ATTACHMENT 7-I

SOIL ANALYTICAL DATA

- Consolidation Testing
- Hydraulic Conductivity Testing
- Classification, Particle Size, Atterberg Limits & Specific Gravity

Consolidation Testing

Consolidated-Undrained Triaxial Compression

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-24 (40-44)

TRI Log #: E2391-81-06
Test Method: ASTM D4767

Specimens			
Identification	-	-	-
Depth/Elev. (ft)	-	-	-
Eff. Consol. Stress (psi)	10.0	20.0	40.0
Initial Specimen Properties			
Avg. Diameter (in)	1.99	1.98	1.98
Avg. Height (in)	4.57	4.51	4.51
Avg. Water Content (%)	24.8	25.3	24.8
Bulk Density (pcf)	124.4	124.2	126.0
Dry Density (pcf)	99.7	99.1	101.0
Saturation (%)	95.4	96.0	98.5
Void Ratio, n	0.71	0.72	0.69
Specific Gravity (D854)	2.73	2.73	2.73
Total Back-Pressure (psi)	79.5	76.2	79.0
B-Value, End of Saturation	0.96	0.96	0.98

Test Setup	
Specimen Condition	Undisturbed / Intact
Specimen Preparation	Trimmed
Mounting Method	Wet
Consolidation	Isotropic

Post-Consolidation / Pre-Shear			
Void Ratio	0.68	0.68	0.63
Area (in^2)	3.07	3.03	3.01

Shear / Post-Shear			
Avg. Water Content (%)	27.6	26.7	24.3
Rate of Strain (%/hr)	1.00	1.00	1.00

At Failure						
Failure Criterion: Peak Principal Stress	Difference, $(\sigma_1'-\sigma_3')_{max}$			Ratio, $(\sigma_1'/\sigma_3')_{max}$		
Axial Strain at Failure (%), $\varepsilon_{a,f}$	15.0	15.0	5.3	3.1	2.6	4.3
Minor Effective Stress (psi), $\sigma_3'_f$	11.2	21.2	26.7	6.8	12.4	25.8
Principal Stress Difference (psi), $(\sigma_1-\sigma_3)_f$	25.6	41.1	56.8	19.9	30.6	56.1
Pore Water Pressure, Δu_f (psi)	-1.2	-1.4	13.3	3.2	7.5	14.2
Major Effective Stress (psi), $\sigma_1'_f$	36.8	62.3	83.5	26.7	42.9	81.9
Effective Friction Angle (degrees)	29.6			29.2		
Effective Cohesion (psi)	0.8			2.0		

Jeffrey A. Kuhn , Ph.D., P.E., 1/22/2016
Analysis & Quality Review/Date

Laboratory Staff - SOC, LC and Dr. Mark Fountain, Ph.D.

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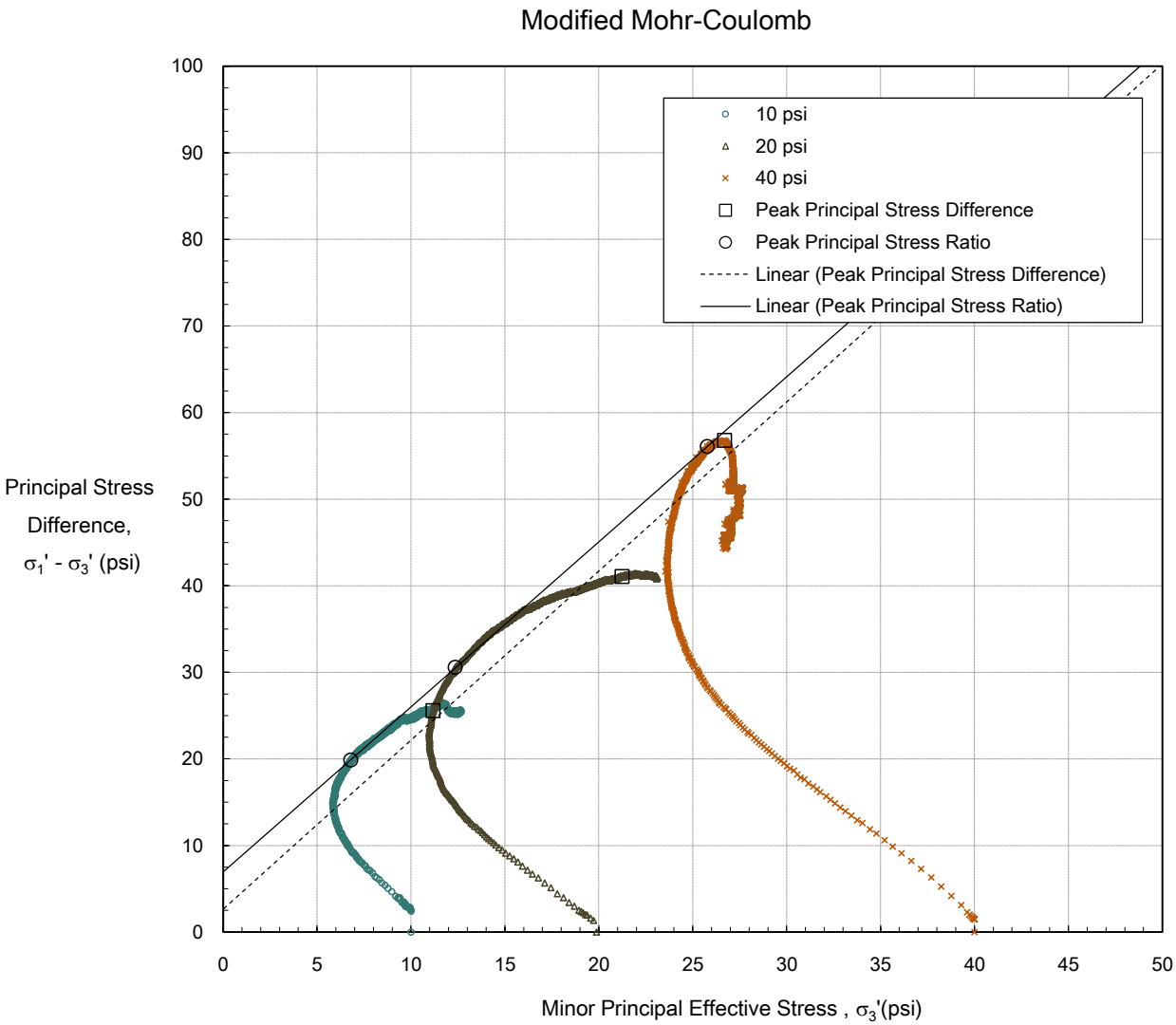
Consolidated-Undrained Triaxial Compression

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-24 (40-44)

TRI Log #: E2391-81-06
Test Method: ASTM D4767



Failure Criterion: Peak Principal Stress	Difference, $(\sigma_1'-\sigma_3')_{max}$	Ratio, $(\sigma_1'/\sigma_3')_{max}$
Effective Friction Angle (deg)	29.6	29.2
Effective Cohesion (psi)	0.8	2.0

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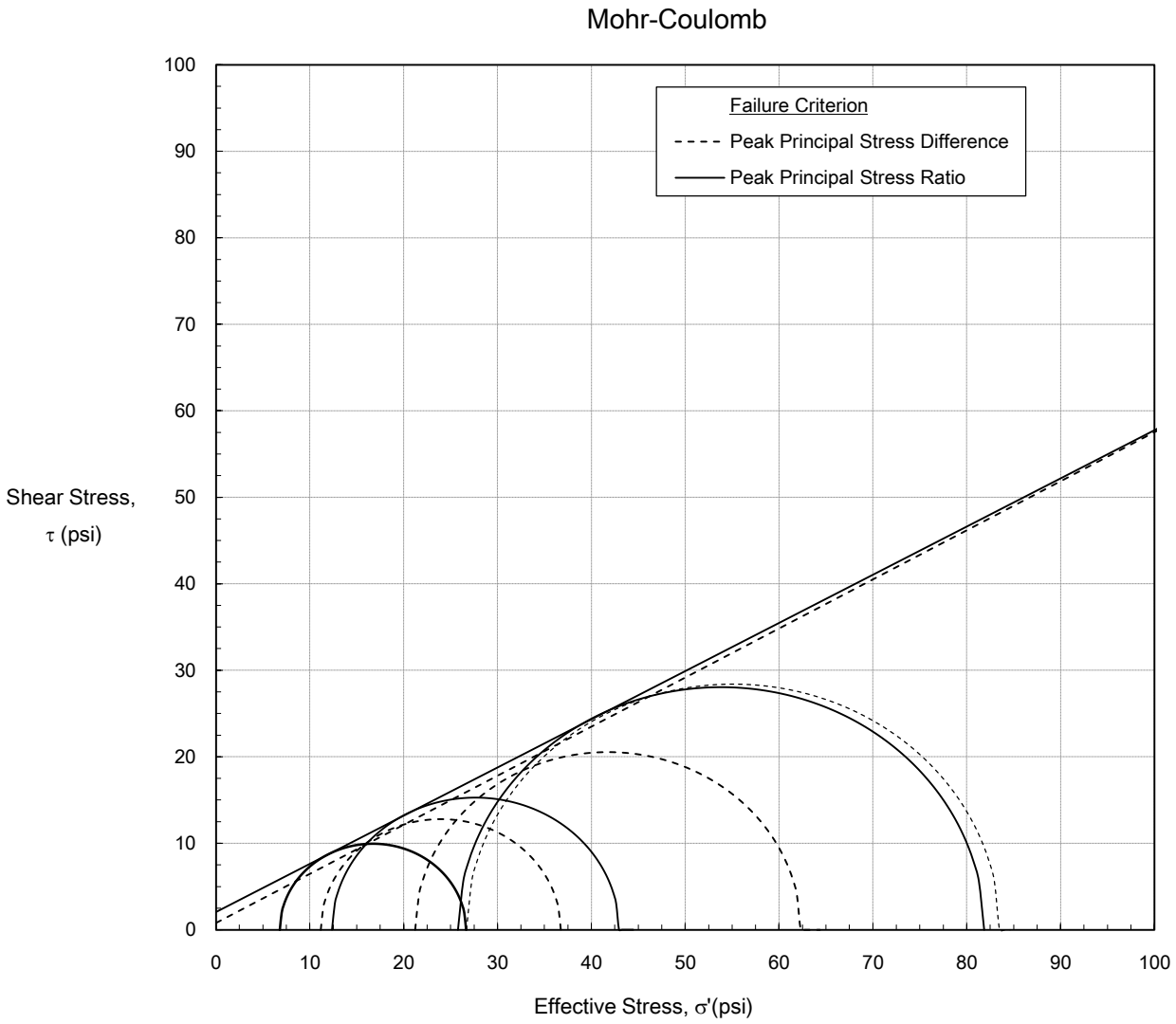

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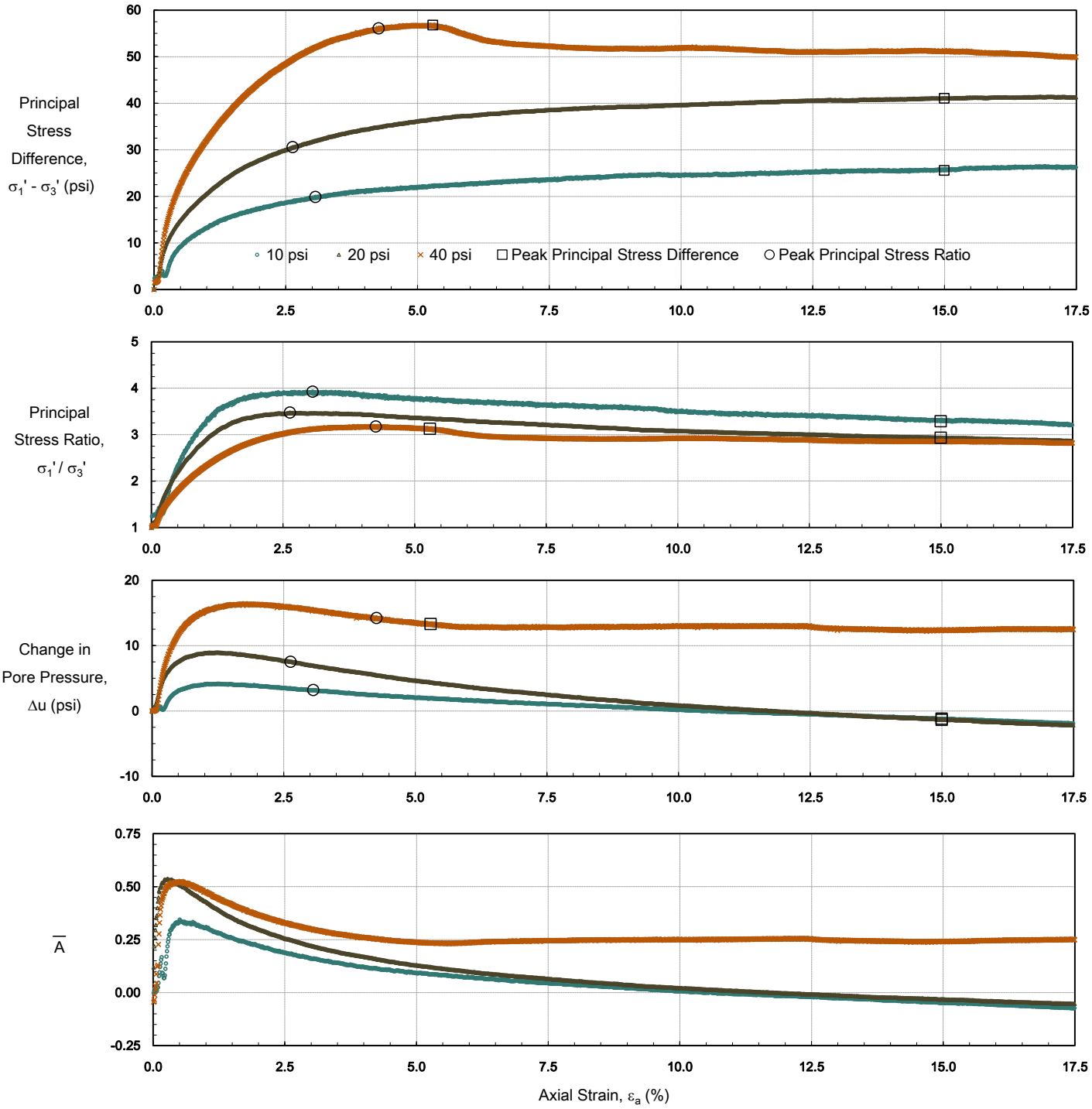

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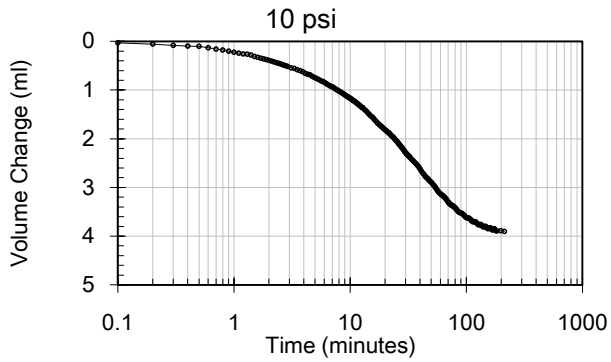
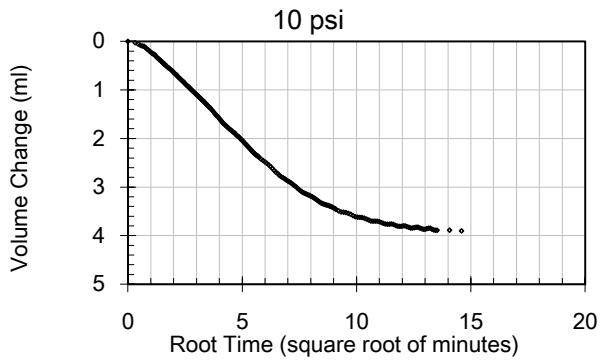
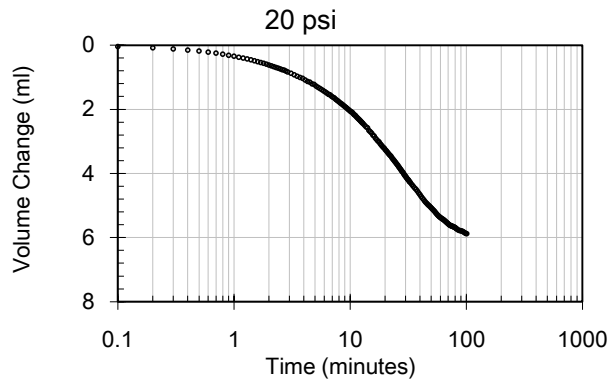
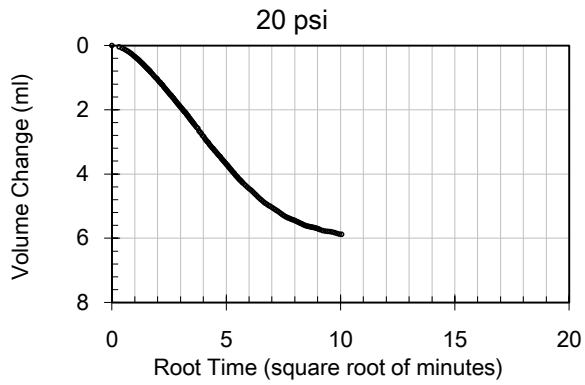
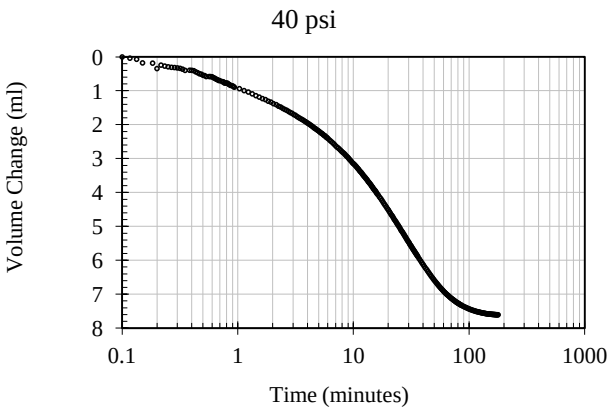
Consolidation

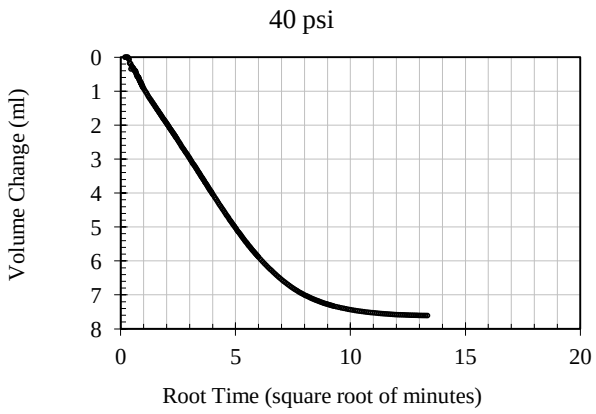












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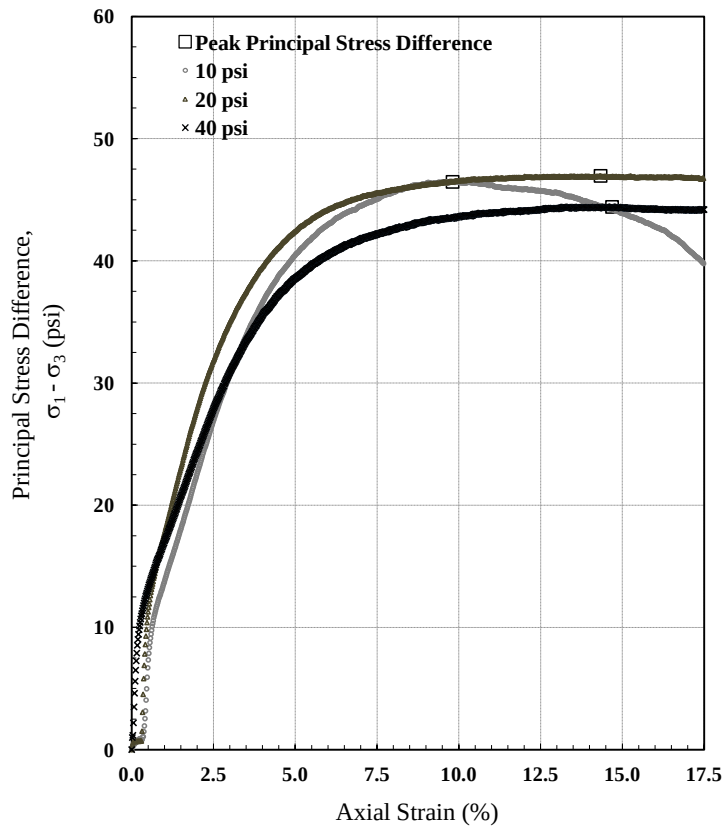
Unconsolidated-Undrained (Q) Triaxial Compression

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-24 (22-24)

