APPENDIX B – LABORATORY TEST RESULTS

Particle Size Distribution Test Reports (12)
Liquid and Plastic Limits, and Natural Water Content Test Report (1 page, 12 Tests)
Standard Proctor Test Report (3)
Tri-axial Shear Test Reports (3)-Undisturbed Samples
Tri-axial Shear Test Reports (3)-Remolded Bulk Samples
Laboratory Testing Procedures

TIMELY ENGINEERING SOIL TESTS, LLC

1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	KI
Date	10/12/11
Checked By	KB

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-

ASTM D 6913 (D 422 old version), D 1140, C 136, C 117 / AASHTO T 88, T 27, T 11, T 311; Particle Size Analysis (Split Sieve)

MOISTURE CONTENT of TOTAL SAMPLE

Mass of Wet Sample & Tare, g	249.90
Mass of Dry Sample & Tare, g	238.70
Mass of Tare, g	101.10
Moisture Content, %	8.1

MOISTURE CONTENT of FINE MATERIAL

Mass of Wet Sample & Tare, g	239.50
Mass of Dry Sample & Tare, g	224.20
Mass of Tare, g	89.23
Moisture Content, %	11.3

TOTAL Mass of wet sample before splitting & tare, g	1980.1
Mass of Tare, g	0.0
TOTAL Mass of dry sample, g	1831.1

Mass of Wet Fine Material & Tare, g	202.48
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	181.86
% of Total Sample Passing Split Sieve	93.1

SIEVE ANALYSIS*

COARSE MATERIAL

Mass of Tare, g: 0.0

Sieve Size		Sample & Tare, g	% RETAINED	% PASSING
12"	COBBLES		0.0	100.0
3"			0.0	100.0
2.5"	COARSE GRAVEL		0.0	100.0
2"			0.0	100.0
1.5"			0.0	100.0
1"		0.0	0.0	100.0
.75"		27.9	1.5	98.5
.5"	FINE GRAVEL	48.5	2.6	97.4
.375"		69.4	3.8	96.2
#4	COARSE SAND	126.8	6.9	93.1

FINE MATERIAL

Mass of Tare, g: 0.00

Sieve Size		Cumulative Mass retained, g	% PASSING (of Total)
#10	MEDIUM	9.6	88.2
#20	SAND	25.8	79.9
#40		48.8	68.1
#60	FINE SAND	76.5	53.9
#100		103.5	40.1
#200	FINES	128.7	27.2

* - ASTM Definitions of Classification
** - AASHTO Definitions of Classification

NOTE: # 4 (4.75 mm) Sieve used for splitting sample on fine and coarse material

Oven ID #	12/13/14/15
Balance ID#	1/6/7
Sieve Shaker ID #	54

PARTICLE-SIZE ANALYSIS*

% COBBLES	0.0	% MEDIUM Sand	20.1
% COARSE Gravel	1.5	% FINE Sand	40.9
% FINE Gravel	5.4	% FINES	27.2
% COARSE Sand	4.9	% TOTAL SAMPLE	100.0

PARTICLE-SIZE ANALYSIS**

% COBBLES	0.0	% COARSE Sand	20.1
% COARSE Gravel (Stone)	0.0	% FINE Sand	40.9
% MEDIUM Gravel (Stone)	3.8	% FINES (Silt-Clay)	27.2
% FINE Gravel (Stone)	8.0	% TOTAL SAMPLE	100.0

REMARKS

DESCRIPTION: Reddish Brown and Gray (Micaceous) Silty Sand

USCS (ASTM D2487; D2488): SM

AASHTO (M 145): NA

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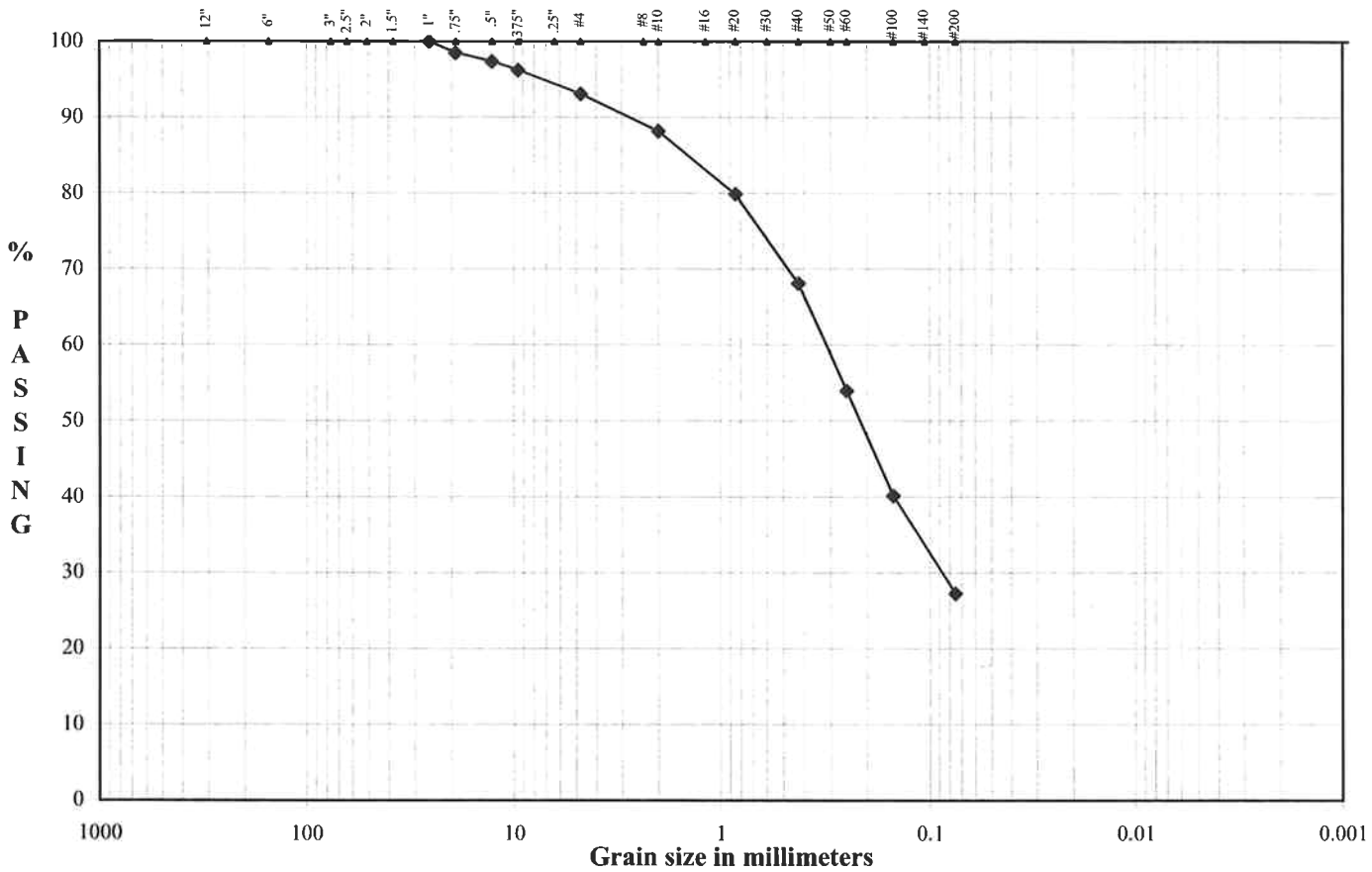
		Date	10/12/11
		Checked By	KB

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-

ASTM D 6913 (D 422 old version), D 1140, C 136, C 117 / AASHTO T 88, T 27, T 11, T 311
Standard Test Method for Particle-Size Analysis of Soils and Aggregates (Split Sieve)

Particle-Size Analysis



Boulders	Cobbles	Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines: Silt or Clay

D_{10}	NA	mm
D_{30}	NA	mm
D_{60}	NA	mm
Cu	NA	
Cc	NA	

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Web: www.test-llc.com

Tested By	KI/EB
Date	10/12/11
Checked By	KB

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703/UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-

ASTM D 6913 (D 422 old version), D 1140, C 136, C 117 / AASHTO T 88, T 27, T 11, T 311; Particle Size Analysis (Split Sieve)

MOISTURE CONTENT of TOTAL SAMPLE

Mass of Wet Sample & Tare, g	295.6
Mass of Dry Sample & Tare, g	289.0
Mass of Tare, g	155.0
Moisture Content, %	4.9

MOISTURE CONTENT of FINE MATERIAL

Mass of Wet Sample & Tare, g	272.89
Mass of Dry Sample & Tare, g	259.65
Mass of Tare, g	124.41
Moisture Content, %	9.8

TOTAL Mass of wet sample before splitting & tare, g	1604.4
Mass of Tare, g	0.0
TOTAL Mass of dry sample, g	1529.1

Mass of Wet Fine Material & Tare, g	210.97
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	192.16
% of Total Sample Passing Split Sieve	99.6

SIEVE ANALYSIS*

COARSE MATERIAL

Mass of Tare, g: 0.0

Sieve Size		Sample & Tare, g	% RETAINED	% PASSING
12"	COBBLES		0.0	100.0
3"	COARSE GRAVEL		0.0	100.0
2.5"			0.0	100.0
2"			0.0	100.0
1.5"			0.0	100.0
1"			0.0	100.0
.75"	FINE GRAVEL		0.0	100.0
.5"			0.0	100.0
.375"		0.0	0.0	100.0
#4	COARSE SAND	6.1	0.4	99.6

FINE MATERIAL

Mass of Tare, g: 0.00

Sieve Size		Cumulative Mass retained, g	% PASSING (of Total)
#10	MEDIUM SAND	24.68	86.8
#20		81.27	57.5
#40	FINE SAND	124.15	35.3
#60		153.70	19.9
#100		169.38	11.8
#200	FINES	180.29	6.2

* - ASTM Definitions of Classification
** - AASHTO Definitions of Classification

NOTE: # 4 (4.75 mm) Sieve used for splitting sample on fine and coarse material

Oven ID #	12/13/14/15
Balance ID#	1/6/7
Sieve Shaker ID #	54

PARTICLE-SIZE ANALYSIS*

% COBBLES	0.0	% MEDIUM Sand	51.6
% COARSE Gravel	0.0	% FINE Sand	29.1
% FINE Gravel	0.4	% FINES	6.2
% COARSE Sand	12.8	% TOTAL SAMPLE	100.0

PARTICLE-SIZE ANALYSIS**

% COBBLES	0.0	% COARSE Sand	51.6
% COARSE Gravel (Stone)	0.0	% FINE Sand	29.1
% MEDIUM Gravel (Stone)	0.0	% FINES (Silt-Clay)	6.2
% FINE Gravel (Stone)	13.2	% TOTAL SAMPLE	100.0

REMARKS

DESCRIPTION: Gray (Micaceous) Well Graded Sand with Silt

USCS (ASTM D2487; D2488): SW-SM

AASHTO (M 145): NA

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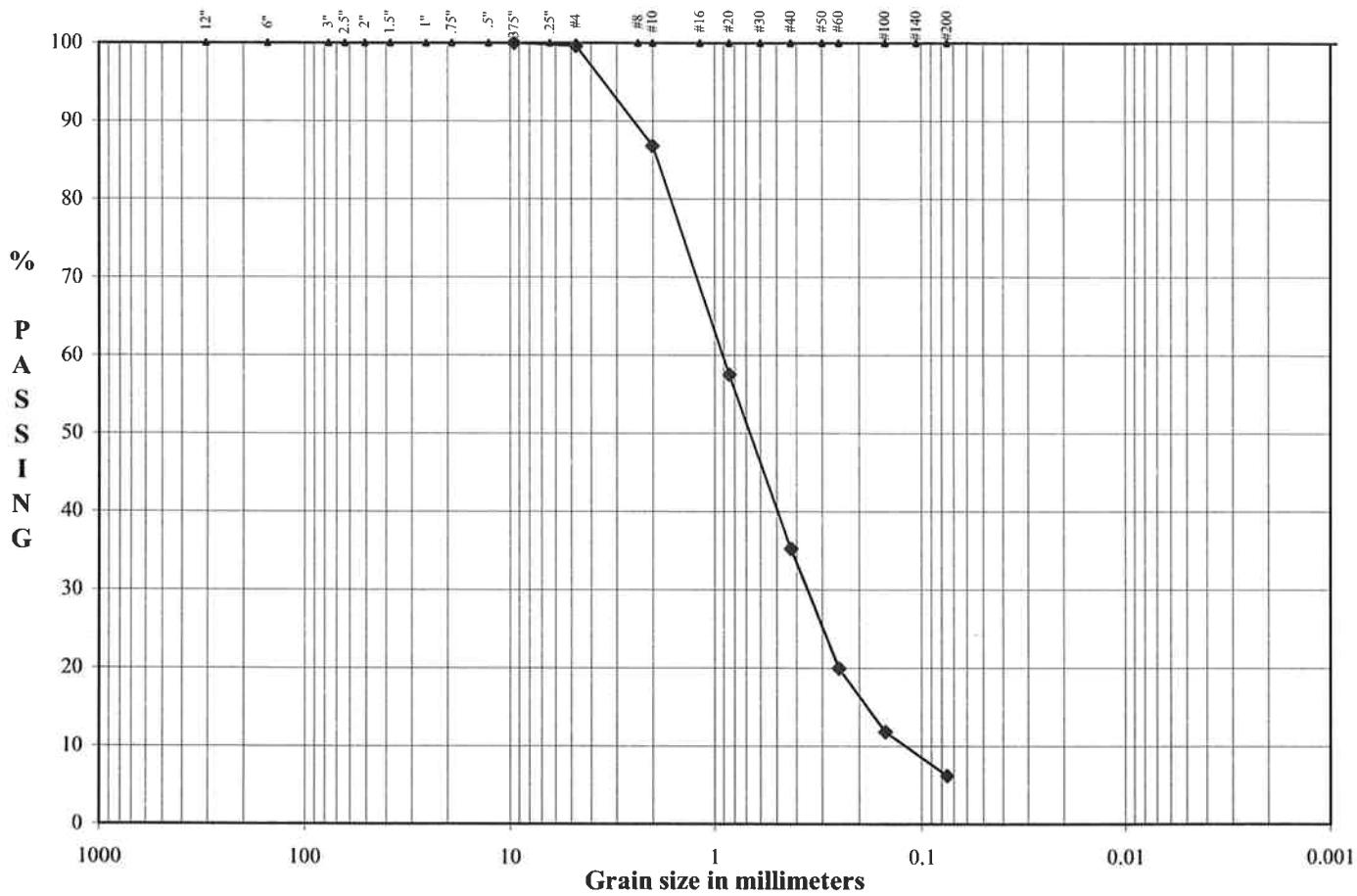
		Date	10/12/11
		Checked By	KB

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703/UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-

ASTM D 6913 (D 422 old version), D 1140, C 136, C 117 / AASHTO T 88, T 27, T 11, T 311
Standard Test Method for Particle-Size Analysis of Soils and Aggregates (Split Sieve)

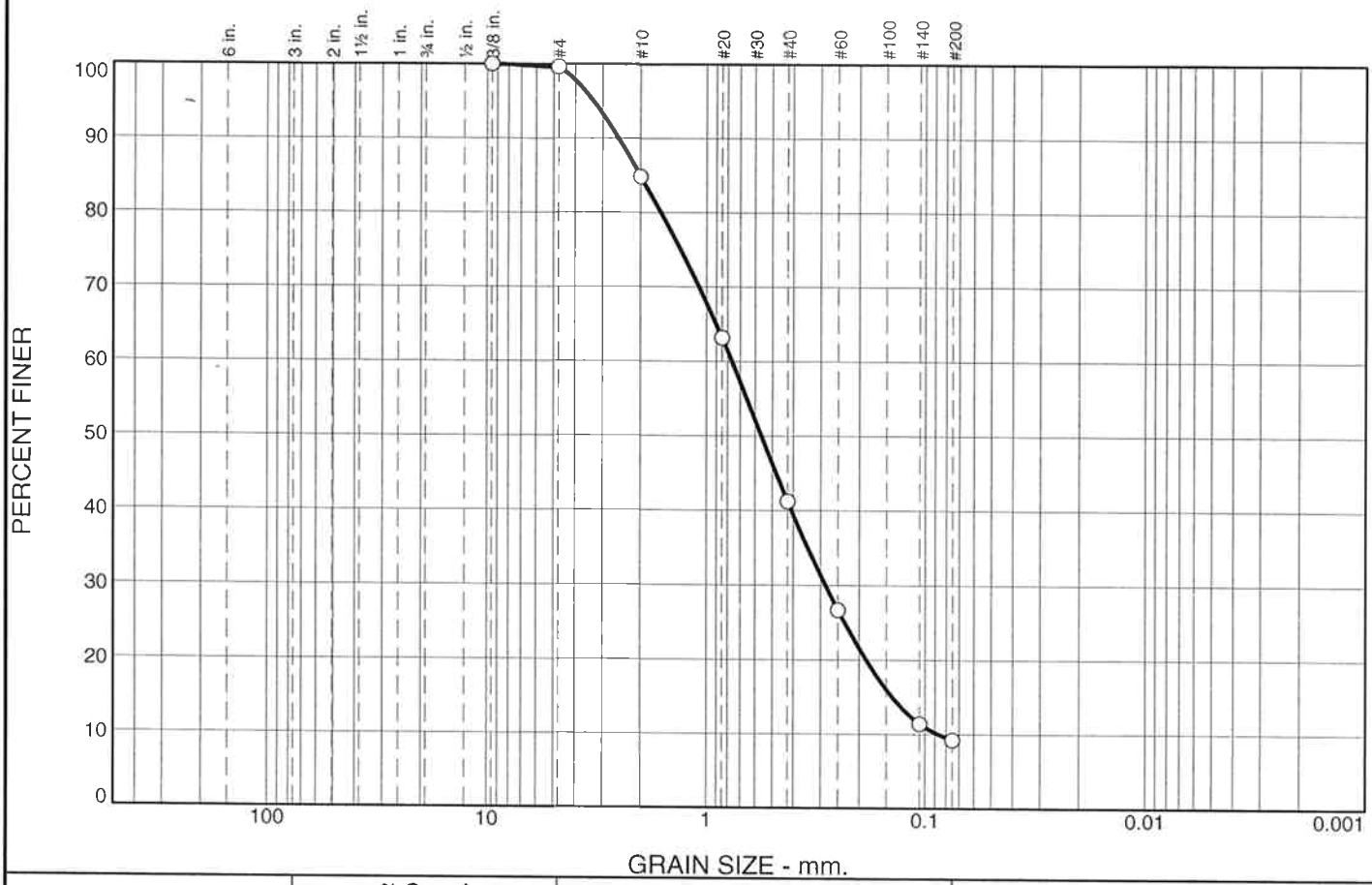
Particle-Size Analysis



Boulders	Cobbles	Gravel		Sand			Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

D_{10}	0.13	mm
D_{30}	0.36	mm
D_{60}	0.95	mm
Cu	7.5	
Cc	1.1	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.4	14.8	43.6	32.0	9.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.6		
#10	84.8		
#20	63.2		
#40	41.2		
#60	26.7		
#140	11.4		
#200	9.2		

* (no specification provided)

Material Description

Sand, trace silt, higly micaceous, red brown and tan

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.5417 D_{85}= 2.0175 D_{60}= 0.7656
D_{50}= 0.5607 D_{30}= 0.2854 D_{15}= 0.1415
D_{10}= 0.0876 C_u= 8.74 C_c= 1.21

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

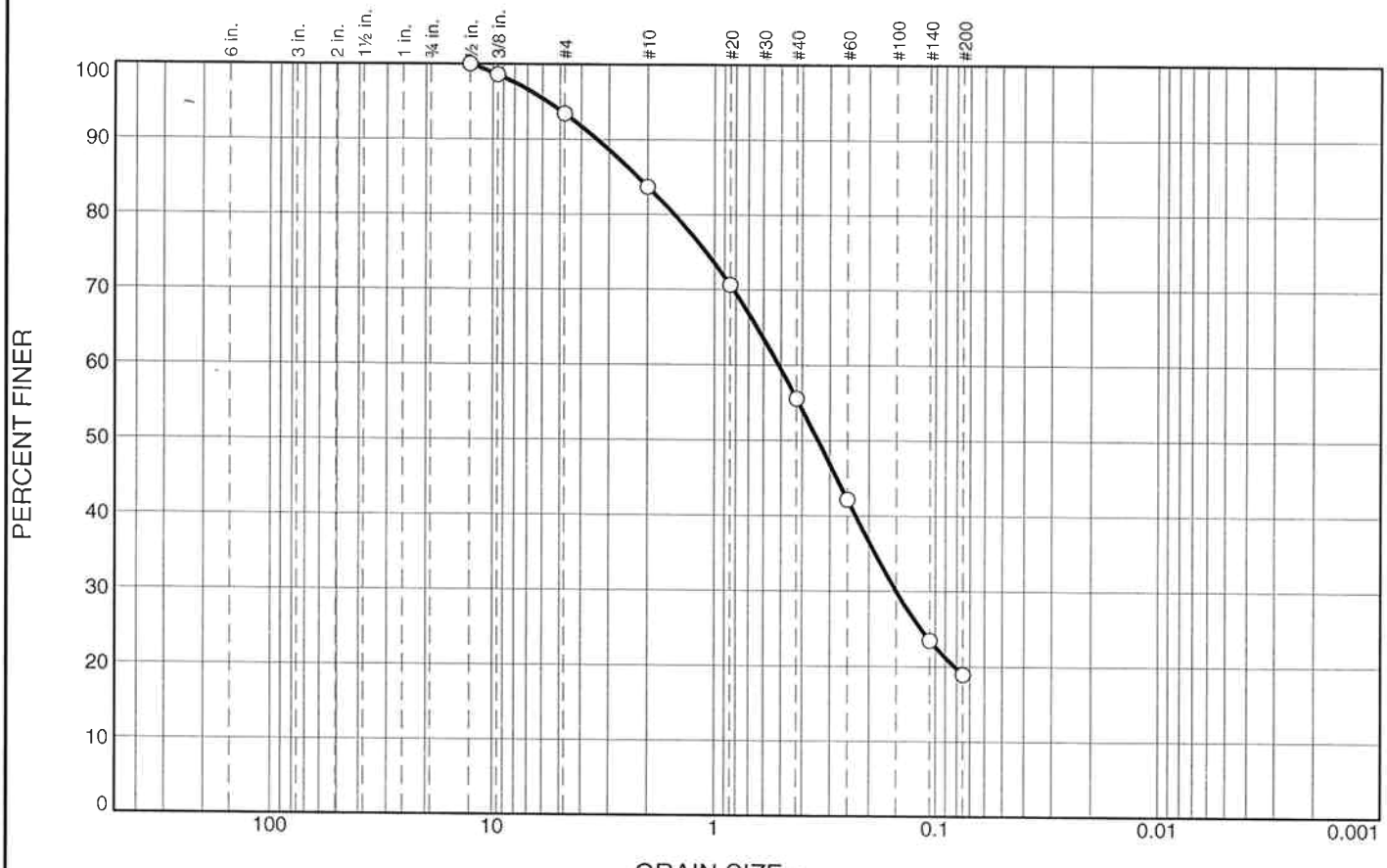
Location: 148+45L
Sample Number: UD 3 **Depth:** 10-12 ft. **Date:** 10/20/11

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	6.6	9.7	28.1	36.7	18.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	98.6		
#4	93.4		
#10	83.7		
#20	70.6		
#40	55.6		
#60	42.2		
#140	23.4		
#200	18.9		

* (no specification provided)

Material Description

Sand, some silt, trace clay, micaceous, brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 3.3937 D_{85}= 2.2198 D_{60}= 0.5125
D_{50}= 0.3400 D_{30}= 0.1505 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

