REPORT of FIELD INVESTIGATION
and
MSE WALL FEASIBILITY STUDY

SC-41 over the Wando River

Berkeley-Charleston Counties,
South Carolina

Prepared For:

Triplett-King & Associates, Inc.

By:

F&ME

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April 22, 2005

F&ME File No.: G4067

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April 22, 2005

Mr. Russell Howell, P.E.
CECS, Inc.
3020 Devine street
Columbia, South Carolina 29205

Re.: Report of Field Investigation and MSE Wall Feasibility Study
SC 41 Bridge Replacement over the Wando River
Berkeley-Charleston Counties, South Carolina
F&ME Project No. G4067

Dear Russell:

The following presents a summary of: 1) our review of project site geology, 2) the field investigation program, 3) the soil stratigraphy as encountered in the soil test borings and dilatometer soundings performed for this phase of investigation, 4) results of the soil laboratory testing program, and 5) the results our conceptual analyses of predicted MSE wall performance for the SC-41 Replacement Bridge over the Wando River south approach embankment.

Geology

The MSE wall study site is located in the Lower Coastal Plain Physiographic Province of South Carolina. The Coastal Plain consist of a wedge of sedimentary deposits which overlie basement rocks beginning at the Fall Line and in crease in thickness moving seaward. In the Charleston area this sediment wedge is on the order of 2,500 feet thick. The major shallow geological formation in this wedge is the Cooper Group. This formation is locally referred to as "Cooper Marl". The Cooper Group is comprised of several sub-groups or formations which vary in composition depending upon depositional environments. Properties of the Cooper Marl are well documented in the Charleston area in that it is the predominate support formation for most major structures.

For engineering purposes, Cooper Marl is classified as a sandy silt or clay or silty sand. The formation is over consolidated with plasticity ranging from low to high. Geologically the formation is described as a phosphatic limestone containing calcium carbonates in the range of 60 to 80 percent (i.e. calcareous).

Field Investigations

On December 27, 2005, six (6) soil test borings (WB-1 though WB-6) with standard penetration testing (SPT) were performed to depths of 35 feet below present ground surface. Borings WB-1, WB-3 and WB-5 were performed left of planned roadway centerline and were advanced utilizing a Tiger-tracked mounted drill rig with cat-head/gravity (G) drop hammer system. Borings WB-2, WB-4, and WB-6 were located right of planned roadway centerline and were advanced utilizing a CME-55 truck mounted drill rig with an automatic (A) trip hammer system. The distinction between the two hammer systems is apparent by the actual recorded standard penetration test values (N values) shown in the following table.

Field Recorded N Values

	Boring I.D.	WB-1	WB-2	WB-3	WB-4	WB-5	WB-6
	Hammer Type	G	A	G	A	G	A
SPT Test Depth (ft)	1.5-3.0	5	6	4	9	8	9
	3.5-5.0	16	9	9	5	13	4
	6.0-7.5	12	10	10	7	9	5
	8.5-10.0	19	4	13	6	12	7
	13.5-15.0	9	3	7	3	7	3
	18.5-20.0	15	5	15	4	10	2
	23.5-25.0	7	5	10	5	7	3
	28.5-30.0	11	7	13	6	13	6
	33.5-35.0	14	8	14	7	13	6
Avg. N Value (bpf)		12.0	6.3	10.6	5.8	10.2	5.0

F&ME contacted our drilling contractor to request any energy rating testing that they may have performed on either of the two hammer systems. Due to deletion of the ASTM test method for hammer energy rating, these tests have not been performed by the driller in the last several years. Based on our experience and with consultation with the drilling contractor, a typical energy transfer efficiency for a gravity drop hammer system is believed to be approximately 55%. A typical energy transfer efficiency for an automatic trip hammer system is believed to be from 90% to the theoretical maximum 100%. In order to correlate the SPT data from the two different hammer systems, we have assumed that the gravity hammer is 55% efficient and the automatic hammer is 95% efficient, and have normalized the adjusted N values to N70 (70% energy transfer efficiency). The results are presented in the following table.

Normalized N70 Values

	Boring I.D.	WB-1	WB-2	WB-3	WB-4	WB-5	WB-6
	Hammer Type	G	A	G	A	G	A
SPT Test Depth (ft)	1.5-3.0	4	8	3	12	6	12
	3.5-5.0	13	12	7	7	10	5
	6.0-7.5	9	14	8	10	7	7
	8.5-10.0	15	5	10	8	9	10
	13.5-15.0	7	4	6	4	6	4
	18.5-20.0	12	7	12	5	8	3
	23.5-25.0	6	7	8	7	6	4
	28.5-30.0	9	10	10	8	10	8
	33.5-35.0	11	11	11	10	10	8
Avg. N Value (bpf)		9.4	8.6	8.3	7.8	8.0	6.8

On the soil test boring logs presented in the Appendix, we have shown the blows per 6" increment as those recorded in the field. The N values shown on the logs are the normalized N70 values and are the basis for soil consistency descriptions shown on the soil test boring logs and as discussed in this section and subsequent sections of this report.

On December 30, 2004, and January 3, 2005, a total of six (6) dilatometer soundings (WD-1 through WD-6) were performed at 2 to 3 feet offsets to their respective soil test boring (i.e. WD-1 offset to WB-1, etc.). The dilatometer test (DMT) soundings were pushed to refusal depths ranging from 16 to 17 feet below present ground surface for WD-1, WD-2, and WD-5. The remaining three (3) DMT soundings were terminated at a depth of approximately 31 feet below existing grade. We have included in the Appendix the DMT data reduction output for each of the DMT soundings.

On January 3, 2005, three (3) soil auger probes (WS-3, WS-4, and WS-6) were performed at 2 to 3 feet offsets to their respective soil test boring (i.e. WS-3 offset to WD-3, etc.). The purpose of these auger probes were to collect a total of eight (8) Shelby tube samples of soil strata which were identified as representative of relatively 'soft' soil consistencies as well as 'firmer' consistencies for undisturbed tri-axial shear strength testing and consolidation tests. The following table lists the Shelby tube collection depths below present ground surface and the corresponding soil stratigraphy as indicated in the adjoining soil test boring.

Shelby Tube Collection Table

Boring I.D.	Sample I.D.	Sample Depth (ft)	Soil Stratigraphy
WS-3	ST-1	6.0-8.0	Alluvial – Stiff, Sandy Lean CLAY (CL)
WS-3	ST-2	8.0-10.0	Alluvial – Stiff, Sandy Lean CLAY (CL)
WS-3	ST-3	18.5-20.5	Marl – Firm, Silty Fine SAND (SM)
WS-3	ST-4	20.5-22.5	Marl – Firm, Silty Fine SAND (SM)
WS-4	ST-1	18.5-20.5	Marl – Firm, Fine Sandy SILT (ML)
WS-4	ST-2	20.5-22.5	Marl – Firm, Fine Sandy SILT (ML)
WS-6	ST-1	13.5-15.5	Alluvial – Soft, Sandy Lean to Elastic CLAY (CL-CH)
WS-6	ST-2	15.5-17.5	Alluvial – Soft, Sandy Lean to Elastic CLAY (CL-CH)

The locations of the soil test borings, dilatometer soundings and auger borings for Shelby tube collections are schematically shown on the Test Boring Location Plan in the Appendix. All recovered spilt-spoon soil samples and Shelby tubes were logged in the field by F&ME personnel, and transported to our laboratory for further evaluation and/or testing.

Laboratory Test Program

Select samples were tested in the laboratory to determine applicable physical and engineering properties. The laboratory test program included grain size distribution, Atterberg limits, moisture contents, consolidated-undrained (CU) tri-axial shear strength testing, and consolidation tests. The Atterberg limits, grain size distribution, and moisture content tests (i.e. soil indices) were utilized to determine the behavioral characteristics of the soils and were also utilized to verify the field classifications by the Unified Soil Classification System (USCS). The results of the Atterberg limits, grain size distribution, and moisture content tests are summarized in the following table.

Soil Indices Results Summary						
Boring I.D.	Depth (ft)	P.I.	L.L.	MC (%)	Fines (%)	USCS
WB-3	6.0-7.5	22	41	29.0	62.5	CL
WB-3	18.5-20.0	NP	NP	47.1	44.7	SM
WB-4	18.5-20.0	NP	NP	45.9	51.5	ML
WB-6	13.5-15.0	27	50	45.7	73.0	CL-CH

The CU shear strength tests were used for determination of soil strength parameters and validation of the soil strength parameters as derived from DMT soundings. The results of the CU tests and the corresponding soil stratigraphy as indicated in the adjoining soil test boring are summarized in the following table.

Shear Strength Testing Results Summary				
Boring I.D.	Depth (ft)	Cohesion (ksf)	Friction Angle (degrees)	Soil Stratigraphy
WS-3	6.0-10.0	0.35	23.0	Alluvial – Stiff, Sandy Lean CLAY (CL)
WS-3	18.5-22.5	1.8	15.7	Marl – Firm, Silty Fine SAND (SM)
WS-4	18.5-22.5	0.95	30.7	Marl – Firm, Fine Sandy SILT (ML)
WS-6	13.5-17.5	1.0	4.7	Alluvial – Soft, Sandy Lean to Elastic CLAY (CL-CH)

Consolidation tests were also performed for comparisons of settlements predicted from the DMT derived soil modulus of elasticity (E_d) as well as determine time-rates of consolidation. The results of the consolidation tests are summarized in the following table.

Consolidation Testing Results Summary									
Boring I.D.	Depth (ft)	Load (ksf)	Void Ratio (e)	C_r	$P'c$ (ksf)	C_c	t_{50} (min.)	c_v	C_α
WS-3	6.0-10.0	0.00	0.66	0.10	1.33	0.20	N.A.	N.A	N.A.
		0.72	0.62				3.8	0.012	0.0011
		1.44	0.58				13	0.003	0.0013
		2.88	0.54				16	0.003	0.0020
		5.76	0.48				23	0.002	0.0027
WS-6	13.5-17.5	0.00	1.34	0.30	1.73	0.64	N.A.	N.A.	N.A.
		0.72	1.27				0.2	0.230	0.0008
		1.44	1.20				4	0.011	0.0024
		2.88	1.08				6	0.007	0.0051
		5.76	0.89				15	0.002	0.0081

C_r = Recompression index
$P'c$ = Effective preconsolidation stress
C_c = Compression index
t_{50} = Time for 50% consolidation
c_v = Coefficient of consolidation (for 50% consolidation)
C_α = Secondary compression index

Soil Stratigraphy

As indicated at these boring locations, the uppermost soil strata encountered were fill soils to approximate depths of 2 to 3 feet below existing ground surface. The placement of these fill soils was verified by conversations with Mr. Joe Sharp, owner of Atlantis Marine boat storage facility. Below the fill layer, three major strata were identified. The top two strata layers consisted of alluvial re-worked Coastal Plain soil material with the uppermost soil unit generally described as firm to stiff, sandy lean clays (CL). The lower unit is generally described as soft to firm, sandy lean to elastic clay (CL-CH). Neglecting the first SPT test depth interval (i.e. the fill soil layer), the N70 values of these clay layers ranged from 4 blows per foot (bpf) to 15 bpf, with averaged values per boring of about 7 to 11 bpf. This strata extended to depths of approximately 17 to 18 feet below present ground surface.

Below the re-worked Coastal Plain soils, the Cooper Marl Formation was encountered. The Cooper Marl is typically described as firm to stiff, fine sandy silty clay (CL). N70 values in the marl to the depths investigated generally ranged from 3 to 12 bpf. All soil test borings were terminated in the marl at 35 feet below present ground surface.

Seismic Considerations

No liquefiable soils were noted in the soil test borings or as interpreted from the dilatometer soundings overlying the Cooper Marl at the MSE wall study area. The Cooper Marl Formation is seismically stable.

MSE Wall External/Global Stability Analyses

In our conceptual external/global stability analyses of MSE walls, the following design and performance criteria were utilized.

1.) Design Criteria

Design Life:

100 Years (Permanent Structure)

Reinforced Backfill Material:

Select Granular Backfill (Option 1)
Internal Friction Angle, ϕ = 32^{O}
Wet Unit Weight = 120 pcf

Light-Weight Stone Backfill (Option 2)
Internal Friction Angle, ϕ = 38^{O}
Wet Unit Weight = 60 pcf

Retained Backfill:

Internal Friction Angle, ϕ	$= 30^{O}$
Wet Unit Weight	= 120 pcf

Light-Weight Stone Backfill (Option 2)

Internal Friction Angle, ϕ	$= 38^{O}$
Wet Unit Weight	= 60 pcf

(The above Option 2 reinforced and retained backfill material is presented in order to reduce predicted settlements. Predicted settlements will be discussed in the following sections of this report.)

Foundation Soils:

Internal Friction Angle, ϕ	$= 15^{O}$
Cohesion	= 750 psf

External Stability:	Static	Seismic
Global Stability Safety Factor, $FS_{Overall.}$	1.30	1.10
Sliding Stability Safety Factor, $FS_{Stabilty}$	1.50	1.10
Overturning Safety Factor, $FS_{Overturn}$	2.00	1.50
Eccentricity	< L/6	< L/3
Bearing Capacity Safety Factor, $FS_{Bearing}$	2.50	2.00

Loadings:

Traffic Live Load:	250 psf Uniformly Distributed
Dead Load:	250 psf Uniformly Distributed
Barrier Dead Load:	2000 lb/LF Strip Load

Seismic Design Method: Two-Level Design

Design Earthquakes:

Safety Evaluation Earthquake (SEE):	2% Probability of Exceedance in 50 Years
Functional Evaluation Earthquake (FEE):	10% Probability of Exceedance in 50 Years
SEE Peak Ground Acceleration (PGA)	0.372g
FEE Peak Ground Acceleration (PGA)	0.139g

2.) Performance Criteria

The MSE wall will be designed to insure that the internal stability and performance of the MSE wall meets the following performance criteria:

SEE: Designed so that the structure does not collapse under the design earthquake.

FEE: Designed so that the structure has limited damage and that any damage that does occur is accessible and readily repairable.

SEE Max. Lateral Permissible Displacement: 4"
SEE Max. Vertical Permissible Displacement: 2"

FEE Max. Lateral Permissible Displacement: 3"
FEE Max. Vertical Permissible Displacement: 1"

Settlement:

Total Settlement <12"
(For permanent wall panel placement during construction)
Max. Total Settlement after Paving (per 20 year period) 2"
Differential Settlement $\leq$ 1/200

We have utilized the computer program MSEW 2.0 in our conceptual external/global stability analyses of a hypothetical MSE wall section. The MSE wall modeled was 22 feet exposed wall height with 3 feet of wall embedment. The wall strap length was preliminarily determined as 32 feet based on initial design run of the computer program with the design criteria as outlined above controlling computer generated wall design. We input the foundation soil strength parameters based on the laboratory shear strength test results for the two alluvial soil samples and analyzed the wall with foundation c = 1.0 ksf and phi = 5 degrees, and performed a second analysis with foundation c = 0.35 ksf and phi = 23 degrees. Our final analyses for foundation soil consideration was to average the two cohesion and phi values and verify that this equivalent/homogenous strength parameters was applicable (i.e. c = 0.75 ksf and phi = 15 degrees). The seismic design event for the analyses was based on the SEE unfactored peak ground acceleration value.

For future settlement considerations, we analyzed two options: Option 1 - select granular backfill with 'normal' retained soil zone (i.e. 120 pcf embankment unit weight); and, Option 2 - light-weight stone place in both reinforced and retained zones (i.e. 60 pcf embankment unit weight).

The following table presents the factor of safety (FS) results of the conceptual external stability analyses.

MSE Wall External Stability FS Results

Option	Foundation Soils	Global Stability		Sliding Stability		Overturning		Max. Eccent.		Bearing Cap.	
		Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic	Static	Seismic
1	Case 1	1.87	**0.95**	2.47	**1.07**	10.65	3.72	L/21	L/7	**1.77**	**1.45**
	Case 2	2.00	**1.02**	3.32	1.44	10.65	3.72	L/21	L/7	3.13	2.36
	Case 3	2.08	**1.08**	3.11	1.35	10.65	3.72	L/21	L/7	2.63	2.09
2	Case 1	3.09	1.40	4.96	2.09	12.05	4.30	L/24	L/9	3.16	2.69
	Case 2	2.78	1.28	4.70	1.98	12.05	4.30	L/24	L/9	5.61	4.49
	Case 3	3.15	1.46	5.25	2.21	12.05	4.30	L/24	L/9	4.68	3.92

Case 1: cohesion = 1.0 ksf and phi = 5 degrees
Case 2: cohesion = 0.35 ksf and phi = 23 degrees
Case 3: cohesion = 0.75 ksf and phi = 15 degrees
NOTE: Bold type are FS below project criteria.

The above soil shear strength parameters are based on consolidated-undrained testing conditions and are considered conservative values due to neglecting long-term strength gains (i.e. consolidated-drained soil strength will be greater). In addition, review of the DMT derived soil shear strength cohesion values in the alluvial soil profile typically indicate higher in-situ shear strength cohesion values than that utilized in our

analyses. In our opinion, the above tabulated factors of safeties should be considered as short-term, during construction values and that the long-term factors of safeties, where deficient, will meet or exceed project criteria. Again, the hypothetical MSE wall height analyzed in this feasibility study is considered as the maximum permissible wall height (i.e. 22 feet exposed wall height) and we have limited the wall strap length to 32 feet. Shorter wall height walls or lengthening the design wall straps will result in greater factors of safeties for bearing capacity and sliding stability.

The MSEW 2.0 computer output sheets for each condition analyzed and summarized above is included in the Appendix.

Settlement Analyses

Based on the DMT derived soil modulus of elasticity (E_d), the following table presents the predicted settlements for various fill heights, and utilizing select granular reinforced backfill as Option 1, and utilizing light weight aggregate as Option 2.

DMT Predicted Total Settlements		
Option	Fill Height (ft)	Settlement (in.)
1	10	3.7
2	10	2.7
1	15	5.1
2	15	3.1
1	20	6.4
2	20	3.7

Based on the laboratory consolidation soil testing for determination of consolidation indices and coefficients, and imprinted preconsolidation stresses, the following table presents the calculated settlements for various fill height placements, the use of select granular reinforced backfill (Option 1), and use of light weight aggregate (Option 2).

Consolidation Testing Predicted Total Settlements		
Option	Fill Height (ft)	Settlement (in.)
1	10	13.7
2	10	9.8
1	15	17.0
2	15	12.0
1	20	21.5
2	20	13.7

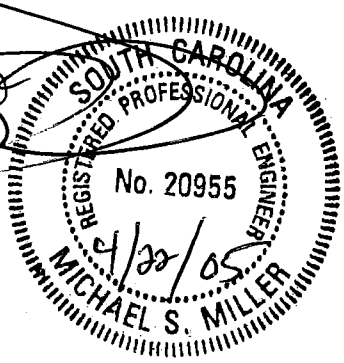
The time rate for 90% consolidation to occur is approximately eleven (11) years following embankment construction and without ground modification. This time period can be reduced to meet project post-construction settlement criteria utilizing vertical wick-drains.

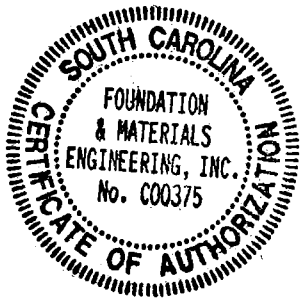
The above predicted settlements include effective stress increases due to 500 psf (250 psf live load + 250 psf dead load) surcharge.

If you need any additional information for your determination of MSE wall feasibility, please do not hesitate to contact us.

Sincerely,

F&ME CONSULTANTS

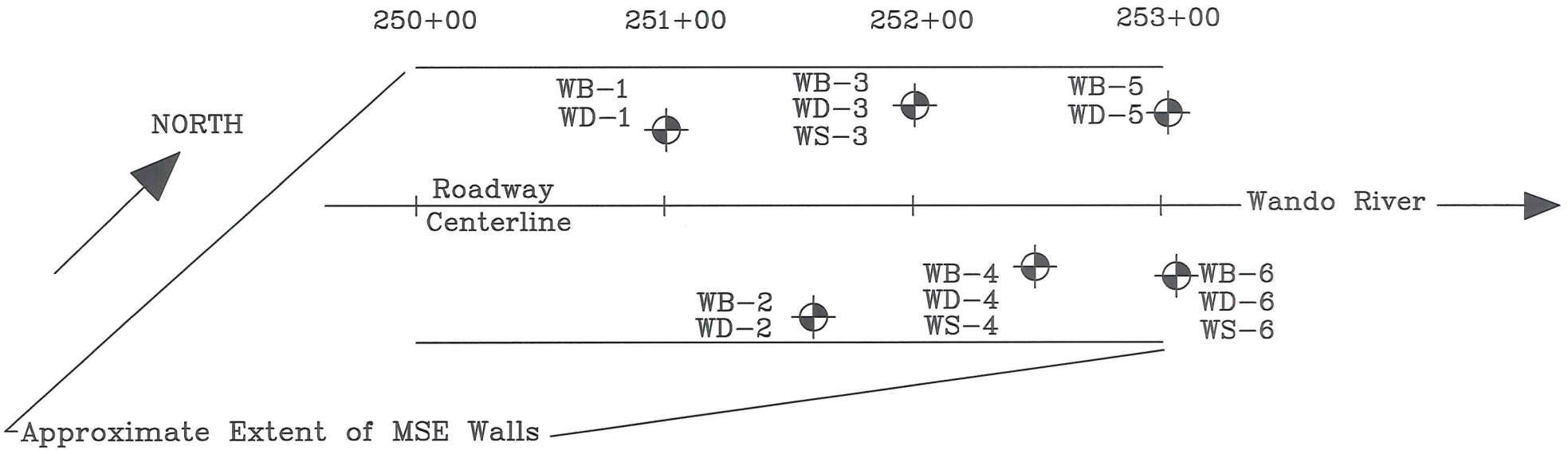




Michael S. Miller, P.E.
Project Engineer

cc: Eric Burgess, P.E./TKA

APPENDIX



SCALE

100 75 50 25 0 100 FEET

LEGEND

Test Location

WB-1 Soil Test Boring

WS-1 Shelby Tube Sample

WD-1 Dilatometer Sounding

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MSE WALL TEST LOCATION PLAN
SC 41 over Wando River
Berkeley County, South Carolina

Triplett-King & Associates, Inc.

DRAWN BY: JRW
CHECKED BY: MSM
APPROVED BY: MSM

SCALE: As Shown
PROJECT: G4067
Figure: 1

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SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WB-1

Station: 251+00
Offset: 30' Left of CL

Date Drilled: 12/27/04 | Supervisor: Ricky Wessinger

Casing Length (ft): | Approx. Surface Elevation (ft): 7.40

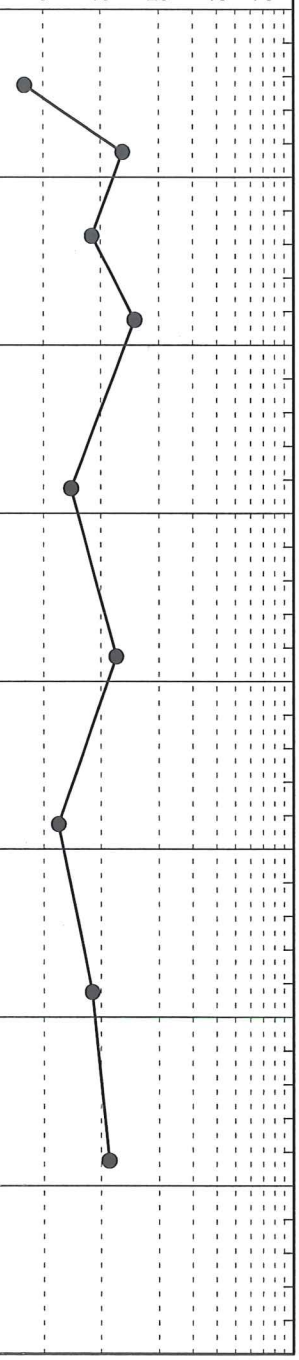
Hammer Type: ☒ Gravity ☐ Automatic ☐ Other:

Water Level: 2.0 Feet at 48 Hours from T.O.B. | Drilling Method: RW

Notes:
BPI are actual recorded blows. N values have been adjusted to N70 assuming a hammer N55.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample Type-No.	1st 6"	2nd 6"	3rd 6"	N Value
	0.3	Grass Rootmat and Topsoil	1.5	SS-1	1	2	3	4
		FILL-Soft, Light Brown, Sandy Lean CLAY (CL)	3.5	SS-2	4	6	10	13
2.4	3.0	ALLUVIAL-Stiff, Gray and Orange Mottled, Fine to Medium Sandy Lean CLAY (CL)	6.0	SS-3	4	6	6	9
			8.5	SS-4	6	7	12	15
-2.6	12.0	Firm, Gray and Brown Mottled, Fine Sandy Lean to Elastic CLAY (CL-CH)	13.5	SS-5	3	4	5	7
-7.6	17.0	MARL-Firm to Stiff, Brownish-Green, Calcareous, Fine Sandy SILT (ML)	18.5	SS-6	3	5	10	12
-12.6			23.5	SS-7	2	3	4	6
-17.6			28.5	SS-8	3	4	7	9
-22.6			33.5	SS-9	5	6	8	11
-27.6	35.0	Boring Terminated at 35.0 Feet						

STD. PENETRATION TEST DATA (blows/ft)
5 10 20 40 70



LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

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SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WB-2

Station: 251+60
Offset: 40' Right of CL

Date Drilled: 12/27/04 | Supervisor: Ricky Wessinger

Casing Length (ft): | Approx. Surface Elevation (ft): 7.40

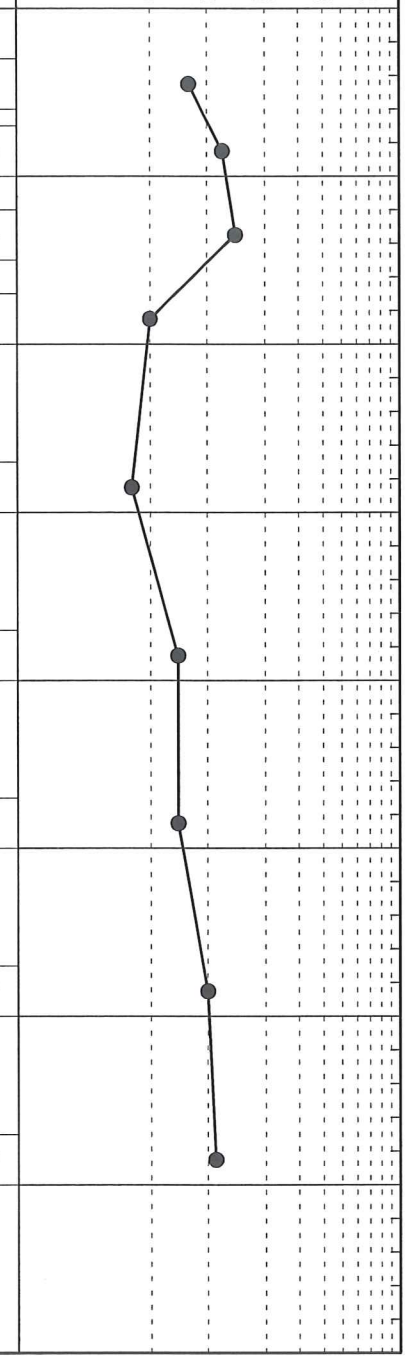
Hammer Type: ☐ Gravity ☒ Automatic ☐ Other:

Water Level: 0.6 Feet at 48 Hours from T.O.B. | Drilling Method: RW

Notes:
BPI are actual recorded blows. N values have been adjusted to N70 assuming a hammer N95.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample Type-No.	1st 6"	2nd 6"	3rd 6"	N Value
	0.3	Gravel Parking Area						
		FILL-Firm, Tannish-Gray Sandy Lean CLAY (CL)	1.5					
	2.0	ALLUVIAL-Stiff, Gray and Orange Mottled, Fine to Medium Sandy Lean CLAY (CL)		SS-1	2	3	3	8
			3.5					
				SS-2	7	3	6	12
2.4			6.0					
				SS-3	2	4	6	14
	8.0	Soft to Firm, Brown and Gray Mottled, Fine Sandy Lean to Elastic CLAY (CL-CH)	8.5					
				SS-4	2	2	2	5
-2.6								
			13.5					
				SS-5	1	2	1	4
-7.6								
	17.0	MARL-Firm to Stiff, Brownish-Green, Calcareous, Fine Sandy SILT (ML)	18.5					
				SS-6	1	2	3	7
-12.6								
			23.5					
				SS-7	1	2	3	7
-17.6								
			28.5					
				SS-8	1	3	4	10
-22.6								
			33.5					
				SS-9	2	3	5	11
-27.6	35.0	Boring Terminated at 35.0 Feet						

STD. PENETRATION TEST DATA (blows/ft)
5 10 20 40 70



LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

F&ME
CONSULTANTS

SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WB-3

Station: 252+00
Offset: 38' Left of CL

Date Drilled: 12/27/04 | Supervisor: Ricky Wessinger

Casing Length (ft): | Approx. Surface Elevation (ft): 7.40

Hammer Type: ☒ Gravity ☐ Automatic ☐ Other:

Water Level: 1.8 Feet at 48 Hours from T.O.B. | Drilling Method: RW

Notes:
BPI are actual recorded blows. N values have been adjusted to N70 assuming a hammer N55.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample Type-No.	1st 6"	2nd 6"	3rd 6"	N Value
	0.5	FILL-Sand Layer FILL-Soft, Brown, Fine to Medium Sandy Lean CLAY (CL)		1.5					
					SS-1	2	2	2	3
	3.0	ALLUVIAL-Firm to Stiff, Gray and Orange Mottled, Fine to Medium Sandy Lean CLAY (CL)		3.5					
					SS-2	2	4	5	7
2.4				6.0					
					SS-3	3	4	6	8
				8.5					
					SS-4	3	5	8	10
-2.6	11.0	Firm, Brown and Gray Mottled, Fine Sandy Lean to Elastic CLAY (CL-CH)							
				13.5					
					SS-5	2	3	4	6
-7.6									
	18.5	MARL-Firm, Brownish-Green, Calcareous, Silty Fine SAND (SM)		18.5					
					SS-6	3	6	9	12
-12.6									
	22.0	Firm to Stiff, Brownish-Green, Calcareous, Fine Sandy SILT (ML)		23.5					
					SS-7	3	4	6	8
-17.6									
				28.5					
					SS-8	4	6	7	10
-22.6									
				33.5					
					SS-9	4	6	8	11
-27.6	35.0	Boring Terminated at 35.0 Feet							

STD. PENETRATION TEST DATA (blows/ft)
5 10 20 40 70

PI=21; LL=41; MC=29%; Fines=62.5%

PI-NP; MC=47%; Fines=44.7%

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

F&ME CONSULTANTS

SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WB-4

Station: 252+50
Offset: 22' Right of CL

Date Drilled: 12/27/04 | Supervisor: Ricky Wessinger

Casing Length (ft): | Approx. Surface Elevation (ft): 7.40

Hammer Type: ☐ Gravity ☒ Automatic ☐ Other:

Water Level: 5.6 Feet at 48 Hours from T.O.B. | Drilling Method: RW

Notes:
BPI are actual recorded blows. N values have been adjusted to N70 assuming a hammer N95.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample Type-No.	1st 6"	2nd 6"	3rd 6"	N Value	STD. PENETRATION TEST DATA (blows/ft)
									5 10 20 40 70
		FILL-Soft, Brown Fine to Medium Sandy Lean CLAY (CL)	1.5						
	2.5			SS-1	1	2	7	12	
		ALLUVIAL-Firm to Stiff, Gray and Orange Mottled, Fine Sandy Lean CLAY (CL)	3.5						
				SS-2	1	2	3	7	
2.4		▼	6.0						
				SS-3	1	3	4	10	
			8.5						
				SS-4	2	3	3	8	
-2.6									
	12.0	Soft, Gray and Brown Mottled, Fine Sandy Lean to Elastic CLAY (CL-CH)	13.5						
				SS-5	1	1	2	4	
-7.6									
	18.0	MARL-Firm to Stiff, Brownish-Green, Calcareous, Fine Sandy SILT (ML) with Brocken Shell Fragments at Top of Layer	18.5						
				SS-6	1	2	2	5	PI=NP; MC=6%; Fines=51.5%
-12.6									
			23.5						
				SS-7	1	2	3	7	
-17.6									
			28.5						
				SS-8	1	3	3	8	
-22.6									
			33.5						
				SS-9	1	3	4	10	
-27.6	35.0	Boring Terminated at 35.0 Feet							

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

F&ME CONSULTANTS

SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WB-5

Station: 253+02
Offset: 37' Left of CL

Date Drilled: 12/27/04 | Supervisor: Ricky Wessinger

Casing Length (ft): | Approx. Surface Elevation (ft): 7.40

Hammer Type: ☒ Gravity ☐ Automatic ☐ Other:

Water Level: 1.8 Feet at 48 Hours from T.O.B. | Drilling Method: RW

Notes:
BPI are actual recorded blows. N values have been adjusted to N70 assuming a hammer N55.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample Type-No.	1st 6"	2nd 6"	3rd 6"	N Value
	0.5	FILL-Clayey Sand Layer							
		FILL-Firm, Brown Fine to Medium Sandy Lean CLAY (CL)		1.5	SS-1	2	4	4	6
	3.0	ALLUVIAL-Firm to Stiff, Gray and Orange Mottled, Fine Sandy Lean CLAY (CL)		3.5	SS-2	3	5	8	10
2.4				6.0	SS-3	2	3	6	7
				8.5	SS-4	3	5	7	9
-2.6	12.0	Firm, Gray and Brown Mottled, Fine Sandy Lean to Elastic CLAY (CL-CH)		13.5	SS-5	2	3	4	6
-7.6	17.0	MARL-Firm to Stiff, Brownish-Green, Calcareous, Fine Sandy Lean SILT (ML)		18.5	SS-6	3	4	6	8
-12.6				23.5	SS-7	2	3	4	6
-17.6				28.5	SS-8	4	6	7	10
-22.6				33.5	SS-9	5	5	8	10
-27.6	35.0	Boring Terminated at 35.0 Feet							

STD. PENETRATION TEST DATA (blows/ft)
5 10 20 40 70

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

F&ME CONSULTANTS

SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WB-6

Station: 253+05
Offset: 25' Right of CL

Date Drilled: 12/27/04 | Supervisor: Ricky Wessinger

Casing Length (ft): | Approx. Surface Elevation (ft): 7.40

Hammer Type: ☐ Gravity ☒ Automatic ☐ Other:

Water Level: 7.0 Feet at 48 Hours from T.O.B. | Drilling Method: RW

Notes:
BPI are actual recorded blows. N values have been adjusted to N70 assuming a hammer N95.