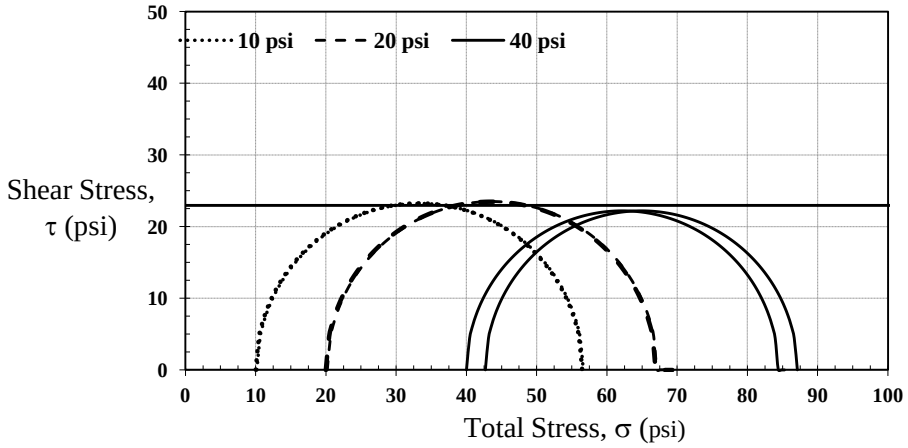
TRI Log #: E2391-81-06
Test Method: ASTM D2850



Samples			
Sample I.D.	-	-	-
Depth/Elev. (ft)	-	-	-
Minor Principal Stress (psi)	10.0	20.0	40.0
Initial Properties			
Avg. Diameter (in)	2.85	2.85	2.85
Avg. Height (in)	5.89	5.89	5.67
Avg. Water Content (%)	22.4	22.8	22.5
Bulk Density (pcf)	129.5	128.4	125.9
Dry Density (pcf)	105.8	104.6	102.7
Saturation (%)	100.0	100.0	100.0
Void Ratio	0.54	0.56	0.59
Specific Gravity (D854)	2.61	2.61	2.61

At Failure			
Failure Criterion	Maximum Deviator Stress		
Rate of Strain (%/hr)	60	60	60
Axial Strain at Failure (%)	9.8	14.3	14.7
Minor Total Stress (psi)	10.0	20.0	40.0
Major Total Stress (psi)	56.5	67.0	84.4
Principal Stress Diff. (psi)	46.5	47.0	44.4

Total Stress Envelope	
Friction Angle (deg)	0.0
Cohesion (psi)	23.0



Jeffrey A. Kuhn , Ph.D., P.E., 1/22/2016
Analysis & Quality Review/Date
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Consolidated-Undrained Triaxial Compression

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-27: (20-22 & 22-24)

TRI Log #: E2391-81-06
Test Method: ASTM D4767

Specimens			
Identification	-	-	-
Depth/Elev. (ft)	-	-	-
Eff. Consol. Stress (psi)	10.0	20.0	40.0
Initial Specimen Properties			
Avg. Diameter (in)	1.99	1.98	1.99
Avg. Height (in)	4.71	4.52	4.54
Avg. Water Content (%)	18.5	18.9	18.9
Bulk Density (pcf)	131.5	130.4	131.8
Dry Density (pcf)	110.9	109.7	110.8
Saturation (%)	96.9	95.7	98.6
Void Ratio, n	0.51	0.53	0.52
Specific Gravity (D854)	2.69	2.69	2.69
Total Back-Pressure (psi)	80.3	80.5	79.4
B-Value, End of Saturation	0.98	0.99	0.98

Test Setup	
Specimen Condition	Undisturbed / Intact
Specimen Preparation	Trimmed
Mounting Method	Wet
Consolidation	Isotropic

Post-Consolidation / Pre-Shear			
Void Ratio	0.51	0.48	0.44
Area (in^2)	3.12	3.01	3.00

Shear / Post-Shear			
Avg. Water Content (%)	21.1	21.6	20.8
Rate of Strain (%/hr)	1.00	1.00	1.00

At Failure						
Failure Criterion: Peak Principal Stress	Difference, $(\sigma_1'-\sigma_3')_{max}$			Ratio, $(\sigma_1'/\sigma_3')_{max}$		
Axial Strain at Failure (%), $\varepsilon_{a,f}$	15.0	15.0	15.0	2.5	3.2	4.9
Minor Effective Stress (psi), $\sigma_3'_f$	24.5	31.8	44.8	7.0	17.4	32.5
Principal Stress Difference (psi), $(\sigma_1-\sigma_3)_f$	50.0	59.7	79.3	24.5	41.6	65.9
Pore Water Pressure, Δu_f (psi)	-14.7	-12.0	-5.0	2.7	2.4	7.3
Major Effective Stress (psi), $\sigma_1'_f$	74.5	91.5	124.1	31.5	59.0	98.4
Effective Friction Angle (degrees)	24.8			26.6		
Effective Cohesion (psi)	4.5			4.1		

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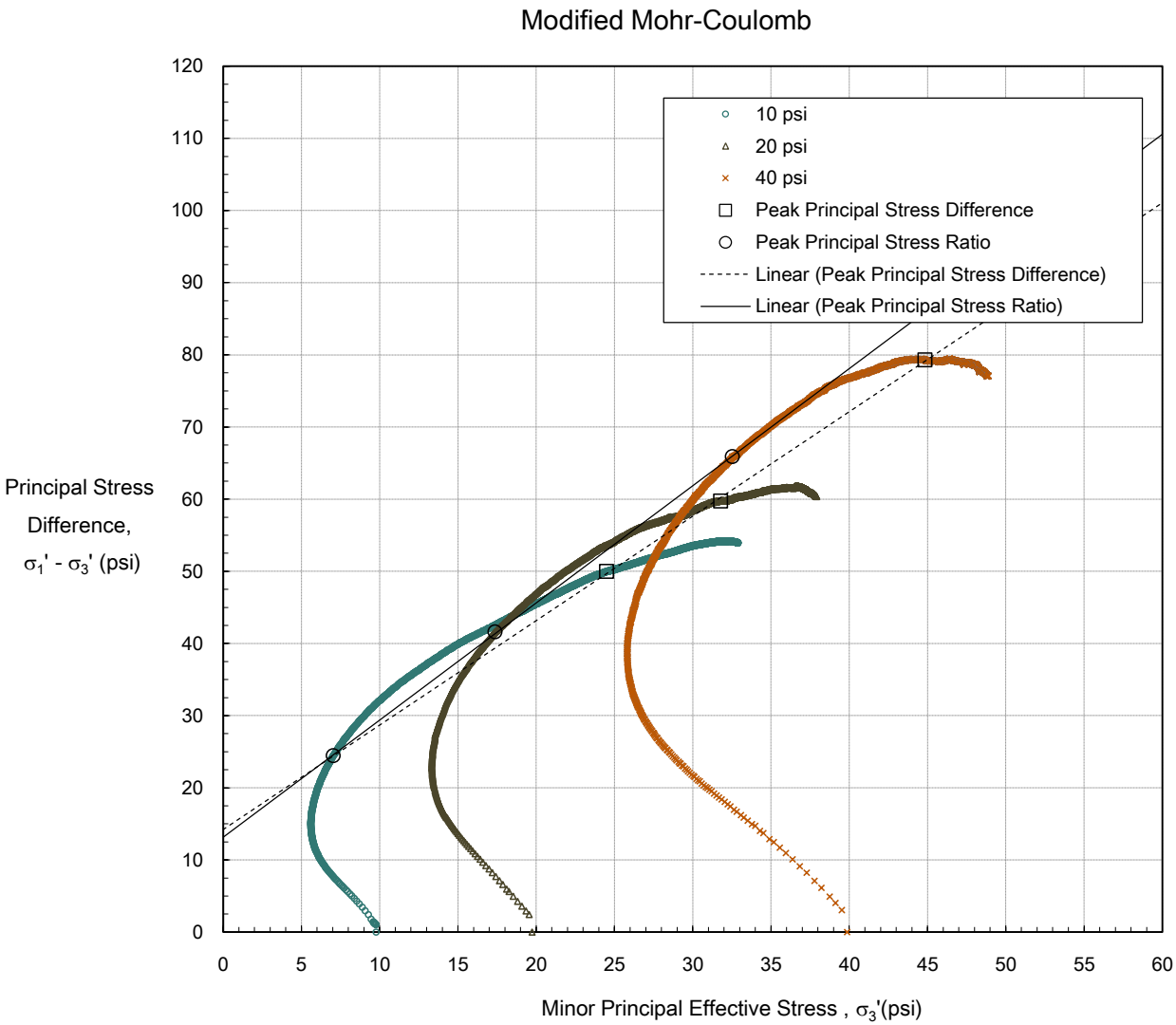
Consolidated-Undrained Triaxial Compression

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-27: (20-22 & 22-24)

TRI Log #: E2391-81-06
Test Method: ASTM D4767



Failure Criterion: Peak Principal Stress	Difference, $(\sigma_1'-\sigma_3')_{max}$	Ratio, $(\sigma_1'/\sigma_3')_{max}$
Effective Friction Angle (deg)	24.8	26.6
Effective Cohesion (psi)	4.5	4.1

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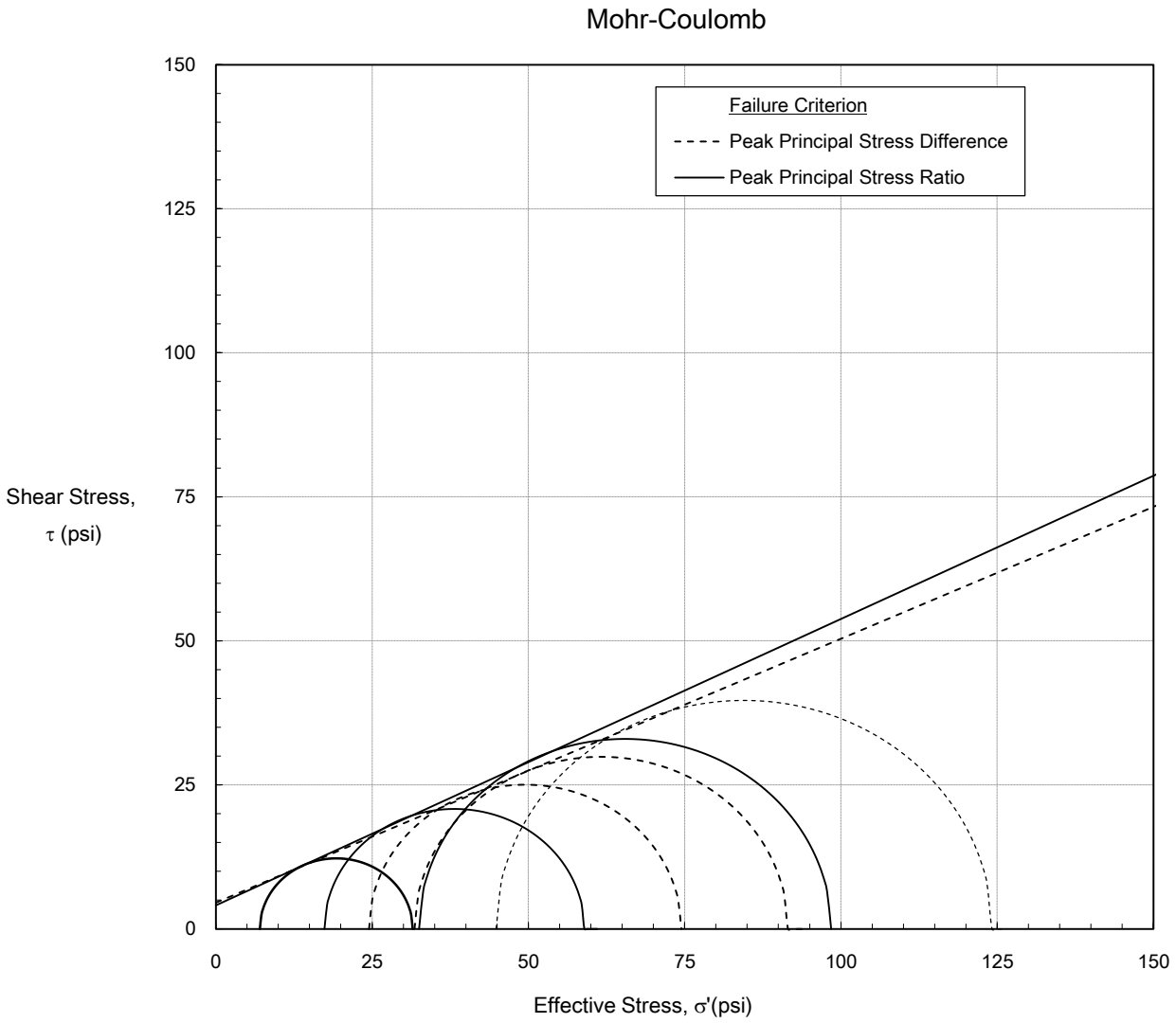

Failure Criterion: Peak Principal Stress	Difference, $(\sigma_1'-\sigma_3')_{max}$	Ratio, $(\sigma_1'/\sigma_3')_{max}$
Effective Friction Angle (deg)	24.8	26.6
Effective Cohesion (psi)	4.5	4.1

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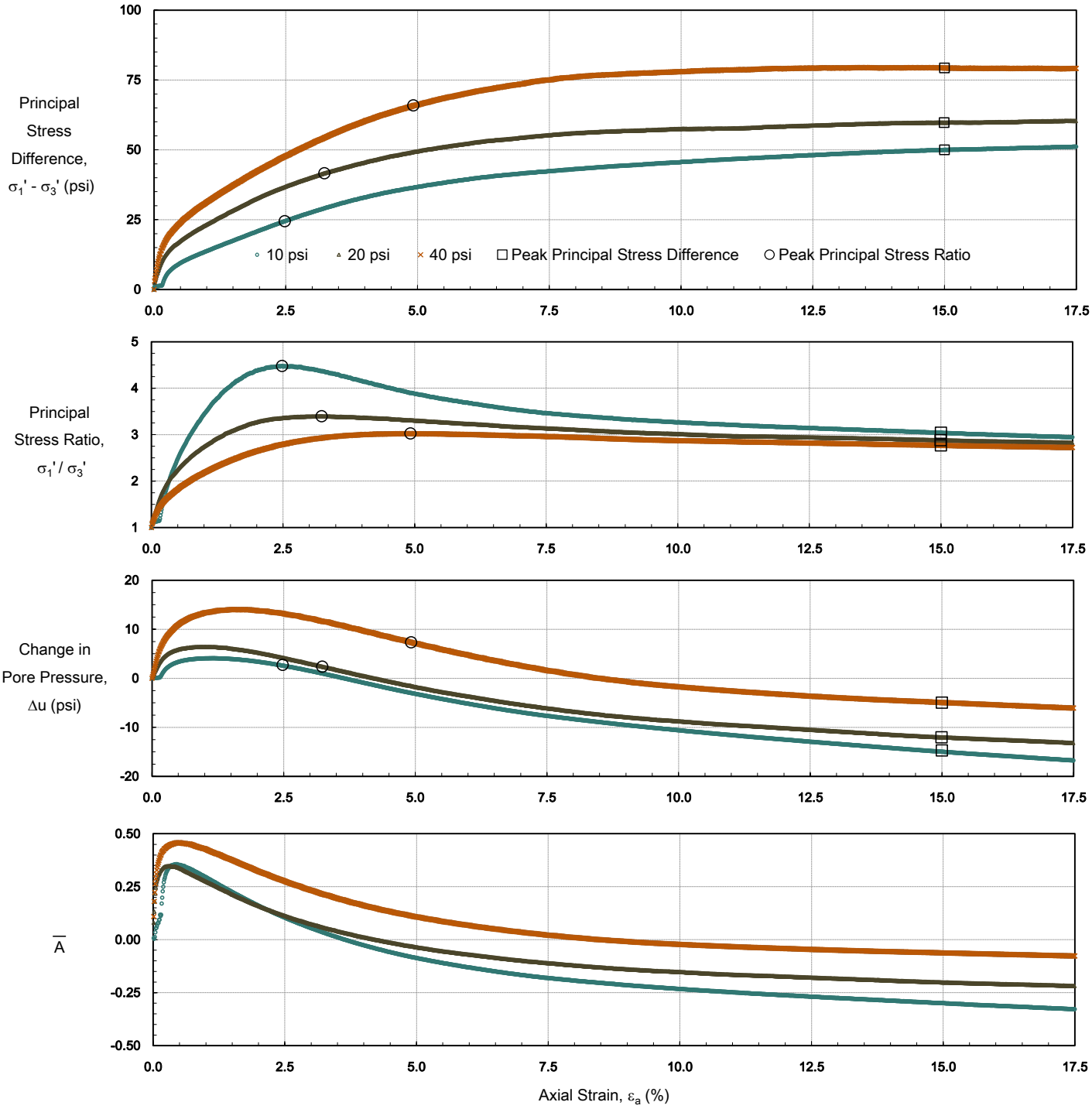

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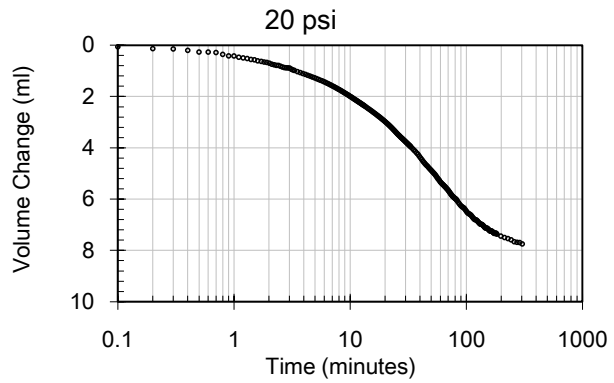
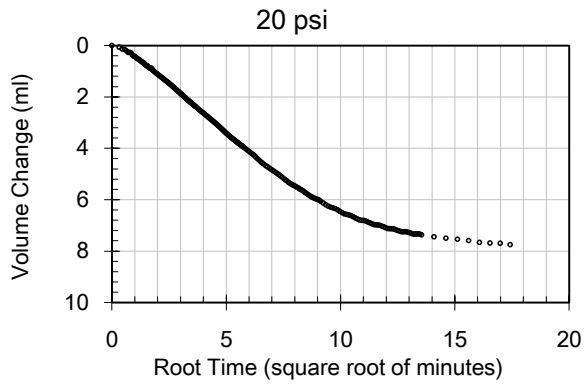
Project: Ottawa County Farms Expansion
Sample: DB-27: (20-22 & 22-24)

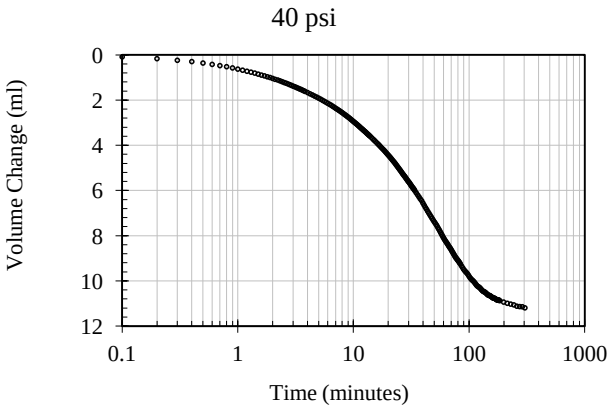
TRI Log #: E2391-81-06
Test Method: ASTM D4767

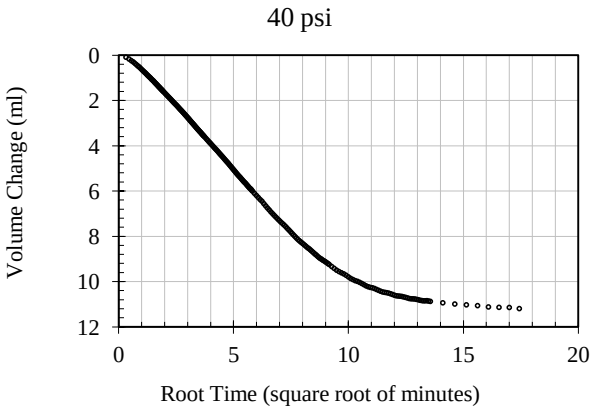
Consolidation

Note: The specimen at the lowest effective stress was back-pressure saturated at its target effective stress. Accordingly, no consolidation data is available.