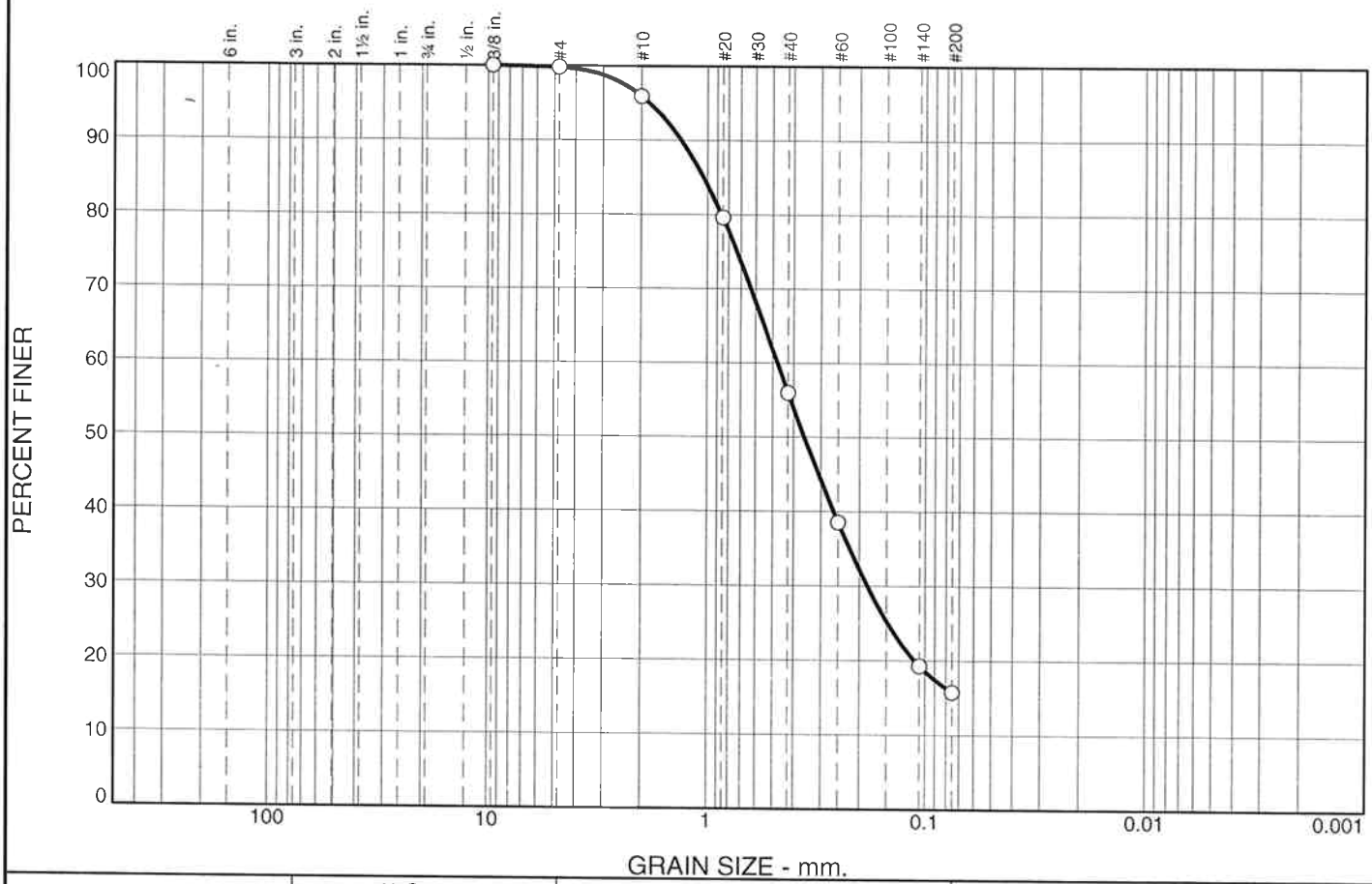
Location: 126+64 L
Sample Number: Bulk 1 **Depth:** 12-22 ft. **Date:** 10/11/2011

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	3.9	39.9	40.3	15.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.8		
#10	95.9		
#20	79.6		
#40	56.0		
#60	38.5		
#140	19.2		
#200	15.7		

* (no specification provided)

Material Description

Sand, some silt, trace clay, micaceous, brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.3210 D_{85}= 1.0432 D_{60}= 0.4757
D_{50}= 0.3576 D_{30}= 0.1838 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Location: 144+00 L
Sample Number: Bulk 2 **Depth:** 6-13 ft. **Date:** 10/11/2011

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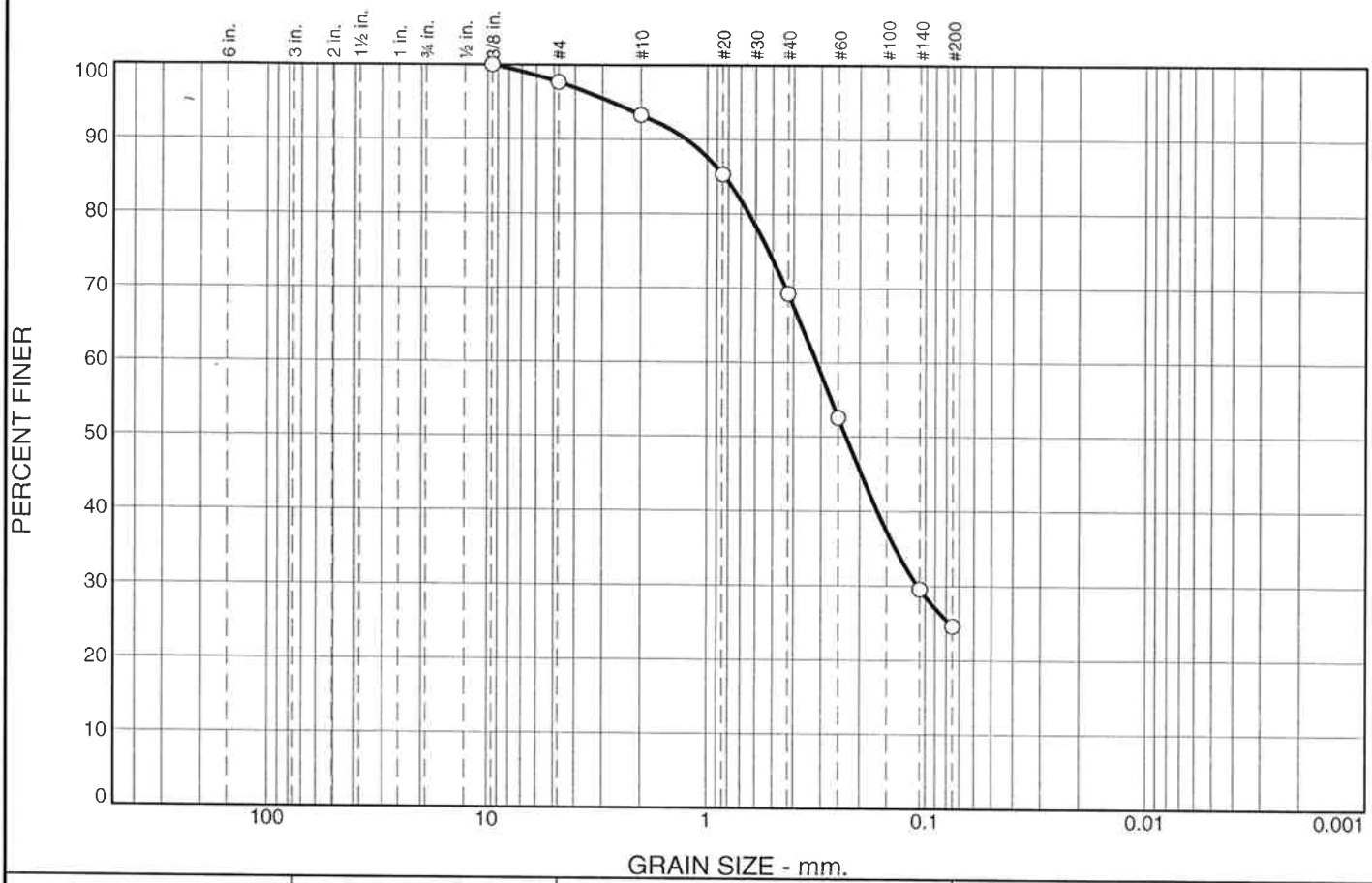
Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	4.4	23.9	44.7	24.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	97.6		
#10	93.2		
#20	85.3		
#40	69.3		
#60	52.6		
#140	29.5		
#200	24.6		

* (no specification provided)

Material Description

Sand, some silt, trace clay, micaceous, reddish brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.2514 D_{85}= 0.8346 D_{60}= 0.3147
D_{50}= 0.2307 D_{30}= 0.1089 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Location: 148+45L and 148+15L Composite
Sample Number: Bulk 3

Date: 10/11/2011

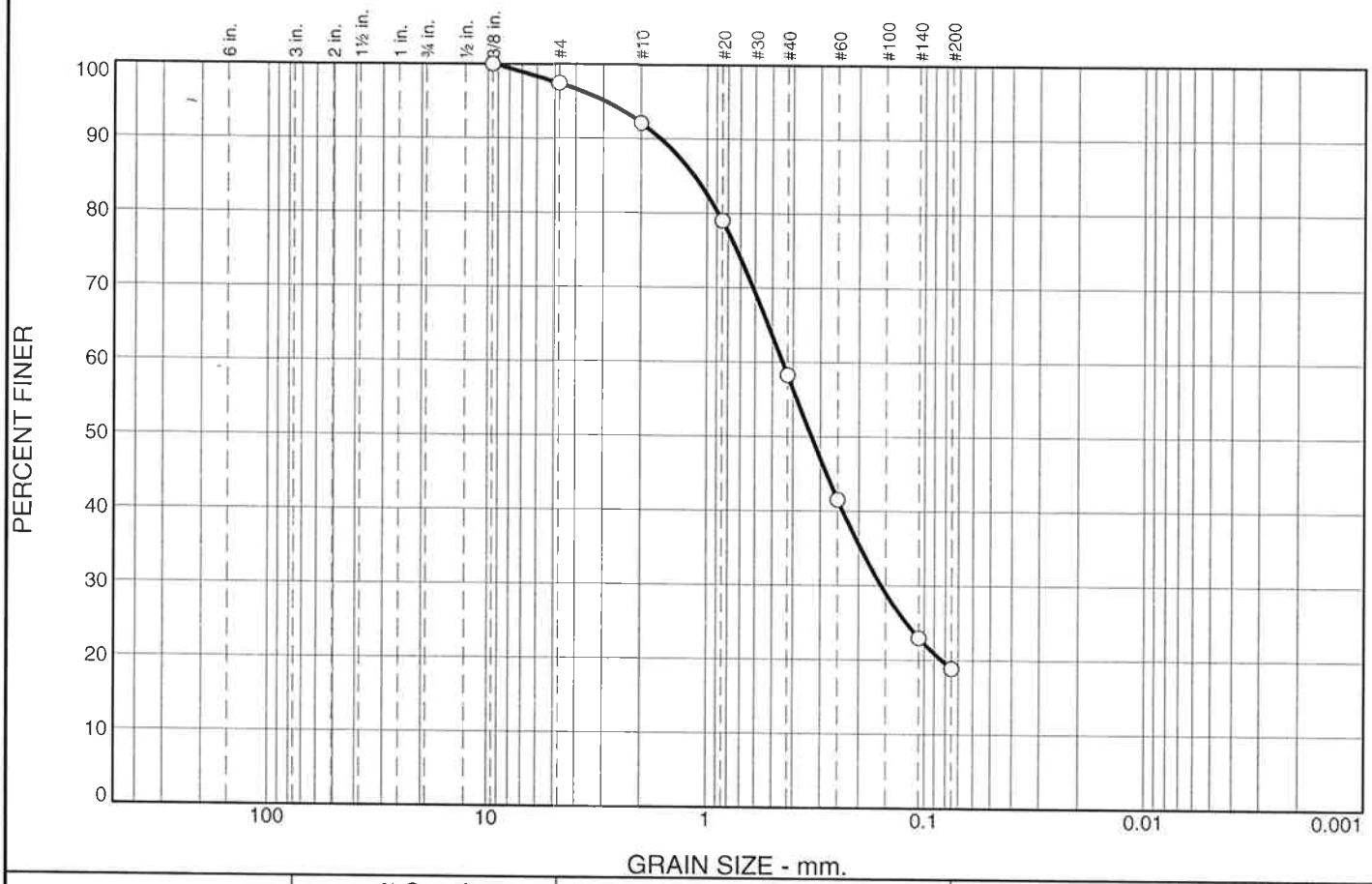
United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements

Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.6	5.3	33.8	39.5	18.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	97.4		
#10	92.1		
#20	79.0		
#40	58.3		
#60	41.5		
#140	22.9		
#200	18.8		

* (no specification provided)

Material Description

Sand, some silt, trace clay, micaceous, brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.6295 D_{85}= 1.1411 D_{60}= 0.4480
D_{50}= 0.3299 D_{30}= 0.1580 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Location: 141+88 L
Sample Number: Bulk 4 **Depth:** 3-11 ft. **Date:** 10/11/11

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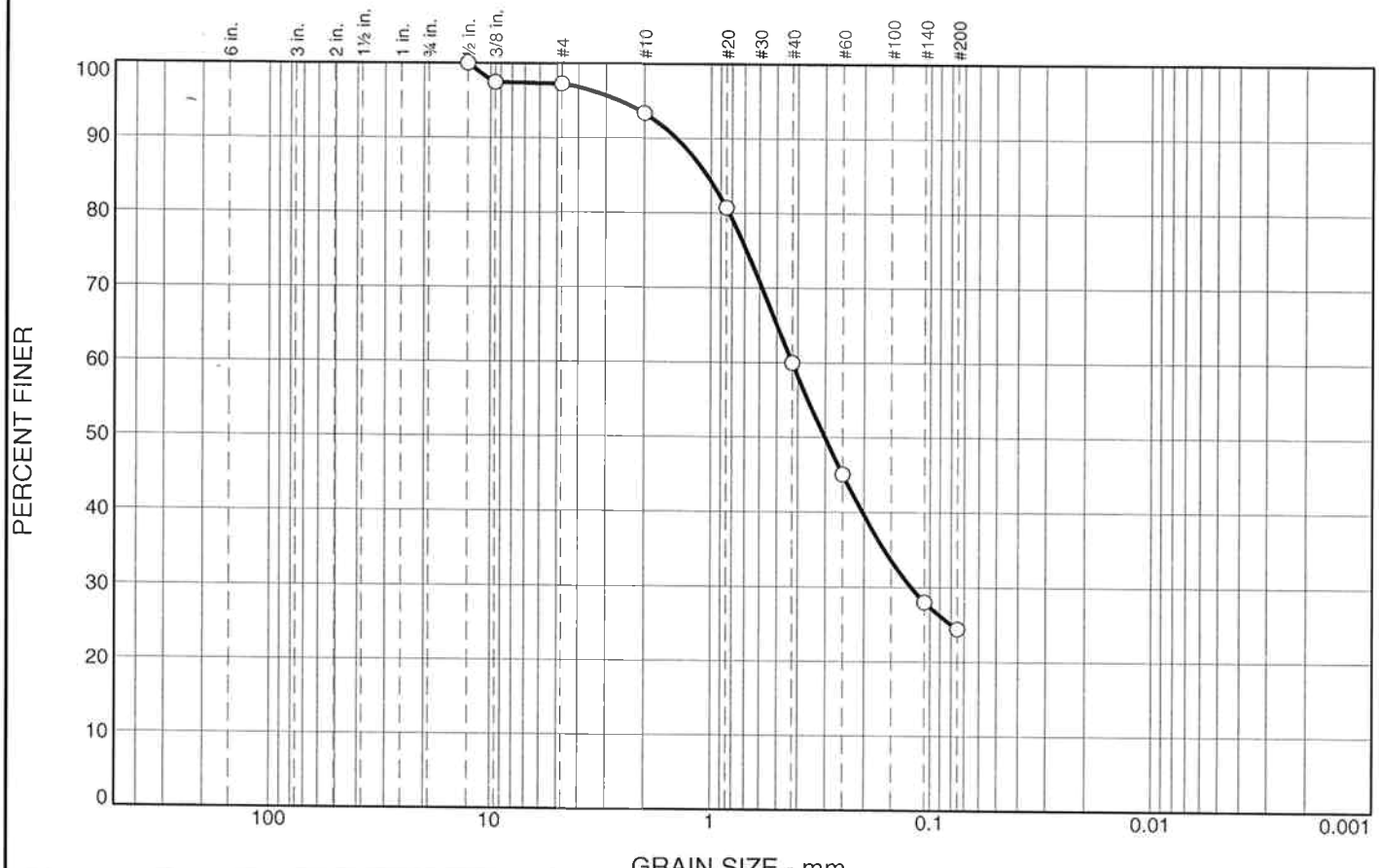
Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.7	3.9	33.5	35.5	24.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	97.5		
#4	97.3		
#10	93.4		
#20	80.7		
#40	59.9		
#60	45.1		
#140	28.0		
#200	24.4		

* (no specification provided)

Material Description

Sand, some silt, trace clay, micaceous, red brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.4366 D_{85}= 1.0385 D_{60}= 0.4257
D_{50}= 0.3016 D_{30}= 0.1222 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

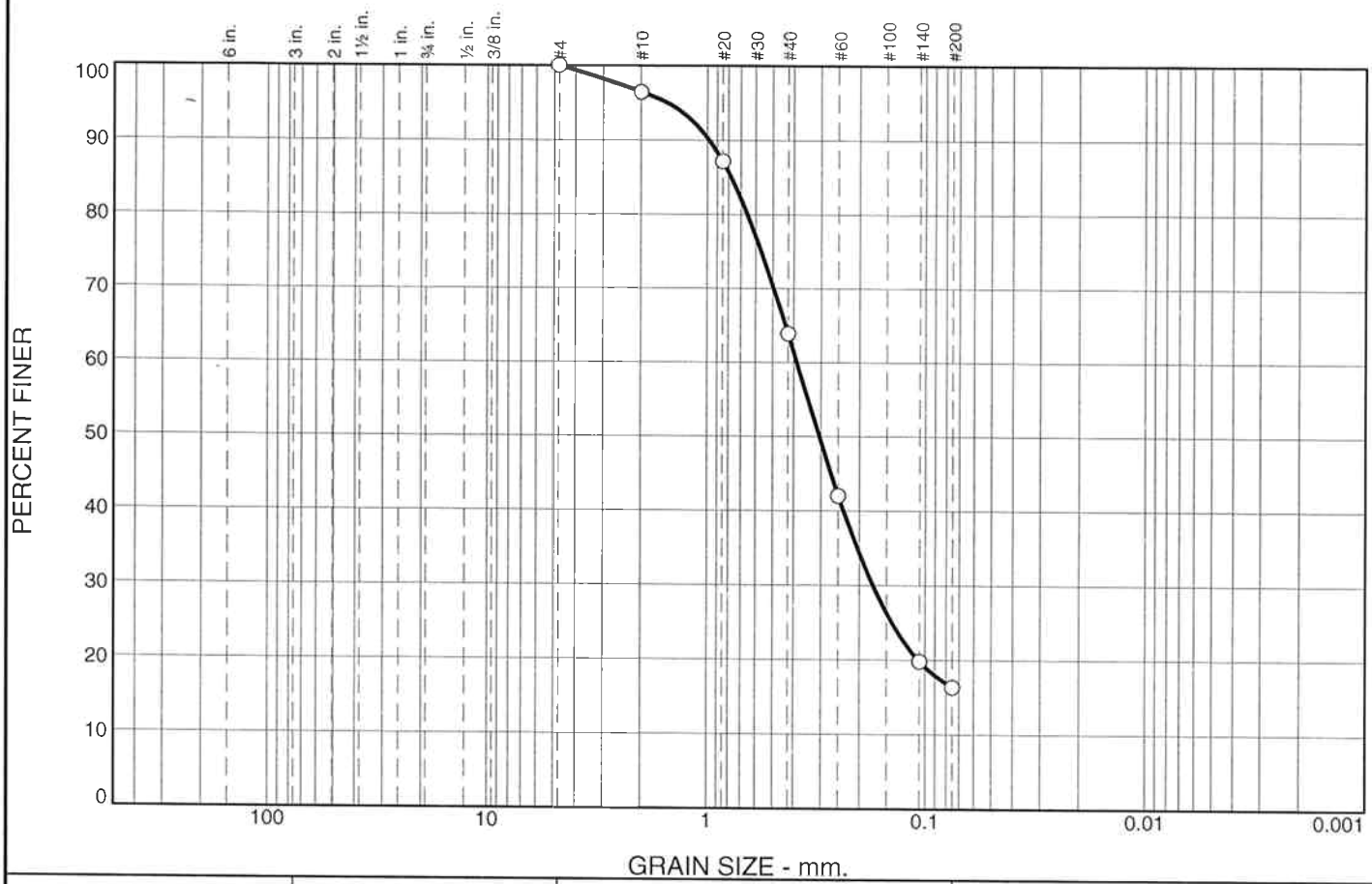
Location: 134+37 L
Sample Number: Bulk 5 **Depth:** 2-8 ft. **Date:** 10/11/2011

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	3.5	32.6	47.6	16.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	96.5		
#20	87.2		
#40	63.9		
#60	42.0		
#140	19.8		
#200	16.3		

* (no specification provided)

Material Description

Sand, some silt, trace clay, micaceous, brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.9791 D_{85}= 0.7780 D_{60}= 0.3874
D_{50}= 0.3055 D_{30}= 0.1734 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

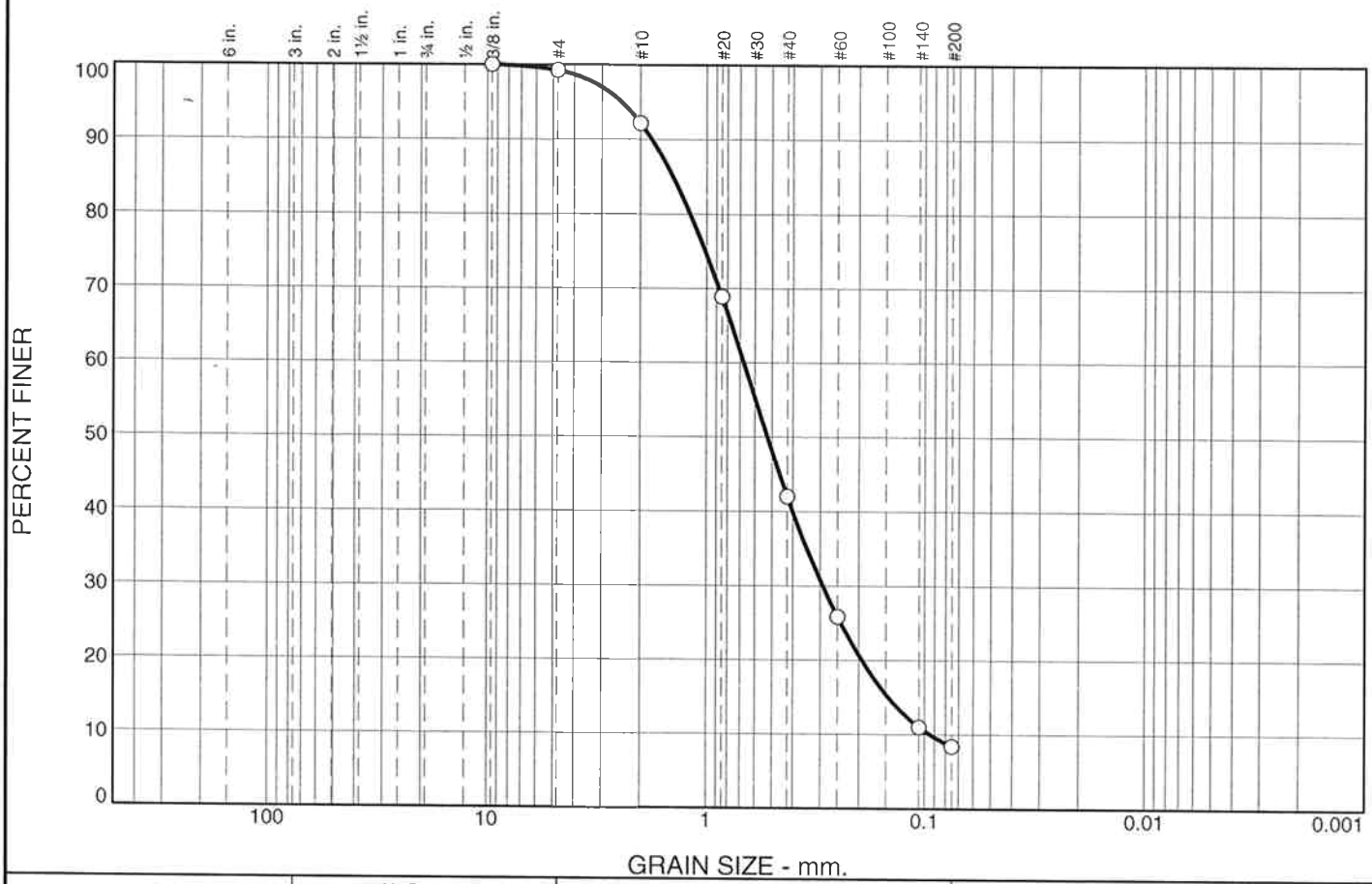
Location: 123+72 R
Sample Number: Jar 1 **Depth:** 6-7.5 ft. **Date:** 10/11/2011

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.8	7.0	50.2	33.6	8.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.2		
#10	92.2		
#20	68.9		
#40	42.0		
#60	25.8		
#140	10.9		
#200	8.4		

* (no specification provided)

Material Description

Sand, trace silt, micaceous, brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.7774 D_{85}= 1.4249 D_{60}= 0.6747
D_{50}= 0.5248 D_{30}= 0.2924 D_{15}= 0.1468
D_{10}= 0.0951 C_u= 7.10 C_c= 1.33