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Sample Depth (ft)	Sample Type-No.	1st 6"	2nd 6"	3rd 6"	N Value
		FILL-Firm, Brown, Clayey Fine to Medium SAND (SC)	1.5	SS-1	1	5	4	12
	3.5		3.5	SS-2	1	2	2	5
2.4		ALLUVIAL-Firm to Stiff, Gray and Orange Mottled, Fine Sandy Lean CLAY (CL)	6.0	SS-3	1	2	3	7
		▼	8.5	SS-4	2	2	5	10
-2.6								
	13.0	Soft, Gray and Brown Mottled, Fine Sandy Lean to Elastic CLAY (CL-CH)	13.5	SS-5	1	1	2	4
-7.6								
	18.0	MARL-Soft to Firm, Brownish-Green, Fine Sandy SILT (ML)	18.5	SS-6	1	1	1	3
-12.6								
			23.5	SS-7	1	1	2	4
-17.6								
			28.5	SS-8	1	2	4	8
-22.6								
			33.5	SS-9	1	3	3	8
-27.6	35.0	Boring Terminated at 35.0 Feet						

STD. PENETRATION TEST DATA (blows/ft)
5 10 20 40 70

PI=27; LL=50; MC=46%; Fines=73.0%

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. :WD-1

F&ME Consultants
Page 1a
JOB FILE: SC-41 over Wando River-MSE Wall Study
FILE NO. : G4067
LOCATION: Off-set to Boring WB-1
SNDG.BY : Ricky Wessinger
SNDG. DATE: December 30, 2004
ANAL.BY : Michael Miller
ANAL. DATE: January 19, 2005

ANALYSIS PARAMETERS:

LO RANGE = 11.16 TSF
ROD DIAM. = 0.69 IN BL.THICK. = 0.02 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.00 TSF
FR.RED.DIA. = 0.83 IN BL.WIDTH = 0.15 IN PHI FACTOR = 1
WATER DEPTH = 6.6 FT
HI GAGE 0 = 0.05 TSF LIN.ROD WT. = 2.8 LBF/FT
DELTA-A = 0.10 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF
DELTA/PHI = 0.5 DELTA-B = 0.55 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	THRUST (LBF)	A (TSF)	B (TSF)	C (TSF)	DA (TSF)	DB (TSF)	ZMRNG (TSF)	ZMLO (TSF)	ZMHI (TSF)	ZMCAL (TSF)	P0 (TSF)	P1 (TSF)	P2 (TSF)	U0 (TSF)	GAMMA (PCF)	SVP (TSF)
1.0	6.4	496	0.73	2.98		0.10	0.55	11.16	0.00	0.05	0.00	0.75	2.42		0.000	106.1	0.054
2.0	5.4	567	1.10	1.93		0.10	0.55	11.16	0.00	0.05	0.00	1.19	1.38		0.000	93.6	0.103
3.0	4.4	1160	2.30	4.70		0.10	0.55	11.16	0.00	0.05	0.00	2.32	4.14		0.000	106.1	0.152
4.0	3.4	1947	3.97	6.84		0.10	0.55	11.16	0.00	0.05	0.00	3.96	6.28		0.000	112.3	0.208
5.0	2.4	2300	3.60	6.68		0.10	0.55	11.16	0.00	0.05	0.00	3.58	6.13		0.000	112.3	0.263
6.0	1.4	2020	3.55	5.95		0.10	0.55	11.16	0.00	0.05	0.00	3.57	5.40		0.000	106.1	0.319
7.0	0.4	2249	5.74	9.81		0.10	0.55	11.16	0.00	0.05	0.00	5.68	9.26		0.014	113.6	0.359
8.0	-0.6	3554	6.37	10.65		0.10	0.55	11.16	0.00	0.05	0.00	6.30	10.10		0.046	113.6	0.384
9.0	-1.6	3729	5.48	8.56		0.10	0.55	11.16	0.00	0.05	0.00	5.46	8.01		0.078	113.6	0.408
10.0	-2.6	3124	4.85	8.09		0.10	0.55	11.16	0.00	0.05	0.00	4.83	7.54		0.111	113.6	0.433
11.0	-3.6	4150	3.92	8.72		0.10	0.55	11.16	0.00	0.05	0.00	3.81	8.16		0.142	113.6	0.457
12.0	-4.6	3632	3.65	6.89		0.10	0.55	11.16	0.00	0.05	0.00	3.63	6.34		0.175	113.6	0.482
13.0	-5.6	4000	5.69	8.51		0.10	0.55	11.16	0.00	0.05	0.00	5.69	7.96		0.207	113.6	0.506
14.0	-6.6	4143	6.16	10.23		0.10	0.55	11.16	0.00	0.05	0.00	6.10	9.68		0.239	113.6	0.531
15.0	-7.6	4280	2.98	6.89		0.10	0.55	11.16	0.00	0.05	0.00	2.91	6.34		0.271	107.3	0.554
16.0	-8.6	5638	3.08	12.74		0.10	0.55	11.16	0.00	0.05	0.00	2.74	12.13		0.304	119.2	0.579

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. : WD-1

F&ME Consultants
Page 2
JOB FILE: SC-41 over Wando River-MSE Wall Study
FILE NO. :G4067
LOCATION: Off-set to Boring WB-1
SNDG.BY : Ricky Wessinger
SNDG. DATE: December 30, 2004
ANAL.BY : Michael Miller
ANAL. DATE: January 19, 2005

ANALYSIS PARAMETERS:
LO RANGE = 11.16 TSF
ROD DIAM. = 0.69 IN BL.THICK. = 0.02 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.00 TSF
FR.RED.DIA. = 0.83 IN BL.WIDTH = 0.15 IN PHI FACTOR = 1
WATER DEPTH = 6.6 FT
HI GAGE 0 = 0.05 TSF LIN.ROD WT. = 2.8 LBF/FT
DELTA-A = 0.10 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF;
DELTA / PHI = 0.5 DELTA - B = 0.55 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	KD	ID	UD (TSF)	ED	K0 (TSF)	SU (TSF)	QD (DEG)	PHI (TSF)	SIGFF (DEG)	PHIO (TSF)	PC	OCR (TSF)	M	SOIL TYPE
1.0	6.4	13.92	2.20		57	1.32		35.7	47.9	0.09	43.6	0.73	13.4	163	SILTY SAND
2.0	5.4	11.52	0.16		6	2.01	0.20					1.59	15.4	17	MUD
3.0	4.4	15.16	0.79		64	2.37	0.42					3.60	23.6	184	CLAYEY SILT
4.0	3.4	19.02	0.59		80	2.70	0.76					6.99	33.6	251	SILTY CLAY
5.0	2.4	13.60	0.71		89	2.22	0.64					5.24	19.9	246	CLAYEY SILT
6.0	1.4	11.18	0.51		64	1.97	0.61					4.68	14.6	166	SILTY CLAY
7.0	0.4	15.75	0.63		124	2.42	1.04					8.99	25.0	364	CLAYEY SILT
8.0	-0.6	16.25	0.61		132	2.46	1.16					10.10	26.3	390	CLAYEY SILT
9.0	-1.6	13.18	0.47		89	2.18	0.95					7.75	19.0	243	SILTY CLAY
10.0	-2.6	10.89	0.57		94	1.94	0.79					6.10	14.1	242	SILTY CLAY
11.0	-3.6	8.02	1.19		151	1.60						3.99	8.7	345	SILT
12.0	-4.6	7.16	0.78		94	1.48	0.52					3.53	7.3	203	CLAYEY SILT
13.0	-5.6	10.81	0.41		78	1.93	0.92					7.05	13.9	203	SILTY CLAY
14.0	-6.6	11.01	0.61		124	1.95	0.98					7.61	14.3	323	CLAYEY SILT
15.0	-7.6	4.77	1.29		119									211	SANDY SILT
16.0	-8.6	4.20	3.86		326									569	SAND

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. :WD-2

F&ME Consultants
Page 1a
JOB FILE: SC-41 over Wando River-MSE Wall Study
FILE NO. : G4067
LOCATION: Off-set to Boring WB-2
SNDG.BY : Ricky Wessinger
SNDG. DATE: December 30, 2004
ANAL.BY : Michael Miller
ANAL. DATE: January 19, 2005

ANALYSIS PARAMETERS:

LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.00 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 0.6 FT
HI GAGE 0 = 0.05 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.16 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF
DELTA/PHI = 0.5 DELTA-B = 0.26 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	THRUST (LBF)	A (TSF)	B (TSF)	C (TSF)	DA (TSF)	DB (TSF)	ZMRNG (TSF)	ZMLO (TSF)	ZMHI (TSF)	ZMCAL (TSF)	P0 (TSF)	P1 (TSF)	P2 (TSF)	U0 (TSF)	GAMMA (PCF)	SVP (TSF)
1.0	6.4	576	0.42	1.88		0.16	0.26	9.40	0.00	0.05	0.00	0.52	1.62		0.014	107.3	0.054
2.0	5.4	1486	1.31	2.71		0.16	0.26	9.40	0.00	0.05	0.00	1.41	2.45		0.045	101.1	0.074
3.0	4.4	1621	2.45	4.38		0.16	0.26	9.40	0.00	0.05	0.00	2.54	4.12		0.077	107.3	0.094
4.0	3.4	2201	2.56	5.12		0.16	0.26	9.40	0.00	0.05	0.00	2.61	4.85		0.110	107.3	0.116
5.0	2.4	2871	4.54	8.09		0.16	0.26	9.40	0.00	0.05	0.00	4.54	7.83		0.141	113.6	0.138
6.0	1.4	2478	4.33	7.10		0.16	0.26	9.40	0.00	0.05	0.00	4.37	6.84		0.174	113.6	0.163
7.0	0.4	2646	3.97	6.21		0.16	0.26	9.40	0.00	0.05	0.00	4.03	5.95		0.206	107.3	0.186
8.0	-0.6	3621	7.88	13.15		0.16	0.26	9.40	0.00	0.05	0.00	7.80	12.84		0.238	122.3	0.211
9.0	-1.6	4178	4.85	6.94		0.16	0.26	9.40	0.00	0.05	0.00	4.93	6.68		0.270	113.6	0.238
10.0	-2.6	4739	5.38	8.09		0.16	0.26	9.40	0.00	0.05	0.00	5.42	7.83		0.303	113.6	0.263
11.0	-3.6	4913	4.33	6.73		0.16	0.26	9.40	0.00	0.05	0.00	4.40	6.47		0.334	113.6	0.287
12.0	-4.6	4498	3.29	5.43		0.16	0.26	9.40	0.00	0.05	0.00	3.36	5.17		0.367	107.3	0.310
13.0	-5.6	4736	3.34	9.03		0.16	0.26	9.40	0.00	0.05	0.00	3.24	8.77		0.399	119.2	0.334
14.0	-6.6	5096	3.76	6.11		0.16	0.26	9.40	0.00	0.05	0.00	3.82	5.85		0.431	107.3	0.359
15.0	-7.6	5299	6.06	9.03		0.16	0.26	9.40	0.00	0.05	0.00	6.09	8.77		0.464	113.6	0.382
16.0	-8.6	6686	3.76	15.76		0.16	0.26	9.40	0.00	0.05	0.00	3.34	15.45		0.496	119.2	0.408
17.0	-9.6	8913	10.86	14.41		0.16	0.26	9.40	0.00	0.05	0.00	10.81	14.09		0.527	119.2	0.435

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. : WD-2
Page 2
FILE NO. :G4067

F&ME Consultants
JOB FILE: SC-41 over Wando River-MSE Wall Study
LOCATION: Off-set to Boring WB-2
SNDG.BY : Ricky Wessinger
ANAL.BY : Michael Miller

SNDG. DATE: December 30, 2004
ANAL. DATE: January 19, 2005

ANALYSIS PARAMETERS:
LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.00 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 0.6 FT
HI GAGE 0 = 0.05 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.16 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF;
DELTA / PHI = 0.5 DELTA - B = 0.26 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	KD	ID	UD (TSF)	ED	K0 (TSF)	SU (TSF)	QD (DEG)	PHI (TSF)	SIGFF (DEG)	PHIO (TSF)	PC	OCR (TSF)	M	SOIL TYPE
1.0	6.4	9.36	2.16			38	1.16		7.3	42.3	0.09	37.0	0.52	9.7	93 SILTY SAND
2.0	5.4	18.49	0.76			37	2.66	0.26					2.37	32.1	112 CLAYEY SILT
3.0	4.4	26.27	0.65			55	3.24	0.51					5.20	55.6	188 CLAYEY SILT
4.0	3.4	21.65	0.90			78	2.91	0.50					4.74	41.1	252 CLAYEY SILT
5.0	2.4	31.88	0.75			114	3.61	0.97					10.37	75.1	410 CLAYEY SILT
6.0	1.4	25.75	0.59			86	3.20	0.88					8.78	53.9	290 SILTY CLAY
7.0	0.4	20.61	0.50			67	2.83	0.75					7.07	38.1	212 SILTY CLAY
8.0	-0.6	35.77	0.67			175	3.84	1.71					19.00	89.9	648 CLAYEY SILT
9.0	-1.6	19.59	0.38			61	2.75	0.91					8.35	35.1	191 SILTY CLAY
10.0	-2.6	19.47	0.47			84	2.74	0.99					9.15	34.8	262 SILTY CLAY
11.0	-3.6	14.14	0.51			72	2.27	0.73					6.07	21.1	205 SILTY CLAY
12.0	-4.6	9.64	0.60			63	1.80	0.49					3.61	11.6	155 CLAYEY SILT
13.0	-5.6	8.48	1.95			192	1.04		63.5	42.7	0.56	40.3	2.62	7.8	450 SILTY SAND
14.0	-6.6	9.42	0.60			70	1.77	0.55					4.03	11.2	171 SILTY CLAY
15.0	-7.6	14.71	0.48			93	2.32	1.02					8.59	22.5	267 SILTY CLAY
16.0	-8.6	6.96	4.26			421	0.78		94.2	44.3	0.69	42.4	1.86	4.6	919 SAND
17.0	-9.6	23.59	0.32			114	3.05	2.10					20.46	47.0	378 CLAY

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. :WD-3

F&ME Consultants
Page 1a
JOB FILE: SC-41 over Wando River-MSE Wall Study
FILE NO. : G4067
LOCATION: Off-set to Boring WB-3
SNDG.BY : Ricky Wessinger
SNDG. DATE: January 3, 2005
ANAL.BY : Michael Miller
ANAL. DATE: January 19, 2005

ANALYSIS PARAMETERS:
LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 24.3 FT
LO GAGE 0 = 0.00 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 1.8 FT
HI GAGE 0 = 0.05 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.13 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF
DELTA/PHI = 0.5 DELTA-B = 0.23 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	THRUST (LBF)	A (TSF)	B (TSF)	C (TSF)	DA (TSF)	DB (TSF)	ZMRNG (TSF)	ZMLO (TSF)	ZMHI (TSF)	ZMCAL (TSF)	P0 (TSF)	P1 (TSF)	P2 (TSF)	U0 (TSF)	GAMMA (PCF)	SVP (TSF)
1.0	23.3	1100	1.31	6.58		0.13	0.23	9.40	0.00	0.05	0.00	1.18	6.35		0.000	112.3	0.540
2.0	22.3	1486	1.72	6.11		0.13	0.23	9.40	0.00	0.05	0.00	1.65	5.88		0.006	113.6	0.589
3.0	21.3	717	2.35	3.34		0.13	0.23	9.40	0.00	0.05	0.00	2.44	3.11		0.038	101.1	0.610
4.0	20.3	869	2.09	4.12		0.13	0.23	9.40	0.00	0.05	0.00	2.13	3.89		0.071	107.3	0.631
5.0	19.3	1297	2.87	5.01		0.13	0.23	9.40	0.00	0.05	0.00	2.90	4.78		0.102	107.3	0.651
6.0	18.3	1841	3.50	6.06		0.13	0.23	9.40	0.00	0.05	0.00	3.51	5.83		0.135	107.3	0.673
7.0	17.3	2176	3.13	5.32		0.13	0.23	9.40	0.00	0.05	0.00	3.16	5.09		0.167	107.3	0.694
8.0	16.3	2690	5.27	9.24		0.13	0.23	9.40	0.00	0.05	0.00	5.22	9.01		0.199	113.6	0.718
9.0	15.3	3043	7.05	10.96		0.13	0.23	9.40	0.00	0.05	0.00	6.99	10.68		0.231	113.6	0.742
10.0	14.3	3074	5.90	9.60		0.13	0.23	9.40	0.00	0.05	0.00	5.86	9.32		0.264	113.6	0.767
11.0	13.3	3724	5.01	7.83		0.13	0.23	9.40	0.00	0.05	0.00	5.01	7.60		0.295	113.6	0.791
12.0	12.3	3764	3.76	6.16		0.13	0.23	9.40	0.00	0.05	0.00	3.78	5.93		0.328	107.3	0.814
13.0	11.3	4370	2.24	4.33		0.13	0.23	9.40	0.00	0.05	0.00	2.29	4.10		0.360	107.3	0.835
14.0	10.3	3903	1.77	5.48		0.13	0.23	9.40	0.00	0.05	0.00	1.73	5.25		0.393	113.6	0.859
15.0	9.3	4414	0.94	1.31		0.13	0.23	9.40	0.00	0.05	0.00	1.06	1.08		0.424	94.8	0.879
16.0	8.3	4569	4.38	7.26		0.13	0.23	9.40	0.00	0.05	0.00	4.38	7.03		0.457	113.6	0.899
17.0	7.3	5285	6.73	10.75		0.13	0.23	9.40	0.00	0.05	0.00	6.68	10.47		0.489	113.6	0.923
18.0	6.3	8624	6.53	9.40		0.13	0.23	9.40	0.00	0.05	0.00	6.53	9.17		0.521	113.6	0.948
19.0	5.3	7781	6.11	8.30		0.13	0.23	9.40	0.00	0.05	0.00	6.14	8.07		0.553	113.6	0.972
20.0	4.3	7014	5.38	7.15		0.13	0.23	9.40	0.00	0.05	0.00	5.43	6.92		0.586	107.3	0.996
21.0	3.3	6882	3.55	7.78		0.13	0.23	9.40	0.00	0.05	0.00	3.48	7.55		0.617	113.6	1.018
22.0	2.3	6910	7.99	15.24		0.13	0.23	9.40	0.00	0.05	0.00	7.77	14.96		0.650	122.3	1.046
23.0	1.3	7175	9.81	15.66		0.13	0.23	9.40	0.00	0.05	0.00	9.62	15.38		0.682	122.3	1.074
24.0	0.3	7080	10.02	13.99		0.13	0.23	9.40	0.00	0.05	0.00	9.92	13.71		0.714	119.2	1.104
25.0	-0.7	5762	10.44	13.68		0.13	0.23	9.40	0.00	0.05	0.00	10.37	13.39		0.746	119.2	1.131
26.0	-1.7	5581	10.65	13.89		0.13	0.23	9.40	0.00	0.05	0.00	10.58	13.60		0.779	119.2	1.159
27.0	-2.7	6342	11.59	15.76		0.13	0.23	9.40	0.00	0.05	0.00	11.47	15.48		0.810	119.2	1.186
28.0	-3.7	6604	11.07	14.82		0.13	0.23	9.40	0.00	0.05	0.00	10.97	14.54		0.844	119.2	1.214
29.0	-4.7	6796	11.28	15.03		0.13	0.23	9.40	0.00	0.05	0.00	11.18	14.75		0.875	119.2	1.241
30.0	-5.7	6983	10.86	14.82		0.13	0.23	9.40	0.00	0.05	0.00	10.75	14.54		0.906	119.2	1.268
31.0	-6.7	7021	11.28	14.62		0.13	0.23	9.40	0.00	0.05	0.00	11.20	14.33		0.940	119.2	1.296

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. : WD-3

F&ME Consultants — Page 2

JOB FILE: SC-41 over Wando River-MSE Wall Study — FILE NO. :G4067

LOCATION: Off-set to Boring WB-3

SNDG.BY : Ricky Wessinger — SNDG. DATE: January 3, 2005

ANAL.BY : Michael Miller — ANAL. DATE: January 19, 2005

ANALYSIS PARAMETERS:

LO RANGE = 9.40 TSF

ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1

SURF.ELEV. = 24.3 FT

LO GAGE 0 = 0.00 TSF

FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1

WATER DEPTH = 1.8 FT

HI GAGE 0 = 0.05 TSF LIN.ROD WT. = 4.2 LBF/FT

DELTA-A = 0.13 TSF OCR FACTOR = 1

SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF;

DELTA / PHI = 0.5 DELTA - B = 0.23 TSF M FACTOR = 1

MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1

UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	KD	ID	UD (TSF)	ED	K0 (TSF)	SU (TSF)	QD (DEG)	PHI (TSF)	SIGFF (DEG)	PHIO (TSF)	PC	OCR (TSF)	M	SOIL TYPE
1.0	23.3	2.19	4.36		180	0.61		14.1	31.2	0.81	28.8	0.95	1.8	212	SAND
2.0	22.3	2.78	2.58		147	0.65		18.5	32.6	0.91	30.4	1.27	2.2	198	SILTY SAND
3.0	21.3	3.94	0.28		23	0.97	0.31					1.75	2.9	35	CLAY
4.0	20.3	3.27	0.86		62	0.84	0.26					1.36	2.1	84	CLAYEY SILT
5.0	19.3	4.30	0.67		65	1.04	0.38					2.15	3.3	106	CLAYEY SILT
6.0	18.3	5.02	0.68		80	1.16	0.47					2.83	4.2	144	CLAYEY SILT
7.0	17.3	4.32	0.64		67	1.04	0.40					2.31	3.3	110	CLAYEY SILT
8.0	16.3	6.99	0.76		132	1.46	0.75					5.05	7.0	281	CLAYEY SILT
9.0	15.3	9.12	0.54		127	1.74	1.09					7.91	10.7	307	SILTY CLAY
10.0	14.3	7.29	0.62		120	1.50	0.85					5.77	7.5	262	CLAYEY SILT
11.0	13.3	5.96	0.55		90	1.31	0.68					4.35	5.5	176	SILTY CLAY
12.0	12.3	4.24	0.62		74	1.03	0.46					2.63	3.2	121	CLAYEY SILT
13.0	11.3	2.30	0.95		63	0.62	0.22					1.04	1.2	65	SILT
14.0	10.3	1.56	2.63		122	0.36		57.9	38.5	1.40	37.4	0.65	0.8	103	SILTY SAND
15.0	9.3	0.73	0.02		0	0.11	0.05					0.18	0.2	0	MUD
16.0	8.3	4.37	0.67		92	1.05	0.52					3.04	3.4	151	CLAYEY SILT
17.0	7.3	6.70	0.61		132	1.42	0.92					6.10	6.6	276	CLAYEY SILT
18.0	6.3	6.33	0.44		92	1.37	0.88					5.72	6.0	186	SILTY CLAY
19.0	5.3	5.75	0.35		67	1.28	0.80					5.04	5.2	129	CLAY
20.0	4.3	4.87	0.31		52	1.14	0.67					3.99	4.0	91	CLAY
21.0	3.3	2.81	1.42		141	0.45		98.9	40.5	1.68	39.7	1.35	1.3	179	SANDY SILT
22.0	2.3	6.81	1.01		250	1.44						7.07	6.8	528	SILT
23.0	1.3	8.31	0.65		200	1.64	1.40					9.92	9.2	462	CLAYEY SILT
24.0	0.3	8.34	0.41		132	1.64	1.45					10.23	9.3	305	SILTY CLAY
25.0	-0.7	8.51	0.31		105	1.66	1.52					10.83	9.6	245	CLAY
26.0	-1.7	8.46	0.31		105	1.65	1.55					10.98	9.5	244	CLAY
27.0	-2.7	8.99	0.38		139	1.72	1.71					12.37	10.4	333	SILTY CLAY
28.0	-3.7	8.34	0.35		124	1.64	1.59					11.26	9.3	287	SILTY CLAY
29.0	-4.7	8.30	0.35		124	1.64	1.62					11.43	9.2	286	CLAY
30.0	-5.7	7.76	0.39		132	1.57	1.52					10.52	8.3	294	SILTY CLAY
31.0	-6.7	7.92	0.31		109	1.59	1.59					11.09	8.6	246	CLAY

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. :WD-4

F&ME Consultants
Page 1a
JOB FILE: SC-41 over Wando River-MSE Wall Study
FILE NO. : G4067
LOCATION: Off-Set to Boring WB-4
SNDG.BY : Ricky Wessinger
SNDG. DATE: December 30, 2004
ANAL.BY : Michael Miller
ANAL. DATE: January 26, 2005

ANALYSIS PARAMETERS:

LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.05 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 5.6 FT
HI GAGE 0 = 0.00 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.16 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF
DELTA/PHI = 0.5 DELTA-B = 0.26 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	THRUST (LBF)	A (TSF)	B (TSF)	C (TSF)	DA (TSF)	DB (TSF)	ZMRNG (TSF)	ZMLO (TSF)	ZMHI (TSF)	ZMCAL (TSF)	P0 (TSF)	P1 (TSF)	P2 (TSF)	U0 (TSF)	GAMMA (PCF)	SVP (TSF)
1.0	6.4	1484	1.25	2.77		0.16	0.26	9.40	0.05	0.00	0.00	1.31	2.45		0.000	99.8	0.054
2.0	5.4	1297	1.41	2.40		0.16	0.26	9.40	0.05	0.00	0.00	1.48	2.09		0.000	99.8	0.103
3.0	4.4	3495	2.87	6.68		0.16	0.26	9.40	0.05	0.00	0.00	2.81	6.37		0.000	106.1	0.153
4.0	3.4	1469	2.45	3.92		0.16	0.26	9.40	0.05	0.00	0.00	2.51	3.60		0.000	106.1	0.208
5.0	2.4	1171	2.82	4.54		0.16	0.26	9.40	0.05	0.00	0.00	2.86	4.23		0.000	106.1	0.260
6.0	1.4	1702	3.60	5.59		0.16	0.26	9.40	0.05	0.00	0.00	3.63	5.27		0.013	107.3	0.302
7.0	0.4	2355	4.07	8.09		0.16	0.26	9.40	0.05	0.00	0.00	4.00	7.78		0.044	113.6	0.325
8.0	-0.6	2456	4.33	6.84		0.16	0.26	9.40	0.05	0.00	0.00	4.33	6.53		0.077	113.6	0.350
9.0	-1.6	2946	6.11	9.03		0.16	0.26	9.40	0.05	0.00	0.00	6.09	8.72		0.109	113.6	0.374
10.0	-2.6	3751	6.42	9.24		0.16	0.26	9.40	0.05	0.00	0.00	6.41	8.93		0.141	113.6	0.399
11.0	-3.6	3841	5.85	8.51		0.16	0.26	9.40	0.05	0.00	0.00	5.84	8.20		0.173	113.6	0.423
12.0	-4.6	4295	5.06	7.10		0.16	0.26	9.40	0.05	0.00	0.00	5.08	6.79		0.206	113.6	0.448
13.0	-5.6	4212	3.29	5.27		0.16	0.26	9.40	0.05	0.00	0.00	3.32	4.96		0.237	107.3	0.470
14.0	-6.6	4558	3.18	4.96		0.16	0.26	9.40	0.05	0.00	0.00	3.23	4.65		0.270	107.3	0.492
15.0	-7.6	4736	2.30	2.77		0.16	0.26	9.40	0.05	0.00	0.00	2.40	2.45		0.302	94.8	0.511
16.0	-8.6	4002	5.53	8.09		0.16	0.26	9.40	0.05	0.00	0.00	5.53	7.78		0.334	113.6	0.530
17.0	-9.6	4271	5.32	7.93		0.16	0.26	9.40	0.05	0.00	0.00	5.32	7.62		0.366	113.6	0.554
18.0	-10.6	4300	6.42	9.03		0.16	0.26	9.40	0.05	0.00	0.00	6.42	8.72		0.399	113.6	0.579
19.0	-11.6	4322	6.11	8.87		0.16	0.26	9.40	0.05	0.00	0.00	6.10	8.56		0.430	113.6	0.603
20.0	-12.6	4494	6.00	8.30		0.16	0.26	9.40	0.05	0.00	0.00	6.01	7.99		0.464	113.6	0.628
21.0	-13.6	4917	5.12	6.73		0.16	0.26	9.40	0.05	0.00	0.00	5.16	6.42		0.495	107.3	0.651
22.0	-14.6	5239	3.50	6.53		0.16	0.26	9.40	0.05	0.00	0.00	3.48	6.21		0.527	107.3	0.673
23.0	-15.6	6469	7.73	12.53		0.16	0.26	9.40	0.05	0.00	0.00	7.61	12.27		0.560	122.3	0.698
24.0	-16.6	6390	8.98	13.15		0.16	0.26	9.40	0.05	0.00	0.00	8.89	12.89		0.592	119.2	0.727
25.0	-17.6	5689	10.34	13.47		0.16	0.26	9.40	0.05	0.00	0.00	10.36	13.21		0.623	119.2	0.754
26.0	-18.6	5804	10.44	13.36		0.16	0.26	9.40	0.05	0.00	0.00	10.47	13.10		0.657	119.2	0.782
27.0	-19.6	5665	11.69	15.24		0.16	0.26	9.40	0.05	0.00	0.00	11.69	14.98		0.688	119.2	0.809
28.0	-20.6	6613	11.69	15.14		0.16	0.26	9.40	0.05	0.00	0.00	11.70	14.88		0.720	119.2	0.837
29.0	-21.6	6851	11.07	14.20		0.16	0.26	9.40	0.05	0.00	0.00	11.09	13.94		0.753	119.2	0.864
30.0	-22.6	6732	10.86	13.99		0.16	0.26	9.40	0.05	0.00	0.00	10.88	13.73		0.784	119.2	0.892
31.0	-23.6	7135	11.48	14.82		0.16	0.26	9.40	0.05	0.00	0.00	11.49	14.56		0.816	119.2	0.920

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. : WD-4

F&ME Consultants
JOB FILE: SC-41 over Wando River-MSE Wall Study
LOCATION: Off-Set to Boring WB-4
SNDG.BY : Ricky Wessinger
ANAL.BY : Michael Miller