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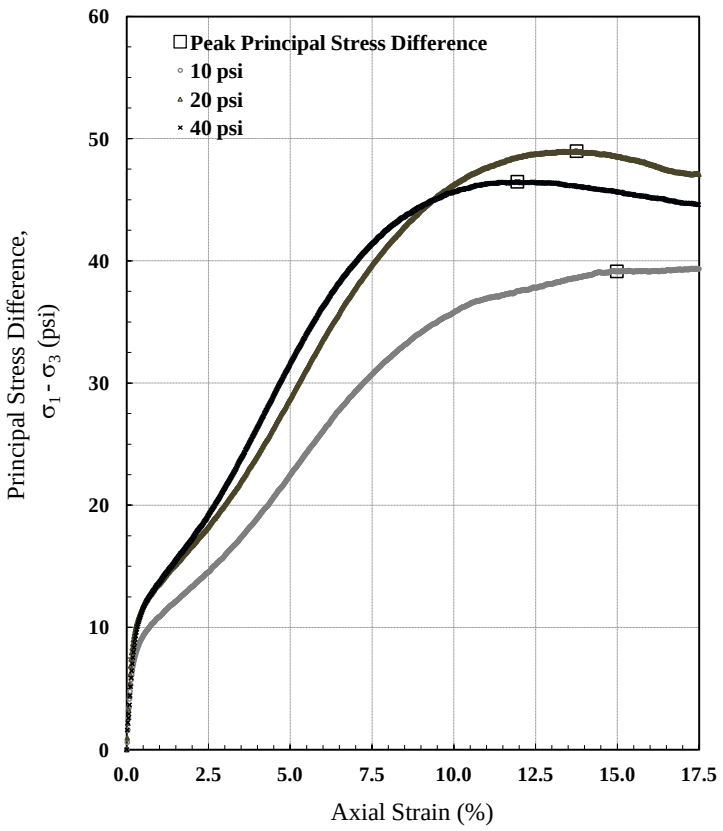
Unconsolidated-Undrained (Q) Triaxial Compression

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-27: (42-44)

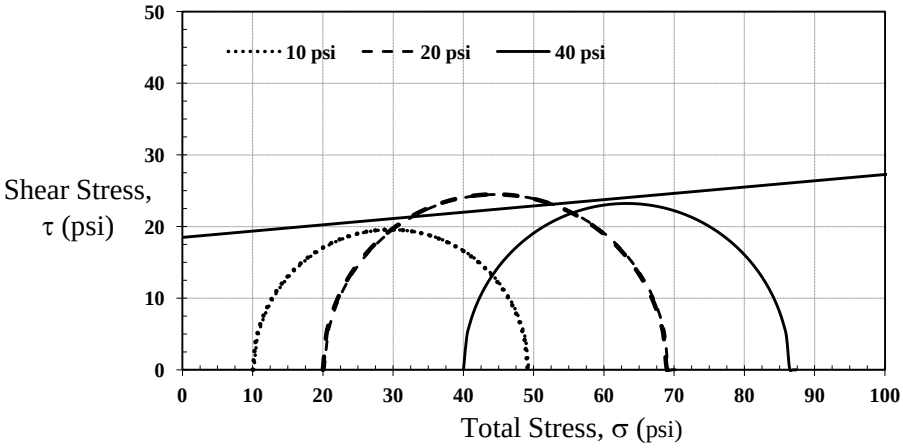
TRI Log #: E2391-81-06
Test Method: ASTM D2850



Samples			
Sample I.D.	-	-	-
Depth/Elev. (ft)	-	-	-
Minor Principal Stress (psi)	10.0	20.0	40.0
Initial Properties			
Avg. Diameter (in)	2.75	2.77	2.75
Avg. Height (in)	6.06	5.92	5.87
Avg. Water Content (%)	21.5	21.9	21.5
Bulk Density (pcf)	129.9	128.9	129.8
Dry Density (pcf)	106.9	105.8	106.9
Saturation (%)	100.0	100.0	100.0
Void Ratio	0.52	0.53	0.52
Specific Gravity (D854)	2.60	2.60	2.60

At Failure			
Failure Criterion	Maximum Deviator Stress		
Rate of Strain (%/hr)	60	60	60
Axial Strain at Failure (%)	15.0	13.8	11.9
Minor Total Stress (psi)	10.0	20.0	40.0
Major Total Stress (psi)	49.1	69.0	86.5
Principal Stress Diff. (psi)	39.1	49.0	46.5

Total Stress Envelope	
Friction Angle (deg)	5.0
Cohesion (psi)	18.5



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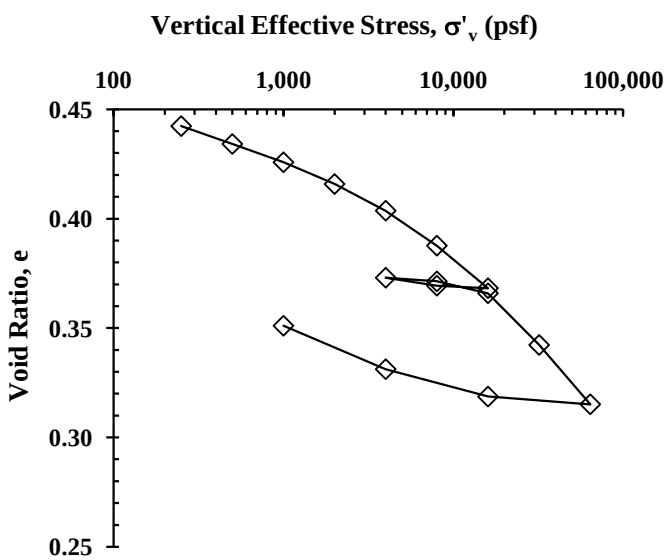
One-Dimensional Consolidation Properties of Soil

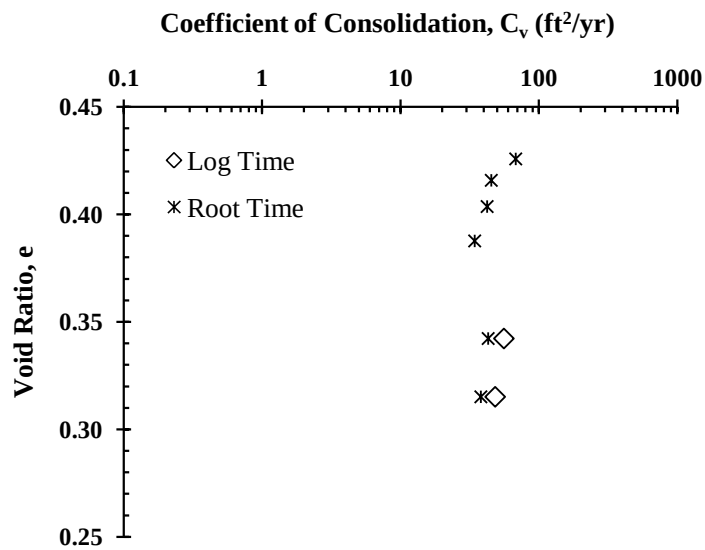
Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-32 (40-42)

TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

Soil Specimen Properties	
Initial Specimen Water Content (%)	15.1
Final Specimen Water Content (%)	14.2
Specimen Diameter (in)	2.499
Initial Specimen Height (in)	0.995
Final Specimen Height (in)	0.928
Final Differential Height (in)	0.067
Initial Dry Unit Weight, γ_o lb_f/ft^3	114.5
Final Dry Unit Weight, γ_f lb_f/ft^3	122.4
Initial Void Ratio, e_o	0.444
Final Void Ratio, e_f	0.351
Initial Degree of Saturation (%)	90.1
Preconsolidation Pressure (psf)	≈6800
Swell Pressure (psf), Maximum Measured	<100
Compression Index, C_c	0.083
Recompression Index, C_r	0.017

σ'_v	e	Strain, ε	C_v (ft^2/year)	
(psf)	(-)	(%)	Log Time	Root Time
Initial	0.444	0.0	-	-
250	0.442	0.1	-	-
500	0.434	0.7	-	-
1,000	0.426	1.3	-	68
2,000	0.416	2.0	-	45
4,000	0.404	2.8	-	42
8,000	0.388	3.9	-	34
16,000	0.368	5.3	-	-
8,000	0.369	5.2	-	-
4,000	0.373	4.9	-	-
8,000	0.371	5.1	-	-
16,000	0.366	5.4	-	-
32,000	0.342	7.1	56	43
64,000	0.315	8.9	48	38
16,000	0.319	8.7	-	-
4,000	0.331	7.8	-	-
1,000	0.351	6.5	-	-





The undisturbed specimen was provided by the client. The specimen was trimmed using a trimming turntable and mounted. The specimen was inundated with tap water during testing. Coefficient of Consolidation was determined using the Log Time and Root Time Methods. A specific gravity of 2.71 was measured in accordance with ASTM D854 for weight-volume calculations. Calculations include machine deflections measured at each loading step. The preconsolidation pressure was determined using the Casagrande construction technique.

Jeffrey A. Kuhn, Ph.D., P.E., 1/22/2016
Quality Review/Date
Laboratory Staff - LC and Dr. Mark Fountain, Ph.D.

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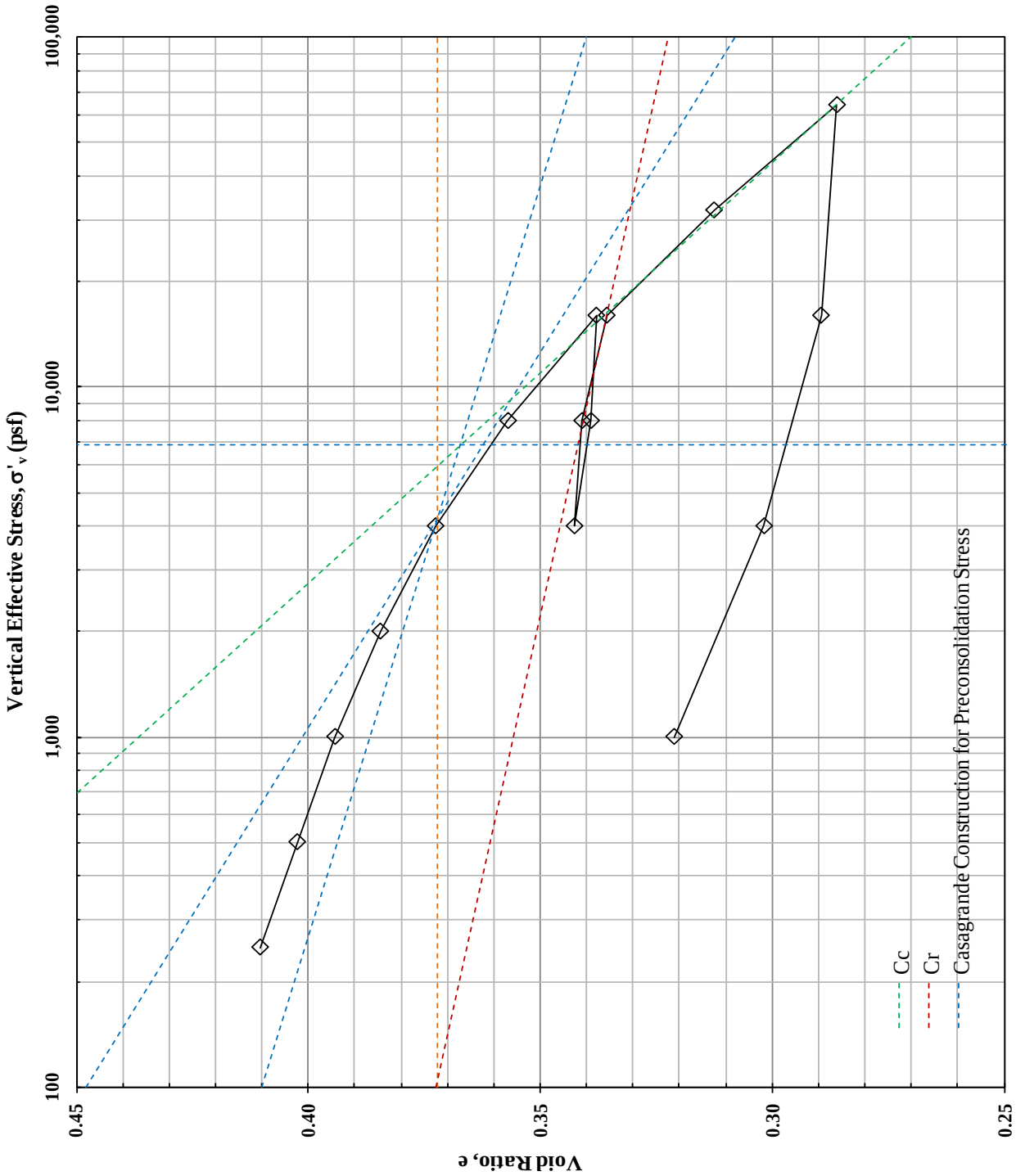
TRI ENVIRONMENTAL, INC.
9063 BEE CAVES RD. – AUSTIN, TX 78733 – USA | PH: 800.880.TEST OR 512.263.2101

One-Dimensional Consolidation Properties of Soil

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-32 (40-42)

TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B



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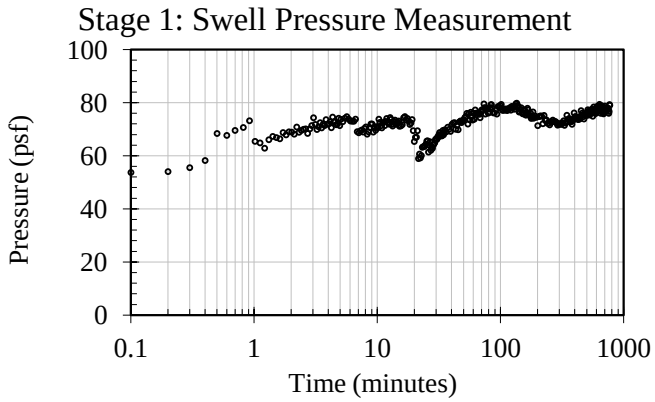

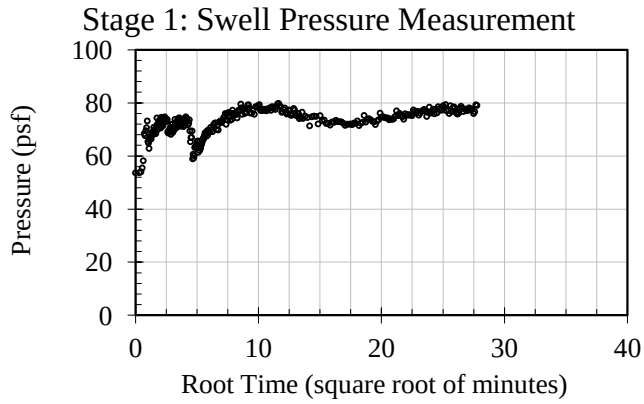

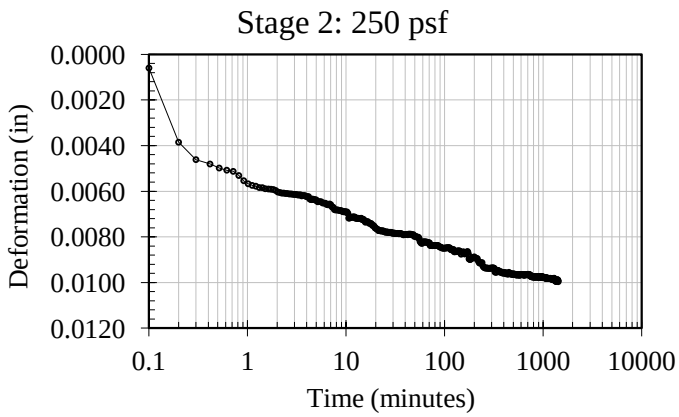

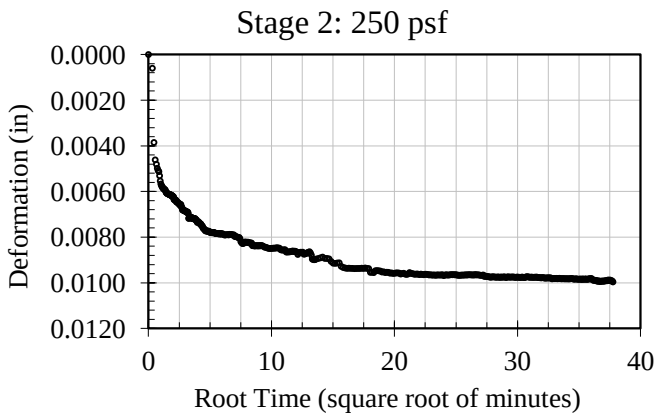

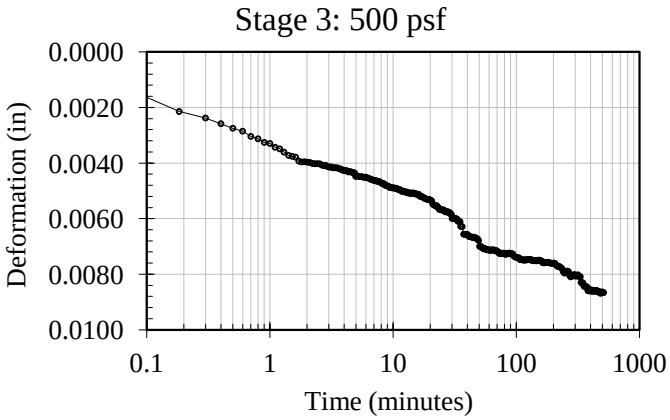

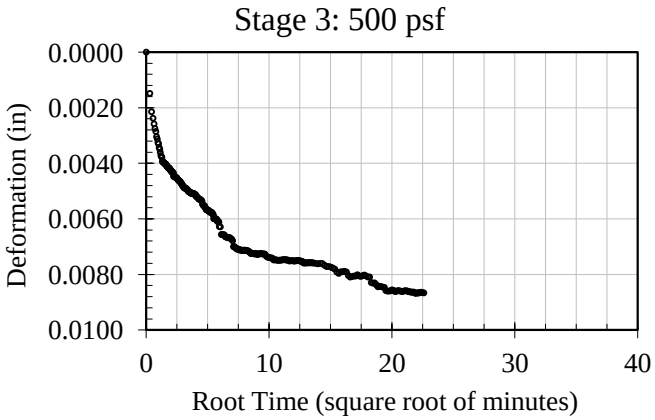

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Project: Ottawa County Farms Expansion
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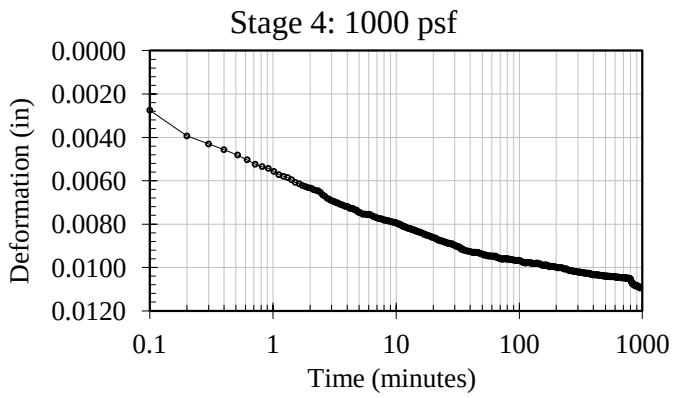

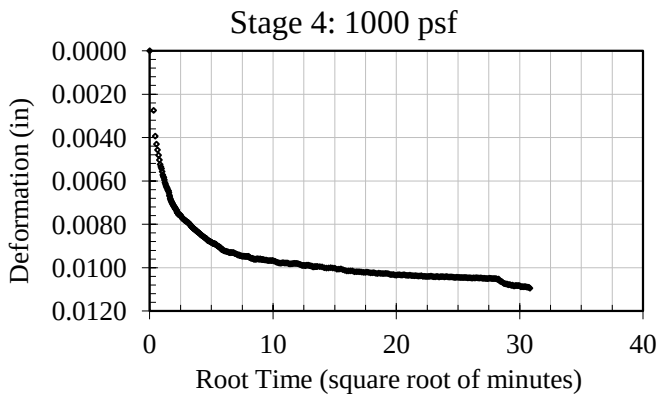

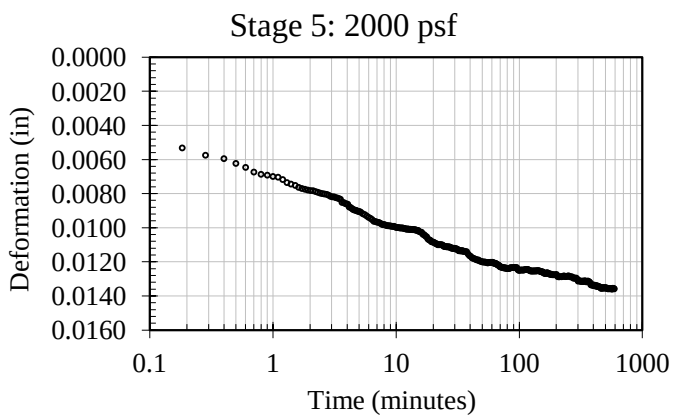

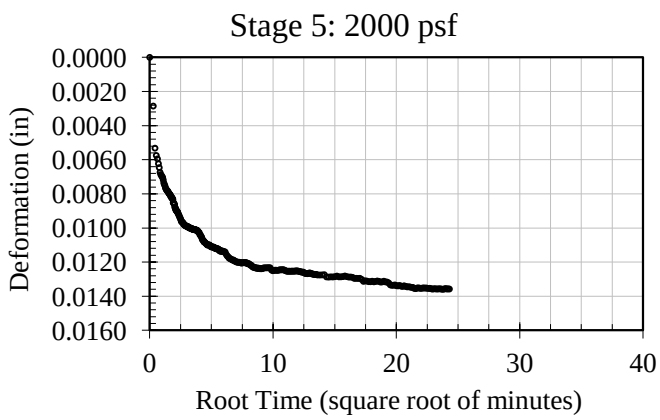

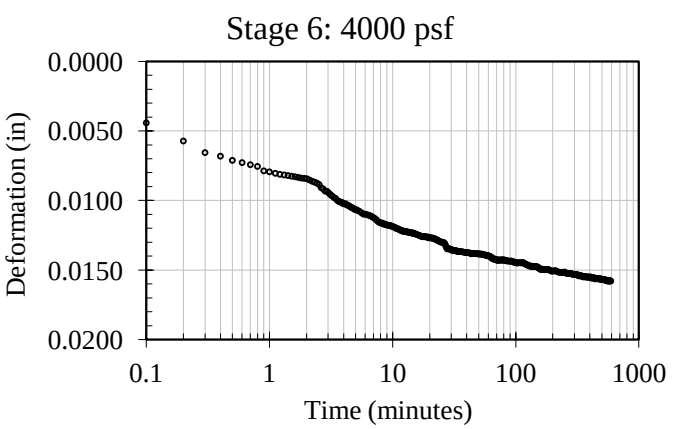

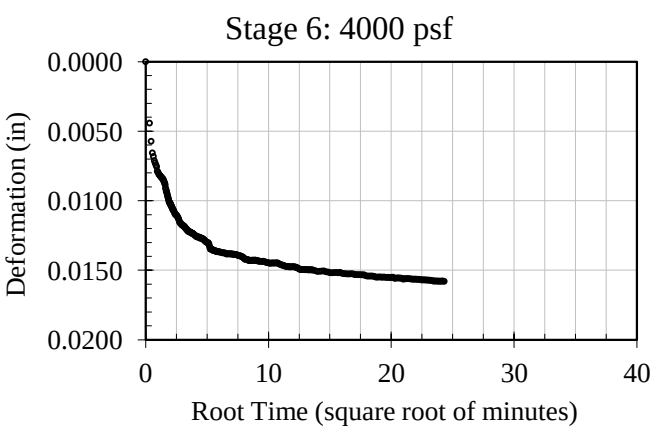

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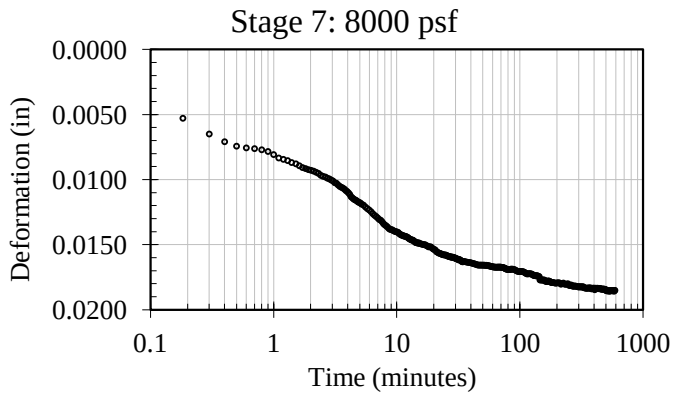