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

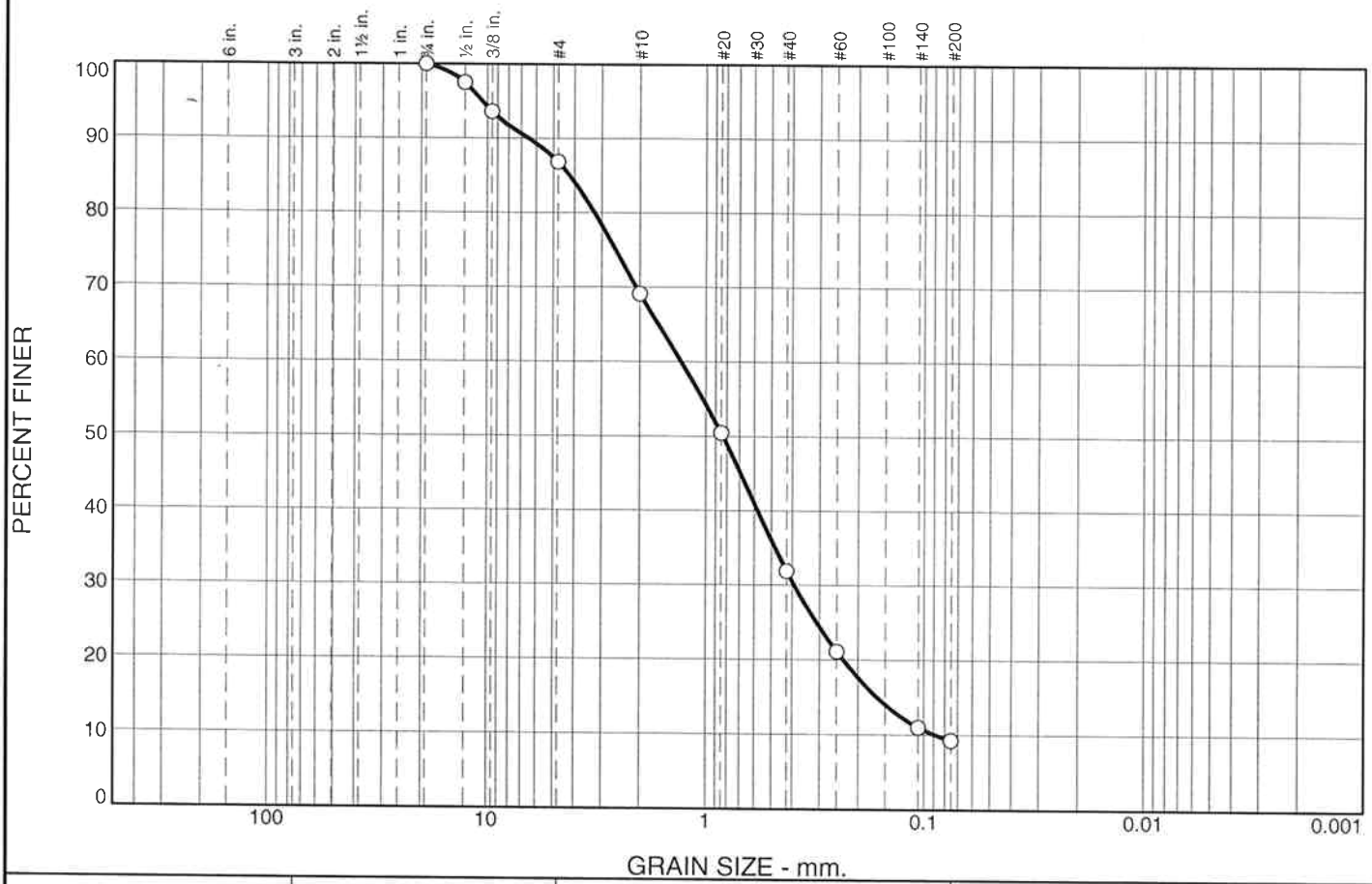
Location: 137+13 R
Sample Number: Jar 2 **Depth:** 11-12.5 ft. **Date:** 10/11/2011

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	13.2	17.7	37.2	22.7	9.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	97.5		
0.375	93.6		
#4	86.8		
#10	69.1		
#20	50.5		
#40	31.9		
#60	21.1		
#140	11.0		
#200	9.2		

* (no specification provided)

Material Description

Sand, trace silt, micaceous, light red brwon

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 6.5286 D_{85}= 4.2107 D_{60}= 1.2976
D_{50}= 0.8348 D_{30}= 0.3930 D_{15}= 0.1641
D_{10}= 0.0892 C_u= 14.55 C_c= 1.33

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

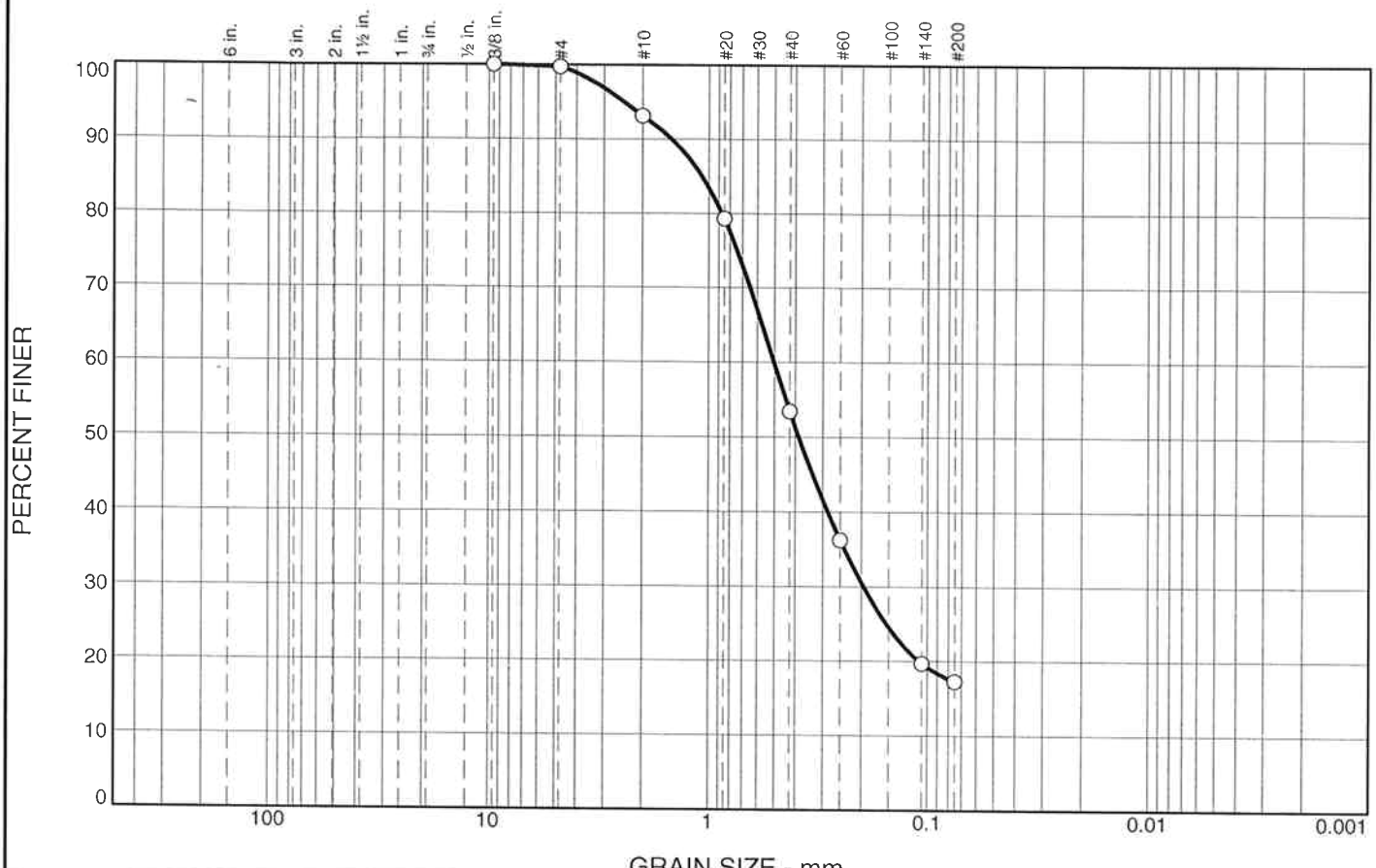
Location: 140+12 L
Sample Number: Jar 3 **Depth:** 16-17.5 ft. **Date:** 10/11/2011

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	6.6	39.7	36.2	17.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	99.7		
#10	93.1		
#20	79.3		
#40	53.4		
#60	36.2		
#140	19.6		
#200	17.2		

* (no specification provided)

Material Description

Sand, some silt, trace clay, micaceous, brown

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.4821 D_{85}= 1.0749 D_{60}= 0.5028
D_{50}= 0.3869 D_{30}= 0.1957 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

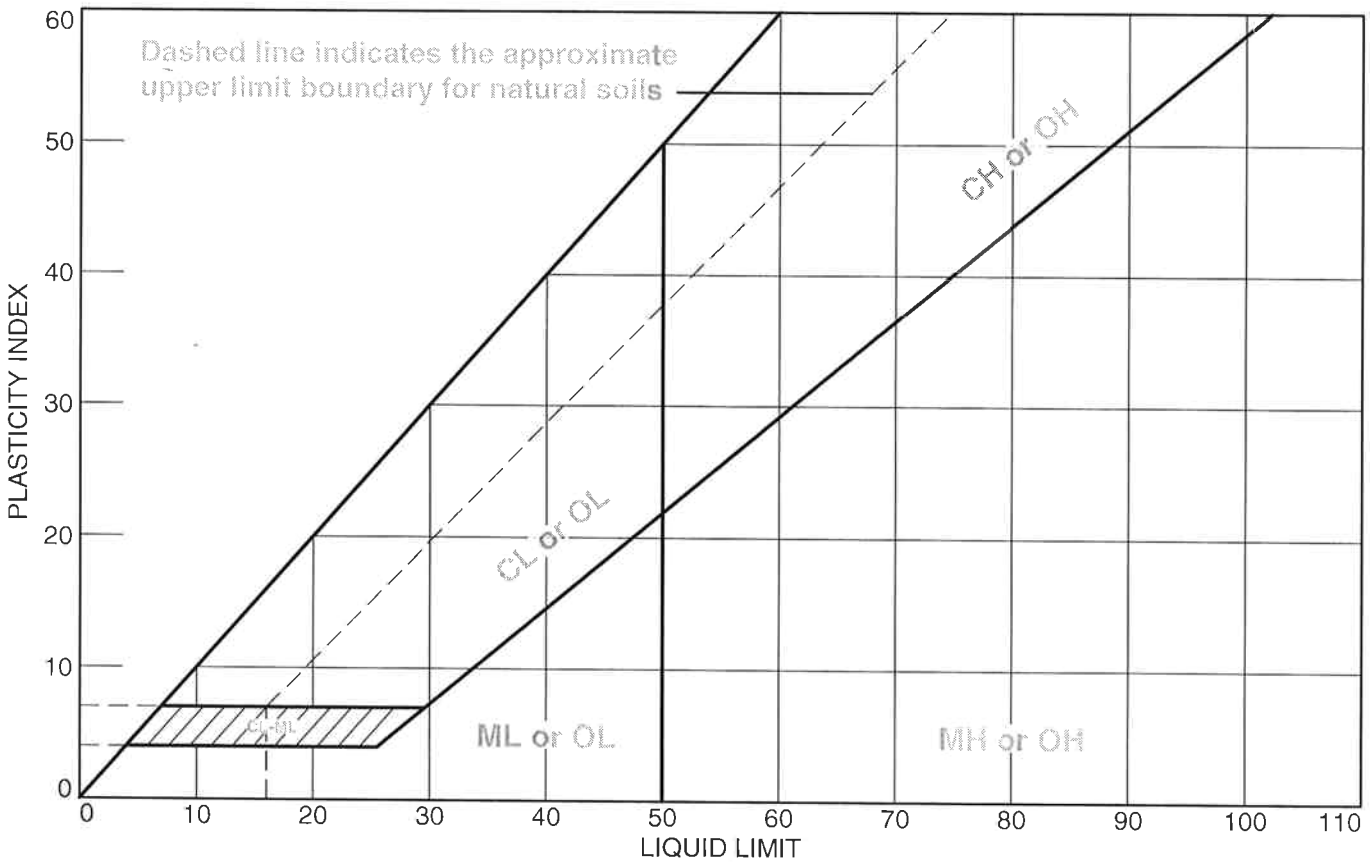
Location: 145+74 R
Sample Number: Jar 4 **Depth:** 8.5-10 ft. **Date:** 10/11/11

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Project No: 2011253001 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●		Bulk 1	12-22 ft.	5.7	NP	NV	NP		SM
■		Bulk 2	6-13 ft.	5.8	NP	NV	NP		SM
▲		Bulk 3		6.3	NP	NV	NP		SM
◆		Bulk 4	3-11 ft.	6.5	NP	NV	NP		SM
▼		Bulk 5	2-8 ft.	9.7	NP	NV	NP		SM
✱		Jar 1	6-7.5 ft.	9.1	NP	NV	NP		SM
⊕		Jar 2	11-12.5 ft.	7.2	NP	NV	NP		SW-SM
⊞		Jar 3	16-17.5 ft.	8.7	NP	NV	NP		SW-SM
⊗		Jar 4	8.5-10 ft.	6.7	NP	NV	NP		SM

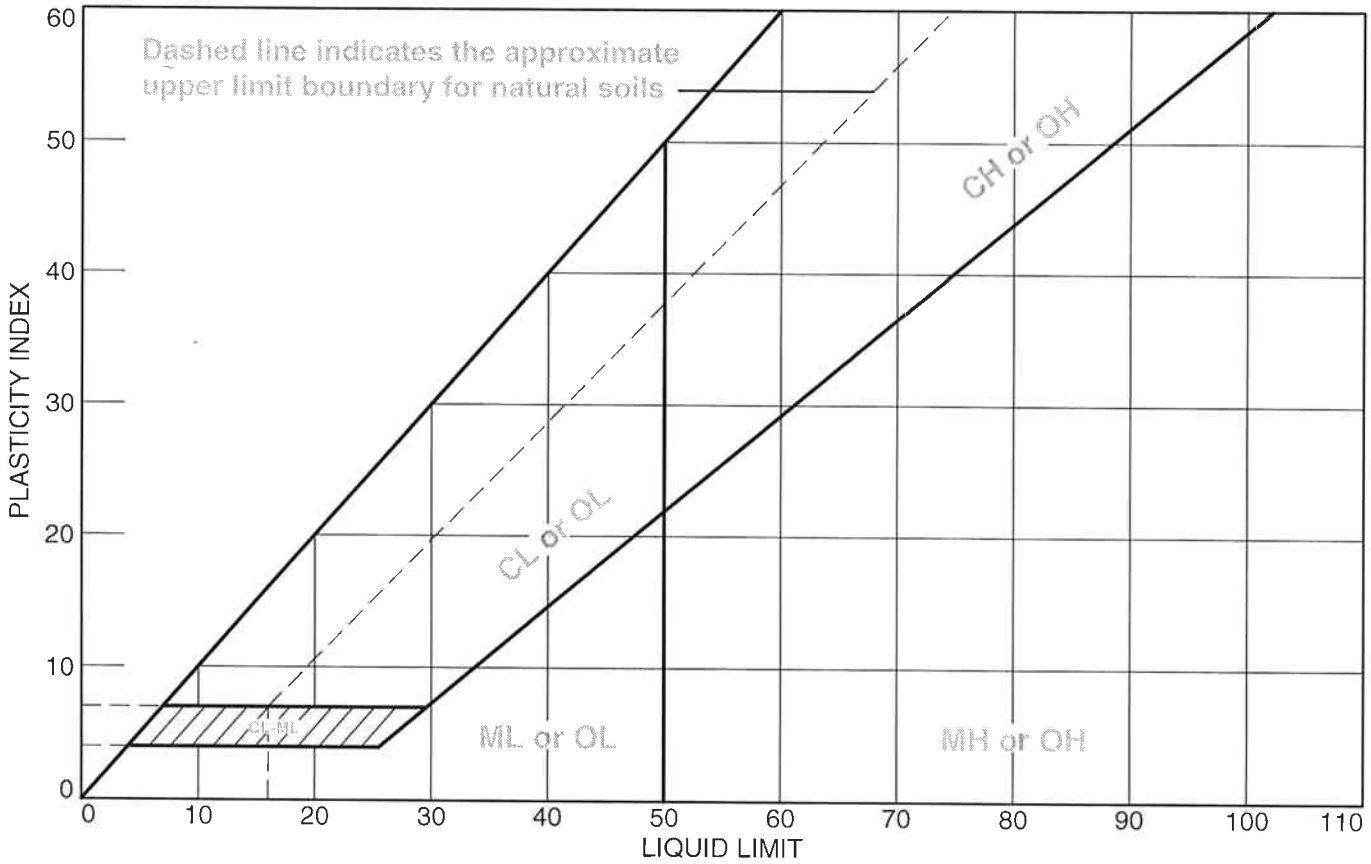
United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements

Project No.: 2011253001 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	LIQUIDITY INDEX	USCS
●		UD1	14-16 ft.	8.1	NP	NV	NP		SM
■		UD2	11.5-13.5	4.9	NP	NV	NP		SW-SM
▲		UD 3	10-12 ft.	7.7	NP	NV	NP		SW-SM

United Consulting

Norcross, Georgia

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements

Project No.: 2011253001 **Figure**

MOISTURE-DENSITY RELATIONSHIP

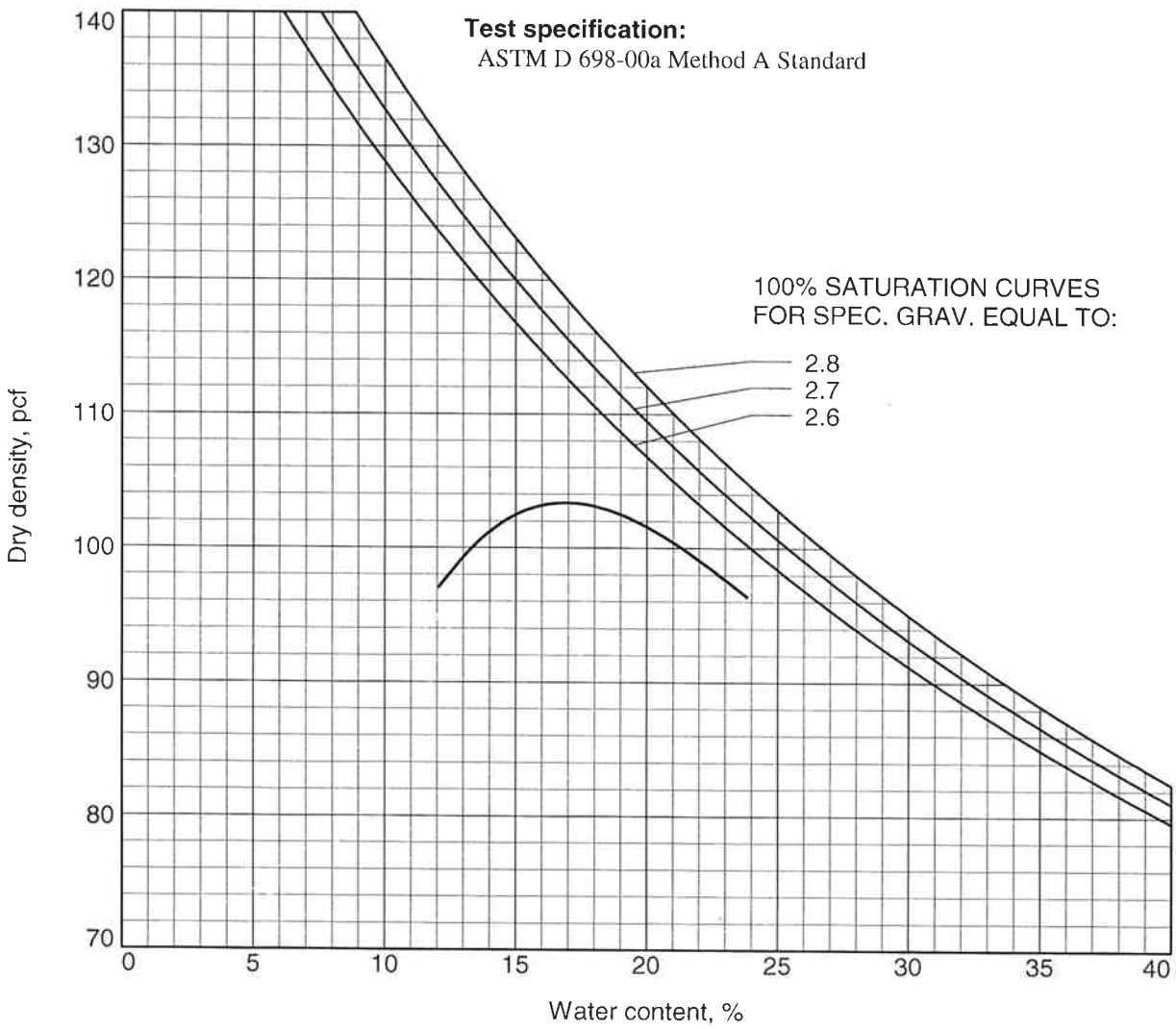
Project No.: 2011253001 **Date:** 10/10/2011
Project: Morgan Falls Road Improvements
Client: City of Sandy Springs
Location: 126+64 L
Sample Number: Bulk 1 **Depth:** 12-22 ft.
Remarks:

MATERIAL DESCRIPTION

Description: Sand, some silt, trace clay, micaceous, brown

Classifications - **USCS:** SM **AASHTO:** A-2-4(0)
Nat. Moist. = 5.7 %
Liquid Limit = NV
Sp.G. =
Plasticity Index = NP
% < No.200 = 18.9 %

TEST RESULTS
Maximum dry density = 103.4 pcf
Optimum moisture = 16.9 %



Figure

United Consulting

MOISTURE-DENSITY RELATIONSHIP

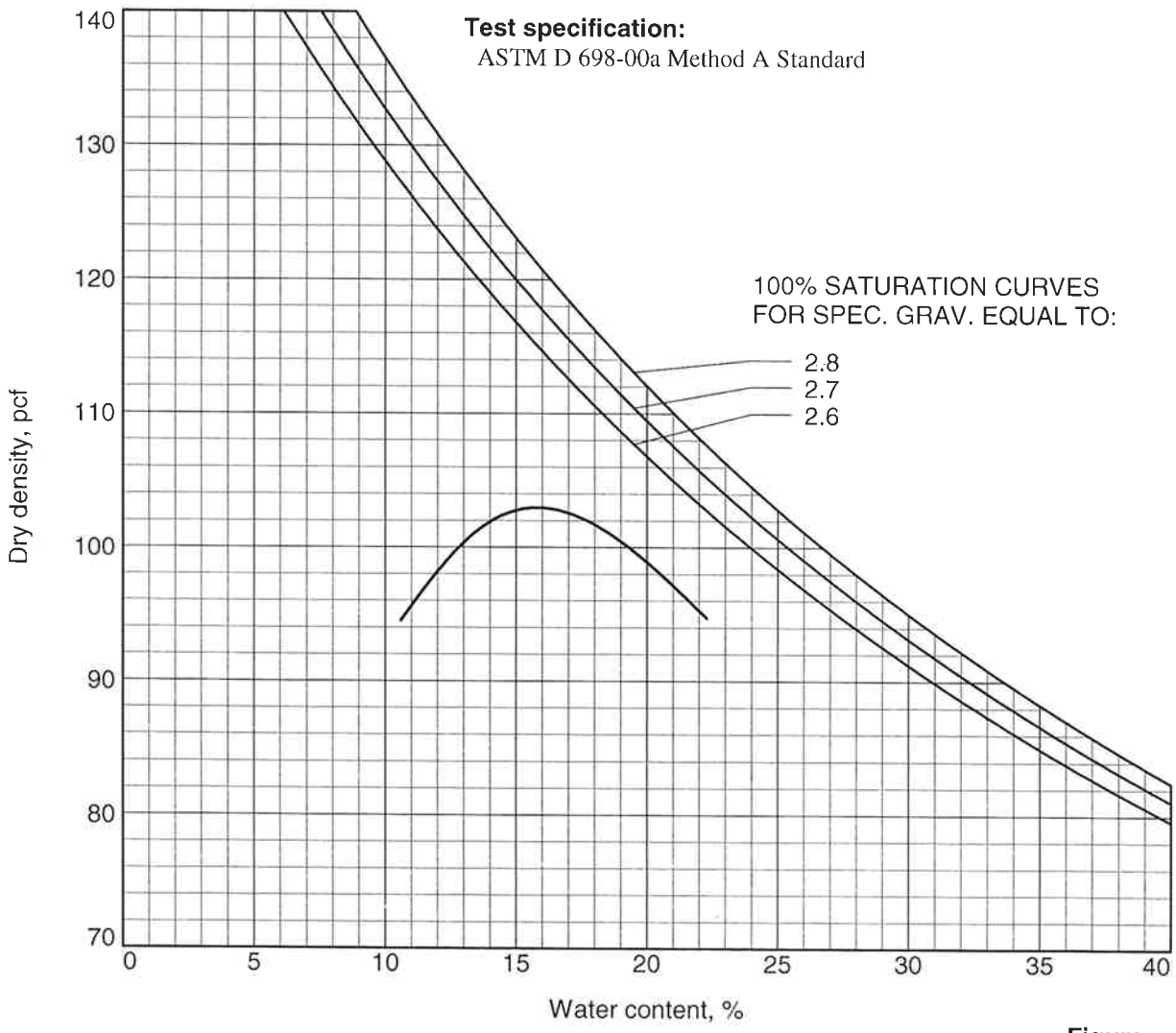
Project No.: 2011253001 **Date:** 10/10/2011
Project: Morgan Falls Road Improvements
Client: City of Sandy Springs
Location: 144+00 L
Sample Number: Bulk 2 **Depth:** 6-13 ft.
Remarks:

MATERIAL DESCRIPTION

Description: Sand, some silt, trace clay, micaceous, brown

Classifications - **USCS:** SM **AASHTO:** A-2-4(0)
Nat. Moist. = 5.8 %
Liquid Limit = NV
Sp.G. =
Plasticity Index = NP
% < No.200 = 15.7 %