FILE NO. :G4067

SNDG. DATE: December 30, 2004
ANAL. DATE: January 26, 2005

ANALYSIS PARAMETERS:
LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.05 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 5.6 FT
HI GAGE 0 = 0.00 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.16 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF;
DELTA / PHI = 0.5 DELTA - B = 0.26 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	KD	ID	UD (TSF)	ED	K0 (TSF)	SU (TSF)	QD (DEG)	PHI (TSF)	SIGFF	PHIO (DEG)	PC (TSF)	OCR (TSF)	M	SOIL TYPE
1.0	6.4	24.13	0.88		40	3.09	0.27						2.63	48.7	134 CLAYEY SILT
2.0	5.4	14.40	0.41		21	2.29	0.27						2.24	21.7	60 SILTY CLAY
3.0	4.4	18.23	1.27		123	2.19		43.2	43.1	0.26	39.6		5.26	34.2	379 SANDY SILT
4.0	3.4	12.05	0.44		38	2.06	0.43						3.42	16.5	102 SILTY CLAY
5.0	2.4	10.99	0.48		48	1.95	0.48						3.71	14.3	123 SILTY CLAY
6.0	1.4	11.98	0.45		57	2.06	0.63						4.93	16.3	152 SILTY CLAY
7.0	0.4	12.18	0.96		132	2.08	0.68						5.44	16.8	353 SILT
8.0	-0.6	12.18	0.52		76	2.08	0.73						5.86	16.8	205 SILTY CLAY
9.0	-1.6	16.01	0.44		91	2.44	1.11						9.58	25.6	269 SILTY CLAY
10.0	-2.6	15.72	0.40		88	2.42	1.16						9.94	24.9	256 SILTY CLAY
11.0	-3.6	13.41	0.42		81	2.20	1.00						8.22	19.5	228 SILTY CLAY
12.0	-4.6	10.91	0.35		58	1.94	0.82						6.31	14.1	152 CLAY
13.0	-5.6	6.54	0.53		57	1.40	0.46						2.99	6.4	118 SILTY CLAY
14.0	-6.6	6.00	0.48		49	1.32	0.43						2.72	5.5	98 SILTY CLAY
15.0	-7.6	4.11	0.03		2	1.01	0.27						1.57	3.1	3 MUD
16.0	-8.6	9.80	0.43		78	1.82	0.85						6.33	11.9	193 SILTY CLAY
17.0	-9.6	8.93	0.46		80	1.71	0.79						5.72	10.3	190 SILTY CLAY
18.0	-10.6	10.38	0.38		80	1.88	1.00						7.57	13.1	203 SILTY CLAY
19.0	-11.6	9.38	0.44		86	1.77	0.92						6.73	11.1	209 SILTY CLAY
20.0	-12.6	8.83	0.36		69	1.70	0.89						6.38	10.1	163 SILTY CLAY
21.0	-13.6	7.16	0.27		44	1.49	0.71						4.76	7.3	94 CLAY
22.0	-14.6	4.37	0.93		95	1.05	0.40						2.28	3.4	159 SILT
23.0	-15.6	10.10	0.66		162	1.85	1.16						8.73	12.5	406 CLAYEY SILT
24.0	-16.6	11.42	0.48		139	2.00	1.41						11.00	15.1	364 SILTY CLAY
25.0	-17.6	12.91	0.29		99	2.15	1.70						13.82	18.3	271 CLAY
26.0	-18.6	12.55	0.27		91	2.11	1.71						13.73	17.5	247 CLAY
27.0	-19.6	13.60	0.30		114	2.22	1.95						16.10	19.9	318 CLAY
28.0	-20.6	13.11	0.29		111	2.17	1.93						15.73	18.8	304 CLAY
29.0	-21.6	11.95	0.28		99	2.05	1.77						14.06	16.3	264 CLAY
30.0	-22.6	11.32	0.28		99	1.99	1.71						13.32	14.9	259 CLAY
31.0	-23.6	11.61	0.29		106	2.02	1.83						14.29	15.5	281 CLAY

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. :WD-5
Page 1a
FILE NO. : G4067

F&ME Consultants
JOB FILE: SC-41 over Wando River-MSE Wall Study
LOCATION: Off-Set to Boring WB-5
SNDG.BY : Ricky Wessinger
ANAL.BY : Michael Miller

SNDG. DATE: December 30, 2004
ANAL. DATE: January 26, 2005

ANALYSIS PARAMETERS:

LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.05 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 1.8 FT
HI GAGE 0 = 0.00 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.14 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF
DELTA/PHI = 0.5 DELTA-B = 0.26 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	THRUST (LBF)	A (TSF)	B (TSF)	C (TSF)	DA (TSF)	DB (TSF)	ZMRNG (TSF)	ZMLO (TSF)	ZMHI (TSF)	ZMCAL (TSF)	P0 (TSF)	P1 (TSF)	P2 (TSF)	U0 (TSF)	GAMMA (PCF)	SVP (TSF)
1.0	6.4	1528	1.72	4.91		0.14	0.26	9.40	0.05	0.00	0.00	1.67	4.59		0.000	106.1	0.054
2.0	5.4	1618	1.41	4.65		0.14	0.26	9.40	0.05	0.00	0.00	1.35	4.33		0.006	113.6	0.101
3.0	4.4	1034	1.83	3.08		0.14	0.26	9.40	0.05	0.00	0.00	1.87	2.77		0.038	101.1	0.123
4.0	3.4	1171	2.56	3.65		0.14	0.26	9.40	0.05	0.00	0.00	2.61	3.34		0.071	101.1	0.142
5.0	2.4	1751	4.23	6.32		0.14	0.26	9.40	0.05	0.00	0.00	4.23	6.00		0.102	107.3	0.161
6.0	1.4	1943	3.03	4.54		0.14	0.26	9.40	0.05	0.00	0.00	3.06	4.23		0.135	107.3	0.183
7.0	0.4	1793	4.49	8.20		0.14	0.26	9.40	0.05	0.00	0.00	4.41	7.88		0.167	113.6	0.206
8.0	-0.6	2335	5.90	9.60		0.14	0.26	9.40	0.05	0.00	0.00	5.82	9.34		0.199	113.6	0.231
9.0	-1.6	2514	5.74	8.77		0.14	0.26	9.40	0.05	0.00	0.00	5.69	8.46		0.231	113.6	0.255
10.0	-2.6	2849	5.59	8.30		0.14	0.26	9.40	0.05	0.00	0.00	5.55	7.99		0.264	113.6	0.280
11.0	-3.6	3292	5.01	7.78		0.14	0.26	9.40	0.05	0.00	0.00	4.98	7.46		0.295	113.6	0.304
12.0	-4.6	3793	4.18	6.73		0.14	0.26	9.40	0.05	0.00	0.00	4.16	6.42		0.328	113.6	0.329
13.0	-5.6	4145	4.85	10.02		0.14	0.26	9.40	0.05	0.00	0.00	4.70	9.76		0.360	113.6	0.353
14.0	-6.6	4573	5.74	8.56		0.14	0.26	9.40	0.05	0.00	0.00	5.70	8.25		0.393	113.6	0.378
15.0	-7.6	4236	7.05	10.23		0.14	0.26	9.40	0.05	0.00	0.00	6.98	9.97		0.424	113.6	0.402
16.0	-8.6	4328	6.21	8.82		0.14	0.26	9.40	0.05	0.00	0.00	6.18	8.51		0.457	113.6	0.427
17.0	-9.6	8652	8.35	20.88		0.14	0.26	9.40	0.05	0.00	0.00	7.83	20.62		0.489	122.3	0.453

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. : WD-5

F&ME Consultants
JOB FILE: SC-41 over Wando River-MSE Wall Study
LOCATION: Off-Set to Boring WB-5
SNDG.BY : Ricky Wessinger
ANAL.BY : Michael Miller

FILE NO. :G4067

SNDG. DATE: December 30, 2004
ANAL. DATE: January 26, 2005

ANALYSIS PARAMETERS:
LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.05 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 1.8 FT
HI GAGE 0 = 0.00 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.14 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF;
DELTA / PHI = 0.5 DELTA - B = 0.26 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	KD	ID	UD (TSF)	ED	K0 (TSF)	SU (TSF)	QD (DEG)	PHI (TSF)	SIGFF (DEG)	PHIO (TSF)	PC	OCR (TSF)	M	SOIL TYPE
1.0	6.4	30.88	1.76		101									362	SANDY SILT
2.0	5.4	13.22	2.22		103	1.62		20.1	42.6	0.17	38.3	1.90	18.7	286	SILTY SAND
3.0	4.4	14.90	0.49		31	2.34	0.33					2.82	22.9	90	SILTY CLAY
4.0	3.4	17.92	0.29		25	2.61	0.48					4.33	30.6	78	CLAY
5.0	2.4	25.59	0.43		62	3.19	0.86					8.59	53.3	209	SILTY CLAY
6.0	1.4	15.96	0.40		41	2.44	0.54					4.67	25.5	120	SILTY CLAY
7.0	0.4	20.62	0.82		120	2.83	0.84					7.83	38.1	384	CLAYEY SILT
8.0	-0.6	24.35	0.63		122	3.11	1.16					11.38	49.3	409	CLAYEY SILT
9.0	-1.6	21.44	0.51		96	2.89	1.09					10.31	40.5	309	SILTY CLAY
10.0	-2.6	18.91	0.46		85	2.69	1.02					9.30	33.3	262	SILTY CLAY
11.0	-3.6	15.40	0.53		87	2.39	0.86					7.34	24.2	252	SILTY CLAY
12.0	-4.6	11.63	0.59		78	2.02	0.66					5.13	15.6	208	SILTY CLAY
13.0	-5.6	12.29	1.17		175	2.09						5.99	17.0	474	SILT
14.0	-6.6	14.05	0.48		89	2.26	0.95					7.91	20.9	250	SILTY CLAY
15.0	-7.6	16.33	0.45		103	2.47	1.22					10.64	26.5	307	SILTY CLAY
16.0	-8.6	13.41	0.41		80	2.20	1.01					8.31	19.5	224	SILTY CLAY
17.0	-9.6	16.18	1.74		444	2.00		105.9	41.9	0.75	39.9	12.92	28.5	1312	SANDY SILT

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

SNDG. NO. :WD-6
Page 1a
FILE NO. : G4067

F&ME Consultants
JOB FILE: SC-41 over Wando River-MSE Wall Study
LOCATION: Off-Set to Boring WB-6
SNDG.BY : Ricky Wessinger
ANAL.BY : Michael Miller

SNDG. DATE: December 30, 2004
ANAL. DATE: January 26, 2005

ANALYSIS PARAMETERS:

LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.05 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 7.0 FT
HI GAGE 0 = 0.00 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.13 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF
DELTA/PHI = 0.5 DELTA-B = 0.23 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	THRUST (LBF)	A (TSF)	B (TSF)	C (TSF)	DA (TSF)	DB (TSF)	ZMRNG (TSF)	ZMLO (TSF)	ZMHI (TSF)	ZMCAL (TSF)	P0 (TSF)	P1 (TSF)	P2 (TSF)	U0 (TSF)	GAMMA (PCF)	SVP (TSF)
1.0	6.4	1087	1.20	2.45	0.13	0.23	9.40	0.05	0.00	0.00	1.23	2.17	0.000	99.8	0.054		
2.0	5.4	2031	2.77	7.57	0.13	0.23	9.40	0.05	0.00	0.00	2.62	7.29	0.000	112.3	0.106		
3.0	4.4	2631	1.31	2.82	0.13	0.23	9.40	0.05	0.00	0.00	1.32	2.54	0.000	99.8	0.159		
4.0	3.4	895	1.46	2.56	0.13	0.23	9.40	0.05	0.00	0.00	1.49	2.28	0.000	99.8	0.209		
5.0	2.4	1155	1.83	3.18	0.13	0.23	9.40	0.05	0.00	0.00	1.85	2.90	0.000	99.8	0.259		
6.0	1.4	1574	2.51	4.75	0.13	0.23	9.40	0.05	0.00	0.00	2.48	4.47	0.000	106.1	0.311		
7.0	0.4	2889	1.20	5.38	0.13	0.23	9.40	0.05	0.00	0.00	1.09	5.09	0.000	112.3	0.364		
8.0	-0.6	2467	2.66	5.32	0.13	0.23	9.40	0.05	0.00	0.00	2.62	5.04	0.032	107.3	0.387		
9.0	-1.6	1885	3.39	6.37	0.13	0.23	9.40	0.05	0.00	0.00	3.33	6.09	0.065	107.3	0.409		
10.0	-2.6	3087	3.92	6.58	0.13	0.23	9.40	0.05	0.00	0.00	3.87	6.30	0.097	113.6	0.432		
11.0	-3.6	3740	3.55	6.32	0.13	0.23	9.40	0.05	0.00	0.00	3.50	6.03	0.128	107.3	0.455		
12.0	-4.6	3947	3.18	5.59	0.13	0.23	9.40	0.05	0.00	0.00	3.15	5.30	0.162	107.3	0.477		
13.0	-5.6	4304	2.71	5.01	0.13	0.23	9.40	0.05	0.00	0.00	2.69	4.73	0.193	107.3	0.498		
14.0	-6.6	5173	2.40	4.02	0.13	0.23	9.40	0.05	0.00	0.00	2.41	3.74	0.226	107.3	0.520		
15.0	-7.6	6042	1.31	3.65	0.13	0.23	9.40	0.05	0.00	0.00	1.27	3.37	0.258	107.3	0.541		
16.0	-8.6	5519	7.26	9.03	0.13	0.23	9.40	0.05	0.00	0.00	7.26	8.75	0.290	113.6	0.565		
17.0	-9.6	5722	6.47	9.19	0.13	0.23	9.40	0.05	0.00	0.00	6.43	8.91	0.322	113.6	0.589		
18.0	-10.6	5504	6.89	10.23	0.13	0.23	9.40	0.05	0.00	0.00	6.81	10.00	0.355	113.6	0.614		
19.0	-11.6	6112	7.62	10.96	0.13	0.23	9.40	0.05	0.00	0.00	7.54	10.73	0.386	113.6	0.638		
20.0	-12.6	5376	6.79	9.81	0.13	0.23	9.40	0.05	0.00	0.00	6.72	9.58	0.419	113.6	0.663		
21.0	-13.6	5978	6.53	8.77	0.13	0.23	9.40	0.05	0.00	0.00	6.50	8.49	0.451	113.6	0.687		
22.0	-14.6	5290	5.59	7.73	0.13	0.23	9.40	0.05	0.00	0.00	5.56	7.44	0.483	113.6	0.712		
23.0	-15.6	5815	5.22	7.26	0.13	0.23	9.40	0.05	0.00	0.00	5.21	6.97	0.515	113.6	0.736		
24.0	-16.6	6031	5.32	7.10	0.13	0.23	9.40	0.05	0.00	0.00	5.32	6.82	0.548	107.3	0.759		
25.0	-17.6	6408	5.43	7.20	0.13	0.23	9.40	0.05	0.00	0.00	5.43	6.92	0.579	113.6	0.782		
26.0	-18.6	5486	2.71	4.23	0.13	0.23	9.40	0.05	0.00	0.00	2.72	3.95	0.612	107.3	0.805		
27.0	-19.6	6551	5.38	7.99	0.13	0.23	9.40	0.05	0.00	0.00	5.33	7.70	0.644	113.6	0.828		
28.0	-20.6	7318	10.65	13.99	0.13	0.23	9.40	0.05	0.00	0.00	10.63	13.76	0.677	119.2	0.854		
29.0	-21.6	7704	10.44	13.78	0.13	0.23	9.40	0.05	0.00	0.00	10.42	13.55	0.708	119.2	0.881		
30.0	-22.6	8405	10.54	13.99	0.13	0.23	9.40	0.05	0.00	0.00	10.51	13.76	0.740	119.2	0.909		
31.0	-23.6	8496	10.65	13.99	0.13	0.23	9.40	0.05	0.00	0.00	10.63	13.76	0.773	119.2	0.936		

DILATOMETER DATA LISTING & INTERPRETATION (BASED ON THE 1988 DILATOMETER MANUAL)

F&ME Consultants
JOB FILE: SC-41 over Wando River-MSE Wall Study
LOCATION: Off-Set to Boring WB-6
SNDG.BY : Ricky Wessinger
ANAL.BY : Michael Miller

FILE NO. :G4067

SNDG. DATE: December 30, 2004
ANAL. DATE: January 26, 2005

ANALYSIS PARAMETERS:
LO RANGE = 9.40 TSF
ROD DIAM. = 1.75 IN BL.THICK. = 0.59 IN SU FACTOR = 1
SURF.ELEV. = 7.4 FTLO GAGE 0 = 0.05 TSF
FR.RED.DIA. = 2.11 IN BL.WIDTH = 3.78 IN PHI FACTOR = 1
WATER DEPTH = 7.0 FT
HI GAGE 0 = 0.00 TSF LIN.ROD WT. = 4.2 LBF/FT
DELTA-A = 0.13 TSF OCR FACTOR = 1
SP.GR.WATER = 1.030 CAL GAGE 0 = 0.00 TSF;
DELTA / PHI = 0.5 DELTA - B = 0.23 TSF M FACTOR = 1
MAX SU ID = 1.0 SU OPTION = 0 MIN PHI ID = 1.2 OCR OPTION = 0 K0 FACTOR = 1
UNIT CONVERSIONS: 1 BAR = 1.019 KGF/CM2 = 100 KPA = 1.044 TSF = 14.51 PSI 1 M = 3.2808 FT

Z (FT)	ELEV (FT)	KD	ID	UD (TSF)	ED	K0 (TSF)	SU (TSF)	QD (DEG)	PHI (TSF)	SIGFF (TSF)	PHIO (DEG)	PC (TSF)	OCR (TSF)	M	SOIL TYPE
1.0	6.4	22.77	0.77		32	2.99	0.25						2.40	44.4	108 CLAYEY SILT
2.0	5.4	24.64	1.78		162	3.07		21.3	40.5	0.18	36.0		7.28	68.5	544 SANDY SILT
3.0	4.4	8.33	0.92		42	1.64	0.21						1.47	9.3	98 SILT
4.0	3.4	7.16	0.52		27	1.48	0.23						1.52	7.3	58 SILTY CLAY
5.0	2.4	7.16	0.57		37	1.48	0.28						1.89	7.3	78 SILTY CLAY
6.0	1.4	7.99	0.80		69	1.60	0.39						2.69	8.7	157 CLAYEY SILT
7.0	0.4	2.97	3.71		139	0.42		42.3	41.7	0.61	39.4		0.45	1.2	201 SAND
8.0	-0.6	6.67	0.94		85	1.42	0.39						2.54	6.5	176 SILT
9.0	-1.6	8.00	0.84		95	1.60	0.51						3.55	8.7	217 CLAYEY SILT
10.0	-2.6	8.73	0.64		85	1.69	0.61						4.31	10.0	198 CLAYEY SILT
11.0	-3.6	7.41	0.75		88	1.52	0.51						3.52	7.7	193 CLAYEY SILT
12.0	-4.6	6.28	0.72		74	1.36	0.44						2.84	6.0	151 CLAYEY SILT
13.0	-5.6	5.01	0.82		71	1.16	0.34						2.09	4.2	127 CLAYEY SILT
14.0	-6.6	4.20	0.61		46	1.02	0.29						1.66	3.2	74 CLAYEY SILT
15.0	-7.6	1.89	2.05		73	0.11		93.1	45.2	0.93	43.7		0.06	0.1	69 SILTY SAND
16.0	-8.6	12.35	0.21		52	2.09	1.21						9.66	17.1	140 CLAY
17.0	-9.6	10.38	0.41		86	1.88	1.01						7.67	13.0	218 SILTY CLAY
18.0	-10.6	10.53	0.49		111	1.90	1.08						8.18	13.3	282 SILTY CLAY
19.0	-11.6	11.22	0.45		111	1.98	1.21						9.40	14.7	289 SILTY CLAY
20.0	-12.6	9.51	0.45		99	1.78	1.02						7.55	11.4	243 SILTY CLAY
21.0	-13.6	8.81	0.33		69	1.70	0.96						6.94	10.1	163 CLAY
22.0	-14.6	7.15	0.37		65	1.48	0.77						5.19	7.3	140 SILTY CLAY
23.0	-15.6	6.38	0.38		62	1.37	0.69						4.49	6.1	125 SILTY CLAY
24.0	-16.6	6.29	0.31		52	1.36	0.70						4.54	6.0	104 CLAY
25.0	-17.6	6.20	0.31		52	1.35	0.71						4.57	5.8	104 CLAY
26.0	-18.6	2.63	0.57		42	0.70	0.25						1.23	1.5	48 SILTY CLAY
27.0	-19.6	5.67	0.50		82	1.27	0.67						4.21	5.1	158 SILTY CLAY
28.0	-20.6	11.64	0.32		109	2.02	1.70						13.34	15.6	288 CLAY
29.0	-21.6	11.01	0.32		109	1.95	1.64						12.62	14.3	282 CLAY
30.0	-22.6	10.76	0.33		113	1.92	1.64						12.54	13.8	289 CLAY
31.0	-23.6	10.52	0.32		109	1.90	1.64						12.48	13.3	277 CLAY

F&ME
CONSULTANTS

SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WS-3

Station: 252+00
Offset: 3' Offset to WB-3

Date Drilled: 01/03/05	Supervisor: Ricky Wessinger	Notes:
Casing Length (ft):	Approx. Surface Elevation (ft): 7.40	
Hammer Type: ☐ Gravity ☐ Automatic ☐ Other:		
Water Level:	Drilling Method: RW	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample Type-No.	1st 6" / 2nd 6" / 3rd 6"	N Value	STD. PENETRATION TEST DATA (blows/ft) 5 10 20 40 70
		Boring Performed for Shelby Tube Collections. For Soil Stratigraphy, refer to Boring WB-3.						
2.4				6.0				
					ST-1			
				8.0				
					ST-2			
-2.6								
-7.6								
				18.5				
					ST-3			
-12.6				20.5				
					ST-4			
	22.5							
-17.6								
-22.6								
-27.6								

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

F&ME CONSULTANTS

SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WS-4

Station: 252+50
Offset: 3' Offset to WB-4

Date Drilled: 01/03/05	Supervisor: Ricky Wessinger	Notes:
Casing Length (ft):	Approx. Surface Elevation (ft): 7.40	
Hammer Type: ☐ Gravity ☐ Automatic ☐ Other:		
Water Level:	Drilling Method:	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample Type-No.	1st 6" / 2nd 6" / 3rd 6"	N Value	STD. PENETRATION TEST DATA (blows/ft) 5 10 20 40 70
		Boring Performed for Shelby Tube Collections. For Soil Stratigraphy, refer to Boring WB-4.						
2.4								
-2.6								
-7.6								
				18.5	ST-1			
-12.6				20.5				
					ST-2			
	22.5							
-17.6								
-22.6								
-27.6								

LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05

F&ME
CONSULTANTS

SC-41 over Wando River - MSE Wall Study
Berkeley County, South Carolina
G4067

LOG OF BORING No. WS-6

Station: 253+05
Offset: 3' Offset to WB-6

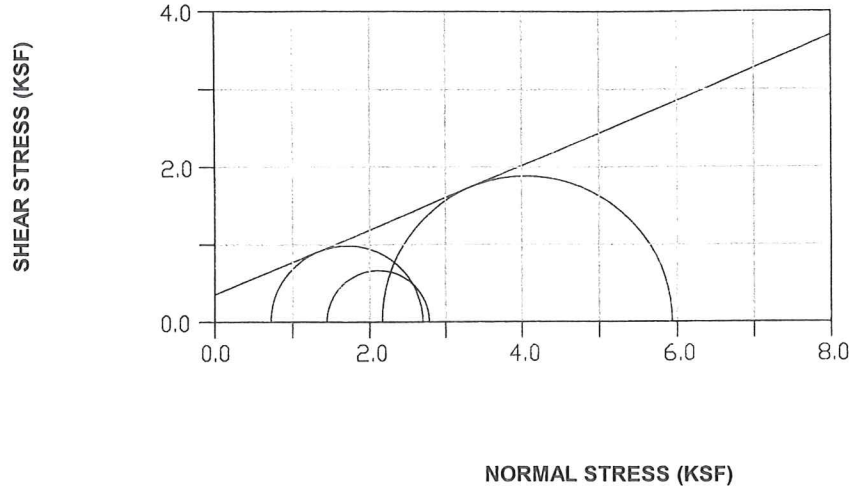
Date Drilled: 01/03/05	Supervisor: Ricky Wessinger	Notes:
Casing Length (ft):	Approx. Surface Elevation (ft): 7.40	
Hammer Type: ☐ Gravity ☐ Automatic ☐ Other:		
Water Level:	Drilling Method:	

Elevation (ft)	Depth (ft)	MATERIAL DESCRIPTION	Graphic Log	Sample Depth (ft)	Sample Type-No.	1st 6" / 2nd 6" / 3rd 6"	N Value	STD. PENETRATION TEST DATA (blows/ft) 5 10 20 40 70
		Boring Performed for Shelby Tube Collections. For Soil Stratigraphy, refer to Boring WB-6.						
2.4								
-2.6								
				13.5	ST-1			
-7.6				15.5	ST-2			
	17.5							
-12.6								
-17.6								
-22.6								
-27.6								

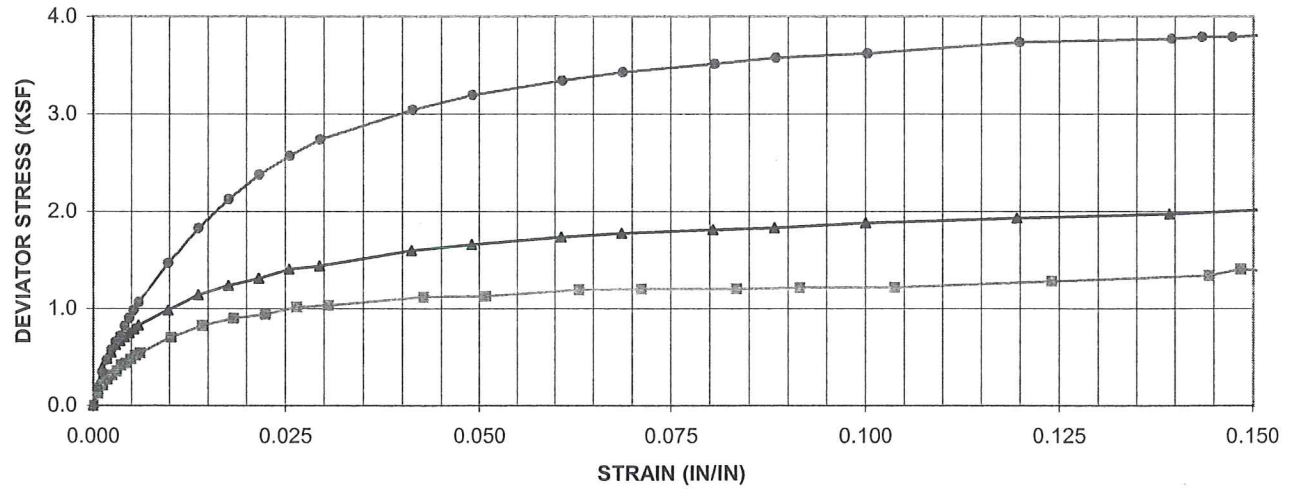
LEGEND

SAMPLER TYPE		DRILLING METHOD	
SS - Split Spoon	NQ - Rock Core, 1-7/8"	HSA - Hollow Stem Auger	RW - Rotary Wash
ST - Shelby Tube	CU - Cuttings	CFA - Continuous Flight Augers	RC - Rock Core
AWG - Rock Core, 1-1/8"	CT - Continuous Tube	DC - Driving Casing	PHD - Percussion Hammer Drill

SOIL_TEST_BORING MIKE.GPJ SC_DOT.GDT 01/31/05



C =0.35 KSF
ϕ= 23.0 Degrees



TRIAXIAL SHEAR TEST

F&ME
CONSULTANTS

SAMPLE ID: WS-3 | **DEPTH**: 7.0'-10.0'
LL:51 | **PL**:19 | **PI**:32
SOIL DESC.: Blue/Gray Fine Sandy Lean/Elastic CLAY (CL/CH)
PROJECT: SC Hwy 41 over Wando River - MSE Wall Study

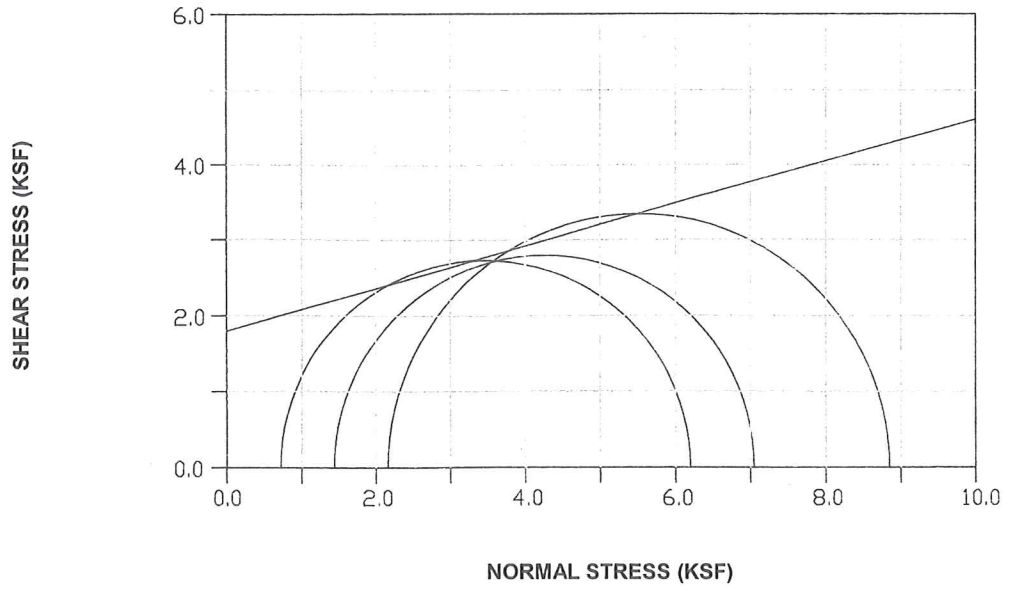
TEST TYPE: CONSOLIDATED UNDRAINED

SAMPLE NO.	1	2	3	SAMPLE NO.	1	2	3
VOID RATIO	---	---	---	INITIAL WEIGHT (lbs.)	2.364	2.170	2.409
SATURATION (Si)	97%	92%	100%	INITIAL HEIGHT (In.)	5.100	4.918	5.088
SATURATION (Sf)	---	---	---	INITIAL DIAMETER (In.)	2.883	2.842	2.861
SPECIFIC GRAVITY	2.65	2.65	2.65	INITIAL WET DENSITY (pcf)	122.68	120.20	127.28
CHAMBER STRESS	0.720	1.440	2.160	MOISTURE CONTENT (w%)	25.19	25.22	22.71
DEVIATOR STRESS	2.016	1.381	3.807	INITIAL DRY DENSITY (pcf)	97.99	95.99	103.73

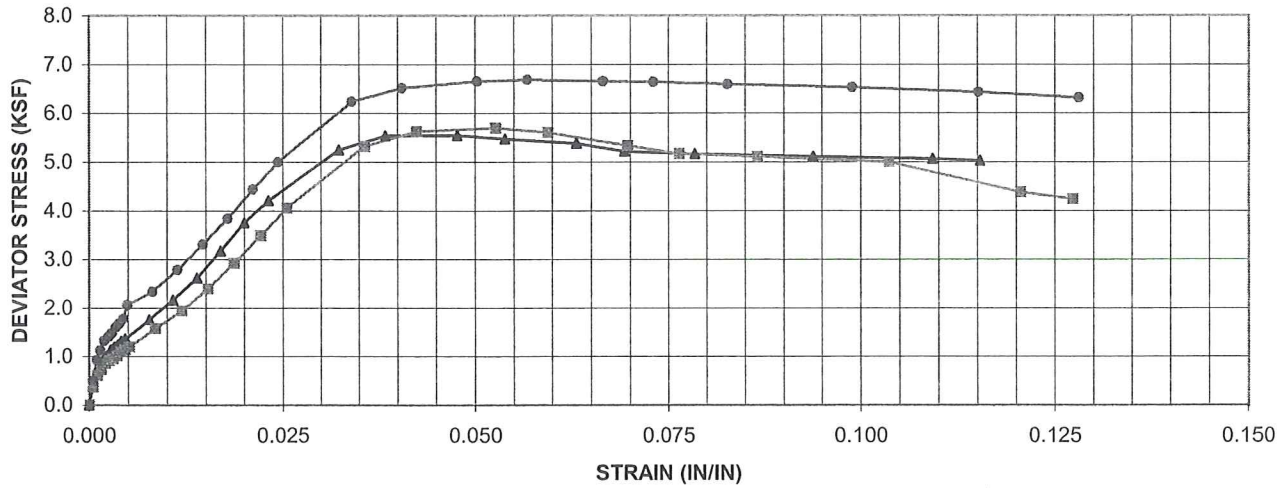
TRIAXIAL TEST DATA

Plotted at ~15% Strain - Specific Gravity Assumed

Sample No. 2 Deleted From Shear Strength Determination



C =1.8 KSF
ϕ= 15.7 Degrees



TRIAXIAL SHEAR TEST

F&ME
CONSULTANTS

SAMPLE ID: WS-3 | **DEPTH**: 20.5' - 22.5'
LL: NP | **PL**: NP | **PI**: NP
SOIL DESC.: MARL - Green/Gray Fine Sandy SILT (ML)
PROJECT: SC Hwy 41 over Wando River - MSE Wall Study