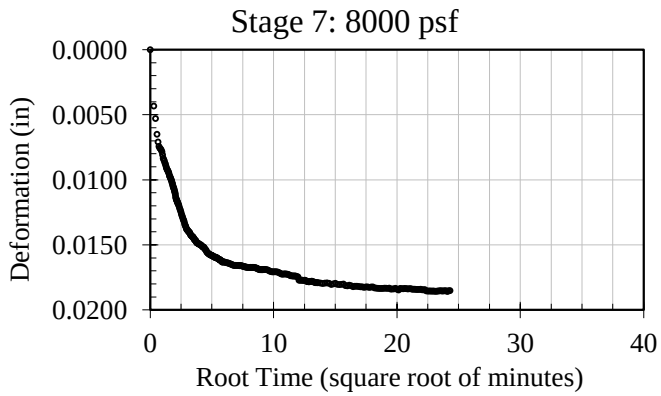

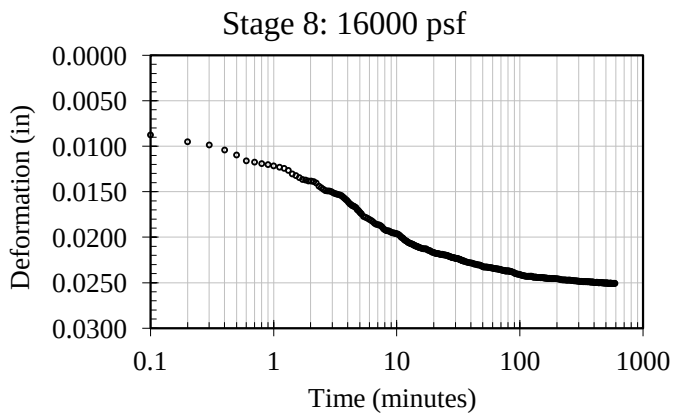

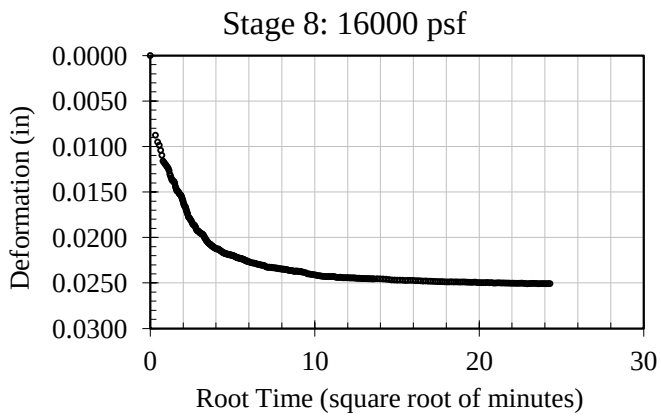

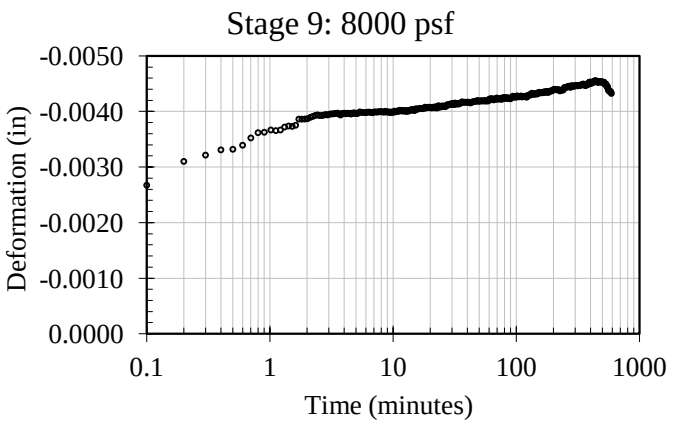

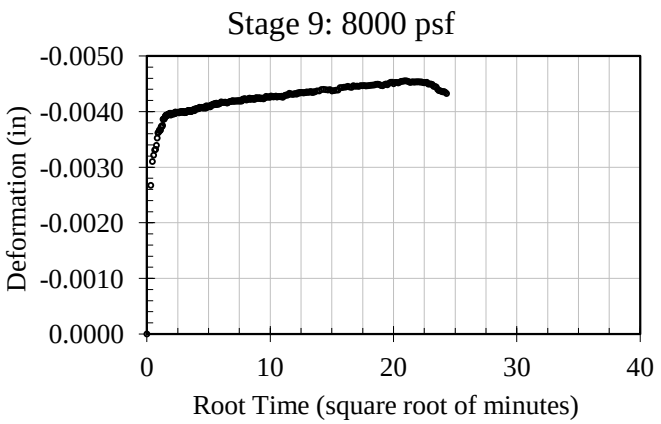

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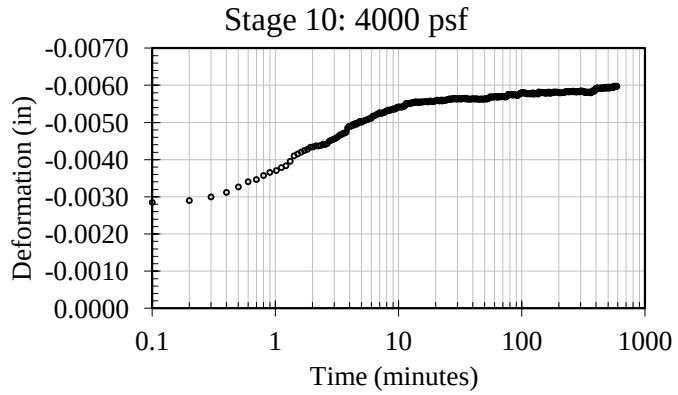
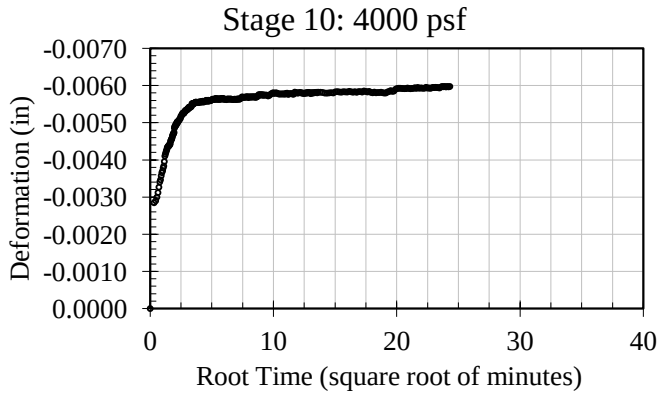
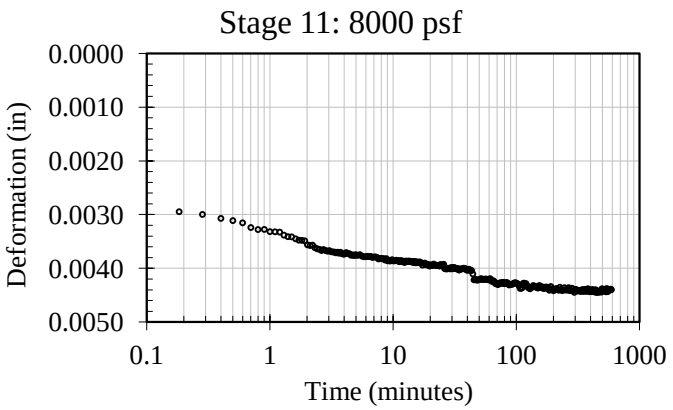
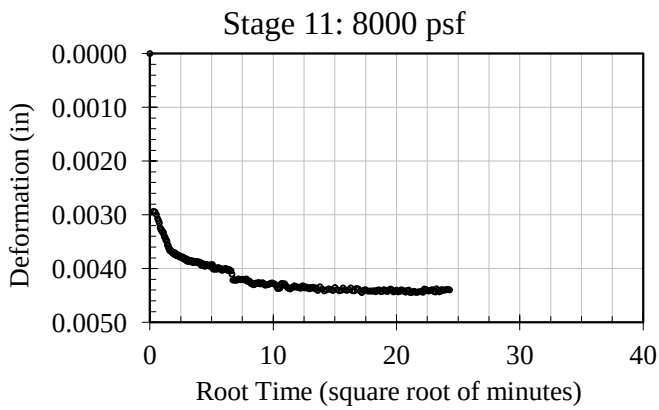
Project: Ottawa County Farms Expansion
Specimen: DB-32 (40-42)

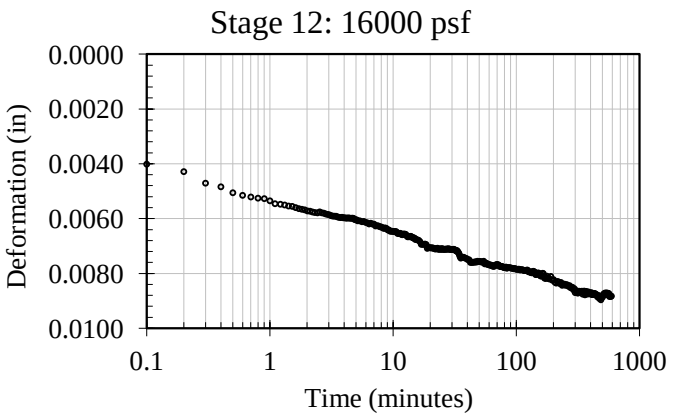
TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

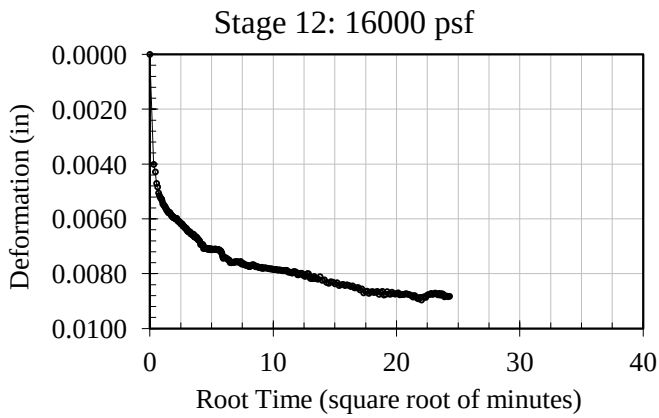












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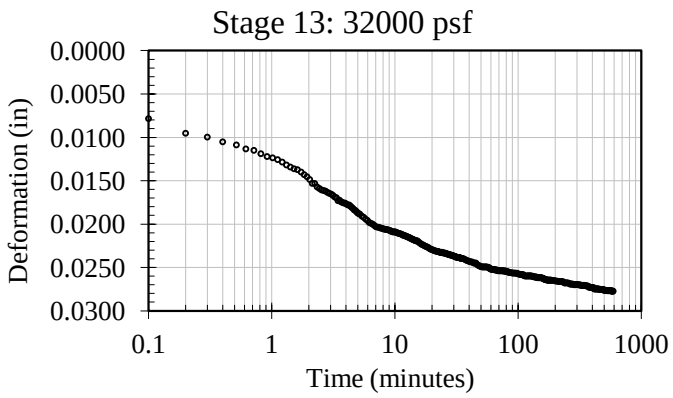
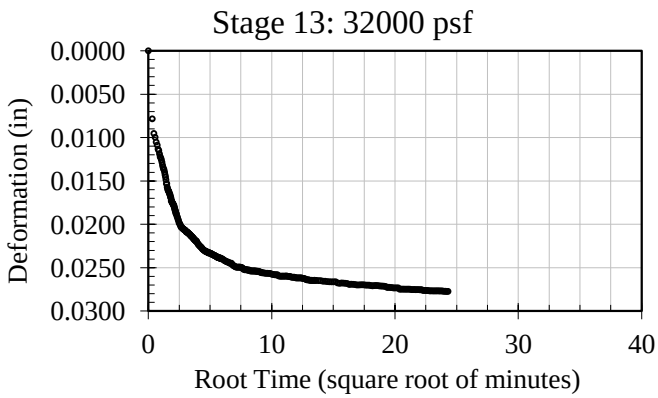
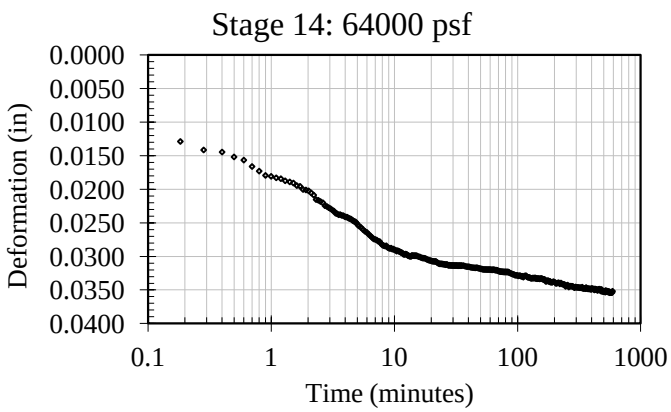
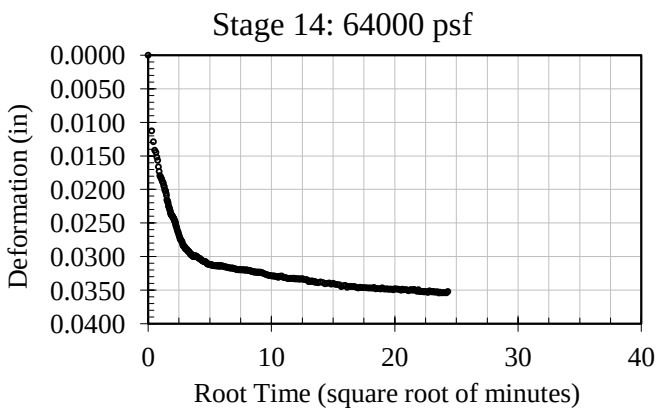
Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-32 (40-42)

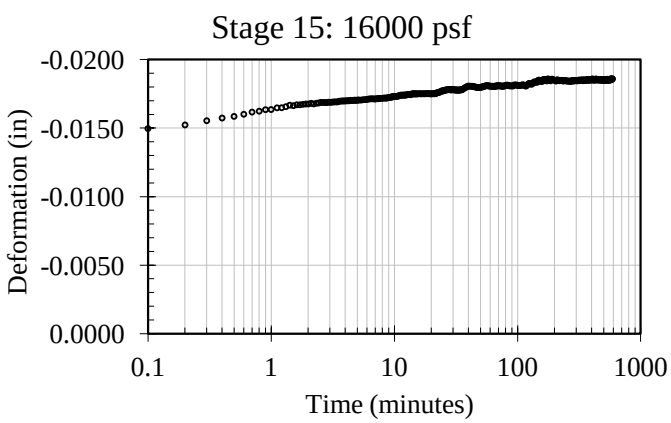
TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

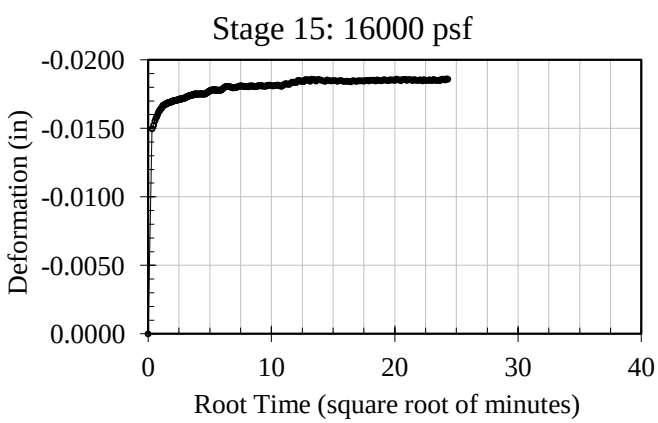












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One-Dimensional Consolidation Properties of Soil

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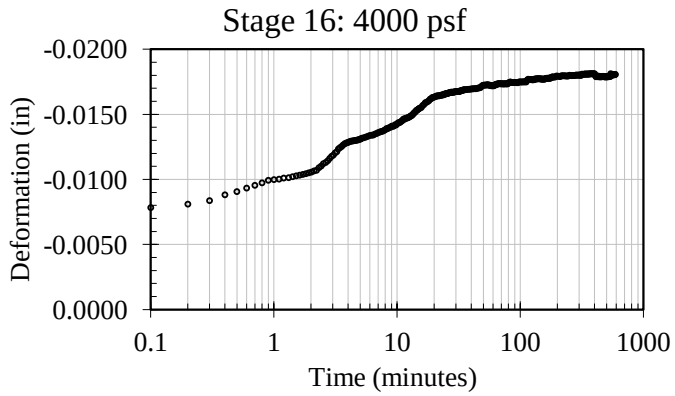
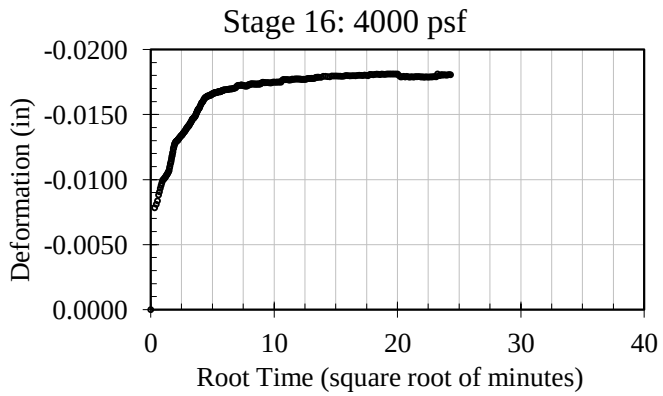
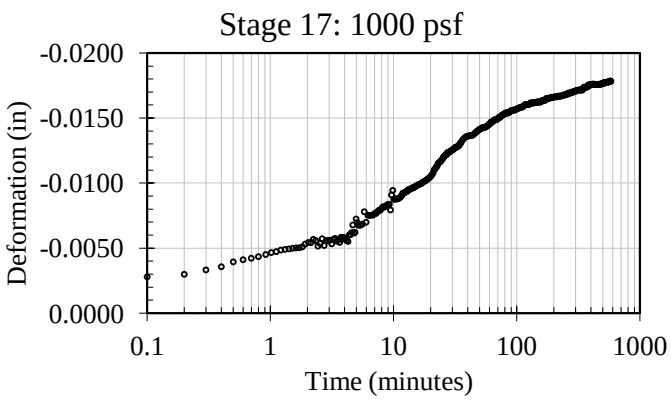
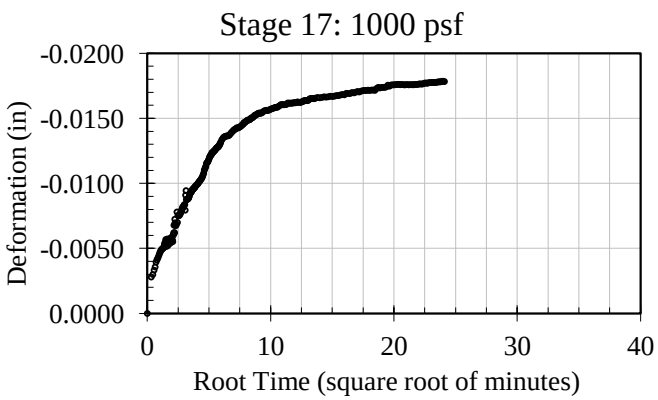
Project: Ottawa County Farms Expansion
Specimen: DB-32 (40-42)

TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B









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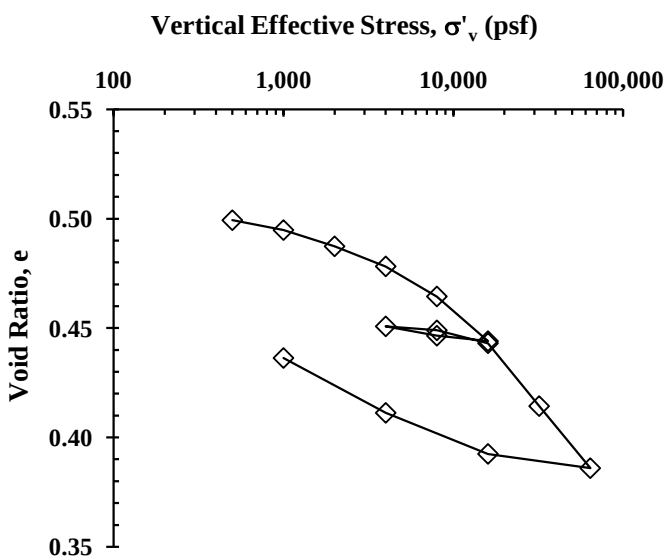
One-Dimensional Consolidation Properties of Soil

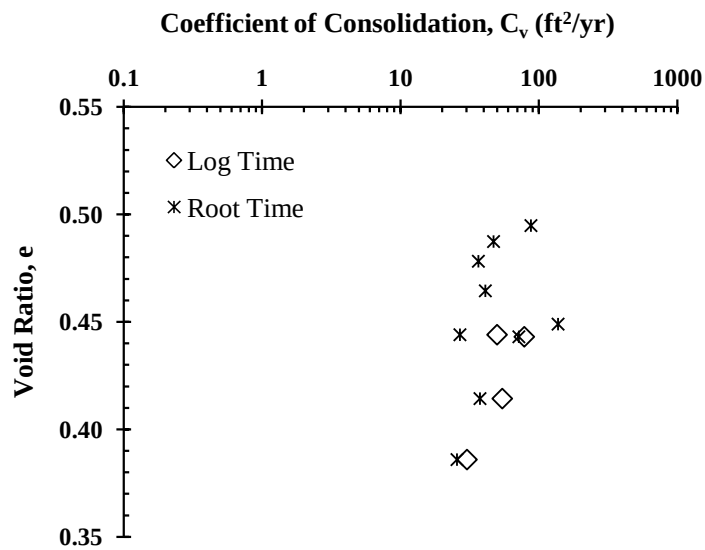
Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-36: (40-42)

TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

Soil Specimen Properties	
Initial Specimen Water Content (%)	19.4
Final Specimen Water Content (%)	17.8
Specimen Diameter (in)	2.499
Initial Specimen Height (in)	1.000
Final Specimen Height (in)	0.956
Final Differential Height (in)	0.044
Initial Dry Unit Weight, γ_o lb_f/ft^3	107.6
Final Dry Unit Weight, γ_f lb_f/ft^3	115.1
Initial Void Ratio, e_o	0.536
Final Void Ratio, e_f	0.436
Initial Degree of Saturation (%)	96.0
Preconsolidation Pressure (psf)	≈8700
Swell Pressure (psf), Maximum Measured	274
Compression Index, C_c	0.093
Recompression Index, C_r	0.019

σ'_v	e	Strain, ε	C_v (ft^2/year)	
(psf)	(-)	(%)	Log Time	Root Time
Initial	0.536	0.0	-	-
500	0.499	2.4	-	-
1,000	0.495	2.7	-	88
2,000	0.487	3.2	-	47
4,000	0.478	3.8	-	37
8,000	0.464	4.7	-	41
16,000	0.444	6.0	50	27
8,000	0.446	5.8	-	-
4,000	0.451	5.6	-	-
8,000	0.449	5.7	-	140
16,000	0.443	6.1	78	72
32,000	0.414	7.9	54	38
64,000	0.386	9.8	30	26
16,000	0.392	9.4	-	-
4,000	0.411	8.1	-	-
1,000	0.436	6.5	-	-





The undisturbed specimen was provided by the client. The specimen was trimmed using a trimming turntable and mounted. The specimen was inundated with tap water during testing. Coefficient of Consolidation was determined using the Log Time and Root Time Methods. A specific gravity of 2.64 was measured in accordance with ASTM D854 for weight-volume calculations. Calculations include machine deflections measured at each loading step. The preconsolidation pressure was determined using the Casagrande construction technique.

Jeffrey A. Kuhn, Ph.D., P.E., 1/22/2016
Quality Review/Date
Laboratory Staff - LC and Dr. Mark Fountain, Ph.D.

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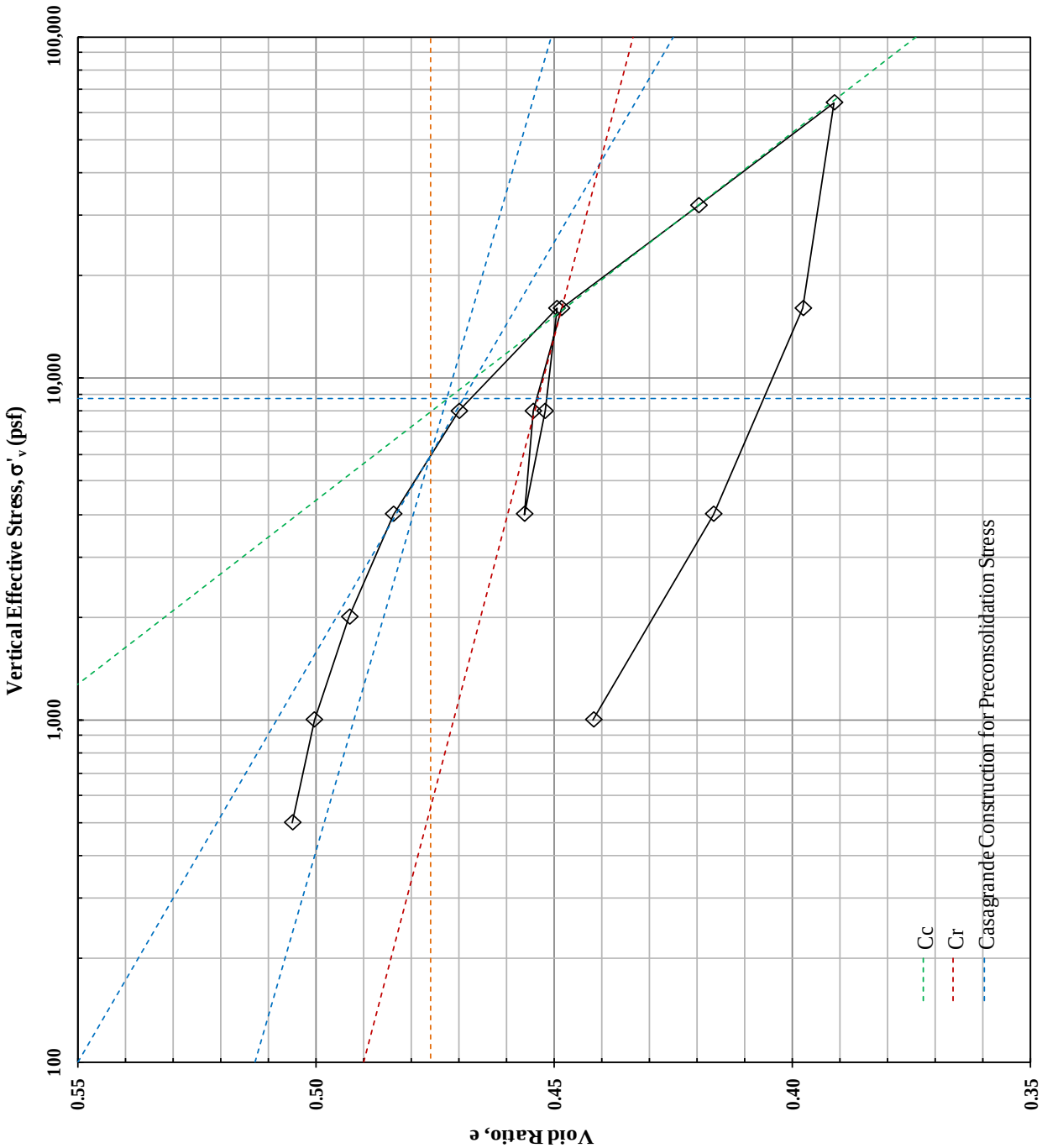

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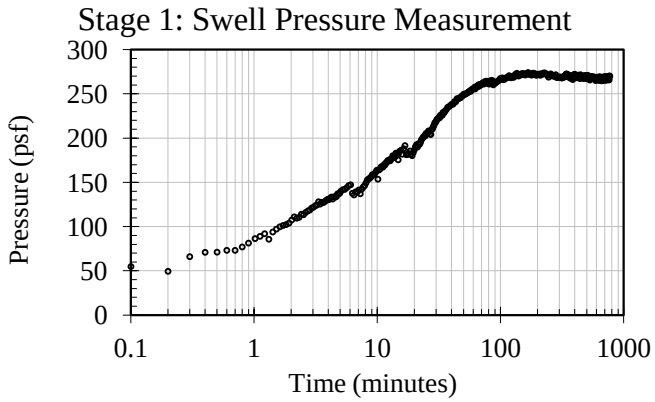
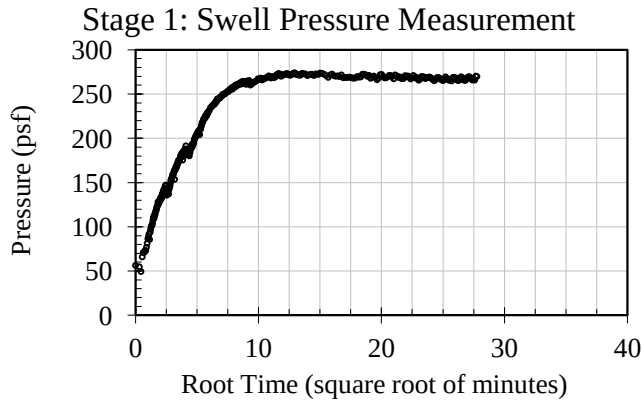
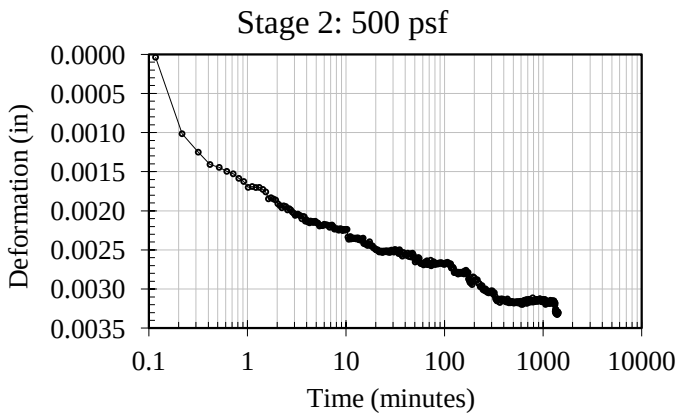
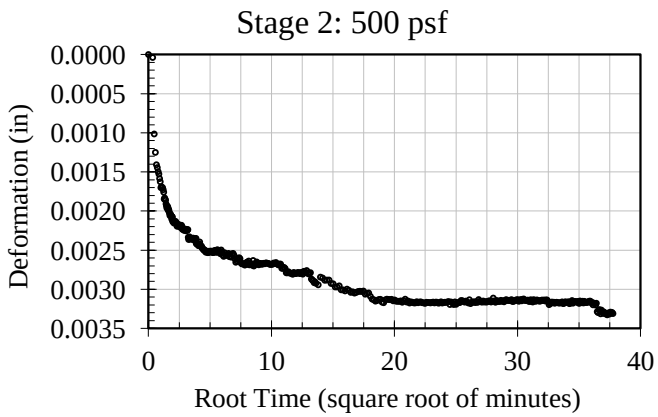
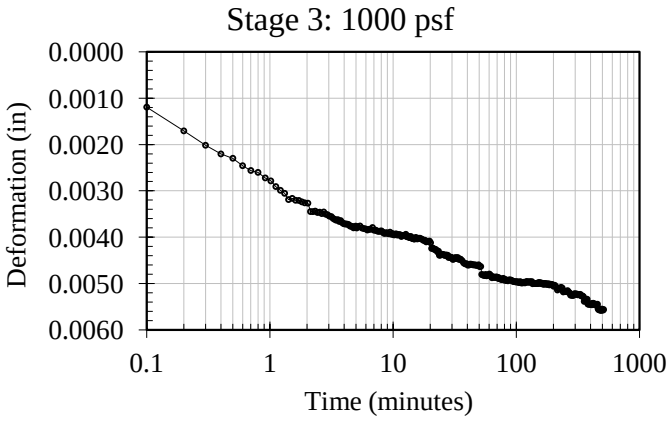
TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

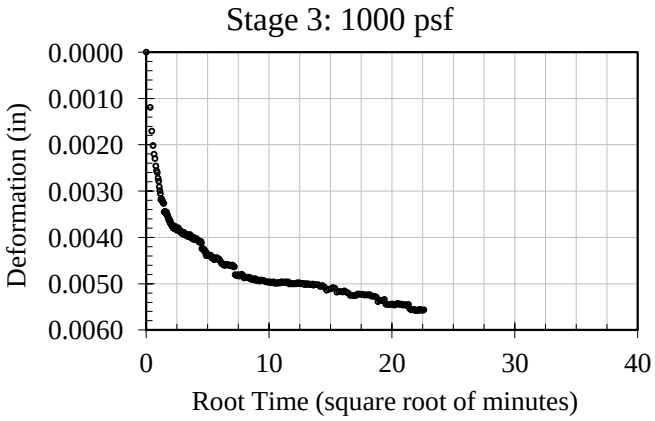












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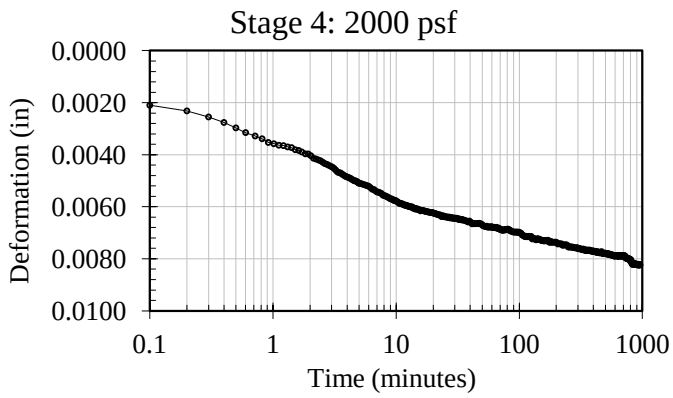
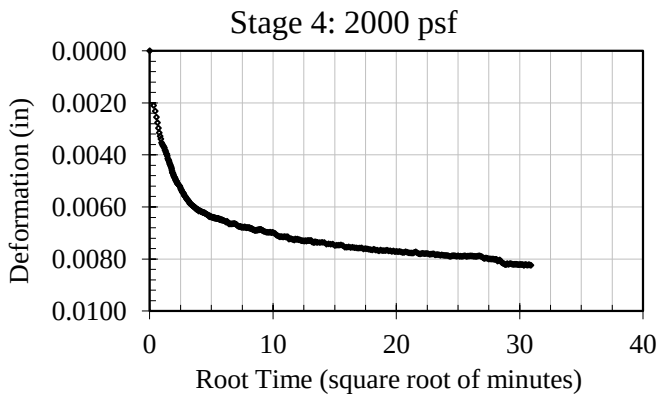
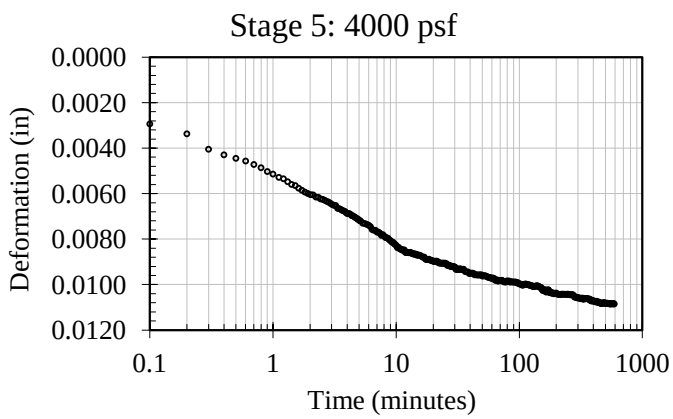
One-Dimensional Consolidation Properties of Soil

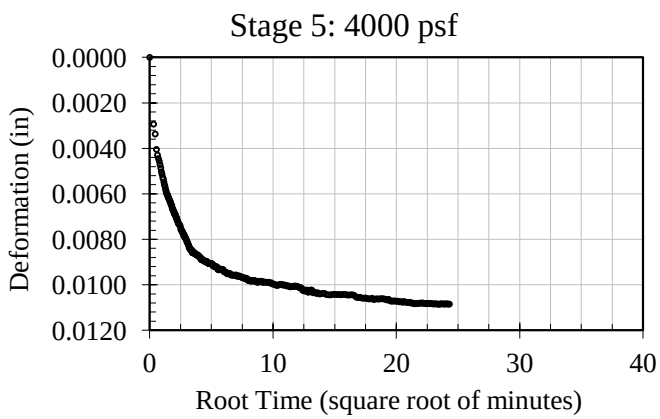
Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-36: (40-42)

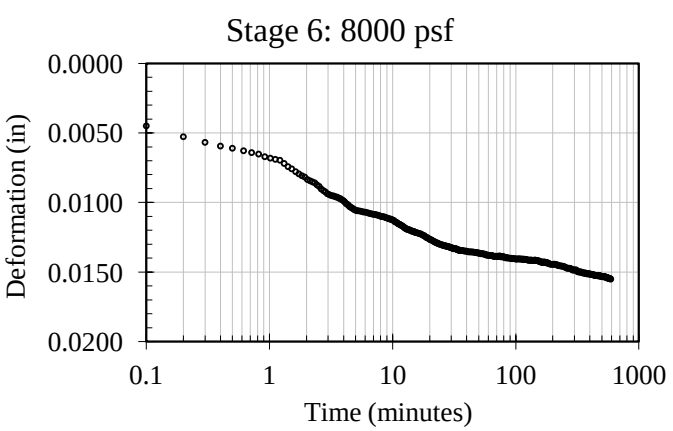
TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

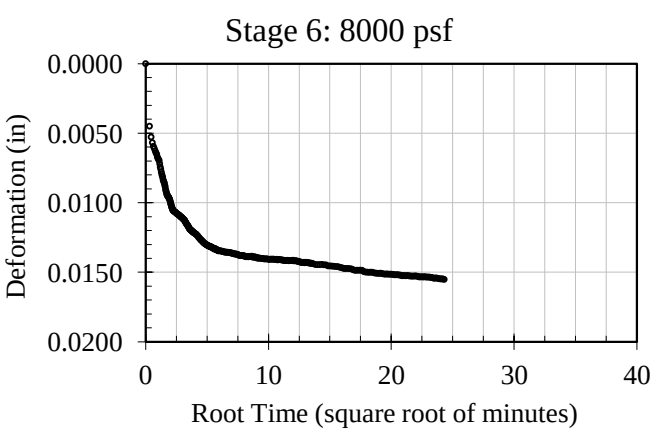












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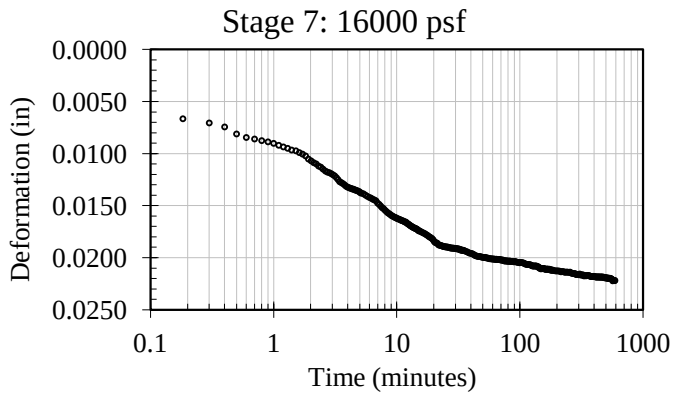
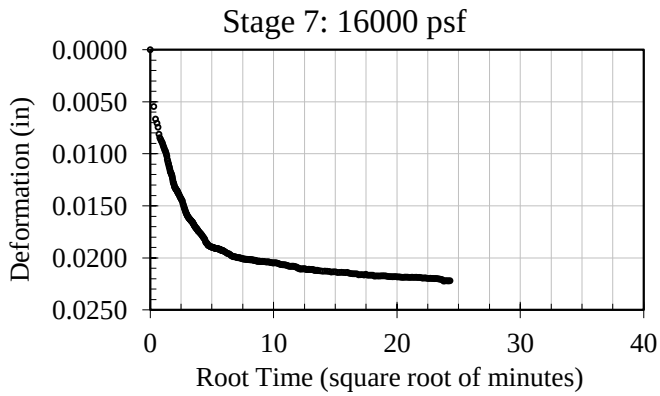
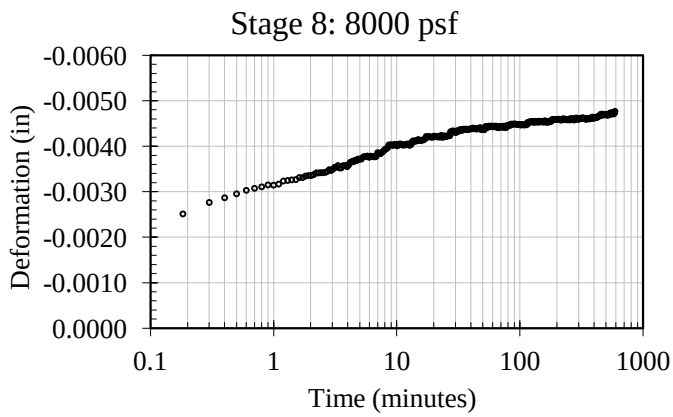
One-Dimensional Consolidation Properties of Soil