TEST RESULTS
Maximum dry density = 103.0 pcf
Optimum moisture = 15.8 %



Figure

United Consulting

MOISTURE-DENSITY RELATIONSHIP

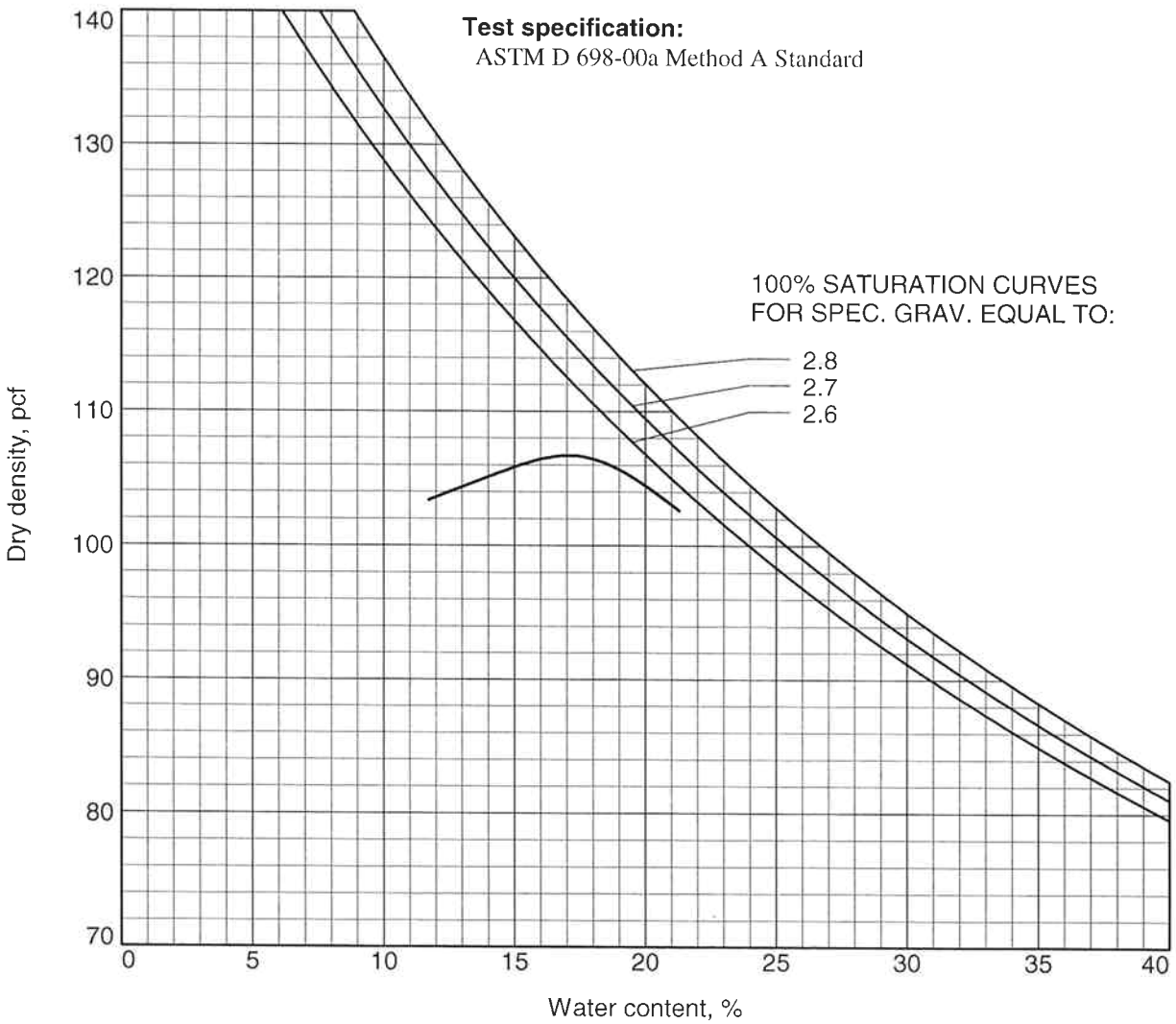
Project No.: 2011253001 **Date:** 10/11/11
Project: Morgan Falls Road Improvements
Client: City of Sandy Springs
Location: 148+45L and 148+15L Composite
Sample Number: Bulk 3
Remarks:

MATERIAL DESCRIPTION

Description: Sand, some silt, trace clay, micaceous, reddish brown

Classifications - **USCS:** SM **AASHTO:** A-2-4(0)
Nat. Moist. = 6.3 % **Sp.G. =**
Liquid Limit = NV **Plasticity Index =** NP
% < No.200 = 24.6 %

TEST RESULTS
Maximum dry density = 106.7 pcf
Optimum moisture = 17.1 %



Figure

United Consulting

TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com		Tested By: VG/KI Date: 10/11/11 Checked By:

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-

SPECIMEN PROPERTIES

	(initial)	(after consol.)
Height, in	6.004	5.898
Diameter, in	2.852	2.931
Height-to-Diameter Ratio	2.1	2.0
Area, in^2	6.39	6.75
Volume, cm^3	628.54	652.11
Mass of Wet Sample, g	1036.20	1238.10
Mass of Dry Sample, g	930.70	930.70
Wet Density, pcf	102.9	118.5
Dry Density, pcf	92.4	89.1
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm^3	344.70	344.70
Volume of Voids, cm^3	283.83	307.40
Void Ratio	0.82	0.89
% Saturation	37.2	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	239.50	1238.10
Mass of Dry Sample and Tare, g	224.20	930.70
Mass of Tare, g	89.23	0.00
Moisture, %	11.34	33.03

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	201.9
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.17
Chamber Pressure, psi	86.0
Back Pressure, psi	80.0
Eff. Consol. Stress,(Minor pr. stress, σ_3),psi	6.0
Change in Height, in	0.106
"B" Value	0.95
t_{50}, min	-

SHEAR DATA

Elapsed Time (min)	Deformation Stage 1 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Total Strain Stage 1 (%)	Corrected Area (in^2)	Dev.Stress ($\Delta\sigma=\sigma_1-\sigma_3$)	Major Principal Stress, psi		Eff.Stress Ratio	P' $(\sigma'_1+\sigma'_3)/2$ (psi)	Q $(\sigma_1-\sigma_3)/2$ (psi)	Eff. Minor Pr. Stress
			Total, U	Change,ΔU			(psi)	Total σ_1	Eff. σ'_1	σ'_1/σ'_3			σ'_3 (psi)
0.0	0.000	19.8	80.0	0.0	0.00	6.75	0.0	6.0	6.0	1.00	6.0	0.0	6.0
0.5	0.005	29.2	81.0	1.0	0.08	6.75	1.4	7.4	6.4	1.28	5.7	0.7	5.0
1.0	0.010	38.4	82.0	2.0	0.17	6.76	2.8	8.8	6.8	1.69	5.4	1.4	4.0
1.5	0.015	43	82.4	2.4	0.25	6.76	3.4	9.4	7.0	1.95	5.3	1.7	3.6
2.0	0.020	45.5	82.7	2.7	0.34	6.77	3.8	9.8	7.1	2.13	5.2	1.9	3.3
2.5	0.025	48.3	82.9	2.9	0.42	6.78	4.2	10.2	7.3	2.35	5.2	2.1	3.1
3.0	0.030	51	83.0	3.0	0.51	6.78	4.6	10.6	7.6	2.53	5.3	2.3	3.0
3.5	0.035	52.6	83.1	3.1	0.59	6.79	4.8	10.8	7.8	2.65	5.3	2.4	2.9
4.0	0.040	54.8	83.2	3.2	0.68	6.79	5.2	11.2	8.0	2.81	5.4	2.6	2.8
5.0	0.050	58.4	83.2	3.2	0.85	6.80	5.7	11.7	8.4	3.06	5.6	2.8	2.8
7.5	0.075	66.3	83.3	3.3	1.27	6.83	6.8	12.8	9.5	3.55	6.1	3.4	2.7
8.5	0.085	69.3	83.3	3.3	1.44	6.85	7.2	13.2	9.9	3.68	6.3	3.6	2.7
9.5	0.095	71.9	83.3	3.3	1.61	6.86	7.6	13.6	10.3	3.77	6.5	3.8	2.7
10.0	0.100	73.1	83.2	3.2	1.70	6.86	7.8	13.8	10.5	3.81	6.6	3.9	2.8
11.0	0.110	75.5	83.2	3.2	1.87	6.88	8.1	14.1	10.9	3.87	6.9	4.1	2.8
12.0	0.120	77.4	83.1	3.1	2.03	6.89	8.4	14.4	11.2	3.90	7.1	4.2	2.9
13.0	0.130	79.2	83.1	3.1	2.20	6.90	8.6	14.6	11.5	3.93	7.2	4.3	2.9
14.0	0.140	80.9	83.0	3.0	2.37	6.91	8.8	14.8	11.9	3.93	7.4	4.4	3.0
15.0	0.150	82.3	82.9	2.9	2.54	6.92	9.0	15.0	12.1	3.93	7.6	4.5	3.1
Values @ Failure				3.1	2.20	6.90	8.6	14.6	11.5	3.93	7.2	4.3	2.9

Failure criteria used* 3 *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff.Stress Ratio(σ'_1/σ'_3)

Multistage Triaxial CU.xls [Stage 1], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com	Tested By	VG
		Date	10/12/11
		Checked By	

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-

SPECIMEN PROPERTIES

		(initial)	(after consol.)
Height, in		5.748	5.782
Diameter, in		2.969	2.936
Height-to-Diameter Ratio		1.9	2.0
Area, in^2		6.92	6.77
Volume, cm^3		652.11	641.67
Mass of Wet Sample, g		1238.10	1227.66
Mass of Dry Sample, g		930.70	930.70
Wet Density, pcf		118.5	119.4
Dry Density, pcf		89.1	90.5
Specific Gravity	(assumed)	2.700	2.700
Volume of Solids, cm^3		344.70	344.70
Volume of Voids, cm^3		307.40	296.96
Void Ratio		0.89	0.86
% Saturation		100.0	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1238.10	1227.66
Mass of Dry Sample and Tare, g	930.70	930.70
Mass of Tare, g	0.00	0.00
Moisture, %	33.03	31.91

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-10.4
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.17
Chamber Pressure, psi	92.0
Back Pressure, psi	80.0
Eff. Consol. Stress,(Minor pr. stress, σ_3),psi	12.0
Change in Height, in	-0.034
"B" Value	0.95
t_{50}, min	-

SHEAR DATA

Deformation Stage 2 (inch)	Total Deformation ST.1 + ST.2 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 2 %	Corrected Area (in^2)	Dev.Stress ($\Delta\sigma=\sigma_1-\sigma_3$)	Major Principal Stress, psi		Effective Stress Ratio	P' ($\sigma'_1+\sigma'_3$)/2 (psi)	Q ($\sigma_1-\sigma_3$)/2 (psi)	Eff. Minor Pr. Stress	Total Strain ST.1 + ST.2 %
			Total, U	Change,ΔU			(psi)	Total σ_1	Eff. σ'_1	σ'_1/σ'_3			σ'_3 (psi)	
0.000	0.116	20.6	80.0	0.0	0.00	6.77	0.0	12.0	12.0	1.00	12.0	0.0	12.0	1.97
0.005	0.121	40.9	81.9	1.9	0.09	6.78	3.0	15.0	13.1	1.30	11.6	1.5	10.1	2.05
0.010	0.126	57.2	83.1	3.1	0.17	6.78	5.4	17.4	14.3	1.61	11.6	2.7	8.9	2.14
0.015	0.131	65.2	83.9	3.8	0.26	6.79	6.6	18.6	14.7	1.81	11.4	3.3	8.2	2.22
0.020	0.136	72.1	84.4	4.4	0.35	6.80	7.6	19.6	15.2	2.00	11.4	3.8	7.6	2.31
0.025	0.141	77.9	84.8	4.8	0.43	6.80	8.4	20.4	15.6	2.17	11.4	4.2	7.2	2.39
0.030	0.146	82.5	85.1	5.1	0.52	6.81	9.1	21.1	16.0	2.32	11.4	4.5	6.9	2.48
0.035	0.151	86.5	85.4	5.4	0.61	6.81	9.7	21.7	16.3	2.46	11.5	4.8	6.6	2.56
0.040	0.156	89	85.6	5.6	0.69	6.82	10.0	22.0	16.5	2.56	11.4	5.0	6.4	2.64
0.050	0.166	95.3	85.9	5.9	0.86	6.83	10.9	22.9	17.1	2.78	11.6	5.5	6.1	2.81
0.075	0.191	104.5	86.3	6.3	1.30	6.86	12.2	24.2	18.0	3.13	11.9	6.1	5.8	3.24
0.100	0.216	109.4	86.4	6.4	1.73	6.89	12.9	24.9	18.5	3.30	12.0	6.4	5.6	3.66
0.150	0.266	114.5	86.5	6.5	2.59	6.95	13.5	25.5	19.0	3.45	12.3	6.8	5.5	4.51
0.200	0.316	117.6	86.5	6.5	3.46	7.01	13.8	25.8	19.3	3.51	12.4	6.9	5.5	5.36
0.275	0.391	120.6	86.5	6.5	4.76	7.11	14.1	26.1	19.5	3.57	12.5	7.0	5.5	6.63
0.325	0.441	122.3	86.5	6.5	5.62	7.18	14.2	26.2	19.6	3.60	12.5	7.1	5.5	7.48
0.375	0.491	123.8	86.5	6.5	6.49	7.24	14.3	26.3	19.7	3.61	12.6	7.1	5.5	8.32
0.425	0.541	125.4	86.5	6.5	7.35	7.31	14.3	26.3	19.8	3.63	12.6	7.2	5.5	9.17
0.450	0.566	126	86.6	6.6	7.78	7.34	14.4	26.4	19.8	3.64	12.6	7.2	5.4	9.60
0.475	0.591	127	86.6	6.6	8.22	7.38	14.4	26.4	19.9	3.65	12.7	7.2	5.4	10.02
0.500	0.616	127.8	86.6	6.6	8.65	7.41	14.5	26.5	19.9	3.66	12.7	7.2	5.4	10.44
0.525	0.641	128.4	86.6	6.6	9.08	7.45	14.5	26.5	19.9	3.67	12.7	7.2	5.4	10.87
0.550	0.666	129.1	86.6	6.6	9.51	7.48	14.5	26.5	19.9	3.66	12.7	7.2	5.4	11.29
Values @ Failure				**6.6**	**8.65**	**7.45**	**14.5**	**26.5**	**19.9**	**3.67**	**12.7**	**7.2**	**5.4**	**10.87**

Failure criteria used* 3 *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff.Stress Ratio(σ'_1/σ'_3)

Multistage Triaxial CU.xls [Stage 2], REV. 1: 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com		Tested By: VG Date: 10/12/11 Checked By:

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-

SPECIMEN PROPERTIES

		(initial)	(after consol.)
Height, in		5.232	5.297
Diameter, in		3.087	2.999
Height-to-Diameter Ratio		1.7	1.8
Area, in^2		7.48	7.06
Volume, cm^3		641.67	613.01
Mass of Wet Sample, g		1227.66	1198.80
Mass of Dry Sample, g		930.70	930.37
Wet Density, pcf		119.4	122.1
Dry Density, pcf		90.5	94.7
Specific Gravity	(assumed)	2.700	2.700
Volume of Solids, cm^3		344.70	344.58
Volume of Voids, cm^3		296.96	268.43
Void Ratio		0.86	0.78
% Saturation		100.0	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1227.66	1618.10
Mass of Dry Sample and Tare, g	930.70	1349.80
Mass of Tare, g	0.00	419.90
Moisture, %	31.91	28.85

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-28.9
Machine Speed, in / min	0.01000
Strain Rate, % / min	0.19
Chamber Pressure, psi	104.0
Back Pressure, psi	80.0
Eff. Consol. Stress,(Minor pr. stress, σ_3),psi	24.0
Change in Height, in	-0.065
"B" Value	0.95
t_{50}, min	-

SHEAR DATA

Deformation Stage 3 (inch)	Total Deformation ST.1 + ST.2 + ST.3 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 3 %	Corrected Area (in^2)	Deviator Stress ($\Delta\sigma=\sigma_1-\sigma_3$) (psi)	Major Principal Stress, psi		Effective Stress Ratio σ'_1/σ'_3	P' $(\sigma'_1+\sigma'_3)/2$ (psi)	Q $(\sigma_1-\sigma_3)/2$ (psi)	Eff. Minor Pr. Stress σ'_3 (psi)	Total Strain ST.1 + ST.2 + ST.3, %
			Total, U	Change,ΔU				Total σ_1	Eff. σ'_1					
0.000	0.601	24.8	80.0	0.0	0.00	7.06	0.0	24.0	24.0	1.00	24.0	0.0	24.0	10.19
0.005	0.606	61.1	82.7	2.7	0.08	7.07	5.1	29.1	26.4	1.24	23.9	2.6	21.3	10.27
0.009	0.610	83.3	84.8	4.8	0.18	7.07	8.3	32.3	27.5	1.43	23.3	4.1	19.2	10.35
0.014	0.615	97.5	86.3	6.3	0.26	7.08	10.3	34.3	28.0	1.58	22.8	5.1	17.7	10.43
0.019	0.620	109.2	87.5	7.5	0.36	7.09	11.9	35.9	28.4	1.72	22.5	6.0	16.5	10.51
0.024	0.625	118.9	88.4	8.4	0.45	7.09	13.3	37.3	28.9	1.85	22.2	6.6	15.6	10.59
0.029	0.630	126.5	89.2	9.2	0.54	7.10	14.3	38.3	29.1	1.97	22.0	7.2	14.8	10.68
0.034	0.635	131.7	89.8	9.8	0.64	7.11	15.0	39.0	29.2	2.06	21.7	7.5	14.2	10.76
0.039	0.640	137.7	90.3	10.3	0.73	7.11	15.9	39.9	29.6	2.16	21.6	7.9	13.7	10.85
0.044	0.645	142	90.8	10.8	0.83	7.12	16.5	40.5	29.7	2.25	21.4	8.2	13.2	10.93
0.049	0.650	147.4	91.2	11.2	0.93	7.13	17.2	41.2	30.0	2.34	21.4	8.6	12.8	11.02
0.074	0.675	163.2	92.4	12.4	1.39	7.16	19.3	43.3	30.9	2.67	21.3	9.7	11.6	11.44
0.099	0.700	173.2	93.1	13.1	1.87	7.20	20.6	44.6	31.5	2.89	21.2	10.3	10.9	11.87
0.124	0.725	181	93.6	13.6	2.33	7.23	21.6	45.6	32.0	3.08	21.2	10.8	10.4	12.28
0.148	0.749	186.7	93.9	13.9	2.79	7.27	22.3	46.3	32.4	3.21	21.2	11.1	10.1	12.70
0.173	0.774	191.6	94.1	14.1	3.26	7.30	22.8	46.8	32.7	3.31	21.3	11.4	9.9	13.12
0.197	0.798	195.4	94.3	14.3	3.73	7.34	23.3	47.3	33.0	3.40	21.3	11.6	9.7	13.54
0.223	0.824	199	94.3	14.3	4.20	7.37	23.6	47.6	33.3	3.44	21.5	11.8	9.7	13.97
0.248	0.849	202	94.4	14.4	4.68	7.41	23.9	47.9	33.5	3.49	21.6	12.0	9.6	14.39
0.273	0.874	204.5	94.5	14.5	5.16	7.45	24.1	48.1	33.6	3.54	21.6	12.1	9.5	14.82
0.298	0.899	206.9	94.5	14.5	5.63	7.48	24.3	48.3	33.8	3.56	21.7	12.2	9.5	15.25
0.348	0.949	211	94.5	14.5	6.56	7.56	24.6	48.6	34.1	3.59	21.8	12.3	9.5	16.08
0.397	0.998	215.1	94.5	14.5	7.50	7.63	24.9	48.9	34.4	3.62	22.0	12.5	9.5	16.92
Values @ Failure				**14.5**	**5.63**	**7.48**	**24.3**	**48.3**	**33.8**	**3.56**	**21.7**	**12.2**	**9.5**	**15.25**

Failure criteria used* 2 *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff.Stress Ratio(σ'_1/σ'_3)

Multistage Triaxial CU.xls [Stage 3], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC

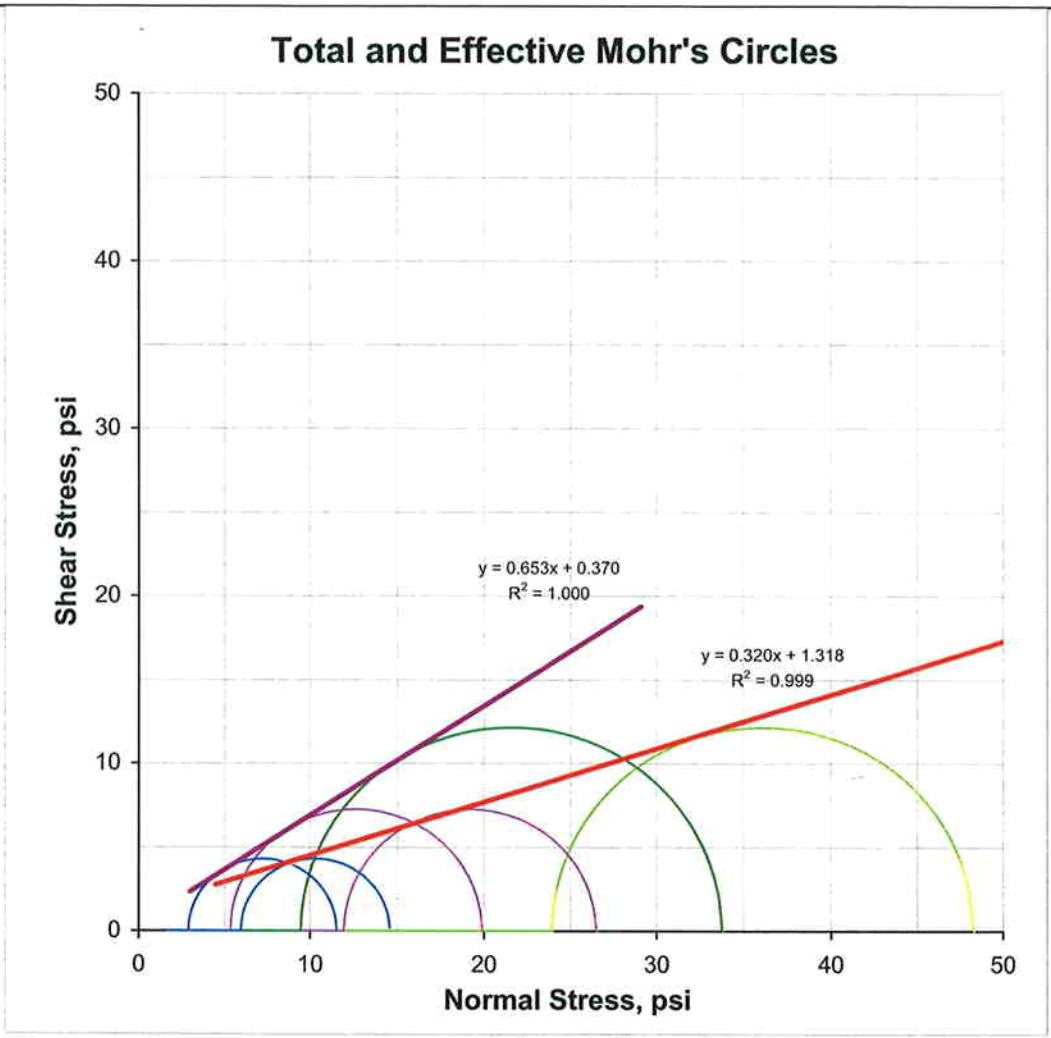
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	VG
Date	10/12/11
Check	LB

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-



	ST. 1	ST. 2	ST. 3
Effective Consolidation Stress, psi	6.0	12.0	24.0
Deviator Stress at Failure, psi	8.6	14.5	24.3
Effective Minor Principal Stress at Failure, psi	2.9	5.4	9.5
Effective Major Principal Stress at Failure, psi	11.5	19.9	33.8
Axial Strain at Failure, %	2.20	8.65	5.63

STRENGTH PARAMETERS			
Total		Effective	
ϕ °	17.7	ϕ' °	33.2
C, psi	1.3	C', psi	0.4

Multistage Triaxial CU.xls [Mohr's Circles], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC

