.6*Vm)	122.02	125.72	128.94	127.45	124.05		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	374.50	379.20	392.60	295.20	373.90		
Wt. Tare & Soil Dry	(W5)	323.30	323.30	330.90	246.30	307.30		
Wt. Tare	(W6)	6.70	6.70	6.80	6.60	6.50		
Wt. Moisture	(W7=W4-W5)	51.20	55.90	61.70	48.90	66.60		
Wt. Dry Soil	(W8=W5-W6)	316.60	316.60	324.10	239.70	300.80		
Water Content (%)	(W7/W8)*100	16.17%	17.66%	19.04%	20.40%	22.14%		
Dry Density (pcf)	(wd/(1+wc))	105.0	106.9	108.3	105.9	101.6		

Maximum Dry Density (pcf)	107.8
Optimum Moisture Content (%)	18.7
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: Sandy CLAY (CL), some silt, medium plasticity, wet, dark gray (TRANSITION TAILINGS).

USCS: CL

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)		**A**			
Weight of Saturated-Surface-Dry (gm)		**B**			
Weight of Saturated Sample in Water	(gm)	**C**			
Absorption of Oversize Particles (%)		[(B-A)/A]*100			
Bulk Specific Gravity		A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

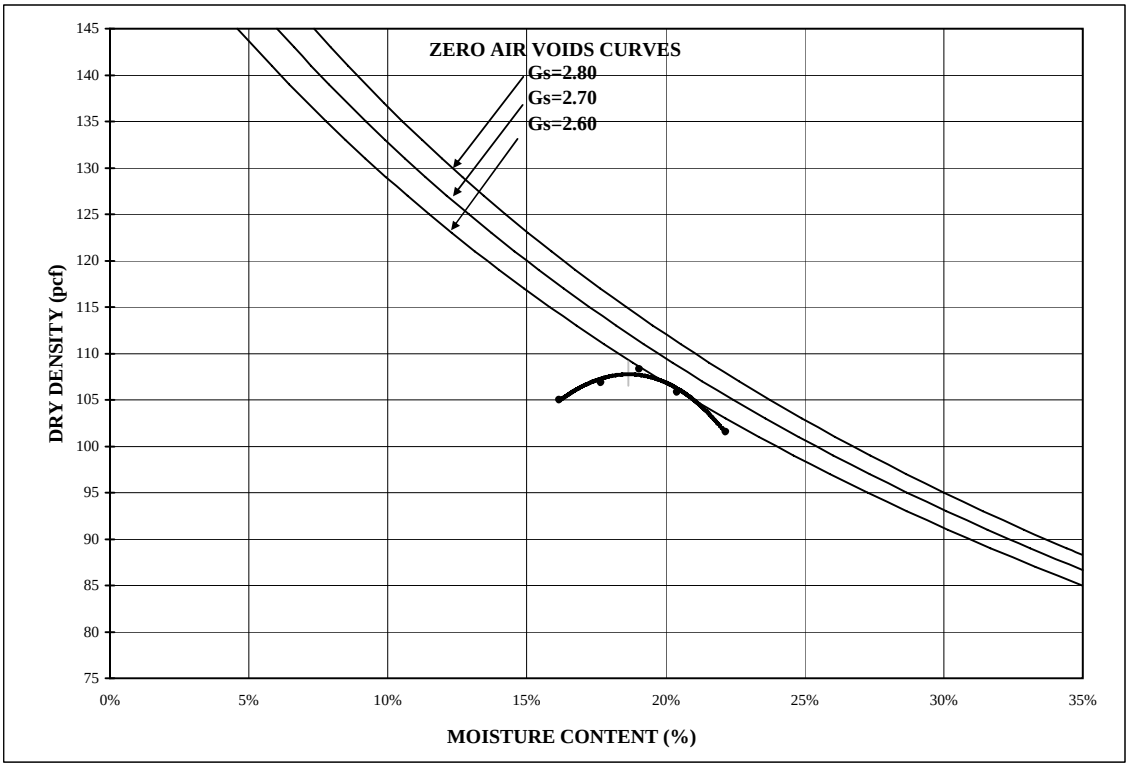
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	RPD
DATE	3/21/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-10** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	105.0	16.2%
2	106.9	17.7%
3	108.3	19.0%
4	105.9	20.4%
5	101.6	22.1%

Maximum Dry Density (pcf)	**107.8**
Optimum Moisture (%)	**18.7**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION Sandy CLAY (CL), some silt, medium plasticity, wet, dark gray (TRANSITION TAILINGS).

USCS CL

TECH RPD
DATE 3/21/06
REVIEW LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings			**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-11		NA		
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		52.70
Wt Tare & Soil Dry	(W2)		35.40
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		17.30
Wt Dry Soil	(W5=W2-W3)		35.00
Water Content (dec)	(wc=W4/W5)		0.4943
Water Content (%)	(W4/W5)*100		49.43%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1661.90	1765.00	1841.40	1785.60	1785.40		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1661.90	1765.00	1841.40	1785.60	1785.40		
Wet Density, wd (pcf)	(W3/453.6*Vm)	110.12	116.95	122.02	118.32	118.31		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	462.20	390.60	316.30	404.10	333.20		
Wt. Tare & Soil Dry	(W5)	379.90	313.00	250.20	311.60	256.60		
Wt. Tare	(W6)	6.60	6.60	6.60	6.60	6.60		
Wt. Moisture	(W7=W4-W5)	82.30	77.60	66.10	92.50	76.60		
Wt. Dry Soil	(W8=W5-W6)	373.30	306.40	243.60	305.00	250.00		
Water Content (%)	(W7/W8)*100	22.05%	25.33%	27.13%	30.33%	30.64%		
Dry Density (pcf)	(wd/(1+wc))	90.2	93.3	96.0	90.8	90.6		

Maximum Dry Density (pcf)	96.0
Optimum Moisture Content (%)	27.8
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: SILT (ML), low plasticity, moist, dark brown (SLIMES TAILINGS).

USCS: ML

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	A			
Weight of Saturated-Surface-Dry (gm)	B			
Weight of Saturated Sample in Water (gm)	C			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

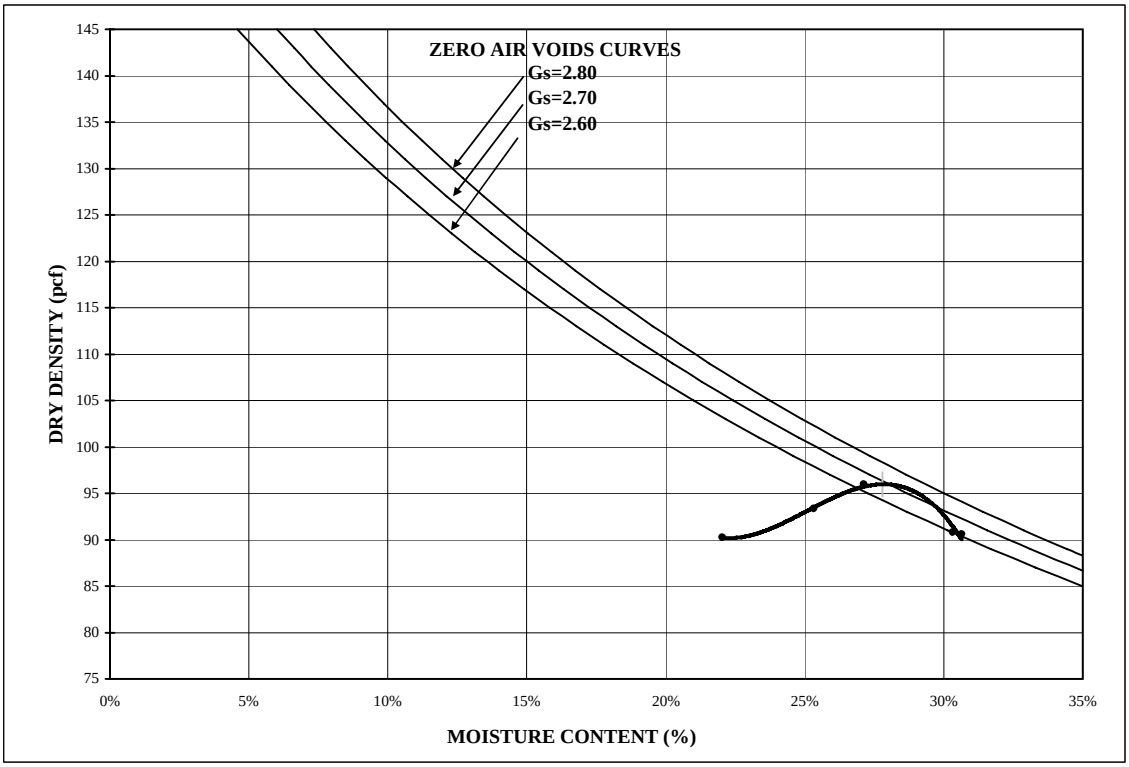
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	RPD
DATE	03/23/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-11** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	90.2	22.0%
2	93.3	25.3%
3	96.0	27.1%
4	90.8	30.3%
5	90.6	30.6%

Maximum Dry Density (pcf)	**96.0**
Optimum Moisture (%)	**27.8**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION SILT (ML), low plasticity, moist, dark brown (SLIMES TAILINGS).

USCS ML

TECH	RPD
DATE	03/23/06
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings			**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-12		NA		
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		47.30
Wt Tare & Soil Dry	(W2)		33.70
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		13.60
Wt Dry Soil	(W5=W2-W3)		33.30
Water Content (dec)	(wc=W4/W5)		0.4084
Water Content (%)	(W4/W5)*100		40.84%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1777.40	1810.50	1873.90	1872.10	1843.20		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1777.40	1810.50	1873.90	1872.10	1843.20		
Wet Density, wd (pcf)	(W3/453.6*Vm)	117.78	119.97	124.17	124.05	122.14		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	289.60	287.80	286.20	293.50	403.60		
Wt. Tare & Soil Dry	(W5)	245.00	240.40	235.80	238.20	324.60		
Wt. Tare	(W6)	6.70	6.60	6.60	6.60	6.60		
Wt. Moisture	(W7=W4-W5)	44.60	47.40	50.40	55.30	79.00		
Wt. Dry Soil	(W8=W5-W6)	238.30	233.80	229.20	231.60	318.00		
Water Content (%)	(W7/W8)*100	18.72%	20.27%	21.99%	23.88%	24.84%		
Dry Density (pcf)	(wd/(1+wc))	99.2	99.7	101.8	100.1	97.8		

Maximum Dry Density (pcf)	101.6
Optimum Moisture Content (%)	22.5
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: Silty Clay (CL), medium plasticity, moist, grayish brown (SLIMES TAILINGS).

USCS: CL

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	**A**			
Weight of Saturated-Surface-Dry (gm)	**B**			
Weight of Saturated Sample in Water (gm)	**C**			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

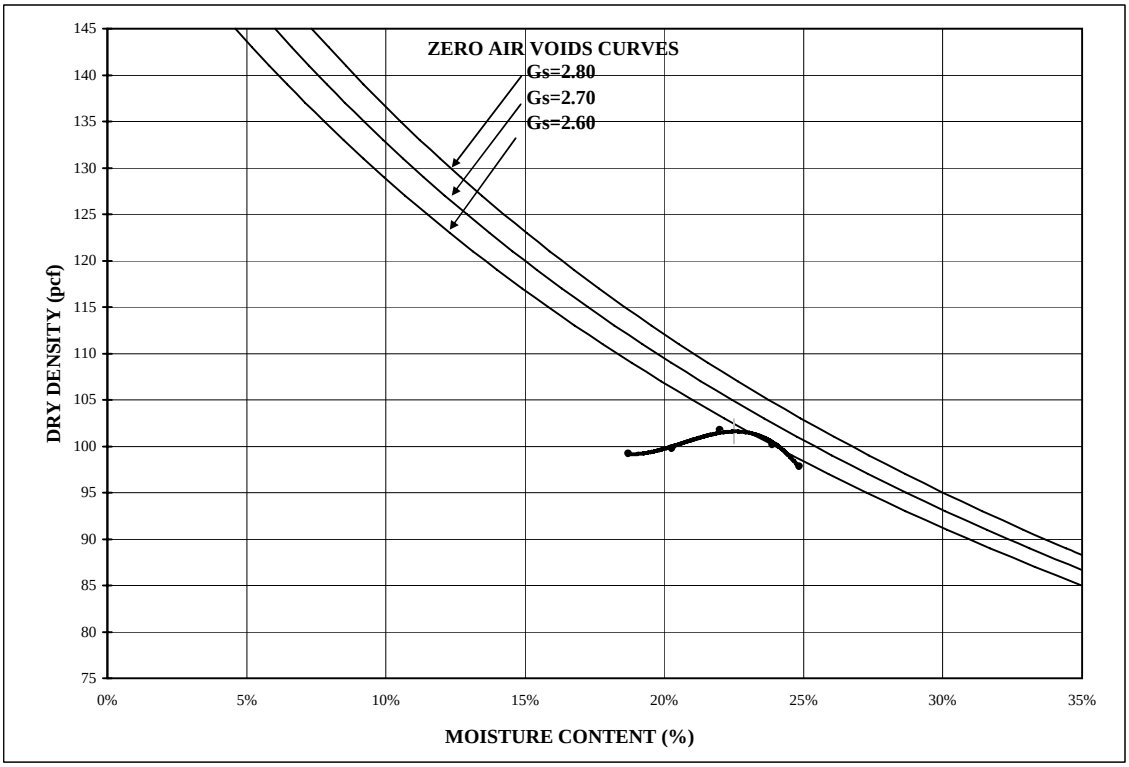
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-12** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	99.2	18.7%
2	99.7	20.3%
3	101.8	22.0%
4	100.1	23.9%
5	97.8	24.8%

Maximum Dry Density (pcf)	**101.6**
Optimum Moisture (%)	**22.5**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION Silty Clay (CL), medium plasticity, moist, grayish brown (SLIMES TAILINGS).

USCS CL

TECH RPD
DATE 3/23/06
REVIEW LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings		**TEST TYPE**	ASTM D 698	Method A
PROJECT NUMBER	0532269				
SAMPLE IDENTITY	GABT-13	NA			
SAMPLE TYPE	Composite				

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		46.60
Wt Tare & Soil Dry	(W2)		34.00
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		12.60
Wt Dry Soil	(W5=W2-W3)		33.60
Water Content (dec)	(wc=W4/W5)		0.3750
Water Content (%)	(W4/W5)*100		37.50%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1804.20	1827.40	1845.30	1857.20	1820.60		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1804.20	1827.40	1845.30	1857.20	1820.60		
Wet Density, wd (pcf)	(W3/453.6*Vm)	119.55	121.09	122.27	123.06	120.64		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	269.40	252.00	314.80	287.00	275.60		
Wt. Tare & Soil Dry	(W5)	214.30	199.10	244.20	222.40	210.50		
Wt. Tare	(W6)	6.70	6.70	6.70	6.70	6.70		
Wt. Moisture	(W7=W4-W5)	55.10	52.90	70.60	64.60	65.10		
Wt. Dry Soil	(W8=W5-W6)	207.60	192.40	237.50	215.70	203.80		
Water Content (%)	(W7/W8)*100	26.54%	27.49%	29.73%	29.95%	31.94%		
Dry Density (pcf)	(wd/(1+wc))	94.5	95.0	94.3	94.7	91.4		

Maximum Dry Density (pcf)	**95.0**
Optimum Moisture Content (%)	**28.7**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: CLAY (CL), low to medium plasticity, moist, grayish brown (SLIMES TAILINGS).

USCS: CL

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	**A**			
Weight of Saturated-Surface-Dry (gm)	**B**			
Weight of Saturated Sample in Water (gm)	**C**			
Absorption of Oversize Particles (%)	**[(B-A)/A]*100**			
Bulk Specific Gravity	**A/(B-C)**			

AS-RECEIVED MOISTURE CONTENT: --

AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

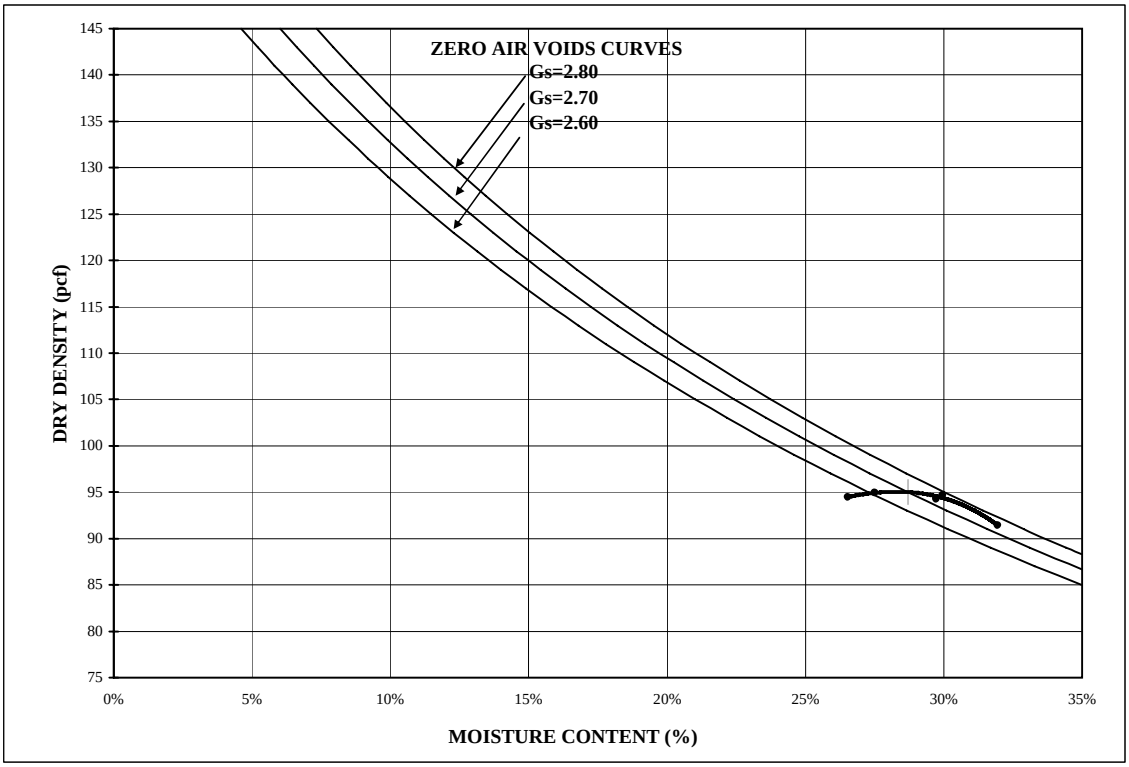
TECH	LAQ
DATE	03/23/06
REVIEW	LAQ

March , 2006 **0532269**

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-13** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	94.5	26.5%
2	95.0	27.5%
3	94.3	29.7%
4	94.7	29.9%
5	91.4	31.9%

Maximum Dry Density (pcf)	**95.0**
Optimum Moisture (%)	**28.7**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION CLAY (CL), low to medium plasticity, moist, grayish brown (SLIMES TAILINGS).

USCS CL

TECH	LAQ
DATE	03/23/06
REVIEW	LAQ

ASTM D 698 & 1557

PROJECT NAME	Moab Tailings	**TEST TYPE**	ASTM D 698 Method A
PROJECT NUMBER	0532269		
SAMPLE IDENTITY	GABT-14 NA		
SAMPLE TYPE	Composite		

	TYPE COMPACTOR	**PREPARATION**	
Mold Number	217	Mechanical	Wet Method
Mold Weight (gm)	0.00		
Mold Diameter (in.)	4.000	**TYPE PROCTOR**	
Mold Height (in.)	4.575	Standard	
Mold Volume (cu.ft.)	0.0333		
	5.5 -lbf. Rammer with 12 inch drop		

Method A: 20% OR LESS RETAINED ON #4

Method B: > 20% RETAINED ON #4 AND 20% OR LESS RETAINED ON 3/8"

Method C: > 20% RETAINED ON 3/8" AND < 30% RETAINED ON 3/4"

WATER CONTENT		**COARSE FRACTION**	**TOTAL SAMPLE**
Wt Tare & Soil Wet	(W1)		68.80
Wt Tare & Soil Dry	(W2)		45.30
Wt Tare	(W3)		0.40
Wt Moisture	(W4=W1-W2)		23.50
Wt Dry Soil	(W5=W2-W3)		44.90
Water Content (dec)	(wc=W4/W5)		0.5234
Water Content (%)	(W4/W5)*100		52.34%

Total weight before processing and percent retained

Total weight, wet (coarse & fine)	0.00
Total weight, dry (coarse & fine)	0.00
Weight retained on #4 sieve (wet)	0.00
Weight retained on 3/8" sieve (wet)	0.00
Weight retained on 3/4" sieve (wet)	0.00
Percent retained on #4 sieve (dry)	0.00%
Percent retained on 3/8" sieve (dry)	0.00%
Percent retained on 3/4" sieve (dry)	0.00%

POINT RESULTS (FINE)		**1**	**2**	**3**	**4**	**5**	**6**	**7**
Wt. Soil & Mold	(W1)	1706.30	1724.10	1832.90	1822.50	1819.80		
Weight of Mold	(W2)	0.00	0.00	0.00	0.00	0.00		
Wt. of Wet Soil	(W3=W1-W2)	1706.30	1724.10	1832.90	1822.50	1819.80		
Wet Density, wd (pcf)	(W3/453.6*Vm)	113.06	114.24	121.45	120.76	120.59		
WATER CONTENTS								
Wt. Tare & Soil Wet	(W4)	356.50	285.60	232.80	414.70	418.70		
Wt. Tare & Soil Dry	(W5)	307.40	243.50	195.70	345.90	342.60		
Wt. Tare	(W6)	6.80	6.70	6.60	6.70	6.80		
Wt. Moisture	(W7=W4-W5)	49.10	42.10	37.10	68.80	76.10		
Wt. Dry Soil	(W8=W5-W6)	300.60	236.80	189.10	339.20	335.80		
Water Content (%)	(W7/W8)*100	16.33%	17.78%	19.62%	20.28%	22.66%		
Dry Density (pcf)	(wd/(1+wc))	97.2	97.0	101.5	100.4	98.3		

Maximum Dry Density (pcf)	101.5
Optimum Moisture Content (%)	20.9
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	

DESCRIPTION: CLAY (CH), High plasticity, moist, dark gray (SLIMES TAILINGS).

USCS: CH

Specific Gravity And Absorption of Coarse Aggregate - ASTM C 127

Weight of Oven Dry Sample (gm)	**A**			
Weight of Saturated-Surface-Dry (gm)	**B**			
Weight of Saturated Sample in Water (gm)	**C**			
Absorption of Oversize Particles (%)	[(B-A)/A]*100			
Bulk Specific Gravity	A/(B-C)			

AS-RECEIVED MOISTURE CONTENT: --

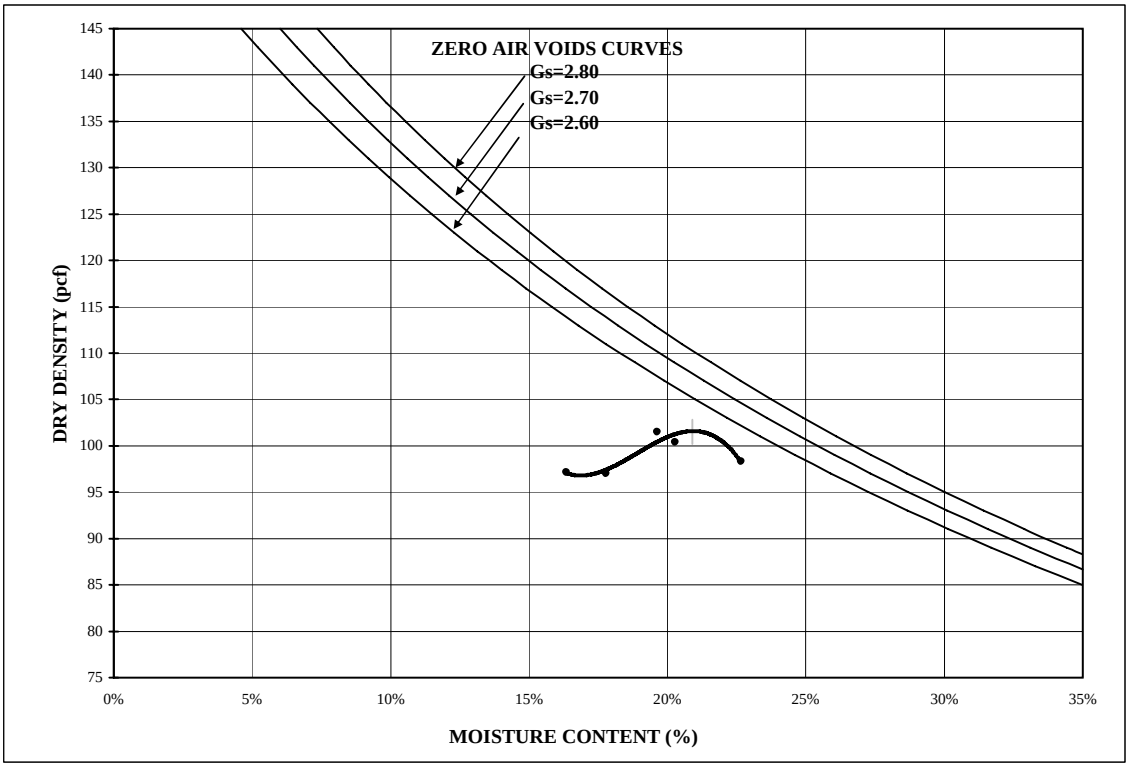
AVERAGE ABSORPTION	
AVERAGE BULK SPECIFIC GRAVITY	

TECH	LAQ
DATE	3/23/06
REVIEW	LAQ

MOISTURE / DRY DENSITY CURVE
ASTM D 698 Method A

Mechanical	Standard	Wet Method

PROJECT NAME: **Moab Tailings**
PROJECT NUMBER: **0532269**
SAMPLE ID: **GABT-14** DEPTH: **NA** SAMPLE TYPE: **Composite**



COMPACTION POINTS		
Specimen Number	Dry Density (pcf)	Moisture Content (%)
1	97.2	16.3%
2	97.0	17.8%
3	101.5	19.6%
4	100.4	20.3%
5	98.3	22.7%

Maximum Dry Density (pcf)	**101.5**
Optimum Moisture (%)	**20.9**
Corrected Maximum Dry Density (pcf)	
Corrected Optimum Moisture (%)	
As-Received Moisture Content	--
% Passing #4 sieve	**1.0**
% Passing 3/8" sieve	**1.0**
% Passing 3/4" sieve	**1.0**

DESCRIPTION CLAY (CH), High plasticity, moist, dark gray (SLIMES TAILINGS).

USCS CH

TECH LAQ
DATE 3/23/06
REVIEW LAQ

LOOSE AND SETTLED DENSITY TESTING

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-01**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	488.90
Wt Tare & Soil Dry	**(W2)**	457.60
Wt Tare	**(W3)**	6.80
Wt Moisture	**(W4=W1-W2)**	31.30
Wt Dry Soil	**(W5=W2-W3)**	450.80
Water Content (dec)	**(wc=W4/W5)**	0.0694
Water Content (%)	**(W4/W5)*100**	6.94%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.950
Mass of wet soil (lb)	2.378
Wet Density of Soil (pcf)	71.51
Dry Density of Soil (pcf)	66.86

SETTLE DENSITY

Average Settlement (in.)	1.406
Settled Height (in.)	3.167
Settlement Volume (cu.ft.)	0.0230
Mass of wet soil & mold (lb)	11.950
Mass of wet soil (lb)	2.378
Wet Density of Soil (pcf)	103.26
Dry Density of Soil (pcf)	96.56

Settlement (in.):	
	1.375
	1.438
	1.406
	1.375
	1.469
	1.375

Loose Wet Density (pcf)	71.506
Loose Dry Density (pcf)	66.864
Settled Wet Density (pcf)	103.263
Settled Dry Density (pcf)	96.558
Vertical Percent Settlement	30.75%
Percent Compaction	82.04%

Sample Description:

SAND (SP), little silt, trace gravel, fine grained, reddish brown (COVER SOIL).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-02**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	443.20
Wt Tare & Soil Dry	**(W2)**	411.90
Wt Tare	**(W3)**	6.60
Wt Moisture	**(W4=W1-W2)**	31.30
Wt Dry Soil	**(W5=W2-W3)**	405.30
Water Content (dec)	**(wc=W4/W5)**	0.0772
Water Content (%)	**(W4/W5)*100**	7.72%

LOOSE DENSITY

Mass of wet soil & mold (lb)	12.190
Mass of wet soil (lb)	2.618
Wet Density of Soil (pcf)	78.72
Dry Density of Soil (pcf)	73.08

SETTLE DENSITY

Average Settlement (in.)	1.005
Settled Height (in.)	3.568
Settlement Volume (cu.ft.)	0.0259
Mass of wet soil & mold (lb)	12.190
Mass of wet soil (lb)	2.618
Wet Density of Soil (pcf)	100.91
Dry Density of Soil (pcf)	93.67

Settlement (in.):	
	1.000
	1.000
	1.063
	1.031
	1.000
	0.938

Loose Wet Density (pcf)	78.723
Loose Dry Density (pcf)	73.079
Settled Wet Density (pcf)	100.907
Settled Dry Density (pcf)	93.673
Vertical Percent Settlement	21.98%
Percent Compaction	85.78%

Sample Description:

SAND (SP), some silt, poorly graded, yellowish brown (COVER SOIL).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-03**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	387.60
Wt Tare & Soil Dry	**(W2)**	351.60
Wt Tare	**(W3)**	6.70
Wt Moisture	**(W4=W1-W2)**	36.00
Wt Dry Soil	**(W5=W2-W3)**	344.90
Water Content (dec)	**(wc=W4/W5)**	0.1044
Water Content (%)	**(W4/W5)*100**	10.44%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.692
Mass of wet soil (lb)	2.120
Wet Density of Soil (pcf)	63.75
Dry Density of Soil (pcf)	57.72

SETTLE DENSITY

Average Settlement (in.)	1.443
Settled Height (in.)	3.130
Settlement Volume (cu.ft.)	0.0228
Mass of wet soil & mold (lb)	11.692
Mass of wet soil (lb)	2.120
Wet Density of Soil (pcf)	93.13
Dry Density of Soil (pcf)	84.33

Settlement (in.):	
	1.375
	1.438
	1.438
	1.500
	1.531
	1.375

Loose Wet Density (pcf)	63.748
Loose Dry Density (pcf)	57.723
Settled Wet Density (pcf)	93.133
Settled Dry Density (pcf)	84.330
Vertical Percent Settlement	31.55%
Percent Compaction	79.33%

Sample Description:

SAND (SP), some silt, poorly graded, moist, yellowish brown (SAND TAILINGS).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-04**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	B3
Mold Weight (lb)	9.578
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	364.00
Wt Tare & Soil Dry	**(W2)**	327.70
Wt Tare	**(W3)**	8.10
Wt Moisture	**(W4=W1-W2)**	36.30
Wt Dry Soil	**(W5=W2-W3)**	319.60
Water Content (dec)	**(wc=W4/W5)**	0.1136
Water Content (%)	**(W4/W5)*100**	11.36%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.775
Mass of wet soil (lb)	2.197
Wet Density of Soil (pcf)	66.06
Dry Density of Soil (pcf)	59.33

SETTLE DENSITY

Average Settlement (in.)	1.396	**Settlement (in.):** 1.313
Settled Height (in.)	3.177	1.375
Settlement Volume (cu.ft.)	0.0231	1.625
		1.500
Mass of wet soil & mold (lb)	11.775	1.313
Mass of wet soil (lb)	2.197	1.250
Wet Density of Soil (pcf)	95.09	
Dry Density of Soil (pcf)	85.39	

Loose Wet Density (pcf)	66.064
Loose Dry Density (pcf)	59.326
Settled Wet Density (pcf)	95.093
Settled Dry Density (pcf)	85.394

Sample Description:

SAND (SP), trace to little silt, trace clay, poorly graded, moist, light brown (SAND TAILINGS).

Vertical Percent Settlement	30.53%
Percent Compaction	82.19%

TECH	LAQ
DATE	3/23/06
REVIEW	RPD

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-05**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	440.20
Wt Tare & Soil Dry	**(W2)**	359.70
Wt Tare	**(W3)**	6.50
Wt Moisture	**(W4=W1-W2)**	80.50
Wt Dry Soil	**(W5=W2-W3)**	353.20
Water Content (dec)	**(wc=W4/W5)**	0.2279
Water Content (%)	**(W4/W5)*100**	22.79%

LOOSE DENSITY

Mass of wet soil & mold (lb)	13.000
Mass of wet soil (lb)	3.428
Wet Density of Soil (pcf)	103.08
Dry Density of Soil (pcf)	83.95

SETTLE DENSITY

Average Settlement (in.)	0.844
Settled Height (in.)	3.729
Settlement Volume (cu.ft.)	0.0271
Mass of wet soil & mold (lb)	13.000
Mass of wet soil (lb)	3.428
Wet Density of Soil (pcf)	126.40
Dry Density of Soil (pcf)	102.94

Settlement (in.):	
	0.875
	0.750
	0.875
	0.875
	0.938
	0.750

Loose Wet Density (pcf)	103.080
Loose Dry Density (pcf)	83.947
Settled Wet Density (pcf)	126.405
Settled Dry Density (pcf)	102.942
Vertical Percent Settlement	18.45%
Percent Compaction	90.86%

Sample Description:

Clayey SAND (SC), poorly graded, saturated, reddish brown (TRANSITION TAILINGS).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.
3. Free standing water present above sample at time of testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-06**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	B3
Mold Weight (lb)	9.578
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	307.30
Wt Tare & Soil Dry	**(W2)**	284.80
Wt Tare	**(W3)**	8.10
Wt Moisture	**(W4=W1-W2)**	22.50
Wt Dry Soil	**(W5=W2-W3)**	276.70
Water Content (dec)	**(wc=W4/W5)**	0.0813
Water Content (%)	**(W4/W5)*100**	8.13%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.800
Mass of wet soil (lb)	2.222
Wet Density of Soil (pcf)	66.82
Dry Density of Soil (pcf)	61.79

SETTLE DENSITY

Average Settlement (in.)	1.386
Settled Height (in.)	3.188
Settlement Volume (cu.ft.)	0.0232
Mass of wet soil & mold (lb)	11.800
Mass of wet soil (lb)	2.222
Wet Density of Soil (pcf)	95.86
Dry Density of Soil (pcf)	88.65

Settlement (in.):	
	1.313
	1.500
	1.375
	1.500
	1.375
	1.250

Loose Wet Density (pcf)	66.815
Loose Dry Density (pcf)	61.791
Settled Wet Density (pcf)	95.858
Settled Dry Density (pcf)	88.649
Vertical Percent Settlement	30.30%
Percent Compaction	82.62%

Sample Description:

SAND (SP), little to some silt, saturated, reddish brown (SAND TAILINGS).

TECH	LAQ
DATE	3/23/06
REVIEW	RPD

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-07**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	512.20
Wt Tare & Soil Dry	**(W2)**	376.50
Wt Tare	**(W3)**	8.10
Wt Moisture	**(W4=W1-W2)**	135.70
Wt Dry Soil	**(W5=W2-W3)**	368.40
Water Content (dec)	**(wc=W4/W5)**	0.3683
Water Content (%)	**(W4/W5)*100**	36.83%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.991
Mass of wet soil (lb)	2.419
Wet Density of Soil (pcf)	72.74
Dry Density of Soil (pcf)	53.16

SETTLE DENSITY

Average Settlement (in.)	1.698
Settled Height (in.)	2.875
Settlement Volume (cu.ft.)	0.0209
Mass of wet soil & mold (lb)	11.991
Mass of wet soil (lb)	2.419
Wet Density of Soil (pcf)	115.71
Dry Density of Soil (pcf)	84.56

Settlement (in.):	
	1.625
	1.625
	1.813
	1.750
	1.813
	1.563

Loose Wet Density (pcf)	72.739
Loose Dry Density (pcf)	53.158
Settled Wet Density (pcf)	115.706
Settled Dry Density (pcf)	84.559
Vertical Percent Settlement	37.13%
Percent Compaction	78.81%

Sample Description:

Sandy SILT (ML), moist, reddish brown (TRANSITION TAILINGS).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-07a**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	556.80
Wt Tare & Soil Dry	**(W2)**	433.40
Wt Tare	**(W3)**	6.70
Wt Moisture	**(W4=W1-W2)**	123.40
Wt Dry Soil	**(W5=W2-W3)**	426.70
Water Content (dec)	**(wc=W4/W5)**	0.2892
Water Content (%)	**(W4/W5)*100**	28.92%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.698
Mass of wet soil (lb)	2.126
Wet Density of Soil (pcf)	63.93
Dry Density of Soil (pcf)	49.59

SETTLE DENSITY

Average Settlement (in.)	2.136
Settled Height (in.)	2.437
Settlement Volume (cu.ft.)	0.0177
Mass of wet soil & mold (lb)	11.698
Mass of wet soil (lb)	2.126
Wet Density of Soil (pcf)	119.95
Dry Density of Soil (pcf)	93.04

Settlement (in.):	
	2.188
	2.188
	2.063
	2.125
	2.188
	2.063

Loose Wet Density (pcf)	63.929
Loose Dry Density (pcf)	49.588
Settled Wet Density (pcf)	119.953
Settled Dry Density (pcf)	93.045
Vertical Percent Settlement	46.71%
Percent Compaction	86.71%

Sample Description:

Sandy SILT (ML), moist, reddish brown (TRANSITION TAILINGS).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.
3. Sample processed through a No. 4 screen.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-08**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	B3
Mold Weight (lb)	9.578
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	334.80
Wt Tare & Soil Dry	**(W2)**	294.00
Wt Tare	**(W3)**	6.60
Wt Moisture	**(W4=W1-W2)**	40.80
Wt Dry Soil	**(W5=W2-W3)**	287.40
Water Content (dec)	**(wc=W4/W5)**	0.1420
Water Content (%)	**(W4/W5)*100**	14.20%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.959
Mass of wet soil (lb)	2.381
Wet Density of Soil (pcf)	71.60
Dry Density of Soil (pcf)	62.70

SETTLE DENSITY

Average Settlement (in.)	1.521
Settled Height (in.)	3.052
Settlement Volume (cu.ft.)	0.0222
Mass of wet soil & mold (lb)	11.959
Mass of wet soil (lb)	2.381
Wet Density of Soil (pcf)	107.27
Dry Density of Soil (pcf)	93.94

Settlement (in.):	
	1.750
	1.750
	1.375
	1.375
	1.500
	1.375

Loose Wet Density (pcf)	71.597
Loose Dry Density (pcf)	62.696
Settled Wet Density (pcf)	107.272
Settled Dry Density (pcf)	93.936
Vertical Percent Settlement	33.26%
Percent Compaction	83.28%

Sample Description:

Sandy SILT (ML), little to some clay, moist, reddish brown (TRANSITION TAILINGS).

TECH	LAQ
DATE	3/23/06
REVIEW	RPD

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-09**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	B3
Mold Weight (lb)	9.578
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	227.60
Wt Tare & Soil Dry	**(W2)**	175.10
Wt Tare	**(W3)**	6.60
Wt Moisture	**(W4=W1-W2)**	52.50
Wt Dry Soil	**(W5=W2-W3)**	168.50
Water Content (dec)	**(wc=W4/W5)**	0.3116
Water Content (%)	**(W4/W5)*100**	31.16%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.965
Mass of wet soil (lb)	2.387
Wet Density of Soil (pcf)	71.78
Dry Density of Soil (pcf)	54.73

SETTLE DENSITY

Average Settlement (in.)	1.782	**Settlement (in.):**	1.938
Settled Height (in.)	2.792		1.750
Settlement Volume (cu.ft.)	0.0203		1.688
			1.750
Mass of wet soil & mold (lb)	11.965		1.938
Mass of wet soil (lb)	2.387		1.625
Wet Density of Soil (pcf)	117.58		
Dry Density of Soil (pcf)	89.65		

Loose Wet Density (pcf)	71.777
Loose Dry Density (pcf)	54.726
Settled Wet Density (pcf)	117.584
Settled Dry Density (pcf)	89.651

Sample Description:

Sandy CLAY (CL), some silt, medium plasticity, grayish brown, moist (TRANSITION TAILINGS).

Vertical Percent Settlement	38.96%
Percent Compaction	87.89%

TECH	LAQ
DATE	3/23/06
REVIEW	RPD

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-10**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	B3
Mold Weight (lb)	9.578
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	205.30
Wt Tare & Soil Dry	**(W2)**	166.20
Wt Tare	**(W3)**	6.60
Wt Moisture	**(W4=W1-W2)**	39.10
Wt Dry Soil	**(W5=W2-W3)**	159.60
Water Content (dec)	**(wc=W4/W5)**	0.2450
Water Content (%)	**(W4/W5)*100**	24.50%

LOOSE DENSITY

Mass of wet soil & mold (lb)	12.320
Mass of wet soil (lb)	2.742
Wet Density of Soil (pcf)	82.45
Dry Density of Soil (pcf)	66.23

SETTLE DENSITY

Average Settlement (in.)	1.604
Settled Height (in.)	2.969
Settlement Volume (cu.ft.)	0.0216
Mass of wet soil & mold (lb)	12.320
Mass of wet soil (lb)	2.742
Wet Density of Soil (pcf)	127.00
Dry Density of Soil (pcf)	102.01

Settlement (in.):	
	1.750
	1.750
	1.500
	1.500
	1.500
	1.625

Loose Wet Density (pcf)	82.452
Loose Dry Density (pcf)	66.227
Settled Wet Density (pcf)	127.003
Settled Dry Density (pcf)	102.012
Vertical Percent Settlement	35.08%
Percent Compaction	94.63%

Sample Description:

Sandy CLAY (CL), some silt, medium plasticity, wet, dark gray (TRANSITION TAILINGS).

TECH	LAQ
DATE	3/23/06
REVIEW	RPD

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-11**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	397.20
Wt Tare & Soil Dry	**(W2)**	278.30
Wt Tare	**(W3)**	6.60
Wt Moisture	**(W4=W1-W2)**	118.90
Wt Dry Soil	**(W5=W2-W3)**	271.70
Water Content (dec)	**(wc=W4/W5)**	0.4376
Water Content (%)	**(W4/W5)*100**	43.76%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.512
Mass of wet soil (lb)	1.940
Wet Density of Soil (pcf)	58.34
Dry Density of Soil (pcf)	40.58

SETTLE DENSITY

Average Settlement (in.)	1.750
Settled Height (in.)	2.823
Settlement Volume (cu.ft.)	0.0205
Mass of wet soil & mold (lb)	11.512
Mass of wet soil (lb)	1.940
Wet Density of Soil (pcf)	94.50
Dry Density of Soil (pcf)	65.73

Settlement (in.):	
	1.750
	1.875
	1.875
	1.625
	1.750
	1.625

Loose Wet Density (pcf)	58.336
Loose Dry Density (pcf)	40.578
Settled Wet Density (pcf)	94.498
Settled Dry Density (pcf)	65.733
Vertical Percent Settlement	38.27%
Percent Compaction	68.47%

Sample Description:

SILT (ML), low plasticity, moist, dark brown (SLIMES TAILINGS).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-12**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	475.00
Wt Tare & Soil Dry	**(W2)**	324.20
Wt Tare	**(W3)**	6.60
Wt Moisture	**(W4=W1-W2)**	150.80
Wt Dry Soil	**(W5=W2-W3)**	317.60
Water Content (dec)	**(wc=W4/W5)**	0.4748
Water Content (%)	**(W4/W5)*100**	47.48%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.920
Mass of wet soil (lb)	2.348
Wet Density of Soil (pcf)	70.60
Dry Density of Soil (pcf)	47.87

SETTLE DENSITY

Average Settlement (in.)	0.771
Settled Height (in.)	3.802
Settlement Volume (cu.ft.)	0.0277
Mass of wet soil & mold (lb)	11.920
Mass of wet soil (lb)	2.348
Wet Density of Soil (pcf)	84.92
Dry Density of Soil (pcf)	57.58

Settlement (in.):	
	0.750
	0.875
	0.750
	0.750
	0.750
	0.750

Loose Wet Density (pcf)	70.604
Loose Dry Density (pcf)	47.873
Settled Wet Density (pcf)	84.918
Settled Dry Density (pcf)	57.579
Vertical Percent Settlement	16.86%
Percent Compaction	56.67%

Sample Description:

Silty Clay (CL), medium plasticity, moist, grayish brown (SLIMES TAILINGS).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-13**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	B3
Mold Weight (lb)	9.578
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	327.30
Wt Tare & Soil Dry	**(W2)**	233.30
Wt Tare	**(W3)**	6.70
Wt Moisture	**(W4=W1-W2)**	94.00
Wt Dry Soil	**(W5=W2-W3)**	226.60
Water Content (dec)	**(wc=W4/W5)**	0.4148
Water Content (%)	**(W4/W5)*100**	41.48%

LOOSE DENSITY

Mass of wet soil & mold (lb)	11.870
Mass of wet soil (lb)	2.292
Wet Density of Soil (pcf)	68.92
Dry Density of Soil (pcf)	48.71

SETTLE DENSITY

Average Settlement (in.)	1.813
Settled Height (in.)	2.761
Settlement Volume (cu.ft.)	0.0201
Mass of wet soil & mold (lb)	11.870
Mass of wet soil (lb)	2.292
Wet Density of Soil (pcf)	114.17
Dry Density of Soil (pcf)	80.70

Settlement (in.):	
	2.000
	1.875
	1.875
	1.750
	1.750
	1.625

Loose Wet Density (pcf)	68.920
Loose Dry Density (pcf)	48.713
Settled Wet Density (pcf)	114.172
Settled Dry Density (pcf)	80.697
Vertical Percent Settlement	39.63%
Percent Compaction	84.94%

Sample Description:

CLAY (CL), low to medium plasticity, moist, grayish brown (SLIMES TAILINGS).

TECH	LAQ
DATE	3/23/06
REVIEW	RPD

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

LOOSE & SETTLED DENSITY

PROJECT NAME	**Moab Tailings**	
PROJECT NUMBER	053-2269	
SAMPLE IDENTITY	**GABT-14**	**N/A**
SAMPLE TYPE	**Composite**	

Mold Number	A3
Mold Weight (lb)	9.572
Mold Diameter (in.)	4.000
Mold Height (in.)	4.573
Mold Volume (cu.ft.)	0.0333

WATER CONTENT

Wt Tare & Soil Wet	**(W1)**	470.00
Wt Tare & Soil Dry	**(W2)**	324.20
Wt Tare	**(W3)**	6.60
Wt Moisture	**(W4=W1-W2)**	145.80
Wt Dry Soil	**(W5=W2-W3)**	317.60
Water Content (dec)	**(wc=W4/W5)**	0.4591
Water Content (%)	**(W4/W5)*100**	45.91%

LOOSE DENSITY

Mass of wet soil & mold (lb)	12.691
Mass of wet soil (lb)	3.119
Wet Density of Soil (pcf)	93.79
Dry Density of Soil (pcf)	64.28

SETTLE DENSITY

Average Settlement (in.)	0.792
Settled Height (in.)	3.781
Settlement Volume (cu.ft.)	0.0275
Mass of wet soil & mold (lb)	12.691
Mass of wet soil (lb)	3.119
Wet Density of Soil (pcf)	113.42
Dry Density of Soil (pcf)	77.74

Settlement (in.):	
	0.750
	0.875
	0.875
	0.750
	0.750
	0.750

Loose Wet Density (pcf)	93.788
Loose Dry Density (pcf)	64.280
Settled Wet Density (pcf)	113.424
Settled Dry Density (pcf)	77.737
Vertical Percent Settlement	17.31%
Percent Compaction	76.59%

Sample Description:

CLAY (CH), High plasticity, moist, dark gray (SLIMES TAILINGS).

TECH	RPD
DATE	3/23/06
REVIEW	LAQ

COMMENTS:

1. These procedures are not standardized, but follow recommendations from:
   * ASTM D-4253 Standard Method for Maximum Index Density and Unit Weight of Soil Using Vibratory Table
   * ASTM D-4254 Standard Method for Maximum Index Density and Unit Weight of Soil and Calculation of Relative Density
2. Percent Compaction Calculated assuming optimum values from Proctor Testing.

Appendix B

Certificate of Analysis

November 7, 2006

Shaw E & I, Inc.

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

CERTIFICATE OF ANALYSIS

Erin Stanley
General Engineering Laboratories
2040 Savage Road
Charleston SC 29407

November 7, 2006

This is the Certificate of Analysis for the following samples:

Shaw Project ID:	**GEL – Moab**
Shaw Project Number:	**109855.01410000**
Date Received by Lab:	May 4, 2006
Number of Samples:	Fourteen (14)
Sample Type:	Soil

I. Introduction/Case Narrative

Fourteen soil samples were received by the Shaw Geotechnical Laboratory on May 4, 2006. Samples were submitted for determination of particle-size distribution, Atterberg limits, hydraulic conductivity, consolidated-undrained triaxial shear strength, one-dimensional consolidation properties, and capillary moisture relationships.

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

Reviewed and Approved:

Ralph Cole
Laboratory Manager, Geotechnical Services

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

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)*, 2006. Shaw Environmental and infrastructure, Standard Operating Procedures.

Particle-Size Distribution of Soils ..... **ASTM D 422**
Standard Proctor Compaction Characteristics ..... **ASTM D 698**
One-Dimensional Consolidation Properties of Soils ..... **ASTM D 2435**
Atterberg Limits ..... **AASTM D 4318**
Consolidated-Undrained Triaxial Shear Strength ..... **ASTM D 4767**
Constant Head Permeability ..... **ASTM D 5084**
Capillary Moisture Relationships ..... **Mfr. procedure**

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.

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- 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 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

Moisture content results are reported as supporting data for several test results.

A specific gravity value of 2.65 was assumed and used for certain calculations of ancillary supporting data, such as phase relations (degree of saturation, void ratio) reported in some test results. This value is an average of all natural earth materials and could vary markedly from the sample being tested.

Hydraulic conductivity (permeability) tests were performed by recompacting bulk material into test specimens. Density and moisture parameters supplied by the client. One test specimen was prepared for each sample. The specimens were tested at 20 psi confining pressure, followed by 40 psi and 60 psi test series. In some cases, permeability tests at higher confining pressures produced slower flow rates. This is usually ascribed to specimen consolidation and smaller void channels. In other cases, permeability tests at higher confining pressures produced faster flow rates. This is usually ascribed to more thorough specimen saturation, or washing of fines.

Consolidated-undrained triaxial shear tests were performed by recompacting bulk material into test specimens. Density and moisture parameters supplied by the client. Three test specimens were prepared for each sample. The specimens were tested at 20 psi, 40 psi and 60 psi confining pressures.

Appendix A
Sample Cross-Reference List

Shaw Geotechnical Laboratory
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SAMPLE NUMBER CROSS-REFERENCE LIST (Cont'd)

LAB SAMPLE NO.	CLIENT SAMPLE NO.	MATRIX
BC0911	GABT-01	Soil
BC0912	GABT-02	Soil
BC0913	GABT-03	Soil
BC0914	GABT-04	Soil
BC0915	GABT-05	Soil
BC0916	GABT-06	Soil
BC0917	GABT-07	Soil
BC0918	GABT-08	Soil
BC0919	GABT-09	Soil
BC0920	GABT-10	Soil
BC0921	GABT-11	Soil
BC0922	GABT-12	Soil
BC0923	GABT-13	Soil
BC0924	GABT-14	Soil

Appendix B
Data Results

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

Shaw Geotechnical Laboratory
Oak Ridge TN
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MOISTURE CONTENT

PROJECT NAME
GEL - Moab

PROJECT NUMBER
109855.01410000

LAB SAMPLE NO.	CLIENT SAMPLE NO.	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846
BC0911	GABT-01	7.0	6.6	93.4
BC0912	GATB-02	6.6	6.1	93.9
BC0913	GATB-03	12.6	11.2	88.8
BC0914	GATB-04	12.8	11.3	88.7
BC0915	GATB-05	20.7	17.1	82.9
BC0916	GATB-06	8.1	7.5	92.5
BC0917	GATB-07	34.1	25.4	74.6
BC0918	GATB-08	11.4	10.2	89.8
BC0919	GATB-09	20.5	17.0	83.0
BC0920	GATB-10	16.9	14.5	85.5
BC0921	GATB-11	24.8	19.9	80.1
BC0922	GATB-12	20.9	17.3	82.7
BC0923	GATB-13	26.9	21.2	78.8
BC0924	GATB-14	17.8	15.1	84.9

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.