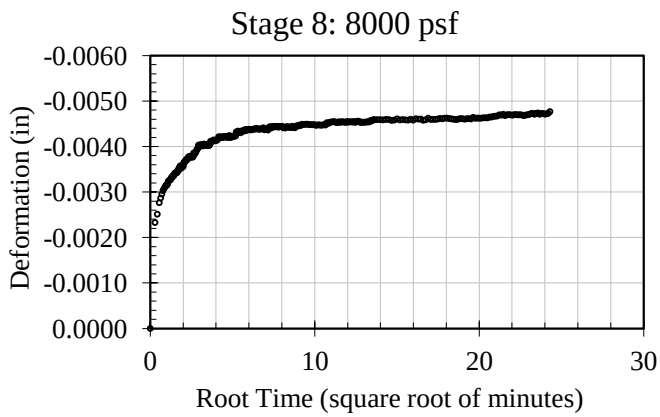
Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-36: (40-42)

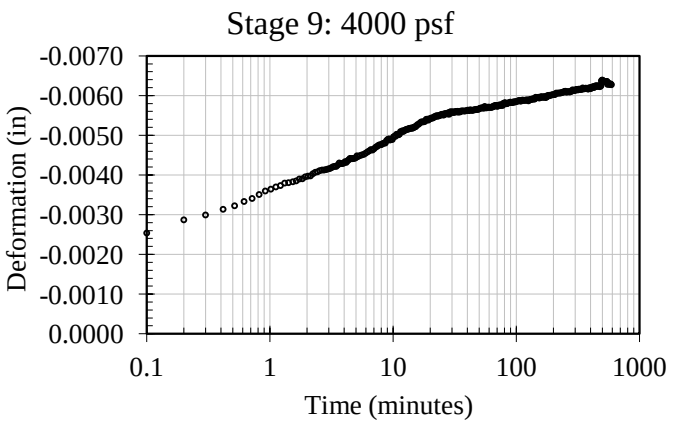
TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

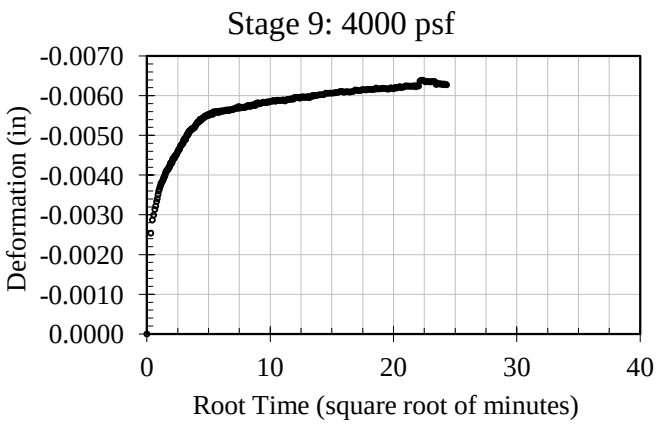












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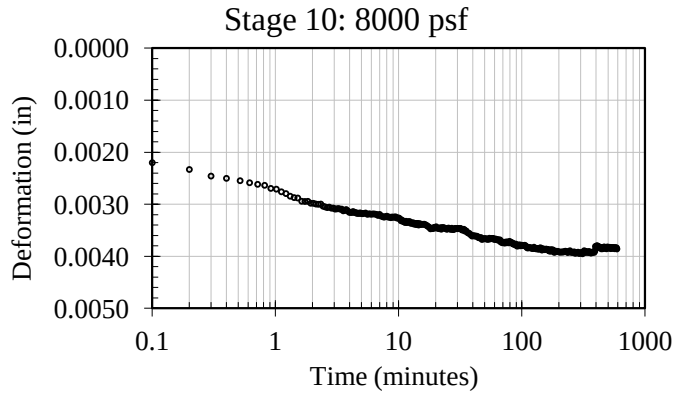
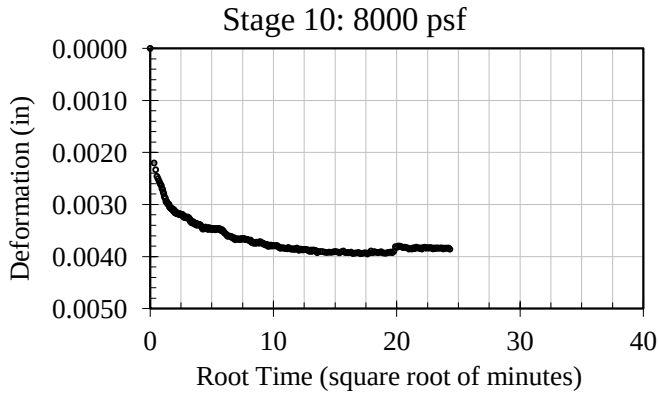
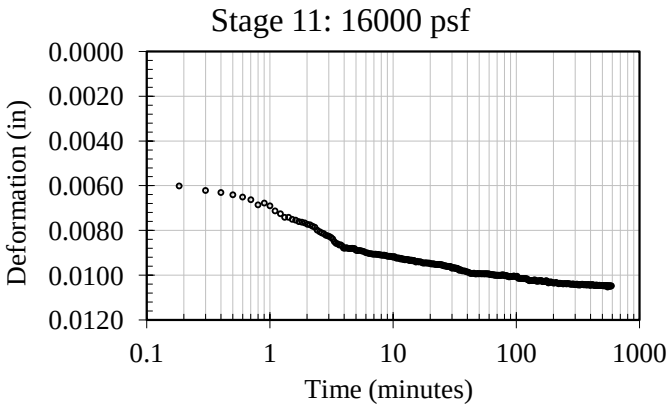
One-Dimensional Consolidation Properties of Soil

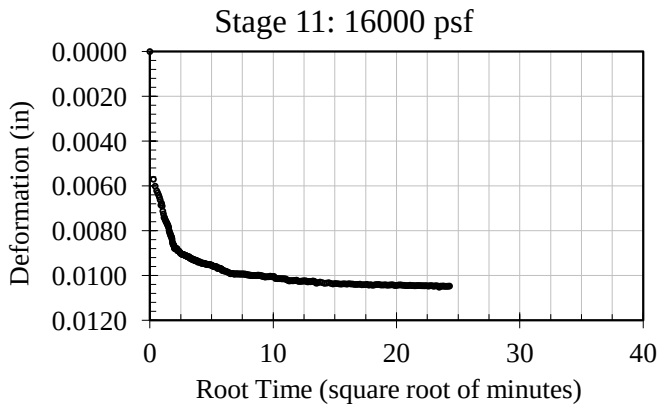
Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-36: (40-42)

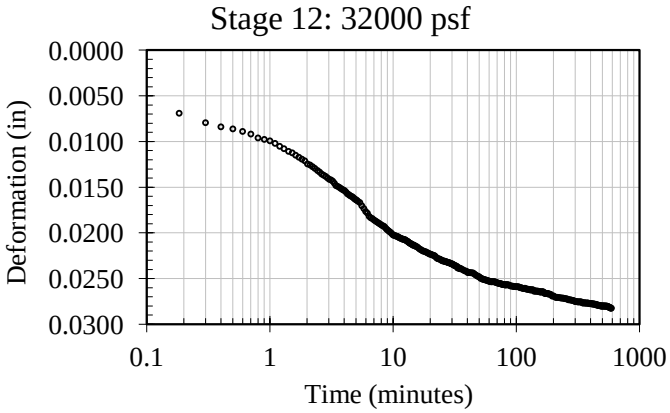
TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

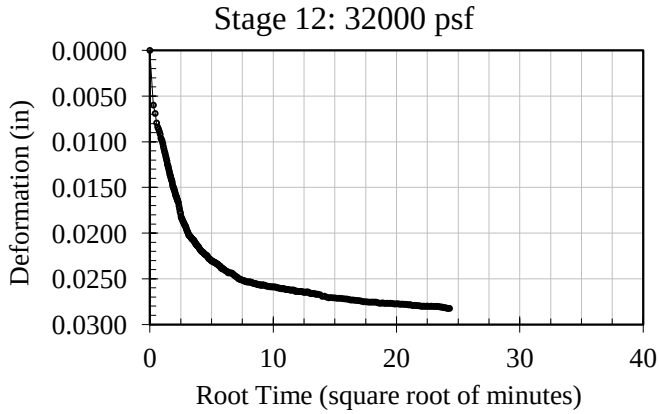












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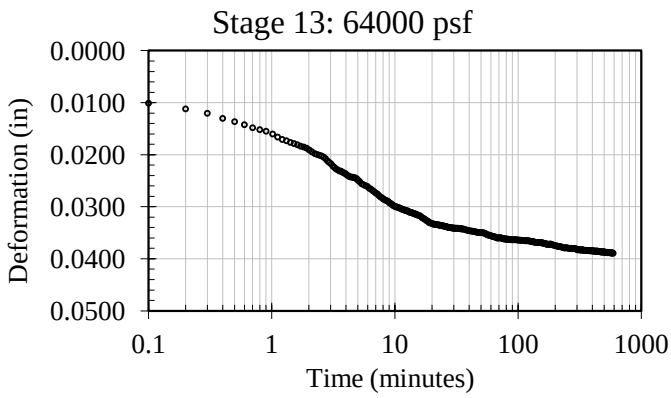
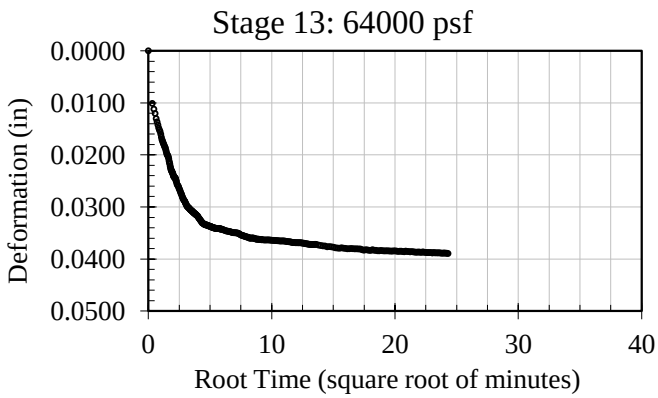
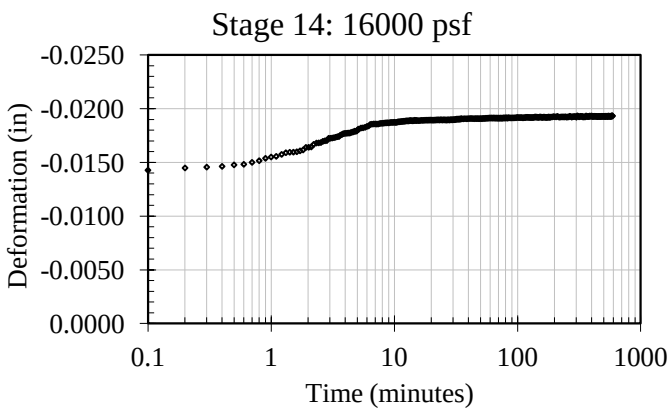
One-Dimensional Consolidation Properties of Soil

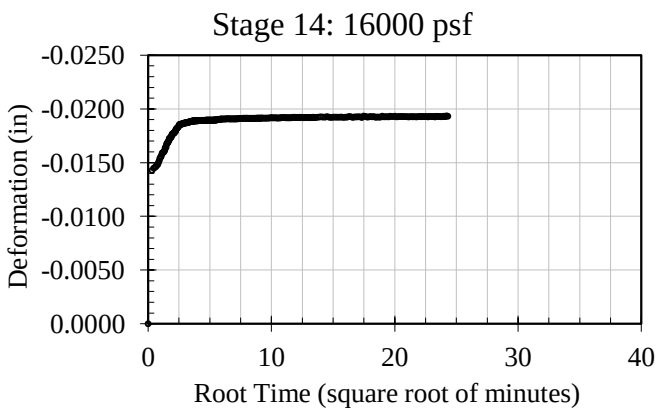
Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-36: (40-42)

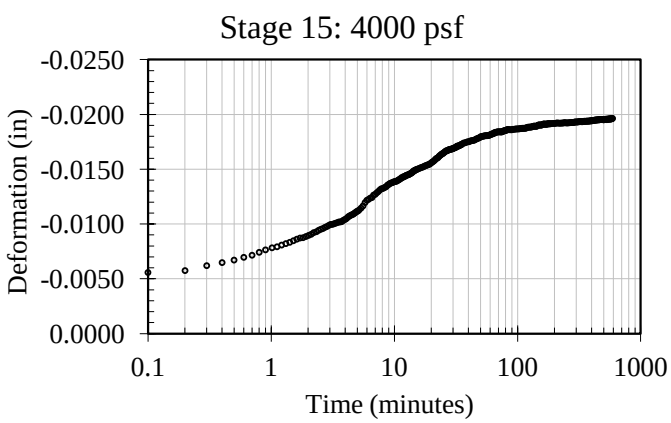
TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B

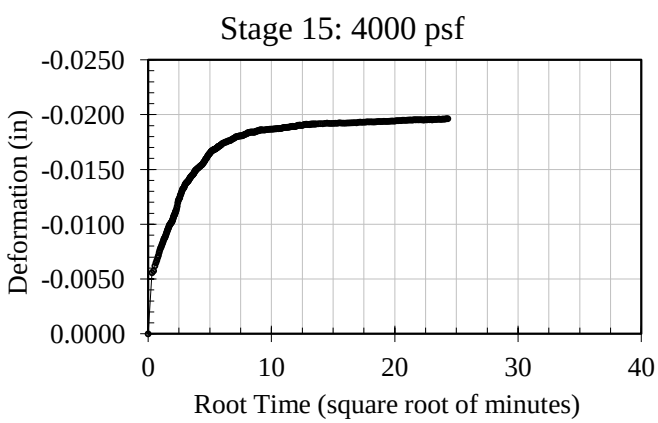












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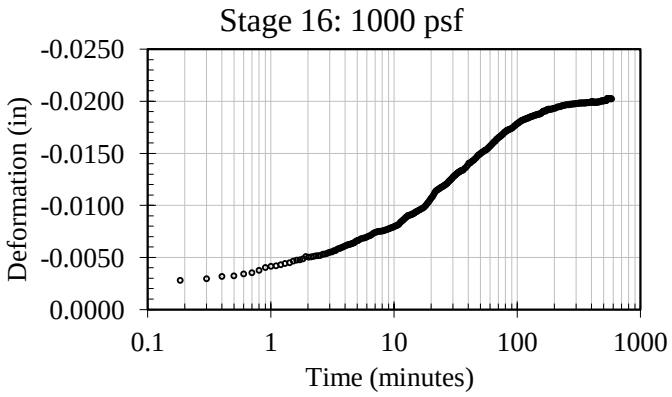
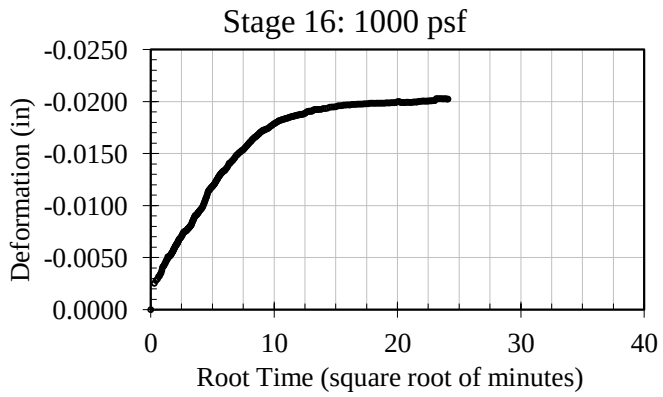
One-Dimensional Consolidation Properties of Soil

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Specimen: DB-36: (40-42)

TRI Log No.: E2391-81-06
Test Method: ASTM D 2435, Method B





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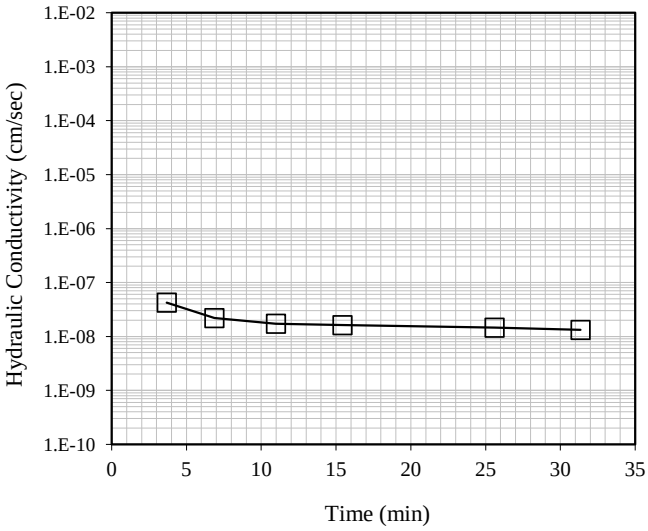
Hydraulic Conductivity Testing

Hydraulic Conductivity

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample ID: DB-24 (22-24)

TRI Log #: 19733
Test Method: ASTM D5084 Method F



Initial Values	
Sample Condition	Undisturbed
Diameter (in)	2.83
Height (in)	1.70
Initial Mass (g)	363.2
Sample Area (in^2)	6.29
Water Content (%)	23.2
Total Unit Weight (pcf)	129.0
Dry Unit Weight (pcf)	104.7
Specific Gravity (ASTM D854)	2.61
Degree of Saturation	109.0
Void Ratio	0.56
Porosity	0.36
1 Pore Volume (cc)	62.7
Eff. Confining Stress (psi)	5.0
B-Value Prior to Permeation	0.98

Specimen Image

Time	Hydraulic Conductivity, K at 20° C
Min	cm/s
11.0	1.7E-08
15.4	1.6E-08
25.6	1.5E-08
31.4	1.3E-08
Average, Last 2 Readings	**1.4E-08**

Note: Permeation measurements were made with a mercury U-tube.

Jeffrey A. Kuhn, Ph.D., P.E., 3/10/2016
Analysis & Quality Review/Date
Testing Performed By: SOC & LC

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DRIESENGA & ASSOCIATES, INC.
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Holland, Michigan 49424
Ph. (616) 396-0255 • Fax (616) 396-0100
www.driesenga.com

HYDRAULIC CONDUCTIVITY
FLEXIBLE WALL PERMEABILITY USING MERCURY

(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	DB-25 (75'-77')
Date:	2/4/16	Sample Desc.:	Brown Clay, Trace Silt

SAMPLE INFORMATION

	Initial		Final	
Length:	6.65 cm	2.62 in	6.67 cm	2.63 in
Diameter:	7.24 cm	2.85 in	7.27 cm	2.86 in
Water Content:	15%		15%	
Dry Density:	1.93 g/cc	120.6 pcf	1.92 g/cc	120.0 pcf

Saturation (B Coefficient): 0.96

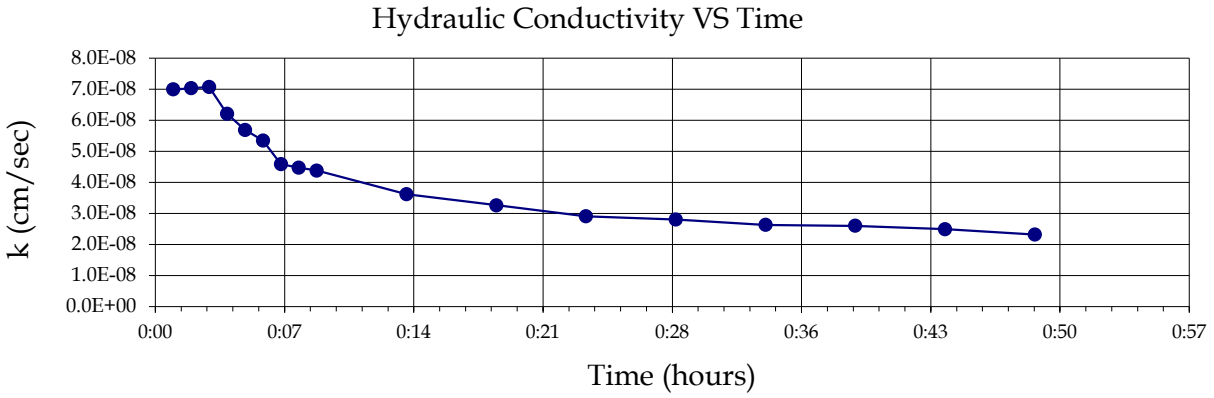
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Back Pressure: 58 psi

Hydraulic gradient: 34.3 to 41.1

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 2.4E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	DB-26 (41'-43')
Date:	2/5/16	Sample Desc.:	Brown Clay, Trace Silt

SAMPLE INFORMATION

	Initial		Final	
Length:	6.96 cm	2.74 in	6.96 cm	2.74 in
Diameter:	7.16 cm	2.82 in	7.19 cm	2.83 in
Water Content:	24%		27%	
Dry Density:	1.64 g/cc	102.4 pcf	1.60 g/cc	100.0 pcf