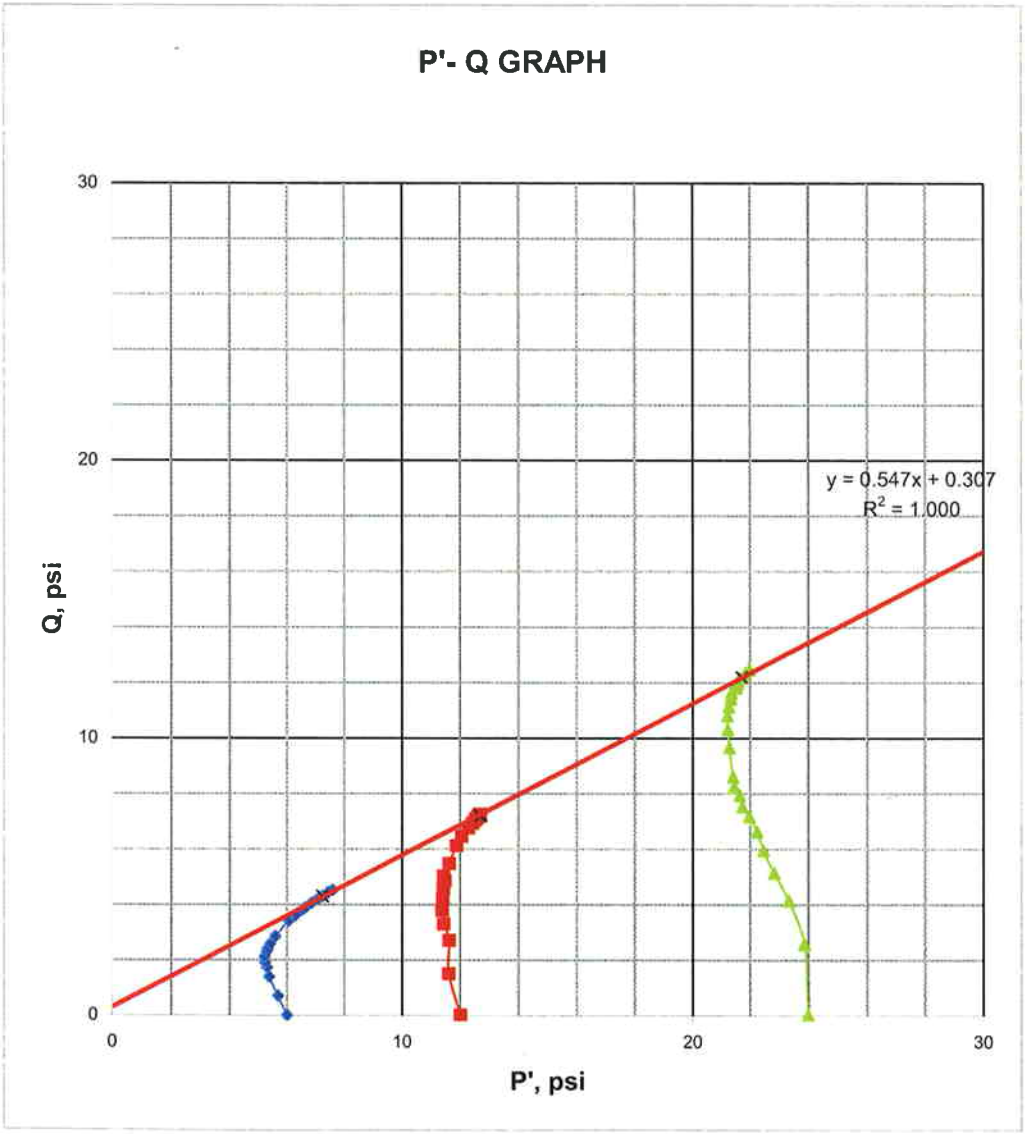
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tech	VG
Date	10/12/11
Check	KB

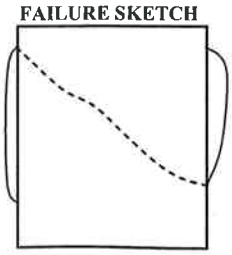
ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-



FAILURE SKETCH



a, psi	0.3
α, degree	28.7

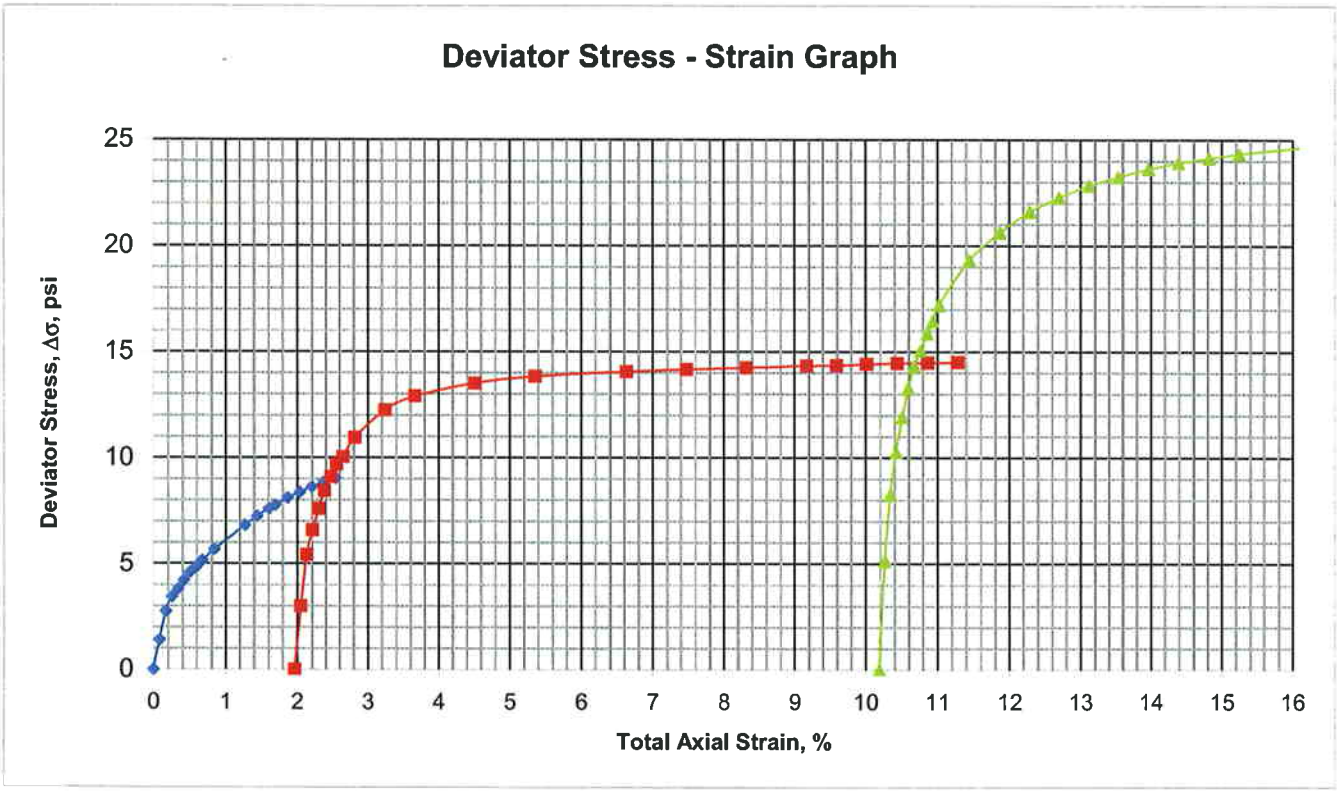
Multistage Triaxial CU.xls [P'-Q Graph], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com		Tested By: VG Date: 10/12/11 Check: LB

ASTM D 4767M/ AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-



		REMARKS	DESCRIPTION
Balance ID Number	1/6/7	Portion of sample used for testing located 7" above bottom of shelby tube.Sample was remolded to 99.9% of initial (as-received) dry density at 3.2% above natural moisture content.	Reddish Brown and Gray (Micaceous) Silty Sand
Oven ID Number	12/13/14		
Deformation Indicator ID #	103-109		
Digital Caliper ID #	16/17		
Load Cell ID #	11		
Apparatus ID #	10		

NOTES:
1. Method for Saturation
2. Method for determination of cross-sectional area after consol.
3. Final moisture content (Stage 3) obtained from entire sample

WET	
B	

LL	-
PL	-
PI	-
Gs	-

USCS (ASTM D2487: D2488)
SM

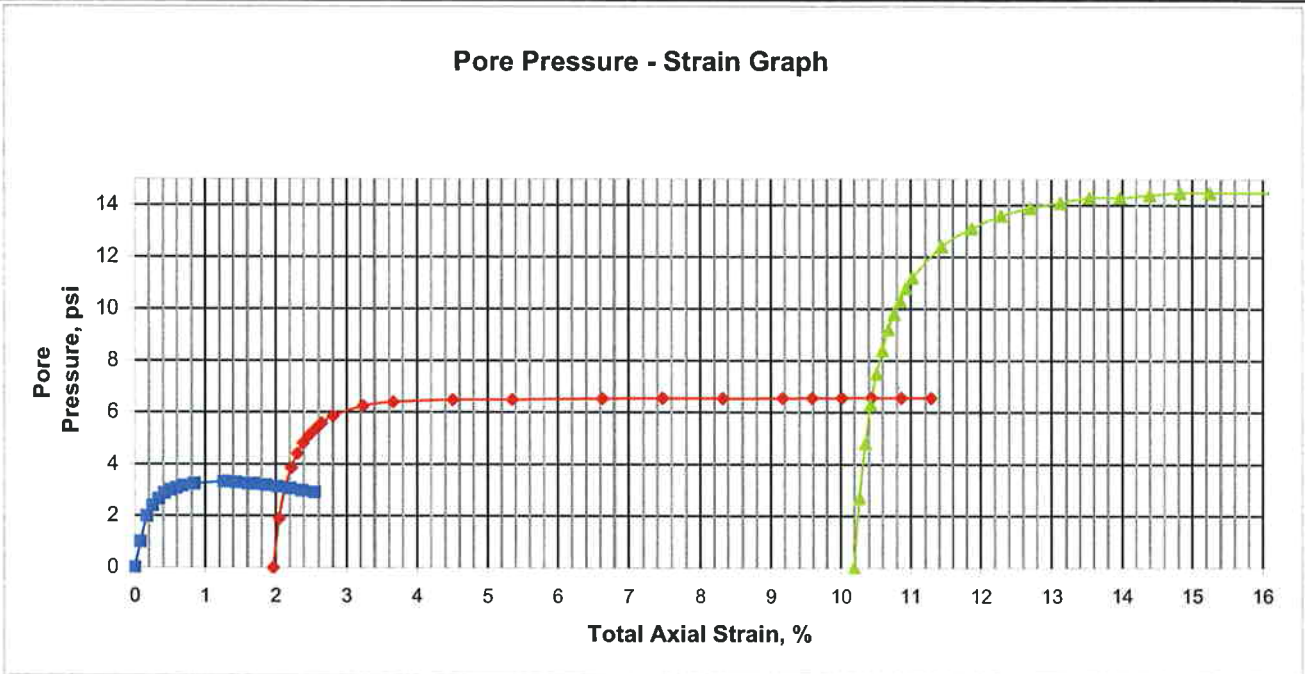
Multistage Triaxial CU.xls [Stress Strain Graph], REV. 1; 10-21-05

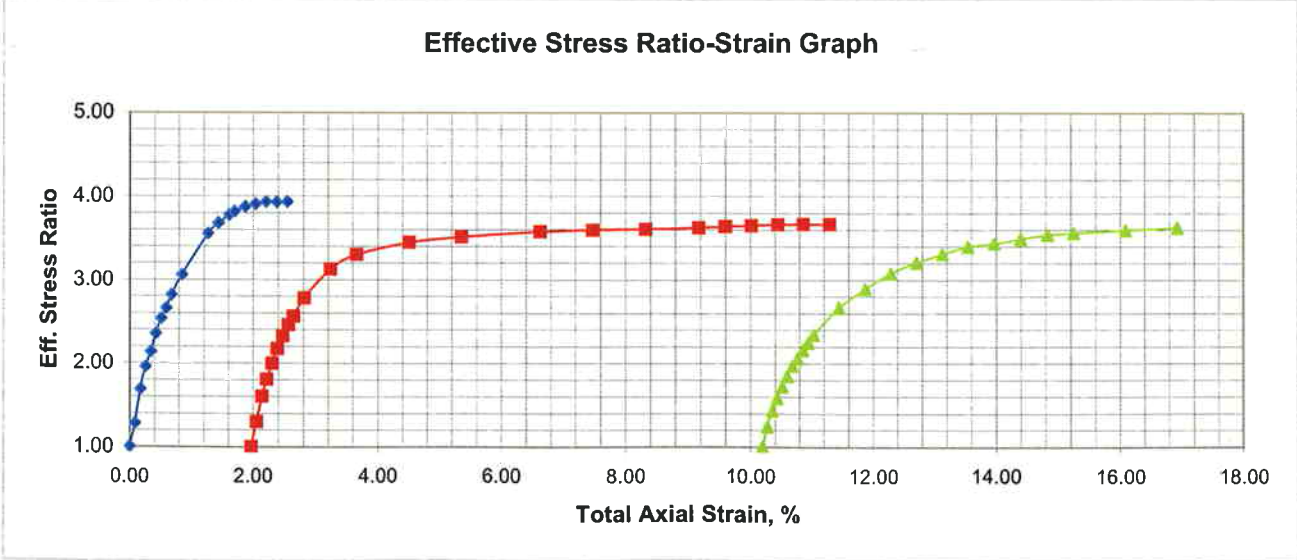
TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com	Tested By	VG
		Date	10/12/11
		Check	KB

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12702/UD-1 126+65L	Depth/Elev.	14'-16'
Location	-	Add. Info	-





Multistage Triaxial CU.xls [Stress Ratio & Pore Water Pr.-Strain Graph], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com		Tested By: KI Date: 10/14/11 Checked By:

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703 /UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-

SPECIMEN PROPERTIES

	(initial)	(after consol.)
Height, in	6.004	5.994
Diameter, in	2.852	2.902
Height-to-Diameter Ratio	2.1	2.1
Area, in^2	6.39	6.62
Volume, cm^3	628.54	649.87
Mass of Wet Sample, g	1238.30	1262.80
Mass of Dry Sample, g	973.48	973.48
Wet Density, pcf	123.0	121.3
Dry Density, pcf	96.7	93.5
Specific Gravity (assumed)	2.700	2.700
Volume of Solids, cm^3	360.55	360.55
Volume of Voids, cm^3	267.99	289.32
Void Ratio	0.74	0.80
% Saturation	98.8	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	446.50	1262.80
Mass of Dry Sample and Tare, g	399.90	973.48
Mass of Tare, g	228.60	0.00
Moisture, %	27.20	29.72

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	24.5
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.17
Chamber Pressure, psi	85.0
Back Pressure, psi	80.0
Eff. Consol. Stress,(Minor pr. stress, σ_3),psi	5.0
Change in Height, in	0.010
"B" Value	0.95
t_{50}, min	-

SHEAR DATA

Elapsed Time (min)	Deformation Stage 1 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Total Strain Stage 1 (%)	Corrected Area (in^2)	Dev.Stress ($\Delta\sigma=\sigma_1-\sigma_3$)	Major Principal Stress, psi		Eff.Stress Ratio	P' $(\sigma'_1+\sigma'_3)/2$ (psi)	Q $(\sigma_1-\sigma_3)/2$ (psi)	Eff. Minor Pr. Stress
			Total, U	Change,ΔU			(psi)	Total σ_1	Eff. σ'_1	σ'_1/σ'_3			σ'_3 (psi)
0.0	0.000	20.6	80.0	0.0	0.00	6.62	0.0	5.0	5.0	1.00	5.0	0.0	5.0
0.5	0.005	36.8	81.6	1.6	0.08	6.62	2.4	7.4	5.8	1.72	4.6	1.2	3.4
1.0	0.010	42.3	82.0	2.0	0.17	6.63	3.3	8.3	6.3	2.09	4.6	1.6	3.0
1.5	0.015	45.2	82.2	2.2	0.25	6.63	3.7	8.7	6.5	2.32	4.7	1.9	2.8
2.0	0.020	48.7	82.3	2.3	0.33	6.64	4.2	9.2	7.0	2.56	4.8	2.1	2.7
2.6	0.026	51.5	82.4	2.4	0.43	6.65	4.7	9.7	7.3	2.77	5.0	2.3	2.6
3.0	0.030	53.1	82.4	2.4	0.50	6.65	4.9	9.9	7.5	2.89	5.0	2.4	2.6
3.5	0.035	56.2	82.4	2.4	0.58	6.66	5.3	10.3	7.9	3.09	5.2	2.7	2.6
4.0	0.040	59.1	82.5	2.5	0.67	6.66	5.8	10.8	8.3	3.27	5.4	2.9	2.6
5.0	0.050	63.1	82.5	2.5	0.83	6.67	6.4	11.4	8.9	3.50	5.7	3.2	2.6
6.0	0.060	68.1	82.4	2.4	1.00	6.68	7.1	12.1	9.7	3.77	6.1	3.6	2.6
7.0	0.070	73.2	82.4	2.4	1.17	6.69	7.9	12.9	10.5	4.00	6.5	3.9	2.6
8.0	0.080	78.1	82.3	2.3	1.33	6.71	8.6	13.6	11.3	4.16	7.0	4.3	2.7
9.0	0.090	83.5	82.2	2.2	1.50	6.72	9.4	14.4	12.2	4.34	7.5	4.7	2.8
10.0	0.100	88.5	82.1	2.1	1.67	6.73	10.1	15.1	13.0	4.46	8.0	5.0	2.9
11.0	0.110	94.1	82.0	2.0	1.84	6.74	10.9	15.9	14.0	4.58	8.5	5.5	3.1
12.0	0.120	99.2	81.8	1.8	2.00	6.75	11.6	16.6	14.9	4.62	9.0	5.8	3.2
13.0	0.130	104.5	81.6	1.6	2.17	6.76	12.4	17.4	15.8	4.68	9.6	6.2	3.4
14.0	0.140	110.1	81.4	1.4	2.34	6.77	13.2	18.2	16.8	4.71	10.2	6.6	3.6
15.0	0.150	114.4	81.3	1.3	2.50	6.79	13.8	18.8	17.5	4.73	10.6	6.9	3.7
16.0	0.160	119.8	81.1	1.1	2.67	6.80	14.6	19.6	18.5	4.71	11.2	7.3	3.9
17.0	0.170	124.5	80.9	0.9	2.84	6.81	15.3	20.3	19.4	4.70	11.7	7.6	4.1
Values @ Failure				1.3	2.50	6.79	13.8	18.8	17.5	4.73	10.6	6.9	3.7

Failure criteria used* 3 *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff.Stress Ratio(σ'_1/σ'_3)

Multistage Triaxial CU.xls [Stage 1], REV. 1: 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC

1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	LB
Date	10/15/11
Checked By	LB

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703 /UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-

SPECIMEN PROPERTIES

		(initial)	(after consol.)
Height, in		5.824	5.858
Diameter, in		2.944	2.923
Height-to-Diameter Ratio		2.0	2.0
Area, in^2		6.81	6.71
Volume, cm^3		649.87	644.17
Mass of Wet Sample, g		1262.80	1257.10
Mass of Dry Sample, g		973.48	973.48
Wet Density, pcf		121.3	121.8
Dry Density, pcf		93.5	94.3
Specific Gravity	(assumed)	2.700	2.700
Volume of Solids, cm^3		360.55	360.55
Volume of Voids, cm^3		289.32	283.62
Void Ratio		0.80	0.79
% Saturation		100.0	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1262.80	1257.10
Mass of Dry Sample and Tare, g	973.48	973.48
Mass of Tare, g	0.00	0.00
Moisture, %	29.72	29.13

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-5.7
Machine Speed, in / min	0.0100
Strain Rate, % / min	0.17
Chamber Pressure, psi	90.0
Back Pressure, psi	80.0
Eff. Consol. Stress,(Minor pr. stress, σ_3),psi	10.0
Change in Height, in	-0.034
"B" Value	0.95
t_{50}, min	-

SHEAR DATA

Deformation Stage 2 (inch)	Total Deformation ST.1 + ST.2 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 2 %	Corrected Area (in^2)	Dev.Stress ($\Delta\sigma=\sigma_1-\sigma_3$)	Major Principal Stress, psi		Effective Stress Ratio	P' ($\sigma'_1+\sigma'_3$)/2 (psi)	Q ($\sigma_1-\sigma_3$)/2 (psi)	Eff. Minor Pr. Stress	Total Strain ST.1 + ST.2 %
			Total, U	Change,ΔU			(psi)	Total σ_1	Eff. σ'_1	σ'_1/σ'_3			σ'_3 (psi)	
0.000	0.136	19.5	80.0	0.0	0.00	6.71	0.0	10.0	10.0	1.00	10.0	0.0	10.0	2.27
0.005	0.141	59.1	82.7	2.7	0.09	6.72	5.9	15.9	13.2	1.81	10.2	2.9	7.3	2.35
0.010	0.146	74.3	83.3	3.3	0.17	6.72	8.2	18.2	14.9	2.22	10.8	4.1	6.7	2.44
0.015	0.151	87.7	83.6	3.6	0.26	6.73	10.1	20.1	16.5	2.58	11.5	5.1	6.4	2.52
0.020	0.156	96.5	83.8	3.8	0.34	6.73	11.4	21.4	17.6	2.84	11.9	5.7	6.2	2.60
0.025	0.161	104.3	83.8	3.8	0.43	6.74	12.6	22.6	18.8	3.03	12.5	6.3	6.2	2.69
0.030	0.166	114.5	83.8	3.8	0.51	6.74	14.1	24.1	20.3	3.27	13.2	7.0	6.2	2.77
0.040	0.176	130.5	83.8	3.8	0.68	6.76	16.4	26.4	22.6	3.65	14.4	8.2	6.2	2.94
0.050	0.186	144	83.7	3.7	0.85	6.77	18.4	28.4	24.7	3.92	15.5	9.2	6.3	3.10
0.060	0.196	152.9	83.6	3.6	1.02	6.78	19.7	29.7	26.1	4.07	16.2	9.8	6.4	3.27
0.075	0.211	163.2	83.3	3.3	1.28	6.80	21.1	31.1	27.8	4.17	17.2	10.6	6.7	3.52
0.090	0.226	172	83.0	3.0	1.54	6.82	22.4	32.4	29.4	4.20	18.2	11.2	7.0	3.77
0.100	0.236	177.6	82.8	2.8	1.71	6.83	23.2	33.2	30.4	4.21	18.8	11.6	7.2	3.94
0.110	0.246	181.9	82.6	2.6	1.88	6.84	23.7	33.7	31.2	4.20	19.3	11.9	7.4	4.10
0.120	0.256	187.1	82.4	2.3	2.05	6.85	24.5	34.5	32.1	4.20	19.9	12.2	7.7	4.27
0.130	0.266	191.2	82.2	2.2	2.22	6.86	25.0	35.0	32.9	4.19	20.4	12.5	7.8	4.44
Values @ Failure				**2.8**	**1.71**	**6.83**	**23.2**	**33.2**	**30.4**	**4.21**	**18.8**	**11.6**	**7.2**	**3.94**

Failure criteria used* **3** *Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff.Stress Ratio(σ'_1/σ'_3)

Multistage Triaxial CU.xls [Stage 2], REV. 1: 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC

1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tested By	LB
Date	10/15/11
Checked By	LB

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703 /UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-

SPECIMEN PROPERTIES

		(initial)	(after consol.)
Height, in		5.728	5.778
Diameter, in		2.956	2.926
Height-to-Diameter Ratio		1.9	2.0
Area, in^2		6.86	6.72
Volume, cm^3		644.17	636.67
Mass of Wet Sample, g		1257.10	1251.10
Mass of Dry Sample, g		973.48	975.86
Wet Density, pcf		121.8	122.7
Dry Density, pcf		94.3	95.7
Specific Gravity	(assumed)	2.700	2.700
Volume of Solids, cm^3		360.55	361.43
Volume of Voids, cm^3		283.62	275.24
Void Ratio		0.79	0.76
% Saturation		100.0	100.0

WATER CONTENT DETERMINATION

	(initial)	(final)
Mass of Wet Sample and Tare, g	1257.10	1410.10
Mass of Dry Sample and Tare, g	973.48	1134.90
Mass of Tare, g	0.00	159.20
Moisture, %	29.13	28.21

TEST DATA PRIOR TO LOADING

Volume change (Consolidation), ml	-6.0
Machine Speed, in / min	0.01000
Strain Rate, % / min	0.17
Chamber Pressure, psi	100.0
Back Pressure, psi	80.0
Eff. Consol. Stress,(Minor pr. stress, σ_3),psi	20.0
Change in Height, in	-0.050
"B" Value	0.95
t_{50}, min	-