November 7, 2006
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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: GEL-Moab

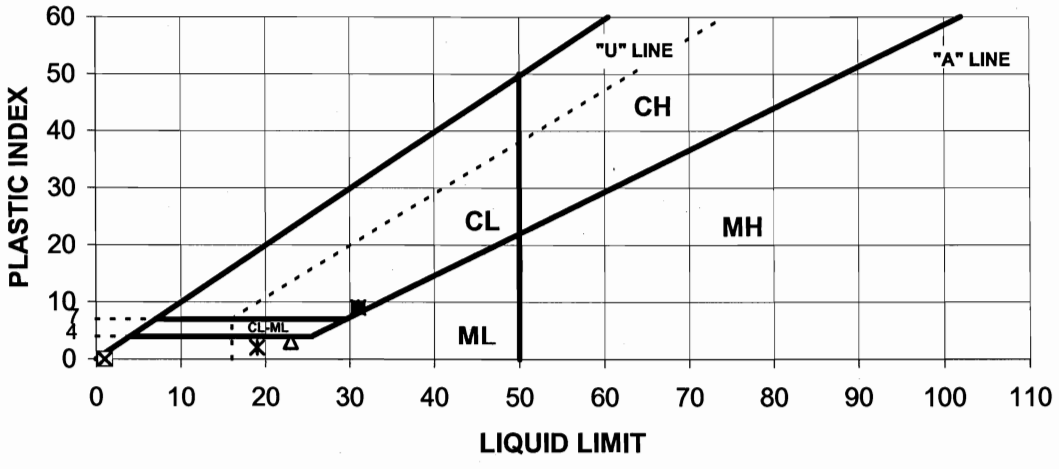
PROJECT NO. 109855.01410000

ATTERBERG LIMITS RESULTS

LAB SAMPLE NO.		FIELD SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SYMBOL
BC0911	●	GABT-01	NP	NP	NP	NP
BC0912	◆	GABT-02	NP	NP	NP	NP
BC0913	□	GABT-03	NP	NP	NP	NP
BC0914	◇	GABT-04	NP	NP	NP	NP
BC0915	+	GABT-05	NP	NP	NP	NP
BC0916	○	GABT-06	NP	NP	NP	NP
BC0917	■	GABT-07	31	22	9	CL
BC0918	X	GABT-08	NP	NP	NP	NP
BC0919	△	GABT-09	23	20	3	ML
BC0920	*	GABT-10	19	17	2	ML

*NP=Nonplastic

PLASTICITY CHART



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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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ATTERBERG LIMITS
ASTM D 4318

PROJECT NAME: GEL-Moab

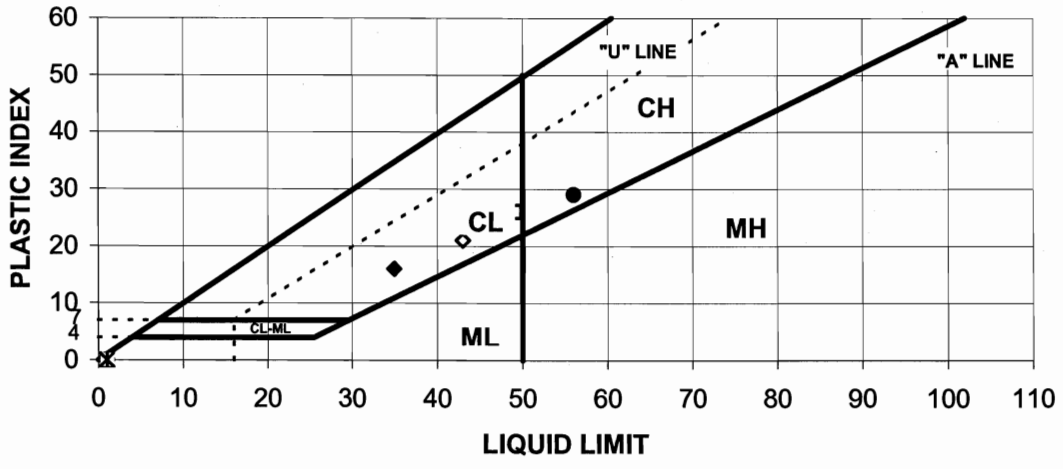
PROJECT NO. 109855.01410000

ATTERBERG LIMITS RESULTS

LAB SAMPLE NO.		FIELD SAMPLE NO.	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	USCS SYMBOL
BC0921	●	GABT-11	56	27	29	CH
BC0922	◆	GABT-22	35	19	16	CL
BC0923	□	GABT-13	49	23	26	CL
BC0924	◇	GABT-14	43	22	21	CL
	+					
	○					
	■					
	x					
	△					
	*					

*NP=Nonplastic

PLASTICITY CHART



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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-01
Lab Sample No.
BC0911

Specific Gravity = 2.65
assumed

Moisture Content = 7.0%
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	97.8%
	#4	4.750	95.6%
	#10	2.000	92.6%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	89.9%
	#40	0.425	82.8%
	#60	0.250	69.0%
	#100	0.149	46.6%
	#140	0.106	32.8%
	#200	0.075	22.9%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05044	18.3%
	0.03608	15.5%
	0.02316	12.7%
	0.01347	10.6%
	0.00925	9.9%
	0.00681	8.4%
	0.00480	7.7%
	0.00332	6.3%
	0.00143	3.5%

4.4% Gravel 72.7% Sand 22.9% Silt/Clay

November 7, 2006
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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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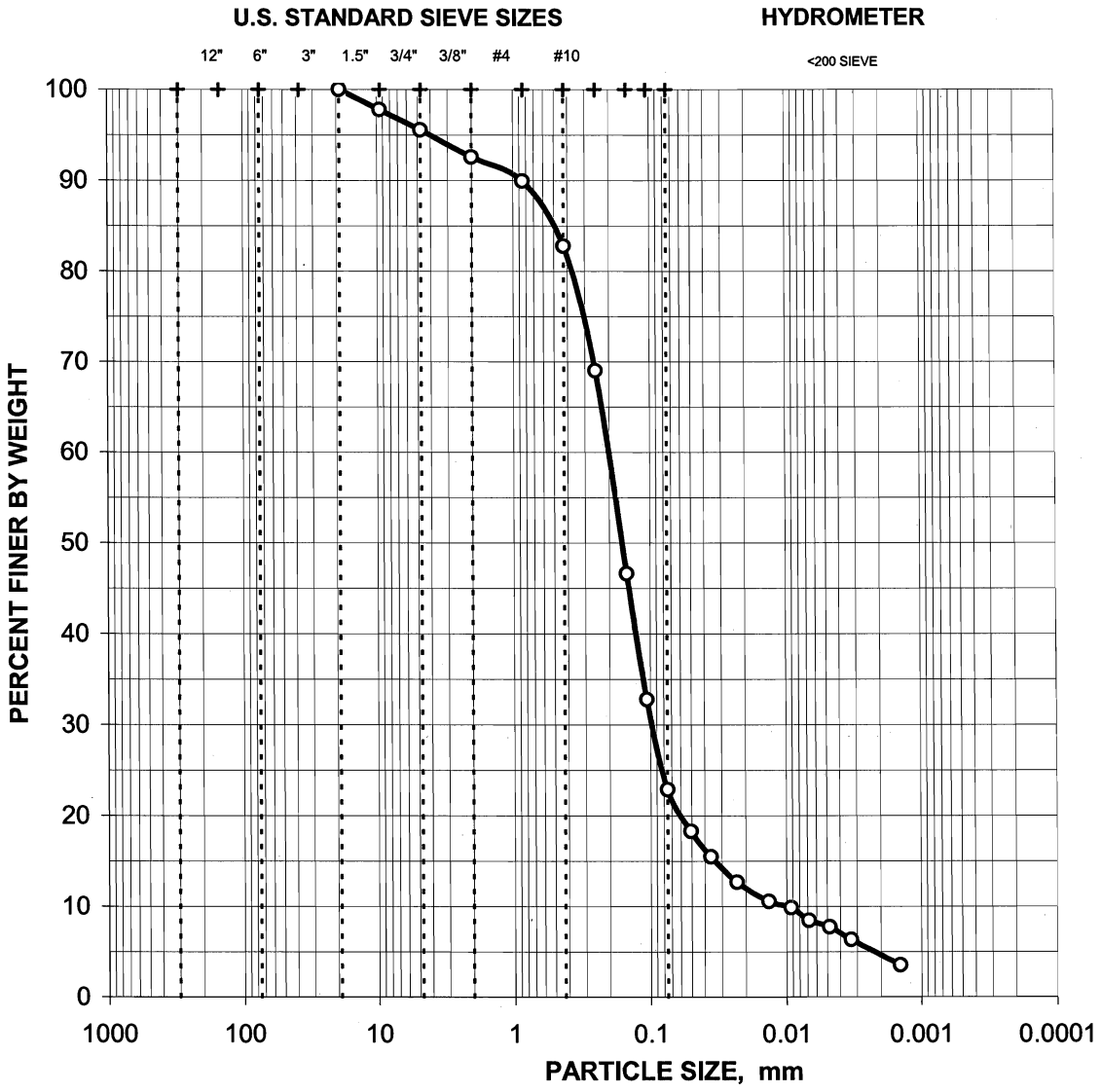
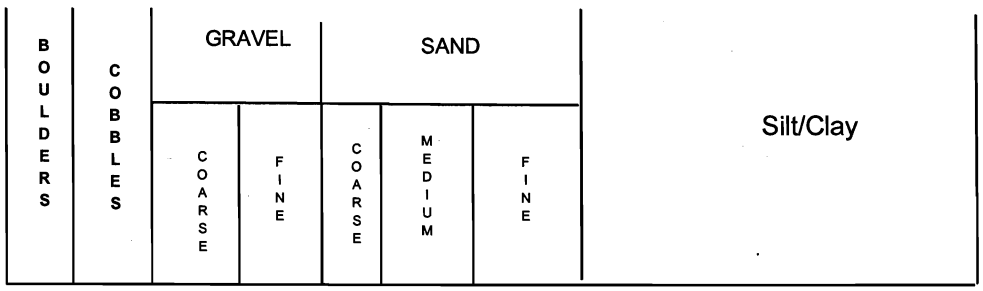
GEL - Moab



CLIENT SAMPLE NO.: GABT-01

LAB SAMPLE NO.: BC0911



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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-02
Lab Sample No.
BC0912

Specific Gravity = 2.65
assumed

Moisture Content = 6.6%
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	98.9%
	#4	4.750	97.0%
	#10	2.000	95.5%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	94.1%
	#40	0.425	88.1%
	#60	0.250	68.5%
	#100	0.149	39.4%
	#140	0.106	25.0%
	#200	0.075	16.6%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05102	14.1%
	0.03635	12.8%
	0.02324	10.2%
	0.01361	7.7%
	0.00966	6.4%
	0.00685	5.8%
	0.00395	4.5%
	0.00335	3.8%
	0.00144	2.6%

3.0% Gravel 80.4% Sand 16.6% Silt/Clay

November 7, 2006
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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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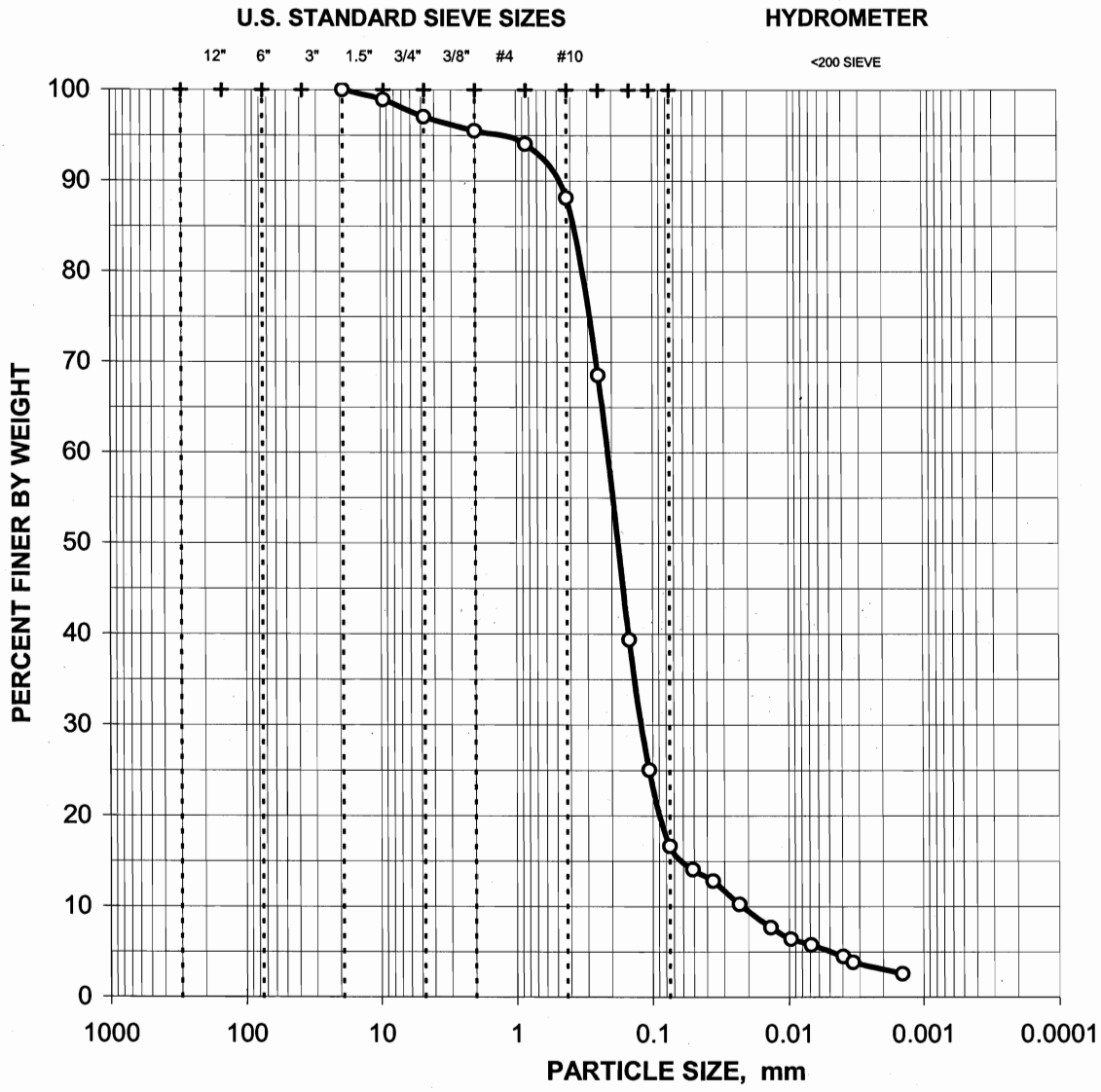
GEL - Moab



CLIENT SAMPLE NO.: GABT-02 **LAB SAMPLE NO.:** BC0912

BOULDERS	COBBLES	GRAVEL		SAND			Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

November 7, 2006
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General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-03
Lab Sample No.
BC0913

Specific Gravity = 2.65
assumed

Moisture Content = 12.6%
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	99.5%
	#10	2.000	99.4%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	99.0%
	#40	0.425	93.9%
	#60	0.250	77.7%
	#100	0.149	48.4%
	#140	0.106	29.0%
	#200	0.075	16.8%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05178	11.7%
	0.03701	9.1%
	0.02349	7.1%
	0.01332	5.2%
	0.00979	3.9%
	0.00694	3.2%
	0.00407	2.6%
	0.00337	1.9%
	0.00144	1.9%

0.5% Gravel 82.6% Sand 16.8% Silt/Clay

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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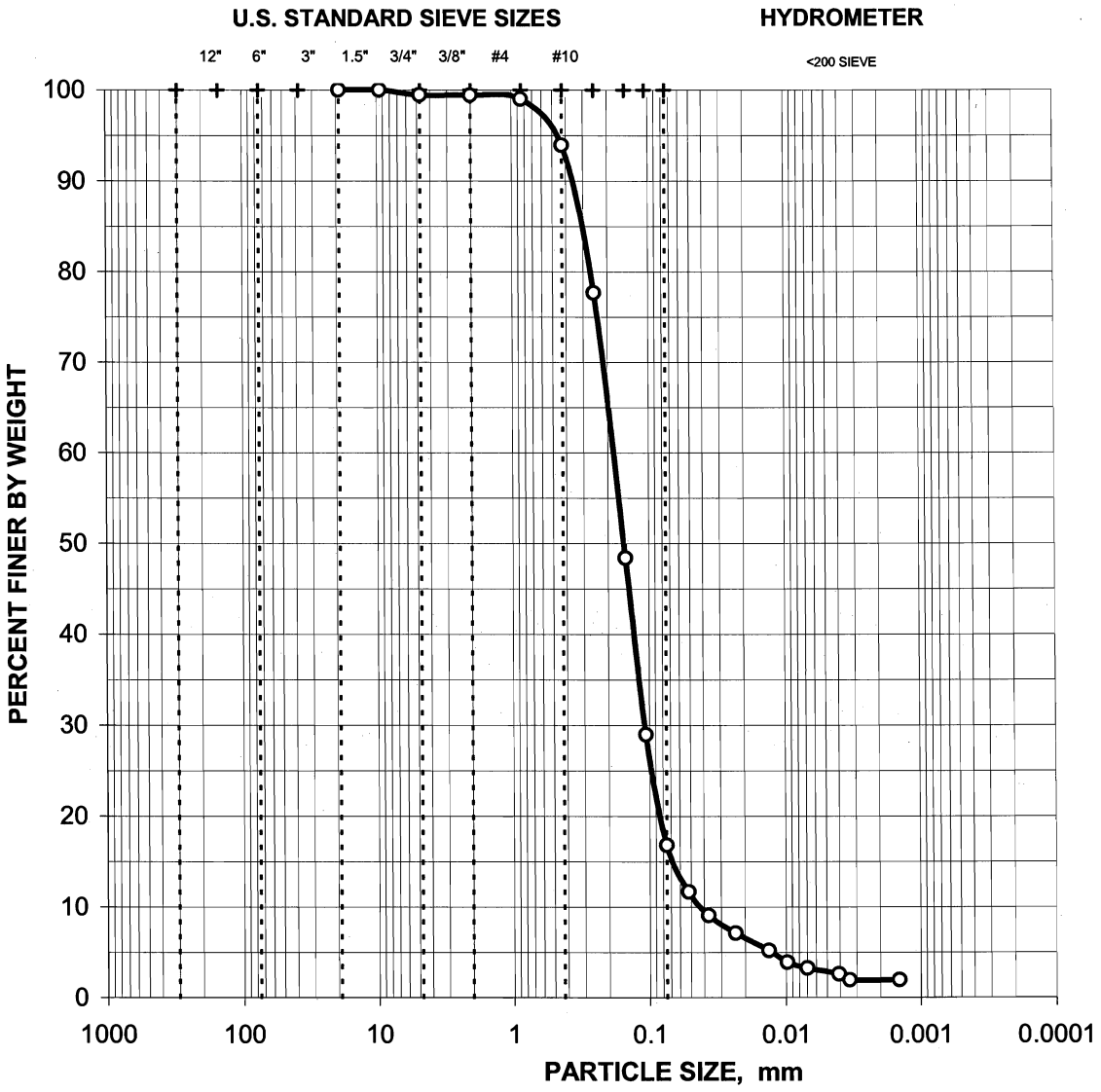
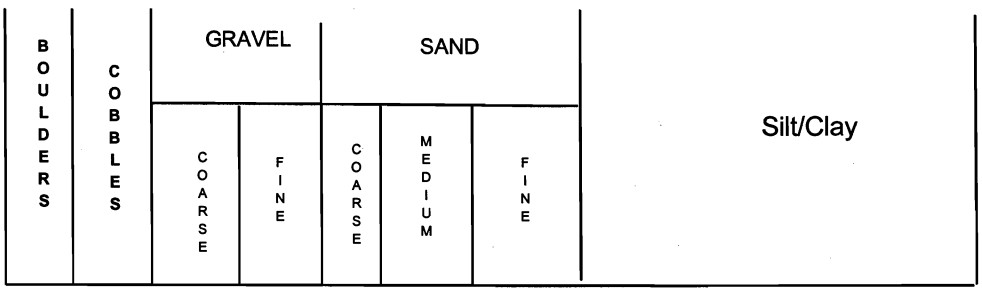
GEL - Moab



CLIENT SAMPLE NO.: GABT-03

LAB SAMPLE NO.: BC0913



November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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Oak Ridge TN
(865) 482-6497

PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-04
Lab Sample No.
BC0914

Specific Gravity = 2.65
assumed

Moisture Content = 12.8%
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	99.7%
	#10	2.000	99.6%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	99.4%
	#40	0.425	96.9%
	#60	0.250	82.0%
	#100	0.149	52.9%
	#140	0.106	35.0%
	#200	0.075	23.6%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05140	16.3%
	0.03668	13.9%
	0.02324	13.1%
	0.01371	7.3%
	0.00976	5.7%
	0.00692	4.9%
	0.00490	4.1%
	0.00336	3.3%
	0.00144	3.3%

0.3% Gravel 76.1% Sand 23.6% Silt/Clay

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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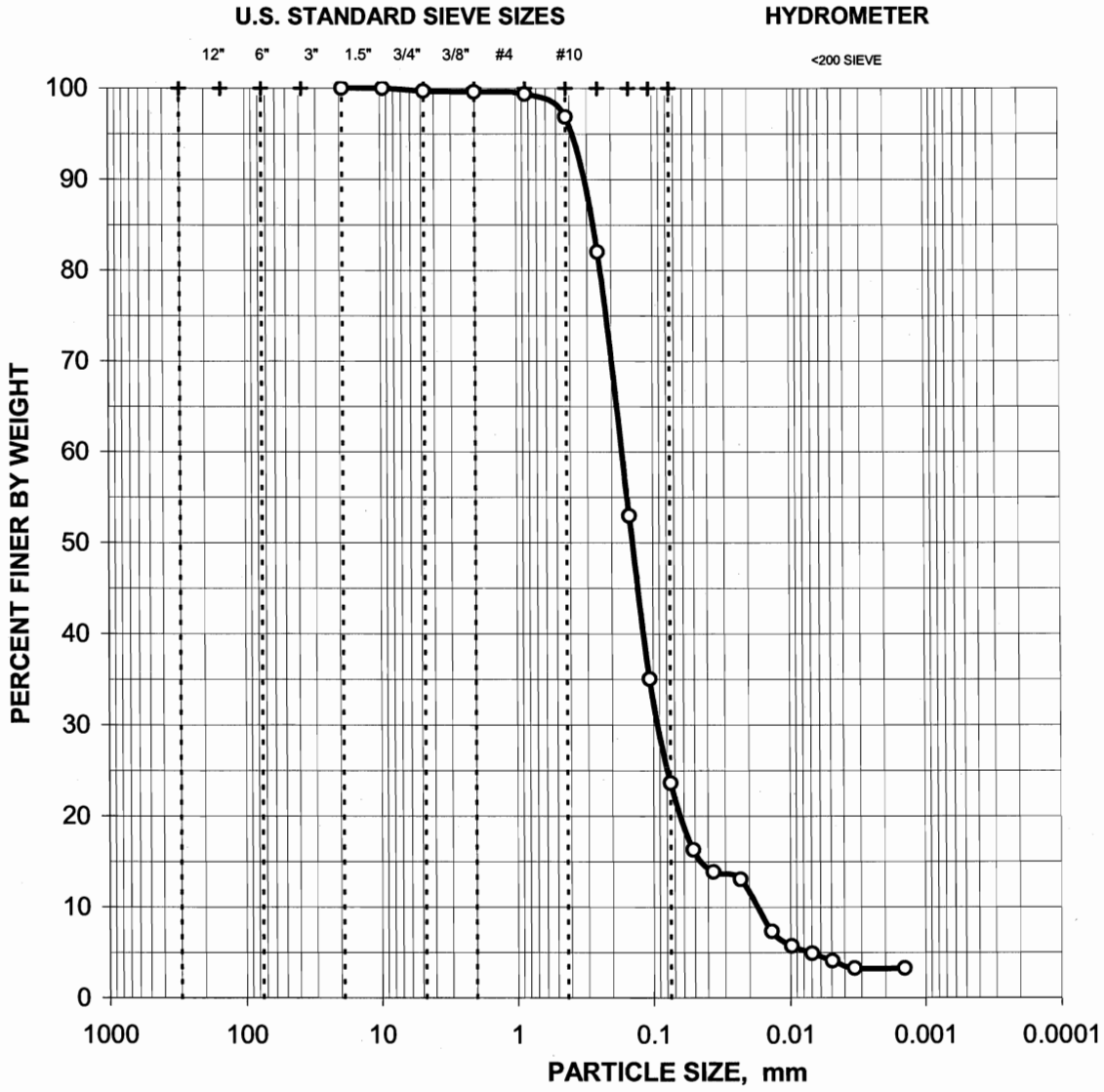
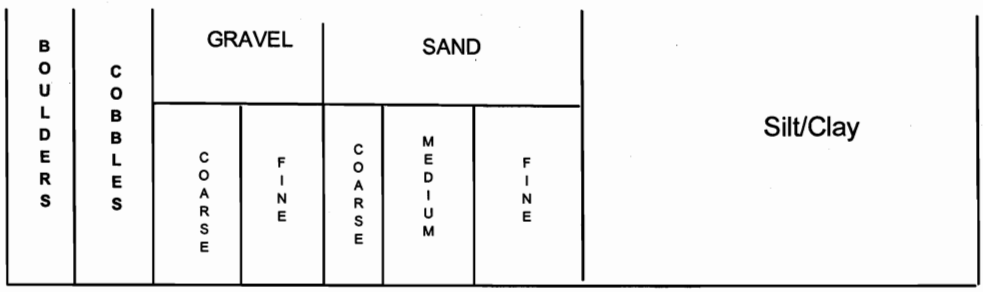
GEL - Moab



CLIENT SAMPLE NO.: GABT-04

LAB SAMPLE NO.: BC0914



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General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-05
Lab Sample No.
BC0915

Specific Gravity = 2.65
assumed

Moisture Content = 20.7%
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	98.7%
	#4	4.750	97.2%
	#10	2.000	95.8%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	94.4%
	#40	0.425	90.0%
	#60	0.250	73.4%
	#100	0.149	46.7%
	#140	0.106	31.5%
	#200	0.075	21.6%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05089	17.8%
	0.03640	15.3%
	0.01854	11.5%
	0.01321	9.6%
	0.00971	8.3%
	0.00687	7.0%
	0.00491	5.7%
	0.00337	5.1%
	0.00128	4.5%

2.8% Gravel 75.6% Sand 21.6% Silt/Clay

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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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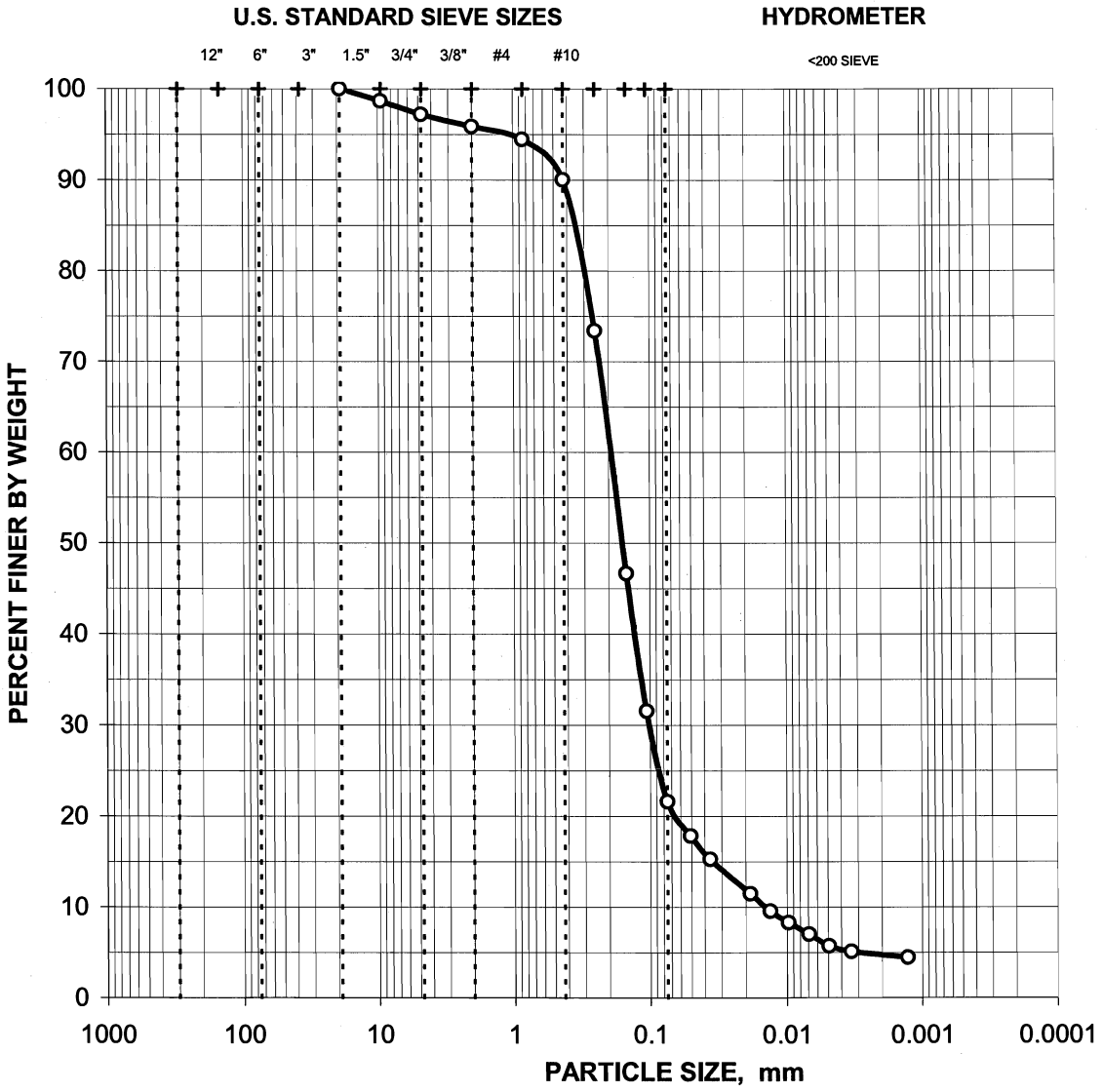
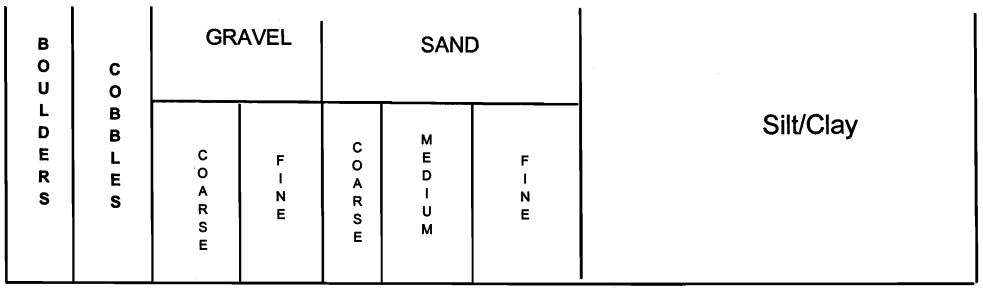
GEL - Moab



CLIENT SAMPLE NO.: GABT-05

LAB SAMPLE NO.: BC0915



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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-06
Lab Sample No.
BC0916

Specific Gravity = 2.65
assumed

Moisture Content = 8.1%
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	99.7%
	#4	4.750	99.5%
	#10	2.000	99.3%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	98.9%
	#40	0.425	92.8%
	#60	0.250	69.9%
	#100	0.149	40.3%
	#140	0.106	25.6%
	#200	0.075	16.7%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05206	13.2%
	0.03722	10.6%
	0.02371	9.3%
	0.01263	6.6%
	0.00982	5.9%
	0.00694	5.9%
	0.00493	5.3%
	0.00338	4.6%
	0.00129	4.0%

0.5% Gravel 82.8% Sand 16.7% Silt/Clay

November 7, 2006
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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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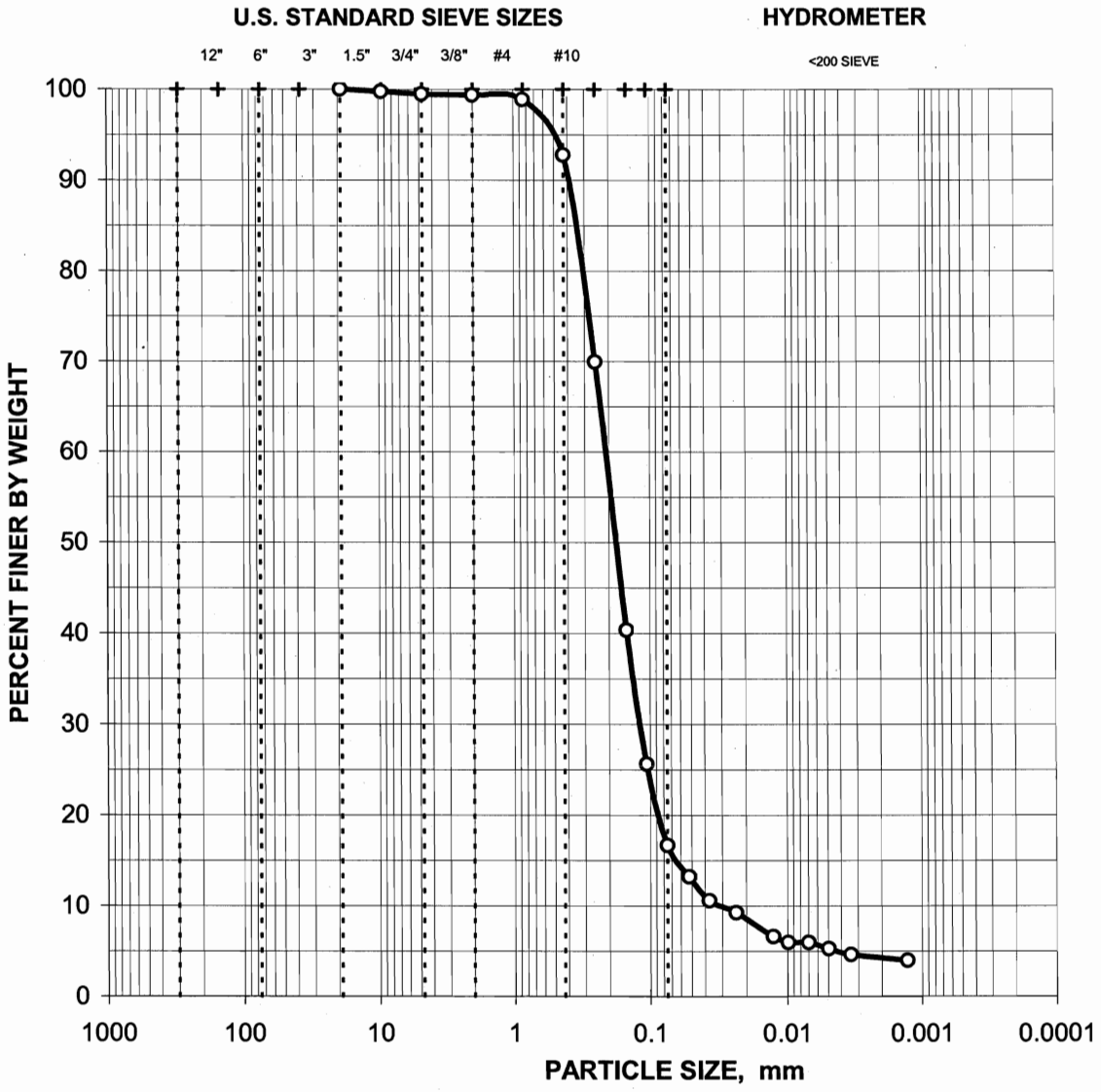
GEL - Moab



CLIENT SAMPLE NO.: GABT-06

LAB SAMPLE NO.: BC0916

BOULDERS	COBBLES	GRAVEL		SAND			Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

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Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-07
Lab Sample No.
BC0917

Specific Gravity = 2.65
assumed

Moisture Content = 34.1%
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	99.1%
	#10	2.000	98.1%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	95.4%
	#40	0.425	92.1%
	#60	0.250	85.1%
	#100	0.149	69.4%
	#140	0.106	58.4%
	#200	0.075	49.7%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.04784	46.0%
	0.03427	42.0%
	0.02195	38.0%
	0.01309	29.0%
	0.00959	17.0%
	0.00623	10.0%
	0.00491	9.0%
	0.00337	8.0%
	0.00128	7.0%

0.9% Gravel 49.4% Sand 49.7% Silt/Clay

November 7, 2006
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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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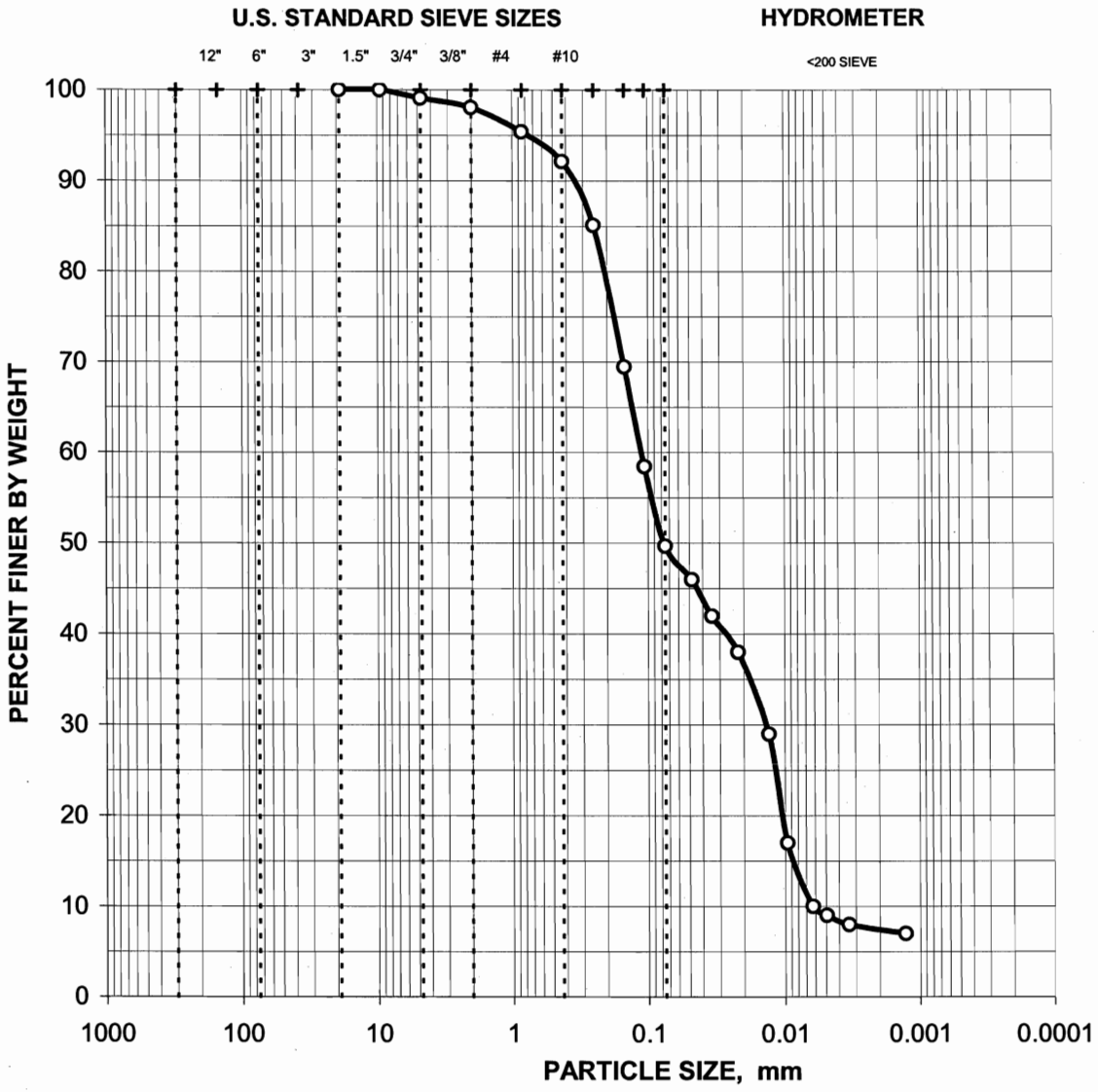
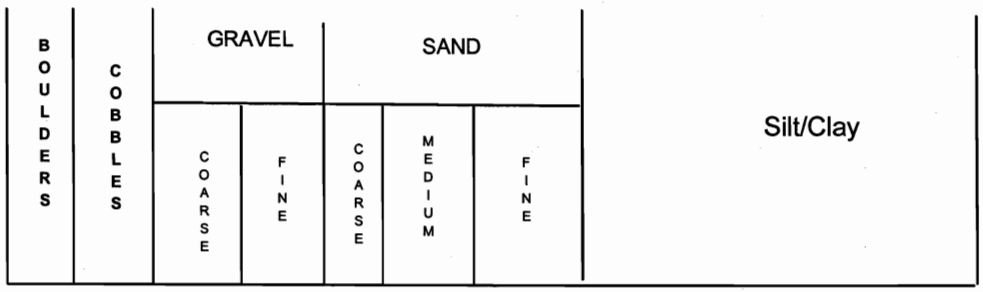
GEL - Moab



CLIENT SAMPLE NO.: GABT-07

LAB SAMPLE NO.: BC0917



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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-08
Lab Sample No.
BC0918

Specific Gravity = 2.65
assumed

Moisture Content = 11.4%
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	99.3%
	#10	2.000	98.4%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	96.6%
	#40	0.425	90.7%
	#60	0.250	78.7%
	#100	0.149	54.1%
	#140	0.106	39.1%
	#200	0.075	27.8%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.05148	22.7%
	0.03681	18.9%
	0.02346	17.0%
	0.01364	14.2%
	0.00971	12.3%
	0.00689	11.3%
	0.00486	10.4%
	0.00335	9.4%
	0.00128	7.6%

0.7% Gravel 71.6% Sand 27.8% Silt/Clay

November 7, 2006
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General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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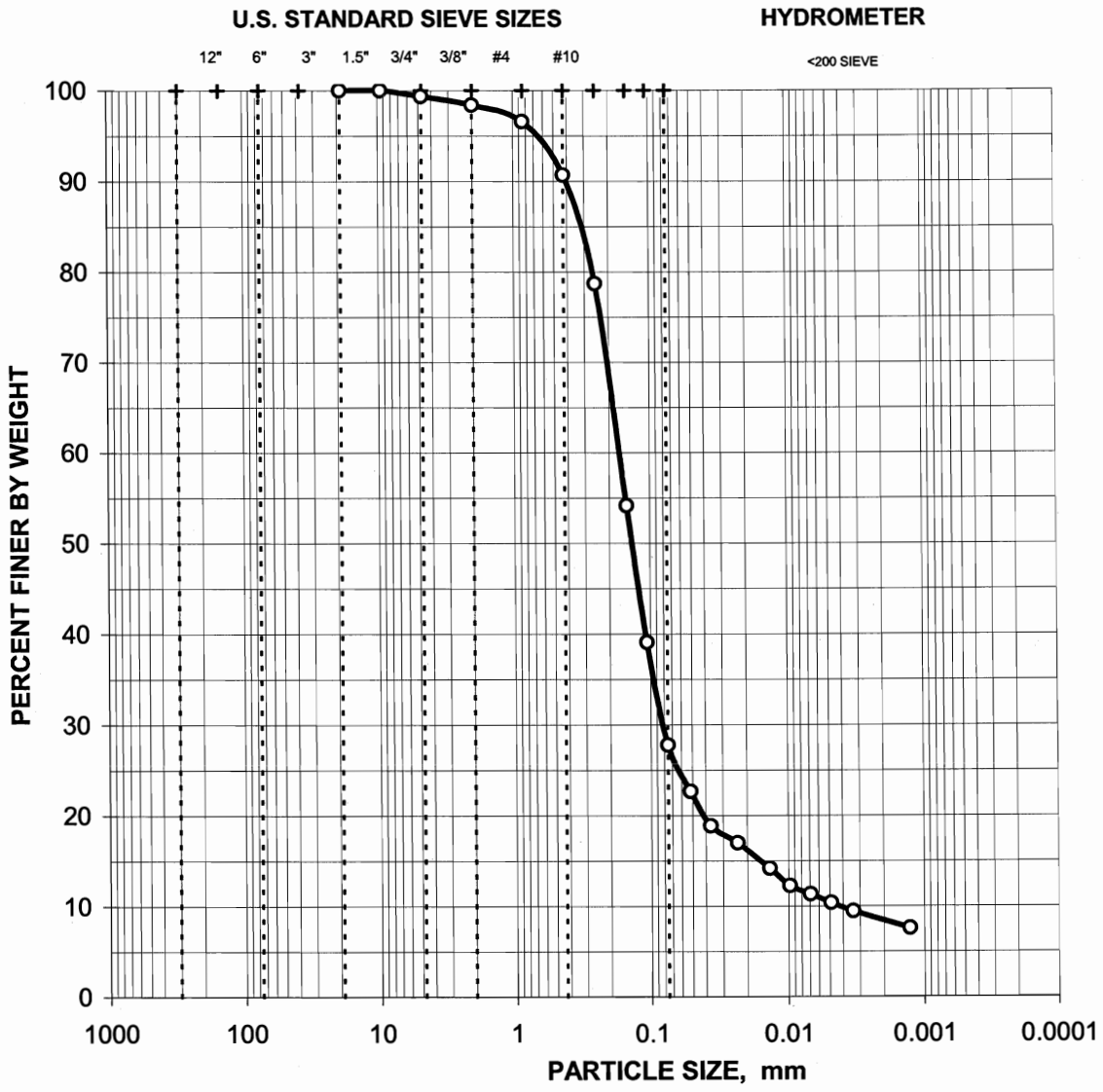
GEL - Moab



CLIENT SAMPLE NO.: GABT-08

LAB SAMPLE NO.: BC0918

BOULDERS	COBBLES	GRAVEL		SAND			Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

November 7, 2006
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Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-09
Lab Sample No.
BC0919

Specific Gravity = 2.65
assumed

Moisture Content = 20.5%
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	100.0%
	#10	2.000	100.0%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	98.4%
	#40	0.425	96.5%
	#60	0.250	94.1%
	#100	0.149	85.0%
	#140	0.106	72.4%
	#200	0.075	58.3%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.04458	43.4%
	0.03293	35.9%
	0.01863	25.1%
	0.01267	19.7%
	0.00796	15.6%
	0.00672	13.6%
	0.00481	10.8%
	0.00331	9.5%
	0.00130	6.1%

0.0% Gravel 41.7% Sand 58.3% Silt/Clay

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General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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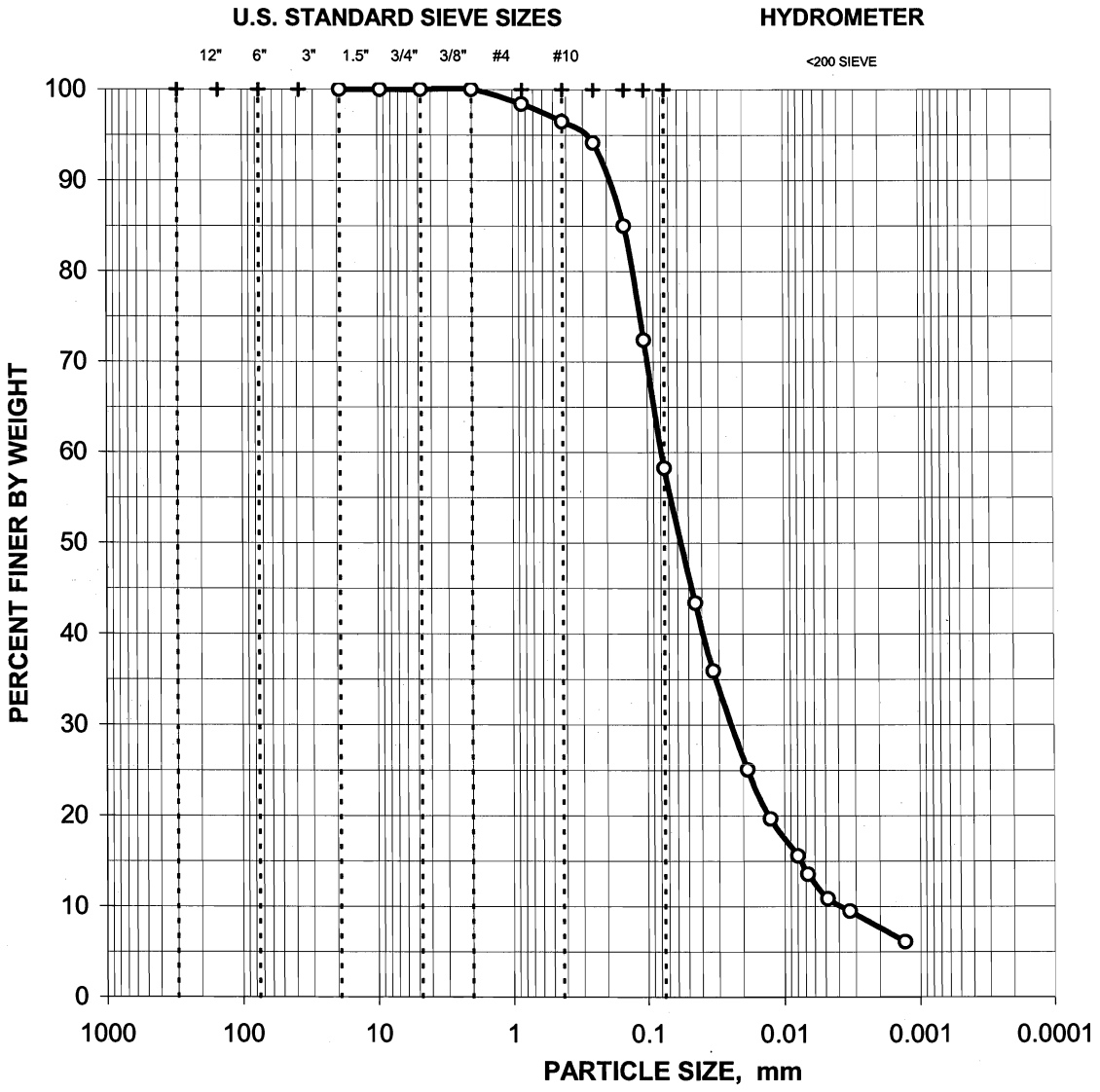
GEL - Moab



CLIENT SAMPLE NO.: GABT-09

LAB SAMPLE NO.: BC0919

BOULDERS	COBBLES	GRAVEL		SAND			Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

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Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-10
Lab Sample No.
BC0920

Specific Gravity = 2.65
assumed

Moisture Content = 16.9%
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	100.0%
	#10	2.000	98.2%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	95.7%
	#40	0.425	90.3%
	#60	0.250	78.5%
	#100	0.149	55.7%
	#140	0.106	40.8%
	#200	0.075	30.4%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER	0.06621	29.9%
	0.04806	25.5%
	0.03455	22.4%
	0.02230	18.7%
	0.01356	8.1%
	0.00963	7.5%
	0.00678	6.8%
	0.00480	6.8%
	0.00331	6.2%
	0.00138	6.2%

0.0% Gravel 69.6% Sand 30.4% Silt/Clay

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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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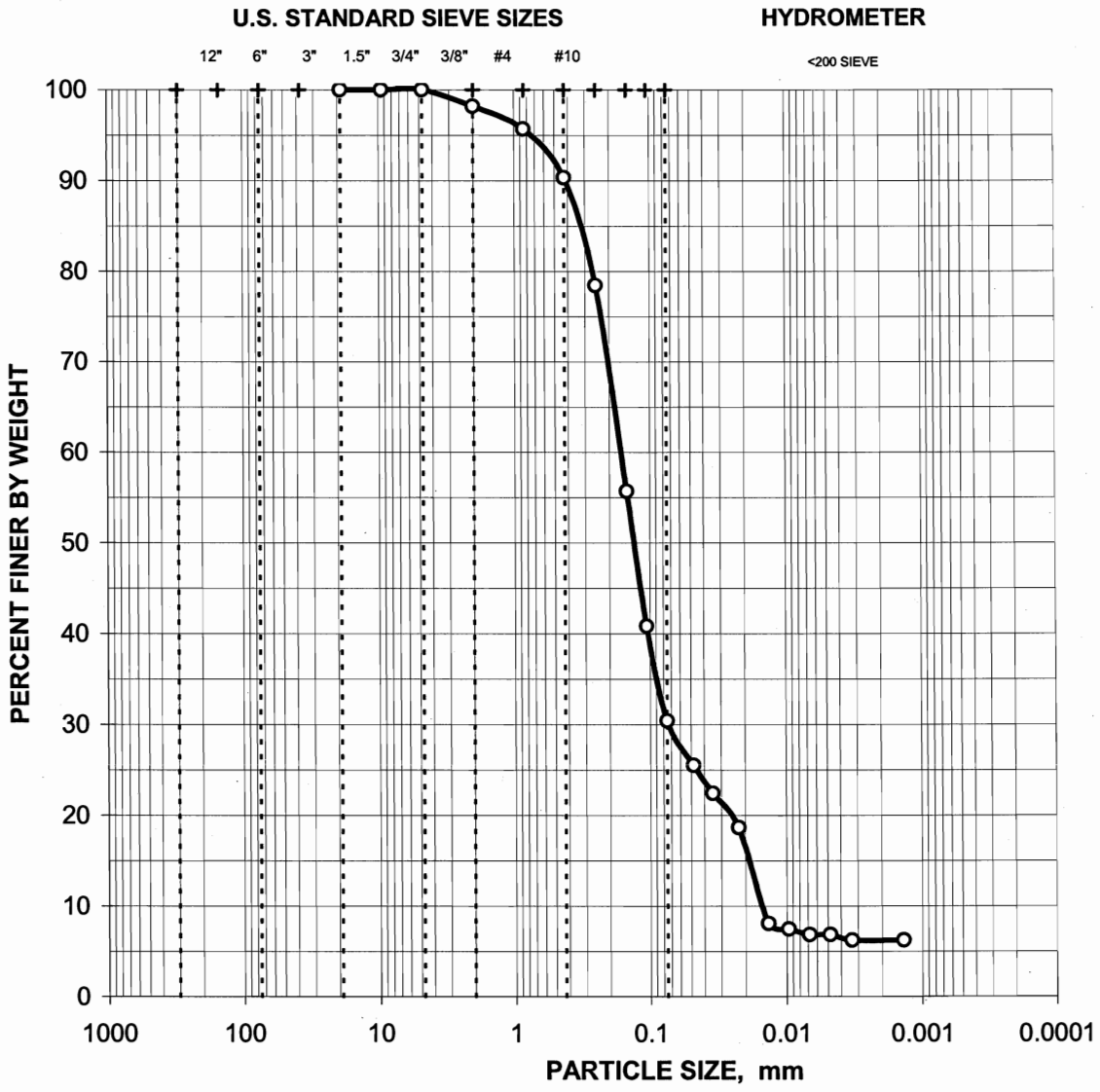

CLIENT SAMPLE NO.: GABT-10 **LAB SAMPLE NO.:** BC0920

BOULDERS	COBBLES	GRAVEL		SAND			Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

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Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-11
Lab Sample No.
BC0921

Specific Gravity = 2.65
assumed

Moisture Content = 24.8%
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	100.0%
	#10	2.000	99.5%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	98.0%
	#40	0.425	95.2%
	#60	0.250	91.5%
	#100	0.149	86.2%
	#140	0.106	82.2%
	#200	0.075	78.4%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.02636	75.2%
	0.01595	69.1%
	0.01059	61.4%
	0.00775	55.3%
	0.00568	49.1%
	0.00418	41.5%
	0.00296	33.8%
	0.00133	16.9%

0.0% Gravel 21.6% Sand 78.4% Silt/Clay

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Shaw Project No. 109855.01410000