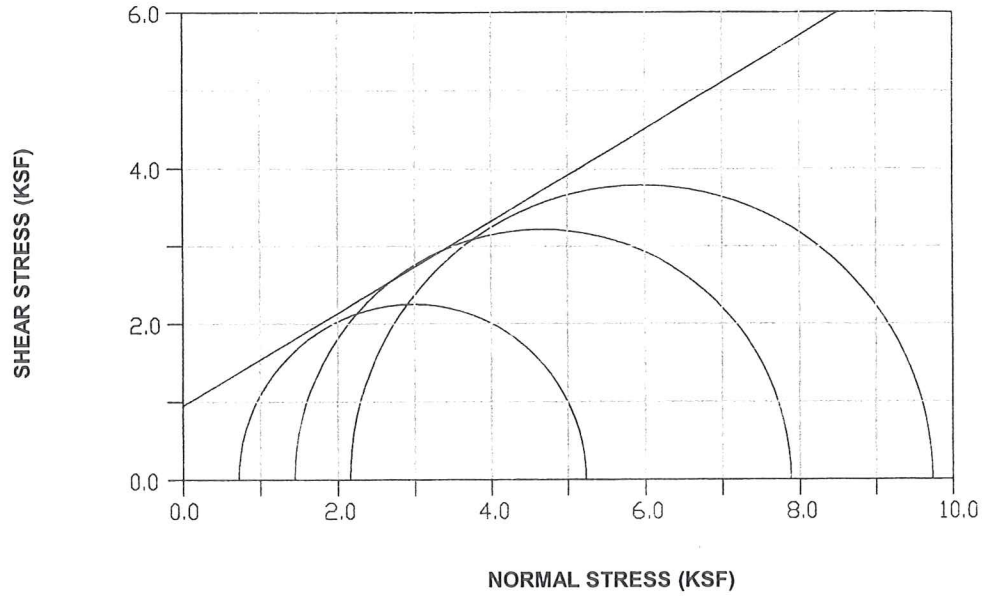
TEST TYPE: CONSOLIDATED UNDRAINED

SAMPLE NO.	1	2	3
VOID RATIO	---	---	---
SATURATION (Si)	100%	100%	98%
SATURATION (Sf)	---	---	---
SPECIFIC GRAVITY	2.65	2.65	2.65
CHAMBER STRESS	0.720	1.440	2.160
DEVIATOR STRESS	5.554	5.700	6.686

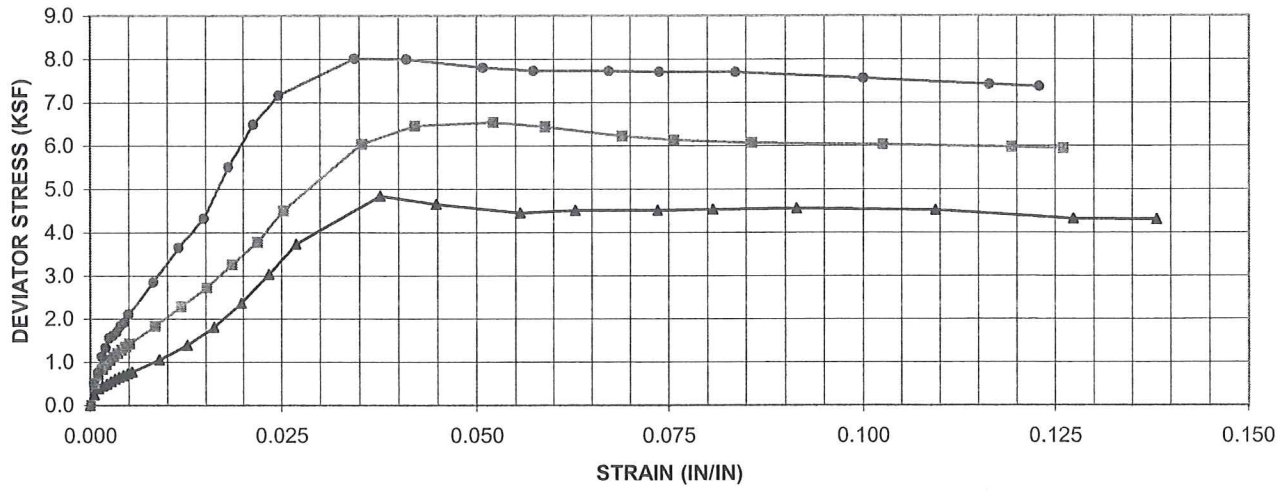
SAMPLE NO.	1	2	3
INITIAL WEIGHT (Lbs.)	2.659	2.392	2.528
INITIAL HEIGHT (In.)	6.502	5.890	6.167
INITIAL DIAMETER (In.)	2.874	2.875	2.896
INITIAL WET DENSITY (pcf)	108.94	108.12	107.56
MOISTURE CONTENT (w%)	47.50	47.32	45.58
INITIAL DRY DENSITY (pcf)	73.86	73.39	73.88

TRIAXIAL TEST DATA

Specific Gravity Assumed - Plotted at Peak Stress



C = 0.95 KSF
ϕ = 30.7 Degrees



TRIAXIAL SHEAR TEST

F&ME
CONSULTANTS

SAMPLE ID: WS-4 | **DEPTH**: 20.5' - 22.5'
LL: NP | **PL**: NP | **PI**: NP
SOIL DESC.: MARL - Green/Gray Silty Fine SAND (SM)
PROJECT: SC Hwy 41 over Wando River - MSE Wall Study

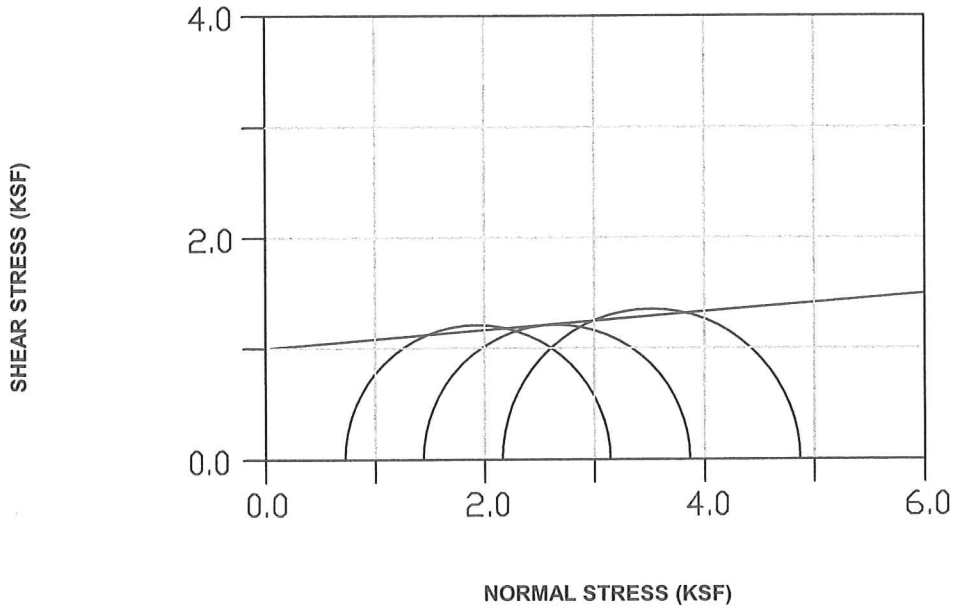
TEST TYPE: CONSOLIDATED UNDRAINED

SAMPLE NO.	1	2	3
VOID RATIO	---	---	---
SATURATION (Si)	99%	98%	100%
SATURATION (Sf)	---	---	---
SPECIFIC GRAVITY	2.65	2.65	2.65
CHAMBER STRESS	0.720	1.440	2.160
DEVIATOR STRESS	4.842	6.543	8.015

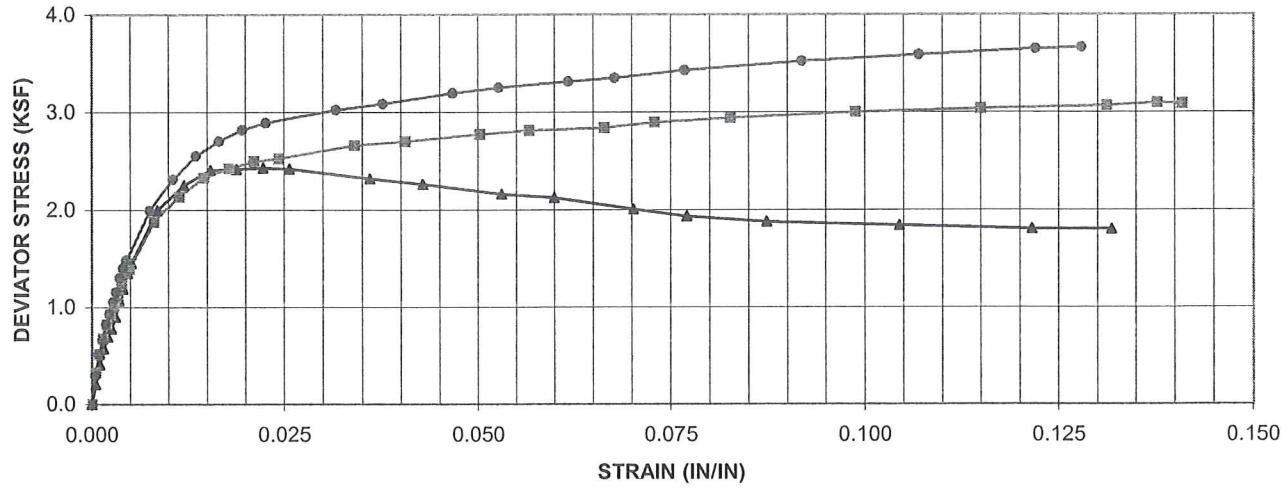
SAMPLE NO.	1	2	3
INITIAL WEIGHT (Lbs.)	2.284	2.466	2.489
INITIAL HEIGHT (In.)	5.575	5.950	6.100
INITIAL DIAMETER (In.)	2.872	2.869	2.866
INITIAL WET DENSITY (pcf)	109.28	109.90	109.27
MOISTURE CONTENT (w%)	44.60	42.47	45.16
INITIAL DRY DENSITY (pcf)	75.57	77.14	75.28

TRIAXIAL TEST DATA

Specific Gravity Assumed - Plotted at Peak Stress



C =1.0 KSF
ϕ = 4.7 Degrees



TRIAXIAL SHEAR TEST

F&ME
CONSULTANTS

SAMPLE ID: WS-6 | **DEPTH**: 13.5' - 17.5'
LL: 26 | **PL**: 23 | **PI**: 3
SOIL DESC.: Blue/Gray Fine Sandy SILT (ML)
PROJECT: SC Hwy 41 over Wando River - MSE Wall Study

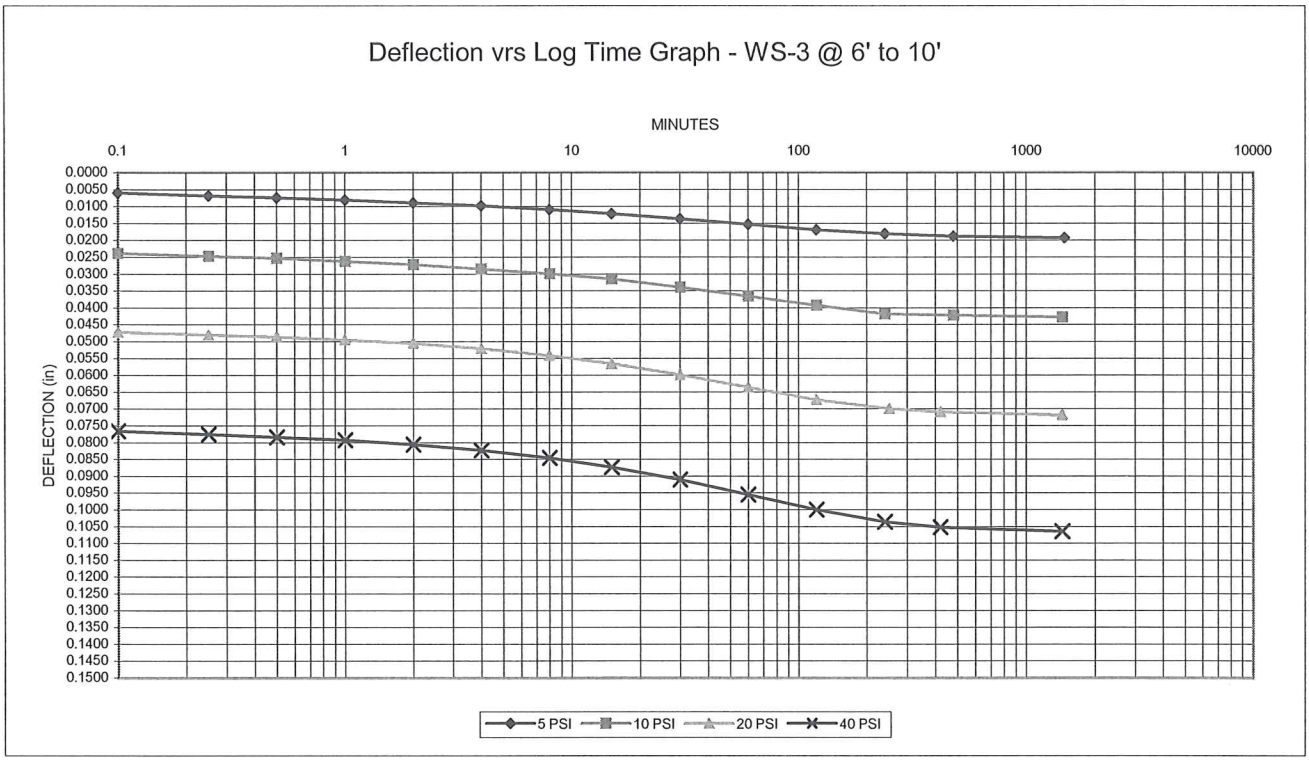
TEST TYPE: CONSOLIDATED UNDRAINED

SAMPLE NO.	1	2	3
VOID RATIO	---	---	---
SATURATION (Si)	100%	100%	100%
SATURATION (Sf)	---	---	---
SPECIFIC GRAVITY	2.65	2.65	2.65
CHAMBER STRESS	0.720	1.440	2.160
DEVIATOR STRESS	5.14	6.66	10.93

SAMPLE NO.	1	2	3
INITIAL WEIGHT (Lbs.)	3.208	2.859	3.014
INITIAL HEIGHT (In.)	6.858	6.175	6.640
INITIAL DIAMETER (In.)	2.851	2.865	2.856
INITIAL WET DENSITY (pcf)	126.61	124.11	122.42
MOISTURE CONTENT (w%)	25.24	27.03	27.76
INITIAL DRY DENSITY (pcf)	101.09	97.70	95.82

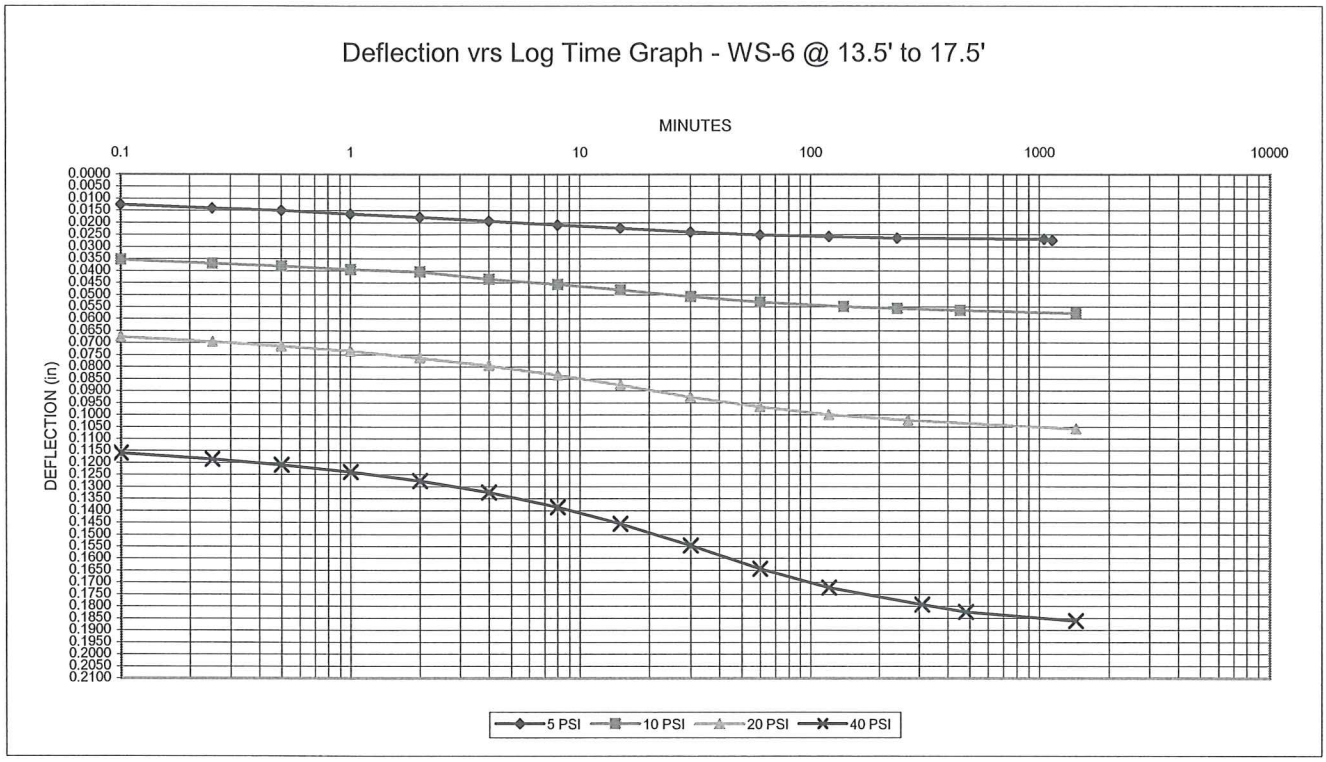
TRIAXIAL TEST DATA

Specific Gravity Assumed - Plotted at Peak Stress



Series 1 5 psi		Series 2 10 psi		Series 3 20 psi		Series 4 40 psi			
min	DR	min	DR	min	DR	min	DR		
0.1	0.0060	0.1	0.0239	0.1	0.0472	0.1	0.0766		
0.25	0.0068	0.25	0.0247	0.25	0.0480	0.25	0.0776		
0.5	0.0074	0.5	0.0253	0.5	0.0487	0.5	0.0784		
1	0.0081	1	0.0262	1	0.0495	1	0.0793		
2	0.0089	2	0.0272	2	0.0506	2	0.0806		
4	0.0098	4	0.0285	4	0.0521	4	0.0823		
8	0.0109	8	0.0299	8	0.0542	8	0.0846		
15	0.0122	15	0.0315	15	0.0566	15	0.0874		
30	0.0137	30	0.0339	30	0.0599	30	0.0911		
60	0.0153	60	0.0366	60	0.0636	60	0.0955		
120	0.0169	120	0.0393	120	0.0673	120	0.1000		
240	0.0181	240	0.0418	251	0.0700	240	0.1036		
480	0.0188	480	0.0422	420	0.0709	420	0.1052		
1470	0.0193	1440	0.0428	1440	0.0719	1440	0.1065		
Ca=	0.0011	Ca=	0.0013	Ca=	0.0020	Ca=	0.0027		

DR=Dial Reading (adjusted for test equipment calibration)



Series 1		Series 2		Series 3		Series 4			
5 psi		10 psi		20 psi		40 psi			
min	DR	min	DR	min	DR	min	DR		
0.1	0.0125	0.1	0.0354	0.1	0.0675	0.1	0.1160		
0.25	0.0140	0.25	0.0370	0.25	0.0696	0.25	0.1186		
0.5	0.0150	0.5	0.0381	0.5	0.0714	0.5	0.1210		
1	0.0164	1	0.0395	1	0.0734	1	0.1239		
2	0.0178	2	0.0404	2	0.0763	2	0.1276		
4	0.0194	4	0.0435	4	0.0796	4	0.1324		
8	0.0210	8	0.0457	8	0.0835	8	0.1386		
15	0.0223	15	0.0479	15	0.0876	15	0.1455		
30	0.0239	30	0.0507	30	0.0926	30	0.1546		
60	0.0251	60	0.0530	60	0.0967	60	0.1643		
120	0.0258	139	0.0549	120	0.1000	120	0.1722		
240	0.0264	240	0.0557	267	0.1022	309	0.1793		
1050	0.0269	453	0.0565	1440	0.1059	480	0.1823		
1140	0.0274	1440	0.0577			1440	0.1861		
Ca=	0.0008	Ca=	0.0024	Ca=	0.0051	Ca=	0.0080		

DR=Dial Reading (adjusted for test equipment calibration)

SC DEPARTMENT OF TRANSPORTATION FORM 930 (REV. 8/01)

TEST REPORT OF SOIL

LABORATORY NO. 0019
COLUMBIA, SC

FILE NO. PROJECT NO. G4067 PIN.

SAMPLE OF	Soil	SUBMITTED BY	Wade Myers
DATE SAMPLED	01/06/2005	ADDRESS	F&ME Consultants
IDENTIFICATION	0019	TESTED FOR USE IN	N/A
SAMPLE TAKEN FROM	WS-3	DATE RECEIVED	01/19/2005
SAMPLED BY	R. Wessinger	DATE TESTED	02/02/2005
QUANTITY	Shelby Tube Sample	OTHER INFORMATION	7.1'-7.6'
SUPPLY SOURCE	N/A	TESTED BY	BS
ADDRESS	N/A		

SAMPLE AS A WHOLE: (SC T-34)

PASSING 2 1/2"	
PASSING 1 1/2"	
PASSING 3/4"	
PASSING 3/8"	
PASSING NO. 4	100
PASSING NO. 10	96
SILT	2
CLAY	61

MATERIAL UNDER NO. 10: (SC T-34)

RETAINED NO. 20	2
PASSING NO. 20 RET. NO. 40	7
PASSING NO. 40 RET. NO. 60	3
SAND ABOVE NO. 60	12
PASSING NO. 60 RET. NO. 100	4
PASSING NO. 100 RET. NO. 200	19
TOTAL SAND	34
SILT	2
CLAY (BY ELUTRIATION)	64

OPT. MOIS. CONTENT, % (AASHTO T-99)	NOT REQUESTED
MAX. DRY DENSITY, PCF (AASHTO T-99)	NOT REQUESTED
LIQUID LIMIT (AASHTO T-89)	51
PLASTIC INDEX (AASHTO T-90)	32
COLOR	Blue-Gray
LOSS OF IGNITION (SC T-36)	NOT REQUESTED
AASHTO CLASSIFICATION (M-145)	A-7-6(18)
ASTM CLASSIFICATION (D2487)	NOT REQUESTED

Remarks: _____

COPY TO: _____ COPY TO: _____

COPY TO: _____ COPY TO: _____

COPY TO: _____ COPY TO: _____

NOTE: VARIATIONS FROM SPECIFICATIONS MARKED THUS: (X)

NOTE: CORRECTIONS NOTED WITH AN ASTERISK: (*)

Wade Myers

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

Card

Lab Number	0019
Pin	
File No.	
Project No.	G4067
Sample of	Soil
Date Sampled	06-Jan-05
Identification	0019
Sampled from	WS-3
Sampled by	R. Wessinger
Quantity	Shelby Tube Sample
Supply Source	N/A
Address	N/A
Submitted by	Wade Myers
Address	F&ME Consultants
To be used in	N/A
Other Information	7.1'-7.6'
Record or Check Sample	

WHOLE

Pass 2 1/2"	500	100
Pass 1 1/2"	500	100
Pass 3/4"	500	100
Pass 3/8"	500	100
Pass #4	500	100
Pass #10	478	96
Pass#40		88
Silt		2
*Clay		61
Total		63

BELOW #10

Ret #20		0.8	1.8
Pass #20	Ret #40	3.0	6.5
Pass #40	Ret #60	1.5	3.3
Sand Above #60			11.6
Pass #60	Ret #100	1.8	4.0
Pass #100	Ret #200	8.4	18.6
Total Sand			34.1
Silt		0.8	1.7
*Clay		29.1	64.2
Total		45.3	100.0
Wt of Sample		48.9	
Residue		19.8	
Loss(Clay)		29.1	

Employee Name: BS

Liquid Limit	51
Plasticity Index	32
Classification	A-7-6(18)
Color	Blue-Gray
Ignition Loss	#DIV/0!

A.	Air-dried weight:	50.0	grams
B.	Oven dried weight:	48.9	grams
C.	Hygroscopic moisture:	1.1	grams
D.	Hygroscopic moisture content:	2.3	%
E.	Air-dried weight:	50.0	grams
F.	Calculated oven dried weight:	48.9	grams

(1)	No. of Blows	27	27		27	P.L.
(2)	Wt.C & Wet Soil	31.50	31.49			25.72
(3)	Wt.C & Dry Soil	27.82	27.82			24.90
(4)	Wt. Container	20.59	20.59			20.56
(5)	Wt. Moisture	3.68	3.67			0.82
(6)	Wt. Dry Soil	7.23	7.23			4.34
(7)	(5) x 100 / (6)	50.90	50.76	50.90		18.89
		Test Sample	Check Sample			

%Pass #40 in mat. Below #10 sieve	92
% Clay in mat. Below #40 sieve	64

Current Date:	April 25, 2005
Date of Final Reporting	
Date Testing Completed	February 2, 2005
Date Received	January 19, 2005
First Copy To:	
Second Copy To:	
Copy To:	
Copy To:	
Third Copy To:	
Date Tested	02-Feb-05
Tested By:	BS
Other Remarks	

Remarks **Pick From List**
This sample of soil does meet the SCDOT specifications for use as
This sample of soil does meet the SCDOT specifications for use as
This sample of soil does **Not** meet the SCDOT specifications for use as
For information only on
This sample does compare
This sample does **Not** compare
919 Required

Right Click Mouse Go To Pick From List Then Pick The Remark

SC DEPARTMENT OF TRANSPORTATION FORM **930** (REV. 8/01)

TEST REPORT OF SOIL

LABORATORY NO. 0019
COLUMBIA, SC

FILE NO. PROJECT NO. G4067 PIN.

SAMPLE OF	Soil	SUBMITTED BY	Wade Myers
DATE SAMPLED	01/06/2005	ADDRESS	F&ME Consultants
IDENTIFICATION	0019	TESTED FOR USE IN	N/A
SAMPLE TAKEN FROM	WS-3	DATE RECEIVED	01/19/2005
SAMPLED BY	R. Wessinger	DATE TESTED	02/07/2005
QUANTITY	Shelby Tube Sample	OTHER INFORMATION	21.5'-22.0'
SUPPLY SOURCE	N/A	TESTED BY	BS
ADDRESS	N/A		

SAMPLE AS A WHOLE: (SC T-34)

PASSING 2 1/2"	
PASSING 1 1/2"	
PASSING 3/4"	
PASSING 3/8"	
PASSING NO. 4	100
PASSING NO. 10	99
SILT	2
CLAY	51

MATERIAL UNDER NO. 10: (SC T-34)

RETAINED NO. 20	0
PASSING NO. 20 RET. NO. 40	1
PASSING NO. 40 RET. NO. 60	2
SAND ABOVE NO. 60	3
PASSING NO. 60 RET. NO. 100	7
PASSING NO. 100 RET. NO. 200	37
TOTAL SAND	47
SILT	2
CLAY (BY ELUTRIATION)	51

OPT. MOIS. CONTENT, % (AASHTO T-99)	NOT REQUESTED
MAX. DRY DENSITY, PCF (AASHTO T-99)	NOT REQUESTED
LIQUID LIMIT (AASHTO T-89)	-
PLASTIC INDEX (AASHTO T-90)	NP
COLOR	Marl. Green/Gray
LOSS OF IGNITION (SC T-36)	NOT REQUESTED
AASHTO CLASSIFICATION (M-145)	A-4(0)
ASTM CLASSIFICATION (D2487)	NOT REQUESTED

Remarks: _____

COPY TO: _____ COPY TO: _____
COPY TO: _____ COPY TO: _____
COPY TO: _____ COPY TO: _____

NOTE: VARIATIONS FROM SPECIFICATIONS MARKED THUS: (X)

NOTE: CORRECTIONS NOTED WITH AN ASTERISK: (*)

Wade Myers

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

Card

Lab Number	0019
Pin	
File No.	
Project No.	G4067
Sample of	Soil
Date Sampled	06-Jan-05
Identification	0019
Sampled from	WS-3
Sampled by	R. Wessinger
Quantity	Shelby Tube Sample
Supply Source	N/A
Address	N/A
Submitted by	Wade Myers
Address	F&ME Consultants
To be used in	N/A
Other Information	21.5'-22.0'
Record or Check Sample	

WHOLE

Pass 2 1/2"	500	100
Pass 1 1/2"	500	100
Pass 3/4"	500	100
Pass 3/8"	500	100
Pass #4	500	100
Pass #10	497	99
Pass#40		98
Silt		2
*Clay		51
Total		52

BELOW #10

Ret #20		0.3	0.5
Pass #20	Ret #40	0.4	0.6
Pass #40	Ret #60	0.9	1.5
Sand Above #60			2.6
Pass #60	Ret #100	4.3	7.4
Pass #100	Ret #200	21.8	37.4
Total Sand			47.4
Silt		0.9	1.6
*Clay		29.8	51.0
Total		58.4	100.0
Wt of Sample		49.6	
Residue		19.8	
Loss(Clay)		29.8	

Liquid Limit	-
Plasticity Index	NP
Classification	A-4(0)
Color	Marl. Green/Gray
Ignition Loss	#DIV/0!

A.	Air-dried weight:	50.0	grams
B.	Oven dried weight:	49.6	grams
C.	Hygroscopic moisture:	0.4	grams
D.	Hygroscopic moisture content:	0.8	%
E.	Air-dried weight:	50.0	grams
F.	Calculated oven dried weight:	49.6	grams

(1)	No. of Blows				0	P.L.
(2)	Wt.C & Wet Soil					
(3)	Wt.C & Dry Soil					
(4)	Wt. Container					
(5)	Wt. Moisture	0.00	0.00			0.00
(6)	Wt. Dry Soil	0.00	0.00			0.00
(7)	(5) x 100 / (6)	0.00	0.00	0.00		0.00
		Test Sample	Check Sample			

%Pass #40 in mat. Below #10 sieve	99
% Clay in mat. Below #40 sieve	61

Current Date:	April 25, 2005
Date of Final Reporting	
Date Testing Completed	February 7, 2005
Date Received	January 19, 2005
First Copy To:	
Second Copy To:	
Copy To:	
Copy To:	
Third Copy To:	
Date Tested	07-Feb-05
Tested By:	BS
Other Remarks	
Remarks **Pick From List**	This sample of soil does meet the SCDOT specifications for use as
	This sample of soil does meet the SCDOT specifications for use as
	This sample of soil does **Not** meet the SCDOT specifications for use as
	For information only on
	This sample does compare
	This sample does **Not** compare
	919 Required

Right Click Mouse Go To Pick From List Then Pick The Remark

Employee Name: BS

SC DEPARTMENT OF TRANSPORTATION FORM **930** (REV. 8/01)

TEST REPORT OF SOIL

LABORATORY NO. 0019
COLUMBIA, SC

FILE NO. PROJECT NO. G4067 PIN.