SHEAR DATA

Deformation Stage 3 (inch)	Total Deformation ST.1 + ST.2 + ST.3 (inch)	Axial Load (lb)	Pore-Water Pressure, psi		Strain Stage 3 %	Corrected Area (in^2)	Deviator Stress ($\Delta\sigma=\sigma_1-\sigma_3$) (psi)	Major Principal Stress, psi		Effective Stress Ratio σ'_1/σ'_3	P' $(\sigma'_1+\sigma'_3)/2$ (psi)	Q $(\sigma_1-\sigma_3)/2$ (psi)	Eff. Minor Pr. Stress σ'_3 (psi)	Total Strain ST.1 + ST.2 + ST.3, %
			Total, U	Change,ΔU				Total σ_1	Eff. σ'_1					
0.000	0.216	20.4	80.0	0.0	0.00	6.72	0.0	20.0	20.0	1.00	20.0	0.0	20.0	3.60
0.005	0.221	77.7	84.7	4.7	0.09	6.73	8.5	28.5	23.8	1.56	19.5	4.3	15.3	3.69
0.010	0.226	100.1	86.5	6.5	0.17	6.74	11.8	31.8	25.3	1.88	19.4	5.9	13.5	3.77
0.015	0.231	115.6	87.3	7.3	0.26	6.74	14.1	34.1	26.8	2.11	19.7	7.1	12.7	3.85
0.020	0.236	128.4	87.8	7.8	0.35	6.75	16.0	36.0	28.2	2.31	20.2	8.0	12.2	3.94
0.025	0.241	139.9	88.2	8.2	0.43	6.75	17.7	37.7	29.5	2.50	20.6	8.8	11.8	4.02
0.030	0.246	150.9	88.5	8.5	0.52	6.76	19.3	39.3	30.8	2.67	21.2	9.7	11.5	4.10
0.035	0.251	161.1	88.5	8.5	0.61	6.77	20.8	40.8	32.3	2.81	21.9	10.4	11.5	4.19
0.040	0.256	170.8	88.7	8.7	0.69	6.77	22.2	42.2	33.5	2.96	22.4	11.1	11.3	4.27
0.050	0.266	187.1	88.8	8.8	0.87	6.78	24.6	44.6	35.8	3.19	23.5	12.3	11.2	4.44
0.075	0.291	220.7	88.9	8.9	1.30	6.81	29.4	49.4	40.5	3.64	25.8	14.7	11.1	4.85
0.100	0.316	237.5	88.7	8.7	1.73	6.84	31.7	51.7	43.0	3.81	27.2	15.9	11.3	5.27
0.150	0.366	260.7	88.0	8.0	2.60	6.90	34.8	54.8	46.8	3.90	29.4	17.4	12.0	6.11
0.200	0.416	278.9	87.3	7.3	3.46	6.97	37.1	57.1	49.9	3.91	31.3	18.6	12.8	6.94
0.250	0.466	296.1	86.5	6.5	4.33	7.03	39.2	59.2	52.7	3.91	33.1	19.6	13.5	7.77
0.300	0.516	310.9	85.9	5.9	5.19	7.09	41.0	61.0	55.1	3.90	34.6	20.5	14.1	8.61
0.350	0.566	325.4	85.2	5.2	6.06	7.16	42.6	62.6	57.4	3.89	36.1	21.3	14.8	9.44
0.400	0.616	338.8	84.7	4.7	6.92	7.22	44.1	64.1	59.4	3.87	37.4	22.0	15.4	10.28
0.450	0.666	351.6	84.1	4.1	7.79	7.29	45.4	65.4	61.3	3.86	38.6	22.7	15.9	11.11
0.500	0.716	363.4	83.6	3.6	8.65	7.36	46.6	66.6	63.0	3.84	39.7	23.3	16.4	11.95
0.550	0.766	375.2	83.1	3.1	9.52	7.43	47.7	67.7	64.7	3.82	40.8	23.9	16.9	12.78
0.600	0.816	386.2	82.6	2.6	10.38	7.50	48.8	68.8	66.2	3.80	41.8	24.4	17.4	13.61
0.700	0.916	407.1	81.7	1.7	12.11	7.65	50.5	70.5	68.9	3.75	43.6	25.3	18.4	15.28
Values @ Failure				7.3	3.46	6.97	37.1	57.1	49.9	3.91	31.3	18.6	12.8	6.94

Failure criteria used* 3

*Note: "1" = Max Deviator Stress; "2" = Deviator Stress @ 15% Strain; "3" = Max Eff.Stress Ratio(σ'_1/σ'_3)

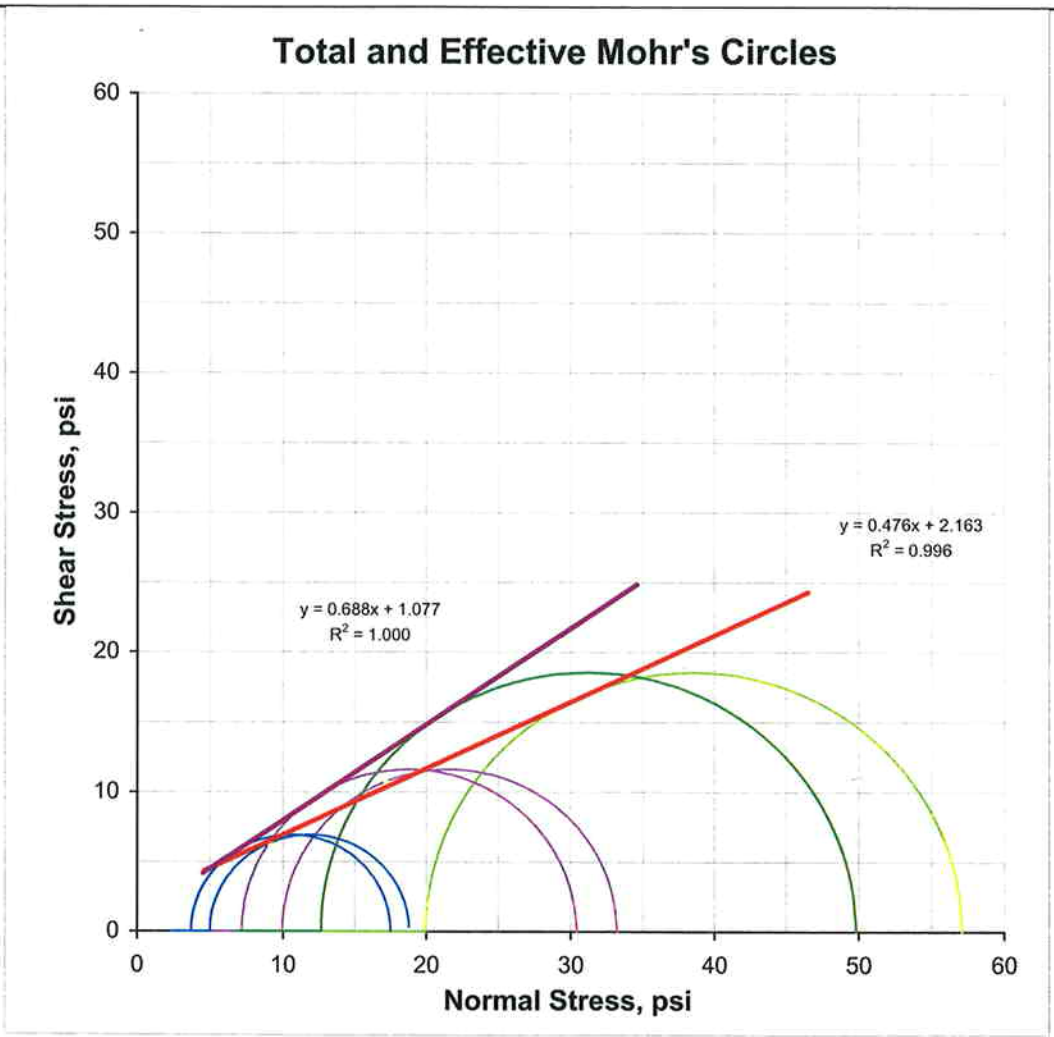
Multistage Triaxial CU.xls [Stage 3], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com	Tested By	LB
		Date	10/15/11
		Check	LB

ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703 /UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-



	ST. 1	ST. 2	ST. 3
Effective Consolidation Stress, psi	5.0	10.0	20.0
Deviator Stress at Failure, psi	13.8	23.2	37.1
Effective Minor Principal Stress at Failure, psi	3.7	7.2	12.8
Effective Major Principal Stress at Failure, psi	17.5	30.4	49.9
Axial Strain at Failure, %	2.50	1.71	3.46

STRENGTH PARAMETERS			
Total		Effective	
ϕ °	25.5	ϕ' °	34.5
C, psi	2.2	C', psi	1.1

Multistage Triaxial CU.xls [Mohr's Circles], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC

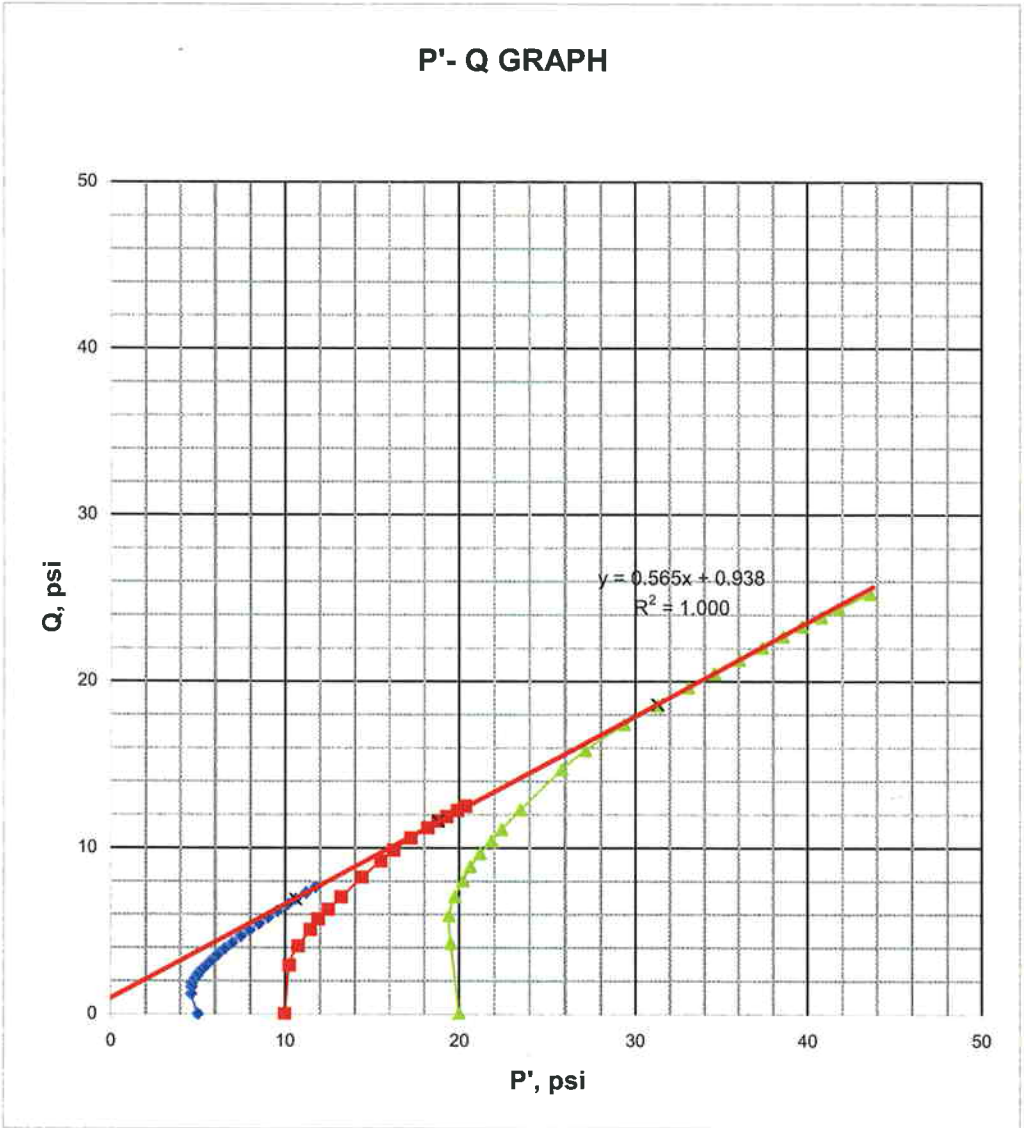
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com

Tech	LB
Date	10/15/11
Check	LB

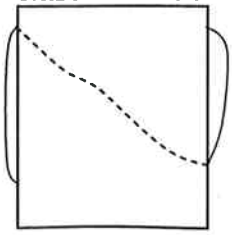
ASTM D 4767M / AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703 /UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-



FAILURE SKETCH



a, psi	0.9
α, degree	29.5

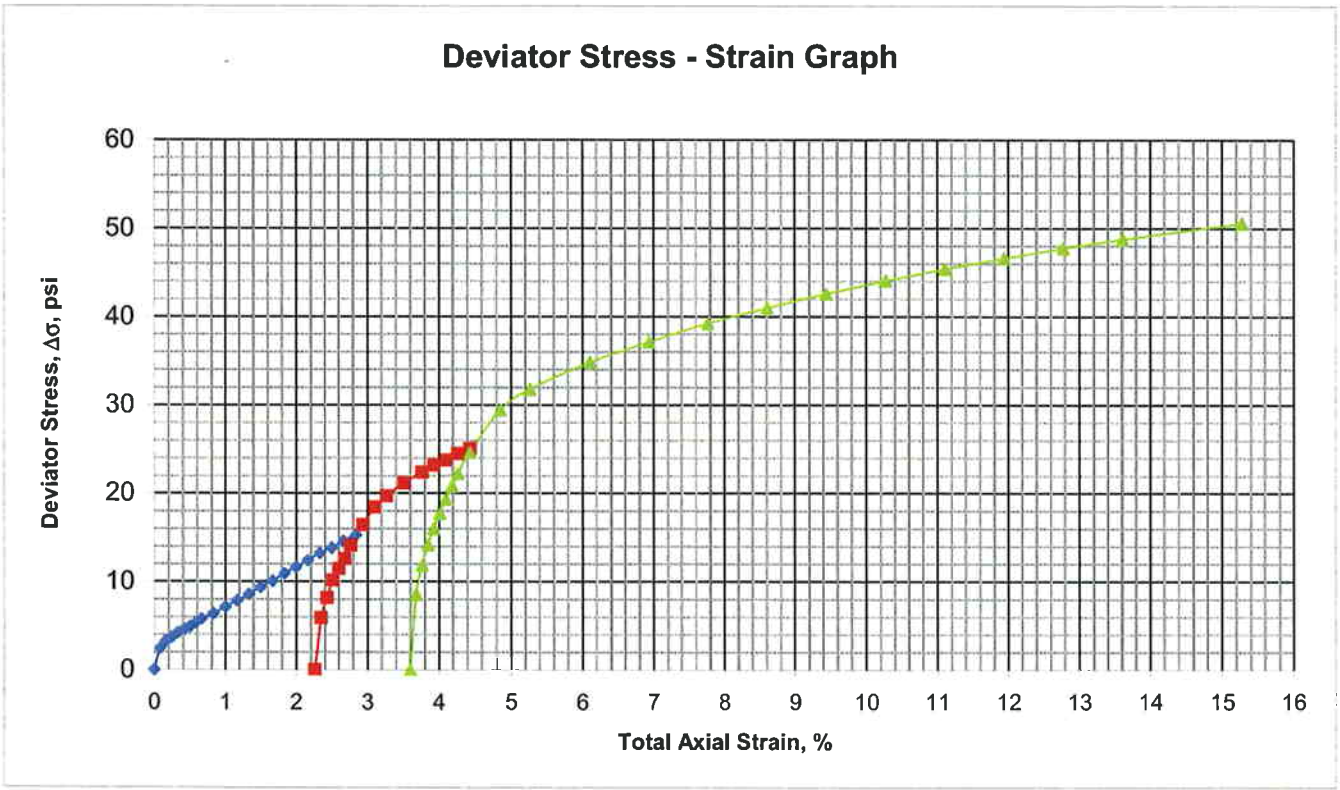
Multistage Triaxial CU.xls [P'-Q Graph], REV. 1; 10-21-05

TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com		Tested By: LB Date: 10/15/11 Check: LB

ASTM D 4767M/ AASHTO T 297M

Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703 /UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-



		REMARKS	DESCRIPTION
Balance ID Number	1/6/7	Portion of sample used for testing located 0.5" above bottom of shelby tube.Sample was remolded to 99.8% of initial (as-received) dry density at Moisture Content above natural (sufficient for remolding @ cohesion condition)	Gray (Micaceous) Well Graded Sand with Silt
Oven ID Number	12/13/14		
Deformation Indicator ID #	103-109		
Digital Caliper ID #	16/17		
Load Cell ID #	11		
Apparatus ID #	10		

NOTES:
1. Method for Saturation
2. Method for determination of cross-sectional area after consol.
3. Final moisture content (Stage 3) obtained from entire sample

WET	
B	

LL	-
PL	-
PI	-
Gs	-

USCS (ASTM D2487: D2488)
SW-SM

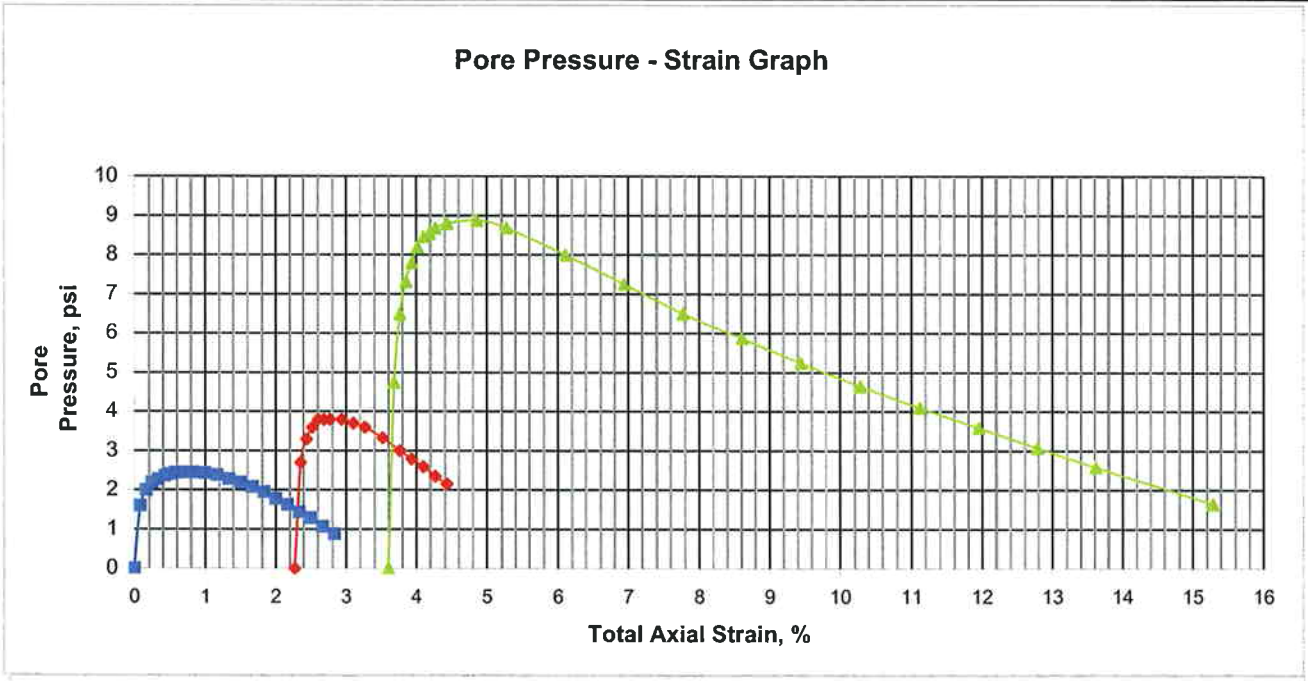
Multistage Triaxial CU.xls [Stress Strain Graph], REV. 1; 10-21-05

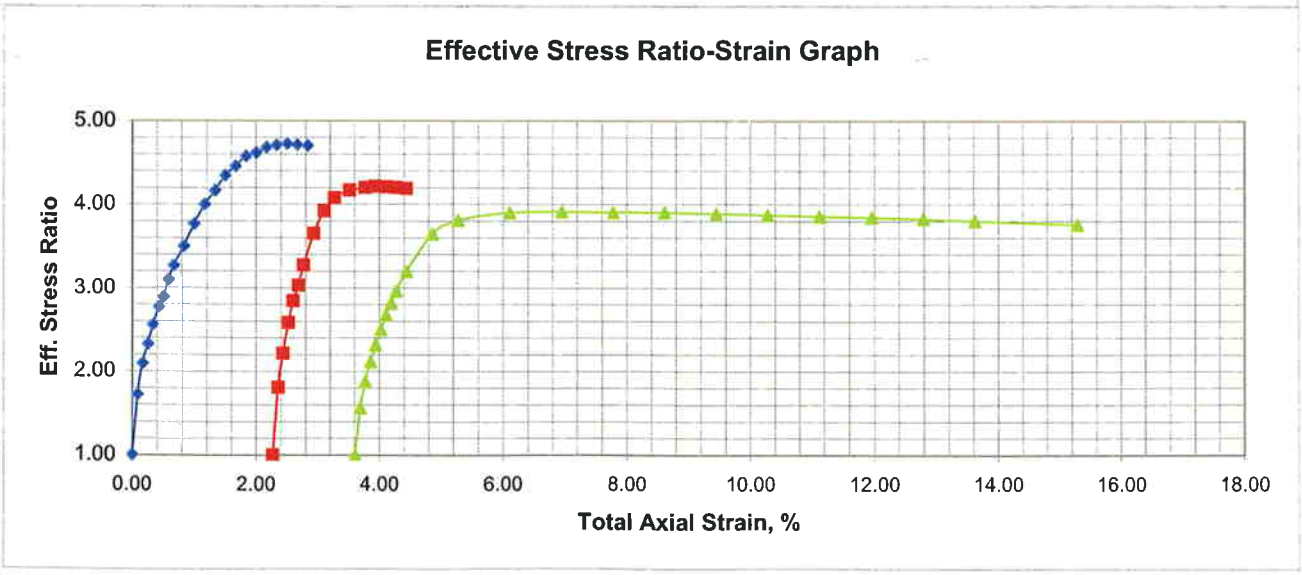
TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com	Tested By	LB
		Date	10/15/11
		Check	LB

ASTM D 4767M / AASHTO T 297M

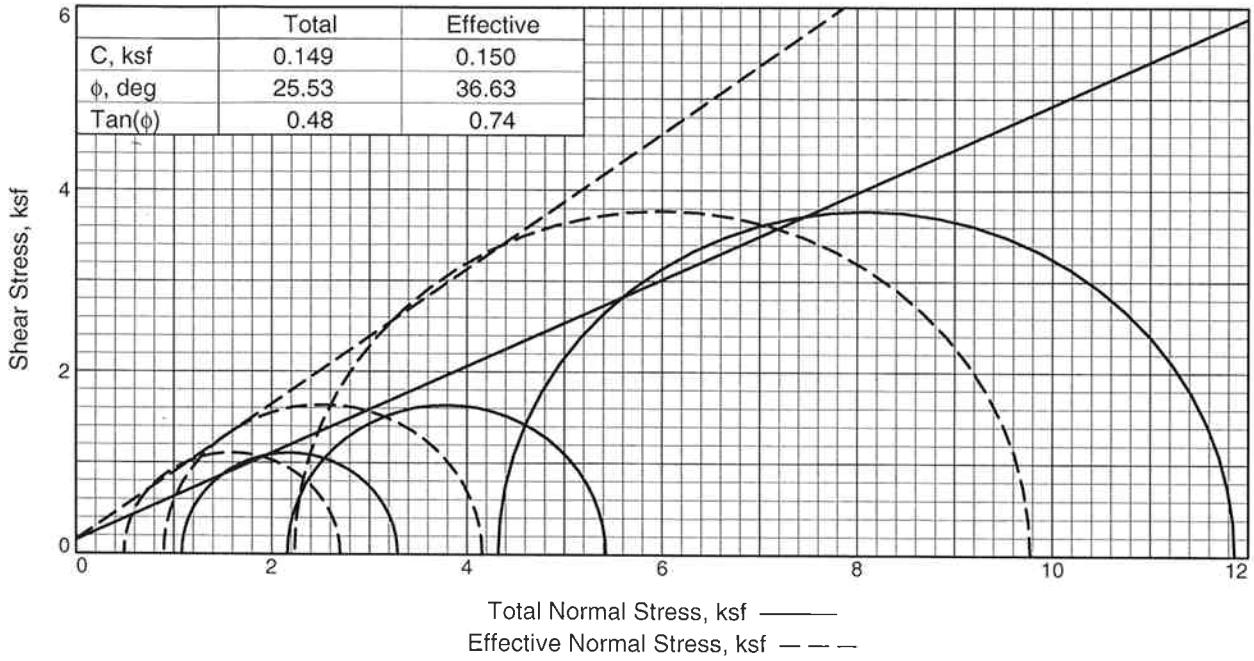
Standard Test Method for Multistage Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Pr. #	20112530.01	Lab. PR. #	1129-01-1
Pr. Name	Morgan Falls	S. Type	UD
Sample ID	12703 /UD-2 144+00L	Depth/Elev.	11.5'-13.5'
Location	-	Add. Info	-

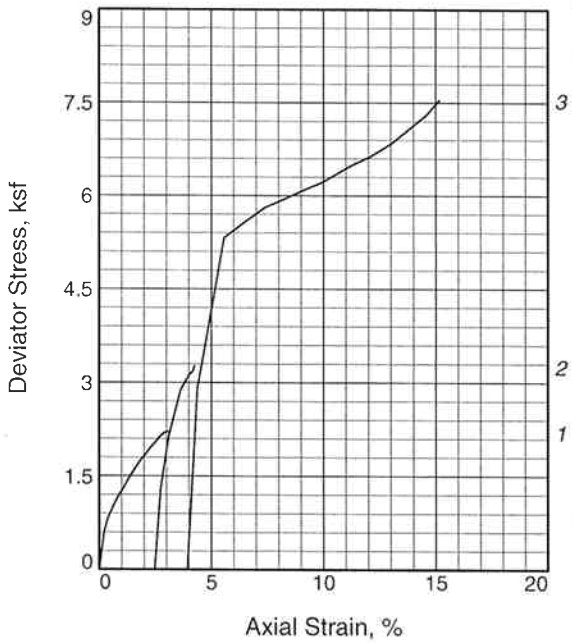




Multistage Triaxial CU.xls [Stress Ratio & Pore Water Pr.-Strain Graph], REV. 1; 10-21-05



	Total	Effective
C, ksf	0.149	0.150
ϕ, deg	25.53	36.63
Tan(ϕ)	0.48	0.74



Sample No.		1	2	3
Initial	Water Content, %	8.2	8.4	8.4
	Dry Density, pcf	121.4	121.1	121.1
	Saturation, %	56.6	57.9	57.8
	Void Ratio	0.3888	0.3922	0.3919
	Diameter, in.	2.870	2.870	2.870
	Height, in.	5.600	5.600	5.600
At Test	Water Content, %	14.2	12.0	11.7
	Dry Density, pcf	121.9	127.3	128.0
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.3822	0.3243	0.3168
	Diameter, in.	2.865	2.822	2.817
	Height, in.	5.591	5.508	5.498
Strain rate, in./min.		0.008	0.008	0.008
Eff. Cell Pressure, psi		7.500	15.000	30.000
Fail. Stress, ksf		2.210	3.264	7.541
Total Pore Pr., ksf		10.670	11.347	12.168
Strain, %		3.1	4.2	15.2
Ult. Stress, ksf		2.210	3.264	7.541
Total Pore Pr., ksf		10.670	11.347	12.168
Strain, %		3.1	4.2	15.2
$\bar{\sigma}_1$ Failure, ksf		2.699	4.157	9.773
$\bar{\sigma}_3$ Failure, ksf		0.490	0.893	2.232

Type of Test:
CU with Pore Pressures

Sample Type: UD

Description: Sand, trace silt, higly micaceous, red brown and tan

LL= NV **PI=** NP

Assumed Specific Gravity= 2.7

Remarks:

Client: City of Sandy Springs

Project: Morgan Falls Road Improvements

Location: 148+45L

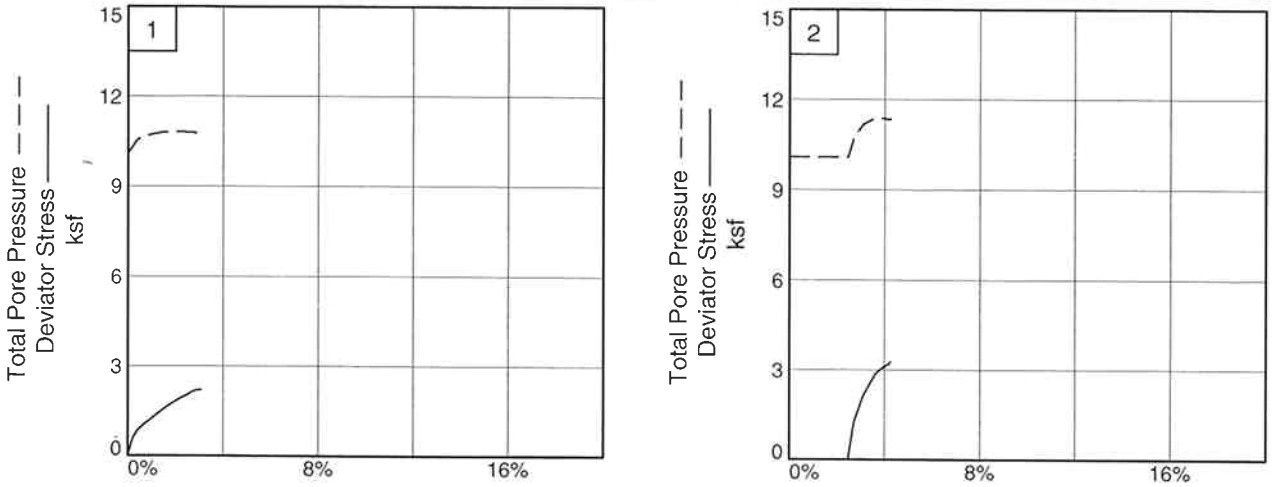
Sample Number: UD 3 **Depth:** 10-12 ft.