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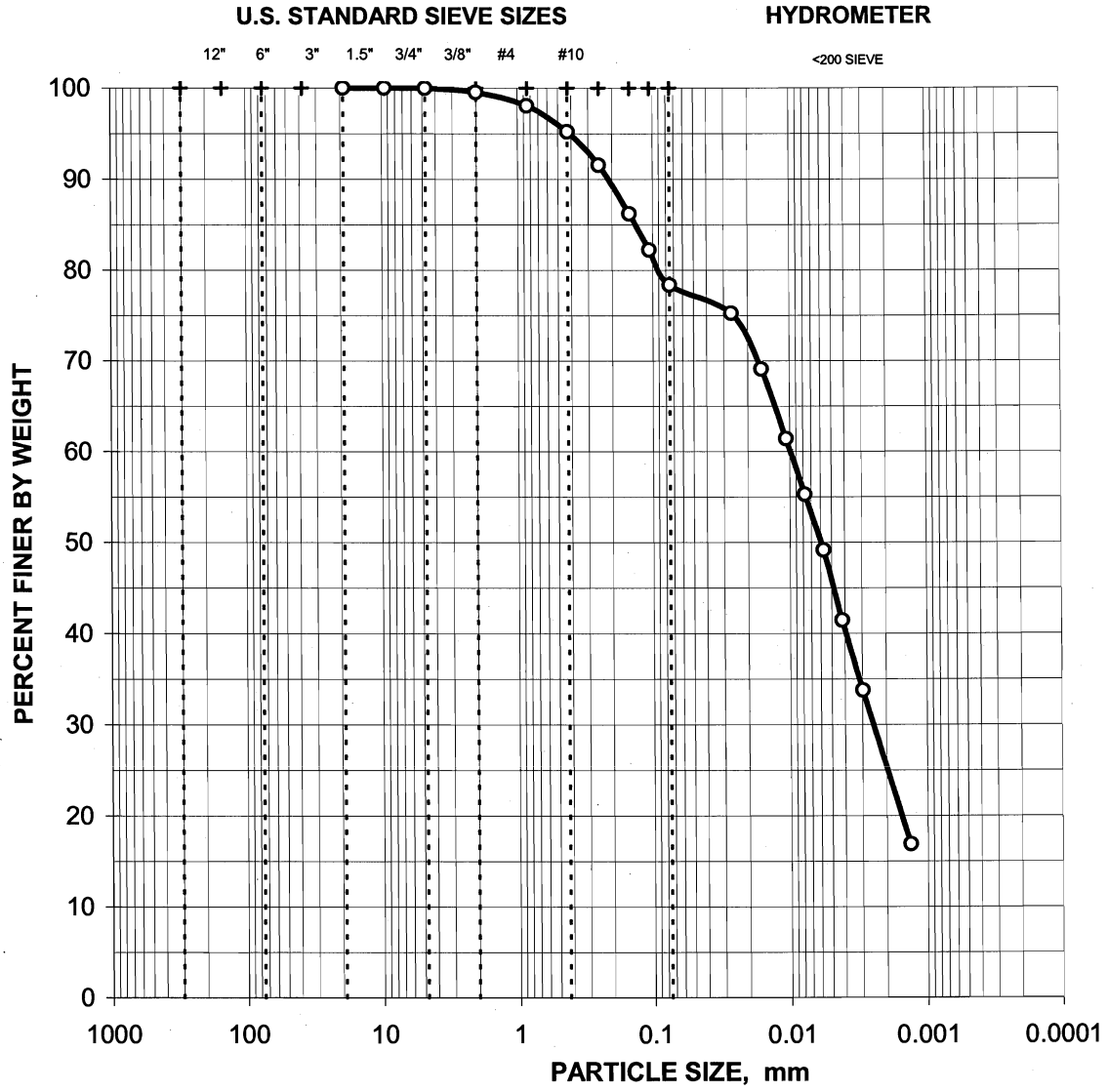
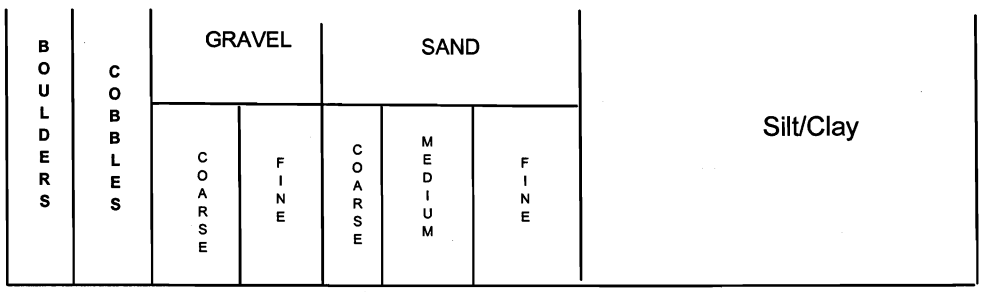


CLIENT SAMPLE NO.: GABT-11 **LAB SAMPLE NO.:** BC0921



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Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-12
Lab Sample No.
BC0922

Specific Gravity = 2.65
assumed

Moisture Content = 20.9%
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	100.0%
	#10	2.000	99.6%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	95.5%
	#40	0.425	91.2%
	#60	0.250	86.8%
	#100	0.149	75.8%
	#140	0.106	63.9%
	#200	0.075	58.8%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.03236	43.1%
	0.02703	38.3%
	0.02122	35.1%
	0.01262	28.7%
	0.00910	24.0%
	0.00654	20.0%
	0.00467	16.8%
	0.00324	14.4%
	0.00137	9.6%

0.0% Gravel 41.2% Sand 58.8% Silt/Clay

November 7, 2006
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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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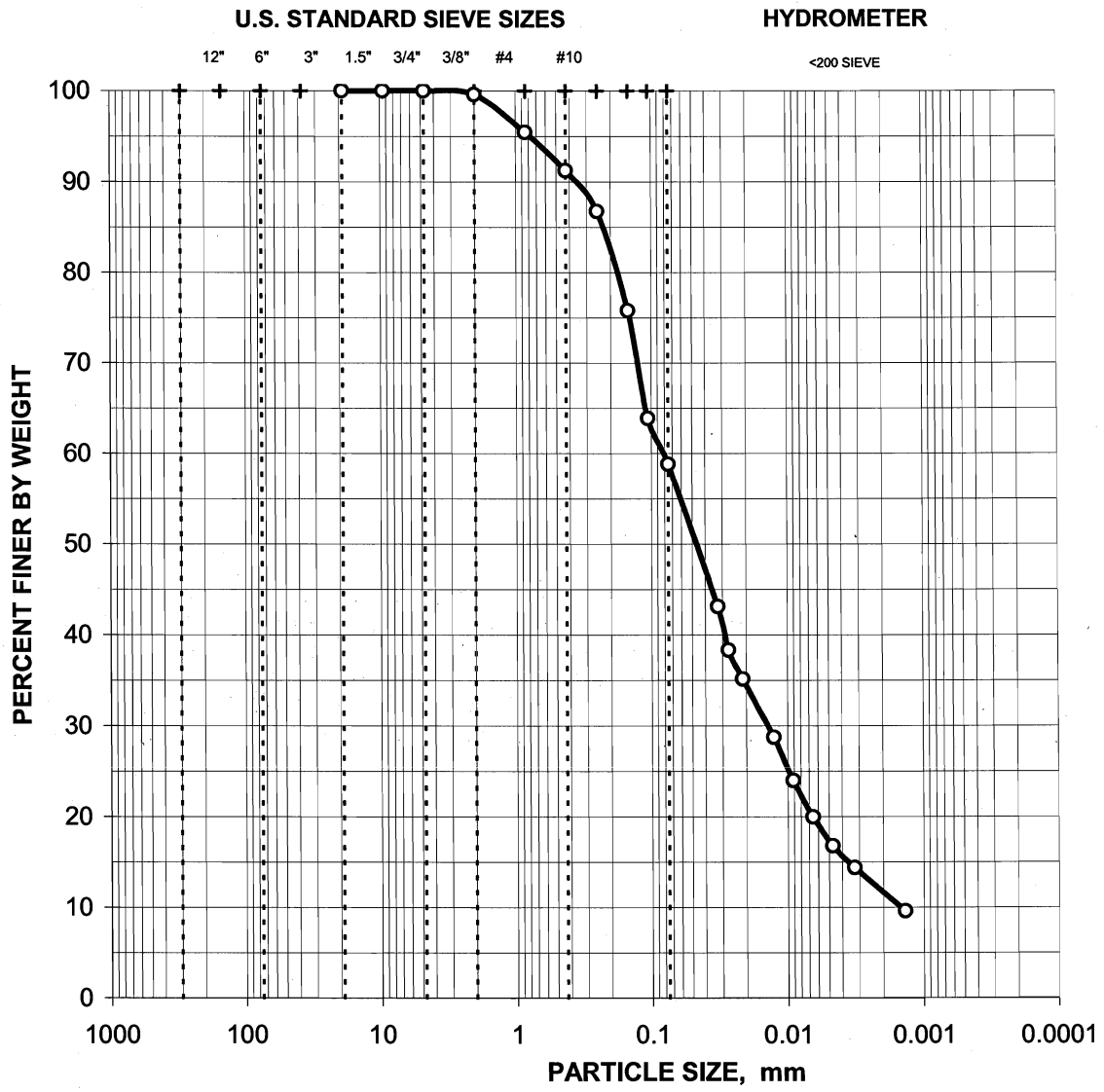
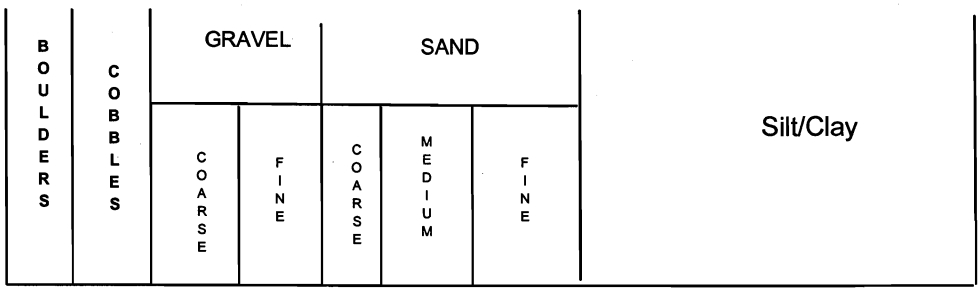
GEL - Moab



CLIENT SAMPLE NO.: GABT-12 **LAB SAMPLE NO.:** BC0922



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General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-13
Lab Sample No.
BC0923

Specific Gravity = 2.65
assumed

Moisture Content = 26.9%
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	100.0%
	#10	2.000	99.9%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	99.8%
	#40	0.425	99.2%
	#60	0.250	98.3%
	#100	0.149	96.0%
	#140	0.106	92.8%
	#200	0.075	88.3%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.04030	86.7%
	0.02943	79.5%
	0.01918	72.3%
	0.01154	61.9%
	0.00839	54.7%
	0.00604	49.5%
	0.00411	40.3%
	0.00309	33.0%
	0.00135	17.5%

0.0% Gravel 11.7% Sand 88.3% Silt/Clay

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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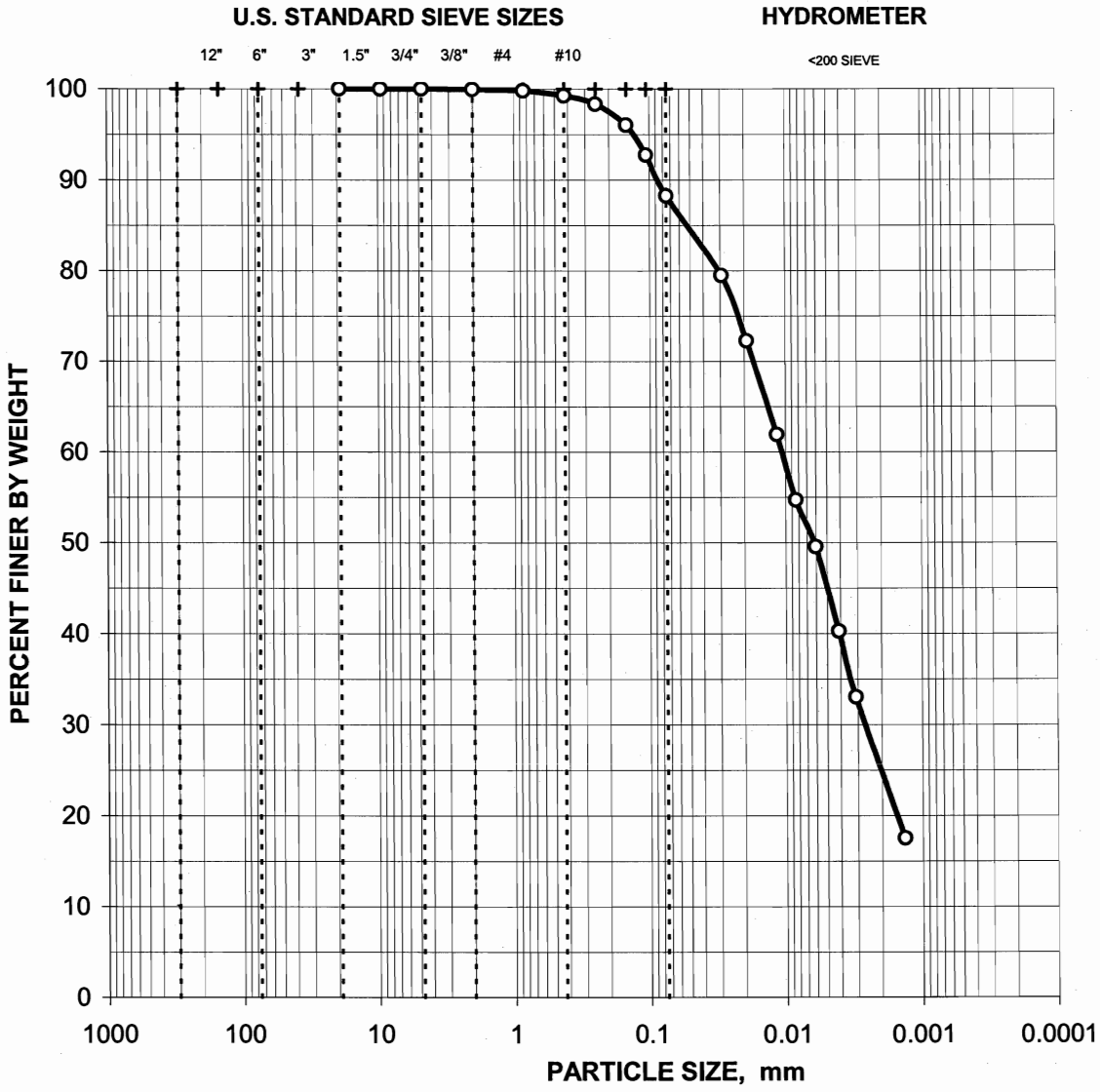
GEL - Moab



CLIENT SAMPLE NO.: GABT-13 **LAB SAMPLE NO.:** BC0923

BOULDERS	COBBLES	GRAVEL		SAND			Silt/Clay
		COARSE	FINE	COARSE	MEDIUM	FINE	

November 7, 2006
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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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PARTICLE-SIZE ANALYSIS
ASTM D 422

Project Name
GEL - Moab
Project No.
109855.01310000

Client Sample No.
GABT-14
Lab Sample No.
BC0924

Specific Gravity = 2.65
assumed

Moisture Content = 17.8%
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	100.0%
	#10	2.000	100.0%

	Sieve No.	Diameter mm	Percent Finer
FINE	#20	0.850	98.5%
	#40	0.425	96.5%
	#60	0.250	95.0%
	#100	0.149	92.8%
	#140	0.106	89.4%
	#200	0.075	83.6%

HYDROMETER ANALYSIS

	Diameter mm	Percent Finer
HYDROMETER		
	0.04103	77.6%
	0.03001	69.9%
	0.01969	62.1%
	0.01182	52.4%
	0.00855	46.6%
	0.00618	40.7%
	0.00441	34.9%
	0.00310	30.1%
	0.00135	15.5%

0.0% Gravel 16.4% Sand 83.6% Silt/Clay

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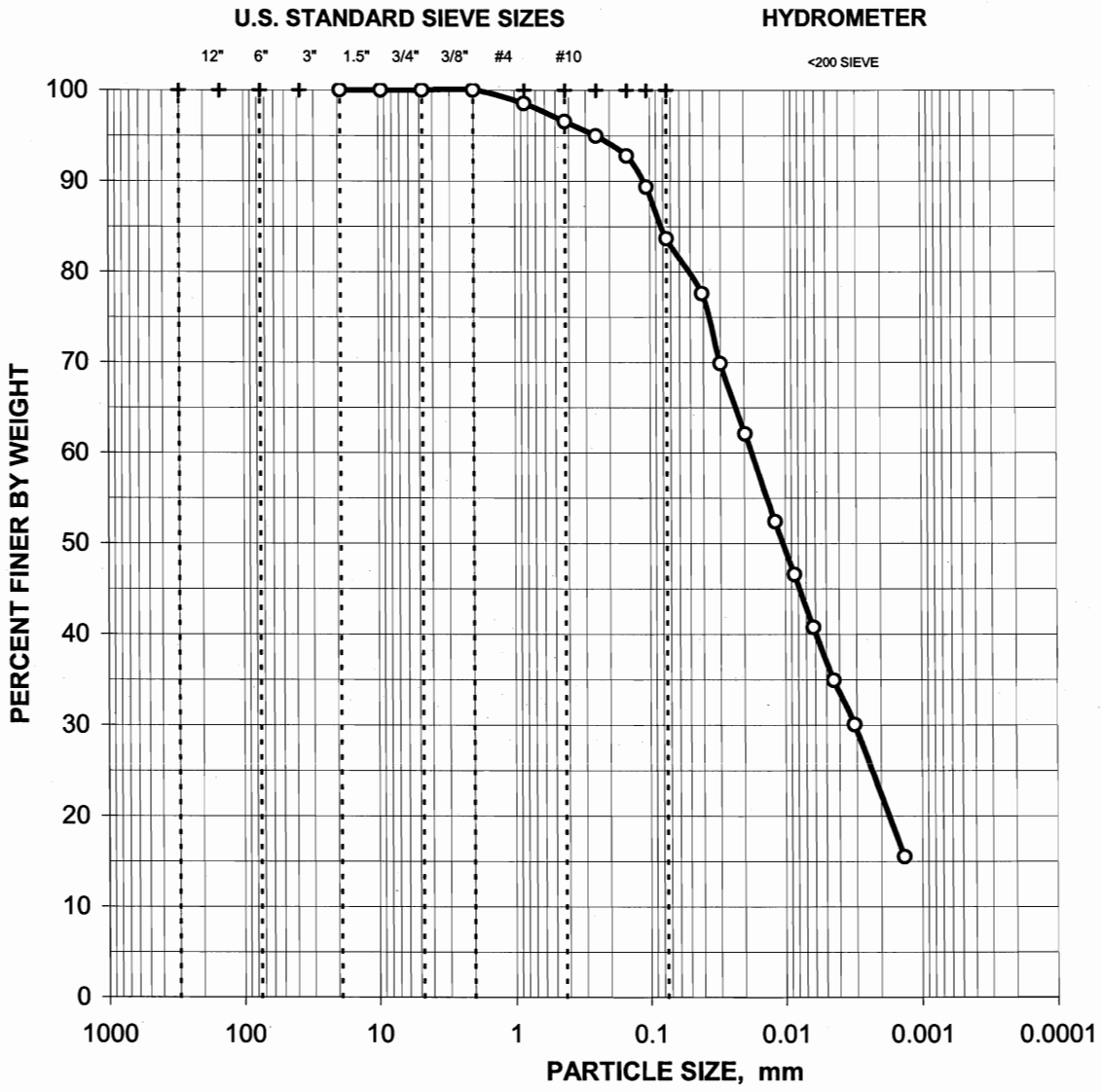
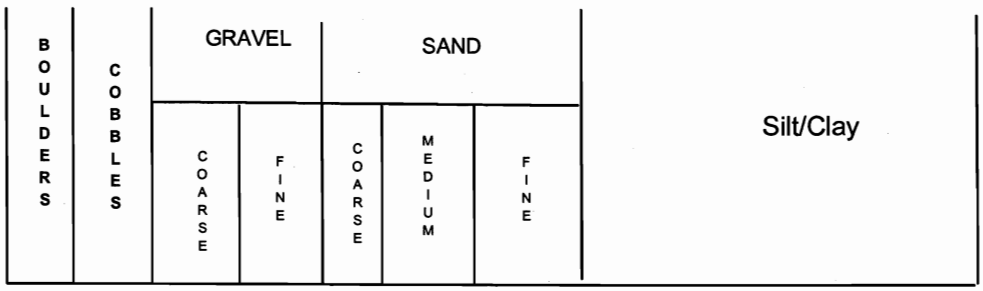
GEL - Moab



CLIENT SAMPLE NO.: GABT-14

LAB SAMPLE NO.: BC0924



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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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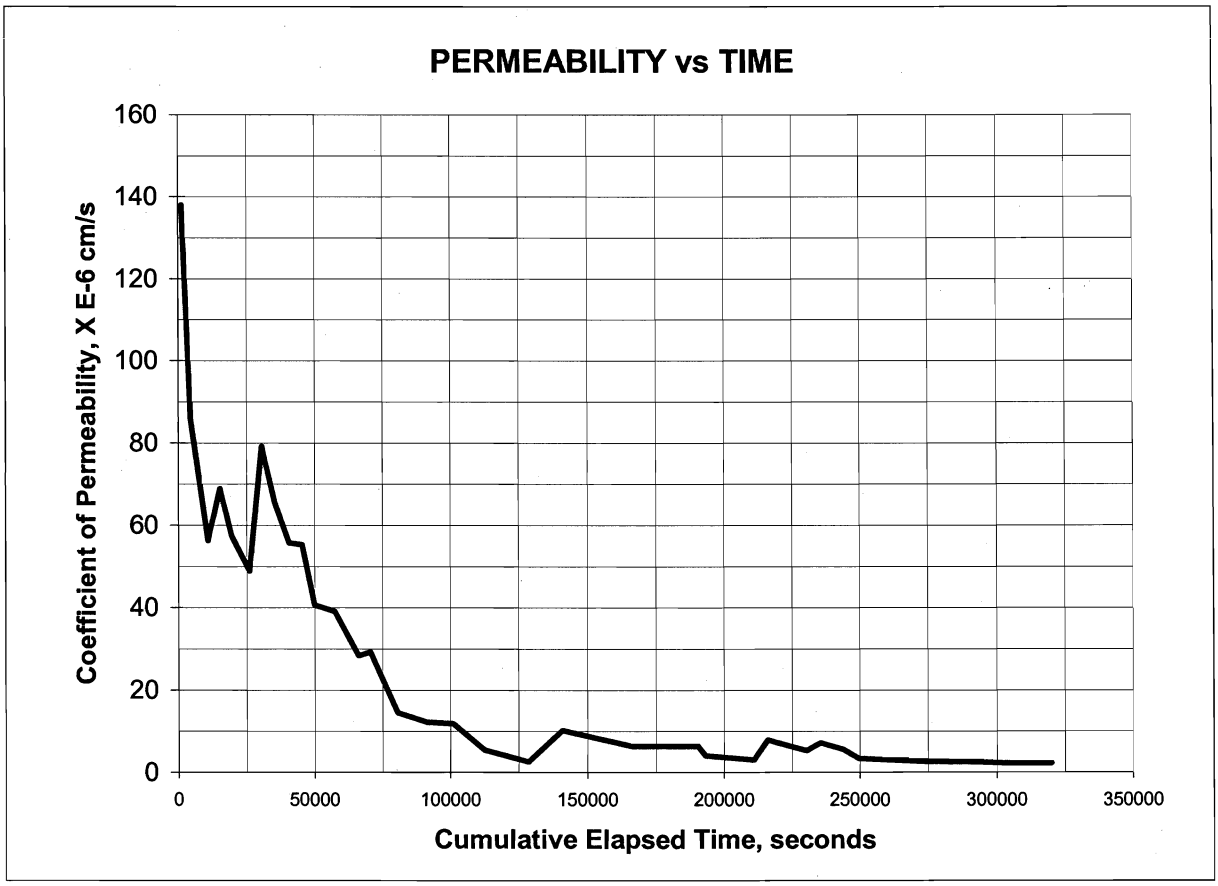
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-01
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0911

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	20
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	356.39		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	7.0		Total backpressure, psi	17.0
Wet unit weight, pcf	113.7			
Dry unit weight, pcf	106.3		Permeant Fluid	Deaired DI Water
Degree of saturation, %	33.4	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 4.7E-06



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Shaw Project No. 109855.01410000

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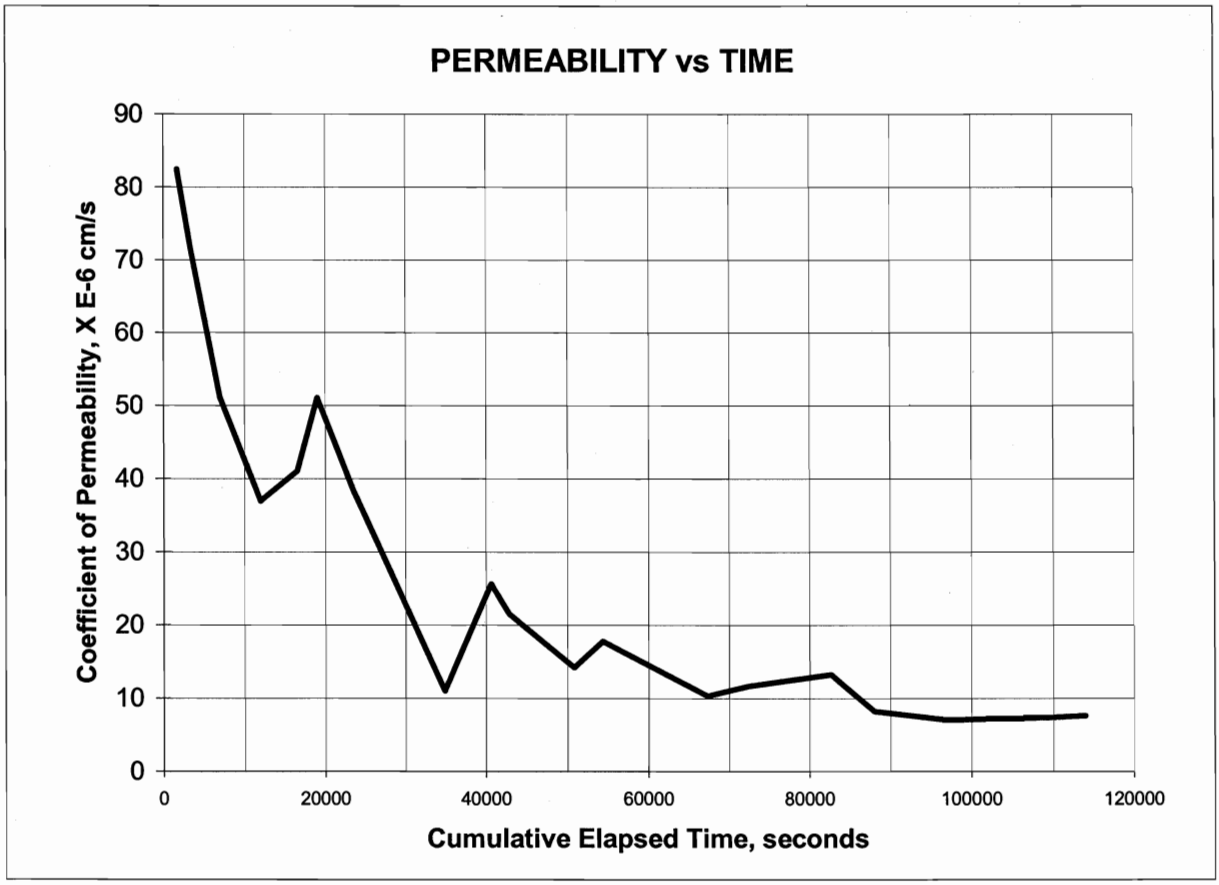
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-01
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0911

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	40
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	356.39		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	7.0		Total backpressure, psi	37.0
Wet unit weight, pcf	113.7			
Dry unit weight, pcf	106.3		Permeant Fluid	Deaired DI Water
Degree of saturation, %	33.4	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 7.6E-06



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Shaw Project No. 109855.01410000

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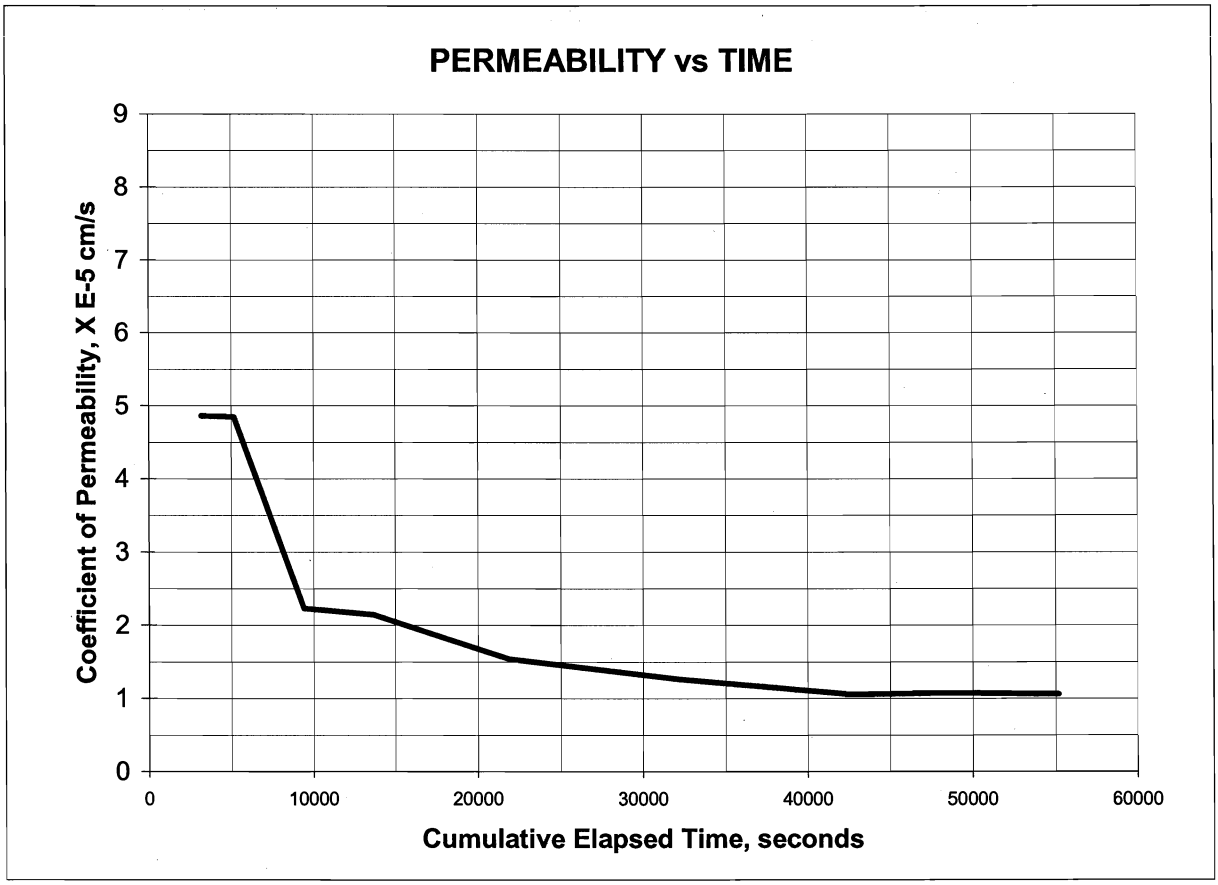
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-01
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0911

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	356.39		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	7.0		Total backpressure, psi	57.0
Wet unit weight, pcf	113.7			
Dry unit weight, pcf	106.3		Permeant Fluid	Deaired DI Water
Degree of saturation, %	33.4	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 1.1E-05



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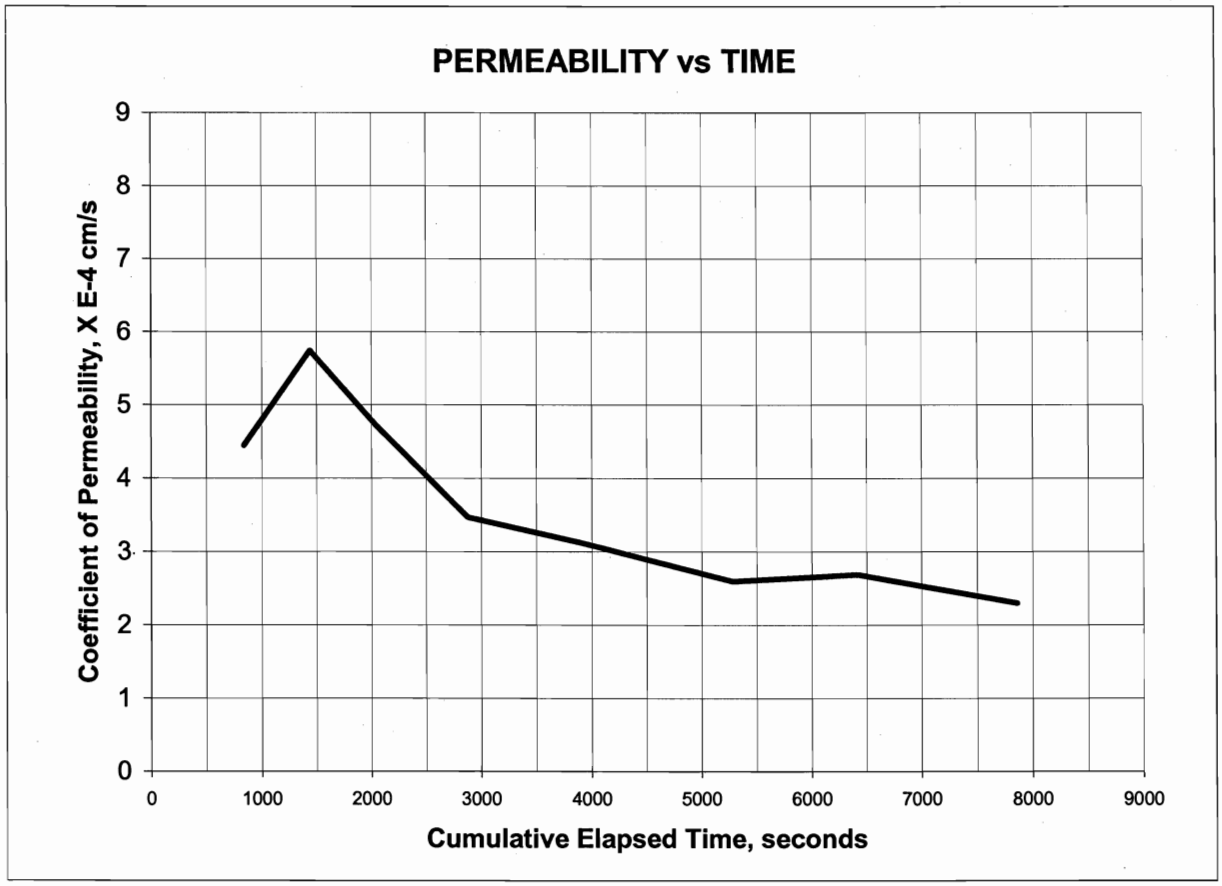
HYDRAULIC CONDUCTIVITY / PERMEABILITY ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-03
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0913

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	20
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	324.39		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	14.4		Total backpressure, psi	17.5
Wet unit weight, pcf	103.5			
Dry unit weight, pcf	90.5		Permeant Fluid	Deaired DI Water
Degree of saturation, %	46.0	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 2.7E-04



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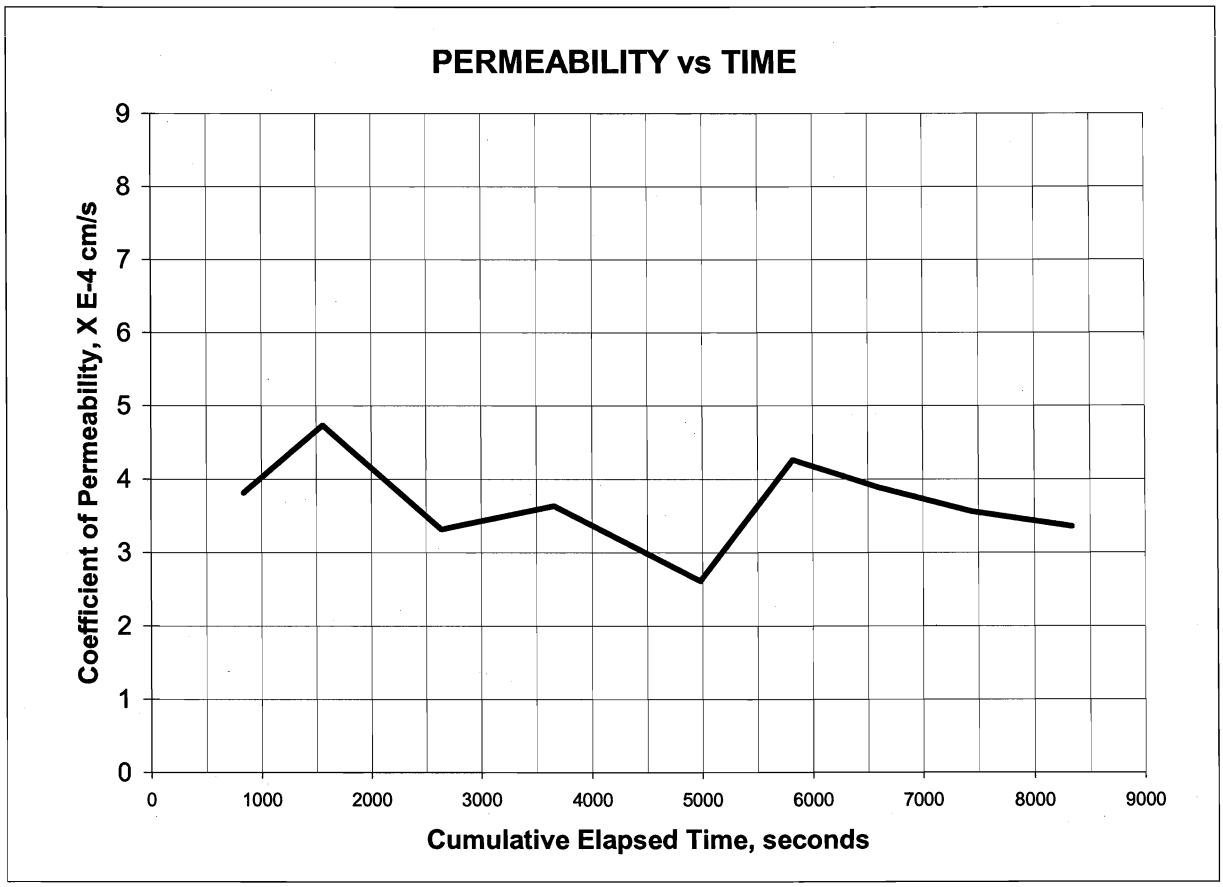
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-03
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0913

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	40
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	324.39		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	14.4		Total backpressure, psi	37.5
Wet unit weight, pcf	103.5			
Dry unit weight, pcf	90.5		Permeant Fluid	Deaired DI Water
Degree of saturation, %	46.0	estimated		
Specific gravity of solids	2.650	assumed		

Coefficient of Permeability, cm/s 3.8E-04



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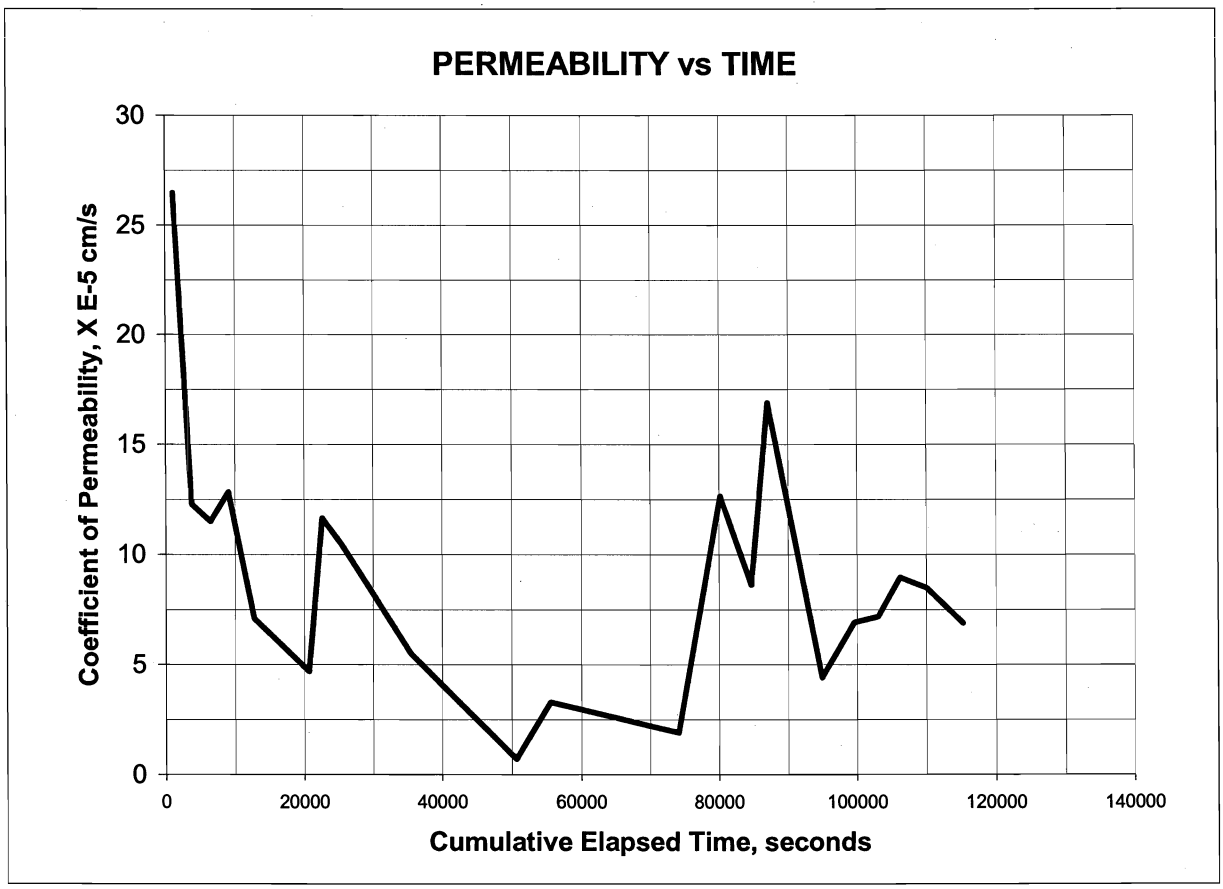
HYDRAULIC CONDUCTIVITY / PERMEABILITY ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-03
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0913

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	324.39		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	14.4		Total backpressure, psi	57.5
Wet unit weight, pcf	103.5			
Dry unit weight, pcf	90.5		Permeant Fluid	Deaired DI Water
Degree of saturation, %	46.0	estimated		
Specific gravity of solids	2.650	assumed	Test readings did not meet the stability requirements of ASTM D 5084	

Coefficient of Permeability, cm/s 7.9E-05



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Shaw Project No. 109855.01410000

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HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

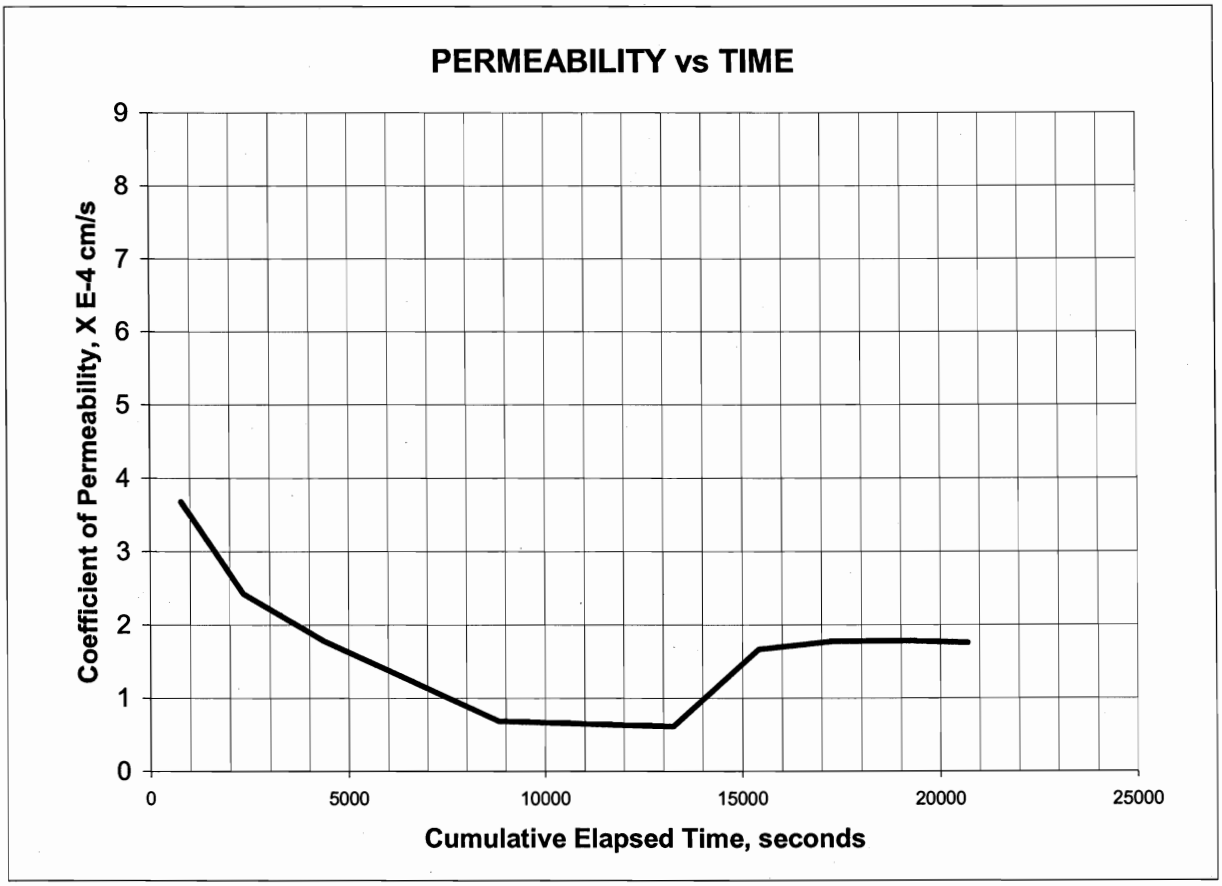
PROJECT NAME: GEL Moab
PROJECT NO. 109855.0141000

CLIENT SAMPLE NO. GATB-04
LAB SAMPLE NO. BC0914

	INITIAL	
Specimen diameter, cm	4.96	
Specimen length, cm	10.12	
Wet weight of specimen, g.	324.78	
Specimen cross-sect. area, cm^2	19.34	
Water content, %	17.5	
Wet unit weight, pcf	103.6	
Dry unit weight, pcf	88.2	
Degree of saturation, %	53.0	estimated
Specific gravity of solids	2.650	assumed

Cell confining pressure, psi	20
Hydraulic gradient	3.5
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	2.5
Total backpressure, psi	17.5
Permeant Fluid	Deaired DI Water

Coefficient of Permeability, cm/s 1.7E-04



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HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

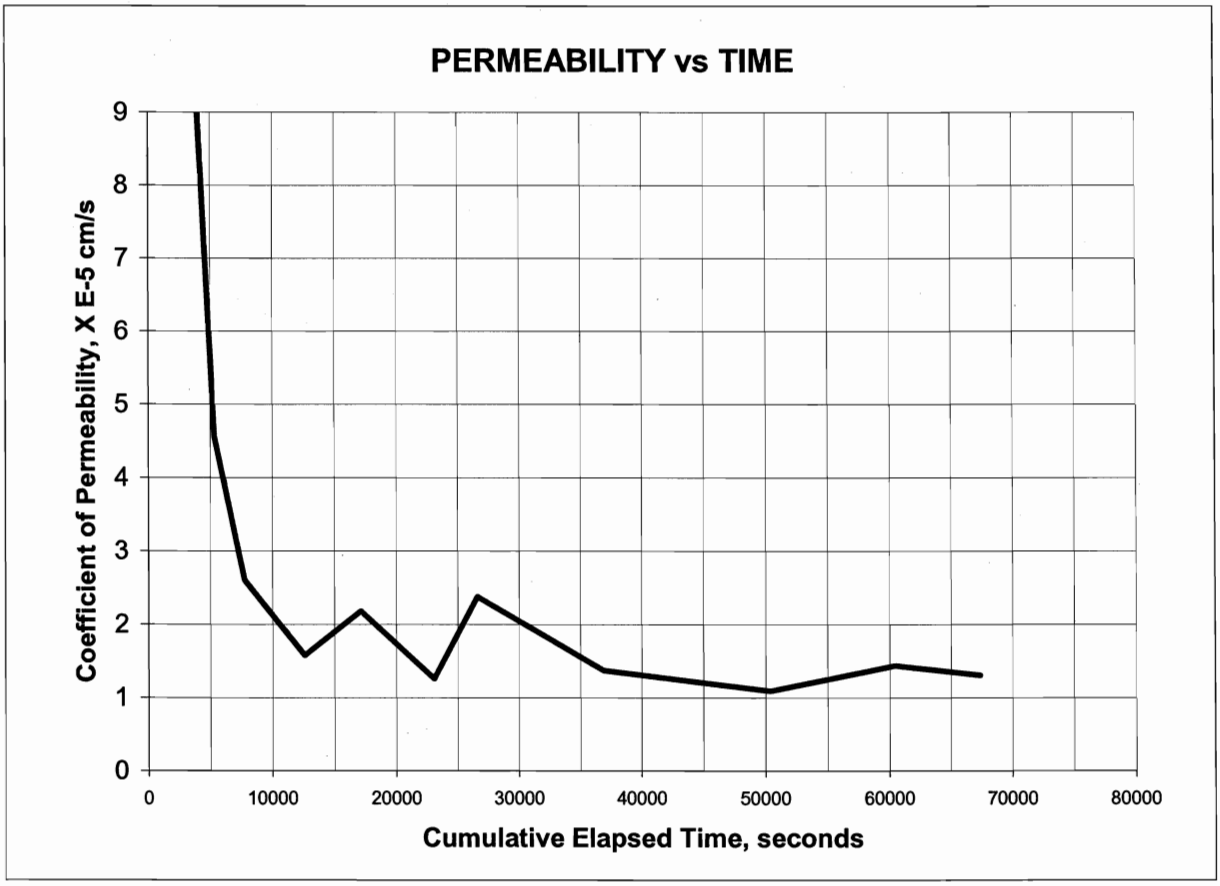
PROJECT NAME: GEL Moab
PROJECT NO. 109855.0141000

CLIENT SAMPLE NO. GATB-04
LAB SAMPLE NO. BC0914

	INITIAL	
Specimen diameter, cm	4.96	
Specimen length, cm	10.12	
Wet weight of specimen, g.	324.78	
Specimen cross-sect. area, cm^2	19.34	
Water content, %	17.5	
Wet unit weight, pcf	103.6	
Dry unit weight, pcf	88.2	
Degree of saturation, %	53.0	estimated
Specific gravity of solids	2.65	assumed

Cell confining pressure, psi	40
Hydraulic gradient	7.0
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.0
Total backpressure, psi	37.0
Permeant Fluid	Deaired DI Water

Coefficient of Permeability, cm/s 1.3E-05



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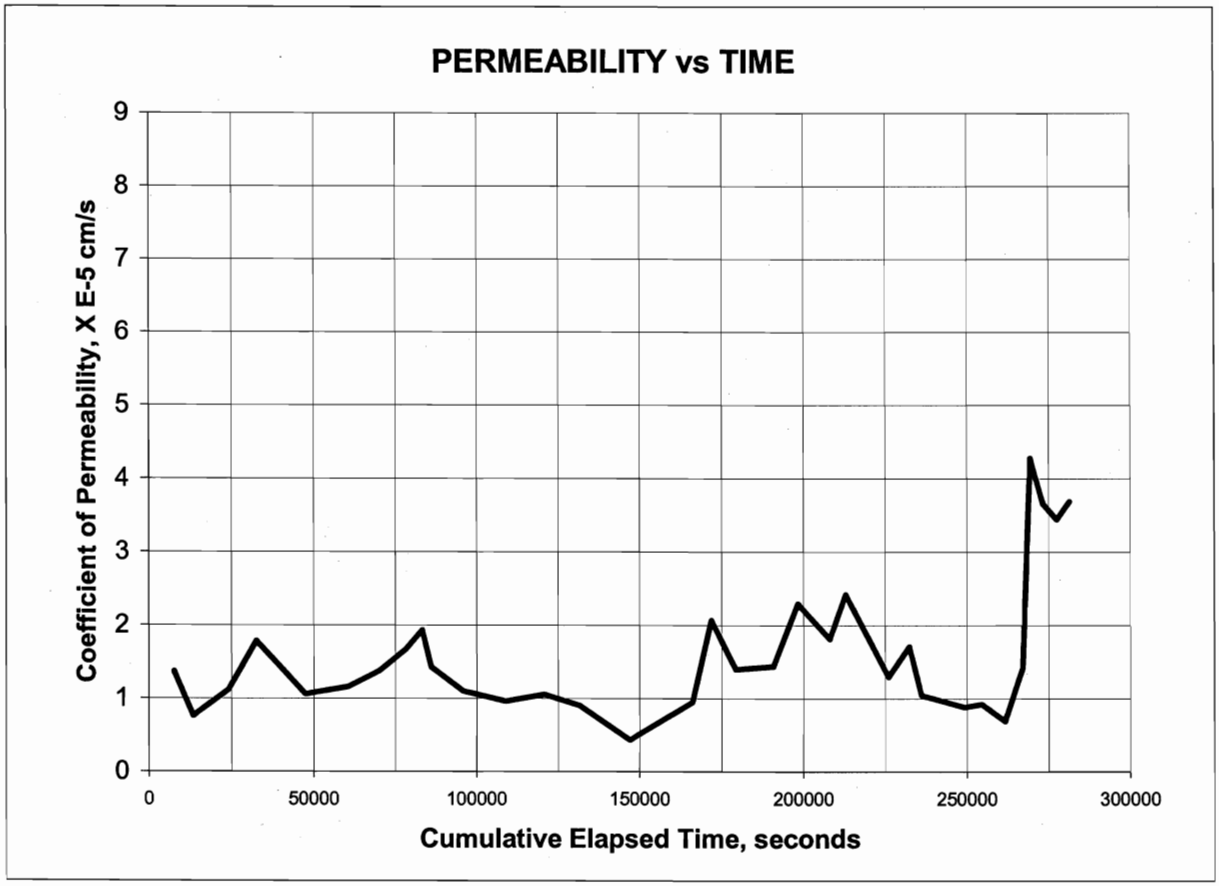
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-04
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0914

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	324.78		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	17.5		Total backpressure, psi	57.0
Wet unit weight, pcf	103.6			
Dry unit weight, pcf	88.2		Permeant Fluid	Deaired DI Water
Degree of saturation, %	53.0	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 1.8E-05