SAMPLE OF	Soil	SUBMITTED BY	Wade Myers
DATE SAMPLED	01/06/2005	ADDRESS	F&ME Consultants
IDENTIFICATION	0019	TESTED FOR USE IN	N/A
SAMPLE TAKEN FROM	WS-4	DATE RECEIVED	01/19/2005
SAMPLED BY	R. Wessinger	DATE TESTED	02/07/2005
QUANTITY	Shelby Tube Sample	OTHER INFORMATION	22.0'-22.5'
SUPPLY SOURCE	N/A	TESTED BY	BS
ADDRESS	N/A		

SAMPLE AS A WHOLE: (SC T-34)

PASSING 2 1/2"	
PASSING 1 1/2"	
PASSING 3/4"	
PASSING 3/8"	
PASSING NO. 4	100
PASSING NO. 10	99
SILT	1
CLAY	48

MATERIAL UNDER NO. 10: (SC T-34)

RETAINED NO. 20	1
PASSING NO. 20 RET. NO. 40	1
PASSING NO. 40 RET. NO. 60	2
SAND ABOVE NO. 60	3
PASSING NO. 60 RET. NO. 100	11
PASSING NO. 100 RET. NO. 200	36
TOTAL SAND	50
SILT	1
CLAY (BY ELUTRIATION)	49

OPT. MOIS. CONTENT, % (AASHTO T-99)	NOT REQUESTED
MAX. DRY DENSITY, PCF (AASHTO T-99)	NOT REQUESTED
LIQUID LIMIT (AASHTO T-89)	-
PLASTIC INDEX (AASHTO T-90)	NP
COLOR	Marl. Green/Gray
LOSS OF IGNITION (SC T-36)	NOT REQUESTED
AASHTO CLASSIFICATION (M-145)	A-4(0)
ASTM CLASSIFICATION (D2487)	NOT REQUESTED

Remarks: _____

COPY TO: _____ COPY TO: _____

COPY TO: _____ COPY TO: _____

COPY TO: _____ COPY TO: _____

NOTE: VARIATIONS FROM SPECIFICATIONS MARKED THUS: (X)

NOTE: CORRECTIONS NOTED WITH AN ASTERISK: (*)

/Wade Myers

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

Card		
	Lab Number	0019
	Pin	
	File No.	
	Project No.	G4067
	Sample of	Soil
	Date Sampled	06-Jan-05
	Identification	0019
	Sampled from	WS-4
	Sampled by	R. Wessinger
	Quantity	Shelby Tube Sample
	Supply Source	N/A
	Address	N/A
	Submitted by	Wade Myers
	Address	F&ME Consultants
	To be used in	N/A
	Other Information	22.0'-22.5'
	Record or Check Sample	

WHOLE				
	Pass 2 1/2"		500	100
	Pass 1 1/2"		500	100
	Pass 3/4"		500	100
	Pass 3/8"		500	100
	Pass #4		500	100
	Pass #10		496	99
	Pass#40			98
	Silt			1
	*Clay			48
	Total			50

BELOW #10				
	Ret #20		0.4	0.7
	Pass #20	Ret #40	0.4	0.7
	Pass #40	Ret #60	1.1	1.7
	Sand Above #60			3.1
	Pass #60	Ret #100	6.5	10.6
	Pass #100	Ret #200	22.2	36.2
	Total Sand			50.0
	Silt		0.9	1.4
	*Clay		29.8	48.6
	Total		61.2	100.0
	Wt of Sample		49.6	
	Residue		19.8	
	Loss(Clay)		29.8	

Employee Name: BS

Liquid Limit	-
Plasticity Index	NP
Classification	A-4(0)
Color	Marl. Green/Gray
Ignition Loss	#DIV/0!

A.	Air-dried weight:	50.0	grams
B.	Oven dried weight:	49.6	grams
C.	Hygroscopic moisture:	0.4	grams
D.	Hygroscopic moisture content:	0.9	%
E.	Air-dried weight:	50.0	grams
F.	Calculated oven dried weight:	49.6	grams

(1)	No. of Blows				0	P.L.
(2)	Wt.C & Wet Soil					
(3)	Wt.C & Dry Soil					
(4)	Wt. Container					
(5)	Wt. Moisture	0.00	0.00			0.00
(6)	Wt. Dry Soil	0.00	0.00			0.00
(7)	(5) x 100 / (6)	0.00	0.00	0.00		0.00
		Test Sample	Check Sample			

%Pass #40 in mat. Below #10 sieve	99
% Clay in mat. Below #40 sieve	61

Current Date:	April 25, 2005
Date of Final Reporting	
Date Testing Completed	February 7, 2005
Date Received	January 19, 2005
First Copy To:	
Second Copy To:	
Copy To:	
Copy To:	
Third Copy To:	
Date Tested	07-Feb-05
Tested By:	BS
Other Remarks	
Remarks **Pick From List**	This sample of soil does meet the SCDOT specifications for use as
	This sample of soil does meet the SCDOT specifications for use as
	This sample of soil does **Not** meet the SCDOT specifications for use as
	For information only on
	This sample does compare
	This sample does **Not** compare
	919 Required

Right Click Mouse Go To Pick From List Then Pick The Remark

SC DEPARTMENT OF TRANSPORTATION FORM 930 (REV. 8/01)

TEST REPORT OF
SOIL

LABORATORY NO. 0019
COLUMBIA, SC

FILE NO. PROJECT NO. G4067 PIN.

SAMPLE OF	Soil	SUBMITTED BY	Wade Myers
DATE SAMPLED	01/06/2005	ADDRESS	F&ME Consultants
IDENTIFICATION	0019	TESTED FOR USE IN	N/A
SAMPLE TAKEN FROM	WS-6	DATE RECEIVED	01/19/2005
SAMPLED BY	R. Wessinger	DATE TESTED	02/02/2005
QUANTITY	Shelby Tube Sample	OTHER INFORMATION	13.5'-14.3'
SUPPLY SOURCE	N/A	TESTED BY	BS
ADDRESS	N/A		

SAMPLE AS A WHOLE: (SC T-34)

PASSING 2 1/2"	
PASSING 1 1/2"	
PASSING 3/4"	
PASSING 3/8"	
PASSING NO. 4	100
PASSING NO. 10	99
SILT	1
CLAY	59

MATERIAL UNDER NO. 10: (SC T-34)

RETAINED NO. 20	0
PASSING NO. 20 RET. NO. 40	0
PASSING NO. 40 RET. NO. 60	1
SAND ABOVE NO. 60	1
PASSING NO. 60 RET. NO. 100	1
PASSING NO. 100 RET. NO. 200	36
TOTAL SAND	39
SILT	1
CLAY (BY ELUTRIATION)	60

OPT. MOIS. CONTENT, % (AASHTO T-99)	NOT REQUESTED
MAX. DRY DENSITY, PCF (AASHTO T-99)	NOT REQUESTED
LIQUID LIMIT (AASHTO T-89)	26
PLASTIC INDEX (AASHTO T-90)	3
COLOR	Blue-Gray
LOSS OF IGNITION (SC T-36)	NOT REQUESTED
AASHTO CLASSIFICATION (M-145)	A-4(0)
ASTM CLASSIFICATION (D2487)	NOT REQUESTED

Remarks: _____

COPY TO: _____ COPY TO: _____
COPY TO: _____ COPY TO: _____
COPY TO: _____ COPY TO: _____

NOTE: VARIATIONS FROM SPECIFICATIONS MARKED THUS: (X)

NOTE: CORRECTIONS NOTED WITH AN ASTERISK: (*)

Wade Myers

F&ME CONSULTANTS
3112 Devine Street
Columbia, South Carolina 29205

Card		
	Lab Number	0019
	Pin	
	File No.	
	Project No.	G4067
	Sample of	Soil
	Date Sampled	06-Jan-05
	Identification	0019
	Sampled from	WS-6
	Sampled by	R. Wessinger
	Quantity	Shelby Tube Sample
	Supply Source	N/A
	Address	N/A
	Submitted by	Wade Myers
	Address	F&ME Consultants
	To be used in	N/A
	Other Information	13.5'-14.3'
	Record or Check Sample	

WHOLE			
	Pass 2 1/2"	500	100
	Pass 1 1/2"	500	100
	Pass 3/4"	500	100
	Pass 3/8"	500	100
	Pass #4	500	100
	Pass #10	494	99
	Pass#40		98
	Silt		1
	*Clay		59
	Total		61

BELOW #10			
	Ret #20	0.0	0.1
Pass #20	Ret #40	0.2	0.5
Pass #40	Ret #60	0.4	0.8
	Sand Above #60		1.3
Pass #60	Ret #100	0.6	1.3
Pass #100	Ret #200	17.8	36.1
	Total Sand		38.7
	Silt	0.7	1.5
	*Clay	29.5	59.9
	Total	49.3	100.0

Wt of Sample	49.3
Residue	19.8
Loss(Clay)	29.5

Employee Name: BS

Liquid Limit	26
Plasticity Index	3
Classification	A-4(0)
Color	Blue-Gray
Ignition Loss	#DIV/0!

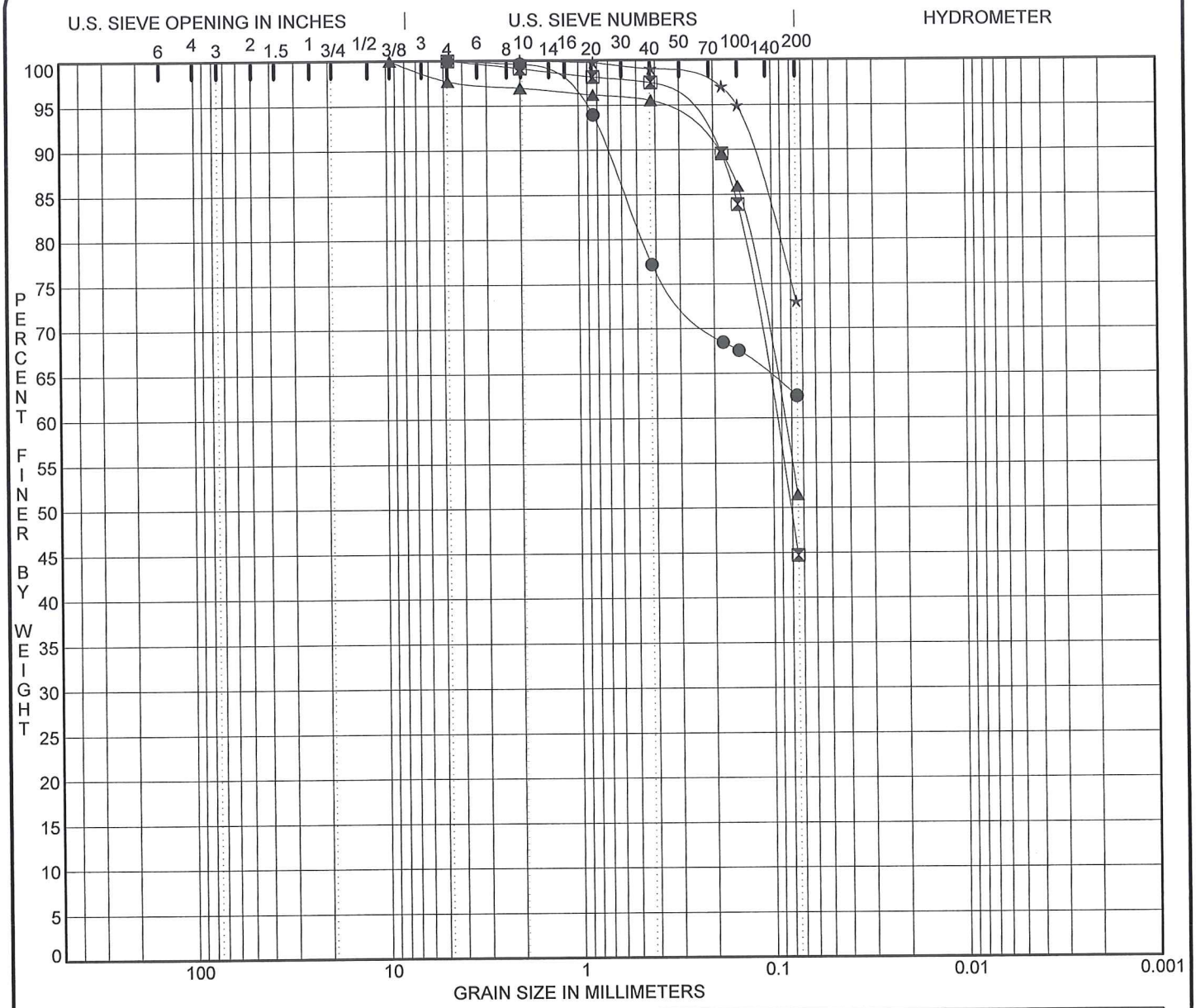
A.	Air-dried weight:	50.0	grams
B.	Oven dried weight:	49.3	grams
C.	Hygroscopic moisture:	0.7	grams
D.	Hygroscopic moisture content:	1.3	%
E.	Air-dried weight:	50.0	grams
F.	Calculated oven dried weight:	49.3	grams

(1)	No. of Blows	26	26		26	P.L.
(2)	Wt.C & Wet Soil	22.93	23.16			20.99
(3)	Wt.C & Dry Soil	20.94	21.17			20.04
(4)	Wt. Container	13.20	13.24			15.87
(5)	Wt. Moisture	1.99	1.99			0.95
(6)	Wt. Dry Soil	7.74	7.93			4.17
(7)	(5) x 100 / (6)	25.71	25.09	25.71		22.78
		Test Sample	Check Sample			

%Pass #40 in mat. Below #10 sieve	99
% Clay in mat. Below #40 sieve	60

Current Date:	April 25, 2005
Date of Final Reporting	
Date Testing Completed	February 2, 2005
Date Received	January 19, 2005
First Copy To:	
Second Copy To:	
Copy To:	
Copy To:	
Third Copy To:	
Date Tested	02-Feb-05
Tested By:	BS
Other Remarks	
Remarks **Pick From List**	This sample of soil does meet the SCDOT specifications for use as
	This sample of soil does meet the SCDOT specifications for use as
	This sample of soil does **Not** meet the SCDOT specifications for use as
	For information only on
	This sample does compare
	This sample does **Not** compare
	919 Required

Right Click Mouse Go To Pick From List Then Pick The Remark



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● WB 3	6.0'-7.5'	Grayish Orange F-M Sandy Lean CLAY (CL)	29.0	41	20	22		
⊠ WB-3	18.5'-20.0'	Tan Silty F-M SAND (SM)	47.1	NP	NP	NP		
▲ WB-4	18.5'-20.0'	Gray F-M Sandy SILT (ML)	45.9	NP	NP	NP		
★ WB-6	13.5'-15.0'	Gray F-M Sandy Lean to Elastic CLAY (CL-CH)	45.7	50	23	27		

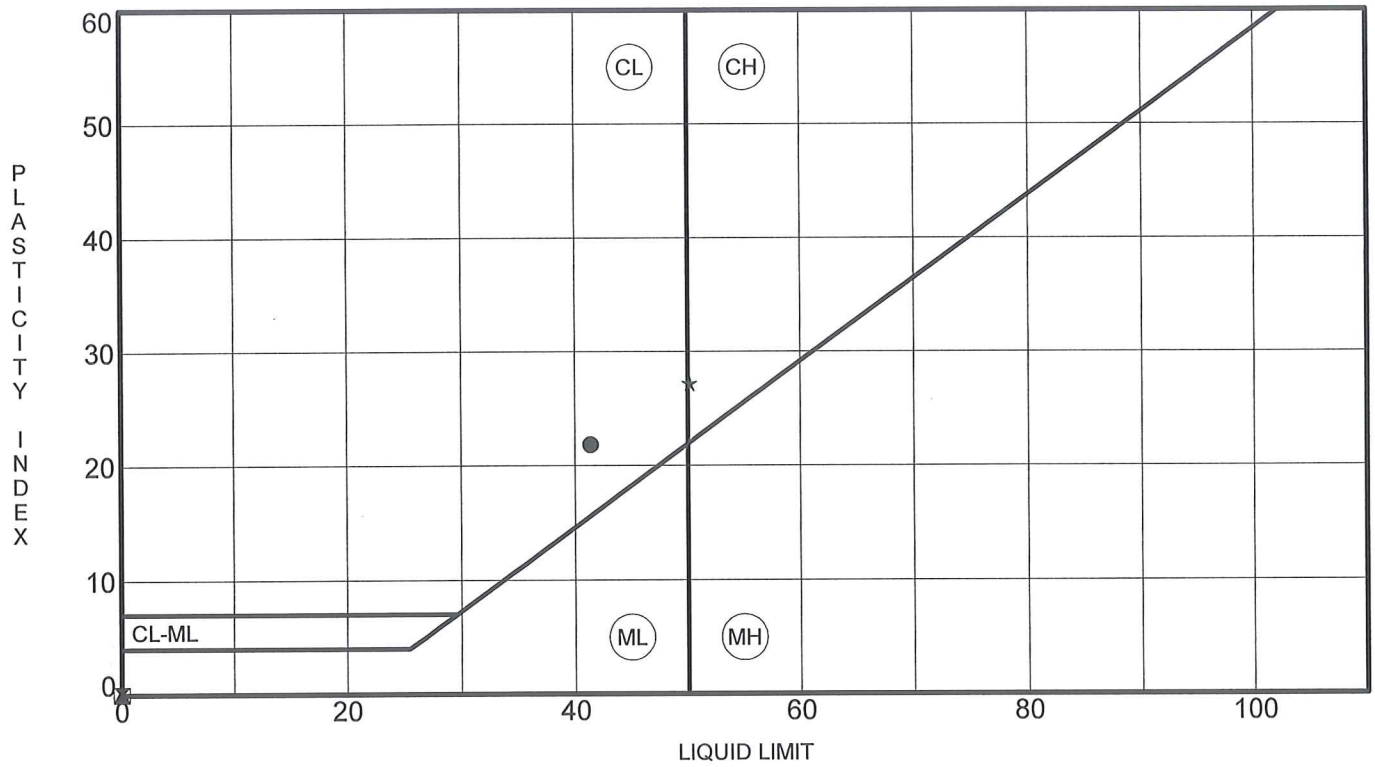
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● WB 3	6.0'-7.5'	4.76				0.0	37.5	62.5	
⊠ WB-3	18.5'-20.0'	4.76	0.10			0.0	55.3	44.7	
▲ WB-4	18.5'-20.0'	9.52	0.09			2.3	46.2	51.5	
★ WB-6	13.5'-15.0'	2.00				0.0	27.0	73.0	

PROJECT SC-41 Bridge Replacement Over Wando River
LOCATION Berkeley/Charleston Counties, South Carolina

JOB NO. G4067
DATE 4/25/05

F&ME CONSULTANTS

GRADATION CURVES



	Specimen Identification		LL	PL	PI	Fines	Classification
●	WB 3	7.5	41	20	21	62	Grayish Orange F-M Sandy Lean CLAY (CL)
⊠	WB-3	20.0	NP	NP	NP	45	Tan Silty F-M SAND (SM)
▲	WB-4	20.0	NP	NP	NP	51	Gray F-M Sandy SILT (ML)
★	WB-6	15.0	50	23	27	73	Gray F-M Sandy Lean to Elastic CLAY (CL-CH)

F&ME CONSULTANTS

ATTERBERG LIMITS' RESULTS

Project: SC-41 Bridge Replacement Over Wando River

Location: Berkeley/Charleston Counties, South Carolina

Number: G4067

US ATTERBERG LIMITS G4067LAB.GPJ US LAB.GDT 4/25/05

AASHTO DESIGN METHOD
SC-41 over Wando River

PROJECT IDENTIFICATION

Title: SC-41 over Wando River
Project Number: G4067
Client: Triplett-King & Associates
Designer: F&ME Consultants
Station Number:

Description:

Hypothetical: Static and SEE Evaluation; 22 Foot High MSE Wall; Select Granular Backfill (Option 1); Foundation c=1.0 ksf; phi=5 degrees

Company's information:

Name: F&ME Consultants
Street: 3112 Devine Street

Columbia, SC 29205
Telephone #: (803) 245-4540
Fax #: (803) 254-4542
E-Mail: mmiller@fmecol.com

Original file path and name: C:\MSEW Version 2.0\SC41 over Wando - 22' Wall.BEN
Original date and time of creating this file: Sat Dec 11 12:30:43 2004

PROGRAM MODE:

ANALYSIS
of a SIMPLE STRUCTURE
using METAL STRIPS as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	120.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

RETAINED SOIL

Unit weight, γ	120.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	110.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	5.0 °
Equivalent cohesion, $c_{equiv.}$	1000.0 lb/ft ^{2}

Water table is at wall base elevation

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Ka (external stability) = 0.3333 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 6.49 $N\gamma$ = 0.45

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.372
Kae ($\alpha_o > 0$) = 0.6983 Kae ($\alpha_o = 0$) = 0.3333 Δ Kae = 0.3649 (see eq. 37 in DEMO 82)
Seismic soil-metal strip friction coefficient, F* is 80.0% of its specified static value.

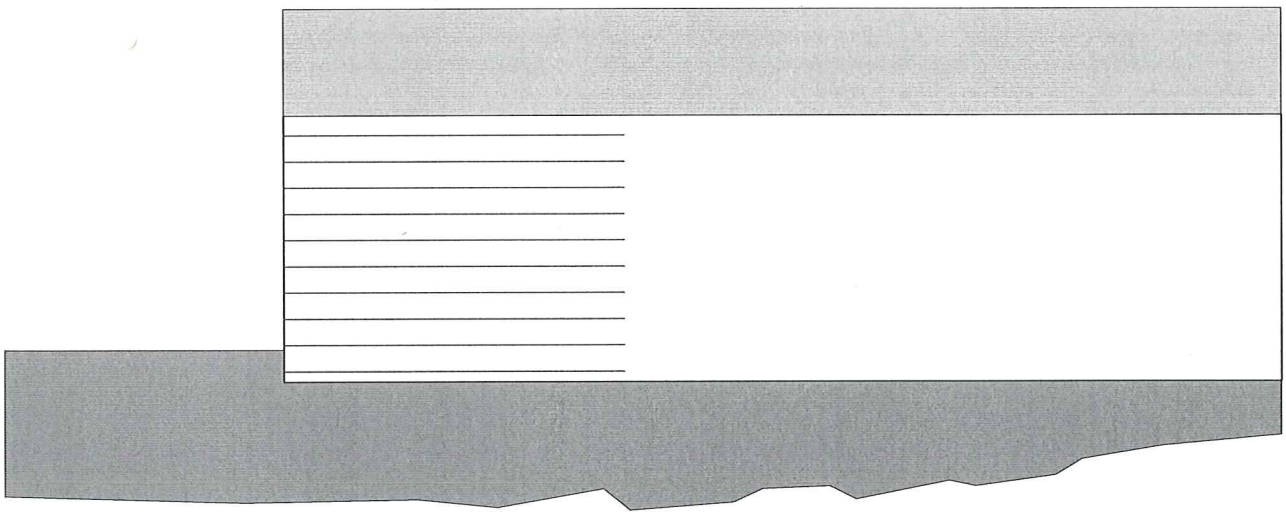
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	25.00	[ft]	{ Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 22.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft ²], and live load is 250.0 [lb/ft ²]

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 1.77, Meyerhof stress = 3834 lb/ft².

Foundation Interface: Direct sliding, Fs = 2.466, Eccentricity, e/L = 0.0470, Fs-overturning = 10.65

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	2.66	2.95	2.953	5.955	4.030	0.0438	ReStrip
2	3.44	32.00	1	N/A	2.61	2.90	2.900	5.047	4.402	0.0363	ReStrip
3	5.90	32.00	1	N/A	2.82	3.14	3.138	4.915	4.851	0.0295	ReStrip
4	8.36	32.00	1	N/A	1.51	1.68	1.676	2.691	5.407	0.0234	ReStrip
5	10.82	32.00	1	N/A	1.65	1.83	1.829	2.851	6.113	0.0179	ReStrip
6	13.28	32.00	1	N/A	1.82	2.03	2.027	2.974	7.048	0.0131	ReStrip
7	15.74	32.00	1	N/A	2.05	2.28	2.277	3.111	8.356	0.0089	ReStrip
8	18.20	32.00	1	N/A	1.60	1.78	1.777	2.125	10.361	0.0054	ReStrip
9	20.66	32.00	1	N/A	5.99	6.65	6.653	6.361	14.020	0.0027	ReStrip
10	23.12	32.00	1	N/A	6.80	7.56	7.559	4.883	24.804	0.0007	ReStrip

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

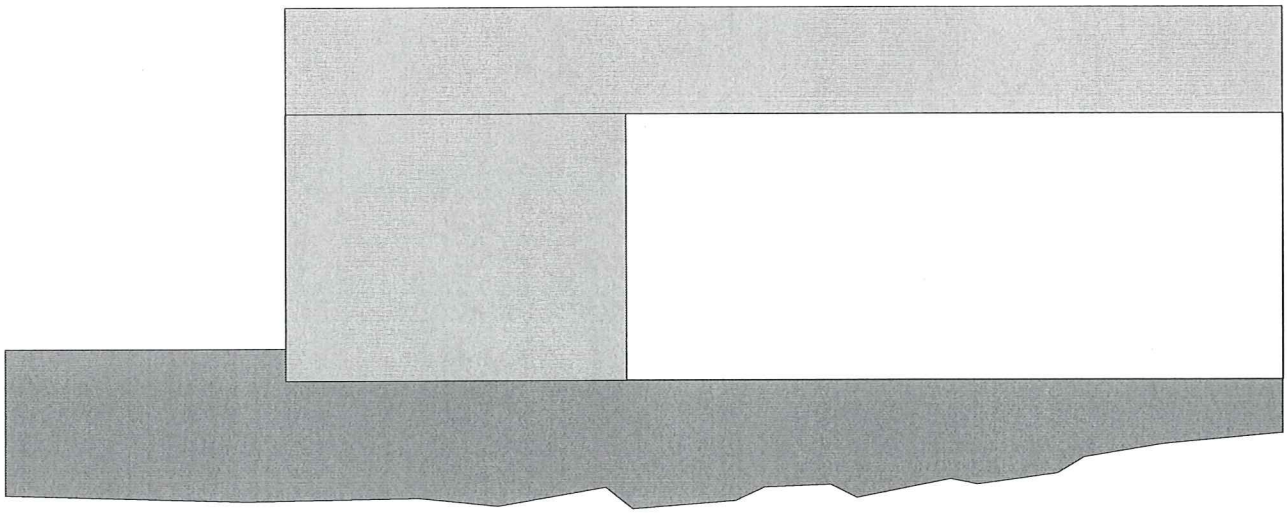
Bearing capacity, Fs = 1.45, Meyerhof stress = 4663 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.066, Eccentricity, e/L = 0.1343, Fs-overturning = 3.72

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	2.06	2.29	2.286	3.688	1.753	0.1241	ReStrip
2	3.44	32.00	1	N/A	2.05	2.28	2.277	3.171	1.946	0.1004	ReStrip
3	5.90	32.00	1	N/A	2.20	2.45	2.449	3.069	2.187	0.0793	ReStrip
4	8.36	32.00	1	N/A	1.17	1.30	1.305	1.676	2.496	0.0606	ReStrip
5	10.82	32.00	1	N/A	1.27	1.41	1.414	1.763	2.908	0.0444	ReStrip
6	13.28	32.00	1	N/A	1.39	1.54	1.544	1.812	3.484	0.0307	ReStrip
7	15.74	32.00	1	N/A	1.52	1.68	1.685	1.842	4.350	0.0195	ReStrip
8	18.20	32.00	1	N/A	1.13	1.26	1.259	1.205	5.800	0.0108	ReStrip
9	20.66	32.00	1	N/A	3.96	4.40	4.397	3.363	8.768	0.0046	ReStrip
10	23.12	32.00	1	N/A	4.30	4.78	4.775	2.468	18.768	0.0009	ReStrip

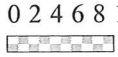
BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
Water table is at wall base elevation	6801	6745	[lb/ft ²]
Meyerhof stress, σ_V	3834.3	4663	[lb/ft ²]
Eccentricity, e	1.40	3.99	[ft]
Eccentricity, e/L	0.044	0.125	
Fs calculated	1.77	1.45	
Base length	32.00	32.00	[ft]



SCALE:

0 2 4 6 8 10[ft]



DIRECT SLIDING for GIVEN LAYOUT
(for METAL STRIPS reinforcements)

Along reinforced and foundation soils interface: Fs-static = 2.466 and Fs-seismic = 1.066

#	Metal strip Elevation [ft]	Metal strip Length [ft]	Fs Static	Fs Seismic	Metal strip Type #	Product name
1	0.98	32.00	4.030	1.753	1	ReStrip
2	3.44	32.00	4.402	1.946	1	ReStrip
3	5.90	32.00	4.851	2.187	1	ReStrip
4	8.36	32.00	5.407	2.496	1	ReStrip
5	10.82	32.00	6.113	2.908	1	ReStrip
6	13.28	32.00	7.048	3.484	1	ReStrip
7	15.74	32.00	8.356	4.350	1	ReStrip
8	18.20	32.00	10.361	5.800	1	ReStrip
9	20.66	32.00	14.020	8.768	1	ReStrip
10	23.12	32.00	24.804	18.768	1	ReStrip

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0470, e/L seismic = 0.1343; Overturning: Fs-static = 10.65, Fs-seismic = 3.72

#	Metal strip Elevation [ft]	Metal strip Length [ft]	e / L Static	e / L Seismic	Metal strip Type #	Product name
1	0.98	32.00	0.0438	0.1241	1	ReStrip
2	3.44	32.00	0.0363	0.1004	1	ReStrip
3	5.90	32.00	0.0295	0.0793	1	ReStrip
4	8.36	32.00	0.0234	0.0606	1	ReStrip
5	10.82	32.00	0.0179	0.0444	1	ReStrip
6	13.28	32.00	0.0131	0.0307	1	ReStrip
7	15.74	32.00	0.0089	0.0195	1	ReStrip
8	18.20	32.00	0.0054	0.0108	1	ReStrip
9	20.66	32.00	0.0027	0.0046	1	ReStrip
10	23.12	32.00	0.0007	0.0009	1	ReStrip

RESULTS for STRENGTH **[Note: Actual Fs-overall = (Yield stress) / (Actual stress)]**

#	Metal strip Elevation [ft]	Coverage ratio, Rc=b/Sh	Horizontal spacing, Sh [ft]	Long-term strength Fy·Ac·Rc/b [lb/ft]	Tmax [lb/ft]	Tmd [lb/ft]	Specified minimum Fs-overall static	Actual calculated Fs-overall static	Specified minimum Fs-overall seismic	Actual calculated Fs-overall seismic
1	0.98	0.133	1.230	8118	2748.99	802.73	N/A	2.953	N/A	2.286
2	3.44	0.133	1.230	8118	2799.71	765.01	N/A	2.900	N/A	2.277
3	5.90	0.133	1.230	8118	2587.36	727.28	N/A	3.138	N/A	2.449
4	8.36	0.067	2.460	4059	2421.88	689.56	N/A	1.676	N/A	1.305
5	10.82	0.067	2.460	4059	2219.33	651.84	N/A	1.829	N/A	1.414
6	13.28	0.067	2.460	4059	2002.40	626.14	N/A	2.027	N/A	1.544
7	15.74	0.067	2.460	4059	1782.89	626.14	N/A	2.277	N/A	1.685
8	18.20	0.044	3.690	2706	1523.22	626.14	N/A	1.777	N/A	1.259
9	20.66	0.133	1.230	8118	1220.30	626.14	N/A	6.653	N/A	4.397
10	23.12	0.133	1.230	8118	1074.01	626.14	N/A	7.559	N/A	4.775

RESULTS for PULLOUT

NOTE: Uniform live load is not included in calculating the overburden pressure used to assess pullout resistance.