Saturation (B Coefficient): 0.99

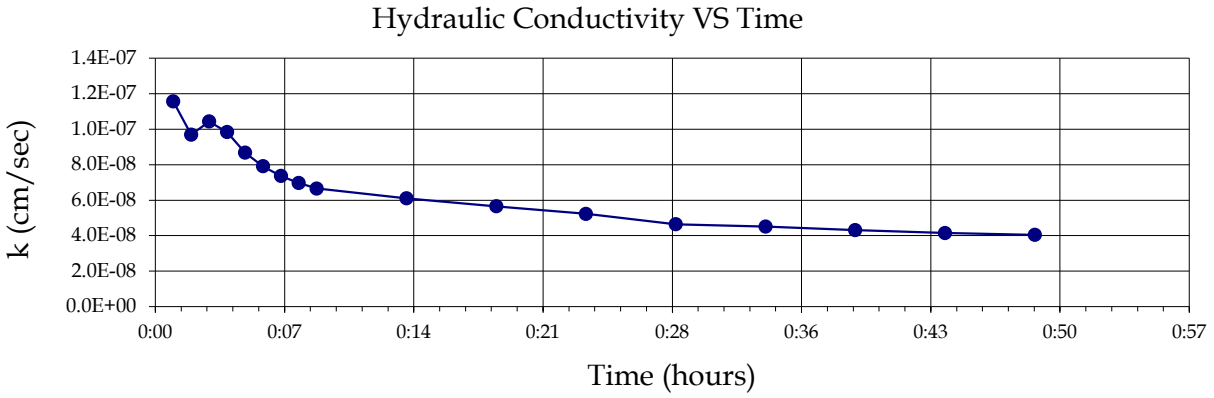
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Back Pressure: 58 psi

Hydraulic gradient: 28.5 to 38.3

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 4.1E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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Holland, Michigan 49424
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HYDRAULIC CONDUCTIVITY
FLEXIBLE WALL PERMEABILITY USING MERCURY

(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	DB-26 (43'-45')
Date:	2/10/16	Sample Desc.:	Soft Brown Clay, Trace Silt

SAMPLE INFORMATION

	Initial		Final	
Length:	6.85 cm	2.70 in	6.80 cm	2.68 in
Diameter:	6.94 cm	2.73 in	7.03 cm	2.77 in
Water Content:	26%		26%	
Dry Density:	1.70 g/cc	105.9 pcf	1.65 g/cc	103.2 pcf

Saturation (B Coefficient): 0.96

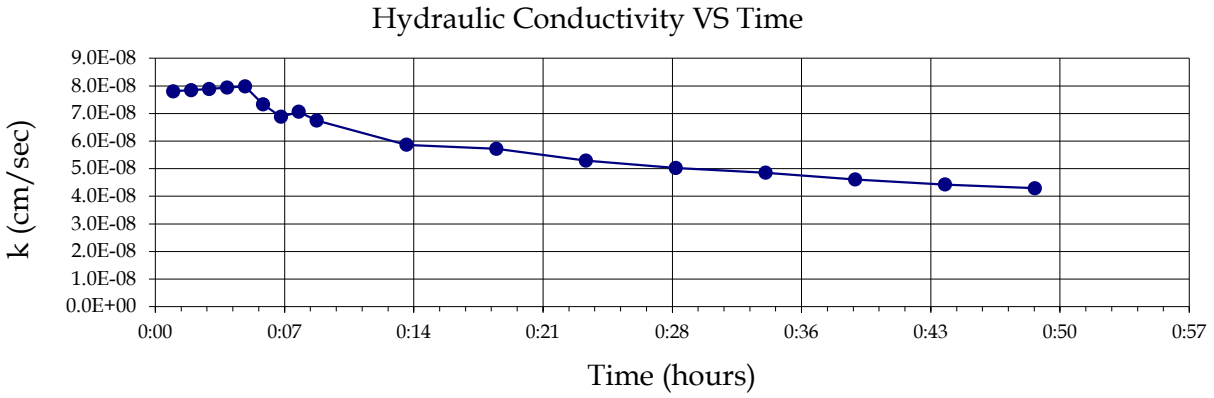
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Back Pressure: 58 psi

Hydraulic gradient: 29.8 to 40.1

Effective Consolidation: 2 psi



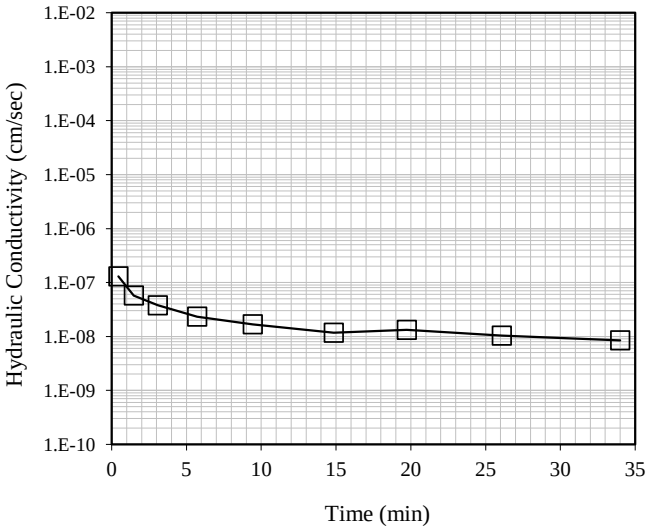
Average Stabilized Hydraulic Conductivity k: 4.4E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

Hydraulic Conductivity

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample ID: DB-27: (20-22 & 22-24)

TRI Log #: 19733
Test Method: ASTM D5084 Method F



Initial Values	
Sample Condition	Undisturbed
Diameter (in)	2.81
Height (in)	1.46
Initial Mass (g)	317.5
Sample Area (in^2)	6.21
Water Content (%)	15.7
Total Unit Weight (pcf)	133.3
Dry Unit Weight (pcf)	115.2
Specific Gravity (ASTM D854)	2.69
Degree of Saturation	92.6
Void Ratio	0.46
Porosity	0.31
1 Pore Volume (cc)	46.6
Eff. Confining Stress (psi)	5.0
B-Value Prior to Permeation	0.98

Specimen Image

Time	Hydraulic Conductivity, K at 20° C
Min	cm/s
14.9	1.2E-08
19.7	1.3E-08
26.1	1.0E-08
34.0	8.5E-09
Average, Last 2 Readings	**9.4E-09**

Note: Permeation measurements were made with a mercury U-tube.

Jeffrey A. Kuhn, Ph.D., P.E., 3/10/2016
Analysis & Quality Review/Date
Testing Performed By: SOC & LC

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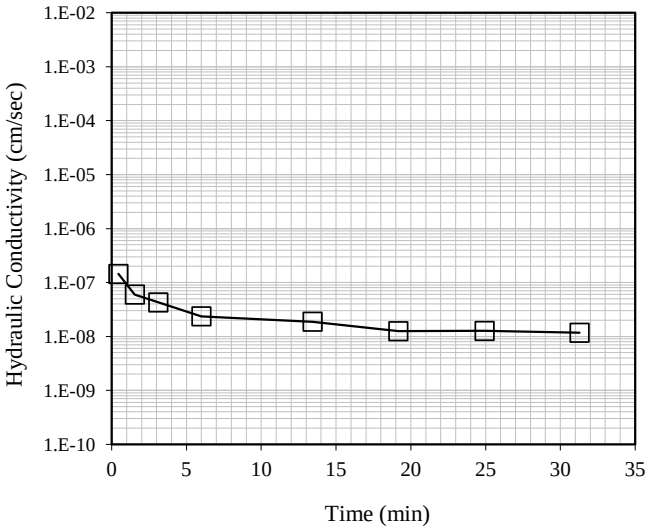
Hydraulic Conductivity

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample ID: DB-27: (42-44)

TRI Log #: 19733
Test Method: ASTM D5084 Method F



Initial Values	
Sample Condition	Undisturbed
Diameter (in)	2.75
Height (in)	1.55
Initial Mass (g)	303.4
Sample Area (in^2)	5.94
Water Content (%)	23.0
Total Unit Weight (pcf)	125.8
Dry Unit Weight (pcf)	102.2
Specific Gravity (ASTM D854)	2.60
Degree of Saturation	101.9
Void Ratio	0.59
Porosity	0.37
1 Pore Volume (cc)	55.7
Eff. Confining Stress (psi)	5.0
B-Value Prior to Permeation	0.98

Specimen Image

Time	Hydraulic Conductivity, K at 20° C
Min	cm/s
13.4	1.9E-08
19.2	1.2E-08
24.9	1.3E-08
31.3	1.2E-08
Average, Last 2 Readings	**1.2E-08**

Note: Permeation measurements were made with a mercury U-tube.

Jeffrey A. Kuhn, Ph.D., P.E., 3/10/2016
Analysis & Quality Review/Date
Testing Performed By: SOC & LC

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HYDRAULIC CONDUCTIVITY
FLEXIBLE WALL PERMEABILITY USING MERCURY

(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	M-21 (45'-47')
Date:	2/3/16	Sample Desc.:	Brown Clay, Trace Silt

SAMPLE INFORMATION

	Initial		Final	
Length:	6.69 cm	2.63 in	6.72 cm	2.65 in
Diameter:	7.16 cm	2.82 in	7.15 cm	2.81 in
Water Content:	24%		24%	
Dry Density:	1.65 g/cc	102.7 pcf	1.66 g/cc	103.9 pcf

Saturation (B Coefficient): 0.97

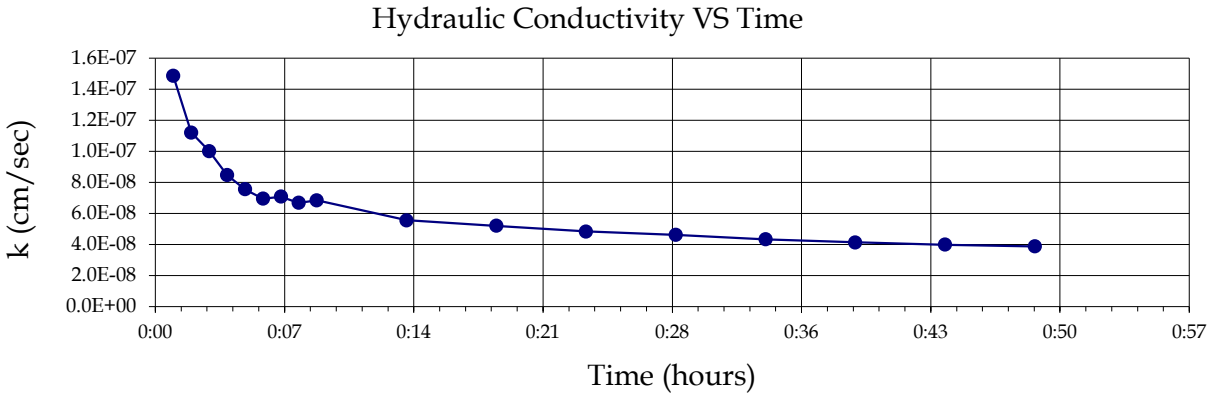
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Back Pressure: 58 psi

Hydraulic gradient: 29.9 to 39.8

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 3.9E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	M-21 (47'-49')
Date:	2/4/16	Sample Desc.:	Brown Clay, Trace Silt

SAMPLE INFORMATION

	Initial		Final	
Length:	6.97 cm	2.74 in	6.99 cm	2.75 in
Diameter:	7.24 cm	2.85 in	7.23 cm	2.85 in
Water Content:	23%		23%	
Dry Density:	1.70 g/cc	106.0 pcf	1.71 g/cc	106.5 pcf

Saturation (B Coefficient): 0.97

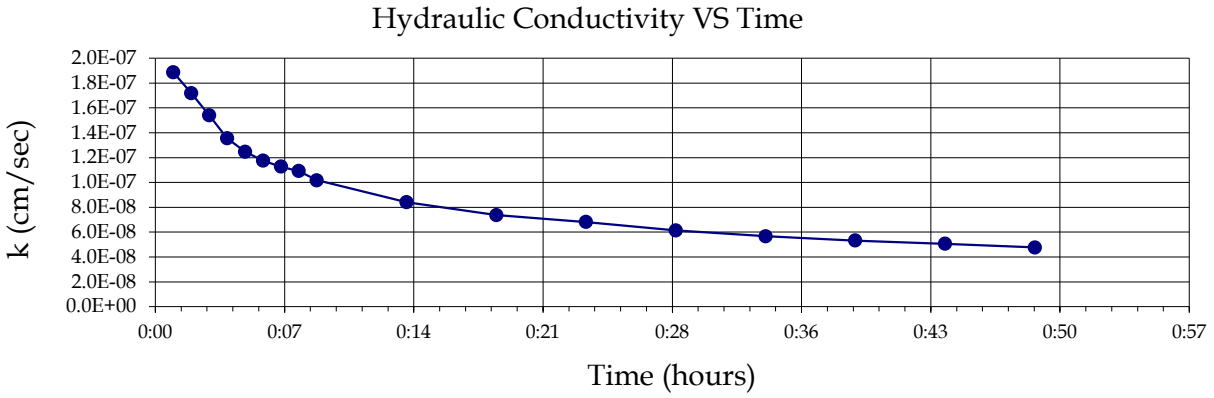
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Hydraulic gradient: 27.3 to 38.4

Back Pressure: 58 psi

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 4.9E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	SB-31
Date:	11/6/15	Sample Desc.:	Brown Clay

SAMPLE INFORMATION

	Initial		Final	
Length:	7.72 cm	3.04 in	7.73 cm	3.04 in
Diameter:	7.23 cm	2.85 in	7.27 cm	2.86 in
Water Content:	18%		20%	
Dry Density:	1.83 g/cc	114.1 pcf	1.78 g/cc	111.2 pcf

Saturation (B Coefficient): 0.97

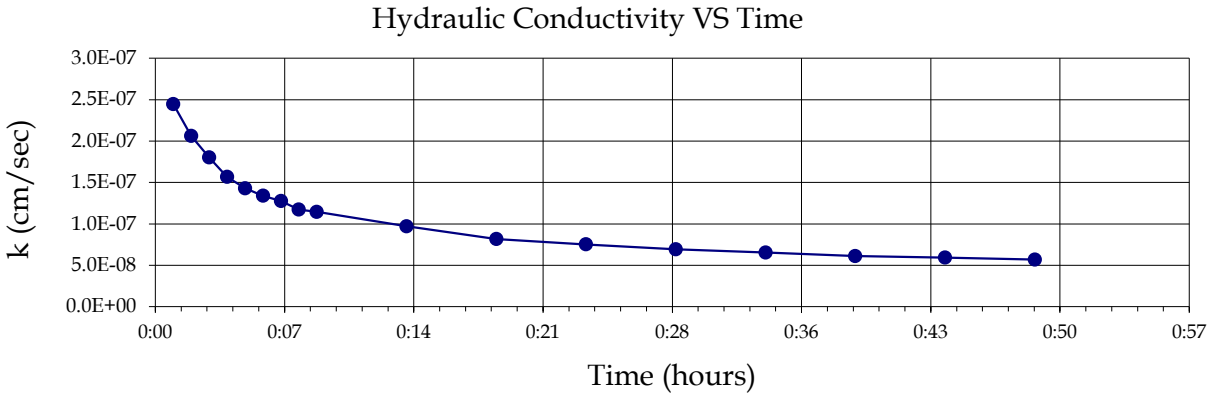
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Back Pressure: 58 psi

Hydraulic gradient: 24.6 to 35.8

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 5.8E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	SB-33 (48'-50')
Date:	11/19/15	Sample Desc.:	Brown Clay, Trace Silt, Trace Coarse Sand/Fine Gravel

SAMPLE INFORMATION

	Initial		Final	
Length:	6.99 cm	2.75 in	7.03 cm	2.77 in
Diameter:	7.22 cm	2.84 in	7.25 cm	2.85 in
Water Content:	25%		26%	
Dry Density:	1.64 g/cc	102.3 pcf	1.62 g/cc	101.2 pcf

Saturation (B Coefficient): 0.96

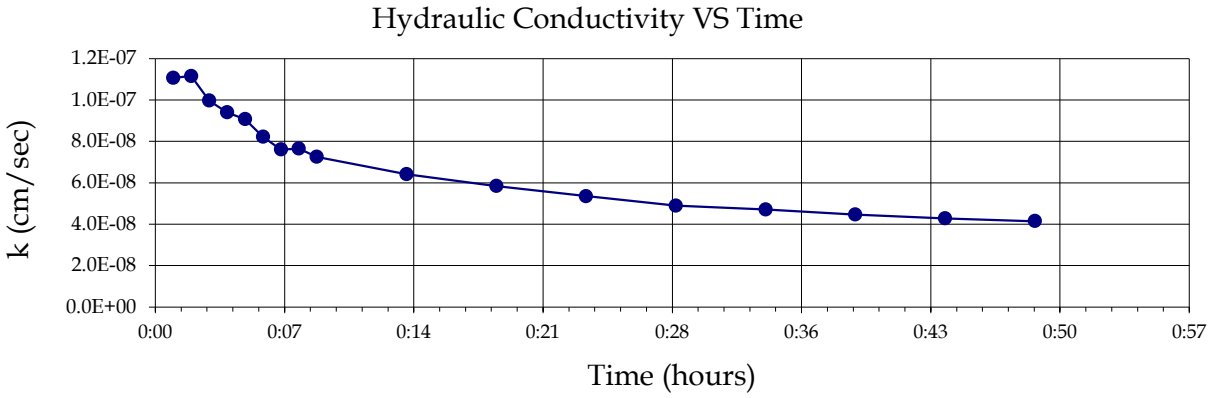
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Hydraulic gradient: 29.0 to 39.3

Back Pressure: 58 psi

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 4.2E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	SB-35 (42'-44')
Date:	11/20/15	Sample Desc.:	Brown Clay, Trace Silt, Trace Coarse Sand/Fine Gravel

SAMPLE INFORMATION

	Initial		Final	
Length:	7.12 cm	2.80 in	7.12 cm	2.80 in
Diameter:	7.26 cm	2.86 in	7.25 cm	2.85 in
Water Content:	16%		17%	
Dry Density:	1.90 g/cc	118.6 pcf	1.91 g/cc	118.9 pcf

Saturation (B Coefficient): 0.96

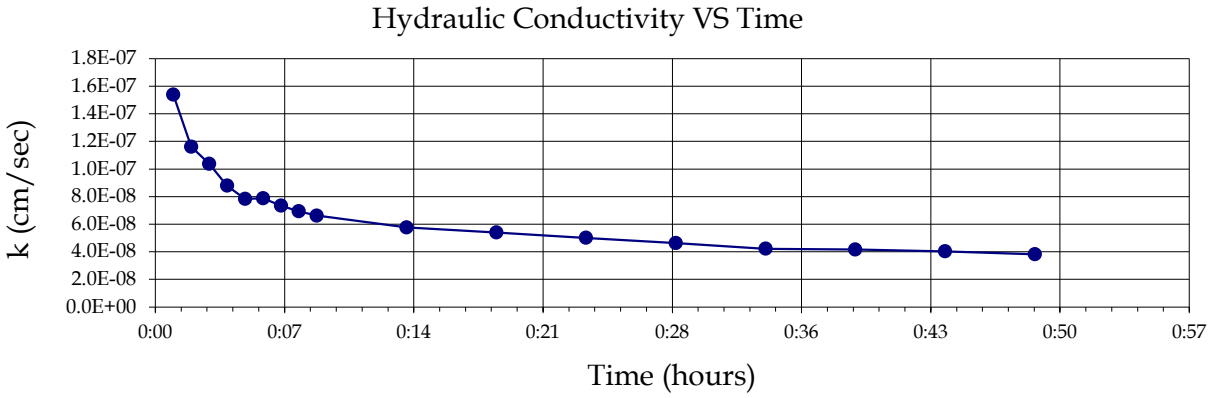
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Hydraulic gradient: 28.3 to 37.4

Back Pressure: 58 psi

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 3.9E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	SB-37 (42-44')
Date:	11/23/15	Sample Desc.:	Brown Clay, Trace Silt, Trace Coarse Sand/Fine Gravel

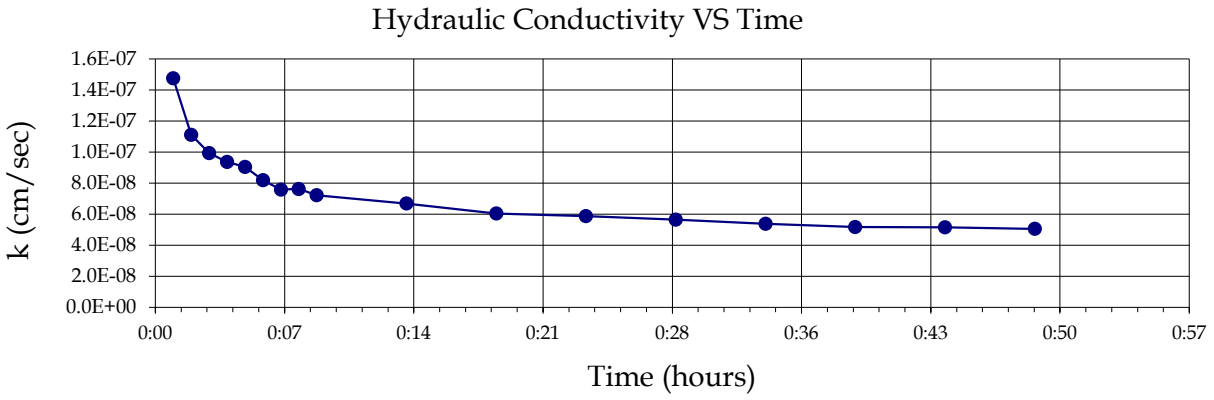
SAMPLE INFORMATION

	Initial		Final	
Length:	7.08 cm	2.79 in	7.08 cm	2.79 in
Diameter:	7.24 cm	2.85 in	7.26 cm	2.86 in
Water Content:	22%		23%	
Dry Density:	1.69 g/cc	105.5 pcf	1.68 g/cc	104.6 pcf