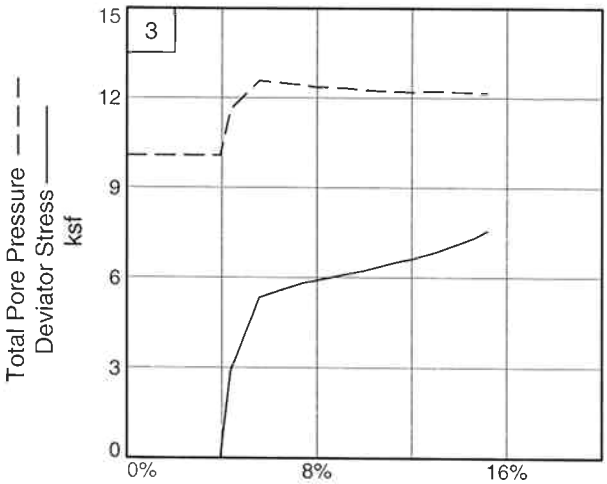
Proj. No.: 2011253001 **Date Sampled:** 10/20/11

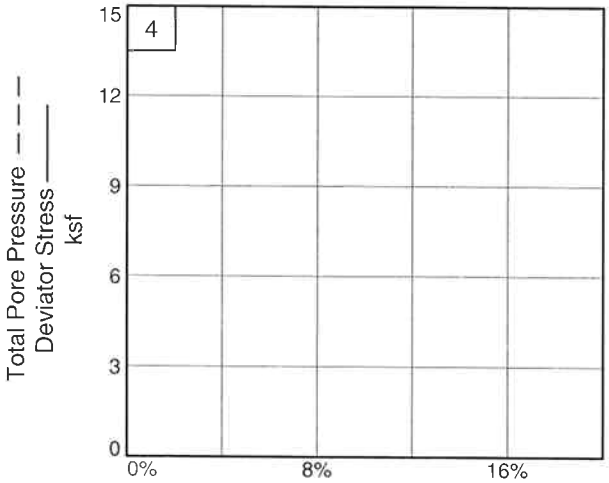
TRIAXIAL SHEAR TEST REPORT

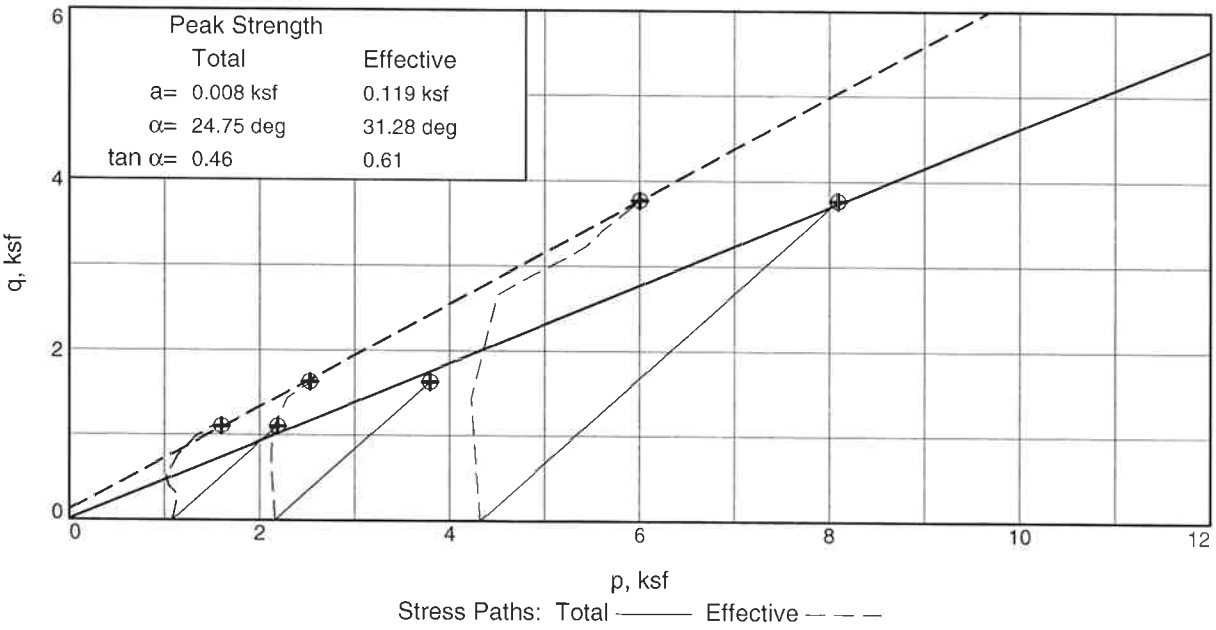
United Consulting

Figure _____



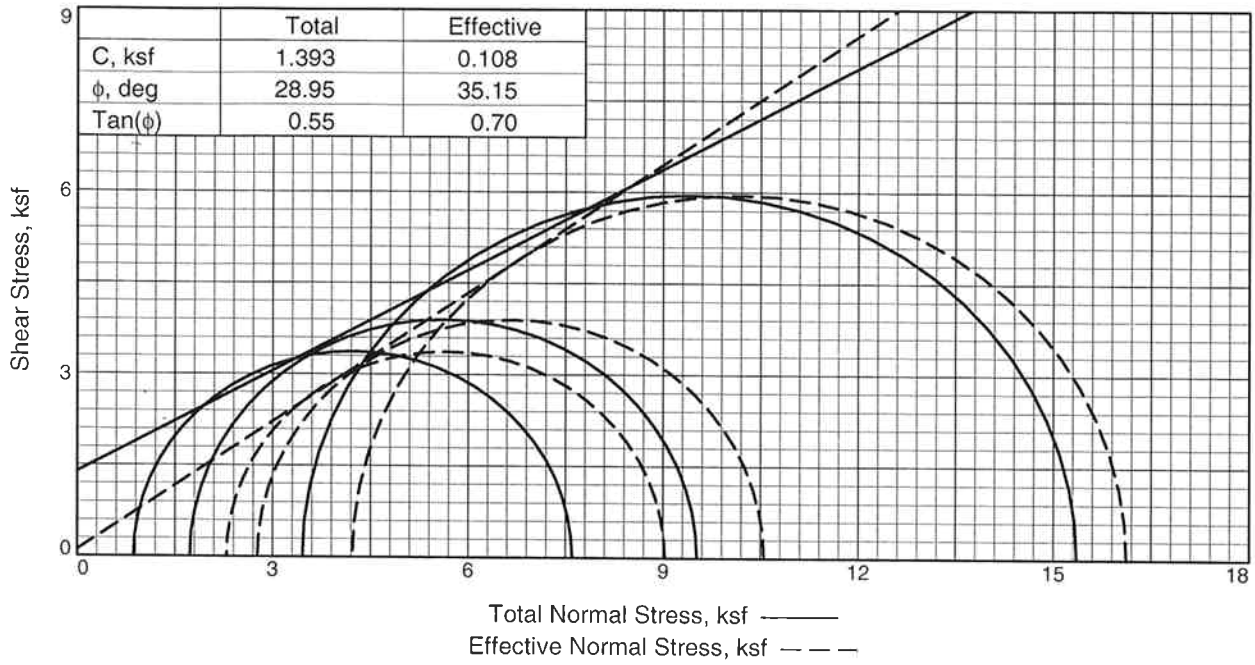




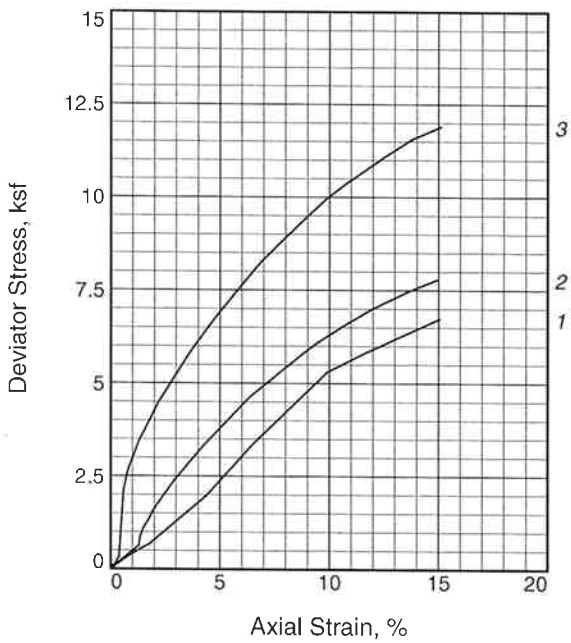


Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Location: 148+45L **Depth:** 10-12 ft. **Sample Number:** UD 3
Project No.: 2011253001 **Figure** _____

United Consulting



	Total	Effective
C, ksf	1.393	0.108
ϕ, deg	28.95	35.15
Tan(ϕ)	0.55	0.70



Sample No.		1	2	3
Initial	Water Content, %	19.0	19.0	18.9
	Dry Density, pcf	98.7	98.7	98.7
	Saturation, %	72.5	72.5	72.3
	Void Ratio	0.7077	0.7077	0.7077
	Diameter, in.	2.870	2.870	2.870
	Height, in.	6.000	6.000	6.000
At Test	Water Content, %	24.5	24.0	22.9
	Dry Density, pcf	101.4	102.3	104.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6627	0.6484	0.6182
	Diameter, in.	2.845	2.836	2.819
	Height, in.	5.947	5.930	5.894
Strain rate, in./min.		0.008	0.008	0.008
Back Pressure, psi		70.000	80.000	80.000
Cell Pressure, psi		76.000	92.000	104.000
Fail. Stress, ksf		6.74	7.79	11.90
Total Pore Pr., ksf		8.65	10.48	10.76
Ult. Stress, ksf		6.74	7.79	11.90
Total Pore Pr., ksf		8.65	10.48	10.76
$\bar{\sigma}_1$ Failure, ksf		9.03	10.55	16.12
$\bar{\sigma}_3$ Failure, ksf		2.29	2.76	4.22

Type of Test:
CU with Pore Pressures

Sample Type: Remolded

Description: Sand, some silt, trace clay, micaceous, brown

LL= NV **PI=** NP

Assumed Specific Gravity= 2.7

Remarks:

Client: City of Sandy Springs

Project: Morgan Falls Road Improvements

Location: 126+64 L

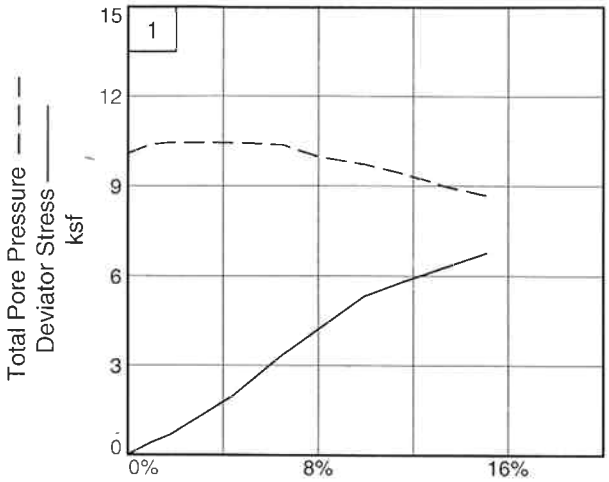
Sample Number: Bulk 1 **Depth:** 12-22 ft.

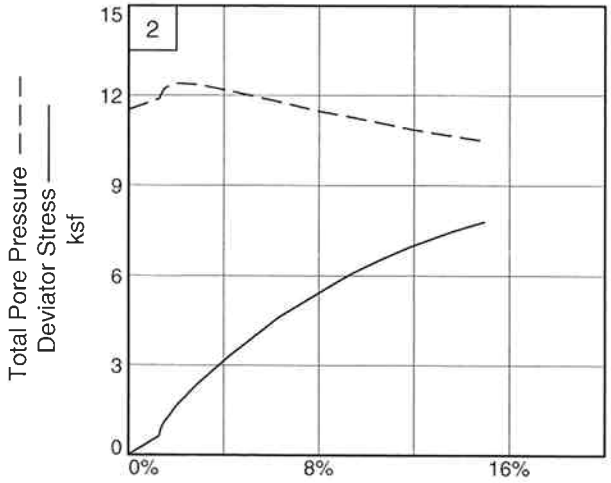
Proj. No.: 2011253001 **Date Sampled:** 10/11/2011

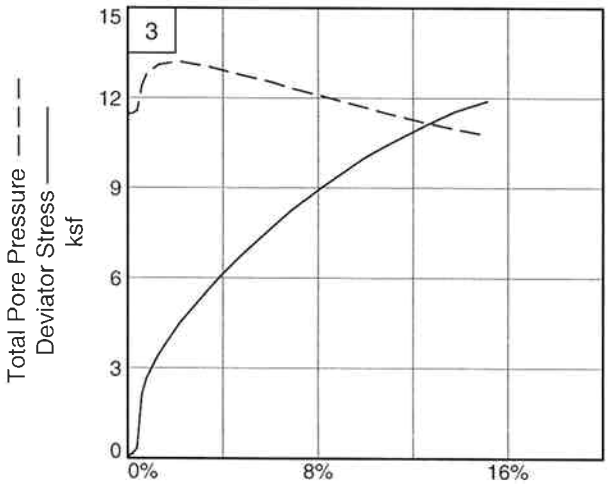
TRIAXIAL SHEAR TEST REPORT

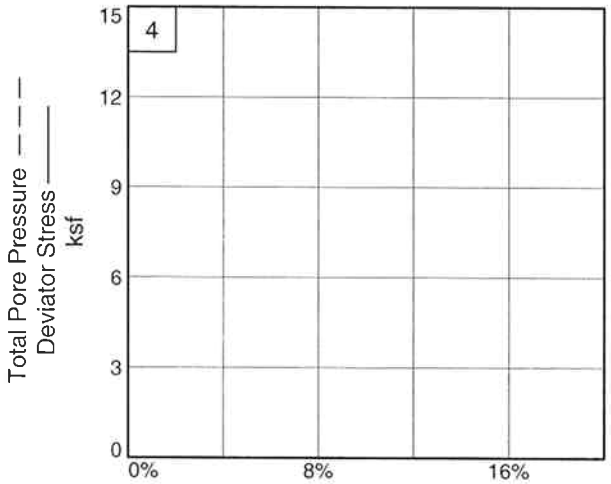
United Consulting

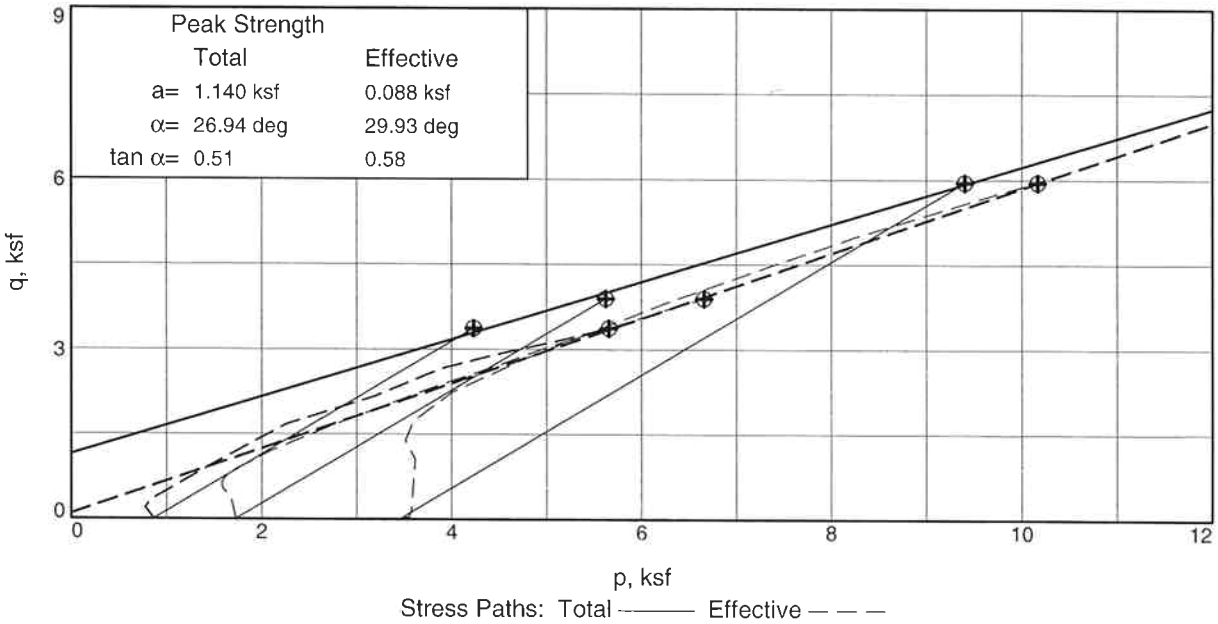
Figure _____











Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Location: 126+64 L **Depth:** 12-22 ft. **Sample Number:** Bulk 1
Project No.: 2011253001 **Figure** _____

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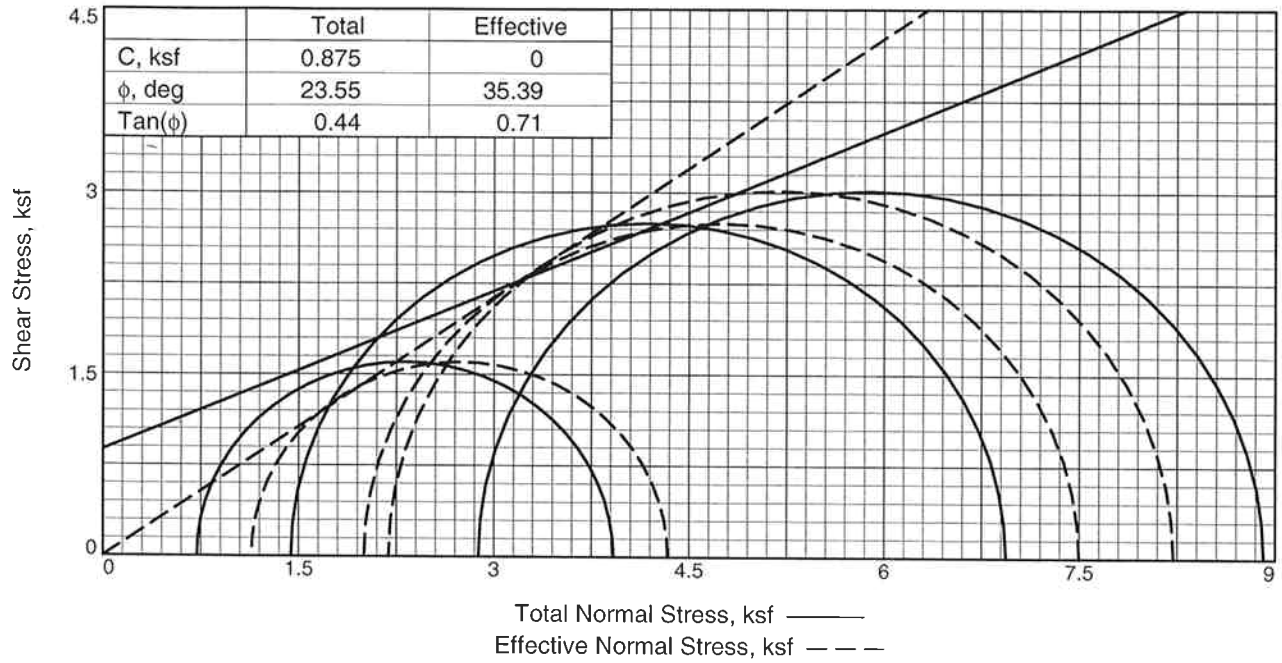
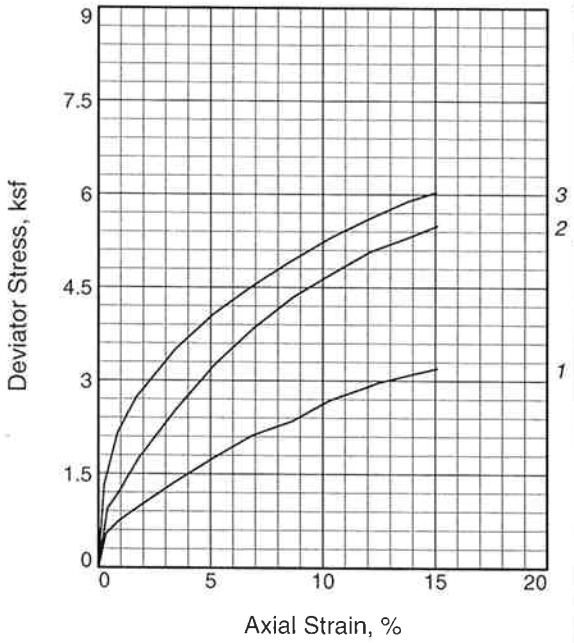


	Total	Effective
C, ksf	0.875	0
ϕ, deg	23.55	35.39
Tan(ϕ)	0.44	0.71



Sample No.		1	2	3
Initial	Water Content, %	18.0	17.7	18.0
	Dry Density, pcf	97.8	97.8	97.9
	Saturation, %	67.3	66.2	67.1
	Void Ratio	0.7237	0.7232	0.7226
	Diameter, in.	2.870	2.870	2.870
	Height, in.	6.000	6.000	6.000
At Test	Water Content, %	25.5	24.6	24.3
	Dry Density, pcf	99.8	101.3	101.8
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.6885	0.6642	0.6551
	Diameter, in.	2.850	2.837	2.832
	Height, in.	5.959	5.931	5.921
Strain rate, in./min.		0.008	0.008	0.008
Eff. Cell Pressure, psi		5.000	10.000	20.000
Fail. Stress, ksf		3.198	5.495	6.032
Total Pore Pr., ksf		10.382	12.398	15.091
Strain, %		15.1	15.1	15.0
Ult. Stress, ksf		3.198	5.495	6.032
Total Pore Pr., ksf		10.382	12.398	15.091
Strain, %		15.1	15.1	15.0
$\bar{\sigma}_1$ Failure, ksf		4.336	7.496	8.221
$\bar{\sigma}_3$ Failure, ksf		1.138	2.002	2.189

Type of Test:
CU with Pore Pressures

Sample Type: Remolded

Description: Sand, some silt, trace clay, micaceous, brown

LL= NV **PI=** NP

Assumed Specific Gravity= 2.7

Remarks:

Client: City of Sandy Springs

Project: Morgan Falls Road Improvements

Location: 144+00 L

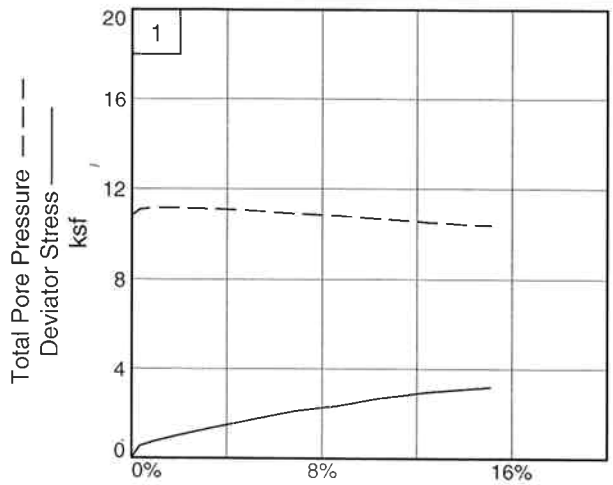
Sample Number: Bulk 2 **Depth:** 6-13 ft.