#	Metal strip Elevation [ft]	Coverage Ratio Rc=b/Sh	Tmax [lb/ft]	Tmd [lb/ft]	Le [ft] (see NOTE)	La [ft]	Avail.Static Pullout, Pr [lb/ft]	Specified Static Fs	Actual Static Fs	Avail.Seism. Pullout, Pr [lb/ft]	Specified Seismic Fs	Actual Seismic Fs
1	0.98	0.133	2749	803	31.41	0.59	16371.4	N/A	5.955	13097.1	N/A	3.688
2	3.44	0.133	2800	765	29.93	2.07	14131.2	N/A	5.047	11304.9	N/A	3.171
3	5.90	0.133	2587	727	28.46	3.54	12716.2	N/A	4.915	10173.0	N/A	3.069
4	8.36	0.067	2422	690	26.98	5.02	6517.7	N/A	2.691	5214.2	N/A	1.676
5	10.82	0.067	2219	652	25.51	6.49	6328.1	N/A	2.851	5062.5	N/A	1.763
6	13.28	0.067	2002	626	24.50	7.50	5954.7	N/A	2.974	4763.7	N/A	1.812
7	15.74	0.067	1783	626	24.50	7.50	5547.4	N/A	3.111	4437.9	N/A	1.842
8	18.20	0.044	1523	626	24.50	7.50	3237.5	N/A	2.125	2590.0	N/A	1.205
9	20.66	0.133	1220	626	24.50	7.50	7762.4	N/A	6.361	6209.9	N/A	3.363
10	23.12	0.133	1074	626	24.50	7.50	5244.5	N/A	4.883	4195.6	N/A	2.468

RESULTS for CONNECTION (static conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	2749	0.90	7306	8118	N/A	2.66	N/A	2.95	ReStrip
2	3.44	0.133	1.230	2800	0.90	7306	8118	N/A	2.61	N/A	2.90	ReStrip
3	5.90	0.133	1.230	2587	0.90	7306	8118	N/A	2.82	N/A	3.14	ReStrip
4	8.36	0.067	2.460	2422	0.90	3653	4059	N/A	1.51	N/A	1.68	ReStrip
5	10.82	0.067	2.460	2219	0.90	3653	4059	N/A	1.65	N/A	1.83	ReStrip
6	13.28	0.067	2.460	2002	0.90	3653	4059	N/A	1.82	N/A	2.03	ReStrip
7	15.74	0.067	2.460	1783	0.90	3653	4059	N/A	2.05	N/A	2.28	ReStrip
8	18.20	0.044	3.690	1523	0.90	2435	2706	N/A	1.60	N/A	1.78	ReStrip
9	20.66	0.133	1.230	1220	0.90	7306	8118	N/A	5.99	N/A	6.65	ReStrip
10	23.12	0.133	1.230	1074	0.90	7306	8118	N/A	6.80	N/A	7.56	ReStrip

RESULTS for CONNECTION (seismic conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	3552	0.90	7306	8118	N/A	2.06	N/A	2.29	ReStrip
2	3.44	0.133	1.230	3565	0.90	7306	8118	N/A	2.05	N/A	2.28	ReStrip
3	5.90	0.133	1.230	3315	0.90	7306	8118	N/A	2.20	N/A	2.45	ReStrip
4	8.36	0.067	2.460	3111	0.90	3653	4059	N/A	1.17	N/A	1.30	ReStrip
5	10.82	0.067	2.460	2871	0.90	3653	4059	N/A	1.27	N/A	1.41	ReStrip
6	13.28	0.067	2.460	2629	0.90	3653	4059	N/A	1.39	N/A	1.54	ReStrip
7	15.74	0.067	2.460	2409	0.90	3653	4059	N/A	1.52	N/A	1.68	ReStrip
8	18.20	0.044	3.690	2149	0.90	2435	2706	N/A	1.13	N/A	1.26	ReStrip
9	20.66	0.133	1.230	1846	0.90	7306	8118	N/A	3.96	N/A	4.40	ReStrip
10	23.12	0.133	1.230	1700	0.90	7306	8118	N/A	4.30	N/A	4.78	ReStrip

GLOBAL/COMPOUND STABILITY ANALYSIS (Using Bishop method and ROR = 0.0)

A horizontal seismic coefficient, Kh=Alpha zero, equal to 0.372 has been applied.
The seismic force is applied at the center of the sliding mass.

STATIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 1.874
(it corresponds to a critical circle at Xc = 0.00, Yc = 35.00 and R = 46.10 [ft] where (x=0, y=0) is taken at the TOE or Xc = 120.00, Yc = 1035.00 and R = 46.10 [ft] when the terrain coordinate system is used as shown in the table below.)

SEISMIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 0.952
(it corresponds to a critical circle at Xc = 10.00, Yc = 75.00 and R = 88.33 [ft] where (x=0, y=0) is taken at the TOE or Xc = 130.00, Yc = 1075.00 and R = 88.33 [ft] when the terrain coordinate system is used as shown in the table below.)

TERRAIN/WATER PROFILE

Point	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Soil layer #1:	γ = 110.00 [lb/ft ^{3}]			ϕ = 5.0°		c = 1000.00 [lb/ft ^{2}]					
x [ft]	0.0	20.0	40.0	70.0	90.0	119.9	120.0	270.0	280.0	290.0	300.0
y [ft]	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	1045.0	1045.0
Soil layer #2	γ = 120.00 [lb/ft ^{3}]			ϕ = 10.0°		c = 2000.00 [lb/ft ^{2}]					
x [ft]	0.0	50.0	100.0	150.0	200.0	250.0	275.0	280.0	290.0	295.0	300.0
y [ft]	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	994.5
Water table:											
x [ft]	0.0	32.8	65.6	98.4	131.2	164.0	196.9	229.7	262.5	295.3	300.0
y [ft]	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6

AASHTO DESIGN METHOD
SC-41 over Wando River

PROJECT IDENTIFICATION

Title: SC-41 over Wando River
Project Number: G4067
Client: Triplett-King & Associates
Designer: F&ME Consultants
Station Number:

Description:

Hypothetical: Static and SEE Evaluation; 22 Foot High MSE Wall; Select Granular Backfill (Option 1); Foundation c=0.35 ksf; phi=23 degrees

Company's information:

Name: F&ME Consultants
Street: 3112 Devine Street

Columbia, SC 29205
Telephone #: (803) 245-4540
Fax #: (803) 254-4542
E-Mail: mmiller@fmecol.com

Original file path and name: C:\MSEW Version 2.0\SC41 over Wando - 22' Wall.BEN
Original date and time of creating this file: Sat Dec 11 12:30:43 2004

PROGRAM MODE:

ANALYSIS
of a SIMPLE STRUCTURE
using METAL STRIPS as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	120.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

RETAINED SOIL

Unit weight, γ	120.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	110.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	23.0 °
Equivalent cohesion, $c_{equiv.}$	350.0 lb/ft ^{2}

Water table is at wall base elevation

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Ka (external stability) = 0.3333 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 18.05 $N\gamma$ = 8.20

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.372
Kae ($\alpha_o > 0$) = 0.6983 Kae ($\alpha_o = 0$) = 0.3333 Δ Kae = 0.3649 (see eq. 37 in DEMO 82)
Seismic soil-metal strip friction coefficient, F* is 80.0% of its specified static value.

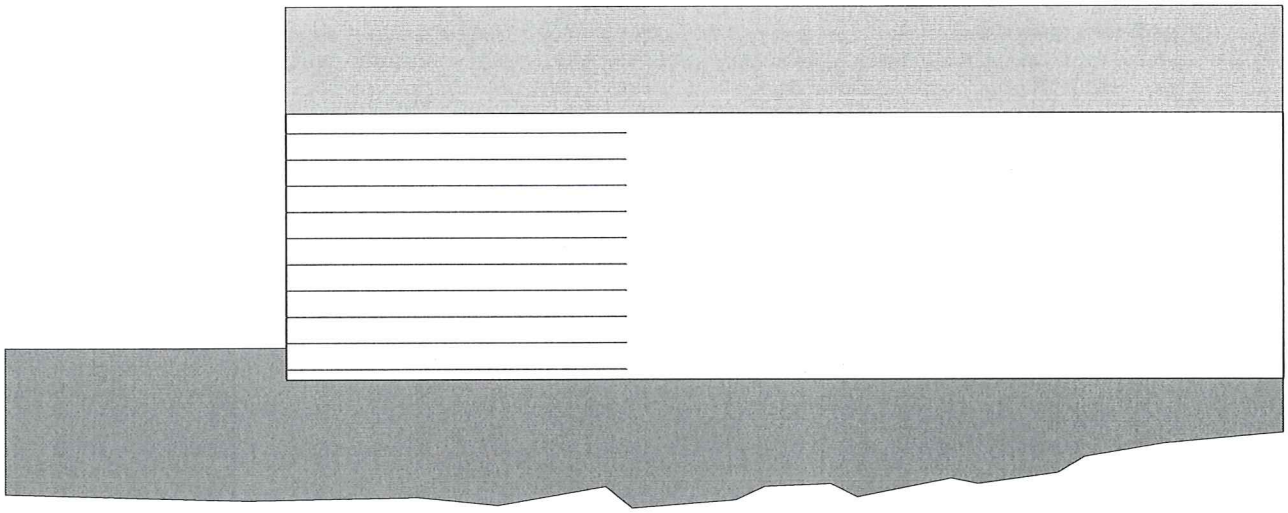
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	25.00	[ft]	{ Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 22.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft ²], and live load is 250.0 [lb/ft ²]

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 3.13, Meyerhof stress = 3834 lb/ft².

Foundation Interface: Direct sliding, Fs = 3.321, Eccentricity, e/L = 0.0470, Fs-overturning = 10.65

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	2.66	2.95	2.953	5.955	4.030	0.0438	ReStrip
2	3.44	32.00	1	N/A	2.61	2.90	2.900	5.047	4.402	0.0363	ReStrip
3	5.90	32.00	1	N/A	2.82	3.14	3.138	4.915	4.851	0.0295	ReStrip
4	8.36	32.00	1	N/A	1.51	1.68	1.676	2.691	5.407	0.0234	ReStrip
5	10.82	32.00	1	N/A	1.65	1.83	1.829	2.851	6.113	0.0179	ReStrip
6	13.28	32.00	1	N/A	1.82	2.03	2.027	2.974	7.048	0.0131	ReStrip
7	15.74	32.00	1	N/A	2.05	2.28	2.277	3.111	8.356	0.0089	ReStrip
8	18.20	32.00	1	N/A	1.60	1.78	1.777	2.125	10.361	0.0054	ReStrip
9	20.66	32.00	1	N/A	5.99	6.65	6.653	6.361	14.020	0.0027	ReStrip
10	23.12	32.00	1	N/A	6.80	7.56	7.559	4.883	24.804	0.0007	ReStrip

ANALYSIS: CALCULATED FACTORS (Seismic conditions)

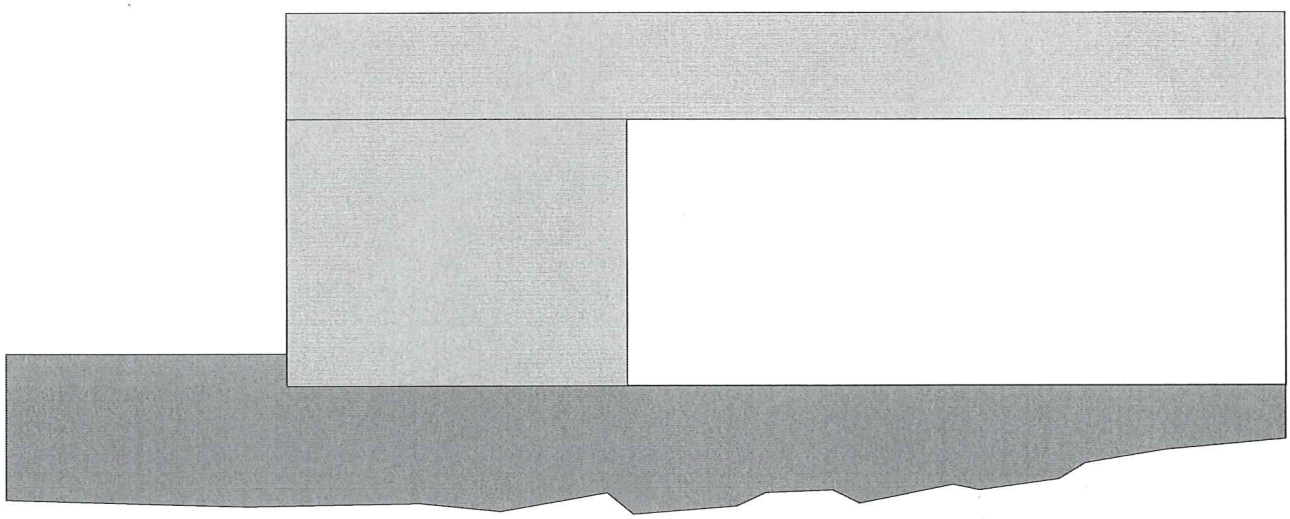
Bearing capacity, Fs = 2.36, Meyerhof stress = 4663 lb/ft².

Foundation Interface: Direct sliding, Fs = 1.436, Eccentricity, e/L = 0.1343, Fs-overturning = 3.72

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	2.06	2.29	2.286	3.688	1.753	0.1241	ReStrip
2	3.44	32.00	1	N/A	2.05	2.28	2.277	3.171	1.946	0.1004	ReStrip
3	5.90	32.00	1	N/A	2.20	2.45	2.449	3.069	2.187	0.0793	ReStrip
4	8.36	32.00	1	N/A	1.17	1.30	1.305	1.676	2.496	0.0606	ReStrip
5	10.82	32.00	1	N/A	1.27	1.41	1.414	1.763	2.908	0.0444	ReStrip
6	13.28	32.00	1	N/A	1.39	1.54	1.544	1.812	3.484	0.0307	ReStrip
7	15.74	32.00	1	N/A	1.52	1.68	1.685	1.842	4.350	0.0195	ReStrip
8	18.20	32.00	1	N/A	1.13	1.26	1.259	1.205	5.800	0.0108	ReStrip
9	20.66	32.00	1	N/A	3.96	4.40	4.397	3.363	8.768	0.0046	ReStrip
10	23.12	32.00	1	N/A	4.30	4.78	4.775	2.468	18.768	0.0009	ReStrip

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
Water table is at wall base elevation	12013	11001	[lb/ft ²]
Meyerhof stress, σ_V	3834.3	4663	[lb/ft ²]
Eccentricity, e	1.40	3.99	[ft]
Eccentricity, e/L	0.044	0.125	
Fs calculated	3.13	2.36	
Base length	32.00	32.00	[ft]



SCALE:

0 2 4 6 8 10[ft]

DIRECT SLIDING for GIVEN LAYOUT
(for METAL STRIPS reinforcements)

Along reinforced and foundation soils interface: Fs-static = 3.321 and Fs-seismic = 1.436

#	Metal strip Elevation [ft]	Metal strip Length [ft]	Fs Static	Fs Seismic	Metal strip Type #	Product name
1	0.98	32.00	4.030	1.753	1	ReStrip
2	3.44	32.00	4.402	1.946	1	ReStrip
3	5.90	32.00	4.851	2.187	1	ReStrip
4	8.36	32.00	5.407	2.496	1	ReStrip
5	10.82	32.00	6.113	2.908	1	ReStrip
6	13.28	32.00	7.048	3.484	1	ReStrip
7	15.74	32.00	8.356	4.350	1	ReStrip
8	18.20	32.00	10.361	5.800	1	ReStrip
9	20.66	32.00	14.020	8.768	1	ReStrip
10	23.12	32.00	24.804	18.768	1	ReStrip

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0470, e/L seismic = 0.1343; Overturning: Fs-static = 10.65, Fs-seismic = 3.72

#	Metal strip Elevation [ft]	Metal strip Length [ft]	e / L Static	e / L Seismic	Metal strip Type #	Product name
1	0.98	32.00	0.0438	0.1241	1	ReStrip
2	3.44	32.00	0.0363	0.1004	1	ReStrip
3	5.90	32.00	0.0295	0.0793	1	ReStrip
4	8.36	32.00	0.0234	0.0606	1	ReStrip
5	10.82	32.00	0.0179	0.0444	1	ReStrip
6	13.28	32.00	0.0131	0.0307	1	ReStrip
7	15.74	32.00	0.0089	0.0195	1	ReStrip
8	18.20	32.00	0.0054	0.0108	1	ReStrip
9	20.66	32.00	0.0027	0.0046	1	ReStrip
10	23.12	32.00	0.0007	0.0009	1	ReStrip

RESULTS for STRENGTH **[Note: Actual Fs-overall = (Yield stress) / (Actual stress)]**

#	Metal strip Elevation [ft]	Coverage ratio, Rc=b/Sh	Horizontal spacing, Sh [ft]	Long-term strength Fy·Ac·Rc/b [lb/ft]	Tmax [lb/ft]	Tmd [lb/ft]	Specified minimum Fs-overall static	Actual calculated Fs-overall static	Specified minimum Fs-overall seismic	Actual calculated Fs-overall seismic
1	0.98	0.133	1.230	8118	2748.99	802.73	N/A	2.953	N/A	2.286
2	3.44	0.133	1.230	8118	2799.71	765.01	N/A	2.900	N/A	2.277
3	5.90	0.133	1.230	8118	2587.36	727.28	N/A	3.138	N/A	2.449
4	8.36	0.067	2.460	4059	2421.88	689.56	N/A	1.676	N/A	1.305
5	10.82	0.067	2.460	4059	2219.33	651.84	N/A	1.829	N/A	1.414
6	13.28	0.067	2.460	4059	2002.40	626.14	N/A	2.027	N/A	1.544
7	15.74	0.067	2.460	4059	1782.89	626.14	N/A	2.277	N/A	1.685
8	18.20	0.044	3.690	2706	1523.22	626.14	N/A	1.777	N/A	1.259
9	20.66	0.133	1.230	8118	1220.30	626.14	N/A	6.653	N/A	4.397
10	23.12	0.133	1.230	8118	1074.01	626.14	N/A	7.559	N/A	4.775

RESULTS for PULLOUT

NOTE: Uniform live load is not included in calculating the overburden pressure used to assess pullout resistance.

#	Metal strip Elevation [ft]	Coverage Ratio Rc=b/Sh	Tmax [lb/ft]	Tmd [lb/ft]	Le [ft] (see NOTE)	La [ft]	Avail.Static Pullout, Pr [lb/ft]	Specified Static Fs	Actual Static Fs	Avail.Seism. Pullout, Pr [lb/ft]	Specified Seismic Fs	Actual Seismic Fs
1	0.98	0.133	2749	803	31.41	0.59	16371.4	N/A	5.955	13097.1	N/A	3.688
2	3.44	0.133	2800	765	29.93	2.07	14131.2	N/A	5.047	11304.9	N/A	3.171
3	5.90	0.133	2587	727	28.46	3.54	12716.2	N/A	4.915	10173.0	N/A	3.069
4	8.36	0.067	2422	690	26.98	5.02	6517.7	N/A	2.691	5214.2	N/A	1.676
5	10.82	0.067	2219	652	25.51	6.49	6328.1	N/A	2.851	5062.5	N/A	1.763
6	13.28	0.067	2002	626	24.50	7.50	5954.7	N/A	2.974	4763.7	N/A	1.812
7	15.74	0.067	1783	626	24.50	7.50	5547.4	N/A	3.111	4437.9	N/A	1.842
8	18.20	0.044	1523	626	24.50	7.50	3237.5	N/A	2.125	2590.0	N/A	1.205
9	20.66	0.133	1220	626	24.50	7.50	7762.4	N/A	6.361	6209.9	N/A	3.363
10	23.12	0.133	1074	626	24.50	7.50	5244.5	N/A	4.883	4195.6	N/A	2.468

RESULTS for CONNECTION (static conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	2749	0.90	7306	8118	N/A	2.66	N/A	2.95	ReStrip
2	3.44	0.133	1.230	2800	0.90	7306	8118	N/A	2.61	N/A	2.90	ReStrip
3	5.90	0.133	1.230	2587	0.90	7306	8118	N/A	2.82	N/A	3.14	ReStrip
4	8.36	0.067	2.460	2422	0.90	3653	4059	N/A	1.51	N/A	1.68	ReStrip
5	10.82	0.067	2.460	2219	0.90	3653	4059	N/A	1.65	N/A	1.83	ReStrip
6	13.28	0.067	2.460	2002	0.90	3653	4059	N/A	1.82	N/A	2.03	ReStrip
7	15.74	0.067	2.460	1783	0.90	3653	4059	N/A	2.05	N/A	2.28	ReStrip
8	18.20	0.044	3.690	1523	0.90	2435	2706	N/A	1.60	N/A	1.78	ReStrip
9	20.66	0.133	1.230	1220	0.90	7306	8118	N/A	5.99	N/A	6.65	ReStrip
10	23.12	0.133	1.230	1074	0.90	7306	8118	N/A	6.80	N/A	7.56	ReStrip

RESULTS for CONNECTION (seismic conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	3552	0.90	7306	8118	N/A	2.06	N/A	2.29	ReStrip
2	3.44	0.133	1.230	3565	0.90	7306	8118	N/A	2.05	N/A	2.28	ReStrip
3	5.90	0.133	1.230	3315	0.90	7306	8118	N/A	2.20	N/A	2.45	ReStrip
4	8.36	0.067	2.460	3111	0.90	3653	4059	N/A	1.17	N/A	1.30	ReStrip
5	10.82	0.067	2.460	2871	0.90	3653	4059	N/A	1.27	N/A	1.41	ReStrip
6	13.28	0.067	2.460	2629	0.90	3653	4059	N/A	1.39	N/A	1.54	ReStrip
7	15.74	0.067	2.460	2409	0.90	3653	4059	N/A	1.52	N/A	1.68	ReStrip
8	18.20	0.044	3.690	2149	0.90	2435	2706	N/A	1.13	N/A	1.26	ReStrip
9	20.66	0.133	1.230	1846	0.90	7306	8118	N/A	3.96	N/A	4.40	ReStrip
10	23.12	0.133	1.230	1700	0.90	7306	8118	N/A	4.30	N/A	4.78	ReStrip

GLOBAL/COMPOUND STABILITY ANALYSIS (Using Bishop method and ROR = 0.0)

A horizontal seismic coefficient, Kh=Alpha zero, equal to 0.372 has been applied.
The seismic force is applied at the center of the sliding mass.

STATIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 1.992
(it corresponds to a critical circle at Xc = 0.00, Yc = 40.00 and R = 50.00 [ft] where (x=0, y=0) is taken at the TOE or Xc = 120.00, Yc = 1040.00 and R = 50.00 [ft] when the terrain coordinate system is used as shown in the table below.)

SEISMIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 1.017
(it corresponds to a critical circle at Xc = -10.00, Yc = 75.00 and R = 88.33 [ft] where (x=0, y=0) is taken at the TOE or Xc = 110.00, Yc = 1075.00 and R = 88.33 [ft] when the terrain coordinate system is used as shown in the table below.)

TERRAIN/WATER PROFILE

Point	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Soil layer #1:	γ = 110.00 [lb/ft ^{3}]			ϕ = 23.0°		c = 350.00 [lb/ft ^{2}]					
x [ft]	0.0	20.0	40.0	70.0	90.0	119.9	120.0	270.0	280.0	290.0	300.0
y [ft]	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	1045.0	1045.0
Soil layer #2	γ = 120.00 [lb/ft ^{3}]			ϕ = 10.0°		c = 2000.00 [lb/ft ^{2}]					
x [ft]	0.0	50.0	100.0	150.0	200.0	250.0	275.0	280.0	290.0	295.0	300.0
y [ft]	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	994.5
Water table:											
x [ft]	0.0	32.8	65.6	98.4	131.2	164.0	196.9	229.7	262.5	295.3	300.0
y [ft]	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6

AASHTO DESIGN METHOD
SC-41 over Wando River

PROJECT IDENTIFICATION

Title: SC-41 over Wando River
Project Number: G4067
Client: Triplett-King & Associates
Designer: F&ME Consultants
Station Number:

Description:

Hypothetical: SEE Evaluation; 22 Foot High MSE Wall; Select Granular Backfill (Option 1); FOUNDATION C = 0.75 KSF phi = 15 DEGREES

Company's information:

Name: F&ME Consultants
Street: 3112 Devine Street

Columbia, SC 29205
Telephone #: (803) 245-4540
Fax #: (803) 254-4542
E-Mail: mmiller@fmecol.com

Original file path and name: C:\MSEW Version 2.0\SC41 over Wando - 22' Wall.BEN
Original date and time of creating this file: Sat Dec 11 12:30:43 2004

PROGRAM MODE:

ANALYSIS
of a SIMPLE STRUCTURE
using METAL STRIPS as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	120.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	32.0 °

RETAINED SOIL

Unit weight, γ	120.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	30.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	110.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	15.0 °
Equivalent cohesion, $c_{equiv.}$	750.0 lb/ft ^{2}

Water table is at wall base elevation

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.3073 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Ka (external stability) = 0.3333 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 10.98 $N\gamma$ = 2.65

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.372
Kae ($\alpha_o > 0$) = 0.6983 Kae ($\alpha_o = 0$) = 0.3333 Δ Kae = 0.3649 (see eq. 37 in DEMO 82)
Seismic soil-metal strip friction coefficient, F* is 80.0% of its specified static value.

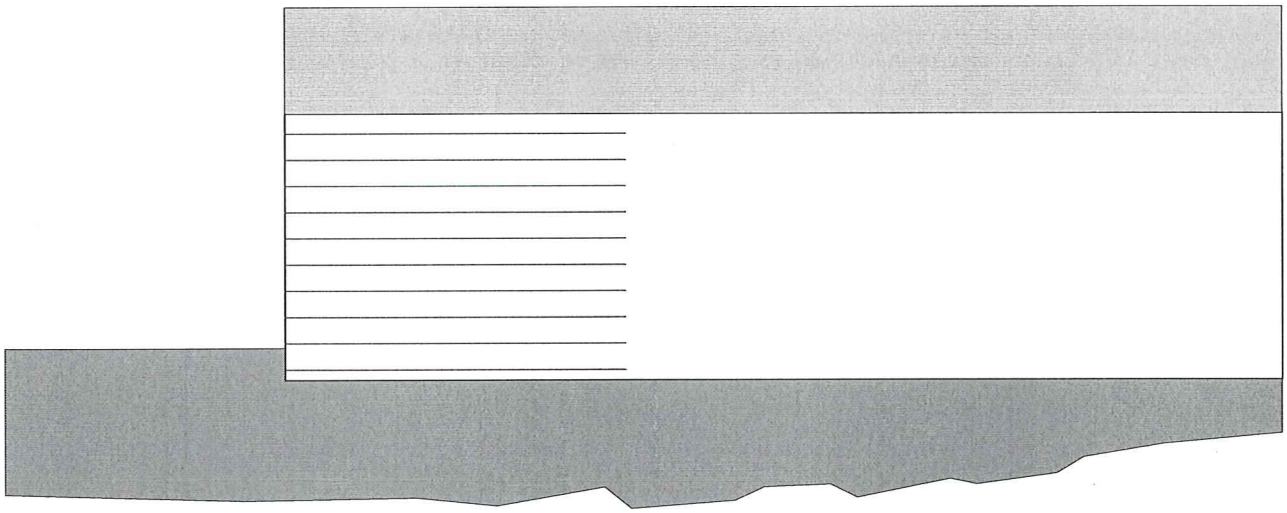
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	25.00	[ft]	{ Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 22.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft ²], and live load is 250.0 [lb/ft ²]

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 2.63, Meyerhof stress = 3834 lb/ft².
Foundation Interface: Direct sliding, Fs = 3.112, Eccentricity, e/L = 0.0470, Fs-overturning = 10.65

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	2.66	2.95	2.953	5.955	4.030	0.0438	ReStrip
2	3.44	32.00	1	N/A	2.61	2.90	2.900	5.047	4.402	0.0363	ReStrip
3	5.90	32.00	1	N/A	2.82	3.14	3.138	4.915	4.851	0.0295	ReStrip
4	8.36	32.00	1	N/A	1.51	1.68	1.676	2.691	5.407	0.0234	ReStrip
5	10.82	32.00	1	N/A	1.65	1.83	1.829	2.851	6.113	0.0179	ReStrip
6	13.28	32.00	1	N/A	1.82	2.03	2.027	2.974	7.048	0.0131	ReStrip
7	15.74	32.00	1	N/A	2.05	2.28	2.277	3.111	8.356	0.0089	ReStrip
8	18.20	32.00	1	N/A	1.60	1.78	1.777	2.125	10.361	0.0054	ReStrip
9	20.66	32.00	1	N/A	5.99	6.65	6.653	6.361	14.020	0.0027	ReStrip
10	23.12	32.00	1	N/A	6.80	7.56	7.559	4.883	24.804	0.0007	ReStrip

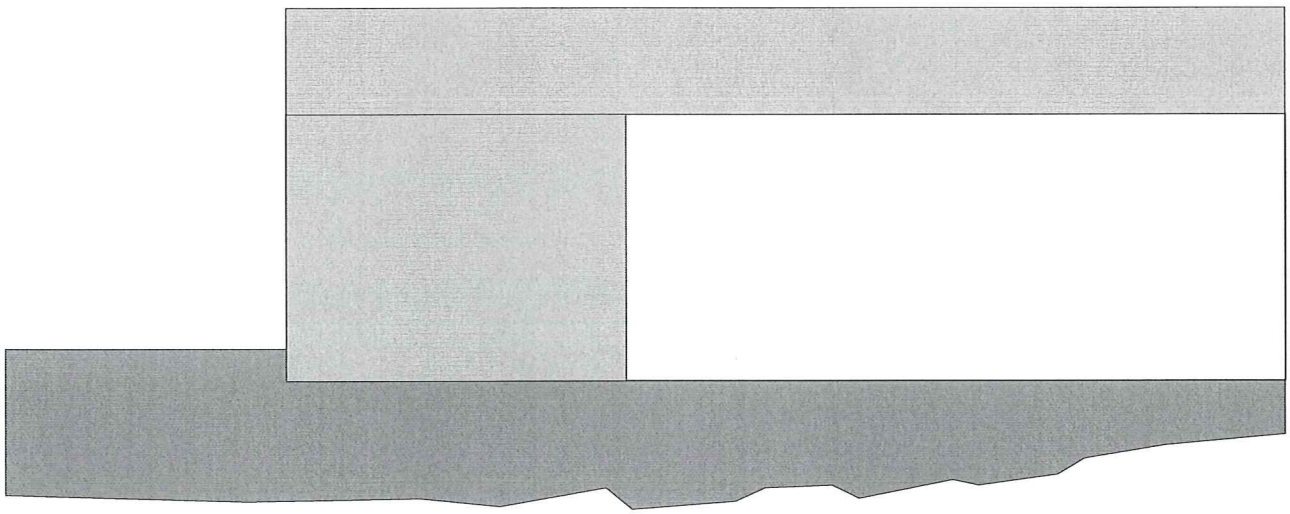
ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 2.09, Meyerhof stress = 4663 lb/ft².
Foundation Interface: Direct sliding, Fs = 1.346, Eccentricity, e/L = 0.1343, Fs-overturning = 3.72

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	2.06	2.29	2.286	3.688	1.753	0.1241	ReStrip
2	3.44	32.00	1	N/A	2.05	2.28	2.277	3.171	1.946	0.1004	ReStrip
3	5.90	32.00	1	N/A	2.20	2.45	2.449	3.069	2.187	0.0793	ReStrip
4	8.36	32.00	1	N/A	1.17	1.30	1.305	1.676	2.496	0.0606	ReStrip
5	10.82	32.00	1	N/A	1.27	1.41	1.414	1.763	2.908	0.0444	ReStrip
6	13.28	32.00	1	N/A	1.39	1.54	1.544	1.812	3.484	0.0307	ReStrip
7	15.74	32.00	1	N/A	1.52	1.68	1.685	1.842	4.350	0.0195	ReStrip
8	18.20	32.00	1	N/A	1.13	1.26	1.259	1.205	5.800	0.0108	ReStrip
9	20.66	32.00	1	N/A	3.96	4.40	4.397	3.363	8.768	0.0046	ReStrip
10	23.12	32.00	1	N/A	4.30	4.78	4.775	2.468	18.768	0.0009	ReStrip

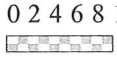
BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
Water table is at wall base elevation	10071	9745	[lb/ft ²]
Meyerhof stress, σ_V	3834.3	4663	[lb/ft ²]
Eccentricity, e	1.40	3.99	[ft]
Eccentricity, e/L	0.044	0.125	
Fs calculated	2.63	2.09	
Base length	32.00	32.00	[ft]



SCALE:

0 2 4 6 8 10[ft]



DIRECT SLIDING for GIVEN LAYOUT
(for METAL STRIPS reinforcements)

Along reinforced and foundation soils interface: Fs-static = 3.112 and Fs-seismic = 1.346

#	Metal strip Elevation [ft]	Metal strip Length [ft]	Fs Static	Fs Seismic	Metal strip Type #	Product name
1	0.98	32.00	4.030	1.753	1	ReStrip
2	3.44	32.00	4.402	1.946	1	ReStrip
3	5.90	32.00	4.851	2.187	1	ReStrip
4	8.36	32.00	5.407	2.496	1	ReStrip
5	10.82	32.00	6.113	2.908	1	ReStrip
6	13.28	32.00	7.048	3.484	1	ReStrip
7	15.74	32.00	8.356	4.350	1	ReStrip
8	18.20	32.00	10.361	5.800	1	ReStrip
9	20.66	32.00	14.020	8.768	1	ReStrip
10	23.12	32.00	24.804	18.768	1	ReStrip

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0470, e/L seismic = 0.1343; Overturning: Fs-static = 10.65, Fs-seismic = 3.72

#	Metal strip Elevation [ft]	Metal strip Length [ft]	e / L Static	e / L Seismic	Metal strip Type #	Product name
1	0.98	32.00	0.0438	0.1241	1	ReStrip
2	3.44	32.00	0.0363	0.1004	1	ReStrip
3	5.90	32.00	0.0295	0.0793	1	ReStrip
4	8.36	32.00	0.0234	0.0606	1	ReStrip
5	10.82	32.00	0.0179	0.0444	1	ReStrip
6	13.28	32.00	0.0131	0.0307	1	ReStrip
7	15.74	32.00	0.0089	0.0195	1	ReStrip
8	18.20	32.00	0.0054	0.0108	1	ReStrip
9	20.66	32.00	0.0027	0.0046	1	ReStrip
10	23.12	32.00	0.0007	0.0009	1	ReStrip

RESULTS for STRENGTH **[Note: Actual Fs-overall = (Yield stress) / (Actual stress)]**

#	Metal strip Elevation [ft]	Coverage ratio, Rc=b/Sh	Horizontal spacing, Sh [ft]	Long-term strength Fy·Ac·Rc/b [lb/ft]	Tmax [lb/ft]	Tmd [lb/ft]	Specified minimum Fs-overall static	Actual calculated Fs-overall static	Specified minimum Fs-overall seismic	Actual calculated Fs-overall seismic
1	0.98	0.133	1.230	8118	2748.99	802.73	N/A	2.953	N/A	2.286
2	3.44	0.133	1.230	8118	2799.71	765.01	N/A	2.900	N/A	2.277
3	5.90	0.133	1.230	8118	2587.36	727.28	N/A	3.138	N/A	2.449
4	8.36	0.067	2.460	4059	2421.88	689.56	N/A	1.676	N/A	1.305
5	10.82	0.067	2.460	4059	2219.33	651.84	N/A	1.829	N/A	1.414
6	13.28	0.067	2.460	4059	2002.40	626.14	N/A	2.027	N/A	1.544
7	15.74	0.067	2.460	4059	1782.89	626.14	N/A	2.277	N/A	1.685
8	18.20	0.044	3.690	2706	1523.22	626.14	N/A	1.777	N/A	1.259
9	20.66	0.133	1.230	8118	1220.30	626.14	N/A	6.653	N/A	4.397
10	23.12	0.133	1.230	8118	1074.01	626.14	N/A	7.559	N/A	4.775

RESULTS for PULLOUT

NOTE: Uniform live load is not included in calculating the overburden pressure used to assess pullout resistance.