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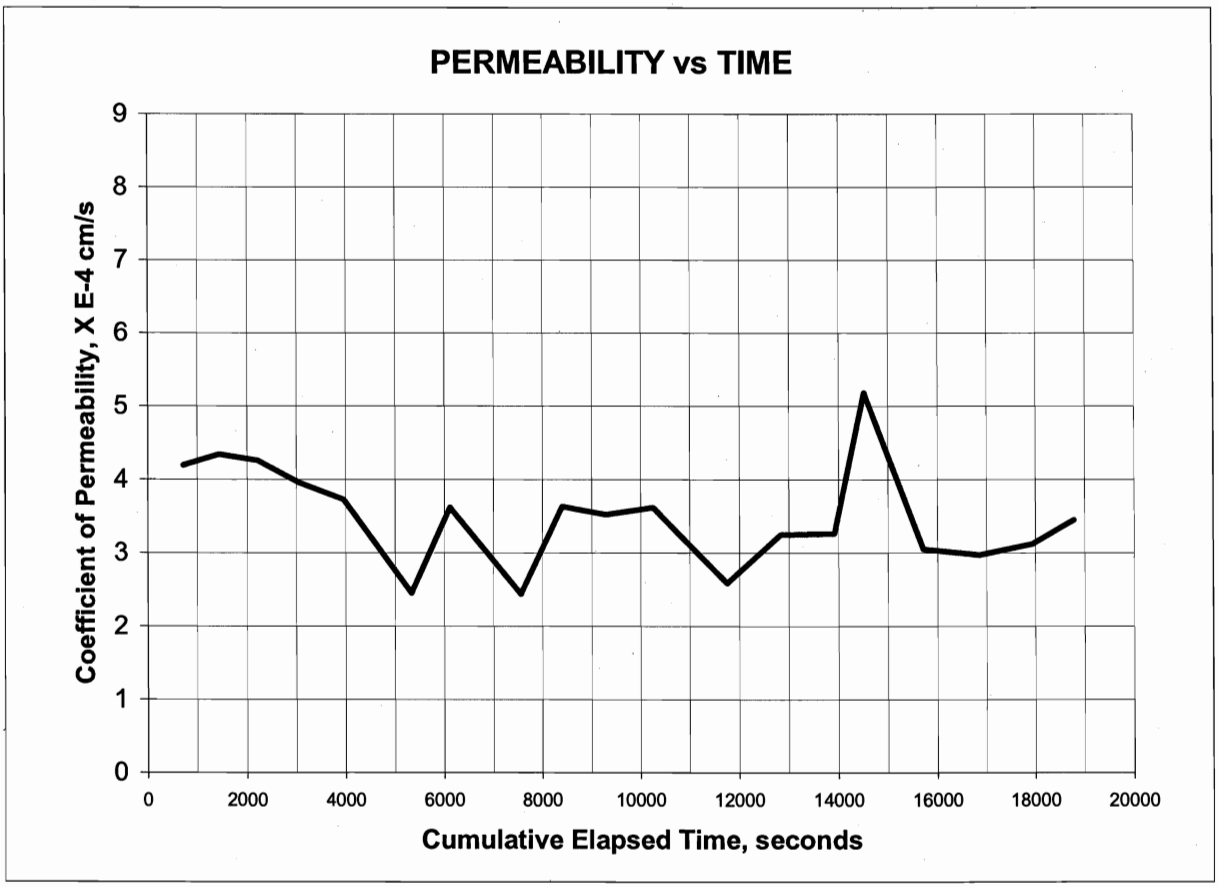
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-05
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0915

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	20
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	367.42		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	15.3		Total backpressure, psi	17.5
Wet unit weight, pcf	117.3			
Dry unit weight, pcf	101.7		Permeant Fluid	Deaired DI Water
Degree of saturation, %	64.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 3.1E-04



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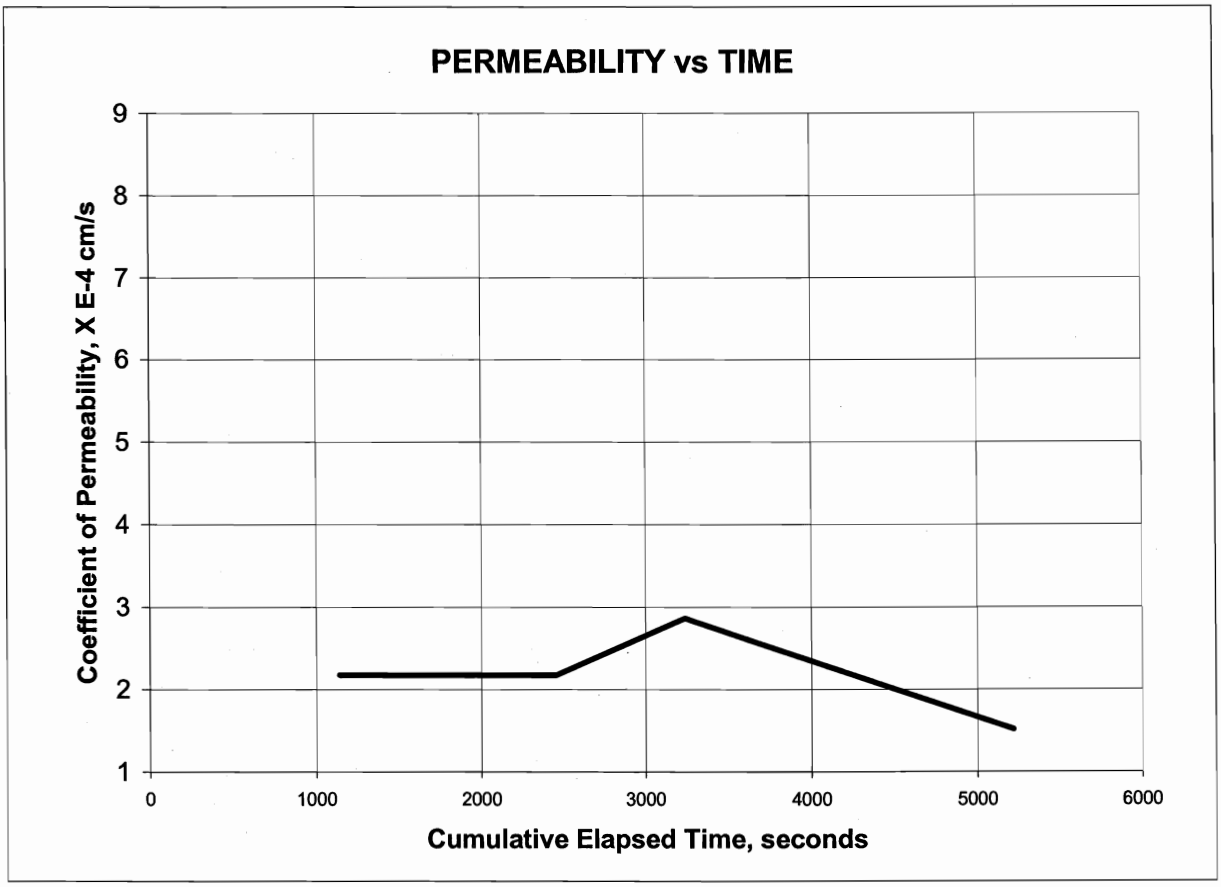
HYDRAULIC CONDUCTIVITY / PERMEABILITY ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-05
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0915

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	40
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	367.42		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	15.3		Total backpressure, psi	37.5
Wet unit weight, pcf	117.3			
Dry unit weight, pcf	101.7		Permeant Fluid	Deaired DI Water
Degree of saturation, %	64.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 2.2E-04



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Shaw Project No. 109855.01410000

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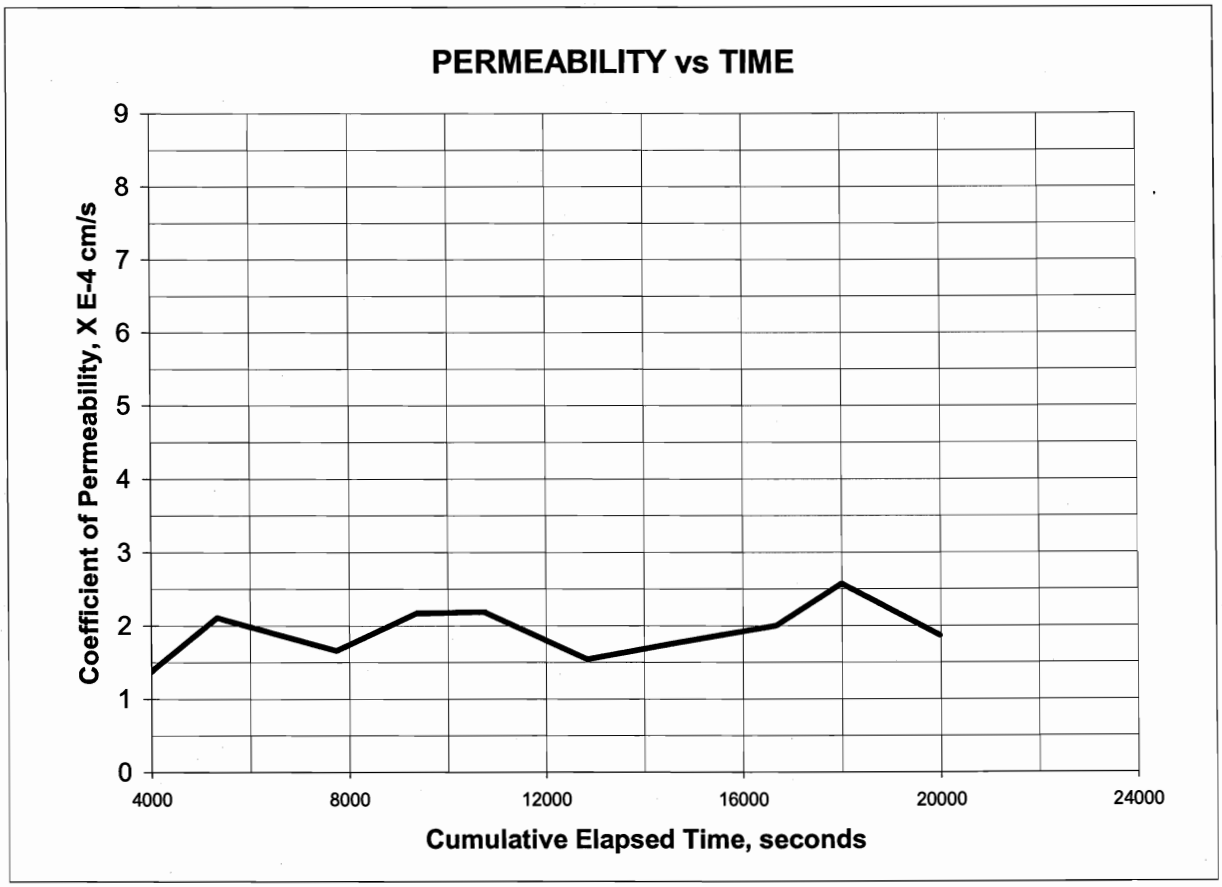
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-05
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0915

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	367.42		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	15.3		Total backpressure, psi	57.5
Wet unit weight, pcf	117.3			
Dry unit weight, pcf	101.7		Permeant Fluid	Deaired DI Water
Degree of saturation, %	64.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 2.1E-04



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HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

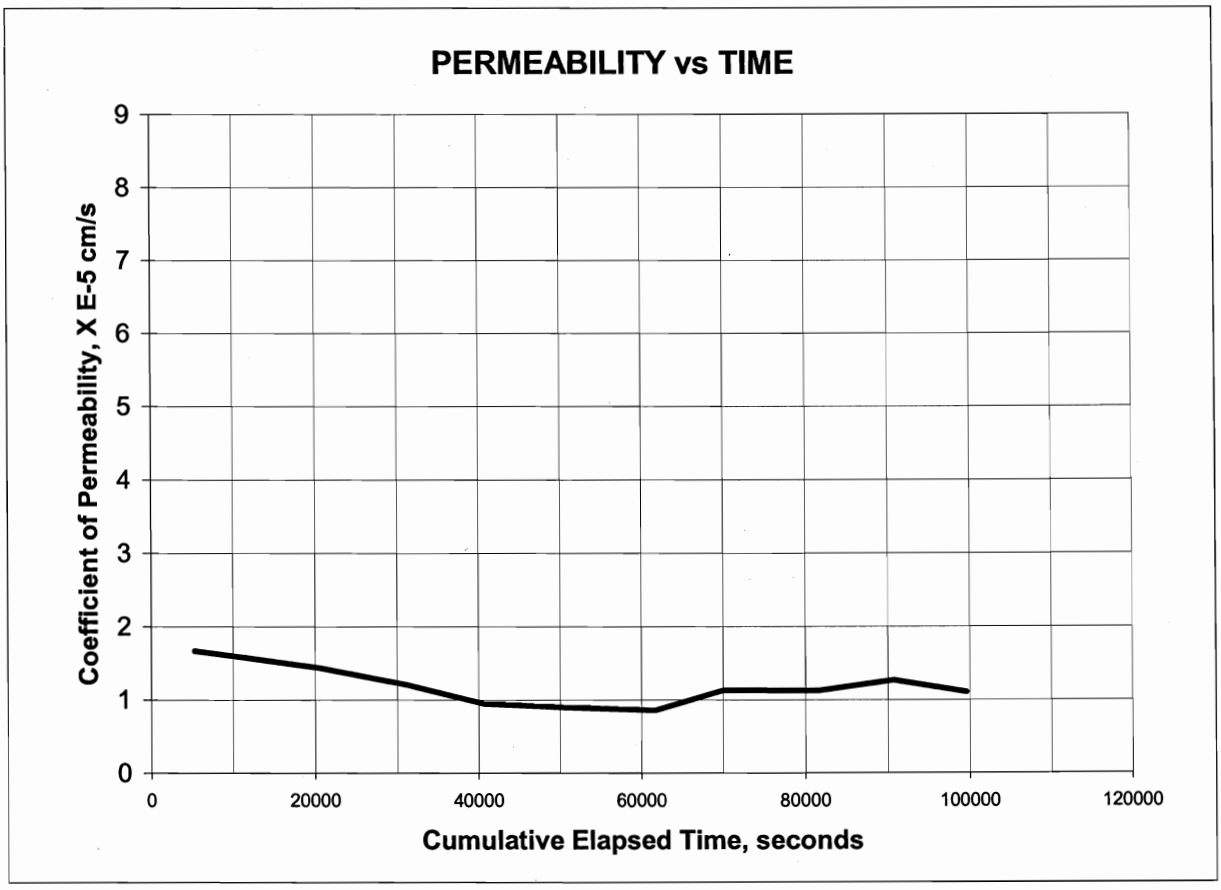
PROJECT NAME: GEL Moab
PROJECT NO. 109855.0141000

CLIENT SAMPLE NO. GABT-07
LAB SAMPLE NO. BC0917

	INITIAL	
Specimen diameter, cm	4.96	
Specimen length, cm	10.12	
Wet weight of specimen, g.	363.52	
Specimen cross-sect. area, cm^2	19.34	
Water content, %	20.5	
Wet unit weight, pcf	116.0	
Dry unit weight, pcf	96.3	
Degree of saturation, %	75.6	estimated
Specific gravity of solids	2.65	assumed

Cell confining pressure, psi	20
Hydraulic gradient	7.0
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	3.0
Total backpressure, psi	17.0
Permeant Fluid	Deaired DI Water

Coefficient of Permeability, cm/s 1.2E-05



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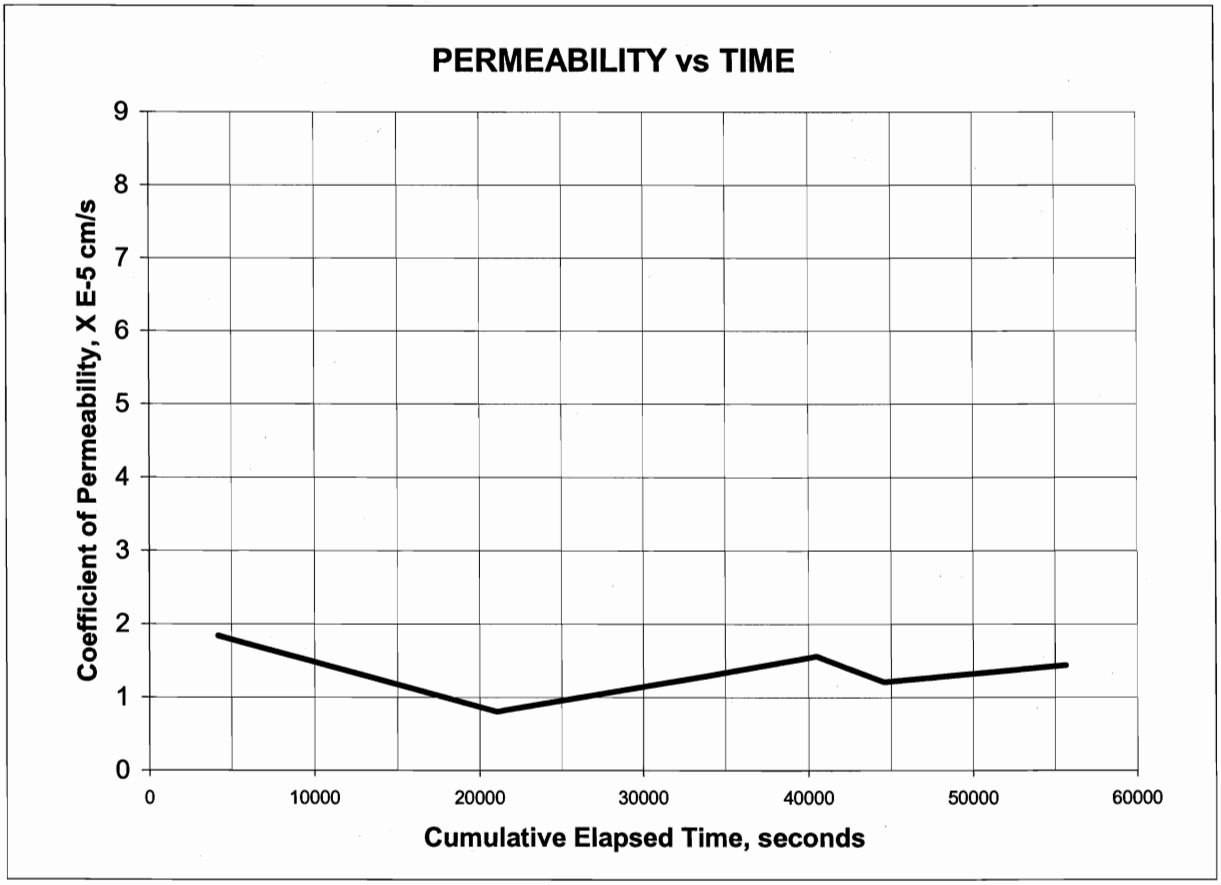
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-07
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0917

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	40
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	363.52		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	20.5		Total backpressure, psi	37.0
Wet unit weight, pcf	116.0			
Dry unit weight, pcf	96.3		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 1.4E-05



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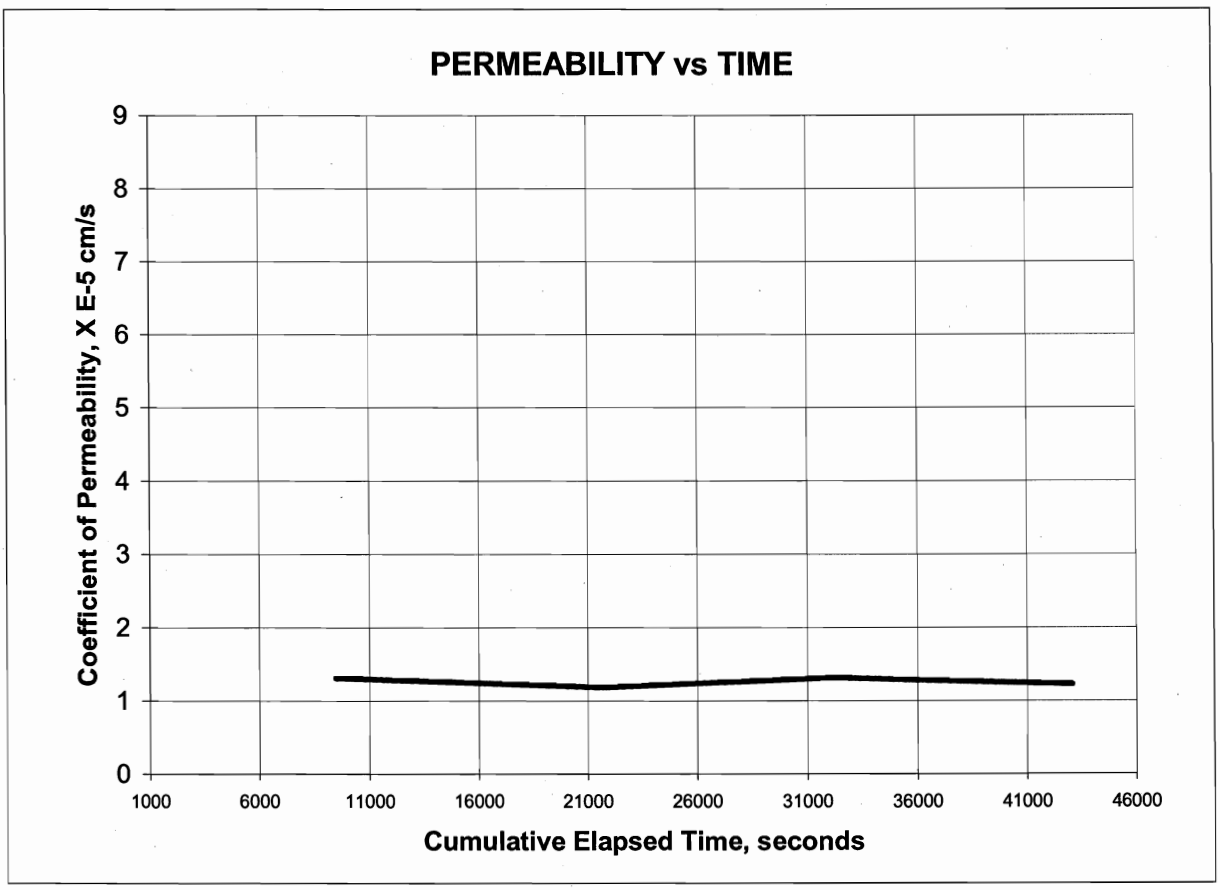
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-07
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0917

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	363.52		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	20.5		Total backpressure, psi	57.0
Wet unit weight, pcf	116.0			
Dry unit weight, pcf	96.3		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 1.3E-05



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General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

Shaw Geotechnical Laboratory
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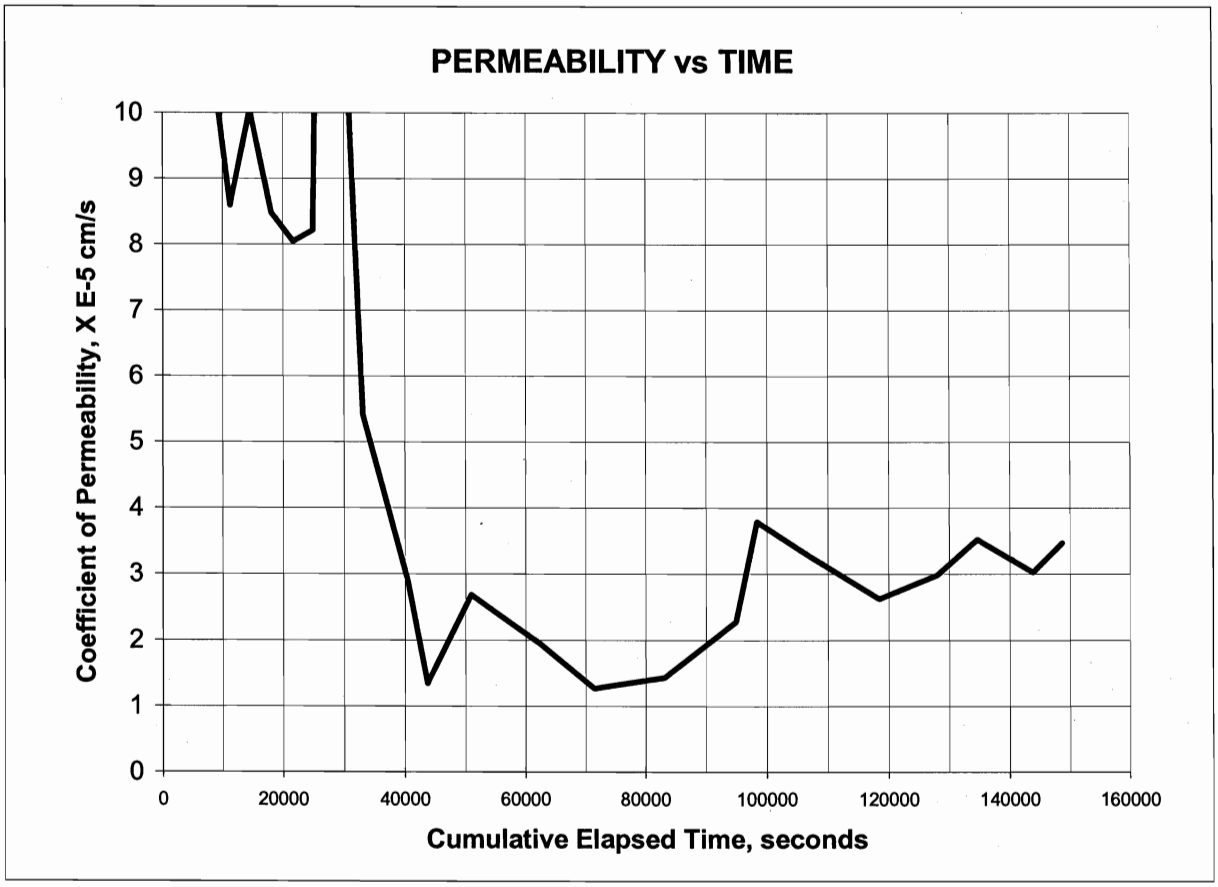
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-08
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0918

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	20
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	374.76		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	17.9		Total backpressure, psi	17.5
Wet unit weight, pcf	119.6			
Dry unit weight, pcf	101.4		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.2	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 3.2E-05



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Shaw Project No. 109855.01410000

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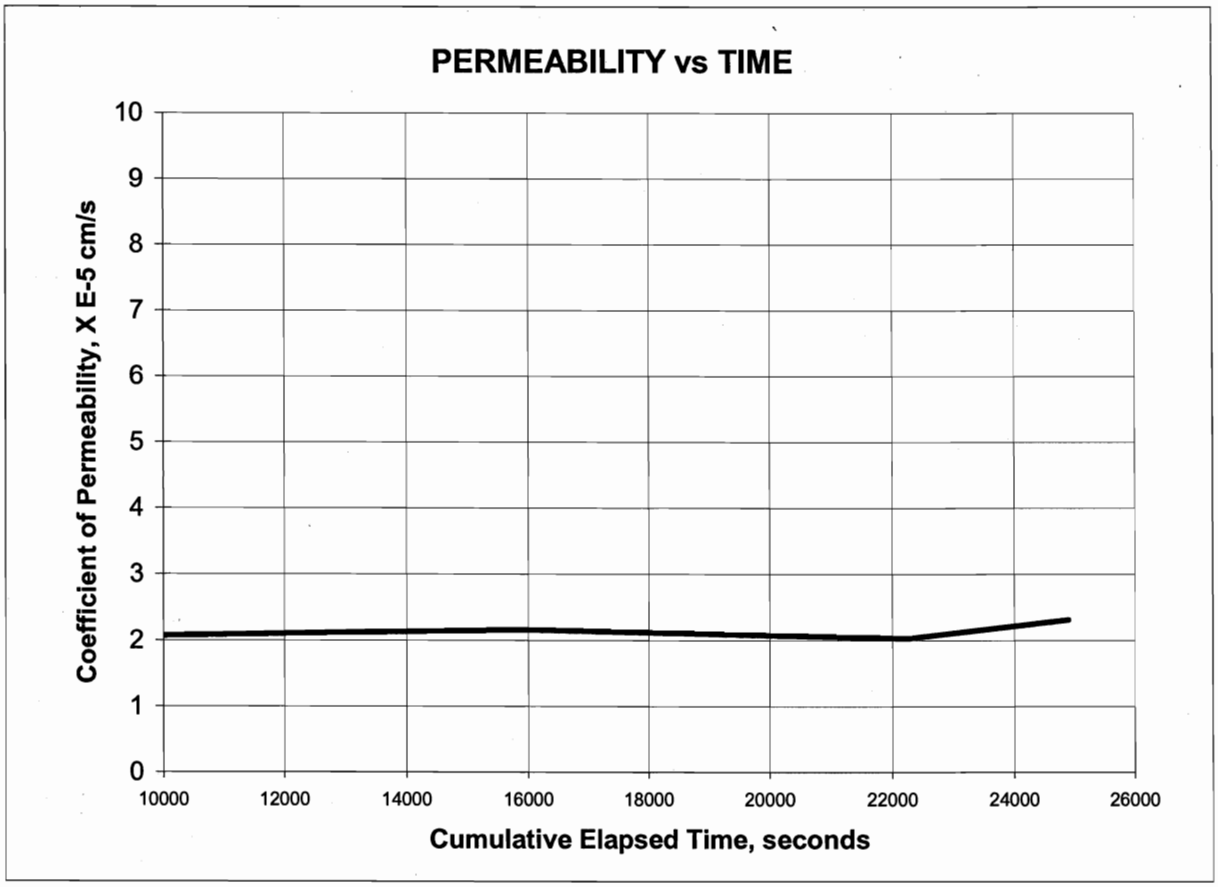
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-08
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0918

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	40
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	374.76		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	17.9		Total backpressure, psi	37.0
Wet unit weight, pcf	119.6			
Dry unit weight, pcf	101.4		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.2	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 2.1E-05



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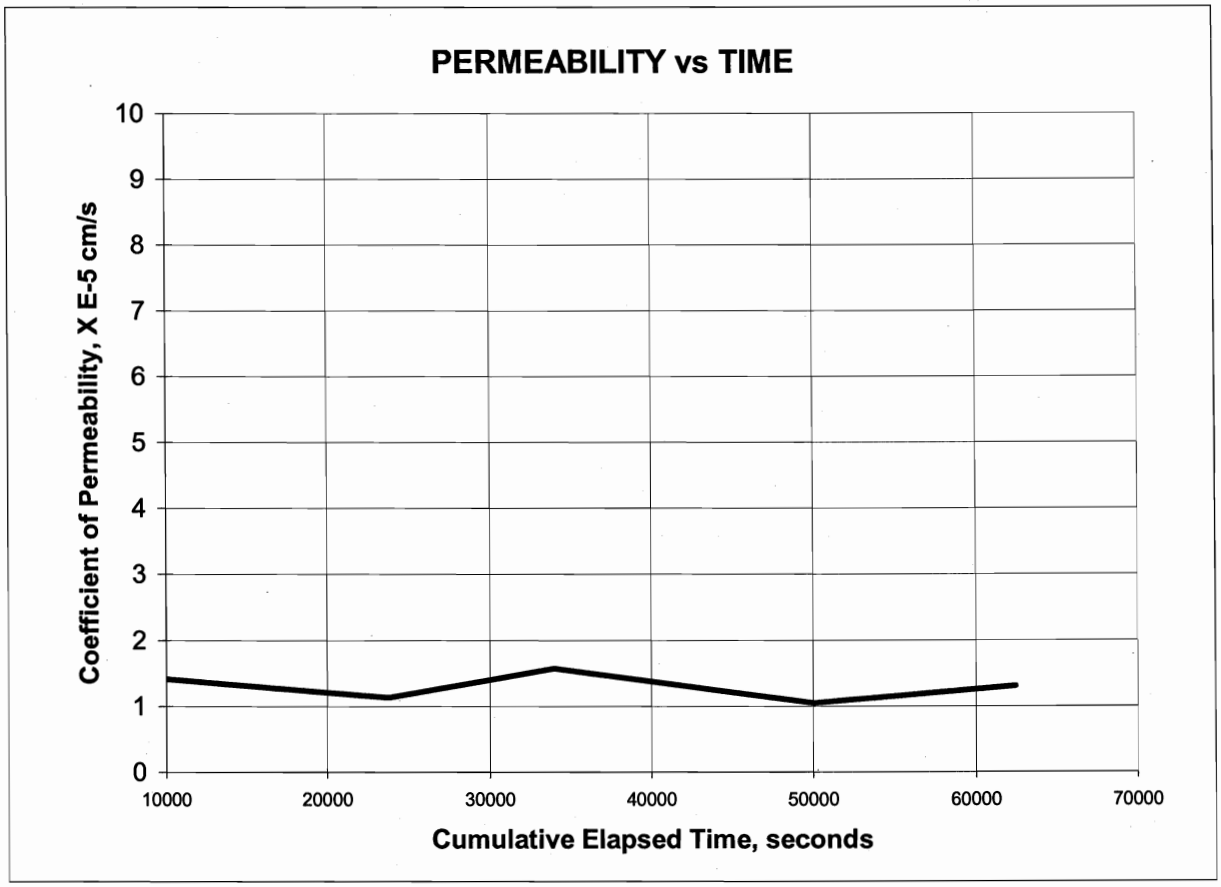
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GABT-08
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0918

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	374.76		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	17.9		Total backpressure, psi	57.0
Wet unit weight, pcf	119.6			
Dry unit weight, pcf	101.4		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.2	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 7.4E-05



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Shaw Project No. 109855.01410000

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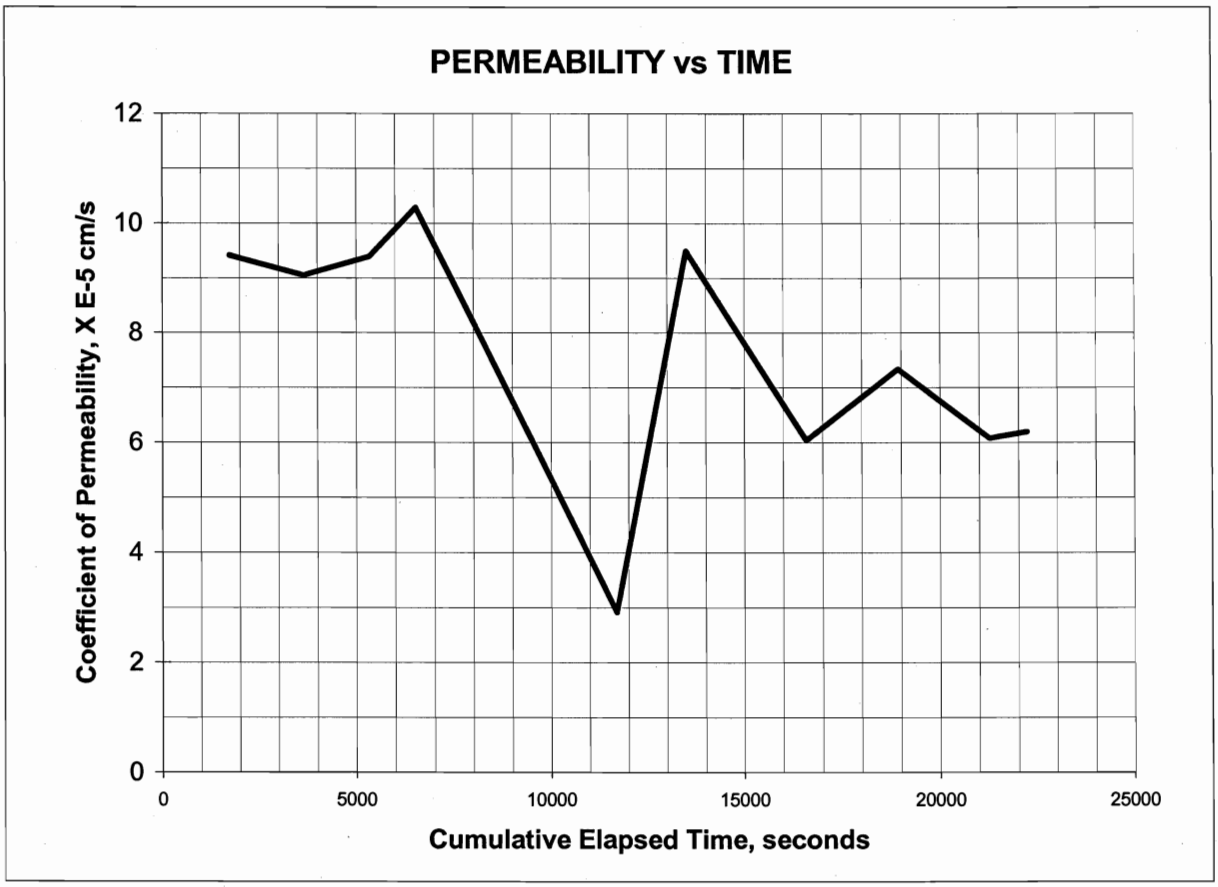
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-09
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0919

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	20
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	353.83		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	23.0		Total backpressure, psi	17.0
Wet unit weight, pcf	112.9			
Dry unit weight, pcf	91.8		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.9	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 6.4E-05



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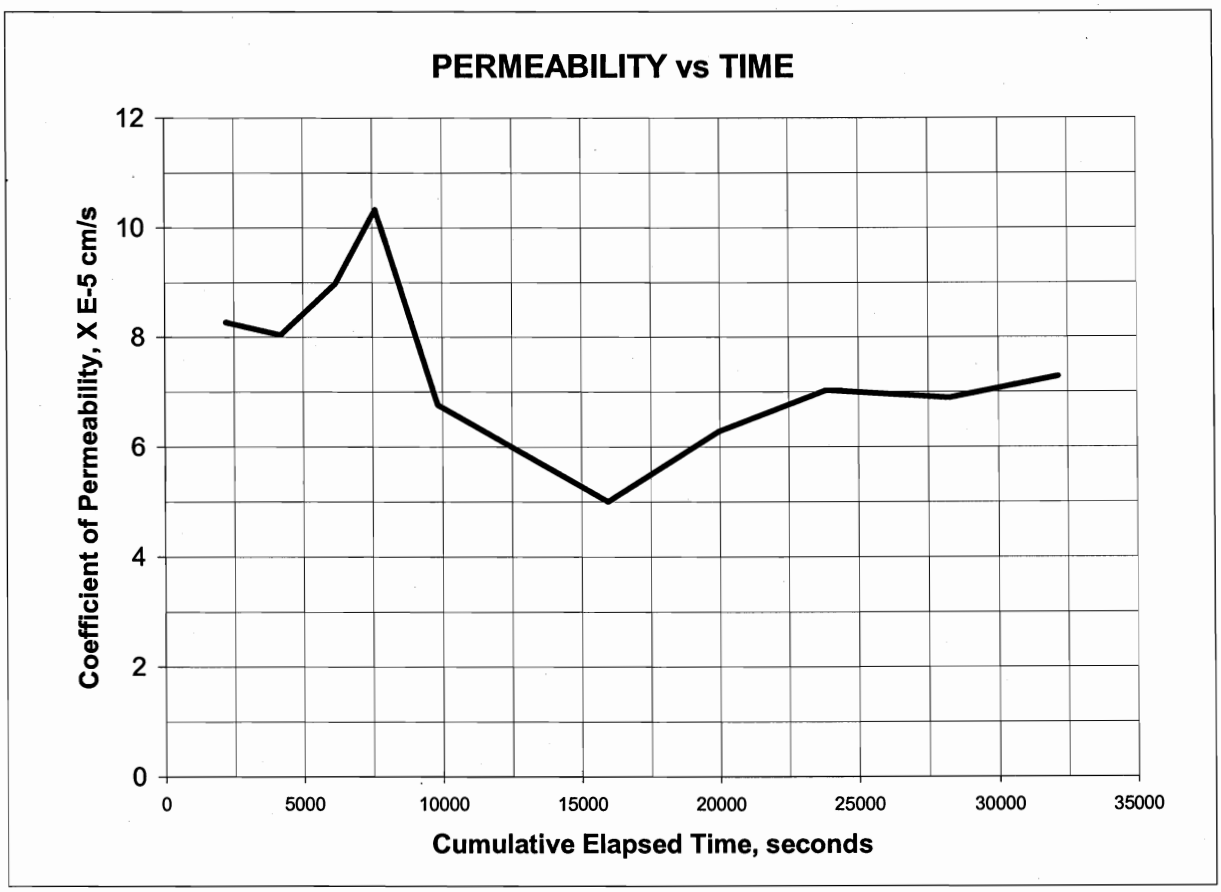
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-09
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0919

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	40
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	353.83		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	23.0		Total backpressure, psi	37.5
Wet unit weight, pcf	112.9			
Dry unit weight, pcf	91.8		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.9	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 6.9E-05



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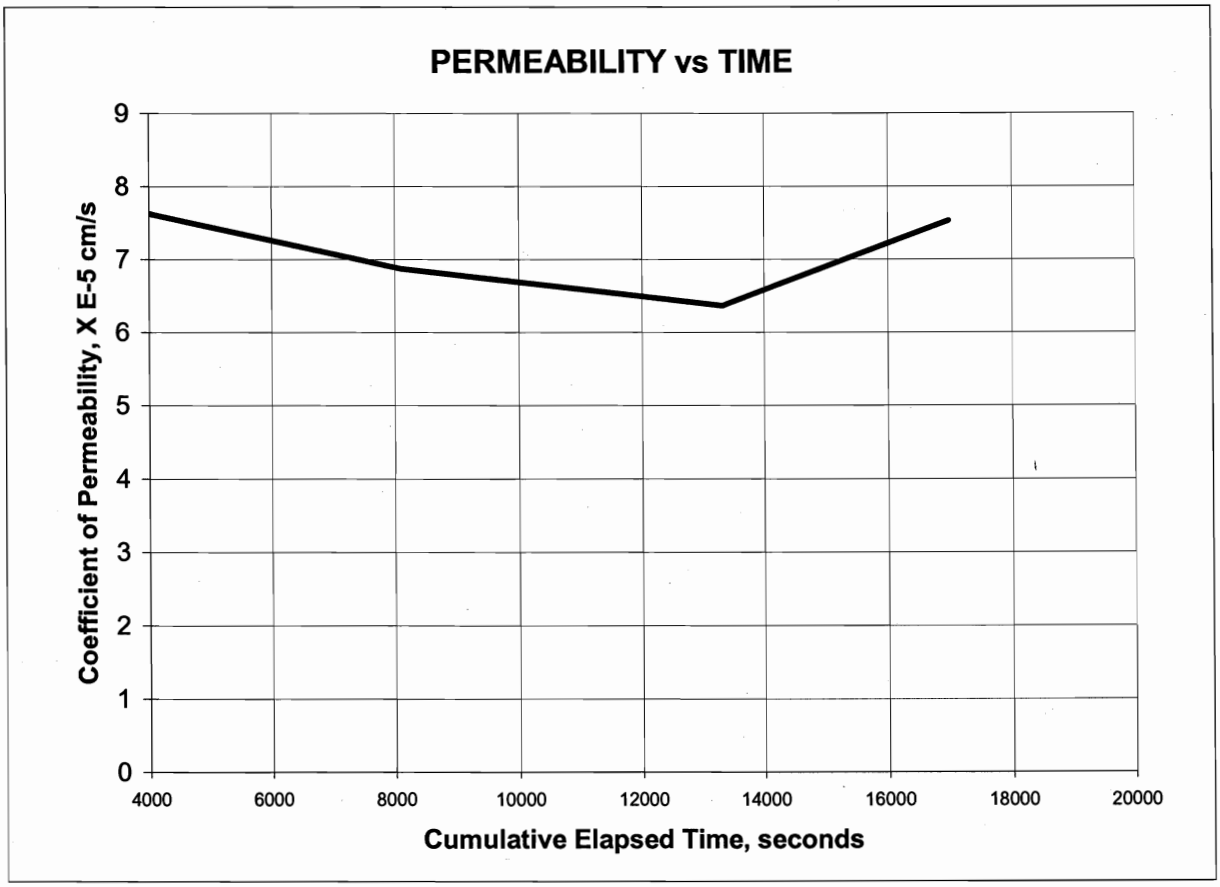
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-09
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0919

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	3.5
Wet weight of specimen, g.	353.83		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	2.5
Water content, %	23.0		Total backpressure, psi	57.5
Wet unit weight, pcf	112.9			
Dry unit weight, pcf	91.8		Permeant Fluid	Deaired DI Water
Degree of saturation, %	75.9	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 7.1E-05



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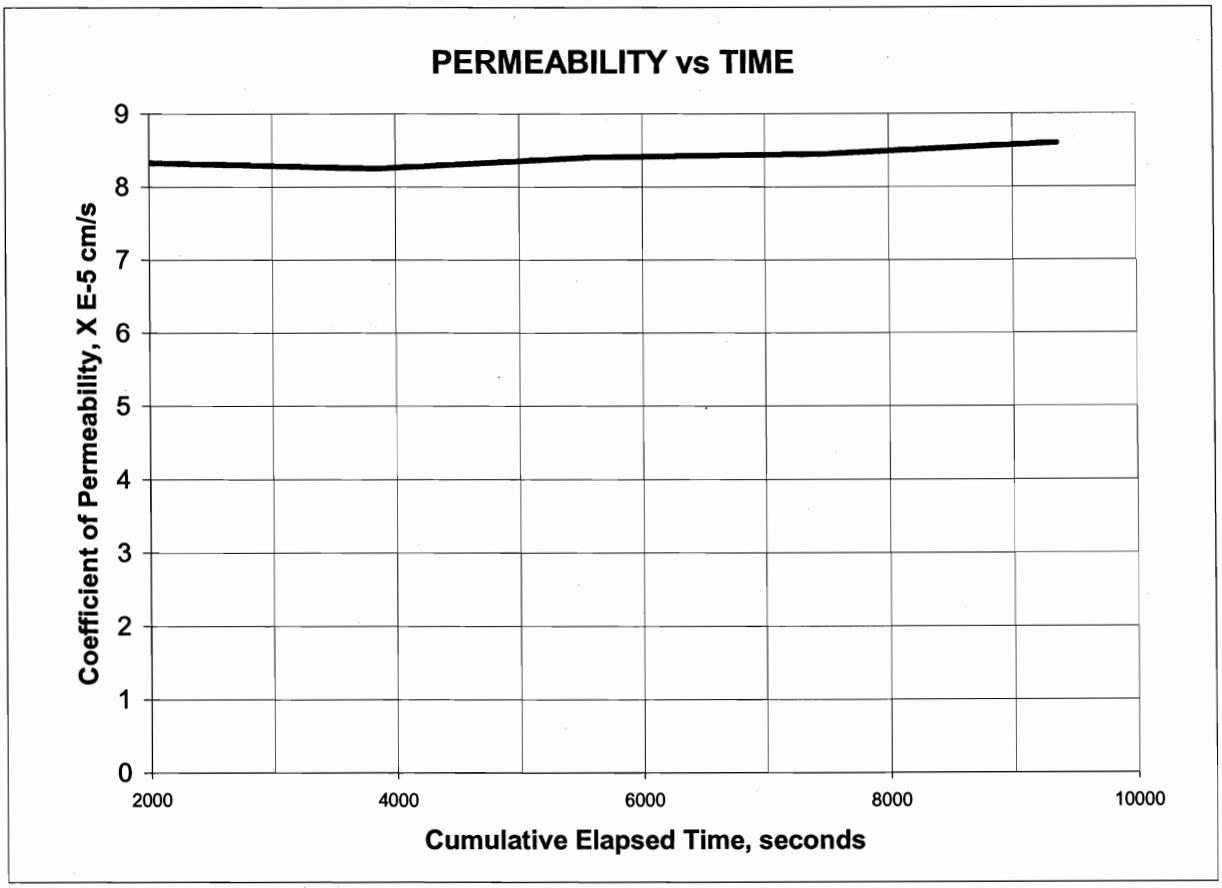
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-12
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0922

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	20
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	316.81		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	20.9		Total backpressure, psi	17.0
Wet unit weight, pcf	101.1			
Dry unit weight, pcf	83.6		Permeant Fluid	Deaired DI Water
Degree of saturation, %	56.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 8.4E-05



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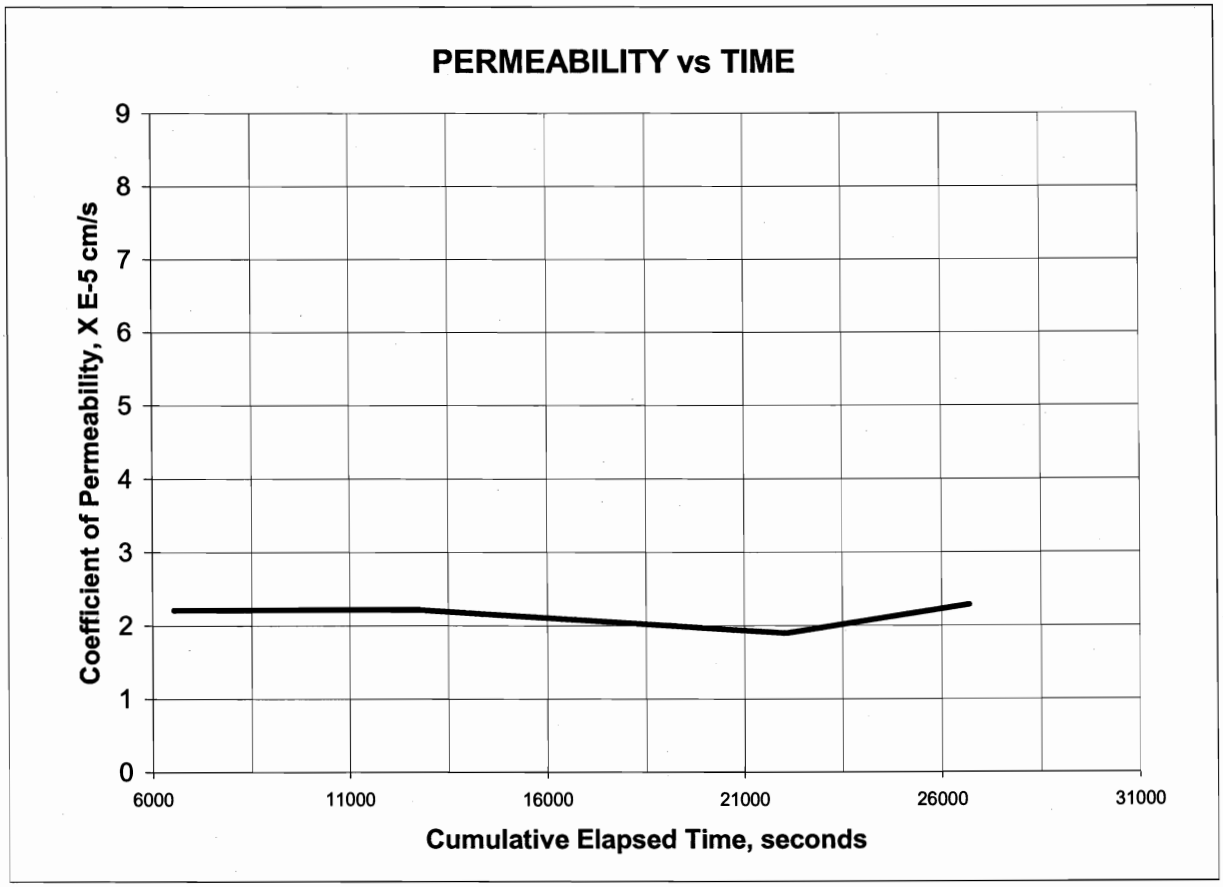
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-12
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0922

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	40
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	316.81		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	20.9		Total backpressure, psi	37.0
Wet unit weight, pcf	101.1			
Dry unit weight, pcf	83.6		Permeant Fluid	Deaired DI Water
Degree of saturation, %	56.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 2.1E-05



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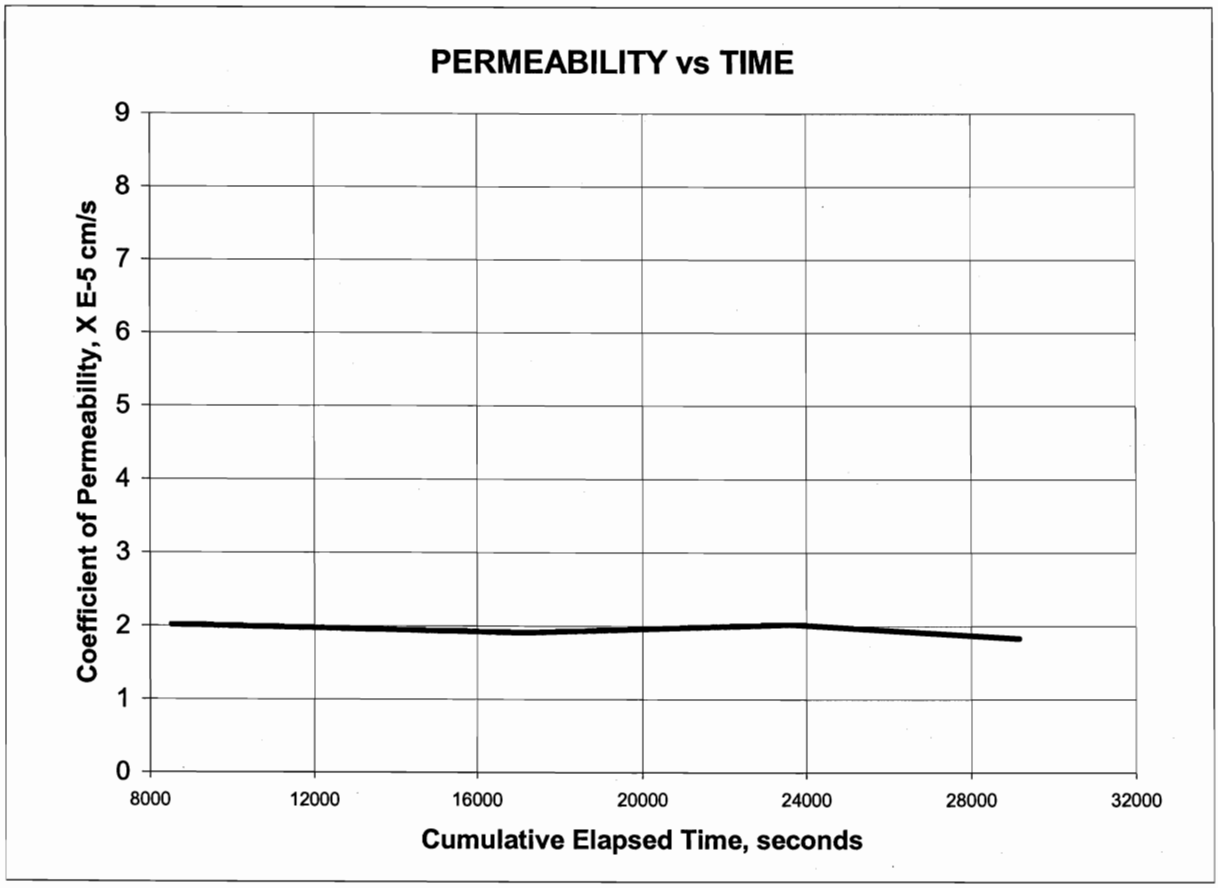
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-12
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0922

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	316.81		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	3.0
Water content, %	20.9		Total backpressure, psi	57.0
Wet unit weight, pcf	101.1			
Dry unit weight, pcf	83.6		Permeant Fluid	Deaired DI Water
Degree of saturation, %	56.6	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 1.9E-05