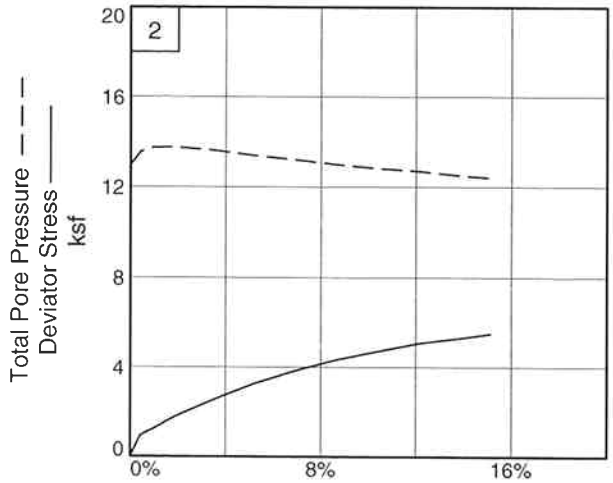
Proj. No.: 2011253001 **Date Sampled:** 10/11/2011

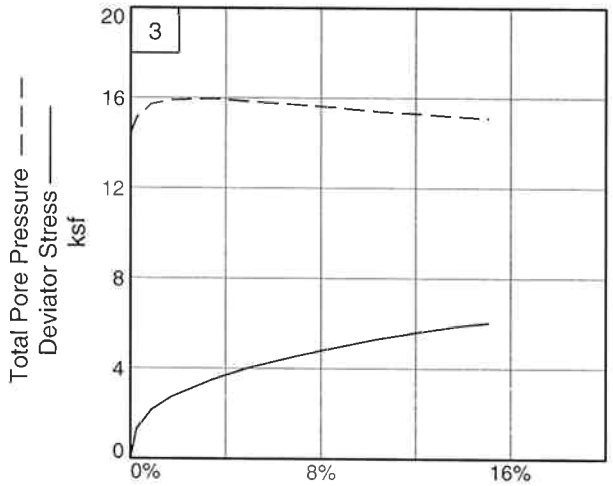
TRIAXIAL SHEAR TEST REPORT

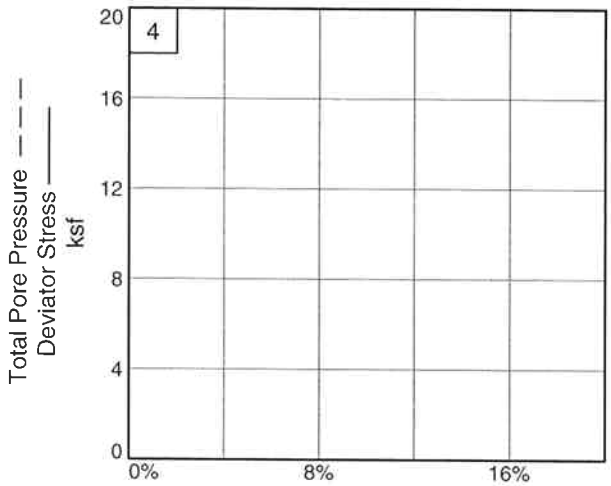
United Consulting

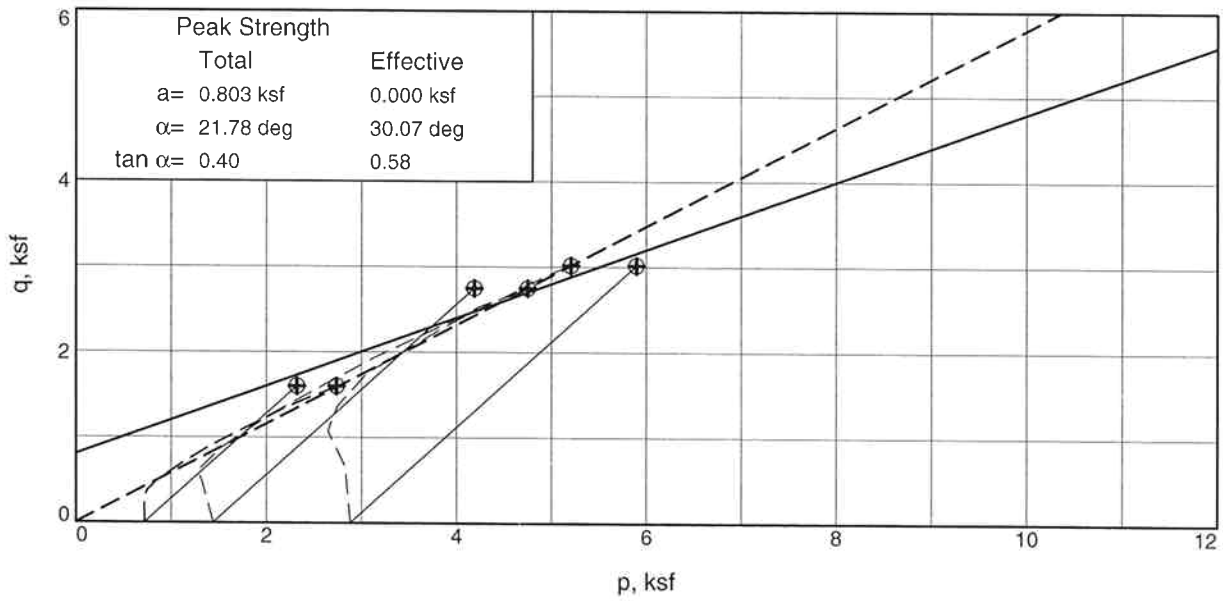
Figure _____











Stress Paths: Total ——— Effective — — —

Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Location: 144+00 L **Depth:** 6-13 ft. **Sample Number:** Bulk 2
Project No.: 2011253001 **Figure** _____

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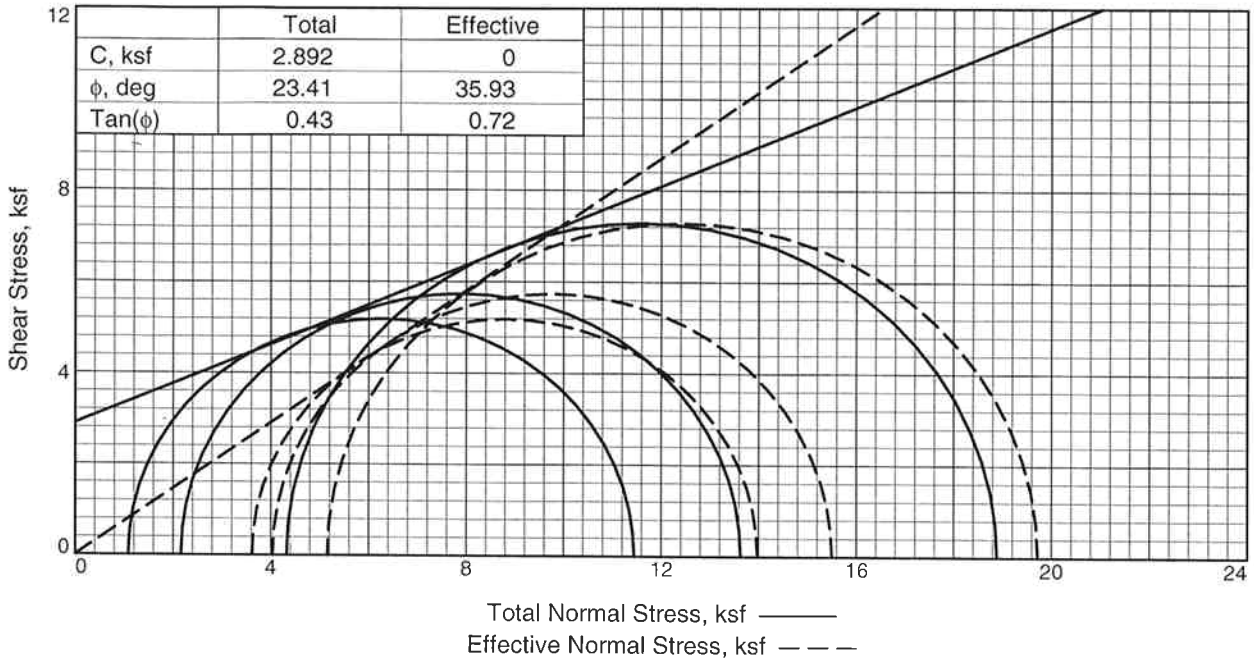
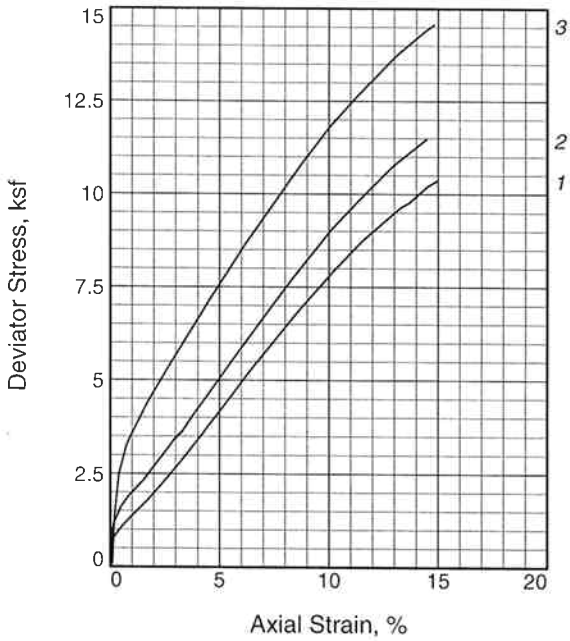


	Total	Effective
C, ksf	2.892	0
ϕ, deg	23.41	35.93
Tan(ϕ)	0.43	0.72



Sample No.		1	2	3
Initial	Water Content, %	19.1	19.1	19.1
	Dry Density, pcf	101.4	101.4	101.4
	Saturation, %	77.9	77.9	77.9
	Void Ratio	0.6623	0.6623	0.6623
	Diameter, in.	2.870	2.870	2.870
	Height, in.	6.000	6.000	6.000
At Test	Water Content, %	22.2	21.8	18.6
	Dry Density, pcf	105.4	106.1	112.3
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5997	0.5891	0.5014
	Diameter, in.	2.833	2.827	2.774
	Height, in.	5.924	5.911	5.802
Strain rate, in./min.		0.008	0.008	0.008
Back Pressure, psi		70.000	75.000	75.000
Cell Pressure, psi		77.500	90.000	105.000
Fail. Stress, ksf		10.36	11.47	14.56
Total Pore Pr., ksf		7.55	8.93	9.96
Ult. Stress, ksf		10.36	11.47	14.56
Total Pore Pr., ksf		7.55	8.93	9.96
$\bar{\sigma}_1$ Failure, ksf		13.98	15.50	19.72
$\bar{\sigma}_3$ Failure, ksf		3.61	4.03	5.16

Type of Test:
CU with Pore Pressures

Sample Type: Remolded

Description: Sand, some silt, trace clay, micaceous, reddish brown

LL= NV **PI=** NP

Assumed Specific Gravity= 2.7

Remarks:

Client: City of Sandy Springs

Project: Morgan Falls Road Improvements

Location: 148+45L and 148+15L Composite

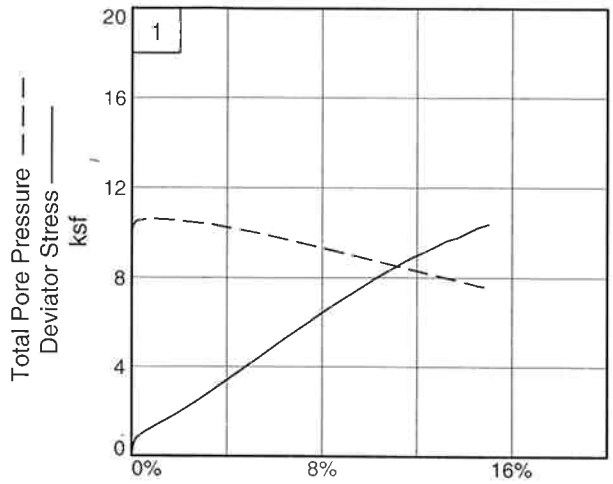
Sample Number: Bulk 3

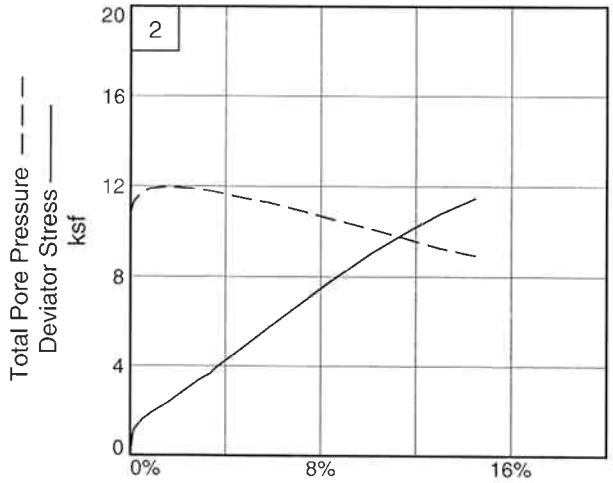
Proj. No.: 2011253001 **Date Sampled:** 10/11/2011

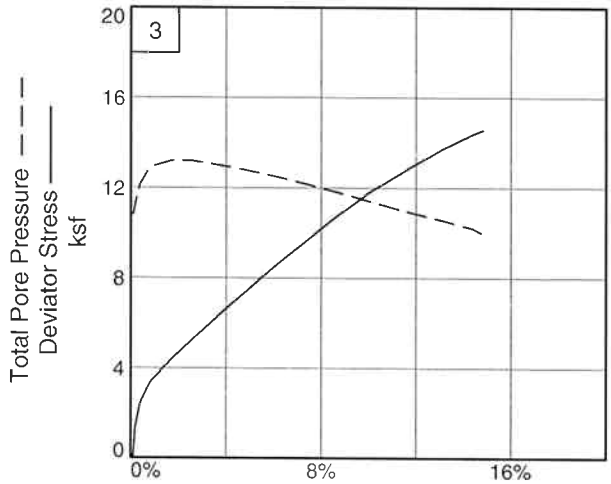
TRIAXIAL SHEAR TEST REPORT

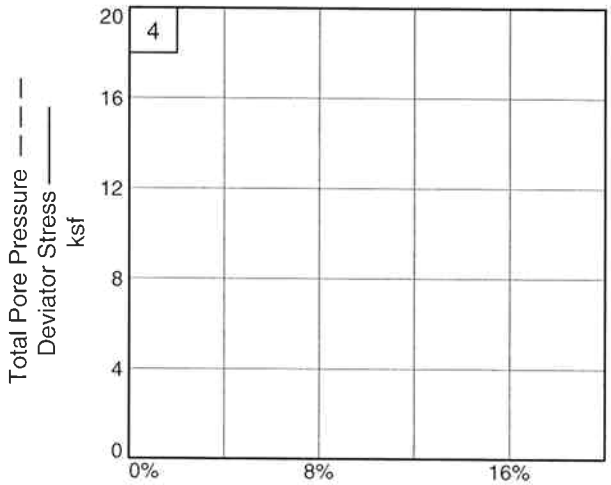
United Consulting

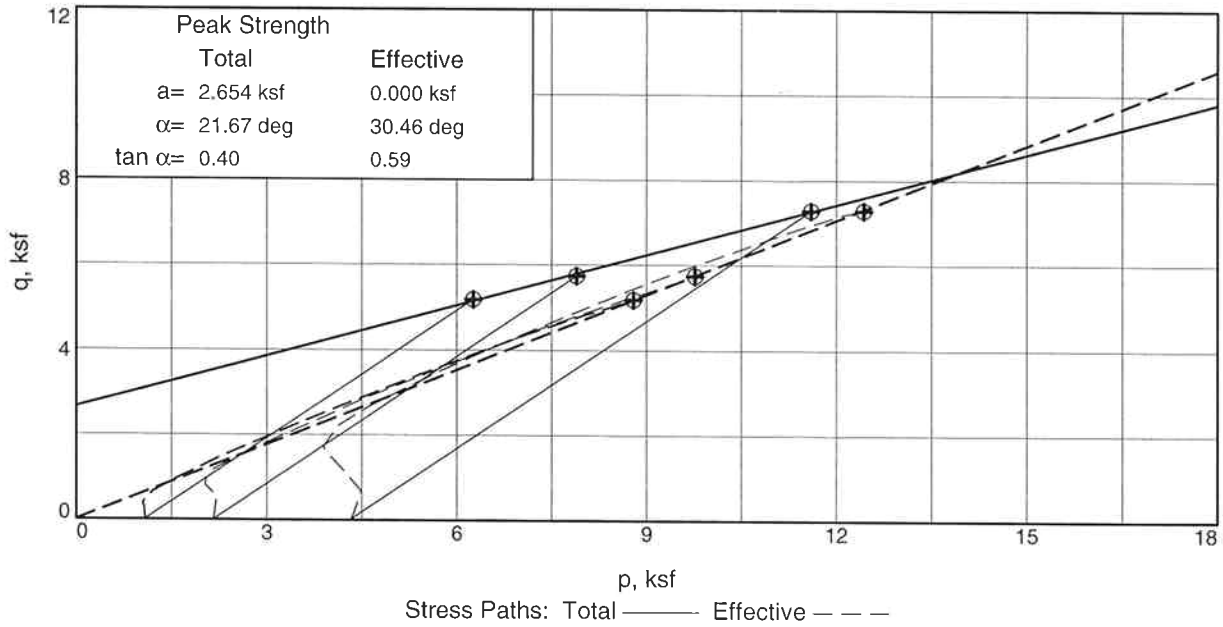
Figure _____











Client: City of Sandy Springs
Project: Morgan Falls Road Improvements
Location: 148+45L and 148+15L Composite
Sample Number: Bulk 3
Project No.: 2011253001
Figure _____

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LABORATORY TESTING PROCEDURES

Moisture Content

The moisture content was determined for selected soil samples. A representative portion of each sample was weighed and then placed in an oven and dried at 110 degree Centigrade for at least 15 to 16 hours. After removal from the oven, the soil was again weighed. The weight of the moisture lost during drying thus was determined. From this data, the moisture content of the sample was then calculated as the weight of moisture divided by dry weight of the soil, expressed as a percentage. This test was conducted according to ASTM D 2216. Moisture content is a useful index of a soil's compressibility. If the soil is to be used as fill, the moisture content may be compared to the range of water content for which proper compaction may be achieved. The moisture content results are indicated on the boring logs attached and on the table 1.

Grain Size (Sieve) Analysis with or without Hydrometer

Grain Size Analysis tests were performed to determine the particle size distribution of selected samples tested. The grain size distribution of soils coarser than a number 200 sieve was determined by passing the samples through a standard set of nested sieves. Materials finer than the number 200 sieve were suspended in water and the grain size distribution computed from the time rate of settlement of the different size particles. Air-dried soil passed through #200 sieve. 50 grams of that must soak in s/c agent for a minimum of 8 hours. Soil is then put in graduated cylinder with a hydrometer. Readings are taken at specified times. A graph is drawn from data. These tests were similar to those described by ASTM D 421 and D 422. The results are included in the Appendix.

Liquid and Plastic Limits (Atterberg Limits)

Liquid Limit and Plastic Limit tests aid in the classification of the soils and provide an indication of the soil behavior with moisture change. The Plasticity Index is calculated by subtracting the Plastic Limit (PL) from the Liquid Limit (LL). The Liquid Limit is the moisture content at which the soil will flow as a heavy viscous fluid and is the upper limit of the plastic range, as determined in accordance with ASTM D 4318. The Plastic Limit is the moisture content at which the soil begins to lose its plasticity, as determined in accordance with ASTM D 4318. The Liquidity Index is the ratio of the difference between the in-place moisture and the plastic limit to the Plasticity Limit. Soil is air-dried and pulverized to pass through # 4 sieve prior to running the test. The results are shown on the attached Liquid and Plastic Limits reports in the Appendix.

Undisturbed Sampling

Split-barrel samples and/or auger cuttings are suitable for visual examination and classification tests, but are not sufficiently intact for quantitative laboratory testing. Alternate sample methods are required.

For quantitative laboratory testing, relatively undisturbed samples were obtained by pushing sections of three inch O.D., 16 gauge, steel or brass tubing (Shelby tube) into the soil at the desired sampling levels, as described in ASTM D 1587. Each tube, together with the encased soil, was carefully removed from the ground, made airtight, and transported to the laboratory. Locations and depths of undisturbed samples were recorded on each "Log of Boring".

Triaxial Shear

Three specimens (with minimum of 6-inch long) are prepared from the UD sample. For insufficient recovery, either multistage triaxial shear on one specimen or triaxial shear on smaller length is performed. We have the capability of performing triaxial shear on a 4-inch long sample using some difficult preparation time. After preparation of the specimen, the specimen is encased in a rubber membrane and is placed in the triaxial cell. The specimen is initially saturated using the increasing confining pressures. Once the saturation is obtained, the desired all around confining pressures are applied and the axial load is increased until the specimen fails in shear or in excess of 15% strain is achieved. Pore pressures are measured for CU tests to help determine total and effective stresses during testing. Readings are taken and then plotted in the form of Mohr's circles using the computer program. Method is similar as described in ASTM D 4767.

Soil Compaction (Standard Proctor Test)

This test determines the maximum dry density that could be achieved by using a uniform compactive effort at varying moisture contents. Two primary methods of compaction are used. For standard Proctor, 5.5-lb (2.49-kg) rammer is dropped 12 inches (305-mm) and for modified Proctor, 10-lb (4.54-kg) rammer is dropped 18 inches (457-mm) for compaction on the bulk sample in the cylindrical mold. Compaction is done in 3 and 5 equal layers respectively. The methods are explained in ASTM D 698 and ASTM D 1557, respectively.

APPENDIX C

Site Photographs (20 Photos)
PWR and Rock Photographs (6 Photos)

SITE PHOTOGRAPHS

Looking in increasing station along Wall 2 from Sta. 121+30, 25' Lt

Looking in increasing station along Wall 4 from Sta. 123+50, 25' Lt

Looking in decreasing station along Wall 4B from Sta. 125+75±, 45±' Lt

Looking in increasing station along Wall 4B from Sta. 125+75±, 45±' Lt

Looking in decreasing station along Wall 4 from Sta. 125+25±, 40±' Lt

Looking in decreasing station along Wall 6 from Sta. 135+00, 35' Lt

Looking in decreasing station along Wall 8 from Sta. 137+85, 30' Lt

Looking in increasing station along Wall 9 from Sta. 139+50, 25' Lt

Looking in decreasing station along Wall 9 from Sta. 140+30, 25' Lt

Looking in increasing station along Wall 13 from Sta. 143+00, 25' Lt

Looking in increasing station along Wall 13A from Sta. 148+15, 40' Lt

Looking in decreasing station along Wall 13A from Sta. 148+45, 50' Lt

Looking in decreasing station along Wall 14 from Sta. 147+50, 10' Rt

Looking in increasing station along Wall 1 from Sta. 120+50, 10' Rt

Looking at Wall 1 from Sta. 123+50, 10' Lt

Looking in decreasing station along Wall 1 from Sta. 126+65, 10' Rt

Looking in increasing station along Walls 5 and 5A from Sta. 132+00, 15' Rt

Looking in decreasing station along Wall 5A from Sta. 135+25, 13' Rt

Looking in increasing station along Wall 7 from Sta. 136+50, 13' Rt

Looking in decreasing station along Wall 11 from Sta. 143+35, 12' Rt

PWR AND ROCK ALONG THE ROADWAY SLOPE

Looking at the beginning of PWR along the roadway at Sta. 123+70± Left

Looking at the end of PWR along the roadway at Sta. 123+95±

Looking at the beginning of Rock along the roadway at Sta. 125+50± Left

Looking at the end of Rock along the roadway at Sta. 126+50± Left

Looking at the beginning of Rock along the roadway at Sta. 127+00± Right

Looking at the end of Rock along the roadway at Sta. 129+15± Right