#	Metal strip Elevation [ft]	Coverage Ratio Rc=b/Sh	Tmax [lb/ft]	Tmd [lb/ft]	Le [ft] (see NOTE)	La [ft]	Avail.Static Pullout, Pr [lb/ft]	Specified Static Fs	Actual Static Fs	Avail.Seism. Pullout, Pr [lb/ft]	Specified Seismic Fs	Actual Seismic Fs
1	0.98	0.133	2749	803	31.41	0.59	16371.4	N/A	5.955	13097.1	N/A	3.688
2	3.44	0.133	2800	765	29.93	2.07	14131.2	N/A	5.047	11304.9	N/A	3.171
3	5.90	0.133	2587	727	28.46	3.54	12716.2	N/A	4.915	10173.0	N/A	3.069
4	8.36	0.067	2422	690	26.98	5.02	6517.7	N/A	2.691	5214.2	N/A	1.676
5	10.82	0.067	2219	652	25.51	6.49	6328.1	N/A	2.851	5062.5	N/A	1.763
6	13.28	0.067	2002	626	24.50	7.50	5954.7	N/A	2.974	4763.7	N/A	1.812
7	15.74	0.067	1783	626	24.50	7.50	5547.4	N/A	3.111	4437.9	N/A	1.842
8	18.20	0.044	1523	626	24.50	7.50	3237.5	N/A	2.125	2590.0	N/A	1.205
9	20.66	0.133	1220	626	24.50	7.50	7762.4	N/A	6.361	6209.9	N/A	3.363
10	23.12	0.133	1074	626	24.50	7.50	5244.5	N/A	4.883	4195.6	N/A	2.468

RESULTS for CONNECTION (static conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	2749	0.90	7306	8118	N/A	2.66	N/A	2.95	ReStrip
2	3.44	0.133	1.230	2800	0.90	7306	8118	N/A	2.61	N/A	2.90	ReStrip
3	5.90	0.133	1.230	2587	0.90	7306	8118	N/A	2.82	N/A	3.14	ReStrip
4	8.36	0.067	2.460	2422	0.90	3653	4059	N/A	1.51	N/A	1.68	ReStrip
5	10.82	0.067	2.460	2219	0.90	3653	4059	N/A	1.65	N/A	1.83	ReStrip
6	13.28	0.067	2.460	2002	0.90	3653	4059	N/A	1.82	N/A	2.03	ReStrip
7	15.74	0.067	2.460	1783	0.90	3653	4059	N/A	2.05	N/A	2.28	ReStrip
8	18.20	0.044	3.690	1523	0.90	2435	2706	N/A	1.60	N/A	1.78	ReStrip
9	20.66	0.133	1.230	1220	0.90	7306	8118	N/A	5.99	N/A	6.65	ReStrip
10	23.12	0.133	1.230	1074	0.90	7306	8118	N/A	6.80	N/A	7.56	ReStrip

RESULTS for CONNECTION (seismic conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	3552	0.90	7306	8118	N/A	2.06	N/A	2.29	ReStrip
2	3.44	0.133	1.230	3565	0.90	7306	8118	N/A	2.05	N/A	2.28	ReStrip
3	5.90	0.133	1.230	3315	0.90	7306	8118	N/A	2.20	N/A	2.45	ReStrip
4	8.36	0.067	2.460	3111	0.90	3653	4059	N/A	1.17	N/A	1.30	ReStrip
5	10.82	0.067	2.460	2871	0.90	3653	4059	N/A	1.27	N/A	1.41	ReStrip
6	13.28	0.067	2.460	2629	0.90	3653	4059	N/A	1.39	N/A	1.54	ReStrip
7	15.74	0.067	2.460	2409	0.90	3653	4059	N/A	1.52	N/A	1.68	ReStrip
8	18.20	0.044	3.690	2149	0.90	2435	2706	N/A	1.13	N/A	1.26	ReStrip
9	20.66	0.133	1.230	1846	0.90	7306	8118	N/A	3.96	N/A	4.40	ReStrip
10	23.12	0.133	1.230	1700	0.90	7306	8118	N/A	4.30	N/A	4.78	ReStrip

GLOBAL/COMPOUND STABILITY ANALYSIS (Using Bishop method and ROR = 0.0)

A horizontal seismic coefficient, Kh=Alpha zero, equal to 0.372 has been applied.
The seismic force is applied at the center of the sliding mass.

STATIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 2.077
(it corresponds to a critical circle at Xc = 0.00, Yc = 35.00 and R = 46.10 [ft] where (x=0, y=0) is taken at the TOE or Xc = 120.00, Yc = 1035.00 and R = 46.10 [ft] when the terrain coordinate system is used as shown in the table below.)

SEISMIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 1.084
(it corresponds to a critical circle at Xc = 0.00, Yc = 75.00 and R = 88.33 [ft] where (x=0, y=0) is taken at the TOE or Xc = 120.00, Yc = 1075.00 and R = 88.33 [ft] when the terrain coordinate system is used as shown in the table below.)

TERRAIN/WATER PROFILE

Point	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Soil layer #1:	γ = 110.00 [lb/ft ^{3}]			ϕ = 15.0°		c = 750.00 [lb/ft ^{2}]					
x [ft]	0.0	20.0	40.0	70.0	90.0	119.9	120.0	270.0	280.0	290.0	300.0
y [ft]	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	1045.0	1045.0
Soil layer #2	γ = 120.00 [lb/ft ^{3}]			ϕ = 10.0°		c = 2000.00 [lb/ft ^{2}]					
x [ft]	0.0	50.0	100.0	150.0	200.0	250.0	275.0	280.0	290.0	295.0	300.0
y [ft]	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	994.5
Water table:											
x [ft]	0.0	32.8	65.6	98.4	131.2	164.0	196.9	229.7	262.5	295.3	300.0
y [ft]	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6

AASHTO DESIGN METHOD
SC-41 over Wando River

PROJECT IDENTIFICATION

Title: SC-41 over Wando River
Project Number: G4067
Client: Triplett-King & Associates
Designer: F&ME Consultants
Station Number:

Description:

Hypothetical: Static and SEE Evaluation; 22 Foot High MSE Wall; Light-Weight Stone Backfill (Option 2); Foundation c=1.0 ksf; phi=5 degrees

Company's information:

Name: F&ME Consultants
Street: 3112 Devine Street

Columbia, SC 29205
Telephone #: (803) 245-4540
Fax #: (803) 254-4542
E-Mail: mmiller@fmecol.com

Original file path and name: C:\MSEW Version 2.0\SC41 over Wando - 22' Wall.BEN
Original date and time of creating this file: Sat Dec 11 12:30:43 2004

PROGRAM MODE:

ANALYSIS
of a SIMPLE STRUCTURE
using METAL STRIPS as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	60.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	38.0 °

RETAINED SOIL

Unit weight, γ	60.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	38.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, γ_{equiv}	110.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	5.0 °
Equivalent cohesion, $c_{equiv.}$	1000.0 lb/ft ^{2}

Water table is at wall base elevation

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2379 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Ka (external stability) = 0.2379 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 6.49 $N\gamma$ = 0.45

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.372
Kae ($\alpha_o > 0$) = 0.5241 Kae ($\alpha_o = 0$) = 0.2379 Δ Kae = 0.2862 (see eq. 37 in DEMO 82)
Seismic soil-metal strip friction coefficient, F* is 80.0% of its specified static value.

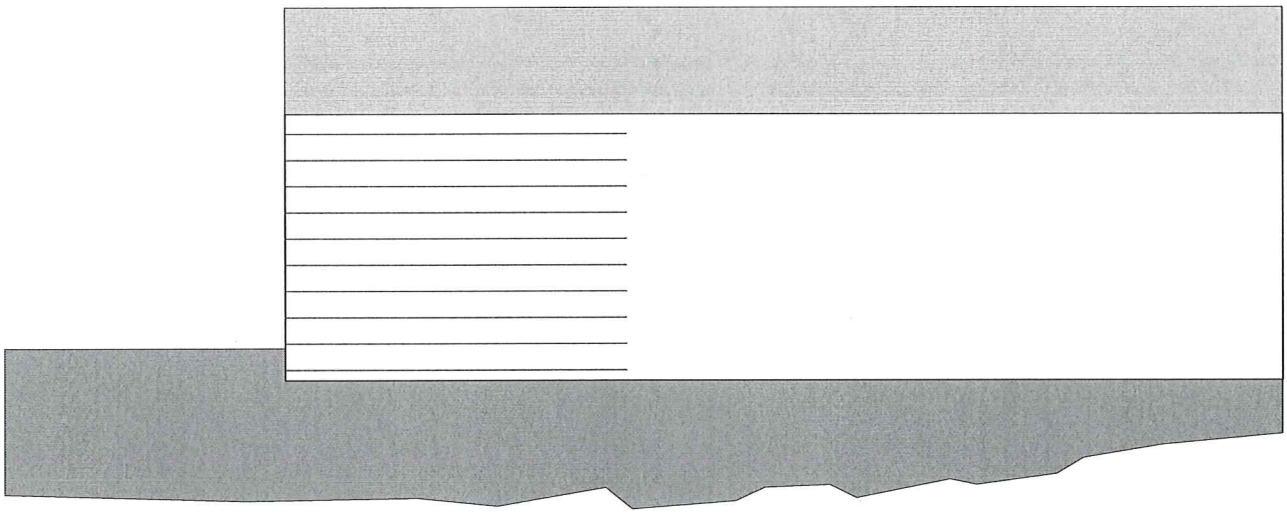
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	25.00	[ft]	{ Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 22.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft ²], and live load is 250.0 [lb/ft ²]

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 3.16, Meyerhof stress = 2157 lb/ft².
Foundation Interface: Direct sliding, Fs = 4.964, Eccentricity, e/L = 0.0415, Fs-overturning = 12.05

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	5.98	6.64	6.642	9.052	6.063	0.0388	ReStrip
2	3.44	32.00	1	N/A	5.80	6.45	6.446	7.641	6.562	0.0326	ReStrip
3	5.90	32.00	1	N/A	6.19	6.87	6.873	7.278	7.160	0.0268	ReStrip
4	8.36	32.00	1	N/A	3.25	3.61	3.606	3.747	7.893	0.0214	ReStrip
5	10.82	32.00	1	N/A	3.46	3.85	3.849	3.786	8.818	0.0166	ReStrip
6	13.28	32.00	1	N/A	3.73	4.15	4.147	3.798	10.040	0.0123	ReStrip
7	15.74	32.00	1	N/A	4.04	4.49	4.486	3.843	11.759	0.0085	ReStrip
8	18.20	32.00	1	N/A	2.99	3.32	3.323	2.550	14.452	0.0052	ReStrip
9	20.66	32.00	1	N/A	10.37	11.53	11.527	7.463	19.626	0.0025	ReStrip
10	23.12	32.00	1	N/A	10.13	11.26	11.260	5.600	36.517	0.0006	ReStrip

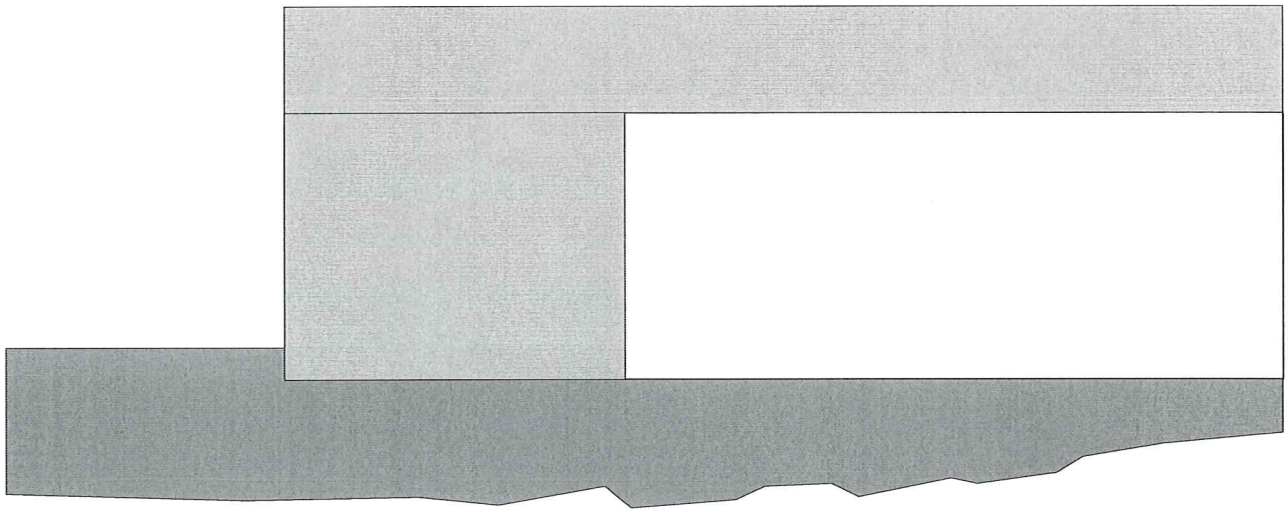
ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 2.69, Meyerhof stress = 2512 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.092, Eccentricity, e/L = 0.1164, Fs-overturning = 4.30

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	4.50	5.00	5.000	5.451	2.580	0.1076	ReStrip
2	3.44	32.00	1	N/A	4.45	4.94	4.945	4.689	2.866	0.0870	ReStrip
3	5.90	32.00	1	N/A	4.73	5.26	5.255	4.452	3.223	0.0686	ReStrip
4	8.36	32.00	1	N/A	2.48	2.76	2.761	2.295	3.684	0.0524	ReStrip
5	10.82	32.00	1	N/A	2.65	2.94	2.941	2.314	4.299	0.0383	ReStrip
6	13.28	32.00	1	N/A	2.83	3.14	3.142	2.302	5.164	0.0264	ReStrip
7	15.74	32.00	1	N/A	3.00	3.33	3.333	2.284	6.473	0.0167	ReStrip
8	18.20	32.00	1	N/A	2.16	2.40	2.400	1.473	8.693	0.0092	ReStrip
9	20.66	32.00	1	N/A	7.18	7.98	7.980	4.133	13.331	0.0039	ReStrip
10	23.12	32.00	1	N/A	7.07	7.85	7.851	3.124	29.655	0.0008	ReStrip

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
Water table is at wall base elevation	6806	6761	[lb/ft ²]
Meyerhof stress, σ_V	2156.6	2512	[lb/ft ²]
Eccentricity, e	1.16	3.26	[ft]
Eccentricity, e/L	0.036	0.102	
Fs calculated	3.16	2.69	
Base length	32.00	32.00	[ft]



SCALE:

0 2 4 6 8 10[ft]

DIRECT SLIDING for GIVEN LAYOUT
(for METAL STRIPS reinforcements)

Along reinforced and foundation soils interface: Fs-static = 4.964 and Fs-seismic = 2.092

#	Metal strip Elevation [ft]	Metal strip Length [ft]	Fs Static	Fs Seismic	Metal strip Type #	Product name
1	0.98	32.00	6.063	2.580	1	ReStrip
2	3.44	32.00	6.562	2.866	1	ReStrip
3	5.90	32.00	7.160	3.223	1	ReStrip
4	8.36	32.00	7.893	3.684	1	ReStrip
5	10.82	32.00	8.818	4.299	1	ReStrip
6	13.28	32.00	10.040	5.164	1	ReStrip
7	15.74	32.00	11.759	6.473	1	ReStrip
8	18.20	32.00	14.452	8.693	1	ReStrip
9	20.66	32.00	19.626	13.331	1	ReStrip
10	23.12	32.00	36.517	29.655	1	ReStrip

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0415, e/L seismic = 0.1164; Overturning: Fs-static = 12.05, Fs-seismic = 4.30

#	Metal strip Elevation [ft]	Metal strip Length [ft]	e / L Static	e / L Seismic	Metal strip Type #	Product name
1	0.98	32.00	0.0388	0.1076	1	ReStrip
2	3.44	32.00	0.0326	0.0870	1	ReStrip
3	5.90	32.00	0.0268	0.0686	1	ReStrip
4	8.36	32.00	0.0214	0.0524	1	ReStrip
5	10.82	32.00	0.0166	0.0383	1	ReStrip
6	13.28	32.00	0.0123	0.0264	1	ReStrip
7	15.74	32.00	0.0085	0.0167	1	ReStrip
8	18.20	32.00	0.0052	0.0092	1	ReStrip
9	20.66	32.00	0.0025	0.0039	1	ReStrip
10	23.12	32.00	0.0006	0.0008	1	ReStrip

RESULTS for STRENGTH [Note: Actual Fs-overall = (Yield stress) / (Actual stress)]

#	Metal strip Elevation [ft]	Coverage ratio, Rc=b/Sh	Horizontal spacing, Sh [ft]	Long-term strength Fy·Ac·Rc/b [lb/ft]	Tmax [lb/ft]	Tmd [lb/ft]	Specified minimum Fs-overall static	Actual calculated Fs-overall static	Specified minimum Fs-overall seismic	Actual calculated Fs-overall seismic
1	0.98	0.133	1.230	8118	1222.17	401.36	N/A	6.642	N/A	5.000
2	3.44	0.133	1.230	8118	1259.34	382.50	N/A	6.446	N/A	4.945
3	5.90	0.133	1.230	8118	1181.20	363.64	N/A	6.873	N/A	5.255
4	8.36	0.067	2.460	4059	1125.57	344.78	N/A	3.606	N/A	2.761
5	10.82	0.067	2.460	4059	1054.47	325.92	N/A	3.849	N/A	2.941
6	13.28	0.067	2.460	4059	978.92	313.07	N/A	4.147	N/A	3.142
7	15.74	0.067	2.460	4059	904.92	313.07	N/A	4.486	N/A	3.333
8	18.20	0.044	3.690	2706	814.26	313.07	N/A	3.323	N/A	2.400
9	20.66	0.133	1.230	8118	704.30	313.07	N/A	11.527	N/A	7.980
10	23.12	0.133	1.230	8118	721.00	313.07	N/A	11.260	N/A	7.851

RESULTS for PULLOUT

NOTE: Uniform live load is not included in calculating the overburden pressure used to assess pullout resistance.

#	Metal strip Elevation [ft]	Coverage Ratio Rc=b/Sh	Tmax [lb/ft]	Tmd [lb/ft]	Le [ft] (see NOTE)	La [ft] (see NOTE)	Avail.Static Pullout, Pr [lb/ft]	Specified Static Fs	Actual Static Fs	Avail.Seism. Pullout, Pr [lb/ft]	Specified Seismic Fs	Actual Seismic Fs
1	0.98	0.133	1222	401	31.41	0.59	11063.1	N/A	9.052	8850.5	N/A	5.451
2	3.44	0.133	1259	383	29.93	2.07	9622.7	N/A	7.641	7698.1	N/A	4.689
3	5.90	0.133	1181	364	28.46	3.54	8596.8	N/A	7.278	6877.5	N/A	4.452
4	8.36	0.067	1126	345	26.98	5.02	4217.3	N/A	3.747	3373.9	N/A	2.295
5	10.82	0.067	1054	326	25.51	6.49	3992.6	N/A	3.786	3194.1	N/A	2.314
6	13.28	0.067	979	313	24.50	7.50	3717.7	N/A	3.798	2974.2	N/A	2.302
7	15.74	0.067	905	313	24.50	7.50	3477.5	N/A	3.843	2782.0	N/A	2.284
8	18.20	0.044	814	313	24.50	7.50	2076.2	N/A	2.550	1661.0	N/A	1.473
9	20.66	0.133	704	313	24.50	7.50	5256.1	N/A	7.463	4204.9	N/A	4.133
10	23.12	0.133	721	313	24.50	7.50	4037.6	N/A	5.600	3230.1	N/A	3.124

RESULTS for CONNECTION (static conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	1222	0.90	7306	8118	N/A	5.98	N/A	6.64	ReStrip
2	3.44	0.133	1.230	1259	0.90	7306	8118	N/A	5.80	N/A	6.45	ReStrip
3	5.90	0.133	1.230	1181	0.90	7306	8118	N/A	6.19	N/A	6.87	ReStrip
4	8.36	0.067	2.460	1126	0.90	3653	4059	N/A	3.25	N/A	3.61	ReStrip
5	10.82	0.067	2.460	1054	0.90	3653	4059	N/A	3.46	N/A	3.85	ReStrip
6	13.28	0.067	2.460	979	0.90	3653	4059	N/A	3.73	N/A	4.15	ReStrip
7	15.74	0.067	2.460	905	0.90	3653	4059	N/A	4.04	N/A	4.49	ReStrip
8	18.20	0.044	3.690	814	0.90	2435	2706	N/A	2.99	N/A	3.32	ReStrip
9	20.66	0.133	1.230	704	0.90	7306	8118	N/A	10.37	N/A	11.53	ReStrip
10	23.12	0.133	1.230	721	0.90	7306	8118	N/A	10.13	N/A	11.26	ReStrip

RESULTS for CONNECTION (seismic conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	1624	0.90	7306	8118	N/A	4.50	N/A	5.00	ReStrip
2	3.44	0.133	1.230	1642	0.90	7306	8118	N/A	4.45	N/A	4.94	ReStrip
3	5.90	0.133	1.230	1545	0.90	7306	8118	N/A	4.73	N/A	5.26	ReStrip
4	8.36	0.067	2.460	1470	0.90	3653	4059	N/A	2.48	N/A	2.76	ReStrip
5	10.82	0.067	2.460	1380	0.90	3653	4059	N/A	2.65	N/A	2.94	ReStrip
6	13.28	0.067	2.460	1292	0.90	3653	4059	N/A	2.83	N/A	3.14	ReStrip
7	15.74	0.067	2.460	1218	0.90	3653	4059	N/A	3.00	N/A	3.33	ReStrip
8	18.20	0.044	3.690	1127	0.90	2435	2706	N/A	2.16	N/A	2.40	ReStrip
9	20.66	0.133	1.230	1017	0.90	7306	8118	N/A	7.18	N/A	7.98	ReStrip
10	23.12	0.133	1.230	1034	0.90	7306	8118	N/A	7.07	N/A	7.85	ReStrip

GLOBAL/COMPOUND STABILITY ANALYSIS (Using Bishop method and ROR = 0.0)

A horizontal seismic coefficient, Kh=Alpha zero, equal to 0.372 has been applied.
The seismic force is applied at the center of the sliding mass.

STATIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 3.086
(it corresponds to a critical circle at Xc = 0.00, Yc = 40.00 and R = 50.00 [ft] where (x=0, y=0) is taken at the TOE or Xc = 120.00, Yc = 1040.00 and R = 50.00 [ft] when the terrain coordinate system is used as shown in the table below.)

SEISMIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 1.399
(it corresponds to a critical circle at Xc = 10.00, Yc = 75.00 and R = 88.33 [ft] where (x=0, y=0) is taken at the TOE or Xc = 130.00, Yc = 1075.00 and R = 88.33 [ft] when the terrain coordinate system is used as shown in the table below.)

TERRAIN/WATER PROFILE

Point	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Soil layer #1:	γ = 110.00 [lb/ft ^{3}]			ϕ = 5.0°		c = 1000.00 [lb/ft ^{2}]					
x [ft]	0.0	20.0	40.0	70.0	90.0	119.9	120.0	270.0	280.0	290.0	300.0
y [ft]	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	1045.0	1045.0
Soil layer #2	γ = 120.00 [lb/ft ^{3}]			ϕ = 10.0°		c = 2000.00 [lb/ft ^{2}]					
x [ft]	0.0	50.0	100.0	150.0	200.0	250.0	275.0	280.0	290.0	295.0	300.0
y [ft]	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	994.5
Water table:											
x [ft]	0.0	32.8	65.6	98.4	131.2	164.0	196.9	229.7	262.5	295.3	300.0
y [ft]	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6

AASHTO DESIGN METHOD
SC-41 over Wando River

PROJECT IDENTIFICATION

Title: SC-41 over Wando River
Project Number: G4067
Client: Triplett-King & Associates
Designer: F&ME Consultants
Station Number:

Description:

Hypothetical: Static and SEE Evaluation; 22 Foot High MSE Wall; Light-Weight Stone Backfill (Option 2); Foundation c=0.35 ksf; phi=23 degrees

Company's information:

Name: F&ME Consultants
Street: 3112 Devine Street

Columbia, SC 29205
Telephone #: (803) 245-4540
Fax #: (803) 254-4542
E-Mail: mmiller@fmecol.com

Original file path and name: C:\MSEW Version 2.0\SC41 over Wando - 22' Wall.BEN
Original date and time of creating this file: Sat Dec 11 12:30:43 2004

PROGRAM MODE:

ANALYSIS
of a SIMPLE STRUCTURE
using METAL STRIPS as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	60.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	38.0 °

RETAINED SOIL

Unit weight, γ	60.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	38.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	110.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	23.0 °
Equivalent cohesion, $c_{equiv.}$	350.0 lb/ft ^{2}

Water table is at wall base elevation

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2379 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Ka (external stability) = 0.2379 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 18.05 $N\gamma$ = 8.20

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.372
Kae ($\alpha_o > 0$) = 0.5241 Kae ($\alpha_o = 0$) = 0.2379 Δ Kae = 0.2862 (see eq. 37 in DEMO 82)
Seismic soil-metal strip friction coefficient, F* is 80.0% of its specified static value.