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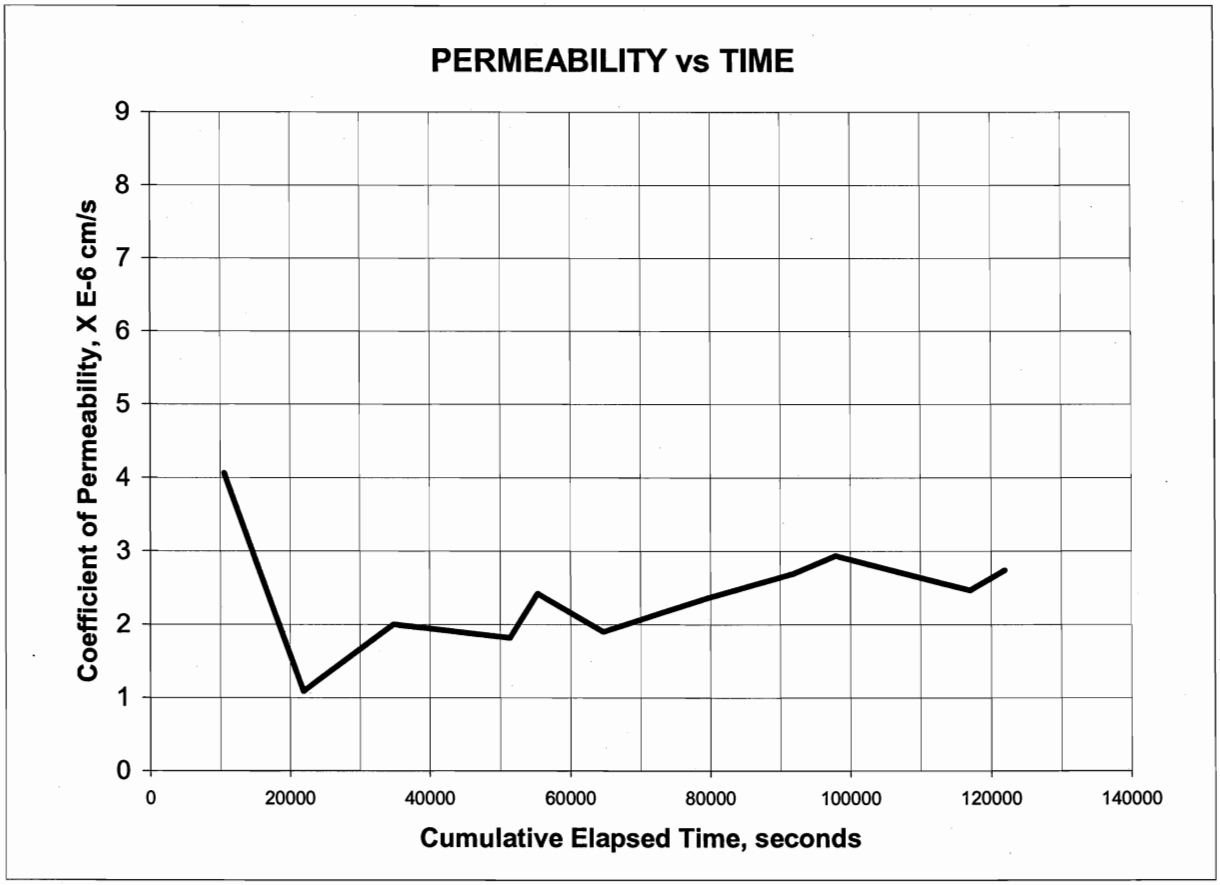
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-14
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0924

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	20
Specimen length, cm	10.12		Hydraulic gradient	7.0
Wet weight of specimen, g.	312.37		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	4.0
Water content, %	22.8		Total backpressure, psi	16.0
Wet unit weight, pcf	99.7			
Dry unit weight, pcf	81.2		Permeant Fluid	Deaired DI Water
Degree of saturation, %	58.2	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 2.7E-06



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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

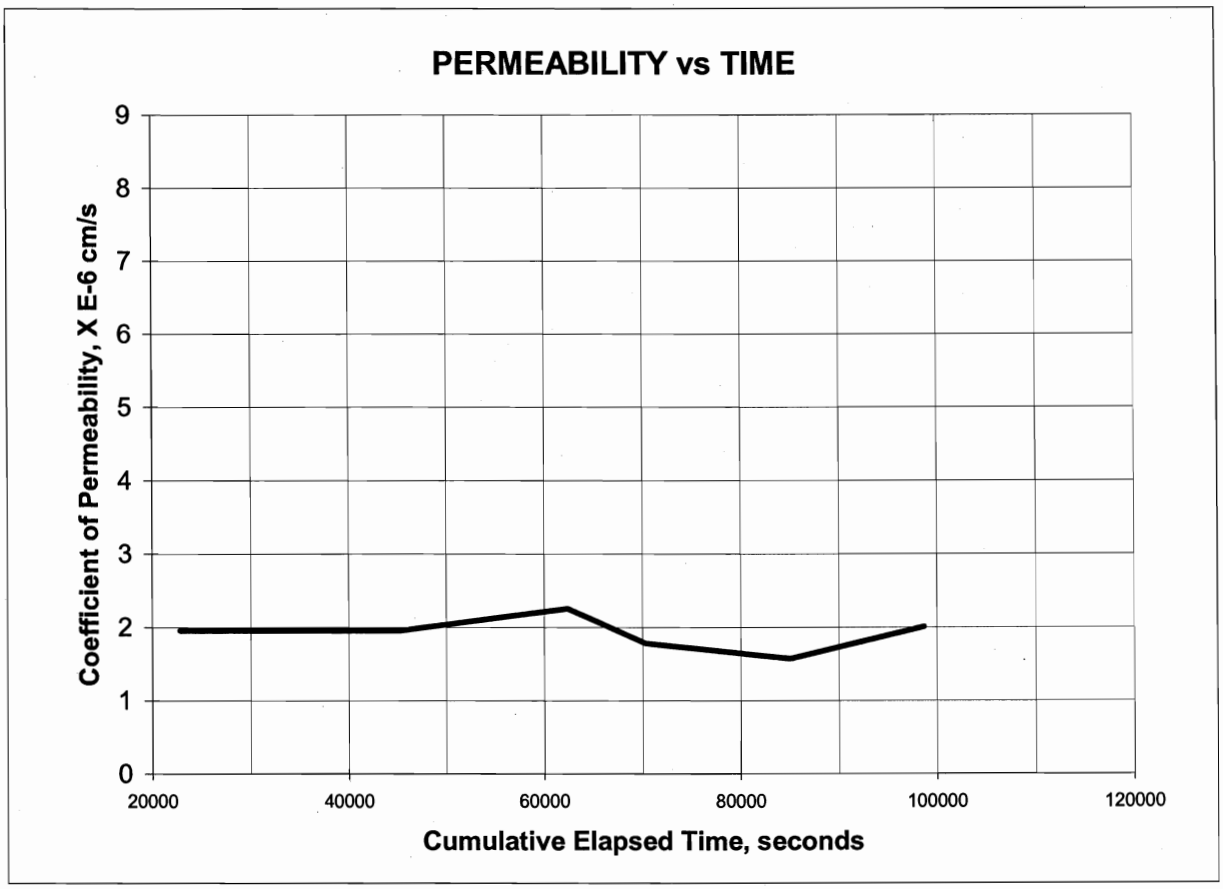
PROJECT NAME: GEL Moab
PROJECT NO. 109855.0141000

CLIENT SAMPLE NO. GATB-14
LAB SAMPLE NO. BC0924

	INITIAL	
Specimen diameter, cm	4.96	
Specimen length, cm	10.12	
Wet weight of specimen, g.	312.37	
Specimen cross-sect. area, cm^2	19.34	
Water content, %	22.8	
Wet unit weight, pcf	99.7	
Dry unit weight, pcf	81.2	
Degree of saturation, %	58.18	estimated
Specific gravity of solids	2.65	assumed

Cell confining pressure, psi	40
Hydraulic gradient	13.9
Min. consolidation stress, psi	2.0
Max. consolidation stress, psi	4.0
Total backpressure, psi	36.0
Permeant Fluid	Deaired DI Water

Coefficient of Permeability, cm/s 1.8E-06



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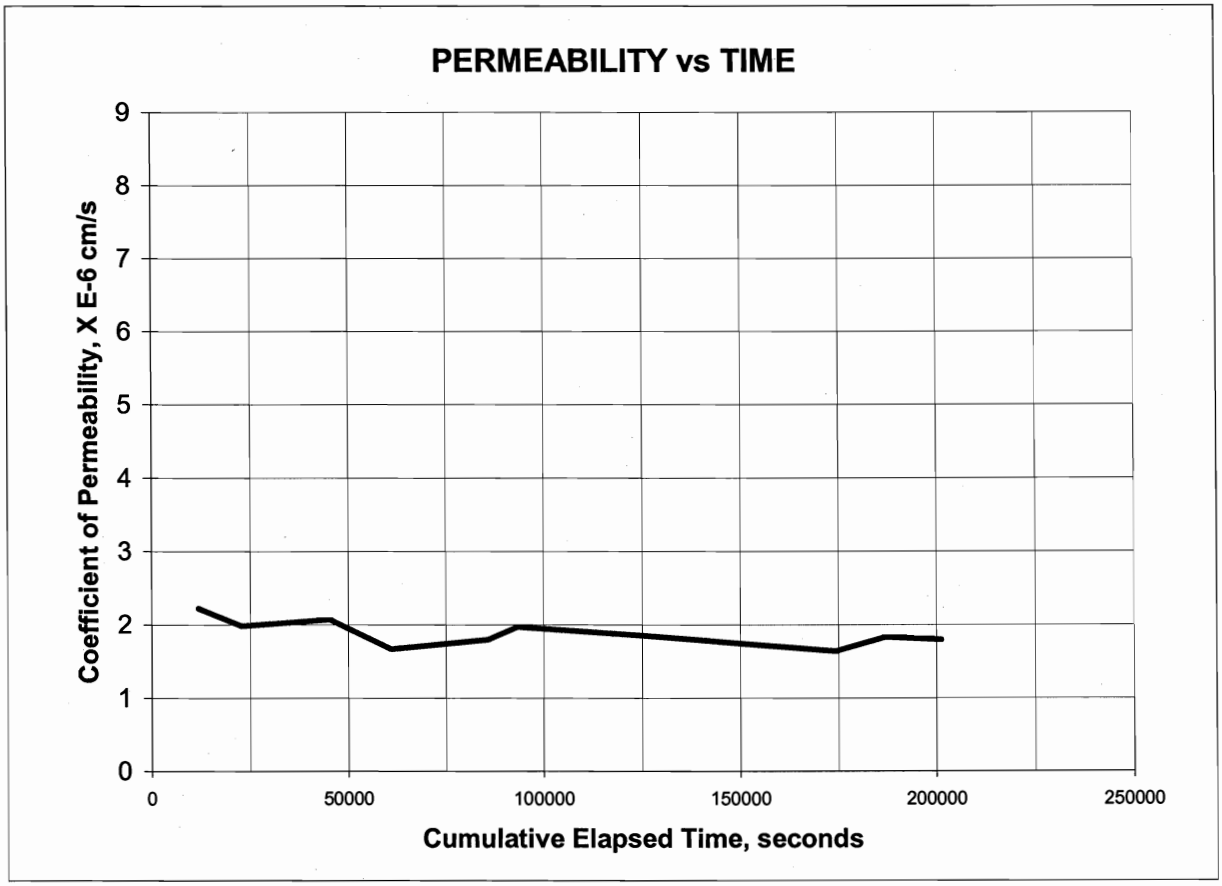
HYDRAULIC CONDUCTIVITY / PERMEABILITY
ASTM D 5084

PROJECT NAME:	GEL Moab	CLIENT SAMPLE NO.	GATB-14
PROJECT NO.	109855.0141000	LAB SAMPLE NO.	BC0924

	INITIAL			
Specimen diameter, cm	4.96		Cell confining pressure, psi	60
Specimen length, cm	10.12		Hydraulic gradient	13.9
Wet weight of specimen, g.	312.37		Min. consolidation stress, psi	2.0
Specimen cross-sect. area, cm^2	19.34		Max. consolidation stress, psi	4.0
Water content, %	22.8		Total backpressure, psi	56.0
Wet unit weight, pcf	99.7			
Dry unit weight, pcf	81.2		Permeant Fluid	Deaired DI Water
Degree of saturation, %	58.18	estimated		
Specific gravity of solids	2.65	assumed		

Coefficient of Permeability, cm/s 1.8E-06



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CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME
GEL Moab

LAB SAMPLE NUMBER
BC0914

PROJECT NUMBER
109855.01410000

CLIENT SAMPLE NUMBER
GABT-04

TEST NUMBER	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846	VAPOR TENSION, Mpa
1	3.1	3.0	97.0	-4.1
2	3.8	3.7	96.3	-3.3
3	4.8	4.6	95.4	-1.4
4	5.5	5.2	94.8	-1.4
5	6.6	6.2	93.8	-1.0
6	7.2	6.7	93.3	-0.6
7	8.7	8.0	92.0	-0.4
8	11.4	10.2	89.8	-0.3
9	12.0	10.7	89.3	-0.3
10	13.8	12.2	87.8	-0.3
11	16.7	14.3	85.7	-0.2
12	17.3	14.8	85.2	-0.2
13	21.8	17.9	82.1	-0.1
14	27.8	21.8	78.2	-0.1
15	29.8	22.9	77.1	-0.1
16	32.1	24.3	75.7	0.0
17				
18				
19				
20				
21				
22				
23				
24				
25				

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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Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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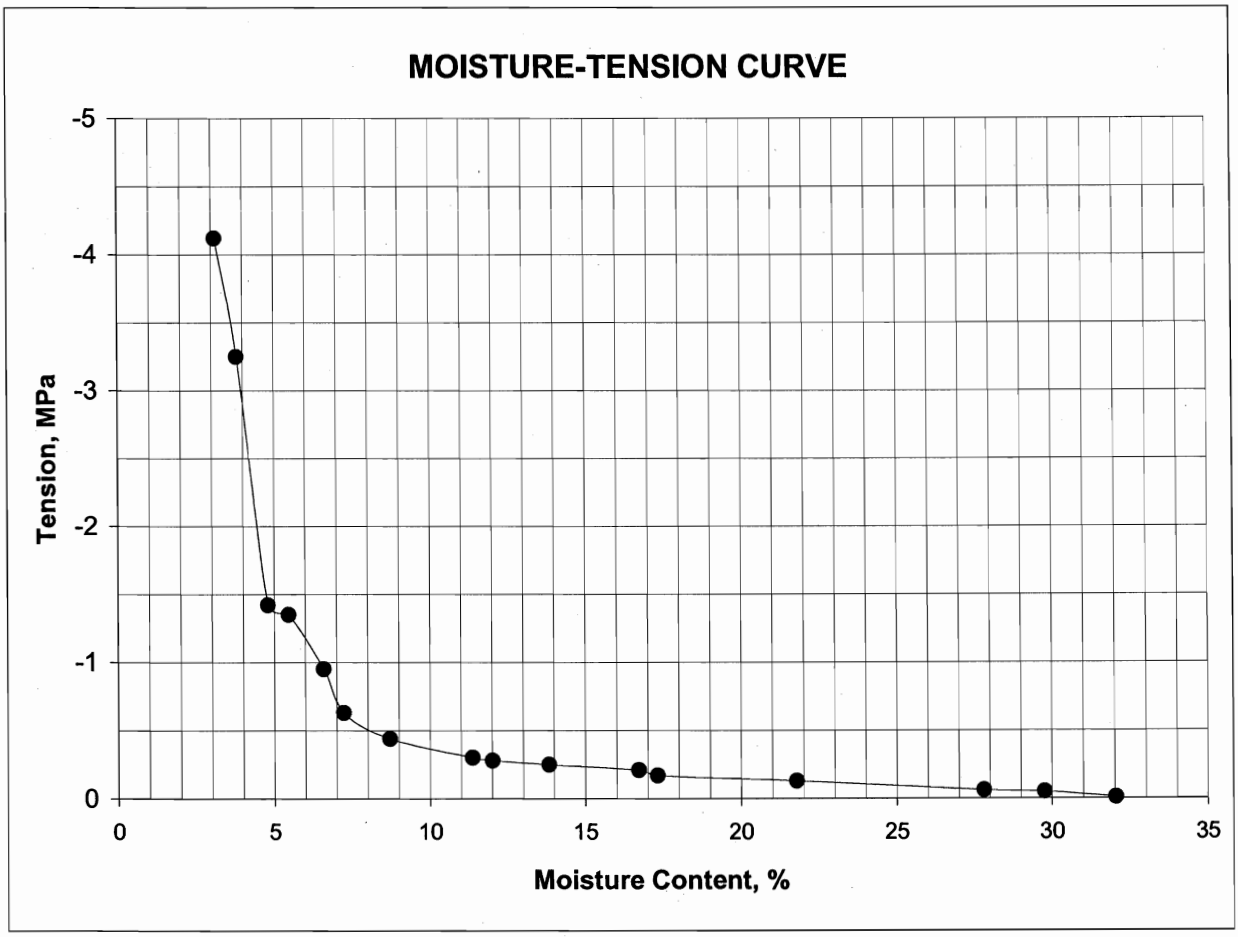
CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME:	**GEL Moab**	CLIENT SAMPLE NO.	**GABT-04**
PROJECT NO.:	**109855.01410000**	SHAW LAB SAMPLE	**BC0914**



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CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME
GEL Moab

LAB SAMPLE NUMBER
BC0916

PROJECT NUMBER
109855.01410000

CLIENT SAMPLE NUMBER
GABT-06

TEST NUMBER	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846	VAPOR TENSION, Mpa
1	2.9	2.9	97.1	-8.8
2	4.8	4.5	95.5	-6.4
3	4.9	4.6	95.4	-5.9
4	8.1	7.5	92.5	-3.2
5	10.7	9.7	90.3	-2.2
6	13.2	11.6	88.4	-1.7
7	16.6	14.3	85.7	-1.3
8	19.7	16.5	83.5	-1.1
9	22.6	18.4	81.6	-0.8
10	25.4	20.3	79.7	-0.6
11	28.4	22.1	77.9	-0.6
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

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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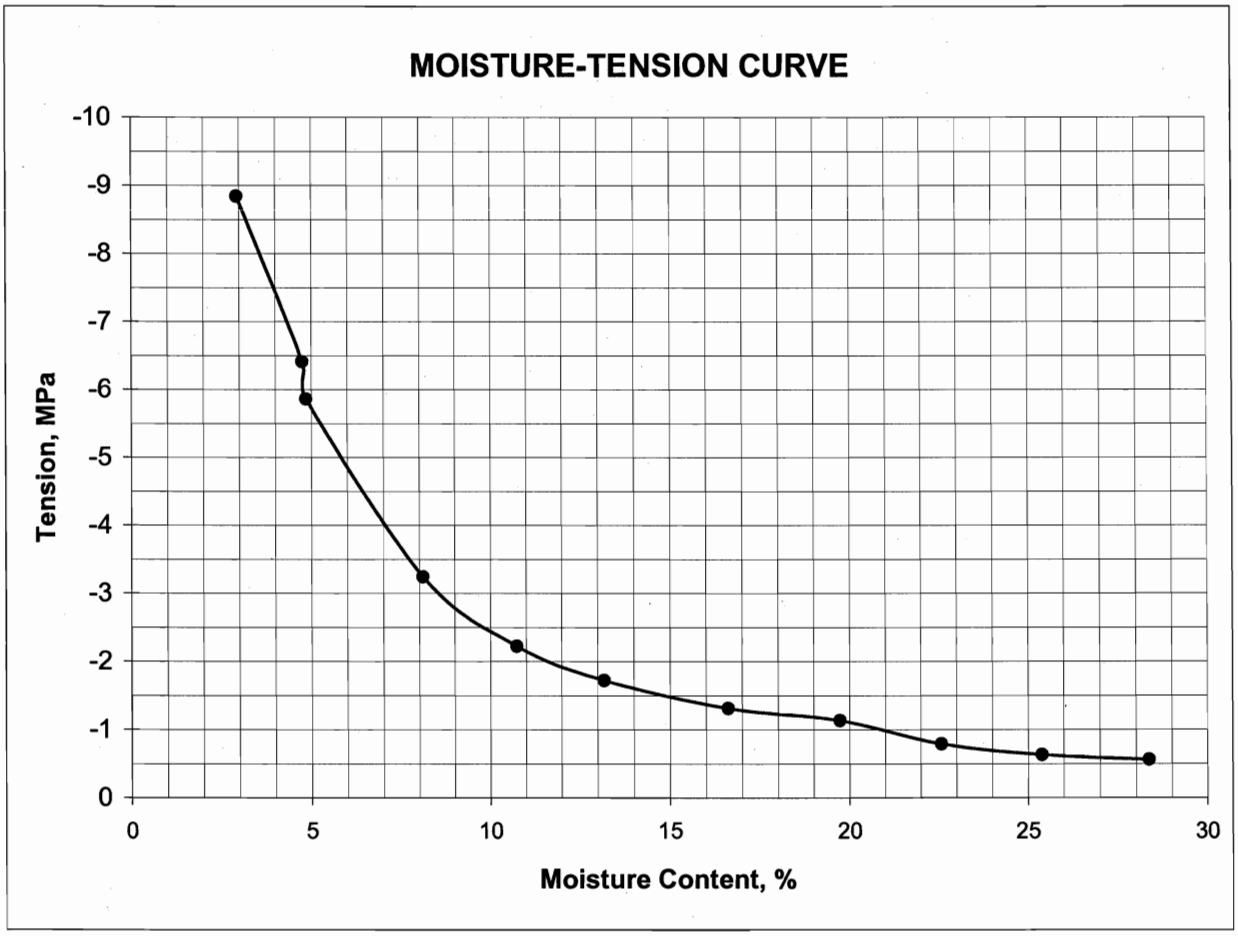
CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME:	**GEL Moab**	CLIENT SAMPLE NO.	**GABT-06**
PROJECT NO.:	**109855.01410000**	SHAW LAB SAMPLE	**BC0916**



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CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME
GEL Moab

LAB SAMPLE NUMBER
BC0919

PROJECT NUMBER
109855.01410000

CLIENT SAMPLE NUMBER
GABT-09

TEST NUMBER	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846	VAPOR TENSION, Mpa
1	4.3	4.1	95.9	-12.1
2	6.7	6.3	93.7	-6.4
3	8.5	7.8	92.2	-4.1
4	11.0	9.9	90.1	-3.1
5	12.5	11.1	88.9	-2.3
6	14.6	12.7	87.3	-1.7
7	18.5	15.6	84.4	-1.4
8	22.4	18.3	81.7	-1.3
9	26.9	21.2	78.8	-1.2
10	29.7	22.9	77.1	-0.9
11	31.6	24.0	76.0	-0.8
12	34.7	25.8	74.2	-0.7
13	37.6	27.3	72.7	-0.7
14	38.1	27.6	72.4	-0.7
15				
16				
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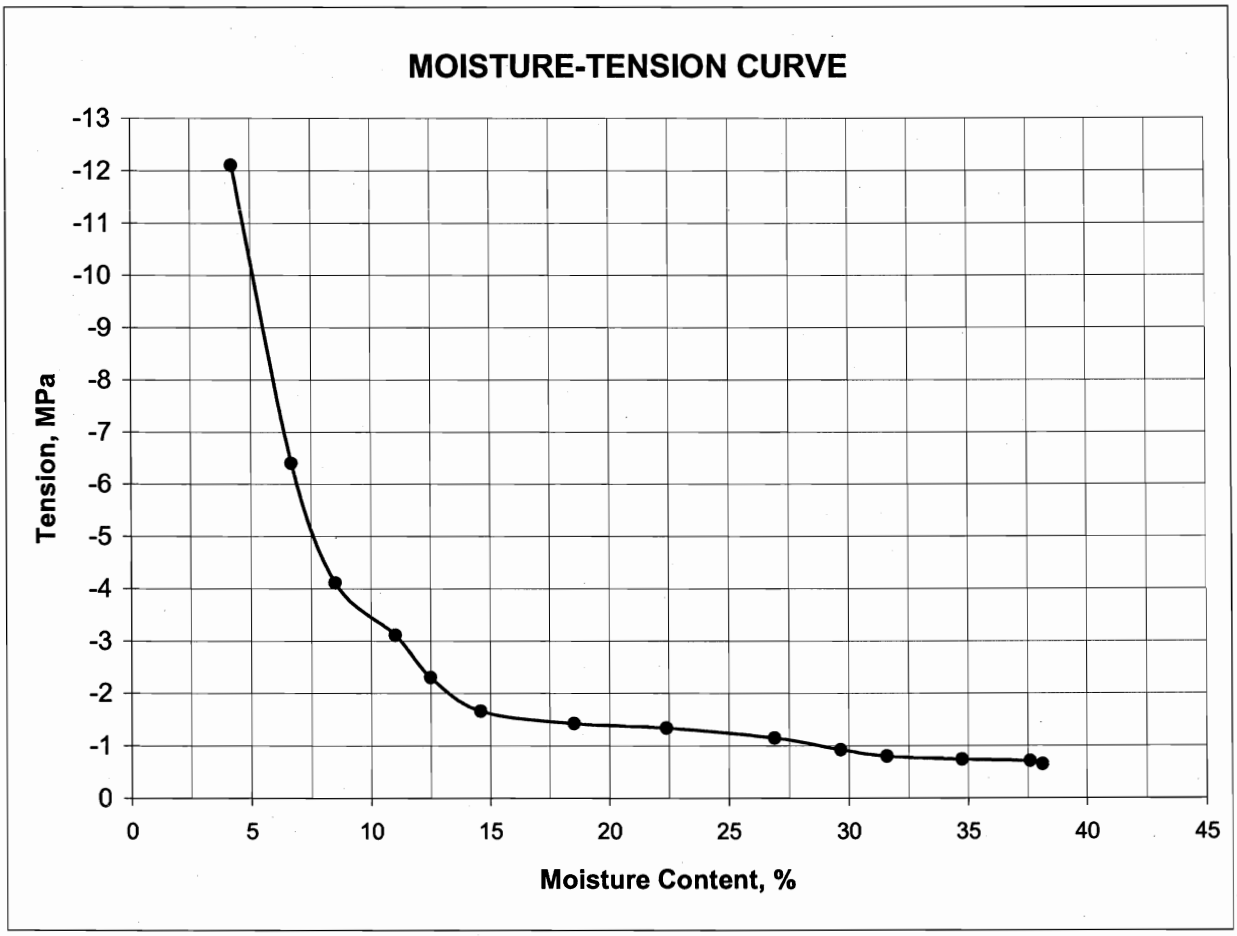
ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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

CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME:	**GEL Moab**	CLIENT SAMPLE NO.	**GABT-09**
PROJECT NO.:	**109855.01410000**	SHAW LAB SAMPLE	**BC0919**



November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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

CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME
GEL Moab

LAB SAMPLE NUMBER
BC0920

PROJECT NUMBER
109855.01410000

CLIENT SAMPLE NUMBER
GABT-10

TEST NUMBER	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846	VAPOR TENSION, Mpa
1	5.8	5.4	94.6	-25.6
2	7.9	7.3	92.7	-24.6
3	10.3	9.3	90.7	-18.3
4	12.4	11.0	89.0	-16.0
5	13.8	12.2	87.8	-13.6
6	16.3	14.0	86.0	-12.0
7	20.7	17.1	82.9	-9.4
8	22.4	18.3	81.7	-8.1
9	23.7	19.2	80.8	-7.5
10	25.4	20.2	79.8	-6.7
11	28.5	22.2	77.8	-5.8
12	30.8	23.6	76.4	-5.5
13				
14				
15				
16				
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23				
24				
25				

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.

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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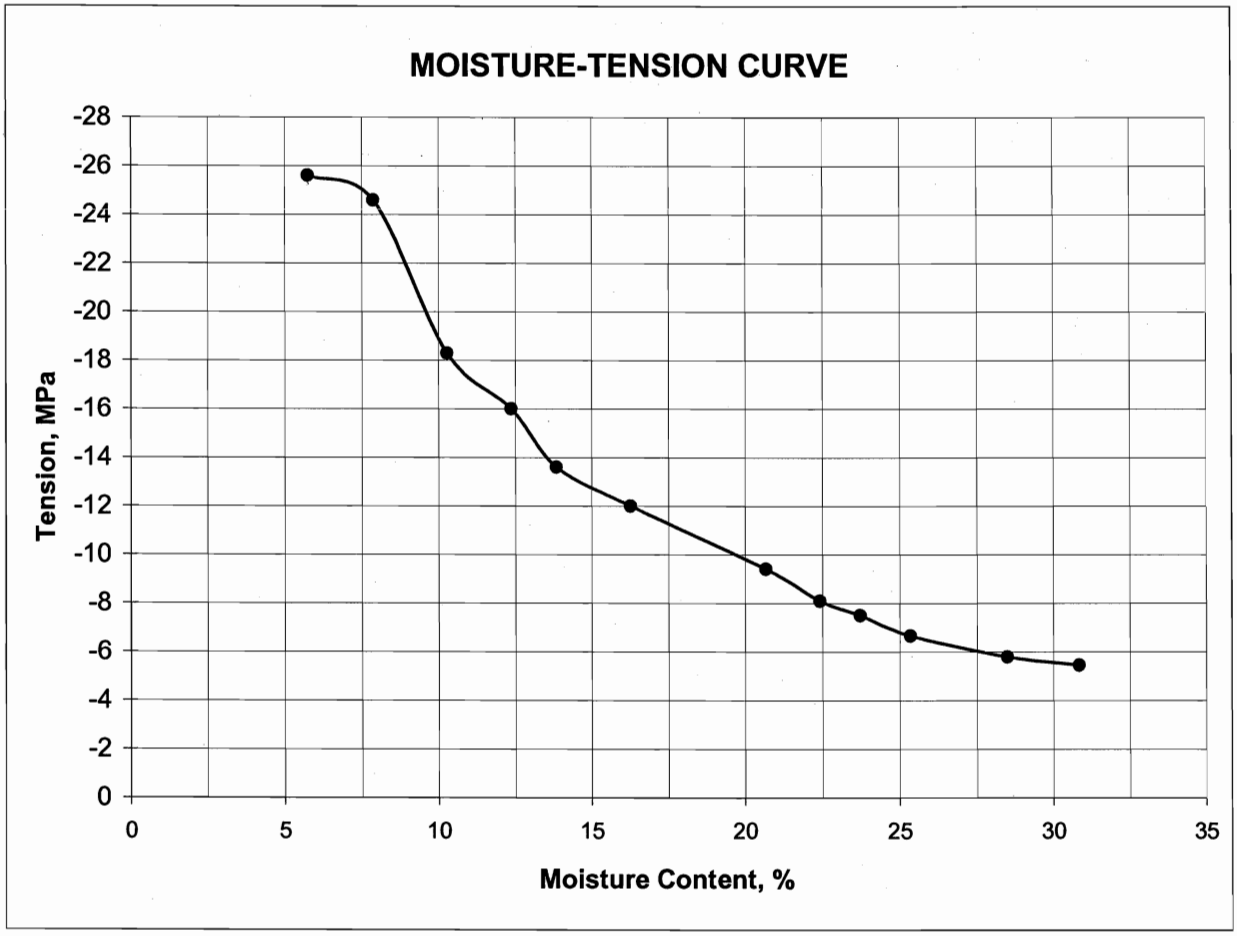
Oak Ridge TN
(865) 482-6497

CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME:	**GEL Moab**	CLIENT SAMPLE NO.	**GABT-10**
PROJECT NO.:	**109855.01410000**	SHAW LAB SAMPLE	**BC0920**



November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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(865) 482-6497

CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME
GEL Moab

LAB SAMPLE NUMBER
BC0921

PROJECT NUMBER
109855.01410000

CLIENT SAMPLE NUMBER
GABT-11

TEST NUMBER	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846	VAPOR TENSION, Mpa
1	10.9	9.9	90.1	-10.9
2	13.1	11.6	88.4	-5.5
3	17.5	14.9	85.1	-2.7
4	21.1	17.4	82.6	-1.8
5	22.4	18.3	81.7	-1.5
6	26.4	20.9	79.1	-1.1
7	33.6	25.2	74.8	-0.9
8	37.5	27.3	72.7	-0.7
9	40.1	28.6	71.4	-0.6
10	45.2	31.1	68.9	-0.5
11	56.9	36.3	63.7	-0.5
12	60.4	37.6	62.4	-0.4
13				
14				
15				
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25				

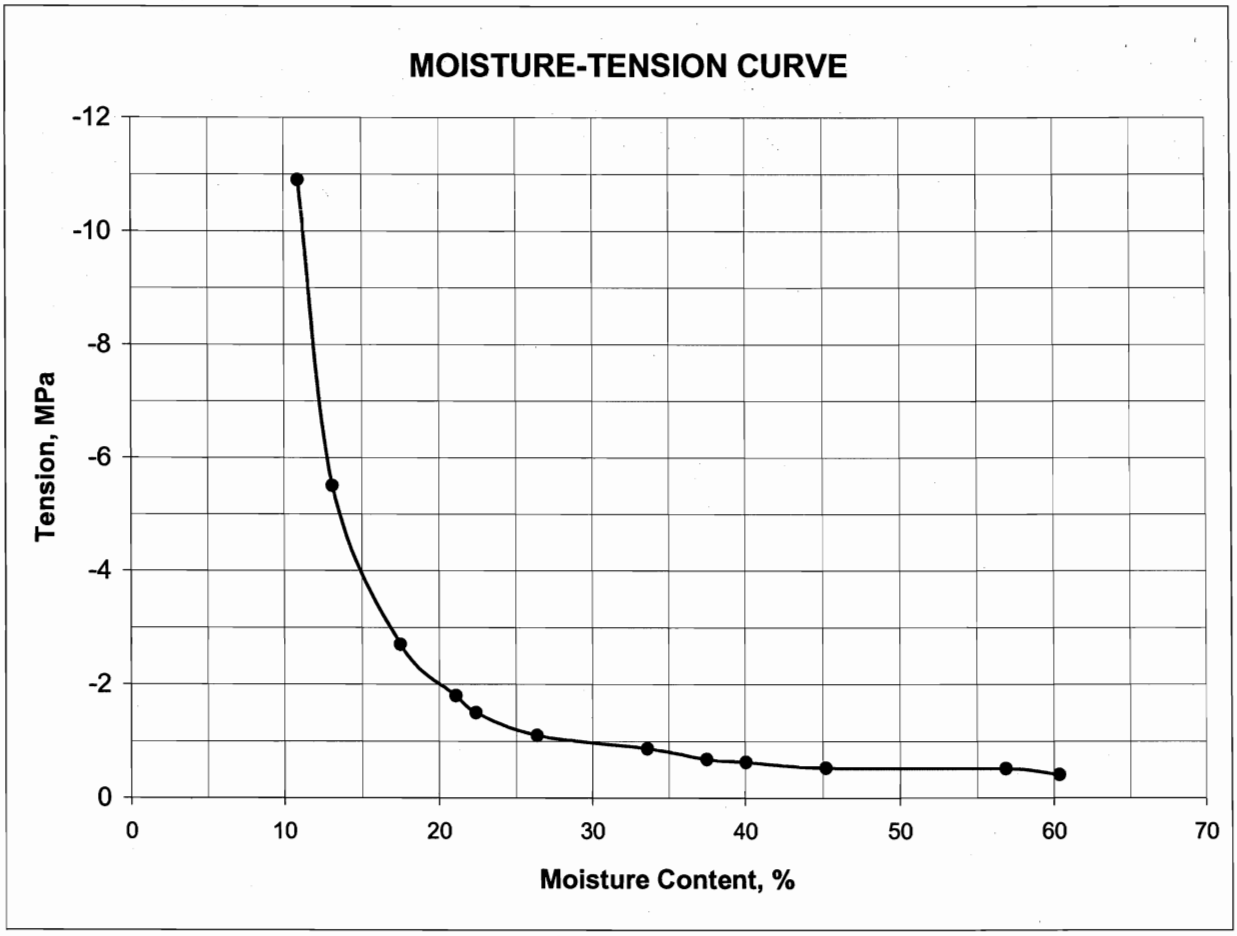
ASTM D 2216 results are based on dry sample weight.
SW846 results are based on wet sample weight.
Solids content is determined by subtracting the SW846 moisture (%) from 100.

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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

CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME:	**GEL Moab**	CLIENT SAMPLE NO.	**GABT-11**
PROJECT NO.:	**109855.01410000**	SHAW LAB SAMPLE	**BC0921**



November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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

CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME
GEL Moab

LAB SAMPLE NUMBER
BC0923

PROJECT NUMBER
109855.01410000

CLIENT SAMPLE NUMBER
GABT-13

TEST NUMBER	MOISTURE, % ASTM D 2216	MOISTURE , % SW846	SOLIDS, % SW846	VAPOR TENSION, Mpa
1	11.7	10.4	89.6	-6.0
2	15.4	13.4	86.6	-2.8
3	16.1	13.8	86.2	-2.5
4	16.8	14.4	85.6	-2.1
5	17.9	15.2	84.8	-1.9
6	20.8	17.2	82.8	-1.3
7	23.1	18.8	81.2	-1.0
8	28.1	21.9	78.1	-0.7
9	33.2	24.9	75.1	-0.5
10	39.4	28.3	71.7	-0.5
11	43.9	30.5	69.5	-0.4
12	51.2	33.9	66.1	-0.4
13	56.1	35.9	64.1	-0.3
14	60.5	37.7	62.3	-0.3
15				
16				
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25				

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.

Shaw Geotechnical Laboratory
Oak Ridge TN
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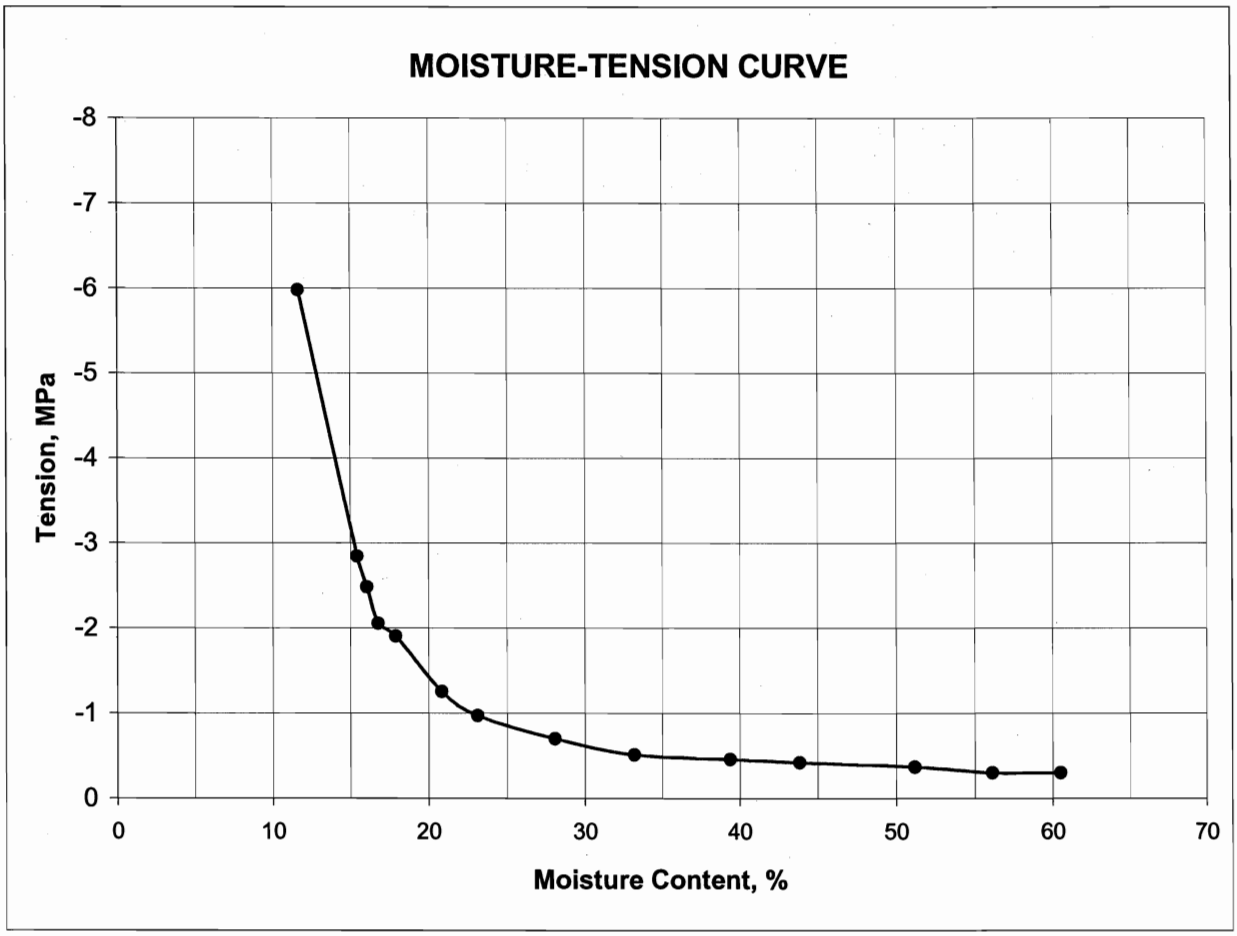
CAPILLARY-MOISTURE RELATIONS by POTENTIOMETER

PROJECT NAME:	**GEL Moab**	CLIENT SAMPLE NO.	**GABT-13**
PROJECT NO.:	**109855.01410000**	SHAW LAB SAMPLE	**BC0923**



November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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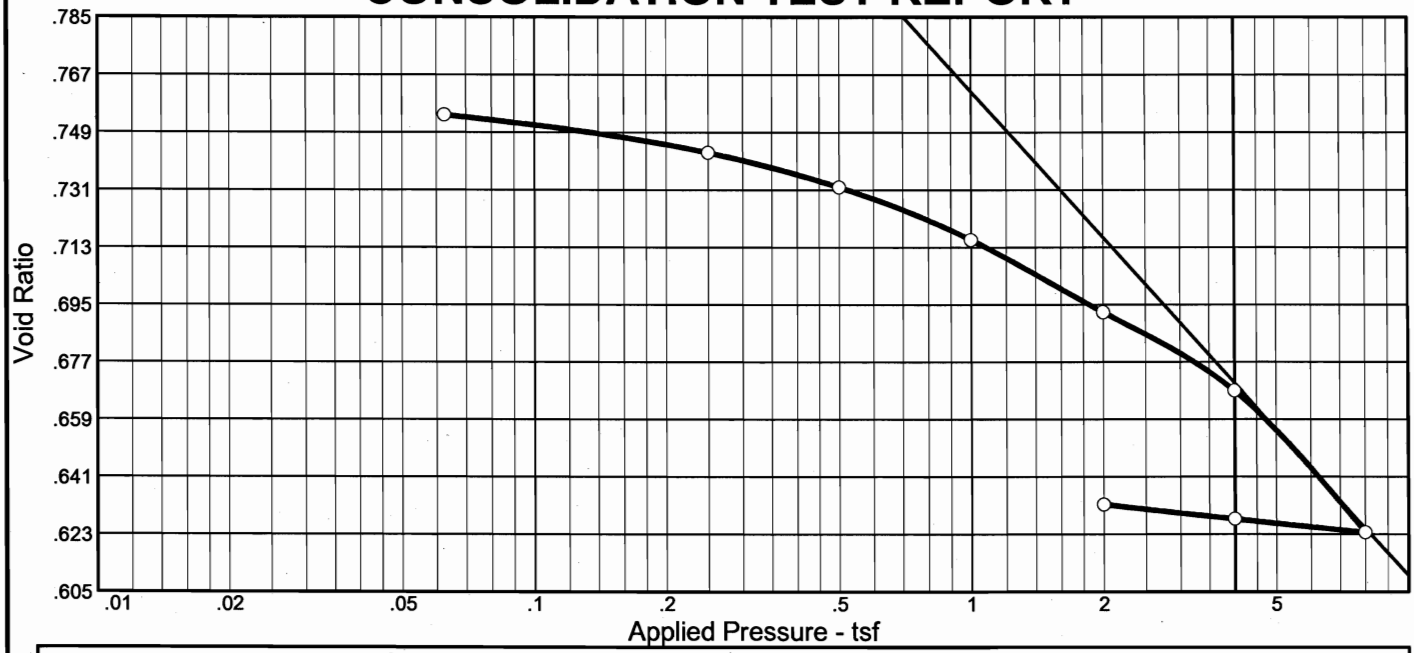
CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	0.71									
3	0.50	0.17									
4	1.00	0.67									
5	2.00	0.32									
6	4.00	0.26									
7	8.00	0.18									
8	4.00	0.55									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture							
53.1 %	17.6 %	88.4	NP	NP	2.65	4.26	0.15	0.880

MATERIAL DESCRIPTION	USCS	AASHTO
Silty SAND	SM	

Project: GEL Moab

ETDC Project No.: 109855
ETDC Sample No.: BC0914
Client Sample No.: GABT-04

CONSOLIDATION TEST REPORT

Shaw E&I

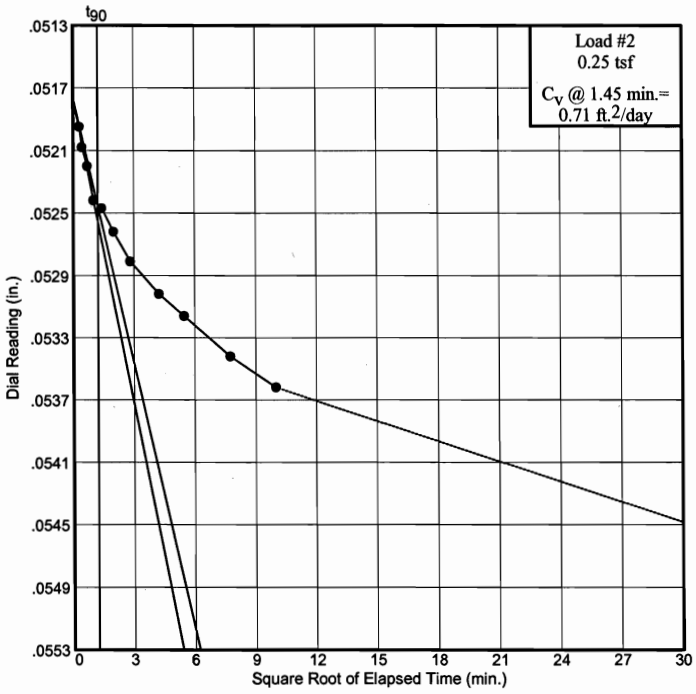
Remarks:

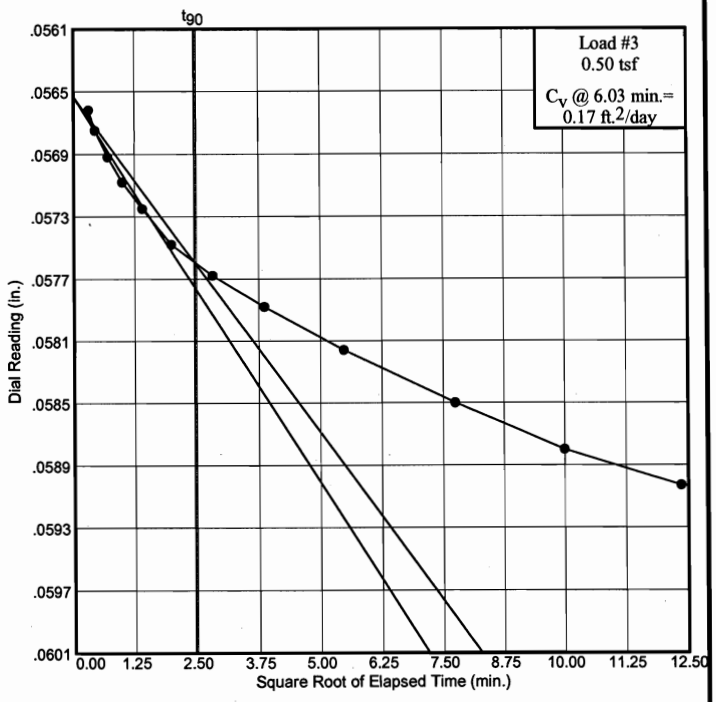
Figure BC0914

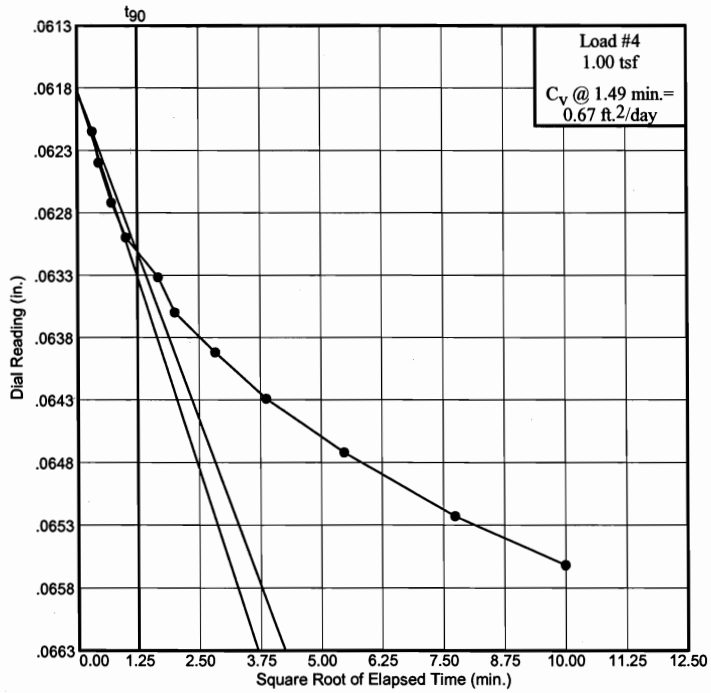
Dial Reading vs. Time

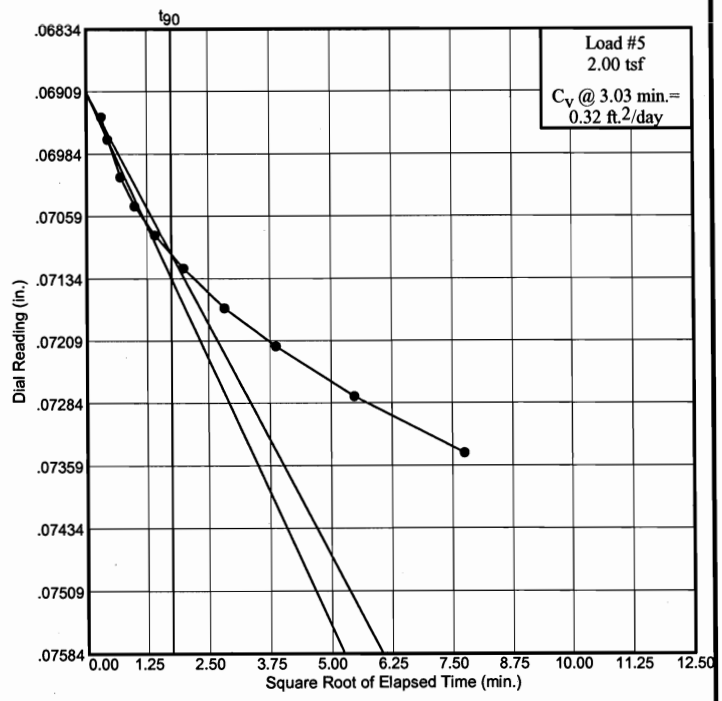
Project No.: 109855
Project: GEL Moab

Location: GEL Moab









Dial Reading vs. Time

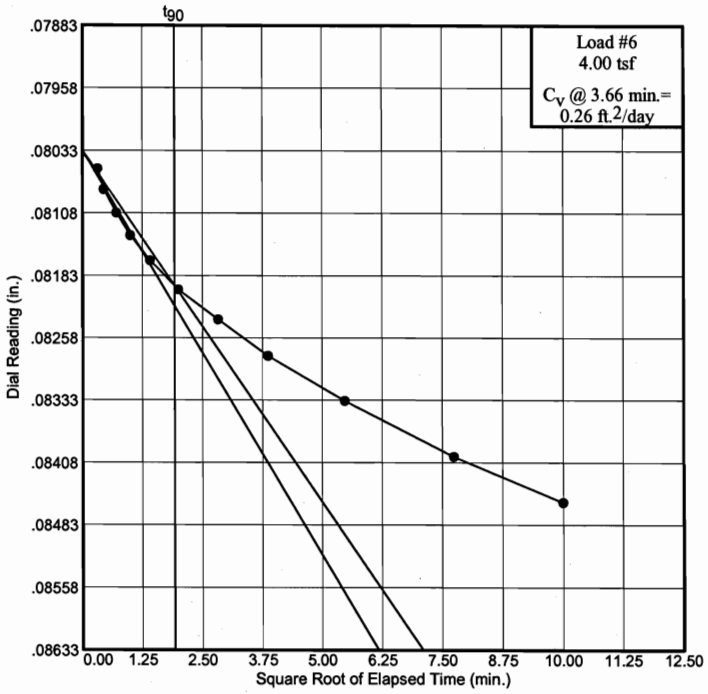
Shaw E&I

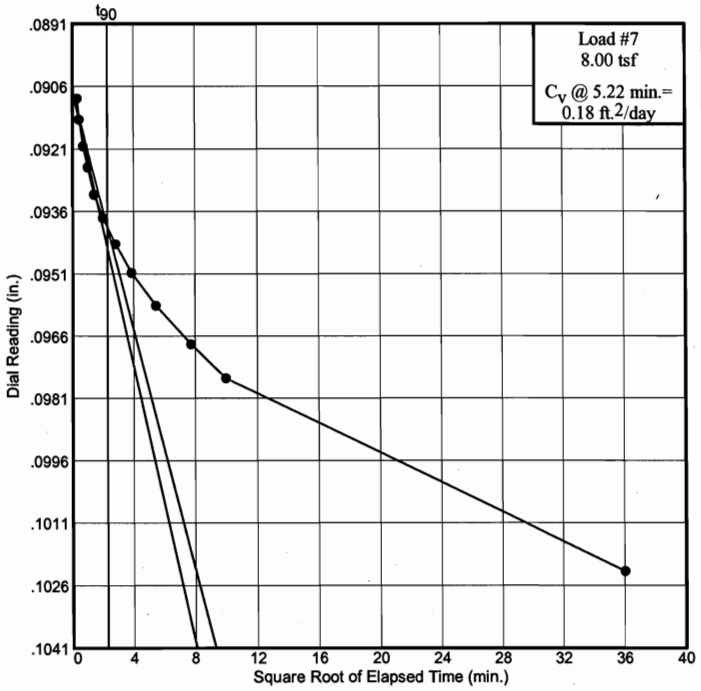
Figure B915

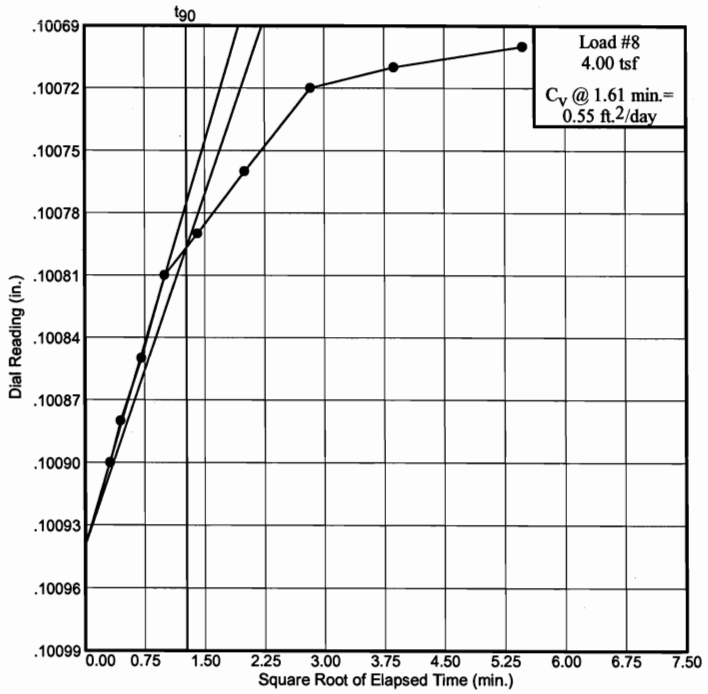
Dial Reading vs. Time

Project No.: 109855
Project: GEL Moab

Location: GEL Moab







Dial Reading vs. Time

Shaw E&I

Figure 916

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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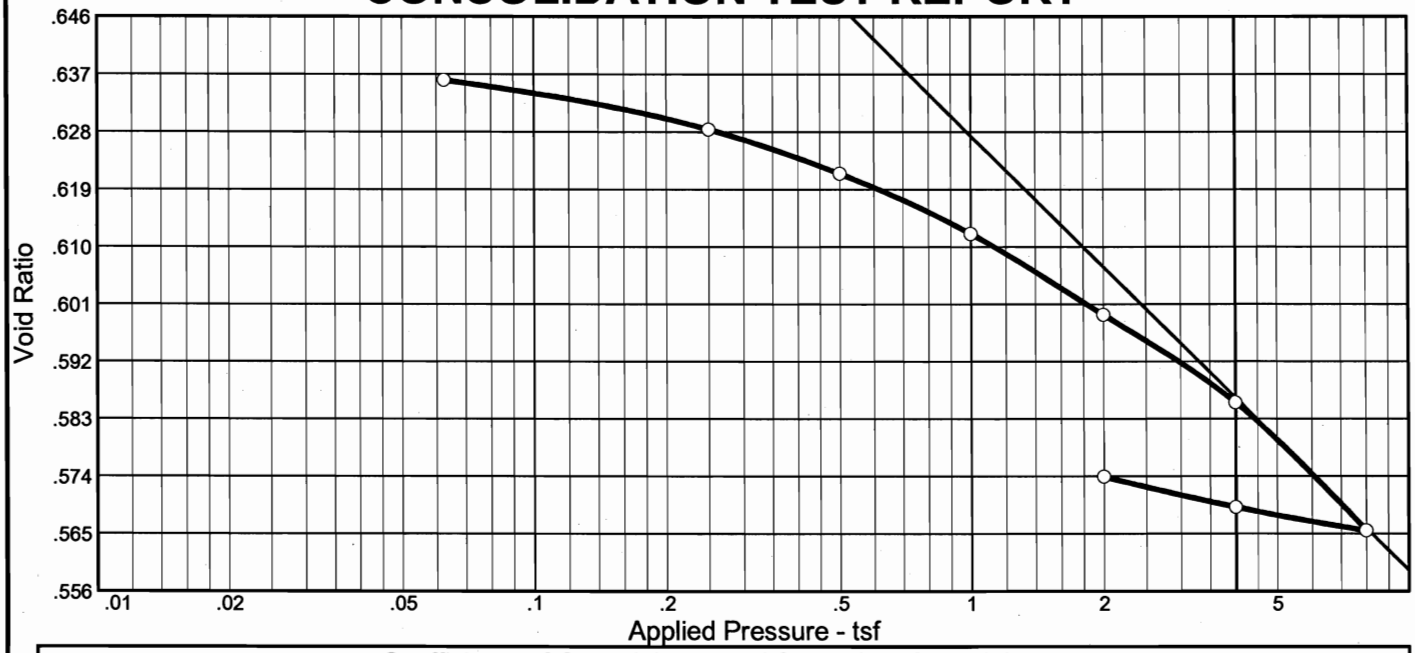
CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	0.22									
3	0.50	0.68									
4	1.00	0.39									
5	2.00	0.21									
6	4.00	0.34									
7	8.00	0.21									
8	4.00	0.20									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture							
68.5 %	16.5 %	102.3	NP	NP	2.65	4.19	0.07	0.638