Saturation
(B Coefficient): 0.97

PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4
Hydraulic gradient: 27.1 to 39.2
Back Pressure: 58 psi
Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 5.1E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	SB-38 (50-52')
Date:	11/24/15	Sample Desc.:	Brown Clay, Trace Silt, Trace Coarse Sand/Fine Gravel

SAMPLE INFORMATION

	Initial		Final	
Length:	6.76 cm	2.66 in	6.80 cm	2.68 in
Diameter:	7.13 cm	2.81 in	7.19 cm	2.83 in
Water Content:	21%		21%	
Dry Density:	1.80 g/cc	112.1 pcf	1.77 g/cc	110.3 pcf

Saturation
(B Coefficient): 0.97

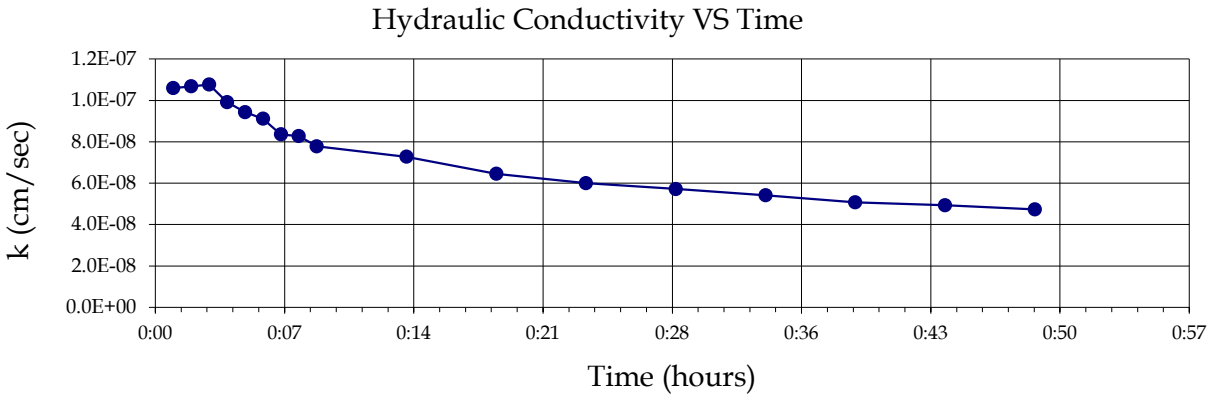
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Hydraulic gradient: 29.6 to 42.1

Back Pressure: 58 psi

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 4.9E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	SB-40
Date:	12/14/15	Sample Desc.:	Brown Clay, Trace Silt, Trace Gravel

SAMPLE INFORMATION

	Initial		Final	
Length:	7.35 cm	2.89 in	7.42 cm	2.92 in
Diameter:	7.24 cm	2.85 in	7.19 cm	2.83 in
Water Content:	15%		15%	
Dry Density:	1.96 g/cc	122.0 pcf	1.98 g/cc	123.8 pcf

Saturation (B Coefficient): 0.95

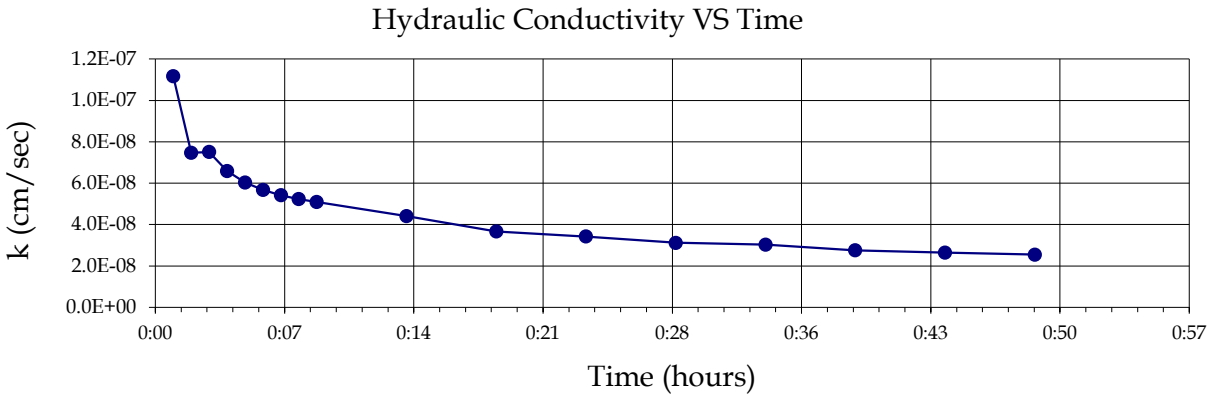
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Hydraulic gradient: 32.4 to 38.8

Back Pressure: 58 psi

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 2.6E-08 cm/sec

Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

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(ASTM D5084)

PROJECT INFORMATION

Client:	E&E Solutions	Lab Project #:	1510644.4A
Project:	Ottawa County Farms Landfill	Sample #:	SB-41 (38'-40')
Date:	2/11/16	Sample Desc.:	Brown Clay, Trace Silt

SAMPLE INFORMATION

	Initial		Final	
Length:	7.32 cm	2.88 in	7.35 cm	2.89 in
Diameter:	7.20 cm	2.83 in	7.28 cm	2.87 in
Water Content:	23%		23%	
Dry Density:	1.74 g/cc	108.8 pcf	1.71 g/cc	106.7 pcf

Saturation (B Coefficient): 0.98

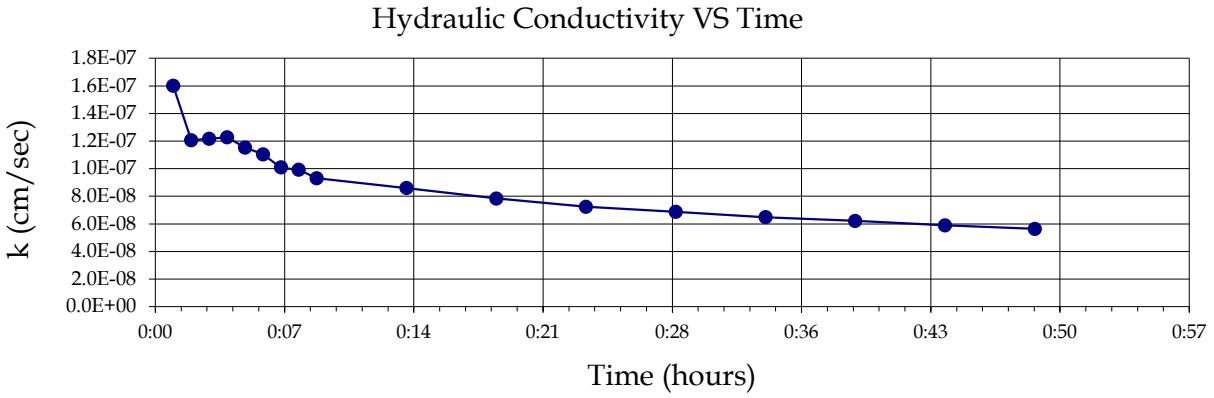
PERMOMETER TEST

Permeant Liquid: 0.005 N CaSO4

Back Pressure: 58 psi

Hydraulic gradient: 24.8 to 36.6

Effective Consolidation: 2 psi



Average Stabilized Hydraulic Conductivity k: 5.8E-08 cm/sec

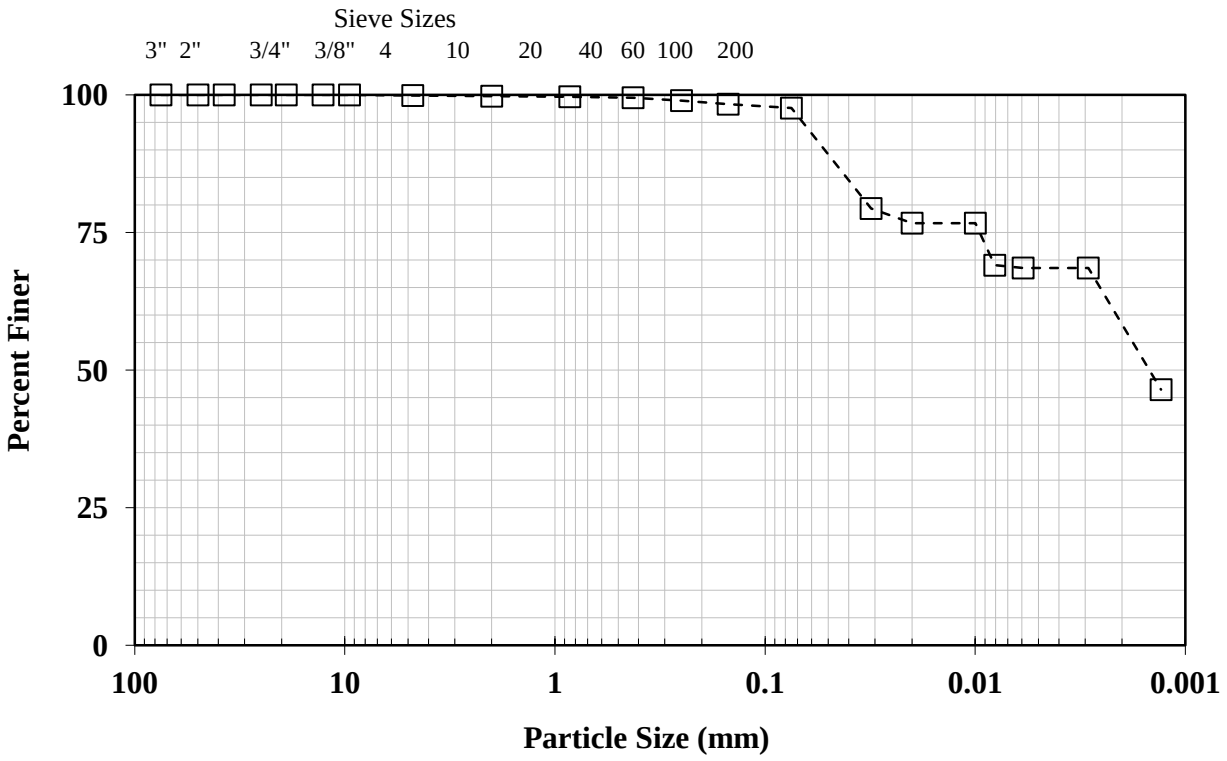
Remarks: Sample was extracted from shelby tube, trimmed, and mounted prior to analysis

Classification, Particle Size, Atterberg Limits & Specific Gravity

Particle Size Analysis for Soils

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-24 (22-24)

TRI Log#: 19733.1
Test Method: ASTM D422



Sieve Analysis		
Sieve Size		Percent Passing
3 in.	(76.2 mm)	100.0
2 in.	(50.8 mm)	100.0
1.5 in.	(38.1 mm)	100.0
1 in.	(25.4 mm)	100.0
3/4 in.	(19.0 mm)	100.0
1/2 in.	(12.7 mm)	100.0
3/8 in.	(9.51 mm)	100.0
No. 4	(4.76 mm)	99.9
No. 10	(2.00 mm)	99.8
No. 20	(0.841 mm)	99.7
No. 40	(0.420 mm)	99.5
No. 60	(0.250 mm)	99.0
No. 100	(0.149 mm)	98.3
No. 200	(0.074 mm)	97.6
Hydrometer Analysis		
Particle Size		Percent Passing
0.005 mm		68.6
0.002 mm		58.3

USCS Classification (ASTM D2487)	Silt (ML)	
As-Received Moisture Content (%)	(ASTM D2216)	- -
Atterberg Limits (ASTM D4318, Method A : Multipoint)	Liquid Limit (3 pt)	43
	Plastic Limit	31
	Plastic Index	12
Notes: Specimen was air dried, 3 point Liquid Limit procedure was used. (NL = No Liquid Limit, NP = No Plastic Limit)		
Specific Gravity	(ASTM D854)	2.61
Organic Content (%)	(ASTM D2974)	- -
Carbonate Content (%)	(ASTM D4373)	- -

Jeffrey A. Kuhn, Ph.D., P.E., 4/8/2016
Quality Review/Date
Tested by: KH & PC

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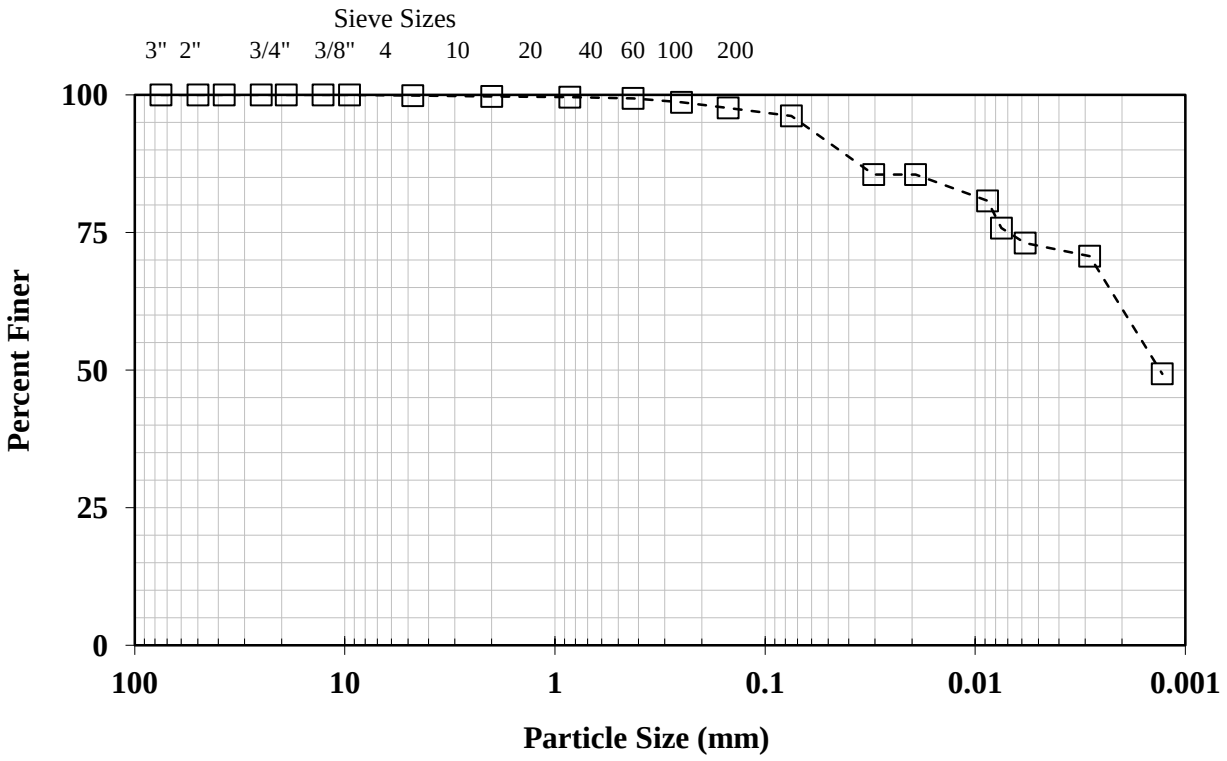
Particle Size Analysis for Soils

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-27 (20-22 & 22-24)

TRI Log#: 19733.2
Test Method: ASTM D422



Sieve Analysis		
Sieve Size		Percent Passing
3 in.	(76.2 mm)	100.0
2 in.	(50.8 mm)	100.0
1.5 in.	(38.1 mm)	100.0
1 in.	(25.4 mm)	100.0
3/4 in.	(19.0 mm)	100.0
1/2 in.	(12.7 mm)	100.0
3/8 in.	(9.51 mm)	100.0
No. 4	(4.76 mm)	99.9
No. 10	(2.00 mm)	99.7
No. 20	(0.841 mm)	99.6
No. 40	(0.420 mm)	99.4
No. 60	(0.250 mm)	98.7
No. 100	(0.149 mm)	97.6
No. 200	(0.074 mm)	96.2
Hydrometer Analysis		
Particle Size		Percent Passing
0.005 mm		72.6
0.002 mm		61.1

USCS Classification (ASTM D2487)	Lean clay (CL)	
As-Received Moisture Content (%)	(ASTM D2216)	- -
Atterberg Limits (ASTM D4318, Method A : Multipoint)	Liquid Limit (3 pt)	48
	Plastic Limit	23
	Plastic Index	25
Notes: Specimen was air dried, 3 point Liquid Limit procedure was used. (NL = No Liquid Limit, NP = No Plastic Limit)		
Specific Gravity	(ASTM D854)	2.69
Organic Content (%)	(ASTM D2974)	- -
Carbonate Content (%)	(ASTM D4373)	- -

Jeffrey A. Kuhn, Ph.D., P.E., 4/8/2016
Quality Review/Date
Tested by: KH & PC

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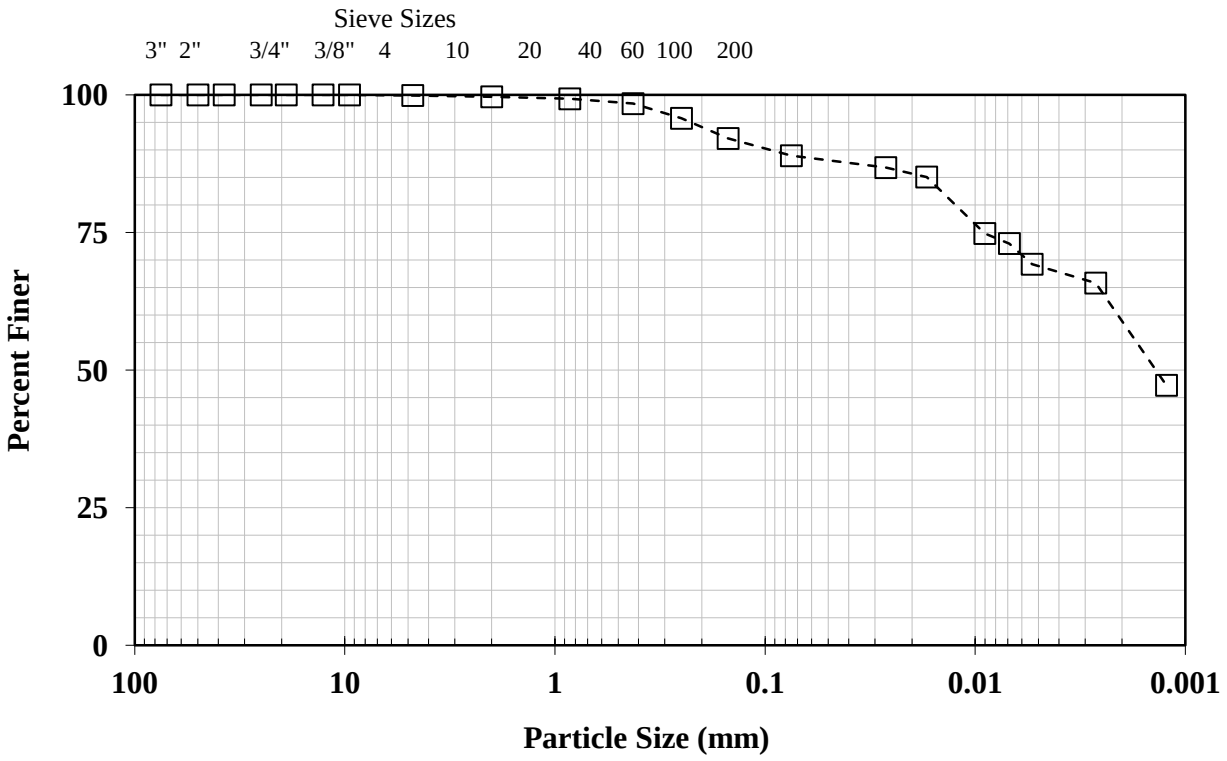
Particle Size Analysis for Soils

Client: Weaver Consultants Group
Project: Ottawa County Farms Expansion
Sample: DB-27 (42-44)

TRI Log#: 19733.3
Test Method: ASTM D422



Sieve Analysis		
Sieve Size		Percent Passing
3 in.	(76.2 mm)	100.0
2 in.	(50.8 mm)	100.0
1.5 in.	(38.1 mm)	100.0
1 in.	(25.4 mm)	100.0
3/4 in.	(19.0 mm)	100.0
1/2 in.	(12.7 mm)	100.0
3/8 in.	(9.51 mm)	100.0
No. 4	(4.76 mm)	99.9
No. 10	(2.00 mm)	99.7
No. 20	(0.841 mm)	99.3
No. 40	(0.420 mm)	98.4
No. 60	(0.250 mm)	95.7
No. 100	(0.149 mm)	92.1
No. 200	(0.074 mm)	89.0
Hydrometer Analysis		
Particle Size		Percent Passing
0.005 mm		68.9
0.002 mm		58.9

USCS Classification (ASTM D2487)	Lean clay (CL)	
As-Received Moisture Content (%)	(ASTM D2216)	- -
Atterberg Limits (ASTM D4318, Method A : Multipoint)	Liquid Limit (3 pt)	44
	Plastic Limit	22
	Plastic Index	22
Notes: Specimen was air dried, 3 point Liquid Limit procedure was used. (NL = No Liquid Limit, NP = No Plastic Limit)		
Specific Gravity	(ASTM D854)	2.60
Organic Content (%)	(ASTM D2974)	- -
Carbonate Content (%)	(ASTM D4373)	- -

Jeffrey A. Kuhn, Ph.D., P.E., 4/8/2016
Quality Review/Date
Tested by: KH & PC

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