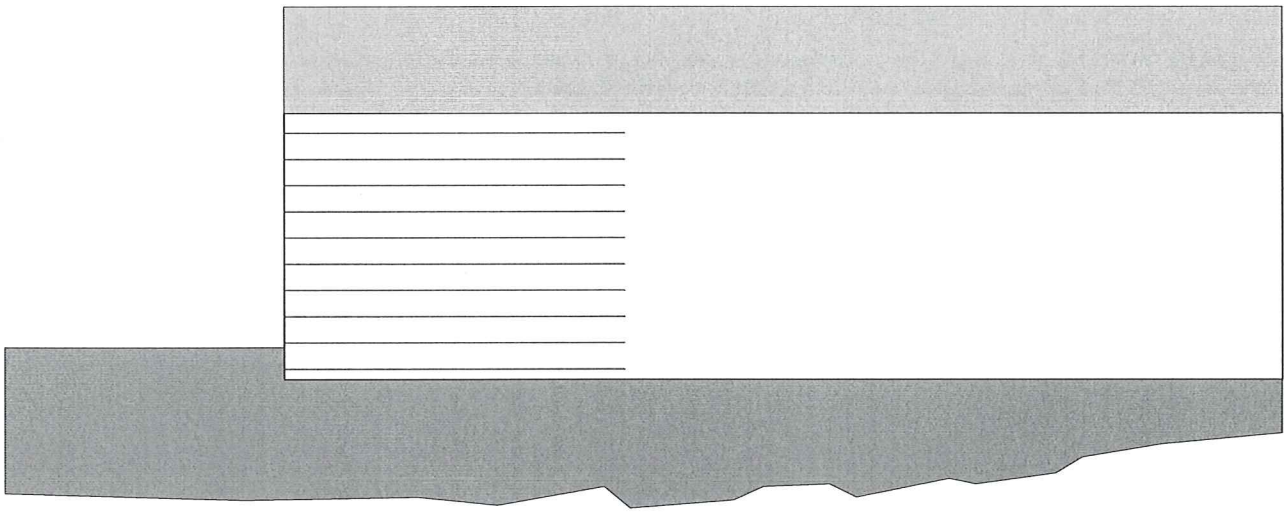
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	25.00	[ft]	{ Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 22.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft ^{2}], and live load is 250.0 [lb/ft ^{2}]

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 5.61, Meyerhof stress = 2157 lb/ft².
Foundation Interface: Direct sliding, Fs = 4.704, Eccentricity, e/L = 0.0415, Fs-overturning = 12.05

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	5.98	6.64	6.642	9.052	6.063	0.0388	ReStrip
2	3.44	32.00	1	N/A	5.80	6.45	6.446	7.641	6.562	0.0326	ReStrip
3	5.90	32.00	1	N/A	6.19	6.87	6.873	7.278	7.160	0.0268	ReStrip
4	8.36	32.00	1	N/A	3.25	3.61	3.606	3.747	7.893	0.0214	ReStrip
5	10.82	32.00	1	N/A	3.46	3.85	3.849	3.786	8.818	0.0166	ReStrip
6	13.28	32.00	1	N/A	3.73	4.15	4.147	3.798	10.040	0.0123	ReStrip
7	15.74	32.00	1	N/A	4.04	4.49	4.486	3.843	11.759	0.0085	ReStrip
8	18.20	32.00	1	N/A	2.99	3.32	3.323	2.550	14.452	0.0052	ReStrip
9	20.66	32.00	1	N/A	10.37	11.53	11.527	7.463	19.626	0.0025	ReStrip
10	23.12	32.00	1	N/A	10.13	11.26	11.260	5.600	36.517	0.0006	ReStrip

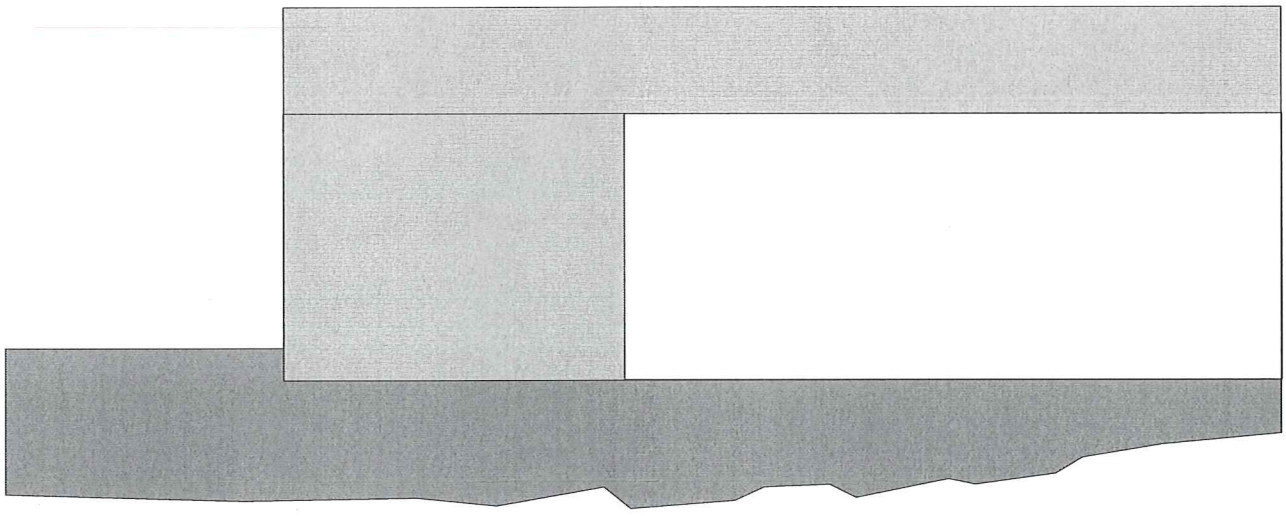
ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 4.49, Meyerhof stress = 2512 lb/ft².
Foundation Interface: Direct sliding, Fs = 1.983, Eccentricity, e/L = 0.1164, Fs-overturning = 4.30

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	4.50	5.00	5.000	5.451	2.580	0.1076	ReStrip
2	3.44	32.00	1	N/A	4.45	4.94	4.945	4.689	2.866	0.0870	ReStrip
3	5.90	32.00	1	N/A	4.73	5.26	5.255	4.452	3.223	0.0686	ReStrip
4	8.36	32.00	1	N/A	2.48	2.76	2.761	2.295	3.684	0.0524	ReStrip
5	10.82	32.00	1	N/A	2.65	2.94	2.941	2.314	4.299	0.0383	ReStrip
6	13.28	32.00	1	N/A	2.83	3.14	3.142	2.302	5.164	0.0264	ReStrip
7	15.74	32.00	1	N/A	3.00	3.33	3.333	2.284	6.473	0.0167	ReStrip
8	18.20	32.00	1	N/A	2.16	2.40	2.400	1.473	8.693	0.0092	ReStrip
9	20.66	32.00	1	N/A	7.18	7.98	7.980	4.133	13.331	0.0039	ReStrip
10	23.12	32.00	1	N/A	7.07	7.85	7.851	3.124	29.655	0.0008	ReStrip

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
Water table is at wall base elevation	12104	11286	[lb/ft ²]
Meyerhof stress, σ_V	2156.6	2512	[lb/ft ²]
Eccentricity, e	1.16	3.26	[ft]
Eccentricity, e/L	0.036	0.102	
Fs calculated	5.61	4.49	
Base length	32.00	32.00	[ft]



SCALE:

0 2 4 6 8 10[ft]

DIRECT SLIDING for GIVEN LAYOUT
(for METAL STRIPS reinforcements)

Along reinforced and foundation soils interface: Fs-static = 4.704 and Fs-seismic = 1.983

#	Metal strip Elevation [ft]	Metal strip Length [ft]	Fs Static	Fs Seismic	Metal strip Type #	Product name
1	0.98	32.00	6.063	2.580	1	ReStrip
2	3.44	32.00	6.562	2.866	1	ReStrip
3	5.90	32.00	7.160	3.223	1	ReStrip
4	8.36	32.00	7.893	3.684	1	ReStrip
5	10.82	32.00	8.818	4.299	1	ReStrip
6	13.28	32.00	10.040	5.164	1	ReStrip
7	15.74	32.00	11.759	6.473	1	ReStrip
8	18.20	32.00	14.452	8.693	1	ReStrip
9	20.66	32.00	19.626	13.331	1	ReStrip
10	23.12	32.00	36.517	29.655	1	ReStrip

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0415, e/L seismic = 0.1164; Overturning: Fs-static = 12.05, Fs-seismic = 4.30

#	Metal strip Elevation [ft]	Metal strip Length [ft]	e / L Static	e / L Seismic	Metal strip Type #	Product name
1	0.98	32.00	0.0388	0.1076	1	ReStrip
2	3.44	32.00	0.0326	0.0870	1	ReStrip
3	5.90	32.00	0.0268	0.0686	1	ReStrip
4	8.36	32.00	0.0214	0.0524	1	ReStrip
5	10.82	32.00	0.0166	0.0383	1	ReStrip
6	13.28	32.00	0.0123	0.0264	1	ReStrip
7	15.74	32.00	0.0085	0.0167	1	ReStrip
8	18.20	32.00	0.0052	0.0092	1	ReStrip
9	20.66	32.00	0.0025	0.0039	1	ReStrip
10	23.12	32.00	0.0006	0.0008	1	ReStrip

RESULTS for STRENGTH [Note: Actual Fs-overall = (Yield stress) / (Actual stress)]

#	Metal strip Elevation [ft]	Coverage ratio, Rc=b/Sh	Horizontal spacing, Sh [ft]	Long-term strength Fy·Ac·Rc/b [lb/ft]	Tmax [lb/ft]	Tmd [lb/ft]	Specified minimum Fs-overall static	Actual calculated Fs-overall static	Specified minimum Fs-overall seismic	Actual calculated Fs-overall seismic
1	0.98	0.133	1.230	8118	1222.17	401.36	N/A	6.642	N/A	5.000
2	3.44	0.133	1.230	8118	1259.34	382.50	N/A	6.446	N/A	4.945
3	5.90	0.133	1.230	8118	1181.20	363.64	N/A	6.873	N/A	5.255
4	8.36	0.067	2.460	4059	1125.57	344.78	N/A	3.606	N/A	2.761
5	10.82	0.067	2.460	4059	1054.47	325.92	N/A	3.849	N/A	2.941
6	13.28	0.067	2.460	4059	978.92	313.07	N/A	4.147	N/A	3.142
7	15.74	0.067	2.460	4059	904.92	313.07	N/A	4.486	N/A	3.333
8	18.20	0.044	3.690	2706	814.26	313.07	N/A	3.323	N/A	2.400
9	20.66	0.133	1.230	8118	704.30	313.07	N/A	11.527	N/A	7.980
10	23.12	0.133	1.230	8118	721.00	313.07	N/A	11.260	N/A	7.851

RESULTS for PULLOUT

NOTE: Uniform live load is not included in calculating the overburden pressure used to assess pullout resistance.

#	Metal strip Elevation [ft]	Coverage Ratio Rc=b/Sh	Tmax [lb/ft]	Tmd [lb/ft]	Le [ft] (see NOTE)	La [ft] (see NOTE)	Avail.Static Pullout, Pr [lb/ft]	Specified Static Fs	Actual Static Fs	Avail.Seism. Pullout, Pr [lb/ft]	Specified Seismic Fs	Actual Seismic Fs
1	0.98	0.133	1222	401	31.41	0.59	11063.1	N/A	9.052	8850.5	N/A	5.451
2	3.44	0.133	1259	383	29.93	2.07	9622.7	N/A	7.641	7698.1	N/A	4.689
3	5.90	0.133	1181	364	28.46	3.54	8596.8	N/A	7.278	6877.5	N/A	4.452
4	8.36	0.067	1126	345	26.98	5.02	4217.3	N/A	3.747	3373.9	N/A	2.295
5	10.82	0.067	1054	326	25.51	6.49	3992.6	N/A	3.786	3194.1	N/A	2.314
6	13.28	0.067	979	313	24.50	7.50	3717.7	N/A	3.798	2974.2	N/A	2.302
7	15.74	0.067	905	313	24.50	7.50	3477.5	N/A	3.843	2782.0	N/A	2.284
8	18.20	0.044	814	313	24.50	7.50	2076.2	N/A	2.550	1661.0	N/A	1.473
9	20.66	0.133	704	313	24.50	7.50	5256.1	N/A	7.463	4204.9	N/A	4.133
10	23.12	0.133	721	313	24.50	7.50	4037.6	N/A	5.600	3230.1	N/A	3.124

RESULTS for CONNECTION (static conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	1222	0.90	7306	8118	N/A	5.98	N/A	6.64	ReStrip
2	3.44	0.133	1.230	1259	0.90	7306	8118	N/A	5.80	N/A	6.45	ReStrip
3	5.90	0.133	1.230	1181	0.90	7306	8118	N/A	6.19	N/A	6.87	ReStrip
4	8.36	0.067	2.460	1126	0.90	3653	4059	N/A	3.25	N/A	3.61	ReStrip
5	10.82	0.067	2.460	1054	0.90	3653	4059	N/A	3.46	N/A	3.85	ReStrip
6	13.28	0.067	2.460	979	0.90	3653	4059	N/A	3.73	N/A	4.15	ReStrip
7	15.74	0.067	2.460	905	0.90	3653	4059	N/A	4.04	N/A	4.49	ReStrip
8	18.20	0.044	3.690	814	0.90	2435	2706	N/A	2.99	N/A	3.32	ReStrip
9	20.66	0.133	1.230	704	0.90	7306	8118	N/A	10.37	N/A	11.53	ReStrip
10	23.12	0.133	1.230	721	0.90	7306	8118	N/A	10.13	N/A	11.26	ReStrip

RESULTS for CONNECTION (seismic conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	1624	0.90	7306	8118	N/A	4.50	N/A	5.00	ReStrip
2	3.44	0.133	1.230	1642	0.90	7306	8118	N/A	4.45	N/A	4.94	ReStrip
3	5.90	0.133	1.230	1545	0.90	7306	8118	N/A	4.73	N/A	5.26	ReStrip
4	8.36	0.067	2.460	1470	0.90	3653	4059	N/A	2.48	N/A	2.76	ReStrip
5	10.82	0.067	2.460	1380	0.90	3653	4059	N/A	2.65	N/A	2.94	ReStrip
6	13.28	0.067	2.460	1292	0.90	3653	4059	N/A	2.83	N/A	3.14	ReStrip
7	15.74	0.067	2.460	1218	0.90	3653	4059	N/A	3.00	N/A	3.33	ReStrip
8	18.20	0.044	3.690	1127	0.90	2435	2706	N/A	2.16	N/A	2.40	ReStrip
9	20.66	0.133	1.230	1017	0.90	7306	8118	N/A	7.18	N/A	7.98	ReStrip
10	23.12	0.133	1.230	1034	0.90	7306	8118	N/A	7.07	N/A	7.85	ReStrip

GLOBAL/COMPOUND STABILITY ANALYSIS (Using Bishop method and ROR = 0.0)

A horizontal seismic coefficient, Kh=Alpha zero, equal to 0.372 has been applied.
The seismic force is applied at the center of the sliding mass.

STATIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 2.785
(it corresponds to a critical circle at Xc = 0.00, Yc = 45.00 and R = 54.08 [ft] where (x=0, y=0) is taken at the TOE or Xc = 120.00, Yc = 1045.00 and R = 54.08 [ft] when the terrain coordinate system is used as shown in the table below.)

SEISMIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 1.281
(it corresponds to a critical circle at Xc = -10.00, Yc = 75.00 and R = 88.33 [ft] where (x=0, y=0) is taken at the TOE or Xc = 110.00, Yc = 1075.00 and R = 88.33 [ft] when the terrain coordinate system is used as shown in the table below.)

TERRAIN/WATER PROFILE

Point	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Soil layer #1:	γ = 110.00 [lb/ft ^{3}]			ϕ = 23.0°		c = 350.00 [lb/ft ^{2}]					
x [ft]	0.0	20.0	40.0	70.0	90.0	119.9	120.0	270.0	280.0	290.0	300.0
y [ft]	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	1045.0	1045.0
Soil layer #2	γ = 120.00 [lb/ft ^{3}]			ϕ = 10.0°		c = 2000.00 [lb/ft ^{2}]					
x [ft]	0.0	50.0	100.0	150.0	200.0	250.0	275.0	280.0	290.0	295.0	300.0
y [ft]	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	994.5
Water table:											
x [ft]	0.0	32.8	65.6	98.4	131.2	164.0	196.9	229.7	262.5	295.3	300.0
y [ft]	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6

AASHTO DESIGN METHOD
SC-41 over Wando River

PROJECT IDENTIFICATION

Title: SC-41 over Wando River
Project Number: G4067
Client: Triplett-King & Associates
Designer: F&ME Consultants
Station Number:

Description:

Hypothetical: SEE Evaluation; 22 Foot High MSE Wall; Light-Weight Stone Backfill (Option 2) FOUNDATION C=0.75 KSF phi = 15 DEGREES

Company's information:

Name: F&ME Consultants
Street: 3112 Devine Street

Columbia, SC 29205
Telephone #: (803) 245-4540
Fax #: (803) 254-4542
E-Mail: mmiller@fmecol.com

Original file path and name: C:\MSEW Version 2.0\SC41 over Wando - 22' Wall.BEN
Original date and time of creating this file: Sat Dec 11 12:30:43 2004

PROGRAM MODE:

ANALYSIS
of a SIMPLE STRUCTURE
using METAL STRIPS as reinforcing material.

SOIL DATA

REINFORCED SOIL

Unit weight, γ	60.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	38.0 °

RETAINED SOIL

Unit weight, γ	60.0 lb/ft ^{3}
Design value of internal angle of friction, ϕ	38.0 °

FOUNDATION SOIL (Considered as an equivalent uniform soil)

Equivalent unit weight, $\gamma_{equiv.}$	110.0 lb/ft ^{3}
Equivalent internal angle of friction, $\phi_{equiv.}$	15.0 °
Equivalent cohesion, $c_{equiv.}$	750.0 lb/ft ^{2}

Water table is at wall base elevation

LATERAL EARTH PRESSURE COEFFICIENTS

Ka (internal stability) = 0.2379 (if batter is less than 10°, Ka is calculated from eq. 15. Otherwise, eq. 38 is utilized)
Ka (external stability) = 0.2379 (if batter is less than 10°, Ka is calculated from eq. 16. Otherwise, eq. 17 is utilized)

BEARING CAPACITY

Bearing capacity coefficients (calculated by MSEW): Nc = 10.98 $N\gamma$ = 2.65

SEISMICITY

Maximum ground acceleration coefficient, α_o = 0.372
Kae ($\alpha_o > 0$) = 0.5241 Kae ($\alpha_o = 0$) = 0.2379 Δ Kae = 0.2862 (see eq. 37 in DEMO 82)
Seismic soil-metal strip friction coefficient, F* is 80.0% of its specified static value.

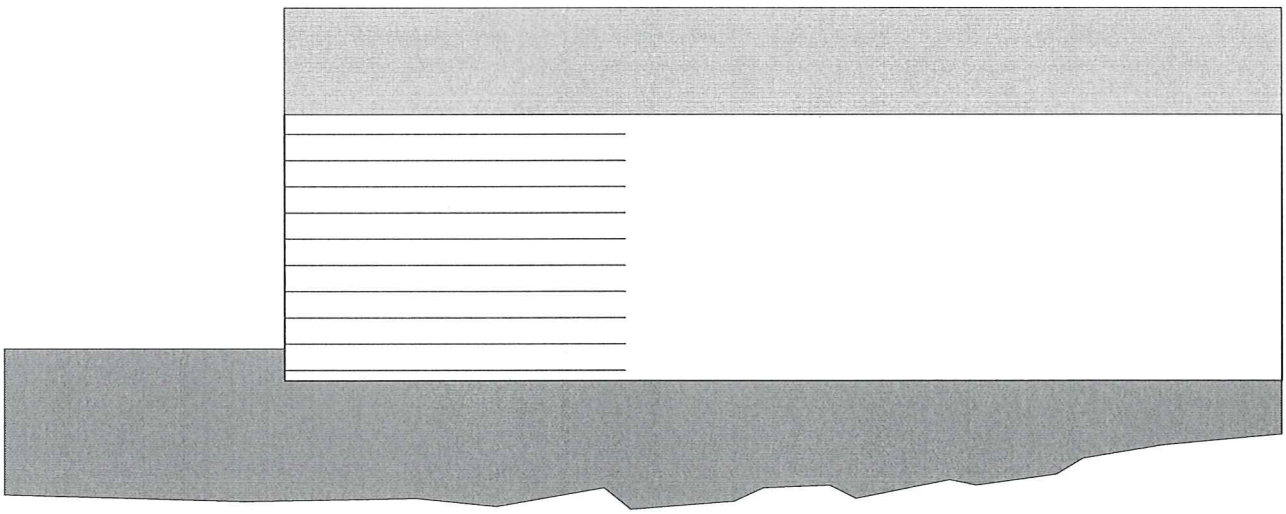
INPUT DATA: Geometry and Surcharge loads (of a SIMPLE STRUCTURE)

Design height, Hd	25.00	[ft]	{ Embedded depth is E = 3.00 ft, and height above top of finished bottom grade is H = 22.00 ft }
Batter, ω	0.0	[deg]	
Backslope, β	0.0	[deg]	
Backslope rise	0.0	[ft]	Broken back equivalent angle, I = 0.00° (see Fig. 25 in DEMO 82)

UNIFORM SURCHARGE

Uniformly distributed dead load is 250.0 [lb/ft ²], and live load is 250.0 [lb/ft ²]

ANALYZED REINFORCEMENT LAYOUT:



SCALE:

0 2 4 6 8 10[ft]

ANALYSIS: CALCULATED FACTORS (Static conditions)

Bearing capacity, Fs = 4.68, Meyerhof stress = 2157 lb/ft².
Foundation Interface: Direct sliding, Fs = 5.247, Eccentricity, e/L = 0.0415, Fs-overturning = 12.05

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	5.98	6.64	6.642	9.052	6.063	0.0388	ReStrip
2	3.44	32.00	1	N/A	5.80	6.45	6.446	7.641	6.562	0.0326	ReStrip
3	5.90	32.00	1	N/A	6.19	6.87	6.873	7.278	7.160	0.0268	ReStrip
4	8.36	32.00	1	N/A	3.25	3.61	3.606	3.747	7.893	0.0214	ReStrip
5	10.82	32.00	1	N/A	3.46	3.85	3.849	3.786	8.818	0.0166	ReStrip
6	13.28	32.00	1	N/A	3.73	4.15	4.147	3.798	10.040	0.0123	ReStrip
7	15.74	32.00	1	N/A	4.04	4.49	4.486	3.843	11.759	0.0085	ReStrip
8	18.20	32.00	1	N/A	2.99	3.32	3.323	2.550	14.452	0.0052	ReStrip
9	20.66	32.00	1	N/A	10.37	11.53	11.527	7.463	19.626	0.0025	ReStrip
10	23.12	32.00	1	N/A	10.13	11.26	11.260	5.600	36.517	0.0006	ReStrip

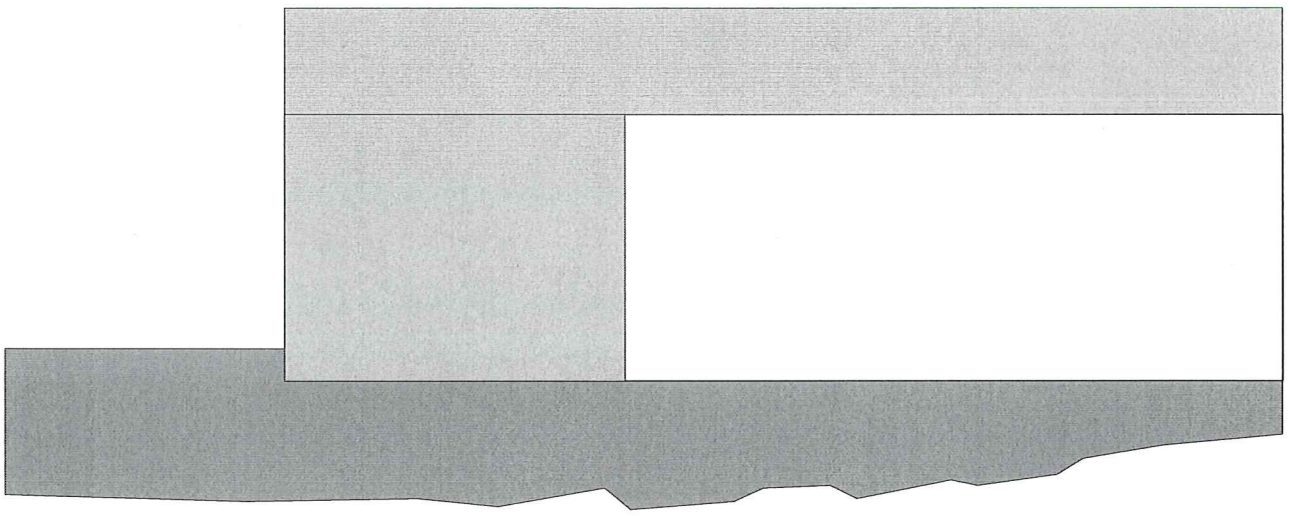
ANALYSIS: CALCULATED FACTORS (Seismic conditions)

Bearing capacity, Fs = 3.92, Meyerhof stress = 2512 lb/ft².
Foundation Interface: Direct sliding, Fs = 2.212, Eccentricity, e/L = 0.1164, Fs-overturning = 4.30

	METAL STRIP			CONNECTION							
#	Elevation [ft]	Length [ft]	Type #	Fs-overall [pullout resistance]	Fs-overall [connection break]	Fs-overall [metal strip strength]	Metal strip strength Fs	Pullout resistance Fs	Direct sliding Fs	Eccentricity e/L	Product name
1	0.98	32.00	1	N/A	4.50	5.00	5.000	5.451	2.580	0.1076	ReStrip
2	3.44	32.00	1	N/A	4.45	4.94	4.945	4.689	2.866	0.0870	ReStrip
3	5.90	32.00	1	N/A	4.73	5.26	5.255	4.452	3.223	0.0686	ReStrip
4	8.36	32.00	1	N/A	2.48	2.76	2.761	2.295	3.684	0.0524	ReStrip
5	10.82	32.00	1	N/A	2.65	2.94	2.941	2.314	4.299	0.0383	ReStrip
6	13.28	32.00	1	N/A	2.83	3.14	3.142	2.302	5.164	0.0264	ReStrip
7	15.74	32.00	1	N/A	3.00	3.33	3.333	2.284	6.473	0.0167	ReStrip
8	18.20	32.00	1	N/A	2.16	2.40	2.400	1.473	8.693	0.0092	ReStrip
9	20.66	32.00	1	N/A	7.18	7.98	7.980	4.133	13.331	0.0039	ReStrip
10	23.12	32.00	1	N/A	7.07	7.85	7.851	3.124	29.655	0.0008	ReStrip

BEARING CAPACITY for GIVEN LAYOUT

	STATIC	SEISMIC	UNITS
Water table is at wall base elevation	10101	9837	[lb/ft ²]
Meyerhof stress, σ_V	2156.6	2512	[lb/ft ²]
Eccentricity, e	1.16	3.26	[ft]
Eccentricity, e/L	0.036	0.102	
Fs calculated	4.68	3.92	
Base length	32.00	32.00	[ft]



SCALE:

0 2 4 6 8 10[ft]

DIRECT SLIDING for GIVEN LAYOUT
(for METAL STRIPS reinforcements)

Along reinforced and foundation soils interface: Fs-static = 5.247 and Fs-seismic = 2.212

#	Metal strip Elevation [ft]	Metal strip Length [ft]	Fs Static	Fs Seismic	Metal strip Type #	Product name
1	0.98	32.00	6.063	2.580	1	ReStrip
2	3.44	32.00	6.562	2.866	1	ReStrip
3	5.90	32.00	7.160	3.223	1	ReStrip
4	8.36	32.00	7.893	3.684	1	ReStrip
5	10.82	32.00	8.818	4.299	1	ReStrip
6	13.28	32.00	10.040	5.164	1	ReStrip
7	15.74	32.00	11.759	6.473	1	ReStrip
8	18.20	32.00	14.452	8.693	1	ReStrip
9	20.66	32.00	19.626	13.331	1	ReStrip
10	23.12	32.00	36.517	29.655	1	ReStrip

ECCENTRICITY for GIVEN LAYOUT

At interface with foundation: e/L static = 0.0415, e/L seismic = 0.1164; Overturning: Fs-static = 12.05, Fs-seismic = 4.30

#	Metal strip Elevation [ft]	Metal strip Length [ft]	e / L Static	e / L Seismic	Metal strip Type #	Product name
1	0.98	32.00	0.0388	0.1076	1	ReStrip
2	3.44	32.00	0.0326	0.0870	1	ReStrip
3	5.90	32.00	0.0268	0.0686	1	ReStrip
4	8.36	32.00	0.0214	0.0524	1	ReStrip
5	10.82	32.00	0.0166	0.0383	1	ReStrip
6	13.28	32.00	0.0123	0.0264	1	ReStrip
7	15.74	32.00	0.0085	0.0167	1	ReStrip
8	18.20	32.00	0.0052	0.0092	1	ReStrip
9	20.66	32.00	0.0025	0.0039	1	ReStrip
10	23.12	32.00	0.0006	0.0008	1	ReStrip

RESULTS for STRENGTH [Note: Actual Fs-overall = (Yield stress) / (Actual stress)]

#	Metal strip Elevation [ft]	Coverage ratio, Rc=b/Sh	Horizontal spacing, Sh [ft]	Long-term strength Fy·Ac·Rc/b [lb/ft]	Tmax [lb/ft]	Tmd [lb/ft]	Specified minimum Fs-overall static	Actual calculated Fs-overall static	Specified minimum Fs-overall seismic	Actual calculated Fs-overall seismic
1	0.98	0.133	1.230	8118	1222.17	401.36	N/A	6.642	N/A	5.000
2	3.44	0.133	1.230	8118	1259.34	382.50	N/A	6.446	N/A	4.945
3	5.90	0.133	1.230	8118	1181.20	363.64	N/A	6.873	N/A	5.255
4	8.36	0.067	2.460	4059	1125.57	344.78	N/A	3.606	N/A	2.761
5	10.82	0.067	2.460	4059	1054.47	325.92	N/A	3.849	N/A	2.941
6	13.28	0.067	2.460	4059	978.92	313.07	N/A	4.147	N/A	3.142
7	15.74	0.067	2.460	4059	904.92	313.07	N/A	4.486	N/A	3.333
8	18.20	0.044	3.690	2706	814.26	313.07	N/A	3.323	N/A	2.400
9	20.66	0.133	1.230	8118	704.30	313.07	N/A	11.527	N/A	7.980
10	23.12	0.133	1.230	8118	721.00	313.07	N/A	11.260	N/A	7.851

RESULTS for PULLOUT

NOTE: Uniform live load is not included in calculating the overburden pressure used to assess pullout resistance.

#	Metal strip Elevation [ft]	Coverage Ratio Rc=b/Sh	Tmax [lb/ft]	Tmd [lb/ft]	Le [ft] (see NOTE)	La [ft]	Avail.Static Pullout, Pr [lb/ft]	Specified Static Fs	Actual Static Fs	Avail.Seism. Pullout, Pr [lb/ft]	Specified Seismic Fs	Actual Seismic Fs
1	0.98	0.133	1222	401	31.41	0.59	11063.1	N/A	9.052	8850.5	N/A	5.451
2	3.44	0.133	1259	383	29.93	2.07	9622.7	N/A	7.641	7698.1	N/A	4.689
3	5.90	0.133	1181	364	28.46	3.54	8596.8	N/A	7.278	6877.5	N/A	4.452
4	8.36	0.067	1126	345	26.98	5.02	4217.3	N/A	3.747	3373.9	N/A	2.295
5	10.82	0.067	1054	326	25.51	6.49	3992.6	N/A	3.786	3194.1	N/A	2.314
6	13.28	0.067	979	313	24.50	7.50	3717.7	N/A	3.798	2974.2	N/A	2.302
7	15.74	0.067	905	313	24.50	7.50	3477.5	N/A	3.843	2782.0	N/A	2.284
8	18.20	0.044	814	313	24.50	7.50	2076.2	N/A	2.550	1661.0	N/A	1.473
9	20.66	0.133	704	313	24.50	7.50	5256.1	N/A	7.463	4204.9	N/A	4.133
10	23.12	0.133	721	313	24.50	7.50	4037.6	N/A	5.600	3230.1	N/A	3.124

RESULTS for CONNECTION (static conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	1222	0.90	7306	8118	N/A	5.98	N/A	6.64	ReStrip
2	3.44	0.133	1.230	1259	0.90	7306	8118	N/A	5.80	N/A	6.45	ReStrip
3	5.90	0.133	1.230	1181	0.90	7306	8118	N/A	6.19	N/A	6.87	ReStrip
4	8.36	0.067	2.460	1126	0.90	3653	4059	N/A	3.25	N/A	3.61	ReStrip
5	10.82	0.067	2.460	1054	0.90	3653	4059	N/A	3.46	N/A	3.85	ReStrip
6	13.28	0.067	2.460	979	0.90	3653	4059	N/A	3.73	N/A	4.15	ReStrip
7	15.74	0.067	2.460	905	0.90	3653	4059	N/A	4.04	N/A	4.49	ReStrip
8	18.20	0.044	3.690	814	0.90	2435	2706	N/A	2.99	N/A	3.32	ReStrip
9	20.66	0.133	1.230	704	0.90	7306	8118	N/A	10.37	N/A	11.53	ReStrip
10	23.12	0.133	1.230	721	0.90	7306	8118	N/A	10.13	N/A	11.26	ReStrip

RESULTS for CONNECTION (seismic conditions)

#	Metal strip Elevation [ft]	Coverage ratio Rc=b/Sh	Horizontal spacing, Sh [ft]	Connection force, To [lb/ft]	Reduction factor for connection break, CRu	Long-term connection strength,Tac (break criterion) [lb/ft]	Metal strip long-term strength, [lb/ft]	Fs-overall connection break		Fs-overall Metal strip strength		Product name
								Specified	Actual	Specified	Actual	
1	0.98	0.133	1.230	1624	0.90	7306	8118	N/A	4.50	N/A	5.00	ReStrip
2	3.44	0.133	1.230	1642	0.90	7306	8118	N/A	4.45	N/A	4.94	ReStrip
3	5.90	0.133	1.230	1545	0.90	7306	8118	N/A	4.73	N/A	5.26	ReStrip
4	8.36	0.067	2.460	1470	0.90	3653	4059	N/A	2.48	N/A	2.76	ReStrip
5	10.82	0.067	2.460	1380	0.90	3653	4059	N/A	2.65	N/A	2.94	ReStrip
6	13.28	0.067	2.460	1292	0.90	3653	4059	N/A	2.83	N/A	3.14	ReStrip
7	15.74	0.067	2.460	1218	0.90	3653	4059	N/A	3.00	N/A	3.33	ReStrip
8	18.20	0.044	3.690	1127	0.90	2435	2706	N/A	2.16	N/A	2.40	ReStrip
9	20.66	0.133	1.230	1017	0.90	7306	8118	N/A	7.18	N/A	7.98	ReStrip
10	23.12	0.133	1.230	1034	0.90	7306	8118	N/A	7.07	N/A	7.85	ReStrip

GLOBAL/COMPOUND STABILITY ANALYSIS (Using Bishop method and ROR = 0.0)

A horizontal seismic coefficient, Kh=Alpha zero, equal to 0.372 has been applied.
The seismic force is applied at the center of the sliding mass.

STATIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 3.151
(it corresponds to a critical circle at Xc = 0.00, Yc = 45.00 and R = 54.08 [ft] where (x=0, y=0) is taken as the TOE or Xc = 120.00, Yc = 1045.00 and R = 54.08 [ft] when the terrain coordinate system is used as shown in the table below.)

SEISMIC CONDITIONS:
For the specified search grid, the calculated minimum Fs is 1.465
(it corresponds to a critical circle at Xc = 0.00, Yc = 75.00 and R = 88.33 [ft] where (x=0, y=0) is taken as the TOE or Xc = 120.00, Yc = 1075.00 and R = 88.33 [ft] when the terrain coordinate system is used as shown in the table below.)

TERRAIN/WATER PROFILE

Point	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
Soil layer #1:	γ = 110.00 [lb/ft ^{3}]			ϕ = 15.0°		c = 750.00 [lb/ft ^{2}]					
x [ft]	0.0	20.0	40.0	70.0	90.0	119.9	120.0	270.0	280.0	290.0	300.0
y [ft]	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	996.0	1045.0	1045.0
Soil layer #2	γ = 120.00 [lb/ft ^{3}]			ϕ = 10.0°		c = 2000.00 [lb/ft ^{2}]					
x [ft]	0.0	50.0	100.0	150.0	200.0	250.0	275.0	280.0	290.0	295.0	300.0
y [ft]	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	982.0	994.5
Water table:											
x [ft]	0.0	32.8	65.6	98.4	131.2	164.0	196.9	229.7	262.5	295.3	300.0
y [ft]	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6	992.6