MATERIAL DESCRIPTION	USCS	AASHTO
Silty SAND	SM	

Project: GEL Moab

ETDC Project No.: 109855
ETDC Sample No.: BC0916
Client Sample No.: GABT-06

CONSOLIDATION TEST REPORT

Shaw E&I

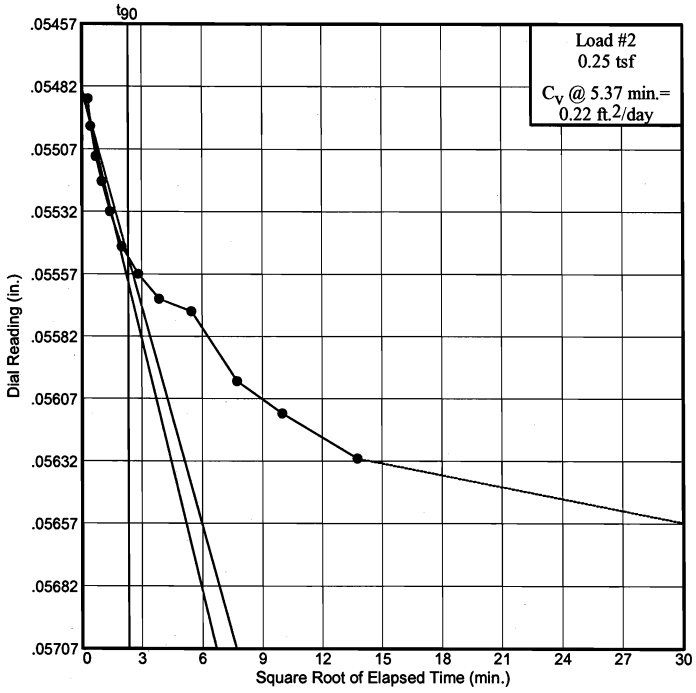
Remarks:

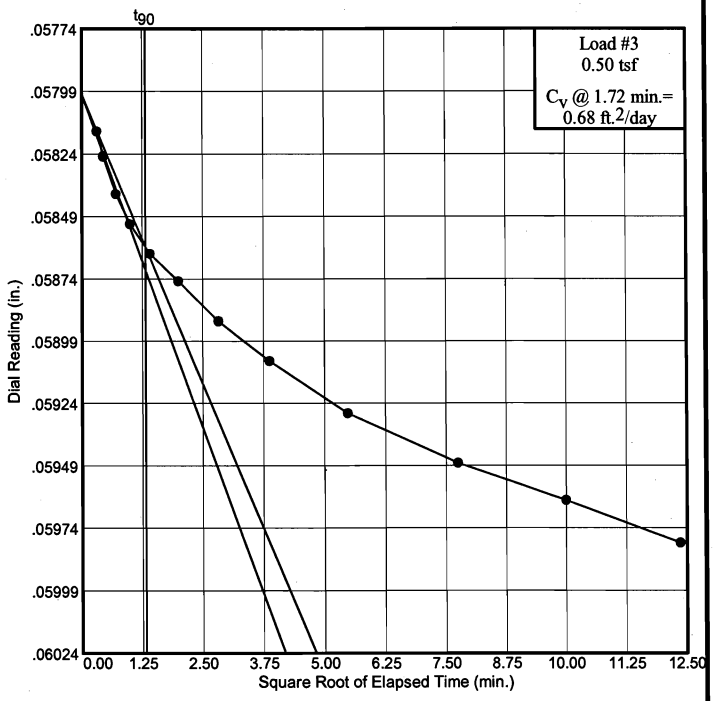
Figure BC0916

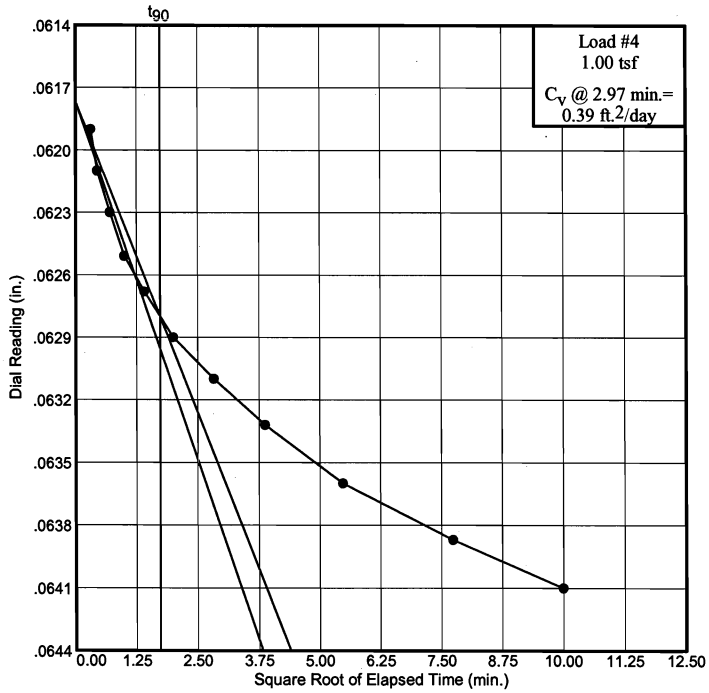
Dial Reading vs. Time

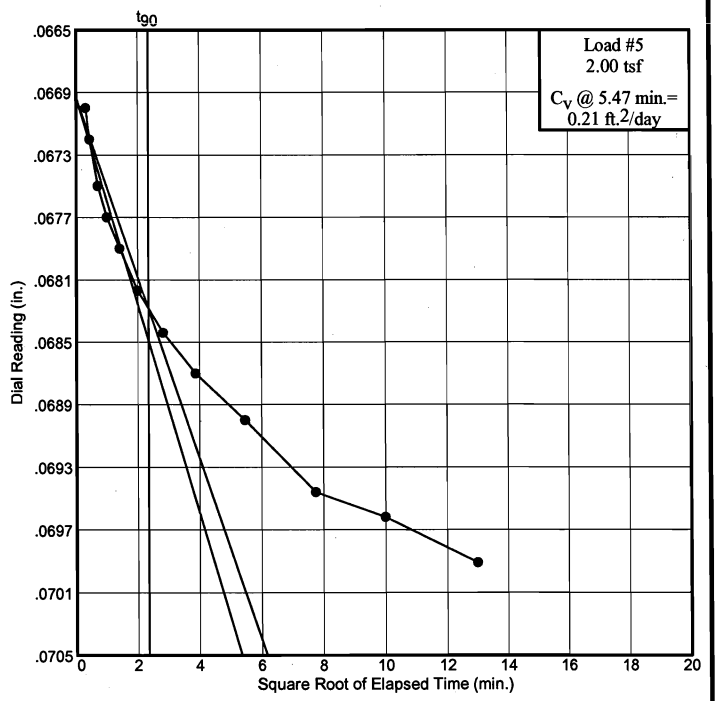
Project No.: 109855
Project: GEL Moab

Location: Moab









Dial Reading vs. Time

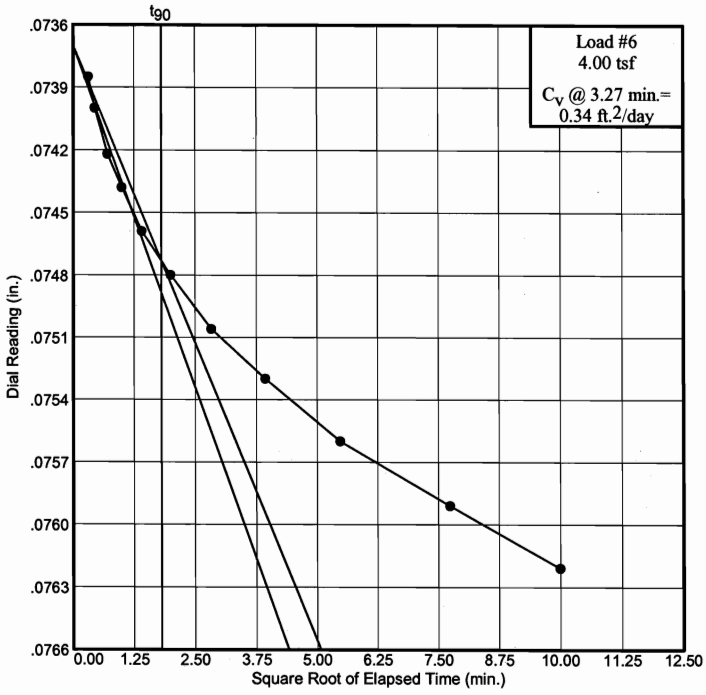
Shaw E&I

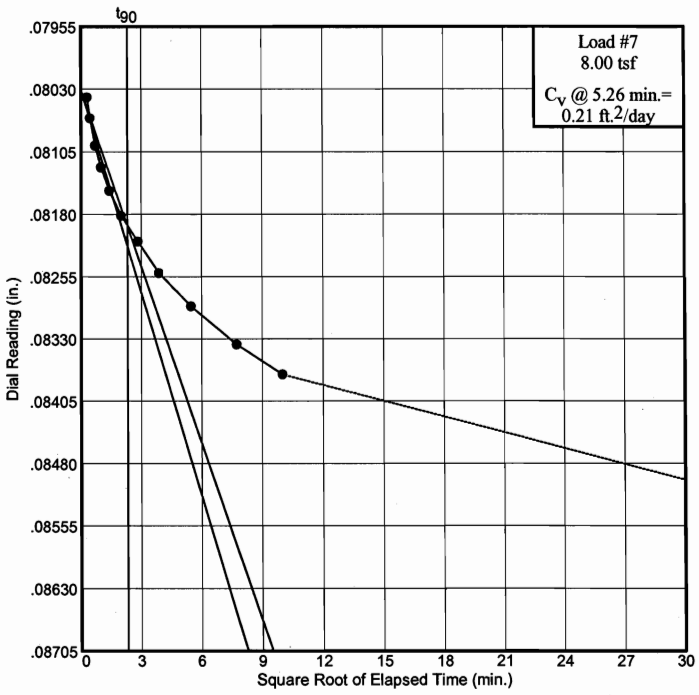
Figure B917

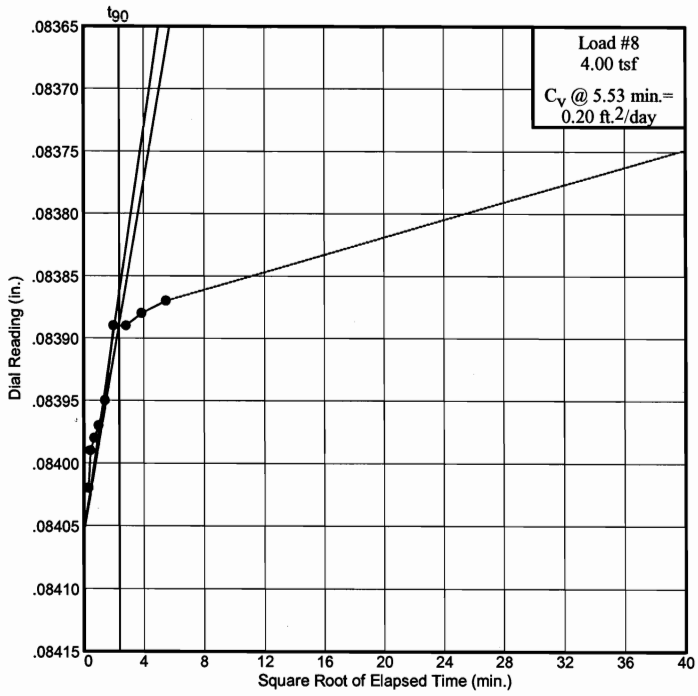
Dial Reading vs. Time

Project No.: 109855
Project: GEL Moab

Location: Moab







Dial Reading vs. Time

Shaw E&I

Figure 918

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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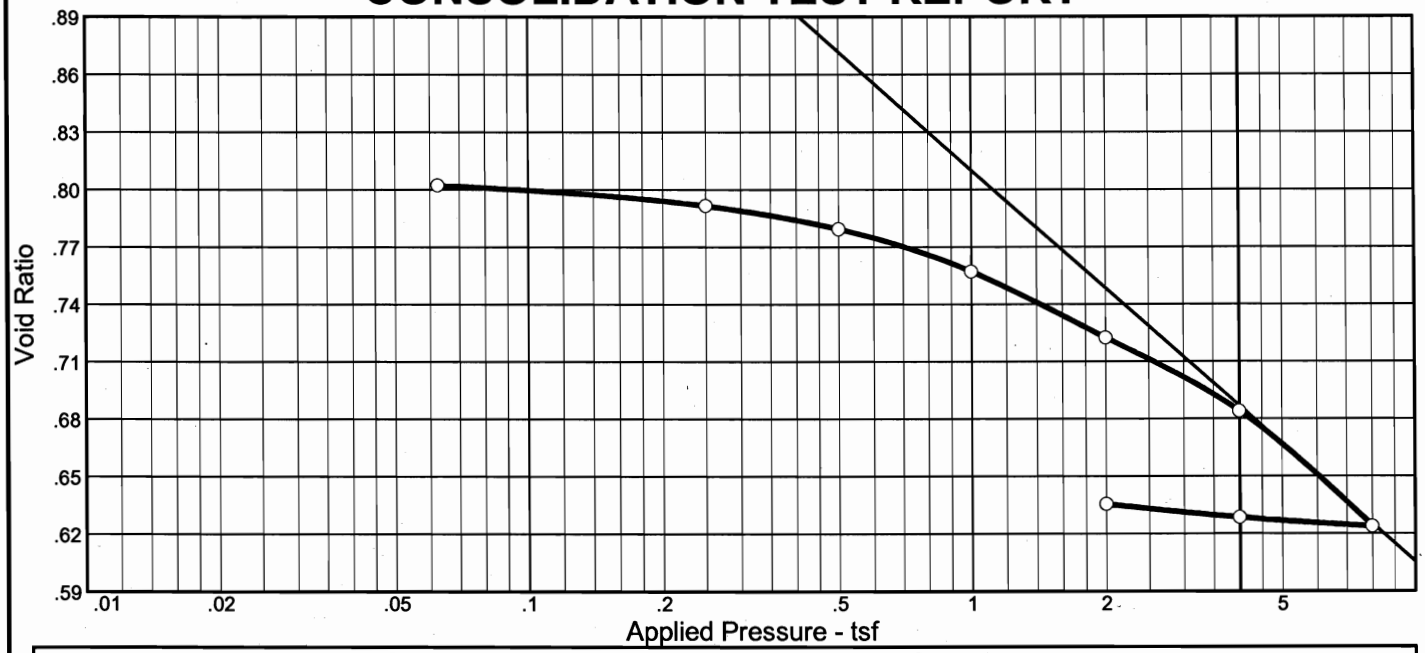
CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	0.86									
3	0.50	0.69									
4	1.00	0.36									
5	2.00	0.35									
6	4.00	0.65									
7	8.00	0.20									
8	4.00	0.63									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture							
75.7 %	23.1 %	92.3	23	3	2.65	4.22	0.20	0.808

MATERIAL DESCRIPTION	USCS	AASHTO
Sandy SILT	SM	

Project: GEL Moab

ETDC Project No.: 109855
ETDC Sample No.: BC0919
Client Sample No.: GABT-09

CONSOLIDATION TEST REPORT

Shaw E&I

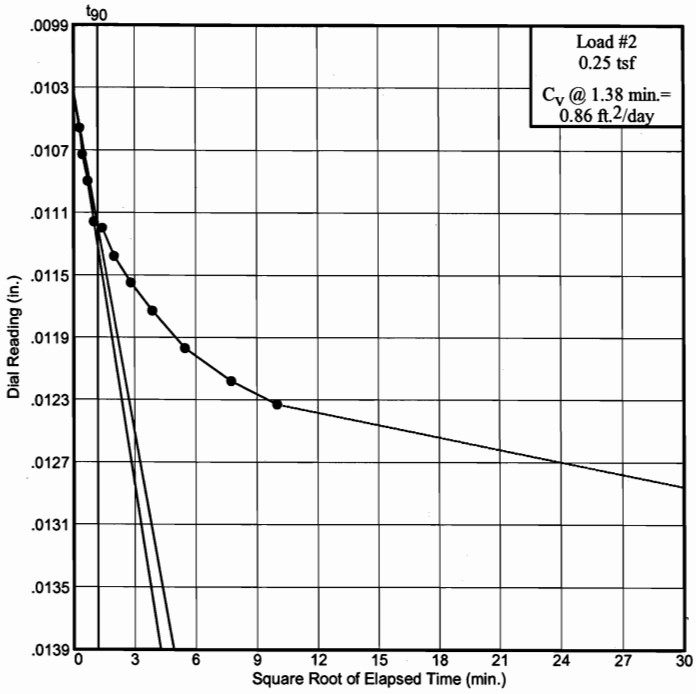
Remarks:

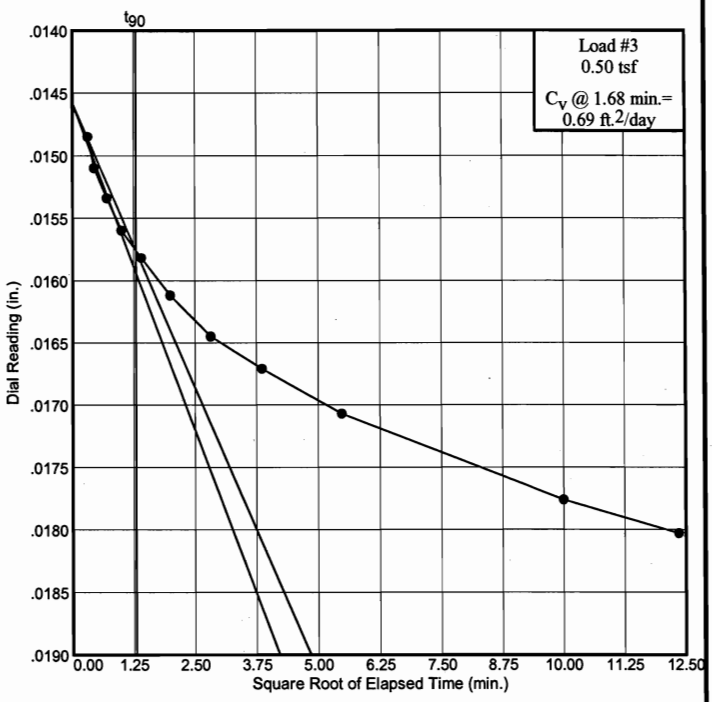
Figure BC0919

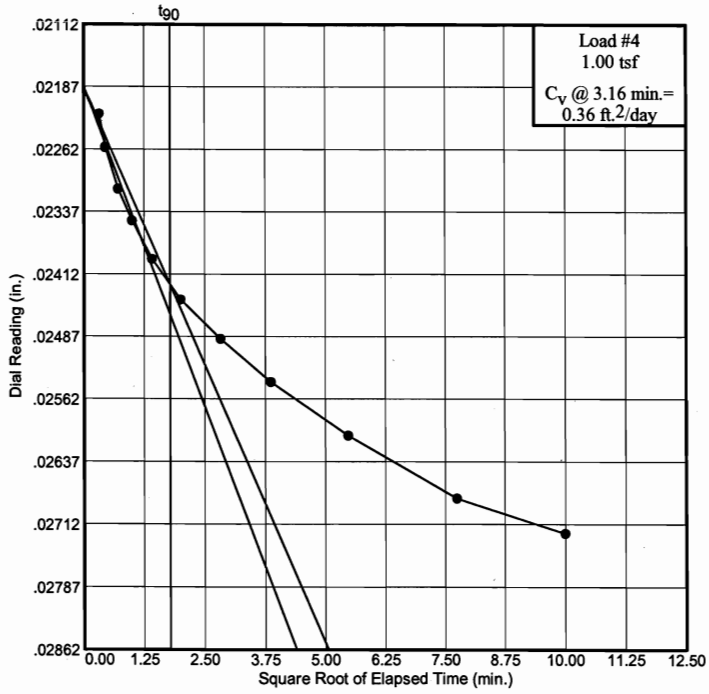
Dial Reading vs. Time

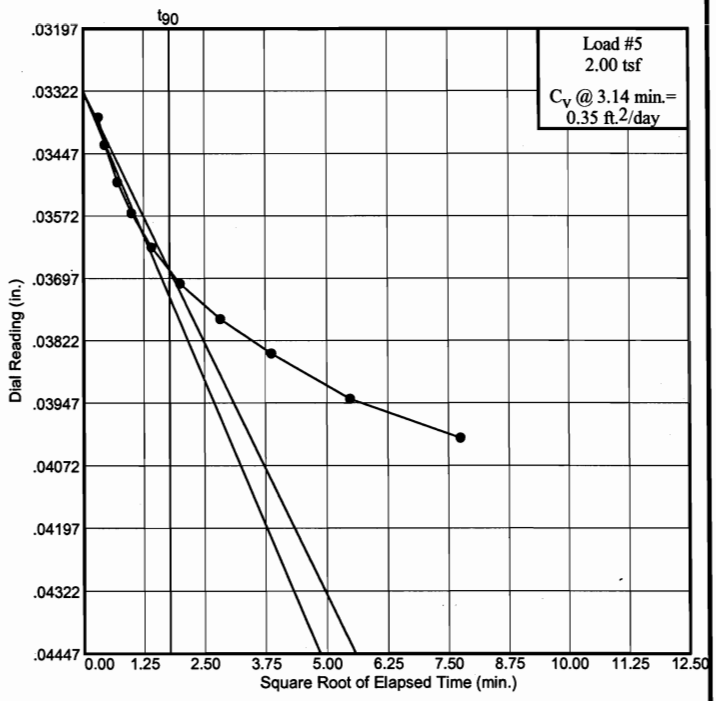
Project No.: 109855
Project: GEL Moab

Location: Moab









Dial Reading vs. Time

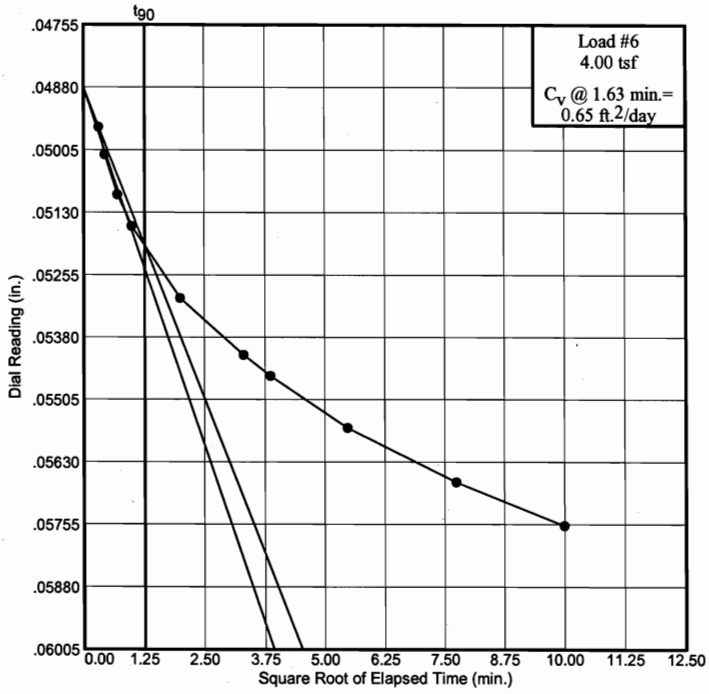
Shaw E&I

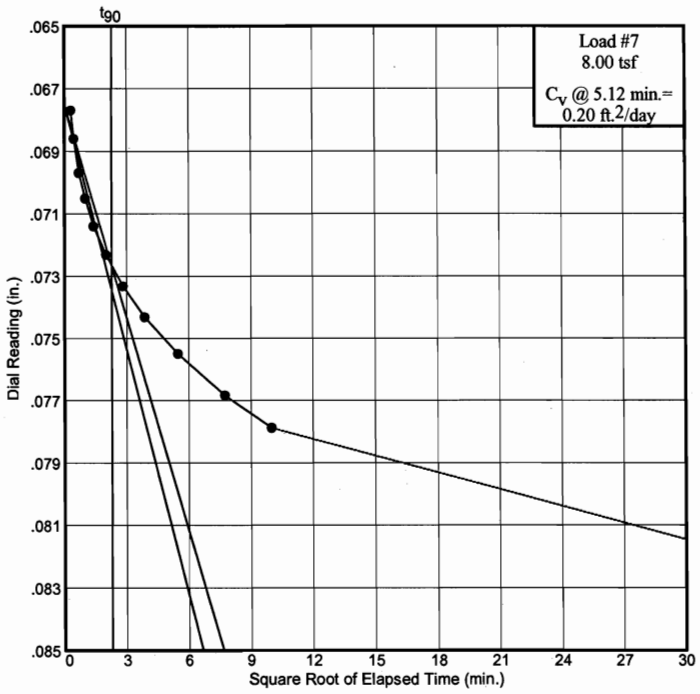
Figure B920

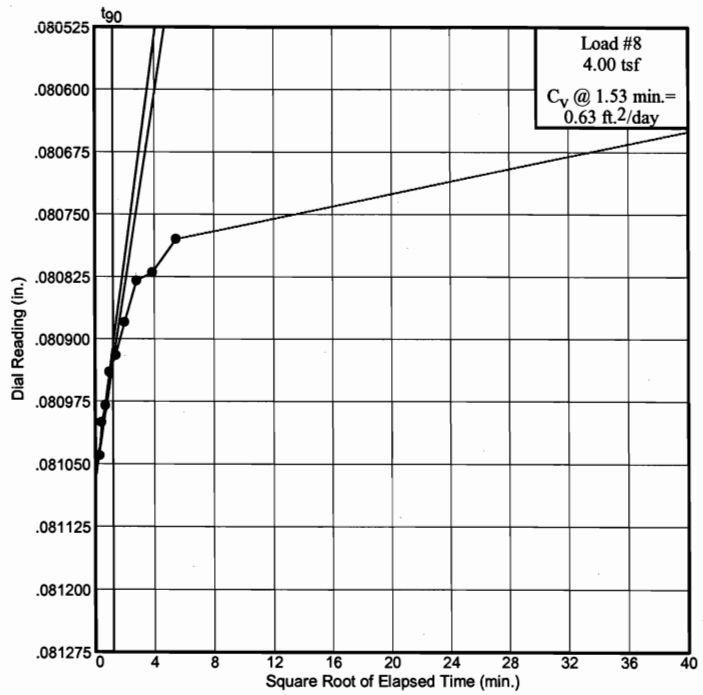
Dial Reading vs. Time

Project No.: 109855
Project: GEL Moab

Location: Moab







Dial Reading vs. Time

Shaw E&I

Figure 921

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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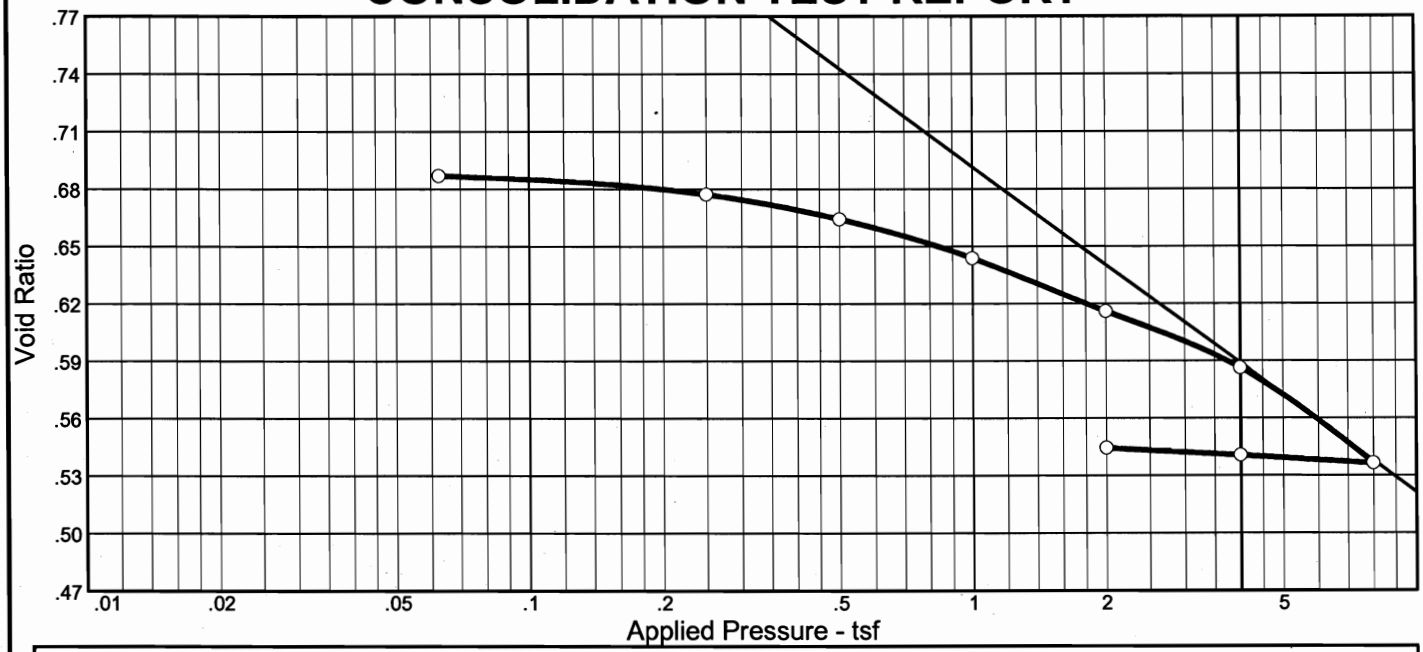


Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	0.11									
3	0.50	0.19									
4	1.00	0.35									
5	2.00	0.36									
6	4.00	0.29									
7	8.00	0.18									
8	4.00	0.53									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture							
78.2 %	20.7 %	102.1	19	2	2.65	4.24	0.17	0.703

MATERIAL DESCRIPTION	USCS	AASHTO
Silty SAND	ML	

Project: GEL Moab

ETDC Project No.: 109855
ETDC Sample No.: BC0920
Client Sample No.: GABT-10

Remarks:

CONSOLIDATION TEST REPORT

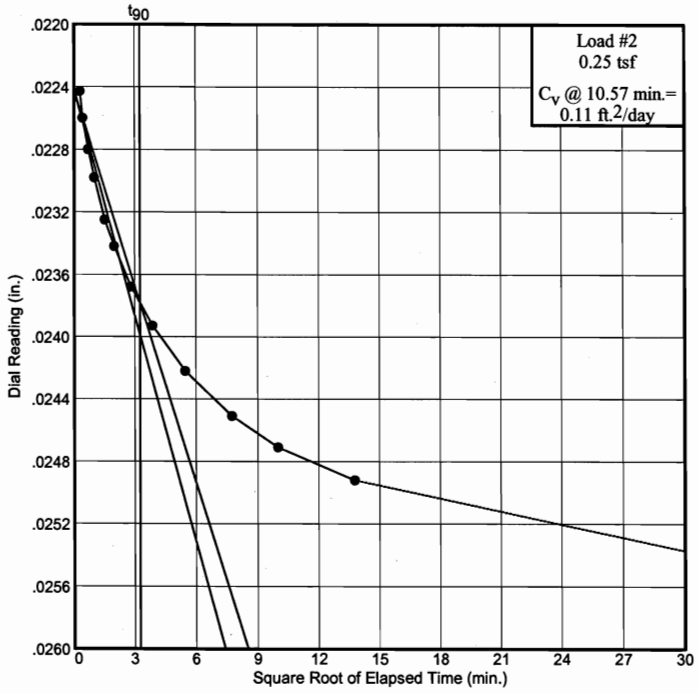
Shaw E&I

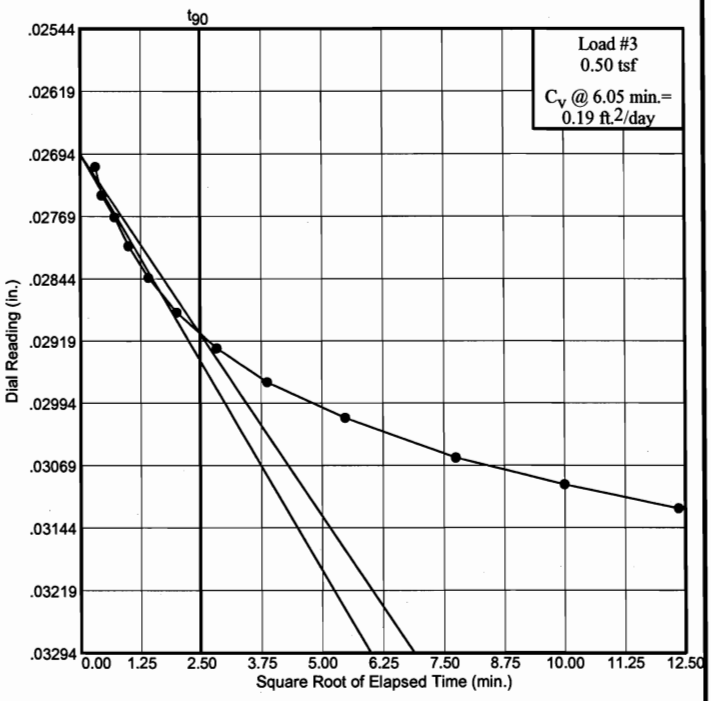
Figure BC0920

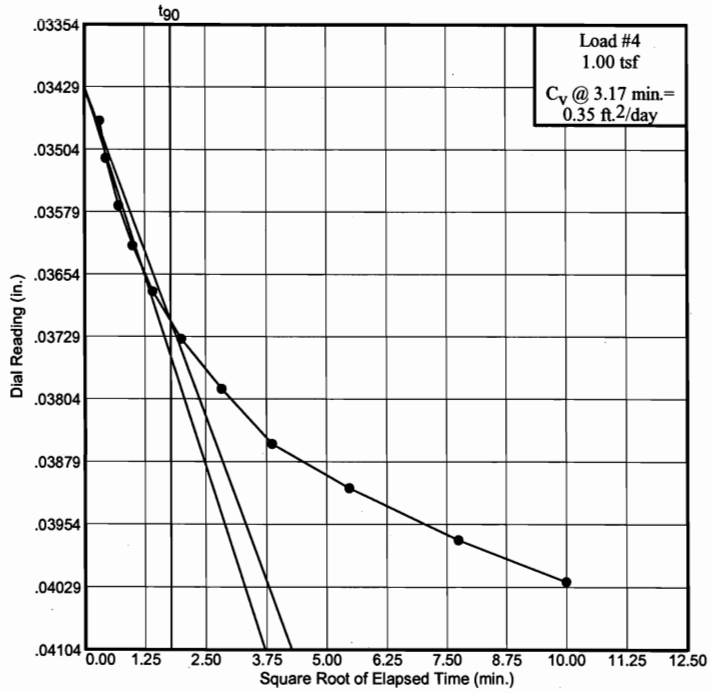
Dial Reading vs. Time

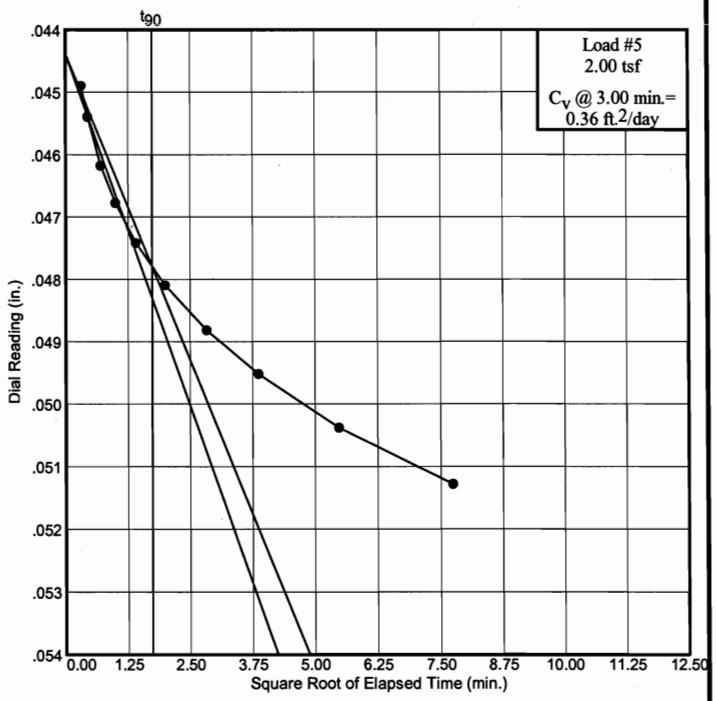
Project No.: 109855
Project: GEL Moab

Location: Moab









Dial Reading vs. Time

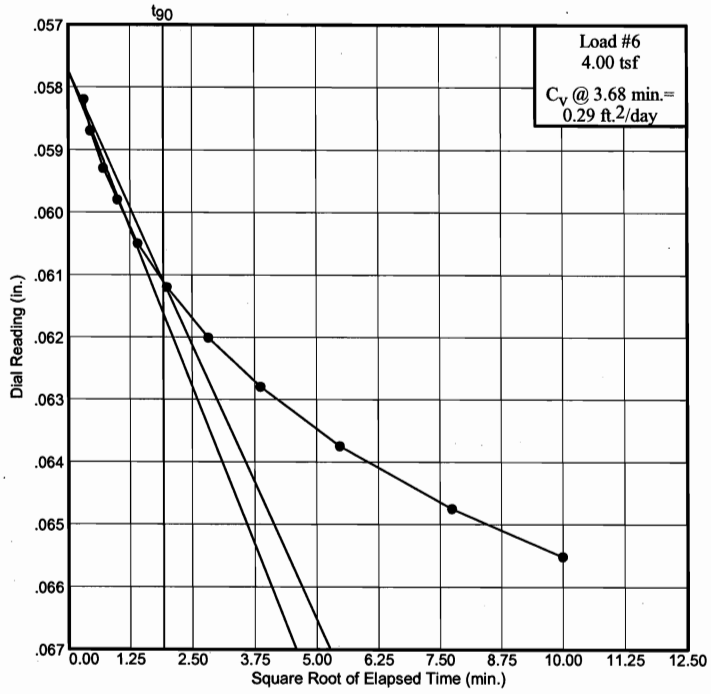
Shaw E&I

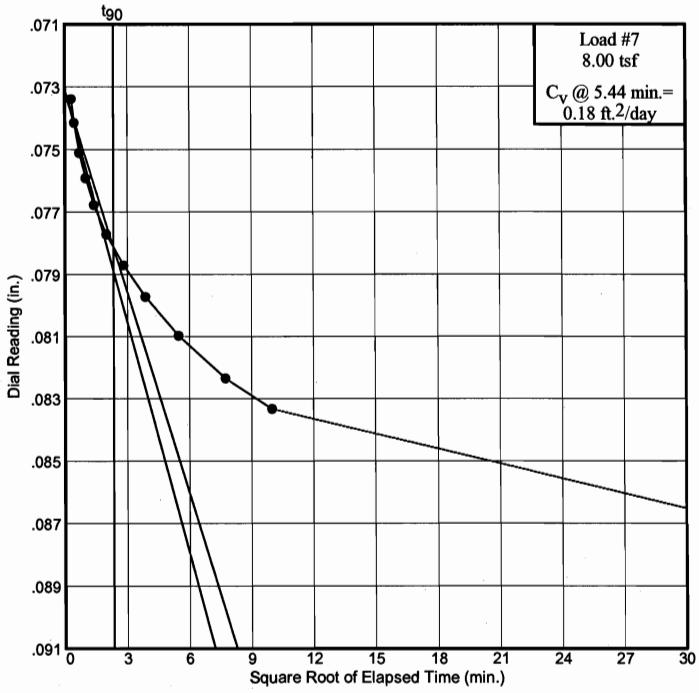
Figure B921

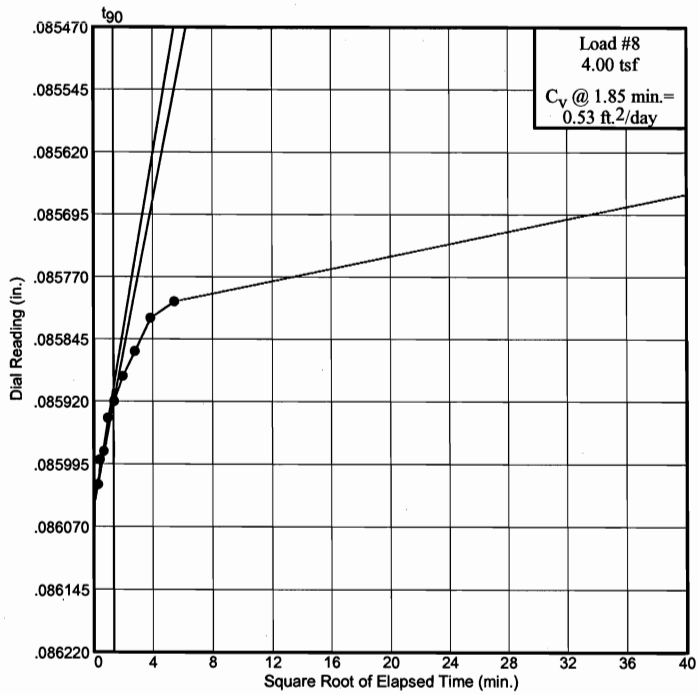
Dial Reading vs. Time

Project No.: 109855
Project: GEL Moab

Location: Moab







Dial Reading vs. Time

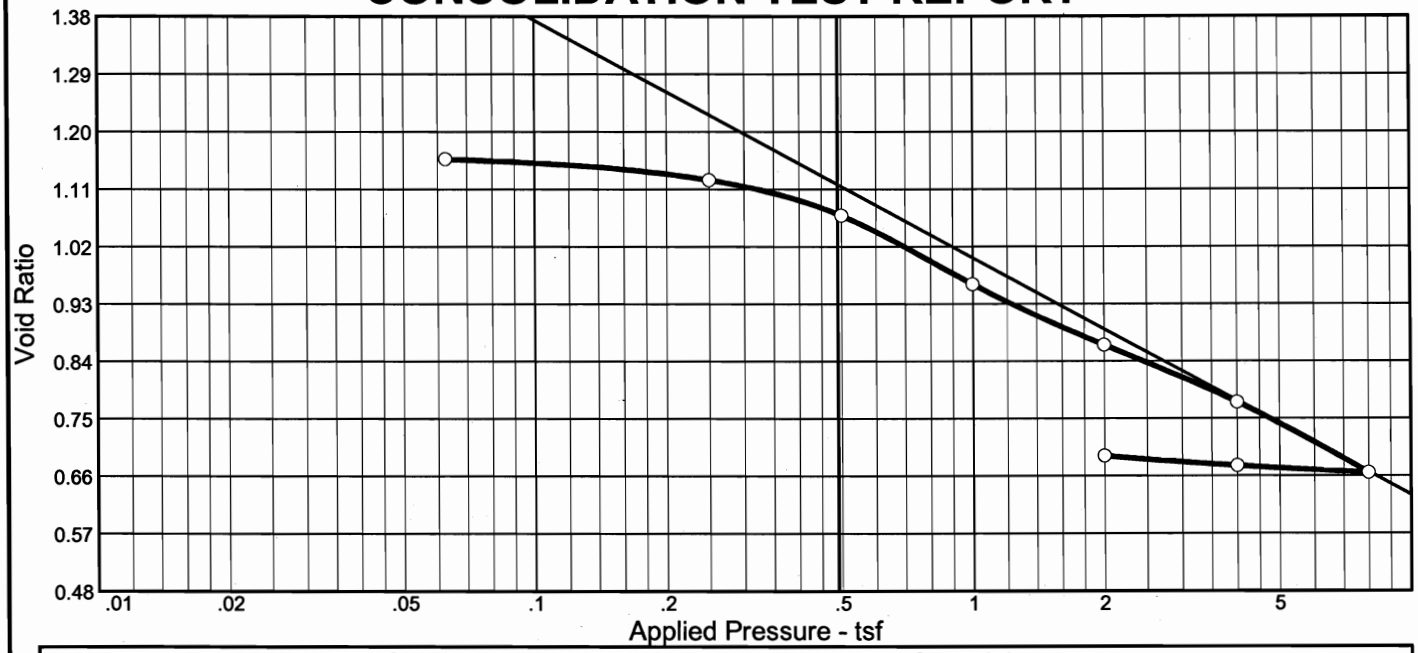
Shaw E&I

Figure 922

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	0.24									
3	0.50	0.40									
4	1.00	1.32									
5	2.00	0.14									
6	4.00	0.10									
7	8.00	0.07									
8	4.00	0.23									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture							
68.5 %	29.9 %	75.3	56	29	2.65	0.78	0.37	1.157

MATERIAL DESCRIPTION	USCS	AASHTO
Fat CLAY with sand	CH	

Project: GEL Moab

ETDC Project No.: 109855
ETDC Sample No.: BC0921
Client Sample No.: GABT-11

CONSOLIDATION TEST REPORT

Shaw E&I

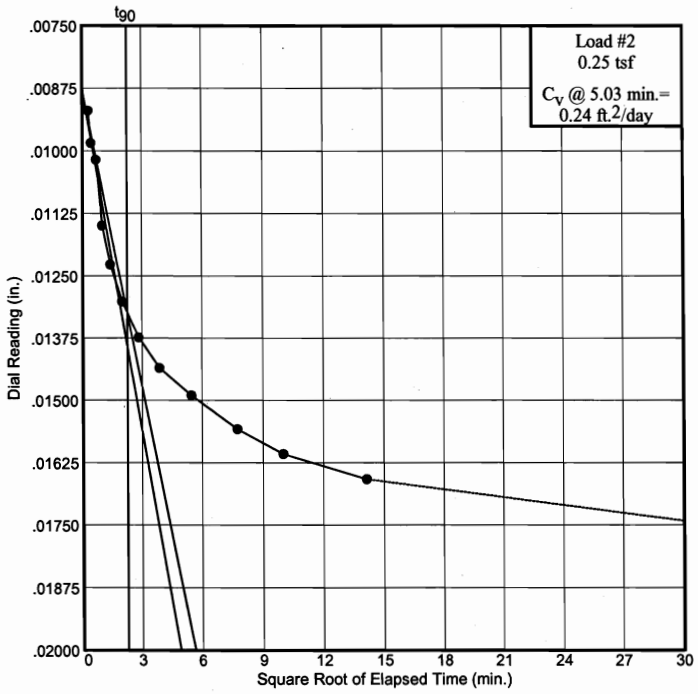
Remarks:

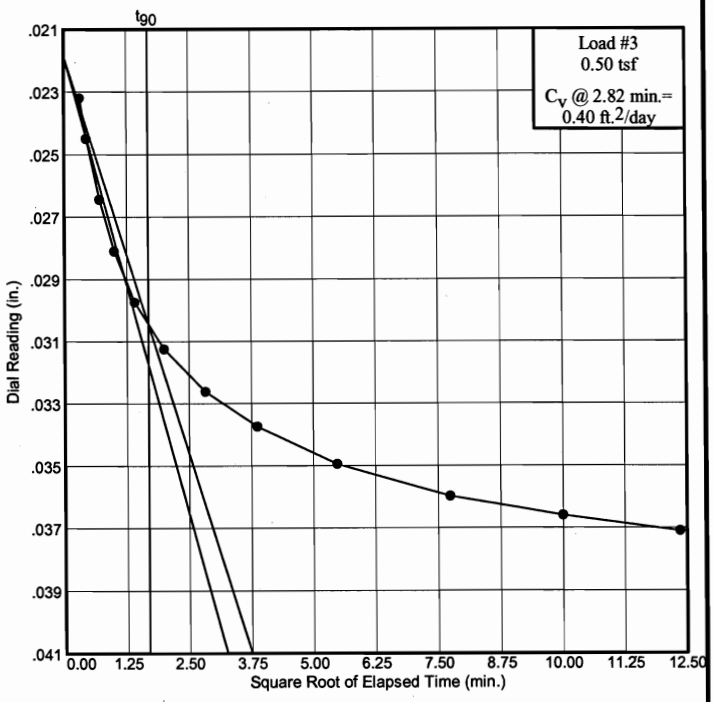
Figure BC0921

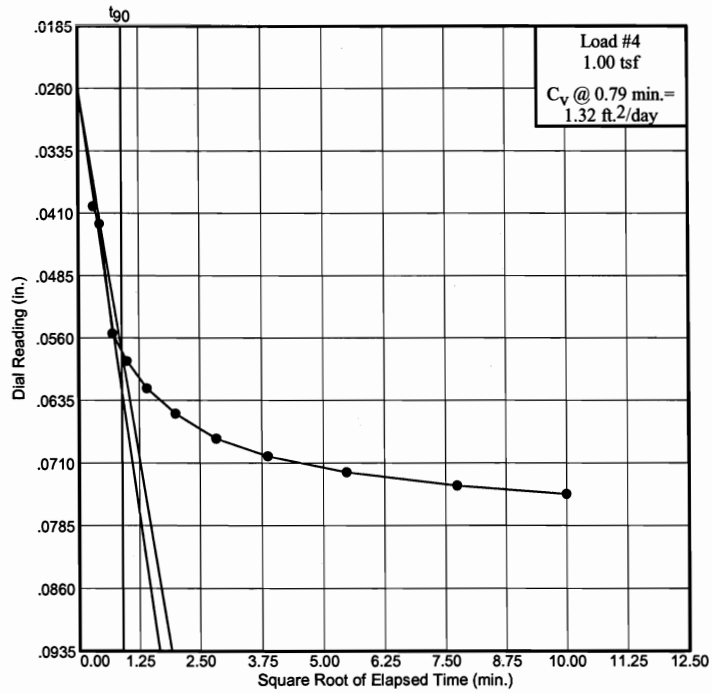
Dial Reading vs. Time

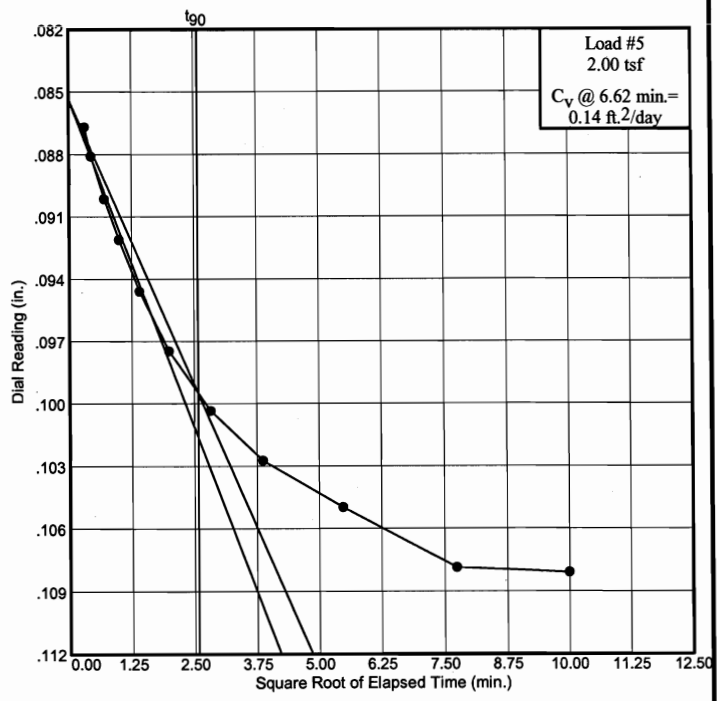
Project No.: 109855
Project: GEL Moab

Location: Moab









Dial Reading vs. Time

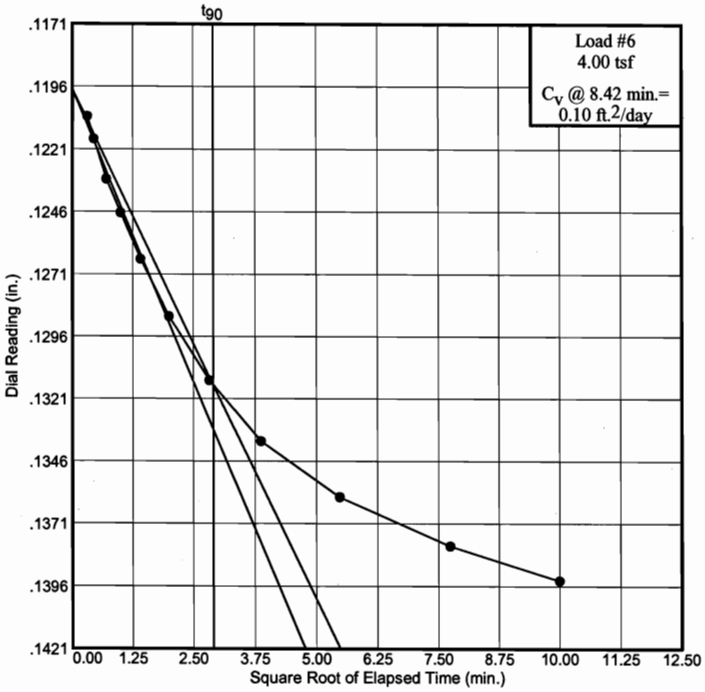
Shaw E&I

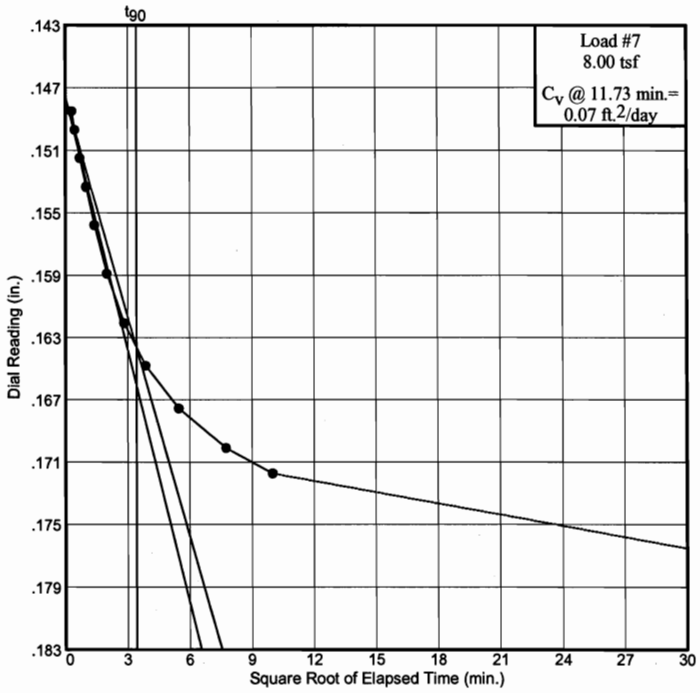
Figure B922

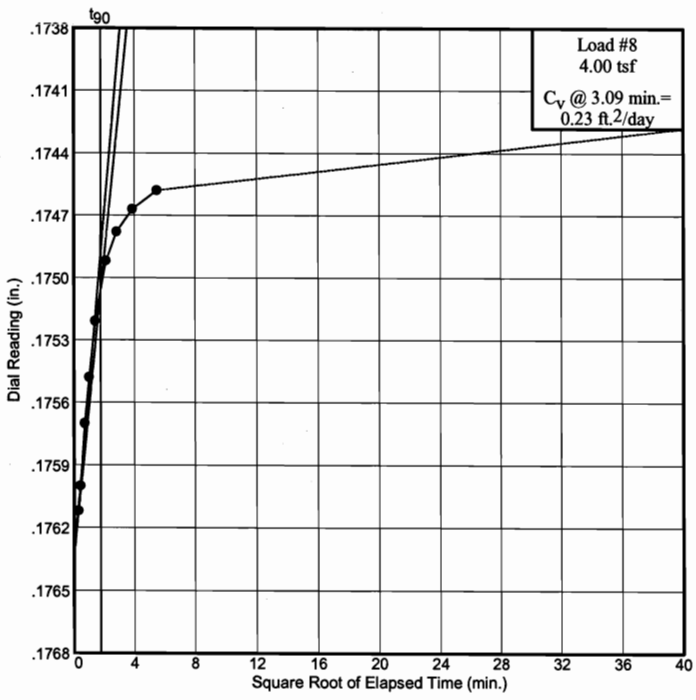
Dial Reading vs. Time

Project No.: 109855
Project: GEL Moab

Location: Moab







Dial Reading vs. Time

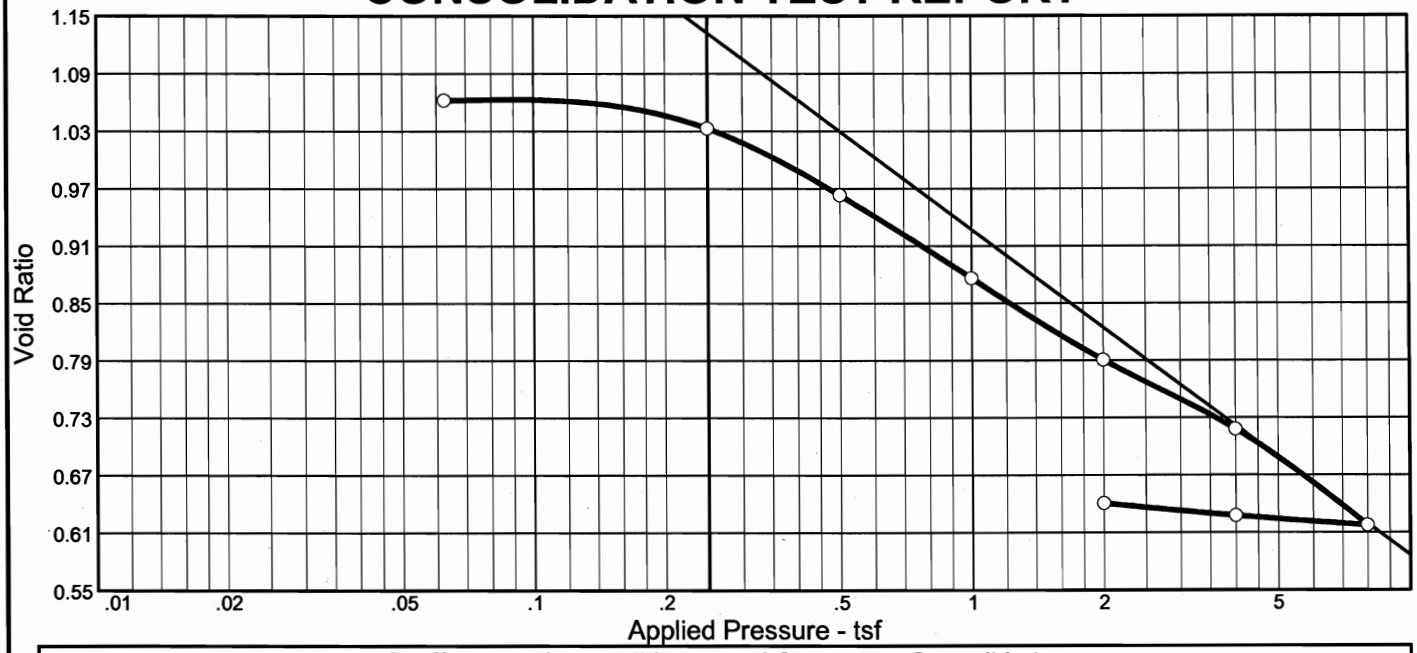
Shaw E&I

Figure 923

November 7, 2006
Erin Stanley
General Engineering Laboratories
Shaw Project Name: GEL – Moab
Shaw Project No. 109855.01410000

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

CONSOLIDATION TEST REPORT



Coefficients of Consolidation and Secondary Consolidation

No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α	No.	Load (tsf)	C_v (ft.2/day)	C_α
2	0.25	0.23									
3	0.50	0.82									
4	1.00	0.40									
5	2.00	0.16									
6	4.00	0.17									
7	8.00	0.07									
8	4.00	0.25									

Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	P_c (tsf)	C_c	Initial Void Ratio
Saturation	Moisture							
77.8 %	30.9 %	80.7	49	38	2.65	0.61	0.34	1.052

MATERIAL DESCRIPTION	USCS	AASHTO
Lean CLAY	CL	

Project: GEL Moab

ETDC Project No.: 109855
ETDC Sample No.: BC0923
Client Sample No.: GABT-13

CONSOLIDATION TEST REPORT

Shaw E&I

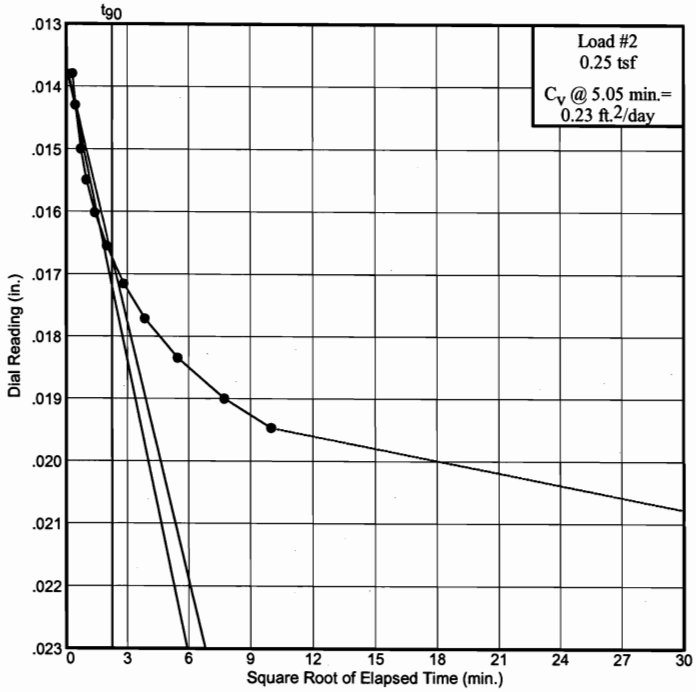
Remarks:

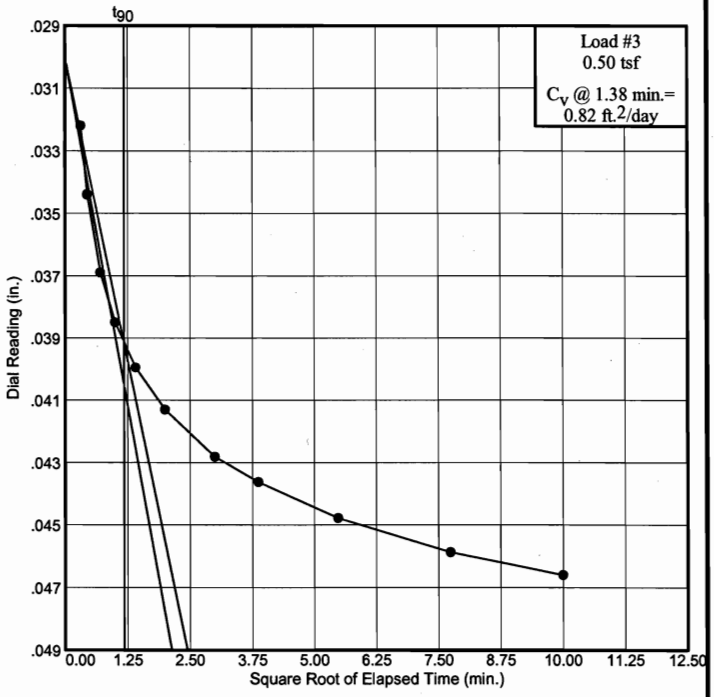
Figure BC0923

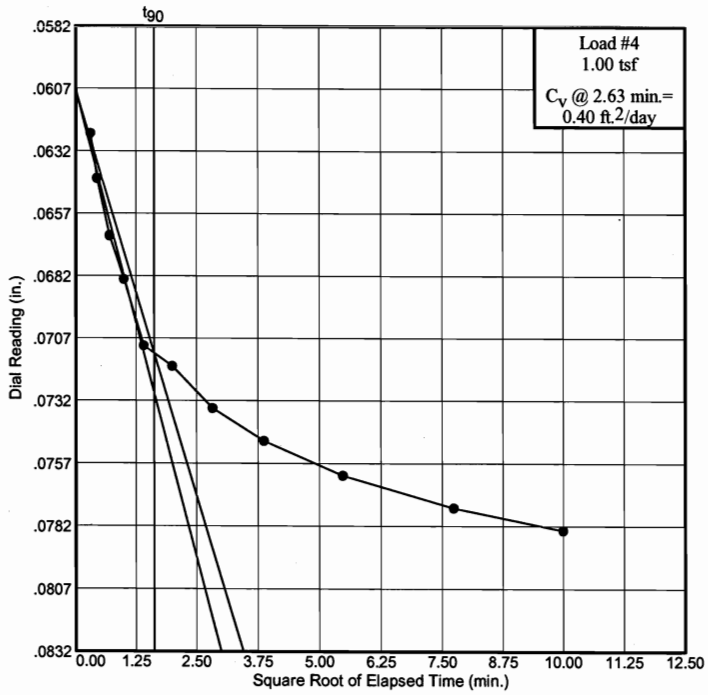
Dial Reading vs. Time

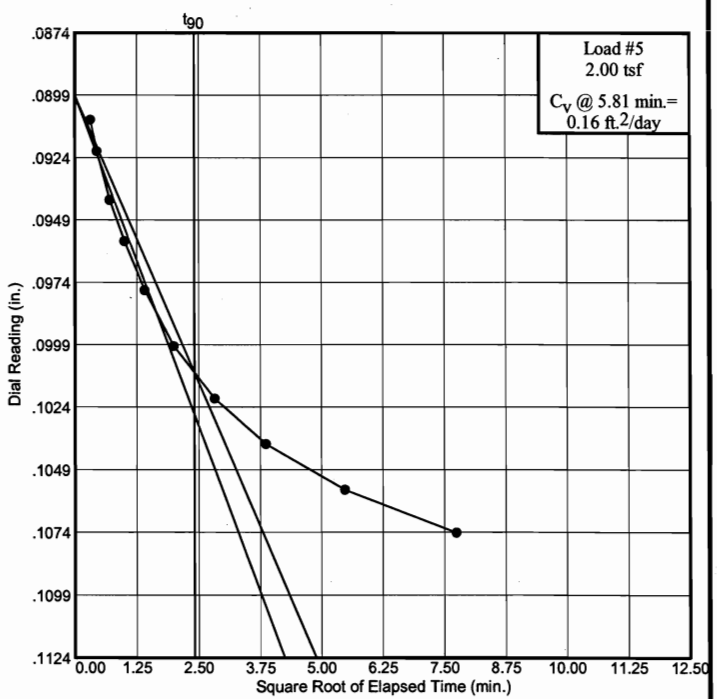
Project No.: 109855
Project: GEL Moab

Location: Moab









Dial Reading vs. Time

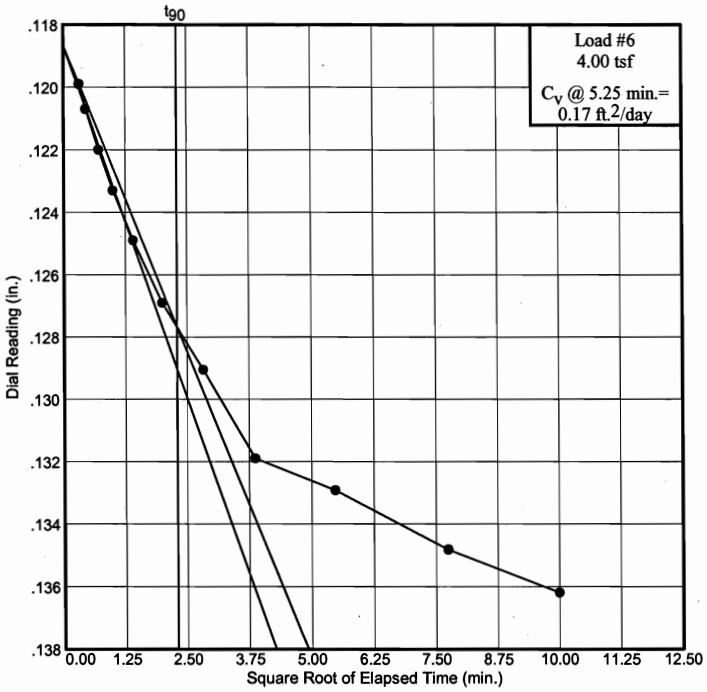
Shaw E&I

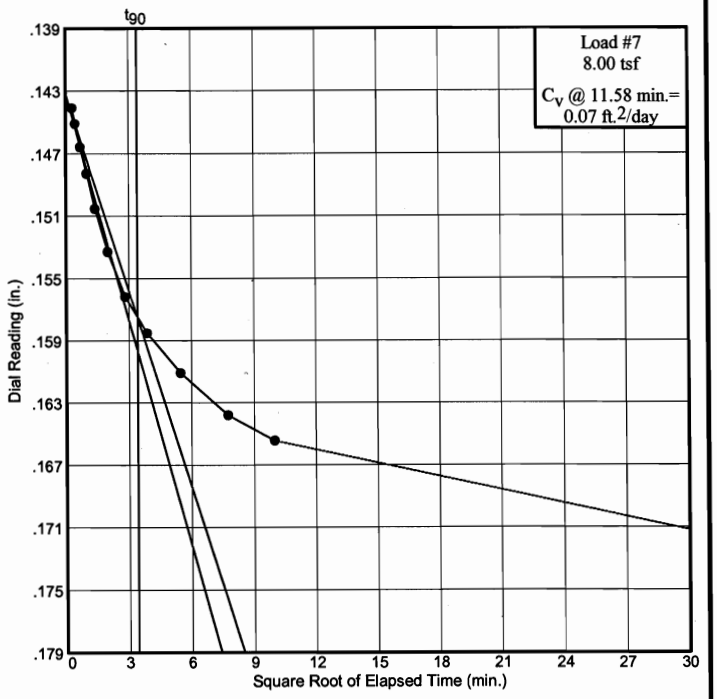
Figure B924

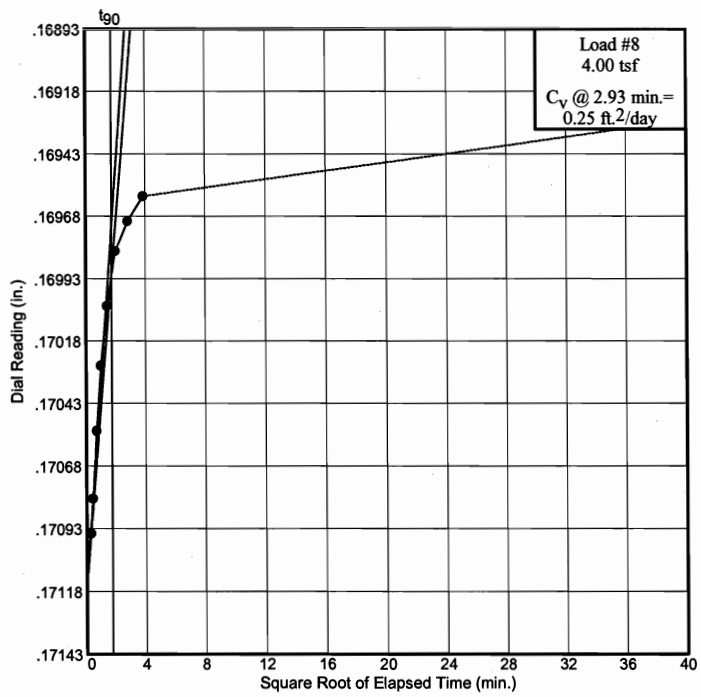
Dial Reading vs. Time

Project No.: 109855
Project: GEL Moab

Location: Moab



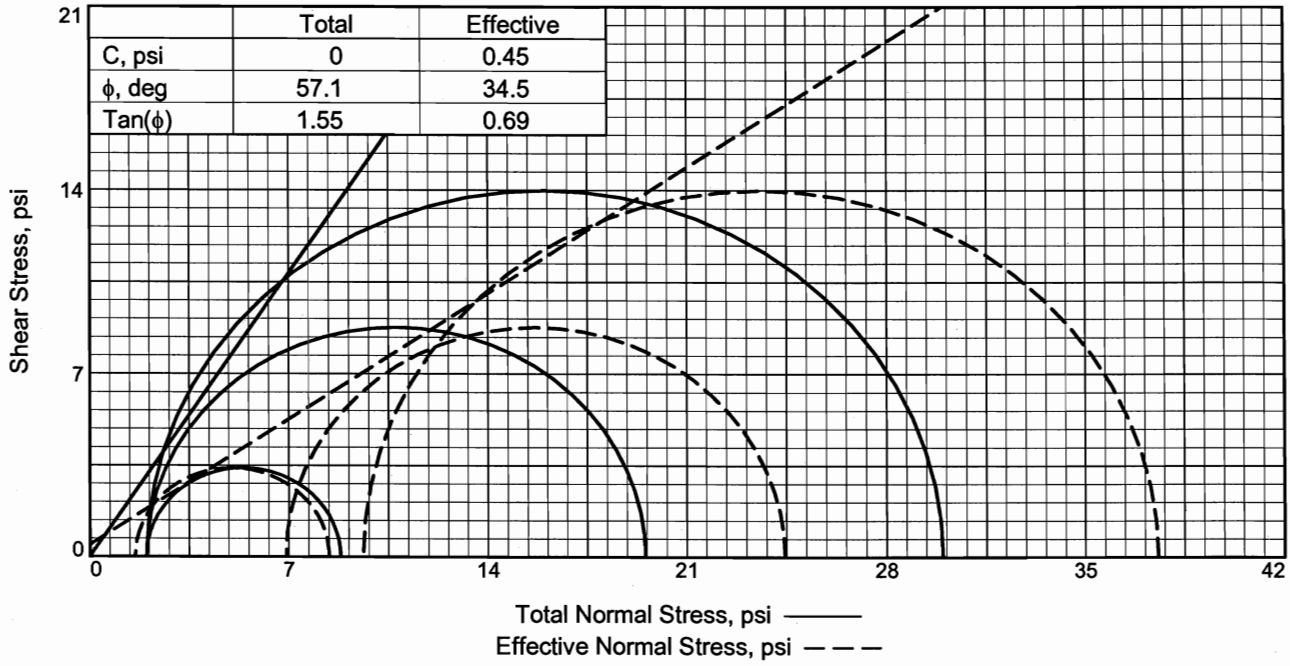


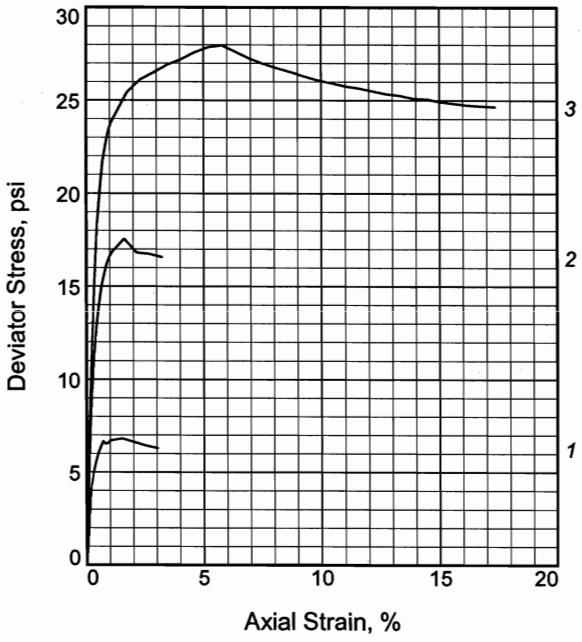


Dial Reading vs. Time

Shaw E&I

Figure 925





Sample No.		1	2	3
Initial	Water Content,	17.1	N/A	N/A
	Dry Density, pcf	88.7	N/A	N/A
	Saturation,	52.3	N/A	N/A
	Void Ratio	0.8644	N/A	N/A
	Diameter, in.	2.50	2.50	2.50
	Height, in.	4.97	4.97	4.97
At Test	Water Content,	31.7		
	Dry Density, pcf	90.0		
	Saturation,	100.0		
	Void Ratio	0.8388		
	Diameter, in.	2.49		
	Height, in.	4.94		
Strain rate, in./min.		0.00	0.00	0.00
Eff. Cell Pressure, psi		2.0	2.0	2.0
Fail. Stress, psi		6.8	17.5	28.0
Total Pore Pr., psi		18.4	33.1	50.4
Strain, %		1.5	1.6	5.8
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		8.4	24.4	37.6
$\bar{\sigma}_3$ Failure, psi		1.6	6.9	9.6

Type of Test:
CU with Pore Pressures

Sample Type: Recompacted

Description:

LL= NP **PI=** NP

Assumed Specific Gravity= 2.65

Remarks: Incremental loading, same specimen for all points

Figure BC0913

Client: GEL

Project: GEL Moab

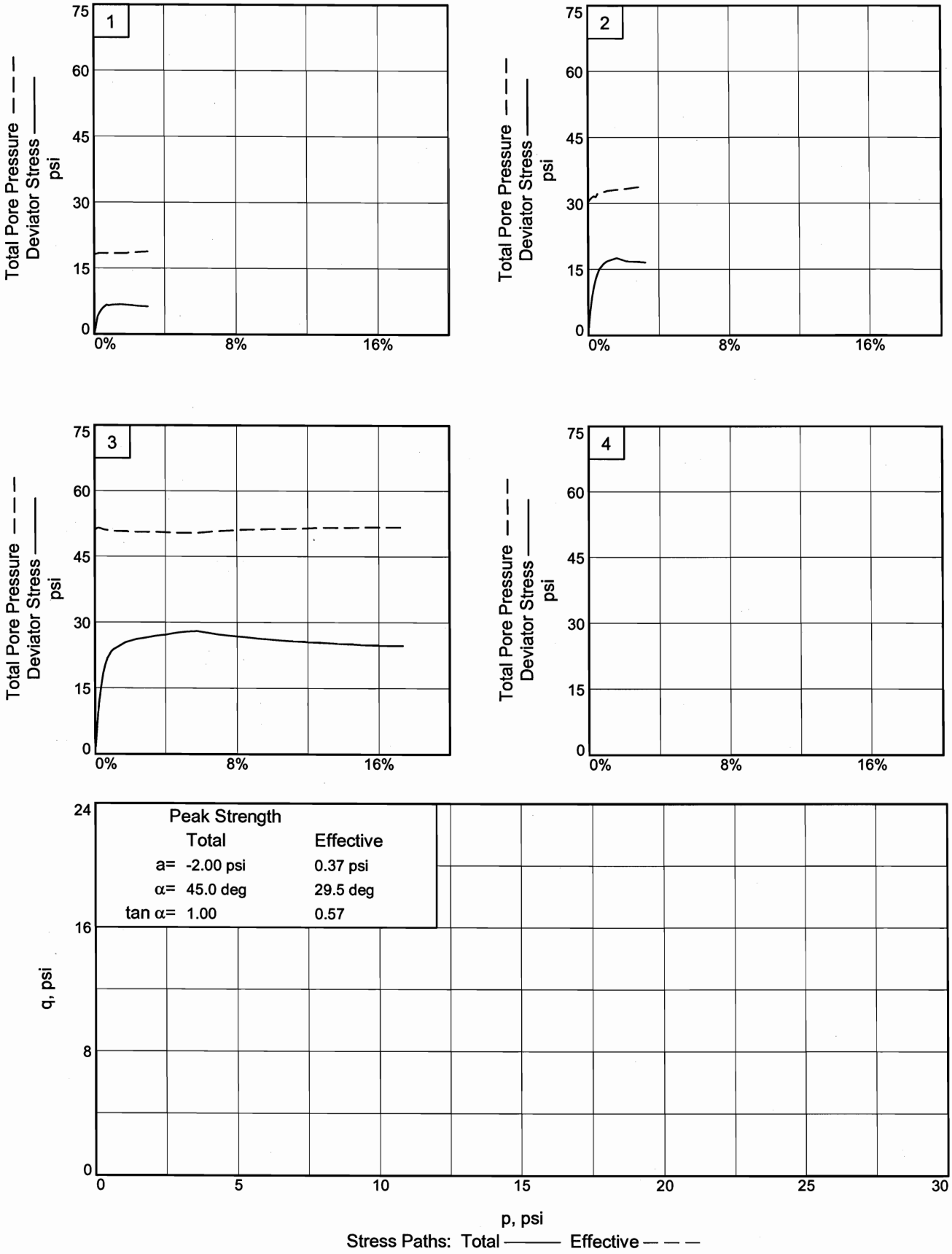
Location: Moab

Sample Number: BC0913

Proj. No.: 109855 **Date:**

TRIAXIAL SHEAR TEST REPORT

Shaw E&I



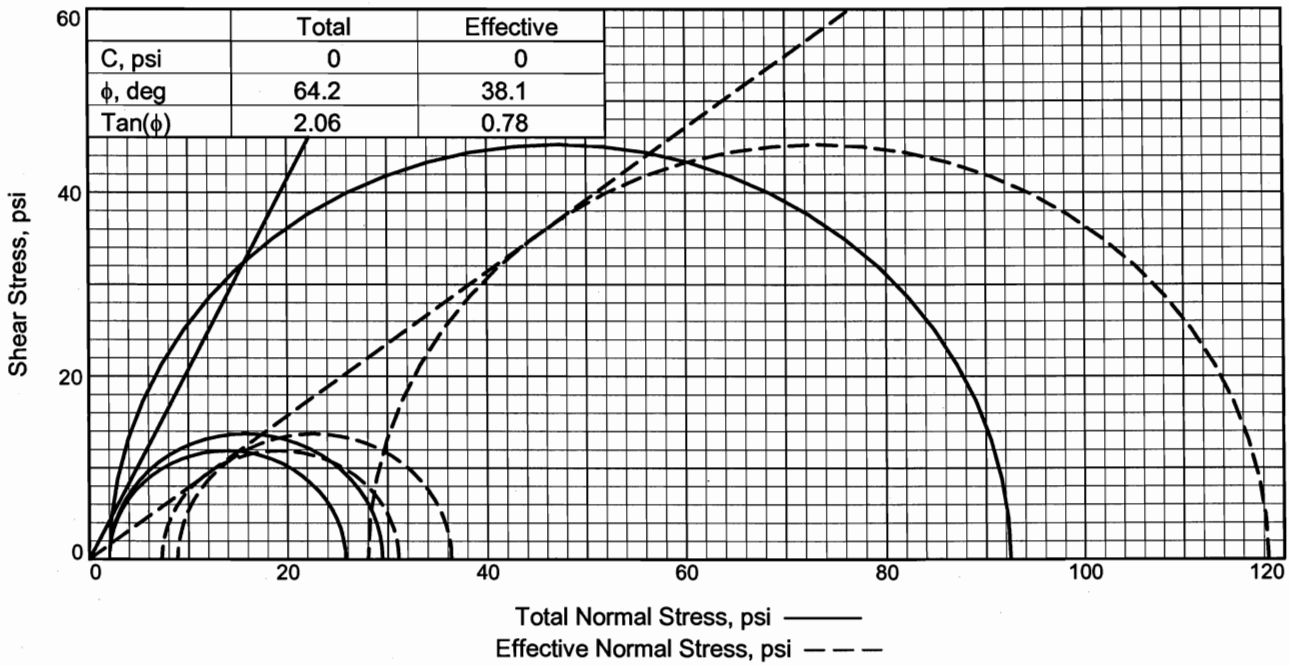
Client: GEL

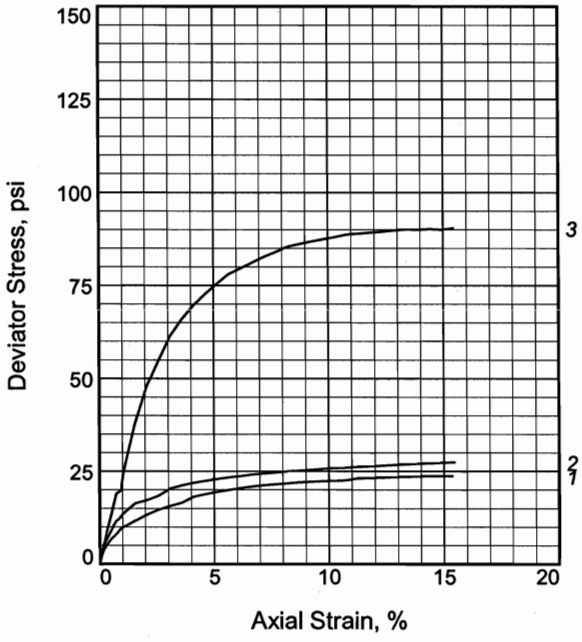
Project: GEL Moab

Location: Moab **Sample Number:** BC0913

Project No.: 109855 **Figure** _____

Shaw E&I





Sample No.		1	2	3
Initial	Water Content,	17.9	17.9	17.9
	Dry Density, pcf	102.1	101.4	101.5
	Saturation,	76.5	75.2	75.4
	Void Ratio	0.6203	0.6310	0.6292
	Diameter, in.	2.51	2.50	2.49
	Height, in.	4.90	5.11	5.11
At Test	Water Content,	22.8	14.5	14.7
	Dry Density, pcf	103.1	119.5	119.2
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.6039	0.3848	0.3882
	Diameter, in.	2.50	2.36	2.36
	Height, in.	4.88	4.85	4.85
Strain rate, in./min.		0.00	0.00	0.00
Eff. Cell Pressure, psi		2	2	2
Fail. Stress, psi		24	27	90
Total Pore Pr., psi		13	31	32
Strain, %		14.3	15.5	15.5
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		31	36	118
$\bar{\sigma}_3$ Failure, psi		7	9	28

Type of Test:
CU with Pore Pressures

Sample Type:

Description:

Assumed Specific Gravity= 2.65

Remarks:

Figure _____

Client: GEL

Project: GEL Moab

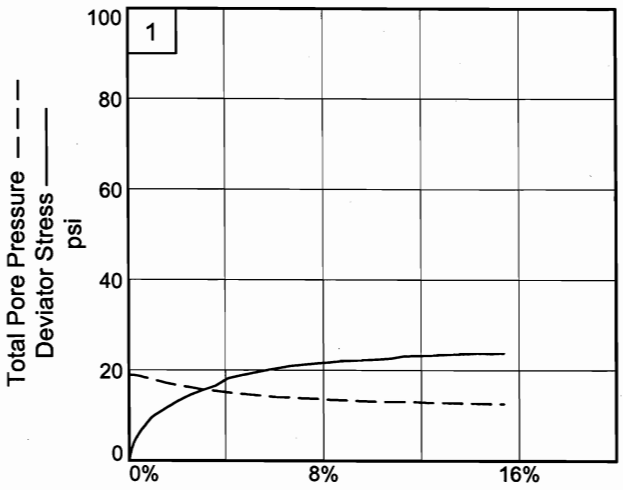
Location: Moab

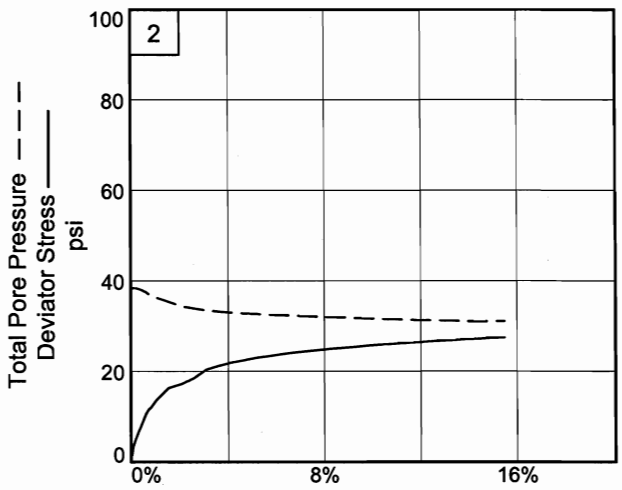
Sample Number: BC0915

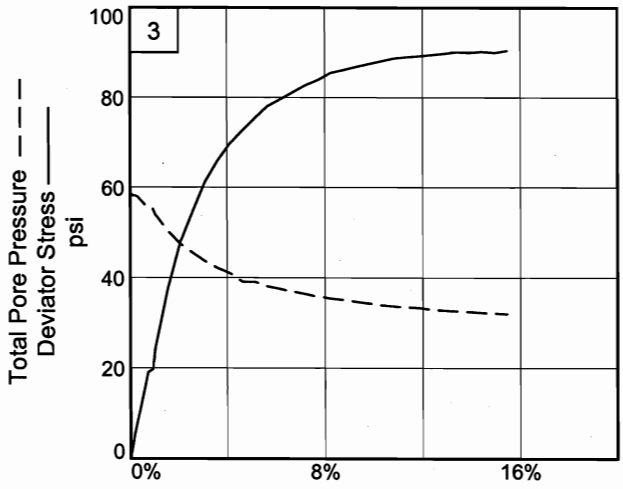
Proj. No.: 109855 **Date:**

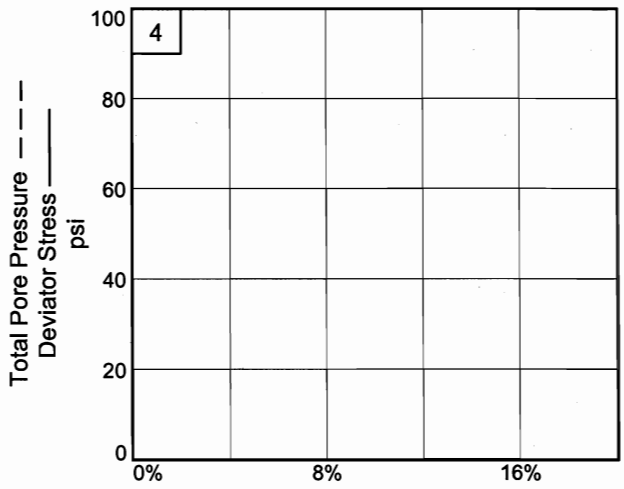
TRIAXIAL SHEAR TEST REPORT

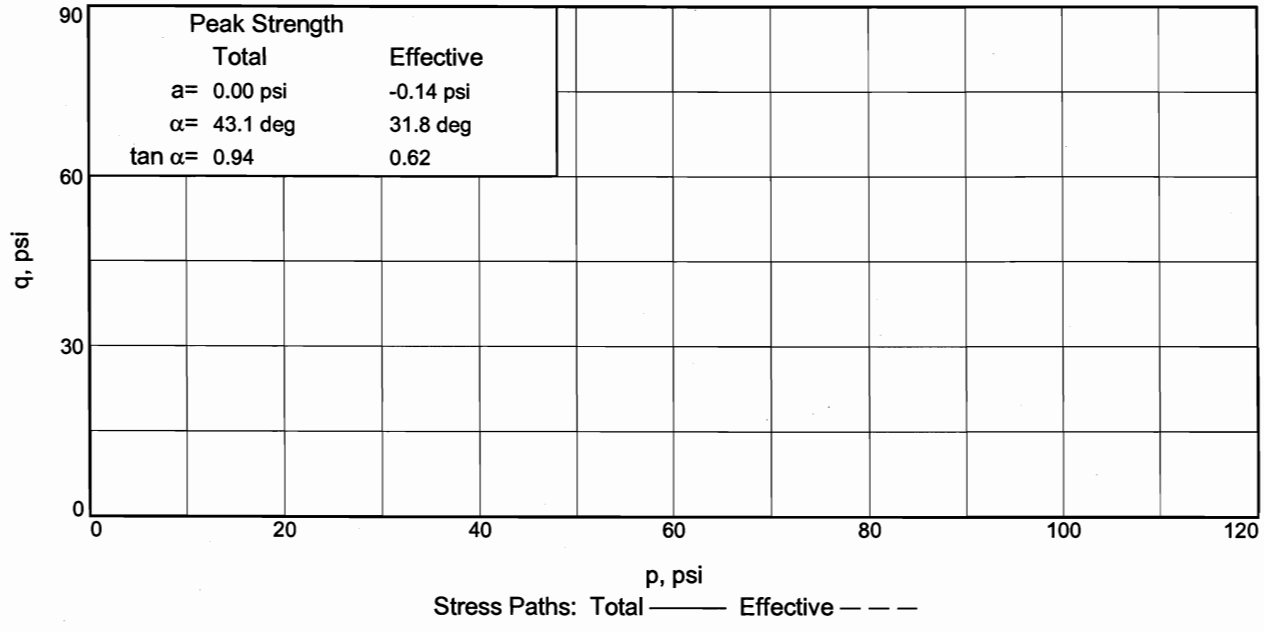
Shaw E&I





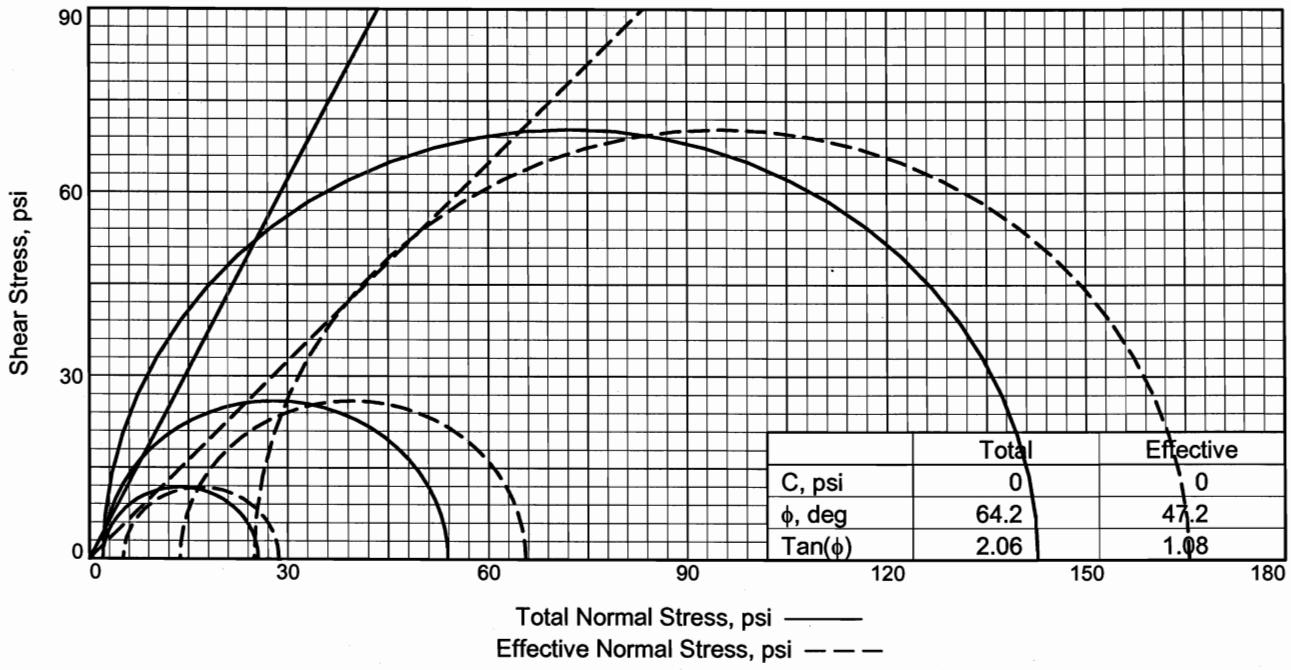




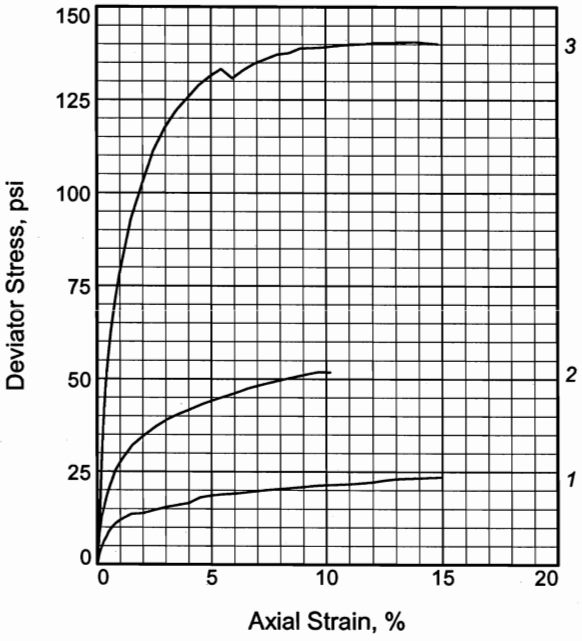


Client: GEL
Project: GEL Moab
Location: Moab **Sample Number:** BC0915
Project No.: 109855 **Figure** _____

Shaw E&I



	Total	Effective
C, psi	0	0
ϕ, deg	64.2	47.2
Tan(ϕ)	2.06	1.08



Sample No.		1	2	3
Initial	Water Content,	20.5	20.5	20.5
	Dry Density, pcf	95.9	96.6	96.6
	Saturation,	69.7	70.9	70.9
	Void Ratio	0.8222	0.8089	0.8089
	Diameter, in.	2.50	2.49	2.49
	Height, in.	5.05	5.11	5.11
At Test	Water Content,	27.7	21.3	26.8
	Dry Density, pcf	98.4	109.4	99.8
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.7757	0.5977	0.7510
	Diameter, in.	2.48	2.39	2.47
	Height, in.	5.00	4.91	5.06
Strain rate, in./min.		0.00	0.01	0.01
Eff. Cell Pressure, psi		2	2	2
Fail. Stress, psi		24	52	141
Total Pore Pr., psi		15	26	35
Strain, %		15.0	9.7	13.8
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		29	66	166
$\bar{\sigma}_3$ Failure, psi		5	14	25

Type of Test:
CU with Pore Pressures

Sample Type:

Description:

Assumed Specific Gravity= 2.8

Remarks:

Figure _____

Client: GEL

Project: GEL Moab

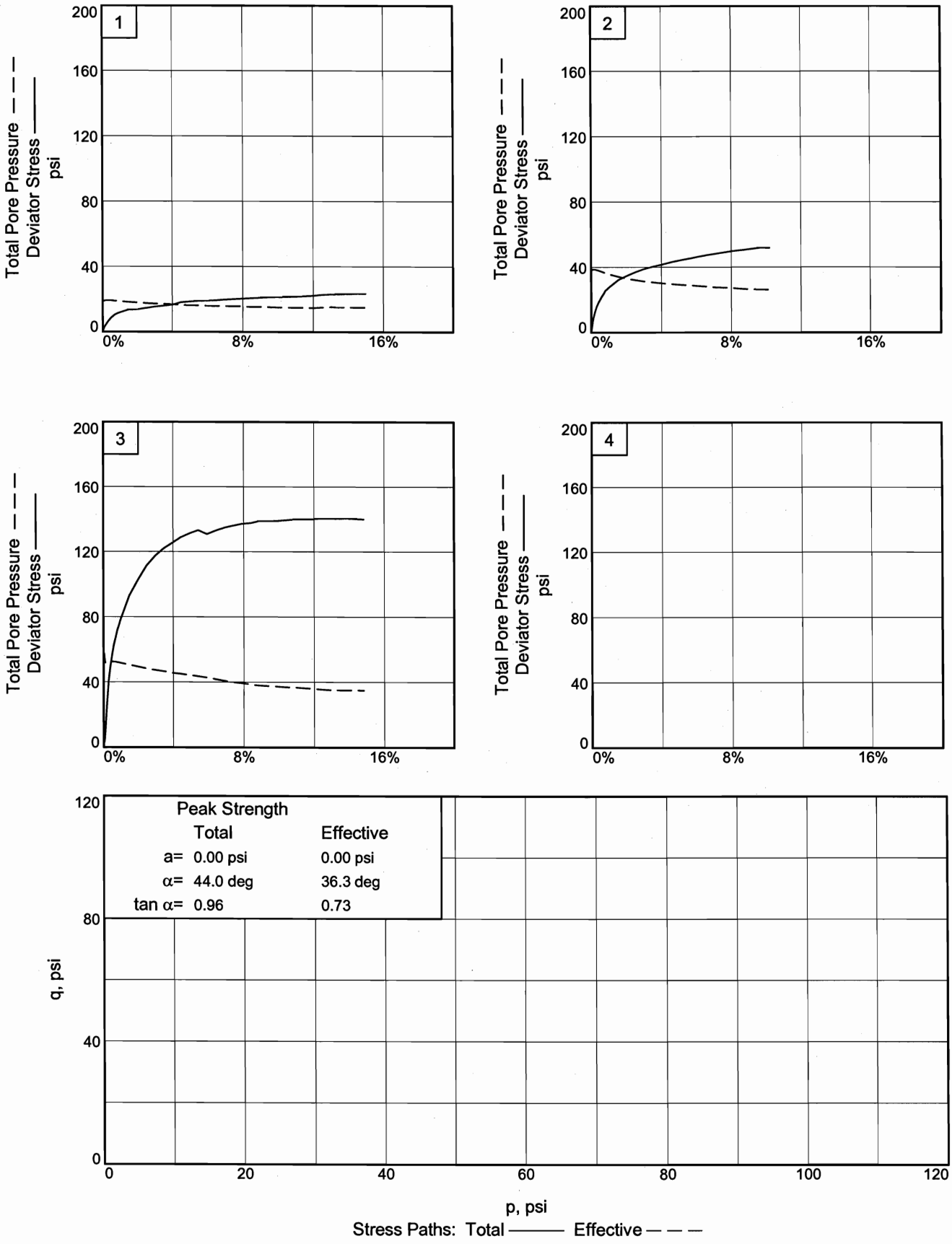
Location: Moab

Sample Number: BC0917

Proj. No.: 109855 **Date:**

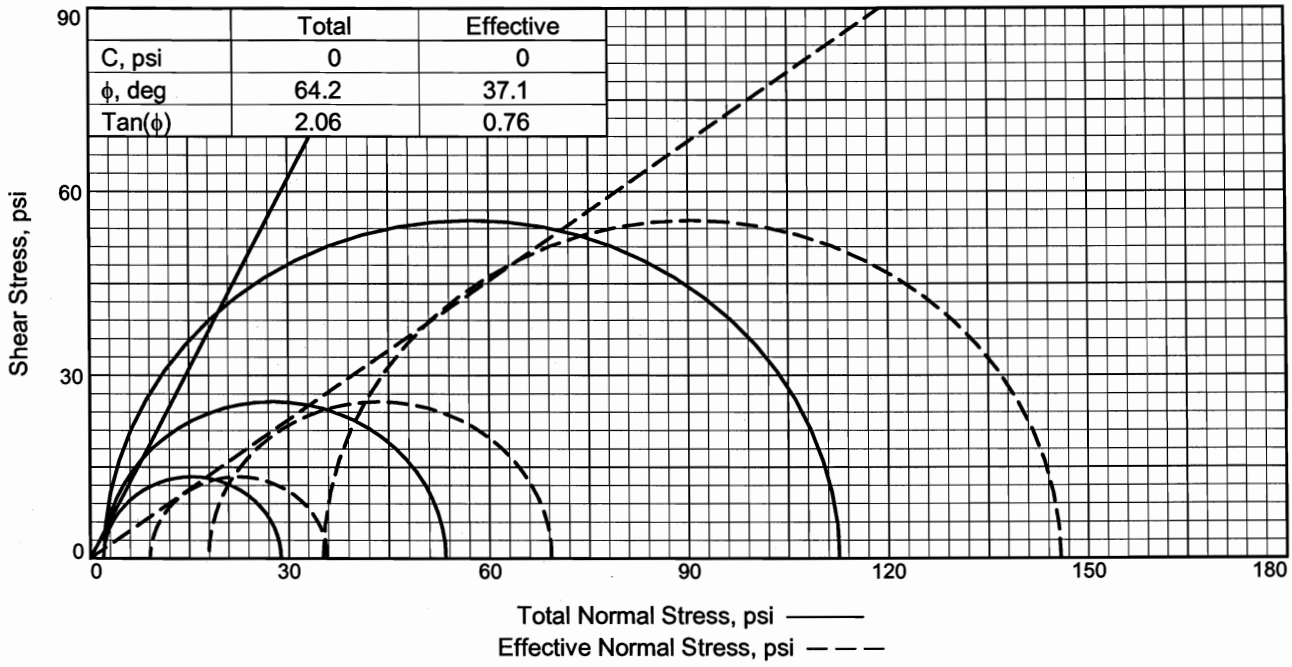
TRIAXIAL SHEAR TEST REPORT

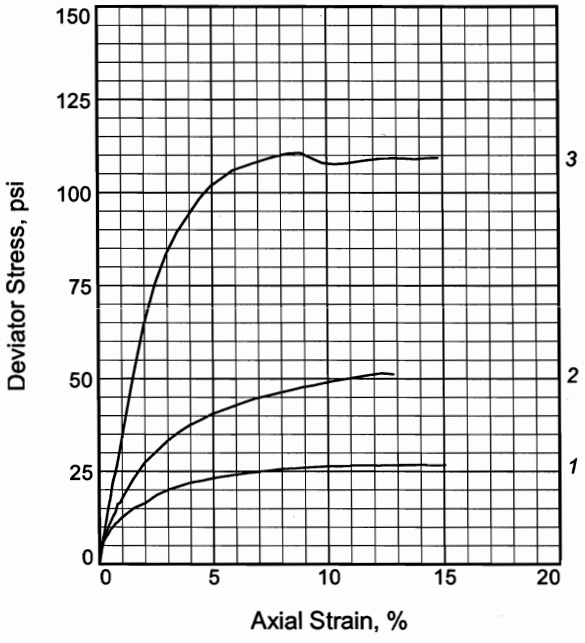
Shaw E&I



Client: GEL
Project: GEL Moab
Location: Moab **Sample Number:** BC0917
Project No.: 109855 **Figure** _____

Shaw E&I





Sample No.		1	2	3
Initial	Water Content,	15.3	15.3	15.3
	Dry Density, pcf	101.7	101.8	101.8
	Saturation,	64.6	64.8	64.8
	Void Ratio	0.6263	0.6246	0.6246
	Diameter, in.	2.50	2.49	2.49
	Height, in.	5.00	5.11	5.11
At Test	Water Content,	23.2	21.9	22.1
	Dry Density, pcf	102.4	104.7	104.4
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.6148	0.5797	0.5849
	Diameter, in.	2.49	2.47	2.47
	Height, in.	4.98	5.07	5.07
Strain rate, in./min.		0.00	0.00	0.00
Eff. Cell Pressure, psi		2	2	2
Fail. Stress, psi		27	51	111
Total Pore Pr., psi		11	22	25
Strain, %		14.0	12.3	8.9
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		36	69	146
$\bar{\sigma}_3$ Failure, psi		9	18	35

Type of Test:
CU with Pore Pressures

Sample Type:

Description:

Assumed Specific Gravity= 2.65

Remarks:

Figure _____

Client: GEL

Project: GEL Moab

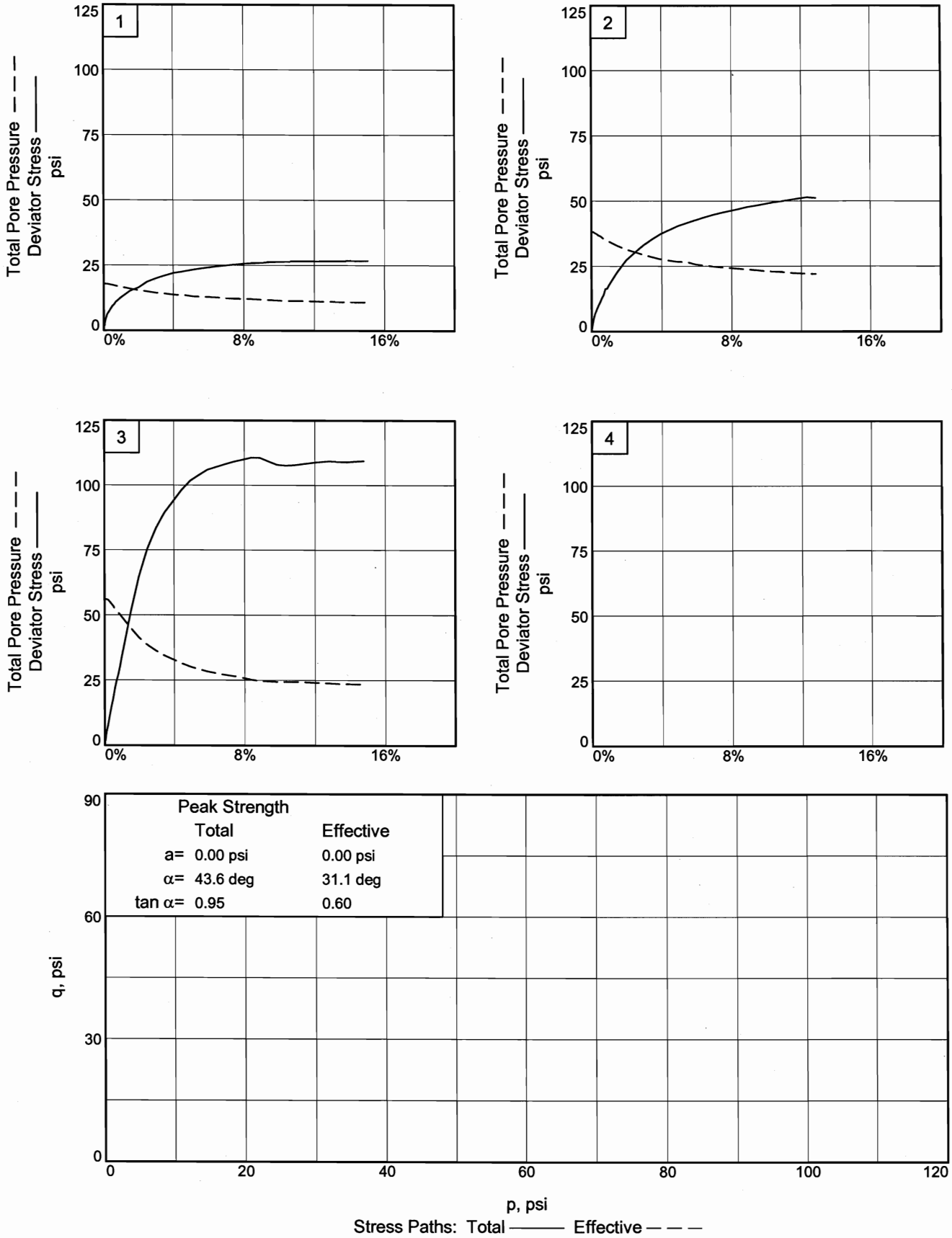
Location: Moab

Sample Number: BC0918

Proj. No.: 109855 **Date:**

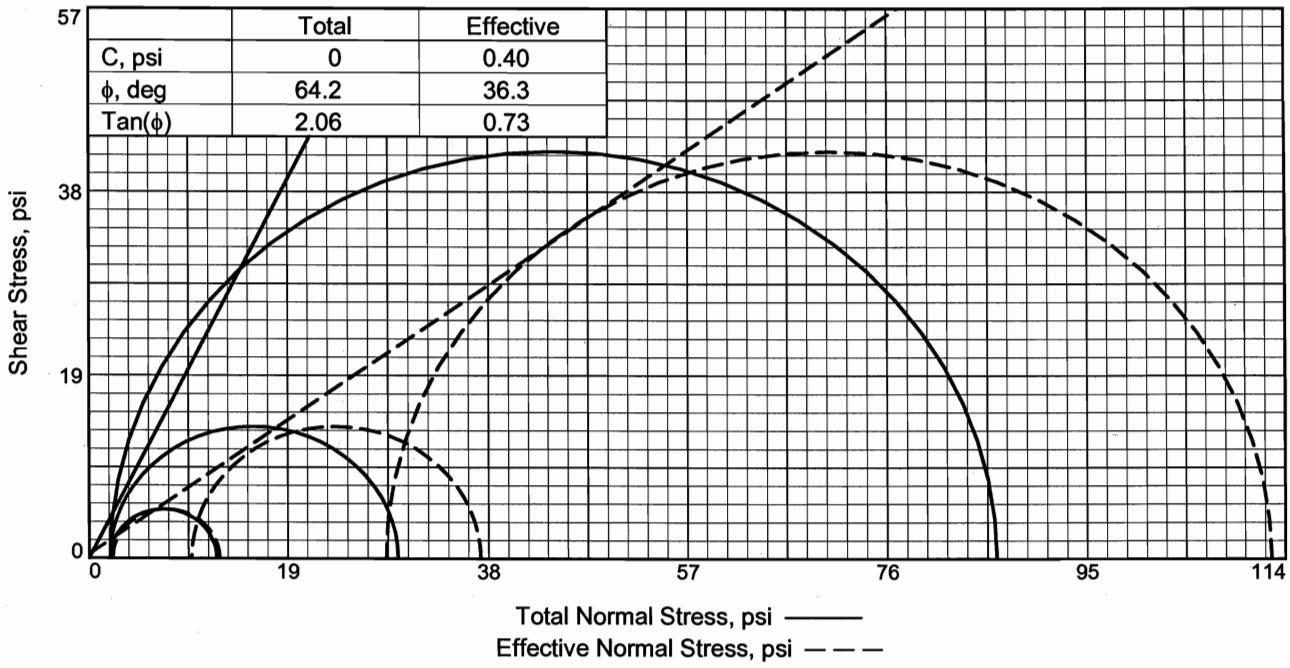
TRIAXIAL SHEAR TEST REPORT

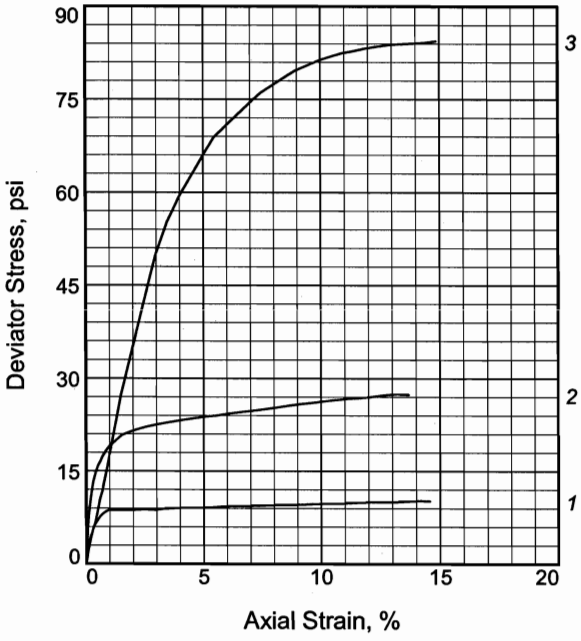
Shaw E&I



Client: GEL
Project: GEL Moab
Location: Moab **Sample Number:** BC0918
Project No.: 109855 **Figure** _____

Shaw E&I





Sample No.		1	2	3
Initial	Water Content,	23.1	23.1	23.1
	Dry Density, pcf	91.7	91.8	91.8
	Saturation,	76.1	76.3	76.2
	Void Ratio	0.8038	0.8016	0.8027
	Diameter, in.	2.50	2.49	2.49
	Height, in.	5.00	5.11	5.12
At Test	Water Content,	36.7	23.2	27.5
	Dry Density, pcf	83.9	102.5	95.7
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.9715	0.6136	0.7290
	Diameter, in.	2.58	2.40	2.46
	Height, in.	5.15	4.93	5.05
Strain rate, in./min.		0.00	0.01	0.01
Eff. Cell Pressure, psi		2	2	2
Fail. Stress, psi		10	27	84
Total Pore Pr., psi		18	30	32
Strain, %		14.1	13.2	14.9
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		13	37	113
$\bar{\sigma}_3$ Failure, psi		2	10	28

Type of Test:
CU with Pore Pressures
Sample Type: Recompacted
Description:

LL= 23 **PL=** 20 **PI=** 3
Assumed Specific Gravity= 2.65
Remarks:

Figure BC0919

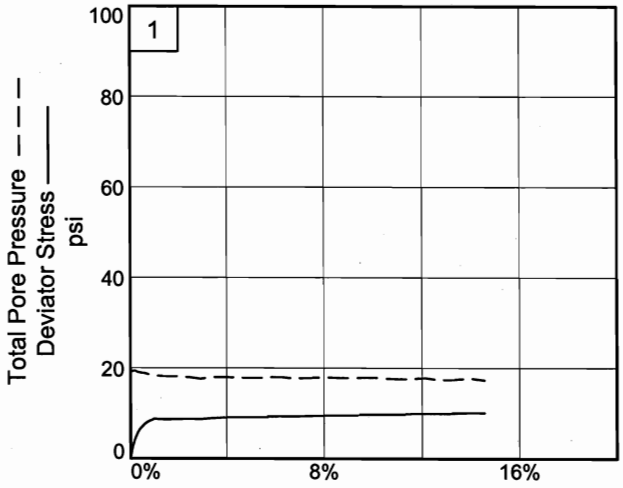
Client: GEL

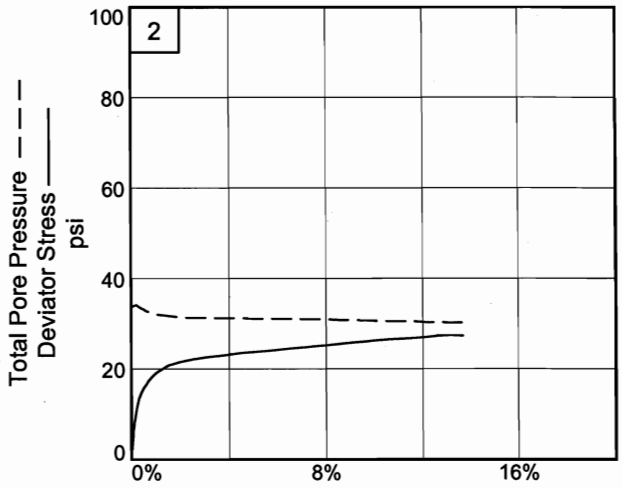
Project: GEL Moab

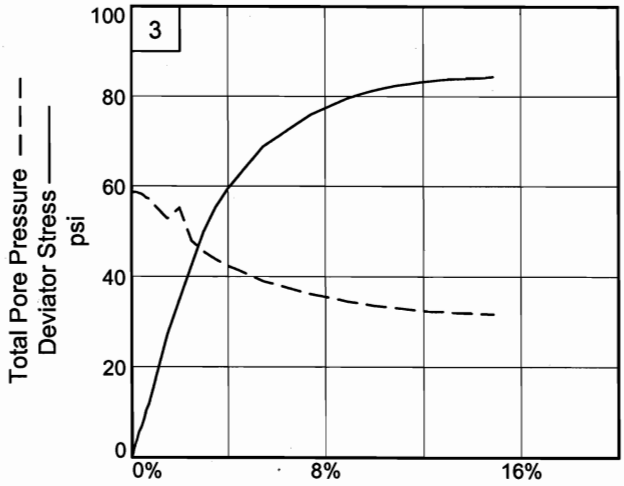
Location: Moab
Sample Number: BC0919
Proj. No.: 109855 **Date:**

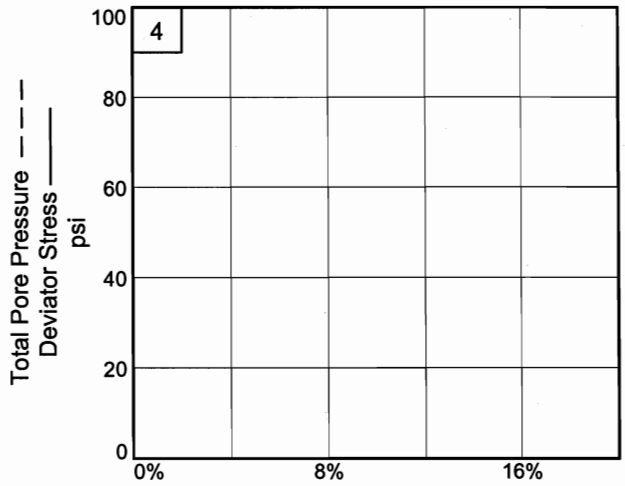
TRIAXIAL SHEAR TEST REPORT

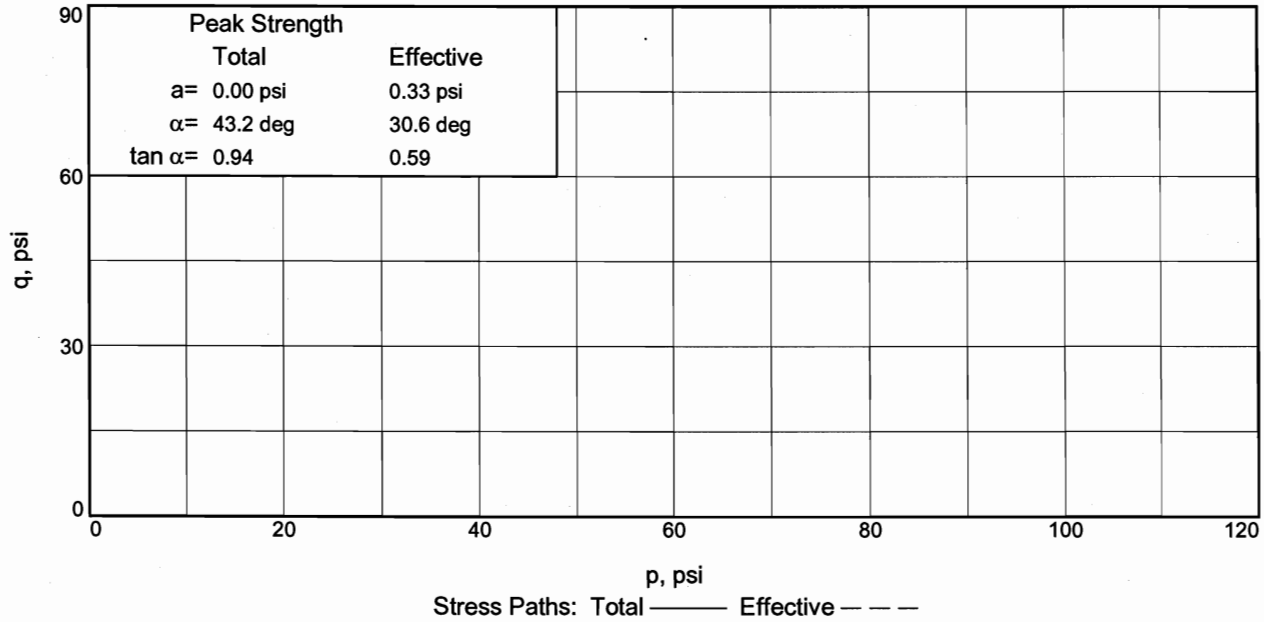
Shaw E&I





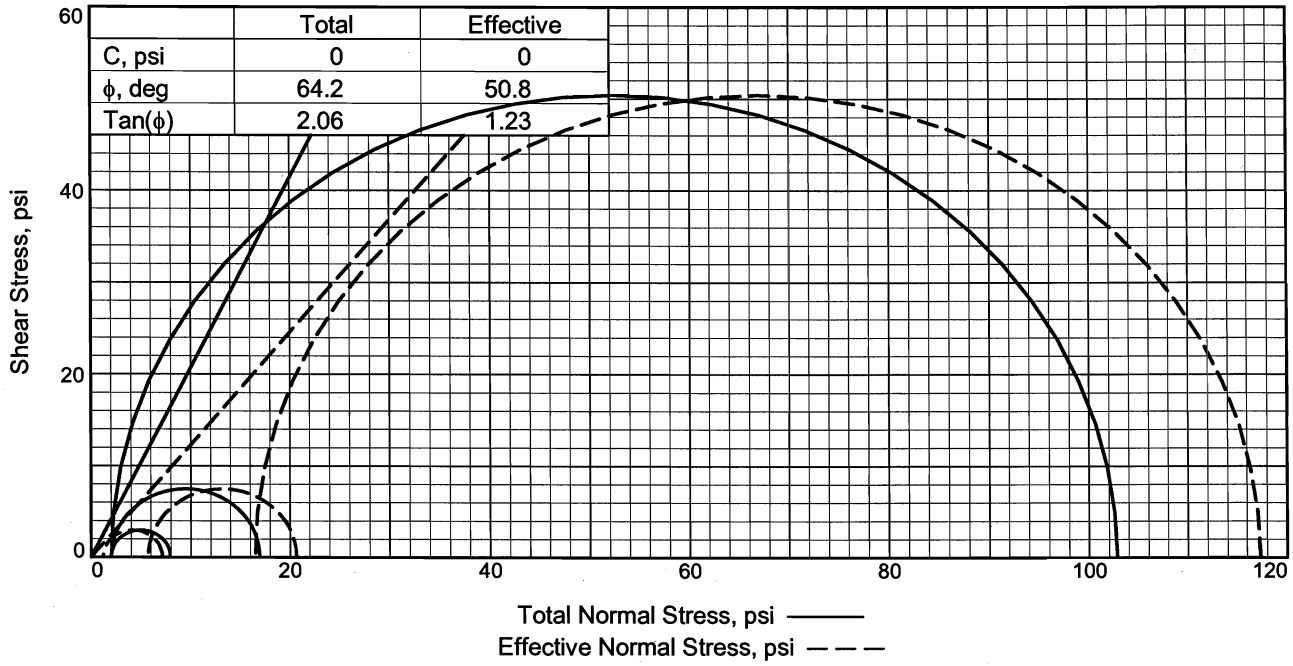


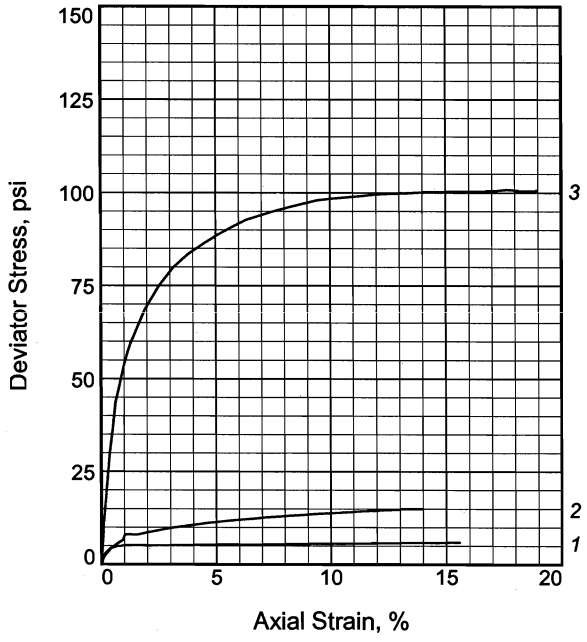




Client: GEL
Project: GEL Moab
Location: Moab **Sample Number:** BC0919
Project No.: 109855 **Figure** _____

Shaw E&I





Sample No.		1	2	3
Initial	Water Content,	24.3	24.3	77.0
	Dry Density, pcf	82.0	81.4	17.1
	Saturation,	63.2	62.4	23.6
	Void Ratio	1.0184	1.0317	8.6569
	Diameter, in.	2.49	2.49	2.00
	Height, in.	4.98	5.11	4.00
At Test	Water Content,	31.2	27.3	314.8
	Dry Density, pcf	90.6	96.0	17.7
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.8261	0.7229	8.3427
	Diameter, in.	2.41	2.36	1.98
	Height, in.	4.81	4.85	3.96
Strain rate, in./min.		0.00	0.00	0.01
Eff. Cell Pressure, psi		2	2	2
Fail. Stress, psi		6	15	101
Total Pore Pr., psi		19	34	43
Strain, %		15.1	13.9	17.7
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		7	21	117
$\bar{\sigma}_3$ Failure, psi		1	6	17

Type of Test:
CU with Pore Pressures

Sample Type:

Description:

Assumed Specific Gravity= 2.65

Remarks:

Figure _____

Client: GEL

Project: GEL Moab

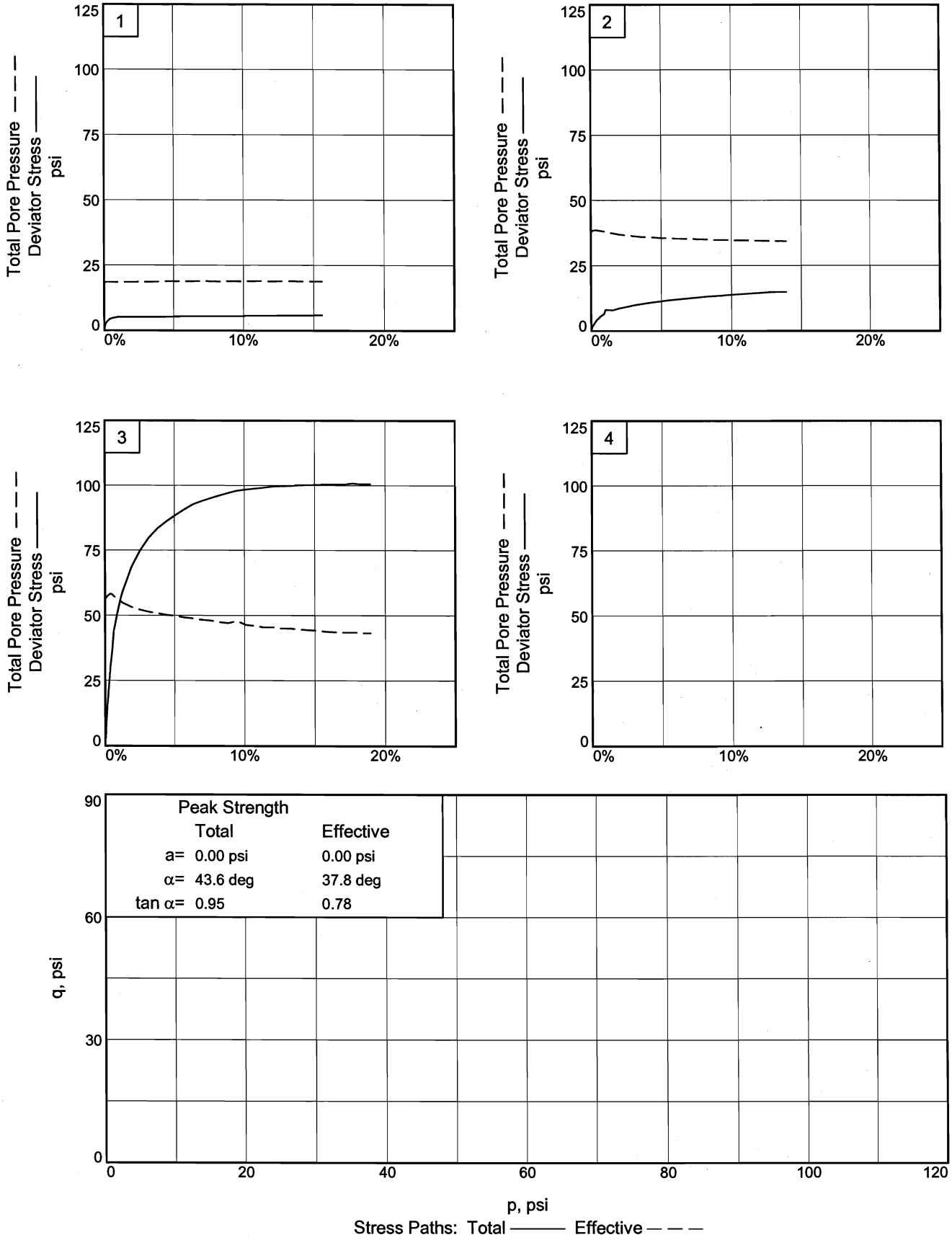
Location: Moab

Sample Number: BC0922

Proj. No.: 109855 **Date:**

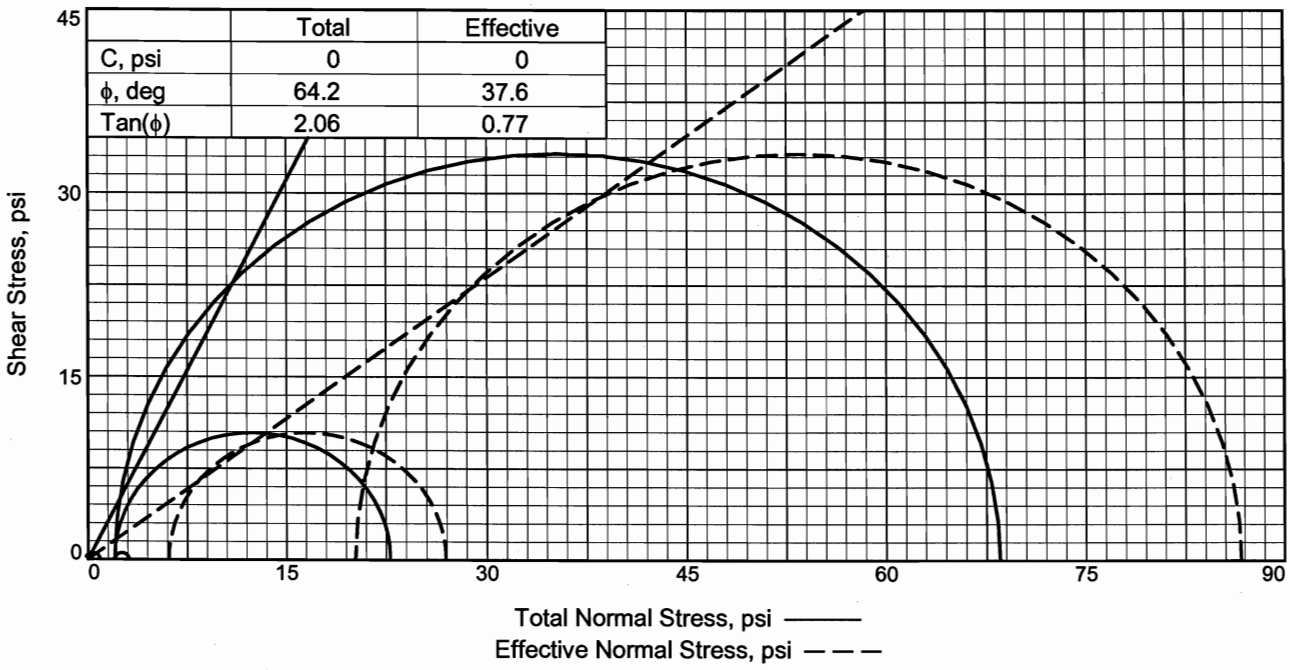
TRIAXIAL SHEAR TEST REPORT

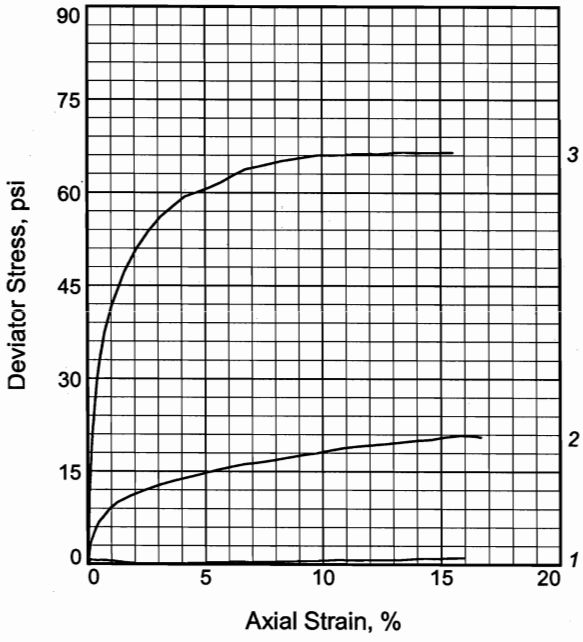
Shaw E&I



Client: GEL
Project: GEL Moab
Location: Moab **Sample Number:** BC0922
Project No.: 109855 **Figure** _____

Shaw E&I





Sample No.		1	2	3
Initial	Water Content,	20.0	20.0	20.0
	Dry Density, pcf	83.0	84.4	84.4
	Saturation,	50.6	52.3	52.3
	Void Ratio	1.1070	1.0710	1.0710
	Diameter, in.	2.47	2.47	2.47
	Height, in.	5.11	4.93	4.93
At Test	Water Content,	22.6	5.6	34.0
	Dry Density, pcf	107.1	151.2	89.5
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.6316	0.1561	0.9533
	Diameter, in.	2.27	2.02	2.43
	Height, in.	4.70	4.12	4.84
Strain rate, in./min.		0.01	0.01	0.01
Eff. Cell Pressure, psi		2.0	2.0	2.0
Fail. Stress, psi		1.1	20.8	66.5
Total Pore Pr., psi		20.2	33.9	39.8
Strain, %		15.9	15.8	13.4
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		0.9	26.9	86.7
$\bar{\sigma}_3$ Failure, psi		-0.2	6.1	20.2

Type of Test:
CU with Pore Pressures

Sample Type:

Description:

Assumed Specific Gravity= 2.8

Remarks:

Figure _____

Client: GEL

Project: GEL Moab

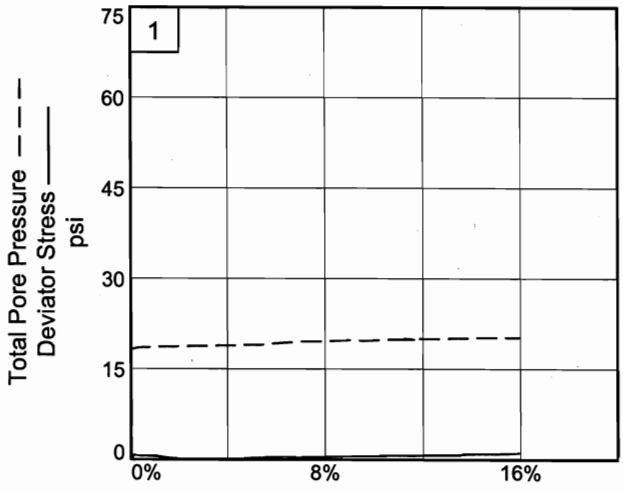
Location: Moab

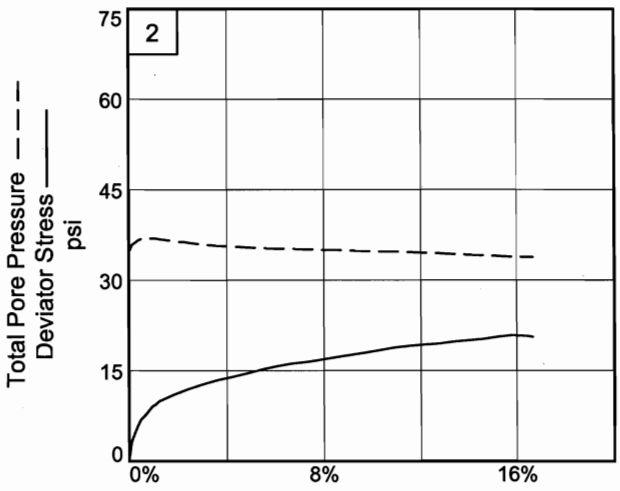
Sample Number: BC0924

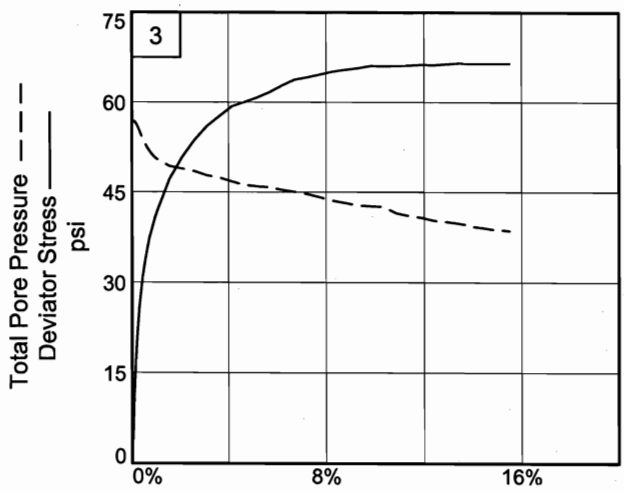
Proj. No.: 109855 **Date:**

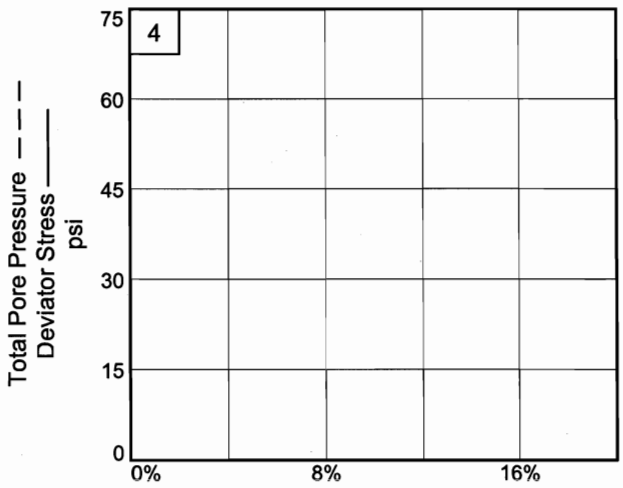
TRIAXIAL SHEAR TEST REPORT

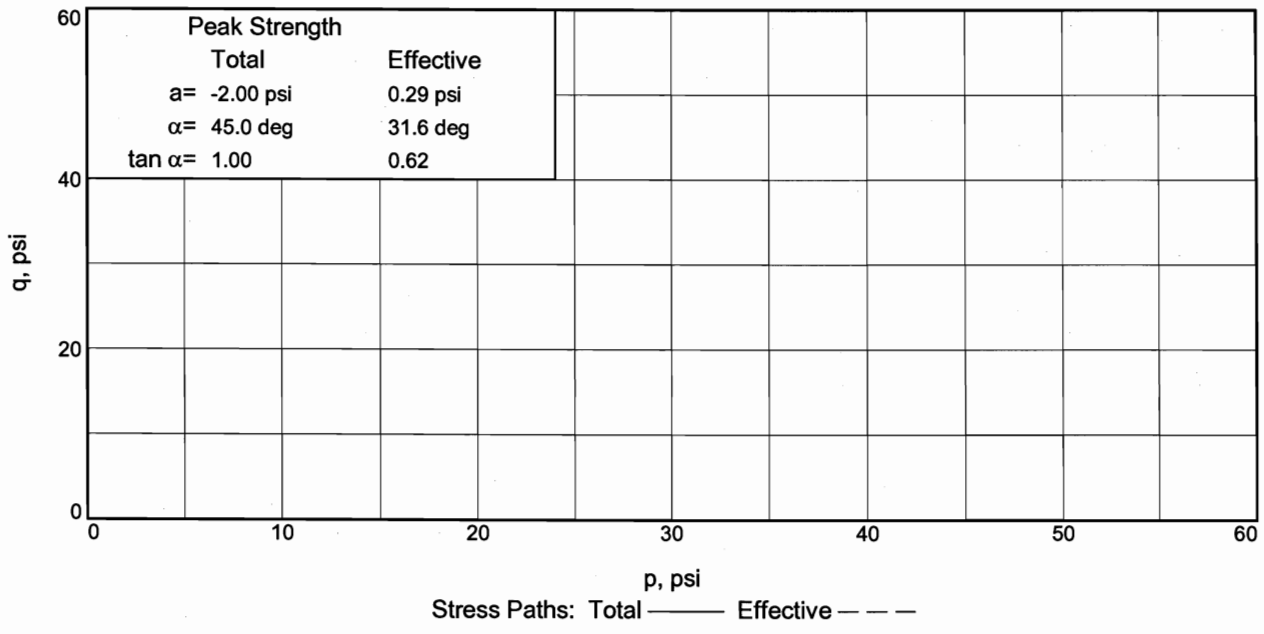
Shaw E&I











Client: GEL
Project: GEL Moab
Location: Moab **Sample Number:** BC0924
Project No.: 109855 **Figure** _____

Shaw E&I

Appendix C
Chain of Custody Records

Stoller
Legacy Management Team
Stoller • Battelle • Source One

Chain of Custody / Sample Submittal Form

RIN: 06040352
COC: 06040352.1.1
Sampler(s):

Project: MOAB CHARACTERIZATION
Cost Number: 06-203-4-01-5-2-01
Purchase Order: 24316

Laboratory: General Engineering Laboratories
Address: 2040 Savage Road
Charleston, SC 29407
Phone: 843.556.8171

Ticket	Sample Date	Time	Site	Location	Container	Preservation	Filtered	# Containsers	Analysis
	12/08/2005		MOA01	GABT-01	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-02	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-03	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-04	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-05	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-06	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-07	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-08	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-09	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-10	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-11	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-12	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-13	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-14	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim

ODC: Consolidation (ASTM D2435), HC: Hydraulic Conductivity (ASTM D5084), TSS: CU Triaxial Shear Strengh (ASTM D4767), CMR: Capillary Moisture Relationship (ASTM D2325)
Part Size: Grain Size Distrubution (ASTM D422), At Lim: Atterburg Limits (ASTM D4318), ST: Shake Test (SOG TALGEO0002), LRT: Liquid Release Test (9095A)

Reliquished by (signature)	Date	Time	Reliquished by (signature)	Date	Time
[signature]	5-2-06	0915			
Received by (signature)	Date	Time	Received by (signature)	Date	Time
Don Hurley SHAW E&I	5-4-06	0830			

Additional Testing Requests

Bench Test Sample No.	Soil Type	Atterberg limits (LL/PL,PI) ASTM D 4318	Grain Size Distribution ASTM D422	Sample Prep	Hydraulic Conductivity using Flexible Wall Permeameter (ASTM D 5084) confining pressure = 20,40,60 psi	CU Triaxial Shear Strength with Pore Pressure Measurement (ASTM D 4767) confining pressure = 20,40,60 psi	Consolidation (ASTM D 2435) confining pressure = 15,30,60 psi	Capillary-Moisture Relationship (ASTM D 2325, D 3152, or D 5298)	Maximum Dry Density (pcf) (Standard Proctor)	Optimum Moisture Content (Standard Proctor)
GABT-01	Cover Soil	X	X	Compact to 85% max, 2% wet of opt	X				117.7	11.9%
GABT-02	Cover Soil	X	X						109.2	13.8%
GABT-03	Sand Tailings	X	X	Compact to 85% of max, 2% wet of opt	X	X			106.3	12.7%
GABT-04	Sand Tailings	X	X	Compact to 85% of max, 2% wet of opt	X	X	X	X	103.9	15.6%
GABT-05	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X			113.3	13.1%
GABT-06	Sand Tailings	X	X	Compact to 95% of max, 2% wet of opt			X	X	107.3	14.6%
GABT-07	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X			107.3	18.4%
GABT-08	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X			112.8	16.0%
GABT-09	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X	X	X	102.0	21.1%
GABT-10	Transition Tailings	X	X	Compact to 95% of max, 2% wet of opt			X	X	107.8	18.7%
GABT-11	Slimes Tailings	X	X	Compact to 80% of max, 2% wet of opt			X	X	96.0	27.8%
GABT-12	Slimes Tailings	X	X	Compact to 80% of max, 2% wet of opt	X	X			101.6	22.5%
GABT-13	Slimes Tailings	X	X	Compact to 85% of max, 2% wet of opt			X	X	95.0	28.7%
GABT-14	Slimes Tailings	X	X	Compact to 80% of max, 2% wet of opt	X	X			101.5	20.9%

Appendix C

Certificate of Analysis

February 15, 2007

Shaw E & I, Inc.

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

CERTIFICATE OF ANALYSIS

Erin Stanley
General Engineering Laboratories
2040 Savage Road
Charleston SC 29407

February 15, 2007

This is the Certificate of Analysis for the following samples:

Shaw Project ID:	**GEL – Moab**
Shaw Project Number:	**109855.01410000**
Date Received by Lab:	May 4, 2006
Number of Samples:	Fourteen (14)
Sample Type:	Soil

I. Introduction/Case Narrative

Fourteen soil samples were received by the Shaw Geotechnical Laboratory on May 4, 2006. Samples were submitted for determination of particle-size distribution, Atterberg limits, hydraulic conductivity, consolidated-undrained triaxial shear strength, one-dimensional consolidation properties, and capillary moisture relationships. Previous reports have distributed all sample results except for the CU triaxial test for sample GBABT-04, which is reported here.

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

Reviewed and Approved:

Ralph Cole
Laboratory Manager, Geotechnical Services

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

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)*, 2006. Shaw Environmental and infrastructure, Standard Operating Procedures.

Consolidated-Undrained Triaxial Shear Strength .....**ASTM D 4767**

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 trained in the application of standard laboratory procedures for geotechnical analyses as well as the quality assurance measures implemented by Shaw.

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

- 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

A specific gravity value of 2.65 was assumed and used for certain calculations of ancillary supporting data, such as phase relations (degree of saturation, void ratio) reported in some test results. This value is an average of all natural earth materials and could vary markedly from the sample being tested.

Consolidated-undrained triaxial shear tests were performed by recompacting bulk material into test specimens. Density and moisture parameters supplied by the client. Three test specimens were prepared for each sample. The specimens were tested at 20 psi, 40 psi and 60 psi confining pressures.

Cohesion intercepts for this sample were set to “zero” from negative intercepts calculated by the commercial software used to reduce data.

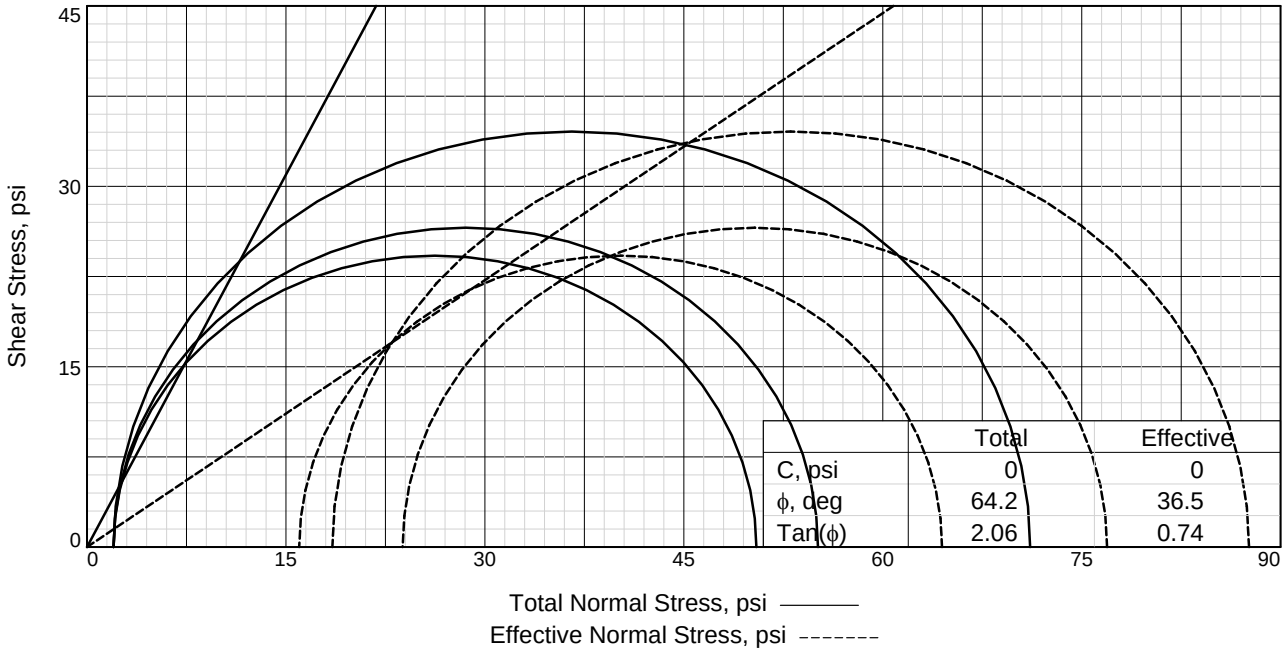
Appendix A
Sample Cross-Reference List

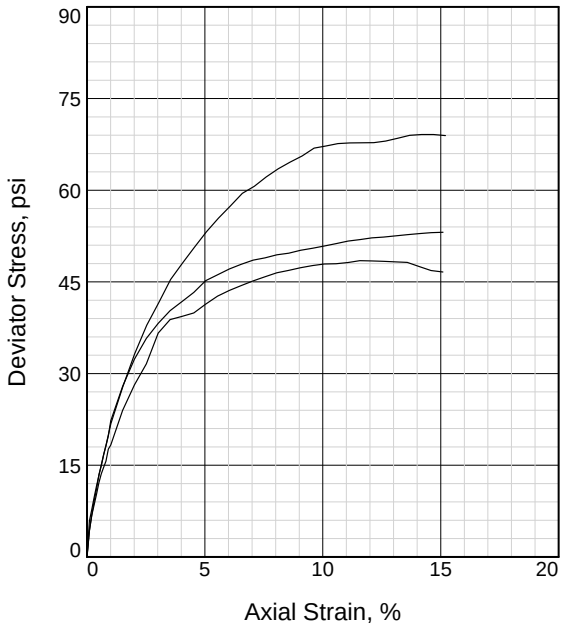
Shaw Geotechnical Laboratory
Oak Ridge TN
(865) 482-6497

SAMPLE NUMBER CROSS-REFERENCE LIST (Cont'd)

LAB SAMPLE NO.	CLIENT SAMPLE NO.	MATRIX
BC0911	GABT-01	Soil
BC0912	GABT-02	Soil
BC0913	GABT-03	Soil
BC0914	GABT-04	Soil
BC0915	GABT-05	Soil
BC0916	GABT-06	Soil
BC0917	GABT-07	Soil
BC0918	GABT-08	Soil
BC0919	GABT-09	Soil
BC0920	GABT-10	Soil
BC0921	GABT-11	Soil
BC0922	GABT-12	Soil
BC0923	GABT-13	Soil
BC0924	GABT-14	Soil

Appendix B
Data Results





Sample No.		1	2	3
Initial	Water Content,	17.8	17.8	17.8
	Dry Density, pcf	88.8	88.9	88.6
	Saturation,	54.8	54.8	54.5
	Void Ratio	0.8622	0.8618	0.8663
	Diameter, in.	2.49	2.49	2.49
	Height, in.	4.99	4.99	5.00
At Test	Water Content,	31.6	31.4	30.1
	Dry Density, pcf	90.1	90.2	92.0
	Saturation,	100.0	100.0	100.0
	Void Ratio	0.8368	0.8332	0.7982
	Diameter, in.	2.48	2.48	2.46
	Height, in.	4.97	4.97	4.93
Strain rate, in./min.		0.01	0.01	0.01
Eff. Cell Pressure, psi		2.0	2.0	2.0
Fail. Stress, psi		48.5	53.1	69.1
Total Pore Pr., psi		4.0	16.2	41.5
Strain, %		11.6	15.1	14.7
Ult. Stress, psi				
Total Pore Pr., psi				
Strain, %				
$\bar{\sigma}_1$ Failure, psi		64.5	76.9	87.6
$\bar{\sigma}_3$ Failure, psi		16.0	23.8	18.5

Type of Test:
CU with Pore Pressures

Sample Type: Recompacted

Description: Sandy SILT

LL= NP **PI=** NP

Assumed Specific Gravity= 2.65

Remarks:

Figure BC0914

Client: GEL

Project: GEL Moab

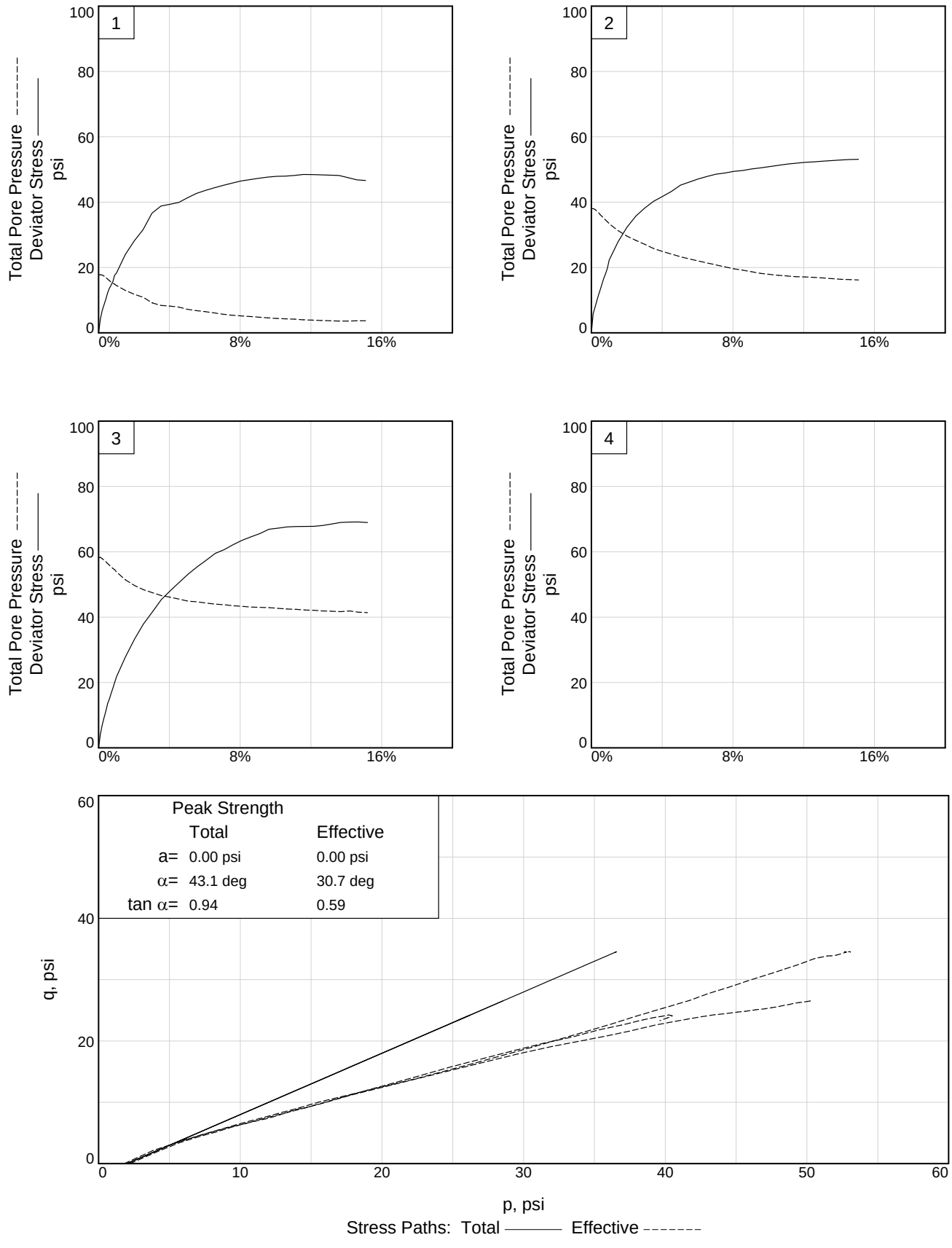
Location: GABT-04

Sample Number: BC0914

Proj. No.: 109855 **Date:**

TRIAXIAL SHEAR TEST REPORT

Shaw E&I



Client: GEL
Project: GEL Moab
Location: GABT-04 **Sample Number:** BC0914
Project No.: 109855 **Figure** _____

Shaw E&I

Appendix C
Chain of Custody Records

Stoller
Legacy Management Team
Stoller • Battelle • Source One

Chain of Custody / Sample Submittal Form

RIN: 06040352
COC: 06040352.1.1
Sampler(s):

Project: MOAB CHARACTERIZATION
Cost Number: 06-203-4-01-5-2-01
Purchase Order: 24316

Laboratory: General Engineering Laboratories
Address: 2040 Savage Road
Charleston, SC 29407
Phone: 843.556.8171

Ticket	Sample Date	Time	Site	Location	Container	Preservation	Filtered	# Containsers	Analysis
	12/08/2005		MOA01	GABT-01	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-02	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-03	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-04	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-05	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-06	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-07	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-08	BUCKET	None		1	ODC,HC,TSS,CMR,Part Size,At Lim
	12/08/2005		MOA01	GABT-09	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-10	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-11	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-12	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-13	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim
	12/08/2005		MOA01	GABT-14	BAG	None		1	ODC,HC,TSS,CMR,ST,LRT,Part Size,At Lim

ODC: Consolidation (ASTM D2435), HC: Hydraulic Conductivity (ASTM D5084), TSS: CU Triaxial Shear Strengh (ASTM D4767), CMR: Capillary Moisture Relationship (ASTM D2325)
Part Size: Grain Size Distrubution (ASTM D422), At Lim: Atterburg Limits (ASTM D4318), ST: Shake Test (SOG TALGEO0002), LRT: Liquid Release Test (9095A)

Reliquished by (signature)	Date	Time	Reliquished by (signature)	Date	Time
[signature]	5-2-06	0915			
Received by (signature)	Date	Time	Received by (signature)	Date	Time
Don Hurley SHAW E&I	5-4-06	0830			

Additional Testing Requests

Bench Test Sample No.	Soil Type	Atterberg limits (LL/PL,PI) ASTM D 4318	Grain Size Distribution ASTM D422	Sample Prep	Hydraulic Conductivity using Flexible Wall Permeameter (ASTM D 5084) confining pressure = 20,40,60 psi	CU Triaxial Shear Strength with Pore Pressure Measurement (ASTM D 4767) confining pressure = 20,40,60 psi	Consolidation (ASTM D 2435) confining pressure = 15,30,60 psi	Capillary-Moisture Relationship (ASTM D 2325, D 3152, or D 5298)	Maximum Dry Density (pcf) (Standard Proctor)	Optimum Moisture Content (Standard Proctor)
GABT-01	Cover Soil	X	X	Compact to 85% max, 2% wet of opt	X				117.7	11.9%
GABT-02	Cover Soil	X	X						109.2	13.8%
GABT-03	Sand Tailings	X	X	Compact to 85% of max, 2% wet of opt	X	X			106.3	12.7%
GABT-04	Sand Tailings	X	X	Compact to 85% of max, 2% wet of opt	X	X	X	X	103.9	15.6%
GABT-05	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X			113.3	13.1%
GABT-06	Sand Tailings	X	X	Compact to 95% of max, 2% wet of opt			X	X	107.3	14.6%
GABT-07	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X			107.3	18.4%
GABT-08	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X			112.8	16.0%
GABT-09	Transition Tailings	X	X	Compact to 90% of max, 2% wet of opt	X	X	X	X	102.0	21.1%
GABT-10	Transition Tailings	X	X	Compact to 95% of max, 2% wet of opt			X	X	107.8	18.7%
GABT-11	Slimes Tailings	X	X	Compact to 80% of max, 2% wet of opt			X	X	96.0	27.8%
GABT-12	Slimes Tailings	X	X	Compact to 80% of max, 2% wet of opt	X	X			101.6	22.5%
GABT-13	Slimes Tailings	X	X	Compact to 85% of max, 2% wet of opt			X	X	95.0	28.7%
GABT-14	Slimes Tailings	X	X	Compact to 80% of max, 2% wet of opt	X	X			101.5	20.9%